سافت استارتر پیشرفته دیجیتالی

سانترنو

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سافت استارتر پیشرفته

راهنمای نصب سریع

منتشر شده در تاریخ ۲۰۱۰/۳/۱

این کتابچه ، راهنمای کاربر بوده و می بایست بدقت مطالعه و از دستورالعملهای ارائه شده در آن برای ایمنی ، کاربرد و تعمیرات و نگهداری استفاده نمود .

از این دستگاه تنها برای مقاصد طراحی شده استفاده کنید . لذا سایر کاربردها ممکن است نادرست و نیز خطرناک باشد . تولید کننده مسئول خسارات احتمالی ناشی از استفاده نادرست، غلط و غیر منطقی نیست.

شرکت سانترنو الکتریک تنها در مقابل استفاده صحیح و برابر تنظیمات انجام شده ، پاسخگو می باشد

هر گونه تغییر در ساختار و یا چرخه عملکرد سیستم می بایست با مجوز و یا توسط گروه مهندسی شرکت سانترنو الکتریک انجام پذیرد

شرکت سانترنو هیچ مسئولیتی در قبال عواقب ناشی از استفاده از قطعات یدکی غیر اصلی ندارد

حق هرگونه تغییرات فنی در این کتابچه راهنما و دستگاه بدون نیاز به اطلاع قبلی نزد شرکت سانترنو محفوظ می باشد . هرگونه اشتباه در چاپ و یا مواردی از این دست ، در چاپهای آتی کتابچه راهنما اصلاح خواهد شد .

شرکت سانترنو مسوول کلیه اشتباهاتی است که در نسخه اصلی کتابچه راهنما به زبان ایتالیایی وجود دارد

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FAMCO هایپرصنعت

SANTERNO CARRARO GROUP

فهرست مطالب

۱- نکات ایمنی

این نماد در سراسر این کتابچه راهنمای کاربر برای جلب توجه موضوع ویژه ای در رابطه با نصب یا بهره برداری از سافت استارتر بکار رفته است .

نکات ایمنی بیان شده با وجودیکه تمامی علل آسیب تجهیزات را در بر نمیگیرد اما می تواند علل شایع و بلقوه آن را نشان دهد . مسوولیت خواندن و درک کلیه دستورالعملهای این راهنما قبل از نصب ، بهره برداری و تعمیرات و نگهداری بر عهده نصاب دستگاه می باشد . مضافاً اینکه عملکرد خوب الکتریکی و استفاده مناسب از لوازم و تجهیزات حفاظت فردی و پیروی از توصیه های این راهنما می تواند مثمر ثمر باشد .

مثالها و نمودارهای این کتابچه صرفاً جهت گویا کردن مطالب مربوطه می باشد . اطلاعات موجود در این کتابچه ممکن است در هر زمانی و بدون اطلاع قبلی به کاربران دچار تغییرات شود . در این حالت هیچگونه مسوولیت و تعهدی در قبال خسارات مستقیم یا غیرمستقیم وارده در نحوه عملکرد دستگاه پذیرفته نخواهد شد .

هشدار - خطر شوک الکتریکی

سافت استارتر با اتصال به منبع برق اصلی ، حاوی ولتاژ خطرناکی است . لذا تنها یک تعمیرکار آشنا به مسائل ایمنی مجاز به انجام اتصالات می باشد .نصب نادرست موتور یا سافت استارتر می تواند منجر به خرابی تجهیزات ، آسیب جدی و یا حتی خطر مرگ گردد . لذا پیروی از این کتابچه راهنما یا روشهای محلی ایمنی الکتریکی پیشنهاد می شود .

اتصال کوتاه

سافت استارتر مقاوم و ضدِ اتصال کوتاه نبوده ، لذا در صورت وقوع اتصال کوتاه یا اضافه بار شدید ، می بایست صحت عملکرد سافت استارتر توسط یک تعمیرکار مجاز کاملاً آزمایش گردد

حفاظت در مقابل اتصال زمین

مسولیت این نوع حفاظت بر اساس روشهای حفاظتی محلی ، برعهده کاربر دستگاه یا نصاب آن می باشد .

۲-معرفی

سافت استارتر **ASAB** یک سیستم دیجیتالی پیشرفته جهت موتورهای ۷ تا ۸۰۰ کیلوواتی می باشد . این سافت استارتر طیف کاملی از موتورها و سیستمهای حفاظتی را پوشش داده و طراحی آن بر اساس درخواست مشتری از قابلیت اجرای بالایی برخوردار می باشد .

۲-۱- لیست ویژگی ها

گستره تنظیمات استارت و استپ

- کنترل شتاب
- جریان ثابت
- شیب جریان
- شیب ولتاژ زمانبندی شده در هنگام ایست نرم
- ترمز

مدل شده برای کلیه اتصلات مورد نیاز

- ۲۳ آمپر تا ۱۶۰۰ آمپر (نامی)
- ۲۰۰ ولت متناوب تا ۵۲۵ ولت متناوب
- ۳۸۰ ولت متناوب تا ۶۹۰ ولت متناوب
- بای پاس داخلی تا ۲۲۰ آمپر (۱۱۰ کیلوواات)
- اتصال مثلث داخلی یا خارجی (تشخیص خودکار)

ورودی و خروجی ها

- ورودی کنترل از راه دور (سه ورودی ثابت و یک ورودی قابل برنامه ریزی)
- رله های خروجی (سه خروجی قابل برنامه ریزی)
- خروجی آنالوگ
- ماژولهای ارتباطی **Profibus , Modbus , DeviceNet** (اختیاری)

صفحه نمایش شفاف برای مشاهده با نمایش کامل عملکردها

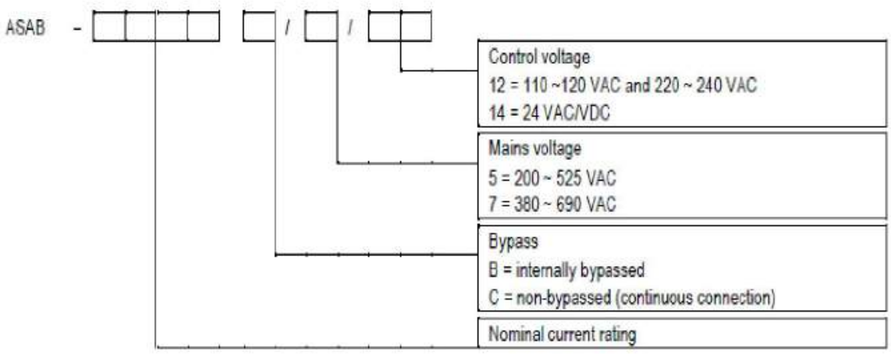
- چند زبانه
- صفحه نمایش چند وضعیتی با امکان نمایش عملکرد
- ثبت رویدادها با برچسب زمان و تاریخ وقوع
- شمارنده عملیاتی (تعداد استارت، ساعت کارکرد، ثبت انرژی الکتریکی مصرفی)
- نظارت بر عملکرد (جریان، ولتاژ، ضریب قدرت، انرژی الکتریکی)
- صفحه نمایش قابل برنامه ریزی توسط کاربر

حفاظتهای قابل برنامه ریزی

- اضافه بار
- زمان استارت بیش از حد
- افت جریان
- افزایش جریان آنی
- عدم تعادل جریان
- فرکانس منبع
- قطع ورودی
- مقاومت گرمایی موتور
- مدار قدرت
- توالی فاز

۲,۲مشخصات

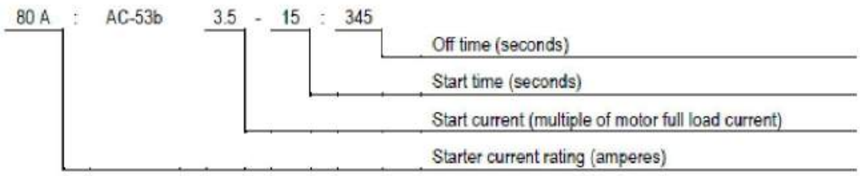
۲,۲,۱ مدل کد گذاری



۲,۲,۲. نرخ جریان

در مورد محدوده های جریانی که در نمودار زیر نیامده است اما در شرایط عملیاتی می باشند ، با فروشنده محلی خود تماس بگیرید

نرخ جریان در عملکرد بای پاس



اتصال مثلث داخلی

	AC53b 3.0-10:350 40 °C <1000 metres	AC53b 3.5-15:345 40 °C <1000 metres	AC53b 4.0-20:340 40 °C <1000 metres	AC53b 4.5-30:330 40 °C <1000 metres
ASAB-0023B	23 A	20 A	17 A	15 A
ASAB-0043B	43 A	37 A	31 A	26 A
ASAB-0053B	53 A	53 A	46 A	37 A
	AC53b 3.0-10:590 40 °C <1000 metres	**AC53b 3.5-15:585 40 °C <1000 metres**	**AC53b 4.0-20:580 40 °C <1000 metres**	**AC53b 4.5-30:570 40 °C <1000 metres**
ASAB-0076B	76 A	64 A	55 A	47 A
ASAB-0097B	97 A	82 A	69 A	58 A
ASAB-0100B	100 A	88 A	74 A	61 A
ASAB-0105B	105 A	105 A	95 A	78 A
ASAB-0145B	145 A	123 A	106 A	90 A
ASAB-0170B	170 A	145 A	121 A	97 A
ASAB-0200B	200 A	189 A	160 A	134 A
ASAB-0220B	220 A	210 A	178 A	148 A
ASAB-0255C	255 A	231 A	201 A	176 A
ASAB-0380C	380 A	380 A	359 A	299 A
ASAB-0430C	430 A	430 A	368 A	309 A
ASAB-0620C	620 A	620 A	540 A	434 A
ASAB-0650C	650 A	650 A	561 A	455 A
ASAB-0790C	790 A	790 A	714 A	579 A
ASAB-0930C	930 A	930 A	829 A	661 A
ASAB-1200C	1200 A	1200 A	1200 A	1071 A
ASAB-1410C	1410 A	1410 A	1319 A	1114 A
ASAB-1600C	1600 A	1600 A	1600 A	1353 A

نکته :

مدلهای ASAB-۱۶۰۰C~ASAB-۰۲۵۵C می بایست بصورت خارجی بای پاس گردد

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اتصال مثلث خارجی

	AC53b 3.0-10:350 40 °C <1000 metres	AC53b 3.5-15:345 40 °C <1000 metres	AC53b 4.0-20:340 40 °C <1000 metres	AC53b 4.5-30:330 40 °C <1000 metres
ASAB-0023B	35 A	30 A	26 A	22 A
ASAB-0043B	65 A	59 A	51 A	44 A
ASAB-0053B	80 A	80 A	69 A	55 A
	AC53b 3.0-10:590 40 °C <1000 metres	**AC53b 3.5-15:585 40 °C <1000 metres**	**AC53b 4.0-20:580 40 °C <1000 metres**	**AC53b 4.5-30:570 40 °C <1000 metres**
ASAB-0076B	114 A	96 A	83 A	70 A
ASAB-0097B	146 A	123 A	104 A	87 A
ASAB-0100B	150 A	132 A	112 A	92 A
ASAB-0105B	158 A	158 A	143 A	117 A
ASAB-0145B	218 A	184 A	159 A	136 A
ASAB-0170B	255 A	217 A	181 A	146 A
ASAB-0200B	300 A	283 A	241 A	200 A
ASAB-0220B	330 A	315 A	268 A	223 A
ASAB-0255C	383 A	346 A	302 A	264 A
ASAB-0380C	570 A	570 A	539 A	449 A
ASAB-0430C	645 A	645 A	552 A	464 A
ASAB-0620C	930 A	930 A	810 A	651 A
ASAB-0650C	975 A	975 A	842 A	683 A
ASAB-0790C	1185 A	1185 A	1071 A	868 A
ASAB-0930C	1395 A	1395 A	1244 A	992 A
ASAB-1200C	1800 A	1800 A	1800 A	1606 A
ASAB-1410C	2115 A	2115 A	1979 A	1671 A
ASAB-1600C	2400 A	2400 A	2400 A	2030 A

نرخ جریان برای حالت کار مداوم (بدون بای پاس)

351 A : AC-53a 3.5 - 15 : 50 - 6

Starts per hour

On-load duty cycle (%)

Start time (seconds)

Start current (multiple of motor full load current)

Starter current rating (amperes)

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In-line connection

	AC53a 3-10:50-6 40 °C <1000 metres	AC53a 3.5-15:50-6 40 °C <1000 metres	AC53a 4-20:50-6 40 °C <1000 metres	AC53a 4.5-30:50-6 40 °C <1000 metres
ASAB-0255C	255 A	222 A	195 A	171 A
ASAB-0380C	380 A	380 A	348 A	292 A
ASAB-0430C	430 A	413 A	355 A	301 A
ASAB-0620C	620 A	614 A	515 A	419 A
ASAB-0650C	650 A	629 A	532 A	437 A
ASAB-0790C	790 A	790 A	694 A	567 A
ASAB-0930C	930 A	930 A	800 A	644 A
ASAB-1200C	1200 A	1200 A	1135 A	983 A
ASAB-1410C	1410 A	1355 A	1187 A	1023 A
ASAB-1600C	1600 A	1600 A	1433 A	1227 A

Inside delta connection

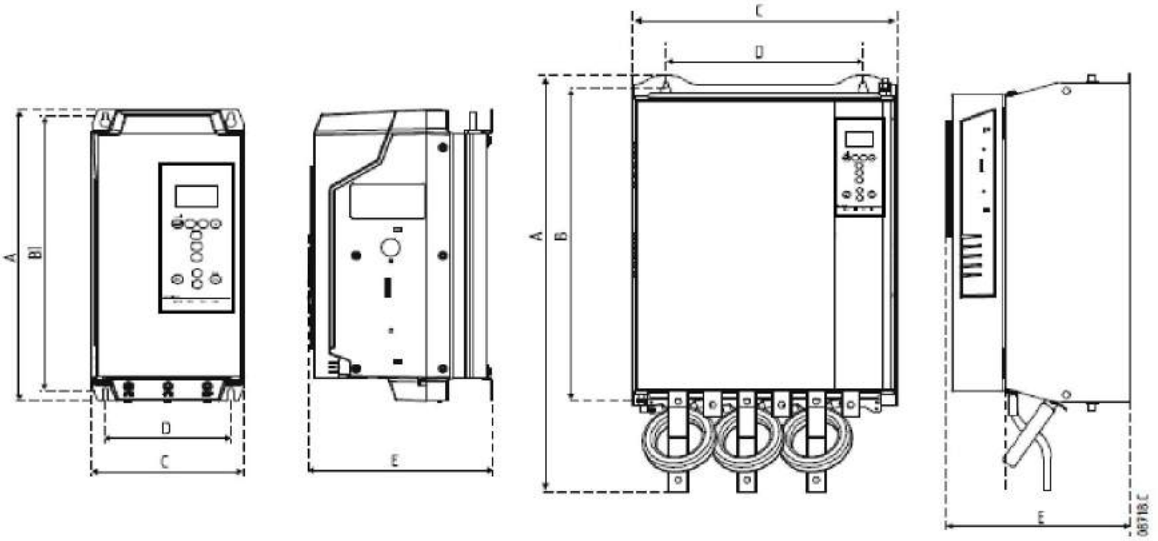
	AC53a 3-10:50-6 40 °C <1000 metres	AC53a 3.5-15:50-6 40 °C <1000 metres	AC53a 4-20:50-6 40 °C <1000 metres	AC53a 4.5-30:50-6 40 °C <1000 metres
ASAB-0255C	382 A	334 A	293 A	257 A
ASAB-0380C	570 A	570 A	522 A	437 A
ASAB-0430C	645 A	620 A	533 A	451 A
ASAB-0620C	930 A	920 A	773 A	628 A
ASAB-0650C	975 A	943 A	798 A	656 A
ASAB-0790C	1185 A	1185 A	1041 A	850 A
ASAB-0930C	1395 A	1395 A	1200 A	966 A
ASAB-1200C	1800 A	1800 A	1702 A	1474 A
ASAB-1410C	2115 A	2033 A	1780 A	1535 A
ASAB-1600C	2400 A	2400 A	2149 A	1840 A

حداقل و حداکثر تنظیمات جریان

حداقل و حداکثر تنظیمات جریان در بار کامل و با توجه به نوع مدل :

	In-line connection		Inside delta connection	
Model	Minimum	Maximum	Minimum	Maximum
ASAB-0023B	5 A	23 A	5 A	34 A
ASAB-0043B	9 A	43 A	9 A	64 A
ASAB-0053B	11 A	53 A	11 A	79 A
ASAB-0076B	15 A	76 A	15 A	114 A
ASAB-0097B	19 A	97 A	19 A	145 A
ASAB-0100B	20 A	100 A	20 A	150 A
ASAB-0105B	21 A	105 A	21 A	157 A
ASAB-0145B	29 A	145 A	29 A	217 A
ASAB-0170B	34 A	170 A	34 A	255 A
ASAB-0200B	40 A	200 A	40 A	300 A
ASAB-0220B	44 A	220 A	44 A	330 A
ASAB-0255C	51 A	255 A	51 A	382 A
ASAB-0380C	76 A	380 A	76 A	570 A
ASAB-0430C	86 A	430 A	86 A	645 A
ASAB-0620C	124 A	620 A	124 A	930 A
ASAB-0650C	130 A	650 A	130 A	975 A
ASAB-0790C	158 A	790 A	158 A	1185 A
ASAB-0930C	186 A	930 A	186 A	1395 A
ASAB-1200C	240 A	1200 A	240 A	1800 A
ASAB-1410C	282 A	1410 A	282 A	2115 A
ASAB-1600C	320 A	1600 A	320 A	2400 A

۲,۲,۳- ابعاد و اوزان



Model	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	E mm (inch)	Weight kg (lb)
ASAB-0023B ASAB-0043B ASAB-0053B	295 (11.6)	278 (10.9)	150 (5.9)	124 (4.9)	182 (7.2)	4.2 (9.3)
ASAB-0076B						4.5 (9.9)
ASAB-0097B ASAB-0100B ASAB-0105B					212 (8.14)	4.9 (10.8)
ASAB-0145B ASAB-0170B ASAB-0200B ASAB-0220B	438 (17.2)	380 (15.0)	275 (10.8)	248 (9.8)	249 (9.8)	14.9 (32.8)
ASAB-0255C	460 (18.1)	400 (15.0)	390 (15.4)	320 (12.6)	278 (11.0)	23.9 (52.7)
ASAB-0380C ASAB-0430C	689 (27.1)	522 (20.5)	430 (16.9)	320 (12.6)	301 (11.9)	35 (77.2)
ASAB-0620C ASAB-0650C ASAB-0790C ASAB-0930C						45 (99.2)
ASAB-1200C ASAB-1410C ASAB-1600C	856 (33.7)	727 (28.6)	585 (23.0)	500 (19.7)	363 (14.3)	120 (264.6)

نکته :

برای مدلهای ASAB-۰۱۴۵B ~ ASAB-۱۶۰۰C ابعاد A و C یکسان می باشند . باس بارهایی که شامل این ابعاد نمیگردند ، از نظر پیکر بندی متفاوت خواهند بود .

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٤,٢,٢. مشخصات

منبع تغذیه

ولتاژ اصلی (L۱ , L۲, L۳)
ASAB/xxxx/۵.. ۲۰۰ VAC ~ ۵۲۵ VAC (± ۱۰٪)
ASAB/xxxx/۷........................ ۳۸۰ VAC ~ ۶۰۰ VAC (± ۱۰٪) (اتصال مستقیم یا مثلث داخلی)
ASAB/xxxx/۷................ ۳۸۰ VAC ~ ۶۹۰ VAC (± ۱۰٪) (فقط سیستمهای تغذیه ستاره با نقطه ارت)

کنترل ولتاژ (A۴, A۵, A۶)
۱۲ .... ۱۱۰ ~ ۱۲۰ VAC or ۲۲۰ ~ ۲۴۰ VAC (+ ۱۰٪ / -۱۵٪), ۶۰۰mA
۱٤... .... ۲۴ VAC/VDC
فرکانس اصلی... .... ٤٥ هرتز تا ٦٦ هرتز
اندازه ولتاژ عایقی نسبت به زمین... ۶۰۰ VAC
اندازه مقاومت در برابر ولتاژ ضربه... ..... ٤ کیلو ولت
طراحی فرم .... بای پاس یا پیوسته ، نیمه هادی فرم شماره ۱

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ASAB/۰۲۵۵C to ASAB/۰۹۳۰C......................... جریان نهایی ۸۵ kA
ASAB/۱۲۰۰C to ASAB/۱۶۰۰C....................... جریان نهایی ۱۰۰ kA

قابلیت الکترومغناطیسی (مطابق با دستورالعمل EEC/۳۳٦/۸۹ اتحادیه اروپا)
قابلیت انتشار......................... IEC ۶۰۹۴۷-۴-۲ Class B and Lloyds Marine No ۱ Specification
ایمنی الکترومغناطیس .... IEC ۶۰۹۴۷-۴-۲

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استپ (٥٦ ، ٥٧)... .... کنتاکت بسته
ریست (٥٨ ، ٥٧)... .... کنتاکت بسته
ورودیهای قابل برنامه ریزی (٥٣ ، ٥٥).. کنتاکت باز
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رله های خروجی...................... ..... ۱۰A @ ۲۵۰ VAC resistive, ۵A @ ۲۵۰ VAC AC۱۵ pf ۰,۳
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رله B (۲۱ ، ۲۲ ، ۲٤)........................ .... تغییر

رله C (۳۳ ، ۳٤)... کنتاکت باز
خروجی آنالوگ (٤٠ ، ٤١) .... ۰-۲۰ mA or ۴-۲۰ mA (قابل انتخاب)
حداکثر بار.. (۱۲VDC @ ۲۰ mA) ۶۰۰ Ω
دقت... .... ± ۵ ٪
۲٤ بار حداکثر در ولت خروجی (۵۵ ، ٤۱)................................... ۲۰۰ میلی آمپر
دقت.. ± ۱۰ ٪
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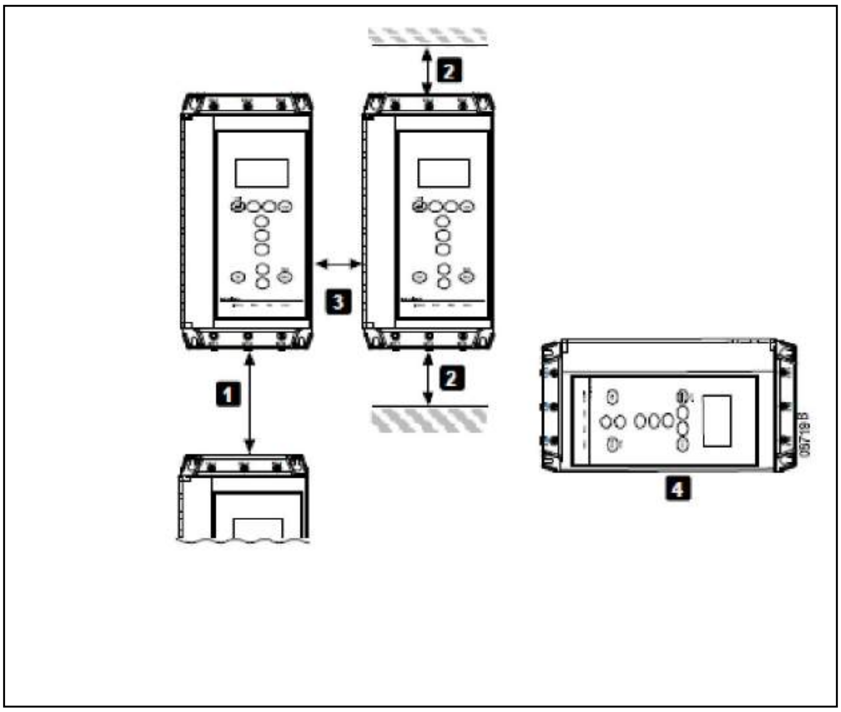
حفاظت
ASAB/۰۰۲۳B ~ ASAB/۰۱۰۵B.. .... IP ۲۰
ASAB/۰۱۴۵B ~ ASAB/۱۶۰۰C.. .... IP ۰۰
دمای کار.............................. -۱۰ ˚C to ۶۰ ˚C, above ۴۰ ˚C with derating
دمای نگهداری در انبار.. -۲۵ ˚C to + ۶۰ ˚C
عامل ارتفاع.................................. ۰ - ۱۰۰۰ متر ، بالاتر از ۱۰۰۰ متر خارج از محدوده
رطوبت.. . رطوبت نسبی ۵ ٪ تا ۹۵ ٪
درجه آلودگی.. .... آلودگی درجه ۳
لرزش... بر اساس IEC ۶۰۰۶۸-۲-۶
اتلاف گرما
در حین استارت.................................. ٤,۵ وات در هر آمپر
در طول کار
ASAB/۰۰۲۳B ~ ASAB/۰۰۵۳B.. ≥ حدود ۳۹ وات
ASAB/۰۰۷۶B ~ ASAB/۰۱۰۵B.. ≥ حدود ۵۱ وات
ASAB/۰۱۴۵B ~ ASAB/۰۲۲۰B.. ≥ حدود ۱۲۰ وات
ASAB/۰۲۵۵C ~ ASAB/۰۹۳۰C.. حدود ٤,۵ وات در آمپر
ASAB/۱۲۰۰C ~ ASAB/۱۶۰۰C.. حدود ٤,۵ وات در آمپر

تأییدیه
IEC ۶۰۹۴۷-۴-۲ .... CE CE
IEC ۶۰۹۴۷-۴-۲ .... C۰
UL ۵۰۸ .... UL/ C-UL
ASAB/۰۰۲۳B ~ ASAB/۰۱۰۵B .... IP۲۰ & NEMA۱, UL Indoor Type ۱
ASAB/۰۱۴۵B ~ ASAB/۱۶۰۰C .... IP۰۰, UL Indoor Open Type
CCC (در انتظار).. GB ۱۴۰۴۸-۶
RoHS .... Compliant with EU Directive ۲۰۰۲/۹۵/EC
Marine (ASAB-۰۰۲۳B to ASAB-۰۲۲۰B only) .... Lloyds Marine No ۱ Specification

۳- نصب

۳-۱- نصب فیزیکی



۱- در ASAB-۰۲۵۵C ~ ASAB-۰۰۲۳B فاصله مجاز بین سافت استارتر ها : ۱۰۰ mm (۳,۹۴ inches)

در ASAB-۱۶۰۰C ~ ASAB-۰۳۸۰C فاصله مجاز بین سافت استارتر ها : ۲۰۰ mm (۷,۸۸ inches)

۲- در ASAB-۰۲۲۰B ~ ASAB-۰۰۲۳B فاصله مجاز بین سافت و سطوح سخت : ۵۰ mm (۱,۹۷ inches)

در ASAB-۰۲۵۵C فاصله مجاز بین سافت و سطوح سخت : ۱۰۰ mm (۳,۹۴ inches)

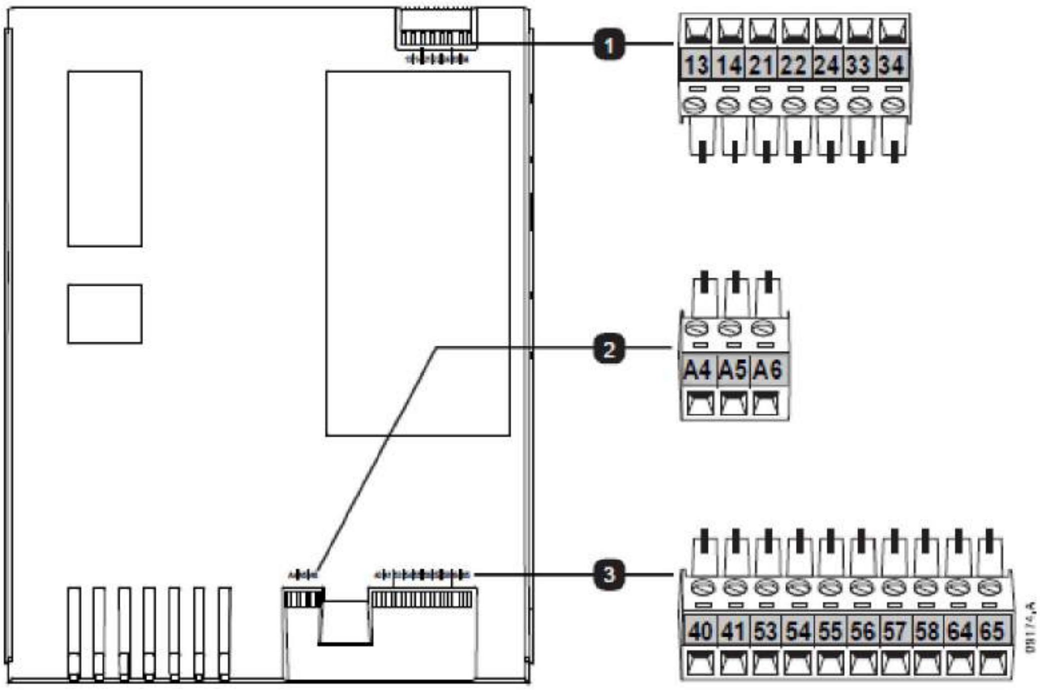
در ASAB-۱۶۰۰C ~ ASAB-۰۳۸۰C فاصله مجاز بین سافت و سطوح سخت : ۲۰۰ mm (۷,۸۸ inches)

۳- سافت استارتر ها میتوانند با اختلاف ۵۰ میلیمتر در کنار یکدیگر نصب شوند

۴- زمانیکه سافت استارتر ها دقیقاً در کنار و چسبیده بهم نصب شده اند ، نرخ جریان ۱۵ درصد کاهش می یابد

۳-۲- ترمینالهای کنترلی

ترمینالهای کنترلی شامل ترمینالهای سوکتی به اندازه ۲٫۵mm۲ می باشند . جهت انجام سیمکشی ، ابتدا ترمینال را از جای خود درآورده ، سیمهای مربوطه را وصل و سپس ترمینال را در جای خود قرار دهید



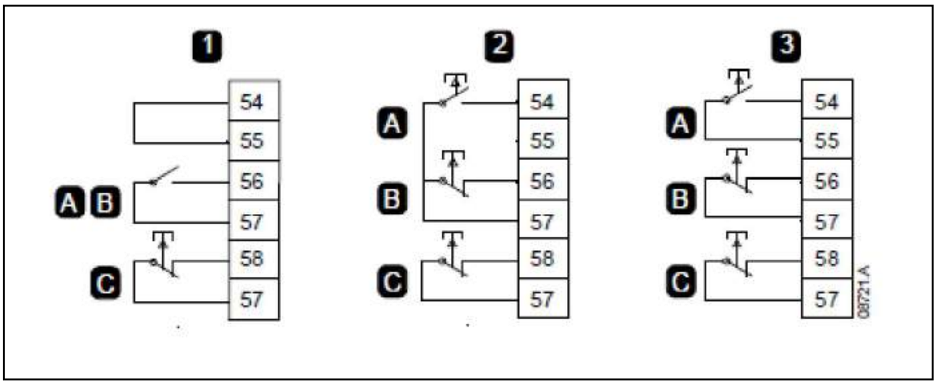
رله های خروجی	۱
رله خروجی A	۱۳و۱۴
رله خروجی B	۲۱و۲۲و۲۴
رله خروجی C	۳۳و۳۴
کنترل ولتاژ (وابسته به مدل)	۲
۱۱۰~۱۲۰ VAC	A۵, A۶
۲۲۰~۲۴۰ VAC	A۴, A۶
۲۴ VAC/VDC	A۵, A۶
ورودی ها و خروجی ها	۳
استارت	۵۴و۵۵
استپ	۵۶و۵۷
ریست	۵۸و۵۷
ورودی قابل برنامه ریزی A	۵۳و۵۵
مقاومت گرمایی موتور	۶۴و۶۵
ورودی آنالوگ	۴۰و۴۱
خروجی ۲۴ VDC	۵۵و۴۱

نکته :

در صورتیکه از ترمیستور (مقاومت حرارتی) استفاده نمی کنید ، ترمینالهای ۶۴ و ۶۵ را اتصال کوتاه نکنید

۳-۳- سیم کشی مدار کنترل

سافت استارتر **ASAB** دارای سه ورودی ثابت برای کنترل از راه دور است . این ورودیها می بایست توسط کنتاکتهای ولتاژ و جریان ضعیف کنترل گردند (مانند کنتاکتهای نقطه طلا یا مشابه آن)



کنترل دو سیمه	۱
کنترل سه سیمه	۲
کنترل چهار سیمه	۳
استارت	A
استپ	B
ریست	C

احتیاط

ترمینالهای کنترلی نباید تحت ولتاژ قرار گیرند . این ترمینالها تحت ولتاژ ۲۴ ولت بوده و صرفاً می بایست به کنتاکتهای بدون مقاومت متصل گردند .

۳-٤- رله های خروجی

سافت استارتر **ASAB** دارای سه رله خروجی قابل برنامه ریزی است

عملکرد این رله ها بستگی به نحوه تنظیم پارامترهای ۷A~۷I دارد

- اگر خروجی به کنتاکتور اصلی مرتبط شود ، خروجی با دریافت پیام استارت فعال شده و تا زمانیکه سافت استارتر مشغول کنترل دور موتور باشد ، فعال باقی می ماند (یعنی تا زمان استپ ناگهانی یا استپ نرم موتور)
- اگر خروجی به عملکرد کار سافت مرتبط گردد ، با کاهش جریان به زیر ۱۲۰ درصد جریان بار کامل ، کنتاکت خروجی فعال شده و تا زمان استپ ناگهانی یا استپ نرم فعال باقی می ماند .
- اگر خروجی بستگی به قطع سافت داشته باشد ، با فرمان قطع ، خروجی فعال می شود
- اگر خروجی به یک علامت (Flag) مرتبط شود ، فعال شدن آن بستگی به فعال شدن یک علامت خاص دارد (پارامترهای ۷J~۷L)

احتیاط

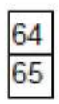
سیم پیچ برخی کنتاکتورهای الکترونیکی برای سوئیچ مستقیم توسط رله های برد اصلی مناسب نیستند . جهت یافتن این سازگاری با کارخانه سازنده یا تأمین کننده کنتاکتور مشورت کنید

۳-۵ مقاومت حرارتی موتور

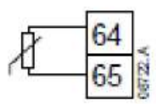
مقاومت حرارتی موتور می تواند بطور مستقیم به سافت استارتر متصل شود . در این حالت در صورتیکه مقاومت مدار ترمیستور به بیش از ۳،۶ k Ω برسد ، سافت استارتر فرمان قطع صادر خواهد نمود .

خروجی ترمیستور

بدون ترمیستور



با ترمیستور



نکته :

در صورتیکه هیچگونه مقاومت حرارتی به ترمینالهای ورودی ترمیستور (۶۴ و ۶۵) وصل نگردد ، ترمینالهای مربوطه می بایست بصورت مدار باز قرار گیرند . در صورت اتصال کوتاه این ترمینالها ، سافت استارتر به حالت قطع خواهد رفت .

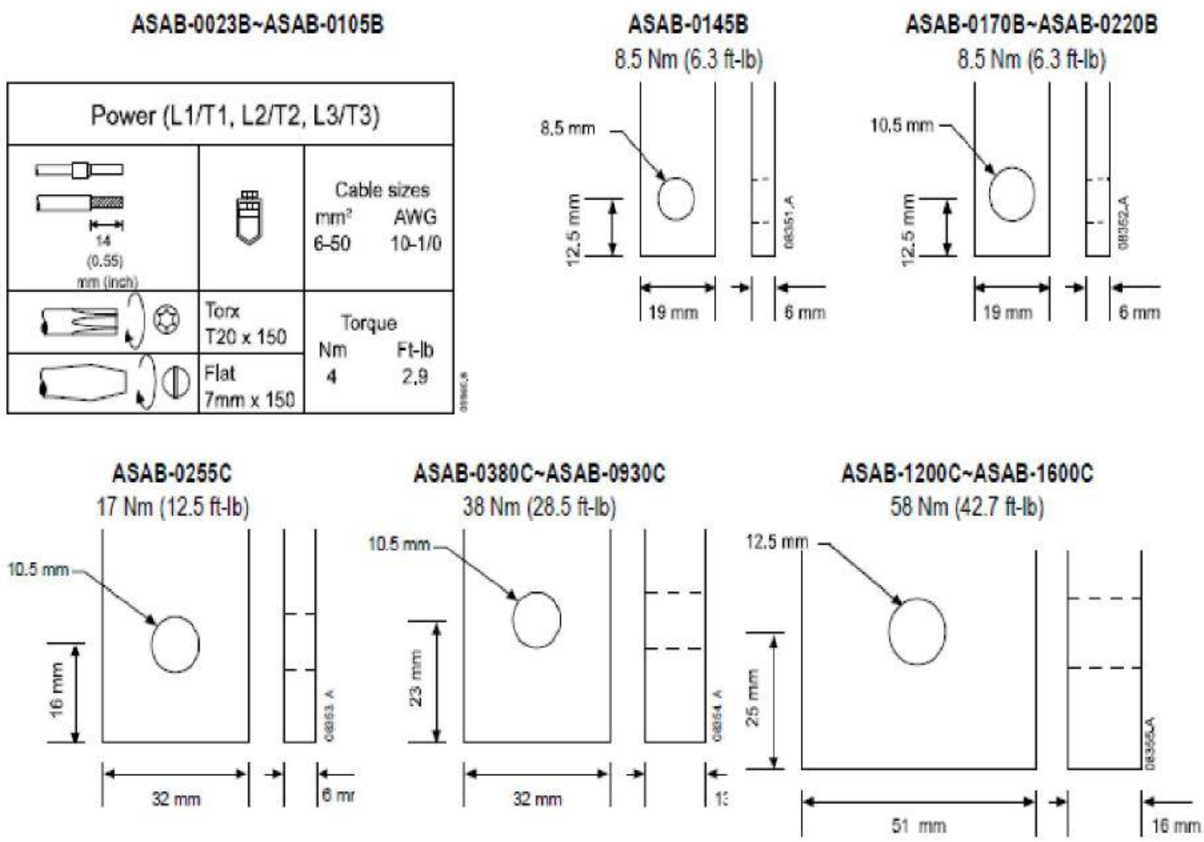
مقاومت گرمایی می بایست با کابل مخصوص زره دار (شیلد) به ترمینالهای مربوطه اتصال یابد و از هرگونه ارتینگ ، منابع قدرت یا مدارات کنترلی ایزوله باشد .

۳-۶- همبندی مدار قدرت

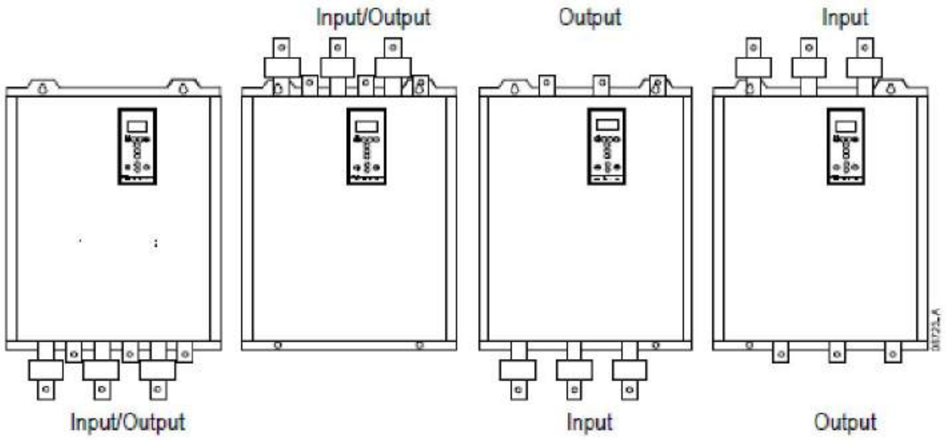
صرفاً از کابل مسی افشان یا خشک استفاده شود (در دمای ۷۵ درجه ساتیگراد)

نکته :

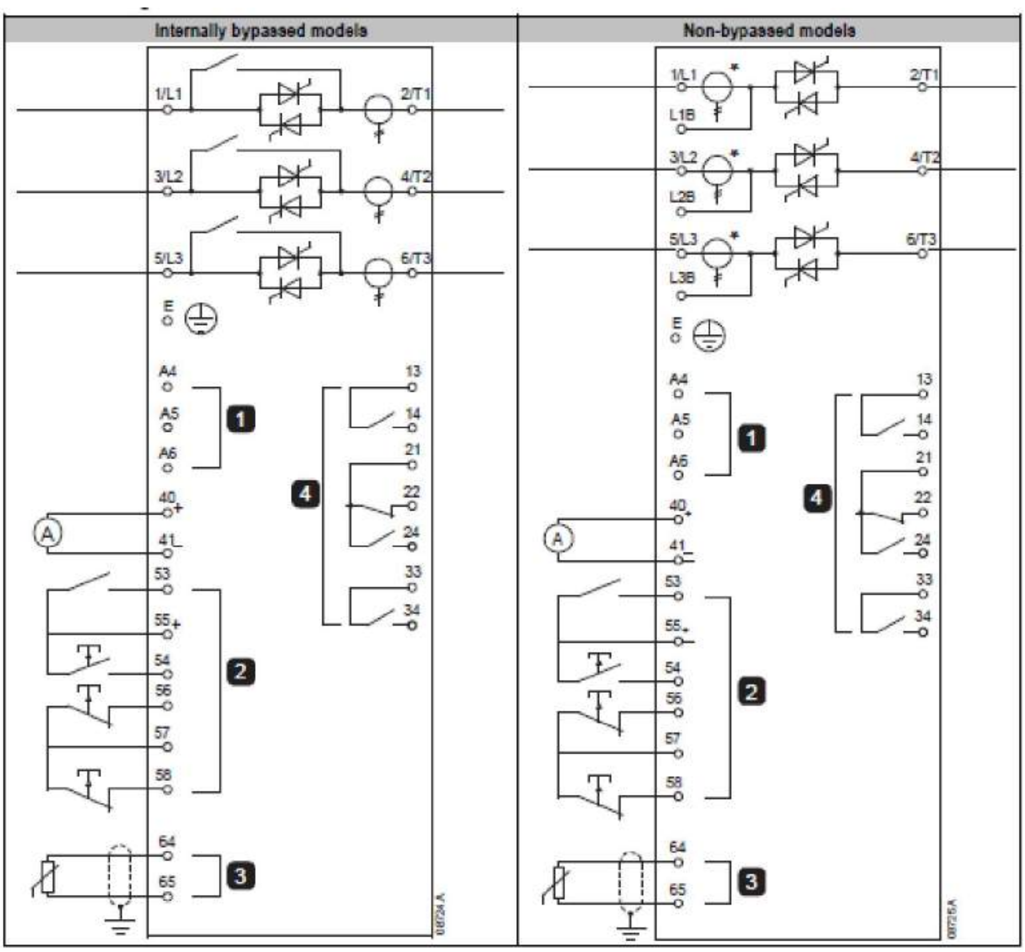
در برخی دستگاهها از باس بار آلومنیوم استفاده شده است . پیشنهاد می گردد ابتدا سطح تماس را بوسیله سمباده یا برس استیل کاملاً تمیز نموده و بمنظور جلوگیری از خوردگی ، یک اتصال مناسب برقرار کنید .



در مدل های ASAB-۰۳۸۰C ~ ASAB-۱۶۰۰C باس بارهای ورودی و خروجی بسته به درخواست مشتری می توانند در بالا یا پائین دستگاه قرار گیرند . برای کسب اطلاعات بیشتر میتوانید به دستورالعمل قدم به قدم روش تنظیم باس بار مراجعه فرمائید .



۳-۷- دیاگرامهای شماتیک



استارت	۵۴و۵۵
استپ	۵۶و۵۷
ریست	۵۸و۵۷
ورودی قابل برنامه ریزی A	۵۳و۵۵
رله خروجی A	۱۳و۱۴
رله خروجی B	۲۱و۲۲و۲۴
رله خروجی C	۳۳و۳۴

کنترل ولتاژ (وابسته به مدل)	۱
ورودی های کنترل از راه دور	۲
ورودی مقاومت حرارتی موتور	۳
رله های خروجی	۴
خروجی آنالوگ	۴۰و۴۱
خروجی ۲۴ VDC	۵۵و۴۱

نکته :

در مدلهای مختلف ، ترمینالهای کنترل ولتاژ مختلف می باشد :

- ۱۲ (۱۱۰~۱۲۰ VAC) A۵, A۶
- ۱۲ (۲۲۰~۲۴۰ VAC) A۴, A۶
- ۱۴ (۲۴ VAC/VDC) A۵, A۶

نکته :

در مدل ASAB-۰۲۵۵C ترانس جریانها در خروجی قرار گرفته و با برچسب T۱B, T۲B , T۳B. مشخص شده اند

۴- مدار قدرت

٤-۱- اتصالات موتور

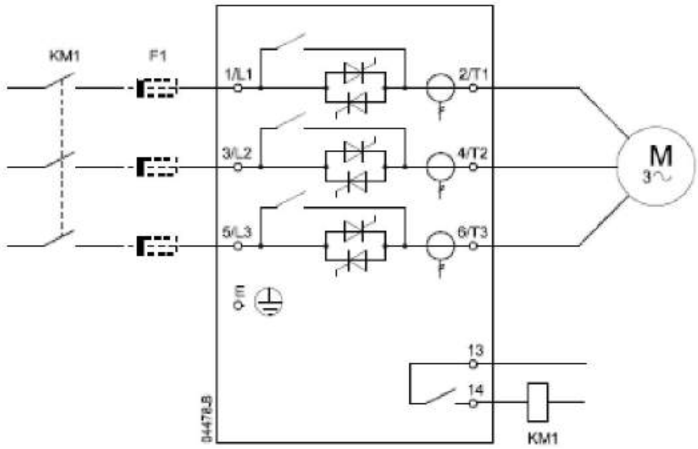
سافت استارتر ASAB قادر است که به موتور با اتصال مثلث داخلی یا مثلث خارجی وصل گردد (اغلب به اتصالات سه سیمه یا شش سیمه معروفند) . سافت استارتر بطور اتوماتیک نوع اتصال موتور را تشخیص داده و نسبت به انجام محاسبات لازم اقدام می نماید . تنها نکته مورد نیاز تنظیم ماکزیمم جریان موتور در پارامتر ۱A می باشد .

نکته :

برای حفظ امنیت پرسنل ، در سافت استارترهای مدل ASAB-۰۱۰۵B به بالا ، ترمینالهای قدرت بوسیله نوارهای ضد ضربه محافظت شده اند . اما درهنگام استفاده از کابلهای قطور ممکن است مجبور شوید این نوارها از جای خود خارج کنید

مدلهایی که دارای مدار بای پاس داخلی هستند ، نیازی به استفاده از کنتاکتور خارجی ندارند

٤,١,١ – اتصال سه سیمه با بای پاس داخلی

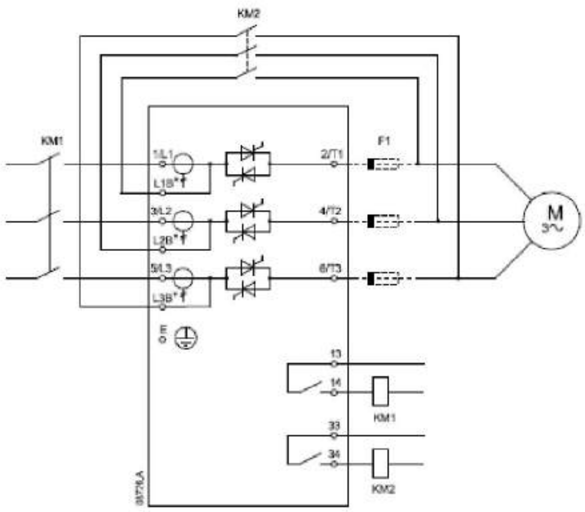


KM۱	کنتاکتور اصلی (اختیاری)
F۱	فیوز نیمه هادی (اختیاری)

۴,۱,۲- اتصال سه سیمه با بای پاس خارجی

مدلهایی که دارای بای پاس داخلی نیستند ، دارای ترمینالهای مخصوص بای پاس می باشند . این امر به سافت استارتر اجازه میدهد ضمن برقراری حفاظت های لازم ، عملکرد مدار را نیز تحت نظر داشته باشد در حالیکه از یک کنتاکتور بای پاس خارجی بهره مند است .

رله بای پاس به ترمینالهای بای پاس می بایست متصل شده و فرمان وصل را از یک رله خروجی قابل برنامه ریزی که با وضعیت کار (RUN) ست شده است فرمان گیرد (مراجعه شود به پارامترهای ۷A~۷I)



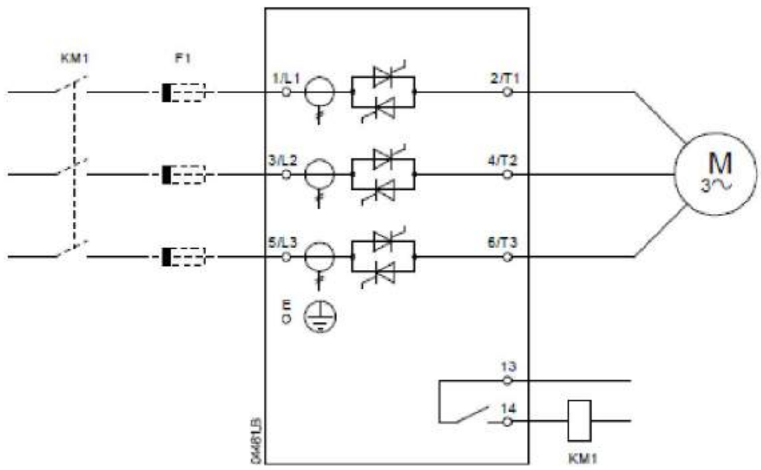
KM۱	کنتاکتور اصلی
KM۲	کنتاکتور بای پاس
F۱	فیوز نیمه هادی (اختیاری)

نکته :

ترمینالهای بای پاس در ASAB-۰۲۵۵C عبارتند از : T۱B, T۲B, T۳B . ترمینالهای بای پاس درASAB-۰۳۸۰C ~ ASAB-۱۶۰۰C عبارتند از : L۱B, L۲B, L۳B

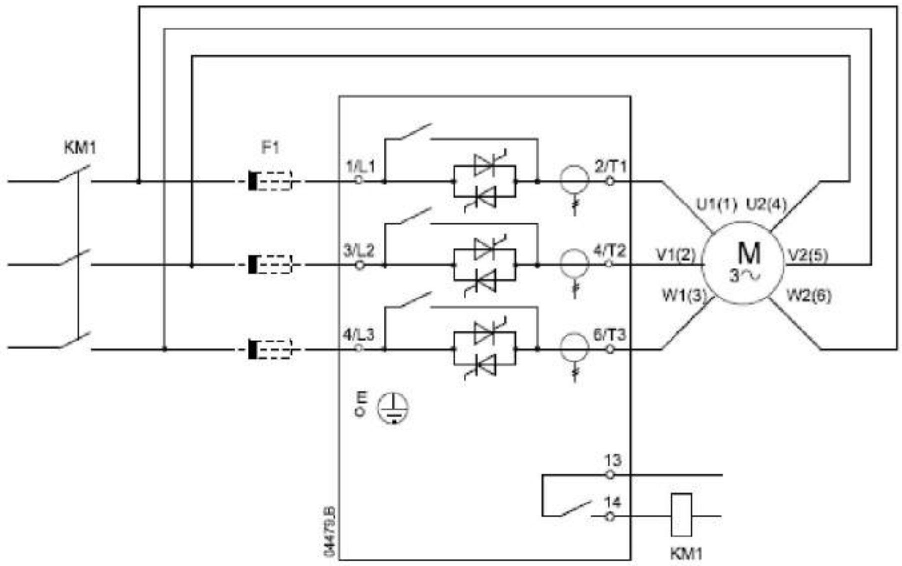
فیوزها می توانند در صورت درخواست در سمت ورودی دستگاه نصب گردند

۴،۱،۳- اتصال سه سیمه بدون بای پاس



KM۱	کنتاکتور اصلی (اختیاری)
F۱	فیوز نیمه هادی (اختیاری)

۴,۱,۴ - اتصال شش سیمه با بای پاس داخلی



KM۱	کنتاکتور اصلی
F۱	فیوز نیمه هادی (اختیاری)

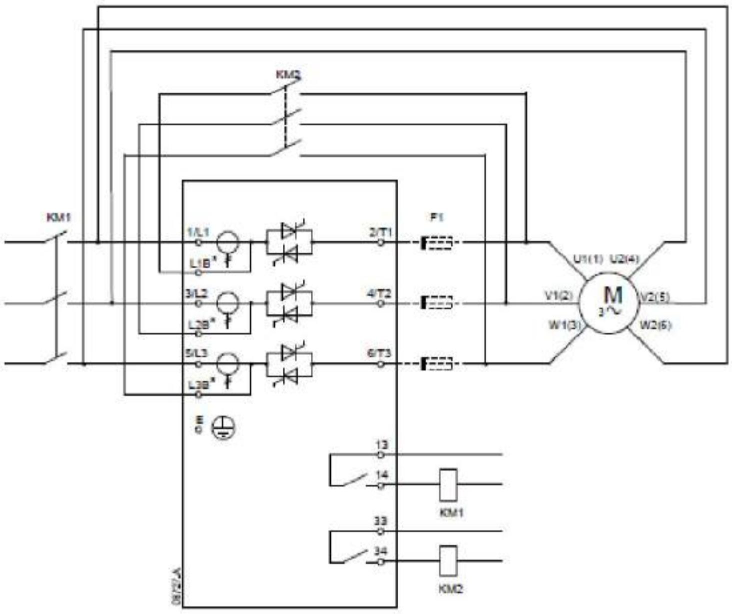
توجه :

زمانیکه سافت استارتربه یک موتور با اتصال شش سیمه وصل می گردد ، همواره از یک کنتاکتور اصلی یا کلید قدرت با رله شنت در ورودی استفاده می شود

۴,۱,۵ - اتصال شش سیمه با بای پاس خارجی

مدلهایی که دارای بای پاس داخلی نیستند ، دارای ترمینالهای مخصوص بای پاس می باشند . این امر به سافت استارتر اجازه میدهد ضمن برقراری حفاظت های لازم ، عملکرد مدار را نیز تحت نظر داشته باشد در حالیکه از یک کنتاکتور بای پاس خارجی بهره مند است .

رله بای پاس به ترمینالهای بای پاس می بایست متصل شده و فرمان وصل را از یک رله خروجی قابل برنامه ریزی که با وضعیت کار (RUN) ست شده است فرمان گیرد (مراجعه شود به پارامترهای ۷A~۷I)



KM۱	کنتاکتور اصلی
KM۲	کنتاکتور بای پاس
F۱	فیوز نیمه هادی (اختیاری)

نکته :

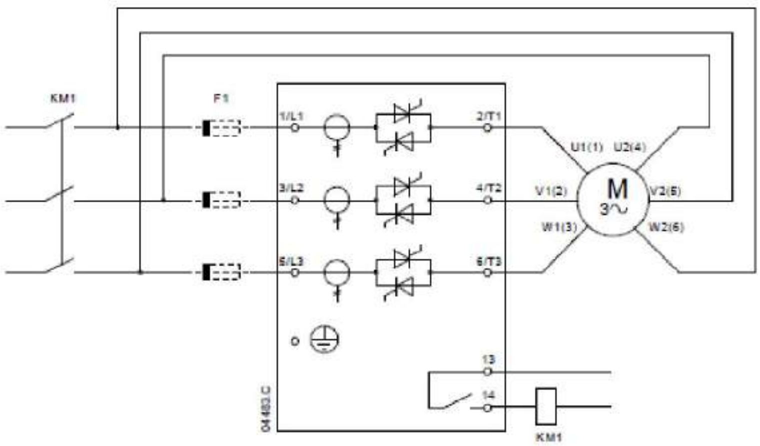
ترمینالهای بای پاس در ASAB-۰۲۵۵C عبارتند از : T۱B, T۲B, T۳B . ترمینالهای بای پاس درASAB-۰۳۸۰C ~ ASAB-۱۶۰۰C عبارتند از : L۱B, L۲B, L۳B

فیوزها می توانند در صورت درخواست در سمت ورودی دستگاه نصب گردند

توجه :

زمانیکه سافت استارتربه یک موتور با اتصال شش سیمه وصل می گردد ، همواره از یک کنتاکتور اصلی یا کلید قدرت با رله شنت در ورودی استفاده می شود

۴,۱,۶- اتصال شش سیمه بدون بای پاس



KM۱	کنتاکتور اصلی
F۱	فیوز نیمه هادی (اختیاری)

توجه :

زمانیکه سافت استارتر به یک موتور با اتصال شش سیمه وصل می گردد ، همواره از یک کنتاکتور اصلی یا کلید قدرت با رله شنت در ورودی استفاده می شود

۴٫۲. کنتاکتور بای پاس

سافت استارترهای مدل ASAB-۰۲۲۰B ~ ASAB-۰۰۲۳B دارای بای پاس داخلی بوده و نیازی به کنتاکتور بای پاس خارجی ندارند
سافت استارترهای مدل ASAB-۱۶۰۰C ~ ASAB-۰۲۵۵C دارای بای پاس داخلی نبوده لذا نیاز به کنتاکتور بای پاس خارجی دارند . در این حالت از یک کنتاکتور کلاس AC۱ با جریان نامی معادل یا بیشتر از جریان ماکزیمم موتور استفاده کنید

۴٫۳. کنتاکتور اصلی

استفاده از کنتاکتور اصلی برای سافت استارترهای متصله به سیستم سه سیمه اختیاری بوده و برای سیستمها شش سیمه اجباری است . در این حالت از یک کنتاکتور کلاس AC۳ با جریان نامی معادل یا بیشتر از جریان ماکزیمم موتور استفاده کنید

۴٫۴. کلید قدرت

می توان از یک کلید قدرت مجهز به رله شنت بجای کنتاکتور اصلی استفاده کرد تا در مواقع اضطراری موتور را از مدار سافت استارتر ایزوله نماید . در این حال تغذیه رله شنت می بایست از سمت ورودی کلید قدرت تأمین شده یا از یک منبع ولتاژ جداگانه استفاده کرد

۴٫۵. اصلاح ضریب قدرت

در صورت استفاده از خازن اصلاح ضریب قدرت ، میبایست از یک کنتاکتور جداگانه برای قطع و وصل آن استفاده کرد

توجه :

خازن اصلاح ضریب قدرت می بایست در سمت ورودی سافت استارتر وصل شود . اتصال خازن در سمت خروجی سافت استارتر موجب صدمه به سافت میگردد .

۴,۶. فیوز

فیوزهای نیمه هادی برای ایجاد هماهنگی (از نوع تیپ ۲) و نیز کاهش خطر آسیب به تریستورها در مقابل اضافه بار بکار برده می شوند .

فیوزهای HRC (مانند فیوزهای AJT) برای ایجاد هماهنگی از نوع تیپ یک بکار می روند .

نکته :

در روش کنترل تطبیقی مشخصات سرعت موتور کنترل می گردد همراه با محدودیت زمانی برنامه ریزی شده . لذا این کار ممکن است نسبت به روشهای سنتی کنترل سرعت ، دارای سطح بالاتری از جریان باشد .

برای کاربردهایی که از روش کنترل تطبیقی برای استپ نرم جهت موتورهایی با زمان استپ بیش از ۳۰ ثانیه استفاده می کنند ، می بایست از شاخه حفاظتی مطابق زیر تبعیت و اتخاب نمود :

- استفاده از فیوز HRC در ورودی با آمپراژ حداقل ۱۵۰ درصد جریان کامل موتور
- فیوز محافظ موتور در ورودی با آمپراژ حداقل ۱۰۰ تا ۱۵۰ درصد جریان کامل موتور
- کلید اتوماتیک (بریکر) با ستینگ زمانی طولانی و آمپراژ حداقل ۱۵۰ درصد جریان کامل موتور
- کلید اتوماتیک (بریکر) با ستینگ زمانی کوتاه و آمپراژ حداقل ۴۰۰ درصد جریان کامل موتور برای ۳۰ ثانیه

نکته :

انتخاب فیوز بر پایه ۴ برابر جریان کامل موتوربا زمان شروع بکار ۲۰ ثانیه و بر اساس استاندارد منتشره در هر ساعت ، دوره کارکرد ، دمای محیطی ۴۰ درجه سانتیگراد و ارتفاع تا ۱۰۰۰ متر از سطح دریا تنظیم شده است . لذا در صورتی که محدوده کاری شما خارج از این محدوده می باشد با تأمین کننده محلی مشورت نمائید

از این جدول صرفاً بعنوان یک راهنما و پیشنهاد استفاده کنید . جهت انتخاب فیوز با توجه به کاربرد خاص آن با تأمین کننده محلی مشورت نمائید .

Model	SCR I^2t (A^2s)	Supply Voltage (≤ 440 VAC)	Supply Voltage (≤ 575 VAC)	Supply Voltage (≤ 690 VAC)
ASAB-0023B	1150	170M1314	170M1314	170M1314
ASAB-0043B	8000	170M1316	170M1316	170M1316
ASAB-0053B	15000	170M1318	170M1318	170M1318
ASAB-0076B	15000	170M1319	170M1319	170M1318
ASAB-0097B	51200	170M1321	170M1321	170M1319
ASAB-0100B	80000	170M1321	170M1321	170M1321
ASAB-0105B	125000	170M1321	170M1321	170M1321
ASAB-0145B	125000	170M1321	170M1321	170M1321
ASAB-0170B	320000	170M2621	170M2621	170M2621
ASAB-0200B	320000	170M2621	170M2621	170M2621
ASAB-0220B	320000	170M2621	170M2621	170M2621
ASAB-0255C	320000	170M2621	170M2621	170M2621
ASAB-0380C	320000	170M6011	170M6011	----
ASAB-0430C	320000	170M6011	170M6011	----
ASAB-0620C	1200000	170M6015	170M6015	170M6014
ASAB-0650C	1200000	170M6015	170M6015	170M6014
ASAB-0790C	2530000	170M6017	170M6017	170M6016
ASAB-0930C	4500000	170M6019	170M6019	170M6019
ASAB-1200C	4500000	170M6021	----	----
ASAB-1410C	6480000	----	----	----
ASAB-1600C	12500000	170M6019*	----	----

Model	SCR I^2t (A^2s)	Supply Voltage (≤ 440 VAC)	Supply Voltage (≤ 575 VAC)	Supply Voltage (≤ 690 VAC)
ASAB-0023B	1150	63FE	63FE	63FE
ASAB-0043B	8000	120FEE	120FEE	120FEE
ASAB-0053B	15000	200FEE	200FEE	200FEE
ASAB-0076B	15000	200FEE	200FEE	200FEE
ASAB-0097B	51200	200FEE	200FEE	200FEE
ASAB-0100B	80000	280FM	280FM	280FM
ASAB-0105B	125000	280FM	280FM	280FM
ASAB-0145B	125000	280FM	280FM	280FM
ASAB-0170B	320000	450FMM	450FMM	450FMM
ASAB-0200B	320000	450FMM	450FMM	450FMM
ASAB-0220B	320000	450FMM	450FMM	450FMM
ASAB-0255C	320000	450FMM	450FMM	450FMM
ASAB-0380C	320000	400FMM*	400FMM	400FMM*
ASAB-0430C	320000	----	----	----
ASAB-0620C	1200000	630FMM*	630FMM*	----
ASAB-0650C	1200000	630FMM*	630FMM*	----
ASAB-0790C	2530000	----	----	----
ASAB-0930C	4500000	----	----	----
ASAB-1200C	4500000	----	----	----
ASAB-1410C	6480000	----	----	----
ASAB-1600C	12500000	----	----	----

<table>
<tr><th>Model</th><th>SCR I^2t (A^2s)</th><th>Supply Voltage
(≤ 440 VAC)</th><th>Supply Voltage
(≤ 575 VAC)</th><th>Supply Voltage
(≤ 690 VAC)</th></tr>
<tr><td>ASAB-0023B</td><td>1150</td><td>HSJ40**</td><td>HSJ40**</td><td rowspan="21">Not suitable</td></tr>
<tr><td>ASAB-0043B</td><td>8000</td><td>HSJ80**</td><td>HSJ80**</td></tr>
<tr><td>ASAB-0053B</td><td>15000</td><td>HSJ110**</td><td>HSJ110**</td></tr>
<tr><td>ASAB-0076B</td><td>15000</td><td>HSJ125**</td><td>HSJ125**</td></tr>
<tr><td>ASAB-0097B</td><td>51200</td><td>HSJ175</td><td>HSJ175**</td></tr>
<tr><td>ASAB-0100B</td><td>80000</td><td>HSJ175</td><td>HSJ175</td></tr>
<tr><td>ASAB-0105B</td><td>125000</td><td>HSJ225</td><td>HSJ225</td></tr>
<tr><td>ASAB-0145B</td><td>125000</td><td>HSJ250</td><td>HSJ250**</td></tr>
<tr><td>ASAB-0170B</td><td>320000</td><td>HSJ300</td><td>HSJ300</td></tr>
<tr><td>ASAB-0200B</td><td>320000</td><td>HSJ350</td><td>HSJ350</td></tr>
<tr><td>ASAB-0220B</td><td>320000</td><td>HSJ400**</td><td>HSJ400**</td></tr>
<tr><td>ASAB-0255C</td><td>320000</td><td>HSJ450**</td><td>HSJ450**</td></tr>
<tr><td>ASAB-0380C</td><td>320000</td><td rowspan="9">Not suitable</td><td rowspan="9">Not suitable</td></tr>
<tr><td>ASAB-0430C</td><td>320000</td></tr>
<tr><td>ASAB-0620C</td><td>1200000</td></tr>
<tr><td>ASAB-0650C</td><td>1200000</td></tr>
<tr><td>ASAB-0790C</td><td>2530000</td></tr>
<tr><td>ASAB-0930C</td><td>4500000</td></tr>
<tr><td>ASAB-1200C</td><td>4500000</td></tr>
<tr><td>ASAB-1410C</td><td>6480000</td></tr>
<tr><td>ASAB-1600C</td><td>12500000</td></tr>
</table>

Model	SCR I^2t (A^2s)	Supply Voltage (≤ 440 VAC)	Supply Voltage (≤ 575 VAC)	Supply Voltage (≤ 690 VAC)
ASAB-0023B	1150	A070URD30XXX0063	A070URD30XXX0063	----
ASAB-0043B	8000	A070URD30XXX0125	A070URD30XXX0125	A070URD30XXX0125
ASAB-0053B	15000	A070URD30XXX0125	A070URD30XXX0125	A070URD30XXX0125
ASAB-0076B	15000	A070URD30XXX0160	A070URD30XXX0160	A070URD30XXX0160
ASAB-0097B	51200	A070URD30XXX0200	A070URD30XXX0200	A070URD30XXX0200
ASAB-0100B	80000	A070URD30XXX0200	A070URD30XXX0200	A070URD30XXX0200
ASAB-0105B	125000	A070URD30XXX0315	A070URD30XXX0315	A070URD30XXX0315
ASAB-0145B	125000	A070URD30XXX0315	A070URD30XXX0315	A070URD30XXX0315
ASAB-0170B	320000	A070URD30XXX0315	A070URD30XXX0315	A070URD30XXX0315
ASAB-0200B	320000	A070URD30XXX0450	A070URD30XXX0450	A070URD30XXX0450
ASAB-0220B	320000	A070URD30XXX0450	A070URD30XXX0450	A070URD30XXX0450
ASAB-0255C	320000	A070URD30XXX0450	A070URD30XXX0450	A070URD30XXX0450
ASAB-0380C	320000	A070URD33XXX0700	A070URD33XXX0700	----
ASAB-0430C	320000	A070URD33XXX0700	A070URD33XXX0700	----
ASAB-0620C	1200000	A070URD33XXX1000	A070URD33XXX1000	A070URD33XXX1000
ASAB-0650C	1200000	A070URD33XXX1000	A070URD33XXX1000	A070URD33XXX1000
ASAB-0790C	2530000	A070URD33XXX1400	A070URD33XXX1400	A070URD33XXX1250
ASAB-0930C	4500000	A070URD33XXX1400	A070URD33XXX1400	A070URD33XXX1400
ASAB-1200C	4500000	A055URD33XXX2250	----	----
ASAB-1410C	6480000	A055URD33XXX2250	----	----
ASAB-1600C	12500000	----	----	----

Model	SCR I^2t (A^2s)	Supply Voltage (≤ 440 VAC)	Supply Voltage (≤ 575 VAC)	Supply Voltage (≤ 690 VAC)
ASAB-0023B	1150	6.9URD30D11A0050	6.9URD30D11A0050	6.9URD30D11A0050
ASAB-0043B	8000	6.9URD30D11A0125	6.9URD30D11A0125	6.9URD30D11A0125
ASAB-0053B	15000	6.9URD30D11A0125	6.9URD30D11A0125	6.9URD30D11A0125
ASAB-0076B	15000	6.9URD30D11A0160	6.9URD30D11A0160	6.9URD30D11A0160
ASAB-0097B	51200	6.9URD30D11A0200	6.9URD30D11A0200	6.9URD30D11A0200
ASAB-0100B	80000	6.9URD30D11A0200	6.9URD30D11A0200	6.9URD30D11A0200
ASAB-0105B	125000	6.9URD30D11A0315	6.9URD30D11A0315	6.9URD30D11A0315
ASAB-0145B	125000	6.9URD30D11A0315	6.9URD30D11A0315	6.9URD30D11A0315
ASAB-0170B	320000	6.9URD30D11A0315	6.9URD30D11A0315	6.9URD30D11A0315
ASAB-0200B	320000	6.9URD31D11A0450	6.9URD31D11A0450	6.9URD31D11A0450
ASAB-0220B	320000	6.9URD31D11A0450	6.9URD31D11A0450	6.9URD31D11A0450
ASAB-0255C	320000	6.9URD31D11A0450	6.9URD31D11A0450	6.9URD31D11A0450
ASAB-0380C	320000	6.9URD33D11A0700	6.9URD33D11A0700	6.9URD33D11A0700
ASAB-0430C	320000	6.9URD33D11A0700	6.9URD33D11A0700	6.9URD33D11A0700
ASAB-0620C	1200000	6.9URD33D11A1000	6.9URD33D11A1000	6.9URD33D11A1000
ASAB-0650C	1200000	6.9URD33D11A1000	6.9URD33D11A1000	6.9URD33D11A1000
ASAB-0790C	2530000	6.6URD33D11A1400	6.6URD33D11A1400	----
ASAB-0930C	4500000	6.6URD33D11A1400	6.6URD33D11A1400	----
ASAB-1200C	4500000	6.9URD233PLAF2200	6.9URD233PLAF2200	----
ASAB-1410C	6480000	6.9URD233PLAF2200	6.9URD233PLAF2200	6.9URD233PLAF2200
ASAB-1600C	12500000	6URD233PLAF2800	6URD233PLAF2800	----

Model	SCR I^2t (A^2s)	Supply Voltage (≤ 440 VAC)	Supply Voltage (≤ 575 VAC)	Supply Voltage (≤ 690 VAC)
ASAB-0023B	1150	AJT25	AJT25	Not suitable
ASAB-0043B	8000	AJT50	AJT50	
ASAB-0053B	15000	AJT60	AJT60	
ASAB-0076B	15000	AJT80	AJT80	
ASAB-0097B	512000	AJT100	AJT100	
ASAB-0100B	80000	AJT100	AJT100	
ASAB-0105B	125000	AJT125	AJT125	
ASAB-0145B	125000	AJT150	AJT150	
ASAB-0170B	320000	AJT175	AJT175	
ASAB-0200B	320000	AJT200	AJT200	
ASAB-0220B	320000	AJT250	AJT250	
ASAB-0255C	320000	AJT300	AJT300	
ASAB-0380C	320000	AJT450	AJT450	
ASAB-0430C	320000	AJT450	AJT450	
ASAB-0620C	1200000	A4BQ800	A4BQ800	
ASAB-0650C	1200000	A4BQ800	A4BQ800	
ASAB-0790C	2530000	A4BQ1200	A4BQ1200	
ASAB-0930C	4500000	A4BQ1200 / A4BT1100	A4BQ1200 / A4BT1100	
ASAB-1200C	4500000	A4BQ1600	A4BQ1600	
ASAB-1410C	6480000	A4BQ2000	A4BQ2000	
ASAB-1600C	12500000	A4BQ2500 / A4BT1800	A4BQ2500 / A4BT1800	

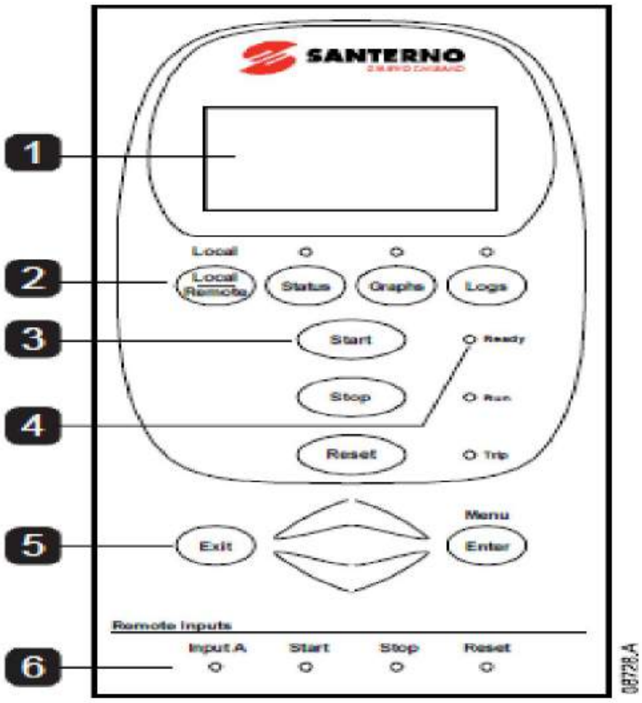
۷-۴- ترمینالهای ارت

ترمینالهای ارت در پشت دستگاه سافت استارتر قرار دارد

- ASAB-۰۰۲۳B ~ ASAB-۰۱۰۵B دارای یک ترمینال در سمت ورودی است
- ASAB-۰۱۴۵B ~ ASAB-۱۶۰۰C دارای دو ترمینال بوده که یکی در سمت ورودی و یکی در سمت خروجی است

۵- عملکرد

۵-۱- صفحه کلید و نمایش عملکرد



نمایشگر چهار خطه جهت نمایش جزئیات برنامه ریزی و وضعیت دستگاه	۱
LOCAL/REMOTE : تغییر وضعیت بین کنترل محلی و از راه دور STATUS : جهت بازکردن صفحه وضعیت دستگاه و مرور وضعیتهای مختلف GRAPHS : جهت بازکردن صفحه نمودارها و مرور نمودارهای مختلف LOGS : جهت بررسی موارد ثبت شده	۲
دکمه های کنترل محلی : START : روشن کردن موتور STOP : خاموش کردن موتور	۳

RESET : ریست کردن وضعیت قطع (فقط در دسترسی محلی موجود می باشد)	
ال ای دی های نشان دهنده وضعیت فعلی سافت (به شرح جدول زیر)	۴
دکمه جهتی منو : EXIT : جهت خروج از یک منو یا پارامتر ، یا انصراف از ایجاد تغییر در یک پارامتر MENU/ENTER : ورود به یک منو یا پارامتر و یا ذخیره تغییرات انجام شده بر روی یک پارامتر ▲ ▼ : رفتن به منویا پارامتر بعدی یا قبلی ، ایجاد تغییرات در پارامتر فعلی ، مرور بین وضعیتها یا نمودارهای مختلف	۵
ال ای دی های نشاندهنده وضعیت ورودی کنترل از راه دور . هنگامیکه روشن هستند : INPUT A : ورودی قابل برنامه ریزی A فعال است START : ورودی استارت از راه دور فعال است STOP : ورودی استپ از راه دور فعال است RESET : ورودی ریست از راه دور فعال است	۶

ال ای دی های نشاندهنده وضعیت دستگاه

چشمک زن	روشن	نام ال ای دی
موتور در حالت استپ بوده و سافت منتظر گذشت زمان تأخیر ریست (پارامتر ۵A) یا کنترل دمای موتور (پارامتر ۴F) می باشد	موتور خاموش است و دستگاه آماده روشن کردن موتور می باشد	آماده Ready
موتور در حال شروع استارت یا استپ است	موتور در وضعیت کار می باشد (تحت ولتاژ ماکزیمم)	کار RUN
سافت استارتر در وضعیت خطر می باشد	سافت در حالت قطع می باشد	قطع Trip
---	کنترل سافت بصورت محلی می باشد	محلی Local
---	صفحه نمایش در حالت نشان دادن وضعیت ها است	وضعیت Status
نمودار بطور موقت متوقف شده است	صفحه نمایش در حالت نشان دادن نمودارها است	نمودارها Graphs
---	منوی موارد ثبت شده باز می باشد	ثبت Logs

در صورتیکه سافت در وضعیت کنترل از راه دور باشد ، ال ای دی کنترل محلی خاموش میگردد .

در صورتیکه همه ال ای دی ها خاموش باشند ، بمعنای قطع ولتاژ کنترل است .

۵-۱-۲- ایتمهای صفحه نمایش

صفحه کلید ، اطلاعات گسترده ای از عملکرد سافت استارتر را نمایش می دهد . نیمه پائین صفحه نمایش اطلاعات آنلاین جریان یا قدرت موتور را مطابق تنظیمات انجام شده در پارامتر **J۱۰** نشان می دهد . با استفاده از کلید **status** یا کلیدهای جهتی بالا و پائین می توانید اطلاعات بیشتری را در نیمه بالایی صفحه نمایش مرور کنید . شامل :

- وضعیت سافت استارتر
- دمای موتور
- جریان
- قدرت موتور
- ولتاژ
- اطلاعات مربوط به آخرین استارت
- تاریخ و ساعت

نکته :

اطلاعات فوق در صورت تبعیت از تنظیمات پیش فرض نمایش داده شده است

وضعیت سافت استارتر

وضعیت سافت استارتر در واقع اطلاعات عملکردی ، دمای موتور و قدرت موتور را نشان می دهد .

صفحه برنامه ریزی

صفحه برنامه ریزی شده توسط کاربر می تواند جهت نمایش مهمترین اطلاعات برای کاربردهای خاص پیکر بندی شود . با استفاده از پارامترهای **B۱۰** تا **F۱۰** پارامترهای مورد نیاز را انتخاب کنید

دمای موتور

صفحه نشان دهنده درجه حرارت ضمن نشاندادن اینکه کدام یک از موتورهای تنظیم شده در حال کار است ، میزان درجه حرارت هر دو موتور را بصورت درصدی از ظرفیت گرمایی کل نشان می دهد . در صورتیکه سافت تنها برای یک موتور تنظیم شده باشد ، درجه حرارت موتور دوم همواره بصورت ۰٪ نمایش داده می شود

جریان

صفحه نشاندهنده جریان ، میزان جریان خطی هر فاز را بصورت آنلاین نمایش می دهد .

قدرت موتور

صفحه نمایش دهنده قدرت موتور ، میزان توان مصرفی را برحسب کیلوات ، اسب بخار و کیلوولت آمپر و نیز ضریب قدرت موتور را نشان می دهد

اطلاعات آخرین استارت

صفحه نمایشگر جزئیات مربوط به آخرین استارت موفقیت آمیز را به شرح زیر نشان میدهد :

- مدت زمان استارت (بر حسب ثانیه)
- بیشترین جریان زمان استارت (بر حسب درصدی از جریان کامل موتور)
- محاسبه میزان افزایش دمای موتور

تاریخ و زمان

صفحه نمایشگر ، تاریخ و ساعت فعلی سیستم را نشان می دهد (زمان در قالب ۲۴ ساعته می باشد) . برای کسب جزئیات بیشتر در این خصوص می توانید به تنظیمات ساعت و تاریخ مندرج در صفحه ۴۵ رجوع کنید .

نمودار میزان جریان تریستورها

در صفحه نمایشگر ، میزان جریان تریستورها بصورت نمودار نشان داده می شود

۵-۱-۳- نمودارها

سافت استارتر **ASAB** می تواند اطلاعات مربوط به آیتم های زیر را بصورت آنلاین نمایش دهد

- جریان
- دمای موتور
- توان اکتیو موتور
- توان ظاهری موتور
- ضریب قدرت

تازه ترین اطلاعات در گوشه سمت راست صفحه نمایش داده می شود . اطلاعات قدیمی ذخیره نمی گردند

برای دسترسی به نمودارها و یا اینکه کدام نمودار نمایش داده شود ، کلید **Graphs** را فشار دهید . گرافها می توانند بطور موقت ثابت بمانند تا اجازه تحلیل آنها به کاربر داده شود . برای اینکار دکمه **Graphs** را برای .۵ ثانیه یا بیشتر فشارداده و نگهدارید .

برای خروج از حالت فوق کلید **Graphs** را مجدداً فشار دهید

نکته :

وقتی نمودار در حالت موقتاً ثابت می باشد ، سافت استارتر هیچ اطلاعاتی را اخذ نمی نماید . وقتیکه نمودار از حالت توقف خارج می شود ، یک فاصله کوچک بین اطلاعات قبلی و فعلی بوجود خواهد آمد

۵,۲. فرمانهای استارت ، استپ و ریست

سافت استارتر به سه طریق زیر می تواند کنترل شود :

- با استفاده از دکمه های کی پد
- بوسیله ورودیهای کنترل از راه دور
- توسط یک اتصال سریال

با دکمه LOCAL/REMOTE می توان دستگاه در حالت کنترل محلی (توسط کی پد) یا کنترل از راه دور (توسط ورودی های مربوطه) قرار داد . همچنین می توان دستگاه را بصورتی تنظیم نمود که فقط در یکی از حالات فوق پاسخ دهد (پارامتر ۶A)

هنگامیکه دستگاه در حالت کنترل محلی قرار دارد ، LED مربوط به آن روی کی پد روشن مانده و زمانیکه در حالت کنترل از راه دور قرار دارد این LED خاموش می گردد .

دکمه استپ بر روی کی پد همواره در حالت فعال می باشد .

کنترل توسط یک شبکه با پورت سریال همواره در حالت کنترل محلی فعال بوده و در حالت کنترل از راه دور می تواند فعال یا غیرفعال گردد (رجوع کنید به پارامتر ۶B)

کنترل توسط شبکه سریال احتیاج به اضافه نمودن یک ماژول ارتباطی مخصوص دارد .

۵,۲,۱ - استفاده از سافت استارتر برای کنترل یک موتور

برای راه اندازی نرم ، دکمه START را روی کی پد فشار داده یا ورودی استارت از راه دور را فعال سازید . موتور با استفاده از مود استارت واقع در پارامتر ۲A شروع بکار خواهد نمود .

برای متوقف ساختن موتور ، دکمه STOP را روی کی پد فشار داده یا ورودی استپ از راه دور را فعال سازید . موتور با استفاده از مود استپ واقع در پارامتر ۲H شروع بکار خواهد نمود .

برای ریست کردن یک قطع Trip از دکمه RESET روی کی پد استفاده نموده یا ورودی ریست از راه دور را فعال نمائید

برای متوقف ساختن موتور در حالت اضطراری ، دکمه های محلی STOP و RESET را بطور همزمان فشار دهید . در این حال سافت استارتر موجب بی برق شدن موتور و قطع کنتاکتور اصلی می گردد . استپ اضطراری را می توان با استفاده از یکی از ورودیهای قابل برنامه ریزی کنترل نمود .

۵،۳- روشهای استارت نرم

سافت استارتر ها روشهای متنوعی برای راه اندازی موتور ارائه می دهند . هر یک از روشهای استارت نرم از یک کنترل اولیه متفاوت استفاده می نمایند .

پارامترهای عملکردی تحت تأثیر	پارامتر کنترل شده	روش استارت نرم
جریان ، گشتاور و شتاب راه اندازی	ولتاژ	شیب ولتاژ با زمانبندی
گشتاور و شتاب راه اندازی	جریان	جریان ثابت
جریان و شتاب راه اندازی	گشتاور	کنترل گشتاور
جریان و گشتاور	شتاب	کنترل تطبیقی شتاب

بهترین نتایج زمانی بدست می آید که روش انتخاب شده ، مستقیماً پارامتر مورد نظر که از اهمیت بالایی برخوردار است را نسبت به کاربرد مورد نظر کنترل نماید .

عموماً سافت استارترها برای محدود کردن جریان راه اندازی و یا کنترل شتاب یا کاهش سرعت بار استفاده می گردند

سافت استارتر **ASAB** می تواند با هر دو روش جریان ثابت یا کنترل تطبیقی شتاب تنظیم گردد

استفاده شود از	برای کنترل ...
جریان ثابت Constant Current	جریان راه اندازی موتور
کنترل تطبیقی AAC Adaptive Control	شتاب یا کاهش سرعت موتور یا بار

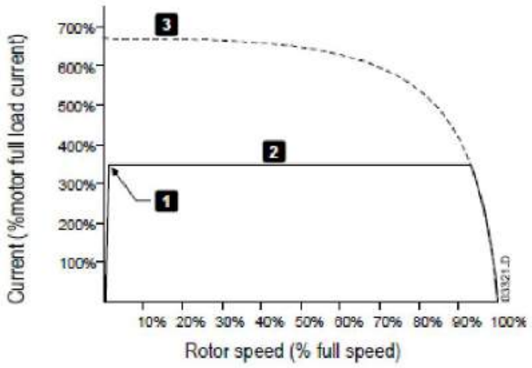
۵،۳،۱- جریان ثابت

روش جریان ثابت یکی از روشهای سنتی در سافت استارترها می باشد که میزان جریان را از صفر تا حد مورد نظر بالا برده و جریان را در آن حد ثابت نگه داشته تا موتور به شتاب مورد نظر برسد . این روش برای کاربردهایی مناسب است که می بایست میزان جریان از یک حد خاص پائینتر نگه داشته شود .

۱- جریان راه اندازی (پارامتر **۲C**)

۲- جریان محدود (پارامتر **۲B**)

۳- جریان ولتاژ کامل



SANTERNO
CARRARO GROUP

۵،۳،۲- شیب جریان

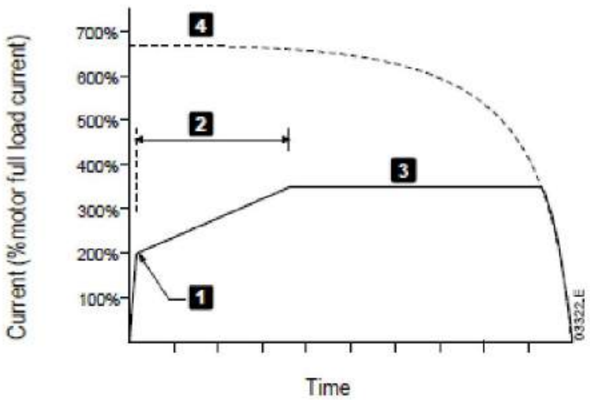
سافت استارترهای با شیب جریانی ، میزان جریان را از یک سطح خاص شروع کرده (۱) و تا حد نهایی خود (۲) طی یک مدت زمان طولانی (۳) بالا می برد .

این روش برای کاربردهایی مفید است که :

بارهایی که در شروع متفاوتند (بعنوان مثال یک تسمه نقاله که در شروع می تواند بدون بار یا با بار باشد) . در این حالت جریان راه اندازی را در سطحی که میخواهید سافت استارتر از آن نقطه برای راهاندازی یک بار سبک شروع بکار نماید تنظیم کرده (پارامتر ۲C) ، سپس پارامتر ۲B را بعنوان میزان جریان محدود شده برای راه اندازی بار سنگین تنظیم نمائید .

عملیات ترمز بار به سادگی انجام می پذیرد ، اما نیاز به زمان راه اندازی بیشتری دارد (بعنوان مثال یک پمپ گریز از مرکز که فشار خط لوله متصل به آن نیاز به پر شدن آرام دارد)

توان منبع تغذیه محدود می باشد (بعنوان مثال یک دستگاه ژنراتور) که یک کاربرد آرام در راه اندازی اجازه می دهد تا دستگاه تأمین برق زمان پاسخگویی لازم را در اختیار داشته باشد .



۱- جریان راه اندازی (پارامتر ۲C)
۲- زمان شیب استارت (پارامتر ۲D)
۳- جریان محدود (پارامتر ۲B)
۴- جریان ولتاژ کامل

۵،۳،۳ –راه اندازی به روش کنترل تطبیقی (AAC)

کنترل افزایش سرعت بروش تطبیقی یک روش جدید و هوشمند برای راه اندازی موتورها است .

در یک سافت استارتر با کنترل تطبیقی ، جریان بنا به نیاز برای استارت موتور تنظیم شده (توسط خود سافت) با یک زمان تعیین شده و استفاده از یک پروفایل افزایش سرعت .

نکته :

افزایش سرعت به روش کنترل تطبیقی (AAC) نمی تواند موتور را بیشتر از سرعتی که در روش راه اندازی مستقیم (DOL) وجود دارد راه اندازی کند . در صورتیکه شیب زمان استارت (پارامتر ۲D) کمتر از شیب زمان استارت در راه اندازی مستقیم باشد ، جریان راه اندازی ممکن است به سطح جریان راه اندازی مستقیم برسد

هرکاربردی یک پروفایل راه اندازی ویژه دارد که بر مبنای ویژگیهای بار و موتور پایه ریزی شده است . راه اندازی به روش کنترل تطبیقی دارای سه نوع پروفایل متفاوت برای پوشش دادن کاربردهای مختلف می باشد . انتخاب یک پروفایل که با پروفایل راه اندازی موتور (کاربرد) مطابقت داشته باشد موجب می شود که یک افزایش سرعت یکنواخت داشته باشیم .انتخاب یک پروفایل که بطور چشمگیری متفاوت از پروفایل کاربرد باشد می تواند پروفایل کاربرد را خنثی سازد .

سافت استارتر کلیه حرکات موتور را در حین هر استارت رصد کرده تا کنترل بهتری در استارتهای آتی داشته باشد .

کنترل سرعت به روش تطبیقی

برای بکار گیری AAC برای کنترل عملیات استارت :

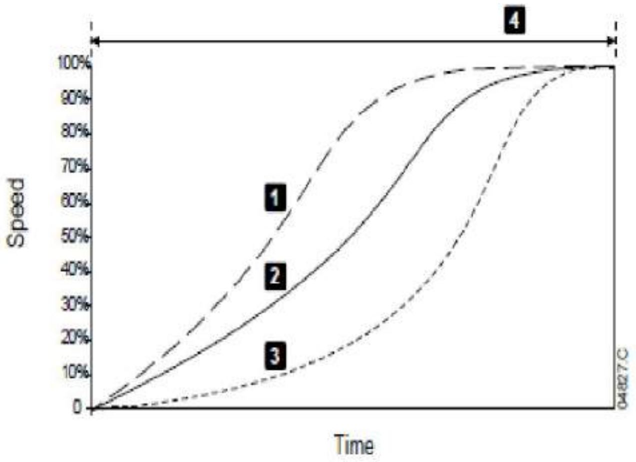
حالت کنترل تطبیقی (Adaptive Control) را از منوی حالتهای استارت انتخاب نمائید (پارامتر ۲A)

زمان شیب استارت مورد نظر را تنظیم کنید (پارامتر ۲D)

پروفایل استارت مورد نیاز را انتخاب کنید (پارامتر ۲J)

حد جریان استارت را تنظیم کنید (پارامتر ۲B) و این مقدار را به اندازه کافی بزرگ در نظر بگیرید تا یک استارت موفق داشته باشید . در اولین راه اندازی به روش AAC ممکن است یک جریان راه اندازی ثابت داشته باشید ، این بدین علت است که سافت استارتر در اولین راه اندازی مشخصات موتور متصله را دریافت می کند تا در استارتهای بعدی از این اطلاعات استفاده نماید .

پروفایلهای استارت تطبیقی (پارامتر J۲) :



۱- افزایش سرعت سریع

۲- افزایش سرعت با شیب ثابت

۳- افزایش سرعت کند

۴- زمان شیب استارت (پارامتر D۲)

چگونه پروفایل مورد نیاز را انتخاب کنیم :

بهترین پروفایل بستگی به جزئیات دقیق هر کاربردی دارد . اگر شما درخواستهای فرآیندی ویژه ای دارید ، این موضوع را با تأمین کننده محلی درمیان بگذارید .

بعضی از بارها مانند پمپهای شناور ، نباید در سرعتهای کم راه اندازی شوند . یک پروفایل با افزایش سرعت سریع می تواند شتاب را بسرعت بالا برده ، سپس به کنترل باقیمانده زمان استارت بپردازد .

نکته :

کنترل تطبیقی ، بر اساس یک پروفایل برنامه ریزی شده به کنترل بار می پردازد . لذا زمان استارت بستگی زیادی به پروفایل انتخابی و زمان استارت برنامه ریزی شده دارد .

اگر موتوری که در حالت کنترل تطبیقی جهت کنترل استارت یا استپ به سافت متصل بوده است را تعویض کنید , ویا اینکه سافت با یک موتور دیگر (جدای از دستگاه اصلی) تست شده باشد ، سافت احتیاج به فراگیری مشخصات موتور جدید دارد . در این حالت در صورتیکه پارمترهای A۱ (جریان کامل موتور) یا L۲ (میزان بهره کنترل تطبیقی) تغییر کرده باشد ، سافت بصورت اتوماتیک نسبت به دریافت مشخصات موتور جدید اقدام می کند .

نکته :

روش کنترل تطبیقی ، پروفایل سرعت موتور را با یک زمان محدود برنامه ریزی شده کنترل می کند . این بدین معنا است که ممکن است جریان راه اندازی بزرگتری نسبت به روشهای سنتی کنترل داشته باشید .

تنظیم دقیق کنترل تطبیقی :

اگر استارت یا استپ موتور بطور یکنواخت و صاف صورت نپذیرد ، میزان بهره کنترل تطبیقی را تنظیم نمائید (پارامتر L۲) . تنظیم بهره تصمیم میگیرد که تا چه اندازه ای سافت استارتر در استارتهای و استپهای آتی تغییر کند و این موضوع بر اساس اطلاعاتی است که از استارتهای قبلی حاصل شده است .تنظیم بهره بر روی هر دوی عملیات استارت و استپ تأثیرگذار می باشد .

- اگر افزایش یا کاهش شتاب در پایان استارت یا استپ خیلی سریع باشد ، میزان بهره را به ۵ تا ۱۰ درصد افزایش دهید
- اگر نوسان سرعت در حین استارت یا استپ داشتید ، میزان بهره را اندکی کم کنید

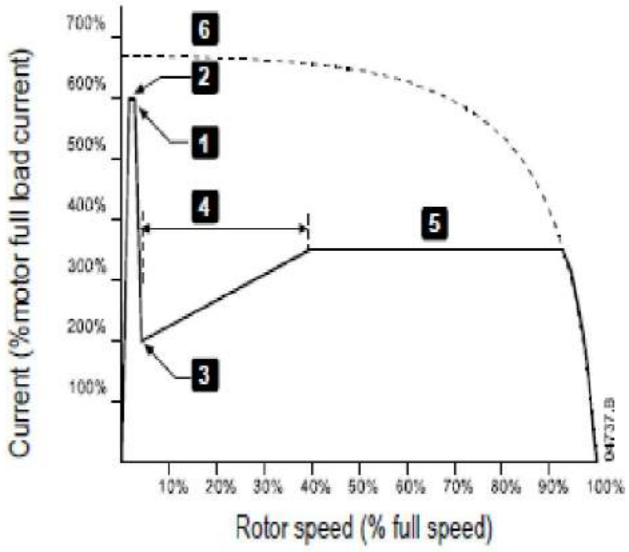
نکته :

در صورت ایجاد تغییر در میزان بهره ، سافت احتیاج به اخذ مجدد مشخصات موتور دارد . لذا در این حالت اولین راه اندازی بعد از ایجاد تغییر ، بصورت راهاندازی با جریان ثابت خواهد بود

۵,۳,۴ – استارت ضربه ای

استارت ضربه ای یک گشتاور اضافی در مدت زمان کوتاه به راهاندازی موتور اضافه می کند ، و در پایان با یک شیب جریانی و یا یک جریان ثابت استارت تکمیل می گردد

استارت ضربه ای زمانی مفید است که بار ما نیاز به یک گشتاور قوی برای کنده شدن و سپس یک افزایش شتاب راحت داشته باشد (بعنوان مثال چرخ لنگر در دستگاههای پرس)



۱- سطح استارت ضربه ای (پارامتر ۲E)

۲- زمان استارت ضربه ای (پارامتر ۲F)

۳- جریان اولیه (پارامتر ۲C)

۴- شیب زمان استارت (پارامتر ۲D)

۵- حد جریان(پارامتر ۲B)

۶- جریان در زمان ولتاژ کامل

۵,۴. روشهای استپ

سافت استارتر روشهای مختلفی برای استپ کردن موتور نیز دارد :

روش استپ	نتیجه
سرازیر شدن Coast To Stop	سرعت بار بطور طبیعی کاهش می یابد
شیب زمان ولتاژ TVR Soft Stop	ایجاد زمان توقف اضافی
کنترل تطبیقی Adaptive Control	ایجاد زمان توقف اضافی با توجه به نوع پروفایل
ترمز Brake	کاهش زمان توقف

سافت استارترها عموماً در کاربردهای پمپاژ استفاده شده از اثرات مخرب ضربه های قوچی جلوگیری بعمل آورند در این کاربرد می بایست از روش کنترل تطبیقی برای روش استپ استفاده نمود

۵,۴,۱ – سرازیر شدن

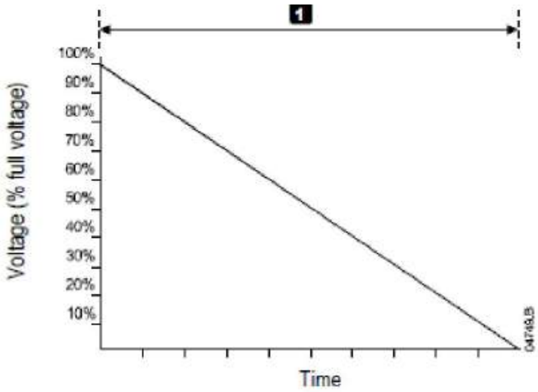
روش سرازیر شدن به موتور اجازه می دهد که سرعت خود را بطور طبیعی و بدون هیچ کنترلی از جانب سافت استارتر کاهش دهد . در این حالت مدت زمان استپ بستگی به نوع بار دارد

۵,۴,۲- روش شیب زمان ولتاژ (TVR)

در این روش ولتاژ موتور به تدریج و طی مدت زمان تعریف شده کاهش می یابد . بار ممکن است به حرکت خود حتی پس از کامل شدن شیب ادامه دهد .

این روش برای کاربردهای موثر است که نیاز به زمان بیشتری برای توقف بار داشته و یا برای جلوگیری از بروز ناپایداری در ژنراتور تغذیه کننده دستگاه بکار می رود .

۱- زمان استپ (پارامتر ۲I)



۵,۴,۳- روش کنترل تطبیقی برای استپ

در این روش با استفاده از کنترل جریان در یک محدوده زمانی خاص و برنامه ریزی شده تحت یک پروفایل ، عملیات استپ نرم صورت میپذیرد .این روش برای ایجاد یک زمان استپ اضافی در بارهای با اینرسی کم می باشد مناسب میباشد

نکته :

روش کنترل تطبیقی یک روش فعال در کاهش سرعت موتور نیست و موجب نمی شود که مدت سریتر از حالت سرازیر شده متوقف گردد . لذا برای بارهای با اینرسی بالا می بایست از ترمز استفاده نمود .

هر کاربردی دارای یک پروفایل خاص استپ بر اساس ویژگی های بار و موتور متصله می باشد . کاهش سرعت به روش کنترل تطبیقی دارای سه نوع پروفایل متفاوت می باشد . لذا بهترین پروفایل را بر اساس ویژگی های کاربر خود انتخاب نمائید .

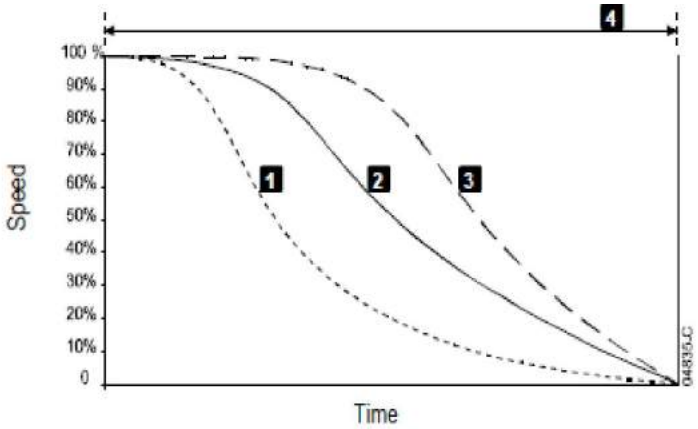
کنترل کاهش سرعت به روش تطبیقی :

برای استفاده از کنترل کاهش سرعت به روش تطبیقی :

۱- حالت کنترل تطبیقی (Adaptive Control) را از منوی حالتهای استپ انتخاب نمائید (پارامتر ۲H)

۲- زمان شیب استپ مورد نظر را تنظیم کنید (پارامتر ۲I)

۳- پروفایل استپ مورد نیاز را انتخاب کنید (پارامتر ۲K)



پروفایلهای استپ تطبیقی (پارامتر ۲K) :

۱- کاهش سرعت سریع
۲- کاهش سرعت با شیب ثابت
۳- کاهش سرعت کند
٤- زمان شیب استپ (پارامتر ۲I)

نکته :

توقف پمپاژ : ویژگیهای هیدرولیکی سیستمهای پمپاژ بسیار متفاوت می باشد .این بدان معنا است که پروفایل ایده آل جهت کاهش سرعت و نیز زمان استپ از هر کاربرد به کاربرد دیگر بسیار متنوع می باشد . جدول زیر جهت راهنمائی در انتخاب پروفایلهای مختلف ارائه شده است ، اما ما پیشنهاد می کنیم که هر سه پروفایل را جهت اخذ بهترین حالت مورد آزمایش قرار دهید

پروفایل	کاربرد
کاهش سرعت کند	سیستمهای با هد بالا که کاهش کوچکی در سرعت موتور یا پمپ موجب حرکت سریع بین جریان رفت و برگشت سیال می گردد
کاهش سرعت با شیب ثابت	سیستمهای با هد کم یا متوسط و جریان سیالی بالا که در آن میزان سیال زیاد است
کاهش سرعت سریع	سیستمهای پمپاژ باز که در آن عمل تخلیه سیال توسط پمپ بدون نیاز به حرکت معکوس صورت می گیرد

نکته :

کنترل تطبیقی بر اساس یک پروفایل برنامه ریزی شده به کنترل بار اقدام می کند . میزان جریان زمان استپ بستگی زیادی به نوع پروفایل انتخابی و زمان توقف دارد .

اگر موتوری که در حالت کنترل تطبیقی جهت کنترل استارت یا استپ به سافت متصل بوده است را تعویض کنید , ویا اینکه سافت با یک موتور دیگر (جدای از دستگاه اصلی) تست شده باشد ، سافت احتیاج به فراگیری مشخصات موتور جدید دارد . در این حالت در صورتیکه پارمترهای ۱A (جریان کامل موتور) یا ۲L (میزان بهره کنترل تطبیقی) تغییر کرده باشد ، سافت بصورت اتوماتیک نسبت به دریافت مشخصات موتور جدید اقدام می کند .

چگونه پروفایل مورد نیاز را انتخاب کنیم :

بهترین پروفایل بستگی به جزئیات دقیق هر کاربردی دارد . اگر شما درخواستهای فرآیندی ویژه ای دارید ، این موضوع را با تأمین کننده محلی درمیان بگذارید .

نکته :

در روش کنترل تطبیقی مشخصات سرعت موتور کنترل می گردد همراه با محدودیت زمانی برنامه ریزی شده . لذا این کار ممکن است نسبت به روشهای سنتی کنترل سرعت ، دارای سطح بالاتری از جریان باشد

۵,۴,۴- ترمز

ترمز باعث کوتاه شدن زمان توقف موتور می گردد

توجه :

در صورتیکه گشتاور ترمزی خیلی بالایی وجود داشته باشد ، موتور قبل از رسیدن به پایان زمان ترمز متوقف شده و موتور می بایست گرمای زیادی را متحمل شود که موجب آسیب به آن

می گردد . توجه داشته باشید که پیکیربندی مورد نیاز می بایست دارای عملکرد ایمن و مطمئنی در خصوص موتور و استارتر باشد .

ترمز :

زمانیکه از حالت ترمز استفاده می گردد ، دستگاه با استفاده از تزریق جریان **DC** به کاهش سرعت موتور اقدام می کند

ترمز در سافت استارتر **ASAB** :

- نیازی به استفاده از کنتاکتور ترمزی **DC** نمی باشد
- هر سه فاز کنترل شده بنابراین جریان ترمزی و گرمای حاصل از آن در کل موتور توزیع می گردند

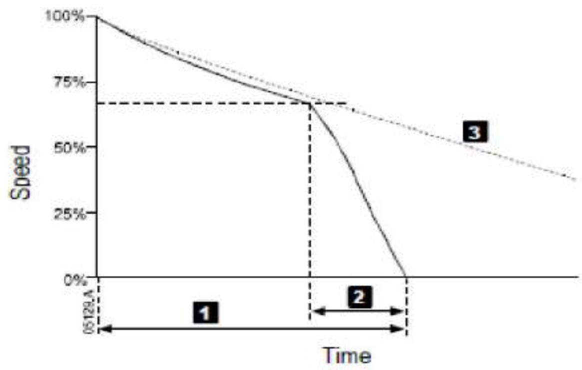
عمل ترمز دو مرحله دارد :

۱- پیش ترمز : ارائه یک سطح میانه از ترمز جهت کاهش سرعت موتور به میزانی که آمادگی کامل جهت تزمز موفقیت آمیز موتور فراهم شود (تقریباً ۷۰٪ سرعت)
۲- ترمز کامل : ایجاد حداکثر گشتاور ترمزی که در سرعتهای بالاتر از ۷۰ درصد بی اثر می باشد

پیکر بندی دستگاه جهت عملکرد ترمز :

۱- پارامتر **۲I** را برای مدت زمان توقف تنظیم کنید (۱) . این مدت زمان برابر زمان کل ترمز می باشد و می بایست بیشتر از مدت زمان خودِ ترمز (پارامتر **۱۵H**) باشد تا به مرحله پیش ترمز اجازه دهد تا سرعت موتور را به ۷۰ درصد کاهش دهد . در صورتیکه زمان توقف خیلی کوتاه باشد ، عمل ترمز با موفقیت انجام نگرفته و موتور به حالت سرازیر شدن متوقف می گردد .
۲- مدت زمان ترمز (پارامتر **۱۵H**) را به اندازه تقریباً یک چهارم کل زمان ترمز تنظیم کنید . این مدت زمان مربوط به مرحله دوم یعنی ترمز کامل می باشد
۳- میزان گشتاور ترمزی را در پارامتر **۱۵G** بگونه ای تنظیم کنید که بهترین حالت ترمز حاصل شود . در صورتیکه این میزان خیلی کم باشد موتور در حالت ترمز کامل قرار نگرفته و در انتها به حالت سرازیری متوقف می گردد .

برای کسب اطلاع بیشتر در خصوص استفاده از **ASAB** با سنسور سرعت خارجی (برای مثال برای کاربردهایی با بار متغیر در زمان ترمز) به ترمز نرم در صفحه ۵۱ مراجعه کنید .



۱- زمان استپ (پارامتر **I**۲)

۲- زمان ترمز (پارامتر **H**۱۵)

۳- زمان سرازیری به استپ

نکته :

عملکرد ترمز باعث می شود که موتور زودتر از آنچه بعنوان نرخ محاسبه شده حرارتی توسط مدل مربوطه صورت گرفته گرم شود . در این حالت کنترل حرارتی موتور در پارامتر **F**۴ را فعال کرده و یا پارامتر **A**۵ را برای زمان تأخیر مناسب ری استارت (شروع مجدد) تنظیم نمائید .

در زمان ترمز یک صدای تیز از موتور شنیده می شود ، که این موضوع در هنگام ترمز طبیعی است

۵.۵. عملکرد پرش :

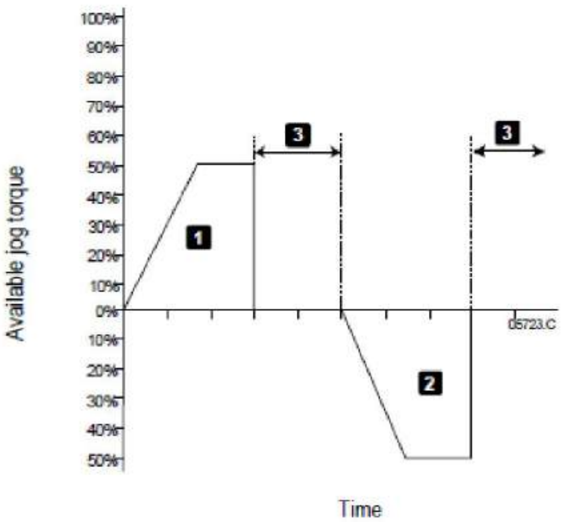
عملکرد پرش موجب راهاندازی موتور در یک سرعت کاهش یافته می گردد ، بطوریکه بین بار و کاربر دستگاه هماهنگی لازم بعمل آید .عمل پرش را می توان در هر دو جهت مستقیم و معکوس به موتور اعمال نمود .

بیشترین گشتاور قابل اعمال در حالت پرش تقریباً بین ۵۰ تا ۷۵ درصد گشتاوربار کامل **(FLT)** می باشد . در حالت حرکت معکوس ، گشتاور قابل اعمال در موقعیت پرش بین ۵۰ تا ۷۵ درصد گشتاور در حالت حرکت مستقیم است . برای تنظیم گشتاور پرش به پارامتر **F**۱۵ مراجعه کنید .

نکته :

تنظیم پارامتر ۱۵F به بیش از ۵۰٪ ممکن است موجب افزایش ارتعاشات شفت گردد .

۱- پرش در جهت مستقیم
۲- پرش در جهت معکوس
۳- عملکرد نرمال



برای فعال کردن حالت پرش از یکی از ورودی های قابل برنامه ریزی استفاده کنید (پارامتر ۶D) در صورتیکه در حین پرش یک فرمان جدید به دستگاه برسد ، فرمان پرش متوقف شده و فرمان جدید اجرا می شود .

نکته :

در حین پرش عملیات راه اندازی نرم و توقف نرم قابل دستیابی نیستند .

احتیاط :

حرکت با سرعت کم در کارکرد مداوم ، نباید به نیت کاهش حرارت موتور انجام پذیرد . از آنجا که در حالت پرش پروفایل حرارتی موتور تغییر کرده و دقت مدل حرارتی موتور نیز پائین می آید . لذا در حالت پرش نباید به عملکرد صحیح حفاظت اضافه بار مطمئن بود

۵,۶- عملکرد اتصال مثلث خارجی

کنترل تطبیقی ، پرش ، ترمز و ادامه کاربا دوفاز (Power Through) در حالت مثلث خارجی (شش سیمه) پشتیبانی نمی گردند . اگر این عملکردها در هنگام برنامه ریزی سافت اعمال

شوند ، اما در عمل سافت به یک موتور با اتصال مثلث خارجی وصل گردد ، رفتارهای زیر بروز خواهد کرد :

استارت با کنترل تطبیقی	سافت با یک جریان ثابت راه اندازی می گردد
استپ با کنترل تطبیقی	اگر پارامتر I۲ (زمان استپ) بر روی بزرگتر از صفر ثانیه تنظیم شده باشد موتور به حالت شیب زمان ولتاژ متوقف می گردد و در صورتیکه این پارامتر برابر صفر انتخاب شود موتور به حالت سرازیری متوقف می شود
پرش	سافت آلارم عدم پشتیبانی می دهد
ترمز	موتور به حالت سرازیری متوقف می گردد
ادامه کار با دو فاز	سافت فرمان قطع داده و پیغام L_X-T_X **Shorted** نمایش داده می شود

نکته :

هنگام اتصال به طریق مثلث خارجی ، تنها حفاظت نامتعادلی جریان بعنوان حفاظت قطع فاز نیز در زمان کارفعال می باشد . لذا در این حالت نباید پارامتر ۴A (حفاظت نامتعادلی جریان) غیرفعال گردد .

احتیاط :

حالت مثلث خارجی زمانی می تواند انتخاب گردد که ولتاژ اصلی کمتر یا مساوی ۶۰۰VAC باشد

۶- منوی برنامه ریزی

منوی برنامه ریزی بشما این امکان می دهد که پارامترهای قابل برنامه ریزی را جهت کنترل عملکرد دستگاه مشاهده و یا تغییر دهید . برای باز کردن این منو ، دکمه **MENU/ENTER** را در حالت نمایش وضعیت یا گراف فشار دهید . برای حرکت بین پارامترهای منو :

- برای حرکت بین پارامترهای گروهی کلید بالا و پائین را فشار دهید
- برای باز کردن یک زیر منو دکمه **MENU/ENTER** را فشار دهید
- برای مشاهده پارامترهای یک گروه دکمه **MENU/ENTER** را فشار دهید
- برای بازگشت به یک سطح قبل از دکمه **EXIT** استفاده کنید
- برای بستن منوی برنامه ریزی دکمه **EXIT** را چندین بار فشار داده یا دکمه های **STATUS** یا **GRAPHS** را بفشارید .

برای تغییر مقدار یک پارامتر :

- روی پارامتر مورد نظر رفته و دکمه **MENU/ENTER** را جهت باز کردن صفحه ویرایش فشار دهید
- برای تغییر میزان پارامتر انتخابی از دکمه های بالا و پائین استفاده کنید . با هر بار فشار دادن این دکمه ها مقدار پارامتر یک واحد کم یا زیاد می شود . در صورتیکه این دکمه ها بیش از ۵ ثانیه فشرده و نگه داشته شوند سرعت کاهش یا افزایش پارامتر بیشتر می شود
- برای ذخیره تغییرات دکمه **MENU/ENTER** را فشار دهید . در این حالت تنظیمات نمایش داده شده روی صفحه نمایش ذخیره شده و کی پد به لیست پارامترها بر میگردد
- برای لغو یک تغییر از دکمه **EXIT** استفاده کنید . در این حالت ابتدا از شما تأیید این موضوع خواسته شده و سپس بدون ذخیره هر گونه تغییر به لیست پارامترها برمی گردد .

شما در هر زمانی می توانید به منوی قابل برنامه ریزی دسترسی داشته باشید حتی زمانیکه سافت در حالت کارکرد می باشد . هر گونه تغییرات ایجاد شده نیز سریعاً اعمال می گردد .

منوی قابل برنامه ریزی دارای ۴ زیر منو است :

منوی تنظیم سریع Quick Setup Menu	به تنظیمات سریع برای کاربردهای عمومی دسترسی خواهید داشت
منوی استاندارد Standard Menu	منوی استاندارد دسترسی شما را به پارامترهای عموماً استفاده شده را آسان می سازد . این موضوع بشما اجازه می دهد تا دستگاه را با کاربرد مورد نظر وفق دهید

منوی گسترده Extended Menu	این منو بشما اجازه دسترسی به تمامی پارامترهای قابل برنامه ریزی را می دهد . این منو جهت کاربرهای باتجربه جهت دستیابی به بهترین تنظیم و استفاده از ویژگیهای پیشرفته دستگاه است
ابزارهای تنظیم Setup Tools	ابزارهای تنظیم شامل تنظیمات مربوط به تعمیر بوده که پیکربندی ساعت ، تاریخ دستگاه و یا بارگذاری یک پارامتر استاندارد را برعهده دارد

۶,۱- تنظیم سریع :

این منو پیکر بندی دستگاه برای کاربردهای عمومی را میسر می سازد . در این حالت دستگاه بر اساس کاربرد مورد نظر پارامترها را تنظیم کرده و یک تنظیم عمومی بشما پیشنهاد میدهد و شما می توانید هر پارامتر را بر اساس نیاز خود تنظیم کنید .

همیشه پارامتر ۱A (جریان بار کامل موتور) را بر اساس پلاک مشخصات موتور تنظیم کنید . مقدار پیشنهادی حداقل جریان بار کامل سافت می باشد .

کاربرد	پارامتر	میزان پیشنهادی
پمپ گریز از مرکز	جریان بار کامل موتور حالت استارت پروفایل استارت تطبیقی زمان شیب استارت محدودیت جریان حالت استپ پروفایل استپ تطبیقی زمان توقف	با توجه به مدل کنترل تطبیقی شتاب سریع ۵ ثانیه ٪۳۵۰٪ کنترل تطبیقی کاهش سرعت کند ۱۵ ثانیه
پمپ شناور	جریان بار کامل موتور حالت استارت پروفایل استارت تطبیقی زمان شیب استارت محدودیت جریان حالت استپ پروفایل استپ تطبیقی	با توجه به مدل کنترل تطبیقی شتاب سریع ۵ ثانیه ٪۳۵۰٪ کنترل تطبیقی کاهش سرعت کند

	زمان توقف	۱۵ ثانیه
فن رطوبتی	جریان بار کامل موتور حالت استارت پروفایل استارت تطبیقی زمان شیب استارت محدودیت جریان	با توجه به مدل کنترل تطبیقی شتاب ثابت ۱۵ ثانیه ٪۳۵۰
فن خشک	جریان بار کامل موتور حالت استارت پروفایل استارت تطبیقی زمان شیب استارت محدودیت جریان زمان استارت اضافی زمان قفل روتور	با توجه به مدل کنترل تطبیقی شتاب ثابت ۲۰ ثانیه ٪۴۰۰ ۳۰ ثانیه ۲۰ ثانیه
کمپرسور اتصال دهنده	جریان بار کامل موتور حالت استارت پروفایل استارت تطبیقی زمان شیب استارت محدودیت جریان	با توجه به مدل کنترل تطبیقی شتاب ثابت ۱۰ ثانیه ٪۴۰۰
کمپرسور جدا کننده	جریان بار کامل موتور حالت استارت پروفایل استارت تطبیقی زمان شیب استارت محدودیت جریان	با توجه به مدل کنترل تطبیقی شتاب ثابت ۱۰ ثانیه ٪۴۵۰
تسمه نقاله	جریان بار کامل موتور حالت استارت پروفایل استارت تطبیقی زمان شیب استارت محدودیت جریان حالت استپ پروفایل استپ تطبیقی زمان توقف	با توجه به مدل کنترل تطبیقی شتاب کند ۱۵ ثانیه ٪۴۰۰ کنترل تطبیقی کاهش سرعت ثابت ۵ ثانیه
چرخ دنده فشار دهنده	جریان بار کامل موتور حالت استارت پروفایل استارت تطبیقی زمان شیب استارت محدودیت جریان	با توجه به مدل کنترل تطبیقی شتاب ثابت ۲۰ ثانیه ٪۴۰۰

	زمان استارت اضافی	۳۰ ثانیه
	زمان قفل روتور	۲۰ ثانیه
گیره فشار دهنده	جریان بار کامل موتور	با توجه به مدل
	حالت استارت	کنترل تطبیقی
	پروفایل استارت تطبیقی	شتاب ثابت
	زمان شیب استارت	۳۰ ثانیه
	محدودیت جریان	٪۴۵۰
	زمان استارت اضافی	۴۰ ثانیه
	زمان قفل روتور	۳۰ ثانیه

در صفحه نمایش میزان های لایت شده نمایانگر مقدار پیشنهادی و مقداری که با علامت مثلث نشان داده شده است نماینگر میزان بارگذاری شده می باشد

۶,۲- منوی استاندارد

منوی استاندارد دسترسی شما را به پارامترهایی که عموماً از آن استفاده کردید آسان می ساخته و این اجازه را به کاربر می دهد تا بر اساس نیاز هر کاربرد پیکربندی خود را انجام دهد

			تنظیم پیش فرض
۱	مشخصات موتور		
	۱A	جریان بار کامل موتور (FLC)	بر اساس مدل
۲	حالتهای استارت و استپ موتور اول		
	۲A	حالت استارت	جریان ثابت
	۲B	حد جریان	۳۵۰٪
	۲C	جریان اولیه	۳۵۰٪
	۲D	زمان شیب استارت	۰۰:۱۰mm:ss
	۲G	زمان استارت اضافه	۰۰:۲۰mm:ss
	۲H	حالت استپ	توقف به روش سرازیری
	۲I	زمان استپ	۰۰:۰۰mm:ss
٤	سطوح حفاظتی		
	۴B	توالی فاز	هر توالی
	۴C	افت جریان	۳۰٪FLC
	۴D	افزایش جریان پیوسته	۴۰۰٪FLC
	۴E	دریافت یک فرمان قطع	همیشه فعال
٥	تأخیرات حفاظتی		
	۵C	تأخیر افت جریان	۰۰:۰۵mm:ss
	۵D	تأخیر افزایش جریان پیوسته	۰۰:۰۰mm:ss
	۵E	تأخیر ورودی قطع A	۰۰:۰۰:mm:ss
	۵F	تأخیر در اجرای فرمان راه اندازی	۰۰:۰۰mm:ss
٦	ورودی ها		
	۶D	عملکرد ورودی A	انتخاب تنظیم موتور
	۶E	نام ورودی A	ورودی قطع
۷	رله های خروجی		

	۷A	عملکرد رله A	کنتاکتور اصلی
	۷B	زمان تأخیر در وصل رله A	۰۰:۰۰mm:ss
	۷C	زمان تأخیر در قطع رله A	۰۰:۰۰mm:ss
	۷D	عملکرد رله B	حرکت
	۷E	زمان تأخیر در وصل رله B	۰۰:۰۰mm:ss
	۷F	زمان تأخیر در قطع رله B	۰۰:۰۰mm:ss
	۷G	عملکرد رله C	قطع
	۷H	زمان تأخیر در وصل رله C	۰۰:۰۰mm:ss
	۷I	زمان تأخیر در قطع رله C	۰۰:mm:ss
	۷J	آستانه افت جریان	۵۰٪FLC
	۷K	آستانه افزایش جریان	۱۰۰٪FLC
	۷L	آستانه دمای موتور	۸۰٪FLC
۱۰	نمایشگر		
	۱۰A	زبان	انگلیسی
	۱۰B	صفحه کاربر – بالا چپ	وضعیت سافت استارتر
	۱۰c	صفحه کاربر – بالا راست	خالی
	۱۰D	صفحه کاربر – پائین چپ	ساعت کارکرد
	۱۰E	صفحه کاربر – پائین راست	خالی
	۱۰J	نمایش جریان یا توان	جریان

۶,۳- منوی گسترده

این منو دسترسی به تمامی پارامترهای دستگاه را میسر می سازد

۱	مشخصات موتور		
	۱A	جریان بار کامل موتور	با توجه به مدل
	۱B	زمان روتور قفل شده	۰۰:۱۰mm:ss
	۱C	جریان بار کامل موتور دوم	با توجه به مدل
	۱D	زمان روتور قفل شده دوم	۰۰:۱۰mm:ss
	۱E	مدل حرارتی دوگانه	تکی
۲	حالتهای استارت و استپ موتور اول		
	۲A	حالت استارت	جریان ثابت
	۲B	حد جریان	۳۵۰٪FLC
	۲C	جریان اولیه	۳۵۰٪FLC
	۲D	زمان شیب استارت	۰۰:۱۰mm:ss
	۲E	سطح استارت ضربه ای	۵۰۰٪FLC
	۲F	زمان استارت ضربه ای	۰ms
	۲G	زمان استارت اضافه	۰۰:۲۰mm:ss
	۲H	حالت استپ	استپ به روش سرازیری
	۲I	زمان استپ	۰۰:۰۰mm:ss
	۲J	پروفایل استارت تطبیقی	شتاب ثابت
	۲K	پروفایل استپ تطبیقی	کاهش سرعت ثابت
	۲L	بهره کنترل تطبیقی	۷۵٪
۳	حالتهای استارت و استپ موتور دوم		
	۳A	حالت استارت ۲	جریان ثابت
	۳B	حد جریان ۲	۳۵۰٪FLC
	۳C	جریان اولیه ۲	۳۵۰٪FLC

	۳D	زمان شیب استارت ۲	۰۰:۱۰mm:ss
	۳E	سطح استارت ضربه ای ۲	۵۰۰٪FLC
	۳F	زمان استارت ضربه ای ۲	۰ms
	۳G	زمان استارت اضافه ۲	۰۰:۳۰mm:ss
	۳H	حالت استپ ۲	استپ به روش سرازیری
	۳I	زمان استپ ۲	۰۰:۰۰mm:ss
	۳J	پروفایل استارت تطبیقی ۲	شتاب ثابت
	۳K	پروفایل استپ تطبیقی ۲	کاهش سرعت ثابت
	۳L	بهره کنترل تطبیقی ۲	۷۵٪
٤	سطوح حفاظتی		
	۴A	عدم تعادل جریان	۳۰٪
	۴B	توالی فاز	هر توالی
	۴C	افت جریان	۲۰٪FLC
	۴D	افزایش جریان پیوسته	۴۰۰٪FLC
	۴E	ورودی قطع A	همیشه فعال
	۴F	کنترل حرارت موتور	کنترل نگردد
	۴G	کنترل فرکانس	استارت / حرکت
	۴H	تلورانس فرکانس	± ۵ هرتز
٥	تأخیر خفاظتی		
	۵A	تأخیر استارت مجدد	۰۰:۱۰mm:ss
	۵B	تأخیر عدم تعادل جریان	۰۰:۰۳mm:ss
	۵C	تأخیر افت جریان	۰۰:۰۵mm:ss
	۵D	تأخیر افزایش جریان پیوسته	۰۰:۰۰mm:ss
	۵E	تأخیر ورودی قطع A	۰۰:۰۰:mm:ss
	۵F	تأخیر در اجرای فرمان راه اندازی	۰۰:۰۰mm:ss
	۵G	تأخیر فرکانس	۰۰:۰۱mm:ss
٦	ورودی ها		
	۶A	محلی / از راه دور	در هر زمان
	۶B	فرمانهای از راه دور	کنترل از راه دور فعال
	۶C	منطق ریست از راه دور	بسته NC
	۶D	عملکرد ورودی A	انتخاب تنظیم موتور
	۶E	نام ورودی A	ورودی قطع
۷	رله های خروجی		
	۷A	عملکرد رله A	کنتاکتور اصلی
	۷B	زمان تأخیر در وصل رله A	۰۰:۰۰mm:ss
	۷C	زمان تأخیر در قطع رله A	۰۰:۰۰mm:ss
	۷D	عملکرد رله B	حرکت
	۷E	زمان تأخیر در وصل رله B	۰۰:۰۰mm:ss
	۷F	زمان تأخیر در قطع رله B	۰۰:۰۰mm:ss
	۷G	عملکرد رله C	قطع
	۷H	زمان تأخیر در وصل رله C	۰۰:۰۰mm:ss
	۷I	زمان تأخیر در قطع رله C	۰۰:mm:ss
	۷J	آستانه افت جریان	۵۰٪FLC
	۷K	آستانه افزایش جریان	۱۰۰٪FLC
	۷L	آستانه دمای موتور	۸۰٪FLC
۸	ورودی و خروجی آنالوگ		
	۸A	خروجی آنالوگ A	جریان (%FLC)
	۸B	مقیاس آنالوگ A	۴-۲۰mA
	۸C	ماکزیمم تغییرات آنالوگ A	۱۰۰٪
	۸D	حداقل تغییرات آنالوگ A	۰٪

۹	ریست اتوماتیک		
	۹A	عملکرد ریست اتوماتیک	غیر فعال
	۹B	ماکزیمم ریست	۱
	۹C	تأخیر ریست در گروههای A و B	۰۰:۰۵mm:ss
	۹D	تأخیر ریست در گروه C	۵ دقیقه
۱۰			
	۱۰A	زبان	انگلیسی
	۱۰B	صفحه کاربر – بالا چپ	وضعیت سافت استارتر
	۱۰C	صفحه کاربر – بالا راست	خالی
	۱۰D	صفحه کاربر – پائین چپ	ساعت کارکرد
	۱۰E	صفحه کاربر – پائین راست	خالی
	۱۰F	پایه زمانی نمایش نمودار	۱۰ثانیه
	۱۰G	ماکزیمم تغییرات نمودار	۴۰۰٪
	۱۰H	حداقل تغییرات نمودار	۰٪
	۱۰I	ولتاژ مرجع	۴۰۰V
	۱۰J	نمایش جریان یا توان	جریان
۱۵	محدودیتها		
	۱۵A	کد دسترسی	۰۰۰۰
	۱۵B	قفل تنظیمات	خواندن / نوشتن
	۱۵C	کار در حالت اضطراری	غیرفعال
	۱۵D	کالیبراسیون جریان	۱۰۰٪
	۱۵E	عملکرد در قبال اتصال کوتاه تریستور	فقط کنترل سه فاز
	۱۵F	گشتاور پرش	۵۰٪
	۱۵G	گشتاور ترمز	۲۰٪
	۱۵H	زمان ترمز	۰۰:۰۱mm:ss
	۱۵I	گشتاور ترمز ۲	۲۰٪
	۱۵J	زمان ترمز ۲	۰۰:۰۱mm:ss
۱۶	عملکرد قطع		
	۱۶A	اضافه بار موتور	قطع سافت استارتر
	۱۶B	نامتعادلی جریان	قطع سافت استارتر
	۱۶C	افت جریان	قطع سافت استارتر
	۱۶D	افزایش جریان سریع	قطع سافت استارتر
	۱۶E	قطع ورودی A	قطع سافت استارتر
	۱۶F	فرکانس	قطع سافت استارتر
	۱۶G	ترمیستور موتور	قطع سافت استارتر
	۱۶H	زمان استارت زیادی	قطع سافت استارتر
	۱۶I	اتصال سافت استارتر	قطع سافت استارتر
	۱۶J	اضافه دما رادیاتور	قطع سافت استارتر
	۱۶K	باتری / ساعت	قطع سافت استارتر
	۱۶L	اتصال شبکه	قطع سافت استارتر

۶,۴. شرح پارامترها

۶,۴,۱- جزئیات موتور

A۱: جریان بار کامل موتور

محدوده : بر اساس مدل

شرح : سافت را با جریان بار کامل موتور متصله هماهنگ می سازد . این میزان می بایست بر اساس پلاک مشخصات موتور تنظیم گردد

B۱ : زمان روتورقفل شده

محدوده : ۱ ثانیه تا ۲ دقیقه   پیش فرض : ۱۰ ثانیه

شرح : عبارت است از ماکزیمم مدت زمانی که موتور با روتور قفل شده می تواند بکار خود ادامه دهد قبل از اینکه به ماکزیمم حرارت خود برسد . این تنظیم می بایست بر اساس اطلاعات موتور انجام پذیرد

C۱ : جریان بار کامل موتور۲

محدوده : بر اساس مدل

شرح : جریان بار کامل موتوربرای موتور دوم

D۱ : زمان روتورقفل شده ۲

محدوده : ۱ ثانیه تا ۲ دقیقه   پیش فرض : ۱۰ ثانیه

شرح : عبارت است از ماکزیمم مدت زمانی که موتور با روتور قفل شده می تواند بکار خود ادامه دهد قبل از اینکه به ماکزیمم حرارت خود برسد . این تنظیم می بایست بر اساس اطلاعات موتور انجام پذیرد

۱E : مدل حرارتی دوگانه

انتخاب : تکی (پیش فرض) یا دوگانه

شرح : برای فعال کردن مدل حرارتی دوگانه بکار می رود . این مدل زمانی مورد نیاز است که دو موتور جداگانه توسط یک دستگاه سافت کنترل گردد

نکته :

مدل حرارتی دوم تنها زمانی فعال می باشد که پارامتر ۱E بروی دوگانه (DUAL) قرار گرفته باشد و تنظیمات موتور دوم نیز برای دستگاه سافت انجام پذیرفته باشد . (یکی از ورودی های قابل برنامه ریزی می بایست بر روی Motor Set Select بوده و آن ورودی نیز فعال باشد)

۶,۴,۲- استارت یا استپ موتور اول

۲A : حالت استارت

انتخاب : جریان ثابت (پیش فرض) یا کنترل تطبیقی

شرح : حالت استارت نرم را انتخاب می نماید

۲B : حد جریان

محدوده : از ۱۰۰٪ تا ۶۰۰٪ جریان بار کامل پیش فرض : ۳۵۰٪

شرح : میزان جریان نهایی برای حالت جریان ثابت یا شیب جریانی استارت نرم بر اساس درصدی از جریان بار کامل را تنظیم می کند

۲C : جریان اولیه راه اندازی

محدوده : از ۱۰۰٪ تا ۶۰۰٪ جریان بار کامل پیش فرض : ۳۵۰٪

شرح : تنظیم جریان شروع راه اندازی برای حالت استارت با شیب جریانی و بر اساس درصدی از جریان بار کامل می باشد . هر چه این مقدار بزرگتر باشد یعنی شتاب گرفتن موتور پس از استارت سریعتر انجام می پذیرد . در صورتیکه نیاز به شیب جریانی ندارید میزان جریان اولیه راه اندازی را برابر حد جریان قرار دهید

۲D : زمان شیب استارت

محدوده : از ۱ تا ۱۸۰ ثانیه پیش فرض : ۱۰ثانیه

شرح : برای زمان کل استارت برای حالت کنترل تطبیقی شتاب یا زمان شیب برای استارت با شیب جریانی تنظیم می گردد (از جریان راه اندازی اولیه تا حد جریان)

۲E : سطح استارت ضربه ای

محدوده : ۱۰۰٪ تا ۷۰۰٪ جریان بار کامل پیش فرض : ۵۰۰٪

شرح : جهت تنظیم میزان جریان ضربه ای استفاده می گردد

۲F : زمان استارت ضربه ای

محدوده : ۰ تا ۲۰۰۰ میلی ثانیه پیش فرض : ۰ میلی ثانیه

شرح : عبارت است از تنظیم مدت زمان استارت ضربه ای – تنظیم بر روی صفر ثانیه به معنای غیرفعال کردن این گزینه است

احتیاط :

در حالت استارت ضربه ای ، تجهیزات مکانیکی در معرض سطح بالاتری از گشتاور قرار می گیرند . در این حالت از میزان استقامت موتور ، بار و اتصالات مطمئن شده ، سپس اقدام به فعال سازی این ویژگی نمائید .

G۲: زمان استارت اضافه

زمان استارت اضافه حداکثر مدت زمانی است که سافت تلاش می کند تا موتور استارت گردد . در صورتیکه پس از گذشت این مدت زمان ، موتور به حالت کارکرد (RUN) نرفت موجب قطع کامل سافت می گردد . لذا این مدت زمان را کمی بیشتر از مدت مورد نیاز تنظیم کنید تا یک استارت سالم داشته باشید . در صورتیکه این میزان صفر منظور گردد بمعنای غیرفعال کردن این حفاظت است

محدوده : ۰ ثانیه تا ۴ دقیقه

شرح : تنظیم بر اساس نیاز

H۲: حالت توقف

انتخاب :

- سرازیری تا توقف (پیش فرض)
- استپ نرم با شیب زمان ولتاژ
- کنترل تطبیقی
- ترمز

شرح : انتخاب حالت توقف

۲I : زمان توقف

محدوده : ۰ ثانیه تا ۴ دقیقه پیش فرض : صفر ثانیه

شرح : تنظیم مدت زمان استپ نرم در حالت شیب زمان ولتاژ و یا کنترل تطبیقی است . در صورت استفاده از کنتاکتور اصلی ، می بایست این کنتاکتور تا پایان زمان توقف در مدار بوده و بسته باشد . برای ایجاد این حالت می توانید از یک خروجی قابل برنامه ریزی که با RUN ست می باشد جهت کنترل کنتاکتور اصلی استفاده نمائید . در صورت استفاده از ترمز ، این میزان باید برابر زمان کل استپ باشد

۲J : پروفایل استارت تطبیقی

انتخاب :

- شتاب سریع
- شتاب ثابت (پیش فرض)
- شتاب کند

شرح : انتخاب نوع پروفایل افزایش سرعت برای حالت کنترل تطبیقی سرعت

۲K : پروفایل استپ تطبیقی

انتخاب :

- کاهش سرعت سریع
- کاهش سرعت ثابت (پیش فرض)
- کاهش سرعت کند

شرح : انتخاب نوع پروفایل کاهش سرعت برای حالت کنترل تطبیقی استپ

۲L : بهره کنترل تطبیقی

محدوده : ۱٪ تا ۲۰۰٪ پیش فرض : ۷۵٪

شرح : برای تنظیم کنترل تطبیقی بکار می رود . انجام تنظیمات بر روی کنترل تطبیقی استارت و استپ تأثیر گذار می باشد

نکته :

پیشنهاد ما اینست که در خصوص این آیتم تغییری در مقدار پیش فرض بوجود نیاورید مگر اینکه عملکرد ، رضایت بخش نباشد . در صورتیکه افزایش یا کاهش سرعت در پایان عملیات استارت یا استپ خیلی سریع اتفاق می افتد ، میزان بهره را ۵ تا ۱۰ درصد افزایش دهید . در صورتیکه سرعت موتور در حین استارت یا استپ دارای نوسان باشد ، میزان بهره را اندکی پائین بیاورید .

۶,۴,۳ – استارت یا استپ موتور دوم

برای جزئیات بیشتر به پارامترهای استارت یا استپ موتور اول مراجعه کنید

۳A : حالت استارت ۲

انتخاب :

- جریان ثابت (پیش فرض)
- کنترل تطبیقی

شرح : حالت استارت نرم را انتخاب می نماید

۳B : حد جریان ۲

محدوده : از ۱۰۰٪ تا ۶۰۰٪ جریان بار کامل   پیش فرض : ۳۵۰٪

شرح : میزان جریان نهایی برای حالت جریان ثابت یا شیب جریانی استارت نرم بر اساس درصدی از جریان بار کامل را تنظیم می کند

۳C : جریان اولیه راه اندازی ۲

محدوده : از ۱۰۰٪ تا ۶۰۰٪ جریان بار کامل   پیش فرض : ۳۵۰٪

شرح : تنظیم جریان شروع راه اندازی برای حالت استارت با شیب جریانی و بر اساس درصدی از جریان بار کامل می باشد . هر چه این مقدار بزرگتر باشد یعنی شتاب گرفتن موتور پس از استارت سریعتر انجام می پذیرد . در صورتیکه نیاز به شیب جریانی ندارید میزان جریان اولیه راه اندازی را برابر حد جریان قرار دهید

۳D : زمان شیب استارت ۲

محدوده : از ۱ تا ۱۸۰ ثانیه   پیش فرض : ۱۰ثانیه

شرح : برای زمان کل استارت برای حالت کنترل تطبیقی شتاب یا زمان شیب برای استارت با شیب جریانی تنظیم می گردد (از جریان راه اندازی اولیه تا حد جریان)

۳E : سطح استارت ضربه ای ۲

محدوده : ۱۰۰٪ تا ۷۰۰٪ جریان بار کامل   پیش فرض : ۵۰۰٪

شرح : جهت تنظیم میزان جریان ضربه ای استفاده می گردد

۳F : زمان استارت ضربه ای ۲

محدوده : ۰ تا ۲۰۰۰ میلی ثانیه　　　　پیش فرض : ۰ میلی ثانیه

شرح : عبارت است از تنظیم مدت زمان استارت ضربه ای – تنظیم بر روی صفر ثانیه به معنای غیرفعال کردن آین گزینه است

احتیاط :

در حالت استارت ضربه ای ، تجهیزات مکانیکی در معرض سطح بالاتری از گشتاور قرار می گیرند . در این حالت از نیزان استقامت موتور ، بار و اتصالات مطمئن شده ، سپس اقدام به فعال سازی این ویژگی بنمائید .

۳G: زمان استارت اضافه ۲

زمان استارت اضافه حداکثر مدت زمانی است که سافت تلاش می کند تا موتور استارت گردد . در صورتیکه پس از گذشت این مدت زمان ، موتور به حالت کارکرد (RUN) نرفت موجب قطع کامل سافت می گردد . لذا این مدت زمان را کمی بیشتر از مدت مورد نیاز تنظیم کنید تا یک استارت سالم داشته باشید . در صورتیکه این میزان صفر منظور گردد بمعنای غیرفعال کردن این حفاظت است

محدوده : ۰ ثانیه تا ۴ دقیقه　　　　پیش فرض : ۲۰ ثانیه

شرح : تنظیم بر اساس نیاز

۳H: حالت توقف ۲

انتخاب :

- سرازیری تا توقف (پیش فرض)
- استپ نرم با شیب زمان ولتاژ
- کنترل تطبیقی
- ترمز

شرح : انتخاب حالت توقف

۳I : زمان توقف ۲

محدوده : ۰ ثانیه تا ۴ دقیقه پیش فرض : صفر ثانیه

شرح : تنظیم مدت زمان استپ نرم در حالت شیب زمان ولتاژ و یا کنترل تطبیقی است . در صورت استفاده از کنتاکتور اصلی ، می بایست این کنتاکتور تا پایان زمان توقف در مدار بوده و بسته باشد . برای ایجاد این حالت می توانید از یک خروجی قابل برنامه ریزی که با RUN ست می باشد جهت کنترل کنتاکتور اصلی استفاده نمائید . در صورت استفاده از ترمز ، این میزان باید برابر زمان کل استپ باشد

۳J : پروفایل استارت تطبیقی ۲

انتخاب :

- شتاب سریع
- شتاب ثابت (پیش فرض)
- شتاب کند

شرح : انتخاب نوع پروفایل افزایش سرعت برای حالت کنترل تطبیقی سرعت

۳K : پروفایل استپ تطبیقی ۲

انتخاب :

- کاهش سرعت سریع
- کاهش سرعت ثابت (پیش فرض)
- کاهش سرعت کند

شرح : انتخاب نوع پروفایل کاهش سرعت برای حالت کنترل تطبیقی استپ

۳L : بهره کنترل تطبیقی ۲

محدوده : ۱٪ تا ۲۰۰٪ پیش فرض : ۷۵٪

شرح : برای تنظیم کنترل تطبیقی بکار می رود . انجام تنظیمات بر روی کنترل تطبیقی استارت و استپ تأثیر گذار می باشد

۶,۴,۴- سطوح حفاظتی

۴A: عدم تعادل جریان

محدوده : ۱۰٪ تا ۵۰٪ پیش فرض : ۳۰٪

شرح : تنظیم نقطه قطع دستگاه برای حفاظت در مقابل عدم تعادل جریان

۴B : توالی فاز

انتخاب :

- هر نوع توالی (پیش فرض)
- فقط توالی مثبت
- فقط توالی منفی

شرح :انتخاب نوع توالی فاز که سافت اجازه استارت دهد . در حین کنترل پیش از استارت ، سافت نوع توالی ترمینالهای ورودی را با نوع انتخاب کنترل کرده و در صورتیکه با هم هماهنگ نباشد ، فرمان قطع می دهد

۴C : افت جریان

محدوده : ۰٪ تا ۱۰۰٪ پیش فرض : ۲۰٪

شرح : تنظیم نقطه قطع دستگاه برای حفاظت در مقابل افت جریان بعنوان درصدی از جریان بار کامل موتور. در این حالت می توانید محدوده ای بین جریان کار عادی موتور و جریان بی باری موتور را انتخاب کنید (بعنوان مثال ۲۵٪ تا ۳۵٪ از جریان بار کامل موتورFLC) .انتخاب ۰٪ بمعنای غیرفعال کردن این نوع حفاظت است .

۴D : افزایش جریان سریع

محدوده : ۸۰٪ تا ۶۰۰٪ جریان بارکامل موتور پیش فرض : ۴۰۰٪

شرح : تنظیم نقطه قطع دستگاه برای حفاظت در مقابل افزایش جریان سریع ، بعنوان درصدی از جریان بار کامل موتور.

۴E: دریافت یک فرمان قطع

انتخاب :

- همیشه فعال (پیش فرض) : به فرمان قطع در هر زمانی عمل می شود و فقط کافی است که سافت برقدار باشد
- فقط هنگام عملکرد : فقط در هنگام کار ، استارت یا استپ به فرمان قطع عمل می شود
- فقط هنگام کار : فقط در هنگام کار سافت ، به فرمان قطع عمل می شود

شرح : انتخاب اینکه چه وقت دستگاه به یک فرمان قطع پاسخ مثبت دهد

۴F : کنترل دمای موتور

انتخاب :

- کنترل نشود (پیش فرض)
- کنترل گردد

شرح : شناسایی موتور بعنوان اینکه آیا ظرفیت گرمایی کافی برای یک استارت موفق دارد یا نه . در این حالت سافت میزان دمای محاسبه شده فعلی موتور را با آخرین دمایی که موتور در هنگام استارت داشته است مقایسه کرده و تنها زمانی اجازه عملکرد به دستگاه می دهد که موتور به اندازه کافی برای یک استارت موفق سرد باشد .

۴G : کنترل فرکانس

انتخاب :

- کنترل نگردد
- فقط زمان استارت
- زمان استارت و کار (پیش فرض)
- فقط زمان کار

شرح : جهت رصد کردن میزان فرکانس برای اینکه سافت به حالت قطع برود یا نه .

۴H : میزان تغییرات فرکانس

محدوده :

- ± ۲ هرتز
- ± ۵ هرتز (پیش فرض)
- ± ۱۰ هرتز
- ± ۱۵ هرتز

شرح : انتخاب میزان تلورانس و تغییرات فرکانس

۶,۴,۵- تأخیرات زمانی حفاظتی

۵A : تأخیر در استارت مجدد

محدوده : از یک ثانیه تا ۶۰ دقیقه پیش فرض : ۱۰ ثانیه

شرح : سافت می تواند یک تأخیر اجباری بین آخرین توقف تا شروع مجدد بعدی ایجاد نماید . در هنگامیکه دستگاه در حین این نوع تأخیر است ، صفحه نمایش مقدار زمان باقیمانده تا برقراری امکان استارت مجدد را نمایش می دهد .

۵B : تأخیر در برابر نامتعادلی جریان

محدوده : از ۰ ثانیه تا ۴ دقیقه پیش فرض : ۳ ثانیه

شرح : قطع دستگاه بواسطه نامتعادلی جریان را برای اجتناب از عملکرد در مواقع بروز نوسان به تأخیر می اندازد

۵C : تأخیردر برابر افت جریان

محدوده : از ۰ ثانیه تا ۴ دقیقه پیش فرض : ۵ ثانیه

شرح : قطع دستگاه بواسطه افت جریان را برای اجتناب از عملکرد در مواقع بروز نوسان به تأخیر می اندازد

۵D : تأخیردر برابر افزایش جریان سریع

محدوده : از ۰ ثانیه تا ۱ دقیقه پیش فرض : ۰ ثانیه

شرح : قطع دستگاه بواسطه افزایش جریان سریع را برای اجتناب از عملکرد در مواقع بروز نوسان به تأخیر می اندازد

۵E : تأخیر در برابر رسیدن یک فرمان قطع

محدوده : از ۰ ثانیه تا ۴ دقیقه پیش فرض : ۰ ثانیه

شرح : ایجاد یک تأخیر بین زمان رسیدن فرمان قطع تا زمانیکه سافت قطع گردد

۵F : تأخیر در برابر رسیدن فرمان راه اندازی

محدوده : از ۰ ثانیه تا ۳۰ دقیقه پیش فرض : ۰ ثانیه

شرح : ایجاد یک تأخیر قبل از اینکه یک فرمان قطع ورودی اتفاق بیافتد . این تأخیر از زمان رسیدن فرمان استارت محاسبه می گردد . در این حالت وضعیت ورودی نادیده گرفته می شود تا زمانیکه زمان تأخیر سپری گردد

۵G : تأخیر فرکانسی

محدوده : از ۰ ثانیه تا ۴ دقیقه پیش فرض : ۱ ثانیه

شرح : قطع دستگاه بواسطه تغییرات خارج از محدوده فرکانس را برای اجتناب از عملکرد در مواقع بروز نوسان به تأخیر می اندازد

SANTERNO
CARRARO GROUP

۶,۴,۶ – کنترل

۶A : محلی / از راه دور

انتخاب :

- محلی / از راه دور در هر زمان (پیش فرض) : دکمه LOCAL/REMOT همیشه فعال است
- محلی / از راه دور در زمان خاموشی : دکمه LOCAL/REMOT فقط زمانی فعال است که دستگاه خاموش باشد
- فقط کنترل محلی : همه ورودیهای کنترل از راه دور غیر فعال است
- فقط کنترل از راه دور : تمامی دکمه های کنترل محلی نظیر START, RESET , LOCAL/REMOT غیر فعال می باشند

شرح : این انتخاب دسترسی شما را به حالت کنترل محلی از روی دستگاه و یا کنترل از راه دور را با فشردن دکمه LOCAL/REMOT تعیین می نماید . در هر یک از حالات فوق دکمه STOP بر روی کیپد همواره فعال است

۶B: فرمان از راه دور

انتخاب :

- کنترل از راه دور غیر فعال
- کنترل از راه دور فعال (پیش فرض)

شرح : در صورتیکه می خواهید سافت استارتر به فرمان استارت و استپ از طریق پورت سریال پاسخ دهد می بایست این گزینه فعال باشد . فرمانهایی نظیر ریست ، قطع اجباری و کنترل محلی / از راه دور همواره فعال می باشند .

۶C: وضعیت کنتاکت ریست از راه دور

انتخاب :

- معمولاً بسته N.C (پیش فرض)
- معمولاً باز N.O

شرح : جهت انتخاب ورودی ریست از راه دور (ترمینالهای ۵۷ و ۵۸) که کنتاکت معمولاً باز باشد یا معمولاً بسته بکار می رود

۶D : عملکرد ورودی A

انتخاب

- انتخاب موتور (پیش فرض) : دستگاه می تواند با اطلاعات دو نوع موتور جداگانه پیکر بندی گردد . هنگامیکه از موتور دوم استفاده می کنید این پارامتر می بایست روی **Motor Set Select** بوده و ترمینالهای ۵۳ و ۵۵ در زمان رسیدن فرمان استارت بسته باشند . در این حالت دستگاه از جهت اینکه اطلاعات کدام موتور را در لحظه استارت استفاده کنند کنترل لازم بعمل آورده و اطلاعات موتور دیگر را در نوبت بعدی استارت (یا استپ) استفاده می نماید .
- قطع وردی با منطق **N.O** : این ورودی بعنوان قطع کننده سافت استارتر می تواند مورد استفاده قرار گیرد . در این حالت ایجاد یک اتصال کوتاه (جمپر) بین ترمینالهای ۵۳ و ۵۵ می تواند باعث قطع سافت استارتر گردد
- قطع وردی با منطق **N.C** : در این حالت ایجاد یک اتصال باز بین ترمینالهای ۵۳ و ۵۵ موجب قطع سافت می گردد
- انتخاب محلی / از راه دور : این ورودی می تواند جهت انتخاب بین کنترل محلی یا از راه دور و بجای استفاده از دکمه مربوطه روی کیپد استفاده گردد . در صورت باز بودن ورودی ، سافت در حالت کنترل محلی قرار خواهد گرفت و بوسیله کیپد کنترل خواهد شد . زمانیکه ورودی بسته باشد ، سافت در حالت کنترل از راه دور قرار خواهد گرفت . در این حالت دکمه های **START** و **LOCAL/REMOT** غیرفعال خواهند بود و سافت هرگونه فرمان محلی یا از راه دور توسط پورت سریال را نادیده خواهد گرفت . برای استفاده از ورودی **A** بعنوان انتخاب بین حالت محلی یا از راه دور می بایست پارامتر **۶A** بر روی **LCL/RMT Anytime** یا **LCL/RMT When Off** قرار گیرد .
- حرکت اضطراری : در حالت حرکت اضطراری سافت استارتر تا موقعیکه متوقف نشود به کار خود ادامه خواهد داد . در این حالت هرگونه فرمان قطع یا اخطار نادیده گرفته می شود (برای جزئیات بیشتر به پارامتر **۱۵C** مراجعه کنید)

- توقف اضطراری : در فرمان توقف اضطراری ، حالت توقف که در پارامتر H۲ تنظیم شده بود نادیده گرفته می شود . زمانیکه اتصال بین ترمینالهای ۵۳ و ۵۵ باز می گردد ، سافت این اجازه را به موتور می دهد که بحالت سرازیری توقف نماید .
- پرش بسمت جلو : موجب فعال شدن پرش در جهت مستقیم می گردد (فقط در حالت از راه دور فعال است)
- پرش در جهت عکس : موجب فعال شدن پرش در جهت عکس می گردد (فقط در حالت از راه دور فعال است)

شرح : انتخاب عملکرد ورودی A

E۶ : نام ورودی A

انتخاب :

- قطع ورودی (پیش فرض)
- فشار کم
- فشار زیاد
- خطای پمپ
- سطح پائین
- سطح بالا
- بدون جریان
- استپ اضطراری
- کنترل کننده
- پی ال سی
- هشدار لرزش

شرح : یک پیغام روی کی پد ظاهر شده تا نوع فعال بودن ورودی A را مشخص کند

۶,۴,۷- رله های خروجی

A۷ : عملکرد رله A

انتخاب :

- خاموش : عدم استفاده از رله A
- کنتاکتور اصلی (پیش فرض) : رله با گرفتن فرمان استارت بسته شده و بسته می ماند تا زمانیکه موتور برقدار است

- حرکت : رله زمانیکه سافت به حالت کار تغییر وضعیت می دهد بسته می گردد
- قطع : رله زمانیکه سافت به حالت قطع می رود بسته می گردد
- اخطار : در هنگام بروز هر اخطاری رله بسته می شود
- افت جریان : با بروز افت جریان (پارامتر ۷J) رله بسته می شود
- افزایش جریان : با بروز افزایش جریان (پارامتر ۷K) رله بسته می شود
- دمای موتور : در زمان فعال شدن دمای موتور ، رله بسته می شود (پارامتر ۷L)

شرح : انتخاب نحوه عملکرد رله A (معمولاً باز N.O)

۷B,۷C : تأخیر رله A

دستگاه می تواند بر اساس یک تأخیر در بسته یا باز شدن رله پیکر بندی شود

پارامتر ۷B : رله A بصورت تأخیر در وصل

محدوده : ۰ ثانیه تا ۵ دقیقه پیش فرض : ۰ ثانیه

شرح : تأخیر در بسته شدن رله A

پارامتر ۷C : رله A بصورت تأخیر در قطع

محدوده : ۰ ثانیه تا ۵ دقیقه پیش فرض : ۰ ثانیه

شرح : تأخیر در باز شدن مجدد رله A

۷D~۷I : رله های خروجی B و C

پارامترهای ۷D~۷I برای تعیین نوع پیکر بندی رله های B و C بکار رفته همچنان که پارامترهای ۷A~۷C برای پیکربندی رله A استفاده شدند . برای کسب جزئیات بیشتر به رله A مراجعه کنید .

رله B یک رله با تغییرات زیاد است

- ۷D : عملکرد رله B پیش فرض : حرکت
- ۷E : رله B با تأخیر در وصل
- ۷F : رله B با تأخیر در قطع

رله C یک رله معمولاً باز N.O است

- ۷G : عملکرد رله C پیش فرض : حرکت

- **۷H : رله C با تأخیر در وصل**
- **۷I : رله C با تأخیر در قطع**

۷J,۷K : نشانگرهای افت جریان و افزایش جریان

دستگاه دارای دو نشانگر(Flag) افت یا افزایش جریان بوده تا بموقع هر عملکرد غیرعادی را گزارش دهد . نشانگر جریانی می تواند بگونه ای پیکر بندی شود که شرایط غیرعادی سطح جریان را در حین کار نشان دهد . این شرایط می تواند افت جریان یا افزایش سریع جریان تا حد قطع باشد . این نشانگرها می توانند توسط یکی از خروجیهای قابل برنامه ریزی سیگنال مناسب جهت تجهیزات جانبی ارسال نمایند . حافظه نشانگر با رسیدن جریان به حالت نرمال پاک خواهد شد .

پارامتر ۷J (نشانگر افت جریان)

محدوده : از ۱٪ تا ۱۰۰٪ جریان بار کامل موتور پیش فرض : ۵۰٪

شرح : بعنوان درصدی از جریان بار کامل موتور مشخص می کند که چه هنگام بعنوان افت جریان ، نشانگر مربوطه عمل کند

پارامتر ۷K (نشانگر افزایش جریان) پیش فرض : ۱۰۰٪

محدوده : از ۵۰٪ تا ۶۰۰٪ جریان بار کامل موتور

شرح : بعنوان درصدی از جریان بار کامل موتور مشخص می کند که چه هنگام بعنوان افزایش جریان ، نشانگر مربوطه عمل کند

۷L : نشانگر دمای موتور

دستگاه دارای یک نشانگر دمای موتور بوده تا بموقع هر عملکرد غیرعادی را گزارش دهد . این نشانگر می تواند نشان دهد که دمای موتور بالاتر از حد نرمال و کمتر از حدی است که بعنوان اضافه بار مشخص شده است . این نشانگرها می توانند توسط یکی از خروجیهای قابل برنامه ریزی سیگنال مناسب جهت تجهیزات جانبی ارسال نمایند .

محدوده : ۰٪ تا ۱۶۰٪ پیش فرض : ۸۰٪

شرح : بعنوان درصدی از ظرفیت حرارتی موتور مشخص می کند که چه هنگام بعنوان افزایش دما ، نشانگر مربوطه عمل کند

۶,۴,۸- خروجی آنالوگ

دستگاه دارای یک خروجی آنالوگ بوده که قابلیت اتصال به تجهیزات جانبی برای رصد کردن رفتار موتور را دارا می باشد .

۸A – خروجی آنالوگ A

انتخاب :

- جریان (%FLC) (پیش فرض) : جریان بر اساس درصدی از جریان بار کامل موتور
- دمای موتور (٪) : دمای موتور بر اساس درصدی از ظرفیت گرمایی موتور
- توان اکتیو (٪) : توان موتور براساس حاصلضرب توان ظاهری در ضریب قدرت (PF) . ضریب قدرت مرجع ۱ بوده و ضریب قدرت موتور اندازه گیری و توسط فرمول زیر توان موتور بر حسب کیلووات محاسبه می گردد :

(√۳.I.V.PF) / ۱۰۰۰

- توان ظاهری (٪) : با حاصلضرب √۳ در جریان متوسط فازها و ولتاژ مرجع (پارامتر I۱۰) حاصل می گردد
- ضریب قدرت موتور : ضریب قدرت موتور که توسط سافت استارتر اندازه گیری شده است

شرح : انتخاب اینکه کدام پارامتر بعنوان خروجی آنالوگ گزارشگیری شود

۸B- مقیاس خروجی آنالوگ A

انتخاب :

- ۰تا ۲۰میلی آمپر
- ۴ تا ۲۰ میلی آمپر (پیش فرض)

شرح : انتخاب محدوده خروجی آنالوگ

۸C- تنظیم حداکثر خروجی آنالوگ A

محدوده : ۰٪ تا ۶۰۰٪ پیش فرض : ۱۰۰٪

شرح : جهت کالیبره کردن حد بالایی خروجی آنالوگ با اندازه گیری سیگنال خروجی توسط یک دستگاه خارجی استفاده می گردد .

۸D- تنظیم حداقل خروجی آنالوگ A

محدوده : ۰٪ تا ۶۰۰٪ پیش فرض : ۰٪

شرح : جهت کالیبره کردن حد بالایی خروجی آنالوگ با اندازه گیری سیگنال خروجی توسط یک دستگاه خارجی استفاده می گردد .

۶,۴,۹ – ریست اتوماتیک

دستگاه می تواند بگونه ای برنامه ریزی شود که در مواجهه با بعضی از قطعی های معین ، بصورت اتوماتیک ریست شود . این موضوع می تواند کمترین عدم کارکرد دستگاه را حاصل کند . قطع ها می توانند جهت ریست اتوماتیک در سه گروه زیر که بیانگر میزان ریسک پذیری سافت است تقسیم شوند :

گروه A :

- نامتعادلی جریان
- قطع فاز
- قطع برق
- فرکانس اصلی

گروه B :

- افت جریان
- افزایش جریان سریع
- قطع ورودی A

گروه C :

افزایش بار موتور

ترمیستور موتور

افزایش دمای سافت استارتر

مابقی قطع ها نمی توانند بطور خودکار ریست شوند

این عملکرد برای همبندی دو سیمه در حالت کنترل از راه دور ایده آل می باشد . در اینصورت با دریافت سیگنال استارت از طریق سیستم دو سیمه ، پس از یک ریست اتوماتیک ، می توان دستگاه را راه اندازی مجدد نمود .

۹A : عملکرد ریست اتوماتیک

انتخاب

- عمل ریست اتوماتیک انجام نگیرد (پیش فرض)
- فقط گروه A
- گروه A و B
- هر سه گروه A، B و C

شرح : تنتخاب اینکه کدام گروه از حالات قطع بصورت اتوماتیک ریست شوند

۹B : تعداد ماکزیمم ریست

محدوده : ۱ تا ۵ پیش فرض : ۱

شرح : تنظیم اینکه چند دفعه سافت استارتر عمل ریست را بطور اتوماتیک انجام دهد در صورتیکه قطع ادامه داشته باشد . در این حالت به شمارنده ریست اتوماتیک با هر بار ریست یکی افزوده می شود و در صورتیکه سیکل استارت یا استپ بطور موفقیت آمیزی طی شود ، یکی از تعداد شمرده شده توسط شمارنده کم می گردد .

نکته :

در صورتیکه سافت بصورت دستی ریست شود ، شمارنده صفر خواهد شد .

۹C , ۹D : تأخیر در ریست اتوماتیک

دستگاه می تواند هر ریست اتوماتیک بعد از حالت قطع را با تأخیر انجام دهد .تأخیرهای جداگانه می تواند برای گروه های A ، B و C اعمال گردد

پارامتر ۹C : تأخیر در ریست برای گروههای A و B

محدوده : از ۵ ثانیه تا ۱۵ دقیقه پیش فرض : ۵ ثانیه

شرح : ایجاد تأخیر بعد از وقوع قطع در گروههای A و B تا ریست

پارامتر ۹D : تأخیر در ریست برای گروه C

محدوده : از ۵ دقیقه تا ۶۰ دقیقه پیش فرض : ۵ دقیقه

شرح : ایجاد تأخیر قبل از اعمال ریست در گروه C

۶,۴,۱۰- صفحه نمایش

۱۰A : زبان

انتخاب :

انگلیسی (پیش فرض)	پرتغالی
چینی	فرانسوی
اسپانیولی	ایتالیایی
آلمانی	روسی

شرح : انتخاب زبانی که صفحه نمایش بر اساس آن اطلاعات و پیغامها را نمایش دهد

۱۰B,۱۰C,۱۰D,۱۰E : صفحه قابل برنامه ریزی کاربر

انتخاب :

- خالی : هیچ اطلاعاتی نمایش داده نشده ، لذا پیغامهای بلند بدون اینکه از صفحه خارج شوند نشان داده می شود
- وضعیت استارتر : وضعیت استارتر را نمایش می دهد (مانند استارت ، حرکت ، استپ یا قطع) . این حالت فقط برای بالای صفحه نمایش سمت چپ و پائین صفحه نمایش سمت چپ قابل دستیابی است .
- جریان موتور : متوسط جریان سه فازه را نمایش می دهد
- ضریب قدرت موتور : میزان ضریب قدرت موتور که توسط سافت اندازه گیری شده است را نمایش می دهد
- فرکانس اصلی : متوسط فرکانس سه فازه را نمایش می دهد
- توان موتور : قدرت مصرفی موتور در حالت کارکرد بر حسب کیلووات را نمایش می دهد
- توان موتور : قدرت مصرفی موتور در حالت کارکرد بر حسب اسب بخار را نمایش می دهد
- دمای موتور : میزان دمای موتور را با استفاده از مدل مربوطه اندازه گیری و نمایش می دهد
- کیلووات ساعت : انرژی مصرفی موتور بر حسب کیلووات ساعت که از طریق سافت تأمین شده است را نمایش می دهد
- ساعت کارکرد : میزان کارکرد موتور متصله به سافت بر حسب ساعت را نمایش می دهد
- شرح : انتخاب اینکه کدام اطلاعات توسط صفحه نمایش قابل برنامه ریزی نشان داده شود .
- ۱۰B : قسمت بالا سمت چپ صفحه نمایش   پیش فرض : وضعیت سافت استارتر
- ۱۰C : قسمت بالا سمت راست صفحه نمایش   پیش فرض : خالی
- ۱۰D : قسمت پائین سمت چپ صفحه نمایش   پیش فرض : ساعت کارکرد
- ۱۰E : قسمت پائین سمت راست صفحه نمایش   پیش فرض : خالی

۱۰F : پایه زمانی نمودار

انتخاب :

- ۱۰ ثانیه (پیش فرض)

- ۳۰ ثانیه
- ۱ دقیقه
- ۵ دقیقه
- ۱۰ دقیقه
- ۳۰ دقیقه
- ۱ ساعت

شرح :تنظیم مقیاس زمانی نمودار بوده . در این حالت نمودار قبلی پس از گذشت زمان تنظیم شده جایش را به نموار جدید (بر اساس اطلاعات جدید) می دهد

۱۰G : ماکزیمم تنظیم نمودار

محدوده : ۰٪ تا ۶۰۰٪ پیش فرض : ۴۰۰٪

شرح : تنظیم حد بالا برای نمایش نمودار

۱۰H : مینیمم تنظیم نمودار

محدوده : ۰٪ تا ۶۰۰٪ پیش فرض : ۰٪

شرح : تنظیم حد پائین برای نمایش نمودار

۱۰I : ولتاژ مرجع اصلی

محدوده : ۱۰۰ تا ۶۹۰ ولت پیش فرض : ۴۰۰ ولت

شرح : تنظیم میزان نامی ولتاژ برای عملکرد نمایشگر کی پد . این میزان برای محاسبه توان اکتیو موتور و توان ظاهری موتور استفاده داشته و ارتباطی به بخش کنترلی دستگاه و یا حفاظتها ندارد

.

۱۰J : نمایش آمپر یا توان

انتخاب :

- جریان (پیش فرض)
- توان بر حسب کیلووات

شرح : انتخاب اینکه دستگاه میزان جریان یا توان موتور را در صفحه نمایشگر اصلی نشان دهد

۶,۴,۱۱- محدودیتها

۱۵A : کد دسترسی

محدوده : ۰۰۰۰ تا ۹۹۹۹ پیش فرض : ۰۰۰۰

شرح : تنظیم کد دسترسی برای کنترل ورود به منوهای محدود شده می باشد . با استفاده از کلیدهای **EXIT** و **MENU/ENTER** رقمی را که میخواهید تغییر دهید انتخاب نموده و با استفاده از کلیدهای جهتی بالا و پائین میزان مورد نظر را وارد کنید

نکته :

در صورتیکه کد دسترسی خود را گم کردید ، با تأمین کننده برای دریافت کد دسترسی مادر تماس بگیرید . کد دسترسی مادر به شما این امکان را می دهد که یک کد دسترسی جدید تعریف کنید .

۱۵B : تنظیمات قفل

انتخاب :

- خواندن و نوشتن (پیش فرض) : این امکان را به کاربر می دهد که میزان پارامترها را در منوی برنامه ریزی تغییر دهد
- فقط خواندن : کاربر صرفاً می تواند مقدار پارامترها را مشاهده کند و دسترسی جهت تغییر میزان پارامترها ندارد

۱۵C : کار در شرایط اضطراری

انتخاب :

- غیر فعال (پیش فرض)
- فعال

شرح : انتخاب اینکه آیا دستگاه در حالت کار در شرایط اضطراری قرار بگیرد یا نه ؟ در حالت کار در شرایط اضطراری دستگاه استارت شده (اگر هنوز در حین کار نباشد) وبدون توجه به هرگونه فرمان استپ یا قطع به کارکرد خود تا پایان شرایط اضطراری ادامه می دهد . با استفاده از یک ورودی قابل برنامه ریزی می توان عملکرد کار در شرایط اضطراری را کنترل نمود

۱۵D : کالیبره کردن جریان

محدوده : ۸۵٪ تا ۱۱۵٪ پیش فرض : ۱۰۰٪

شرح : برای یکسان کردن میزان جریانی که سافت نشان می دهد با جریانی که یک دستگاه خارجی نمایش می دهد استفاده می شود . برای تعیین میزان درصد مورد نیاز برای تنظیم از فرمول زیر استفاده کنید :

جریانی که توسط دستگاه خارجی اندازه گیری شده است / جریانی که سافت نشان میدهد = درصد کالیبراسیون

بعنوان مثال : ۱۰۳٪ = ۶۶A/۶۵A

نکته :

این تنظیم برای کلیه محاسبات و حفاظتهایی که بر پایه جریان است تأثیر گذار می باشد

۱۵E : عملکرد در برابر اتصال کوتاه تریستور

انتخاب :

- فقط کنترل سه فاز (پیش فرض)
- ادامه کار از طریق دو فاز

شرح : زمانیکه میخواهید حالت ادامه کار از طریق دو فاز را داشته باشید از این پارامتر استفاده کنید . برای کاربردهای خاص و بحرانی این حالت به سافت اجازه میدهد که موتور را با دو فاز کنترل کند . در صورتیکه یکی از فازهای سافت استارتر آسیب ببینند ، حالت ادامه کار با دو فاز

تنها زمانی می تواند اتفاق بیافتد که سافت با فرمان **"Lx-Tx Shorted"** قطع شده و ریست گردد .

توجه :

ادامه کار از طریق دو فاز از تکنولوژی سافت دوفازه بهره میگیرد . لذا حفاظتهای اضافی مانند اندازه کلید بریکر مورد نیاز است . در این خصوص با تأمین کننده محلی تماس بگیرید .

ادامه کار با دو فاز تا زمانیکه حالت " فقط کنترل سه فاز " مجدداً انتخاب نشده باشد ، فعال می ماند

ادامه کار از طریق دو فاز از حالت کنترل تطبیقی استارت یا استپ پشتیبانی نمیکند . در این حالت دستگاه بطور اتوماتیک برای استارت نرم ، جریان ثابت و برای استپ نرم شیب ولتاژ زمانبندی شده را انتخاب می کند . در این حالت در صورت غیرفعال کردن ادامه کار توسط دوفاز ، پارامترهای ۲C و ۲B مجدداً می بایست تنظیم و اختصاصی گردد .

نکته :

ادامه کار از طریق دو فاز فقط برای موتورهای مثلث داخلی (سه سیمه) کاربرد دارد .

۱۵F : گشتاور پرش

دستگاه می تواند موتور را در یک سرعت کاهش یافته قرار دهد . در این حالت می توان تسمه نقاله یا چرخ طیار را در موقعیت دقیق خود قرار داد .این عملیات می تواند در هر دو حالت حرکت رو به جلو یا رو به عقب قرار گیرد .

محدوده : ۲۰٪ تا ۱۰۰٪ بار کامل موتور پیش فرض : ۵۰٪

شرح : تنظیم محدودیت جریان برای حالت پرش که بعنوان درصدی از جریان بار کامل موتور بیان می شود

۱۵G – گشتاور ترمزی

محدوده : ۲۰٪ تا ۱۰۰٪ پیش فرض : ۲۰٪

شرح : تنظیم مقدار گشتاور ترمزی که دستگاه میتواند بکمک آن سرعت موتور را کم کند .

۱۵H - زمان ترمز

محدوده : ۱ تا ۳۰ ثانیه پیش فرض : ۱ ثانیه

شرح : مدت زمان تزریق جریان دی سی را مشخص میکند که بواسطه آن موتور استپ می گردد

نکته :

پارامتر ۱۵H در ارتباط با پارامتر ۲I می باشد . به بخش ترمز مراجعه کنید

۱۵I – گشتاور ترمزی موتور دوم

محدوده : ۲۰٪ تا ۱۰۰٪ پیش فرض : ۲۰٪

شرح : تنظیم مقدار گشتاور ترمزی که دستگاه میتواند بکمک آن سرعت موتور را کم کند .

۱۵J - زمان ترمزموتور دوم

محدوده : ۱ تا ۳۰ ثانیه پیش فرض : ۱ ثانیه

شرح : مدت زمان تزریق جریان دی سی را مشخص میکند که بواسطه آن موتور استپ می گردد

۶,۴,۱۲- عملکرد قطع

توجه :

گذشتن از مسائل محافظتی فقط در حالت اضطراری پذیرفته خواهد بود

۱۶A~۱۶L - عملکرد قطع

انتخاب:

- قطع سافت استارتر (پیش فرض)
- آلارم و ثبت واقعه
- فقط ثبت واقعه

شرح : انتخاب اینکه سافت استارتر در مقابل هر محافظت چه عکس العملی از خود نشان دهد

- ۱۶A افزایش بار موتور
- ۱۶B نامتعادلی جریان
- ۱۶C افت جریان
- ۱۶D افزایش جریان لحظه ای
- ۱۶E قطع ورودی A
- ۱۶F فرکانس
- ۱۶G ترمیستور موتور
- ۱۶H زمان استارت بیش از حد
- ۱۶I اتصالات سافت استارتر
- ۱۶J افزایش دمای رادیاتور (هیت سینک)
- ۱۶K باتری / ساعت
- ۱۶L اتصالات شبکه

۶,۵- قفل تنظیمات

شما می توانید منوی برنامه ریزی را قفل نموده تا امکان تغییر پارامترها را از کاربر بگیرید . برای فعال یا غیرفعال کردن قفل تنظیمات می توانید از پارامتر ۱۵B استفاده کنید .

برای قفل کردن منوی برنامه ریزی :

۱- منوی برنامه ریزی را باز کنید

۲- منوی گسترده را باز کنید

۳- گزینه محدودیت (Restricted) را انتخاب کنید

۴- کد دسترسی را وارد نمائید

۵- پارامتر ۱۵B را انتخاب کنید

۶- حالت فقط خواندنی (Read Only) را انتخاب و ذخیره نمائید .

اگر کاربری در زمان فعال بودن قفل تنظیمات سعی کند که پارامتری را تغییر دهد پیغام خطایی نمایش داده خواهد شد .

۶,۶- کد دسترسی

پارامترهای بحرانی و خاص (پارامترهای گروه ۱۵ و بالاتر) بوسیله یک کد چهار رقمی بعنوان کد دسترسی محافظت شده اند تا کاربران غیرمجاز امکان رویت یا تغییر تنظیمات این پارامترها را نداشته باشند .زمانیکه کاربر قصد ورود اطلاعات به یک پارامتر گروه خاص را دارد ، کی پد از او کد دسترسی می خواهد . کد دسترسی فقط یکبار از کاربر خواسته می شود و تا زمانیکه منوی برنامه ریزی بسته نشده است احتیاجی به وارد کردن مجدد کد دسترسی نمی باشد .

برا وارد کردن کد دسترسی از کلیدهای EXIT و MENU/ENTER برای انتخاب محل رقم و از کلیدهای جهتی بالا و پائین برای تغییراعداد استفاده کنید . بعد از ورود هر چهارقم کلید MENU/ENTER را فشار دهید . در این حالت کی پد یک پیام بعنوان صحیح بودن کد نمایش می دهد .

برای تغییر کد دسترسی از پارامتر ۱۵A استفاده کنید و کد دسترسی پیش فرض ۰۰۰۰ (صفر صفر صفر صفر) می باشد .

۶,۷- ابراز تنظیم

ابزار تنظیم شامل گزینه های نگهداری ، پیکر بندی تاریخ و ساعت دستگاه و ریست کردن مدلهای حرارتی یا بارگذاری یک تنظیم پارامتریک استاندارد می گردد .

برای دسترسی به به ابزار تنظیم ، منوی برنامه ریزی را باز کرده و از آن ابزار تنظیم (Setup Tools) را انتخاب کنید .

۶,۷,۱- تنظیم تاریخ و ساعت

برای تنظیم تاریخ و ساعت :

۱- ابزار تنظیم را باز کنید

۲- به صفحه تاریخ/ساعت بروید

۳- دکمه MENU/ENTER را برای ورود به حالت ویرایش فشار دهید .

۴- از دکمه MENU/ENTER و EXIT را برای انتخاب قسمتهایی از تاریخ یا ساعت که میبایست تغییر کند استفاده کنید

۵- با استفاده از دکمه های جهتی بالا و پائین مقدار مورد نظر را وارد نمائید

۶- برای ذخیره تغییرات از دکمه **MENU/ENTER** استفاده کنید . در این حالت دستگاه تغییرات اعمال شده را تأیید می کند . برای لغو کردن تغییرات از دکمه **EXIT** استفاده شود .

۶,۷,۲- بارگذاری / ذخیره تنظیمات

برای بارگذاری / ذخیره تنظیمات احتیاج به کد دسترسی می باشد تا یک کاربر مجاز بتواند :

- دستگاه را با پارامترهای پیش فرض بارگذاری نماید
- با استفاده از یک فایل داخلی تمامی تنظیمات ذخیره شده قبلی را برگرداند
- پارامترهای فعلی را بر روی فایل داخلی ذخیره نماید

علاوه بر فایل تنظیمات پیش فرض کارخانه ، دستگاه می تواند دو فایل پارامتر تنظیم شده توسط کاربر تعریف نماید . این فایلها محتوای مقادیر پیش فرض هستند تا زمانیکه یک فایل تنظیم شده توسط کاربر روی آن ذخیره شود

برای بارگذاری یا ذخیره تنظیمات :

۱- ابزار تنظیم را باز کنید

۲- به صفحه بارگذاری / ذخیره تنظیمات (**Load/Save**) رفته و کلید **MENU/ENTER** را فشار دهید .

۳- روی عملکرد مورد نظر رفته و کلید **MENU/ENTER** رافشار دهید

۴- در صفحه باز شده گزینه بله را برای تأیید و گزینه خیر را برای لغو انتخاب نموده و کلید **MENU/ENTER** را فشار دهید .

زمانیکه عملکرد مورد نظر کاملاً اجرا شد ، صفحه نمایش یک پیغام تأیید را بطور خلاصه نمایش داده و سپس به صفحه وضعیت بر میگردد .

۶,۷,۳- ریست کردن مدلهای حرارتی

نکته :

این عملکرد بوسیله کد دسترسی محافظت شده است

نرم افزار مدلسازی حرارتی پیشرفته دستگاه بطور مداوم عملکرد موتور را تحت نظارت دارد . این قابلیت به دستگاه اجازه می دهد که حرارت موتور را محاسبه نموده و قابلیت استارت موفق در هر زمان را کنترل نماید . در صورتیکه دستگاه برای دو موتور پیکربندی شده باشد ، هر موتور بطور جداگانه مدلسازی حرارتی می گردند .

مدل حرارتی برای موتور فعال در صورت نیاز می تواند ریست شود .

۱- ابزار تنظیم را باز کنید
۲- به صفحه ریست مدل حرارتی رفته و کلید MENU/ENTER را فشار دهید .
۳- با استفاده از کلید جهتی پائین گزینه ریست را انتخاب کرده و کلید MENU/ENTER را فشار دهید .
۴- وقتیکه ریست کردن مدل حرارتی انجام شده ، صفحه نمایش یک پیغام تأیید نشان داده و به صفحه قبلی برمیگردد .

توجه :

ریست کردن مدل حرارتی ممکن است بر عمر موتور تأثیرگذار باشد ، لذا فقط در حالت اضطراری می بایست انجام پذیرد

۷- منوی گزارشات

منوی گزارش اطلاعاتی در مورد وقایع اتفاق افتاده ، قطعی ها و عملکرد سافت استارتر ارائه می دهد . برای باز کردن منوی گزارش ، ابتدا دکمه MENU/ENTER رافشار دهید . برای حرکت میان منوی گزارشات :

- برای باز کردن یک یک گزارش ، دکمه MENU/ENTER را فشار دهید
- برای حرکت بین گزارش نمایش داده شده از کلیدهای جهتی بالا و پائین استفاده کنید
- برای نمایش جزئیات یک گزارش کلید MENU/ENTER را فشار دهید
- برای بازگشت به سطح قبلی از دکمه EXIT استفاده نمائید
- برای بستن منوی گزارشات کلید EXIT را چندین مرتبه فشار دهید

۷٫۱- گزارش قطع

گزارش قطع جزئیات هشت قطع آخر را ذخیره نموده و شامل تاریخ و ساعتی که قطع اتفاق افتاده می گردد .قطع اول بمعنی آخرین قطع (نزدیکترین) و قطع هشتم بمعنی دورترین (قدیمی ترین) قطع می باشد .

برای باز کردن گزارش قطع :

۱- منوی گزارشات را باز کنید

۲- به گزارش قطع رفته و کلید MENU/ENTER را فشار دهید

۳- با استفاده از کلیدهای جهتی بالا و پائین ، قطعی مورد نظر را انتخاب و با فشردن کلید MENU/ENTER وارد جزدیات شوید .

برای بستن گزارش و برگشت به صفحه اصلی چندین با دکمه EXIT را بزنید

۷٫۲- گزارش رویدادها

گزارش وقایع جزئیات زمانی ۹۹ رویداد آخر(عملکرد ، آلارمها و قطع ها) را ذخیره نموده و شامل تاریخ و ساعتی رویداد می گردد .رویداد اول بمعنی آخرین رویداد (نزدیکترین) و رویداد نود و نهم بمعنی دورترین (قدیمی ترین) رویداد می باشد .

برای باز کردن گزارش رویداد :

۱- منوی گزارشات را باز کنید

۲- به گزارش رویداد رفته و کلید MENU/ENTER را فشار دهید

۳- با استفاده از کلیدهای جهتی بالا و پائین ، رویداد مورد نظر را انتخاب و با فشردن کلید MENU/ENTER وارد جزدیات شوید .

برای بستن گزارش و برگشت به صفحه اصلی چندین با دکمه EXIT را بزنید

۷٫۳- شمارشگر عملکرد

شمارشگر عملکرد ، آمار عملکرد سافت استارتر را ذخیره می کند :

- **ساعت کارکرد (در کل طول عمر و از زمان آخرین ریست)**
- **تعداد استارت (در کل طول عمر و از زمان آخرین ریست)**

- انرژی مصرفی موتور بر حسب کیلووات ساعت (در کل طول عمر و از زمان آخرین ریست)
- تعداد دفعاتی که مدل حرارتی ریست شده است

برای مشاهده شمارشگرها :

- منوی ثبت را باز کنید .
- بر روی شمارشگرها (Counters) رفته و کلید **MENU/ENTER** را یزنید .
- با استفاده از کلیدهای جهتی بالا و پائین می توانید بین شمارشگرهای مختلف حرکت کنید . برای مشاهده جزئیات کلید **MENU/ENTER** را بزنید .
- برای ریست کردن هر شمارنده ابتدا کلید **MENU/ENTER** را زده سپس با استفاده از کلیدهای جهتی بالا و پائین انتخاب کنید که آیا شمارشگر ریست شود یا نه . با زدن دوباره کلید **MENU/ENTER** می توانید گزینه انتخابی را تأیید کنید .

برای بستن صفحه شمارشگر و بازگشت به منوی ثبت از دکمه **MENU/ENTER** استفاده کنید

نکته :

عملکرد ریست شمارشگرها توسط کد دسترسی محافظت می گردد

۹- عیب یابی

۹،۱- پاسخ حفاظت

زمانیکه یک وضعیت حفاظتی شناسایی شود ، دستگاه این موضوع را بعنوان یک رویداد ثبت کرده و ممکن است فرمان قطع یا هشدار صادر نماید . پاسخ سافت استارتر به برخی حفاظتها بستگی به نوع تنظیمات مربوطه در عملکرد قطع دارد (پارامترهای گروه ۱۶)

اگر دستگاه به حالت قطع رفت ، شما می بایست قبل از راه اندازی مجدد اقدام به ریست کردن دستگاه نمائید . در صورتیکه دستگاه فقط اعلام هشدار نمود ، خودِ دستگاه برای یکبار اقدام به ریست کرده و علت هشدار صادر شده را حل خواهد نمود .

بعضی از حفاظتها ممکن است باعث یک قطع مخرب گردند . این یک پاسخ از پیش تعیین شده است و نمیتوان آنرا کنار گذاشت . مکانیزم این نوع حفاظت بگونه ای طراحی شده است که از سافت استارتر محافظت نماید و ممکن است توسط یک خطای داخلی سافت استارتر فعال گردد .

۹،۲- پیغامهای قطع

این جدول لیستی از مکانیزمهای قطع سافت استارتر و علل احتمالی آن ارائه می دهد . بعضی از موارد قابل تنظیم بوده و از پارمترهای گروه ۴ (سطوح حفاظت) و گروه ۱۶ (عملکرد قطع) تأثیر می پذیرند ، اما تعدادی دیگر جزو ساختار داخلی سیستم حفاظتی دستگاه بوده و قابلیت تنظیم ندارند .

صفحه نمایش	علت خطا / راه حل پیشنهادی
Battery/Clock	زمانیکه ساعت داخلی دستگاه با مشکل روبرو شده و یا اینکه ولتاژ باتری پشتیبان کم شده باشد . در صورتیکه ولتاژ باتری پشتیبان کم باشد و دستگاه نیز در وضعیت خاموش قرار گرفته باشد ، اطلاعات و پارامترهای ذخیره شده پاک میگردد. تاریخ و ساعت را مجدداً تنظیم کنید . رجوع شود به پارامتر ۱۶K
Current Imbalance	نامتعادلی جریان به وجود اشکالی در موتور بر می گردد . همچنین در محیط ها و وضعیتهایی مانند : ۱- وجود نامتعادلی در ولتاژهای ورودی ۲- وجود اشکال در سیم پیچی موتور ۳- زمانیکه بار موتور کم است بعضی وقتها نامتعادلی جریان بعلت کابلکشی نادرست بین کنتاکتور بای پاس خارجی با سافت استارتر بوجود آمده و یا یک مشکل داخلی در دستگاه وجود دارد . خصوصاً هنگامیکه یکی از تریستورها با اتصال باز مواجه شده باشد . خرابی یک تریستور تنها با جایگزینی آن با یک تریستور سالم و کنترل عملکرد دستگاه تشخیص داده می شود . به پارامترهای ۴A ، ۵B و ۱۶B رجوع شود
Excess Start Time	قطع بعلت زمان استارت زیادی (اضافه) در حالتهای زیر اتفاق می افتد : ۱- تنظیمات انجام شده در بخش FLC نادرست است (پارامتر ۱A) ۲- در تنظیمات مربوط به محدودیت حداقل جریان ، جریان بسیار کمی انتخاب

	شده است (پارامتر ۲B) ۳- "زمان شیب استارت" بزرگتر از "حداکثر زمان استارت" (پارامتر ۲G)تنظیم شده است ۴- هنگامیکه از کنترل تطبیقی سرعت استفاده می شود ، میزان زمان شیب استارت (پارامتر ۲D) برای بارهای سنگین کم است رجوع شود به پارامترهای ۱A, ۲D, ۲B, ۲G, ۳G, ۱C, ۳D, ۳B, ۱۶H
FLC Too High	این دستگاه می تواند از موتورها با مقادیر FLC بالا نیز پشتیبانی کند . هنگامیکه با اتصال مثلث و بصورت مستقیم به دستگاه وصل می شوند (بر خلاف اتصال مثلث خارجی) . در این حالت در صورتیکه مقدار FLC تنظیمی خیلی زیاد باشد (نسبت به موتور با اتصال مثلث خارجی) ، دستگاه در لحظه استارت قطع می گردد . در این حالت رجوع شود به پارامترهای ۱A و ۱C
Frecuency	فرکانس اصلی از محدوده مجاز فراتر رفته است . دستگاههای دیگری که به برق ورودی در آن محدوده وصل هستند را کنترل کنید زیرا بعضی از دستگاهها بر روی فرکانس ورودی تغییراتی ایجاد می کنند (خصوصاً درایوهای کنترل دور) اگر سافت استارتر به یک ژنراتور بعنوان تأمین کننده برق وصل است ، ممکن است قدرت ژنراتور پائین بوده و یا اشکالی در مدار رگولاتور آن رخ داده باشد . در این حالت رجوع شود به پارامترهای : ۴G ، ۴H ، ۵G ،۱۶F
Heatsink Overtemp	فن های خنک کننده کنترل شود . ضمناً فضای کافی و مناسب جهت تهویه وجود داشته باشد .در مدلهای بای پس داخلی ، فن های خنک کننده در حالتهای زیر شروع بکار می کنند : ۱- در زمان استارت و بمدت ۱۰ دقیقه بعد از تغییر وضعیت به RUN ۲- بمدت ۱۰ دقیقه بعد از استپ نکته : در مدلهای ASAB-۰۰۲۳B~ASAB-۰۰۵۳B و ASAB-۰۱۷۰B فن خنک کننده وجود ندارد در مدلهای بدون بای پاس داخلی از زمان استارت تا ۱۰ دقیقه بعد از استپ ، فن های خنک کننده کار می کنند رجوع شود به پارامترهای : ۱۶J
Input A Trip	علتی که باعث شده ورودی A فعال شود را پیدا و رفع کنید . رجوع شود به پارامترهای : ۶D, ۶E, ۴E, ۵E, ۵F, ۱۶E
Inst Overcurrent	جریان موتور یکدفعه بالا رفته است . این حالت ممکن است در زمان کارکرد موتور در اثر قفل شدن ناگهانی روتور(یا برش آن) اتفاق افتاده که متأثر از یک بار زیاد می باشد . رجوع شود به پارامترهای : ۴D, ۵D, ۱۶D
L۱ Phase Loss L۲ Phase Loss L۳ Phase Loss	اگرقبل از استارت موتور باشد ممکن است یکی از فازها قطع شده باشد . در حالت شروع بکار این خطا در دو حالت اتفاق می افتد : اول اینکه یکی از فازهای ورودی یا متصل به موتور قطع گردد . دوم اینکه جریان یکی از فازها

	بیش از ۳,۳٪ در مدت زمان ۱ ثانیه از مقادیر تنظیم شده در بخش FLC کمتر شود. در این حالت اتصالات مربوط به فازهای ورودی ، فازهای خروجی و اتصالات تخته کلم موتور را کنترل کنید . قطع فاز ممکن است بخاطر خرابی یک تریستور رخ دهد ، خصوصاً هنگامیکه تریستور بعلت باز شدن مدار آن خراب گردد . خرابی یک تریستور تنها با جایگزینی آن با یک تریستور سالم و کنترل عملکرد دستگاه تشخیص داده می شود .
L۱-T۱ Shorted L۲-T۲ Shorted L۳-T۳ Shorted	این حالت زمانی اتفاق می افتد که دستگاه یک اتصال کوتاه در تریستورها یا مدار بای پاس مشاهده کند . در صورتیکه دستگاه به یک موتور با اتصال مثلث داخلی وصل باشد ، به تنظیمات حالت ادامه کار با دوفاز توجه شده تا بواسطه آن موتور بکار خود ادامه دهد و در فرصت مناسب تعمیر شود . در اینصورت رجوع شود به پارامتر : ۱۵E
Motor Overload Motor ۲ Overload	موتور به نهایت ظرفیت گرمائی خود رسیده است . اضافه بار در حالتهای زیر اتفاق می افتد : ۱- تنظیمات محافظتی سافت استارتر با مقادیر نامی موتور همخوانی ندارد ۲- استارتِ بیش از اندازه در طول یک ساعت ۳- توان مورد استفاده بیش از حد است ۴- به سیم پیچ های موتور آسیب وارد شده است موردی که باعث اضافه بار شده است را رفع و اجازه دهید موتور خنک شود . رجوع شود به پارامترهای ۱A,۱B,۱۶A,۱E,۱C,۱D
Motor Connection	اتصالات موتور به دستگاه برای سیمبندی مثلث داخلی یا خارجی بدرستی انجام نگرفته است تک تک اتصالات موتور به دستگاه را از نقطه نظر محکم بودن و عدم قطعی کنترل کنید . اتصالت درون تخته کلم موتور را نیزکنترل کنید
Motor Thermistor	ترمیستور موتور فعال شده و : ۱ - میزان مقاومت ترمیستور در عرض یک ثانیه از ۳,۶ کیلواهم فراتر رفته ۲ - سیم پیچهای موتور بیش از اندازه گرم شده اند . علت گرم شدن سیم پیچها را پیدا و قبل از دوباره راه اندازی موتور ، اجازه دهید خنک شود ۳- مدار ترمیستور موتور باز شده است نکته : در صورتیکه از یک ترمیستور با اندازه مشخص و معتبر استفاده نمی کنید ، می توانید از یک مقاومت به اندازه ۱,۲ کیلو اهم مابین ترمینالهای ۶۴ و ۶۵ استفاده کنید . رجوع شود به پارامتر : ۱۶G
Network comms	سیستم اصلی یک فرمان قطع از طریق شبکه به سافت استارتر ارسال کرده و یا در اتصال به شبکه یک اشکال بوجود آمده است .در اینحالت اتصالات شبکه را کنترل کنید . رجوع شود به پارامتر : ۱۶L

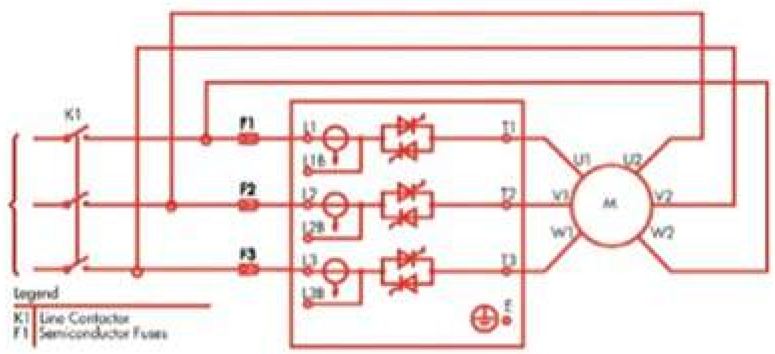
Par Out Of Range	مقدار یک پارامتر خارج از رنج معتبر می باشد . با استفاده از کی پد می توان اولین پارامتر با مقدار غیرمعتبر را پیدا کرد . در این حالت کلید MENU/ENTER را فشرده تا به پارامتر مورد نظر بروید و تنظیمات صحیح را انجام دهید .
Phase sequence	توالی فاز در ورودی سافت استارتر (L۱ , L۲, L۳) بهم خورده است . توالی فاز در ورودی های سافت استارتر را کنترل و مطمئن شوید با مقادیر تنظیم شده در پارامتر ۴B مطابقت دارد . رجوع شود به پارامتر : ۴B
Power Loss	یک یا چند فاز از منبع تأمین برق در هنگام استارت قطع می باشد . کنترل کنید آیا تمامی اتصالات فرمان و قدرت کنتاکتور ورودی (اصلی) برقرار است و آیا کنتاکتور تا رسیدن فرمان استپ به دستگاه بصورت بسته باقی می ماند
Starter comms	- یک اشکال در بین اتصالات مربوط به دستگاه و ماژول اختیاری (Optional) رخ داده است . ماژول را خارج و دوباره نصب نمائید . در صورتیکه اشکال همچنان برقرار باشد با سرویسکار محلی تماس بگیرید . - یک اشکال در مدار داخلی دستگاه رخ داده است . با سرویسکار محلی تماس بگیرید . رجوع شود به پارامتر : ۱۶I
Thermistor Cct	ترمیستور ورودی فعال شده و : ۱- میزان مقاومت ورودی به کمتر از ۲۰ اهم رسیده است (در حالت سرد ، مقاومت اکثر ترمیستورها بیشتر از این حد است) ۲- یک اتصالی در مدار بوجود آمده است . این اتصالی را پیدا و رفع کنید .
Time - Overcurrent	دستگاه دارای بای پاس داخلی است و متحمل یک جریان زیاد در حین کار می باشد (به منحنی حفاظتی قطع ۱۰ آمپر رسیده و یا جریان موتور به ۶ برابر تنظیمات FLC افزایش یافته است) .
Undercurrent	موتور ناگهان با یک کاهش جریان زیاد مواجه شده است . مانند بی بار شدن یکباره موتور که در اثر بریدن شافت ، کوپلینگ و یا تسمه اتفاق افتاده و یا اینکه پمپ بصورت خشک کار کند . در این حالت رجوع شود به پارامترهای : ۴C,۵C,۱۶C
Unsupported Option	پارامتر انتخابی معتبر نمی باشد (بعنوان مثال انتخاب jog در سیمبندی مثلث خارجی)

Soft start/stop static starters for three-phase A-synchronous motors

سری ASAB راه انداز های پیشرفته دیجیتالی مناسب برای موتور هایی با توان 7Kw تا 800Kw می باشند. راه انداز های نرم ASAB با ایجاد سیستم حفاظتی مناسب برای رنج گسترده ای از موتور ها سبب عملکرد قابل اطمینان در کاربردهای مختلف می‌شوند.

مشخصات فنی :

- AAC (سازگار با سیستم کنترل شتاب افزاینده)
- کنترل شیب راه اندازی
- جریان ثابت
- شیب جریان
- توقف نرم بر اساس نمودار شیب ولتاژ زمان بندی شده
- دارای سیستم ترمز
- رنج جریان 23-1600A
- رنج ولتاژ VAC 200-525
- رنج ولتاژ VAC 380-690
- دارای سیستم بای پس داخلی تا 1000A
- سیم بندی داخلی مثلث (تشخیص خودکار)
- ورودی های کنترل از راه دور (3عدد ثابت 1 عدد قابل برنامه ریزی)
- خروجی های رله ای (3 عدد قابل برنامه ریزی)
- خروجی آنالوگ
- با قابلیت ارتباط Device Net, Modbus, Profibus (به صورت اختیاری)
- نمایش پارامتر به صورت چند زبانه
- صفحه نمایش چند حالته با کیفیت گرافیکی عالی
- ثبت تاریخ و زمان وقایع
- دارای شمارنده(تعداد راه اندازی ها ،ساعات کاری، مصرف انرژی بر حسب Kwh)
- نمایش پارامتر ها (جریان ، ولتاژ، ضریب توان، انرژی بر حسب Kwh)
- صفحه نمایش قابل برنامه ریزی
- اضافه بار موتور
- افزایش زمان راه اندازی
- افت جریان
- اضافه جریان ناگهانی
- نامتقارنی جریان
- فرکانس شبکه
- خطای ورودی
- دمای موتور(ترمیستور موتور)
- ولتاژ ورودی
- توالی فاز



Power rate table :

Model 200-525V	Size	Start per Hour	300%, 10s Light Dty	350%, 15s	400%, 20s	450%, 30s Hvy Dty	Start per Hour	300%, 10s Light Dty	350%, 15s	400%, 20s	450%, 30s Hvy Dty
		N°	Amps	Amps	Amps	Amps	N°	Amps	Amps	Amps	Amps
		Bypassed ratings In-line connection					Bypassed ratings Inside delta connection				
ASAB-0023B/5/12/2	G1 no fan	10	23	20	17	15	10	35	30	26	22
ASAB-0043B/5/12/2	G1 no fan	10	43	37	31	26	10	65	59	51	44
ASAB-0053B/5/12/2	G1 no fan	10	53	53	46	37	10	80	80	69	55
ASAB-0076B/5/12/2	G1 no fan	6	76	64	55	47	6	114	96	83	70
ASAB-0097B/5/12/2	G1	6	97	82	69	58	6	146	123	104	87
ASAB-0100B/5/12/2	G1	6	100	88	74	61	6	150	132	112	92
ASAB-0105B/5/12/2	G1	6	105	105	95	78	6	158	158	143	117
ASAB-0145B/5/12/0	G2	6	145	123	106	90	6	218	184	159	136
ASAB-0170B/5/12/0	G2	6	170	145	121	97	6	255	217	181	146
ASAB-0200B/5/12/0	G2	6	200	189	160	134	6	300	283	241	200
ASAB-0220B/5/12/0	G2	6	220	210	178	148	6	330	315	268	223
ASAB-0255B/5/12/0	G3	6	255	231	231	176	6	382	346	302	264
ASAB-0350B/5/12/0	G3	6	350	329	284	244	6	525	494	427	366
ASAB-0425B/5/12/0	G3	6	425	411	355	305	6	638	617	533	458
ASAB-0500B/5/12/0	G4	6	500	445	383	326	6	750	668	575	490
ASAB-0580B/5/12/0	G4	6	580	492	425	364	6	870	738	637	546
ASAB-0700B/5/12/0	G4	6	700	592	512	438	6	1050	889	768	658
ASAB-0820B/5/12/0	G4	6	820	705	606	516	6	1230	1058	910	774
ASAB-0920B/5/12/0	G4	6	920	804	684	571	6	1380	1206	1026	857
ASAB-1000B/5/12/0	G4	6	1000	936	796	664	6	1500	1404	1194	997
		Non Bypassed ratings In-line connection					Non Bypassed ratings Inside delta connection				
ASAB-0255C/5/12/0	G3	6	255	231	201	176	6	383	346	302	264
ASAB-0380C/5/12/0	G4	6	380	380	359	299	6	570	570	539	449
ASAB-0430C/5/12/0	G4	6	430	430	368	309	6	645	645	552	464
ASAB-0620C/5/12/0	G4	6	620	620	540	434	6	930	930	810	651
ASAB-0650C/5/12/0	G4	6	650	650	561	455	6	975	975	842	683
ASAB-0790C/5/12/0	G4	6	790	790	714	579	6	1185	1185	1071	868
ASAB-0930C/5/12/0	G4	6	930	930	829	661	6	1395	1395	1244	992
ASAB-1200C/5/12/0	G5	6	1200	1200	1200	1071	6	1800	1800	1800	1606
ASAB-1410C/5/12/0	G5	6	1410	1410	1319	1114	6	2115	2115	1979	1671
ASAB-1600C/5/12/0	G5	6	1600	1600	1600	1353	6	2400	2400	2400	2030

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Dimensions and weight

Model	Dimensions WxHxD mm (inches)	Weight kg (ibs)
ASAB-0023B	150x295x183 (5.9"x11.6"x7.2")	4.3 (9.5)
ASAB-0043B	150x295x183 (5.9"x11.6"x7.2")	4.3 (9.5)
ASAB-0053B	150x295x183 (5.9"x11.6"x7.2")	4.3 (9.5)
ASAB-0076B	150x295x183 (5.9"x11.6"x7.2")	4.5 (9.9)
ASAB-0097B	150x295x213 (5.9"x11.6"x8.4")	5.0 (11.0)
ASAB-0100B	150x295x213 (5.9"x11.6"x8.4")	5.0 (11.0)
ASAB-0105B	150x295x213 (5.9"x11.6"x8.4")	5.0 (11.0)
ASAB-0145B	275x438x250 (10.8"x17.2"x9.9")	15 (33.0)
ASAB-0170B	275x438x250 (10.8"x17.2"x9.9")	15 (33.0)
ASAB-0200B	275x438x250 (10.8"x17.2"x9.9")	15 (33.0)
ASAB-0220B	275x438x250 (10.8"x17.2"x9.9")	15 (33.0)
ASAB-0255B	424x440x392 (16.7"x17.3"x15.4")	26 (57.2)
ASAB-0350B	424x440x392 (16.7"x17.3"x15.4")	30.2 (66.6)
ASAB-0425B	424x440x392 (16.7"x17.3"x15.4")	30.2 (66.6)
ASAB-0500B	433x640x600 (17.0"x25.2"x23.6")	49.5 (109.1)
ASAB-0580B	433x640x600 (17.0"x25.2"x23.6")	49.5 (109.1)
ASAB-0700B	433x640x600 (17.0"x25.2"x23.6")	60 (132.3)
ASAB-0820B	433x640x600 (17.0"x25.2"x23.6")	60 (132.3)
ASAB-0920B	433x640x600 (17.0"x25.2"x23.6")	60 (132.3)
ASAB-1000B	433x640x600 (17.0"x25.2"x23.6")	60 (132.3)
ASAB-0255C	390x460x280 (15.4"x18.1"x11.0")	24 (52.9)
ASAB-0380C	430x689x300 (16.9"x27.1"x11.8")	45 (98.1)
ASAB-0430C	430x689x300 (16.9"x27.1"x11.8")	45 (98.1)
ASAB-0620C	430x689x300 (16.9"x27.1"x11.8")	45 (98.1)
ASAB-0650C	430x689x300 (16.9"x27.1"x11.8")	45 (98.1)
ASAB-0790C	430x689x300 (16.9"x27.1"x11.8")	45 (98.1)
ASAB-0930C	430x689x300 (16.9"x27.1"x11.8")	53 (116.8)
ASAB-1200C	585x856x364 (23.0"x33.7"x14.3")	117 (257.9)
ASAB-1410C	585x856x364 (23.0"x33.7"x14.3")	117 (257.9)
ASAB-1600C	585x856x364 (23.0"x33.7"x14.3")	130 (286.6)

Power rate table :

Model 380-690V	Size	Start per Hour	300%, 10s Light Dty	350%, 15s	400%, 20s	450%, 30s Hvy Dty	Start per Hour	300%, 10s Light Dty	350%, 15s	400%, 20s	450%, 30s Hvy Dty
		N°	Amps	Amps	Amps	Amps	N°	Amps	Amps	Amps	Amps
		Bypassed ratings In-line connection					Bypassed ratings Inside delta connection				
ASAB-0023B/7/12/2	G1nofan	10	23	20	17	15	10	35	30	26	22
ASAB-0043B/7/12/2	G1nofan	10	43	37	31	26	10	65	59	51	44
ASAB-0053B/7/12/2	G1nofan	10	53	53	46	37	10	80	80	69	55
ASAB-0076B/7/12/2	G1nofan	6	76	64	55	47	6	114	96	83	70
ASAB-0097B/7/12/2	G1	6	97	82	69	58	6	146	123	104	87
ASAB-0100B/7/12/2	G1	6	100	88	74	61	6	150	132	112	92
ASAB-0105B/7/12/2	G1	6	105	105	95	78	6	158	158	143	117
ASAB-0145B/7/12/0	G2	6	145	123	106	90	6	218	184	159	136
ASAB-0170B/7/12/0	G2	6	170	145	121	97	6	255	217	181	146
ASAB-0200B/7/12/0	G2	6	200	189	160	134	6	300	283	241	200
ASAB-0220B/7/12/0	G2	6	220	210	178	148	6	330	315	268	223
ASAB-0255B/7/12/0	G3	6	255	231	231	176	6	382	346	302	264
ASAB-0350B/7/12/0	G3	6	350	329	284	244	6	525	494	427	366
ASAB-0425B/7/12/0	G3	6	425	411	355	305	6	638	617	533	458
ASAB-0500B/7/12/0	G4	6	500	445	383	326	6	750	668	575	490
ASAB-0580B/7/12/0	G4	6	580	492	425	364	6	870	738	637	546
ASAB-0700B/7/12/0	G4	6	700	592	512	438	6	1050	889	768	658
ASAB-0820B/7/12/0	G4	6	820	705	606	516	6	1230	1058	910	774
ASAB-0920B/7/12/0	G4	6	920	804	684	571	6	1380	1206	1026	857
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ASAB-0650C/7/12/0	G4	6	650	650	561	455	6	975	975	842	683
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ASAB-1200C/7/12/0	G5	6	1200	1200	1200	1071	6	1800	1800	1800	1606
ASAB-1410C/7/12/0	G5	6	1410	1410	1319	1114	6	2115	2115	1979	1671
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FAMCO هایپرصنعت

• 15P00CVB100 •

ASAMV

Medium Voltage Soft Starter

USER MANUAL

Rev. 00
Iussed on 16 October 2014

- This manual is integrant and essential to the product. Carefully read the instructions contained herein as they provide important hints for use and maintenance safety.
- This device is to be used only for the purposes it has been designed to. Other uses should be considered improper and dangerous. The manufacturer is not responsible for possible damages caused by improper, erroneous and irrational uses.
- Enertronica Santerno S.p.A. is responsible for the device in its original setting.
- Any changes to the structure or operating cycle of the device must be performed or authorized by Enertronica Santerno S.p.A..
- Enertronica Santerno S.p.A. assumes no responsibility for the consequences resulting by the use of non-original spare-parts.
- Enertronica Santerno S.p.A. reserves the right to make any technical changes to this manual and to the device without prior notice. If printing errors or similar are detected, the corrections will be included in the new releases of the manual.
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Table of Contents

Chapter 1 - Introduction

This chapter is an introduction to the Reduced Voltage Solid State Soft Starter for medium voltage AC motors. It is highly recommended that users read this section thoroughly to become familiar with the basic configuration, operation and features before applying the Soft Starter.

1.1 Overview

The standard Soft Starter is an SCR-based controller designed for the starting, protection and control of AC medium voltage motors. It contains SCR stack assemblies, fiber optic connections, and low voltage control circuitry ready to be interfaced with an enclosure and the necessary equipment to create a complete a Class E2 medium voltage motor Soft Starter.

1.2 Specifications

GENERAL	
AC Supply Voltage	2300 - 13800 VAC +10 to – 15% (Model dependent)
Unit Running Overload Capacity (Percent of motor FLA)	125% - Continuous 500% - 60 seconds, 600% - 30 seconds. 1 Cycle: Up to 14x FLA (Internally protected by the programmable short circuit)
Frequency	50 or 60Hz, +2Hz hardware selectable
Power Circuit	6 SCRs, 12 SCRs, 18 SCRs (Model dependent for 2.3 to 7.2 kV Class) 36 SCRs for 10-13.8 kV Class
SCR Peak Inverse Voltage Ratings	6500V - 19500V (for 2.3 to 7.2 kV Class) 27000V - 39000V (Model dependent for 10 to 13.8kV Class; see Table 1) Note: Contact Factory
Phase Insensitivity	User selectable phase sequence detection
Transient Voltage Protection	RC snubber dv/dt networks (One per inverse pair of SCRs)
Ambient Condition Design	Enclosed units: 0° to 40°C (32° to 104°F) (optional - 20° to 50° C with heaters) 5 - 95% relative humidity 0 - 3300 ft. (1000m) above sea level without de-rating (Ratings for ambient conditions external to unit)
Control	2 or 3 wire 120VAC (Customer supplied)
Auxiliary Contacts	Multiple: Form C (Contacts), rated 5 Amps, 240VAC max.
	8 Relays (4 programmable): Form C contacts
	Fault Indicator: Form C contacts
BIL Rating	60kV for 2.3 to 7.2 kV Class 110kV for 10 to 13.8kV Class
Approvals	UL recognized, Canadian UL (cUL) recognized

ADVANCED MOTOR PROTECTION	
Two Stage Electronic Overload Curves	Starting: Programmable for Class 5 through 30 Run: Programmable for Class 5 through 30 when "At-Speed" is detected.
Overload Reset	Manual
Retentive Thermal Memory	Overload circuit retains thermal condition of the motor regardless of control power status. Unit uses real time clock to adjust for off time.
	Overload will not reset until thermal capacity available in the motor is sufficient for a successful restart. Starter learns and retains this information by monitoring previous successful starts.
Phase Current Imbalance Protection	Imbalance Trip Level: 5 - 30% current between any two phases Imbalance Trip Delay: 1 -20 seconds
Over Current Protection (Electronic Shear Pin)	Trip Level: 100 - 300% of motor FLA Trip Delay: 1 - 20 seconds
Load Loss Trip Protection	Under Current Trip Level: 10 -90 % of motor FLA Under Current Trip Delay: 1 - 60 seconds
Coast Down (Back Spin)	Coast Down Time Range: 1 - 60 minutes

Lockout Timer	
Starts-per-hour Lockout Timer	Range: 1 - 6 successful starts per hour Time between starts: 1 - 60 minutes between start attempts

PROGRAMMABLE OUTPUTS	
Type / Rating	Form C (SPDT), Rated 5 amps 240 VAC max, (1200 VA)
Run Indication	Programmable
At Speed Indication	Programmable
Acceleration Adjustments	Programmable Ramp Types: Voltage or Current Ramp (VR or CR) Starting Torque: 0 - 100% of line voltage (VR) or 0 - 600% of motor FLA (CR) Ramp Time: 1 to 120 seconds Current Limit: 200 - 500% (VR or CR) Power Ramp: 0 – 300%
Dual Ramp Settings	4 Options: VR1+VR2; VR1+CR2; CR1+CR2; CR1+VR2 Dual Ramp Control: Ramp 1 = Default Ramp 2 = selectable via dry contact input
Deceleration Adjustments	Begin Decel Level: 80 - 100% of line voltage Stop Level: 0 to 1% less than Begin Decel Level Decel Time: 1 - 60 seconds
Jog Settings	Voltage Jog: 5 - 75%
Kick Start Settings	Kick Voltage: 10 - 100% Kick Time: 0.1 - 2 seconds
Fault Display	Shorted SCR, Phase Loss, Shunt Trip, Phase Imbalance Trip, Overload, Overtemp, Overcurrent, Short Circuit, Load Loss, Undervoltage or Any Trip
Lockout Display	Coast Down Time, Starts Per Hour, Time Between Starts, and Any Lockout

EVENT HISTORY	
Up to 60 Events	Data includes cause of event, time, date, voltage, power factor and current for each phase and ground fault current at time of event

METERING FUNCTIONS	
Motor Load	Percent of FLA
Current Data	A, B, C Phase Current, Avg Current, Ground Fault (Option)
Thermal Data	Remaining thermal register; thermal capacity to start
Start Data	Avg Start Time, Avg Start Current, Measured Capacity to start, time since last start.
RTD Data (Option)	Temperature readings from up to 12 RTDs (6 stator RTDs)
Voltage Metering	kW, kVAR, PF, kWH

SERIAL COMMUNICATIONS	
Protocol	Modbus RTU
Signal	RS-485, RS-422 or RS232
Network	Up to 247 devices per mode
Functionality	Full operation, status view, and programming via communications port

OPERATOR INTERFACE	
LCD Readout	Alpha numeric LCD display
Keypad	8 function keys with tactile feedback
Status Indicators	12 LEDs include Power, Run, Alarm, Trip, Aux Relays
Remote Mount Capability	Up to 1000 circuit-feet from chassis (Use twisted, shielded wire & power source)

CLOCK and MEMORY	
Operating Memory	SRAM loaded from F-RAM at initialization
Factory Default Storage	Flash Memory
Customer Settings and Status	Non-volatile F-RAM, no battery backup necessary
Real Time Clock	Lithium ion battery for clock memory only

1.3 Reference Chart

NOTES-

1.4 Design Features

The standard Soft Start panel has the following features:

- **SCR Power Modules:** For each phase, the SCRs are arranged in inverse parallel pairs and series *strings as indicated in Table1 below to facilitate sufficient Peak Inverse Voltage ratings for the application*

- **RC Snubber Networks:** Provide Transient Voltage Protection for SCR Power Modules in each phase to avoid dv/dt damage.

- **Firing Circuit:** The SCRs are gated (turned on) using a Sustained Pulse Firing Circuit. This circuitry is isolated from the control voltage by means of fiber optics.

Table 1 Unit PIV Ratings

200 & 400 Amps Units				600 Amps Units			
Voltage	**Series Devices**	**Total Number of SCRs**	**PIV Rating**	**Voltage**	**Series Devices**	**Total Number of SCRs**	**PIV Rating**
2300 V	0	6	6500 V	2300 V	2	12	9000 V
3300 / 4160 V	2	12	9000/13000 V	3300 / 4160 V	4	24	9000/18000 V
6000 - 7200 V	3	18	19500 V	6000 - 7200 V	4	36	18000 V
100, 200, 400, 600 Amps Units				**100, 200, 320, 600 Amps Units**			
Voltage	**Series Devices**	**Total Number of SCRs**	**PIV Rating**	**Voltage**	**Series Devices**	**Total Number of SCRs**	**PIV Rating**
10kV – 11kV	6	36	27000V	13.2 – 13.8kV	6	36	39000V

1.5 Theory of Operation

The Soft Starter is CPU controlled, using a microprocessor based protection and control system for the motor and starter assembly. The CPU uses Phase Angle Firing control of the SCRs to apply a reduced voltage to the motor, and then slowly and gently increases torque using voltage and current control until the motor accelerates to full speed. This starting method lowers the starting current of the motor, reducing electrical stresses on the power system and motor. It also reduces peak starting torque stresses on both the motor and mechanical load, promoting longer service life and less downtime.

1.5.1 Acceleration:

The soft starter comes standard with several methods of accelerating the motor so that it can be programmed to match almost any industrial AC motor application. The factory default setting applies a **Voltage Ramp** with **Current Limit** as this has been proven to be the most reliable starting method for the vast majority of applications. Using this starting method, the Initial Voltage setting applies just enough voltage to cause the motor shaft to begin to turn. This voltage is then gradually increased over the "Ramp Time" setting, until one of two things happen: the motor accelerates to full speed~~,~~ or the Ramp Time expires and the Current Limit setting is reached.

If the motor accelerates to full speed before the ramp time has expired, an automatic Anti- Oscillation feature will override the remaining ramp time and full voltage will be applied. This will prevent any surging or pulsation in the motor torque, which might otherwise occur If the motor has not reached full speed at the end of the ramp time setting, the current limit setting will proportionally regulate the maximum output torque. CPU algorithms provide protection against a stall condition, an overload condition or excessive acceleration time.

The Current Limit feature is provided to accommodate installations where there is limited power available (For example, on-site generator power or utility lines with limited capacity). The torque is increased until the motor current reaches the pre-set Current Limit value at which point it is then held. Current Limit overrides the ramp time setting so if the motor has not accelerated to full speed under the Current Limit setting, the current remains limited for as long as it takes the motor to accelerate to full speed.

When the motor reaches full speed and the current drops to running levels, the soft starter detects an At-Speed condition and automatically closes the Bypass Contactor. The Bypass Contactor serves to shunt power around the SCR stack assemblies to prevent heat build-up in the starter enclosure. At this point, the motor is operating at full voltage, speed and power.

Other starting methods available in the soft starter are:

- **Current Ramp:** Uses a closed loop current feedback algorithm to provide a linear current increase up to a Maximum Current level.
- **Constant Current:** current is immediately increased to the Current Limit point and held there until the motor reaches full speed.
- **Power (KW) Ramp:** Uses a True RMS KW feedback PID loop to provide a linear increase in True RMS motor power to a maximum set KW value.
- **Custom Curve:** Gives the user the ability to plot torque and time points on a graph. The soft starter will then accelerate the motor following these points.
- **Tachometer Feedback Ramp:** uses a closed loop speed follower method monitoring a tachometer input signal from the motor or load shaft to provide a linear RPM acceleration.

1.5.2 Deceleration: The soft starter provides the user with the option of having the load coast to a stop or controlling the deceleration by slowly reducing the voltage to the motor upon initiating a stop command. The Decel feature is the ***opposite of DC injection braking*** in that the motor will actually take longer to come to a stop than if allowed to coast to a stop. The most common application for the Decel feature is pumping applications where a controlled stop prevents water hammer and mechanical damage to the system.

1.6 General Protection

The Soft Starter is provided with a built-in motor protection relay that can be programmed for primary protection of the motor / load system. Operation of the Soft Starter can be divided into 4 modes; Ready, Start, Run and Stop.

1.6.1. ***Ready Mode:*** *I*n this mode, control and line power are applied and the Starter is ready for a start command.

Protection during this mode includes the monitoring of current for leakage through multiple shorted SCRs or welded contacts on the Bypass Contactor. Other protection features in effect are:

- Starter Power Pole Temperature
- Shorted SCR
- Blown Fuse Indication
- Phase Reversal (if enabled)
- Line Frequency Trip Window
- External Input Faults (Digital Input Faults are active in all modes)
- Undervoltage
- Overvoltage

Note: *The “Programming Mode” can only be entered from the Ready Mode. Any attempt to enter data while the motor is starting or running will be blocked. During programming, all protection features and start command are disabled.*

1.6.2 Start Mode**:** These additional protection functions are enabled when the Soft Starter receives a valid Start command:

- Phase Reversal (if enabled) Phase Reversal will still be on and is not a newly activated feature when starting.
- Start Curve
- Acceleration Timer
- Phase Imbalance

- Short Circuit / Load Pre-check (Toe-in-the-Water)
- Ground Fault (Optional)
- External Input Faults
- Accumulated Starting FLA Units (I2t Protection)
- Starting Overload Protection Curve Selection
- Thermal Capacity

Note: *Shorted SCR protection is no longer in effect once the soft starter goes into the Start Mode.*

1.6.3 Run Mode*:* The soft starter enters the Run Mode when it reaches full output voltage *and* the motor current drops below the FLA setting (motor nameplate FLA plus service factor) for a pre-determined period of time. During the Run Mode these additional protection features are enabled:

- Running Overload Protection Curve Selection
- Phase Loss
- Under Current / Load Loss
- Over Current / Electronic Shear Pin (Jam Protection)
- External Input Faults

1.6.4 Stop Mode: Once a Stop command has been given, the protection features change depending on which Stop Mode is selected.

- Decel Mode: Retains all protection features of the Run Mode. At the end of Decel, the motor will be stopped and the protection features change as indicated below.

- Coast-To-Stop Mode: Power is immediately removed from the motor and the Soft Starter returns to the Ready Mode.

- Additional protection features activated when the stop command is given include:
  - Coast-Down / Back Spin Timer
  - Starts-per-Hour
  - Time between Starts
  - External Input Faults

1.7 Thermal Overload Protection

The Soft Starter plays an important role in the protection of your motor in that it monitors the motor for excessive thermal conditions due to starting, running and ambient conditions. The soft starter has a Dynamic Thermal Register system in the CPU that provides a mathematical representation of the thermal condition of the motor.

This thermal information is retained in memory and is monitored for excesses in both value and rate of change. Inputs are derived from current values, imbalances and (optional) RTD measurements making it dynamic to all processes involving the motor. The Soft Starter monitors these conditions separately during the Start and Run modes to provide proper thermal protection at all times.

1.7.1 Start Mode overload protection is selectable using one of three methods:

- **Basic Protection:** I2t data is accumulated and plotted based on an Overload Curve selected in programming. This is programmed per NEMA Class 5-30 standard curves and is based on the Locked Rotor Current (from the motor nameplate) as programmed into the Soft Starter.

- **Measured Start Capacity:** The user enters a measured amount of thermal capacity from a pre-selected successful start as a set point to the Thermal Register for the soft starter to follow.

- **Learned Curve Protection:** The user sets the soft starter to the “LEARN” mode and starts the motor under normal starting conditions. The CPU then samples and records 100 data points during the start curve, analyzes them and creates a graphical representation in memory. The soft starter is then switched to Curve Follow protection mode and monitors motor performance against this curve. This feature is especially useful in initial commissioning tests to record a base line performance sample (In this case, it is not necessarily used for motor protection).

1.7.2 Run Mode overload protection is initiated when the soft starter determines that the motor is At-Speed. Overload Protection is initiated when the motor RMS current rises above a “pick-up point” (as determined by the motor nameplate FLA and service factor). Run mode protection is provided by the CPU monitoring the Dynamic Thermal Register. Data for the Dynamic Thermal Register is accumulated from I2t calculations and cooling rates. A trip occurs when the register reaches 100% as determined by the selected Overload Protection Curve (NEMA Class 5-30 standard curves) and is based on the programmed Locked Rotor Current indicated on the motor nameplate. The Dynamic Thermal Register is altered, or “biased”, by the following conditions:

- **Current Imbalance** will bias the register higher due to additional motor heating as a result of a line current imbalance condition.

- **Normal Cooling** is provided when the motor current drops below the overload pick-up point or the motor is off line. The Cooling rate is lower for motors that are off-line (such as after a trip) since cooling fans are also inoperative**.**

- **RTD Input** (Requires the optional RTD monitor card) provides a separate means of motor protection based on actual temperatures measurements inside the motor. It runs independently of the Thermal Register Model and does not provide input to, or bias that model.

- **Dynamic Reset** is another feature that adds reliability and consistency to the performance of the soft starter. If a motor overload condition occurs and the Overload protection trips, it cannot be reset until sufficient cool down time has elapsed. This cool down time is determined by the "Learned Thermal Capacity" required to start the motor which must be regained before the overload can be reset. This ensures sufficient thermal capacity for a successful restart of the motor.

- **Retentive Memory** provides continuous overload protection and true thermal modeling by means of a running back up of the thermal register even if power is lost. Upon restoration of power, the soft starter will read the Real Time Clock, then recalculate and restore the thermal register to what it should be, given the elapsed time and the cool down rate of the motor.

- **Learned Reset Capacity** is a feature that is unique to the Soft Starter. By sampling the amount of thermal capacity used in the previous three successful starts, the starter will not allow a reset until a sufficient amount of thermal capacity has been regained in the motor. This prevents nuisance tripping and insures that unsuccessful start attempts (which would otherwise use up the starts-per-hour capacity of the motor) are not counted.

1.8 Firing Circuit

The SCR gate firing circuit is critical to the performance and stability of the system. The firing circuit includes several unique features which enhance the ruggedness, noise immunity and flexibility for maximized performance. These features include:

- **Auto Synchronizing** of the gate timing pulses match each phase firing angle to their respective phases. The Soft Starter actively tracks minor shifts in the line frequency avoiding nuisance tripping that may happen with conventional gate firing systems. This is especially useful on portable or backup generator supplies, allowing the soft starter to be used confidently in applications that have unstable power**.**

- **Sustained Pulse** firing keeps the firing signal active for 270 electrical degrees ensuring that the DC gate pulse forces the SCR to fire even if line noise is present. This provides the Soft Starter with superior noise immunity and protects against misfiring, enhancing the soft starter system stability.

- **Closed Loop Firing Control** is a method of balancing the SCR firing pattern. The CPU uses feedback signals from the output current and voltage providing to provide smooth output preventing imbalances during ramping which prevents unnecessary motor heating**.**

- **Transformer Isolation** of SCR firing information and signals prevents interference from line noise and EMI/RFI that may be present. Three phase isolation transformers provide potential measurement, firing board timing while providing isolation from the line voltage. High isolation Ring Transformers are used to step the 120v control voltage down to 28VAC for the Sustained Pulse firing circuit, providing further isolation for the SCR gates.

- **Fiber Optic Isolation** is provided for all gate drive and current feedback signal interfaces between the Medium and Low Voltage systems.

1.9 Electronics

The Soft Starter electronic systems are divided into two categories; Low Voltage and Medium Voltage and are based on where they are located in the Starter structure.

1.9.1 Low Voltage electronics include the Keypad Operator Interface, the CPU and Main Power PC boards which are located in an isolated Low Voltage compartment of the enclosure.

- **Keypad Operator Interface** is a 2 line x 20 character LCD display with back-lighting for low ambient light conditions. The display reads out in truncated English and can show multiple data points in each screen. Twelve LED indicators are included which show the status of, Power, RUN, ALARM, TRIP and the 8 AUX RELAYS. The Operator communicates with the CPU board via a serial cable link and can be remotely located up to 1000ft. from the starter. **FIG. 1.9** shows the Keypad Operator Interface.

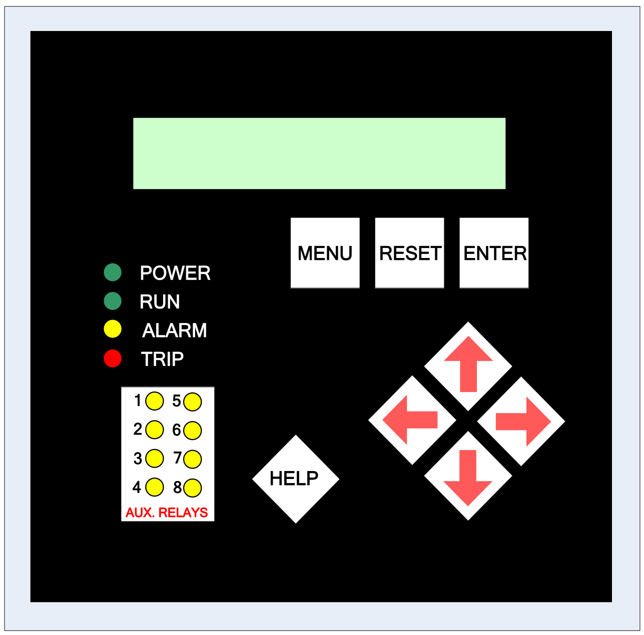


FIG. 1.9 Keypad Operator Interface

- **CPU Board** is where the microprocessor and communications co-processor are located. It is attached to the main Power board. The CPU determines operating functions, stores user programming, acts upon feedback signals ~~f~~or faults~~,~~ and calculates metering and historical data. The board communicates with the Keypad Operator Interface via a serial link cable. Analog and Digital I/O are also located on the CPU board. (See **FIG. 2.3.4**)

- **Main Board** also referred to as the Firing Board, contains the Auxiliary I/O relays and interfaces to the TCB board (see below) for user interface. This board generates all firing signals for the SCR stacks and receives feedback signals which are isolated via fiber optics. The board also provides signal conditioning in preparation for analog to digital conversion. (See **FIG. 2.3.3**)

1.9.2 Control Electronics are located in the Medium Voltage section of the soft starter. They include the Gate Drive and Temp / CT boards.

DANGER

HAZARDOUS VOLTAGE

Disconnect all power supplying this equipment prior to working on it.

Failure to follow this instruction will result in death or serious injury.

- **TCB** (**T**erminal and **C**ontrol **B**oard) is the user connection interface board. This board contains the user terminal blocks, output relays (duplicated), inputs and control power connections. It also contains additional timed relays for interfacing with Power Factor Correction contactors (if used) and other external devices. Please note Power Factor Capacitor warnings in **Section 2.1**.; also see **FIG. 2.2.1**.

- **Gate Drive Boards** are located directly on the SCR stacks. These boards connect to the Main Power board via fiber optic cables. They amplify the gate pulse signals with power from the Ring Transformers to create the Sustained Pulse Firing of the SCRs. There is one Gate Drive board for each pair of SCRs in each stack.

- **Temp / CT Boards** are attached to the Gate Drive boards on the SCR stacks and provide the heat sink Temperature and line current signals back to the Main Power Board via fiber optic cables.

- **MOV Boards** are attached to standoffs mounted on the SCR heat sinks and are mounted directly below the Gate Drive boards. The MOV boards are used to protect the SCRs from over voltage.

- **DV/DT Boards** are also attached to standoffs mounted on the SCR heat sinks and are mounted below the MOV boards. The DV/DT boards are used to mitigate voltage transients across the stack assemblies.

Chapter 2 – Connection

2.1 Warnings

- **Do not service this equipment with voltage applied!** The unit can be the source of fatal electric shock! To avoid shock hazard, disconnect main power and control power before working on the unit. Warning labels must be attached to terminals, enclosure and control panel to meet local codes observing Lock Out, Tag Out procedures.

- **Do not connect (PFC) capacitors or surge capacitors to the load side (motor side) of the unit.** This will cause di/dt damage to the SCRs when they are turned on and will void the warranty on this product. Capacitors can only be connected to the load side of the starter through the use of an isolating contactor which is closed after the soft starting sequence has been completed or when di/dt limiting inductors are factory installed.

- **Avoid connecting capacitors to the input side of the unit.** If you cannot avoid using capacitors across the power lines, they must be located as far upstream as possible of the input line contactor. In this situation, an optional power factor correction (PFC) capacitor contactor should be specified. For additional information and specifications or when di/dt limiting inductors are factory installed, please contact the factory.

- **Never interchange the input and output power connections on the unit.** This will cause excessive voltage to the control circuit logic.

- **For bus protection, it is strongly recommended to use non-gap MOV Type lightning arrestors in areas where lightning is a significant problem.** The arrestors should be mounted on the nearest utility pole at the Station or optionally included with the unit at the time of order.

- **Medium Voltage cables can have significant capacitance values by design which can elevate Di/Dt thru the SCRs to unsafe levels.** Compensating inductors can limit these values to safe levels. Contact the factory if you need more information on this subject.

DANGER

HAZARDOUS VOLTAGE

Disconnect all power supplying this equipment prior to working on it.

Failure to follow this instruction will result in death or serious injury.

CAUTION

SCR DAMAGE

Do not connect (PFC) capacitors to the load side of the unit.

Doing so will cause DI/DT damage to the SCRs when energized.

WARNING

SAFETY HAZARD

Do not bypass electrical or mechanical interlocks.

Failure to follow this instruction will cause severe equipment damage, serious injury or death.

2.2 Control Connections - TCB (Terminal and Control Board)

2.2.1 TCB Board

The TCB board, FIG. 2.2.1 shown below, provides interconnections between the main power and CPU boards and the customer's control logic connections. It is a 120 VAC control board with several auxiliary dry contacts, built-in time delay circuits and an emergency bypass function. It also controls the inline isolation and bypass contactor and provides provisions for shutdown interlocks. (See **Section 2.2.2** for terminal designations and descriptions)

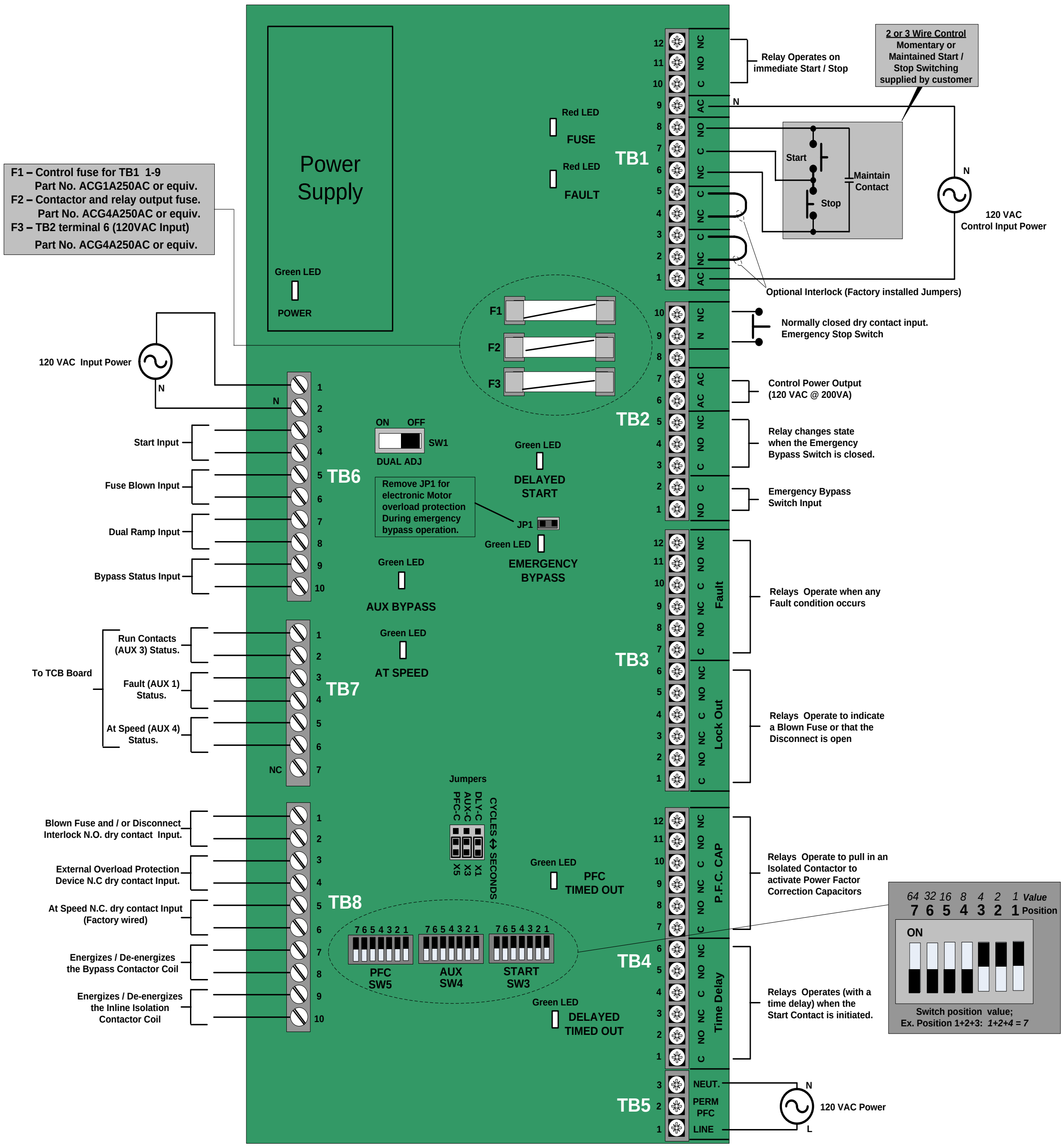


FIG. 2.2.1 TCB Terminal and Control Board

2.2.2 Description of Terminal Connections

TB1 Start / Stop Control		
T	**Description**	
1	**AC**	120 VAC Control Power (Line)
2 **3**	**NC** **C**	Shutdown Input – Accepts customer N.C dry contact (Factory jumper installed)
4 **5**	**NC** **C**	Shutdown Input – Accepts customer N.C dry contact (Factory jumper installed)
6 **7** **8**	**NC** **C** **NO**	Terminal 6, 7 & 8;"2-wire control is connected to pins 6 & 8". Also; "For 3 wire control, connect the N.C. STOP button to pins 6&7 and the N.O. START button to pins 7 & 8
9	**AC**	120 VAC Control Power (Neutral)
10 **11** **12**	**C** **NO** **NC**	Common Normally Open Normally Closed, Form C Relay that changes state on Start and Stop commands

TB2 Emergency Bypass Control		
T	**Description**	
1 **2**	**NO** **C**	When the N.O. contact closes the unit reverts to an electromechanical starter. When a start command is given the unit will start the motor across the line.
3 **4** **5**	**C** **NO** **NC**	Terminals 3, 4 and 5 is a form C output relay that changes state when the contact at TB2 pins 1 & 2 is closed
6 **7**	**NO** **NC**	120 VAC @ 200VA Aux Control Power output.
8	**-**	Not Used
9 **10**	**N** **NC**	Normally Closed Emergency Stop Dry Contact Input. Open to activate the Emergency Stop Feature.

TB3 Fault Relay Outputs		
T	**Description**	
1 **2** **3**	**C** **NO** **NC**	(2) Form C relay output that transfer on blown fuse or disconnect open indication.
4 **5** **6**	**C** **NO** **NC**	(2) Form C relay output that transfer on blown fuse or disconnect open indication.
7 **8** **9**	**C** **NO** **NC**	(2) Form C relay output that transfer on ***any*** fault indication.
10 **11** **12**	**C** **NO** **NC**	(2) Form C relay output that transfer on ***any*** fault indication.

2.2.2. Description of Terminal Connections - Continued

TB4 Optional Relay Outputs		
T		**Description**
1 **2** **3**	**C** **NO** **NC**	2 Form C time delay Aux relay output contacts. Time delay starts when the Start commend is given.
4 **5** **6**	**C** **NO** **NC**	
7 **8** **9**	**C** **NO** **NC**	2 Form C time delay Aux relay output contacts. Time delay starts when the "At Speed" condition is reached ideal for controlling a PFC contactor.
10 **11** **12**	**C** **NO** **NC**	

TB5 TCB Power		
T		**Description**
1	**L**	By connecting TB5 of multiple units in parallel, PFC contactors will be inhibited from closing while a unit is soft starting. PFCs that are already on line will remain on line. The lead unit in the parallel string requires TB5 pins 1 & 3 to be connected to the 120Vac source and neutral respectively.
2	**PFC**	
3	**N**	

TB6 Main and CPU Circuit Board Control Inputs		
T		**Description**
1 **2**	**L** **N**	120 Vac output to Control Power Input (Main & CPU Circuit)
3 **4**	**-** **-**	Start Input
5 **6**	**-** **-**	Fuse Blown Input
7 **8**	**-** **-**	Dual Ramp Input
9 **10**	**-** **-**	Bypass Status Input

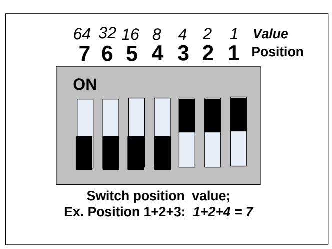
2.2.2 Description of Terminal Connections - Continued

TB7 Main and CPU Circuit Board Control Outputs	
T	**Description**
1 **2**	Run contacts (AUX3) to the TCB board. *(Signal is used to hold the Main Contactor closed during deceleration)*
3 **4**	To the TCB board indicating the status of AUX 1.
5 **6**	At Speed Contacts (AUX 4) used to signal the Bypass Contactor to close.
7	Not Connected / Not Used

TB8 Control Inputs and Outputs	
T	**Description**
1 **2**	N.C. dry contact input from blown fuse and/or disconnect interlock.
3 **4**	N.C. dry contact input from an external Overload Protection device. *(Required if emergency bypass is used)*
5 **6**	N.C. dry contact input from the Bypass Contactor for at speed indication.
7 **8**	Output connected to the Bypass Contactor and energizes / de-energizes the Contactor. *(Factory wired)*
9 **10**	Output connected to the Inline Isolation Contactor and energizes / de-energizes the Contactor. *(Factory wired)*

2.2.3 Description of Jumper Selections and Functions

<table>
<tr><th colspan="4">Jumper Selection</th></tr>
<tr><th colspan="2">Jumper</th><th>Time Delay</th><th>Function</th></tr>
<tr><td>DLY-C</td><td>X1</td><td>Seconds /Cycles</td><td><u>Start Delay</u>
Jumper selects between seconds or cycles (1/60th of a second) for the start delay when a Start command is received and when the CPU actually receives the start signal. Default jumper setting is seconds.</td></tr>
<tr><td>AUX-C</td><td>X3</td><td>Seconds /Cycles</td><td><u>Auxiliary (Start) Delay</u>
Jumper selects between seconds or cycles (1/60th of a second) for the auxiliary start delay when a Start command is received and when the CPU actually receives the start signal. Default jumper setting is seconds.</td></tr>
<tr><td>PFC-C</td><td>X5</td><td>Seconds /Cycles</td><td><u>PFC Contactor Delay</u>
Jumper selects between seconds or cycles (1/60th of a second) for the delay when the Bypass Contactor closes to when the Power Factor Capacitors Contactor is activated. Default jumper setting is seconds.</td></tr>
<tr><td colspan="2">JP1</td><td>N/A</td><td><u>Motor Protection Jumper</u>
When this jumper is in place, the CPU will be disabled during operation in the Emergency Bypass Mode. In this case, insure that there is an external means of overload protection. When the jumper is removed, the CPU will be enabled to provide electronic motor protection when operating in the Emergency Bypass Mode.</td></tr>
</table>

<table>
<tr><th colspan="3">DIP Switches</th></tr>
<tr><th>Switch</th><th colspan="2">Function</th></tr>
<tr><td>SW1</td><td colspan="2">ON: Sets Dual Adjustment
OFF: Disabled</td></tr>
<tr><td>SW2</td><td colspan="2">Not Used</td></tr>
<tr><td>SW3</td><td>Sets the Start Delay Value</td><td rowspan="3">SW3, SW4 and SW5 are 7 position DIP Switches that use binary coding to set the value of the time delay in Cycles or Seconds as selected via jumpers X1 to X6. (See Jumper Table.) The setting range is 0 to 127 (1+2+4+8+16+32+64). The example shown results in a value of 7 (1+2+4)

</td></tr>
<tr><td>SW4</td><td>Sets the AUX Start Delay Value</td></tr>
<tr><td>SW5</td><td>Sets the PFC Contactor Delay Value</td></tr>
</table>

2.2.5 Description of LED Indicators Functions

LED Indicators			
Function	**Location**	**Color**	**Function**
Fuse Blown/ Disconnect	D4	Red	ON: When a Fuse is blown and / or a Disconnect is open.
Fault	D16	Red	ON: When any Fault has occurred.
Start	D7	Yellow	ON: When a Start signal has been initiated.
PFC Timed Out	D17	Yellow	ON: When the Power Factor Correction Capacitors Contactor is energized.
Delay Timed Out	D15	Yellow	ON: When the Auxiliary Start Contacts have been energized.
+24V	D28	Green	ON: +24V supply is good.

2.3 PCB Layout Section - THIS SECTION IS FOR REFERENCE ONLY. NO FIELD WIRING OR CONNECTIONS ARE REQUIRED.

2.3.1 Optional RTD Board

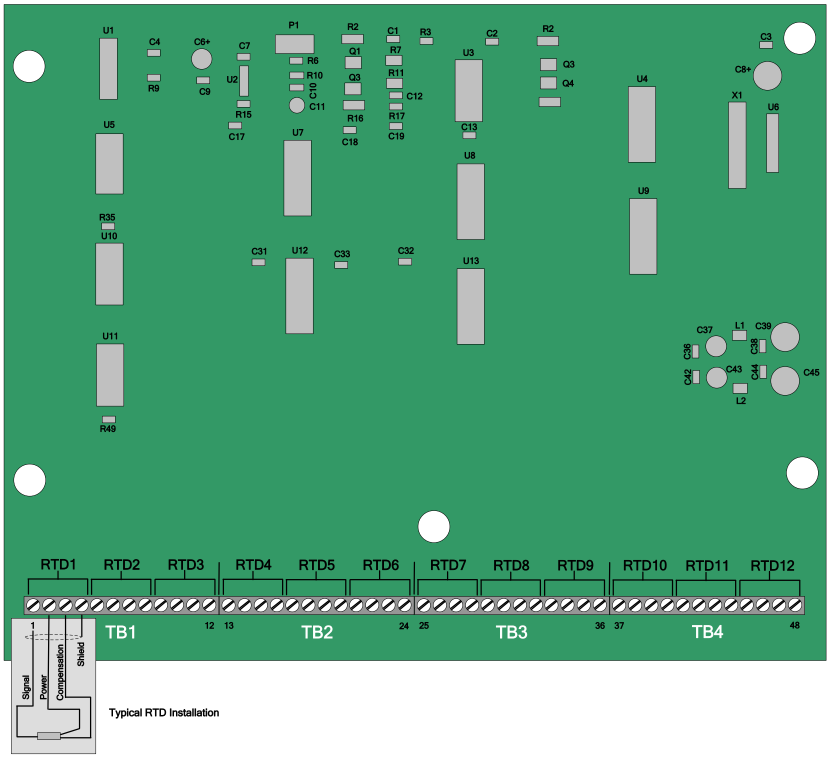


FIG. 2.3.1 Optional RTD Board

2.3.2 RS485 / RS422 Communications Board

Note: *This Board is mounted on the back of the Keypad Interface*

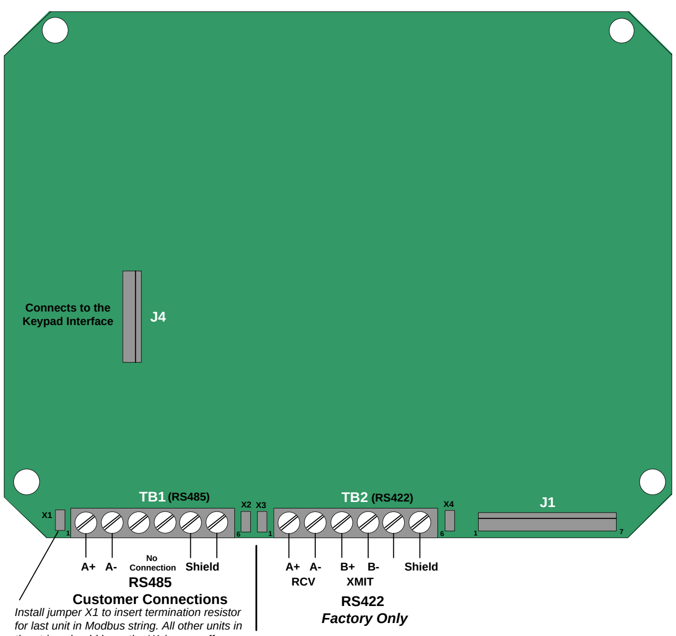


FIG. 2.3.2 RS485 / RS422 Communications Board

2.3.3 Main Board

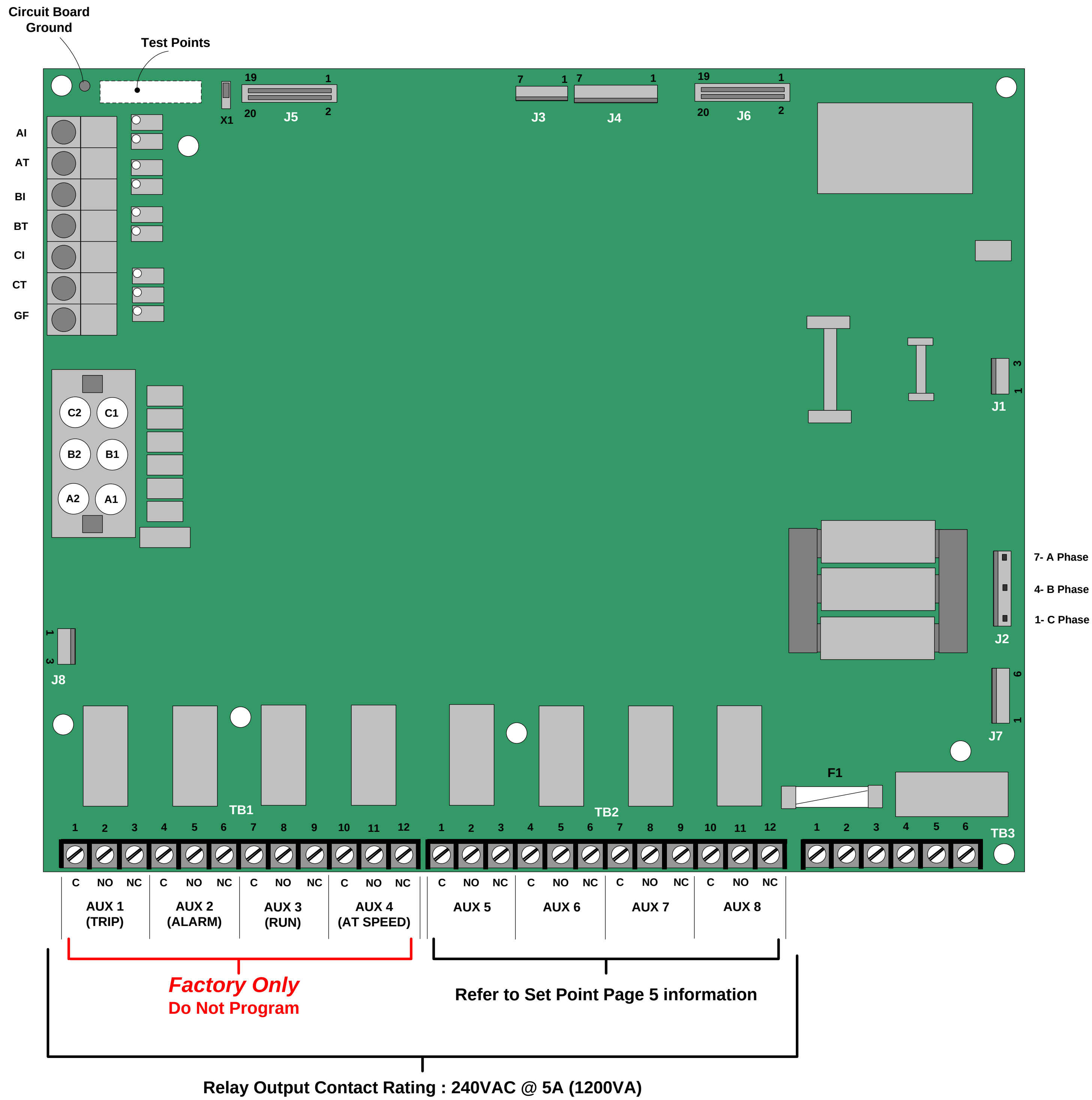


FIG. 2.3.3 Power Board

2.3.4 CPU Board

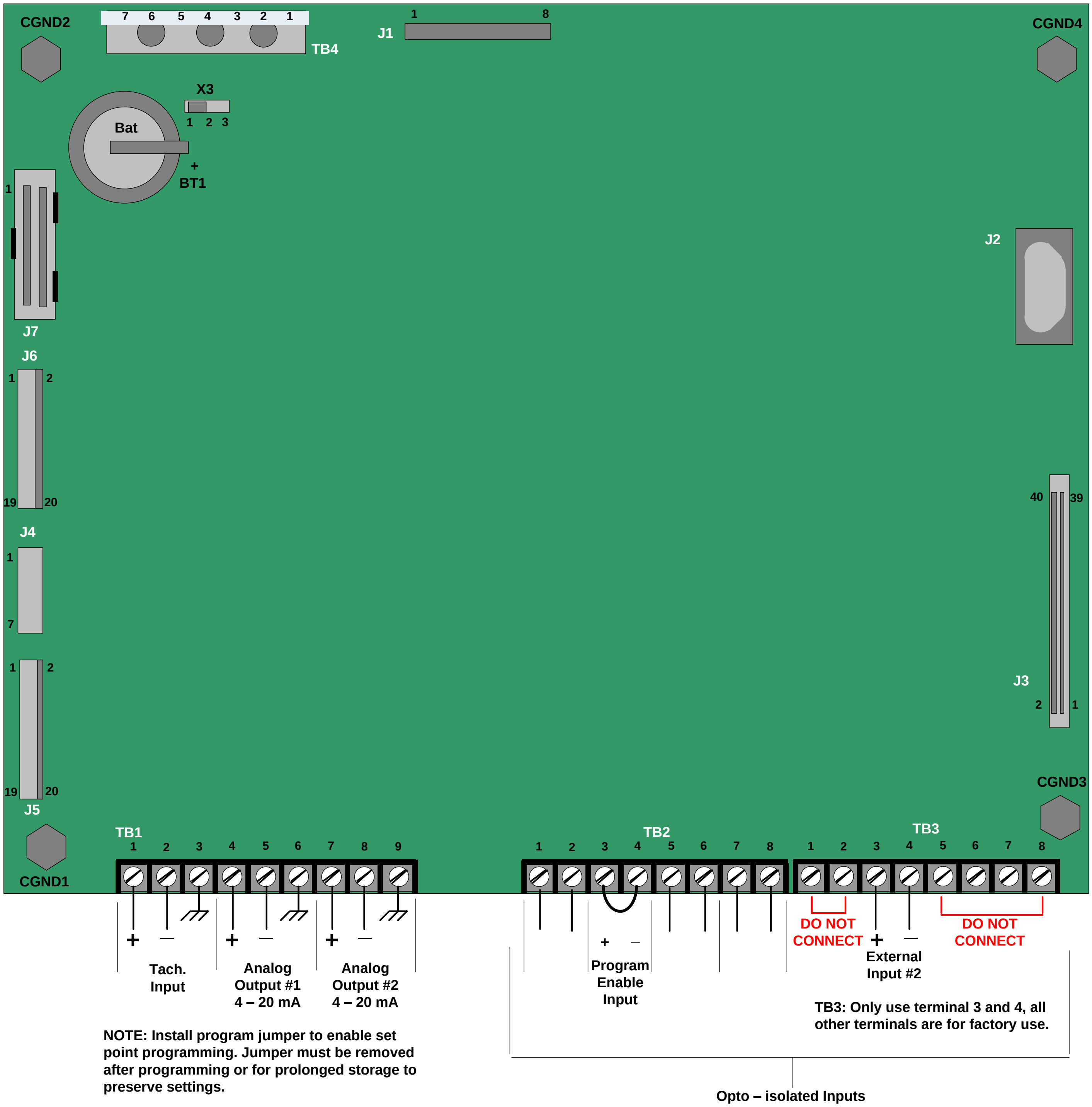


FIG. 2.3.4 CPU Board

2.4 Typical Wiring Diagram

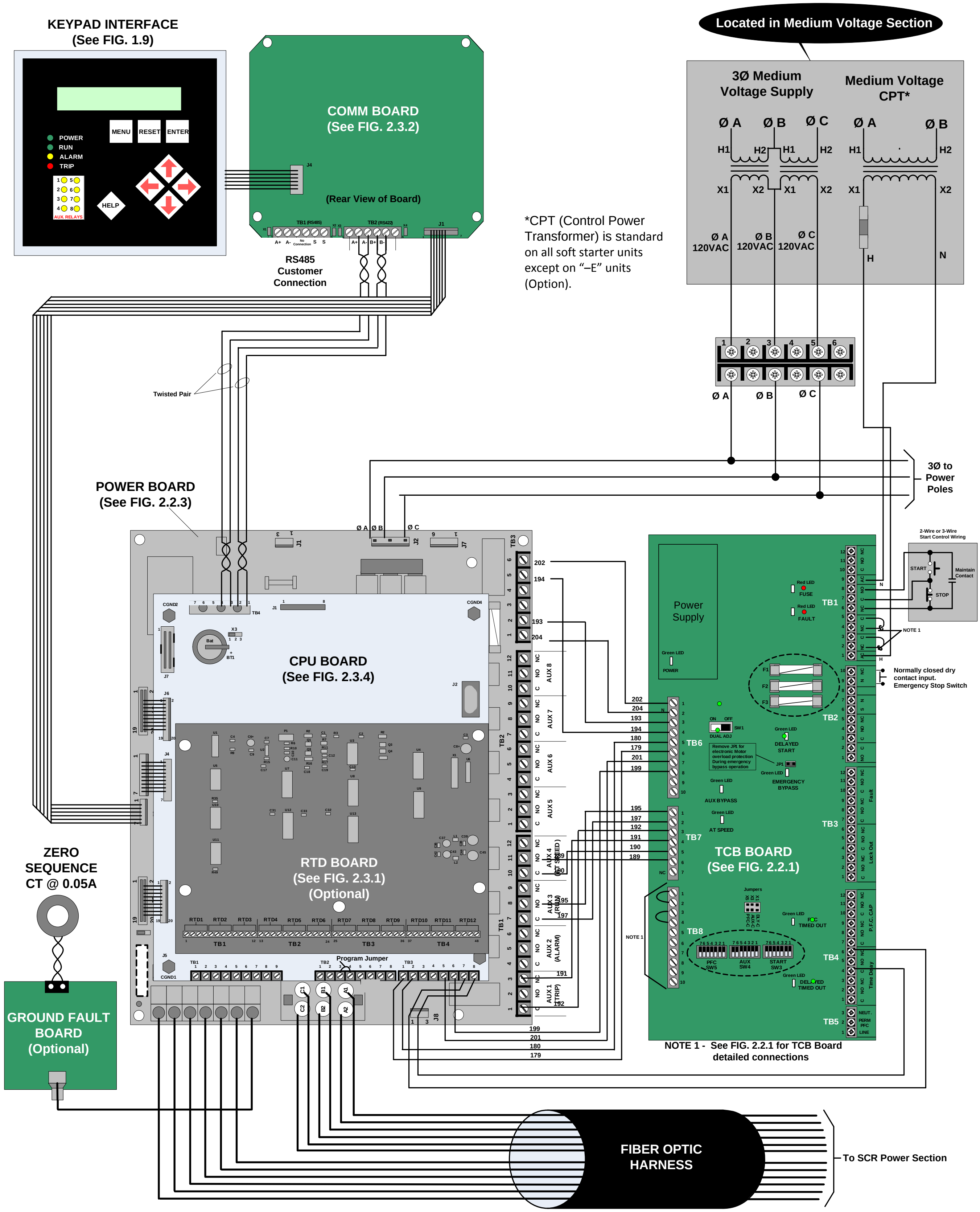


FIG. 2.4 Typical Wiring Diagram

Chapter 3 - Start-up

3.1 Introduction

It is best to operate the motor at its full load starting condition to achieve the proper settings. Initial settings are set to accommodate most motor conditions. **TRY INITIAL SETTINGS FIRST.** See Section 5.1.2 Starter Configuration (Set Point Page 2) to make any adjustments.

3.2 Acceleration Adjustments

The unit is set at the factory with typical starting characteristics that perform well in most applications. When the system is ready to start, try the initial settings. If the motor does not come up to speed, increase the current limit setting. If the motor does not start to turn as soon as desired, raise the Initial voltage adjustment. Adjustment description and procedures are described as follows. See Section 5.1.2 Starter Configuration (Set Point Page 2) for additional Accel settings.

3.2.1 Initial Voltage

Factory Setting = 20% of line voltage
Range = 0% - 100% of line voltage

Initial voltage adjustment changes the initial starting voltage level to the motor.

3.2.2 Ramp Time

Factory Setting = 10 sec.
Range = 0 - 120 sec.

Ramp time adjustment changes the amount of time it takes to reach the current limit point or full voltage if the Current limit point was not reached.

Note: *Refer to your motor manual for the maximum number of starts per hour allowed by the manufacturer and do not exceed the recommended number.*

3.2.3 Current Limit (see FIG. 3.2.3)

Factory Setting = 350% of motor FLA
Range = 200% - 500% of motor FLA

The main function of current limit is to limit the maximum current. It may also be used to extend the ramp time if required. The interaction between the voltage ramp and the current limit will allow the soft start to ramp the motor until the maximum current is reached and the current limit will hold the current at that level. The current limit must be se high enough to allow the motor to reach full speed. The factory setting of 350% is a good starting point.

Do not set the current limit too low on variable starting loads. This could cause the motor to stall and eventually cause the overload protection to trip.

Note: *If the motor does stall, refer to the motor manufacturer's motor data for the proper cooling time.*

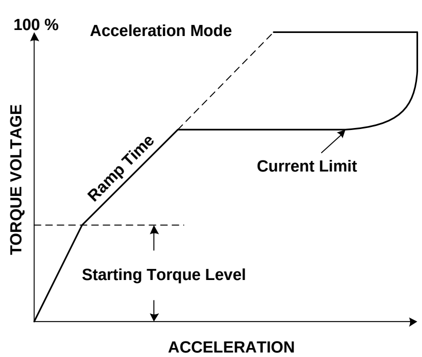


FIG. 3.2.3 Current Limit

3.3 Deceleration Adjustments (Pump Control)

Decel control extends the stopping time on loads that would otherwise stop too quickly when power is removed. Decel control provides smooth deceleration until the load comes to a stop. Three adjustments optimize the deceleration curve to meet the most demanding requirements. **The unit is shipped from the factory with the Decel control feature disabled.**

3.3.1 Deceleration Applications

Apply power and adjust the soft start before enabling or modifying the deceleration adjustments. Both, acceleration and deceleration adjustments should be made under normal load conditions. The deceleration feature provides a slow decrease in the output voltage, accomplishing a gentle decrease in motor torque during the stopping mode. This is the ***OPPOSITE OF BRAKING*** in that, it will take **longer** to come to a stop than if the starter were just turned off. The primary use of this function is to reduce the sudden changes in pressure that are associated with “Water Hammer” and slamming of check valves with centrifugal pumps. Decel control in pump applications is often referred to as **Pump Control**. In a pump system, liquid is being pushed uphill. The force exerted by gravity on the column of liquid as it goes up hill is called the “Head Pressure” in the system. The pump is sized to provide enough Output Pressure to overcome the Head Pressure and move the fluid up the pipe. When the pump is turned off, the Output Pressure rapidly drops to zero and the Head Pressure takes over to send the fluid back down the hill. A “Check Valve” is normally used somewhere in the system to prevent this (if necessary) by only allowing the liquid to flow in one direction. The kinetic energy in that moving fluid is suddenly trapped when the check valve slams closed. Since fluids can’t compress, that energy is transformed into a “Shock Wave” that travels through the piping system looking for an outlet in which to dissipate. The sound of that shock wave is referred to as “Water Hammer” and the energy in that shock wave can be extremely damaging to pipes, fittings, flanges, seals and mounting systems.

By using the Soft Stop/Deceleration feature of the soft starter, the pump output torque is gradually and gently reduced, which slowly reduces the pressure in the pipe. When the Output Pressure is just slightly lower than the Head Pressure, the flow slowly reverses and closes the Check Valve. By this time there is very little energy left in the moving fluid and the Shock Wave is avoided. When the output voltage to the motor is low enough to no longer be needed, the soft starter will end the Decel cycle and turn itself off. (See **FIG. 3.3**)

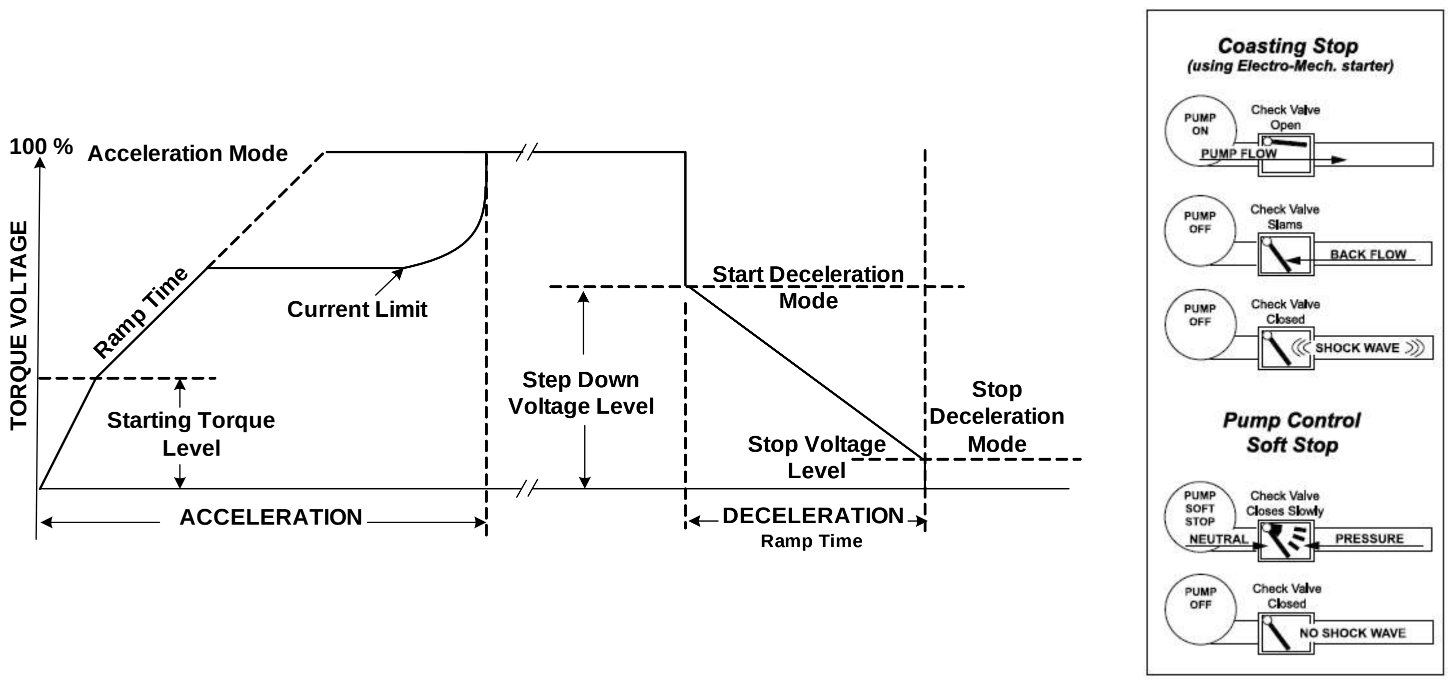


FIG. 3.3 Deceleration Control

Another common application for decel control is on material handling conveyors as a means to prevent sudden stops that may cause products to fall over or to bump into one another. In overhead crane applications, soft stopping of the Bridge or Trolley can prevent loads from beginning to over swing on sudden stops.

3.3.2 Start Deceleration Voltage

Factory Setting = 100% of line voltage
Range = 80% - 100% of line voltage

The step down voltage adjustment eliminates the dead band in the deceleration mode that is experienced while the Voltage drops to a level where the motor deceleration is responsive to decreased voltage. This feature allows for an instantaneous drop in voltage when deceleration is initiated.

3.3.3 Stop Deceleration Voltage

Factory Setting = 20% of line voltage
Range = 0% - 100% of line voltage

The stop voltage level set point is where the deceleration voltage drops to zero.

3.3.4 Deceleration Time

Factory Setting = 5 sec.
Range = 0 - 60 sec.

The deceleration ramp time adjusts the time it takes to reach the stop voltage level set point. The unit should be restarted and stopped to verify that the desired deceleration time has been achieved. When calculating the number of starts per hour, a decel curve should be counted as a start curve. For example, recommended number of starts per hour = 6, allowable starts with decel cycle per hour = 3.

Note: *Do not exceed the motor manufacturer's recommended number of starts per hour.*

3.4 Sequence of Normal Operation

It is best to operate the motor at its full load starting condition to achieve the proper time, torque and ramp settings. Initial settings are set to accommodate most motor conditions.

TRY INITIAL SETTINGS FIRST FOR: - Initial Voltage
- Current Limit
- Ramp Time

See section 5.1.2 Set-point Page 2 to make any adjustments. If the Decel function is enabled, related parameters may also need adjusting to achieve optimal Decel performance

Sequence:

- Close the disconnect switch to apply 3 phase power" Verify the power LED on the keypad comes on.

MOTOR STOPPED **READY TO START**

- Activate the start command, the motor should start accelerating and the RUN LED will come ON.

MOTOR STARTING **00 x FLA**	**OVERLOAD ALARM** **TIME TO TRIP .XXX SECS**

Check: If the motor decelerates, or stops, during the acceleration period, ***activate the Stop button immediately***. Adjustments to the ramp time and or current limit setting are necessary to provide the motor sufficient energy to reach full speed. If the unit does not follow this operational sequence, please refer to the Troubleshooting Chapter.

If the motor does not enter the run mode in the set time (Acceleration time limit, see SP8.2), a trip will occur. When the Motor Reaches full speed the At Speed" LED will come on and the Aux 4 (At speed) relay will energize closing the bypass contactor. Phase A, B, C and Gnd Flt current is then shown on the keypad during operation.

IA:_ _ _ IB:_ _ _
IC:_ _ _ GF:_ _ _

3.5 Emergency Bypass Operation

2.3 to 7.2kV Class

- Remove input power by opening the disconnect switch and lock out.
- Close the emergency Bypass contact located on the TCB board at TB2 (See section 2.2.1 for location).
- Unlock and reclose the disconnect switch.

Note: In the emergency bypass mode, there is no overload protection unless a separate (optional or customer supplier) thermal overload relay is installed, or JP-1 (Motor Protection Jumper, Sec.2.2.3) is removed from the TCB Board.

DANGER

HAZARDOUS OPERATION
Do not operate the Bypass Contactor with medium voltage power applied to the unit.
Failure to follow this instruction will cause the motor to start unexpectedly.

The unit is operable as a normal across-the-line starter. When power is applied, the bypass contactor is energized, tying the input terminals directly to the output terminals. When the "START" command is given,-the main (in line) contactor is energized and the motor line starts. When the "STOP" command is given, the motor is disconnected from the line power via the main (in-line) vacuum contactor.

10 to 13.8kV Class

- Remove input power by opening the disconnect switch and lock out.

Direct on line starting that will follow the normal start stop signal:

- On the TCB board, connect a wire from TB2- pin 1 to TB4 pin 1 and TB2 pin 2 to TB4 pin 2.

The unit will now allow direct on line starting that will follow the normal start stop signal.

For emergency bypass starting operation local to the unit:

- Connect a normally open Dry contact to the TCB board, TB2, pins 1 and 2.

The unit will now start when the external switch is closed and stop when the switch is opened.

Note: If the integral overload protection is not used (see JP-1 Motor Protection Jumper, in Sec. 2.2.3), then bi-metallic overload protection is required (customer supplied if factory emergency overload protection option has not been included.

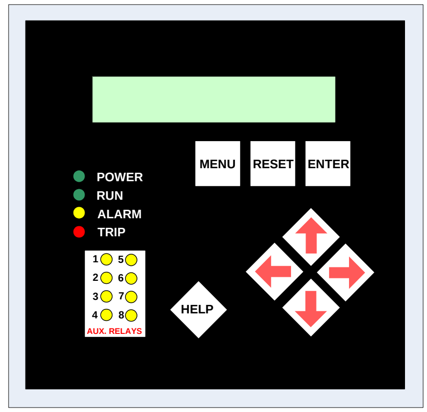
Chapter 4 - User Interface & Menu Navigation

This chapter explains the keypad operator interface, the LCD descriptions and the programming features.

4.1 Keypad/Operator Interface

The user keypad/ operator interface consists of:

- 2 row by 20 characters Liquid Crystal Display (LCD)
- 12 LEDs
- 8 pushbuttons



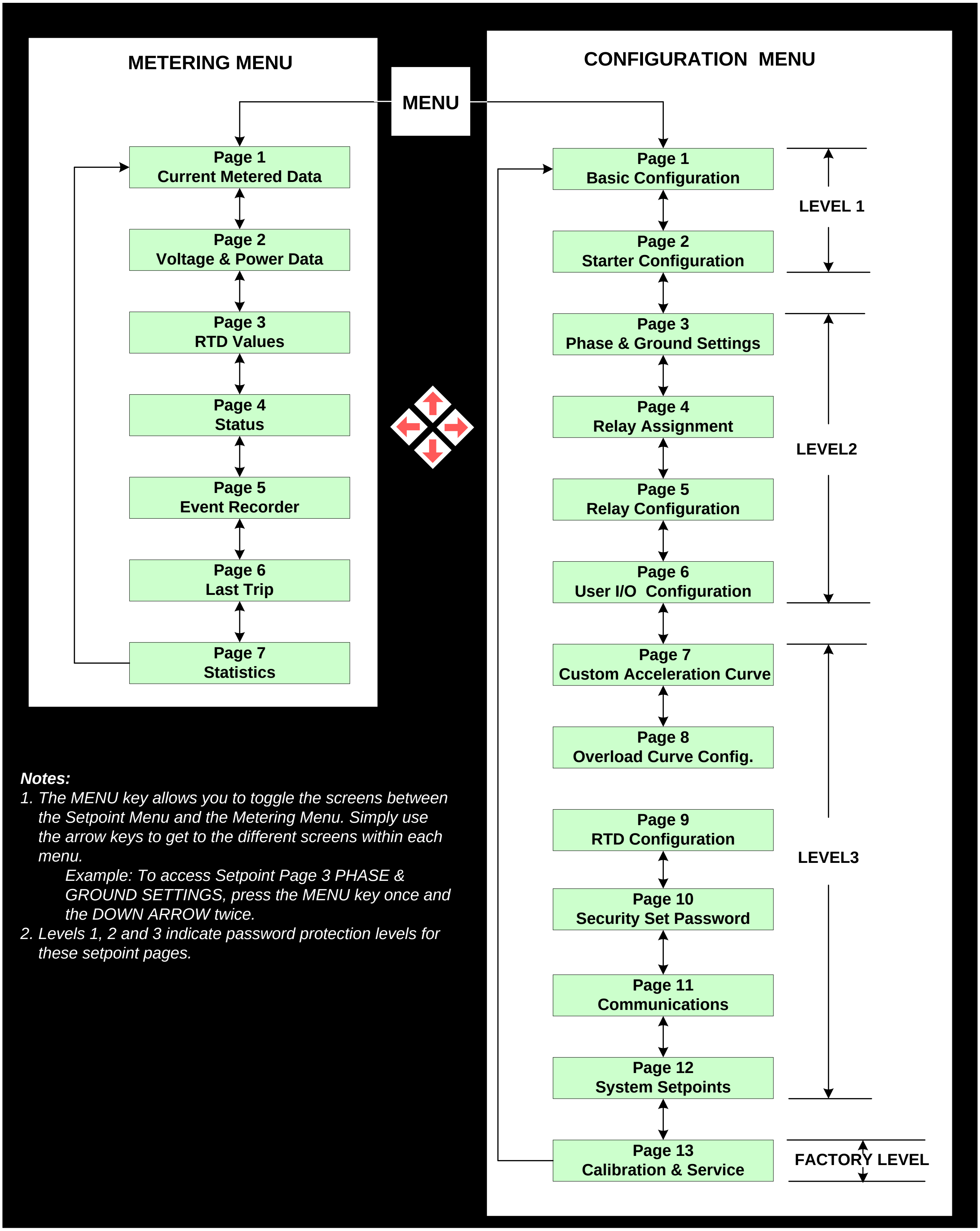
***Note**: The soft starter is menu driven and there are three levels of programming. The programming for two of these levels is password protected. Level two requires a three digit password and level three requires a four digit password.*

4.1.1. Keypad Operator designations and functions

ITEM	DESIGNATION	DESCRIPTION
KEY	MENU	Toggle between the menu selection for metering and set point pages.
	RESET	Will clear the trip indicator and release the trip relay.
	ENTER	Pressing the ENTER button once enters the EDIT mode where set point values can be changed. An "Asterisk" will appear on the display to indicate it is in the edit mode. After a set point value is changed, pressing the ENTER button again will save the revised value to memory and the asterisk will go off indicating the change has been saved. When not in the edit mode, the ENTER pushbutton will toggle through the event indicator list (such as alarms or trips)
	HELP	Provides general help information about a specific set point or action.
	UP ARROW	Will scroll up through the set point and metering menu page. It will scroll to the top of the set point page or a section. In edit mode it will increase a set point in an incremental step or toggle through the available options in the set point.
	RIGHT ARROW	In the main menu the RIGHT ARROW button provides access to the set point page. For set point pages with multiple columns, the RIGHT ARROW will scroll the set point page to the right. When in edit mode it will shift one character to the right.
	DOWN ARROW	Will scroll down through the set point pages and down through the set points. In edit mode, it will decrement through values and toggle available options in the set point.
	LEFT ARROW	Will move to the left through set point pages with multiple columns. When in edit mode it will become the backspace key and will shift one character to the left.
LED	POWER	Indicates control power is present
	RUN	Indicates unit/motor is running
	ALARM	Lights in conjunction with Relay AUX 2 to indicate an Alarm event or warn of possible critical condition.
	TRIP	Lights in conjunction with Relay AUX 1 to indicate a Trip condition has occurred.
	AUX 1- 8	Auxiliary relays (Note: Relays 5-8 are available for customer use)

***Note:** The directional arrow buttons require careful operation. In edit mode, if the buttons are held for a long period, the scrolling speed will increase.*

4.2 Menu Navigation



Notes:

1. The MENU key allows you to toggle the screens between the Setpoint Menu and the Metering Menu. Simply use the arrow keys to get to the different screens within each menu.

Example: To access Setpoint Page 3 PHASE & GROUND SETTINGS, press the MENU key once and the DOWN ARROW twice.

2. Levels 1, 2 and 3 indicate password protection levels for these setpoint pages.

4.2.1 Password Access

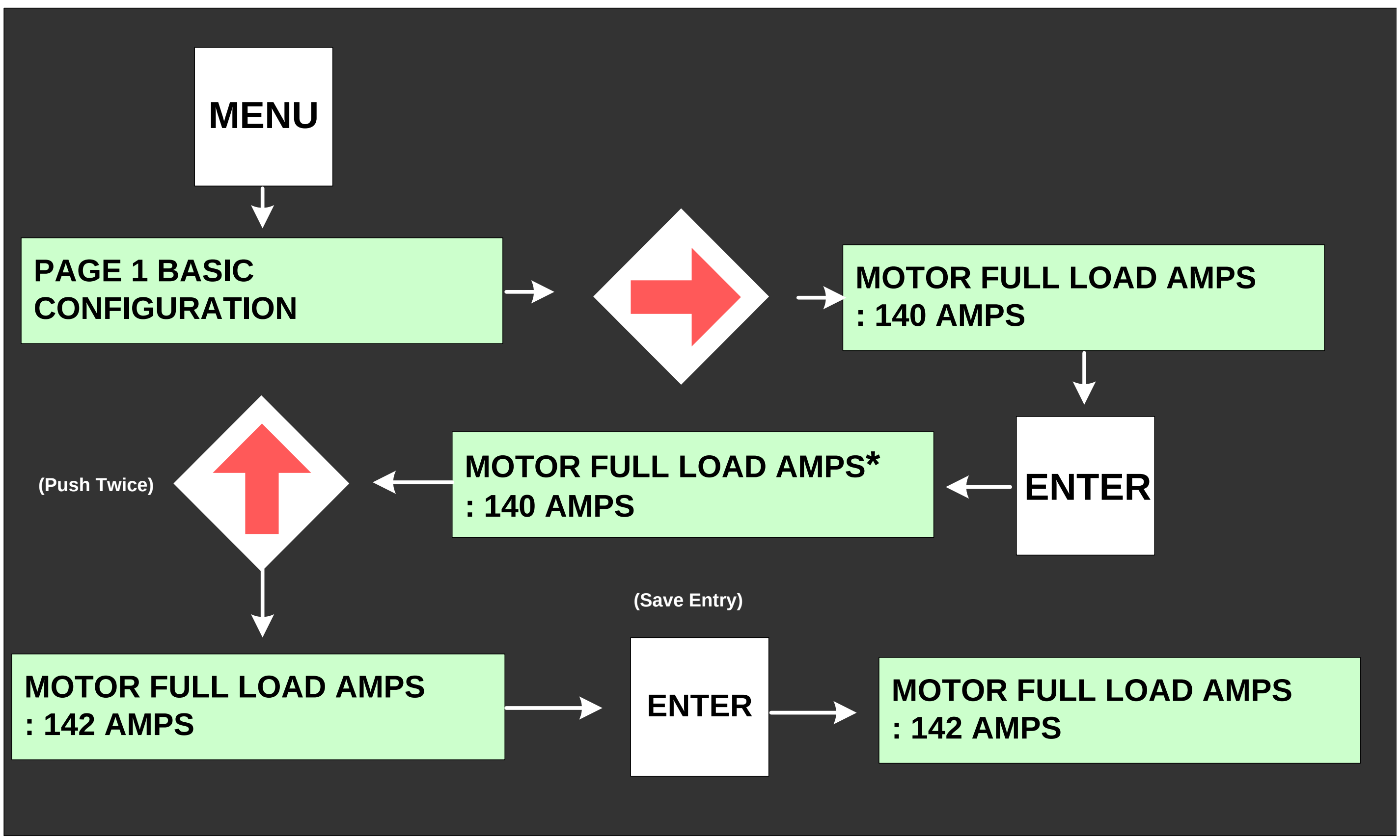
Screens in Level 1 of the set point menu can be changed without password access because they list basic motor information. Screens in Levels 2 and 3 require passwords because they provide more in-depth protection and control of the unit. The password in Levels 2 and 3 can be changed by the user.

Note: Set Points can only be changed when the motor is in Stop/ Ready Mode! The soft starter will not allow a start if it is still in the Edit Mode. When the unit is in the Edit Mode, an asterisk is displayed in the top right corner screen.

4.2.2 Changing Set Points

Example 1: Changing Motor FLA from 140 AMPS to 142 AMPS

1. Press MENU button to display Set point Page 1, Basic Configuration
2. Press the RIGHT ARROW you will view the screen Motor Full Load Amps.
3. Press the ENTER button for edit mode. **Note:** The asterisk (*) in the top right corner of the LCD screen that indicates Edit Mode.
4. To change the value, select the UP ARROW or DOWN ARROW. In this case push the UP ARROW twice (2x).
5. To accept the new value, press the ENTER button. The unit will accept the changes and will leave the edit mode. Note the * is no longer in the top right corner of the LCD Display.



Chapter 5 - Setpoint Programming

The soft starter has thirteen programmable Setpoint pages which define the motor data, ramp curves, protection, I/O configuration and communications. In Section 5.1, the Setpoint pages are outlined in chart form. In Section 5.2 the Setpoint pages are illustrated and defined for easy navigation and programming. ***Note:*** *Setpoints can only be changed then the starter is in the Ready Mode. Also the soft start will not start when it is in programming mode.*

5.1 Setpoints Page List

These charts list the Setpoint Page, the programmable functions and the section.

5.1.1 Basic Configuration (Setpoint Page1)

Setpoint Page	Security Level	Description	Factory Setting Default	Range	Section
Page 1 Basic Configuration	**Level 1 No Password Required**	Motor Full Load Amps (FLA)	Model dependent	50 - 100% of Unit Max Current Rating (Model and Service Factor dependent)	SP1.1
		Service Factor	1.15	1.00 – 1.3	SP1.2
		Overload Class	10	O/L Class 5-30	SP1.3
		NEMA Design	B	A-F	SP1.4
		Insulation Class	B	A, B, C, E, F, H, K, N, S	SP1.5
		Line Voltage	Model dependent	100 to 20000V	SP1.6
		Line Frequency	60	50 or 60 HZ	SP1.7

5.1.2 Starter Configuration (Setpoint Page 2)

Setpoint Page	Security Level	Description	Factory Setting Default	Range	Section
Page 2 Starter Configuration	**Level 1 No Password Required**	Start Control Mode	Start Ramp 1	Jog, Start Ramp 1, Start Ramp 2, Custom Accel Curve, Start Disabled, Dual Ramp, Tach Ramp	SP2.1
		Jog Voltage	50%	5-75%, Off	SP2.2
		Start Ramp #1 Type	Voltage	Voltage, Current	SP2.3
		Initial Voltage #1	20%	0-100%	
		Ramp Time #1	10 sec	1-120 sec	
		Current Limit #1	350% FLA	200-500 %	
		Initial Current #1	200% FLA	0-300 %	
		Ramp Time #1	10 sec	1-120 sec	
		Maximum Current #1	350% FLA	200-500 %	
		Start Ramp #2 Type	Disabled	Disabled, Voltage, Power	
		Initial Voltage #2	60%	0-100 %	SP2.4
		Ramp Time #2	10 sec	1-120 sec	
		Current Limit #2	350% FLA	200-500 %	
		Initial Power #2	20%	0-100 %	
		Ramp Time #2	10 sec	1-120 sec	
		Maximum Power #2	80%	0 – 300 %	
		Kick Start Type	Disabled	Voltage or Disabled	SP2.5
		Kick Start Voltage	65%	10-100 %	
		Kick Start Time	0.50 sec	0.10-2.00	
		Deceleration	Disabled	Enabled or Disabled	SP2.6
		Start Deceleration Voltage	100%	80-100 %	
		Stop Deceleration Voltage	30%	0-79 %	
		Deceleration Time	5 sec	1-60 sec	
		Timed Output Time	Off	1-1000 sec, Off	SP2.7
		Run Delay Time	1 Sec	1-30 sec, Off	SP2.8
		At Speed Delay Time	1 Sec	1-30 sec, Off	SP2.9
		Bypass Pull-in Current	100% FLA	90 – 300%	SP2.10

5.1.3 Phase and Ground Settings (Setpoint Page 3)

Setpoint Page	Security Level	Description	Factory Setting Default	Range	Section
Page 3 Phase and Ground Settings	Level 2 Password Protected	Imbalance Alarm Level	15% FLA	5-30 %, Off	SP3.1
		Imbalance Alarm Delay	1.5 sec	1.0-20.0 sec	
		Imbalance Trip Level	20%	5-30 %, Off	SP3.2
		Imbalance Trip Delay	2.0 sec	1.0-20.0 sec	
		Undercurrent Alarm Level	Off	10-90 %, Off	SP3.3
		Undercurrent Alarm Delay	2.0 sec	1.0-60.0 sec	
		Overcurrent Alarm Level	Off	100-300 %, Off	SP3.4
		Overcurrent Alarm Delay	2.0 sec	1.0-20.0 sec	
		Overcurrent Trip Level	Off	100-300 %, Off	SP3.5
		Overcurrent Trip Delay	2.0 sec	1.0-20.0 sec	
		Phase Loss Trip	Enabled	Enabled or Disabled	SP3.6
		Phase Loss Trip Delay	0.1 sec	0-20.0 sec	
		Phase Rotation Detection	ABC	ABC, ACB or Disabled	SP3.7
		Phase Rotation Trip Delay	1.0 sec	1.0 - 20.0 sec	
		*Ground Fault Alarm Level	Off	5-90 %, Off	SP3.8
		*Ground Fault Alarm Delay	0.1 sec	0.1-20.0 sec	
		*Ground Fault Loset Trip Level	Off	5-90 %, Off	SP3.9
		*Ground Fault Loset Trip Delay	0.5 sec	0.1-20 sec	
		*Ground Fault Hiset Trip Level	Off	5-90 %, Off	SP3.10
		*Ground Fault Hiset Trip Delay	0.008 sec	0.008-0.250 sec	
		Overvoltage Alarm Level	Off	5 -30%, Off	SP3.11
		Overvoltage Alarm Delay	1.0 sec	1.0-30.0 sec	
		Overvoltage Trip Level	10%	5-30%, Off	SP3.12
		Overvoltage Trip Delay	2.0 sec	1.0-30.0 sec	
		Undervoltage Alarm Level	Off	5-30%, Off	SP3.13
		Undervoltage Alarm Delay	1.0 sec	1.0-30.0 sec	
		Undervoltage Trip Level	15%	5-30%, Off	SP3.14
		Undervoltage Trip Delay	2.0 sec	1.0-30.0 sec	
		Line Frequency Trip Window	Disabled	0-6 Hz, Disabled	SP3.15
		Line Frequency Trip Delay	1.0 sec	1.0-20.0 sec	
		P/F Lead P/F Alarm	Off	0.1-1.00, Off	SP3.16
		P/F Lead Alarm Delay	1.0 sec	1-120 sec	
		P/F Lead P/F Trip	Off	.01-1.00, Off	SP3.17
		P/F Lead Trip Delay	1.0 sec	1-120 sec	
		P/F Lag P/F Alarm	Off	.01-1.00, Off	SP3.18
		P/F Lag Alarm Delay	1.0 sec	1-120 sec	
		P/F Lag P/F Trip	Off	.01-1.00, Off	SP3.19
		P/F Lag Trip Delay	1.0 sec	1-120 sec	
		Power Demand Period	10 min	1 - 60 min	SP3.20
		KW Demand Alarm Pickup	Off KW	Off, 1-100000	
		KVA Demand Alarm Pickup	Off KVA	Off, 1-100000	
		KVAR Demand Alarm Pickup	Off KVAR	Off, 1-100000	
		Amps Demand Alarm Pickup	Off Amps	Off, 1-100000	

* Ground fault option must be installed

5.1.4 Relay Assignments (Setpoint Page 4)

Setpoint Page	Security Level	Description	Factory Setting			Range	Section
			1st	2nd	3rd		
Page 4 Relay Assignments	**Level 2 Password Protected**	O/L Trip	Trip Only	None	None	None Trip(AUX1) / Trip Only Alarm(AUX2) AUX3 AUX4 AUX5 - 8 Only Available in 8 Relay System ***Notes:*** ***AUX1 to AUX4 are for Factory*** ***Use only. Do not change!*** ***Only AUX 5 - 8 are used in the 2nd & 3rd relay assignments.***	SP4.1
		I/B Trip	Trip	None	None		
		S/C Trip	Trip Only	None	None		
		Overcurrent Trip	Trip	None	None		
		Stator RTD Trip	None	None	None		
		Non Stator RTD Trip	None	None	None		
		*G/F Hi Set Trip	Trip	None	None		
		*G/F Lo Set Trip	Trip	None	None		
		Phase Loss Trip	Trip	None	None		
		Accel. Time Trip	Trip Only	None	None		
		Start Curve Trip	Trip Only	None	None		
		Over Frequency Trip	None	None	None		
		Under Frequency Trip	Trip	None	None		
		I*I*T Start Curve	Trip	None	None		
		Learned Start Curve	Trip	None	None		
		Phase Reversal	Trip	None	None		
		Overvoltage Trip	Trip	None	None		
		Undervoltage Trip	Trip	None	None		
		Power Factor Trip	None	None	None		
		Tach Accel Trip	None	None	None		
		Inhibits Trip	Alarm	None	None		
		Shunt Trip	None	None	None		
		Bypass Discrepancy	Trip Only	None	None		
		Low Control Voltage	Trip Only	None	None		
		TCB Fault	Trip	None	None		
		External Input #2	None	None	None		
		Dual Ramp	None	None	None		
		Thermostat	Trip	None	None		
		O/L Warning	Alarm	None	None		
		Overcurrent Alarm	Alarm	None	None		
		SCR Fail Shunt Alarm	None	None	None		
		*Ground Fault Alarm	Alarm	None	None		
		Under Current Alarm	None	None	None		
		Motor Running	AUX3	None	None		
		I/B Alarm	Alarm	None	None		
		Stator RTD Alarm	None	None	None		
		Non-Stator RTD Alarm	None	None	None		
		RTD Failure Alarm	None	None	None		
		Self Test Fail	Trip	None	None		
		Thermal Register	Alarm	None	None		
		U/V Alarm	Alarm	None	None		
		O/V Alarm	Alarm	None	None		
		Power Factor Alarm	None	None	None		
		KW Demand Alarm	None	None	None		
		KVA Demand Alarm	None	None	None		
		KVAR Demand Alarm	None	None	None		
		Amps Demand Alarm	None	None	None		
		Timed Output	None	None	None		
		Run Delay Time	None	None	None		
		At Speed	AUX4	None	None		

* Ground fault option must be installed

5.1.5 Relay Configuration (Setpoint Page 5)

Setpoint Page	Security Level	Description	Factory Setting Default	Range	Section
Page 5 Relay Configuration	Level 2 Password Protected	Trip (AUX1) Fail-Safe	No	Yes or No	SP5.1
		Trip (AUX1) Relay Latched	Yes		SP5.2
		Alarm (AUX2) Fail-Safe	No		SP5.1
		Alarm (AUX2) Relay Latched	No		SP5.2
		AUX3 Relay Fail-Safe	No		SP5.1
		AUX3 Relay Latched	No		SP5.2
		AUX4 Relay Fail-Safe	No		SP5.1
		AUX4 Relay Latched	No		SP5.2
		AUX5 Relay Fail-Safe	No		SP5.1
		AUX5 Relay Latched	No		SP5.2
		AUX6 Relay Fail-Safe	No		SP5.1
		AUX6 Relay Latched	No		SP5.2
		AUX7 Relay Fail-Safe	No		SP5.1
		AUX7 Relay Latched	No		SP5.2
		AUX8 Relay Fail-Safe	No		SP5.1
		AUX8 Relay Latched	No		SP5.2

5.1.6 User I/O Configuration (Setpoint Page 6)

Setpoint Page	Security Level	Description	Factory Setting Default	Range	Section
Page 6 User I/O Configuration	Level 2 Password Protected	Tachometer Scale Selection	Disabled	Enabled or Disabled	SP6.1
		Manual Tach Scale 4.0 mA:	0 RPM	0 - 3600	
		Manual Tach Scale 20.0 mA:	2000 RPM	0 - 3600	
		Tach Accel Trip Mode Select	Disabled	Underspeed, Overspeed or Disabled	SP6.2
		Tach Ramp Time	20 sec	1 - 120	
		Tach Underspeed Trip PT	1650 RPM	0 - 3600	
		Tach Overspeed Trip PT	1850 RPM	0 - 3600	
		Tach Accel Trip Delay	1 sec	1 - 60	
		Analog Output #1	RMS Current	Off, RPM 0-3600, Hottest Non-Stator RTD 0-200°C, Hottest Stator RTD 0 - 200°C, RMS Current 0 - 7500 A, % Motor Load 0 - 600% Kw	SP6.3
		Analog Output #1 4mA:	0	0-65535	
		Analog Output #1 20mA:	250	0-65535	
		Analog Output #2	% Motor Load	Same As Analog Input #1	SP6.4
		Analog Output #2 4mA:	0	0-65535	
		Analog Output #2 20mA:	1000	0-65535	
		User Programmable External Inputs			SP6.5
		TCB Fault	Enabled	User Defined, up to 15 Characters	
		Name Ext. Input #1	TCB Fault	Normally Open or Closed	
		TCB Fault Type	NO	0-60 sec	
		TCB Fault Time Delay	1 sec	Enabled or Disabled	
		External Input #2	Disabled	User Defined, up to 15 Characters	
		Name Ext. Input #2	NO	Normally Open or Closed	
		External Input #2 Type	0 sec	0-60 sec	
		External Input #2 Time Delay	Dual Ramp	Enabled or Disabled or Dual Ramp	
		Dual Ramp	Dual Ramp	User Defined, up to 15 Characters	
		Name Ext. Input #3	NO	Normally Open or Closed	
		Dual Ramp Type	0 sec	0-60 sec	
		Dual Ramp Time Delay	Enabled	Enabled or Disabled	
		Thermostat	Thermostat	User Defined, up to 15 Characters	
		Name Ext. Input #4	NC	Normally Open or Closed	
		Thermostat Type	1 sec	0-60 sec	

5.1.7 Custom Acceleration Curve (Setpoint Page 7)

Setpoint Page	Security Level	Description	Factory Setting Default	Range	Section
Page 7 Custom Acceleration Curve	Level 3 Password Protected	Custom Accel Curve	Disabled	Disabled, Curve A, B, or C	SP7.1
		Custom Curve A			
		Curve A Voltage Level 1	25%	0-100%	
		Curve A Ramp Time 1	2 sec	1-60 sec	
		Curve A Voltage Level 2	30%	0-100%	
		Curve A Ramp Time 2	2 sec	1-60 sec	
		Curve A Voltage Level 3	37%	0-100%	
		Curve A Ramp Time 3	2 sec	1-60 sec	
		Curve A Voltage Level 4	45%	0-100%	
		Curve A Ramp Time 4	2 sec	1-60 sec	
		Curve A Voltage Level 5	55%	0-100%	
		Curve A Ramp Time 5	2 sec	1-60 sec	
		Curve A Voltage Level 6	67%	0-100%	
		Curve A Ramp Time 6	2 sec	1-60 sec	
		Curve A Voltage Level 7	82%	0-100%	
		Curve A Ramp Time 7	2 sec	1-60 sec	
		Curve A Voltage Level 8	100%	0-100%	
		Curve A Ramp Time 8	2 sec	1-60 sec	
		Curve A Current Limit	350% FLA	200-500%	
		Custom Curve B		Same Programmable Data Points and Ranges as Custom Curve A	
		Custom Curve C		Same Programmable Data Points and Ranges as Custom Curve A	

5.1.8 Overload Curve Configuration (Setpoint Page 8)

Setpoint Page	Security Level	Description	Factory Setting Default	Range	Section
Page 8 Overload Curve Configuration	Level 3 Password Protected	Basic Run Overload Curve			SP8.1
		Run Curve Locked Rotor Time	O/L Class	1-30 sec, O/L Class	
		Run Locked Rotor Current	600% FLA	400-800%	
		Coast Down Timer	Disabled	1-60 Min, Disabled	
		Basic Start Overload Curve			SP8.2
		Start Curve Locked Rotor Time	O/L Class	1-30 sec, O/L Class	
		Start Locked Rotor Current	600% FLA	400-800%	
		Acceleration Time Limit	30 sec	1-300 sec, Disabled	
		Number of Starts Per Hour	Disabled	1-6, Disabled	
		Time Between Starts Time	5 min	1-60 Min, Disabled	
		Area Under Curve Protection	Disabled	Enabled or Disabled	SP8.3
		Max I*I*T Start	368 FLA	1-2500 FLA*FLA*sec	
		Current Over Curve	Disabled	Disabled, Learn, Enabled	SP8.4
		Learned Start Curve Bias	10%	5-40%	
		Time for Sampling	30 sec	1-300 sec	

5.1.9 RTD Option Configuration (Setpoint Page 9)

Setpoint Page	Security Level	Description	Factory Setting Default	Range	Section
Page 9 RTD Configuration	Level 3 Password Protected	Use NEMA Temp for RTD Values	Disabled	Enabled or Disabled	SP9.1
		# of RTD Used for Stator	4	0-6	SP9.2
		RTD Voting	Disabled	Enabled or Disabled	SP9.3
		Stator Phase A1 Type	Off	120 OHM NI, 100 OHM NI, 100 OHM PT, 10 OHM CU	SP9.4
		RTD #1 Description	Stator A1	User defined, Up to 15 Characters	
		Stator Phase A1 Alarm Level	Off	0-240C (32-464F), Off	
		Stator Phase A1 Trip Level	Off	0-240C (32-464F), Off	
		Stator Phase A2 Type	Off	Same as Stator Phase A1	
		RTD #2 Description	Stator A2	User defined, Up to 15 Characters	
		Stator Phase A2 Alarm	Off	0-240C (32-464F), Off	
		Stator Phase A2 Trip Level	Off	0-240C (32-464F), Off	
		Stator Phase B1 Type	Off	Same as Stator Phase A1	
		RTD #3 Description	Stator B1	User defined, Up to 15 Characters	
		Stator Phase B1 Alarm Level	Off	0-240C (32-464F), Off	
		Stator Phase B1 Trip Level	Off	0-240C (32-464F), Off	
		Stator Phase B2 Type	Off	Same as Stator Phase A1	
		RTD #4 Description	Stator B2	User defined, Up to 15 Characters	
		Stator Phase B2 Alarm Level	Off	0-240C (32-464F), Off	
		Stator Phase B2 Trip Level	Off	0-240C (32-464F), Off	
		Stator Phase C1 Type	Off	Same as Stator Phase A1	
		RTD #5 Description	Stator C1	User defined, Up to 15 Characters	
		Stator Phase C1 Alarm Level	Off	0-240C (32-464F), Off	
		Stator Phase C1 Trip Level	Off	0-240C (32-464F), Off	
		Stator Phase C2 Type	Off	Same as Stator Phase A1	
		RTD #6 Description	Stator C2	User defined, Up to 15 Characters	
		Stator Phase C2 Alarm Level	Off	0-240C (32-464F), Off	
		Stator Phase C2 Trip Level	Off	0-240C (32-464F), Off	
		End Bearing Type	Off	Same as Stator A1	
		RTD #7 Description	End Bearing	User defined, Up to 15 Characters	
		End Bearing Alarm Level	Off	0-240C (32-464F), Off	
		End Bearing Trip Level	Off	0-240C (32-464F), Off	
		Shaft Bearing Type	Off	Same as Stator Phase A1	
		RTD #8 Description	Shaft Bearing	User defined, Up to 15 Characters	
		Shaft Bearing Alarm Level	Off	0-240C (32-464F), Off	
		Shaft Bearing Trip Level	Off	0-240C (32-464F), Off	
		RTD #9 Type	Off	Same as Stator Phase A1	
		RTD #9 Description	User defined	User defined, Up to 15 Characters	
		RTD #9 Alarm Level	Off	0-240C (32-464F), Off	
		RTD #9 Trip Level	Off	0-240C (32-464F), Off	
		RTD #10 Type	Off	Same as Stator Phase A1	
		RTD #10 Description	User defined	User defined, Up to 15 Characters	
		RTD #10 Alarm Level	Off	0-240C (32-464F), Off	
		RTD #10 Trip Level	Off	0-240C (32-464F), Off	
		RTD #11 Type	Off	Same as Stator Phase A1	
		RTD #11 Description	User defined	User defined, Up to 15 Characters	
		RTD #11 Alarm Level	Off	0-240C (32-464F), Off	
		RTD #11 Trip Level	Off	0-240C (32-464F), Off	
		RTD #12 Type	Off	Same as Stator Phase A1	
		RTD #12 Description	User defined	User defined, Up to 15 Characters	
		RTD #12 Alarm Level	Off	0-240C (32-464F), Off	
		RTD #12 Trip Level	Off	0-240C (32-464F), Off	

5.1.10 Password Level Configuration (Setpoint Page10)

Setpoint Page	Security Level	Description	Factory Setting Default	Range	Section
Page 10 Password	**Level 3 Password**	Set Level 2 Password	100	000 – 999 Three Digits	SP10.1
		Set Level 3 Password	1000	0000 – 9999 Four Digits	SP10.2

5.1.11 Communications Configuration (Setpoint Page11)

Setpoint Page	Security Level	Description	Factory Setting Default	Range	Section
Page 11 Communi-cations	**Level 3 Password**	Set Front Baud Rate	9.6 KB/sec	2.4, 4.8, 9.6, 19.2, 38.4 KB/sec	SP11.1
		Set Modbus Baud Rate	9.6 KB/sec	2.4, 4.8, 9.6, 19.2, 38.4 KB/sec	SP11.2
		Modbus Address Number	247	1 – 247	SP11.3
		Set Access Code	1	1 – 999	SP11.4
		Set Link Baud Rate	38.4 KB/sec	2.4, 4.8, 9.6, 19.2, 38.4 KB/sec	SP11.5
		Remote Start/Stop	Disabled	Enabled or Disabled	SP11.6

5.1.12 System (Setpoint Page 12)

Setpoint Page	Security Level	Description	Factory Setting Default	Range	Section
Page 12 System Setpoints	**Level 3 Password Protected**	Default Display Screen			SP12.1
		Metering Data Page #	1	Enter Metering Page (1-4)	
		Metering Data Screen #	1	Enter Metering Screen Page 1(1-10) Page 2 (1-11) Page 3 (1 - 29) Page 4 (1 - 6)	
		Alarms			SP12.2
		RTD Failure Alarm	Disabled	Enabled or Disabled	
		Thermal Register Alarm	90%	Off, 40-95%	
		Thermal Alarm Delay	10 sec	1-20 sec	
		Thermal Register Setup Info			SP12.3
		Cold Stall Time	O/L Class	O/L Class (5-30) or 4-40 second time delay	
		Hot Stall Time	½ O/L Class	½ O/L Class, 4-40 sec	
		Stopped Cool Down Time	30 Min	10-300 Min	
		Running Cool Down Time	15 Min	10-300 Min	
		Relay Measured Cool Rates	Disabled	Enabled or Disabled	
		Thermal Register Minimum	15%	10-50%	
		Motor Design Ambient Temp	40C	10-90C	
		Motor Design Run Temperature	80% Max	50-100% of Motor Stator Max Temp	
		Motor Stator Max Temp	INS CLS	INS CLS, 10-240 C	
		I/B Input to Thermal Register	Enabled	Enabled or Disabled	
		Use Calculated K or Assign	7	1-50, On	
		Press Enter to Clr Thermal Register			SP12.4

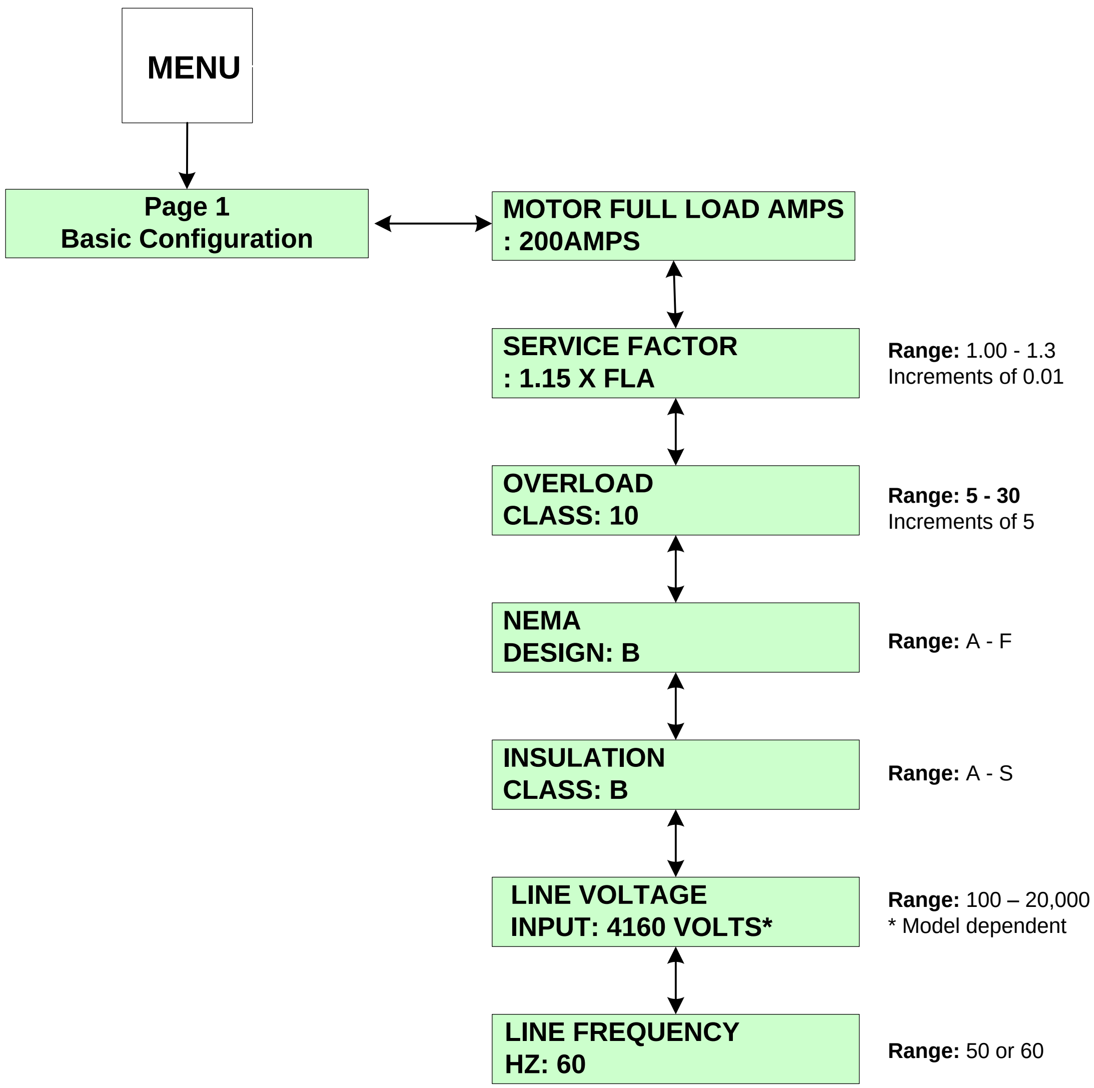
5.1.13 Calibration and Service (Setpoint Page 13)

Setpoint Page	Security Level	Description	Factory Setting Default	Range	Section
Page 13 Calibration & Service	**Factory Use Only**	Set Date and Time (DDMMYY:HHMM)	FACTORY SET; ## / ## / ## ## : ##		SP13.1
		Enter Date (DDMMYYYY)	FACTORY SET; ## / ## / ####	D=1-31, M=1-12, Y=1970-2069	
		Enter Time (HH:MM)	FACTORY SET; ## :##	H=00-23, M=0-59	
		Model # Firmware REV. #	FACTORY SET; ###### ######	Display Only, Cannot be changed	SP13.2
		Press Enter to Access Factory Settings		Available to Qualified Factory Personnel	SP13.3

5.2 Setpoints Menu and Parameter Explanation (SP1 – SP13)

SP.1 Basic Configuration (Setpoint Page 1)

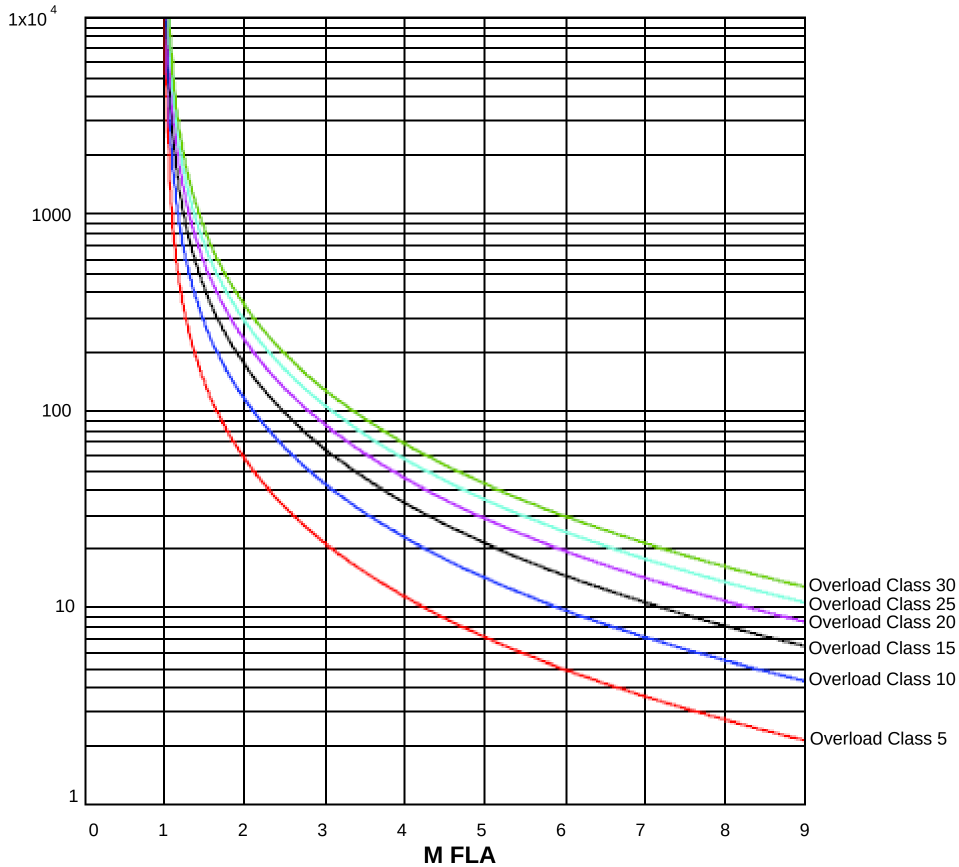
In Setpoint Page 1, is used to setup basic nameplate data of the motor.



SP1.1 Motor Full Load Amps (FLA): Allows the user to enter the motor's FLA rating. Range of adjustment is 50 - 100% (less programmed service factor).

SP1.2 Service Factor: Sets the pickup point on the overload curve as defined by the programmed motor full load current. Ex: If the motor FLA is 100 and the service factor is 1.15, the overload pickup point will be 115 Amps.

SP1.3 Overload Class: Choose the motor protection overload class, range from 5-30. Ex: Overload Class 10 will trip in 10 seconds at six times Motor FLA.



SP1.4 NEMA design: The motor design maximum allowed slip (Select from Class A through F).

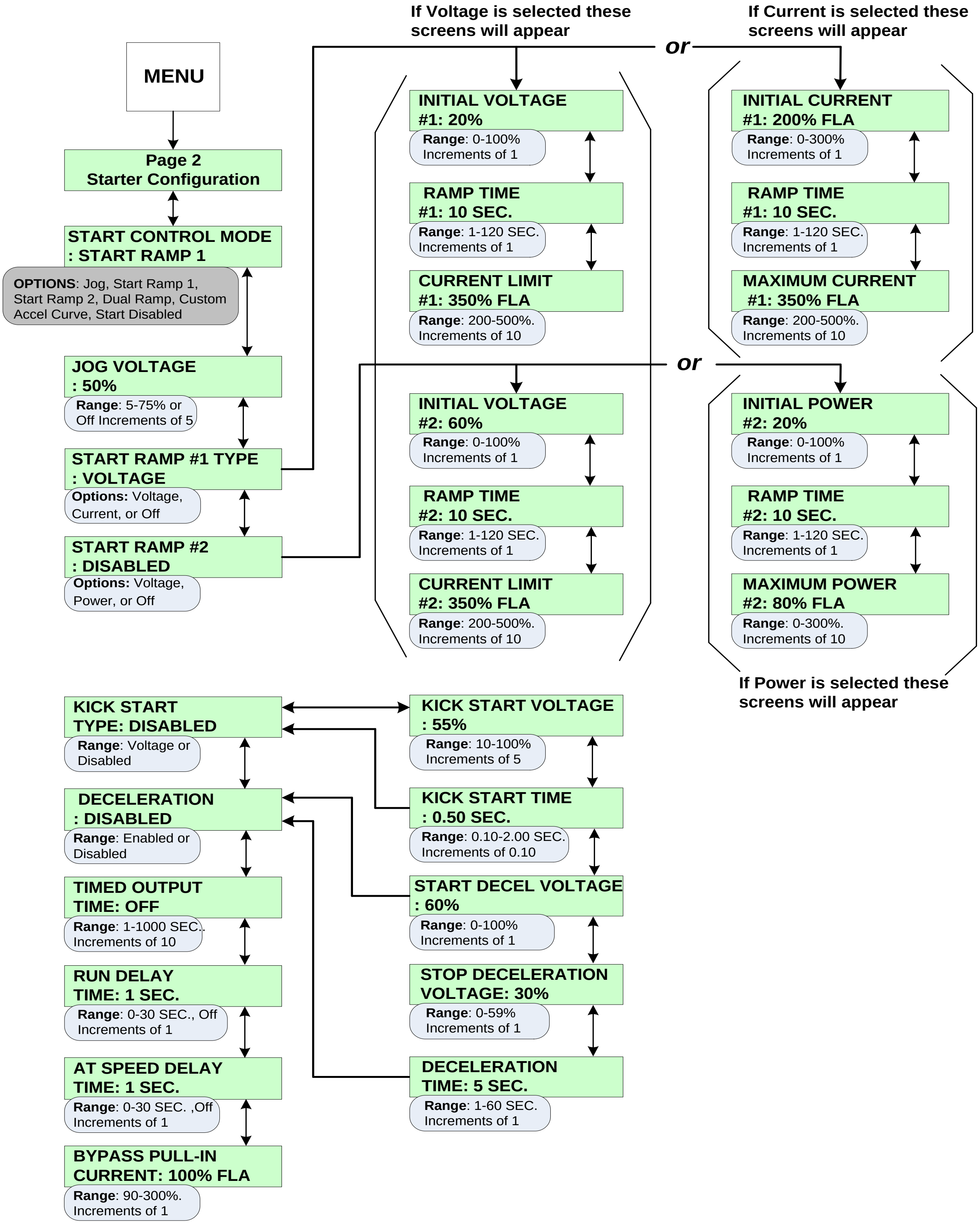
SP1.5 Insulation Class: The motor insulation temperature class (Select A, B, C, E, F, G, H, K, N or S).

SP1.6 Line Voltage Input: Applied Voltage.

SP1.7 Line Frequency: The user may choose either 50 Hz or 60 Hz.

SP.2 Starter Configuration (Setpoint Page 2)

Provides multiple choices for starting ramps that can be selected for particular loads and applications.



SP2 Starter Configuration (Setpoint Page 2) Menu Navigation

SP2.1 Start Control Mode: Dual Ramp, Custom Accel Curve, Jog Voltage, Start Ramp 1, Start Ramp 2.

• **Dual Ramp:** The dual ramp mode works in conjunction with External Input #3. This allows the user to switch between the two start ramps without having to reconfigure the start mode. (For details on configuring External Input #3 for DUAL RAMP see Setpoint **Page 6**.)

• **Custom Accel Curve:** Allows the user to custom design the acceleration start curve to the application. (See Setpoint page 7 for configuration setup.)

Note: *If Custom Accel Curve has not been enabled in Setpoint page 7, the soft starter will ignore the start control mode and read this Setpoint as disabled.*

SP2.2 Jog Voltage: The voltage level necessary to cause the motor to slowly rotate.

SP2.3 Start Ramp 1 Type: The ramp type can be setup for either Voltage or Current. If Voltage is selected, initial voltage, ramp time and current limit are adjustable. If Current is selected, initial current, ramp time and maximum current are adjustable.

Start Ramp 1 Type: Voltage

• **Voltage Ramping** is the most reliable starting method, because the starter will eventually reach an output voltage high enough to draw full current and develop full torque. This method is useful for applications where the load conditions change frequently and where different levels of torque are required. Typical applications include material handling conveyors, positive displacement pumps and drum mixers. Voltage is increased from a starting point, (Initial Torque) to full voltage over an adjustable period of time (Ramp Time). To achieve Voltage Ramping, select VOLTAGE for the START RAMP #1 TYPE Setpoint and set CURRENT LIMIT #1 Setpoint to 500% (The maximum setting). Since this is essentially Locked Rotor Current on most motors, there is little or no Current Limit effect on the Ramp profile.

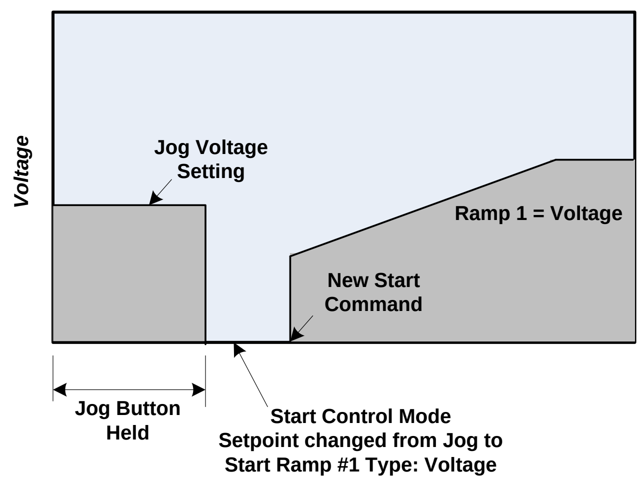


FIG. SP2.3 Example of Switching from Jog to Start Ramp #1 Type: Voltage

• **Voltage Ramping with Current Limit** is the most used curve and is similar to voltage ramping however, it adds an adjustable maximum current output. Voltage is increased gradually until the setting of the Maximum Current Limit Setpoint is reached. The output is held at this level until the motor accelerates to full speed. This may be necessary in applications where the electrical power is limited. Typical applications include portable or emergency generator supplies, utility power near the end of a transmission line and utility starting power demand restrictions.

Note: *Using Current Limit will override the Ramp Time setting if necessary, so use this feature when acceleration time is not critical.*

To set Voltage Ramping with Current Limit, select VOLTAGE for the START RAMP #1 Setpoint and set CURRENT LIMIT #1 Setpoint to a desired lower setting, as determined by your application requirements.

Start Ramp 1 Type: Current

• **Current Ramping** (Closed Loop Torque Ramping)

This method is used for smooth linear increase of output torque. This ramp is only used on some conveyor systems (long haul or down hill). For other applications, use Voltage Ramp or a custom Accel curve. Output voltage is constantly updated to provide the linear current ramp, and therefore the available torque is maximized at any given speed. This is for applications where rapid changes in torque may result in load damage or equipment changes. Typical applications include overland conveyors if belt stretching occurs; fans and mixers if blade warping is a problem; and material handling systems if stacked products fall over or break.

This feature can be used with or without the Maximum Current Limit setting. To achieve Current Ramping select CURRENT for START RAMP #1 TYPE Setpoint and set the MAXIMUM CURRENT #1 Setpoint to the desired level.

• **Current Limit Only** (Current Step) uses the Current Limit feature exclusively.

This method of starting eliminates the Soft Start voltage/current ramp and instead, maximizes the effective application of motor torque within the limits of the motor. In this mode, Setpoint RAMP TIME #1 is set to minimum so that the output current jumps to the current limit setting immediately. Typically used with a limited power supply when starting a difficult load such as a centrifuge or a deep well pump, when the motor capacity is barely adequate (stall condition or overloading occurs) or if other starting modes fail. Since ramp times are set to minimum, START RAMP #1 TYPE is set to either VOLTAGE or CURRENT.

• **Initial Torque** (**Initial Voltage #1 or Initial Current #1**)

Sets the initial start point of either Voltage Ramp or the Current Ramp. Every load requires some amount of torque to start from a standstill. It is inefficient to begin ramping the motor from zero every time, since between zero and the WK2 break-away torque level, no work is being performed. The initial torque level should be set to provide enough torque to start rotating the motor shaft, enabling a Soft Start and preventing torque shock damage. Setting this start point too high will not damage the starter, but may reduce or eliminate the soft start effect.

• **Ramp Time #1**

Sets the maximum allowable time for ramping the initial voltage, current (torque) or power setting to either of the following:

- The Current Limit setting when the motor is still accelerating.
- Full output voltage if the Current Limit is set to maximum.
- kW if Power Ramp is selected.

Increasing the ramp time softens the start process by gradually increasing the voltage, current or power. Ideally, the ramp time should be set for the longest amount of time the application will allow (without stalling the motor). Some applications require a short ramp time due to the mechanics of the system. (i.e. centrifugal pumps, because pump problems can occur due to insufficient torque).

• **Current Limit**

Sets the maximum motor current the starter will allow during the acceleration. As the motor begins to ramp, the Current Limit feature sets a maximum at which the current draw is held. Current Limit remains in effect until the following occurs:

1) The motor reaches full speed (Detected by the At-Speed detection circuit) or;
2) The Overload Protection trips on Motor Thermal Overload. Once the motor reaches full speed, the Current Limit feature becomes inactive. In the Voltage Ramp Profile, the voltage output is increased until it reaches the Current Limit. Ramp time is the maximum amount of time it takes for the voltage to increase until the Current Limit setting takes over. The Current Ramp profile varies the output voltage to provide a linear increase in current up to the Maximum Current Setpoint value. A closed loop feedback of motor current maintains the Current Ramp profile

SP2.4 Start Ramp 2 Type: Please refer to Ramp 1 settings for Ramp 2 Type: Voltage selection.

Start Ramp 2: Power

The **Power Ramp** feature has three programmable set points, Initial Power, Ramp Time and Maximum Power.

> **⚠ CAUTION**
>
> **It is recommended to use the power ramp on a loaded motor! Using the power ramp on an unloaded motor may result in shorter than anticipated acceleration times.**

- The **Initial Power** set point allows the user to define an initial KW (motor power) value that will be applied to the motor when the start sequence is begun. It has a range of 0-100% and a default value of 20%.
- The **Ramp Time** set point functions as all other ramp time set points and allows the user to define a time period during which the applied KW (motor power) will be increased linearly to the Maximum Power value set point. The adjustment range is 1 to 120 seconds. Once the Power Limit value is reached, the system enters a constant power mode that regulates the applied motor power until the motor reaches full speed.
- The **Maximum Power** set point has an adjustment range of 0-300% and a default value of 80%.

Power Ramp Calculations: The basic motor power value is derived from the line voltage and motor FLA, using a unity power factor as a default. This allows for approximation of the motor power rating without any other input data. During the Power Ramp process, the RMS line voltage, RMS motor current and power factor are measured on a cycle by cycle basis and applied to the Power Ramp algorithm. The CPU then calculates the True RMS motor power and will control the SCR firing to deliver the programmed power ramp values to the motor.

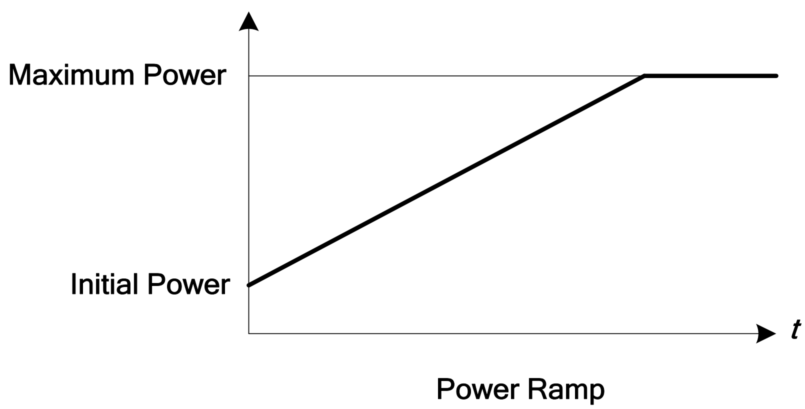


FIG. SP2.4

- **Initial Power**: The Initial power set point allows the user to define an initial KW (motor power) value that will be applied to the motor at the beginning of the start sequence.
- **Ramp Time #2**: See Ramp Time #1 for description
- **Maximum Power**: Sets the maximum motor power the starter will allow during the acceleration. As the motor begins to ramp, the “Maximum Power” sets a limit.

SP2.5 Kick Start: Used as an initial energy burst in applications with high friction loads.

- **Kick Start Voltage**: The initial voltage (as a percent of full voltage value) that is needed to start the motor. (i.e. Breakaway or Initial Torque.)
- **Kick Start Time**: The time the initial torque boost is applied.

SP2.6 Deceleration: Allows the motor to gradually come to a soft stop.

- **Start Deceleration Voltage**: Upon receiving a STOP command the output voltage initially drops to this voltage. (Represented as a percent of voltage value.)

- **Stop Deceleration Voltage**: The drop-off point of the deceleration ramp. (Percent of voltage value.) The point at which the unit output drops to zero to end the deceleration.

- **Deceleration Time:** The time to get to the stop Deceleration Voltage Set point value.

SP2.7 Timed Output: Used with an AUX (5-8) relay. When enabled, and upon a start command, it waits until the programmed time plus the run delayed time has expired. The relay energizes and remains so until a stop command is received. It de-energizes upon receiving a stop command.

SP2.8 Run Delay Time: Can be used with an AUX (5-8) relay. The delay timer begins upon receipt of the start command. The relay will then drop out when the time has expired.

SP2.9 At Speed Delay Time: Used with the AUX 4 relay, it energizes when the motor reaches At Speed and the programmed delay time has expired. The relay remains energized until a stop command has been received.

SP.3 Phase & Ground Settings (Setpoint Page 3)
(Security Level 2)

SP3.1 Imbalance Alarm Level: This is an advance warning of a phase imbalance problem. The problem may not be a fault in the motor, but merely caused by imbalanced voltages.
• **Imbalance Alarm Delay:** The amount of time the imbalance condition must exist before an alarm occurs.

SP3.2 Imbalance Trip Level: This will trip the motor on excessive phase imbalance. The trip level should be programmed to a higher value than the alarm level.
• **Imbalance Trip Delay:** The amount of time the imbalance condition must exist before a trip will occur.

SP3.3 Undercurrent Alarm Level: Typically used to warn of possible load loss, a coupling break or other mechanical problems.
• **Undercurrent Alarm Delay**: The amount of time the undercurrent condition must exist before an alarm will occur.

SP3.4 Overcurrent Alarm Level: Typically used to indicate when the motor is overloaded. This feature can be used to either stop the feed to the equipment or warn operators of an overload condition.

• **Overcurrent Alarm Delay:** The amount of time the overcurrent condition must exist before an alarm will occur.

SP3.5 Overcurrent Trip Level: Typically used to indicate the motor is severely overloaded and at which point a trip occurs.

• **Overcurrent Trip Delay:** The amount of time the overcurrent condition must exist before a trip will occur.

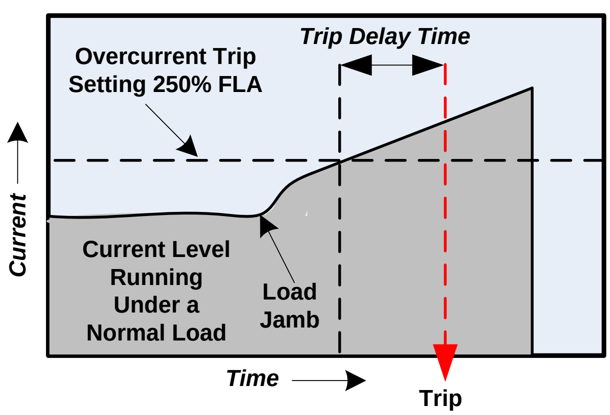
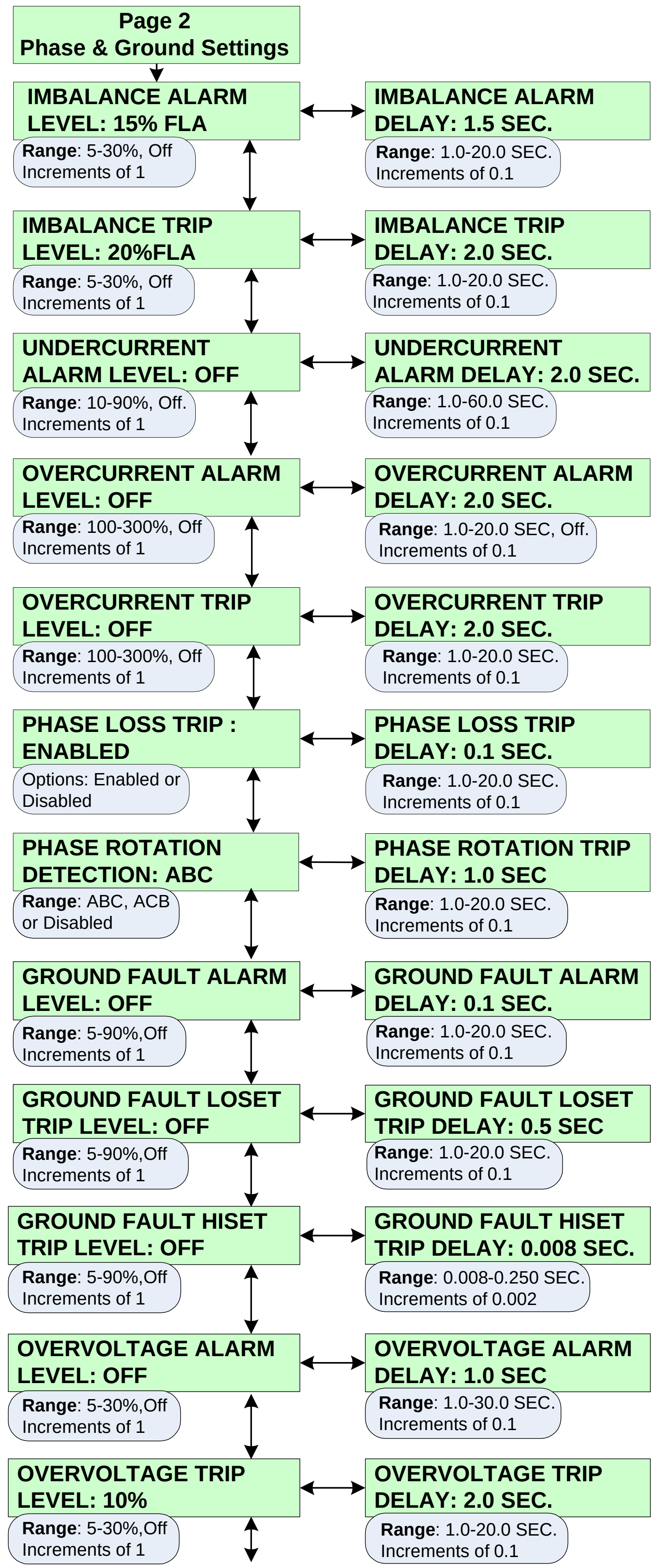


FIG. SP3.5



Continued (Next Page)

SP3.6 Phase Loss Trip: When enabled, the Soft Starter will trip the motor off-line upon a loss of phase power.

• **Phase Loss Trip Delay:** The amount of time the phase loss condition must exist before a trip will occur.

SP3.7 Phase Rotation Detection: The soft starter is continuously monitoring the phase rotation. Upon a start command, a trip will occur if it detects a change in the phase rotation.

• **Phase Rotation:** There are two possible phase rotation options: ABC or ACB. This Setpoint monitors the wiring to ensure that the phase rotation is correct. To view the present phase rotation, go to Metering Page1, screen number 4.

SP3.8 *Ground Fault Alarm: Typically used to warn of low level ground current leakage

• **Ground Fault Alarm Delay:** The amount of time that the ground fault condition must exist before an alarm will occur.

SP3.9 *Ground Fault Loset Trip Level: Typically used to trip the motor on a low level of ground current leakage. This Setpoint is intended to detect high impedance faults.

• **Ground Fault Loset Trip Delay:** The amount of time that the ground fault condition must exist before a trip will occur.

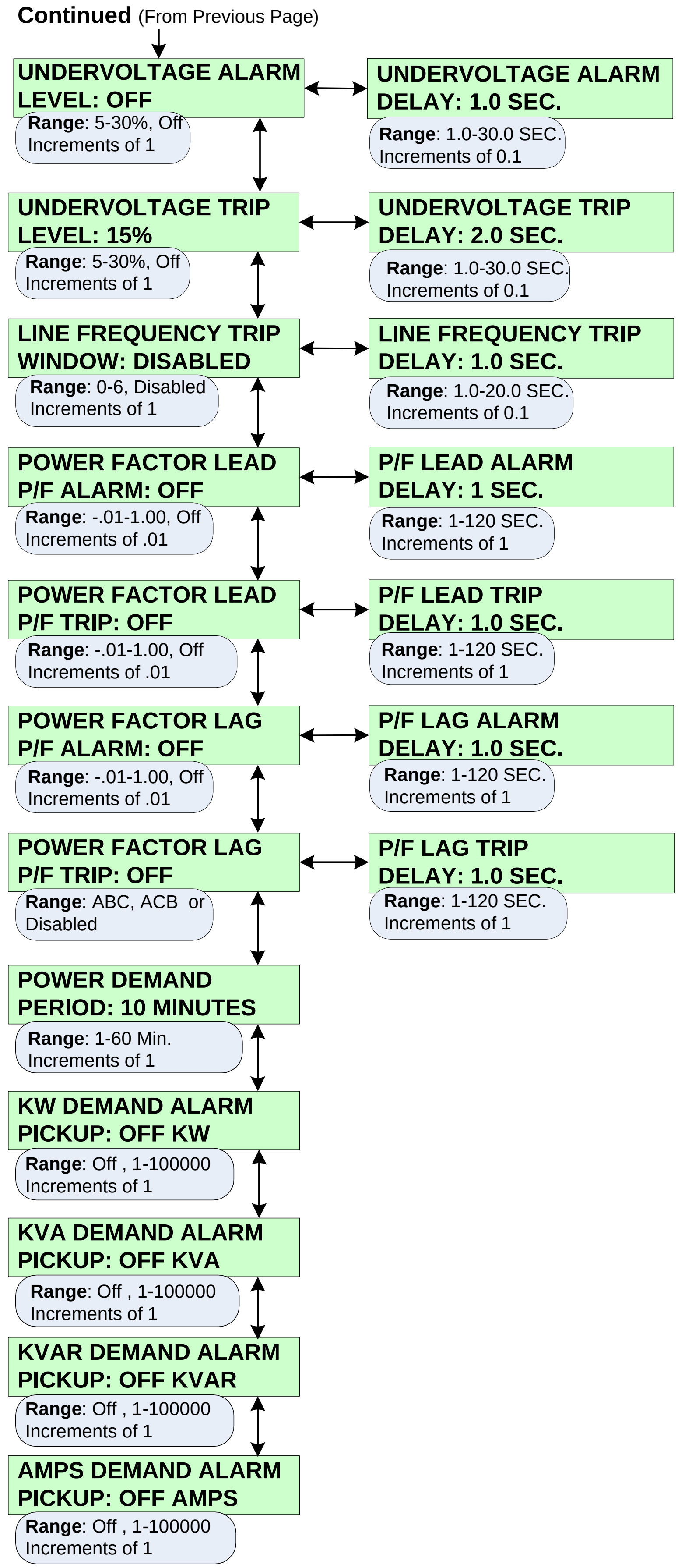
*** Ground Fault Option must be installed**

SP3.10 *Ground Fault Hiset Trip Level: Used to trip the motor (within milliseconds) upon detecting a high level of ground current leakage. This Setpoint is intended to detect low impedance faults.

• ***Ground Fault Hiset Trip Delay:** The amount of time that the ground fault condition must exist before a trip will occur.

SP3.11 Overvoltage Alarm Level: Typically used to indicate when the line voltage is too high. This is an alarm level.

• **Overvoltage Alarm Delay:** The amount of time that the overvoltage condition must exist before an alarm occurs.



SP3.12 Overvoltage Trip Level: Typically used to indicate that the line voltage is too high and at which point a trip occurs

• **Overvoltage Trip Delay:** The amount of time that the overvoltage condition must exist before a trip will occur.

SP3.13 Undervoltage Alarm Level: Typically used to indicate when the line voltage is too low. This is an alarm level.

• **Undervoltage Alarm Delay:** The amount of time that the undervoltage condition must exist before an alarm occurs.

SP3.14 Undervoltage Trip Level: Typically used to indicate that the line voltage is too low at which point a trip occurs.

• **Undervoltage Trip Delay:** The amount of time that the undervoltage condition must exist before a trip occurs.

SP3.15 Line Frequency Trip Window: The acceptable amount of drift above or below the line frequency (Hz) before a trip is generated.

• **Line Frequency Trip Delay:** The amount of time that the frequency drift condition must exist beyond the window before a trip occurs.

SP3.16 Power Factor Lead Alarm: Typically used to indicate a leading power factor.

• **Power Factor Lead Alarm Delay:** The amount of time that the power factor lead condition must exist beyond the window before an alarm occurs.

SP3.17 Power Factor Lead Trip: The acceptable amount of power factor lead before a trip is generated.

• **Power Factor Lead Trip Delay:** The amount of time that the power factor lead condition must exist beyond the window before a trip will occur.

SP3.18 Power Factor Lag Alarm: Typically used to indicate a lagging power factor.

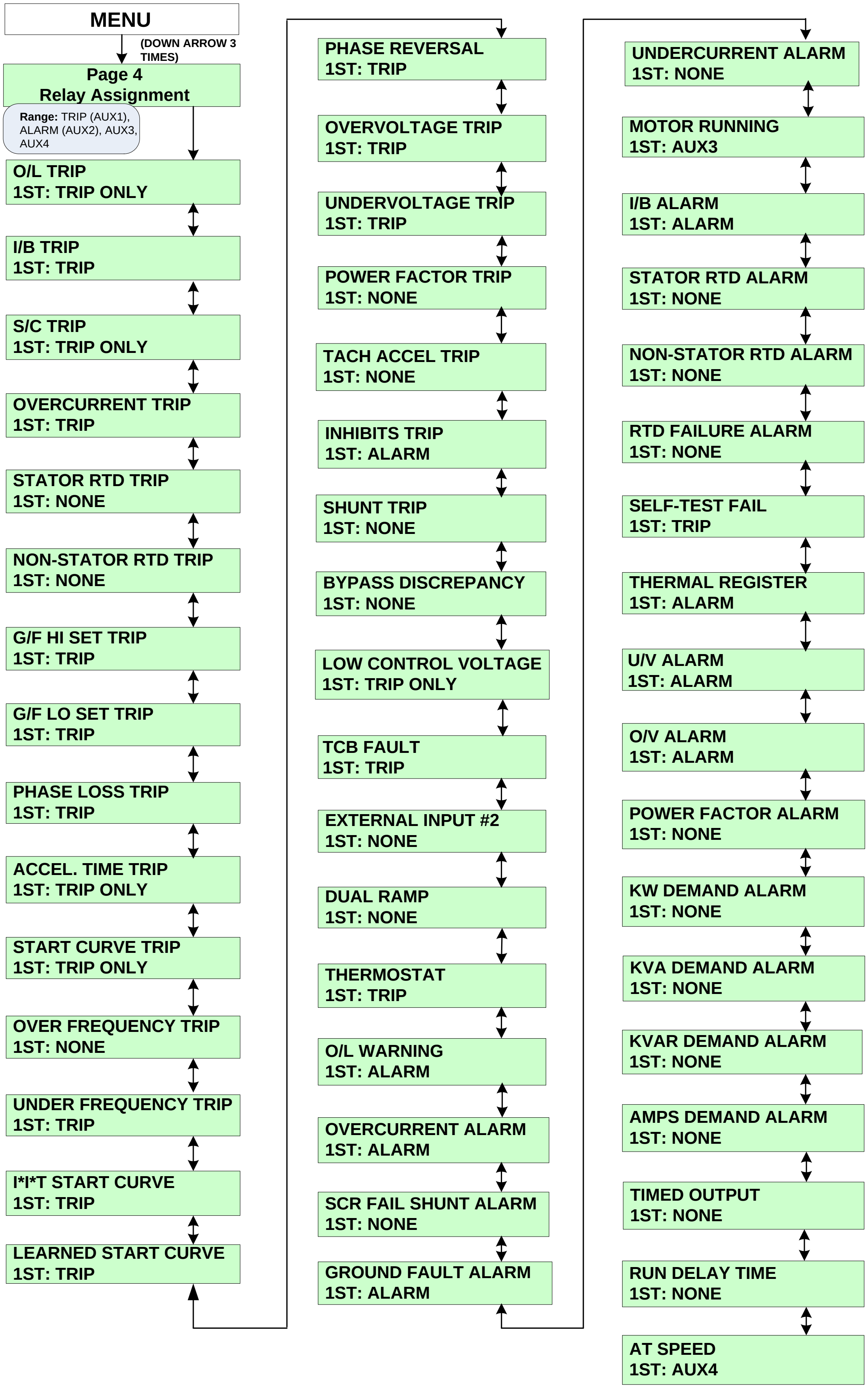
• **Power Factor Lag Alarm Delay:** The amount of time that the power factor lagging condition must exist beyond the window before an alarm occurs.

SP3.19 Power Factor Lag Trip: The acceptable mount of power factor lag before a trip is generated.

• **Power Factor Lag Trip Delay:** The amount of time that the power factor lag condition must exist beyond the window before a trip will occur.

SP3.20 Power Demand Period: The Soft Starter monitors the demand of the motor based on several parameters (current, kW, kVAR, kVA). Monitoring the demand of the motor assist in the energy management program where processes can be altered or scheduled to reduce overall demand. Demand is calculated by taking samples of the output current, kW, kVAR and kVA over a period of time, then averaged and stored into memory.

SP.4 Relay Assignment (Setpoint Page 4)
(Security Level 2)



SP.4 Relay Assignment (Setpoint Page 4) – Continued
(Security Level 2)

All of the protective functions of the Soft Starter are user programmable to an output relay. The factory will ship with all tripping functions assigned to TRIP (AUX1) relay, and all alarm functions to ALARM (AUX2) relay.
Note: AUX1 - 4 are Factory Set and should not be changed.
SP4.1 The following is a list of all the user programmable functions.

Note: *The 1st Relay Assignments are factory defaults and should not be changed.*

RELAY ASSIGNMENTS

FUNCTIONS	**1st**	**2nd**	**3rd**
OVERLOAD TRIP	TRIP ONLY	NONE	NONE
IMBALANCE TRIP	TRIP (AUX1)	NONE	NONE
SHORT CIRCUIT TRIP	TRIP ONLY	NONE	NONE
OVERCURRENT TRIP	TRIP (AUX1)	NONE	NONE
STATOR RTD TRIP	NONE	NONE	NONE
NON-STATOR RTD TRIP	NONE	NONE	NONE
GROUND FAULT HI SET TRIP*	TRIP (AUX1)	NONE	NONE
GROUND FAULT LO SET TRIP*	TRIP (AUX1)	NONE	NONE
PHASE LOSS TRIP	TRIP (AUX1)	NONE	NONE
ACCEL TIME TRIP	TRIP ONLY	NONE	NONE
START CURVE TRIP	TRIP ONLY	NONE	NONE
OVER FREQUENCY TRIP	NONE	NONE	NONE
UNDER FREQUENCY TRIP	TRIP (AUX1)	NONE	NONE
I*I*T START CURVE	TRIP (AUX1)	NONE	NONE
LEARNED START CURVE	TRIP (AUX1)	NONE	NONE
PHASE REVERSAL	TRIP (AUX1)	NONE	NONE
OVERVOLTAGE TRIP	TRIP (AUX1)	NONE	NONE
UNDERVOLTAGE TRIP	TRIP (AUX1)	NONE	NONE
POWER FACTOR TRIP	NONE	NONE	NONE
TACH ACCEL TRIP	NONE	NONE	NONE
INHIBITS TRIP	ALARM (AUX2)	NONE	NONE
SHUNT TRIP	NONE	NONE	NONE
BYPASS DISCREPANCY	TRIP ONLY	NONE	NONE
LOW CONTROL VOLTAGE	TRIP ONLY	NONE	NONE
TCB FAULT	TRIP (AUX1)	NONE	NONE
EXTERNAL INPUT 2	NONE	NONE	NONE
DUAL RAMP	NONE	NONE	NONE
THERMOSTAT	TRIP (AUX1)	NONE	NONE
OVERLOAD WARNING	ALARM (AUX2)	NONE	NONE
OVERCURRENT ALARM	ALARM (AUX2)	NONE	NONE
SCR FAIL SHUNT ALARM	ALARM (AUX2)	NONE	NONE
GROUND FAULT ALARM*	ALARM (AUX2)	NONE	NONE
UNDERCURRENT ALARM	NONE	NONE	NONE
MOTOR RUNNING	AUX3	NONE	NONE
IMBALANCE ALARM	ALARM (AUX2)	NONE	NONE
STATOR RTD ALARM	NONE	NONE	NONE
NON-STATOR RTD ALARM	NONE	NONE	NONE
RTD FAILURE ALARM	NONE	NONE	NONE
SELF TEST FAIL	TRIP (AUX1)	NONE	NONE
THERMAL REGISTER	ALARM (AUX2)	NONE	NONE
U/V ALARM	ALARM (AUX2)	NONE	NONE
O/V ALARM	ALARM (AUX2)	NONE	NONE
POWER FACTOR ALARM	NONE	NONE	NONE
KW DEMAND ALARM	NONE	NONE	NONE
KVA DEMAND ALARM	NONE	NONE	NONE
KVAR DEMAND ALARM	NONE	NONE	NONE
AMPS DEMAND ALARM	NONE	NONE	NONE
TIMED OUTPUT	NONE	NONE	NONE
RUN DELAY TIME	NONE	NONE	NONE
AT SPEED	AUX4	NONE	NONE

*Ground fault option must be installed

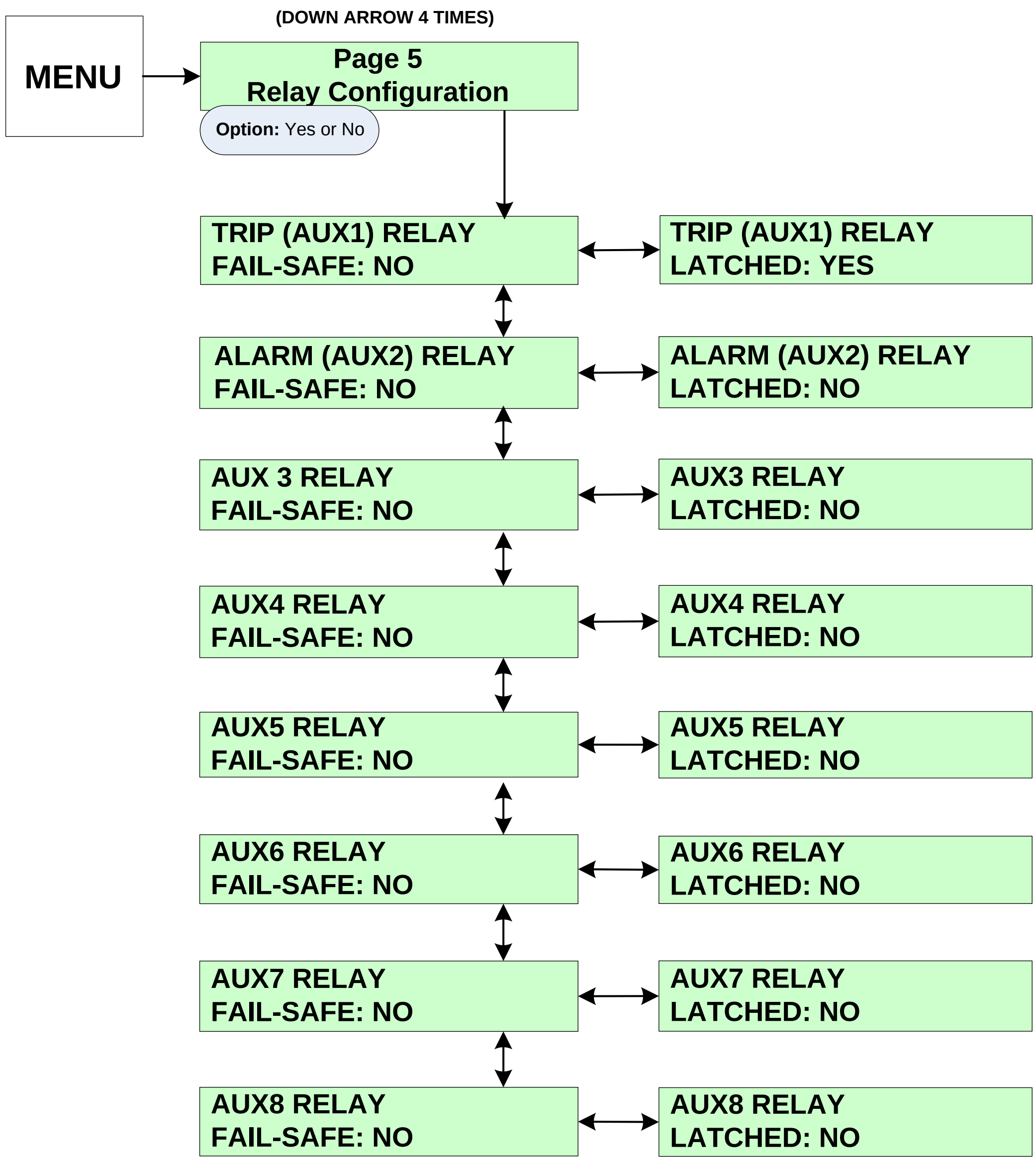
SP.5 Relay Configuration (Setpoint Page 5)
(Security Level 2)

In Setpoint Page 5 the user can configure the four output relays as either fail-safe or non fail-safe and latching or non-latching.

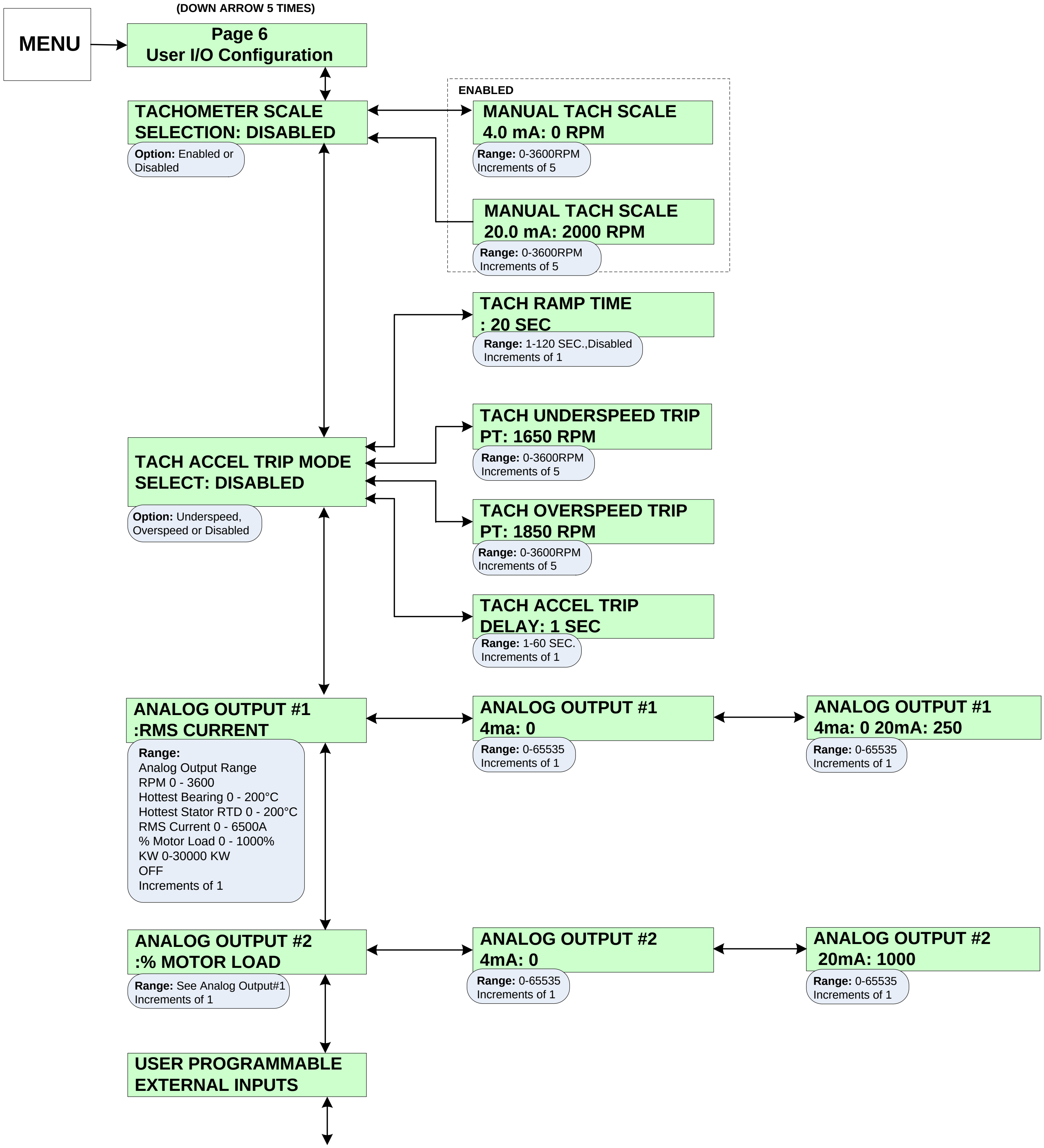
SP5.1 When a relay has been configured for "Fail Safe" and power is applied to the unit the relay will energize and its contacts will change state. The relay will then de-energize and its contacts revert back when an event occurs of if power is removed.

NOTE: *The relays in the soft starter will not prevent a start sequence unless they are wired in as interlocks. If power is lost, the motor power is also lost. Do not change the programming for AUX 1-4. These are for factory use only. AUX 5-8 are user defined outputs.*

SP5.2 A relay configured as non-latching will reset itself when the cause of the trip event is not continuous. The TRIP (AUX1) relay should always be programmed for latching, because this trip should require a visual inspection of the motor and starter before issuing a manual reset to release the relay after a trip has been stored.



SP.6 User I/O Configuration (Setpoint Page 6)
(Security Level 2)



Continue on page 51

SP.6 User I/O Configuration (Setpoint Page 6) - Continued
(Security Level 2)

The Soft Starter can be configured to accept a tachometer feedback signal using the 4-20mA input.

SP6.1 The first screen of Setpoint page 6 is TACHOMETER SCALE SELECTION. When this is set to ENABLED, the user will need to input the tachometer scale of the 4-20mA input range.

- **Manual Tach Scale 4.0 mA**: The unit is looking for an RPM value to assign to the lowest point on the scale. This Value should represent the motor at zero speed.

- **Manual Tach Scale 20.0 mA**: The unit is looking for an RPM value to assign to the highest point on the scale. This value should represent the motor at full speed.

SP6.2 Tach Accel Trip Mode Select: When enabled, the underspeed or overspeed must be selected for the Tach Accel Trip. If underspeed is selected, only the Tach Underspeed Trip Point will be used. If overspeed is selected, only the Tach Overspeed Trip Point will be used.

- **Tach Inhibit Time:** This is the duration of time before the starter begins sampling the tachometer.

- **Tach Underspeed Trip:** Defines the minimum motor speed using the Tach feedback. When the underspeed trip mode is enabled and the motor speed falls below this level for the time specified by the Tach Accel Trip Delay an underspeed trip occurs.

- **Tach Overspeed Trip:** Defines the maximum allowed motor speed using the Tach feedback. When the overspeed trip mode is enabled and the motor speed exceeds this level for the time specified by the Tach Accel Trip Delay an overspeed trip occurs.

- **Tach Accel Trip Delay**: The duration of time that the Tach Accel trip condition must persist before a trip is generated.

SP6.3 The controller provides two 4-20mA analog outputs. Each analog output is independent of the other and can be assigned to monitor different functions. The available output ranges are; RPM, Hottest Non-Stator (Bearing) RTD, Hottest Stator RTD, RMS current, and % Motor Load.

- **Analog Output #1** – Select a function from the available five options to be transmitted from the 4-20mA output.

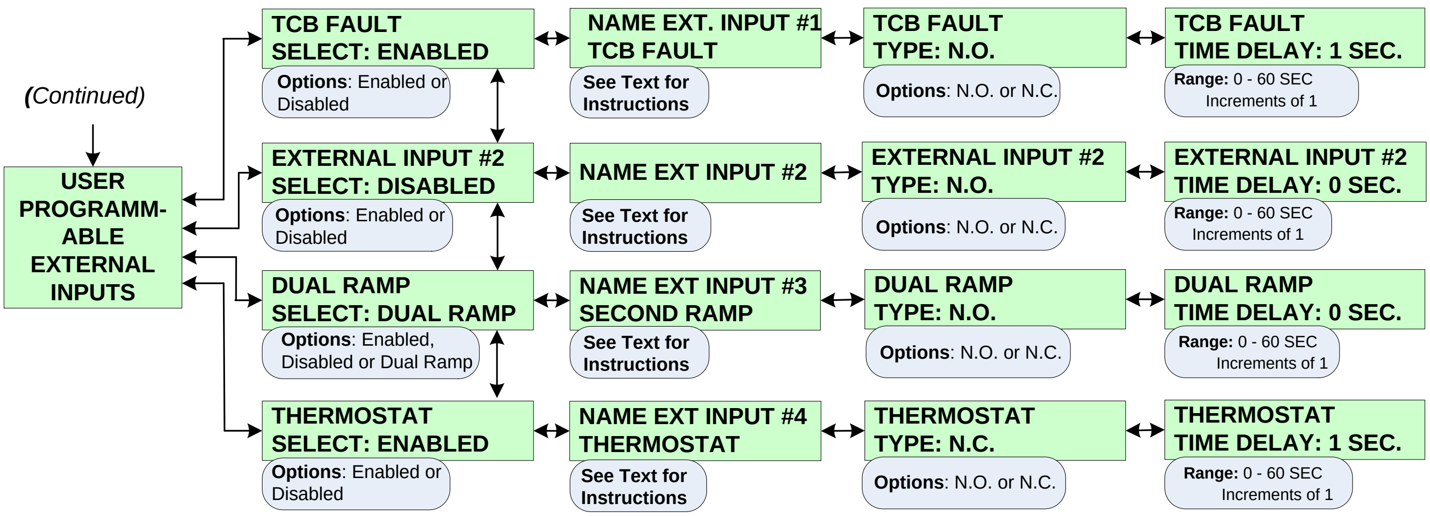
Note: *If selecting RPM, the Tachometer feedback input signal must be present in order for the controller to give proper output. If selecting RTD, the RTD option must be installed and an RTD input signal must be present for a proper output to be given from the analog output.*

- **Analog Output #1 (4 mA)**: Enter a value that the 4mA level will represent for the selected function; typically this value should be 0.

- **Analog Output #1 (20 mA):** Enter a value that the 20mA level will represent for the selected function.

SP6.4 Analog Output #2 – All of the Setpoints and setup screens for Analog Output #2 are the same as those for Analog Output #1.

SP.6 User I/O Configuration (Setpoint Page 6) - Continued
(Security Level 2)



SP6.5 User Programmable External Inputs: The controller provides up to 4 digital external inputs which are individually programmable. A description name can be assigned to each individual input for easy identification.

- **External Input #1:** Factory programmed for TCB Fault.
- **External Input #2:** If used, this Setpoint must be enabled.
- **Name Ext. Input #2:** The user can assign a description name to the input to easily identify the cause of external trip or alarm. Up to 15 characters including spaces can be used to assign the name.
- **External Input #2 Type:** The external input can be set as either a normally open or normally closed contact.
- **External Input #2 Time Delay:** Upon a change in contact setting, the unit will wait the programmed amount of time before generating an output. If no delay is needed, then input 0 seconds. The controller will post an event upon seeing a change in state.
- **External Input #3**: The setup screens and Setpoints for External Input #3 includes the option of being configured for Dual Ramp. In Dual Ramp mode, the initial contact setting is the same as the START RAMP #1. Upon a change in input contact state, the controller will switch over to START RAMP #2 and use that setting for start control mode.

Note: *The start RAMP types should only be switched while the motor is stopped. In Setpoint Page 4 Relay Assignments do not assign any output relay to this function. The controller is programmed with External input #3 programmed for dual ramp. If it is not needed, disable the dual ramp.*

- **External Input #4** – These input screens are for the thermostat input and can be enabled or disabled.

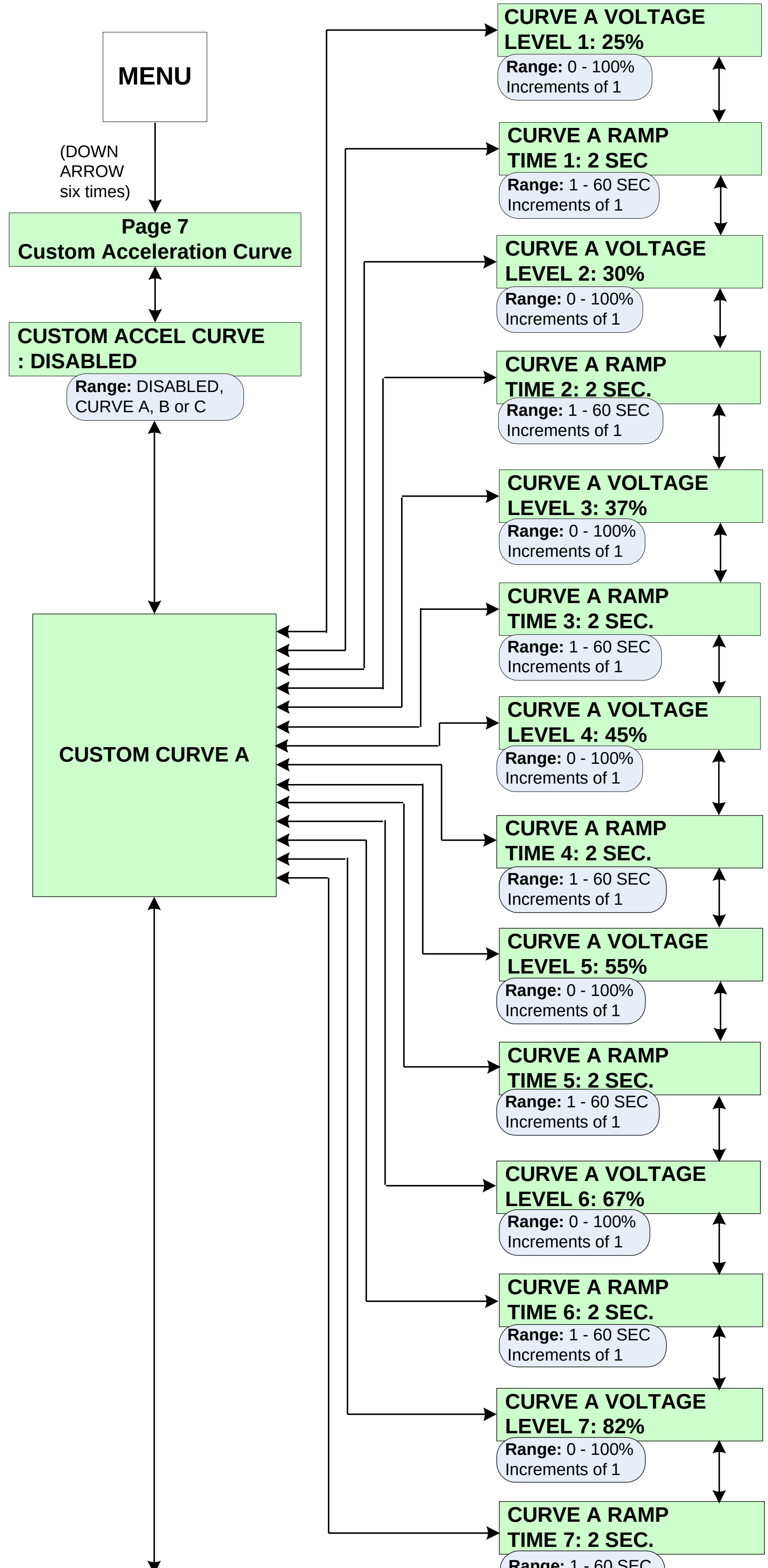
Note: *It is recommended that this function remain enabled. If the thermostat indicates an over temperature condition, the controller will trip the motor.*

SP.7 Custom Acceleration Curve (Setpoint Page 7)
(Security Level 3)

SP7.1 Setpoint Page 7 allows the user to custom design the acceleration curve (start curve) for a specific application. The custom design setup allows for up to three different curves in the Soft Starter. Only one curve can be active (enabled) at any given time. Each of the three curves allow for eight voltage plotting points, with corresponding ramp times and a current limit setting.

Note: *Each successive voltage level must be programmed to a voltage level equal to or greater than the previous level. All eight voltage levels must be programmed and the eighth level has been preset at 100%.*

• If Custom Accel Curve has been set to curve A, B or C on this page, the Soft Starter will override the Start Control Mode selected in Setpoint Page 2, (even if Start Control Mode in Setpoint Page 2 has not been set to Custom Accel Curve).



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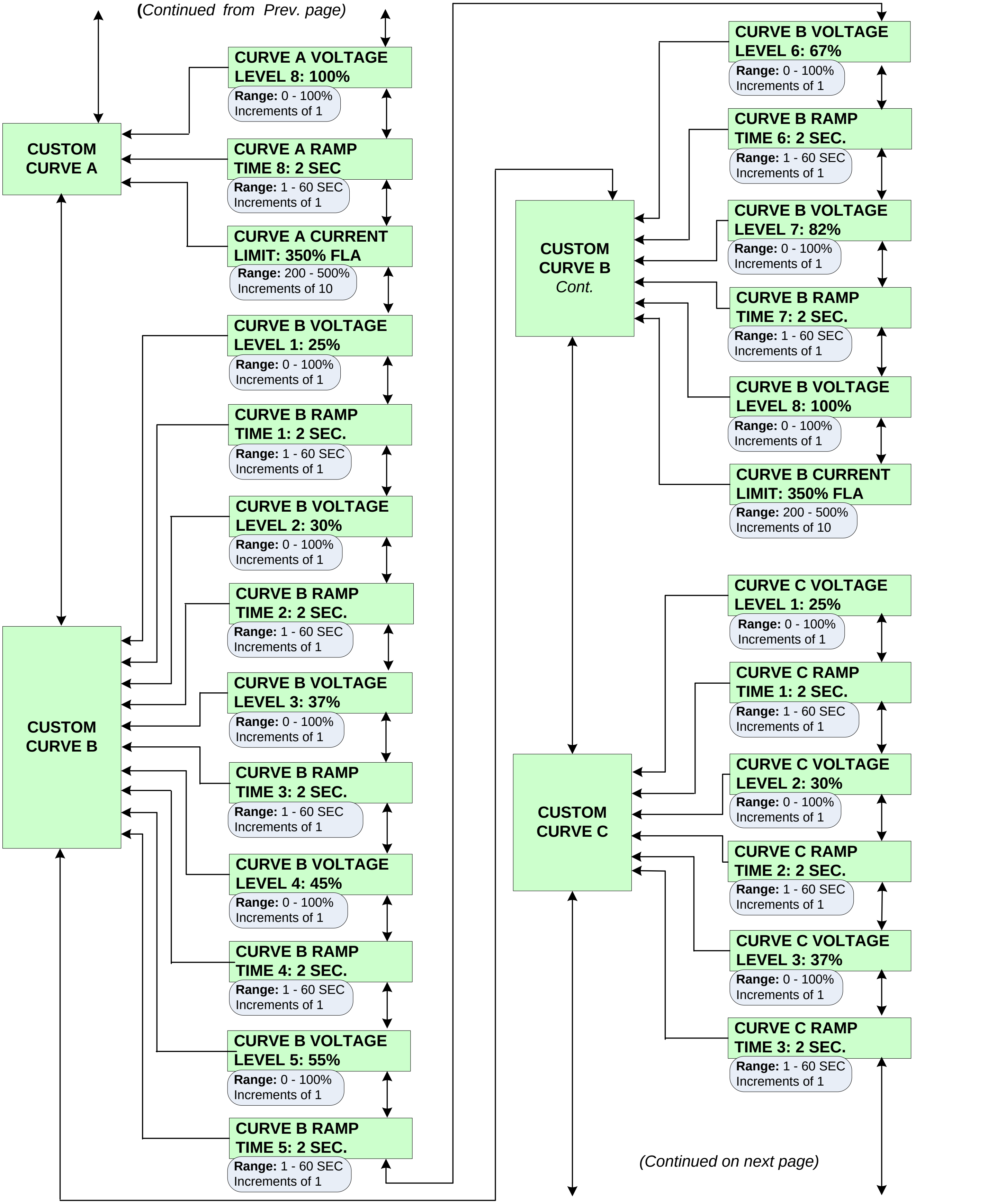
SP.7 Custom Acceleration Curve (Setpoint Page 7) - Continued
(Security Level 3)

(Continued from Prev. page)



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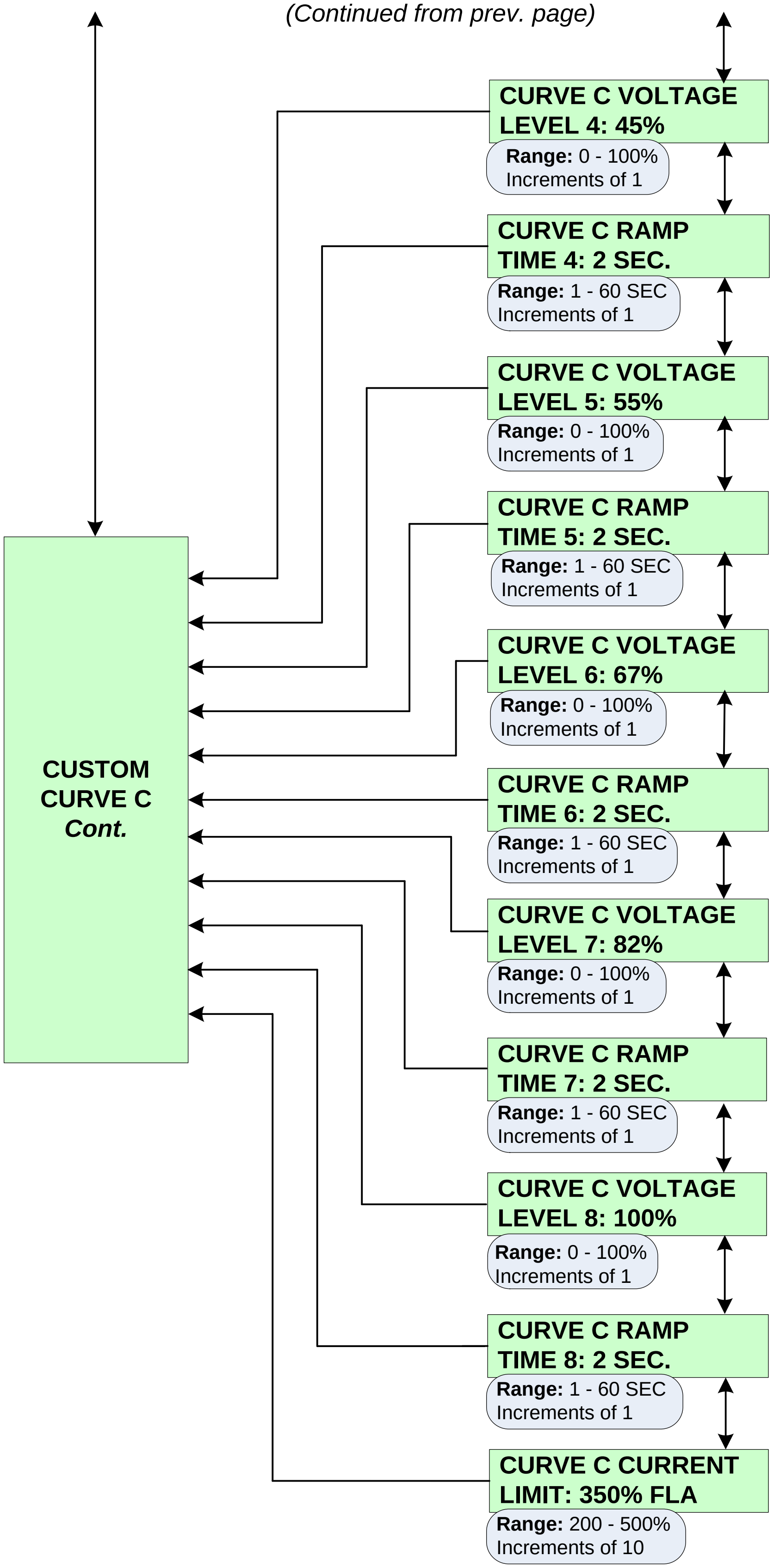
SP.7 Custom Acceleration Curve (Setpoint Page 7) - Continued
(Security Level 3)

(Continued from prev. page)



SP.8 Overload Curve Configuration (Setpoint Page 8)
(Security Level 3)

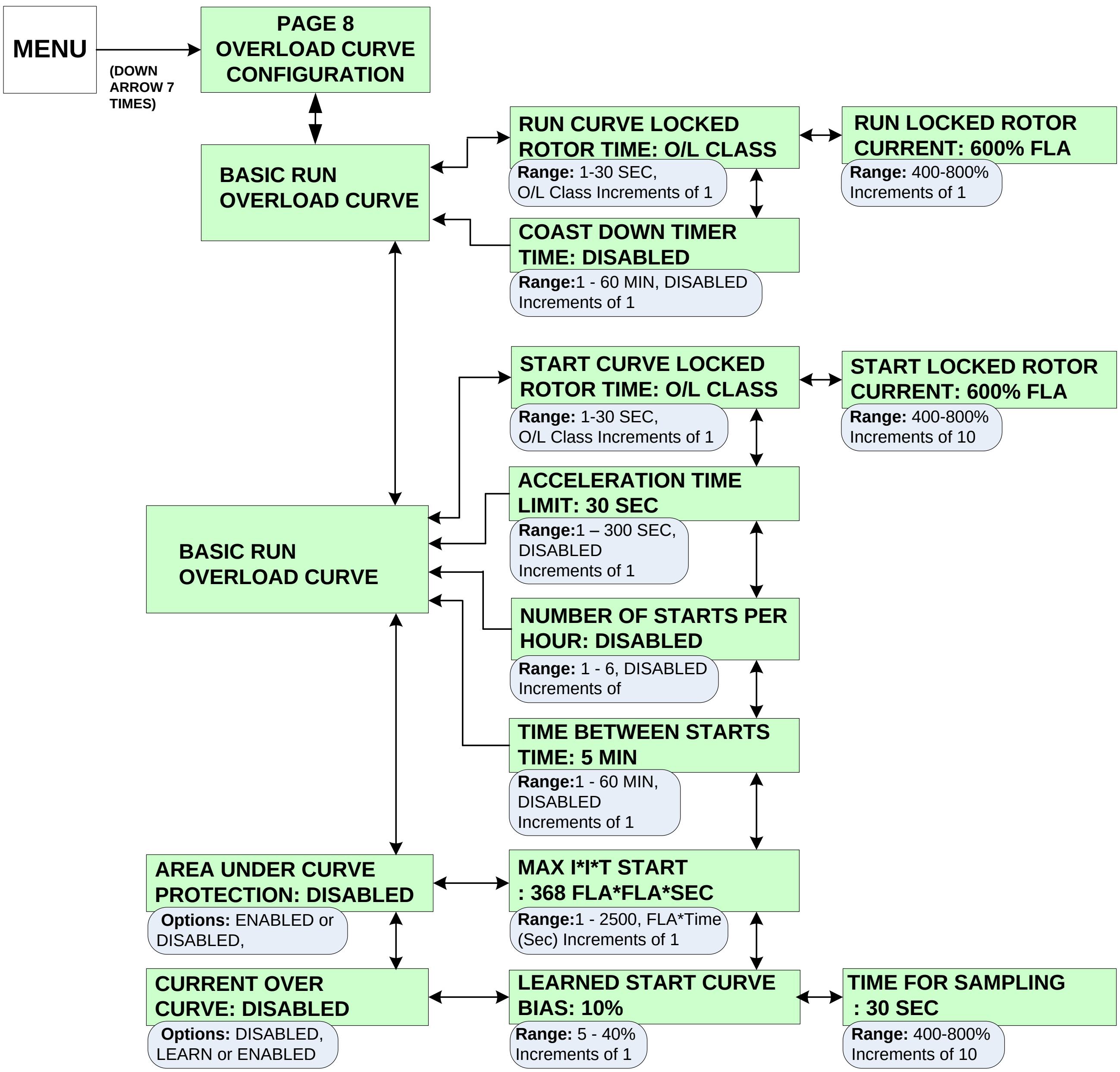
Configures the unit's start and run protection mode. The unit has independent start and run curve protection and the settings can be based on the OL Class or set by the motor's locked rotor current and time.

SP8.1 Basic Run Overload Curve

• **Run Curve Locked Rotor Time**: Set the locked rotor time to the OL Class default chosen in Setpoint Page 1 or set the time in seconds. This is the time the locked rotor condition exists before a trip occurs.

• **Run Locked Rotor Current:** The current the motor draws with full voltage on the windings and no rotor movement (as a percent of motor FLA). Refer to the nameplate data or contact the motor manufacturer.

• **Coast Down Timer:** If enabled, this prevents the motor from restarting for the programmed amount of time, after a stop command is given.



SP8.2 Basic Start Overload Curve

- **Start Curve Locked Rotor Time:** The locked rotor time can be set to the OL Class default chosen in Setpoint Page 1 or to a specific time. The overload condition must exist for the programmed amount of time before a trip occurs.

- **Start Locked Rotor Current:** The current the motor draws with full voltage on the windings and no motor movement (as a percent of motor FLA). Refer to the motor nameplate data or contact the motor manufacturer.

- **Acceleration Time Limit**: If the motor does not enter run mode (reach "at speed") within the preset time, the unit trips on acceleration time limit.

- **Number of Starts per hour:** If enabled, this limits the maximum number of starts permitted per hour. This Setpoint allows a maximum of 6 starts per hour. Contact the motor manufacturer for further information regarding number of starts per hour.

- **Time Between Starts:** If enabled, the soft starter prevents another start attempt until the programmed time has expired.

SP8.3 Area Under Curve Protection: If enabled, this secondary start protection uses both the basic start protection and the area under the curve protection.

- **Max I*I*T Start:** The maximum I^2t allowed during start. If the I^2t to start exceeds this number then the Soft Starter will generate a trip.

SP8.4 Current Over Curve: Learns the motor's starting characteristics and protects the motor based upon the learned curve. It is useful when commissioning a new motor.

- **Learn:** The unit reads the motor's starting characteristics. Start the motor and allow it to come to full speed. The start feedback enables the motor protection based on the learned start curve.

- **Learned Start Curve Bias:** The maximum allowed deviation above or below the start curve before a trip is generated.

- **Time for sampling:** The time the soft starter continues to sample the start curve characteristic during learn mode.

SP.9 RTD Option Configuration (Setpoint Page 9)
(Security Level 3)

Note: The RTD is an option. Contact factory for additional information.

The Soft Starter is available with an optional RTD card that provides 12 programmable RTDs which are individually programmable for type. The available types are 100 ohm platinum, 100 ohm nickel, 120 ohm nickel and 10 ohm copper. Each RTD can be identified with a description name of up to 15 characters (including spacing). Also, each individual RTD has it own alarm and trip level.

SP9.1 Use NEMA Temp for RTD Value:

When this Setpoint is enabled, the Soft Starter will use the NEMA design insulation class to limit the maximum allowed range of the alarm and trip level. The maximum allowed temperature range is 240° C or (464°F).

SP9.2 Number Of RTD'S Used for Stator:

Up to six RTDs can be assigned to monitor the stator of the motor.

SP9.3 RTD Voting:

When this is enabled, the Soft Starter will not post a trip until 2 RTD's have exceeded the trip level. This prevents nuisance RTD tripping.

SP9.4 RTD Setup:

Each of the 12 RTDs is configured in the following manner. The first column is the RTD type, the second column is the RTD description, the third column is the alarm level, and the fourth column is the trip level. The first six RTDs have been pre-programmed with a description name for the STATOR, with two RTDs per phase.

RTDs #1 & #2 have been named STATOR PHASE A1 and A2 respectively. RTDs #3 & 4 are named STATOR PHASE B1 and B2, RTDs #5 & 6 are named STATOR PHASE C1 and C2.

If other description names are required, press the right arrow button from the RTD Type screen to go the RTD description screen. If no alarm or trip level is required these Setpoints can be turned off.

RTD Available Settings:

RTD TYPE:

- 120 OHM NICKEL (NI)
- 100 OHM NICKEL (NI)
- 10 OHM COPPER (CU)
- 100 OHM PLATINUM (PT)
- OFF

ALARM LEVEL: OFF or 0 - 240C (32-464F) Example: ### C = ### F, Increments of 1

RTD DESCRIPTION:

STATOR A1, STATOR A2, STATOR B1, STATOR B2, STATOR C1,
STATOR C2, FRONT BEARING, BACK BEARING, BEARING BOX,
AMBIENT, NONE

SP.9 RTD Option Configuration (Setpoint Page 9) - Continued
(Security Level 3)

MENU

(DOWN ARROW 8 TIMES)

Page 9
RTD CONFIGURATION
Options: ENABLED or DISABLED

 # OF RTD'S USED FOR STATOR: 4
Range: 0 - 6
Increments of 1

RTD VOTING : DISABLED
Options: ENABLED or DISABLED

RANGES:

* 120 OHM NICKEL (NI)
100 OHM NICKEL (NI)
10 OHM COPPER (CU)
100 OHM PLATINUM (PT)
OFF

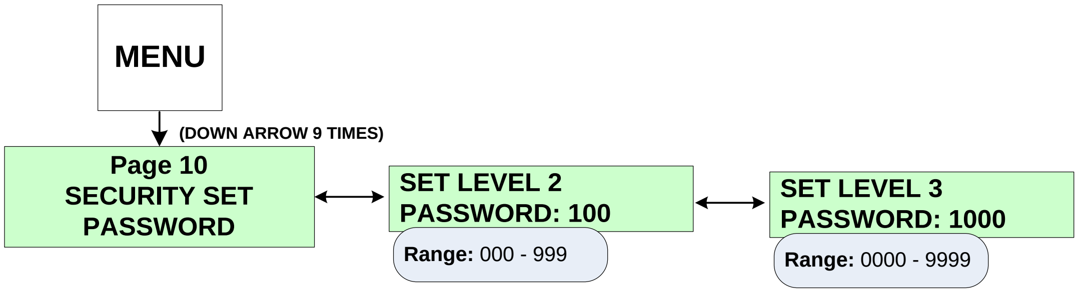
**OFF or 0 - 240C (32-464F) Example: ### C = ### F
Increments of 1

***STATOR A1, STATOR A2, STATOR B1, STATOR B2, STATOR C1, STATOR C2, FRONT BEARING, BACK BEARING, BEARING BOX, AMBIENT, NONE

STATOR PHASE A1 TYPE : OFF Range: *	**RTD # 1 DESCRIPTION STATOR PHASE A1** Range: ***	**STATOR PHASE A1 ALARM LEVEL: OFF** Range: **	**STATOR PHASE A1 TRIP LEVEL: OFF** Range: **
STATOR PHASE A2 TYPE : OFF Range: *	**RTD # 2 DESCRIPTION STATOR PHASE A2** Range: ***	**STATOR PHASE A2 ALARM LEVEL: OFF** Range: **	**STATOR PHASE A2 TRIP LEVEL: OFF** Range: **
STATOR PHASE B1 TYPE : OFF Range: *	**RTD # 3 DESCRIPTION STATOR PHASE B1** Range: ***	**STATOR PHASE B1 ALARM LEVEL: OFF** Range: **	**STATOR PHASE B1 TRIP LEVEL: OFF** Range: **
STATOR PHASE B2 TYPE : OFF Range: *	**RTD # 4 DESCRIPTION STATOR PHASE B2** Range: ***	**STATOR PHASE B2 ALARM LEVEL: OFF** Range: **	**STATOR PHASE B2 TRIP LEVEL: OFF** Range: **
STATOR PHASE C1 TYPE : OFF Range: *	**RTD # 5 DESCRIPTION STATOR PHASE C1** Range: ***	**STATOR PHASE C1 ALARM LEVEL: OFF** Range: **	**STATOR PHASE C1 TRIP LEVEL: OFF** Range: **
STATOR PHASE C2 TYPE : OFF Range: *	**RTD # 6 DESCRIPTION STATOR PHASE C2** Range: ***	**STATOR PHASE C2 ALARM LEVEL: OFF** Range: **	**STATOR PHASE C2 TRIP LEVEL: OFF** Range: **
END BEARING TYPE : OFF Range: *	**RTD #7 DESCRIPTION END BEARING** Range: ***	**END BEARING ALARM LEVEL: OFF** Range: **	**END BEARING TRIP LEVEL: OFF** Range: **
RTD # 9 TYPE : OFF Range: *	**RTD # 9 DESCRIPTION RTD # 9** Range: ***	**RTD # 9 ALARM LEVEL: OFF** Range: **	**RTD # 9 TRIP LEVEL: OFF** Range: **
RTD # 10 TYPE : OFF Range: *	**RTD # 10 DESCRIPTION RTD # 10** Range: ***	**RTD # 10 ALARM LEVEL: OFF** Range: **	**RTD # 10 TRIP LEVEL: OFF** Range: **
RTD # 11 TYPE : OFF Range: *	**RTD # 11 DESCRIPTION RTD # 11** Range: ***	**RTD # 11 ALARM LEVEL: OFF** Range: **	**RTD # 11 TRIP LEVEL: OFF** Range: **
RTD # 12 TYPE : OFF Range: *	**RTD # 12 DESCRIPTION RTD # 12** Range: ***	**RTD # 12 ALARM LEVEL: OFF** Range: **	**RTD # 12 TRIP LEVEL: OFF** Range: **

SP.10 Set Password (Setpoint Page 10)
(Security Level 3)

The soft starter has three levels of user programmable setpoint screens. Level one setpoints do not require a password because the data contained in level one is basic nameplate data and starter control. Level two setpoint screens require a three-digit password to configure the protection schemes. Level three setpoint screens require a four-digit password to access the full range of protection and starter schemes.



SP10.1 Set Level 2 Password: This level uses a 3-digit password. The default level 2 password is 100.

SP10.2 Set Level 3 Password: Level three uses a 4-digit password. The default level 3 password is 1000.

SP.11 Communications (Setpoint Page 11)
(Security Level 3)

SP11.1 Set Front Baud Rate: Configures the RS232 communications baud rate.

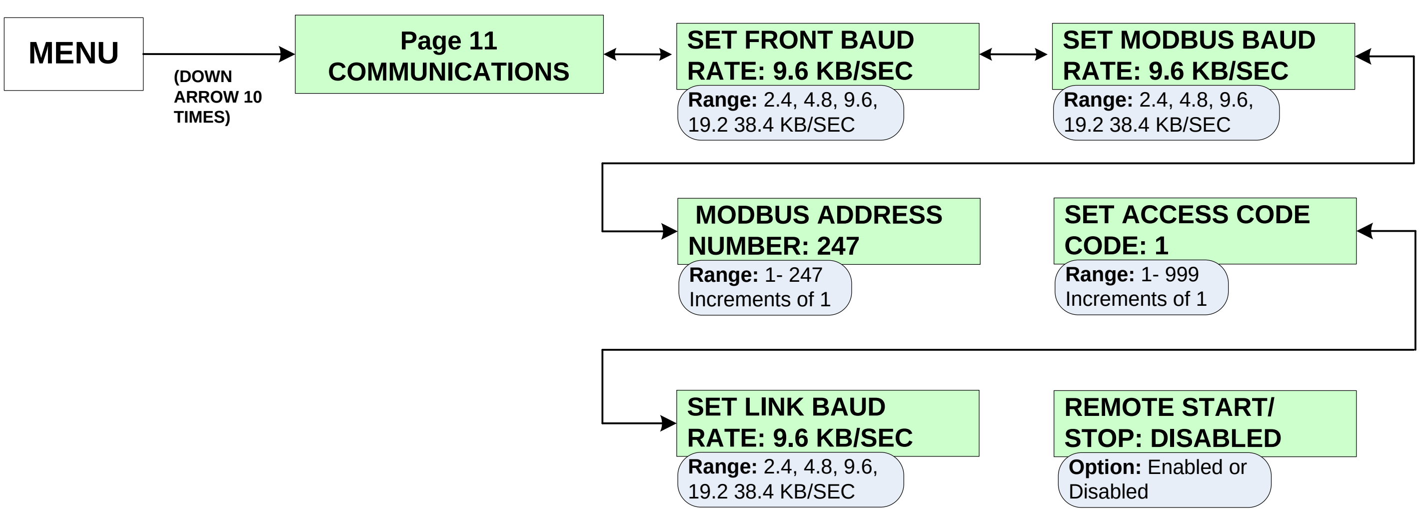
SP11.2 Set Modbus Baud Rate: Configures the Modbus communications baud rate

SP11.3 Modbus Address Number: Assigns a Modbus address to the unit.

SP11.4 Set Access Code: Assigns an access code to the Modbus addressing. This is typically not used

SP11.5 Set Link Baud Rate: Configures the RS422 communications baud rate between the keypad operator and the CPU board (For applications with remote keypad only).

SP11.6 Remote Start/Stop: Allows the RS485 Modbus communications to start and stop the motor. Contact factory for details.



SP.12 System Setpoints (Setpoint Page 12)
(Security Level 3)

SP12.1 Default Display Screen: This Setpoint group allows the user to choose the default screen the Soft Starter displays while the motor is running. Select the metering page number (1-3), then, select the metering screen number. The range varies depending on the selected page. To display a default screen, program the following two Setpoints:

- **Metering Data Page#**: Range is Page 1 - 3.

- **Metering Data Screen#**: If Page 1 is selected as the default page, then Screens 1- 10 are available. If Page 2 Screens 1-29 are available. If Page 3 is selected then Screens 1-6 are available. (See Metering Menu, MP.1, for screen number assignment.)

SP12.2 Alarms: Configures the RTD failure alarm (when RTD option is included) and the thermal register alarm.

- **RTD Failure Alarm:** If enabled, and an RTD shorts or open, an alarm occurs. (Only if RTD option is installed).

- **Thermal Register Alarm:** Sets a level in the thermal register to generate an alarm when the Thermal Register Capacity Used has exceeded this level.

- **Thermal Alarm Delay:** The amount of time that the Thermal Register Used must exceed the Setpoint before an alarm condition will occur.

SP12.3 Thermal Register Setup Information: This Setpoint group will configure the thermal register and indicate to the soft starter which inputs to use when thermal modeling.

- **Cold Stall Time:** Enter the time from the motor manufacturer's specification sheet or use the time defined by the OL Class. This Setpoint is used to define the thermal capacity of the motor.

- **Hot Stall Time:** Enter the amount of time specified by the motor manufacturer or use half of the time defined by the OL Class.
- **Stopped Cool Down Time**: The time the motor needs to cool down after it has stopped. Use only the data provided by the motor manufacturer. This Setpoint is used to configure the cooling rate of the thermal register.

- **Running Cool Down Time:** The amount of time the motor needs to cool down while running. Use only the data provided by the motor manufacturer.

- **Relay Measured Cool Rates:** When the RTD option is supplied, the Soft Starter can be configured to use the measured cooling rates from the RTDs instead of the programmed settings. This Setpoint should only be enabled when the RTD option is present.

- **Thermal Register Minimum:** Sets the value in the thermal register which represents a motor running at the nameplate current (with no overheating or negative sequence currents present).

- **Motor Design Ambient Temperature:** Use the data from the motor manufacturer's specifications. When RTD option is supplied, this Setpoint will be the base point for the RTD biasing of the Thermal Register.

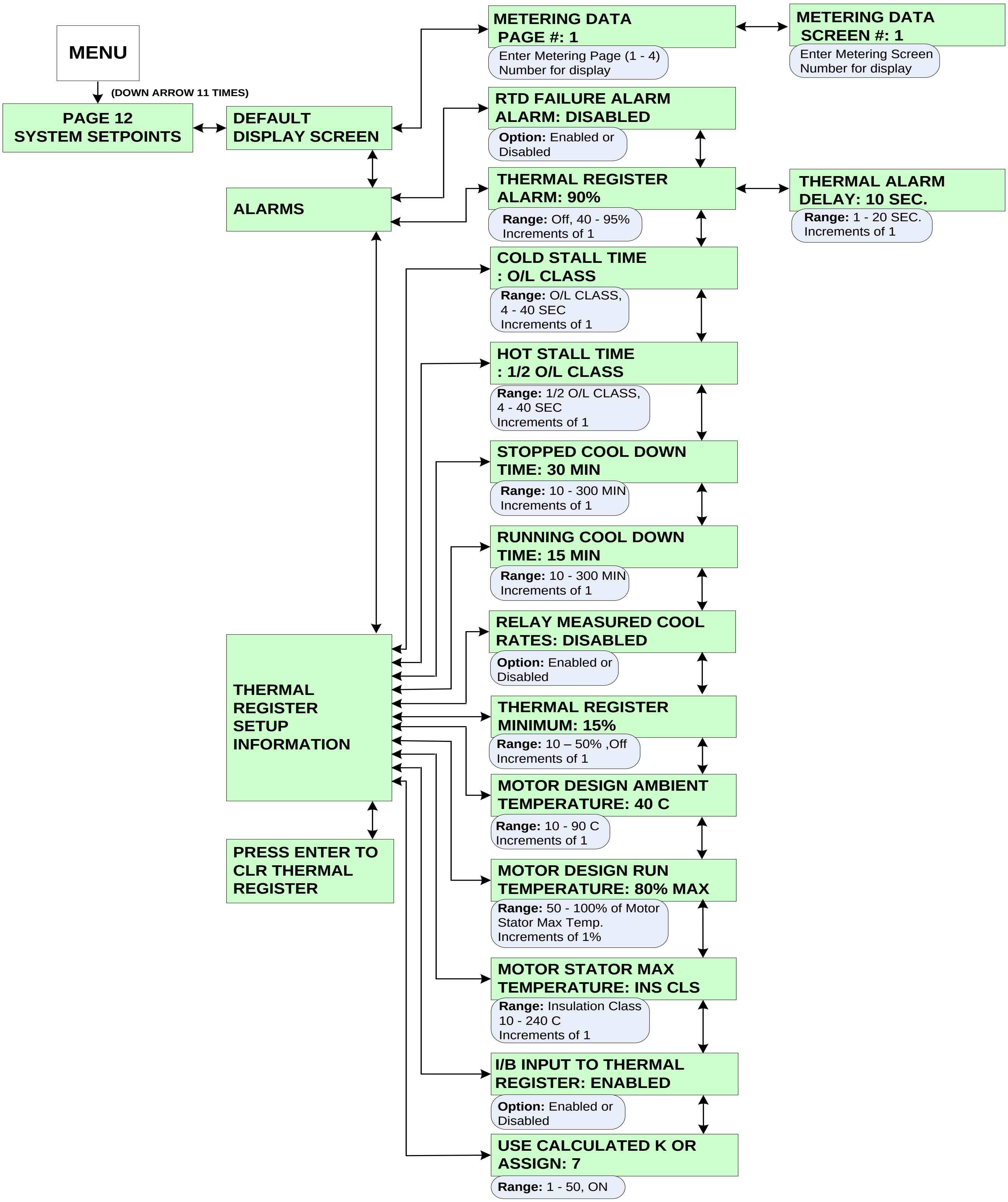
- **Motor Design Run Temperature:** Use the data from the motor manufacturer's specifications. This Setpoint defines the operating temperature rise of the motor at full load amps or 100% load.

- **Motor Stator Max Temperature:** This represents the maximum temperature the stator insulation will withstand. The user may choose to use the temperature setting of the insulation class (selected in Setpoint Page 1) or enter a specific maximum temperature. This value should not exceed the stator's insulation temperature. This maximum temperature represents 100% thermal capacity.

- **U/B Input to Thermal Register:** Always enabled. It allows the soft starter to use the line current imbalance information to bias the Thermal Register.

- **User Calculated K or Assign:** When the Setpoint is set to ON, the soft starter will calculate the k constant factor for biasing the thermal register, or the user may choose to assign the k value.

- **SP12.4 Press Enter to CLR Thermal Register:** Allows the level three password user to clear the thermal register for emergency restarts.



SP.13 Calibration & Service (Setpoint Page 13)

(Security Level 3)

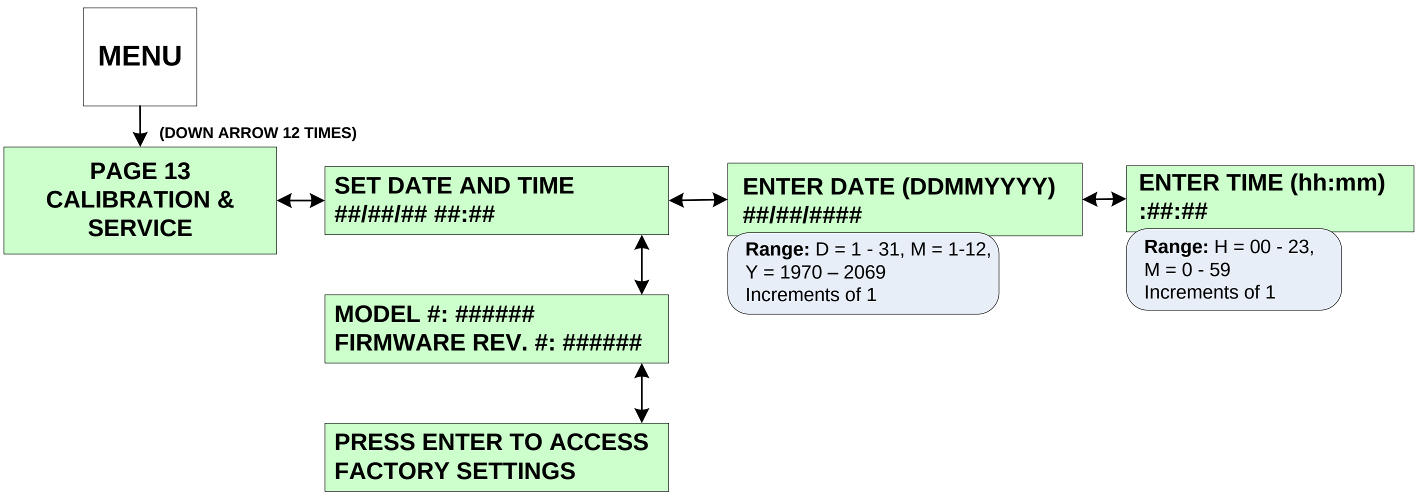
Certain screens are displayed for user information only, such as Current date and time, Model number and Firmware revision number. *Setpoint changes in this page will only be accessible to factory personnel*.

SP13.1 Set Date and Time: Displays the date and time.

- **Enter Date (DDMMYYYY)**: Allows the factory personnel to program the date for the soft starter in the format shown.
- **Enter Time (HH:MM)**: Allows the factory personnel to program the time for the soft starter.

SP13.2 Model & Firmware #: Displays the model number and firmware revision in the soft starter.

SP13.3 Press Enter to Access Factory Settings: Available to qualified personnel.



Chapter 6 - Metering Pages

The Soft Starter offers performance metering which gives the user the ability to view information about the motor and the unit.

6.1 Metering Page List

The following charts list each Metering Page and the functions within that page. The applicable section of the manual is also referenced.

6.1.1 Metering Menu & Data (Metering Page 1)

PAGE 1 Metering Menu & Data	Phase A, B, C and Ground Fault (Option)	1
	Average current of the % of imbalance and the motor's RPM (Tach Option)	2
	Motor load as a percentage of motor FLA	3
	Line frequency and present phase sequence	4
	Percentage of remaining Thermal Register	5
	Thermal capacity required to start the motor	6
	Average time required to start	7
	Average current during start	8
	Measured I2T required to start the motor	9
	Amount of time required to start the motor during the last successful start	10

6.1.2 Metering (Metering Page 2)

PAGE 2 Metering	Phase A, B, C currents and Power Factor	1
	Phase A, B, C currents and Ground Fault (Option)	2
	Displays KW and KVA	3
	Displays KVAR and Power Factor	4
	Displays Peak ON and KW Demand	5
	Displays Peak ON and KVA Demand	6
	Displays Peak ON and KVAR Demand	7
	Displays Peak ON and Amps Demand	8
	Clears Demand values	9
	Displays Megawatt hours used	10
	Press enter to clear statistics on MWH values	11

6.1.3 RTD Option Values (Metering Page 3)

PAGE 3 RTD Values	Hottest stator RTD (#1 - 6)	1
	Hottest non-stator RTD (#7 - 12)	2
	Temperature of start phase A1 in °C and °F	3
	Maximum temperature for RTD #1	4
	Same as Screens 3 - 4 for RTDs #2 - 12	5 - 26
	Clear the maximum temperature register (Level 3 password required)	27
	Measured running thermal stabilization time of motor (in minutes)	28
	Measured stopped cooling time (to ambient) of motor (in minutes)	29

6.1.4 Status (Metering Page 4)

PAGE 4 Status	Current status	1
	Amount of time remaining before an overload trip occurs	2
	Amount of time remaining from a thermal inhibit signal	3
	Coast down time remaining	4
	Amount of time remaining before a start command can be given	5
	Excessive number of starts per hour	6

6.1.5 Event Recorder (Metering Page 5)

PAGE 5 Event Recorder	Displays the event with date and time (Up to 60 events)	1
	Displays Phase A, B, C current values, Ground Fault (Option) at time of trip	1A
	Displays Vab, Vbc, Vca and Power Factor at time of trip	1B

6.1.6 Last Trip (Metering Page 6)

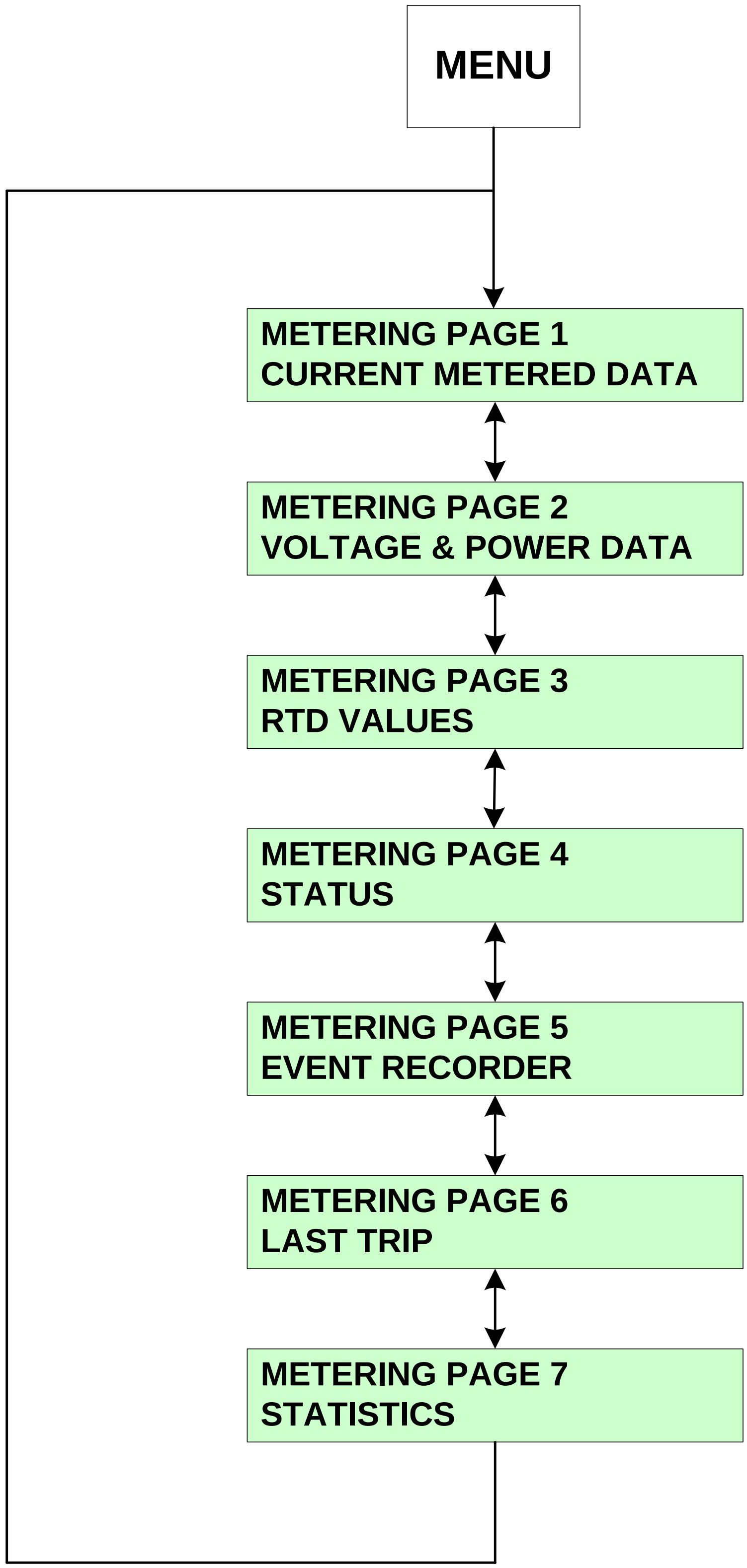
PAGE 6 Last Trip	Cause of last trip	1
	Measured phase current	2
	Measured voltage and power factor	3
	Imbalance percentage, the frequency and the kW	4
	Hottest stator RTD temperature	5
	Hottest non-stator RTD temperature	6

6.1.7 Statistics (Metering Page 7)

PAGE 7 Statistics	Total Megawatt Hours	1
	Accumulated Total Running Hours	2
	Clear the Total Running Hour Count	3
	Total Number of Trips / Number of Short CircuitTrips	4
	Number of Start and Run Overload Trips since the last statistical data clearing	5
	Number of frequency and Current Imbalance trips	6
	Number of Over Current Trips	7
	Stator and Non-Stator RTD Trips	8
	Ground Fault Hiset and Loset Trips	9
	Acceleration Time Trips	10
	Start Curve Trips	11
	I^2T Start Curve Trips	12
	Learned Start Curve Trips	13
	Shunt Trip Trips	14
	Phase Loss Trips	15
	Tach Acceleration Trips	16
	Undervoltage and Overvoltage Trips	17
	Power Factor Trips	18
	Phase Reversal Trips	19
	Low Control Voltage Trips	20
	Ext Inp #1 Trips	21
	Ext Inp #2 Trips	22
	Ext Inp #3 Trips	23
	Ext Inp #4 Trips	24
	Press ENTER to Clear Statistics	25

6.2 Metering Menu and Explanation

Push MENU key to toggle the screens between Setpoint Menu and Metering Menu and follow the arrow keys to get to different screens.



MP.1 Metering (Metering Page 1)

Displays basic current metering data.

MENU

METERING PAGE 1
CURRENT METERED DATA

IA: ###### IB: ######
IC: ###### G/F: #####

Screen 1: Phase A, B, C and ground fault (option) current.

I (AVG): ####
I/B: ## % RPM: ####

Screen 2: Displays the average current, the percent of imbalance and the motor's RPM (available with tachometer input)

MOTOR LOAD % OF FLA
FLA: ### %

Screen 3: Displays the motor load in percent of motor FLA.

LINE FREQUENCY:: ##.##
PHASE ORDER: ###

Screen 4: Displays the line frequency and the present Phase Order.

THERMAL REGISTER
REMAINING: ### %

Screen 5: Displays the percent of the remaining thermal register. In order for the motor to successfully start, the percentage must be greater than the thermal capacity required for a successful start.

THERMAL CAPACITY
TO START: ### %

Screen 6: Displays the thermal capacity required to successfully start the motor.

AVERAGE START TIME
TIME: ##.# SECS

Screen 7: Displays the average time required to start.

AVG START CURENT
: ###### AMPS

Screen 8: Displays the average current during start.

I*I*T TO START
I*I*T: #######

Screen 9: Displays the measured I2T required to start the motor.

LAST START
TIME: ##.# SEC

Screen 10: Displays the amount of time required to start the motor during the last successful start.

MP.2 Metering (Metering Page 2)

Displays the soft starter statistical voltage metering information

MENU

↓

Display	Description
METERING PAGE 2 **VOLTAGE & POWER DATA**	
Vab: ### Vbc: ### **Vca: ### P/F: ## #.##**	**Screen 1:** Displays Phase A, B, C and Power Factor. **Note:** P/F: N/A Motor stopped P/F: LG #.## (Lagging) P/F: LD #.## (Leading)
IA: ##### IB: ##### **IC: ##### G/F:###.#**	**Screen 2:** Displays Phase A, B, C and Ground Fault Current.
kW: ##### **kVA: #####**	**Screen 3:** Displays kW and kVA.
kVAR: ##### **P/F: ## #.##**	**Screen 4:** Displays kVAR and Power Factor.
PEAK ON: ##/## ##:## **kW: #####**	**Screen 5:** Displays Peak On and kW demand.
PEAK ON: ##/## ##:## **kVA: #####**	**Screen 6:** Displays Peak On and kVA demand.
PEAK ON: ##/## ##:## **kVAR: #####**	**Screen 7:** Displays Peak On and kVAR demand.
PEAK ON: ##/## ##:## **AMPS: #####**	**Screen 8:** Displays the average current during start.
PRESS ENTER TO CLEAR **DEMAND VALUES**	**Screen 9:** Clears Demand Values.
MWH USED **: #####**	**Screen 10:** Displays the Megawatt hours used.
PRESS ENTER TO CLEAR **MWH VALUES**	**Screen 11:** Press Enter to clear statistics on MWH values.

MP.3 Metering (Metering Page 3)

Displays the RTD information (When RTD option is installed)

MENU → (DOWN ARROW 2 TIMES) → METERING PAGE 3 RTD VALUES → Screen 1

Screen 1	HOTTEST STATOR RTD#: # @ ### C		
Screen 2	HOTTEST NON-STATOR RTD#: # @ ### C		
Screen 3	STATOR PHASE A1 RTD #1: ### C = ### F	Screen 4	MAX TEMP SINCE CLEAR RTD #1: ### C
Screen 5	STATOR PHASE A2 RTD #2: ### C = ### F	Screen 6	MAX TEMP SINCE CLEAR RTD #2: ### C
Screen 7	STATOR PHASE B1 RTD #3: ### C = ### F	Screen 8	MAX TEMP SINCE CLEAR RTD #3: ### C
Screen 9	STATOR PHASE B2 RTD #4: ### C = ### F	Screen 10	MAX TEMP SINCE CLEAR RTD #4: ### C
Screen 11	STATOR PHASE C1 RTD #5: ### C = ### F	Screen 12	MAX TEMP SINCE CLEAR RTD #5: ### C
Screen 13	STATOR PHASE C2 RTD #6: ### C = ### F	Screen 14	MAX TEMP SINCE CLEAR RTD #6: ### C
Screen 15	END BEARING RTD #7: ### C = ### F	Screen 16	MAX TEMP SINCE CLEAR RTD #7: ### C
Screen 17	SHAFT BEARING RTD #8: ### C = ### F	Screen 18	MAX TEMP SINCE CLEAR RTD #8: ### C
Screen 19	RTD #9 RTD #9: ### C = ### F	Screen 20	MAX TEMP SINCE CLEAR RTD #9: ### C
Screen 21	RTD #10 RTD #10: ### C = ### F	Screen 22	MAX TEMP SINCE CLEAR RTD #10: ### C
Screen 23	RTD #11 RTD #11: ### C = ### F	Screen 24	MAX TEMP SINCE CLEAR RTD #11: ### C
Screen 25	RTD #12 RTD #12: ### C = ### F	Screen 26	MAX TEMP SINCE CLEAR RTD #12: ### C
Screen 27	PRESS ENTER TO CLEAR MAX TEMP REGS		
Screen 28	MEASURED RUN COOL TIME: ### MIN		
Screen 29	MEASURED STOPPED COOL TIME: ### MIN		

Screen 1: Displays the hottest stator RTD (#1 – 6 depending upon number of RTDs used for stator).

Screen 2: Displays the hottest non-stator RTD (#7-12 if #1-6 is used for stator).

Screen 3: Displays the temperature of stator phase A1 in °C and °F.

Screen 4: Displays the maximum temperature for RTD #1 since the last command to clear the thermal register.

Screen 5 - 26: Same as Screens 3 - 4 for RTDs # 2 - 12.

Screen 27: Allows the user to clear the maximum temperature register upon entering the setpoint level 3 password.

Screen 28: Displays the measured run cool time in minutes.

Screen 29: Displays the measured stopped cool time in minutes.

MP.4 Metering (Metering Page 4)

Displays the present status of the soft start

***Screen 1:** Displays the present state of the unit as follows:

Screen 2: Displays the amount of time remaining before an overload trip will occur.

Screen 3: Displays the amount of time remaining from a thermal inhibit. The inhibit time comes from the amount of thermal register remaining versus the amount of thermal capacity required to start.

Screen 4: Displays the coast down time remaining (Backspin time). The time remaining depends upon the user setting in Setpoint Page 8, Coast Down Time.

Screen 5: Displays the amount of time remaining before a start command can be given. The time remaining depends upon the setting in Setpoint page 5.

Screen 6: If the number of starts per hour has exceeded the setting in Setpoint page 8.

**** NOTE: Screen 1 CURRENT STATUS Screens include:***

MOTOR STOPPED
READY TO START

MOTOR STARTING
MULT. OF FLA

MOTOR RUNNING
AT ###.## X FLA

LAST TRIP CAUSE
NONE (or trip cause)

PROGRAMMING
SETPOINTS

MOTOR STATUS
UNKNOWN STATE ### **(Displays relay state upon error)**

MENU

METERING PAGE 4
STATUS

Screen 1

***(CURRENT STATUS)**

Screen 2

O/L TIME LEFT TO TRIP
TRIP: ###### SEC

Screen 3

THERM INH TIME LEFT
: #### MIN

Screen 4

COAST DOWN TIMER
TIME LEFT: #:## MIN

Screen 5

TIME BETWEEN STARTS
TIME: #:## MIN

Screen 6

STARTS PER HOUR TIME
##

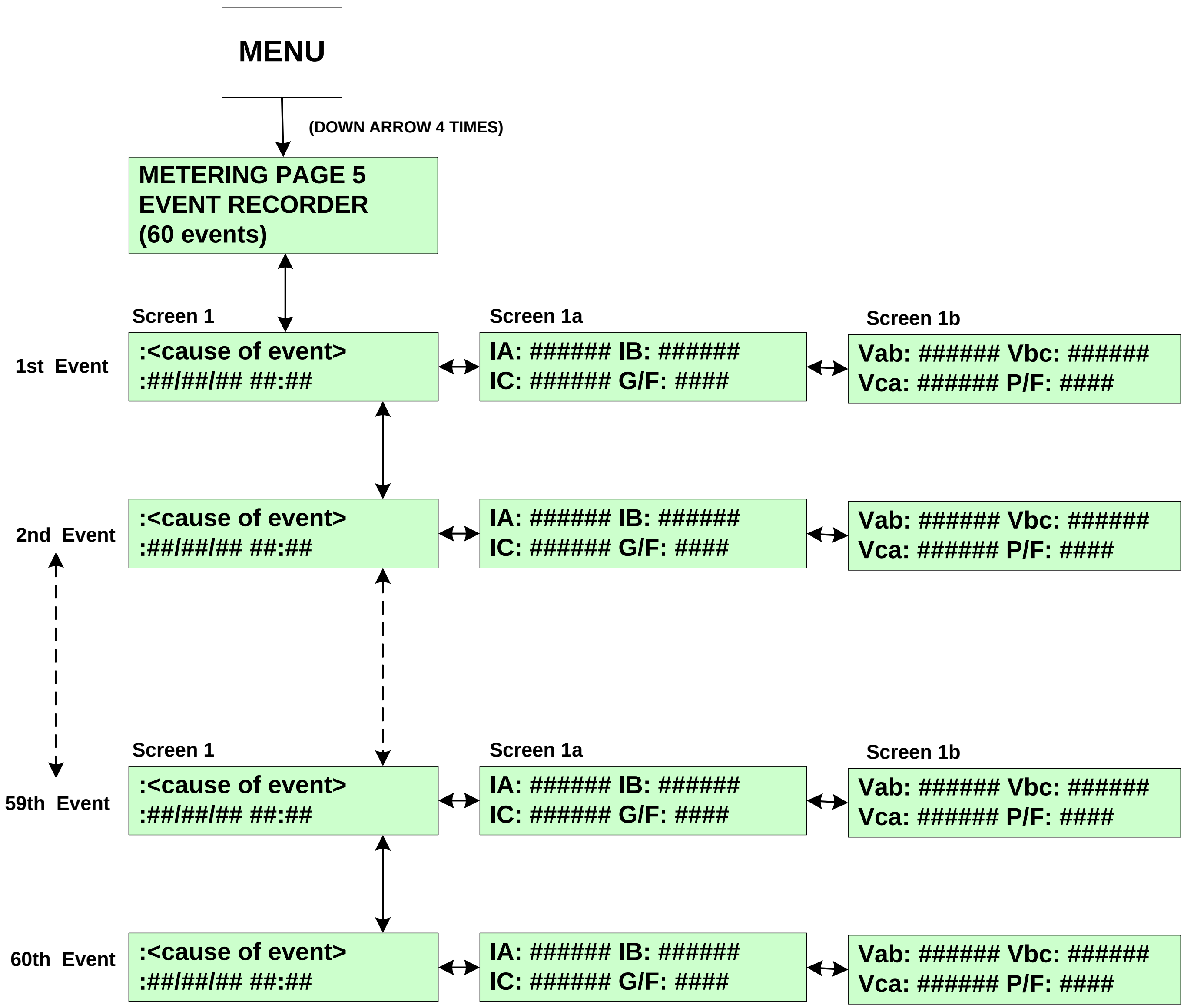
MP.5 Metering (Metering Page 5)

Displays the present status of the soft start

Screen 1: Displays the event (i.e., Imbalance Trip) with the date and time it occurred.

Screen 1a: Displays the current at Phase A, B, C and the ground fault at the time of the event. (***Note:*** *Ground fault option must be present)*

Screen 1b: Displays the Vab, Vbc, Vca and power factor at the time of event.



All events will be viewed from oldest event in buffer to most recent event.

NOTES-

MP.6 Metering (Metering Page 6)

Displays the last trip information

Screen 1: Displays the cause of the last trip.

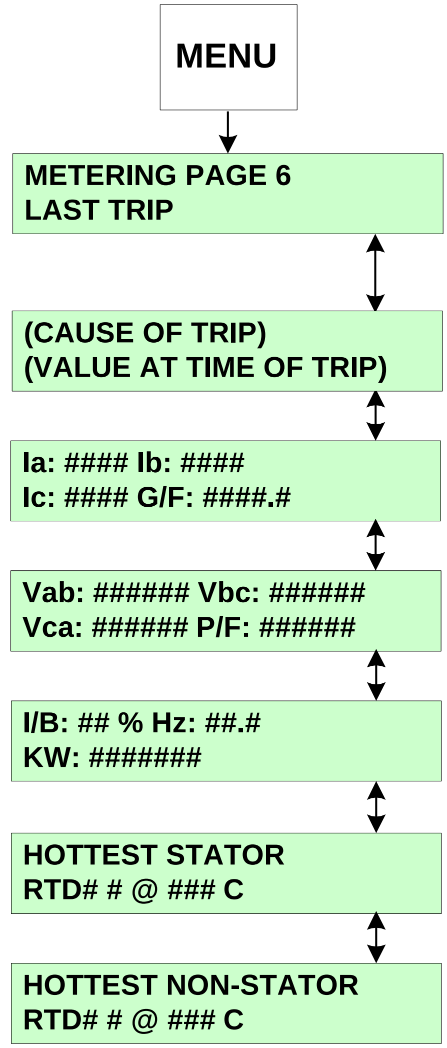
Screen 2: Displays the measured phase current at the time of the trip.

Screen 3: Displays the Vab, Vbc, Vca and power factor at the time of trip.

Screen 4: Displays the imbalance percentage, the frequency and the kW at the time of the trip.

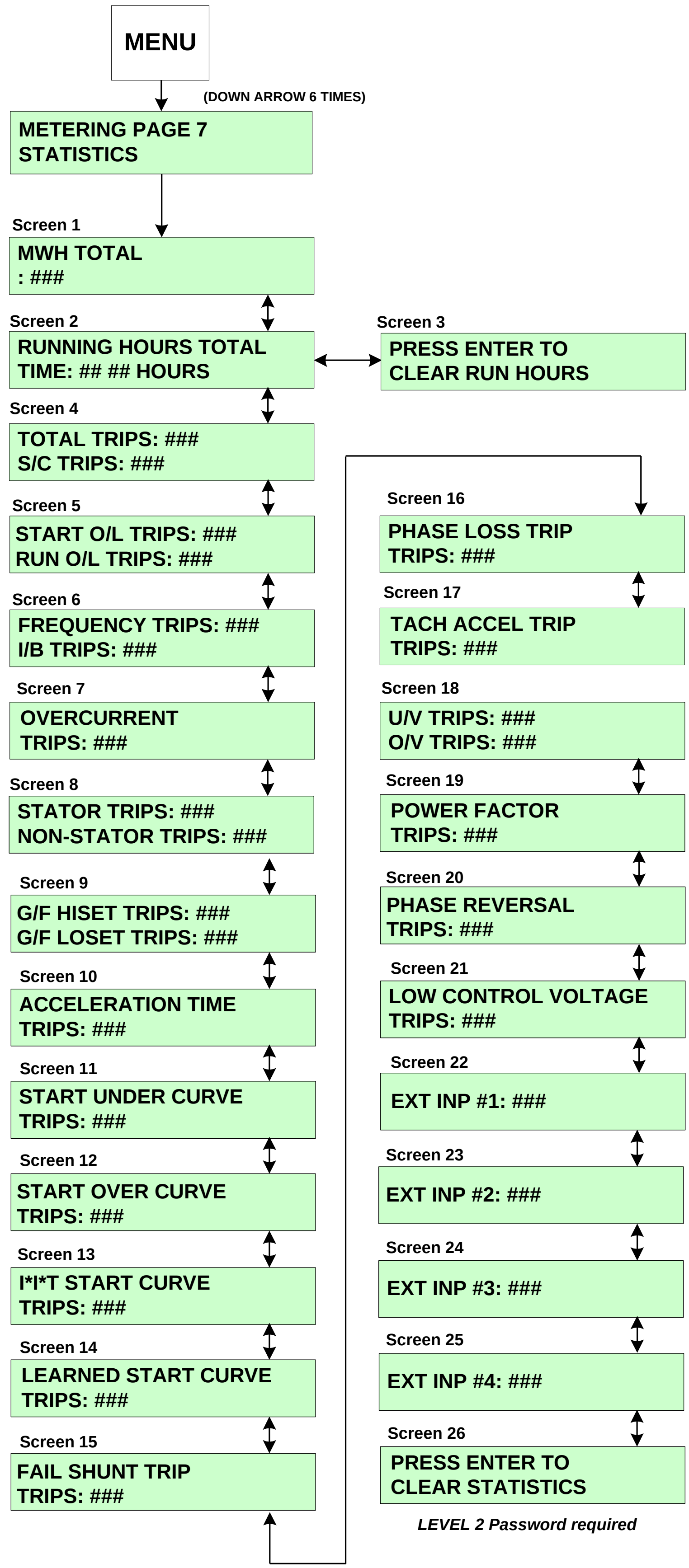
Screen 5: Displays the hottest stator RTD temperature (when RTD option present) at time of the trip.

Screen 6: Displays the hottest non-stator RTD temperature (when RTD option present) at the time of the trip.



MP.7 Statistics (Metering Page 7)

Displays the statistical trip information



Screen 1: Displays the total of megawatt hours.
Screen 2: Displays the accumulated total running hours.
Screen 3: Clears the total running hour count.
Screen 4: Displays the total number of trips since the last clearing of the statistical data and the total number of short circuit trips.
Screen 5: Displays the number of start overload and run overload trips since the last clearing of the statistical data.
Screen 6: Displays the number of frequency trips and Imbalance trips.
Screen 7: Displays the number of overcurrent trips
Screen 8: Displays the number of Stator and non-Stator RTD Trips
Screen 9: Displays the number of Ground Fault Hi and Lo Set trips
Screen 10: Displays the number of acceleration time trips.
Screen 11: Displays the number of start under curve trips
Screen 12: Displays the number start over curve trips
Screen 13: Displays the number of I2T start curve trips
Screen 14: Displays the number of learned start curve trips.
Screen 15: Displays the number of fail shunt trips.
Screen 16: Displays the number of phase loss trips.
Screen 17: Displays the number of tachometer acceleration trips.
Screen 18: Displays the number of undervoltage and overvoltage trips.
Screen 19: Displays the number of power factor trips.
Screen 20: Displays the number of phase reversal trips.
Screen 21: Displays the number of low control voltage trips.
Screen 22: Displays the number of external input #1 trips.
Screen 23: Displays the number of external input #2 trips.
Screen 24: Displays the number of external input #3 trips.
Screen 25: Displays the number of external input #4 trips.
Screen 26: Requires a Security Level 2 password to clear the statistics.

Chapter 7 - Maintenance and Troubleshooting

The Soft Starter is designed to be a maintenance-free product. However, as with all electronic equipment, the unit should be checked periodically for build-up of dirt, moisture or industrial contaminants. These can cause high voltage arc-over, carbon tracking or prevent proper cooling of the SCR heat sinks. All bolts should be checked annually for proper tightness using an accurate torque wrench. According to the manufacturer's manual, check the contactor for air gap spacing of the vacuum bottles.

Note: *If the unit is installed in a contaminated environment and forced air cooling is used, blower filters must be checked and cleaned regularly to insure proper air flow and cooling of the enclosure.*

7.1 Failure Analysis

When a fault occurs, the LCD will display the fault error while the listed LED and AUX Relay will be lit. Please clear all faults before attempting to restart the unit.

Note: *If the problem persists after the required programming changes have been made, and all corrective action has been taken, please contact the factory for assistance.*

Problem	CPU LCD Display	LED	AUX Relay	Possible Cause	Solutions
One of the main fuses blows or circuit breaker opens when the power is applied or disconnect is closed.	**TCB FAULT TRIP**	Trip	AUX1	Short circuit between the inputs	Locate and remove short
				Faulty SCRs	Remove power and test SCR(s). Refer to Section 7.1.1 for the SCR testing procedure
				Emergency Stop Activated	Check Emergency Stop Normally Closed Input. TB2: Terminal 9 & 10
Short Circuit Trip	**SHORT CIRCUIT TRIP**	Trip	AUX1	Short circuit or ground fault in motor/cabling	Locate and remove short or ground
				Phase Loss	Repair cause of phase loss
				Branch circuit protection not correctly sized	Verify correct sizing of branch circuit protection
				Faulty main circuit board	Remove power and replace main circuit board.
				Faulty SCRs	Remove power and test SCR(s). Refer to Section 7.1.1 for the SCR testing procedure
Single Phase Trip	**SINGLE PHASE TRIP** **(Check LCD display for possible fault indicators)**	Trip	AUX1	Single phase incoming power	Correct problem with incoming power
				Faulty SCRs	Remove power and test SCR(s). Refer to Section 7.1.1 for the SCR testing procedure
				Environment Temperature over 122° F (ambient temperature for chassis units) or over 104°F (ambient temperature for enclosed version	Place unit in environment temperature less than 122°F for panel version or less than 104°F for enclosed version.
				Bypass failed to close	Check bypass contactor and wiring. The "At Speed" delay is incorrectly programmed. Reprogram back to factory default value.

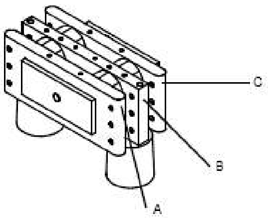
7.1 Failure Analysis - Continued

Problem	CPU LCD Display	LED	AUX Relay	Possible Cause	Solutions
Thermostat trips during run	**EXTERNAL TRIP ON THERMOSTAT**	Trip	AUX1	Fan(s) not functioning (If supplied)	If fans have power, remove power and replace fan(s). If fans do not have power, find cause of power loss and repair.
				Heatsink coated with dirt	Remove power and clean heatsink with high pressure air (80 - 100 psi max clean and dry air).
				Overcurrent on unit	Verify that running current does not exceed unit rating.
				Environment temperature over 122° F (ambient temperature for chassis units) or over 104°F (ambient temperature for enclosed version	Place unit in environment temperature less than 122°F for panel version or less than 104°F for enclosed version.
				Bypass failed to close	Check bypass contactor and wiring.
Phase Loss	**PHASE LOSS**	Trip	AUX1	Loss of 1 or more phases of power from utility or generated power.	Check power source.
				Blown power fuses	Check for short circuits.
Overload	**OVERLOAD TRIP**	Trip	AUX1	Improper programming	Check motor nameplate versus programmed parameters.
				Possible load damage or jammed load	Check motor currents.
Stall prevention	**ACCEL TIME TRIP**	Trip	AUX1	Improper setting for motor load condition	Verify current limit setting.
				Damaged load	Check for load failure.
Under Voltage Trip	**UNDER VOLTAGE TRIP**	Trip	AUX1	Improper programming	Check Setpoint settings.
				Wrong position of disconnect or breaker	Check disconnect or open breaker
				Main contactor failed to close	Check internal connections
				Transformer too small	Reduce current limit setting, saturation or sagging power supply transformer
				Unloaded motor	Check load
Under Current Trip	**UNDER CURRENT TRIP**	Trip	AUX1	Improper programming	Check setpoint settings
				Unloaded motor	Check load
Self-test Failure	**SELF-TEST FAILURE**	Trip	AUX1	Failed CPU or Main Firing Board	Contact factory
				Vibration	Check internal wiring connections
Line Frequency Trip	**OVER OR UNDER FREQUENCY TRIP**	Trip	AUX1	Generator Power Problem or grid change	Troubleshoot and repair generator
					Contact utility company
					Main board failure
					Three phase power removed from Main

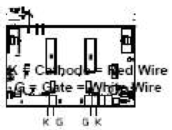
Problem	CPU LCD Display	LED	AUX Relay	Possible Cause	Solutions
Any Ground Fault Trip	**GROUND FAULT HI-SET OR LO-SET**	Trip	AUX1	Improper programming	Check Setpoint settings
				Any wire going to ground (I.e. stator ground, motor ground, soft start ground)	Check with megger or Hi-pot motor leads and motor
				High vibration or loose connections	Check internal connections
Motor Stopped during run	**Check for fault indication**	Trip	AUX1	**WARNING** This is a serious fault condition. Ensure that the fault condition is cleared on the load side before attempting to restart the motor.	
				Load shorted	Remove power and repair.
				Faulty main circuit board	Replace the main circuit board
Control circuit fuses blow after control power is applied.	**None**	None	None	Short in Control Circuit	Remove Power, locate and remove the short.
				Wrong Control Voltage	Apply the correct voltage to the control circuit.
Motor will not start	***Any fault indication message***	Trip	AUX1	No Control Voltage applied to Control Board	Apply control voltage to TCB board.
				Control Power Transformer failure or CPT Fuse failure	Remove power and replace the power transformer or the CPT fuse
				Start Circuit Wired Incorrectly	Remove power and correct the start circuit wiring.
				No Start Command	Apply the start command.
				No 3 Phase Line Voltage	Apply 3 phase line voltage to the unit.
				Shorted SCR in Starter	Remove power and Test SCR(s). Refer to Sec. 7.1.1 for the testing procedure.
				Faulty Control Logic	Remove power and repair the Control Logic.
				Failure of Main Circuit Board	Replace the Main Circuit Board.
Motor vibrates / Motor growls while starting or extremely unbalanced motor currents run mode	**IMBALANCE TRIP**	Trip	AUX1	Faulty Motor	Check the Motor and the Motor connections.
				Faulty SCR(s)	Remove Power and perform the SCR device checks.
				Faulty Gate / Cathode on SCR(s)	Remove Power and Test SCR(s). Refer to Sec. 7.1.1 for the testing procedure.
				Faulty Main Circuit Board.	Replace the Main Circuit Board.
	IMBALANCE ALARM	Alarm	AUX2	Faulty Motor / Wiring	Troubleshoot and repair / replace wiring.
				Faulty Main Circuit Board	Replace the Main Circuit Board.

7.1.1 - SCR Testing Procedure

Perform the SCR Heat Sink Ohm test on each Stack Assembly.



Gate Drive Board



Test Points	OHM Meter Reading	Test Results
From Position A to Position B	Greater than 10K Ohm	Pass
	Less than 5K Ohm	Fail
From Position B to Position C	Greater than 10K Ohm	Pass
	Less than 5K Ohm	Fail
Gate (G) to Cathode (K) for each SCR	8 to 50 Ohms	Pass (Typical 8 to 20 Ohms)
	Less than 8 or greater than 50 Ohms	Fail

Notes

1 - Allow 15 minutes after shutdown for DV/DT network to discharge.

2 - Voltage sharing resistors may need to be disconnected to obtain correct readings for tests between positions A, B & C...

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• 15P0078B1 •

ASAB

ADVANCED SOFT STARTER

INSTALLATION AND PROGRAMMING INSTRUCTIONS

Issued on 21/05/18
R. 06

English

- This manual is integrant and essential to the product. Carefully read the instructions contained herein as they provide important hints for use and maintenance safety.
- This device is to be used only for the purposes it has been designed to. Other uses should be considered improper and dangerous. The manufacturer is not responsible for possible damages caused by improper, erroneous and irrational uses.
- Elettronica Santerno is responsible for the device in its original setting.
- Any changes to the structure or operating cycle of the device must be performed or authorized by the Engineering Department of Elettronica Santerno.
- Elettronica Santerno assumes no responsibility for the consequences resulting from the use of non-original spare parts.
- Elettronica Santerno reserves the right to make any technical changes to this manual and to the device without prior notice. If printing errors or similar are detected, corrections will be included in new releases of the manual.
- The information contained herein is the property of Elettronica Santerno and cannot be reproduced. Elettronica Santerno enforces its rights on the drawings and catalogues according to the law.

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Contents

1 About This Manual

The examples and diagrams in this manual are included solely for illustrative purposes. The information contained in this manual is subject to change at any time and without prior notice. In no event will responsibility or liability be accepted for direct, indirect or consequential damages resulting from the use or application of this equipment.

WARNING
Indicates a hazard that may cause personal injury or death.

CAUTION
Indicates a hazard that may damage the equipment or installation.

NOTE
Provides helpful information.

2 Caution Statements

Caution Statements cannot cover every potential cause of equipment damage but can highlight common causes of damage. It is the installer's responsibility to read and understand all instructions in this manual prior to installing, operating or maintaining the equipment, to follow good electrical practice including applying appropriate personal protective equipment and to seek advice before operating this equipment in a manner other than as described in this manual.

NOTE
The ASAB soft starter is not user serviceable. The unit should only be serviced by authorised service personnel. Unauthorised tampering with the unit will void the product warranty.

2.1 Electrical Shock Risk

The voltages present in the following locations can cause severe electric shock and may be lethal:

- AC supply cables and connections
- Output cables and connections
- Many internal parts of the starter, and external option units

The AC supply must be disconnected from the starter using an approved isolation device before any cover is removed from the starter or before any servicing work is performed.

WARNING - ELECTRICAL SHOCK HAZARD
Models ASAB-0500B~ASAB-1600C: The busbar and heatsink must be treated as live whenever the unit has mains voltage connected (including when the starter is tripped or waiting for a command).

SHORT CIRCUIT
The ASAB is not short circuit proof. After severe overload or short circuit, the operation of the ASAB should be fully tested by an authorised service agent.

GROUNDING AND BRANCH CIRCUIT PROTECTION
It is the responsibility of the user or person installing the ASAB to provide proper grounding and branch circuit protection according to local electrical safety codes.

2.2 System Design and Safety of Personnel

The starter is intended as a component for professional incorporation into complete equipment or a system. If installed incorrectly, the starter may present a safety hazard.

The starter uses high voltages and currents, carries stored electrical energy, and is used to control equipment which can cause injury.

Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction. System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and this guide carefully.

None of the starter functions must be used to ensure safety of personnel, ie they must not be used for safety-related functions.

Careful consideration must be given to the functions of the starter which might result in a hazard, either through their intended behaviour or through incorrect operation due to a fault. In any application where a malfunction of the starter or its control system could lead to or allow damage, loss or injury, a risk analysis must be carried out, and where necessary, further measures taken to reduce the risk.

The system designer is responsible for ensuring that the complete system is safe and designed correctly according to the relevant safety standards.

2.2.1 STOP function

The STOP function does not remove dangerous voltages from the starter, the motor or any external option units.

2.3 Disposal Instructions

Equipment containing electrical components may not be disposed of together with domestic waste.

It must be collected separately as electrical and electronic waste according to local and currently valid legislation.

3 Avertissements à l'attention des clients canadiens

AVERTISSEMENT
L'icône AVERTISSEMENT ci-contre signale les informations concernant des risques pouvant entraîner des blessures graves, voire mortelles. Pour votre sécurité, veuillez consulter les avertissements sur cette page ou demander une copie du présent manuel en français auprès de votre distributeur local.

AVERTISSEMENT – RISQUE DE CHOC ÉLECTRIQUE
Les zones suivantes sont soumises à des tensions pouvant provoquer des risques de chocs électriques graves, voire mortels :

- Raccordement et câbles d'alimentation AC
- Câbles et raccordements de sortie
- De nombreuses pièces internes du démarreur

L'alimentation AC doit être déconnectée du démarreur au moyen d'un dispositif d'isolation agréé avant de retirer des capots ou avant de procéder à des travaux d'entretien.

Modèles ASAB-0500B à ASAB-1600C : Les barres de puissance et le radiateur doivent être traités comme étant des éléments sous tension si l'appareil est relié au secteur (y compris lorsque le démarreur s'est mis en sécurité ou s'il attend une commande).

PAR SÉCURITÉ

- La fonction STOP du démarreur progressif n'isole pas des tensions dangereuses de la sortie du démarreur. Le démarreur progressif doit être déconnecté par un dispositif d'isolement électrique approprié avant d'accéder aux connexions électriques.
- Les fonctions de protection du démarreur progressif ne concernent que la protection du moteur. Il relève de la responsabilité de l'utilisateur d'assurer la sécurité des personnes travaillant sur les machines.
- Le démarreur progressif est un appareil conçu pour s'intégrer dans un système électrique ; il relève donc de la responsabilité du concepteur ou de l'utilisateur de veiller à ce que ce système soit sûr et conçu selon les normes de sécurité locales en vigueur.

AVERTISSEMENT – DÉMARRAGES ACCIDENTELS
Dans certaines installations, des démarrages accidentels peuvent provoquer un risque supplémentaire pour la sécurité des personnes ou endommager les machines contrôlées. Dans de tels cas, il est recommandé de doter l'alimentation du démarreur progressif d'un interrupteur d'isolement et d'un coupe-circuit (par exemple, un disjoncteur) contrôlable à partir d'un système de sécurité externe (par exemple, un arrêt d'urgence, un détecteur de défaut).

AVERTISSEMENT – LE DÉMARREUR PEUT DÉMARRER OU S'ARRÊTER À TOUT MOMENT
Le démarreur progressif répond aux commandes de contrôle de différentes origines et peut par conséquent démarrer ou s'arrêter à tout moment. Toujours déconnecter le démarreur de la tension secteur avant d'accéder au démarreur ou à la charge.

AVERTISSEMENT
Le bouton STOP (ARRÊT) du clavier est toujours actif. Lors de l'utilisation d'une commande à distance 2 fils, le démarreur progressif redémarrera si les entrées de démarrage/arrêt et de reset sont toujours actives.

AVERTISSEMENT – DÉCONNECTER L'ALIMENTATION PRINCIPALE AVANT D'ACCÉDER AU DÉMARREUR OU À LA CHARGE
Le démarreur progressif comporte des protections intégrées qui peuvent déclencher des mises en sécurité dans l'éventualité de défauts et ainsi arrêter le moteur. Des fluctuations de tension, des coupures d'alimentation et des blocages du moteur peuvent produire des mises en sécurité de celui-ci.

Le moteur pourrait redémarrer une fois que les causes de l'arrêt ont été résolues, ce qui pourrait mettre en danger le personnel. Toujours déconnecter le démarreur de la tension secteur avant d'accéder au démarreur ou à la charge.

AVERTISSEMENT
Ne pas appliquer la tension du secteur au démarreur tant que tout le câblage n'est pas terminé.

AVERTISSEMENT
Toujours appliquer la tension de commande avant (ou en même temps que) la tension secteur.

AVERTISSEMENT
Lors du raccordement de l'ASAB en connexion 6 fils, toujours installer un contacteur principal ou un disjoncteur magnéto-thermique à bobine de déclenchement.

4 Introduction

The ASAB is an advanced digital soft start solution for motors from 11 kW to 850 kW. ASAB soft starters provide a complete range of motor and system protection features and have been designed for reliable performance in the most demanding installation situations.

4.1 Feature List

Extensive starting and stopping options

- Adaptive Control
- Constant Current
- Current Ramp
- Timed voltage ramp soft stop
- Brake

Models for all connection requirements

- 23 A to 1600 A (nominal)
- 200 VAC to 525 VAC
- 380 VAC to 690 VAC
- Internally bypassed options
- In-line or inside delta connection (auto-detect)

Inputs and outputs

- Remote control inputs
  (3 x fixed, 1 x programmable)
- Relay outputs
  (3 x programmable)
- Analog output
- Communication modules: Ethernet (Profinet, Modbus TCP, Ethernet/IP), Profibus, DeviceNet, Modbus RTU, and USB

Easy-to-read display with comprehensive feedback

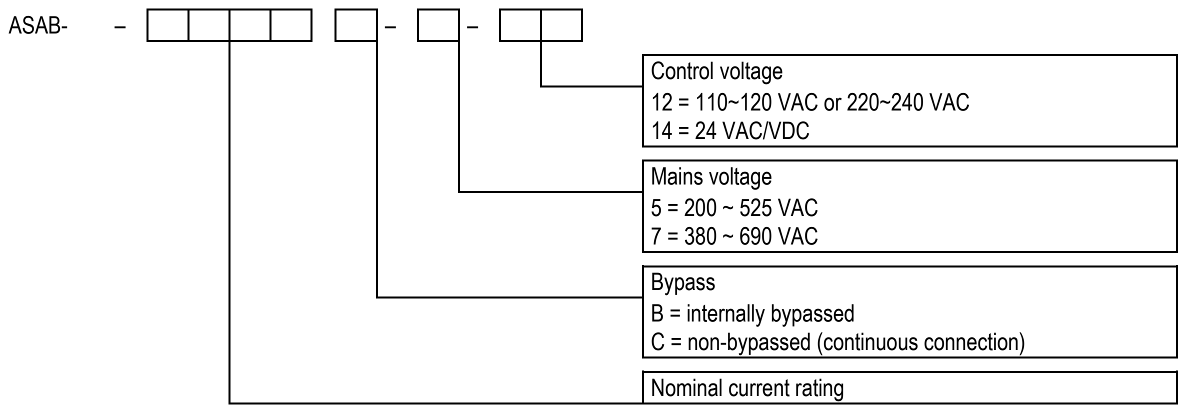
- Multi-language feedback
- Multiple status screens and performance graphs
- Date and time stamped event logging
- Operational counters (number of starts, hours-run, kWh)
- Performance monitoring (current, voltage, power factor, kWh)
- User-programmable monitoring screen

Customisable protection

- Motor overload
- Excess Start Time
- Undercurrent
- Instantaneous overcurrent
- Current imbalance
- Mains frequency
- Input Trip
- Motor thermistor
- Power circuit
- Phase sequence

4.2 Specifications

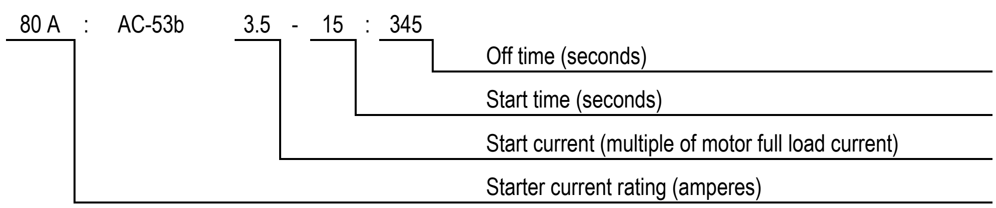
4.2.1 Model Code



4.2.2 Current Ratings

Contact your local supplier for ratings under operating conditions not covered by these ratings charts.

Current Ratings for Bypass Operation



NOTE
Models ASAB-0255C~ASAB-1600C must be externally bypassed.

In-line connection

	AC53b 3.0-10:350 40 ºC <1000 metres	AC53b 3.5-15:345 40 ºC <1000 metres	AC53b 4.0-20:340 40 ºC <1000 metres	AC53b 4.5-30:330 40 ºC <1000 metres
ASAB-0023B	23 A	20 A	17 A	15 A
ASAB-0043B	43 A	37 A	31 A	26 A
ASAB-0053B	53 A	53 A	46 A	37 A
	AC53b 3.0-10:590 40 ºC <1000 metres	**AC53b 3.5-15:585 40 ºC <1000 metres**	**AC53b 4.0-20:580 40 ºC <1000 metres**	**AC53b 4.5-30:570 40 ºC <1000 metres**
ASAB-0076B	76 A	64 A	55 A	47 A
ASAB-0097B	97 A	82 A	69 A	58 A
ASAB-0100B	100 A	88 A	74 A	61 A
ASAB-0105B	105 A	105 A	95 A	78 A
ASAB-0145B	145 A	123 A	106 A	90 A
ASAB-0170B	170 A	145 A	121 A	97 A
ASAB-0200B	200 A	189 A	160 A	134 A
ASAB-0220B	220 A	210 A	178 A	148 A
ASAB-0255B	255 A	231 A	201 A	176 A
ASAB-0255C	255 A	231 A	201 A	176 A
ASAB-0350B	350 A	329 A	284 A	244 A
ASAB-0380C	380 A	380 A	359 A	299 A
ASAB-0425B	425 A	411 A	355 A	305 A
ASAB-0430C	430 A	430 A	368 A	309 A
ASAB-0500B	500 A	445 A	383 A	326 A
ASAB-0580B	580 A	492 A	425 A	364 A
ASAB-0620C	620 A	620 A	540 A	438 A
ASAB-0650C	650 A	650 A	561 A	455 A
ASAB-0700B	700 A	592 A	512 A	438 A
ASAB-0790C	790 A	790 A	714 A	579 A
ASAB-0820B	820 A	705 A	606 A	516 A
ASAB-0920B	920 A	804 A	684 A	571 A
ASAB-0930C	930 A	930 A	829 A	661 A
ASAB-1000B	1000 A	936 A	796 A	664 A
ASAB-1200C	1200 A	1200 A	1200 A	1071 A
ASAB-1410C	1410 A	1410 A	1319 A	1114 A
ASAB-1600C	1600 A	1600 A	1600 A	1353 A

Inside delta connection

	AC53b 3.0-10:350 40 ºC <1000 metres	AC53b 3.5-15:345 40 ºC <1000 metres	AC53b 4.0-20:340 40 ºC <1000 metres	AC53b 4.5-30:330 40 ºC <1000 metres
ASAB-0023B	34 A	30 A	26 A	22 A
ASAB-0043B	64 A	59 A	51 A	44 A
ASAB-0053B	80 A	80 A	69 A	55 A
	AC53b 3.0-10:590 40 ºC <1000 metres	**AC53b 3.5-15:585 40 ºC <1000 metres**	**AC53b 4.0-20:580 40 ºC <1000 metres**	**AC53b 4.5-30:570 40 ºC <1000 metres**
ASAB-0076B	114 A	96 A	83 A	70 A
ASAB-0097B	145 A	123 A	104 A	87 A
ASAB-0100B	150 A	132 A	112 A	92 A
ASAB-0105B	157 A	158 A	143 A	117 A
ASAB-0145B	218 A	184 A	159 A	136 A
ASAB-0170B	255 A	217 A	181 A	146 A
ASAB-0200B	300 A	283 A	241 A	213 A
ASAB-0220B	330 A	315 A	268 A	238 A
ASAB-0255B	382 A	346 A	302 A	264 A
ASAB-0255C	382 A	346 A	302 A	264 A
ASAB-0350B	525 A	494 A	427 A	366 A
ASAB-0380C	570 A	570 A	539 A	449 A
ASAB-0425B	638 A	617 A	533 A	458 A
ASAB-0430C	645 A	645 A	552 A	464 A
ASAB-0500B	750 A	668 A	575 A	490 A
ASAB-0580B	870 A	738 A	637 A	546 A
ASAB-0620C	930 A	930 A	810 A	651 A

ASAB-0650C	975 A	975 A	842 A	683 A
ASAB-0700B	1050 A	889 A	768 A	658 A
ASAB-0790C	1185 A	1185 A	1075 A	868 A
ASAB-0820B	1230 A	1058 A	910 A	774 A
ASAB-0920B	1380 A	1206 A	1026 A	857 A
ASAB-0930C	1395 A	1395 A	1244 A	992 A
ASAB-1000B	1500 A	1404 A	1194 A	997 A
ASAB-1200C	1800 A	1800 A	1800 A	1606 A
ASAB-1410C	2115 A	2115 A	1979 A	1671 A
ASAB-1600C	2400 A	2400 A	2400 A	2030 A

Current Ratings for Continuous Operation (Not bypassed)

351 A : AC-53a 3.5 - 15 : 50 - 6

- 6 — Starts per hour
- 50 — On-load duty cycle (%)
- 15 — Start time (seconds)
- 3.5 — Start current (multiple of motor full load current)
- 351 A — Starter current rating (amperes)

In-line connection

	AC53a 3-10:50-6 40 ºC <1000 metres	AC53a 3.5-15:50-6 40 ºC <1000 metres	AC53a 4-20:50-6 40 ºC <1000 metres	AC53a 4.5-30:50-6 40 ºC <1000 metres
ASAB-0255C	255 A	222 A	195 A	171 A
ASAB-0380C	380 A	380 A	348 A	292 A
ASAB-0430C	430 A	413 A	355 A	301 A
ASAB-0620C	620 A	614 A	515 A	419 A
ASAB-0650C	650 A	629 A	532 A	437 A
ASAB-0790C	790 A	790 A	694 A	567 A
ASAB-0930C	930 A	930 A	800 A	644 A
ASAB-1200C	1200 A	1200 A	1135 A	983 A
ASAB-1410C	1410 A	1355 A	1187 A	1023 A
ASAB-1600C	1600 A	1600 A	1433 A	1227 A

Inside delta connection

	AC53a 3-10:50-6 40 ºC <1000 metres	AC53a 3.5-15:50-6 40 ºC <1000 metres	AC53a 4-20:50-6 40 ºC <1000 metres	AC53a 4.5-30:50-6 40 ºC <1000 metres
ASAB-0255C	382 A	334 A	293 A	257 A
ASAB-0380C	570 A	570 A	522 A	437 A
ASAB-0430C	645 A	620 A	533 A	451 A
ASAB-0620C	930 A	920 A	773 A	628 A
ASAB-0650C	975 A	943 A	798 A	656 A
ASAB-0790C	1185 A	1185 A	1041 A	850 A
ASAB-0930C	1395 A	1395 A	1200 A	966 A
ASAB-1200C	1800 A	1800 A	1702 A	1474 A
ASAB-1410C	2115 A	2033 A	1780 A	1535 A
ASAB-1600C	2400 A	2400 A	2149 A	1840 A

Minimum and Maximum Current Settings

The ASAB's minimum and maximum full load current settings depend on the model:

Model	In-line connection		Inside delta connection	
	Minimum	Maximum	Minimum	Maximum
ASAB-0023B	5 A	23 A	5 A	34 A
ASAB-0043B	9 A	43 A	9 A	64 A
ASAB-0053B	11 A	53 A	11 A	79 A
ASAB-0076B	15 A	76 A	15 A	114 A
ASAB-0097B	19 A	97 A	19 A	145 A
ASAB-0100B	20 A	100 A	20 A	150 A
ASAB-0105B	21 A	105 A	21 A	157 A
ASAB-0145B	29 A	145 A	29 A	217 A
ASAB-0170B	34 A	170 A	34 A	255 A
ASAB-0200B	40 A	200 A	40 A	300 A
ASAB-0220B	44 A	220 A	44 A	330 A
ASAB-0255B	51 A	255 A	51 A	382 A
ASAB-0255C	51 A	255 A	51 A	382 A
ASAB-0350B	70 A	350 A	70 A	525 A
ASAB-0380C	76 A	380 A	76 A	570 A
ASAB-0425B	85 A	425 A	85 A	638 A
ASAB-0430C	86 A	430 A	86 A	645 A
ASAB-0500B	100 A	500 A	100 A	750 A
ASAB-0580B	116 A	580 A	116 A	870 A
ASAB-0620C	124 A	620 A	124 A	930 A
ASAB-0650C	130 A	650 A	130 A	975 A
ASAB-0700B	140 A	700 A	140 A	1050 A
ASAB-0790C	158 A	790 A	158 A	1185 A
ASAB-0820B	164 A	820 A	164 A	1230 A
ASAB-0920B	184 A	920 A	184 A	1380 A
ASAB-0930C	186 A	930 A	186 A	1395 A
ASAB-1000B	200 A	1000 A	200 A	1500 A
ASAB-1200C	240 A	1200 A	240 A	1800 A
ASAB-1410C	282 A	1410 A	282 A	2115 A
ASAB-1600C	320 A	1600 A	320 A	2400 A

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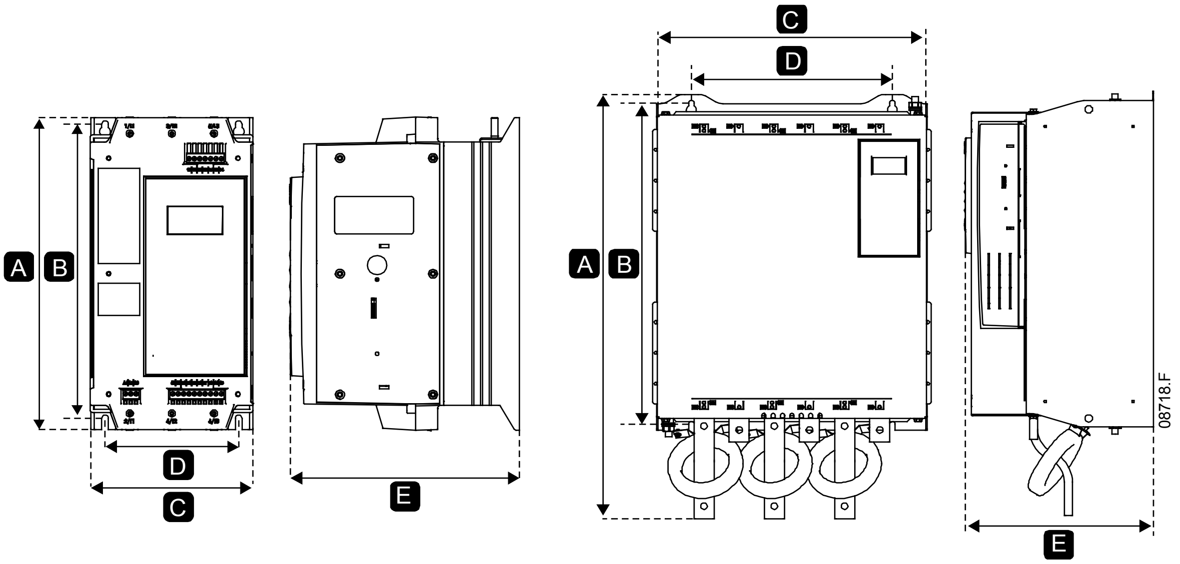
4.2.3 Dimensions and Weights



	Height mm (inch)		Width mm (inch)		Depth mm (inch)	Weight kg (lb)
Model	A	B	C	D	E	
ASAB-0023B	295 (11.6)	278 (10.9)	150 (5.9)	124 (4.9)	183 (7.2)	4.1 (9.0)
ASAB-0043B						
ASAB-0053B						
ASAB-0076B					213 (8.4)	4.4 (9.7)
ASAB-0097B						4.9 (10.8)
ASAB-0100B						
ASAB-0105B						
ASAB-0145B	438 (17.2)	380 (15.0)	275 (10.8)	250 (9.8)	248 (9.8)	13.6 (30.0)
ASAB-0170B						13.8 (30.4)
ASAB-0200B						14.6 (32.2)
ASAB-0220B						
ASAB-0255B	440 (17.3)	392 (15.4)	424 (16.7)	376 (14.8)	296 (11.7)	26 (57.3)
ASAB-0350B						29.4 (64.8)
ASAB-0425B						
ASAB-0500B	640 (25.2)	600 (23.6)	433 (17.0)	320 (12.6)	293 (11.5)	49 (108.0)
ASAB-0580B						
ASAB-0700B						62.5 (137.8)
ASAB-0820B						
ASAB-0920B						63 (138.9)
ASAB-1000B						
ASAB-0255C	460 (18.1)	400 (15.7)	390 (15.4)	320 (12.6)	278 (10.9)	23 (50.7)
ASAB-0380C	689 (27.1)	522 (20.6)	430 (16.9)	320 (12.6)	301 (11.9)	36 (79.4)
ASAB-0430C						
ASAB-0620C						39.5 (87.1)
ASAB-0650C						
ASAB-0790C						
ASAB-0930C						51.5 (113.5)
ASAB-1200C	860 (33.9)	727 (28.6)	574 (22.6)	500 (19.7)	362 (14.3)	128.5 (283.3)
ASAB-1410C						130 (286.6)
ASAB-1600C						140 (308.6)

4.2.4 Specifications

Supply

Mains voltage (L1, L2, L3)

5 .... 200 VAC ~ 525 VAC (± 10%)

7 .... 380 VAC ~ 600 VAC (± 10%) (in-line or inside delta connection)

7 .... 380 VAC ~ 690 VAC (± 10%) (earthed star supply system only)

Control voltage (A4, A5, A6)

12 .... 110 ~ 120 VAC or 220 ~ 240 VAC (+ 10% / -15%), 600mA

14 .... 24 VAC/VDC ±20%, 2.8A

Mains frequency .... 45 Hz ~ 66 Hz

Rated insulation voltage to earth .... 600 VAC

Rated impulse withstand voltage .... 4 kV

Form designation .... Bypassed or continuous, semiconductor motor starter form 1

Short circuit capability

Coordination with semiconductor fuses .... Type 2

Coordination with HRC fuses .... Type 1

ASAB-0023B ~ ASAB-0220B .... prospective current 65 kA

ASAB-0255B ~ ASAB-1000B .... prospective current 85 kA

ASAB-0255C ~ ASAB-0930C .... prospective current 100 kA

ASAB-1200C ~ ASAB-1600C .... prospective current 85 kA

Electromagnetic capability (compliant with EU Directive 2014/35/EU)

EMC Emissions .... IEC 60947-4-2 Class B and Lloyds Marine No 1 Specification

EMC Immunity .... IEC 60947-4-2

.... EAC TR TC 020/2011

Inputs

Input rating .... Active 24 VDC, 8 mA approx

Start (54, 55) .... Normally Open

Stop (56, 57) .... Normally Closed

Reset (58, 57) .... Normally Closed

Programmable input (53, 55) .... Normally Open

Motor thermistor (64, 65) .... Trip >3.6 kΩ, reset <1.6kΩ

Outputs

Relay outputs .... 10A @ 250 VAC resistive, 5A @ 250 VAC AC15 pf 0.3

Programmable outputs

Relay A (13, 14) .... Normally Open

Relay B (21, 22, 24) .... Changeover

Relay C (33, 34) .... Normally Open

Analog output (40, 41) .... 0-20 mA or 4-20 mA (selectable)

Maximum load .... 600 Ω (12 VDC @ 20 mA)

Accuracy .... ± 5%

24 VDC output (55, 41)

Maximum load .... 200 mA

Accuracy .... ± 10%

Environmental

Protection

ASAB-0023B ~ ASAB-0105B IP20

ASAB-0145B ~ ASAB-1600C IP00

Operating temperature .... -10 °C to 60 °C, above 40 °C with derating

Storage temperature .... -25 °C to + 60 °C

Operating Altitude .... 0 - 1000 m, above 1000 m with derating

Humidity .... 5% to 95% Relative Humidity

Pollution degree .... Pollution Degree 3

Vibration (ASAB-0023B ~ ASAB-1000B) .... IEC 60068-2-6

Heat Dissipation

During Start .... 4.5 watts per ampere

During Run

ASAB-0023B ~ ASAB-0053B .... ≤ 39 watts approx

ASAB-0076B ~ ASAB-0105B .... ≤ 51 watts approx

ASAB-0145B ~ ASAB-0220B .... ≤ 120 watts approx

ASAB-0255B ~ ASAB-0500B .... ≤ 140 watts approx

ASAB-0580B ~ ASAB-1000B .... ≤ 357 watts approx

ASAB-0255C ~ ASAB-1600C .... 4.5 watts per ampere approx.

Certification

CE .... EN 60947-4-2
RoHS .... Compliant with EU Directive 2002/95/EC
EAC (formerly GOST) .... TR TC 004/2011 and TR TC 020/2011
Marine .... Lloyds Marine No 1 Specification
UL / C-UL .... UL 508*
ASAB-0023B ~ ASAB-0425B, ASAB-0255C ~ ASAB-1600C .... UL Listed
ASAB-0023B ~ ASAB-0105B .... IP20 & NEMA1, UL Indoor Type 1
ASAB-0145B ~ ASAB-1600C .... IP00, UL Indoor Open Type
.... IP20, when fitted with optional finger guard kit

* For UL certification additional requirements may apply, depending on the models. For details, refer to *UL Compliant Installation* on page 12.

4.2.5 UL Compliant Installation

This section details additional requirements and configuration settings for the ASAB soft starters to be UL-compliant. Refer to *UL Fuse Selection and Short Circuit Ratings* on page 26.

Models ASAB-0023B ~ ASAB-0105B

There is no additional requirement for these models.

Models ASAB-0145B ~ ASAB-0425B, ASAB-0255C ~ ASAB-1600C

Use the recommended pressure terminal/connector kit. Refer to *Terminal/Connector Parts* on page 12 for more information.

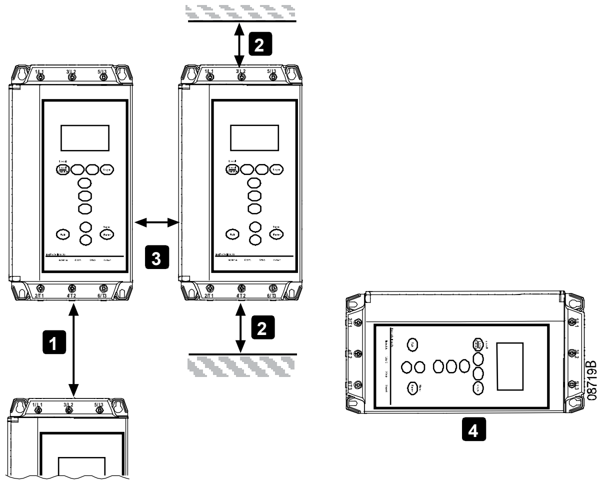
Terminal/Connector Parts

For models ASAB-0145B~ASAB-0425B and ASAB-0255C~ASAB-1600C to be UL compliant, you must use the recommended pressure terminal/connector as detailed in the table below.

Models	FLC (A)	No. of wires	Recommended lugs part No.
ASAB-0145B	145	1	OPHD 95-16
ASAB-0170B	170	1	OPHD 120-16
ASAB-0200B	200	1	OPHD 150-16
ASAB-0220B	220	1	OPHD 185-16
ASAB-0255B	255	1	OPHD 240-20
ASAB-0350B	350	1	OPHD 400-16
ASAB-0425B	425	2	OPHD 185-16
ASAB-0255C	255	1	OPHD 240-20
ASAB-0380C	380	2	1 x 600T-2
ASAB-0430C	430		
ASAB-0620C	620		
ASAB-0650C	650		
ASAB-0790C	790	4	2 x 600T-2
ASAB-0930C	930	3	2 x 600T-2
ASAB-1200C	1200	4	1 x 750T-4
ASAB-1410C	1410		
ASAB-1600C	1600	5	1 x 750T-4 1 x 600T-3

5 Installation

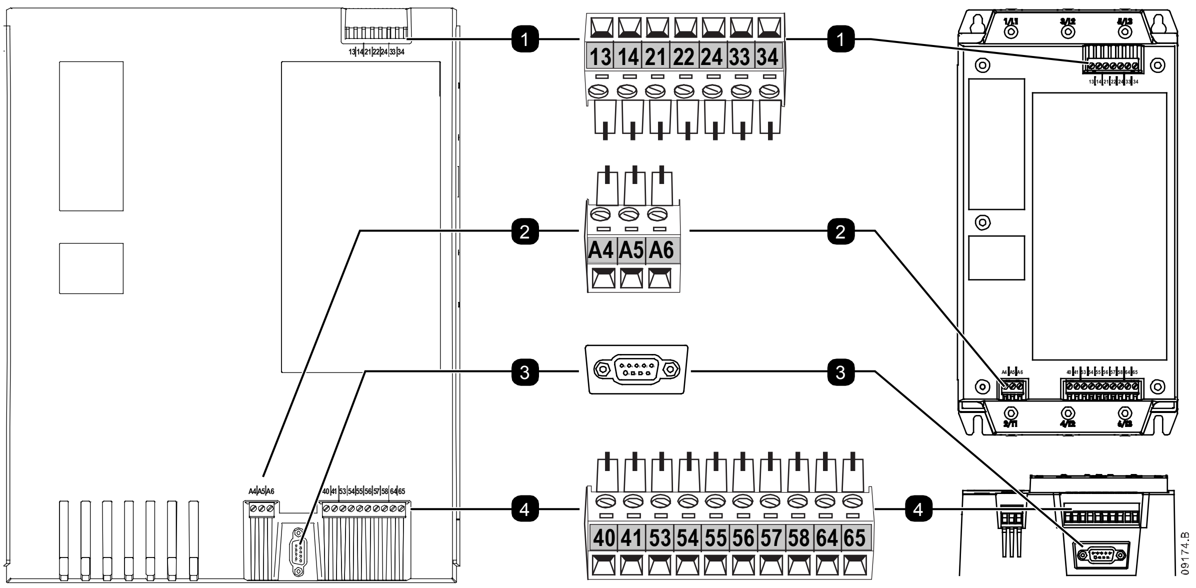
5.1 Physical Installation



1	ASAB-0023B ~ ASAB-0220B: Allow 100 mm (3.94 inches) between soft starters. ASAB-0255B ~ ASAB-1000B: Allow 200 mm (7.88 inches) between soft starters. ASAB-0255C: Allow 100 mm (3.94 inches) between soft starters. ASAB-0380C ~ ASAB-1600C: Allow 200 mm (7.88 inches) between soft starters.
2	ASAB-0023B ~ ASAB-0220B: Allow 50 mm (1.97 inches) between the soft starter and solid surfaces. ASAB-0255B ~ ASAB-1000B: Allow 200 mm (7.88 inches) between the soft starter and solid surfaces. ASAB-0255C: Allow 100 mm (3.94 inches) between the soft starter and solid surfaces. ASAB-0380C ~ ASAB-1600C: Allow 200 mm (7.88 inches) between the soft starter and solid surfaces.
3	Soft starters may be mounted side by side with no clearance (that is, if mounted without communications modules).
4	The soft starter may be mounted on its side. Derate the soft starter's rated current by 15%.

5.2 Control Terminals

Control terminations use 2.5mm² plug-in terminal blocks. Unplug each block, complete the wiring, then reinsert the block.



1	Relay outputs
13, 14	Relay output A
21, 22, 24	Relay output B
33, 34	Relay output C
2	Control voltage (model dependent)
A5, A6	110~120 VAC
A4, A6	220~240 VAC
A5, A6	24 VAC/VDC
3	DB9 connector for remote control panel

4	Inputs and outputs
54, 55	Start
56, 57	Stop
58, 57	Reset
53, 55	Programmable input A
64, 65	Motor thermistor input
40, 41	Analog output
55, 41	24 VDC output

NOTE
If you are not using a thermistor, do not short terminals 64, 65.

NOTE
The DB9 connector on the soft starter should only be used to connect to a remote control panel. Connecting other equipment to this port can damage the soft starter or the equipment.

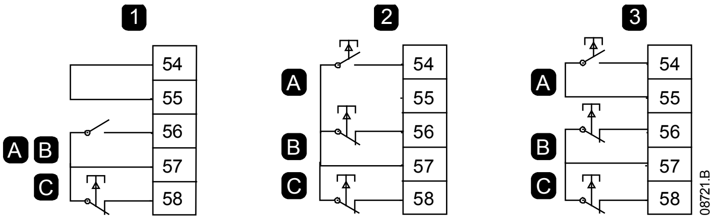
5.3 Control Voltage

Different models require control voltage to different terminals:

- 12 (110~120 VAC) A5, A6
- 12 (220~240 VAC) A4, A6
- 14 (24 VAC/VDC) A5, A6

5.4 Control Wiring

The ASAB has three fixed inputs for remote control. These inputs should be controlled by contacts rated for low voltage, low current operation (gold flash or similar).



1	Two-wire control
2	Three-wire control
3	Four-wire control
A	Start
B	Stop
C	Reset

CAUTION
Do not apply voltage to the control input terminals. These are active 24 VDC inputs and must be controlled with potential free contacts.

Cables to the control inputs must be segregated from mains voltage and motor cabling.

5.5 Relay Outputs

The ASAB has three programmable relay outputs.

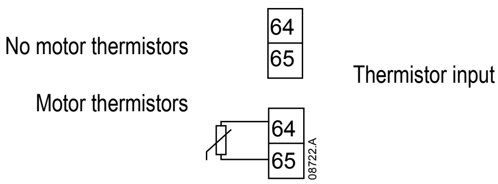
Operation of the programmable outputs is determined by the settings of parameters 7A~7I.

- If assigned to Main Contactor, the output activates as soon as the soft starter receives a start command and remains active while the soft starter is controlling the motor (until the motor starts a coast to stop, or until the end of a soft stop).
- If assigned to Run, the output activates when the soft start is complete (when the starting current falls below 120% of the programmed motor full load current) and remains closed until the beginning of a stop (either soft stop or coast to stop).
- If assigned to a trip function, the output activates when a trip occurs.
- If assigned to a flag, the output activates when the specified flag is active (parameters 7J~7L).

CAUTION
Some electronic contactor coils are not suitable for direct switching with PCB mount relays. Consult the contactor manufacturer/supplier to confirm suitability.

5.6 Motor Thermistors

Motor thermistors can be connected directly to the ASAB. The soft starter will trip when the resistance of the thermistor circuit exceeds approximately 3.6 kΩ or falls below 20 Ω.



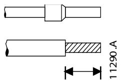
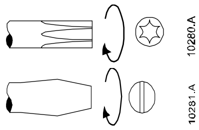
NOTE
If no motor thermistors are connected to the ASAB thermistor input terminals 64, 65 must be open. If 64, 65 are shorted, the ASAB will trip.
The thermistor circuit should be run in screened cable and must be electrically isolated from earth and all other power and control circuits.

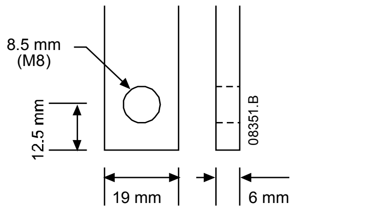
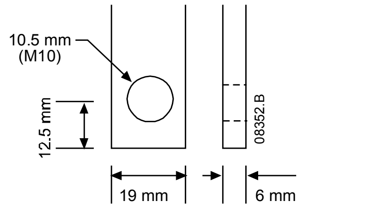
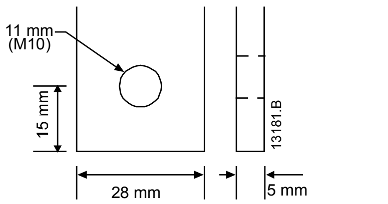
5.7 Power Terminations

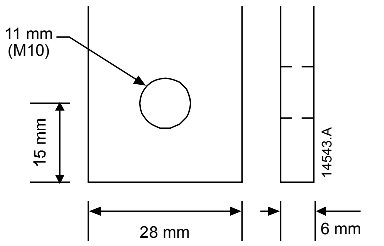
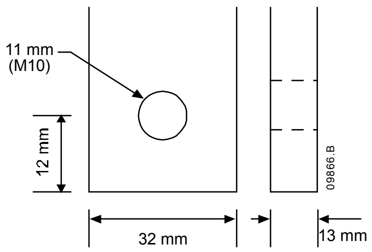
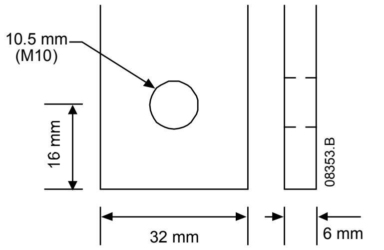
NOTE
For personnel safety, the power terminals on models up to ASAB-0105B are protected by snap-off tabs. When using large cables, it may be necessary to break off these tabs.

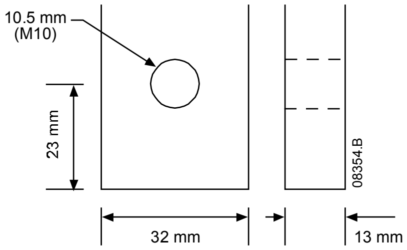
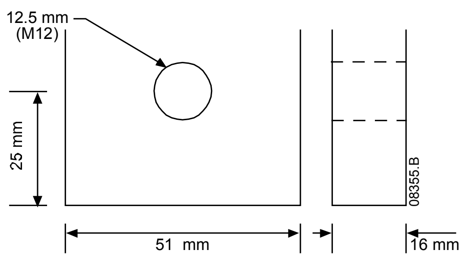
NOTE
Some units use aluminium busbars. When connecting power terminations, we recommend cleaning the surface contact area thoroughly (using an emery or stainless steel brush) and using an appropriate jointing compound to prevent corrosion.

Use only copper stranded or solid conductors, rated for 75 ºC or higher.

ASAB-0023B~ASAB-0105B		
 Cable size: 6-50 mm² (AWG 10-1/0) Torque: 4 Nm (2.9 ft-lb)	 14 mm (0.55 inch)	 Torx T20 x 150 Flat 7 mm x 150

ASAB-0145B	ASAB-0170B~ASAB-0220B	ASAB-0255B
19 Nm (14.0 ft-lb)	38 Nm (28.0 ft-lb)	38 Nm (28.0 ft-lb)
		

ASAB-0350B~ASAB-0425B	ASAB-0500B~ASAB-1000B	ASAB-0255C
38 Nm (28.0 ft-lb)	38 Nm (28.0 ft-lb)	38 Nm (28.0 ft-lb)
		

ASAB-0380C~ASAB-0930C	ASAB-1200C~ASAB-1600C
38 Nm (28.0 ft-lb)	66 Nm (48.7 ft-lb)
	

5.8 Power Input and Output Configurations

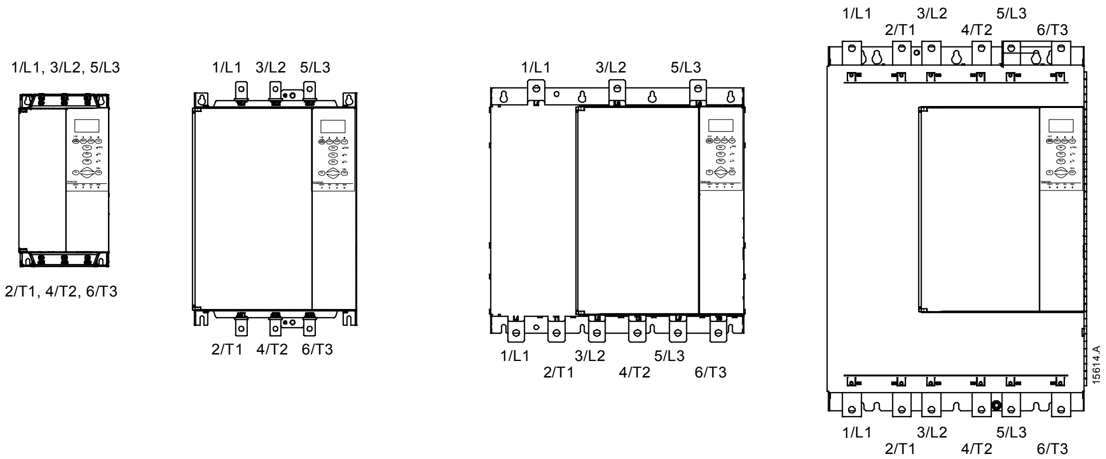
5.8.1 Internally Bypassed Models (ASAB-0023B~ASAB-1000B)

Models ASAB-0023B ~ ASAB-0220B have power inputs at the top of the unit and outputs at the bottom of the unit.

Internally bypassed models ASAB-0255B ~ ASAB-0425B have output busbars at the bottom of the unit and input busbars at both the top and bottom of the unit. The AC supply can be connected 'Top in, Bottom out' or 'Bottom in, Bottom out'.

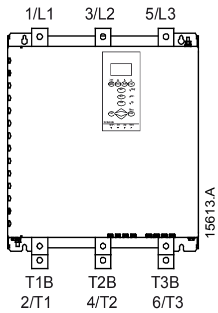
Internally bypassed models ASAB-0500B ~ ASAB-1000B have input and output busbars at the top and bottom of the unit. The AC supply can be connected 'Top in, Bottom out', 'Top in, Top out', 'Bottom in, Bottom out' or 'Bottom in, Top out'.

ASAB-0023B~ ASAB-0105B | ASAB-0145B~ASAB-0220B | ASAB-0255B~ASAB-0425B | ASAB-0500B~ASAB-1000B



5.8.2 Non-bypassed Model - ASAB-0255C

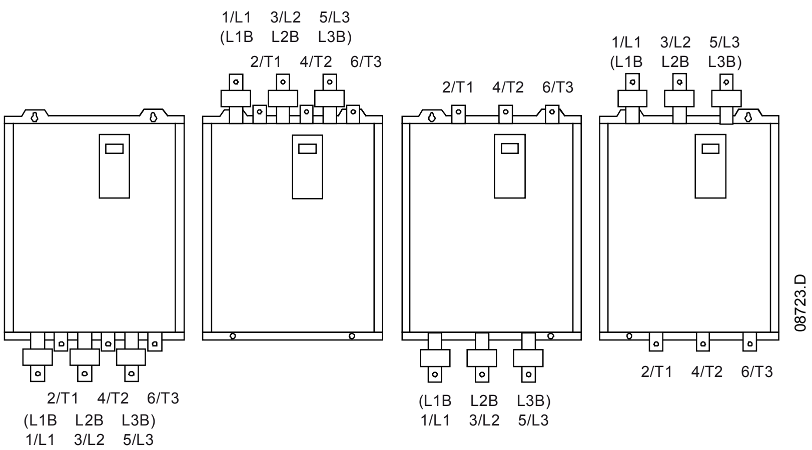
ASAB-0255C has dedicated bypass terminals at the bottom of the unit.
The bypass terminals are T1B, T2B, T3B.



5.8.3 Non-bypassed Models (ASAB-0380C~ASAB-1600C)

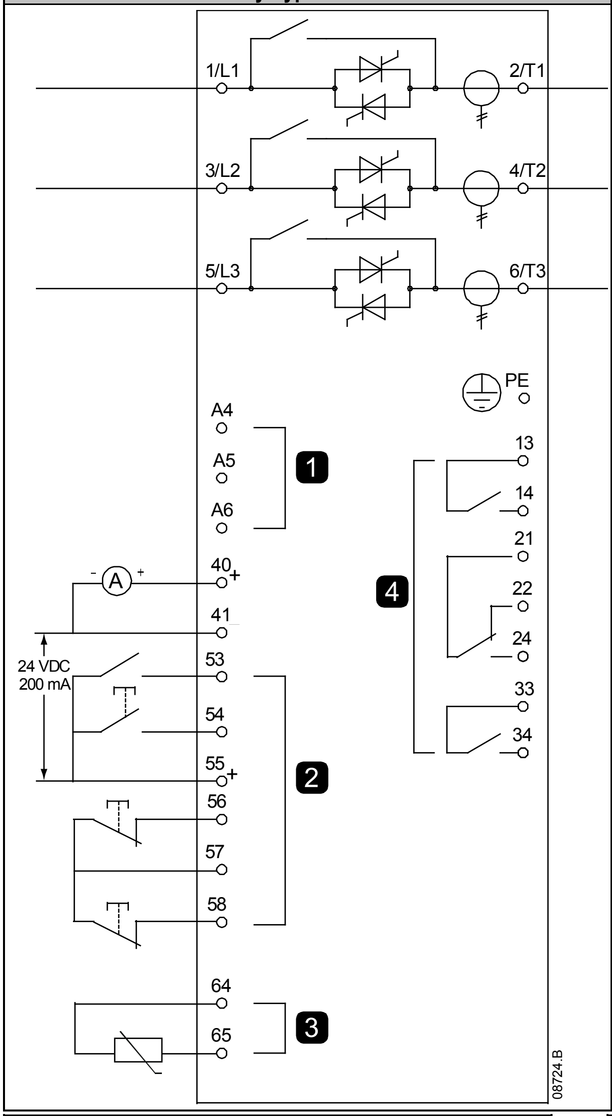
ASAB-0380C~ASAB-1600C have dedicated bypass terminals, on the input busbars. The bypass terminals are L1B, L2B, L3B.

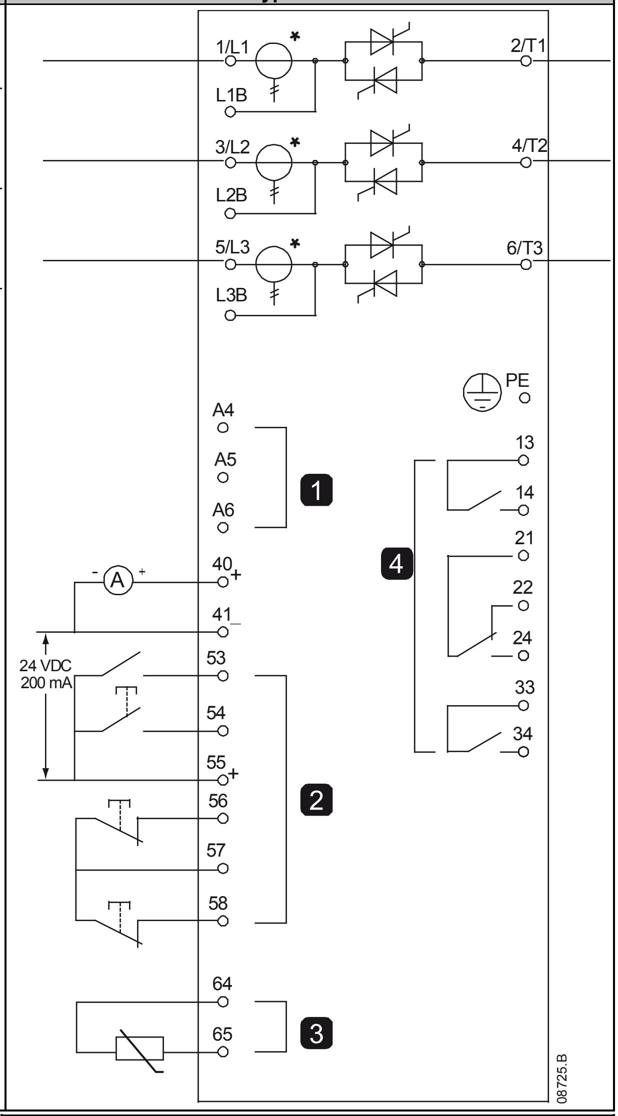
The busbars on non-bypassed models ASAB-0380C ~ ASAB-1600C can be adjusted for top or bottom input and output as required. Refer to *Busbar Adjustment Procedure* for step-by-step instructions. All units are manufactured bottom in/bottom out.



5.9 Schematic Diagrams

Internally bypassed models	Non-bypassed models





1	Control voltage (model dependent)
2	Remote control inputs
3	Motor thermistor input
4	Relay outputs
40, 41	Analog output
55, 41	24 VDC output

54, 55	Start
56, 57	Stop
58, 57	Reset
53, 55	Programmable input A
13, 14	Relay output A
21, 22, 24	Relay output B
33, 34	Relay output C

NOTE
Different models require control voltage to different terminals:
- 12 (110~120 VAC) A5, A6
- 12 (220~240 VAC) A4, A6
- 14 (24 VAC/VDC) A5, A6

NOTE
* ASAB-0255C current transformers are located on the output. Bypass terminals are labelled T1B, T2B and T3B.

6 Power Circuits

6.1 Motor Connection

ASAB soft starters can be connected to the motor in-line or inside delta (also called three-wire and six-wire connection). When connecting in inside delta, enter the motor full load current (FLC) for parameter 1A. The ASAB will automatically detect whether the motor is connected in-line or inside delta and will calculate the correct inside delta current level.

6.1.1 Testing the Installation

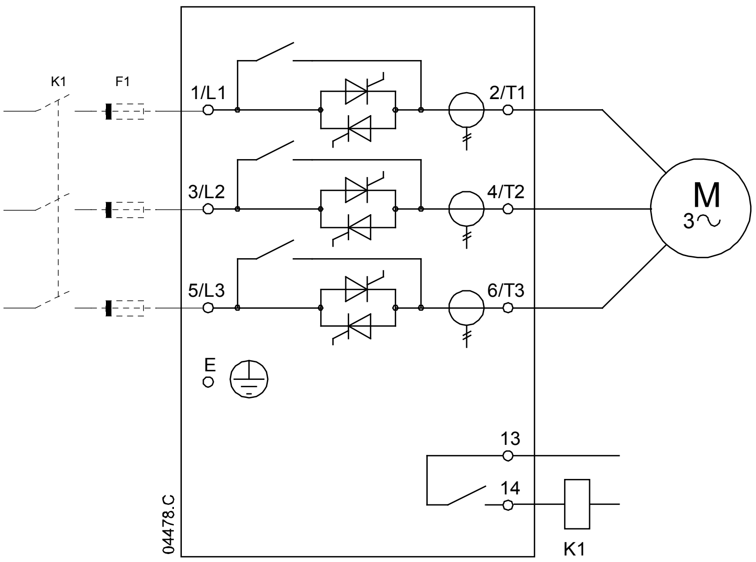
The ASAB can be connected to a small motor for testing. During this test, the soft starter's control input and relay output protection settings can be tested. This test mode is not suitable for testing soft starting or soft stopping performance.

The FLC of the test motor must be at least 2% of the soft starter's minimum FLC (refer to *Minimum and Maximum Current Settings* on page 9).

NOTE
When testing the soft starter with a small motor, set parameter 1A *Motor Full Load Current* to the minimum allowable value.

Models which are internally bypassed do not require an external bypass contactor.

6.1.2 In-line installation, internally bypassed

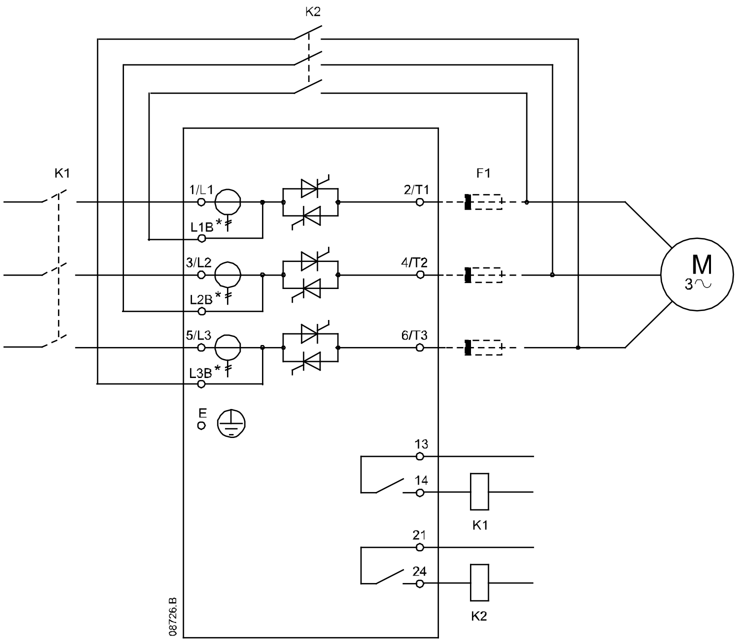


K1	Main contactor (optional)
F1	Semiconductor fuses (optional)

6.1.3 In-line installation, externally bypassed

Non-bypassed models have dedicated bypass terminals, which allow the ASAB to continue providing protection and monitoring functions even when bypassed via an external bypass contactor.

The bypass contactor must be connected to the bypass terminals and controlled by a programmable output configured to Run (refer to parameters 7A~7I).

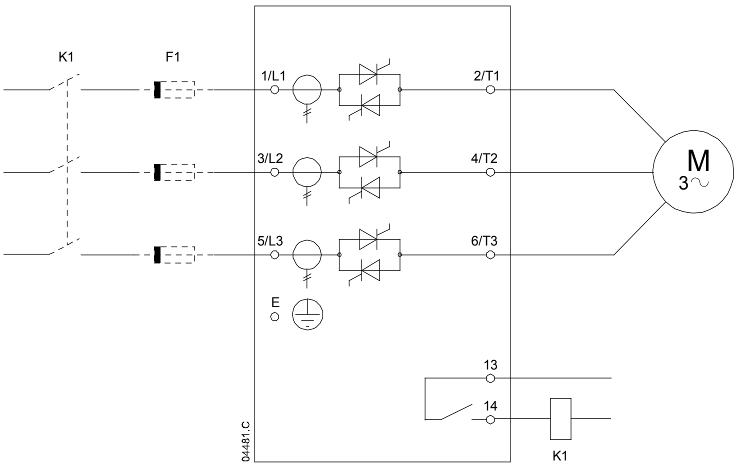


K1	Main contactor (optional)
K2	Bypass contactor (external)
F1	Semiconductor fuses (optional)

NOTE
The bypass terminals on ASAB-0255C are T1B, T2B, T3B. The bypass terminals on ASAB-0380C ~ ASAB-1600C are L1B, L2B, L3B.

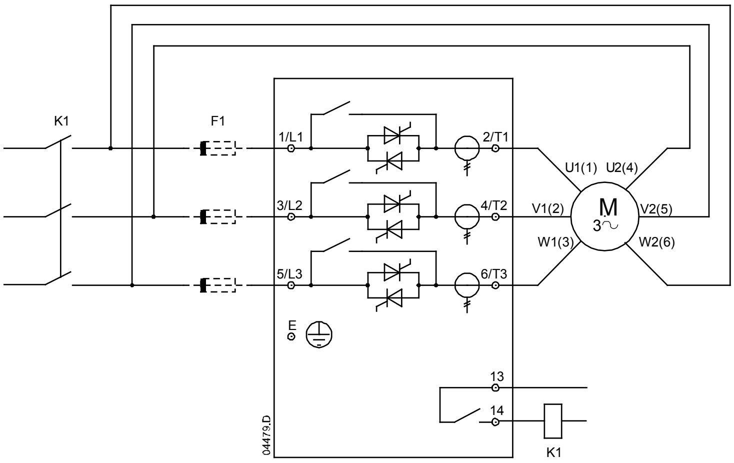
The fuses can be installed on the input side if required.

6.1.4 In-line installation, non-bypassed



K1	Main contactor (optional)
F1	Semiconductor fuses (optional)

6.1.5 Inside delta installation, internally bypassed



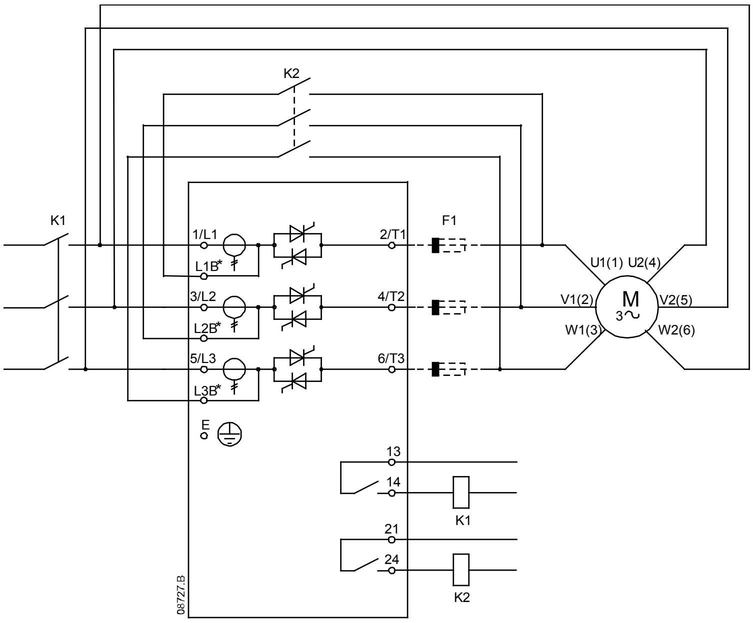
K1	Main contactor (strongly recommended)
F1	Semiconductor fuses (optional)

CAUTION
When connecting the ASAB in inside delta configuration, always install a main contactor or shunt trip circuit breaker.

6.1.6 Inside delta installation, externally bypassed

Non-bypassed models have dedicated bypass terminals, which allow the ASAB to continue providing protection and monitoring functions even when bypassed via an external bypass contactor.

The bypass contactor must be connected to the bypass terminals and controlled by a programmable output configured to Run (refer to parameters 7A~7I).



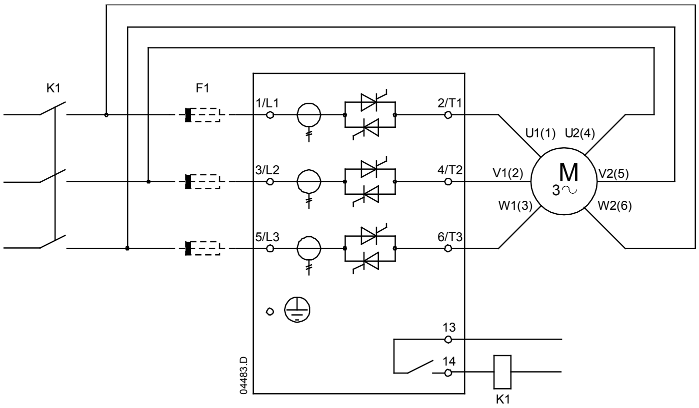
K1	Main contactor (strongly recommended)
K2	Bypass contactor (external)
F1	Semiconductor fuses (optional)

NOTE
The bypass terminals on ASAB-0255C are T1B, T2B, T3B. The bypass terminals on ASAB-0380C ~ ASAB-1600C are L1B, L2B, L3B.

The fuses can be installed on the input side if required.

CAUTION
When connecting the ASAB in inside delta configuration, always install a main contactor or shunt trip circuit breaker.

6.1.7 Inside delta installation, non-bypassed



K1	Main contactor (strongly recommended)
F1	Semiconductor fuses (optional)

CAUTION
When connecting the ASAB in inside delta configuration, always install a main contactor or shunt trip circuit breaker.

6.2 Bypass Contactor

Some ASAB soft starters are internally bypassed and do not require an external bypass contactor.

Non-bypassed soft starters may be installed with an external bypass contactor. Select a contactor with an AC1 rating greater than or equal to the full load current rating of the connected motor.

6.3 Main Contactor

A main contactor must be installed if the ASAB is connected to the motor in inside delta format and is optional for in-line connection. Select a contactor with an AC3 rating greater than or equal to the full load current rating of the connected motor.

6.4 Circuit Breaker

A shunt trip circuit breaker may be used instead of a main contactor to isolate the motor circuit in the event of a soft starter trip. The shunt trip mechanism must be powered from the supply side of the circuit breaker or from a separate control supply.

6.5 Earth Terminals

Earth terminals are located at the back of the soft starter.

- ASAB-0023B ~ ASAB-0105B have one terminal on the input side (top).
- ASAB-0145B ~ ASAB-1000B and ASAB-0255C ~ ASAB-1600C have two terminals, one on the input side (top) and one on the output side (bottom).

6.6 Power Factor Correction

If power factor correction is used, a dedicated contactor should be used to switch in the capacitors.

CAUTION
Power factor correction capacitors must be connected to the input side of the soft starter. Connecting power factor correction capacitors to the output side will damage the soft starter.

6.7 Power Supply Fuses

Semiconductor fuses can be used for Type 2 coordination (according to IEC 60947-4-2 standard) and to reduce the risk of damage to SCRs from transient overload currents.

HRC fuses (such as Ferraz/Mersen AJT fuses) can be used for Type 1 coordination according to IEC 60947-4-2 standard.

CAUTION
Adaptive Control controls the motor's speed profile, within the programmed time limit. This may result in a higher level of current than traditional control methods.

For applications using Adaptive Control to soft stop the motor with stop times greater than 30 seconds, motor branch protection should be selected as follows:

- standard HRC line fuses: minimum 150% motor full load current
- motor rated line fuses: minimum rating 100/150% motor full load current
- motor control circuit breaker minimum long time setting: 150% motor full load current
- motor control circuit breaker minimum short time setting: 400% motor full load current for 30 seconds

NOTE

Fuse selection is based on a 400% FLC start for 20 seconds in conjunction with standard published starts per hour, duty cycle, 40°C ambient temperature and up to 1000 m altitude. For installations operating outside these conditions, consult your local supplier.

These fuse tables contain recommendations only. Always consult your local supplier to confirm the selection for your particular application.

6.7.1 Bussman Fuses - Square Body (170M)

Model	SCR I^2T (A^2S)	Supply Voltage (≤ 440 VAC)	Supply Voltage (≤ 575 VAC)	Supply Voltage (≤ 690 VAC)
ASAB-0023B	1150	170M1314	170M1314	170M1314
ASAB-0043B	8000	170M1316	170M1316	170M1316
ASAB-0053B	15000	170M1318	170M1318	170M1318
ASAB-0076B	15000	170M1319	170M1319	170M1318
ASAB-0097B	51200	170M1321	170M1321	170M1319
ASAB-0100B	80000	170M1321	170M1321	170M1321
ASAB-0105B	125000	170M1321	170M1321	170M1321
ASAB-0145B	125000	170M1321	170M1321	170M1321
ASAB-0170B	320000	170M2621	170M2621	170M2621
ASAB-0200B	320000	170M2621	170M2621	170M2621
ASAB-0220B	320000	170M2621	170M2621	170M2621
ASAB-0255B	320000	170M2621	170M2621	170M2621
ASAB-0255C	320000	170M2621	170M2621	170M2621
ASAB-0350B	202000	170M5011	170M5011	—
ASAB-0380C	320000	170M6011	170M6011	—
ASAB-0425B	320000	170M6011	—	—
ASAB-0430C	320000	170M6011	170M6011	—
ASAB-0500B	320000	170M6008*	—	—
ASAB-0580B	781000	170M6013	170M6013	170M6013
ASAB-0620C	1200000	170M6015	170M6015	170M6014
ASAB-0650C	1200000	170M6015	170M6015	170M6014
ASAB-0700B	781000	170M5015	170M5015	—
ASAB-0790C	2530000	170M6017	170M6017	170M6016
ASAB-0820B	1200000	170M5017	170M6015	—
ASAB-0920B	2530000	170M6017	170M6017	—
ASAB-0930C	4500000	170M6019	170M6019	170M6019
ASAB-1000B	2530000	170M6018	170M6013*	—
ASAB-1200C	4500000	170M6021	—	—
ASAB-1410C	6480000	—	—	—
ASAB-1600C	12500000	170M6019*	—	—

* Two parallel connected fuses required per phase.

6.7.2 Bussman Fuses - British Style (BS88)

Model	SCR I^2T (A^2S)	Supply Voltage (≤ 440 VAC)	Supply Voltage (≤ 575 VAC)	Supply Voltage (≤ 690 VAC)
ASAB-0023B	1150	63FE	63FE	63FE
ASAB-0043B	8000	120FEE	120FEE	120FEE
ASAB-0053B	15000	200FEE	200FEE	200FEE
ASAB-0076B	15000	200FEE	200FEE	200FEE
ASAB-0097B	51200	200FEE	200FEE	200FEE
ASAB-0100B	80000	280FM	280FM	280FM
ASAB-0105B	125000	280FM	280FM	280FM
ASAB-0145B	125000	280FM	280FM	280FM
ASAB-0170B	320000	450FMM	450FMM	450FMM
ASAB-0200B	320000	450FMM	450FMM	450FMM
ASAB-0220B	320000	450FMM	450FMM	450FMM
ASAB-0255B	320000	450FMM	450FMM	450FMM
ASAB-0255C	320000	450FMM	450FMM	450FMM
ASAB-0350B	202000	315FM*	—	—
ASAB-0380C	320000	—	—	—
ASAB-0380C	320000	400FMM*	400FMM	400FMM*

Model	SCR I²T (A²S)	Supply Voltage (≤ 440 VAC)	Supply Voltage (≤ 575 VAC)	Supply Voltage (≤ 690 VAC)
ASAB-0425B	320000	400FMM*	—	—
ASAB-0430C	320000	—	—	—
ASAB-0500B	320000	450FMM*	—	—
ASAB-0580B	781000	500FMM*	500FMM*	500FMM*
ASAB-0620C	1200000	630FMM*	630FMM*	—
ASAB-0650C	1200000	630FMM*	630FMM*	—
ASAB-0700B	781000	630FMM*	—	—
ASAB-0790C	2530000	—	—	—
ASAB-0820B	1200000	—	—	—
ASAB-0920B	2530000	—	—	—
ASAB-0930C	4500000	—	—	—
ASAB-1000B	2530000	—	—	—
ASAB-1200C	4500000	—	—	—
ASAB-1410C	6480000	—	—	—
ASAB-1600C	12500000	—	—	—

* Two parallel connected fuses required per phase.

6.7.3 Ferraz/Mersen Fuses - HSJ

Model	SCR I²T (A²S)	Supply Voltage (≤ 440 VAC)	Supply Voltage (≤ 575 VAC)	Supply Voltage (≤ 690 VAC)
ASAB-0023B	1150	HSJ40**	HSJ40**	
ASAB-0043B	8000	HSJ80**	HSJ80**	
ASAB-0053B	15000	HSJ110**	HSJ110**	
ASAB-0076B	15000	HSJ125**	HSJ125**	
ASAB-0097B	51200	HSJ175	HSJ175**	
ASAB-0100B	80000	HSJ175	HSJ175	
ASAB-0105B	125000	HSJ225	HSJ225	
ASAB-0145B	125000	HSJ250	HSJ250**	
ASAB-0170B	320000	HSJ300	HSJ300	
ASAB-0200B	320000	HSJ350	HSJ350	
ASAB-0220B	320000	HSJ400**	HSJ400**	Not suitable
ASAB-0255B	320000	HSJ450**	HSJ450**	
ASAB-0255C	320000	HSJ450**	HSJ450**	
ASAB-0350B	202000	HSJ500**		
ASAB-0380C	320000			
ASAB-0425B	320000			
ASAB-0430C	320000			
ASAB-0500B	320000			
ASAB-0580B	781000			
ASAB-0620C	1200000	Not suitable	Not suitable	
ASAB-0650C	1200000			
ASAB-0700B	781000			
ASAB-0790C	2530000			
ASAB-0820B	1200000			
ASAB-0920B	2530000			
ASAB-0930C	4500000			
ASAB-1000B	2530000			
ASAB-1200C	4500000			
ASAB-1410C	6480000			
ASAB-1600C	12500000			

** Two series connected fuses required per phase.

6.7.4 Ferraz/Mersen Fuses - North American Style (PSC 690)

Model	SCR I^2T (A^2S)	Supply Voltage (≤ 440 VAC)	Supply Voltage (≤ 575 VAC)	Supply Voltage (≤ 690 VAC)
ASAB-0023B	1150	A070URD30XXX0063	A070URD30XXX0063	—
ASAB-0043B	8000	A070URD30XXX0125	A070URD30XXX0125	A070URD30XXX0125
ASAB-0053B	15000	A070URD30XXX0125	A070URD30XXX0125	A070URD30XXX0125
ASAB-0076B	15000	A070URD30XXX0160	A070URD30XXX0160	A070URD30XXX0160
ASAB-0097B	51200	A070URD30XXX0200	A070URD30XXX0200	A070URD30XXX0200
ASAB-0100B	80000	A070URD30XXX0200	A070URD30XXX0200	A070URD30XXX0200
ASAB-0105B	125000	A070URD30XXX0315	A070URD30XXX0315	A070URD30XXX0315
ASAB-0145B	125000	A070URD30XXX0315	A070URD30XXX0315	A070URD30XXX0315
ASAB-0170B	320000	A070URD30XXX0315	A070URD30XXX0315	A070URD30XXX0315
ASAB-0200B	320000	A070URD30XXX0450	A070URD30XXX0450	A070URD30XXX0450
ASAB-0220B	320000	A070URD30XXX0450	A070URD30XXX0450	A070URD30XXX0450
ASAB-0255C	320000	A070URD30XXX0450	A070URD30XXX0450	A070URD30XXX0450
ASAB-0255B	320000	A070URD30XXX0450	A070URD30XXX0450	A070URD30XXX0450
ASAB-0255C	320000	A070URD30XXX0450	A070URD30XXX0450	A070URD30XXX0450
ASAB-0350B	202000	A070URD31XXX0550	—	—
ASAB-0380C	320000	A070URD33XXX0700	A070URD33XXX0700	—
ASAB-0425B	238000	A070URD32XXX0630	—	—
ASAB-0430C	320000	A070URD33XXX0700	A070URD33XXX0700	—
ASAB-0500B	320000	A070URD32XXX0700	—	—
ASAB-0580B	781000	A070URD32XXX0800	—	—
ASAB-0620C	1200000	A070URD33XXX1000	A070URD33XXX1000	A070URD33XXX1000
ASAB-0650C	1200000	A070URD33XXX1000	A070URD33XXX1000	A070URD33XXX1000
ASAB-0700B	781000	A070URD33XXX0900	—	—
ASAB-0790C	2530000	A070URD33XXX1400	A070URD33XXX1400	A070URD33XXX1400
ASAB-0820B	1200000	A070URD33XXX1100	—	—
ASAB-0920B	2530000	A070URD33XXX1250	—	—
ASAB-0930C	4500000	A070URD33XXX1400	A070URD33XXX1400	A070URD33XXX1400
ASAB-1000B	2530000	A070URD33XXX1400	—	—
ASAB-1200C	4500000	A055URD33XXX2250	—	—
ASAB-1410C	6480000	A055URD33XXX2250	—	—
ASAB-1600C	12500000	—	—	—

XXX = blade type. Refer to Ferraz/Mersen catalog for details.

6.7.5 Ferraz/Mersen Fuses - European Style (PSC 690)

Model	SCR I^2T (A^2S)	Supply Voltage (≤ 440 VAC)	Supply Voltage (≤ 575 VAC)	Supply Voltage (≤ 690 VAC)
ASAB-0023B	1150	6.9URD30D11A0050	6.9URD30D11A0050	6.9URD30D11A0050
ASAB-0043B	8000	6.9URD30D11A0125	6.9URD30D11A0125	6.9URD30D11A0125
ASAB-0053B	15000	6.9URD30D11A0125	6.9URD30D11A0125	6.9URD30D11A0125
ASAB-0076B	15000	6.9URD30D11A0160	6.9URD30D11A0160	6.9URD30D11A0160
ASAB-0097B	51200	6.9URD30D11A0200	6.9URD30D11A0200	6.9URD30D11A0200
ASAB-0100B	80000	6.9URD30D11A0200	6.9URD30D11A0200	6.9URD30D11A0200
ASAB-0105B	125000	6.9URD30D11A0315	6.9URD30D11A0315	6.9URD30D11A0315
ASAB-0145B	125000	6.9URD30D11A0315	6.9URD30D11A0315	6.9URD30D11A0315
ASAB-0170B	320000	6.9URD30D11A0315	6.9URD30D11A0315	6.9URD30D11A0315
ASAB-0200B	320000	6.9URD31D11A0450	6.9URD31D11A0450	6.9URD31D11A0450
ASAB-0220B	320000	6.9URD31D11A0450	6.9URD31D11A0450	6.9URD31D11A0450
ASAB-0255B	320000	6.9URD31D11A0450	6.9URD31D11A0450	6.9URD31D11A0450
ASAB-0255C	320000	6.9URD31D11A0450	6.9URD31D11A0450	6.9URD31D11A0450
ASAB-0350B	202000	6.9URD31D11A0550	—	—
ASAB-0380C	320000	6.9URD33D11A0700	6.9URD33D11A0700	6.9URD33D11A0700
ASAB-0425B	320000	6.9URD32D11A0630	—	—
ASAB-0430C	320000	6.9URD33D11A0700	6.9URD33D11A0700	6.9URD33D11A0700
ASAB-0500B	320000	6.9URD32D11A0700	—	—
ASAB-0580B	781000	6.9URD32D11A0800	—	—
ASAB-0620C	1200000	6.9URD33D11A1000	6.9URD33D11A1000	6.9URD33D11A1000
ASAB-0650C	1200000	6.9URD33D11A1000	6.9URD33D11A1000	6.9URD33D11A1000

Model	SCR I²T (A²S)	Supply Voltage (< 440 VAC)	Supply Voltage (< 575 VAC)	Supply Voltage (< 690 VAC)
ASAB-0700B	781000	6.9URD33D11A0900	—	—
ASAB-0790C	2530000	6.6URD33D11A1400	6.6URD33D11A1400	—
ASAB-0820B	1200000	6.9URD33D11A1100	—	—
ASAB-0920B	2530000	6.9URD33D11A1250	—	—
ASAB-0930C	4500000	6.6URD33D11A1400	6.6URD33D11A1400	—
ASAB-1000B	2530000	6.9URD33D11A1400	—	—
ASAB-1200C	4500000	6URD233PLAF2200	6URD233PLAF2200	—
ASAB-1410C	6480000	6URD233PLAF2200	6URD233PLAF2200	—
ASAB-1600C	12500000	6URD233PLAF2800	6URD233PLAF2800	—

6.7.6 Ferraz/Mersen Fuses - AJT

Model	SCR I²T (A²S)	Supply Voltage (< 440 VAC)	Supply Voltage (< 575 VAC)	Supply Voltage (< 690 VAC)
ASAB-0023B	1150	AJT25	AJT25	Not suitable
ASAB-0043B	8000	AJT50	AJT50	
ASAB-0053B	15000	AJT60	AJT60	
ASAB-0076B	15000	AJT80	AJT80	
ASAB-0097B	512000	AJT100	AJT100	
ASAB-0100B	80000	AJT100	AJT100	
ASAB-0105B	125000	AJT125	AJT125	
ASAB-0145B	125000	AJT150	AJT150	
ASAB-0170B	320000	AJT175	AJT175	
ASAB-0200B	320000	AJT200	AJT200	
ASAB-0220B	320000	AJT250	AJT250	
ASAB-0255C	320000	AJT300	AJT300	
ASAB-0255B	202000	AJT300	AJT300	
ASAB-0350B	202000	AJT400	AJT400	
ASAB-0380C	320000	AJT450	AJT450	
ASAB-0425B	238000	AJT450	AJT450	
ASAB-0430C	320000	AJT450	AJT450	
ASAB-0500B	320000	AJT500	AJT500	
ASAB-0580B	781000	A4BQ800	A4BQ800	
ASAB-0620C	1200000	A4BQ800	A4BQ800	
ASAB-0650C	1200000	A4BQ800	A4BQ800	
ASAB-0700B	781000	A4BQ800	A4BQ800	
ASAB-0790C	2530000	A4BQ1200	A4BQ1200	
ASAB-0820B	1200000	A4BQ1200	A4BQ1200	
ASAB-0920B	2530000	A4BQ1200	A4BQ1200	
ASAB-0930C	4500000	A4BQ1200 / A4BT1100	A4BQ1200 / A4BT1100	
ASAB-1000B	2530000	A4BQ1200	A4BQ1200	
ASAB-1200C	4500000	A4BQ1600	A4BQ1600	
ASAB-1410C	6480000	A4BQ2000	A4BQ2000	
ASAB-1600C	12500000	A4BQ2500 / A4BT1800	A4BQ2500 / A4BT1800	

6.7.7 UL Fuse Selection and Short Circuit Ratings

Two Short Circuit Current Ratings (SCCR) are available for UL compliant applications.

- **Standard Fault Currents (@ 600 VAC circuits)**

The standard fault currents are determined with reference to UL508, section 51, table 51.3. This specifies the short circuit current that the starter must withstand based upon the soft starter model horsepower rating (or Full Load Current (FLC) rating or Locked Rotor Amps (LRA) depending upon model).

If using the Standard Fault Current Ratings, the fuse used must be in accordance with the information in the table below (i.e. model and manufacture specific).

- **High Available Fault Currents (@ 480 VAC circuits)**

It is possible to specify short circuit current ratings exceeding the minimum ratings set by the Standard Fault Currents (see above) when the soft starter is capable of withstanding the high available short circuit current in accordance with the UL 508 test.

If using the High Available Fault Current Ratings, then a suitable fuse may be selected based upon Amperage and Fuse Class (J or L as applicable).

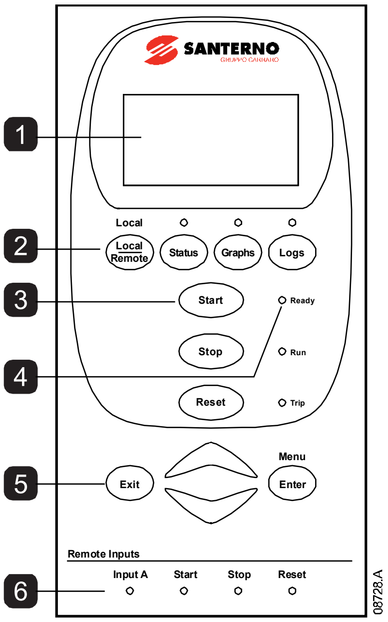
Model	Nominal Rating (A)	Short Circuit Ratings						600 V Short cct rating – 3 cycles †
		High Available		Standard Fault Current				
		@ 480 VAC max.	Max. Fuse Rating (A) (fuse class)	@ 600 VAC	Ferraz/Mersen fuse, Listed J, L or RK5 Class Fuse	Ferraz/Mersen fuse, R/C semi-conductor fuses		
ASAB-0023B	23	65 kA	25 (J)	10 kA	AJT25	A070URD30XXX0063		
ASAB-0043B	43	65 kA	50 (J)	10kA	AJT50	A070URD30XXX0125		
ASAB-0053B	53	65 kA	60 (J)	10 kA	AJT60	A070URD30XXX0125		
ASAB-0076B	76	65 kA	80 (J)	10 kA	AJT80	A070URD30XXX0200		
ASAB-0097B	97	65 kA	100 (J)	10 kA	AJT100	A070URD30XXX0200		
ASAB-0100B	100	65 kA	100 (J)	10 kA	AJT100	A070URD30XXX0200		Not available
ASAB-0105B	105	65 kA	125 (J)	10 kA	AJT125	A070URD30XXX0315		
ASAB-0145B	145	65 kA	150 (J)	18 kA	AJT150 / RK5 200	A070URD30XXX0315		
ASAB-0170B	170	65 kA	175 (J)	18kA	AJT175 / RK5 200	A070URD30XXX0315		
ASAB-0200B	200	65 kA	200 (J)	18 kA	AJT200 / RK5 300	A070URD30XXX0450		
ASAB-0220B	220	65 kA	250 (J)	18 kA	AJT250 / RK5 300	A070URD30XXX0450		
ASAB-0255B	255	65 kA	225 (J)	18 kA	†	-		18 kA – For 3 cycles
ASAB-0350B	350	65 kA	225 (J)	18 kA	†	-		
ASAB-0425B	425	65 kA	350 (J)	30 kA	†	A070URD33XXX0630		30 kA – For 3 cycles
ASAB-0500B	500	65 kA	600 (J)	30 kA	600, Class J	A070URD33XXX0700		
ASAB-0580B	580	65 kA	800 (L)	30 kA	800, Class L	-		
ASAB-0700B	700	65 kA	800 (L)	42 kA	800, Class L	-		42 kA – For 3 cycles
ASAB-0820B	820	65 kA	1200 (L)	42 kA	1200, Class L	A070URD33XXX1000		
ASAB-0920B	920	65 kA%	1200 (L)	85 kA	1200, Class L	A070URD33XXX1400		
ASAB-1000B	1000	65 kA%	1200 (L)	85 kA	1200, Class L	A070URD33XXX1400		
ASAB-0255C	255	65 kA	200(J)	18 kA	AJT300	A070URD30XXX0450		
ASAB-0380C	380	65 kA	450 (J)	18 kA	AJT450 / RK5 500	A070URD33XXX0700		
ASAB-0430C	430	65 kA	450 (J)	30 kA	AJT450	A070URD33XXX0700		
ASAB-0620C	620	65 kA	800 (L)	42 kA	A4BQ800	A070URD33XXX1000		
ASAB-0650C	650	65 kA	800 (L)	42 kA	A4BQ800	A070URD33XXX1000		Not available
ASAB-0790C	790	65 kA	1200 (L)	42 kA	A4BQ1200	A070URD33XXX1400		
ASAB-0930C	930	65 kA	1200 (L)	42 kA	A4BQ1200	A070URD33XXX1400		
ASAB-1200C	1200	65 kA	1600 (L)	85 kA	A4BQ1600	A065URD33XXX1800		
ASAB-1600C	1600	65 kA	2000 (L)	85 kA	A4BQ2500	A050URD33XXX2500		

XXX = blade type. Refer to Ferraz/Mersen catalog for details.

† - Models provided with a "3 cycle rating" are suitable for use in a circuit with the prospective current noted, when protected by any UL Listed fuses or UL Listed circuit breakers sized according to the NEC.

7 Operation

7.1 The Keypad



1	Four-line display for status and programming details.
2	**LOCAL/REMOTE**: Toggle between Local and Remote control **STATUS**: Open the status displays and scroll between different status screens **GRAPHS**: Open the performance graphs and scroll between different graph screens **LOGS**: Open the logs
3	Soft starter local control buttons: **START**: Start the motor **STOP**: Stop the motor **RESET**: Reset a trip (Local mode only).
4	Status LEDs (see below for details)
5	Menu navigation buttons: **EXIT**: Exit the menu or parameter, or cancel a parameter change. **MENU/ENTER**: Enter a menu or parameter, or save a parameter change. ▲ ▼: Scroll to the next or previous menu or parameter, change the setting of the current parameter or scroll through the status or graph screens.
6	Remote input LEDs. When on: **INPUT A**: Programmable input A is active **START**: The remote start input is active **STOP**: The remote stop input is active **RESET**: The remote reset input is active

7.2 Starter Status LEDs

LED name	On	Flashing
Ready	The motor is stopped and the starter is ready to start.	The motor is stopped and the starter is waiting for the *Restart Delay* (parameter 5A) or *Motor Temperature Check* (parameter 4F).
Run	The motor is in run state (receiving full voltage).	The motor is starting or stopping.
Trip	The starter has tripped.	The starter is in warning state.
Local	The starter is in Local control mode.	–
Status	The status screens are active.	–
Graphs	The graph screens are active.	The graph has been paused.
Logs	The logs menu is open.	–

If the starter is in remote control mode, the Local LED will be off.

If all LEDs are off, the starter is not receiving control voltage.

7.3 Displays

The keypad displays a wide range of performance information about the soft starter. The bottom half of the screen shows real-time information on current or motor power (as selected in parameter 10J). Use the **STATUS** button or ▲ and ▼ buttons to select the information shown on the top half of the screen.

- Starter status
- Motor temperature
- Current
- Motor power
- Last start information
- Date and time
- SCR conduction

NOTE
Screens shown here are with the default settings.

7.3.1 Starter Status

The starter status screen shows details of the starter's operating status, motor temperature and motor power.

```
READY
M1 000%          000.0KW
```

7.3.2 Programmable screen

The ASAB's user-programmable screen can be configured to show the most important information for the particular application. Use parameters 10B to 10E to select which information to display.

```
READY
0000 HRS
```

7.3.3 Motor Temperature

The temperature screen shows which motor data set is in use, and the temperature of both motors as a percentage of total thermal capacity. If the ASAB is configured for use on one motor, the temperature for the secondary motor (M2) will always show 0%.

```
   PRIMARY MOTOR SET
➤ M1 000%      M2 000%
```

7.3.4 Current

The current screen shows real-time line current on each phase.

```
     PHASE CURRENTS
000.0A   000.0A   000.0A
```

7.3.5 Motor Power

The motor power screen shows motor power (kW, HP and kVA) and power factor.

```
000.0KW          0000HP
0000KVA         -. - - PF
```

7.3.6 Last Start Information

The last start information screen shows details of the most recent successful start:

- start duration (seconds)
- maximum start current drawn (as a percentage of motor full load current)
- calculated rise in motor temperature

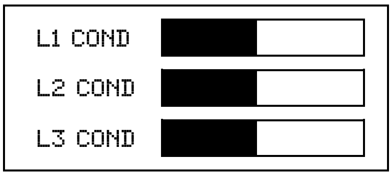
```
LAST START          010 S
350 % FLC      Δ TEMP 5%
```

7.3.7 Date and Time

The date/time screen shows the current system date and time (24 hour format). For details on setting the date and time, refer to *Set Date and Time* on page 51.

7.3.8 SCR Conduction Bargraph

The SCR conduction bargraph shows the level of conduction on each phase.



7.3.9 Graphs

The ASAB can display real-time performance information for:

- current
- motor temperature
- motor kW
- motor kVA
- motor power factor

The newest information is displayed at the right hand edge of the screen. Older data is not stored.

To access the graphs or to change which graph is shown, press the **GRAPHS** button.

The graph can also be paused, to allow past performance to be analysed. To pause the graph, press and hold the **GRAPHS** button for more than 0.5 seconds. To unpause the graph, press the **GRAPHS** button again.

NOTE
The ASAB will not collect data while the graph is paused. When graphing resumes, a small gap will be shown between the old data and the new data.

7.4 Start, Stop and Reset Commands

The soft starter can be controlled in three ways:

- using the buttons on the keypad
- via remote inputs
- via a serial communication link

The **LOCAL/REMOTE** button controls whether the ASAB will respond to local control (via the keypad) or remote control (via the remote inputs). The ASAB can also be set to allow local control only or remote control only, using parameter 6A *Local/Remote*. The Local LED on the keypad is on when the soft starter is in local control mode and off when the soft starter is in remote control mode.

The **STOP** button on the keypad is always enabled.

Control via the fieldbus communication network is always enabled in local control mode, and can be enabled or disabled in remote control mode (parameter 6B *Comms in Remote*). Control via the serial communication network requires an optional communication module.

7.4.1 Using the Soft Starter to Control a Motor

To soft start the motor, press the **START** button on the keypad or activate the Start remote input. The motor will start using the start mode selected in parameter 2A.

To stop the motor, press the **STOP** button on the keypad or activate the Stop remote input. The motor will stop using the stop mode selected in parameter 2H.

To reset a trip on the soft starter, press the **RESET** button on the keypad or activate the Reset remote input.

To stop the motor with a coast to stop, regardless of the setting of parameter 2H *Stop Mode*, press the local **STOP** and **RESET** buttons at the same time. The soft starter will remove power from the motor and open the main contactor, and the motor will coast to stop.

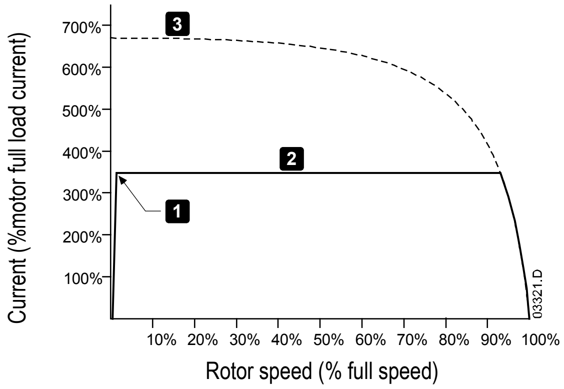
7.5 Soft Start Methods

Soft starters offer a variety of methods to control motor starting. Each soft start method uses a different primary control parameter.

7.5.1 Constant Current

Constant current is the traditional form of soft starting, which raises the current from zero to a specified level and keeps the current stable at that level until the motor has accelerated.

Constant current starting is ideal for applications where the start current must be kept below a particular level.



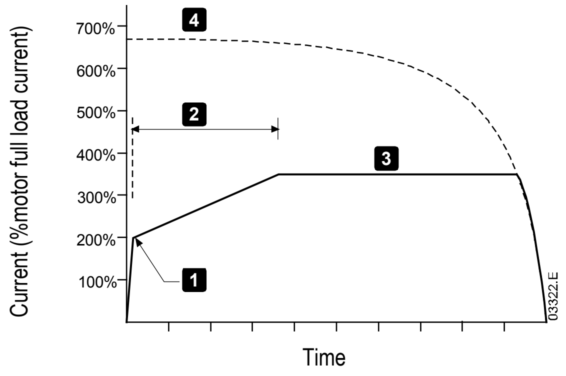
1: Initial current (parameter 2C)
2: Current limit (parameter 2B)
3: Full voltage current

7.5.2 Current Ramp

Current ramp soft starting raises the current from a specified starting level (1) to a maximum limit (3), over an extended period of time (2).

Current ramp starting can be useful for applications where:

- the load can vary between starts (for example a conveyor which may start loaded or unloaded). Set the initial current (parameter 2C) to a level that will start the motor with a light load, and the current limit (parameter 2B) to a level that will start the motor with a heavy load.
- the load breaks away easily, but starting time needs to be extended (for example a centrifugal pump where pipeline pressure needs to build up slowly).
- the electricity supply is limited (for example a generator set), and a slower application of load will allow greater time for the supply to respond.



1: Initial current (parameter 2C)
2: Start ramp time (parameter 2D)
3: Current limit (parameter 2B)
4: Full voltage current

7.5.3 Adaptive Control for Starting

In an adaptive control soft start, the ASAB adjusts the current in order to start the motor within a specified time and using a selected acceleration profile.

CAUTION
Adaptive Control cannot start the motor faster than a direct on-line (DOL) start. If the start ramp time (parameter 2D) is shorter than the motor's DOL start time, starting current may reach DOL levels.

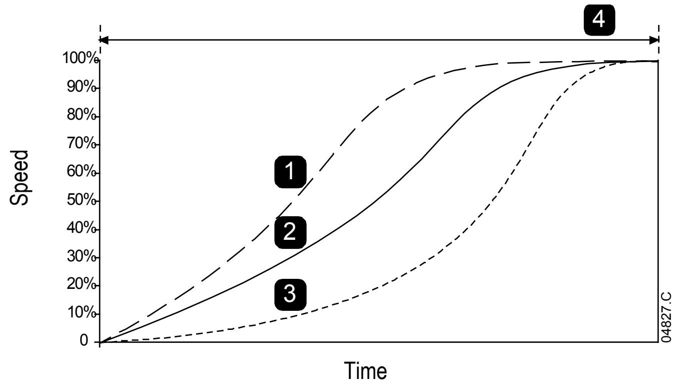
Every application has a particular starting profile, based on characteristics of the load and the motor. Adaptive Control offers three different starting profiles, to suit the requirements of different applications. Selecting a profile that matches the inherent profile of the application can help smooth out acceleration across the full start time. Selecting a dramatically different Adaptive Control profile can somewhat neutralise the inherent profile.

The ASAB monitors the motor's performance during each start, to improve control for future soft starts.

Adaptive Control

To use Adaptive Control to control starting performance:

1. Select Adaptive Control from the Start Mode menu (parameter 2A)
2. Set the desired Start Ramp Time (parameter 2D**)**
3. Select the desired Adaptive Start Profile (parameter 2J)
4. Set a start Current Limit (parameter 2B) sufficiently high to allow a successful start. The first Adaptive Control start will be a Constant Current start. This allows the ASAB to learn the characteristics of the connected motor. This motor data is used by the ASAB during subsequent Adaptive Control starts.



Adaptive start profile (parameter 2J):
1. Early acceleration
2. Constant acceleration
3. Late acceleration
4. Start ramp time (parameter 2D)

How to Select the Adaptive Control Start Profile

The best profile will depend on the exact details of each application.

Some loads, such as submersible pumps, should not be run at slow speeds. An early acceleration profile will raise the speed quickly, then control acceleration through the rest of the start.

NOTE
Adaptive Control will control the load according to the programmed profile. Start current will vary according to the selected acceleration profile and the programmed start time.

If replacing a motor connected to an ASAB programmed for Adaptive Control starting or stopping, or if the starter has been tested on a different motor prior to actual installation, the starter will need to learn the characteristics of the new motor. The ASAB will automatically re-learn the motor's characteristics if parameter 1A *Motor Full Load Current* or parameter 2L *Adaptive Control Gain* is changed.

CAUTION
Adaptive Control controls the motor's speed profile, within the programmed time limit. This may result in a higher level of current than traditional control methods.

Fine-tuning Adaptive Control

If the motor does not start or stop smoothly, adjust the adaptive control gain (parameter 2L). The gain setting determines how much the ASAB will adjust future adaptive control starts and stops, based on information from the previous start. The gain setting affects both starting and stopping performance.

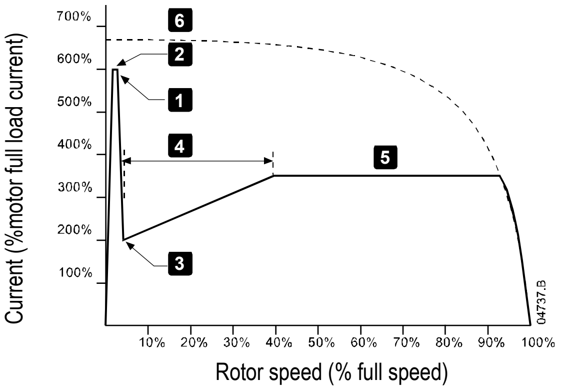
- If the motor accelerates or decelerates too quickly at the end of a start or stop, increase the gain setting by 5%~10%.
- If the motor speed fluctuates during starting or stopping, decrease the gain setting slightly.

NOTE
Changing the gain setting resets the starter's adaptive control learning. The first start after changing the gain will use constant current.

7.5.4 Kickstart

Kickstart provides a short boost of extra torque at the beginning of a start, and can be used in conjunction with current ramp or constant current starting.

Kickstart can be useful to help start loads that require high breakaway torque but then accelerate easily (for example flywheel loads such as presses).



1: Kickstart level (parameter 2E)
2: Kickstart time (parameter 2F)
3: Initial current (parameter 2C)
4: Start ramp time (parameter 2D)
5: Current limit (parameter 2B)
6: Full voltage current

7.6 Stop Methods

Soft starters offer a variety of methods for the control of motor stopping.

Stop Method	Performance Result
Coast To Stop	Natural load run down
TVR Soft Stop	Extended run down time
Adaptive Control	Extended run down time according to selected deceleration profile
Brake	Reduced run down time

Soft starters are often used in pumping applications to eliminate the damaging effects of fluid hammer. Adaptive Control should be the preferred stop method for these applications.

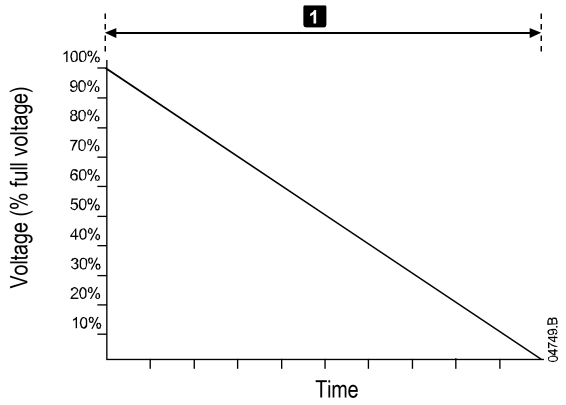
7.6.1 Coast to Stop

Coast to stop lets the motor slow at its natural rate, with no control from the soft starter. The time required to stop will depend on the type of load.

7.6.2 TVR Soft Stop

Timed voltage ramp reduces the voltage to the motor gradually over a defined time. The load may continue to run after the stop ramp is complete.

Timed voltage ramp stopping can be useful for applications where the stop time needs to be extended, or to avoid transients on generator set supplies.



1: Stop time (parameter 2I)

7.6.3 Adaptive Control for Stopping

In an adaptive control soft stop, the ASAB controls the current in order to stop the motor within a specified time and using a selected deceleration profile. Adaptive Control can be useful in extending the stopping time of low inertia loads.

NOTE
Adaptive control does not actively slow the motor down and will not stop the motor faster than a coast to stop. To shorten the stopping time of high inertia loads, use brake.

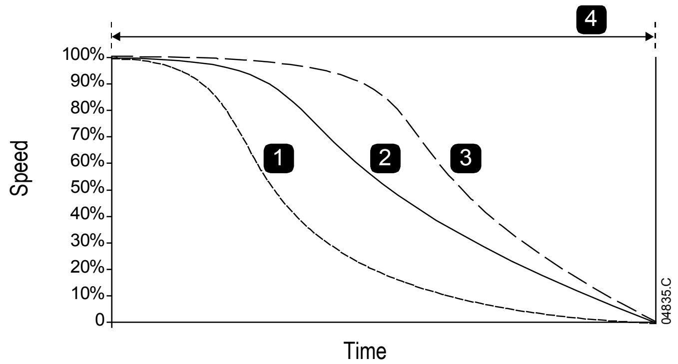
CAUTION
Adaptive Control controls the motor's speed profile, within the programmed time limit. This may result in a higher level of current than traditional control methods.

Every application has a particular stopping profile, based on characteristics of the load and the motor. Adaptive Control offers three different stopping profiles. Choose the adaptive control profile that best matches your application requirements.

Adaptive Control

To use Adaptive Control to control stopping performance:

1. Select Adaptive Control from the Stop Mode menu (parameter 2H)
2. Set the desired Stop Time (parameter 2I)
3. Select the required Adaptive Stop Profile (parameter 2K)



Adaptive Control stop profile (parameter 2K):
1. Early deceleration
2. Constant deceleration
3. Late deceleration
4. Stop time (parameter 2I)

Pump stopping

The hydraulic characteristics of pump systems vary considerably. This variation means the ideal deceleration profile and stop time will vary from application to application. The table provides guidelines on selecting between Adaptive Control deceleration profiles, but we recommend testing the three profiles to identify the best profile for the application.

Adaptive Stop Profile	Application
Late Deceleration	High head systems where even a small decrease in motor/pump speed results in a rapid transition between forward flow and reverse flow.
Constant Deceleration	Low to medium head, high flow applications where the fluid has high momentum.
Early Deceleration	Open pump systems where fluid must drain back through the pump without driving the pump in reverse.

The first Adaptive Control stop will be a normal soft stop. This allows the ASAB to learn the characteristics of the connected motor. This motor data is used by the ASAB during subsequent Adaptive Control stops.

NOTE
Adaptive Control will control the load according to the programmed profile. Stopping current will vary according to the selected deceleration profile and stop time.

If replacing a motor connected to an ASAB programmed for Adaptive Control starting or stopping, or if the starter has been tested on a different motor prior to actual installation, the starter will need to learn the characteristics of the new motor. The ASAB will automatically re-learn the motor's characteristics if parameter 1A *Motor Full Load Current* or parameter 2L *Adaptive Control Gain* is changed.

7.6.4 Brake

Brake reduces the time required to stop the motor.

During braking an increased noise level from the motor may be audible. This is a normal part of motor braking.

When brake is selected, the ASAB uses DC injection to slow the motor.

ASAB braking:

- Does not require the use of a DC brake contactor
- Controls all three phases so that the braking currents and associated heating are evenly distributed through the motor.

CAUTION
If the brake torque is set too high, the motor will stop before the end of the brake time and the motor will suffer unnecessary heating which could result in damage. Careful configuration is required to ensure safe operation of the starter and motor.

A high brake torque setting can result in peak currents up to motor DOL being drawn while the motor is stopping. Ensure protection fuses installed in the motor branch circuit are selected appropriately.

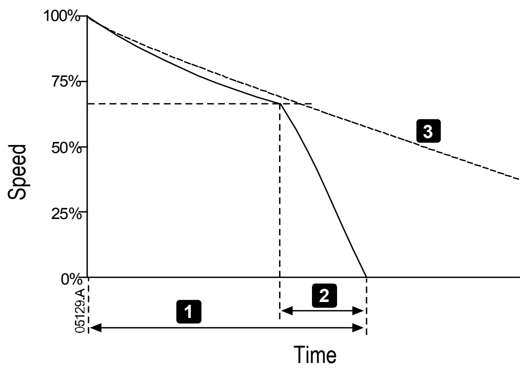
CAUTION
Brake operation causes the motor to heat faster than the rate calculated by the motor thermal model. If you are using brake, install a motor thermistor or allow sufficient restart delay (parameter 5A).

Braking has two stages:

- Pre-brake: provides an intermediate level of braking to slow motor speed to a point where full brake can be operated successfully (approximately 70% speed).
- Full brake: brake provides maximum braking torque but is ineffective at speeds greater than approximately 70%.

To configure the ASAB for brake operation:

1. Set parameter 2I for the desired stopping time duration (1). This is the total braking time and must be set sufficiently longer than the brake time (parameter 15H) to allow the pre-braking stage to reduce motor speed to approximately 70%. If the stop time is too short, braking will not be successful and the motor will coast to stop.
2. Set Brake Time (parameter 15H) to approximately one quarter of the programmed Stop Time. This sets the time for the Full Brake stage (2).
3. Adjust the Brake Torque (parameter 15G) so that the desired stopping performance is achieved. If set too low, the motor will not stop completely and will coast to stop by the end of the braking period.



1: Stop time (parameter 2I)
2: Brake time (parameter 15H)
3: Coast to stop time

CAUTION
When using DC brake, the mains supply must be connected to the soft starter (input terminals L1, L2, L3) in positive phase sequence and parameter 4B *Phase Sequence* must be set to Positive Only.

NOTE
For loads which may vary between braking cycles, install a zero speed sensor to ensure that the soft starter ends DC braking when the motor stops. This avoids unnecessary heating of the motor.

For more information on using the ASAB with an external speed sensor (eg for applications with variable load during the braking cycle), refer to *DC Brake with External Zero Speed Sensor* on page 58.

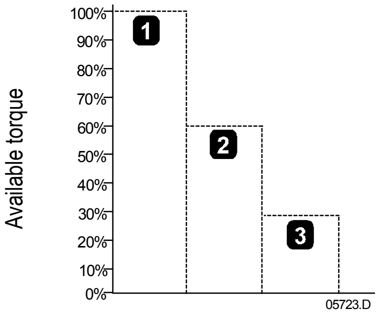
7.7 Jog Operation

Jog runs the motor at reduced speed, to allow alignment of the load or to assist servicing. The motor can be jogged in either forward or reverse direction.

The maximum available torque for jog forward is approximately 50%~75% of motor full load torque (FLT) depending on the motor. The torque when the motor is jogged in reverse is approximately 25% to 50% of FLT.

Parameter 15F *Jog Torque* controls how much of the maximum available jog torque the soft starter will apply to the motor.

NOTE
Setting parameter 15F above 50% may cause increased shaft vibration.



1. Motor FLT
2. Jog forward maximum torque
3. Jog reverse maximum torque

To activate jog operation, use a programmable input (parameter 6D). If any other command is received when jogging the starter will stop and await a new command.

NOTE
Soft start and soft stop are not available during jog operation.

Jog is only available for the primary motor.

CAUTION
Slow speed running is not intended for continuous operation due to reduced motor cooling.

Jog operation causes the motor to heat faster than the rate calculated by the motor thermal model. If you are using jog, install a motor thermistor or allow sufficient restart delay (parameter 5A)

7.8 Inside Delta Operation

Adaptive Control, Jog, Brake and PowerThrough functions are not supported with inside delta (six-wire) operation. If these functions are programmed when the starter is connected inside delta the behaviour is as given below:

Adaptive Control Start	The starter performs a constant current start.
Adaptive Control Stop	The starter performs a TVR soft stop if parameter 2I *Stop Time* is >0 secs. If parameter 2I is set to 0 secs the starter performs a coast to stop.
Jog	The starter issues a warning with the error message Unsupported Option.
Brake	The starter performs a coast to stop.
PowerThrough	The starter trips with the error message Lx-Tx Shorted.

NOTE
When connected in inside delta, current imbalance is the only phase loss protection that is active during run. Do not disable current imbalance protection (parameter 4A) during inside delta operation.

CAUTION
Inside delta operation is only possible with mains voltage ≤ 600 VAC.

8 Programming Menu

The Programming Menu lets you view and change programmable parameters that control how the ASAB operates.

To open the Programming Menu, press the **MENU/ENTER** button while viewing the status or graph screens.

To navigate through the Programming Menu:

- to scroll through parameter groups, press the ▲ or ▼ button.
- to open a submenu, press the **MENU/ENTER** button.
- to view the parameters in a group, press the **MENU/ENTER** button.
- to return to the previous level, press the **EXIT** button.
- to close the Programming Menu, press **EXIT** repeatedly or press the **STATUS** or **GRAPHS** button.

To change a parameter value:

- scroll to the appropriate parameter in the Programming Menu and press **MENU/ENTER** to enter edit mode.
- to alter the parameter setting, use the ▲ and ▼ buttons. Pressing ▲ or ▼ once will increase or decrease the value by one unit. If the button is held for longer than five seconds, the value will increase or decrease at a faster rate.
- to save changes, press **MENU/ENTER**. The setting shown on the display will be saved and the keypad will return to the parameter list.
- to cancel changes, press **EXIT**. The keypad will ask for confirmation, then return to the parameter list without saving changes.

You can access the Programming Menu at any time, including while the soft starter is running. Any changes to the start profile take effect immediately.

The Programming Menu contains four sub-menus:

Quick Setup Menu	Provides access to quick setup options for common applications.
Standard Menu	The Standard Menu provides access to commonly used parameters, allowing you to configure the ASAB to suit your application.
Extended Menu	The Extended Menu provides access to all the ASAB's programmable parameters, allowing experienced users to take advantage of advanced features.
Setup Tools	Setup Tools includes maintenance options to configure the ASAB's date and time or load a standard parameter set.

8.1 Quick Setup

The Quick Setup Menu makes it easy to configure the ASAB for common applications. The ASAB selects the parameters relevant to the application and suggests a typical setting, and you can adjust each parameter to suit your exact requirements.

Always set parameter 1A *Motor Full Load Current* to match the motor's nameplate full load current. The suggested value is the starter's minimum full load current.

On the display, the highlighted values are suggested values and the values enclosed in a box are the loaded values.

Application	Parameter	Suggested value
Pump Centrifugal	*Motor Full Load Current* *Start Mode* *Adaptive Start Profile* *Start Ramp Time* *Stop Mode* *Adaptive Stop Profile* *Stop Time*	Model dependent Adaptive Control Early Acceleration 10 seconds Adaptive Control Late Deceleration 15 seconds
Pump Submersible	*Motor Full Load Current* *Start Mode* *Adaptive Start Profile* *Start Ramp Time* *Stop Mode* *Adaptive Stop Profile* *Stop Time*	Model dependent Adaptive Control Early Acceleration 5 seconds Adaptive Control Late Deceleration 5 seconds
Fan Damped	*Motor Full Load Current* *Start Mode* *Current Limit*	Model dependent Constant Current 350%
Fan Undamped	*Motor Full Load Current* *Start Mode* *Adaptive Start Profile* *Start Ramp Time* *Excess Start Time* *Locked Rotor Time*	Model dependent Adaptive Control Constant Acceleration 20 seconds 30 seconds 20 seconds
Compressor Screw	*Motor Full Load Current* *Start Mode* *Start Ramp Time* *Current Limit*	Model dependent Constant Current 5 seconds 400%
Compressor Recip	*Motor Full Load Current* *Start Mode* *Start Ramp Time* *Current Limit*	Model dependent Constant Current 5 seconds 450%
Conveyor	*Motor Full Load Current* *Start Mode* *Start Ramp Time* *Current Limit* *Stop Mode* *Adaptive Stop Profile* *Stop Time*	Model dependent Constant Current 5 seconds 400% Adaptive Control Constant Deceleration 10 seconds
Crusher Rotary	*Motor Full Load Current* *Start Mode* *Start Ramp Time* *Current Limit* *Excess Start Time* *Locked Rotor Time*	Model dependent Constant Current 10 seconds 400% 30 seconds 20 seconds
Crusher Jaw	*Motor Full Load Current* *Start Mode* *Start Ramp Time* *Current Limit* *Excess Start Time* *Locked Rotor Time*	Model dependent Constant Current 10 seconds 450% 40 seconds 30 seconds

8.2 Standard Menu

The standard menu provides access to commonly used parameters, allowing the user to configure the ASAB as required for the application.

		Default Setting
1	**Motor Details**	
	1A *Motor Full Load Current*	Model dependent
2	**Primary Start/Stop**	
	2A *Start Mode*	Constant Current
	2B *Current Limit*	350%
	2C *Initial Current*	350%
	2D *Start Ramp Time*	00:10 mm:ss
	2G *Excess Start Time*	00:20 mm:ss
	2H *Stop Mode*	Coast To Stop
	2I *Stop Time*	00:00 mm:ss
4	**Protection Levels**	
	4B *Phase Sequence*	Any Sequence
	4C *Undercurrent*	20% FLC
	4D *Instantaneous Overcurrent*	400% FLC
	4E *Input A Trip*	Always Active
5	**Protection Delays**	
	5C *Undercurrent Delay*	00:05 mm:ss
	5D *Instantaneous Overcurrent Delay*	00:00 mm:ss
	5E *Input A Trip Delay*	00:00 mm:ss
	5F *Input A Initial Delay*	00:00 mm:ss
6	**Inputs**	
	6D *Input A Function*	Motor Set Select
	6E *Input A Name*	Input Trip
7	**Relay Outputs**	
	7A *Relay A Function*	Main Contactor
	7B *Relay A On Delay*	00:00 mm:ss
	7C *Relay A Off Delay*	00:00 mm:ss
	7D *Relay B Function*	Run
	7E *Relay B On Delay*	00:00 mm:ss
	7F *Relay B Off Delay*	00:00 mm:ss
	7G *Relay C Function*	Trip
	7H *Relay C On Delay*	00:00 mm:ss
	7I *Relay C Off Delay*	00:00 mm:ss
	7J *Low Current Flag*	50% FLC
	7K *High Current Flag*	100% FLC
	7L *Motor Temperature Flag*	80% FLC
10	**Display**	
	10A *Language*	English
	10B *User Screen - Top Left*	Starter State
	10C *User Screen - Top Right*	Blank
	10D *User Screen - Bottom Left*	Hours Run
	10E *User Screen - Bottom Right*	Blank
	10J *Display A or kW*	Current

8.3 Extended Menu

The Extended Menu provides access to all the ASAB's programmable parameters.

			Default Setting
1	**Motor Details**		
	1A	*Motor Full Load Current*	Model dependent
	1B	*Locked Rotor Time*	00:10 mm:ss
	1C	*Motor FLC-2*	Model dependent
	1D	*Locked Rotor Time-2*	00:10 mm:ss
	1E	*Dual Thermal Model*	Single
2	**Primary Start/Stop**		
	2A	*Start Mode*	Constant Current
	2B	*Current Limit*	350% FLC
	2C	*Initial Current*	350% FLC
	2D	*Start Ramp Time*	00:10 mm:ss
	2E	*Kickstart Level*	500% FLC
	2F	*Kickstart Time*	0 ms
	2G	*Excess Start Time*	00:20 mm:ss
	2H	*Stop Mode*	Coast To Stop
	2I	*Stop Time*	00:00 mm:ss
	2J	*Adaptive Start Profile*	Constant Acceleration
	2K	*Adaptive Stop Profile*	Constant Deceleration
	2L	*Adaptive Control Gain*	75%
3	**Secondary Start/Stop**		
	3A	*Start Mode-2*	Constant Current
	3B	*Current Limit-2*	350% FLC
	3C	*Initial Current-2*	350% FLC
	3D	*Start Ramp-2*	00:10 mm:ss
	3E	*Kickstart Level-2*	500% FLC
	3F	*Kickstart Time-2*	0 ms
	3G	*Excess Start Time-2*	00:20 mm:ss
	3H	*Stop Mode-2*	Coast To Stop
	3I	*Stop Time-2*	00:00 mm:ss
	3J	*Adaptive Start Profile-2*	Constant Acceleration
	3K	*Adaptive Stop Profile-2*	Constant Deceleration
	3L	*Adaptive Control Gain-2*	75%
4	**Protection Levels**		
	4A	*Current Imbalance*	30%
	4B	*Phase Sequence*	Any Sequence
	4C	*Undercurrent*	20% FLC
	4D	*Instantaneous Overcurrent*	400% FLC
	4E	*Input A Trip*	Always Active
	4F	*Motor Temperature Check*	Do Not Check
	4G	*Frequency Check*	Start/Run
	4H	*Frequency Variation*	±5 Hz
5	**Protection Delays**		
	5A	*Restart Delay*	00:10 mm:ss
	5B	*Current Imbalance Delay*	00:03 mm:ss
	5C	*Undercurrent Delay*	00:05 mm:ss
	5D	*Instantaneous Overcurrent Delay*	00:00 mm:ss
	5E	*Input A Trip Delay*	00:00 mm:ss
	5F	*Input A Initial Delay*	00:00 mm:ss
	5G	*Frequency Delay*	00:01 mm:ss
6	**Inputs**		
	6A	*Local/Remote*	LCL/RMT Anytime
	6B	*Comms in Remote*	Enable Control in RMT
	6C	*Remote Reset Logic*	Normally Closed (N/C)
	6D	*Input A Function*	Motor Set Select
	6E	*Input A Name*	Input Trip

7	**Relay Outputs**	
	7A *Relay A Function*	Main Contactor
	7B *Relay A On Delay*	00:00 mm:ss
	7C *Relay A Off Delay*	00:00 mm:ss
	7D *Relay B Function*	Run
	7E *Relay B On Delay*	00:00 mm:ss
	7F *Relay B Off Delay*	00:00 mm:ss
	7G *Relay C Function*	Trip
	7H *Relay C On Delay*	00:00 mm:ss
	7I *Relay C Off Delay*	00:00 mm:ss
	7J *Low Current Flag*	50% FLC
	7K *High Current Flag*	100% FLC
	7L *Motor Temperature Flag*	80%
8	**Analog Output**	
	8A *Analog Output A*	Current (% FLC)
	8B *Analog A Scale*	4-20 mA
	8C *Analog A Maximum Adjustment*	100%
	8D *Analog A Minimum Adjustment*	0%
9	**Auto-Reset**	
	9A *Auto-Reset Action*	Do Not Auto-Reset
	9B *Maximum Resets*	1
	9C *Reset Delay Groups A&B*	00:05 mm:ss
	9D *Reset Delay Group C*	5 minutes
10	**Display**	
	10A *Language*	English
	10B *User Screen - Top Left*	Starter State
	10C *User Screen - Top Right*	Blank
	10D *User Screen - Bottom Left*	Hours Run
	10E *User Screen - Bottom Right*	Blank
	10F *Graph Timebase*	10 seconds
	10G *Graph Maximum Adjustment*	400%
	10H *Graph Minimum Adjustment*	0%
	10I *Mains Reference Voltage*	400 V
	10J *Display A or kW*	Current
15	**Restricted**	
	15A *Access Code*	0000
	15B *Adjustment Lock*	Read & Write
	15C *Emergency Run*	Disable
	15D *Current Calibration*	100%
	15E *Shorted SCR Action*	3-Phase Control Only
	15F *Jog Torque*	50%
	15G *Brake Torque*	20%
	15H *Brake Time*	00:01 mm:ss
	15I *Brake Torque-2*	20%
	15J *Brake Time-2*	00:01 mm:ss
16	**Protection Action**	
	16A *Motor Overload*	Trip Starter
	16B *Current Imbalance*	Trip Starter
	16C *Undercurrent*	Trip Starter
	16D *Instantaneous Overcurrent*	Trip Starter
	16E *Input A Trip*	Trip Starter
	16F *Frequency*	Trip Starter
	16G *Motor Thermistor*	Trip Starter
	16H *Excess Start Time*	Trip Starter
	16I *Starter Communication*	Trip Starter
	16J *Heatsink Overtemperature*	Trip Starter
	16K *Battery/Clock*	Trip Starter
	16L *Network Communication*	Trip Starter
	16M *Low Control Volts*	Trip Starter

8.4 Parameter Descriptions

8.4.1 1 Motor Details

NOTE
Parameter 1B determines the trip current for motor overload protection. The default setting of parameter 1B provides Motor Overload Protection: Class 10, Trip Current 105% of FLA (full load amperage) or equivalent.

1A – Motor FLC

Range: Model dependent

Description: Matches the starter to the connected motor's full load current. Set to the full load current (FLC) rating shown on the motor nameplate.

1B – Locked Rotor Time

Range: 0:01 - 2:00 (minutes:seconds) **Default:** 10 seconds

Description: Sets the maximum length of time the motor can sustain locked rotor current from cold before reaching its maximum temperature. Set according to the motor datasheet.

1C – Motor FLC-2

Range: Model dependent

Description: Sets the secondary motor's full load current.

1D – Locked Rotor Time-2

Range: 0:01 - 2:00 (minutes:seconds) **Default:** 10 seconds

Description: Sets the maximum length of time the motor can sustain locked rotor current from cold before reaching its maximum temperature. Set according to the motor datasheet.

1E – Dual Thermal Model

Options: Single (default)
Dual

Description: Activates dual thermal modelling. The dual thermal model is required only if the ASAB is controlling two physically separate motors.

NOTE
The second thermal model is only active if parameter 1E *Dual Thermal Model* is set to 'Dual' and the starter is using the secondary motor set (a programmable input is set to 'Motor Set Select' and the input is active).

8.4.2 2 Primary Start/Stop

2A – Start Mode

Options: Constant Current (default)
Adaptive Control

Description: Selects the soft start mode.

2B – Current Limit

Range: 100% - 600% FLC **Default:** 350%

Description: Sets the current limit for constant current and current ramp soft starting, as a percentage of motor full load current.

2C – Initial Current

Range: 100% - 600% FLC **Default:** 350%

Description: Sets the initial start current level for current ramp starting, as a percentage of motor full load current. Set so that the motor begins to accelerate immediately after a start is initiated.
If current ramp starting is not required, set the initial current equal to the current limit.

2D – Start Ramp Time

Range: 1 - 180 (seconds) **Default:** 10 seconds

Description: Sets the total start time for an Adaptive Control start or the ramp time for current ramp starting (from the initial current to the current limit).

2E – Kickstart Level

Range: 100% - 700% FLC **Default:** 500%

Description: Sets the level of the kickstart current.

2F – Kickstart Time

Range: 0 – 2000 milliseconds **Default:** 0000 milliseconds

Description: Sets the kickstart duration. A setting of 0 disables kickstart.

CAUTION
Kickstart subjects the mechanical equipment to increased torque levels. Ensure the motor, load and couplings can handle the additional torque before using this feature.

2G – Excess Start Time

Excess start time is the maximum time the ASAB will attempt to start the motor. If the motor does not transition to Run mode within the programmed limit, the starter will trip. Set for a period slightly longer than required for a normal healthy start. A setting of 0 disables excess start time protection.

Range: 0:00 - 4:00 (minutes:seconds) **Default:** 20 seconds

Description: Set as required.

2H – Stop Mode

Options:
Coast To Stop (default)
TVR Soft Stop
Adaptive Control
Brake

Description: Selects the stop mode.

2I – Stop Time

Range: 0:00 - 4:00 (minutes:seconds) **Default:** 0 second

Description: Sets the time for soft stopping the motor using timed voltage ramp or Adaptive Control.
If a main contactor is installed, the contactor must remain closed until the end of the stop time. Use a programmable output configured to Run to control the main contactor. Sets the total stopping time when using brake.

2J – Adaptive Start Profile

Options:
Early Acceleration
Constant Acceleration (default)
Late Acceleration

Description: Selects which profile the ASAB will use for an Adaptive Control soft start.

2K – Adaptive Stop Profile

Options:
Early Deceleration
Constant Deceleration (default)
Late Deceleration

Description: Selects which profile the ASAB will use for an Adaptive Control soft stop.

2L – Adaptive Control Gain

Range: 1% - 200% **Default:** 75%

Description: Adjusts the performance of Adaptive Control. This setting affects both starting and stopping control.

NOTE
We recommend leaving the gain setting at the default level unless performance is not satisfactory.
If the motor accelerates or decelerates too quickly at the end of a start or stop, increase the gain setting by 5%~10%. If the motor speed fluctuates during starting or stopping, decrease the gain setting slightly.

8.4.3 3 Secondary Start/Stop

Refer to the Primary Start/Stop parameters for parameter details.

3A – Start Mode-2

Options: Constant Current (default)
Adaptive Control

Description: Selects the soft start mode.

3B – Current Limit-2

Range: 100% - 600% FLC **Default:** 350%

Description: Sets the current limit for constant current and current ramp soft starting, as a percentage of motor full load current.

3C – Initial Current-2

Range: 100% - 600% **Default:** 350%

Description: Sets the initial start current level for current ramp starting, as a percentage of motor full load current. Set so that the motor begins to accelerate immediately after a start is initiated.
If current ramp starting is not required, set the initial current equal to the current limit.

3D – Start Ramp Time-2

Range: 1 - 180 (seconds) **Default:** 10 seconds

Description: Sets the total start time for an Adaptive Control start or the ramp time for current ramp starting (from the initial current to the current limit).

3E – Kickstart Level-2

Range: 100% - 700% FLC **Default:** 500%

Description: Sets the level of the kickstart current.

3F – Kickstart Time-2

Range: 0 - 2000 (milliseconds) **Default:** 0000 milliseconds

Description: Sets the kickstart duration. A setting of 0 disables kickstart.

3G – Excess Start Time-2

Range: 0:00 - 4:00 (minutes:seconds) **Default:** 20 seconds

Description: Set as required.

3H – Stop Mode-2

Options: Coast To Stop (default)
TVR Soft Stop
Adaptive Control
Brake

Description: Selects the stop mode.

3I – Stop Time-2

Range: 0:00 - 4:00 (minutes:seconds) **Default:** 0 second

Description: Sets the stop time.

3J – Adaptive Start Profile-2

Options: Early Acceleration
Constant Acceleration (default)
Late Acceleration

Description: Selects which profile the ASAB will use for an Adaptive Control soft start.

3K – Adaptive Stop Profile-2

Options: Early Deceleration
Constant Deceleration (default)
Late Deceleration

Description: Selects which profile the ASAB will use for an Adaptive Control soft stop.

3L – Adaptive Control Gain-2

Range: 1% - 200% **Default:** 75%

Description: Adjusts the performance of Adaptive Control. This setting affects both starting and stopping control.

8.4.4 4 Protection Levels

4A – Current Imbalance

Range: 10% - 50% **Default:** 30%

Description: Sets the trip point for current imbalance protection.

4B – Phase Sequence

Options:
Any Sequence (default)
Positive Only
Negative Only

Description: Selects which phase sequences the soft starter will allow at a start. During its pre-start checks, the starter examines the sequence of the phases at its input terminals and trips if the actual sequence does not match the selected option.

4C – Undercurrent

Range: 0% - 100% **Default:** 20%

Description: Sets the trip point for undercurrent protection, as a percentage of motor full load current. Set to a level between the motor's normal working range and the motor's magnetising (no load) current (typically 25% to 35% of full load current). A setting of 0% disables undercurrent protection.

4D – Instantaneous Overcurrent

Range: 80% - 600% FLC **Default:** 400%

Description: Sets the trip point for instantaneous overcurrent protection, as a percentage of motor full load current.

4E – Input A Trip

Options:

Always Active (default)	A trip can occur at any time when the soft starter is receiving power.
Operating Only	A trip can occur while the soft starter is running, stopping or starting.
Run Only	A trip can only occur while the soft starter is running.

Description: Selects when an input trip can occur.

4F – Motor Temperature Check

Options:
Do Not Check (default)
Check

Description: Selects whether the ASAB will verify the motor has sufficient thermal capacity for a successful start. The soft starter compares the motor's calculated temperature with the temperature rise from the last motor start and only operates if the motor is cool enough to start successfully.

4G – Frequency Check

Options:
Do Not Check
Start Only
Start/Run (default)
Run Only

Description: Determines when and if the starter will monitor for a frequency trip.

4H – Frequency Variation

Options:
± 2 Hz
± 5 Hz (default)
± 10 Hz
± 15 Hz

Description: Selects the soft starter's tolerance for frequency variation.

8.4.5 5 Protection Delays

5A – Restart Delay

Range: 00:01 - 60:00 (minutes:seconds) **Default:** 10 seconds

Description: The ASAB can be configured to force a delay between the end of a stop and the beginning of the next start. During the restart delay period, the display shows the time remaining before another start can be attempted.

5B – Current Imbalance Delay

Range: 0:00 - 4:00 (minutes:seconds) **Default:** 3 seconds

Description: Slows the ASAB's response to current imbalance, avoiding trips due to momentary fluctuations.

5C – Undercurrent Delay

Range: 0:00 - 4:00 (minutes:seconds) **Default:** 5 seconds

Description: Slows the ASAB's response to undercurrent, avoiding trips due to momentary fluctuations.

5D – Instantaneous Overcurrent Delay

Range: 0:00 - 1:00 (minutes:seconds) **Default:** 0 second

Description: Slows the ASAB's response to overcurrent, avoiding trips due to momentary overcurrent events.

5E – Input A Trip Delay

Range: 0:00 - 4:00 (minutes:seconds) **Default:** 0 second

Description: Sets a delay between the input activating and the soft starter tripping.

5F – Input A Initial Delay

Range: 00:00 - 30:00 (minutes:seconds) **Default:** 0 second

Description: Sets a delay before an input trip can occur. The initial delay is counted from the time a start signal is received. The state of the input is ignored until the initial delay has elapsed.

5G – Frequency Delay

Range: 0:01 - 4:00 (minutes:seconds) **Default:** 1 second

Description: Slows the ASAB's response to frequency disturbances, avoiding trips due to momentary fluctuations.

8.4.6 6 Inputs

6A – Local/Remote

Options:

LCL/RMT Anytime	**LOCAL/REMOTE** button is always enabled.
LCL/RMT When Off	**LOCAL/REMOTE** button is enabled when the starter is off.
Local Control Only	All remote inputs are disabled.
Remote Control Only	Local control buttons (**START**, **RESET**, **LOCAL/REMOTE**) are disabled.

Description: Selects when the **LOCAL/REMOTE** button can be used to switch between local and remote control, and enables or disables the local control buttons and remote control inputs.
The **STOP** button on the keypad is always enabled.

6B – Comms in Remote

Options: Disable Control in RMT
Enable Control in RMT (default)

Description: Selects whether the starter will accept Start and Stop commands from the serial communication network when in Remote mode. The Reset and Local/Remote Control commands are always enabled.

6C – Remote Reset Logic

Options: Normally Closed (default)
Normally Open

Description: Selects whether the ASAB's remote reset input (terminals 58, 57) is normally open or normally closed.

6D – Input A Function		
Options:	Motor Set Select (default)	The ASAB can be configured with two separate sets of motor data. To use the secondary motor data, parameter 6D must be set to 'Motor Set Select' and 53, 55 must be closed when a start command is given. The ASAB checks which motor data to use at a start, and will use that motor data for the entire start/stop cycle.
	Input Trip (N/O)	Input A can be used to trip the soft starter. When parameter 6D is set to Input Trip (N/O), a closed circuit across 53, 55 trips the soft starter.
	Input Trip (N/C)	When parameter 6D is set to Input Trip (N/C), an open circuit across 53, 55 trips the soft starter.
	Local/Remote Select	Input A can be used to select between local and remote control, instead of using the **LOCAL/REMOTE** button on the keypad. When the input is open, the starter is in local mode and can be controlled via the keypad. When the input is closed, the starter is in remote mode. The **START** and **LOCAL/REMOTE** buttons are disabled, and the soft starter will ignore any Local/Remote select command from the serial communications network. To use Input A to select between local and remote control, parameter 6A must be set to 'LCL/RMT Anytime' or 'LCL/RMT When Off'.
	Emergency Run	In emergency run the soft starter continues to run until stopped, ignoring all trips and warnings (refer to parameter 15C for details). Closing the circuit across 53, 55 activates emergency run. Opening the circuit ends emergency run and the ASAB stops the motor.
	Starter Disable	The ASAB can be disabled via the control inputs. An open circuit across 53, 55 will disable the starter. The ASAB will not respond to start commands. If running, the soft starter will allow the motor to coast to stop, ignoring the soft stop mode set in parameter 2H.
	Jog Forward	Activates jog operation in a forward direction (will operate only in Remote mode).
	Jog Reverse	Activates jog operation in reverse direction (will operate only in Remote mode).
Description:	Selects the function of Input A.	

6E – Input A Name		
Options:	Input Trip (default)	No Flow
	Low Pressure	Starter Disable
	High Pressure	Controller
	Pump Fault	PLC
	Low Level	Vibration
	High Level	
Description:	Selects a message for the keypad to display when Input A is active.	

8.4.7 7 Relay Outputs

7A – Relay A Function		
Options:	Off	Relay A is not used.
	Main Contactor (default)	The relay closes when the ASAB receives a start command, and remains closed as long as the motor is receiving voltage.
	Run	The relay closes when the starter changes to run state.
	Trip	The relay closes when the starter trips (refer to parameter 16A to 16M).
	Warning	The relay closes when the starter issues a warning (refer to parameter 16A to 16M).
	Low Current Flag	The relay closes when the low current flag activates while the motor is running (refer to parameter 7J *Low Current Flag*).
	High Current Flag	The relay closes when the high current flag activates while the motor is running (refer to parameter 7K *High Current Flag*).
	Motor Temperature Flag	The relay closes when the motor temperature flag activates (refer to parameter 7L *Motor Temperature Flag*).
Description:	Selects the function of Relay A (normally open).	

7B, 7C – Relay A Delays

The ASAB can be configured to wait before opening or closing Relay A.

Parameter 7B *Relay A On Delay*

Range:	0:00 - 5:00 (minutes:seconds)	**Default:** 0 second
Description:	Sets the delay for closing Relay A.	

Parameter 7C *Relay A Off Delay*

Range: 0:00 - 5:00 (minutes:seconds) **Default:** 0 second

Description: Sets the delay for re-opening Relay A.

7D~7I – Output Relays B & C

Parameters 7D~7I configure the operation of Relays B and C in the same way as parameters 7A~7C configure Relay A. Refer to Relay A for details.

Relay B is a changeover relay.

- 7D *Relay B Function* **Default:** Run
- 7E *Relay B On Delay*
- 7F *Relay B Off Delay*

Relay C is normally open.

- 7G *Relay C Function* **Default:** Trip
- 7H *Relay C On Delay*
- 7I *Relay C Off Delay*

7J, 7K – Low Current Flag and High Current Flag

The ASAB has low and high current flags to give early warning of abnormal operation. The current flags can be configured to indicate an abnormal current level during operation, between the normal operating level and the undercurrent or instantaneous overcurrent trip levels. The flags can signal the situation to external equipment via one of the programmable outputs.

The flags clear when the current returns within the normal operating range by 10% of the programmed flag value.

Parameter 7J *Low Current Flag*

Range: 1% - 100% FLC **Default:** 50%

Description: Sets the level at which the low current flag operates, as a percentage of motor full load current.

Parameter 7K *High Current Flag*

Range: 50% - 600% FLC **Default:** 100%

Description: Sets the level at which the high current flag operates, as a percentage of motor full load current.

7L – Motor Temperature Flag

The ASAB has a motor temperature flag to give early warning of abnormal operation. The flag can indicate that the motor is operating above its normal operating temperature but lower than the overload limit. The flag can signal the situation to external equipment via one of the programmable outputs.

Range: 0% - 160% **Default:** 80%

Description: Sets the level at which the motor temperature flag operates, as a percentage of the motor's thermal capacity.

8.4.8 8 Analog Output

The ASAB has an analog output, which can be connected to associated equipment to monitor motor performance.

8A – Analog Output A

Options:

Current (% FLC) (default)	Current as a percentage of motor full load current.
Motor Temp (%)	Motor temperature as a percentage of the motor's thermal capacity.
Motor kW (%)	Measured motor kilowatts, as a percentage of maximum kW.
Motor kVA (%)	Measured motor kilovolt amperes, as a percentage of maximum kVA.
Motor pf	Motor power factor, measured by the soft starter.

Measured motor kW:	√3 x average current x mains reference voltage x measured power factor
Maximum motor kW:	√3 x motor FLC x mains reference voltage. Power factor is assumed to be 1
Measured motor kVA:	√3 x average current x mains reference voltage
Maximum motor kVA:	√3 x motor FLC x mains reference voltage

Description: Selects which information will be reported via the analog output.

8B – Analog A Scale

Range: 0-20 mA
4-20 mA (default)

Description: Selects the range of the analog output.

8C – Analog A Maximum

Range: 0% - 600% **Default:** 100%

Description: Calibrates the upper limit of the analog output to match the signal measured on an external current measuring device.

8D – Analog A Minimum

Range: 0% - 600% **Default:** 0%

Description: Calibrates the lower limit of the analog output to match the signal measured on an external current measuring device.

8.4.9 9 Auto-Reset

The ASAB can be programmed to automatically reset certain trips, which can help minimise operating downtime. Trips are divided into three categories for auto-reset, depending on the risk to the soft starter:

Group		
	A	Current imbalance Phase Loss Power loss Frequency
	B	Undercurrent Instantaneous overcurrent Input A Trip
	C	Motor overload Motor thermistor Heatsink Overtemperature

Other trips cannot be automatically reset.

This function is ideal for remote installations using 2-wire control in Remote mode. If the 2-wire start signal is present after an auto-reset, the ASAB will restart.

9A – Auto-Reset Action

Options:
Do Not Auto-Reset (default)
Reset Group A
Reset Group A & B
Reset Group A, B & C

Description: Selects which trips can be auto-reset.

9B – Maximum Resets

Range: 1 - 5 **Default:** 1

Description: Sets how many times the soft starter will auto-reset, if it continues to trip. The reset counter increases by one each time the soft starter auto-resets, and decreases by one after each successful start/stop cycle.

NOTE
If the starter is manually reset, the resets counter will return to zero.

9C – Reset Delay Groups A&B

Range: 00:05 - 15:00 (minutes:seconds) **Default:** 5 seconds

Description: Sets the delay before resetting Group A and Group B trips.

9D – Reset Delay Group C

Range: 5 - 60 (minutes) **Default:** 5 minutes

Description: Sets the delay before resetting Group C trips.

8.4.10 10 Display

10A – Language

Options:

English (default)	Português
Chinese	Français
Español	Italiano
Deutsch	Russian

Description: Selects which language the keypad will use to display messages and feedback.

10B, 10C, 10D, 10E – User-Programmable Screen

Options:	Blank	Displays no data in the selected area, allowing long messages to be shown without overlapping.
	Starter State	The starter's operating state (starting, running, stopping or tripped). Only available for top left and bottom left positions on the screen.
	Motor Current	The average current measured on three phases.
	Motor pf	The motor's power factor, measured by the soft starter.
	Mains Frequency	The average frequency measured on three phases.
	Motor kW	The motor's running power in kilowatts.
	Motor HP	The motor's running power in horsepower.
	Motor Temp	The motor's temperature, calculated by the thermal model.
	kWh	The number of kilowatt hours the motor has run via the soft starter.
	Hours Run	The number of hours the motor has run via the soft starter.

Description: Selects which information will be displayed on the programmable monitoring screen.

- 10B *User Screen - Top Left* **Default:** Starter State
- 10C *User Screen - Top Right* **Default:** Blank
- 10D *User Screen - Bottom Left* **Default:** Hours Run
- 10E *User Screen - Bottom Right* **Default:** Blank

10F – Graph Timebase

Options:
10 seconds (default)
30 seconds
1 minute
5 minutes
10 minutes
30 minutes
1 hour

Description: Sets the graph time scale. The graph will progressively replace the old data with new data.

10G – Graph Maximum

Range: 0% – 600% **Default:** 400%

Description: Adjusts the upper limit of the performance graph.

10H – Graph Minimum

Range: 0% – 600% **Default:** 0%

Description: Adjusts the lower limit of the performance graph.

10I – Mains Reference Voltage

Range: 100 – 690 V **Default:** 400 V

Description: Sets the nominal mains voltage for the keypad's monitoring functions. This is used to calculate motor kilowatts and kilovolt amperes (kVA) but does not affect the ASAB's motor control or protection.

10J – Display A or kW

Options:
Current (default)
Motor kW

Description: Selects whether the ASAB will display current (amperes) or motor kilowatts on the main monitoring screen.

8.4.11 15 Restricted

15A – Access Code

Range: 0000 - 9999 **Default:** 0000

Description: Sets the access code to control access to restricted sections of the menus.
Use the **EXIT** and **MENU/ENTER** buttons to select which digit to alter and use the ▲ and ▼ buttons to change the value.

NOTE
In the event of a lost access code, contact your supplier for a master access code that allows you to re-program a new access code.

15B – Adjustment Lock

Options:	Read & Write (default)	Allows users to alter parameter values in the Programming Menu.
	Read Only	Prevents users altering parameter values in the Programming Menu. Parameter values can still be viewed.

Description: Selects whether the keypad will allow parameters to be changed via the Programming Menu.

15C – Emergency Run

Options: Disable (default)
Enable

Description: Selects whether the soft starter will permit emergency run operation. In emergency run, the soft starter will start (if not already running) and continue to operate until emergency run ends, ignoring stop commands and trips. Emergency run is controlled using a programmable input.

CAUTION
Continued use of Emergency Run is not recommended. Emergency Run may compromise the starter life as all protections and trips are disabled.

Using the starter in 'Emergency Run' mode will void the product warranty.

15D – Current Calibration

Range: 85% - 115% **Default:** 100%

Description: Calibrates the soft starter's current monitoring circuits to match an external current metering device. Use the following formula to determine the necessary adjustment:

$$\text{Calibration (\%)} = \frac{\text{Current shown on ASAB display}}{\text{Current measured by external device}}$$

$$\text{eg } 102\% = \frac{66A}{65A}$$

NOTE
This adjustment affects all current-based functions and protections.

15E – Shorted SCR Action

Options: 3-Phase Control Only (default)
PowerThrough

Description: Selects whether the soft starter will allow PowerThrough operation, if the soft starter is damaged on one phase. The soft starter will use two-phase control, allowing the motor to continue operating in critical applications.

- PowerThrough can only operate with internally bypassed soft starters.
- PowerThrough is only available with in-line installations. If the starter is installed inside delta, PowerThrough will not operate.
- PowerThrough remains active until '3-Phase Control Only' is reselected.

A shorted SCR or a short within the bypass contactor will trip the starter on ‘Lx-Tx shorted’. If PowerThrough is enabled, the trip can be reset and subsequent starts will use PowerThrough two-phase control; however not all features will be available. The trip LED will flash and the display will indicate ‘2 Phase - Damaged SCR'.

CAUTION
PowerThrough uses a two-phase soft start technology and additional care is required when sizing circuit breakers and protection. Contact your local supplier for assistance.

CAUTION
The starter will trip on Lx-Tx Shorted on the first start attempt after control power is applied. PowerThrough will not operate if control power is cycled between starts.

PowerThrough operation does not support Adaptive Control soft starting or soft stopping. In PowerThrough, the ASAB will automatically select constant current soft starting and timed voltage ramp soft stopping. If PowerThrough is enabled, parameters 2C and 2B must be set appropriately.

15F – Jog Torque

The ASAB can jog the motor at a reduced speed, which allows precise positioning of belts and flywheels. Jog can be used for either forward or reverse operation.

Range: 20% - 100% **Default:** 50%

Description: Sets the current limit for jog operation.

15G – Brake Torque			
Range:	20% - 100%	**Default:**	20%
Description:	Sets the amount of brake torque the ASAB will use to slow the motor.		

15H – Brake Time			
Range:	1 - 30 (seconds)	**Default:**	1 second
Description:	Sets the duration for DC injection during a braking stop.		

NOTE
Parameter 15H is used in conjunction with parameter 2I. Refer to *Brake* for details.

15I – Brake Torque-2			
Range:	20% - 100%	**Default:**	20%
Description:	Sets the amount of brake torque the ASAB will use to slow the motor.		

15J – Brake Time-2			
Range:	1 - 30 (seconds)	**Default:**	1 second
Description:	Sets the duration for DC injection during a braking stop.		

8.4.12 16 Protection Action

CAUTION
Defeating the protection may compromise the starter and motor, and should only be done in the case of emergency.

16A~16M – Protection Action

Options: Trip Starter (default)
Warn and Log
Log Only

Description: Selects the soft starter's response to each protection.

- 16A *Motor Overload*
- 16B *Current Imbalance*
- 16C *Undercurrent*
- 16D *Instantaneous Overcurrent*
- 16E *Input A Trip*
- 16F *Frequency*
- 16G *Motor Thermistor*
- 16H *Excess Start Time*
- 16I *Starter Communication*
- 16J *Heatsink Overtemperature*
- 16K *Battery/Clock*
- 16L *Network Communication*
- 16M *Low Control Volts*

8.5 Adjustment Lock

You can lock the Programming Menu to prevent users from altering parameter settings. The adjustment lock can be turned on and off using parameter 15B.

To lock the programming menu:

1. Open the Programming Menu.
2. Open the Extended Menu.
3. Select 'Restricted'.
4. Enter the Access Code.
5. Select parameter 15B *Adjustment Lock*
6. Select and store 'Read Only'.

If a user attempts to change a parameter value when the adjustment lock is active, an error message is displayed:

```
ACCESS DENIED
ADJ LOCK IS ON
```

8.6 Access Code

Critical parameters (parameter group 15 and higher) are protected by a four-digit security access code, preventing unauthorised users from viewing or modifying parameter settings.

When a user attempts to enter a restricted parameter group, the keypad prompts for an access code. The access code is requested once for the programming session, and authorisation continues until the user closes the menu.

To enter the access code, use the **EXIT** and **MENU/ENTER** buttons to select a digit, and the ▲ and ▼ buttons to change the value. When all four digits match your access code, press **MENU/ENTER**. The keypad will display an acknowledgement message before continuing.

```
ENTER ACCESS CODE
      0###
```

MENU/ENTER

```
 ACCESS ALLOWED
   SUPERVISOR
```

To change the access code, use parameter 15A.

The default access code is 0000.

8.7 Setup Tools

Setup Tools includes maintenance options to configure the ASAB's date and time, reset the thermal models or load a standard parameter set.

To access the Setup Tools, open the Programming Menu then select Setup Tools.

8.7.1 Set Date and Time

To set the date and time:

1. Open the Setup Tools.
2. Scroll to the date/time screen.
3. Press the **MENU/ENTER** button to enter edit mode.
4. Press the **MENU/ENTER** and **EXIT** buttons to select which part of the date or time to edit.
5. Use the ▲ and ▼ buttons to change the value.
6. To save changes, press the **MENU/ENTER** button. The ASAB will confirm the changes.

To cancel changes, press the **EXIT** button.

8.7.2 Load/Save Settings

The Load/Save Settings menu requires an access code and allows users to:

- Load the ASAB's parameters with default values
- Reload previously saved parameter settings from an internal file
- Save the current parameter settings to an internal file

In addition to the factory default values file, the ASAB can store two user-defined parameter files. These files contain default values until a user file is saved.

To load or save parameter settings:

1. Open the Setup Tools.
2. Scroll to Load/Save Settings and press the **MENU/ENTER** button.
3. Scroll to the required function and press the **MENU/ENTER** button.

```
LOAD/SAVE SETTINGS
  LOAD DEFAULTS
  LOAD USER SET 1
  LOAD USER SET 2
```

4. At the confirmation prompt, select YES to confirm or NO to cancel and then **MENU/ENTER** to load/save the selection.

```
  LOAD DEFAULTS
       NO
       YES
```

When the action has been completed, the screen will briefly display a confirmation message, then return to the status screens.

8.7.3 Reset Thermal Models

NOTE
This function is protected by the security access code.

The ASAB's advanced thermal modelling software constantly monitors the motor's performance. This allows the ASAB to calculate the motor's temperature and ability to start successfully at any time. If the ASAB is configured for use on two motors, each motor's temperature is modelled separately.

The thermal model for the active motor can be reset if required.

1. Open the Setup Tools.
2. Scroll to Reset Thermal Models and press **MENU/ENTER**.

```
RESET THERMAL MODELS
       M1 X%
       M2 X%
 MENU/ENTER TO RESET
```

3. Use ▼ to select Reset and press **MENU/ENTER** to confirm.

```
DO NOT RESET
RESET
```

4. When the thermal model has been reset, the screen will display a confirmation message then return to the previous screen.

CAUTION
Resetting the motor thermal model may compromise motor life and should only be done in the case of emergency.

9 Logs Menu

The Logs Menu provides information on events, trips and starter performance.

Press the **LOGS** button to open the Logs Menu.

To navigate through the Logs Menu:

- to open a log, press the **MENU/ENTER** button.
- to scroll through the entries in each log, press the ▲ and ▼ buttons.
- to view details of a log entry, press the **MENU/ENTER** button.
- to return to the previous level, press the **EXIT** button.
- to close the Logs Menu, press **LOGS**.

9.1 Trip Log

The Trip Log stores details of the eight most recent trips, including the date and time the trip happened. Trip 1 is the most recent and trip 8 is the oldest stored trip.

To open the Trip Log:

1. Open the Logs Menu.
2. Scroll to Trip Log and press **MENU/ENTER**.
3. Use the ▲ and ▼ buttons to select a trip to view, and press **MENU/ENTER** to display details.

To close the log and return to the main display, press **LOGS**.

9.2 Event Log

The Event Log stores time-stamped details of the starter's 99 most recent events (actions, warnings and trips), including the date and time of the event. Event 1 is the most recent and event 99 is the oldest stored event.

To open the Event Log:

1. Open the Logs Menu.
2. Scroll to Event Log and press **MENU/ENTER**.
3. Use the ▲ and ▼ buttons to select an event to view, and press **MENU/ENTER** to display details.

To close the log and return to the main display, press **LOGS**.

9.3 Performance Counters

The performance counters store statistics on the starter's operation:

- Hours run (lifetime and since counter last reset)
- Number of starts (lifetime and since counter last reset)
- Motor kWh (lifetime and since counter last reset)
- Number of times the thermal model has been reset

To view the counters:

1. Open the Logs Menu.
2. Scroll to counters and press **MENU/ENTER**.
3. Use the ▲ and ▼ buttons to scroll through the counters. Press **MENU/ENTER** to view details.
4. To reset a counter, press **MENU/ENTER** then use the ▲ and ▼ buttons to select Reset/Do Not Reset. Press **MENU/ENTER** to confirm the action.

To close the counter and return to the Logs Menu, press **MENU/ENTER**.

NOTE
The reset counters function is protected by the access code.

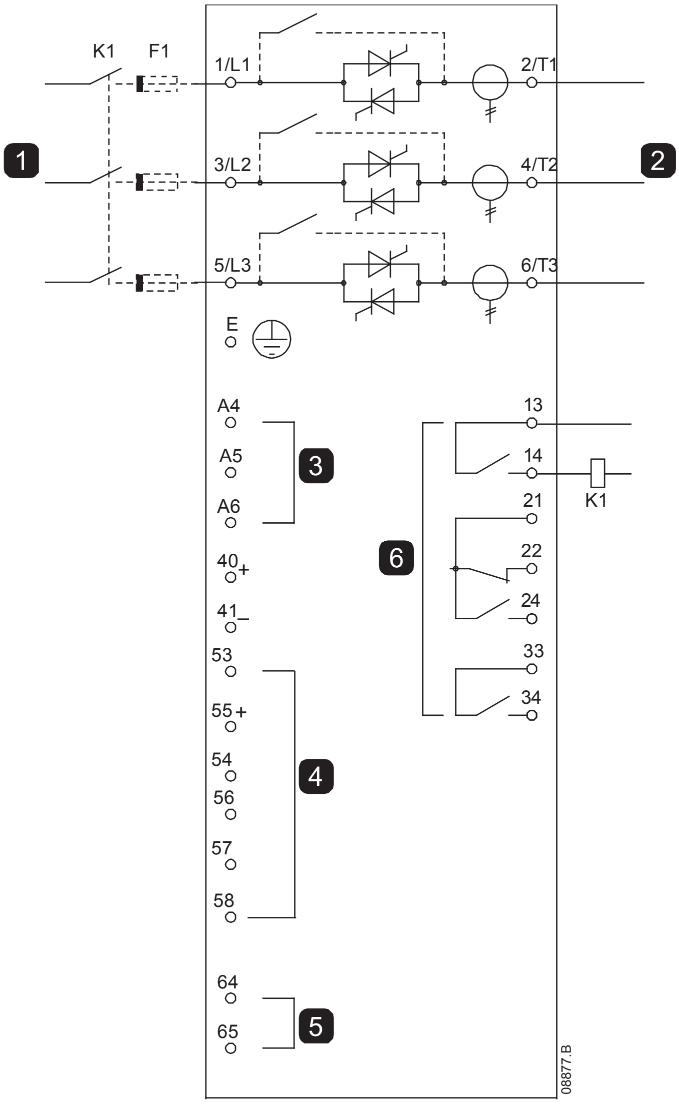
10 Application Examples

A selection of Application Notes are available describing advanced installation or configuration of the ASAB for situations with specific performance requirements. Application notes are available for situations including brake and jog operation, pumping and advanced protection options.

10.1 Installation with Main Contactor

The ASAB is installed with a main contactor (AC3 rated). Control voltage must be supplied from the input side of the contactor.

The main contactor is controlled by the ASAB Main Contactor output, which by default is assigned to Output Relay A (terminals 13, 14).



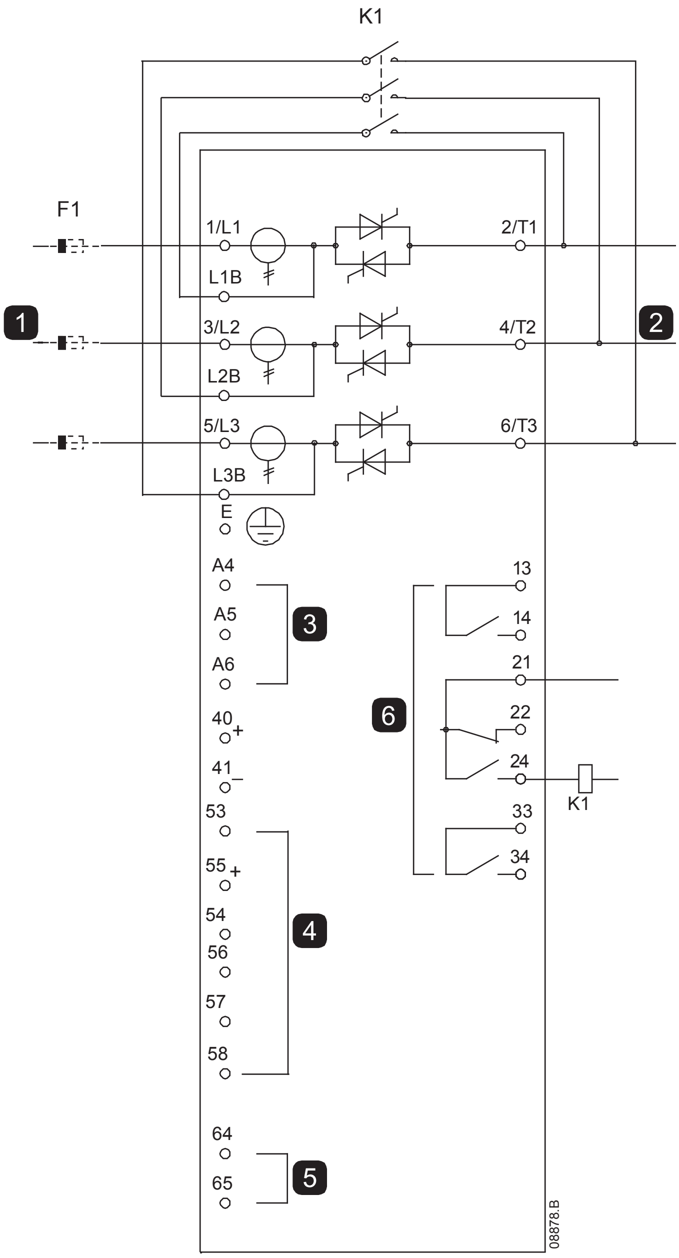
1	Three-phase supply
2	Motor terminals
3	Control voltage (model dependent)
4	Remote control inputs
5	Motor thermistor input
6	Relay outputs
K1	Main contactor
F1	Semiconductor fuses (optional)
S1	Start/stop contact
S2	Reset contact
13, 14	Relay output A
21, 22, 24	Relay output B
33, 34	Relay output C

Parameter settings:

- Parameter 7A *Relay A Function*
  - Select 'Main Contactor' - assigns the Main Contactor function to Relay Output A (default setting)

10.2 Installation with Bypass Contactor

The ASAB is installed with a bypass contactor (AC1 rated). The bypass contactor is controlled by the ASAB Run Output which by default is assigned to Output Relay B (terminals 21, 22, 24).



1	Three-phase supply
2	Motor terminals
3	Control voltage (model dependent)
4	Remote control inputs
5	Motor thermistor input
6	Relay outputs
K1	Bypass contactor (external)
F1	Semiconductor fuses (optional)
S1	Start contact
S2	Stop contact
S3	Reset contact
13, 14	Relay output A
21, 22, 24	Relay output B
33, 34	Relay output C

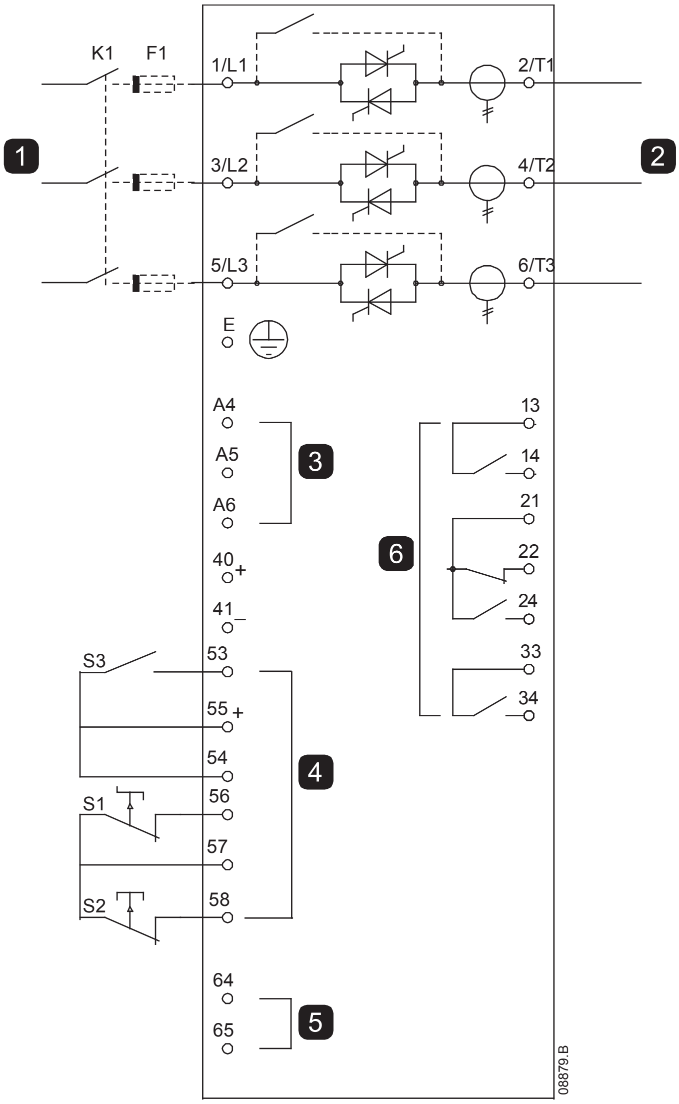
Parameter settings:

- Parameter 7D *Relay B Function*
  - Select 'Run' - assigns the run output function to Relay Output B (default value).

10.3 Emergency Run Operation

In normal operation the ASAB is controlled via a remote two-wire signal (terminals 56, 57).

Emergency Run is controlled by a two-wire circuit connected to Input A (terminals 53, 55). Closing Input A causes the ASAB to run the motor and ignore certain trip conditions.



1	Three-phase supply
2	Motor terminals
3	Control voltage (model dependent)
4	Remote control inputs
5	Motor thermistor input
6	Relay outputs
S1	Start/stop contact
S2	Reset contact
S3	Emergency Run Contact
13, 14	Relay output A
21, 22, 24	Relay output B
33, 34	Relay output C

Parameter settings:

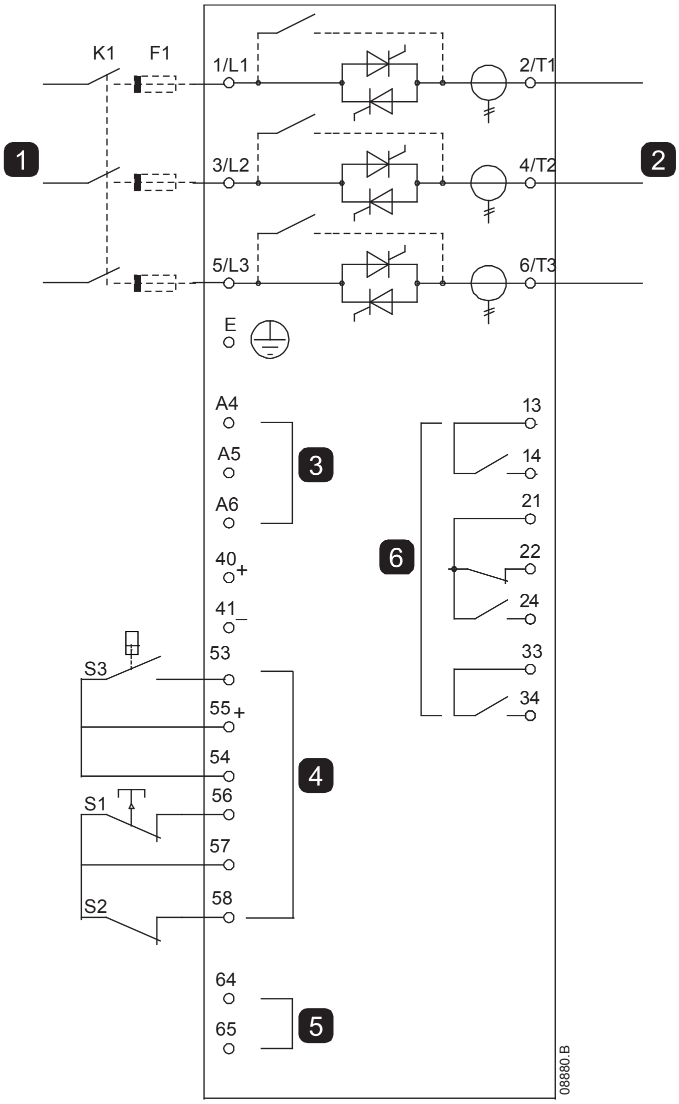
- Parameter 6D *Input A Function*
  - Select 'Emergency Run' - assigns Input A for Emergency Run function.
- Parameter 15C *Emergency Run*
  - Select 'Enable' - Enables Emergency Run mode.

NOTE
Although the Emergency Run satisfies the functionality requirements of Fire Mode, Santerno does not recommend its use in situations that require testing and/or compliance with specific standards as it is not certified.

10.4 Auxiliary Trip Circuit

In normal operation the ASAB is controlled via a remote two-wire signal (terminals 56, 57).

Input A (terminals 53, 55) is connected to an external trip circuit (such as a low pressure alarm switch for a pumping system). When the external circuit activates, the soft starter trips, which stops the motor.



1	Three-phase supply
2	Motor terminals
3	Control voltage (model dependent)
4	Remote control inputs
5	Motor thermistor input
6	Relay outputs
S1	Start/stop contact
S2	Reset contact
S3	Auxiliary trip contact
13, 14	Relay output A
21, 22, 24	Relay output B
33, 34	Relay output C

Parameter settings:

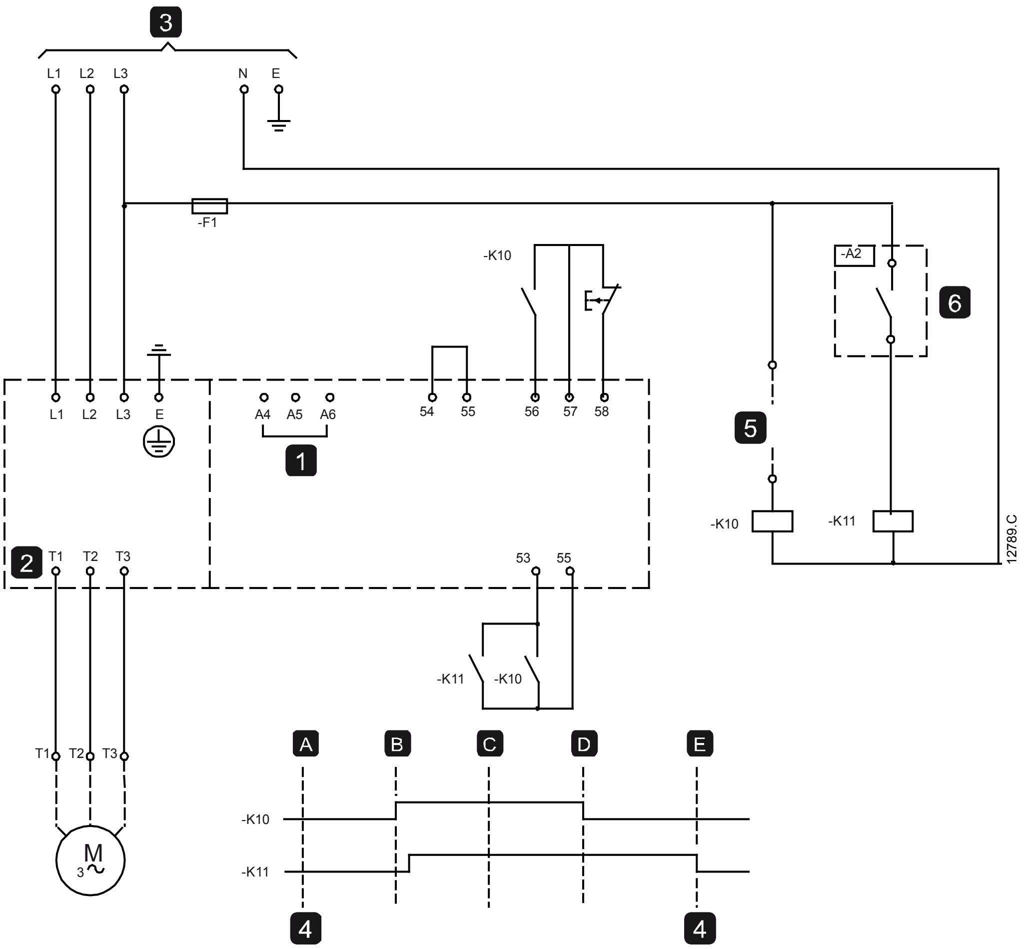
- Parameter 6D *Input A Function*
  - Select 'Input Trip (N/O)'. Assigns the Input A to Auxiliary Trip (N/O) function.
- Parameter 6E *Input A Name*
  - Select a name, eg Low Pressure. Assigns a name to Input A.
- Parameter 4E *Input A Trip*
  - Set as required. For example, 'Run Only' limits the input trip to when the soft starter is running only.
- Parameter 5E *Input A Trip Delay*
  - Set as required. Sets a delay between the input activating and the soft starter tripping.
- Parameter 5F *Input A Initial Delay*
  - Set at around 120 seconds. Limits operation of the input trip to 120 seconds after the start signal. This allows time for pressure to build up in the piping before the low pressure input becomes active.

10.5 DC Brake with External Zero Speed Sensor

For loads which may vary between braking cycles, there are benefits in using an external zero-speed sensor to interface with the ASAB for brake shut-off. This control method ensures that the ASAB braking will always shut off when the motor has reached a standstill, thus avoiding unnecessary motor heating.

The following schematic diagram shows how you can use a zero-speed sensor with the ASAB to turn the brake function off at motor standstill. The zero-speed sensor (A2) is often referred to as an under-speed detector. Its internal contact is open at zero-speed and closed at any speed above zero-speed. Once the motor has reached a standstill, 53, 55 will open and the starter will be disabled. When the next start command is given (ie next application of K10), 53, 55 closes and the ASAB is enabled.

The ASAB must be operated in remote mode and parameter 6D *Input A Function* must be set to 'Starter Disable'.



1	Control voltage		A	Off (Ready)
54, 55	Start		B	Start
56, 57	Stop		C	Run
58, 57	Reset		D	Stop
2	Motor terminals		E	Zero speed
3	Three-phase supply		**5**	Start signal (2, 3, or 4-wire)
4	Starter Disable (shown on starter display)		**6**	Zero speed sensor

For details on configuring DC Brake, refer to *Brake* (page 33).

CAUTION
When using DC brake, the mains supply must be connected to the soft starter (input terminals L1, L2, L3) in positive phase sequence and parameter 4B *Phase Sequence* must be set to Positive Only.

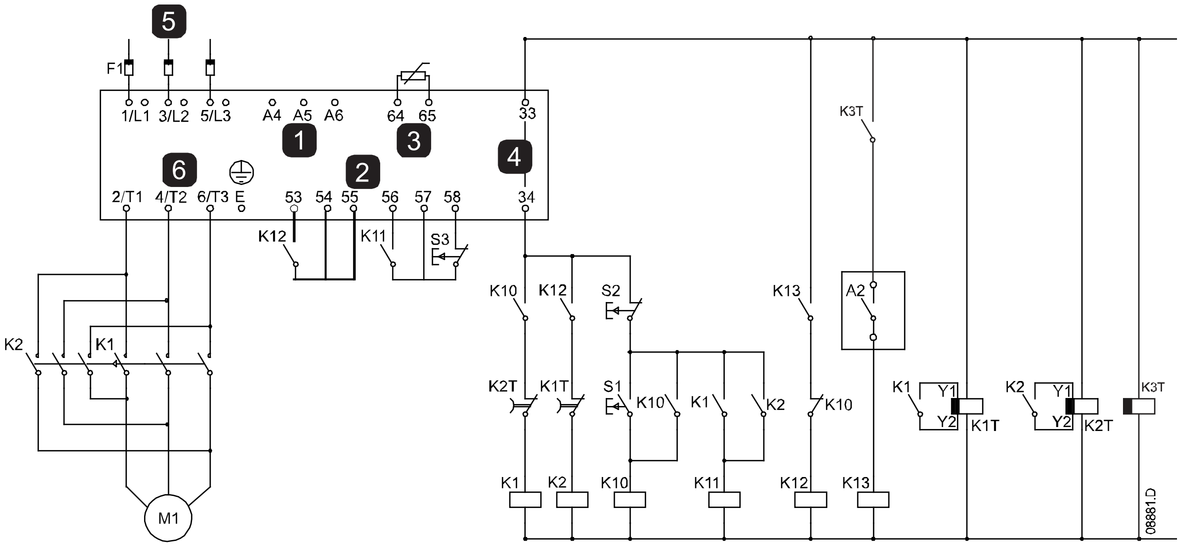
10.6 Soft Braking

For applications with high inertia and/or a variable load, the ASAB can be configured for soft braking.

In this application the ASAB is employed with forward run and braking contactors. When the ASAB receives a start signal (pushbutton S1), it closes the forward run contactor (K1) and controls the motor according to the programmed primary motor settings.

When the ASAB receives a stop signal (pushbutton S2), it opens the forward run contactor (K1) and closes the braking contactor (K2) after a delay of approximately 2-3 seconds (K1T). K12 is also closed to activate the secondary motor settings, which should be user programmed for the desired stopping performance characteristics.

When motor speed approaches zero, the zero speed sensor (A2) stops the soft starter and opens the braking contactor (K2).



1	Control voltage (model dependent)
2	Remote control inputs
3	Motor thermistor input
4	Relay outputs
5	Three-phase supply
6	Motor terminals

A2	Zero speed sensor
K10	Run relay
K11	Start relay
K12	Brake relay
K13	Zero speed sensor relay
K1	Line contactor (Run)
K2	Line contactor (Brake)
K1T	Run delay timer
K2T	Brake delay timer
K3T	Zero speed sensor delay timer
S1	Start contact
S2	Stop contact
S3	Reset contact

Parameter settings:

- Parameter 6D *Input A Function* (terminals 53, 55)
  - Select 'Motor Set Select' - assigns Input A for Motor set selection.
  - Set starting performance characteristics using the primary motor set.
  - Set braking performance characteristics using the secondary motor settings.
- Parameter 7G *Relay C Function*
  - Select 'Trip' - assigns Trip function to Relay Output C.

NOTE
If the ASAB trips on supply frequency (parameter 16F *Frequency*) when the braking contactor K2 opens, modify the frequency protection settings.

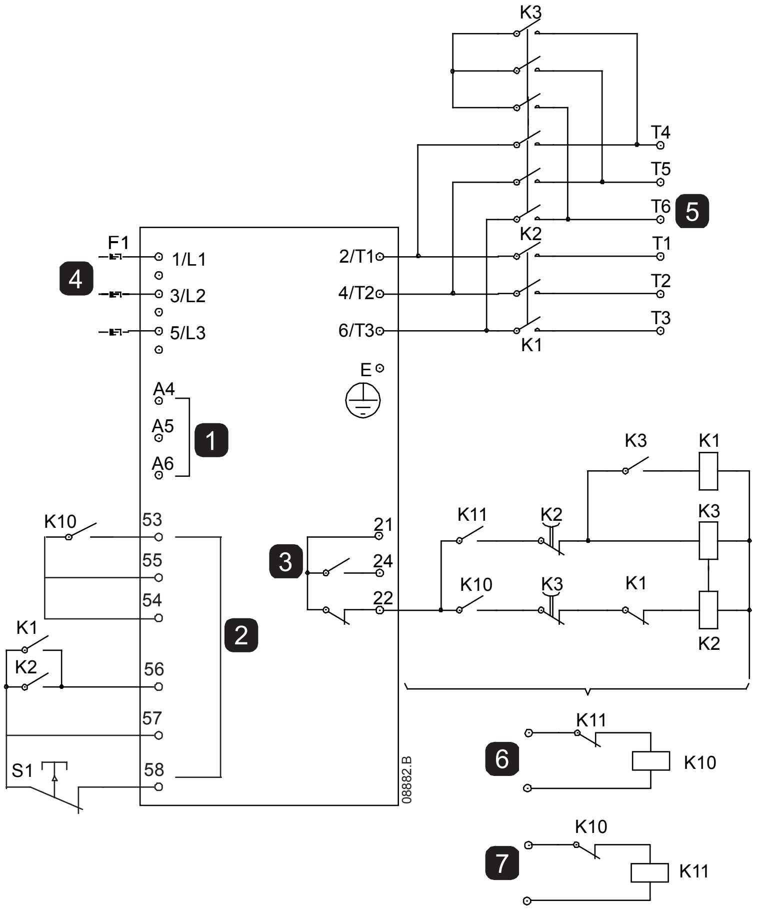
10.7 Two Speed Motor

The ASAB can be configured for control of dual speed Dahlander type motors, using a high speed contactor (K1), low speed contactor (K2) and a star contactor (K3).

NOTE
Pole Amplitude Modulated (PAM) motors alter the speed by effectively changing the stator frequency using external winding configuration. Soft starters are not suitable for use with this type of two-speed motor.

When the soft starter receives a high speed start signal, it closes the high speed contactor (K1) and star contactor (K3), then controls the motor according to the primary motor settings.

When the soft starter receives a low speed start signal, it closes the low speed contactor (K2). This closes Input A and the ASAB controls the motor according to the secondary motor settings.



1	Control voltage (model dependent)	K10	Remote start relay (low speed)
2	Remote control inputs	K11	Remote start relay (high speed)
3	Relay outputs	K1	Line contactor (high speed)
4	Three-phase supply	K2	Line contactor (low speed)
5	Motor terminals	K3	Star contactor (high speed)
6	Remote low speed start input	S1	Reset contact
7	Remote high speed start input	21, 22, 24	Relay output B

NOTE
Contactors K2 and K3 must be mechanically interlocked.

Parameter settings:

- Parameter 6D *Input A Function*
  - Select 'Motor Set Select' - assigns Input A for Motor set selection.
  - Set high speed performance characteristics using the primary motor settings.
  - Set low speed performance characteristics using the secondary motor settings.
- Parameter 7D *Relay B Function*
  - Select 'Trip' - assigns Trip function to Relay Output B

NOTE
If the ASAB trips on supply frequency (parameter 16F *Frequency*) when the high-speed start signal (7) is removed, modify the frequency protection settings.

11 Troubleshooting

11.1 Protection Responses

When a protection condition is detected, the ASAB will write this to the event log and may also trip or issue a warning. The soft starter's response depends on the Protection Action setting (parameter group 16).

Some protection responses cannot be adjusted by the user. These trips are usually caused by external events (such as phase loss) or by a fault within the soft starter. These trips do not have associated parameters and cannot be set to Warn or Log.

If the ASAB trips you will need to identify and clear the condition that triggered the trip, then reset the soft starter before restarting. To reset the starter, press the **RESET** button on the keypad or activate the Reset remote input.

If the ASAB has issued a warning, the soft starter will reset itself once the cause of the warning has been resolved.

11.2 Trip Messages

This table lists soft starter's protection mechanisms and the probable cause of the trip. Some of these can be adjusted using parameter group 4 Protection Levels and parameter group 16 Protection Action, other settings are built-in system protections and cannot be set or adjusted.

Display	Possible cause/Suggested solution
2 PHASE - DAMAGED SCR	This message is displayed if the soft starter tripped on " Lx-Tx shorted" during the pre-start checks and PowerThrough is enabled. It indicates that the starter now operates in PowerThrough mode (2-phase control only). Check for either a shorted SCR or a short within the bypass contactor. Related parameters: 15E
BATTERY/CLOCK	A verification error has occurred on the real time clock, or the backup battery voltage is low. If the battery is low and the power is off, date/time settings will be lost. The ASAB will continue to soft start and soft stop correctly. Reprogram the date and time. The battery is not removable. In order to replace the battery, the main control PCB must be replaced. Related parameters: 16K
CONTROLLER	This is a name selected for a programmable input. Refer to Input A trip.
CURRENT IMBALANCE	Current imbalance can be caused by problems with the motor, the environment or the installation, such as: • An imbalance in the incoming mains voltage • A problem with the motor windings • A light load on the motor • A phase loss on input terminals L1, L2 or L3 during Run mode • An SCR that has failed open circuit. A failed SCR can only be definitely diagnosed by replacing the SCR and checking the starter's performance. Related parameters: 4A, 5B, 16B
CURRENT READ ERR LX	Where 'X' is 1, 2 or 3. Internal fault (PCB fault). The output from the CT circuit is not close enough to zero when the SCRs are turned off. Contact your local supplier for advice. This trip is not adjustable. Related parameters: None
EXCESS START TIME	Excess start time trip can occur in the following conditions: • parameter 1A *Motor Full Load Current* is not appropriate for the motor • parameter 2B *Current Limit* has been set too low • parameter 2D *Start Ramp Time* has been set greater than the setting for 2G *Excess Start Time* setting • parameter 2D *Start Ramp Time* is set too short for a high inertia load when using Adaptive Control Related parameters: 1A, 1C, 2B, 2D, 2G, 3B, 3D, 3G, 16H
FIRING FAIL PX	Where 'X' is phase 1, 2 or 3. The SCR did not fire as expected. The SCR may be faulty or there may be an internal wiring fault. This trip is not adjustable. Related parameters: None
FLC TOO HIGH	The ASAB can support higher motor full load current values when connected to the motor using inside delta configuration rather than in-line connection. If the soft starter is connected in-line but the programmed setting for parameter 1A *Motor Full Load Current* is above the in-line maximum, the soft starter will trip at start (see *Minimum and Maximum Current Settings* on page 9). If the soft starter is connected to the motor using inside delta configuration, the soft starter may not be correctly detecting the connection. Contact your local supplier for advice. Related parameters: 1A, 1C

Display	Possible cause/Suggested solution
FREQUENCY	The mains frequency has gone beyond the specified range. Check for other equipment in the area that could be affecting the mains supply, particularly variable speed drives and switch mode power supplies (SMPS). If the ASAB is connected to a generator set supply, the generator may be too small or could have a speed regulation problem. Related parameters: 4G, 4H, 5G, 16F
HEATSINK OVERTEMPERATURE	Check if cooling fans are operating. If mounted in an enclosure, check if ventilation is adequate. Fans operate during Start, Run and for 10 minutes after the starter exits the Stop state. **NOTE** Models ASAB-0023B to ASAB-0053B and ASAB-0170B do not have a cooling fan. Models with fans will operate the cooling fans from a Start until 10 minutes after a Stop. Related parameters: 16J
HIGH LEVEL	This is a name selected for a programmable input. Refer to Input A trip.
HIGH PRESSURE	This is a name selected for a programmable input. Refer to Input A trip.
INPUT A TRIP	The soft starter's programmable input is set to a trip function and has activated. Resolve the trigger condition. Related parameters: 4E, 5E, 5F, 6D, 6E, 16E
INSTANTANEOUS OVERCURRENT	There has been a sharp rise in motor current, probably caused by a locked rotor condition (shearpin) while running. This may indicate a jammed load. Related parameters: 4D, 5D, 16D
INTERNAL FAULT X	The ASAB has tripped on an internal fault. Contact your local supplier with the fault code (X). Related parameters: None
L1 PHASE LOSS L2 PHASE LOSS L3 PHASE LOSS	During pre-start checks the starter has detected a phase loss as indicated. In run state, the starter has detected that the current on the affected phase has dropped below 2% of the programmed motor FLC for more than 1 second, indicating that either the incoming phase or connection to the motor has been lost. Check the supply and the input and output connections at the starter and at the motor end. Phase loss can also be caused by a failed SCR, particularly an SCR that has failed open circuit. A failed SCR can only be definitely diagnosed by replacing the SCR and checking the starter's performance. Related parameters: None
L1-T1 SHORTED L2-T2 SHORTED L3-T3 SHORTED	During pre-start checks the starter has detected a shorted SCR or a short within the bypass contactor as indicated. If the starter is connected in-line with the motor, consider using PowerThrough to allow operation until the starter can be repaired. **NOTE** PowerThrough is only available with in-line installations. If the starter is installed inside delta, PowerThrough will not operate. The starter will trip on Lx-Tx Shorted on the first start attempt after control power is applied. PowerThrough will not operate if control power is cycled between starts. Related parameters: 15E
LOW CONTROL VOLTS	The ASAB has detected a drop in the control voltage. • Check the external control supply (terminals A4, A5, A6) and reset the starter. If the external control supply is stable: • the 24 V supply on the main control PCB may be faulty; or • the bypass driver PCB may be faulty (internally bypassed models only). Contact your local supplier for advice. This protection is not active in Ready state. Related parameters: 16M
LOW LEVEL	This is a name selected for a programmable input. Refer to Input A trip.
LOW PRESSURE	This is a name selected for a programmable input. Refer to Input A trip.
MOTOR OVERLOAD MOTOR 2 OVERLOAD	The motor has reached its maximum thermal capacity. Overload can be caused by: • The soft starter protection settings not matching the motor thermal capacity • Excessive starts per hour • Excessive throughput • Damage to the motor windings Resolve the cause of the overload and allow the motor to cool. Related parameters: 1A, 1B, 1C, 1D, 2A, 2B, 3A, 3B, 16A
MOTOR CONNECTION TX	Where 'X' is 1, 2 or 3. The motor is not connected correctly to the soft starter for in-line or inside delta use. • Check individual motor connections to the soft starter for power circuit continuity. • Check connections at the motor terminal box. This trip is not adjustable. Related parameters: None

Display	Possible cause/Suggested solution
MOTOR THERMISTOR	The motor thermistor input has been enabled and: • The resistance at the thermistor input has exceeded 3.6 kΩ for more than one second. • The motor winding has overheated. Identify the cause of the overheating and allow the motor to cool before restarting. • The motor thermistor input has been opened. **NOTE** If a valid motor thermistor is no longer used, a 1.2 kΩ resistor must be fitted across terminals 64, 65. Related parameters: 16G
NETWORK COMMUNICATION (BETWEEN MODULE AND NETWORK)	The network master has sent a trip command to the starter, or there may be a network communication problem. Check the network for causes of communication inactivity. Related parameters: 16L
NO FLOW	This is a name selected for a programmable input. Refer to Input A trip.
PARAMETER OUT OF RANGE	• A parameter value is outside the valid range. The starter will load the default value for all affected parameters. Press **RESET** to go to the first invalid parameter and adjust the setting. Related parameters: None
PHASE SEQUENCE	The phase sequence on the soft starter's input terminals (L1, L2, L3) is not valid. Check the phase sequence on L1, L2, L3 and ensure the setting in parameter 4B is suitable for the installation. Related parameters: 4B
PLC	This is a name selected for a programmable input. Refer to Input A trip.
POWER LOSS	The starter is not receiving mains supply on one or more phases when a Start Command is given. Check that the main contactor closes when a start command is given, and remains closed until the end of a soft stop. Check the fuses. If testing the soft starter with a small motor, it must draw at least 2% of its minimum FLC setting on each phase. Related parameters: None
PUMP FAULT	This is a name selected for a programmable input. Refer to Input A trip.
STARTER COMMUNICATION (BETWEEN MODULE AND SOFT STARTER)	• There is a problem with the connection between the soft starter and the optional communications module. Remove and reinstall the module. If the problem persists, contact your local distributor. • There is an internal communications error within the soft starter. Contact your local distributor. Related parameters: 16I
STARTER DISABLE	This is a name selected for a programmable input. Refer to Input A trip.
THERMISTOR CIRCUIT	Check that a PT100 (RTD) is not connected to 64, 65. The thermistor input has been enabled and: • The resistance at the input has fallen below 20 Ω (the cold resistance of most thermistors will be over this value) or • A short circuit has occurred. Check and resolve this condition. Related parameters: None
TIME-OVERCURRENT	The ASAB is internally bypassed and has drawn high current during running. (The 10A protection curve trip has been reached or the motor current has risen to 600% of the motor FLC setting.) Related parameters: None
UNDERCURRENT	The motor has experienced a sharp drop in current, caused by loss of load. Causes can include broken components (shafts, belts or couplings), or a pump running dry. Related parameters: 4C, 5C, 16C
UNSUPPORTED OPTION (FUNCTION NOT AVAILABLE IN INSIDE DELTA)	The selected function is not available (eg jog is not supported in inside delta configuration). Related parameters: None
VIBRATION	This is a name selected for a programmable input. Refer to Input A trip.
VZC FAIL PX	Where 'X' is 1, 2 or 3. Internal fault (PCB fault). Contact your local supplier for advice. This trip is not adjustable. Related parameters: None

11.3 General Faults

This table describes situations where the soft starter does not operate as expected but does not trip or give a warning.

Symptom	Probable Cause
Starter "Not Ready"	• Check Input A (53, 55). The starter disable function may be active. If parameter 6D is set to Starter Disable and there is an open circuit on 53, 55, the ASAB will not start.
The soft starter does not respond to the **START** or **RESET** button on the keypad.	• The soft starter may be in Remote control mode. When the soft starter is in Remote control mode, the Local LED on the starter is off. Press the **LOCAL/REMOTE** button once to change to Local control.
The soft starter does not respond to commands from the control inputs.	• The soft starter may be in Local control mode. When the soft starter is in Local control mode, the Local LED on the starter is on. Press the **LOCAL/REMOTE** button once to change to Remote control. • The control wiring may be incorrect. Check that the remote start, stop and reset inputs are configured correctly (refer to *Control Wiring* on page 14 for details). • The signals to the remote inputs may be incorrect. Test the signalling by activating each input signal in turn. The appropriate remote control input LED should activate on the starter.
The soft starter does not respond to a start command from either the local or remote controls.	• The soft starter may be waiting for the restart delay to elapse. The length of the restart delay is controlled by parameter 5A *Restart Delay*. • The motor may be too hot to permit a start. If parameter 4F *Motor Temperature Check* is set to Check, the soft starter will only permit a start when it calculates that the motor has sufficient thermal capacity to complete the start successfully. Wait for the motor to cool before attempting another start. • The starter may be disabled via a programmable input. If parameter 6D is set to Starter Disable and there is an open circuit on 53, 55, the ASAB will not start. If there is no further need to disable the starter, close the circuit on the input. **NOTE** Parameter 6A *Local/Remote* controls when the **LOCAL/REMOTE** button is enabled.
A reset does not occur after an Auto-Reset, when using a remote two-wire control.	• The remote 2-wire start signal must be removed and reapplied for a re-start.
Non-resettable Thermistor Cct trip, when there is a link between the thermistor input 64, 65 or when the motor thermistor connected between 64, 65 is permanently removed.	• The thermistor input is enabled once a link is fitted and short circuit protection has activated. - Remove the link then load the default parameter set. This will disable the thermistor input and clear the trip. - Place a 1k2 Ω resistor across the thermistor input. - Turn thermistor protection to 'Log only' (parameter 16G).
The soft starter does not control the motor correctly during starting.	• Start performance may be unstable when using a low *Motor Full Load Current* setting (parameter 1A). This can affect use on a small test motor with full load current between 5 A and 50 A. • Power factor correction (PFC) capacitors must be installed on the supply side of the soft starter. To control a dedicated PFC capacitor contactor, connect the contactor to run relay terminals.
Motor does not reach full speed.	• If the start current is too low, the motor will not produce enough torque to accelerate to full speed. The soft starter may trip on excess start time. **NOTE** Make sure the motor starting parameters are appropriate for the application and that you are using the intended motor starting profile. If parameter 6D is set to Motor Set Select, check that the corresponding input is in the expected state. The load may be jammed. Check the load for severe overloading or a locked rotor situation.
Erratic motor operation.	• The SCRs in the ASAB require at least 5 A of current to latch. If you are testing the soft starter on a motor with full load current less than 5 A, the SCRs may not latch correctly.
Erratic and noisy motor operation.	• If the soft starter is connected to the motor using inside delta configuration, the soft starter may not be correctly detecting the connection. Contact your local supplier for advice.
Soft stop ends too quickly.	• The soft stop settings may not be appropriate for the motor and load. Review the settings of parameters 2H, 2I, 3H and 3I. • If the motor is very lightly loaded, soft stop will have limited effect.
Adaptive Control, brake, jog and PowerThrough functions not working.	• These features are only available with in-line installation. If the ASAB is installed inside delta, these features will not operate.
After selecting Adaptive Control the motor	• The first Adaptive Control start is actually 'Constant Current' so that the starter can

Symptom	Probable Cause
used an ordinary start and/or the second start was different to the first.	learn from the motor characteristics. Subsequent starts use Adaptive Control.
PowerThrough does not operate when selected.	• The starter will trip on Lx-Tx Shorted on the first start attempt after control power is applied. PowerThrough will not operate if control power is cycled between starts.
Parameter settings cannot be stored.	• Make sure you are saving the new value by pressing the **MENU/ENTER** button after adjusting a parameter setting. If you press **EXIT**, the change will not be saved. • Check that the adjustment lock (parameter 15B) is set to *Read & Write*. If the adjustment lock is set to *Read Only*, settings can be viewed but not changed. You need to know the security access code to change the adjustment lock setting. • The EEPROM may be faulty on the keypad. A faulty EEPROM will also trip the soft starter, and the keypad will display the message Parameter out of range. Contact your local supplier for advice.
Remote keypad shows message "awaiting data"	The keypad is not receiving data from the control PCB. Check the cable connection.

12 Accessories

12.1 Communication Modules

ASAB soft starters support network communication via easy-to-install communications modules. Each soft starter can support one communications module at a time.

Available protocols:

Ethernet (Profinet, Modbus TCP, Ethernet/IP), Profibus, DeviceNet, Modbus RTU, and USB.

12.2 Remote Control Panel (RCP)

A remote mounted keypad can be installed with the ASAB. The keypad can be mounted up to 3 metres away from the starter, for control and monitoring.

The starter can be controlled and programmed from either the remote keypad or the keypad on the starter. Both displays show the same information.

The remote keypad also allows parameter settings to be copied between soft starters.

12.3 Finger Guard Kit

Finger guards may be specified for personnel safety. Finger guards fit over the soft starter terminals to prevent accidental contact with live terminals. Finger guards provide IP20 protection when correctly installed.

NOTE
Finger guards can be used on soft starter models ASAB-0145B~ASAB-1000B (internally bypassed models only). Different kits are required for different models.

12.4 PC Software

WinMaster PC software provides monitoring, programming and control of up to 99 soft starters.

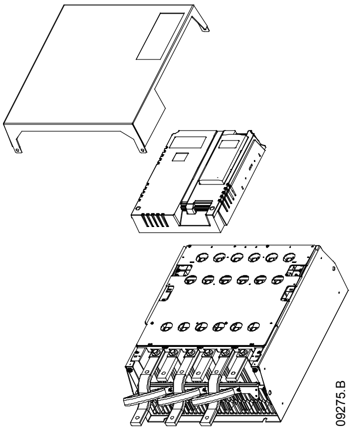
A Modbus or USB communication module is required for each starter to use WinMaster.

13 Busbar Adjustment Procedure

The busbars on non-bypassed models ASAB-0380C ~ ASAB-1600C can be adjusted for top or bottom input and output as required.

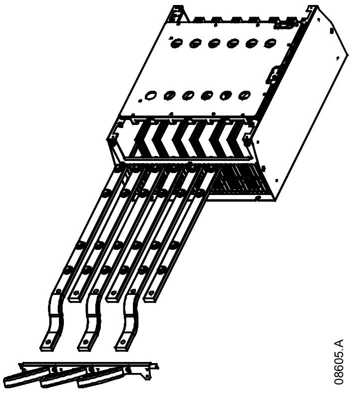
NOTE
Many electronic components are sensitive to static electricity. Voltages so low that they cannot be felt, seen or heard, can reduce the life, affect performance, or completely destroy sensitive electronic components. When performing service, proper ESD equipment should be used to prevent possible damage from occurring.

All units are manufactured with input and output busbars at the bottom of the unit as standard. The input and/or output busbars can be moved to the top of the unit if required.

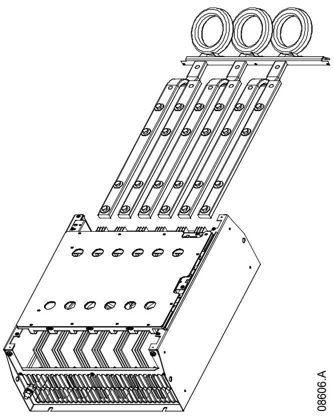


1. Remove all wiring and links from the soft starter before dismantling the unit.
2. Remove the unit cover (4 screws).
3. Remove the keypad faceplate, then gently remove the keypad (2 screws).
4. Remove the control terminal plugs.
5. Gently fold the main plastic away from the starter (12 screws).
6. Unplug the keypad loom from CON 1 (see note).
7. Label each SCR firing loom with the number of the corresponding terminal on the backplane PCB, then unplug the looms.
8. Unplug the thermistor, fan and current transformer wires from the model board.
9. Remove the plastic tray from the starter (four screws).

NOTE
Remove the main plastic slowly to avoid damaging the keypad wiring loom which runs between the main plastic and the backplane PCB.



10. Unscrew and remove the magnetic bypass plates (models ASAB-0620C to ASAB-1600C only).
11. Remove the current transformer assembly (three screws).
12. Identify which busbars are to be moved. Remove the bolts holding these busbars in place then slide the busbars out through the bottom of the starter (four bolts per busbar).



13. Slide the busbars in through the top of the starter. For input busbars, the short curved end should be outside the starter. For output busbars, the unthreaded hole should be outside the starter.
14. Replace the dome washers with the flat face towards the busbar, then tighten the bolts holding the busbars in place to 20 Nm.
15. Place the current transformer assembly over the input busbars and screw the assembly to the body of the starter (see note).
16. Run all wiring to the side of the starter and secure with cable ties.

NOTE
If moving the input busbars, the current transformers (CTs) must also be reconfigured.

1. Label the CTs L1, L2 and L3 (L1 is leftmost when looking from the front of the starter). Remove the cable ties and unscrew the CTs from the bracket.
2. Move the CT bracket to the top of the starter. Position the CTs for the correct phases, then screw the CTs to the bracket. For models ASAB-0380C ~ ASAB-0930C, the CTs must be placed on an angle (the left hand legs of each CT will be on the top row of holes and the right hand legs will be on the bottom tabs).

Q

Product description

HMS high voltage soft starter is a new type start-up equipment which integrates electronic techniques, computer techniques and modern control theory. It is the new generation product to replace the conventional star-delta starter, self-coupling voltage-drop starter and magnetic control voltage-drop starter in high voltage applications.

At a glance

- Widely used in electric industry with rated voltage 3000 to 10000V
- Mainly applicable to the control and protection for the starting and stopping of squirrel-cage type asynchronous and synchronous motors
- Application in water pumps, fans, compressors, crashers, agitators and conveyer belt etc.
- Start frequency reach to 1-3 times per hour
- Open-phase protection, Over-current protection in operation, Unbalanced phase current protection,Overload protection, Underload protection,Start timeout, Over-voltage protection, Under-voltage protection, Phase protection and Ground protection
- Communication support RS485 with Modbus RTU protocol. Support maximum 31 devices in network.
- LCD display with 6 touch membrane keyboard

Customer benefits

- Solves effectively the surging problem of inertia system when stopping.
- Only active at startup (and stop, if equipped). Ramping up the initial voltage to the motor produces gradual motor start.
- Generates a gentle start to relieve torque and tension (conveyors, belt-driven systems, gears, etc)
- Eliminate pressure surges caused in piping systems when fluid changes direction rapidly

Additional information

Specificaiton

Basic parameters	
Type of load	Three-phase squirrel cage asynchronous and synchronous motors
AC voltage	3000---10000VAC
Service frequency	50HZ/60HZ±2HZ
Phase sequence	HMS is allowed to work with any phase sequence (through setting parameter)
Composition of major loop	(12SCRS、18SCRS、30SCRS depend on model)
Bypass contactor	Contactor with direct starting capacity
Control power	AC220V±15%
Transient voltage overload protection	dv/dt snubber network
Start frequency	1-3 times per hour
Ambient condition	Ambient temperature: -20°C -+50°C
	Relative humidity: 5%----95% no condensation
	Altitude less than 1500m (derating when altitude is more than 1500m)
Protective functions	
Open-phase protection	Cut off any phase of primary power supply in the course of starting or operation.
Over-current protection in operation	Operational Over-current protection setting: 20～500%Ie
Unbalanced phase current protection	Unbalanced phase current protection: 0～100%
Overload protection	Overload protection grade: 10A、10、15、20、25、30、OFF
Underload protection	Underload protection grade: 0～99% Action time of underload protection: 0～250S
Start timeout	Start time limit: 0～120S
Over-voltage protection	When voltage of primary power supply is 70% lower than rated value, under-voltage protection is enabled.
Under-voltage protection	When voltage of primary power supply is 120% higher than rated value, over-voltage protection is enabled.
Phase protection	Allow to work with any phase sequence (through setting parameter)
Ground protection	Protection available when grounding current is higher than set value

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Description of communication	
Protocol	Modbus RTU
Communication interface	Rs485
Network connection	Each HMS can communicate with 31 HMS equipments in network.
Function	Operation state and programming can be observed through communication interface.
Operating interface	
LCD display	LCD display/touch screen display
Language	Chinese and English
Keyboard	6 touch membrane keyboard
Meter display	
Voltage of primary power supply	Display voltage of three-phase primary power supply
Three-phase current	Display current of three-phase major loop
Data record	
Fault history	Record recent 15 faults information
History of number of starts	Record number of starts of this soft starter

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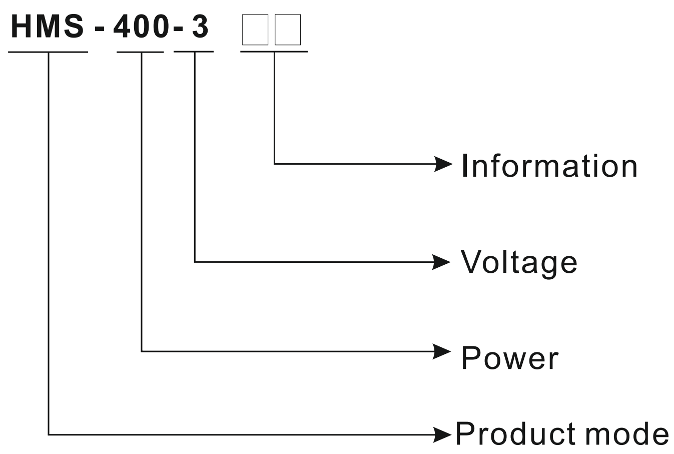
Model Definition



Voltage Grade	Specification	Rated Current (A)	W (mm)	H (mm)	L (mm)
3000V	HMS-400-3	100	1000	2300	1500
	HMS-630-3	150			
	HMS-1600-3	400	1300	2300	1600
	HMS-2500-3	≥600	Reserved		
6000V	HMS-420-6	50	1000	2300	1500
	HMS-630-6	75			
	HMS-800-6	96			
	HMS-1250-6	150			
	HMS-1600-6	200	1300	2300	1600
	HMS-2500-6	300			
	HMS-3300-6	400			
	HMS-4150-6	500			
	HMS-5000-6	≥600	Reserved		
10000V	HMS-420-10	30	1000	2300	1500
	HMS-630-10	45			
	HMS-800-10	60			
	HMS-1250-10	90			
	HMS-1500-10	110			
	HMS-1800-10	130			
	HMS-2250-10	160			
	HMS-2500-10	180			
	HMS-2800-10	200			
	HMS-3500-10	250			
	HMS-4000-10	280			

Voltage Grade	Specification	Rated Current (A)	W (mm)	H (mm)	L (mm)
10000V	HMS-4500-10	320	1300	2300	1600
	HMS-5500-10	400			
	HMS-6000-10	430			
	HMS-7000-10	500			
	HMS-8500-10	≥600	Reserved		

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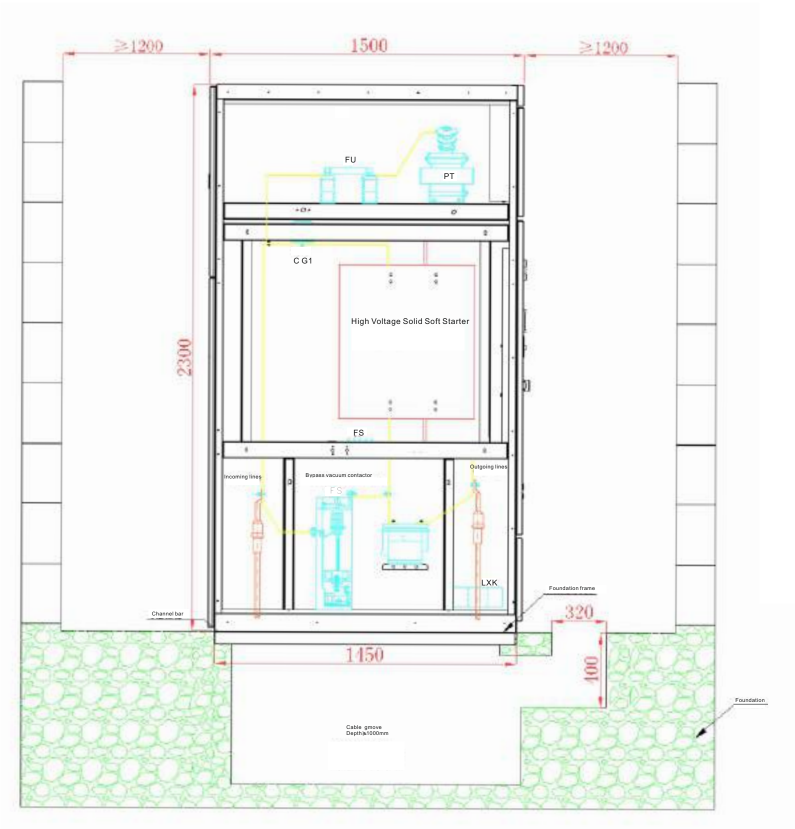
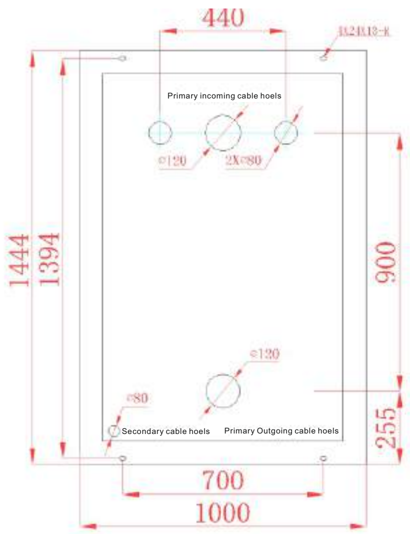
Dimensional Drawing

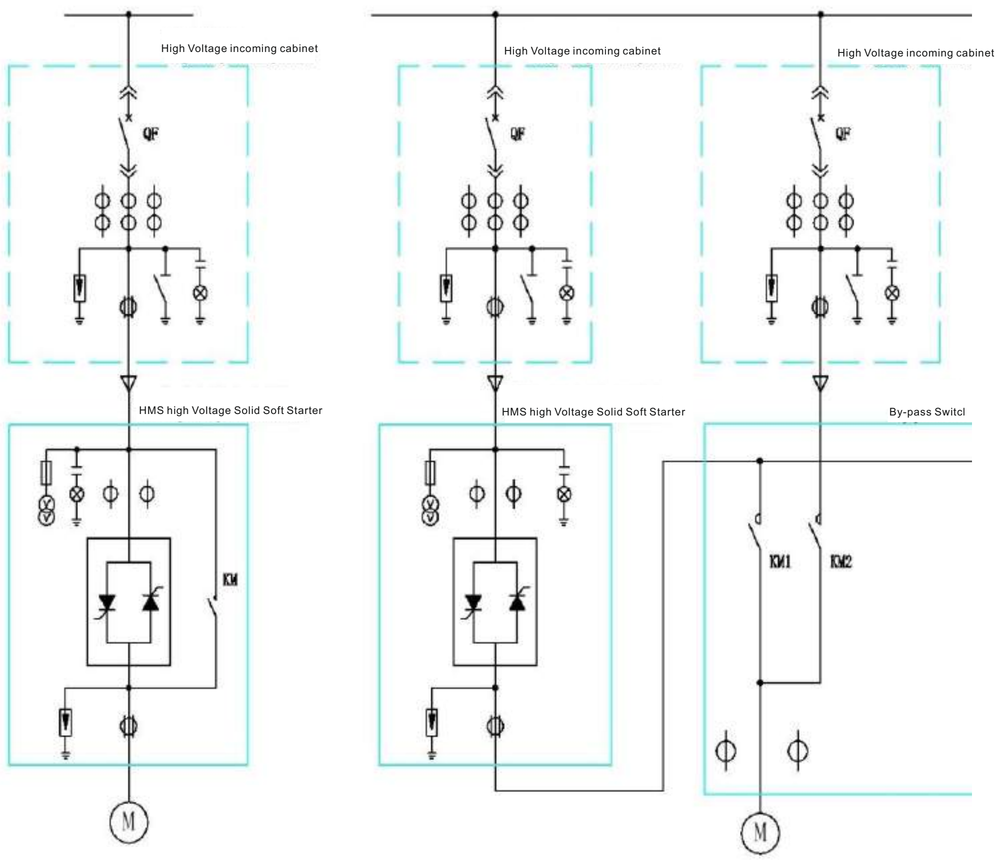


High Voltage Solid Soft Starter installation foundation



High Voltage Solid Soft Starter bottom view

Connection Diagram



One-drive-one plan

One-drive-two plan

FAMCO
هایپرصنعت

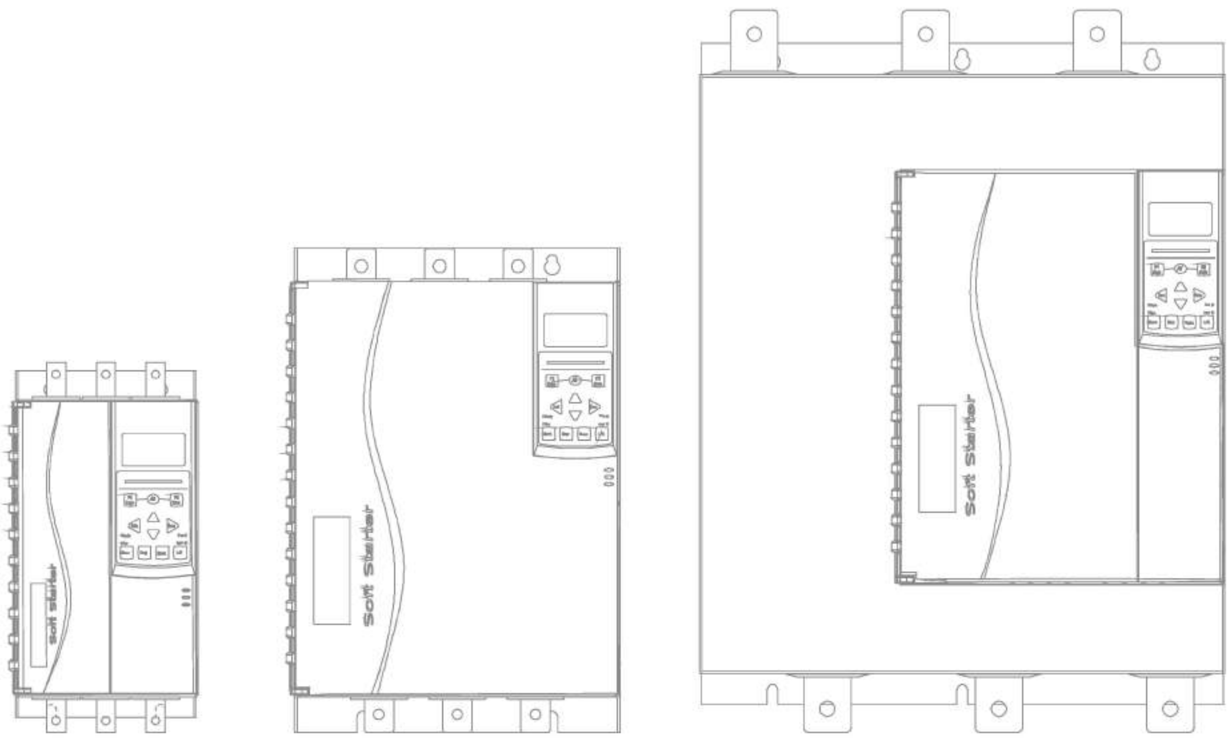
SAMAN GOSTAR TABA

User's Manual

Motor soft starters

DigiSoft S1 Series

Built-in Bypass Motor Soft Starter



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Contents

Section 1 Caution Statements

The use of this symbol in this manual reminds the reader to pay special attention to special precautions regarding the installation and operation of the equipment.

Caution Statements cannot cover every potential cause of equipment damage but can highlight common causes of damage. It is the installer's responsibility to read and understand all instructions in this manual prior to installing,operating or maintaining the soft starter, to follow good electrical practice including applying appropriate personal protective equipment and to seek advice before operating this equipment in a manner other than as described in this manual.

NOTE

The user cannot repair the soft starter. The soft starter should only be repaired by authorized service personnel. Unauthorized modification of the starter will void the product warranty.

1.1 Electrical Shock Risk

The voltages present in the following locations can cause severe electric shock and may be lethal:

- AC supply cables and connections
- Output cables and connections
- Many internal parts of the starter, and external option units

The AC supply must be disconnected from the starter using an approved isolation device before any cover is removed from the starter or before any servicing work is performed.

WARNING DANGER OF ELECTRIC SHOCK

132kW and above: As long as the power supply voltage is connected (including when the starter trips or waits for a command), the bus and radiator must be regarded as charged.

SHORT CIRCUIT

It cannot prevent short circuit. After severe overload or short circuit occurs, the operation of soft start should be fully tested by an authorized service agent.

GROUNDING AND BRANCH CIRCUIT PROTECTION

It is the responsibility of the user or person installing the soft starter to provide proper grounding and branch circuit protection according to local electrical safety codes.

FOR YOUR SAFETY

- The STOP function of the soft starter does not isolate dangerous voltages from the output of the starter. The soft starter must be disconnected by an approved electrical isolation device before accessing electrical connections.
- Soft starter protection features apply to motor protection only. It is the user's responsibility to ensure safety of personnel operating machinery.
- In some installations, accidental starts may pose an increased risk to safety of personnel or damage to the machines being driven. In such cases, it is recommended that the power supply to the soft starter is fitted with an isolating switch and a circuit-breaking device (eg power contactor) controllable through an external safety system (eg emergency stop, fault detector).
- The soft starter has built-in protections which can trip the starter in the event of faults and thus stop the motor. Voltage fluctuations, power cuts and motor jams may also cause the motor to trip.
- There is a possibility of the motor restarting after the causes of shutdown are rectified, which may be dangerous for certain machines or installations. In such cases, it is essential that appropriate arrangements are made against restarting after unscheduled stops of the motor.
- The soft starter is a component designed for integration within an electrical system; it is therefore the responsibility of the system designer/user to ensure the system is safe and designed to comply with relevant local safety standards.

AuCom cannot be held accountable for any damages incurred if the above recommendations are not complied with.

AUTO- - START

Use the auto-start feature with caution. Read all the notes related to auto-start before operation.

The examples and diagrams in this manual are included solely for illustrative purposes. The information contained in this manual is subject to change at any time and without prior notice. In no event will responsibility or liability be accepted for direct, indirect or consequential damages resulting from the use or application of this equipment.

1.2 Disposal Instructions

Equipment containing electrical components may not be disposed of together with domestic waste.

It must be collected separately as electrical and electronic waste according to local and currently valid legislation.

Section 2 Introduction

This soft starter is an advanced digital soft starter solution for motors with power from 11kW to 850kW. Provides a complete set of motor and system protection functions to ensure reliable performance even in the harshest installation environments.

2.1 Feature List

Optional soft start curve
- Adaptive control
- Constant current
- Current ramp

Optional soft stop curve
- Taxi stop
- Timed voltage ramp soft stop
- Adaptive control
- Brake

Extended input and output options
- Remote control input
(3 fixed inputs, 2 programmable inputs)
- Relay output
(1 fixed output, 3 programmable outputs)
- Analog output
- Built-in PT100 RTD input
- Optional expansion card

Easy-to-read display shows comprehensive feedback
- Removable operation panel
- Multilingual feedback
- Event record with date and time stamp
- Working counter (starting times, running hours, kilowatt hours)
- Performance monitoring (current, voltage, power factor, kilowatt hours)
- User-programmable monitoring screen

Customizable protection
- Motor overload
- Start-up timeout
- Under current
- Transient overcurrent
- Current imbalance
- Power frequency
- Input trip
- Motor thermistor
- Power circuit
- Phase sequence

Models that meet all your connectivity needs
- 23A-1600A (rated)
- 200VAC-440VAC
- 380VAC-690VAC
- Internal bypass selection
- Star connection or delta connection

Advanced application optional features
- Input / output extension
- RTD and ground fault protection
- DeviceNet, Modbus, Profibus, Ethernet (Ethernet IP, Modbus TCP, Profinet) or USB communication module

Section 3 Basic Setting

3.1 Setting Procedure Summary

Waring Before cable connection,do not put power supply voltage on soft starter

1.Install soft starter (refer to installation Page 5 to know details)

2.Connect control cable(refer to control terminal Page 5 and control cable page 6)

3.Control voltage applied to soft starter

4.Set up date and time(refer to Page 18)

5.Equipped your application

1.push MENU,open Menu.

2.use ▼ to 'fast setting',then push ▼ to open 'fast setting' menu.

3.Find your application in the list,then push ▶ to start setting

6.If your application not in list of 'fast setting' list

1.push ◀ return to 'menu'

2.use ▼ turn to 'standard menu',then press ▶

3.turn to 'motor data 1' press ▶ ,then press ▶ ,edit parameter 1A motor rated current

4. set up parameter 1A to match rated current

Attention

regarding to senior application,please refer to extension menu page 33 and parameter instruction page 37.

7.Press ◀ many times,close menu

8.Optional using built in simulation tool check and control routing connection correct or not

9.Connect power supply line and soft starter input terminal 1/L1,3/L2,5/L3

Connect motor cable and soft starter's output 2/T1,4/T2,6/T3

3.2 Testing Equipment Installation

You can test the soft start by connecting it to a small motor. During this test, you can test the soft starter control input and relay output protection settings. This test mode is not suitable for testing soft-start performance or soft-stop performance.

The rated current of the test motor is at least 2% of the minimum rated current of the soft starter (see Minimum and Maximum Current Setting on page 71).

Attention

When testing the soft starter with a small motor, set parameter 1A Motor Rated Current to the minimum allowed value.

3.3 Simulation Tool

Software simulation function allows you test working situation and control circuit under conditions of no connection with soft starter

- **Run simulation**
  Simulate the starting, running, and stopping of the motor, and confirm that the soft starter and related equipment are installed correctly. See Run Simulation on page 19 for more information.
- **Protect simulation**
  Simulate each protection mode activitation,confirming soft starter and relative equipment reaction.refer to simulation protection Page 19
- **Output signal simulation**
  Simulate output signal,confirming output and relative control circuit work normally.Refer to signal simulation Page 20

Only when soft starter in condition on ready with control voltage,operation panel in active mode,you can use simulation fuction

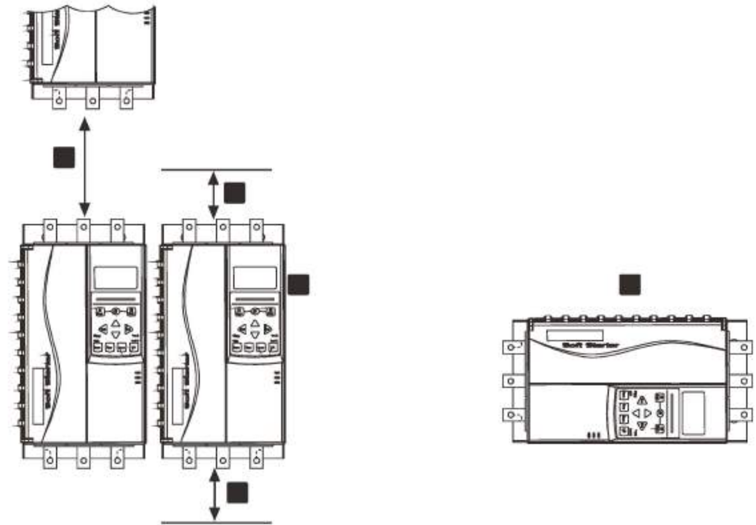
Attention

Input password when using simulation tool

The default access password is 0000

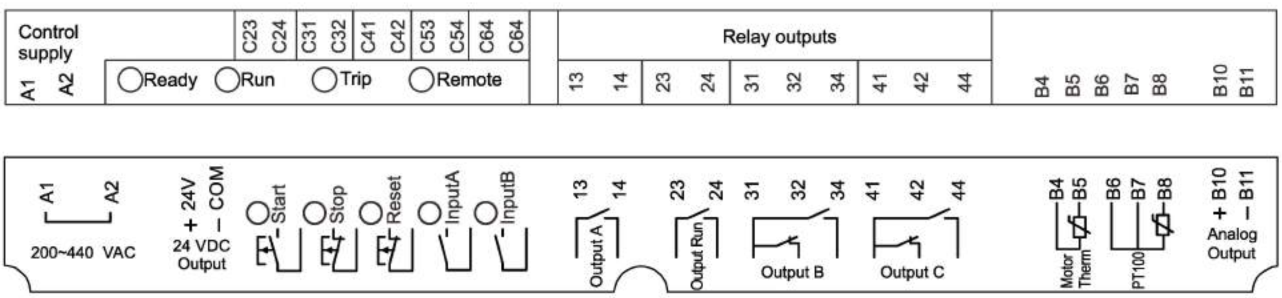
Chapter 4 Installation

4.1 Physical Installation



1	10023B~0220B: distance allowed between soft starter 100mm(3.94 inch) 20255B~1000B: Allow distance among soft starer 200mm (7.88ch)
2	0023B-0220B:allow soft starter and solid goods surface distance 50mm(1.97inch) 0255B~1000B:allow soft starter and solid goods surface distance 200mm(7.88inch)
3	Soft starter can be installed line by line without any gap
4	Soft starter can be installed by side.the rated current of soft starter will reducing 15%.

4.2 Control Terminal

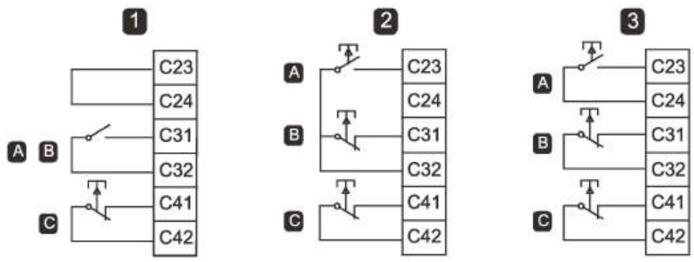


4.3 Control Voltage

- C1 (220~440 VAC) A1, A2

4.4 Control Cable

The soft starter has 3 fixed remote control input.These input shall be controlled by lower rated voltage under condition of small current.



1	Two-wire control
2	Three-wire control
3	Four-wire control
A	Start
B	Stop
C	Reset

Warming:
Do not apply voltage on control input.These input is 24VDC power supply input,must be controlled by touch point control without electricity.
Connection control input cable must separate with power supply voltage and motor cable
Reset input terminal can be always open or closed.use parameter 6M to select configurations.

4.5 Relay Output

Soft starter has 4 relay output,among them one is fixed output,the other 3 piece is PLC output.
When soft staring complete,carry out output closing(staring current is less than PLC rated current 120%),It is always keeping closing status till stopping running(soft stop or sliding stop)
Refer to 7A~7I settings to decide PLC output action

- If this output terminal use to connect main contactor,when soft starter receive order to starting,active the output terminal. In the process under control of soft starter keep active status all along.
- If this output terminal adapt to trip function,active the output terminal when tripping.
- If the output terminal adapt to indication,active the output terminal when activating specified indication.

Warming:
The switching capacity of a PCB-mounted relay is not suitable for some electronic contactor coils. Consult the contactor manufacturer / supplier to confirm its capacity.

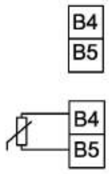
Three additional outputs on the input / output expansion card can be used.

4.6 Motor Thermistor

Connect motor thermistor with soft starter.When thermistor circuit resistor surpass 3.6kΩ or less than 20Ω ,the soft starter will trip.

No motor thermistor

Motor thermistor



Thermistor input

Attention
If no connection between motor thermistor and soft starter,thermistor input terminal B4,B5 shall open circuit. If B4,B5 short circuit,soft starter will trip.
Thermistor shall use shielded cable,it should be separated with ground line and other power supply circuit and control circuit on electricity.

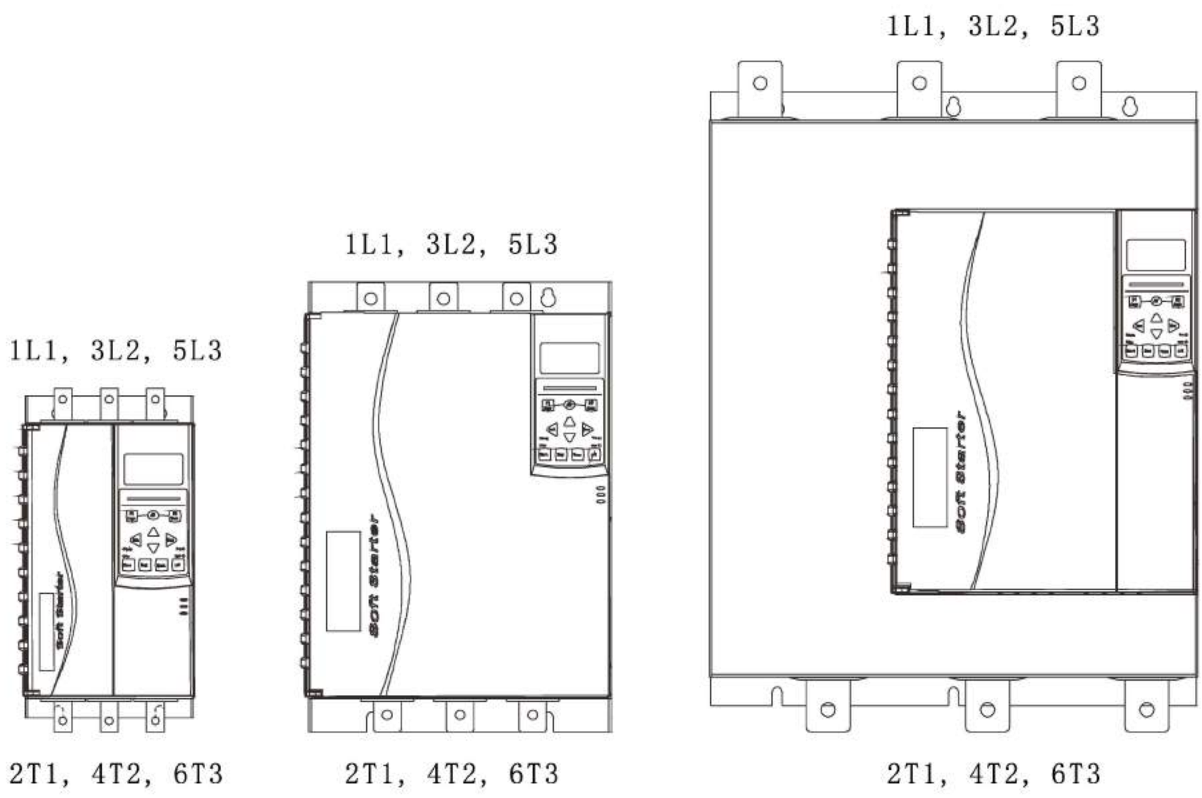
4.7 Earthing Terminal

Earth Terminal locates in back of soft starter.

- 5.5KW~55KW has a earth terminal in input terminal
- 75KW~500KW has 2 earth line terminal,one is in input terminal,the other one is charge of output terminal.

4.8 Power Supply Input And Output Configuration

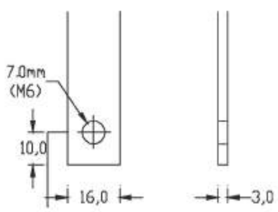
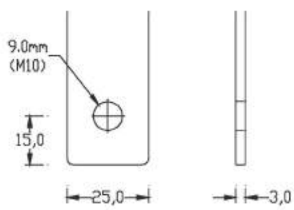
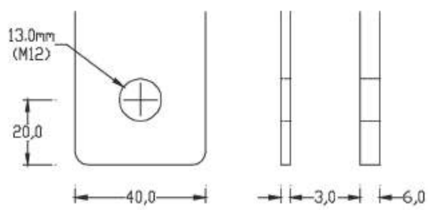
Connect AC power supply according upside in and output downside



4. 9 Power Connection

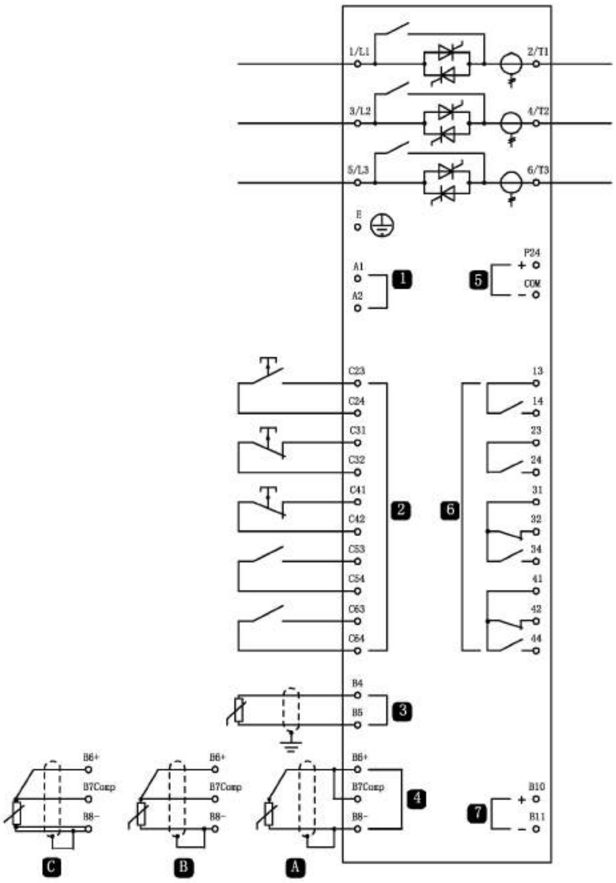
Attention
Part of soft starter use aluminum generatrix. When connect power supply, we suggest you clean surface thoroughly with appropriate adhesive to resist corrosion

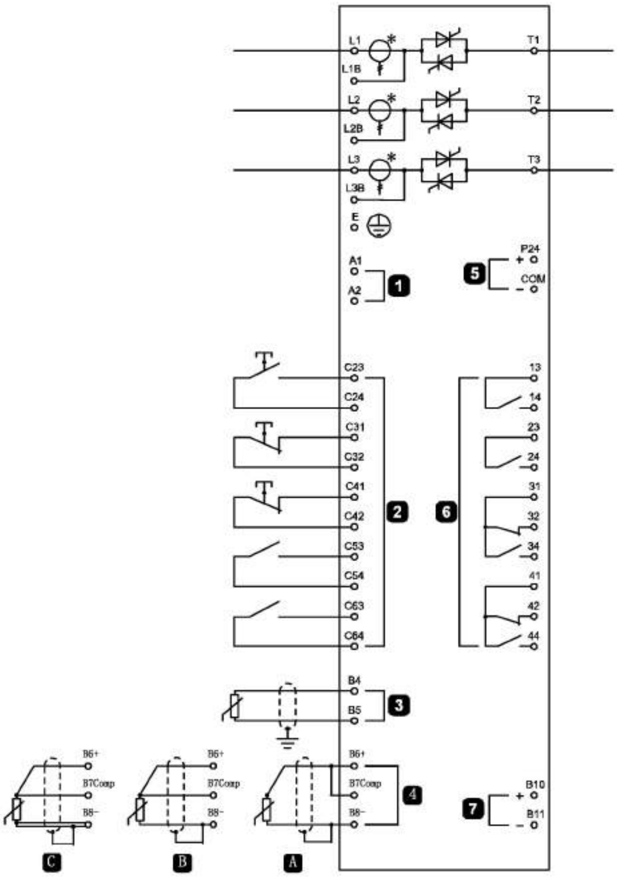
We only use copper strand conductors or solid conductor with rated temperature over 75° C

5.5KW-55KW	75KW-110KW	132KW-320KW
		

4.10 Principle Chart

Internal bypass type	No internal bypass type





1	Control voltage
2	Remote control input
3	Motor thermistor input
4A	RTD/PT100 input -2 line
4B	RTD/PT100 input -3 line
4C	RTD/PT100 input -4 line
5	24VDC output
6	Relay power
7	Model output simulation

C23, C24	Start
C31, C32	stop
C41, C42	Reset
C53, C54	PLC input A
C63, C64	PLC input B
13, 14	Relay output A
23, 24	Carrying relay output
31, 32, 34	Relay output B
41, 42, 44	Relay output C

Control Voltage

- (220~440 VAC) A1, A2

Attention
Soft starter current voltage and current transformer locates in output terminal at the output terminal

Chapter 5 Power Supply Circuit

5.1 Electric Motor Connection

Soft Starter can adopt Star Shape connection or triangle connection to connect motor.If we use triangle connection method, use parameter 1A input motor rated current.Soft starter automatically test motor adopt star connection method or triangle connection method for connection and calculate correct triangle connection current.

There are built-in bypass type no need to install outlay bypass contactor.

Internal bypass type:

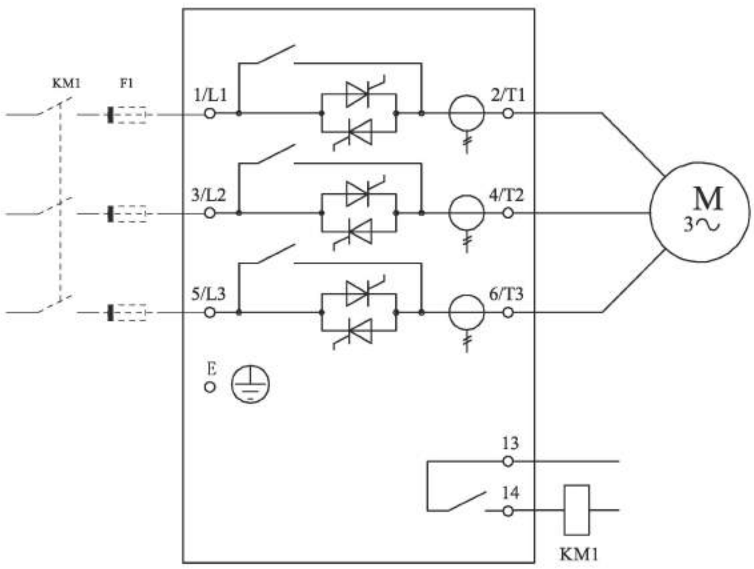
5.5kw、7.5kw、11kw、15kw、18.5kw、22kw、30kw、37kw

45kw、55kw、75kw、90kw、110kw、132kw、160kw、185kw

200kw、220kw、250kw、280kw、320kw、350kw、400kw

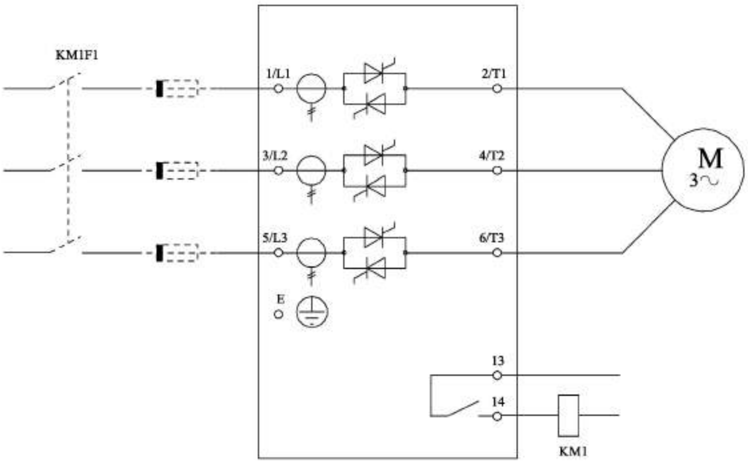
450kw、500kw

Star connection, internal bypass



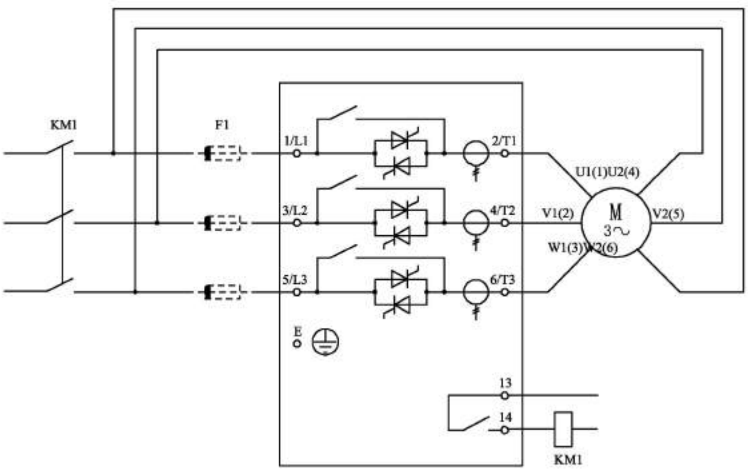
KM1	Main contactor(any selection)
F1	Semiconductor fuse (optional)

Star shape Connection method,without bypass



KM1	Main Contactor
F1	Semiconductor Fuse (optional)

Triangle shape connection method,internal bypass



KM1	Main contactor
F1	Semiconductor fuse(optional)

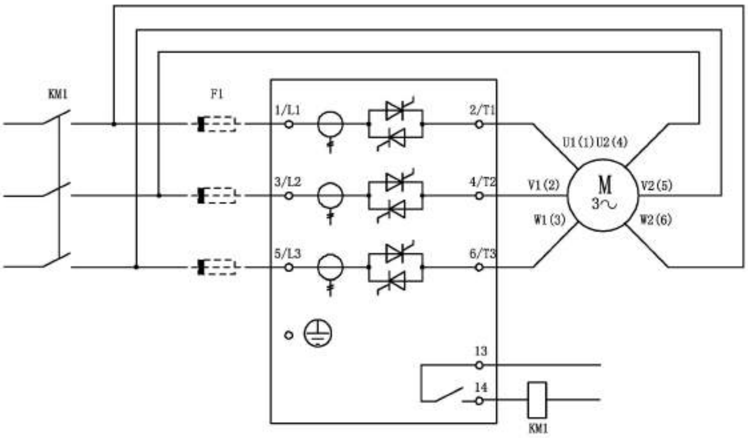
Attention

If adopting triangle connection method connect soft starter,keep install main contractor or Shunt trip circuit breaker.

Attention

If adopt triangle connection method,usd parameter 1A input motor rated current.Soft starter automatically testing motor adopting star connection method or triangle connection method,and Calculate correct triangle connection current.

Triangle connection without bypass



KM1	Main Contactor
F1	Semiconductor Fuse (optional)

5.2 Bypass Contactor

Some soft starters have built-in bypass, so it is not necessary to install external bypass contactor.

Soft starters without built-in bypass may need to be equipped with external bypass contactors. Select a contactor with AC1 rating greater than or equal to the current rating of the connected motor.

Internal bypass type:

5.5kw、7.5kw、11kw、15kw、18.5kw、22kw、30kw、37kw

45kw、55kw、75kw、90kw、110kw、132kw、160kw、185kw

200kw、220kw、250kw、280kw、320kw、350kw、400kw

450kw、500kw

5.3 Main Contactor

If the soft starter is connected to the motor by the triangle connection method, the main contactor must be installed; if the star connection method is adopted, the main contactor can be installed.

Select a contactor with AC3 rating greater than or equal to the current rating of the connected motor.

5.4 Circuit Breaker

It can use Shunt trip circuit breaker,during soft starter tripping disconnect motor circuit,no need to use main contractor

5.5 Power Factor Correction

If use power factor correction,you shall use speciafied contactor to switching capacitor

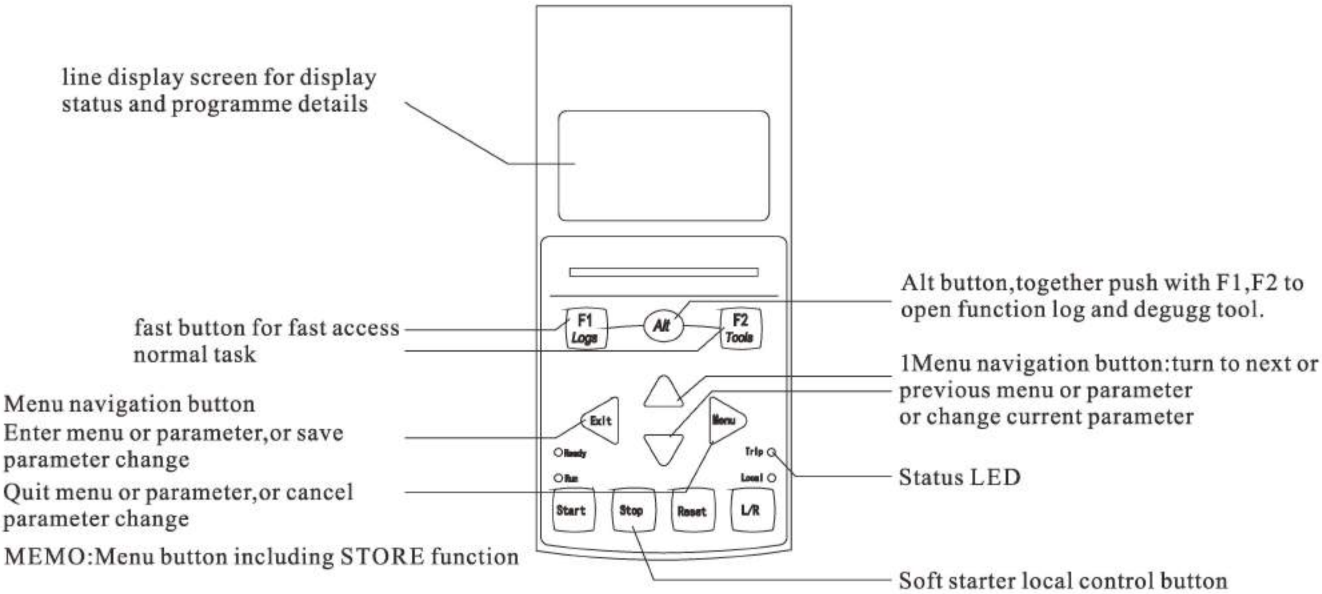
Attention

We muse connect power factor correction capacitor at input terminal of soft starter.
If we adjust capacitor at output terminal connection power factor correction of soft starter.

Chapter 6 Operation Board And Feedback

6.1 Operation Panel

Operation panel will store copy of soft starter parameter,therefore you can use one operation panel to programme.many starters.



Starter status LED

LED Name	Always ON	Twinkle
Ready	Motor stopped,starter ready for starting	Motor stopped,starter wait,restart delay or motor temperature test
Run	Motor on running status(reach full voltage)	Motor start or stop
Trip	Starter trip	Starter in warming status
Local	Starter in local control status	

If starter in remote control mode,local LED light off
If all LED off,it indicate soft starter has no control voltage

- Synchronous operation board and starter

  When operation board connect with starter,it will keep pace with soft starter with the same settings.If insert different operation board into starters,it will display the confirmation message.

New display detected

Use ▲ up and down ▼ button to choose needed option.Push Menu to accept choice and continue
If operation board settings have no effect to soft starter,it will load default value

Copy parameter
Display to starter
Starter to display

6.2 Display

The operator panel will display various information about the performance of the soft starter. The top half of the screen displays (selected in parameter 8D) real-time current information or real-time motor power information. Use ▲ and ▼ buttons to select the information displayed in the bottom half of the screen.

- soft starter status
- motor temperature
- current
- motor power
- previous starting information
- date and time
- Thyristor conduction

Attention
HERE DISPLAY SCREEN will display default settings.

Soft starter status

Soft starter status screen display starter working status,motor Temperature and motor power detailed information

Be ready M1 000% 000.0kW

Programmable screen

May equipped clients programmable screen with soft starter Display relative speciafied applied most important information
Use parameter 8E to 8H select which information displayed

Be ready 0000 hrs - - %

Motor temperature

Temperature screen display current using which motor parameter, The temperature of the two motors is shown as a percentage of the total heat capacity. If the soft starter is used only on one motor, the auxiliary motor temperature (M2) always display 0%.

The first group motor setting ➤ M1 000% M2 000%

Current

The current screen displays the real-time line current for each phase. If RTD/PT100 and the ground fault protection card are installed, the screen also displays the grounding power supply.

```
Phase current
000.0A 000.0A 000.0A
```

Motor power

Motor power screen display motor power(KW,HP,KVA) and power factor.

```
000.0kW  0000HP
0000kVA  -. - - pf
```

Motor power is use power supply according voltage(parameter 8N) to calculate.

Last time starting information

Last time staring information screen display last staring success' detailed information.

- Staring continuous time (seconds)
- Largest staring current(motor rated current percentage)
- Calculate motor temperature rising range

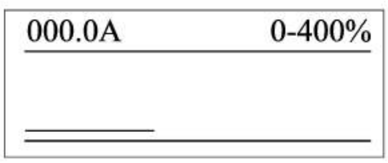
```
Last starting 010s
350% FLC temp 5%
```

Date and time

Date/time screen display current system date and time(24 hours format).if you want to know how to set up time and date,refer to page 18.

Function chart

Function chart display real time working character.Use parameter 8I~8L select information need to displayed



Thyristor conduction bar chart
Thyristor conduction bar chart display each phase conduction level

Chapter 7 Repairing Tool

7.1 Test Device Installation

The soft starter can be connected to a small motor for testing. During this test, the soft starter control input and relay output protection settings can be tested. This test mode is not suitable for testing soft start performance or soft stop performance.

The rated current of the test motor shall be at least 2% of the minimum rated current of the soft starter (see page 71 for minimum current and maximum current settings)

Attention

When testing the starter with a small motor, set the parameter 1A motor rating to the allowable minimum.

7.2 Degug Menu

'test menu' provide access to degugg and testing tool

Press ALT,then press tool,open 'tool'.

Debug Menu Navigation

- Press ▲ or ▼ button and turn to next or last option
- Press ▶ button to open one option to check
- Press ◀ button to return to upper menu
- Press many times to close ◀ menu

Set up date and time

1.Press ALT,then press tool,open 'tool'.

2.Turn to date/time screen

3.Press ▶ button to enter edit mode

4.Press ▶ and ◀ botton to selection parts of date and time settings.

5.Press ▲ or ▼ button to modify value

6.Press ▶ button to save change.the soft starter confirm the modification.

Press ◀ button to cancel modification.

Simulation tool

Software fax tools allow you to test the operation and control circuit of the soft starter when the soft starter is disconnected from the power supply voltage. There are three simulation modes for soft starters.

● Operation simulation	Simulate the start, operation and stop of the motor, and confirm that the soft starter and related equipment are installed correctly.
● Protection simulation	Simulate the activation of each protection mechanism and confirm the normal response of soft starter and related equipment.
● Output signal simulation	Analog output signal, confirm the output and related control circuit work normally.

The simulation tool can be accessed through the debug menu. The simulation function can only be used when the soft starter is in ready state, with control voltage and the operation board is in active state.

Attention

Simulation tool is protected by access password

Default save password is 0000

Operation Simulation

You can press the EXIT button to finish the simulation at any time.
Using operation simulation

1. press ALT, then press the tool to open the tool.
2. turn to the running simulation and press ▶ button.
3. press the start button, or activate the input. Soft starter simulation before starting check Close the main contactor (if installed) and run LED flicker.

Be careful
If the power supply voltage is connected, the error message is displayed.
Disconnect the power supply voltage and continue the next step.

4. Press ▶ button. Soft starter simulation starts, running LED flicker.
5. Press ▶ button to simulate the soft starter. Running LED is often bright without blinking, bypass relay closure.
6. Press the STOP button, or activate the stop input, and the soft starter simulation stops. Run LED flicker, bypass relay opens
7. Press ▶ button, ready LED twinkle, main relay open.
8. Press ▶ to return to the debug menu.

Running simulation ready to apply start signal

Check storage and continue before running simulation start

Operation simulation Be careful! Power off voltage Store and continue

Operation simulation Start X: XX seconds Store and continue

Operation simulation Function Apply stop signal

Operation simulation Stop X: XX seconds Store and continue

Operation simulation Stop it Store and continue

Protection simulation

Protect the activation of each protection mechanism in simulation, confirm the normal response of soft starter and related equipment.

Using protection simulation

1. press ALT, then press ▶ tool to open the tool.
2. turn to the protection simulation, press the button.
3. use ▲ and ▼ buttons to select the protection to emulate.
4. press ▶ button to select the protection selected by simulation.
5. display the screen immediately. The soft starter response depends on the protection settings.
6. use ▲ or ▼ button to choose another simulation, or press ◀ key to exit.

Attention
How to protect the tripping from soft start, then reset before simulating another protection.
If protection setting as "alarm and record'no need to reset.
If protection settings are alarming and log.
Only if press menu store to check the alarm message.
If protection is set to log, the screen does not display any messages,
but adds a record to the log

0.0A Trip trip Selected protection

Output signal simulation

The output signal simulates the output signal, confirms that the output and the related control circuit are working properly, and pays attention to setting the output relay as an appropriate function to monitor the operation of the relay if the marking operation (motor temperature and small/large current) is to be tested.

Using output signal simulation

1. press ALT, then press the tool to open the "tools".
2. turn to output signal simulation, press ▶ button.
3. use ▲ and ▼ buttons to select the function that you want to emulate, then press ▶ button.
4. use ▲ and ▼ buttons to switch signals.
5. Press ◀ to return to the simulation list.

Programmable relay a
OFF
ON

Analog output simulation

Analog output simulation ▲ and ▼ button to modify output terminal current
With the current measuring device analog output terminal,
use ▲ and ▼ button to adjust the percentage value displayed on the display.
The current measured by the current measuring device should be the same as the current displayed on the display.

If the input/output expansion card is installed, the operation of the relay outputs D, E, F and analog output B can also be tested by simulation.

Analog output A
0%
4.0mA

Temperature sensor status

This screen shows the status of the motor thermistor and RTD/PT100.

S = short circuit

H = heat

C=cold

O=open

Temperature sensor status
Thermistor: 0
RTD/PT100s:OOOOOOO
S = Shrt H=Hot C=Cld O=Opn

Only if install RTD/PT100 and earth error extension card,you can use RTD/PT100 B~G

Number I/O status

This screen display number input and output current status
The first line of screen display start input,stop input,reset input and programmerable input(A and B,I/O extension card input)
The last line of the screen shows programmable output A, fixed run output, programmable outputs B and C, and output on the expansion card (if installed)

Digital I / 0 status
Input: 011000
Output: 0000100

Analog output and input status

This screen shows the analog output and the current state of the input
This screen also shows analog output B if an expansion card is installed

Analog I / 0 status
Input:- - - - %
Output a: 04. 0ma

Reset heat protection model

The soft starter's advanced thermal protection model software continuously monitors motor performance so that the soft starter can calculate the motor temperature at any time and can be successfully started at any time. If the soft starter is configured for use on two motors, the temperature of each motor is modeled separately.
The thermal protection model of the selected motor can be reset if necessary

1. Press ALT, then press Tools to open Tools.
2. Scroll to the reset thermal protection model and press ▶ button
3. Use ▼ button to select reset, press stop button to confirm.
4. After resetting the thermal protection model, the screen displays a confirmation message and returns to the previous screen.

Thermal protection model reset
M1 X%
M2 X%
Press ▶ key to reset

Don't reset
Reset

Be careful
Resetting the motor thermal protection model may be detrimental to the life of the motor and should only be used in the event of an emergency.

7.3 Log Menu

The log menu provides information about events, trips, and starter performance.
Press ALT, then F1 (log) to open log

Open the event log:

- Press ALT, then press F1 (log) to open 'Log'
- Press ▶ button to open the log
- Press ▲ and ▼ buttons to scroll through the items in each log
- Press ▶ arrow button to view log details
- Press ◀ arrow button to return to the previous menu

To close the 'Log Menu', press ◀ arrow multiple times

The log menu can only be opened when viewing the monitor screen

Trip log

The trip log stores details of the eight most recent trips, including the trip date and time, Trip 1 is the most recently stored trip, and Trip 8 is the longest trip.

Turn on the trip log:

1. Press ALT, then press F1 (Log) to open 'Log'.
2. Scroll to the trip log and press ▶ button
3. Use ▲ and ▼ arrows to select the event you want to view and press ▶ to right-click to display the details.
4. To close the log and return to the home screen, press ◀ arrow multiple times

Performance counter

The event log stores the details of the 99 latest events (operation, warning and trip) of the starter, with a time stamp, including the date and time of the event. Event 1 is the latest stored event, and event 99 is the longest stored event.

Turn on the trip log:

1. Press ALT, then press F1 (Log) to open 'Log'.
2. Scroll to the trip log and press ▶ button
3. Use ▲ and ▼ arrows to select the event you want to view and press ▶ to right-click to display the details.
4. To close the log and return to the home screen, press ◀ arrow multiple times

Performance counter

The performance counter stores the starter operating statistics:

- Running hours (service life and counters since last reset)
- Number of starts (service life and counter after last reset)
- Motor kWh (service life and counter after last reset)
- Reset times of thermal protection model

Only when the parameter write protection (parameter 15b) is set to read / write, can the resettable counter (running hours, starting times and motor KWH) be reset.

View calculator

1. Press ALT, then press F1 (log).
2. Scroll to the counter and press ▶ button
3. Press ▲ and ▼ buttons to scroll through the counter and press ▶ button to view the details to the right
4. To reset the counter, press ▶ button and use ▲ and ▼ buttons to select Reset/No Reset. Press the MENU button to confirm the operation. To turn off the calculator, return to the log menu and press ▶ arrow key.

Chapter 8 Operation

8.1 Command Priority

The starter disable command takes precedence over any other control command, see parameter 6A Input A Function P43
The emergency run command gives priority to normal control commands, including the auto start/auto stop command, see parameter 15C Emergency Run on P52.
The auto start/auto stop command takes precedence over the normal control command (local, remote, or via serial communication). See also 3 Auto Start/Stop P39.

8.2 Start, Stop and Reset Commands

There are three ways to control the soft starter
1. Using the buttons on the control panel
2. Input via remote control
3. Connect via serial communication
The L/R (local/remote) button controls whether the soft starter responds to local control (via the operator panel) or remote control (via remote input).

- When the soft starter is in local control mode, the local LED on the control panel illuminates.
- When the soft starter is in remote control mode, the local LED is off.

Control via serial communication network is always enabled in local control mode, enabling or disabling via serial communication network control (parameter 6R remote communication) in remote control mode, optional communication is required for control over serial communication networks Module.

Always enable the STOP button on the control panel.

Control the motor with a soft starter

To soft start the motor, press the start button on the operator panel or activate the start remote input. The motor will start using the starting mode selected in parameter 2A.
To soft stop the motor, press the st0p button on the operator panel, or activate stop remote input. The motor will stop in the stop mode selected in parameter 21h1.
To reset the soft starter trip, press the ESET button on the operator panel. Or activate reset remote input.
To allow the motor to coast to a stop regardless of the setting in parameter 2H stop mode, press the local stop and reset buttons simultaneously.
The soft starter will disconnect the power supply of the motor and open the main contactor to stop the motor sliding.

Auto start / auto stop

The soft starter can also be configured to start or stop automatically. The auto start / auto stop operation can only be used in remote mode. In local mode,
The starter will ignore all auto start / auto stop settings. To configure the auto start / auto stop operation, use parameter 3A ~3D.

8.3 soft start method

Soft starters provide a variety of ways to control motor starting. Each soft start method uses different main control parameters.

Soft start method	Controlled parameter	Performance parameters affected
Timing voltage ramp	Voltage	Starting current, starting torque, acceleration
Constant current	Electric current	Starting torque, acceleration
Torque control	torque	Starting current, accelerating
Adaptive control	accelerate	Starting current, starting torque

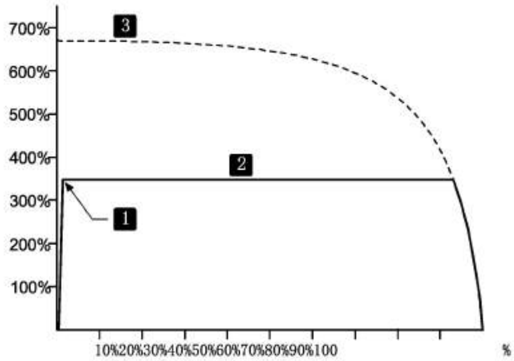
The best effect can be achieved by selecting the soft start method which can directly control the most important application parameters. Soft starters are usually used to limit motor starting current or to control load acceleration and / or deceleration.
The soft starter can be set to constant current or adaptive control.

Control	Use
Motor Starting Current	Constant Current
Motor / Load Acceleration	Adaptive Control

Constant current

Constant current is the traditional soft start mode, which increases the current from zero to the specified current, and then remains unchanged until the motor accelerates.
Constant current starting is suitable for applications where the starting current must be controlled below a certain level.

Current (motor rated current percentage)



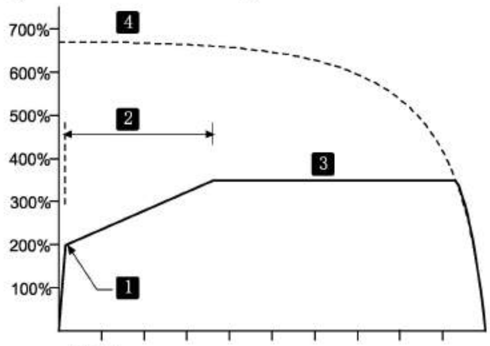
1: initial current (parameter 2C)
2: current limit (parameter 2D)
3: full voltage and current

Rotor speed (percent of full speed)

Current slope

The current ramp soft start increases the current from the specified starting current (1) to the maximum limit (3) within the extended period (2).
Current ramp starting can be used for the following applications:
• the load for each start is different (e.g. conveyor belt for heavy load start or no load start).
Set the initial current (parameter 2C) to the light load starting current of the motor, and
The current limit (parameter 2D) is set to the motor heavy load starting current.
• the load is easy to unload, but the starting time must be extended (e.g. centrifugal pumps that need to slowly build up line pressure).
Limited power supplies (e.g. generator sets) and slow load loading allow more time for the power supply to respond.

Current (motor rated current percentage)



1: initial current (parameter 2C)
2: start ramp time (parameter 2b)
3: current limit (parameter 2D)
4: full voltage and current

time

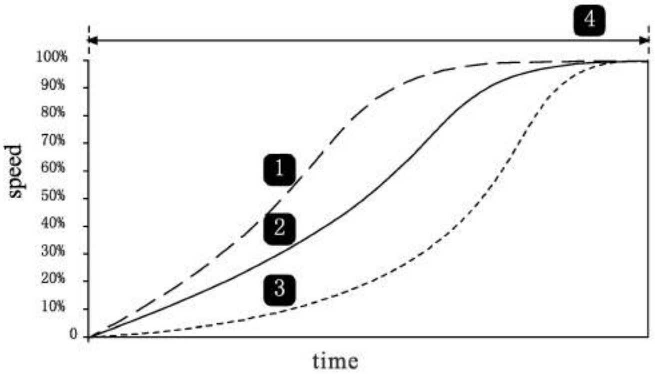
Adaptive start control

In the soft start mode of adaptive control, the soft starter will adjust the current so that the motor can start with the selected acceleration curve within a specified time.

Look out
The speed of adaptive control starting motor can not be faster than that of direct starting mode.
If the starting ramp time (parameter 2b) is shorter than the direct starting time of the motor, the starting current may reach the direct starting current level.

Each application has a specific starting curve based on load characteristics and motor characteristics. Adaptive control provides three different starting curves, which can meet different application requirements. The selection of the curve matching with the application of the inherent curve will help to make the acceleration process smooth in the whole starting time.
If the adaptive control curve with great difference is selected, the control effect of the inherent curve will be greatly affected.
The soft starter monitors the motor performance every time it starts the motor, so as to improve the soft start control in the future.

• adaptive control
Using adaptive control to control the starting performance:
1. Select adaptive control (parameter 2a) on the start mode menu
2. Set the desired starting ramp time (parameter 2b)
3. Select the desired adaptive starting curve (parameter 2e)
4. Set the starting current limit (parameter 2D) large enough to start successfully. The first adaptive control start is constant current start. In this way, the soft starter can understand the characteristics of the connected motor. In the subsequent adaptive control starting process, the soft starter uses this motor data.



Adaptive starting curve (parameter 2e)
1. early acceleration.
2. Constant acceleration
3. post acceleration
4. Start ramp time (parameter 2b)

Be careful
Adaptive control controls the load according to the programmed curve. The starting current varies with the selected acceleration curve and the set starting time. .
If a motor connected to a soft starter programmed with adaptive control to start or stop is replaced, or the starter is tested on a different motor before it is actually installed, the starter must learn the characteristics of the new motor.
If parameter 1A motor rated current or parameter 2K adaptive control gain is changed, the motor characteristics will be understood again automatically.

- How to select the starting curve of adaptive control
The best curve depends on the exact details of each application.
Some loads such as submersible pumps should not be operated at low speed. The early acceleration curve increases the speed rapidly in the starting process, and then controls the acceleration in the remaining starting time.

Look out
Adaptive control can control the speed curve of the motor in the programmed time range.
This may result in a larger current than traditional control methods.

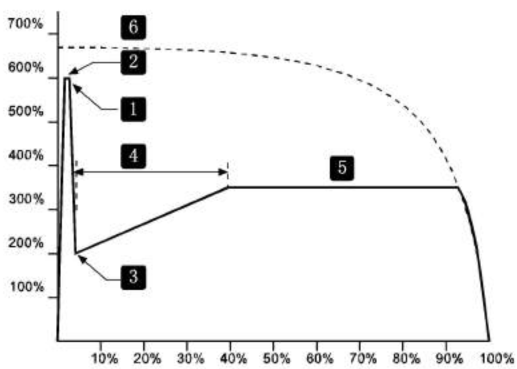
- fine tuning adaptive control
If the motor starts or stops unevenly, adjust the adaptive control gain (parameter 2K). The gain setting determines how much gain the soft starter will adjust at the next adaptive control start and stop based on the information from the last start. The gain setting affects both starting and stopping performance.
- If the motor accelerates rapidly at the end of starting or decelerates rapidly at the end of stopping, increase the gain setting by 5% 10%.
- If the motor speed fluctuates during start or stop, slightly decrease the gain setting.

Be careful
Reset the adaptive control learning record of the starter when changing the gain setting. After changing the gain, start with a constant current for the first time.

Jump start

Jump start provides additional torque for a short time at the start of starting, which can be used with current ramp starting or constant current starting.
Jump starting helps to start loads that require a minimum starting torque but are easy to accelerate later (e.g. flywheel loads such as calenders).

Current (motor rated current percentage)



Rotor speed (percent of full speed)

1: jump start amplitude (parameter 2G)
2: jump start time (parameter 2f)
3: initial current (parameter 2C)
4: start ramp time (parameter 2b)
5: current limit (parameter 2D)
6: full voltage and current

8.4 Stop Method

The soft starter provides a variety of ways to control the motor stop.

Stopping method	Performance results
Taxi stop	Natural load stop
TVR soft stop	Extend stop time
adaptive control	Extend the stop time according to the selected deceleration curve
braking	Reduce stop time

Soft starters are commonly used in pumping applications to eliminate the destructive effect of water hammer. Adaptive control should be the preferred stop method for these applications.

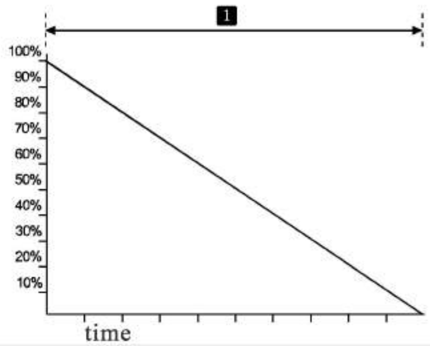
Taxi stop

The sliding stop makes the motor slow down at the natural speed and is not controlled by the soft starter. The time required to stop depends on the type of load.

Timing voltage ramp soft stop

The timing voltage ramp gradually reduces the motor voltage over a specified period of time. After stopping the ramp, the load may continue to run.
Timed voltage ramp stop can be used for applications requiring extended stop times or to avoid transient power supply of the generator set.

Voltage (percent of full voltage)



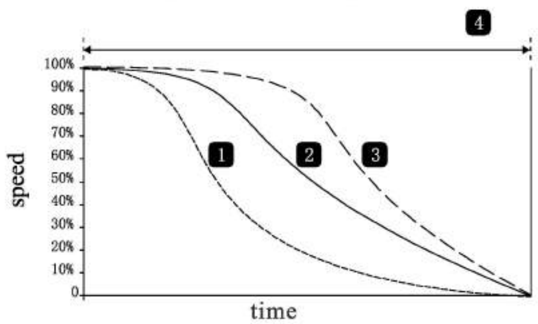
1: stop time (parameter 2I)

Adaptive stop control

In the soft stop mode of adaptive control, the soft starter controls the current to make the motor stop using the selected deceleration curve within the specified time. Adaptive control can be used to extend the stop time of low inertia load.
Each application has a specific stop curve based on load characteristics and motor characteristics. Adaptive control provides three different stop curves. Select the adaptive control curve that can best meet the application requirements.

Be careful
The adaptive control does not let the motor decelerate rapidly, and the motor stop speed is not faster than the sliding stop. To shorten the stop time of the large inertia load, use the brake operation.

Look out
Adaptive control can control the speed curve of the motor in the programmed time range. This may result in a larger current than traditional control methods.
adaptive control
Use adaptive control to control stop performance:
1. Select adaptive control (parameter 2H) on the stop mode menu
2. Set the desired stop time (parameter 2I)
3. Select the desired adaptive stop curve (parameter 2J)



Adaptive control stop curve (parameter 2J):
1. Early slowdown
2. Constant deceleration
3. After deceleration
4. Stop time (parameter 2I)

The first adaptive control stop is the normal soft stop. In this way, the soft starter can understand the characteristics of the connected motor. This motor data is used by the soft starter during subsequent adaptive control stops.

Be careful

Adaptive control controls the load according to the programmed curve. The stop current varies with the selected deceleration curve and stop time.

If a motor connected to a soft starter programmed with adaptive control to start or stop is replaced, or the starter is tested on a different motor before it is actually installed, the starter must learn the characteristics of the new motor. If parameter 1A motor rated current or parameter 2K adaptive control gain is changed, the soft starter automatically re understands the motor characteristics.

- Pump stop

The hydraulic characteristics of pumping system are quite different. This difference means that different deceleration curves and stop times are used for different applications. The following table provides the selection principles for the adaptive control deceleration curve, but we recommend that you test three curves to determine the best curve for the application.

Adaptive stop curve	Application
After deceleration	Even if the motor / water pump speed decreases a little, it will lead to a high head system with fast switching of forward flow and reverse flow.
Constant deceleration	The application of medium and low head and large flow with large liquid momentum.
Early deceleration	An open pumping system in which the liquid must return through the pump but the pump does not reverse.

Braking

Braking can shorten the motor stop time.

During braking, the motor can be heard to make more noise. This is a normal motor braking phenomenon.

After selecting the brake, the soft starter will use dc injection method to slow down the motor.

Soft starter brake:

- DC braking contactor is not required.
- control all three phases to evenly distribute the braking current and corresponding heating in the motor.

Look out

If the braking torque is set too high, the motor stops before the end of the braking time, and the motor generates too much heat, which may cause motor damage. Brake torque must be carefully configured to ensure safe operation of the starter and motor.

When the motor stops, the peak current of the direct starting motor will appear due to too much braking torque setting. Make sure that the fuse installed in the branch circuit of the motor is correctly selected.

Look out

The brake operation makes the heating speed of the motor faster than that calculated by the thermal protection model of the motor.

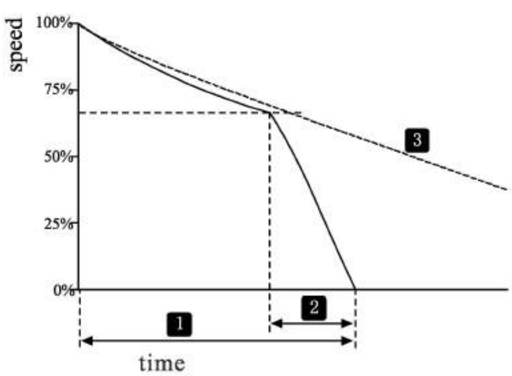
If brake operation is used, install a motor thermistor or set a restart delay long enough (parameter 4m).

Braking is divided into two stages:

- pre braking: moderate braking to reduce the motor speed to the point where full braking can be successfully carried out (about 70% of the speed).
- full braking: provide the maximum braking torque, but the effect is not good when the speed exceeds about 70%.

Equipped with soft starter for braking operation:

1. Set the desired stop time length (1) for parameter 2I. This is the total braking time, which must be set to be more than the braking time (parameter 2m)For a long time, in order to reduce the motor speed to about 70% before braking. If the stop time is too short and the motor fails to brake successfully, the motor will Taxi stop.
2. Set the braking time (parameter 2m) to about a quarter of the programmed stop time. This is the time of the full braking period (2).
3. Adjust the braking torque (parameter 2L) to achieve the desired stopping performance. If the setting is too small, the motor can not stop stably, but will be closed during the braking period After bunching, taxiing stops.



1: stop time (parameter 2i)
2: braking time (parameter 2m)
3: taxi stop time

Be careful
When using DC braking, the power supply and soft starter (input terminals L1, L2, L3) must be connected in positive phase sequence, and the parameter 4G phase sequence must be set to positive.

Be careful
If the load may change during braking, install a zero speed sensor to ensure that the soft starter stops DC braking when the motor stops.
This can avoid unnecessary heating of the motor.

For details on how to use a soft starter with an external speed sensor (for example, in applications where the load changes during braking), see DC braking with an external zero speed sensor on page 57.

8.5 Jog Operation

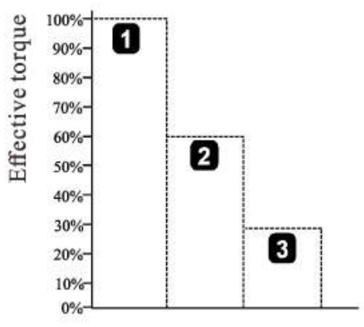
Jog to slow down the motor in order to adjust the load or assist in maintenance. The motor can either jog forward or jog reverse.

Look out
Low speed operation makes the cooling effect of motor decrease, so it is not suitable for continuous operation mode.

Inching operation makes the heating speed of the motor faster than that calculated by the thermal protection model of the motor. If inching operation is used, install - a motor thermistor, or set a restart delay long enough (parameter 4m).

Be careful
Soft start and soft stop cannot be used during inching operation.
Inching is only applicable to group motor. For a detailed understanding of the -- group motor settings and the second group motor settings, refer to the second group motor settings.
For different motor models, the maximum forward inching torque is about 50% - 75% of the rated torque (FLT). The torque of motor reverse inching is about 25% to 50% of rated torque.
Valuepoint 15E the ratio of the torque applied to the motor by the inching torque control to the maximum inching torque of the soft starter.

Be careful
If parameter 15E is set above 50%, shaft vibration may be increased.



1. Rated torque of motor
2. Maximum torque of inching forward rotation
3. Maximum torque of inching reverse

To activate the jog operation, you can use the programmable inputs (see parameters 6a and 6F [only operate in remote control mode]), or you can use the shortcut keys (parameters 8b and 8C).

To stop the jog operation, do one of the following:

- Cancel the jog command.
- Press the stop button on the operator panel.

If the jog command is still valid, start the jog again after the end of the restart delay. During the jog operation, all commands except the above are ignored.

8.6 Working With Triangle Connection Method

The triangle (six wire) connection method does not support adaptive control, inching, braking and two-phase control functions. If these functions are programmed when the starter is connected by the triangle connection method, the control characteristics are as follows:

Adaptive control start	The starter performs a constant current start. .
Adaptive control stop	If the stop time of parameter 2I is set to be greater than 0 s, the starter will perform the soft stop of timing voltage ramp. If parameter 2I is set to 0 seconds, the starter performs a coast down stop.
Point movement	Starter alarm with error message: option not supported.
Braking	The starter performs a coastdown stop.
Two phase control	The starter trips and displays the error message: LX TX short circuit.

Be careful
If the triangle connection method is adopted, the current unbalance protection is the only phase loss protection during operation. Do not disable the current unbalance protection (parameter 4h) when the delta connection method is used.

Be careful
If delta connection method is adopted, input the rated current of motor with parameter 1A. The soft starter automatically detects whether the motor is connected by the star connection method or the triangle connection method, and calculates the correct current of the triangle connection.

Chapter 9 Programming Menu

The programming menu can be accessed at any time, including when the soft starter is running. Any changes to the starting curve take effect immediately.

The programming menu has four submenus:

Quick setup quick setup guides you through how to configure the parameters required for soft starters for common applications. Quickly set up suggestions for each parameter - a value, but you can make more Change these values.

Standard menu

standard menu is convenient for you to access common parameters. You can configure the soft starter according to your own application here.

Extended menu

extended menu is convenient for you to access all programmable parameters of the soft starter, and experienced users can make full use of advanced functions.

Load / save settings

load / save settings allows you to save the current parameter settings to a file, load the parameters in the previously saved file, or reset all parameters to the Default value.

9.1 Programming Menu

You can use the programming menu to view and change programmable parameters that control how the soft starter works.
While viewing the monitoring screen, press the menu button to open the programming menu.
Browse "Programming Menu":

- Press ▲ or ▼ to scroll through the parameter groups.
- Press ▶ button to open the submenu.
- Press ▶ button to view the parameters in the parameter group.
- Press ◀ button to return to the previous menu.
- To close the Programming Menu, press repeatedly ◀

Change parameter value:

Scroll to the corresponding parameter in the "Programming Menu" and press ▶ to enter edit mode.

- Use the ▲ and ▼ buttons to change parameter settings. Press the ▲ or ▼ button once to increase or decrease the parameter value by one unit. If the button is held down for more than five seconds, the parameter value will increase or decrease faster.
- To save the changes, press Menu. The settings on the display will be saved and the control panel will return to the parameter list.
- To cancel changes, press EXIT. The operator panel will ask if you want to confirm the cancellation, then return to the parameter table without saving the changes.

9.2 Parameter Write Protection

The programming menu can be locked to prevent users from modifying parameter settings. Can be write protected with parameter 15B switch parameter.

Lock programming menu:

1. Open the programming menu.
2. Open the extended menu.
3. Select 'Advanced'.
4. Enter the access password.
5. Select parameter 15B parameter write protection
6. Select and store 'Read Only'.

If the user attempts to change the parameter value after the parameter write protection is turned on, an error message is displayed:

Access Denied Adjustment Lock

9.3 Access Password

Important parameters (parameter groups of 15 and above) are protected with four-digit secure access passwords to prevent unauthorized users from viewing or modifying parameter settings.
When the user attempts to enter the restricted parameter group, the operation panel prompts for a password. The programming session only requires the user to enter a-access password. Authorization-is valid until the user closes the menu.
To enter the access code, use ◀ and ▶ buttons to select a digit, and then use the ▲ and ▼ buttons to change the value. When all four digits are the same as the access code, press Menu (STORE)(storage). The operation panel will display a confirmation message before continuing.

Type password 0###

Menu (STOER) (storage)

Allow access administrator

To change the access code, use parameter 15A.
Simulation tools and counter resets can also be protected with secure access codes.
The default access password is 0000.

9.4 Quick Setup

The Quick Setup menu allows you to quickly configure the soft starter for common applications. The soft starter selects the parameters related to the application and recommends typical settings. You can adjust each parameter according to your actual needs. Always set parameter 1A, the rated current of the motor to match the rated current indicated on the motor plate. The recommended value is the minimum rated current of the starter.
On the screen, the highlighted value is the recommended value, and the value marked with ➤ is the loaded value.

Application	Parameter	Suggested Value
Centrifugal pump	Motor rated current Starting method Adaptive starting curve Start ramp time Stop mode Adaptive stop curve Stop time	Depending on model Adaptive Control Early acceleration 10 seconds Adaptive Control Deceleration 15 seconds
Submersible pump	Motor rated current Starting method Adaptive starting curve Start ramp time Stop mode Adaptive stop curve Stop time	Depending on the model. Adaptive Control Speed up early. 5 seconds Adaptive Control After decelerating. 5 seconds
Damped fan	Motor rated current Starting method Current limit	Depending on model Constant current 350%
Undamped fan	Motor rated current Starting method Adaptive starting curve Start ramp time Starting limit time Locked rotor time	Depending on model Adaptive Control Constant acceleration 20 seconds 30 seconds 20 seconds
Screw compressor	Motor rated current Starting method Start ramp time Current limit	Depending on model Constant current 5 seconds 400%
Reciprocating compressor	Motor rated current Starting method	Depending on model Constant current

	Start ramp time Current limit	5 Second 450%
Conveyor belt	Motor rated current Starting method Start ramp time Current limit Stop mode Adaptive stop curve Stop time	Depending on model Constant current 5 seconds 400% Adaptive Control Constant deceleration. 10 seconds
Rotary crusher	Motor rated current Starting method Start ramp time Current limit Starting limit time Locked rotor time	Depending on model Constant current 10 seconds 400% 30 seconds 20 seconds
Jaw Crusher	Motor rated current Starting method Start ramp time Current limit Starting limit time Locked rotor time	Depending on model Constant current 10 seconds 450% 40 seconds 30 seconds

9.5 Standard Menu

The standard menu provides access to common parameters, and users can configure the soft starter according to their application needs. For detailed information on each parameter, see Parameter Descriptions on page 37.

		Parameter group	Default Setting
1		Motor data-1	
	1A	Motor rated current	Depending On Model
2		Start / Stop Mode-1	
	2A	Starting method	Constant Current
	2B	Start ramp time	10s
	2C	Initial current	350%
	2D	Current limit	350%
	2H	Stop mode	Taxi Stop
	2I	Stop time	0s
3		Automatic start / stop	
	3A	Automatic start mode	Turn Off
	3B	Auto start time	1m
	3C	Automatic stop mode	Turn Off
	3D	Auto stop time	1m
4		Protection settings	
	4A	Starting limit time	20s
	4C	Under current	20%
	4D	Undercurrent delay	5s
	4E	Instantaneous overcurrent	400%
	4F	Instantaneous overcurrent delay	0s
	4G	Phase sequence	Any Order
6		Enter	
	6A	Input A function	Motor Parameter Selection
	6B	Enter A name	Input Trip
	6C	Input A tripped	Always Open
	6D	Input A Trip Delay	0s
	6E	Input A initial delay	0s

	6F	Input B function	Input trip (N / 0)
	6G	Enter B name	Input trip
	6H	Input B tripped	Always open
	6I	Input B trip delay	0s
	6J	Input B initial delay	0s
7		Output	
	7A	Relay a function	Main contactor
	7B	Relay a opening delay	0s
	7C	Relay a off delay	0s
	7D	Relay B function	Run
	7E	Relay B on delay	0s
	7F	Relay B off delay	0s
	7G	Relay C function	Tripping operation
	7H	Relay C on delay	0s
	7I	Relay C off delay	0s
	7M	Low current indication	50%
	7N	High current indication	100%
	7O	Motor temperature indication	80%
8		Monitor	
	8A	Language	English
	8B	F1button function	Auto start / stop setting
	8C	F2 button function	Not set up
	8D	Display current or power	Electric current
	8E	Top left corner of screen	Starter status
	8F	Top right corner of screen	Blank
	8G	Bottom left corner of screen	Operating hours
	8H	Bottom right corner of screen	Analog input

9.6 Extended Menu

The extended menu provides access to all programmable parameters of the soft starter.

		Parameter group	Default setting
1		Motor Data-1	
	1A	Rated current of motor	Depending on Model
	1B	Locked to f time	0m: 10s
	1C	Locked rotor current	600%
	1D	Service factor of motor	105%
2		Start / stop MODE-1	
	2A	Starting mode	Constant current
	2B	Starting ramp time	10 s
	2C	Initial current	350%
	2D	Current limit	350%
	2E	Adaptive starting curve	Constant acceleration
	2F	Jump start time	0000ms
	2G	Jump start amplitude	500%
	2H	Stop mode	Taxi stop
	2I	Stopping time	0m:00s
	2J	Adaptive stop curve	Constant deceleration
	2K	Adaptive control gain	75%
	2L	Braking torque	20%
	2M	Braking time	0m:01s

3		Auto start / stop	
	3A	Auto start mode	OFF
	3B	Auto start time	00h:01m
	3C	Automatic stop mode	OFF
	3D	Auto stop time	00h:01m
4		Protection settings	
	4A	Starting limit time	0m:20s
	4B	Starting limit Time-2	0m:20s
	4C	Under current	20%
	4D	Under current delay	0m:05s
	4E	Instantaneous overcurrent	400%
	4F	Instantaneous overcurrent delay	0m:00s
	4G	Phase sequence	Any order
	4H	Current imbalance	30%
	4I	Current unbalance delay	0m:03s
	4J	frequency measurement	Starting and running
	4K	Frequency change	± 5Hz
	4L	Frequency delay	0m:01s
	4M	Restart delay	10s
	4N	Motor temperature measurement	No measurement
	4O	Earth fault current	100 mA
	4P	Earth fault delay	0m:03s
	4Q	Undervoltage	100V
	4R	Undervoltage delay	5s
	4S	Overvoltage	800V
	4T	Overvoltage delay	5s
5		Automatic reset trip	
	5A	Automatic reset function,	Turn off automatic reset
	5B	Maximum reset times	1
	5C	A / b reset delay	00m:05s
	5D	C reset delay	05 m
6		input	
	6A	Input a function	Motor parameter selection
	6B	Enter a name	Input tripping
	6C	Input a trip	Always open
	6D	Input a trip delay	0m:00s
	6E	Input a initial delay	0m:00s
	6F	Input B function	Input trip (n / 0)
	6G	Enter B name	Input tripping
	6H	Input B trip	Always open
	6I	Input B trip delay	0m:00s
	6J	Input B initial delay	00m:00s
	6K	Input C function	shut
	6L	Input D function	shut
	6M	Remote reset logic	Normally closed (N/C)
	6N	Analog input trip	No tripping
	6O	Analog input range	2-10 V
	6P	Simulated trip point	50%
	6Q	Local) remote:	Always open
	6R	Telecontrol communication	Enable during remote control
7		output	
	7A	Relay a function	Main contactor

	7B	Relay a opening delay	0m:00s
	7C	Relay a off delay	0m:00s
	7D	Relay B function	RUN
	7E	Relay B on delay	0m:00s
	7F	Relay B off delay	0m:00s
	7G	Relay C function	Tripping operation
	7H	Relay CF on delay	0m:00s
	7I	Relay C off delay	0m:00s
	7J	Relay D function	OFF
	7K	Relay e function	OFF
	7L	Relay F function	OFF
	7M	Low current indication	50%
	7N	High current indication	100%
	7O	Motor temperature indication	80%
	7P	Analog output a	Current (% rated current)
	7Q	Analog a range	4-20 mA
	7R	Analog a max	100%
	7S	Analog a min	000%
	7T	Analog output B	Current (% rated current)
	7U	Analog B range	4-20 mA
	7V	Analog B Max	100%
	7W	Analog B min	000%
8		Monitor	
	8A	language	English
	8B	F1button function	Auto start / stop setting
	8C	F2 button function	Not set up
	8D	Display current or power	Electric current
	8E	Top left corner of screen	Starter status
	8F	Top right corner of screen	blank
	8G	Bottom left corner of screen	Operating hours
	8H	Bottom right corner of screen	Analog input
	8I	graphic data	Current (% rated current)
	8J	Graphic display period	10s
	8K	Graphic display maximum	400%
	8L	Graphic display minimum	000%
	8M	Current calibration	100%
	8N	Main supply voltage	400 V
	8O	Voltage calibration	100%
9		Motor data-2	
	9A	Double thermal protection model	Single model
	9B	Motor rated current - 2	Depending on Model
	9C	Lock to Time-2	0m:10s
	9D	Locked rotor current-2	600%
	9E	Motor Service factor-2	105%
1 0		Start / stop mode-2	
	10A	Starting mode-2	Constant current
	10B	Starting ramp-2	0m:10s
	10C	Initial current - 2	350%
	10D	Current LIMIT-2	350%
	10E	Adaptive starting curve-2	Constant acceleration
	10F	Jump start Time-2	0000 ms
	10G	Jump start amplitude-2	500%

	10H	Stop mode-2	Taxi stop
	10I	Stop Time-2	0m:00s
	10J	Adaptive stop curve-2	Constant deceleration
	10K	Adaptive control gain-2	75%
	10L	Brake torque-2	20%
	10M	Braking Time-2	0m:01s
11		RTD temperature	
	11A	*RTD/PT100 A℃*	50 °C (122 °F)
	11B	*RTD/PT100 B℃*	50 °C (122 °F)
	11C	*RTD/PT100 C℃*	50 °C (122 °F)
	11D	*RTD/PT100 D℃*	50 °C (122 °F)
	11E	*RTD/PT100 E℃*	50 °C (122 °F)
	11F	*RTD/PT100 F℃*	50 °C (122 °F)
	11G	*RTD/PT100 G℃*	50 °C (122 °F)
12		Slip ring motor	
	12A	Motor data 1 ramp	Single slope
	12B	Motor data 2 ramp	Single slope
	12C	Conversion time	150 ms
	12D	Slip ring deceleration	50%
15		Advanced requires an access password. Default value: 000	
	15A	Access password	0000
	15B	Parameter write protection	Read and write
	15C	Emergency operation	Prohibit
	15D	Short circuit thyristor action	Three phase control only
	15E	Point torque	50%
16		protective measures	
	16A	motor overload	Starter trip
	16B	Starting limit time	Starter trip
	16C	Under current	Starter trip
	16D	Instantaneous overcurrent	Starter trip
	16E	Current imbalance	Starter trip
	16F	frequency	Starter trip
	16G	Input a trip	Starter trip
	16H	Input B trip	Starter trip
	16I	Motor thermistor	Starter trip
	16J	Starter communication	Starter trip
	16K	Network communication failure	Starter trip
	16L	heatsink OT	Starter trip
	16M	Battery clock failure	Starter trip
	16N	Grounding fault	Starter trip
	16O	*RTD/PT100 A*	Starter trip
	16P	*RTD/PT100 B*	Starter trip
	16Q	*RTD/PT100 C*	Starter trip
	16R	*RTD/PT100 D*	Starter trip
	16S	*RTD/PT100 E*	Starter trip
	16T	*RTD/PT100 F*	Starter trip
	16U	*RTD/PT100 G*	Starter trip
	16V	Retain	-
	16W	Retain	-
	16X	Low control voltage	Starter trip
20		limit	
		Factory use only	

9.7 Load / Save Settings

You must enter the access password to access the load / save settings menu, where you can:
- default value of Loading Soft Starter parameters
- reload the parameter settings previously saved in the internal file
- save the current parameter settings in the internal file

In addition to the factory default file, the soft starter can store two custom parameter files. Before you save user files, they contain default values.

Load or save parameter settings:
1. Open the programming menu.
2. Flip to load / save settings and press ▶ button.
3. Turn to the required function and press ▶ button.
4. When prompted for confirmation, select Yes to confirm or no to cancel

Then press the menu (store) button to load / save the selection.

Parameter settings upload / backup
Load defaults
Load spare
Load user settings 1

Load defaults
No
Yes

After completing this operation, the screen displays a short confirmation message and then returns to the status screen.

Be careful
The saved file and the current working settings are stored in both the operation panel and the soft starter. Whenever you insert the dashboard into a new soft starter, the dashboard prompts you to synchronize the settings.

9.8 parameter description

1 motor data 1

The parameters in motor data 1 are used to configure the soft starter to match the connected motor. These parameters describe the operation characteristics of the motor, so that the soft starter can establish the temperature model of the motor.

Be careful
If delta connection method is adopted, input the rated current of motor with parameter 1a. The soft starter automatically detects whether the motor is connected by the star connection method or the triangle connection method, and calculates the correct current of the triangle connection.

1A - rated current of motor

Range: Depending on Model

Explain: Match the starter to the rated current of the connected motor. Set the rated current indicated on the motor label.

1B — locked rotor time

Range: 0:01-2:00(minutes: seconds) Default: 10 seconds

Explain: Sets the maximum time required for the motor to move from cold to maximum temperature with locked rotor current.Set according to motor data sheet.

1C — Locked rotor current

Range: 400%-1200% Rated current Default value: 600%

Explain: Set the locked rotor current of the connected motor as a percentage of the rated current. Set according to motor data sheet.

1D — Starting mode motor service factor

Range: 100%-130% Default value: 105%

Explain: Set the service factor of the motor used in the thermal protection model. If the motor operates at rated current, the service factor of the motor is 100%.
Set according to motor data sheet.

Be careful
Parameters 1b, 1c and 1D determine the trip current of the motor overload protection. The default settings for parameters 1b, 1c and 1D provide motor overload protection: class 10, trip current, 105% of FLA (rated current) or equivalent.

2 start / stop mode 1

2A - starting mode

Options: Constant current (default)
adaptive control
Explain: Select soft start mode.

2B — Starting ramp time

Options: 1 - 180 (seconds) Default value:10 seconds

Explain: Set the total start time of adaptive control starting or the ramp time of current ramp starting (from initial current to current limit).

2C — Initial current

Options: 100% - 600% rated current Default: 350%

Explain: Set the initial starting current for current ramp starting as a percentage of the rated current of the motor. Set the initial current so that the motor starts to accelerate immediately after starting.If current ramp starting is not required, set the initial current to the same value as the current limit.

2D — Current limit

Options: 100% - 600% rated current Default: 350%

Explain: Set the current limit of constant current soft start and current ramp soft start as the percentage of rated motor current.

2E — Adaptive starting curve

Options: Early acceleration
Constant acceleration (default)
Post acceleration
Explain: Select which curve the soft starter uses for adaptive control soft start.

2F — Jump start time

Options: 0–2000 ms Default: 0000 MS

Explain: Set the jump start duration. A setting of 0 disables jump start.

2G — Jump start amplitude

Options: 100% - 700% rated current Default: 500%

Explain:

⚠ Look out
Sudden start-up increases the torque of mechanical equipment. Before using this function, make sure that the motor, load and coupling can withstand additional torque.

2H — Stopping mode

Options: Taxi stop (default)
TVR soft stop
adaptive control
braking
Explain: Select the stop mode.

2I — Stopping time

Options: 0:00-4:00(Minute:seconds) Default: 0 (seconds)

Explain: Set the time required to soft stop the motor using a timed voltage ramp or adaptive control. At the same time, set the total stop time when the braking mode is adopted.
If a main contactor is installed, it must remain closed until the end of the stop time. Use one of the programmable relays to control the main contactor.

2J—Adaptive stop curve

Options: Early deceleration
Constant deceleration (default)
After deceleration

Explain: Select which curve the soft starter uses for soft stop adaptive control.

2K — Adaptive control gain

Range: 1% - 200% Default: 75%

Explain: Adjust the performance of the adaptive control.
This setting affects both the start control and the stop control.

Be careful
We recommend that you leave the gain setting at the default value, unless the performance does not meet the requirements.
If the motor accelerates rapidly at the end of starting or decelerates rapidly at the end of stopping, increase the gain setting by 5% ^ 10%. If the motor speed fluctuates during start or stop, slightly decrease - a little gain setting.

2L — Braking torque

Options: 20%-100% Default: 20%

Explain: Set the brake torque used by soft starter to slow down the motor.

2M — Braking time

Range: 1-30 (seconds) Default: 1 second

Note: set the duration of DC power supply during braking stop.

Be careful Parameter 2M and parameter 2I are used. See braking for details.

3 Auto start / stop

The soft starter can be programmed to start and stop automatically after a specified delay or at a specified time of day. Automatic start and automatic stop can be set separately.

The auto start / auto stop operation can only be used in remote mode. In local mode, the starter will ignore all auto start / auto stop settings.

Look out.
The auto start timer covers all other controls. The motor may start without warning.

warning
This function should not be used with a two wire remote control.
The soft starter still receives start and stop commands from the remote input or serial communication network. To disable local control or remote control, use parameter 6q.
If auto start is enabled, but the user is still in the menu system, activate auto start after menu timeout (no operation board activity is detected within 5 minutes).

3A — Auto start mode

Option: off (default) soft starter will not start automatically.
After the timer stops next time, the soft starter will start automatically after the delay specified in parameter 3B.
Note: the clock soft starter will start automatically at the time set in parameter 3B.
Select whether the soft starter will start automatically after the specified delay or at the specified time of one day.

3B — Auto start time

Options: 00:01 - 24:00 (hour: minute) Default: 1 minute

Explain: Set the soft starter auto start time in 24-hour clock format.

3C — Automatic stop mode

Option: off (default) soft starter will not start automatically.

After the timer stops next time, the soft starter will stop automatically after the delay specified in parameter 3D.

Explain:The clock soft starter will stop automatically at the time set in parameter 3D.

Select whether the soft starter will automatically stop after the specified delay or at the specified time of the day.

3D — Auto stop time

Range: 00:01 - 24:00 (hour: minute) Default: 1 minute

Note: set the automatic stop time of soft starter according to the 24-hour clock format.

4 Protection settings

These parameters determine when to activate the protection mechanism of the soft starter. The activation point of each protection mechanism can be set according to the needs of the device.

The soft starter responds to the protection event by tripping, warning or writing the event to the event log.

The setting of protection measures (parameter setting 16 protection measures) determines the response.

The default response is trip. .

Look out

The protection setting is very important for the safety of soft starter and motor.

The cancellation of the protection mechanism may endanger the safety of the equipment and should only be used in case of emergency.

4A 4B—Starting limit time

The starting limit time is the maximum time required for the soft starter to try to start the motor. If the motor does not transition to operating mode within the programmed limits, the starter trips. Set a time that is slightly longer than the normal start-up time. A setting of 0 disables the start limit time protection.

Range: 0:00 - 4:00 (minutes: seconds) Default: 20 seconds

Note: parameter 4A sets the main motor time, parameter 4B (start limit Time-2) sets the second group of motor time.

4C — Under current

Options: 0%-100%

Explain: Set the under current protection trip point according to the motor rated current percentage. Set to a value between the normal operating current range of the motor and the magnetizing (no-load) current of the motor (usually 25% to 35% of the rated current). Setting 0% disables the under current protection.

4D — Under current delay

Options: 0:00-4:00（minutes: seconds) Default: 5 seconds

Explain: Reduce the response speed of soft starter to under current, and avoid tripping due to instantaneous fluctuation.

4E — Instantaneous overcurrent

Options: 80% - 600% rated current Default: 400%

Explain: Set the instantaneous overcurrent protection trip point according to the motor rated current percentage.

4F — Instantaneous overcurrent delay

Options: 0:00-1:00（minutes: seconds) Default: 0 seconds

Explain: Reduce the response speed of the soft starter to the instantaneous overcurrent and avoid tripping due to the instantaneous fluctuation.

4G — Phase sequence

Options: Any order (default)
Forward
reverse

Explain: Select which phase sequence the soft starter will allow when starting. During the pre start check, the starter checks the phase sequence of its input terminals and trips if the actual phase sequence does not match the selected option.

4H — Current imbalance

Options: 10%-50% Default: 30%

Explain: Set the current unbalance protection trip point.

4I — Current unbalance delay

Range: 0:00 - 4:00 (minutes: seconds) Default: 3 seconds
Note: reduce the response speed of the soft starter to the current imbalance and avoid tripping due to instantaneous fluctuation.

4J — frequency measurement

Options: No measurement
Start time only
Start and run (default)
Runtime only

Explain: Determine when and if the starter will monitor the frequency trip.

4K — Frequency change

Options: ±2 Hz
±5 Hz (default)
±10 Hz
±15Hz

Explain: Select the allowable frequency variation of soft starter.

4L — Frequency delay

Options: 0:01 - 4:00 (minutes: seconds) Default: 1seconds

Explain: Reduce the response speed of soft starter to frequency fluctuation, and avoid tripping due to instantaneous fluctuation.

Be careful
If the power frequency is lower than 35 Hz or higher than 75 Hz, the starter trips immediately.

Look out
If the motor operates outside the specified frequency range for a long time, it may cause motor damage and permanent failure.

4M — Restart delay

Options: 00:01-60:00 (minute: Second) Default: 10 seconds

Explain: A soft starter can be configured to force a delay from the end of the stop to the start of the next start. During the restart delay, the display shows the time remaining before another start can be attempted.

Be careful
The restart delay starts at the end of each stop. Any changes to the restart delay setting will take effect after the next stop.

4N — Motor temperature measurement

Options: Do not measure (default)
Measure

Explain: Select whether the soft start verifies that the motor has sufficient thermal capacity to ensure successful start. The soft starter compares the calculated temperature of the motor with the temperature rise of the last motor start, and starts only when the motor is cooled enough to start successfully.

4O — Earth fault current

Options: 20mA - 50A (grade 21) Default: 100mA

Explain: Set the ground fault protection trip point.

4P — Earth fault delay

Options: 00:01-4:00 (minute: Second) Default: 3 seconds

Explain: Reduce the response speed of soft start to ground fault fluctuation and avoid tripping due to instantaneous fluctuation.

Be careful
The earth fault protection can only be used when the RTD / PT100 and the earth fault protection card are installed.

4Q — Retain

This parameter is reserved for internal use.

4R — Retain

This parameter is reserved for internal use.

4S — Retain

This parameter is reserved for internal use.

4T — Retain

This parameter is reserved for internal use.

5 Automatic reset trip

The soft starter can be programmed to automatically reset certain tripping conditions and minimize downtime.
According to the risks of the soft starter, the trips that can be reset automatically can be divided into three categories:

group	Tripping operation
A	Current imbalance Lack phase Power failure frequency
B	Under current Instantaneous overcurrent Input tripping Input B trip
C	Motor overload (thermal model) RTD / PT100 temperature trip Motor thermistor radiator overheating

Other trips cannot be reset automatically.
This function is especially suitable for two-wire remote control in remote mode. If there is a two wire start signal after the automatic reset, the soft starter will be restarted.

5A—Automatic reset function

Options: Turn off auto reset (default)
Group A reset
Group A and B reset
Group A, B and C reset

Explain: Select which trips can be reset automatically.

5B — Maximum reset times

Range: 1 - 5 Default value: 1

Explain: Set how many times the soft starter resets automatically in case of continuous tripping. After each automatic reset of the soft starter, the reset counter increases by one, and after each successful start / stop cycle of the soft starter, the reset counter decreases by one.

5C — Reset relay groups A and B

Range: 00:05 - 15:00 (minute: Second) Default: 5 seconds

Explain: Set the reset delay of group a trip and group B trip.

5D — Reset relay group C

Range: 5 - 60 (minute) Default: 5 minute

Explain: Set the reset delay of group C trip.

6 input

Soft start has two programmable inputs, which can control the soft start remotely. If necessary, you can use the I / O expansion card to add two inputs.

6A — Input a function

Options: Motor parameter selection (default) can configure two sets of independent motor data for the soft starter. To use the auxiliary motor data, parameter 6A must be set to 'motor parameter selection'. When a start command is issued, C53 and C54 must be closed.
The soft starter checks which motor data to use at startup and uses this motor data throughout the start / stop process.

Input trip (N / 0): The soft starter can be tripped with input A. When parameter 6A is set to input trip (N / O), C53 and C54 close the circuit and trip the soft starter.

Input trip (N / C): When parameter 6A is set to input trip (N / C), C53 and C54 are open to trip the soft starter.

Local / remote selection: You can use input A to select local control or remote control without using the L / R (local / remote) button on the operation panel. When this input is off, the starter is in local control mode and can be started via the operation panel. When this input is closed, the starter control is
Remote control mode. With the START and L / R (local / remote) buttons disabled, the soft starter ignores any local / remote selection commands from the serial communication network.
To use input A to select local or remote control, parameter 6Q must be set to "Always on" or "On when the motor is stopped".

Emergency operation: In the emergency running mode, the soft starter continues to run to stop, ignoring all trips and warnings (See parameter 15C for details).
When C53 and C54 are closed, emergency operation is activated. When the circuit is open, the emergency operation ends and the soft starter stops the motor.

Disable starter: The soft starter can be disabled via the control input. Opening C53, C54 disables the starter. The soft starter does not respond to the start command. If the soft starter is running, it will allow the motor to coast to stop and ignore the soft stop mode set in parameter 2H.

Jog forward: Activate jog forward operation (only available in remote control mode).

Jog reverse: Activates jog reverse operation (only available in remote control mode).

Explain: Select the input A function.

6B — Enter a name

Options:
Input trip (default) no flow
Low pressure
high pressure
Pump failure
Low level
High level
Disable starter
Controller
PLC
Vibration alarm

Explain: Select the message to be displayed on the operation panel when input A is activated.

6C — Input A tripped

Options: Always on (default) It may trip at any time after the soft starter is powered up.
During operation only, the soft starter may trip when it is running, stopped or started.
Trip only Only trips when the soft starter is running.

Explain: Select when an input trip occurs.

6D — Input A Trip Delay

Range: 0:00-4:00 (minutes: seconds) Default: 0 seconds

Explain: Set the delay from input activation until the soft starter trips.

6E — Input A initial delay

Range: 0:00-30:00 (minutes: seconds) Default: 0 seconds

Explain: Set the delay before the input trip occurs. The initial delay is calculated from the start signal received. The input state is ignored until the initial delay has elapsed.

6F、6G、6H、6I、6J — Input B tripped

Parameters 6F ~ 6J configure input B in the same way as parameters 6A ~ 6E configure input A. See Input A for details.

6F Input B function (default: input trip (N / 0))

6G input B name (default: input trip)

6H Input B trip (default: always on)

6I Input B trip delay (default: 0:00)

6J Input B initial delay (default: 0:00)

6K、6L — Input C and input D

Parameters 6A and 6K select the function of input C and input D. See parameter 6A for details. Input C and Input D are only available if an input / output expansion card is installed.

Options: Motor parameter selection
Local / remote selection.
Emergency operation
Disable starter (normally closed)
Off (default)

6M — Remote reset logic

Options: Normally closed (N / C) (default)

Normally open (N / 0)

Explain: Select whether the soft starter remote reset input (terminals C41, C42) is normally open or normally closed.

6N — Analog input trip

If necessary, connect the analog input to the soft starter. External devices can activate the analog input to trip the soft starter in response to external conditions.

Options: Not tripped (default)
Over trip
Too low trip

Explain: Select the response of the soft starter to the analog input signal.

6O — Analog input range

Options: 0-10V (default)

2-10V

Explain: Select the analog output range.

6P — Analog trip point

Options: 0% - 100% Default: 50%

Explain: Set the signal level when an analog input trip occurs as a percentage of the maximum input signal.

6Q — Local / remote

Options: Always on Always enabled L / R (local / remote) button.
Open when motor is stopped Enable when starter is off L / R (local / remote) button.

Local control only Disable all remote inputs.
Remote control only Disable local control buttons (START, RESET and L / R (local / remote)

Explain: Select when to use the L / R (local / remote) button to switch between local and remote control, enable or disable the local control button and remote control input.
The STOP button on the operator panel is always enabled.

Be careful
The STOP button on the operator panel is always enabled. When using two-wire remote control, if the remote start / stop input and remote reset input are still active, the soft starter will restart.

6R — Remote communication

Options: Disabled during remote control
Enabled during remote control (default)

Explain: Select whether the starter receives start and stop commands from the serial communication network in remote control mode.
Reset commands, forced communication trip commands, and local / remote commands are always enabled.

7 Output

Soft start has three programmable outputs that can be used to signal different operating conditions to related equipment. Three additional outputs on the input / output expansion card can be used.

7A — Relay A function

Options:	Turn Off	Relay A is not used.
	Main Contactor (default)	When the soft starter receives the start command, the relay closes. Keep it closed during the power.
	Run	When the starter switches to the running state, the relay closes.
	Trip	When the starter trips, the relay closes (see parameter 16A~16X).
	Caveat	When the starter issues a warning, the relay is closed (see parameters 16A ~ 16X).
	Low Current Indication	When the low current indication is activated (see parameter 7M Low current indication, when the motor is running), the relay is closed.
	High Current Indication	When the high current indication is activated (see parameter 7N High current indication, when the motor is running), the relay is closed.
	Motor Temperature Indication	When the motor temperature indication is activated (see parameter 70 Motor temperature indication), the relay is closed.
	Input A Tripped	When input A activates the soft starter, the relay closes.
	Input B Tripped	When input B activates the soft starter to trip, the relay closes.
	Motor Overload (thermal Model)	When the starter trips due to motor overload, the relay closes.
	Current Imbalance	When the starter trips due to current imbalance, the relay closes.
	Under Current	When the starter trips due to undercurrent, the relay closes.
	Instantaneous Overcurrent	When the starter trips due to transient overcurrent, the relay closes.
	Frequency	When the starter trips due to frequency, the relay closes.
	Ground Fault	When the starter trips due to a ground fault, the relay closes.
	Radiator Overheating	When the starter trips due to overheating of the radiator, the relay closes.
	Missing Phase	When the starter trips due to a phase loss, the relay closes.
	Motor Thermistor	When the starter trips due to the motor thermistor, the relay closes.
	Changeover Contactor	When the high rotor resistance current ramp reaches full voltage, the relay closes and can be used with slip ring motors.
	Undervoltage	Not suitable for soft starters.
	Ready	When the starter is in the ready state, the relay is closed.

7B — Relay A On Delay

Note: Select relay A function (normally open)

Range: 0:00-5:00 (minutes: seconds) Default: 0 seconds

Explain: Set relay A closing delay.

7C — Relay A power-off delay

Range: 0:00-5:00 (minutes: seconds) Default: 0 seconds

Explain: Set relay A reopen delay.

7D~7L—Output relays B, C, D, E and F

Parameter 7D '7L configures relay B, C, D, E, and F operations in the same way as parameter 7A 7C configure relay A. See Relay A Function for details.
Relay B is a switching relay.

- 7D Relay B Function Default: Run
- 7E Relay B ON Delay
- 7F Relay B OFF delay

Relay C is a switching relay.

- 7G Relay C Function Default: Trip
- 7H Relay C ON Delay
- 7I Relay C OFF delay

Relays D, E, and F can only be used when an input / output expansion card is installed. These relays do not support switching delays and do not support the changeover contactor function.
Relay D is normally closed, and relays E and F are normally open.

- 7J Relay D Function Default: OFF
- 7K Relay E ON Delay Default: OFF
- 7L Relay F OFF delay Default: OFF

7M—Low current indication

The soft starter has a low current indication and a high current indication, and issues an abnormal working alarm in advance. The current flag can be configured to display the abnormal current level between the normal operating current level and the under-current trip level or the over-current trip level during operation. These flags can be used to send an exception to an external device through one of the programmable outputs. These flags are cleared when the current returns to the normal operating range, which is a 10% drop from the rated current of the programmed motor.

Range: 1% - 100% Rated current Default: 50%

Explain: Set the low current indication point according to the motor rated current percentage.

7N—High current indication

Range: 50% - 600% Rated current Default: 100%

Explain: Set the high current indication point according to the motor rated current percentage.

7O–Motor temperature indication

The soft starter has a motor temperature indication and issues an abnormal working alarm in advance. The motor temperature indication may indicate that the motor operating temperature exceeds the normal operating temperature, but is below the overload limit. Motor temperature indication can send abnormal conditions to external devices through one of the programmable outputs.

Range: 0%-160% Default: 80%

Explain: Set the motor temperature indicating working level as a percentage of the motor's thermal capacity.

7P—Analog output A

Options: Current (% rated current) (default) The current expressed as a percentage of the rated current of the motor.
Motor temperature (%) Motor temperature expressed as a percentage of motor thermal capacity.
Motor Power (%) Measured motor kilowatt power, expressed as a percentage of maximum power.
Motor capacity (%) The measured motor apparent power is expressed as a percentage of the maximum apparent power.
Motor power factor Motor power factor as measured by the soft starter.

Explain:

Measured motor power: .V3 x average current x power reference voltage x measured power factor Maximum motor power: V3 x rated motor current x power reference voltage. Assume power factor of 1 Measured motor apparent power: V3 x average current x power reference voltage Maximum motor apparent power: V3 x rated motor current x power reference voltage

Select which information is reported through the analog output.

7Q—Analog A range

Range: 0-20 mA
4-20 mA (default)

Explain: Select the analog output range.

7R — Analog A maximum

Range: 0% - 600% Default: 100%

Explain: Calibrate the upper limit of the analog output to match the signal measured on an external current measurement device.

7S — Analog A minimum

Range: 0% - 600% Default: 0%

Explain: Calibrate the lower limit of the analog output to match the signal measured on an external current measurement device.

7T、7U、7V、7W—Analog output B

Parameter 7T ~7W configures the operation of analog output B in the same way as parameter 7P~7S configures analog output A. See Analog Output A for details.
Analog output B is only available if an input / output expansion card is installed.

8 Monitor

You can use these parameters to customize the controller for individual user needs.

8A-Language

Options:
- English（default)
- Chinese
- Español
- Deutsch
- Português
- Français
- Italiano
- Russian

Explain: Select the language in which messages and feedback are displayed on the dashboard.

8B and 8C—F1 and F2 button functions

Options:
- Not set
- Automatic start / stop setting
- Jog forward
- Jog reverse

Explain: Select the function of the F1 and F2 buttons on the operation panel.

Note
No access password is required to use the F1 and F2 buttons. Regardless of the setting of parameter 15B, users can use these functions.
Parameter write protection.

8D—Display current or power

Options:
- Current (default)
- Motor Power

Explain: Select whether the soft starter displays current (Amps) or motor power on the main monitoring screen.

8E、8F、8G、8H—User programmable screen

Option: Blank selected area does not display data, but displays long messages to avoid overlap.
Starter status Starter working status (starting, running, stopping or tripping).
Can only be displayed in the upper left (default) and lower left corners of the screen.
Motor current Three-phase average current.
Motor power factor Motor power factor as measured by the soft starter.
Power frequency The average frequency measured in three phases.
Motor power Motor operating power kW.
Motor horsepower Motor operating power HP.
Motor temperature The motor temperature calculated using the thermal protection model.
Kilowatt hours The number of kilowatt hours consumed by the motor through the soft starter.
Running hours The number of hours the motor has been running through the soft starter.
Analog input Analog input A level (see parameters 6N ~ 6P).
This setting is only available if an input / output expansion card is installed.

Description: Select what information the programmable monitor screen displays.

- 8E Upper left corner of the screen Default value: Starter status
- 8F Upper right corner of the screen Default value: blank
- 8G Screen bottom left corner Default value: running hours
- 8H Lower right corner of the screen Default value: analog input

8I — Graphic data

The soft starter uses real-time performance charts to report characteristics of important operating parameters.
Option: Current (% rated current) (default) Current expressed as a percentage of the motor's rated current.
Motor temperature (%) Motor temperature expressed as a percentage of motor thermal capacity.
Motor power (%) Measured motor kilowatt power, expressed as a percentage of maximum power.
The motor apparent power measured by motor capacity (%) is expressed as a percentage of the maximum apparent power.
Motor power factor Motor power factor as measured by the soft starter.

> Measurement: Measured motor power: √3 x average current x power reference voltage x measured power factor
> Maximum motor power: √3 x rated motor current x power reference voltage. Assume power factor of 1
> Measured motor apparent power: √3 x average current x power supply reference voltage.
> Maximum motor apparent power: √3 x rated motor current x power reference voltage

Description: Select what information the performance graph displays.

8J — Graphic display period

Options: 10 seconds (default)
30 seconds
1 minute
5 points
10 points
30 points
1 hour

Explain: Set the graphic time scale.Graphics replace old data with new data.

8K — Graphic maximum

Range: 0% – 600% Default: 400%

Explain: Adjust the upper limit of the performance graph.

8L — Graphic minimum

0% – 600% Default: 0%

Adjust the lower limit of the performance graph.

8M — Current calibration

Range: 85% - 115% Default: 100%

Explain: Calibrate the soft starter's current monitoring circuit to match the external current measurement equipment.
Use the following formula to determine the necessary adjustment:

$$\text{calibration (\%)} = \frac{\text{Current shown on soft starter display}}{\text{Current measured by external device}}$$

$$\text{such as } 102\% = \frac{66A}{65A}$$

Attention

This adjustment affects all current-based functions and protections.

8N — Power reference voltage

Range: 100–690 V Default: 400V

Explain: Set the power frequency voltage of the operation panel monitoring function. Use this setting to calculate motor power and apparent power (kVA), but it will not affect the control or protection of the motor.

80 Keep

Explain: This parameter is reserved for future use.

9 Motor data-2

The soft starter can support two different sets of motor start and stop data.

- If you want to use the soft starter with two different motors (such as working / standby configuration), use parameter 9A to select the dual thermal protection model and configure parameters 9B ~ 9E according to the second motor.
- To use a soft starter with two sets of different motor data for the same motor (two-speed motors or applications with varying starting conditions), use parameter 9A to select the single thermal protection model, and use parameters 10A to 10G to configure the start and stop curves as required . The soft starter will ignore parameters 9B ~ 9E and will use the settings of the main motor.

To select the second set of motor data, a programmable input must be configured as a parameter setting selection (parameters 6A and 6F). This input must be activated when the soft starter receives a start signal.

Attention

Only when the soft starter is stopped, which set of motor data can be selected.

9A — Double thermal protection model

Options: Single model (default)
Dual model

Explain: Activate the dual thermal protection model. The dual thermal protection model is required only when the soft starter controls two different motors.

9B — Motor rated current 2

Range: Depending on model

Explain: Set the auxiliary motor rated current.

9C — Locked rotor time -2

Range: 0: 01-2: 00 (minutes: seconds) Default: 10s

Explain: Set the maximum time required for the motor to reach the maximum temperature from the cold state with locked rotor current.
Set according to the motor data sheet.

9D — Stall current 2

Range: 400% - 1200% Rated current Default: 600%

Explain: Set the locked rotor current of the connected motor as a percentage of the rated current.
Set according to the motor data sheet.

9E — Motor service factor 2

Range: 100% - 130% Rated current Default: 105%

Explain: Set the service factor for the second group of motors.

10 Start / stop method 2

10A — Starting method 2

Options: Constant current (default)
Adaptive Control
Select the soft start method.

10B — Starting ramp-2

Range: 1 - 180 (s) Default: 10s

Explain: Set the total start time of the adaptive control start or the ramp time of the current ramp start (from the initial current to the current limit).

10C — Initial current 2

Range: 100% - 600% Default: 350%

Options: Set the initial starting current of the current ramp start as a percentage of the rated motor current. Set the initial current so that the motor starts to accelerate immediately after starting to start. If a current ramp start is not required, set the initial current to the same value as the current limit.

10D — Current limit 2

Range: 100%-600% Rated current Default: 350%

Options: Set the current limit for constant current soft start and current ramp soft start as a percentage of the motor's rated current.

10E — Adaptive starting curve 2

Option: Early acceleration
Constant acceleration (default)
Post-acceleration

Explain: Select which curve the soft starter uses for adaptive control soft start.

10F — Jump start time -2

Range: 0-2000 (ms) Default: 0000ms

Explain: Set the kick start duration. Setting 0 disables kick start.

10G — Recoil start amplitude 2

Range: 100% — 700% Rated current Default: 500%

Explain: Set the kick start current amplitude.

10H — Stop mode 2

Options: Taxi stop (default)
TVR soft stop
Adaptive Control
Brake

Explain: Select the stop method.

10I — Stop time 2

Range: 0:00 - 4:00 (Minutes: seconds) Default: 0s

Explain: Set the stop time.

10J — Adaptive stop curve 2

Options: Early deceleration
Constant deceleration (default)
Deceleration

Explain: Select which curve the soft starter uses for adaptive control soft stop.

10K — Adaptive control gain 2

Range: 1% - 200% Default: 75%

Explain: Tuning the performance of adaptive control. This setting affects both start control and stop control.

10L —Brake torque 2

Range: 20%-100% Default: 20%

Explain: Set the amount of braking torque used by the soft starter to slow down the motor.

10M — Braking Time-2

Range: 1-30 (s) Default: 1s

Explain: Set the duration of DC power supply during braking stop.

11 RTD Temperature

The soft starter has one RTD / PT100 input, which can be installed with six other PT100 inputs through this RTD / PT100 and ground fault protection card.
When the temperature exceeds a specified point, these inputs trip the soft starter. You can set a different trip temperature for each input.
Only after installing the RTD / PT100 and ground fault protection card, can you use the PT100 to input B ~ G.

Range: 0-250°C   Default: 50°C

Explain: Set the RTD / PT100 input trip point.

- 11A RTD A Trip temperature
- 11B RTD B Trip temperature
- 11C RTD C Trip temperature
- 11D RTD D Trip temperature
- 11E RTD E Trip temperature
- 11F RTD F Trip temperature
- 11G RTD G Trip temperature

12 Slip Ring Motor

You can use these parameters to configure the soft starter for use with slip ring motors.

12A 12B–Motor data 1 ramp and motor data 2 ramp

Options: Single slope (default)
Shuangpo

Explain: Select whether to use single current ramp or dual current ramp for soft start. Set a single slope for the non-slip ring induction motor and a double slope for the slip ring induction motor.
Parameter 12A selects the main motor ramp configuration, and parameter 12B selects the auxiliary motor ramp configuration.

12C—Conversion time

Options: 100-500 (ms)   Default: 150 ms

Explain: Set the delay from the closing of the rotor resistance relay to the start of the low resistance current ramp. Set the switching time so that the contactor has enough time to close, but the motor does not decelerate.

Parameter 12C only applies if parameter 12A or 12B is set to "Double Ramp" and an output relay is set to changeover contactor.

12D—Slip ring deceleration

Options: 10%-90%   Default: 50%

Explain: Set the conduction level when the rotor resistor is closed, as a percentage of full conduction.
Setting slip ring deceleration can avoid current pulse, but the motor has sufficient speed to start normally.

15 Advanced

15A—Access password

Options: 0000 - 9999   Default: 0000

Explain: Set an access password to control access to restricted sections of the menu.

Use ◀ and ▶ buttons to select the digit to be changed, and use the ▲ and ▼ buttons to change the value.

Note
If you forget the access password, please contact your local supplier to obtain the master access password. You can use this to reset the new access password.

15B—Parameter write protection

Options: Read and write (default) allows the user to modify parameter values on the programming menu.
Read Only Does not allow the user to modify parameter values on the programming menu. You can still view the parameter values.

Explain: Select whether the operator panel allows parameters to be changed via the programming menu.

Note
Any changes to the parameter write protection settings will take effect after the programming menu is closed.

15C—Emergency operation

Options: Disabled (default)
Enable

Explain: Select whether the soft starter allows emergency operation. In emergency running mode, the soft starter starts (if not already running) and continues to work until the end of emergency running, ignoring stop commands and trips. Emergency operation is controlled by programmable parameters.

Attention

It is not recommended to use emergency operation continuously. Emergency operation may damage the life of the starter because all protections and trips are disabled.
Using the starter in emergency operation mode will void the product warranty.

15D—Short-circuit thyristor action

Options: Three-phase control only (default)
Two-phase control

Explain: Select whether the soft starter allows two-phase control. For critical applications, if one phase of the soft starter is damaged, the soft starter is allowed to use two-phase control to control the motor. Two-phase control can only be used after the soft starter has tripped and reset due to "Lx-Tx short circuit".

Attention

Two-phase control can adopt two-phase soft-start technology, so special care must be taken when determining the specifications of the circuit breaker and protection. Contact your local supplier for assistance.

Attention

Only motors connected by star connection support two-phase control. If the soft starter is connected using a delta connection method, two-phase control does not work.

The next time the control power is applied, the starter will trip due to an Lx-Tx short circuit. If the control power is turned on again between two starts, the two-phase control does not work.

15E—Jogging torque

The soft starter can be jogged at low speed, which is convenient for precise adjustment of the belt position and flywheel position. Both jog forward and jog reverse.

Range: 20%-100% Default: 50%

Explain: Set the jog operation current limit.

16 Protective measures

These parameters define how the soft starter responds to different protection events. The soft starter can trip, issue a warning or ignore different protection events as needed.
Writes all protection events to the event log. The default action for all protections is to trip the soft starter.
16N ground fault protection and 16P ~ 16U RTD / PT100 protection can only be used after installing the RTD / PT100 and ground fault protection card.

Attention

The removal of the protection mechanism may endanger the safety of the starter and the motor and should only be used in an emergency.

16A~16X — Protective measures

Options: Starter trip (default)
Alarm and record
Record only

Explain: Select the response of the soft starter to each protection.

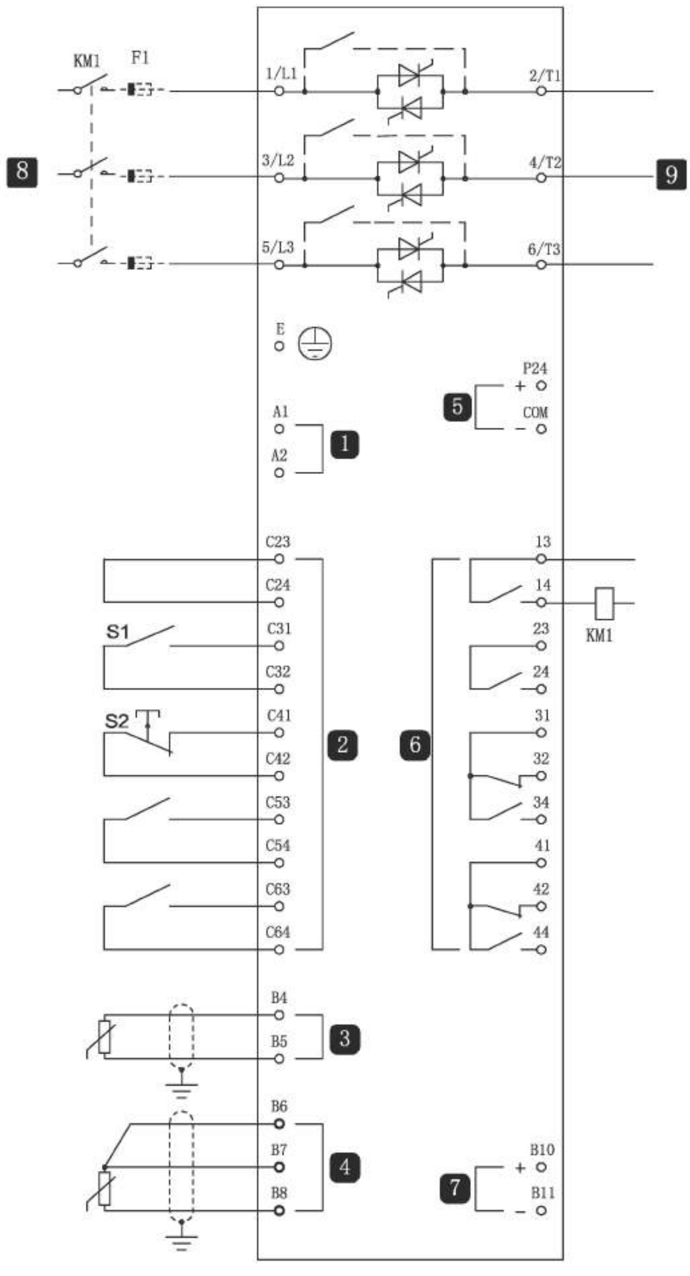
- 16A Motor overload
- 16B Starting limit time
- 16C Under current
- 16D Instantaneous overcurrent
- 16E Current imbalance
- 16F Frequency
- 16G Input a tripped
- 16H Input b tripped
- 16I Motor thermistor
- 16J Starter communication
- 16K network communication failure
- 16L radiator overheating
- 16M battery / clock failure
- 16N ground fault
- 160 ~ 16U RTD A ~ G overheating
- 16V reserved
- 16W reserved
- 16X low control voltage

Chapter 10 Application Examples

The following series of application notes can help you understand the advanced installation and configuration of soft starters under specific performance requirements. Application notes explain various application conditions, including brake operation, jog operation, pumping options, and advanced protection options.

10.1 Installation With Main Contactor

The soft starter is installed together with the main contactor (AC3 class). The control voltage must be input at the input of the contactor.
The main contactor is controlled by the soft contactor main contactor output. This output is assigned to output relay A (terminals 13, 14) by default.



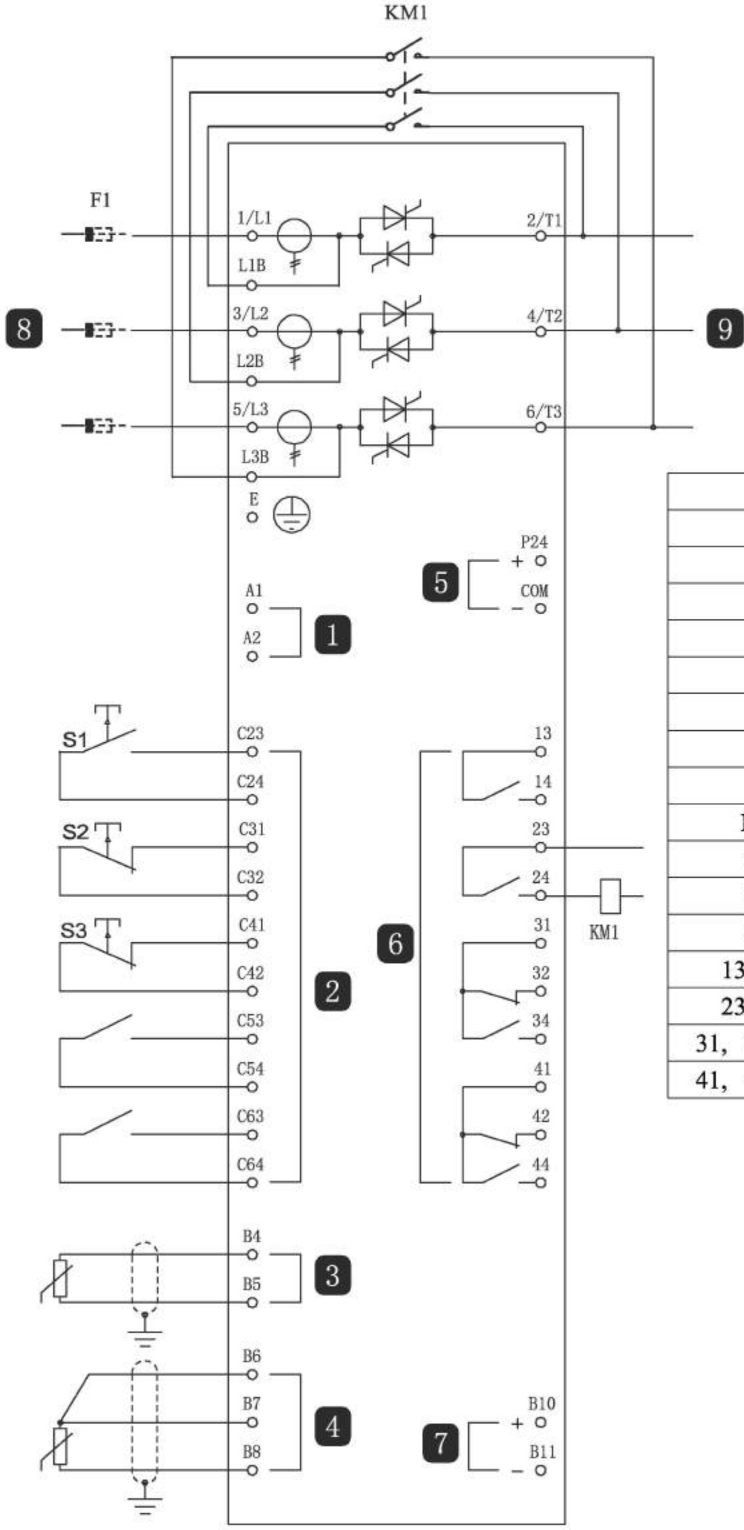
1	Control voltage (depending on model)
2	Remote control input
3	Motor thermistor input
4	RTD / PT100 input
5	24VDC output
6	Relay output
7	Analog output
8	Three-phase power
9	Motor terminal
KM1	Main contactor
F1	Semiconductor fuse (optional)
S1	Start / stop contact
S2	Reset contact
13, 14	Relay output A
23, 24	Run relay output
31, 32, 34	Relay output B
41, 42, 44	Relay output C

Parameter settings:
- parameter 7A relay A function

Select 'Main Contactor'-Assign relay output A as the main contactor function (default setting).

10.2 Installation With External Bypass Contactor

The soft starter is installed together with an external bypass contactor (AC1 class). The bypass contactor is controlled by the soft starter's running output (terminals 23, 24).



1	Control voltage (depending on model)
2	Remote control input
3	Motor thermistor input
4	RTD / PT100 input
5	24VDC output
6	Relay output
7	Analog output
8	Three-phase power
9	Motor terminal
KM1	Main contactor
F1	Semiconductor fuse (optional)
S1	Start / stop contact
S2	Reset contact
13, 14	Relay output A
23, 24	Run relay output
31, 32, 34	Relay output B
41, 42, 44	Relay output C

Parameter settings:

- No special settings are required.

10.3 Emergency Operation

During normal operation, the soft starter is controlled by two-wire remote control signals (terminals C31, C32).

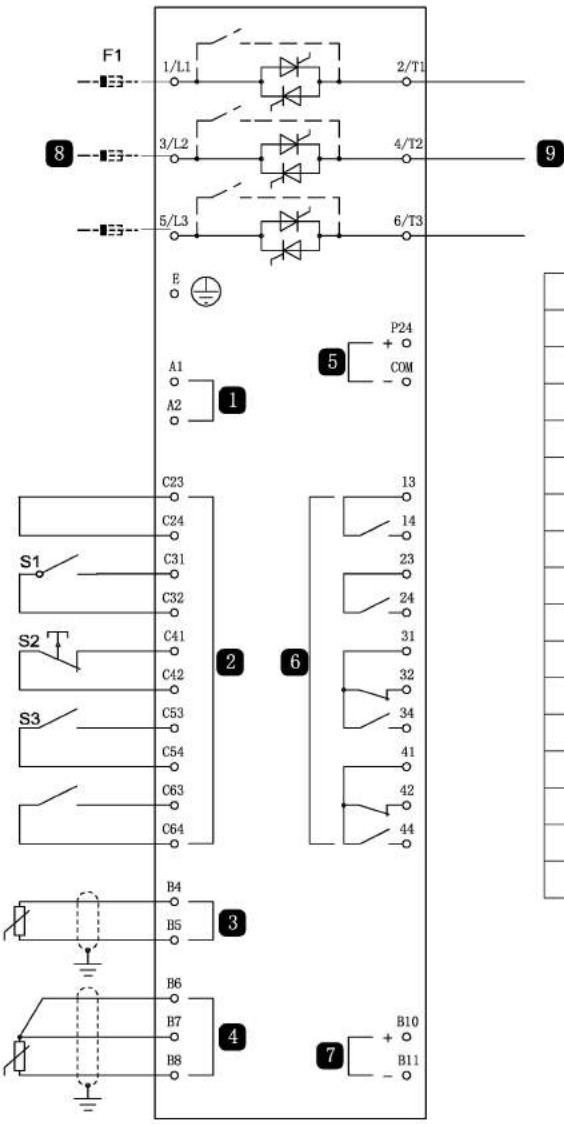
Emergency operation is controlled by a two-wire circuit connected to input A (terminals C53, C54). When input A is closed, the soft starter will run the motor and ignore certain trip conditions.

Attention

Although emergency operation meets the functional requirements of the fire mode, how it is applied is not certified and it is not recommended to use emergency operation in situations where testing and / or compliance with specific standards are required.

Be careful

It is not recommended to use emergency operation continuously. Emergency operation may damage the life of the starter because all protections and trips are disabled.
Using the starter in emergency operation mode will void the product warranty.



1	Control voltage (depending on model)
2	Remote control input
3	Motor thermistor input
4	RTD / PT100 input
5	24VDC output
6	Relay output
7	Analog output
8	Three-phase power
9	Motor terminal
KM1	Main contactor
F1	Semiconductor fuse (optional)
S1	Start / stop contact
S2	Reset contact
13, 14	Relay output A
23, 24	Run relay output
31, 32, 34	Relay output B
41, 42, 44	Relay output C

Parameter settings:

- Parameter 6A input A function

Select "Emergency Run"-Specify input A for the emergency run function.

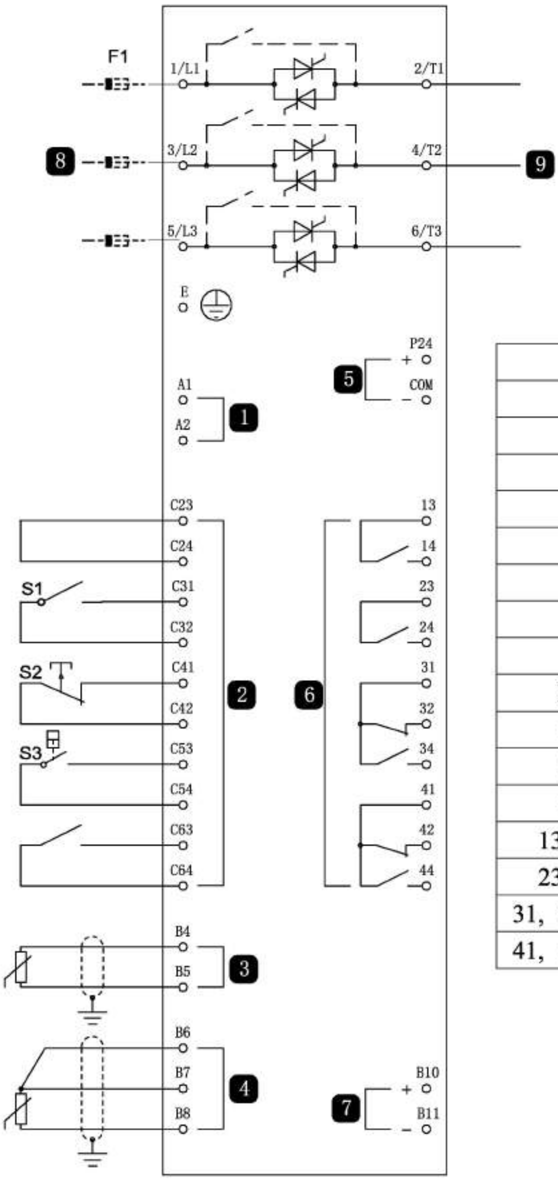
- Parameter 15C emergency operation

Select "Enable"-enable emergency running mode. .

10.4 Auxiliary Trip Circuit

During normal operation, the soft starter is controlled by two-wire remote control signals (terminals C31, C32).

Input A (terminals C53, C54) is connected to an external trip circuit (such as the low-voltage alarm switch of a pumping system). When the external circuit is activated, the soft starter trips to stop the motor.



1	Control voltage (depending on model)
2	Remote control input
3	Motor thermistor input
4	RTD / PT100 input
5	24VDC output
6	Relay output
7	Analog output
8	Three-phase power
9	Motor terminal
KM1	Main contactor
F1	Semiconductor fuse (optional)
S1	Start / stop contact
S2	Reset contact
13, 14	Relay output A
23, 24	Run relay output
31, 32, 34	Relay output B
41, 42, 44	Relay output C

Parameter settings:

- Parameter 6A input A function
  Select "Input Trip (N / 0)". Assign input A for auxiliary trip (normally open) function
- Parameter 6B enter A name
  Select a name, such as "Low Voltage". Specify a name for the input A.
- Parameter 6C input A trip
  Set as required. For example, the "Only Run" limit input trip is valid only when the soft starter is running.
- Parameter 6D input A trip delay
  Set as required. Set the delay from input activation until the soft starter trips.
- Parameter 6E input A initial delay
  Set it to about 120 seconds. Limit the input trip to 120 seconds after the start signal. This way, the pipeline has enough time to increase the water pressure before activating the low pressure input.

10.5 DC Braking With External Zero Speed Sensor

If the load may change during braking, the advantage of using an external zero speed sensor is that the soft starter brake can be turned off. This control method ensures that the soft starter brake is always turned off after the motor is stationary, thereby avoiding unnecessary motor heating.

The following schematic shows how to use the zero speed sensor with a soft starter to turn off the braking function when the motor is stopped. The zero speed sensor (A2) is often called the underspeed detector. Its internal contacts open at zero speed and close when the speed is greater than zero. When the motor reaches the stop state, C53, C54 will be disconnected and the starter will be disabled. After the next start command is issued (ie the next application of Ka1), C53, C54 are closed and the soft starter is enabled.

The soft starter must work in remote mode. Parameter 6A input A function must be set to disable the starter.

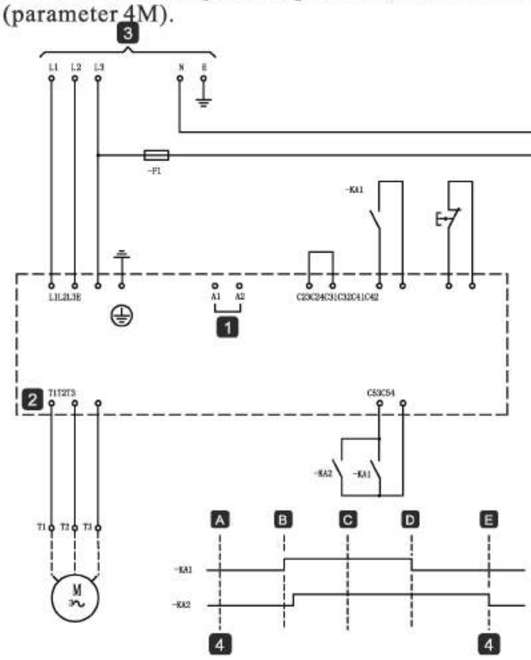
Attention

If the braking torque is set too large, the motor will stop before the braking time is over, and the motor generates excessive heat, which may cause damage to the motor. The braking torque must be carefully configured to ensure the safe operation of the starter and motor.

Setting the braking torque too large will cause the peak current to start directly when the motor is stopped. Make sure that the fuses installed in the motor branch circuit are correctly selected.

Attention

The braking operation caused the motor to heat faster than the speed calculated using the motor thermal protection model. If using brake operation, install a motor thermistor or set a sufficiently long restart delay (parameter 4M).



1	Control power
C23, C24	Start
C31, C32	Stop
C41, C42	Reset
C53, C54	Programmable input A (starter disabled)
2	Motor terminal
3	Three-phase power
4	Disable starter (shown on starter screen)

A	Off (ready)
B	Start
C	Run
D	Stop
E	Zero speed
5	Start signal
6	Zero speed sensor

For details on how to configure DC braking, see Braking on page 27.

Be careful

When using DC braking, the power supply and the soft starter (input terminals L1, L2, L3) must be connected in positive phase sequence, and the parameter is 4G.

The phase sequence must be set to forward.

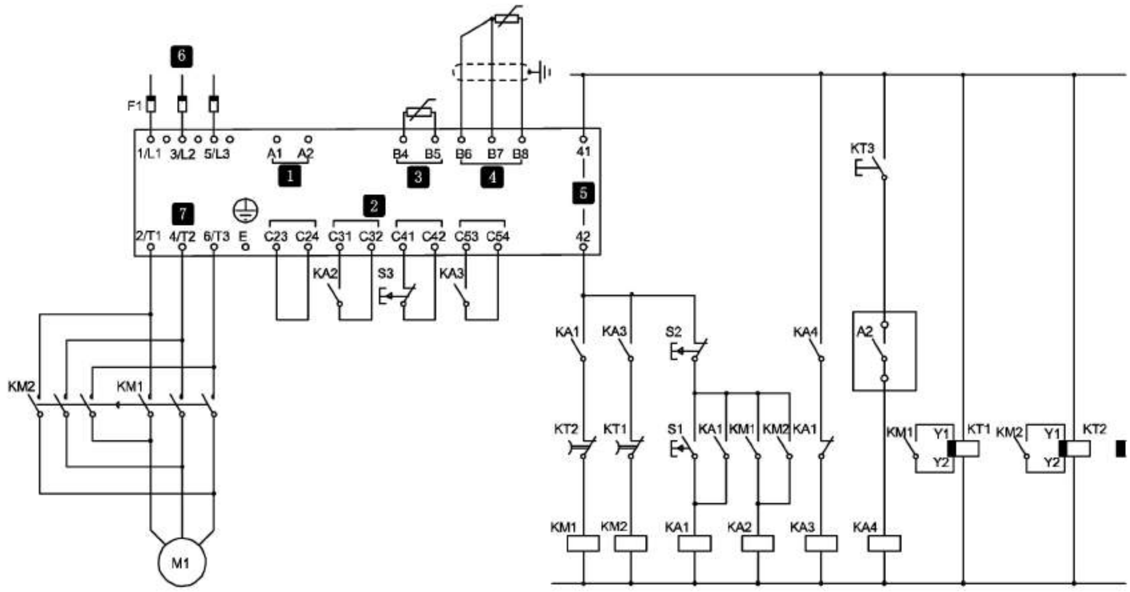
Be careful

If the braking torque is set too large, the motor will stop before the braking time is over, and the motor generates excessive heat, which may cause damage to the motor. The braking torque must be carefully configured to ensure the safe operation of the starter and motor.

Setting the braking torque too large will cause the peak current to start directly when the motor is stopped. Ensure that the fuses installed in the motor branch circuit are selected correctly

10.6 Soft Braking

For large inertia load applications and / or variable load applications, a soft starter can be configured for soft braking.
In this application, soft starters are used with forward and brake contactors. When the soft starter receives the start signal (button S1), close the forward rotation
Contactor (KM1), set control motor according to the programmed group motor.
When the soft starter receives the stop signal (button S2), open the forward contactor (KM1), and close the brake contactor (KM2) after a delay of about 2-3 seconds (kt1).
The KA3 is also closed to activate the second set of motor settings programmed by the user for the desired stop performance characteristics.
When the motor speed is close to zero, the zero speed sensor (A2) stops the soft starter and disconnects the brake contactor (KM2).



1	Control voltage (depending on model)
2	Remote control input
3	Motor thermistor input
4	RTD / PT100 input
5	Relay output
6	Three-phase power
7	Motor terminal
A2	Zero speed sensor.
F1	Semiconductor fuse (optional)
KA1	Running relay
KA2	Starting relay

KA3	Brake relay
KA4	Zero speed sensing relay
KM1	Line contactor (operation)
KM2	Line contactor (brake)
KT1	Run delay timer
KT2	Braking delay timer
KT3	Zero speed sensing delay relay *.
S1	Starting contact
S2	Stop contact
S3	Reset contact

* The KT3 timer is required only if the zero-speed sensor is a relay type that performs a self-test after power-on and then immediately disconnects the output.

parameter settings:

- Parameter 6A input A function. (Terminals C53, C54)
- Select "Motor parameter selection"-specify input A for motor parameter selection.
- Use the first group of motor parameters to set the starting performance characteristics.
- Use the second set of motor settings to set the braking performance characteristics.
- Parameter 7G relay C function
- Select "Trip"-specify the trip function for relay output C.

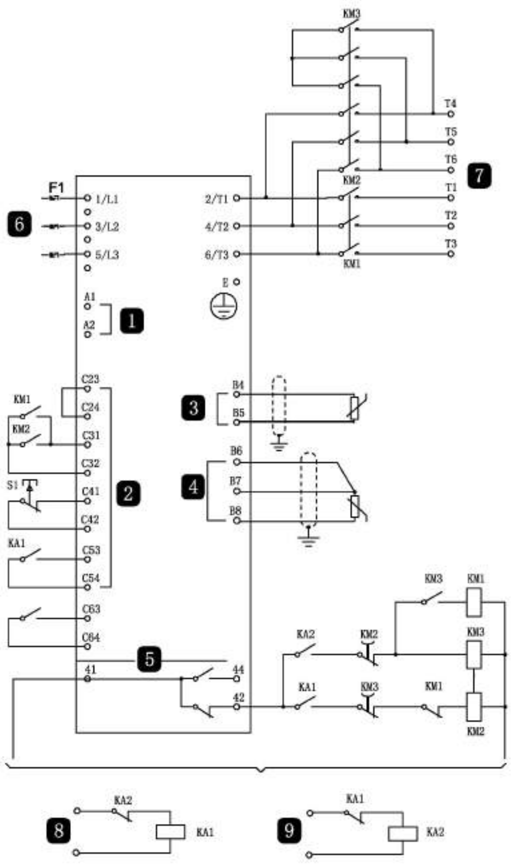
Note
If the soft starter trips due to the power frequency (parameter 16F frequency) when the brake contactor KM2 is opened, modify the frequency protection setting.

10.7 Two-speed Motor

High-speed contactor (Km1), low-speed contactor (KM2) and star contactor (KM3) can be used, and a soft starter can be configured for two-speed Dahlander motor control.

Be careful
Pole amplitude modulation (PAM) motors use external winding configuration to effectively change the rotor frequency, thus changing the speed. Soft starters are not suitable for use with such two speed motors.

When the soft starter receives the high-speed start signal, close the high-speed contactor (KM1) and star contactor (Km3), and then set the control motor according to the first group of motors.
When the soft starter receives the low speed start signal, close the low speed contactor (km2). Input a is closed and the soft starter sets the control motor according to the second set of motors.



1	Control power
2	Remote control input
3	Motor thermistor input
4	RTD / PT100 input
5	Relay output
6	Three-phase power
7	Motor terminal
8	Remote control low speed start input
9	Remote control high speed start input
F1	Semiconductor fuse (optional)
KA1	Remote start relay (low speed)
KA2	Remote start relay (high speed)
KM1	Line contactor (high speed)
KM2	Line contactor(Low speed)
KM3	Starting contactor (high speed)
S1	Reset contact
41, 42, 44	Relay output C

Be careful
Contactors KM2 and KM3 must be mechanically interlocked.

Parameter setting:
- parameter 6A input a function (terminal C53, C54)

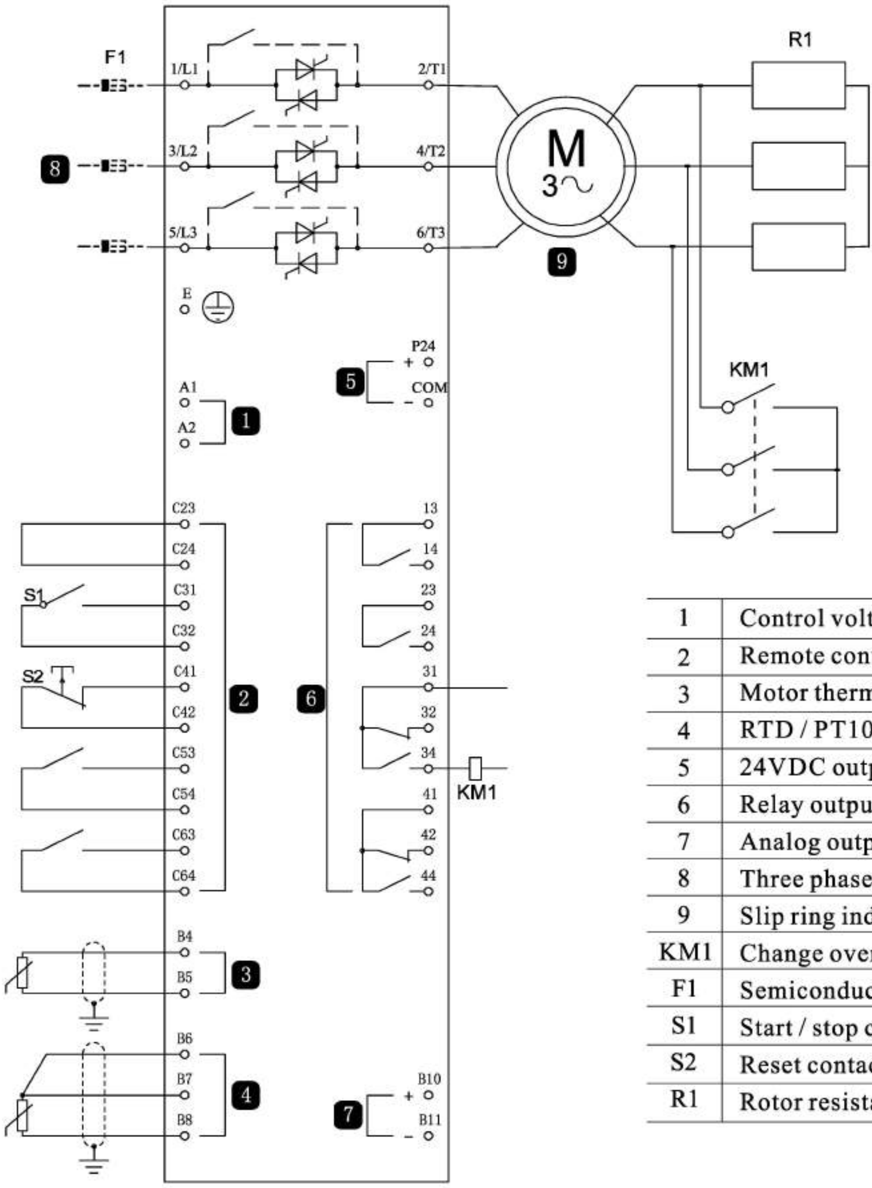
Select "motor parameter selection" one to specify input a for motor parameter selection.
Set the high-speed performance characteristics with the - Group Motor settings.
Use the second set of motors to set the low speed performance characteristics.
- parameter 7g relay C function

Select "trip" - specify trip function for relay output C

Attention
If the soft starter trips due to the power frequency (parameter 16F frequency) when the high-speed start signal (9) is disconnected, the frequency protection setting shall be modified.

10.8 Slip Ring Motor

A soft starter can be used to control the slip ring motor using the rotor resistance.

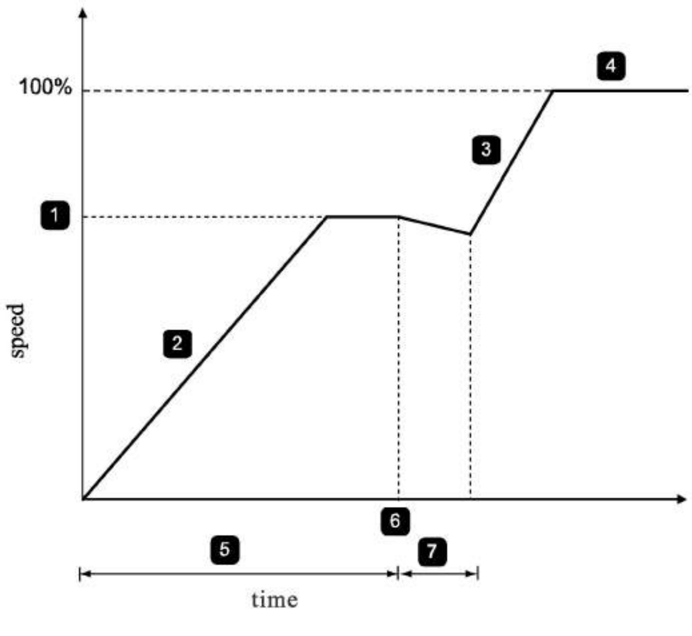


1	Control voltage (depending on model)
2	Remote control input
3	Motor thermistor input
4	RTD / PT100 input
5	24VDC output
6	Relay output
7	Analog output
8	Three phase power supply
9	Slip ring induction motor
KM1	Change over contactor
F1	Semiconductor fuse (optional)
S1	Start / stop contact
S2	Reset contact
R1	Rotor resistance (external)

Debugging

1. Configure the soft starter as follows:
   Parameter setting: parameter 7d relay B function
   Select 'change over contactor'
   - parameter 7e relay B open delay
   Set this parameter to the maximum time (5 minutes: 00 seconds).
   - parameter 12a motor data 1 ramp
   Select 'double slope' (for slip ring induction motor control)
   - parameter 12C conversion time
   The default setting is 150 milliseconds. Set this value to a value greater than the phase closing time of the change-over contactor (KM1).
   - valuepoint 12D slip ring reduction
   The default setting is 50%. Set this parameter large enough to allow the motor to accelerate immediately after the rotor resistance (R1) is bypassed, if set Small enough to avoid motor current pulse.
2. Start the motor under normal load and record the time required for the motor to reach a constant speed when the circuit has external rotor resistance (R1).
   Stop the motor as soon as it reaches a constant speed. Change parameter 7e to the recorded time value.

3. Start the motor under normal load conditions and monitor the speed characteristics and motor current of the motor after the switching contactor (KM1) is switched and the stator resistance (R1) is shorted.
If the motor does not accelerate immediately after the conversion, increase the setting of parameter 12D.
If the motor current changes abruptly after the conversion, the setting of parameter 12D needs to be reduced.



1	R1 constant speed
2	First slope
3	Second slope
4	Operating mode (I <120% of motor rated current)

5	Parameter 7E Relay B Open Delay
6	KM1 closed
7	Parameter 12C conversion time

Note
In order for this device to work properly, only the motor settings of group-are used. Use only constant current starting method (parameter 2A starting method).

Chapter 11 Fault Resolution

11.1 Protection Response

When a protection condition is detected, the soft starter writes the protection condition to the event log. It may trip and may issue a warning. The soft starter response depends on the protective measures setting (parameter setting 16).
The user cannot adjust one or more of the protection responses. These trips are usually caused by external events (such as phase loss), or they may be caused by internal faults of the soft starter. These trips have no related parameters and cannot be set as warnings or logs.
If the soft starter trips, you need to identify and clear the conditions that triggered the trip, reset the soft starter, and then restart. To reset the starter, press the RESET button on the control panel-or activate the "Reset remote input".
If the soft starter alarms, the soft starter will reset automatically after the cause of the alarm is eliminated.

11.2 Trip Message

The following table lists the protection mechanisms and possible trip causes of the soft starter. Some settings can be adjusted with parameter settings 4 protection settings and parameter settings 16 protection measures, while other settings are built-in system protection and cannot be set or adjusted.

Display	Possible cause / suggested solution
Analog input trip	Determine and exclude activation conditions for analog input A. Related parameters: 6N, 60, 6P
Waiting for data	The operation board did not receive data from the control PCB. Check that the cables on the starter are properly connected and installed.
Battery / clock	A real-time clock verification error has occurred, or the backup battery voltage is too low. If the battery voltage is too low and the power is off, the date / time setting will be lost. Reset the clock. Related parameters: 16M
Controller	This is the name chosen for the programmable input. See Input Trip.
Current imbalance	Current imbalances can be caused by motor problems, environmental problems, or installation problems, such as: ● Unbalanced supply voltage ● Motor winding problem ● Small motor load ● Input terminals L1, L2, or L3 lack phase in operating mode The thyristor has an open circuit. Only by replacing the thyristor and checking the performance of the starter can the diagnosis be clearly determined. Whether the thyristor is malfunctioning. Related parameters: 4H, 4I, 16E
Current read error LX	Where X is 1, 2 or 3. Internal fault (PCB failure). When the thyristor power is cut off, the current transformer circuit output does not reach zero. Contact your local supplier for advice. This trip cannot be adjusted. Related parameters: None
Starting limit time	Trip limit time trips can occur in the following situations: • Parameter 1A motor rated current is not suitable for this motor • The parameter 2D current limit is set too small • Parameter 2B start ramp time is set to be larger than the 4A setting start limit time • Parameter 2B The starting ramp time is set too short, it is not suitable for large inertia loads when using adaptive control Related parameters: 1A, 2B, 2D, 4A, 4B, 9B, 10B, 10D, 16B
Trigger failed **PX**	Where X is phase 1, phase 2, or phase 3. The thyristor does not trigger as expected. The thyristor may be malfunctioning, or the internal wiring may be malfunctioning. This trip cannot be adjusted. Related parameters: None
Excessive rated current (Rated current is out of range)	This trip cannot be adjusted. If the soft starter uses a delta connection instead of a star connection to connect the motor, it can support larger motor rated current values. If the soft starter is connected using the star connection method, but the programmed setting of parameter 1A motor rated current exceeds the maximum value of the star connection method, the soft starter will trip when starting (see Minimum and Maximum Current Setting on page 71). If the soft starter is connected to the motor using a delta connection method, the soft starter may not detect the connection correctly. Contact your local supplier for advice. Related parameters: 1A and 9B

Display	Possible cause / suggested solution
Frequency (power)	This trip cannot be adjusted. The power frequency is outside the specified range. Check whether other equipment in this range affects the power supply, especially variable speed drives and switching power supplies. If the soft starter is connected to a generator set, the generator may be too small, or there may be speed regulation problems. Related parameters: 4J, 4K, 4L, 16F
Ground fault	This fault occurs only when an RTD / ground fault card is installed. Test output cable insulation and motor insulation. Identify and eliminate any ground fault cause. Related parameters: 40, 4P, 16N
Radiator overheating	Check if the cooling fan is working. If installed in a cabinet, check for adequate ventilation. During the starter's start and operation, the fan works and continues to work for 10 minutes after the starter enters the stopped state. Note Models 0023B to 0053B and 0170B do not have cooling fans. For models with a cooling fan, the fan is turned on at startup and turned off after 10 minutes of inactivity. Related parameters: 16L
High level	This is the name chosen for the programmable input. See Input Trip.
High pressure	This is the name chosen for the programmable input. See Input Trip.
Input Trip	One of the inputs of the soft starter is set to the trip function and is activated. Check the input status to determine which input is active, and then exclude the trigger condition. Related parameters: 6A、6B、6C、6D、6E、6F、6G、6H、6I、6J、16G、16H
Instantaneous Overcurrent	The soft starter reports this trip when any of the following conditions occur: The motor power increases sharply. Causes may include transient overload conditions exceeding an adjustable delay. Related parameters: 2U、2V、16P The current through the motor exceeds the built-in trip point of the soft starter. 7.2 times of parameter 1A *Motor rated current* 6 times the starter current rating Causes of transient overcurrent include locked rotors, or a malfunction of the motor or wiring. This trip cannot be adjusted. Related parameters: None
Internal fault X	This trip cannot be adjusted. The soft starter has tripped due to an internal fault. Contact your local supplier for the meaning of fault code (X). Related parameters: None
L1 Phase Loss L2 Phase Loss L3 Phase Loss	This trip cannot be adjusted. Before starting, check whether the starter has detected and displayed a phase loss. In the running state, the starter detects that the current of the affected phase has dropped below 2% of the programmed motor's rated current, and the duration exceeds 1 second, which indicates that the phase on the line side is missing or the connection to the motor is disconnected. Check the power, input and output connections of the starter and the motor. Failure of thyristor, especially open circuit of thyristor, will also cause phase loss. Only by replacing the thyristor and checking the performance of the starter, can the diagnosis of the thyristor fail clearly. Related parameters: None
L1-t1 Short L2-t2 Short L3-t3 Short	Before starting, check whether the starter detects and displays a short circuit of the thyristor or an internal short circuit of the bypass contactor. If the starter is connected to the motor using a star connection method, consider using a two-phase control method to keep the starter working until the starter can be repaired. Note Only motors connected by star connection support two-phase control. If the soft starter is connected using a delta connection method, two-phase control does not work. The next time the control power is applied, the starter will trip due to an Lx-Tx short circuit. If the control power is turned on again between two starts, the two-phase control does not work. Related parameters: 15D

Display	Possible cause / suggested solution
Low control voltage	The soft starter has detected a drop in the control voltage. ● Check external control power (terminals A1, A2, A3) and reset the starter. If external control power is stable: ● It may be that the 24V power supply on the main control PCB is faulty, or the bypass drive PCB may be faulty (only the internal bypass type). Contact your local supplier for advice. In the ready state, this protection is not activated. Related parameters: 16X
Low level	This is the name chosen for the programmable input. See Input Trip.
Low pressure	This is the name chosen for the programmable input. See Input Trip.
Motor overload (thermal model)	The motor has reached its maximum thermal capacity. Overload may be caused by: ● Soft starter protection setting does not match the thermal capacity of the motor ● Too many starts per hour ● The output is too large ● Damaged motor windings Remove the cause of the overload and allow the motor to cool Related parameters: 1A, 1B, 1C, 1D, 16A Attention Parameters 1B, 1C and 1D determine the trip current of the motor overload protection. The default settings of parameters 1B, 1C and 1D provide motor overload protection: level 10, trip current, FLA (rated current) 105% or equivalent.
Motor 2 overload	Refer to Motor Overload (Thermal Model) above. Attention Only applicable after programming the second group of motors. Related parameters: 9A, 9B, 9C, 9D, 9E, 16A
Motor connection TX	Where X is 1, 2 or 3. The motor is connected to the soft starter using a star connection or delta connection method. ● Check each connection between the motor and soft starter to see if the power supply circuit is unblocked. ● Check the connections on the motor terminal box. This trip cannot be adjusted. Related parameters: None
Motor thermistor	● The motor thermistor input is enabled and the resistance of the thermistor input exceeds 3.6 kΩ for more than 1 second. ● Motor winding is overheating. Determine the cause of overheating, allow the motor to cool, and then restart the motor. ● The motor thermistor input is turned on. Attention If an effective motor thermistor is no longer used, a 1.2kΩ resistor must be connected between terminals B4 and B5. Related parameters: 16I
Network communication (between interface and network)	The network master has sent a trip command to the starter, or there is a problem with the network communication. Examine the cause of communication problems on the network. Related parameters: 16K
No traffic	This is the name chosen for the programmable input. See Input Trip.
Not ready	Check input A (C53, C54). It is possible to disable the starter via a programmable input. If parameter 6A or 6F is set to disable the starter and there is an open circuit on the corresponding input, the soft starter will not start.
Parameter is out of range	This trip cannot be adjusted. ● The parameter value is outside the valid range. The operator panel will display the first invalid parameter. ● An error occurred while loading the data from the EEPROM into the RAM after the operation board was powered on. ● The parameter setting or actual value on the operation panel does not match the starter parameters. ● "Load user settings" was selected, but no saved files are available. Reset fault. The starter will load the default settings. If the problem persists, contact your local dealer. Related parameters: None

Display	Possible cause / suggested solution
Phase sequence	The phase sequence on the soft starter input terminals (L1, L2, L3). Is incorrect. Check the phase sequence on L1, L2, L3. Make sure the setting in parameter 4G is suitable for the device. Related parameters: 4G
PLC	This is the name chosen for the programmable input. See Input Trip.
Power-down / power circuit	This trip cannot be adjusted. When a start command is issued, one or more phases of the starter are not energized. Check whether the main contactor is closed when the start command is issued and whether it is closed until the soft stop is completed. Check the fuse. If the soft starter is tested with a small motor, at least 2% of the minimum rated current must flow through each phase. Related parameters: None
Pump failure	This is the name chosen for the programmable input. See Input Trip.
RTD A overheated to RTD 6 overheated.	Above the RTD / PT100 set temperature, the soft starter trips. Identify and exclude activation conditions for the corresponding inputs. Attention Pt100 B ~ PT100 G can only be used after RTD / PT100 and ground fault card are installed. Related parameters:11A、11B、11C、11D、11E、11F、11G、16O ~ 16U
RTD circuit failure	The displayed RTD / PT100 has a short circuit. Check and exclude this condition. Related parameters: none
Starter communication (connect Port and soft starter)	There is a problem with the connection between the soft starter and the optional ommunication interface. Remove the interface and reinstall it. If the problem persists, contact your local dealer. The soft starter has an internal communication error. Contact your local dealer. Related parameters:16J
Disable starter	This is the name chosen for the programmable input. See Input Trip.
Thermistor circuit	The thermistor input is enabled, and: ● The input resistance is less than 20 Ω (the cold resistance of most thermistors is greater than this value), or a short circuit has occurred. Check and exclude this condition. Related parameters: none
Time limit overcurrent	The soft starter has a built-in bypass and requires a large current during operation. (When the protection curve of 10A is tripped, or the motor current rises to 600% of the motor rated current setting value.) Related parameters: none
Under current	The motor current drops sharply, which is caused by unloading. Causes of descent include broken components (shafts, belts, or couplings), or the pump is idling. Related parameters: 4C、4D、16C
Unsupported option (Triangle connection method (This feature is not supported)	This trip cannot be adjusted. The selected function cannot be used (for example, the triangle connection method does not support jog). Related parameters: None
Vibration alarm	This is the name chosen for the programmable input. See Input Trip.
VZC failure PX	Where X is 1, 2 or 3. Internal fault (PCB failure). Contact your local supplier for advice. This trip cannot be adjusted Related parameters: None

11.3 General faults

The following table describes known soft starter failures without tripping or warning.

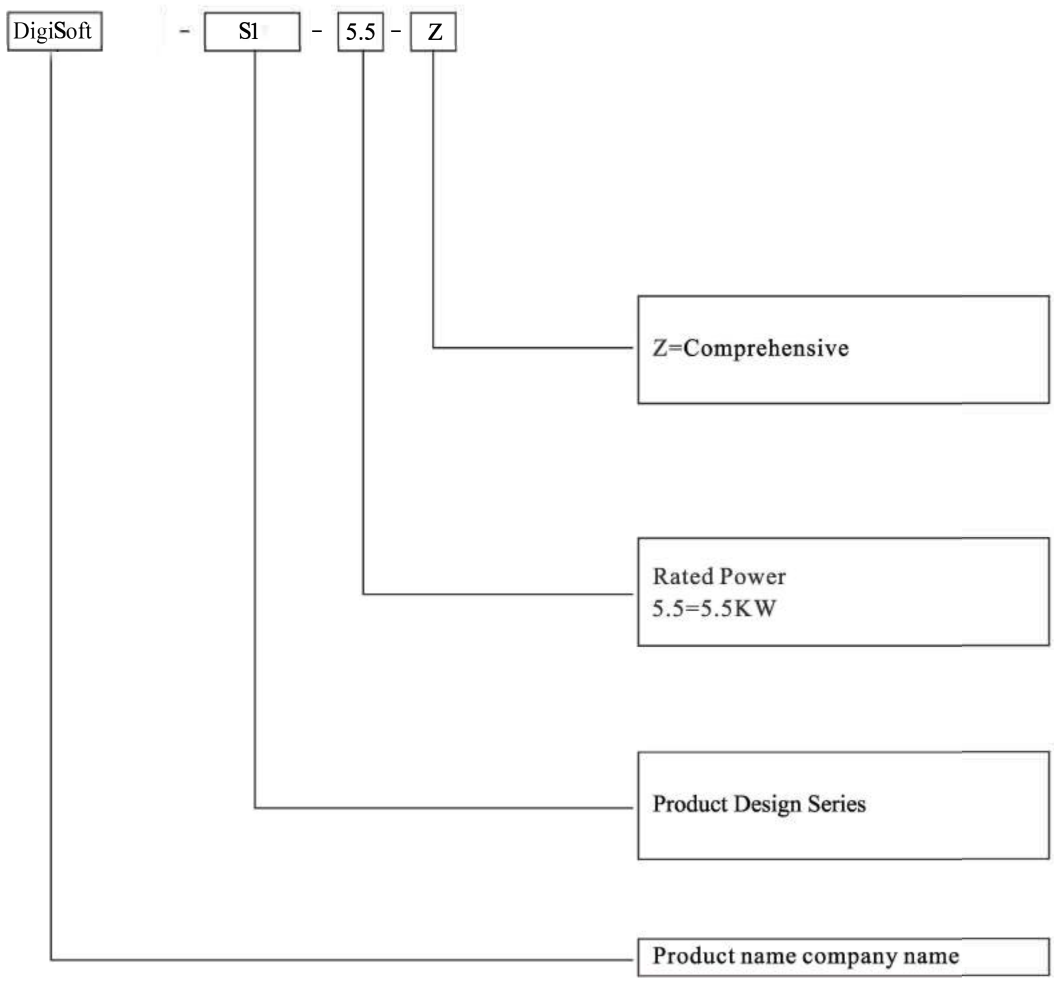
Symptom	Possible reason
Starter "Not Ready"	Check input A (C53, C54). It is possible to disable the starter via a programmable input. If you participate The number 6A or 6F is set to starter disabled and the corresponding input. If there is an open circuit, the soft starter will not start.
The soft starter does not respond to START or RESET on the operation panel.	The soft starter may be in remote control mode. When the soft starter is in remote mode,The local LED on the actuator does not light up. Press the L / R (local / remote) button once to switch to local control.
The soft starter does not respond to commands from the control inputs.	The soft starter may be in local control mode. When the soft starter is in local control mode,The local LED on the starter is on. Press the L / R (local / remote) button once to switch to Local control. The control cable may be connected incorrectly. Check remote control start input, remote control stop input And remote control reset input are configured correctly (see Control Cables on page 6 for details)The signal sent to the remote control input may be wrong. Activate each input signal in turn and test. input signal. The corresponding remote control input LED on the starter should be on.
The soft starter does not respond to start commands from local control or over-control.	The soft starter may be waiting for the restart delay to elapse. Restart delay length is subject to parameters 4M restart delay control. The motor may be too hot to start. If parameter 4N Motor Temperature Measurement is set to Measure Only when the soft starter calculates that the motor has sufficient thermal capacity to successfully complete the start, The soft starter is allowed to start. Wait for the motor to cool down before attempting to start.It is possible to disable the starter via a programmable input. If parameter 6A or 6F is set as starter disabled If there is an open circuit on the corresponding input, the soft starter will not start. If no longer needed Disable the starter and close the input circuit. Note Parameter 6Q Local / Remote: Controls when the L / R (local / remote) button is enabled.
When using two-wire remote control, reset is not performed after automatic reset.	The two-wire remote control start signal must be canceled, and then the start signal reapplied to restart.
When using two-wire remote control, the remote start / stop command overrides the automatic start / stop setting.	The auto start / auto stop function can only be used in remote mode with three or four wire control.
If there is a connection between the thermistor inputs B4 and B5, or if the motor thermistor between B4 and B5 is permanently removed, a non-resettable thermistor circuit will trip.	After establishing the connection and activating the short-circuit protection, enable the thermistor input.Remove the connection and load the default parameter group. This will disable the thermistor input and clear the trip. Connect a 1k2Ω to the thermistor input Set the thermistor protection to "record only" (parameter 16I).
When using two-wire remote control, the remote start / stop command overrides the automatic start / stop setting.	The auto start / auto stop function can only be used in remote mode with three or four wire control.
The soft starter cannot control the motor correctly during the starting process.	If a small motor rated current setting (parameter 1a) is used, the starting performance may be unstable.This may affect the use of soft starters on small test motors rated from 5 A to 50 A.A power factor correction capacitor must be connected at the power supply end of the soft starter. To control dedicatedThe power factor correction capacitor contactor connects the contactor to the operation relay terminal.
The motor cannot reach full speed.	If the starting current is too small, the motor cannot produce enough torque to accelerate to full speed.The soft starter may trip due to the starting limit time. Be careful Ensure that the motor starting parameters are suitable for the application and use the expected motor starting curve. If parameter 6A or 6F is set as motor parameter selection, check whether the corresponding input is in the expected state. The load may be blocked. Check whether the load is seriously overloaded and whether the rotor is locked.
Motor operation is unstable.	The thyristor in the soft starter must have a current of at least 5A to be locked. If the rated current is less than When testing the soft starter on the motor of 5A, the thyristor may not lock normally.

The motor is irregular or noisy.	If the soft starter is connected to the motor by triangle connection method, the soft starter may not be inspected correctly Test connection. Contact your local supplier for advice.
Soft stop ends too fast.	The soft stop setting may not be appropriate for the motor and load. Check the settings of parameters 2h, 2I, 10h and 101. If the load of the motor is very small, the function of soft stop is very limited.
Adaptive control, braking, inching and two-phase control functions do not work.	These functions can only be used with star connection. If the soft starter is connected with triangle connection method, these functions will not work.
After the adaptive control is selected, the motor is started normally, and the second start is different from the first start.	The first adaptive control start is a real constant current so that the starter can understand the motor characteristics. Adaptive control is used for subsequent starting.
When this option is selected, two-phase control does not work.	The next time control power is applied, the starter will trip due to Lx-Tx short circuit. If the control power is switched on again between two starts, the two-phase control will not work.
Starter "waiting for data	The operation board did not receive data from the control PCB. Check the cable of the display on the starter Whether the connection and installation are correct.
The display of the operation panel is in disorder.	The fixing screws of the operation board may not be tightened, causing intermittent connection. Tighten the operation panel Fix the screws or install the four corners in place.
Display distortion	Check whether the fixing screws of the operation board are tightened too tightly. Loosen the screws slightly.
Unable to save parameter settings.	Make sure that after adjusting the parameter settings, press the menu (store) button to save the new values. If you press exit(exit), changes are not saved. Check whether the parameter write protection (parameter 15b) is set to read-write. If parameter write protection is set If it is read-only, you can view the parameters, but you cannot change them. You must enter the security access password To change parameter write protection settings. EEPROM on operation panel. May be faulty. Failure of EEPROM will also cause soft starter Trip, and an error message will be displayed on the operation panel: parameter out of range. Contact local supplier Ask for advice.
Attention! Cut off the main power supply	If the three-phase power supply is connected, the soft starter will not activate the operation simulation. This can prevent accidents Trigger direct start.

Chapter 12 Appendix

12.1 Specifications

Model code



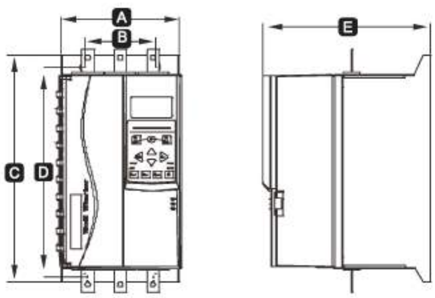
Minimum and maximum current settings

The minimum rated current setting and the maximum rated current setting of the soft starter depend on the model:

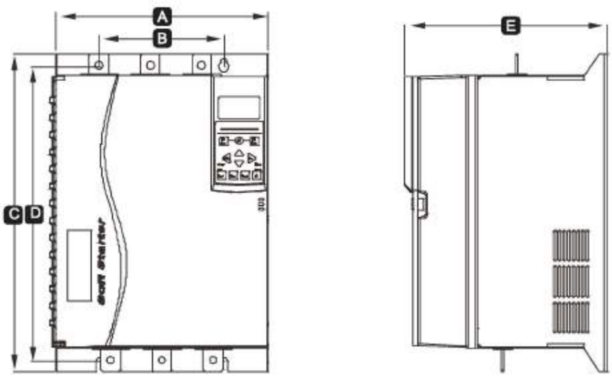
Model	Star connection method	Rated current of delta connection method
DigiSoft S1-5.5-11	11A	16A
DigiSoft S1-7. 5-15	15A	22A
DigiSoft S1-011-23	23A	34A
DigiSoft S1-015-30	30A	44A
DigiSoft S1-018-37	37A	55A
DigiSoft S1-022-45	45A	67A
DigiSoft S1-030-60	60A	89A
DigiSoft S1-037-75	75A	111A
DigiSoft S1-045-90	90A	133A
DigiSoft S1-055-110	110A	163A
DigiSoft S1-075-150	150A	222A
DigiSoft S1-090-180	180A	266A
DigiSoft S1-110-230	230A	325A
DigiSoft S1-132-265	265A	377A
DigiSoft S1- 160-320	320A	474A
DigiSoft S1-185-370	370A	548A
DigiSoft S1-200-400	400A	592A
DigiSoft S1-220-440	440A	629A
DigiSoft S1-250-500	500A	7 40A
DigiSoft S1-280-560	560A	829A
DigiSoft S1-320-630	630A	932A
DigiSoft S1-350-700	700A	1036A
DigiSoft S1- 400-800	800A	1184A
DigiSoft S1-450-900	900A	1332A
DigiSoft S1-500-1000	1000A	1480A

Size and weight

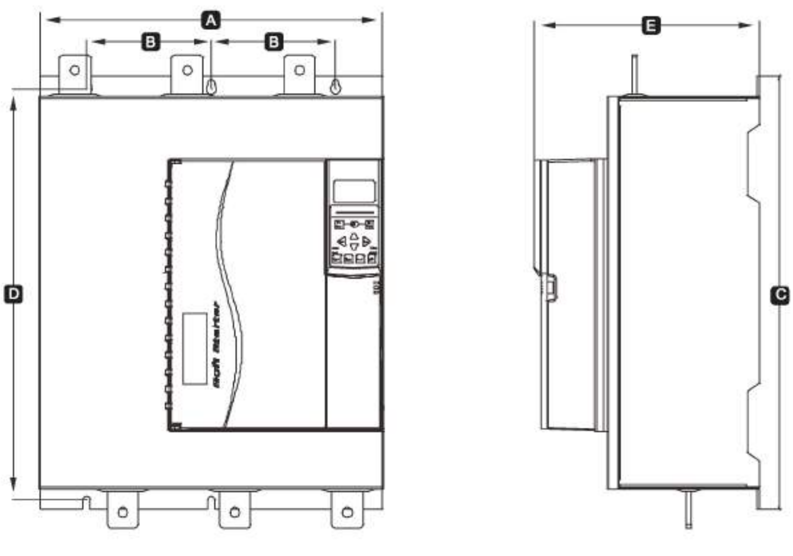
5.5KW~55KW



75KW~110KW



132KW~500KW



Model	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	Weight kg
5.5KW~55KW	152	92	292	269	215	Not applicable	Not applicable	Not applicable	5. 2
75KW~110KW	274	160	408	385	260	Not applicable	Not applicable	Not applicable	17. 5
132KW~500KW	440	320 (160*2)	530	530	290	Not applicable	Not applicable	Not applicable	35. 5

12.2 parameter value

If you need the assistance of the supplier or service technician, please fill in all parameter settings in the table below.

1	Motor data - 1	User settings 1	User settings 2
1A	Rated current of motor		
1B	Locked rotor time		
1C	Locked rotor current		
1D	Service factor of motor		
2	Start / stop MODE-1		
2A	Starting mode		
2B	Starting ramp time		
2C	Initial current		
2D	Current limit		
2E	Adaptive starting curve		
2F	Jump start time		
2G	Jump start amplitude		
2H	Stop mode		
2I	Stopping time		
2J	Adaptive stop curve		
2K	Adaptive control gain		
2L	Braking torque		
2M	Braking time		
3	Auto start / stop		
3A	Auto start mode		
3B	Auto start time		
3C	Automatic stop mode		
3D	Auto stop time		
4	Protection settings		
4A	Starting limit time		
4B	Starting limit Time-2		
4C	Undercurrent		
4D	Under current delay		
4E	Instantaneous overcurrent		
4F	Instantaneous overcurrent delay I		
4G	Phase sequence		
4H	Current imbalance		
4I	Current unbalance delay		
4J	frequency measurement		
4K	Frequency variation		
4L	Frequency delay		
4M	Restart delay		
4N	Motor temperature measurement		
4O	Earth fault current		
4P	Earth fault delay		
4Q	Retain		
4R	Retain		
4S	Retain		
4T	Retain		
5	Automatic reset trip		
5A	Automatic reset function		
5B	Maximum reset times		
5C	A / b reset delay		
5D	C reset delay		

6	Input		
6A	Input a function		
6B	Enter a name		
6C	Input a trip		
6D	Input a trip delay		
6E	Input a initial delay		
6F	Input b function		
6G	Enter b name		
6H	Input b trip		
6I	Input b trip delay		
6J	Input b initial delay		
6K	Input c function		
6L	Input d function		
6M	Remote reset logic		
6N	Analog input trip		
6O	Analog input range		
6P	Simulated trip point		
6Q	Local / remote:		
6R	Remote control communication		
7	Output		
7A	Relay a function		
7B	Relay a opening delay		
7C	Relay a off delay		
7D	Relay b function		
7E	Relay b on delay		
7F	Relay b off delay		
7G	Relay c function		
7H	Relay c on delay		
7I	Relay c off delay		
7J	Relay d function		
7K	Relay e function		
7L	Relay f function		
7M	Low current indication		
7N	High current indication		
7O	Motor temperature indication		
7P	Analog output a		
7Q	Analog a range		
7R	Analog a max		
7S	Analog a min		
7T	Analog output B		
7U	Analog B range		
7V	Analog B Max		
7W	Analog B min		
8	monitor		
8A	language		
8B	F1button function		
8C	F2 button function		
8D	Display current or power		
8E	Top left corner of screen		
8F	Top right corner of screen		

	Bottom left corner of screen		
8H	Bottom right corner of screen		
8I	Graphic data		
8J	Graphic display period		
8K	Graphic display maximum		
8L	Graphic display minimum		
8M	Current calibration		
8N	Main supply voltage		
8O	Voltage calibration		
9	Motor data-2		
9A	Double thermal protection model		
9B	Motor rated current - 2		
9C	Locked rotor time-2		
9D	Locked rotor current-2		
9E	Motor service factor-2		
10	Start / stop mode-2		
10A	Starting mode-2		
10B	Starting ramp-2		
10C	Initial current - 2		
10D	Current limit-2		
10E	Adaptive starting curve-2		
10F	Jump start time-2		
10G	Jump start amplitude-2		
10H	Stop mode-2		
10I	Stop time-2		
10J	Adaptive stop curve-2		
10K	Adaptive control gain 2		
10L	Brake torque-2		
10M	Braking Time-2		
11	RTD temperature		
11A	*RTD/PT100 A°C*		
11B	*RTD/PT100 B°C*		
11C	*RTD/PT100 C°C*		
11D	*RTD/PT100 D°C*		
11E	*RTD/PT100 E°C*		
11F	*RTD/PT100 F°C*		
11G	*RTD/PT100 G°C*		
12	Slip ring motor		
12A	Motor data 1 ramp		
12B	Motor data 2 ramp		
12C	Conversion time		
12D	Slip ring reduction		
15	Senior		
15A	Access code		
15B	Parameter write protection		
15C	Emergency operation		
15D	Short circuit thyristor action		
16	Protective measures		
16A	Motor overload		
16B	Starting limit time		
16C	Undercurrent		

	Instantaneous overcurrent		
16E	Current imbalance		
16F	Frequency		
16G	Input a trip		
16H	Input b trip		
16I	Motor thermistor		
16J	Starter communication		
16K	Network communication failure		
16L	Heatsink ot		
16M	Battery / clock failure		
16N	Grounding fault		
16O	*RTD/PT100 A*		
16P	*RTD/PT100 B*		
16Q	*RTD/PT100 C*		
16R	*RTD/PT100 D*		
16S	*RTD/PT100 E*		
16T	*RTD/PT100 F*		
16U	*RTD/PT100 G*		
16V	Retain		
16W	Retain		
16X	Low control voltage		
20	limit		

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FAMCO
هایپـرصنعت

SANTERNO
CARRARO GROUP

INDUSTRIAL AUTOMATION

USER MANUAL
Manuale d’uso
Manuel d’emploi
Bedienungsanleitung
Manual de uso
Manual do usuário
Руководство по эксплуатации

SOFT STARTER
ASA
Basic User Manual-Manuale d’uso Basic

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ASA series intelligent motor soft starter

Operation instruction manual

Language version: English

■ Please read the instruction manual carefully to understand the content so that it can be properly installed, connected, operated and maintained

■ The technical specifications of this product may be subject to change without notice

■ This manual should be kept until the product is scrapped

■ This manual should be kept in the hands of the actual end user

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روبروی پالایشگاه نفت پارس، پلاک ۱۲

Foreword

Thank you for using SANTERNO product, ASA series intelligent AC motor soft starter.

ASA series of soft starter is the latest development of SANTERNO has an international leading technology of intelligent AC motor soft starter. ASA Series Soft Starter uses the power electronic technology, the microprocessor technology and the modern control theory technology, has the present international advanced level the new starting equipment. This product can effectively limit the starting current of asynchronous motor, which can be widely used in fan, water pump, compressor and other transportation and heavy equipment, is the star delta conversion, autotransformer, magnetron step-down start ideal replacement equipment.

ASA series of soft starter has excellent performance with the international high-end soft starter of the same, but also according to the application characteristics of ITALIAN, further strengthen the product reliability and environmental adaptability, humanization and professional design, can meet various application requirements.

Excellent performance

- **Multi start mode:**

  The maximum output torque can be obtained by the voltage ramp mode. The maximum current can be obtained by the constant current soft starter mode, which can be applied to the load with large static friction force

- **High reliability:**

  The high performance microprocessor is used to process the signal in the control system, so as to avoid the excessive adjustment of the analog circuit in the past, so as to obtain excellent accuracy and execution speed

- **High performance:**

  Programmable delay start mode, programmable interlocks control

  No sequence requirements for input power

  Starting time, parking time can be modified

  Dynamic fault memory function, easy to find the cause of the fault, up to ten faults can be recorded

- **Field bus full dynamic control monitoring starter, easy networking:**

  Bus type is MODBUS.

- **With a variety of protection functions:**

  Protection against over voltage, under voltage, over temperature, phase loss, motor overload, etc.。

- **English character display function:**

  LCD display a variety of operating parameters, programming and fault state with text prompts

- **Perfect humanized design:**

  Beautiful appearance and reasonable structure

  Perfect function and simple operation

  Solid, reliable and compact

  The artistic design of industrial products

- **Reliable quality assurance:**

  Computer simulation design

  STM patch production process

  Excellent electromagnetic compatibility

  High temperature aging, vibration test before the factory

- **Quick and thoughtful after-sales service:**

  Reliable performance and quality lay the foundation for quality service

Provide excellent and complete equipment design

Timely and thoughtful use of consulting

Continuously improve product performance according to user opinion

Typical application

- Water pump - use soft parking function to stop the pump when the water hammer phenomenon, saving the cost of system maintenance
- Ball mill - use of voltage ramp start to reduce the wear of the gear torque, reduce maintenance workload, saving time and saving expenses。
- Fan - reduce belt wear and mechanical impact, saving maintenance costs
- Compressor - use of current limiting, to achieve a smooth start, reduce motor heating, prolong service life
- Crusher - use of blocking protection and rapid protection to avoid mechanical failure or blockage caused by overheating of the motor burned
- Transport machinery - through soft starter to achieve smooth and gradual start process, to avoid product displacement and liquid spills

Use and environmental conditions

- Main circuit power supply: three-phase AC 380V or 660V (- 10%, + 15%),
  50Hz±0.5％, 60Hz±0.6％
  Note: the above data is only applicable to this specification
- Control loop power supply: AC380V, 50/60Hz
- Applicable motor: General squirrel cage asynchronous motor
- Starting frequency: Suggest start and stop not more than 20 times per hour
- Cooling: natural cooling
- Installation: wall mounted
- Protection level: IP00 ~ IP20, depending on the power rating, below 55kW is IP20, 55kW and above is IP00
- Environmental conditions: more than 2000 meters above sea level, should reduce the use of capacity, 5% capacity reduced per every 1000 meters higher.
- The ambient temperature between - 25 ~ 40 ℃.
- Relative humidity is not more than 95% (20c ~ 65C),
- No gel, flammable, explosive, corrosive gas, no conductive dust.
- Indoor installation, good ventilation, vibration less than 0.5g.

Safety precautions

⚠ Please read the Descriptions before installing

⚠ The soft starter must be installed by professional and technical personnel

⚠ The specification of the motor must be matched with the soft starter

⚠ It’s strictly prohibited to connect the capacitor at the soft starter output (U, V, W)

⚠ After e installation of the exposed terminal must be wrapped with insulating tape

⚠ Soft starter or other related equipment shall be grounded reliably

⚠ The input power must be cut off when the equipment is repaired

⚠ Unauthorized disassembly, modification is forbidden of this product.

CONTENTS

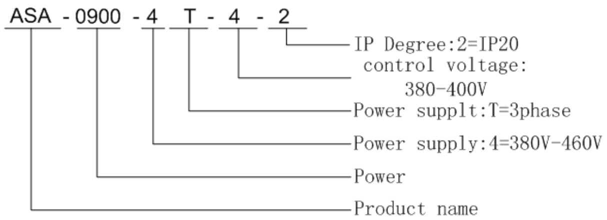
Chapter 1 Introduction of ASA series soft starter

1.1 Description of product model

When open the box, please confirm: whether there is damage or scratch damage phenomenon in transportation, the nameplate rating is consistent with your order, if there is please contact the supplier or direct contact with me bad.

The soft starting type column plate numbers and letters product series, power level, power level and other information.

Soft starter model description:

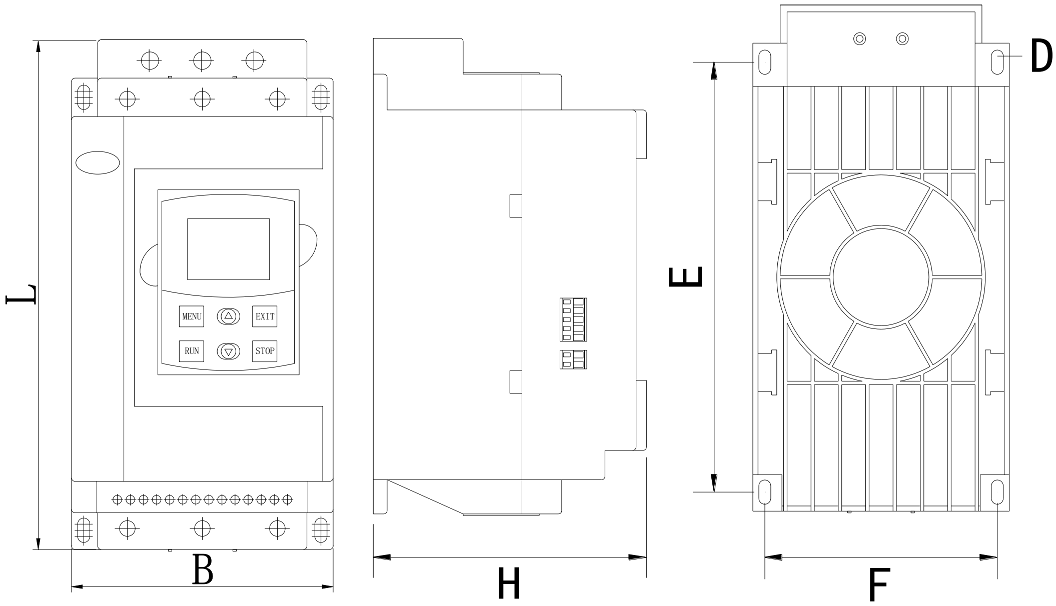


1.2 Nameplate specification

Please check the nameplate on the product to make sure that the goods you received are in conformity with the goods you ordered

1.3 Product appearance and installation

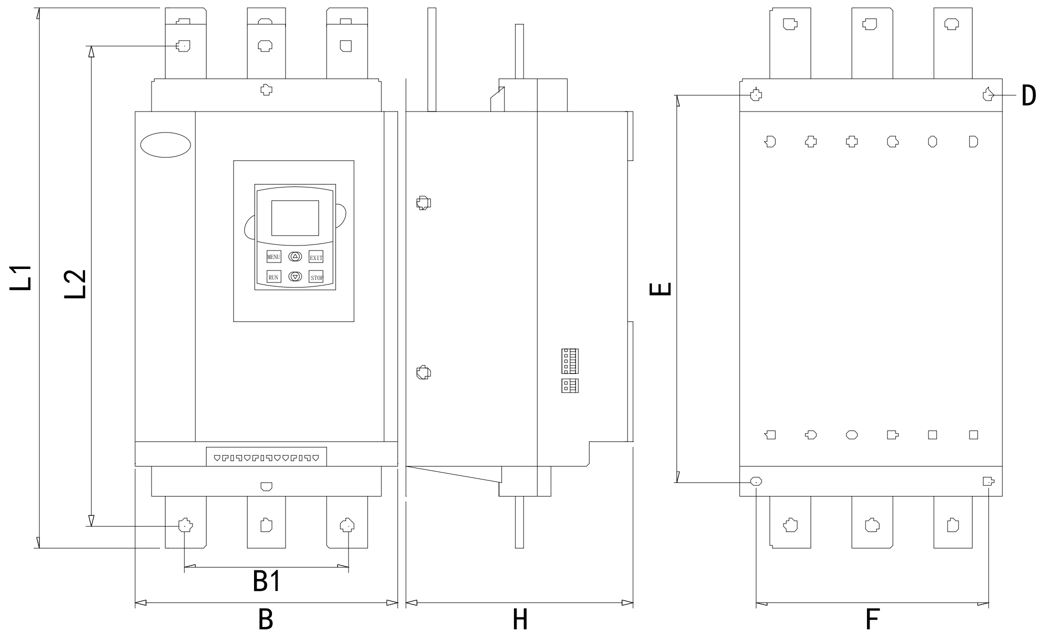
1、ASA series 5KW－55KW Product size



Specifications and models	Power rating（kw）	Rated current（A）	External dimensions（mm）			Installation size（mm）			Net weight（kg）
			L	B	H	E	F	D	
ASA-0055-4T	5.5	11	292	152	159	248	131	M7	4
ASA-0075-4T	7.5	15	292	152	159	248	131	M7	4
ASA-0110-4T	11	23	292	152	159	248	131	M7	4
ASA-0150-4T	15	30	292	152	159	248	131	M7	4
ASA-0185-4T	18.5	37	292	152	159	248	131	M7	4
ASA-0220-4T	22	43	292	152	159	248	131	M7	4
ASA-0300-4T	30	60	292	152	159	248	131	M7	4
ASA-0370-4T	37	75	292	152	159	248	131	M7	4
ASA-0450-4T	45	90	292	152	159	248	131	M7	4
ASA-0550-4T	55	110	292	152	159	248	131	M7	4

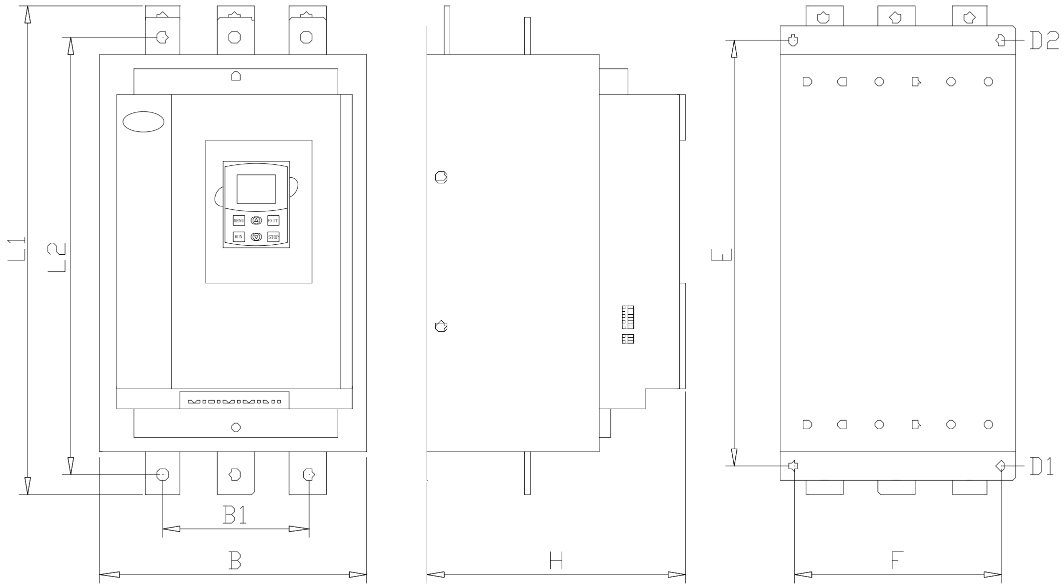
Note: Rated current refers to line connection.

2、ASA series 75KW and above product size



Specifications and models	Power rating (kw)	Rated current (A)	External dimensions (mm)			Installation size (mm)			Net weight (kg)	Copper hole distance	
			L1	B	H	E	F	D		B1	L2
ASA-0750-4T	75	150	530	260	203	380	196	M8	20	163	439
ASA-0900-4T	90	180	530	260	203	380	196	M8	20	163	439
ASA-1150-4T	115	230	530	260	203	380	196	M8	20	163	439
ASA-1320-4T	132	264	530	260	203	380	196	M8	20	163	439
ASA-1600-4T	160	320	530	260	203	380	196	M8	20	163	439
ASA-1850-4T	185	370	530	260	203	380	196	M8	20	163	439
ASA-2000-4T	200	400	530	260	203	380	196	M8	20	163	439

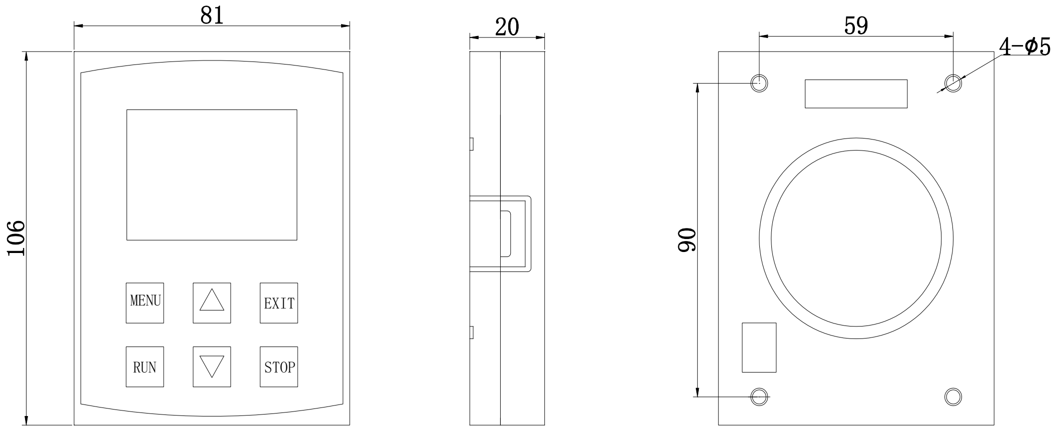
Note: Rated current refers to line connection.



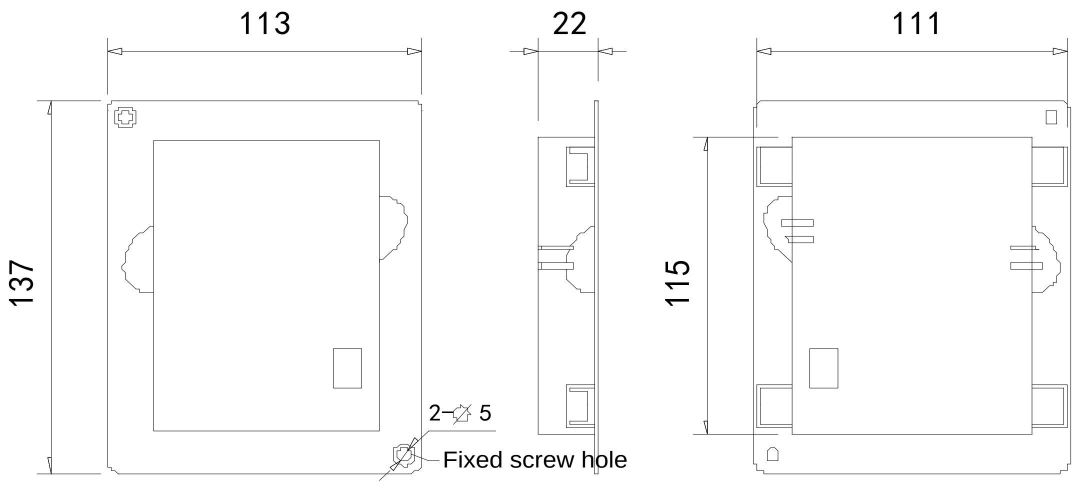
Specifications and models	Power rating（kw）	Rated current（A）	External dimensions（mm）			Installation size（mm）				Net weight（kg）	Copper hole distance	
			L1	B	H	E	F	D1	D2		B1	L2
ASA-2500-4T	250	500	570	290	251	465	260	M9	M13	25	180	510
ASA-2800-4T	280	560	570	290	251	465	260	M9	M13	25	180	510
ASA-3200-4T	320	640	570	290	251	465	260	M9	M13	25	180	510
ASA-3550-4T	355	710	570	290	251	465	260	M9	M13	25	180	510
ASA-4000-4T	400	800	660	410	251	550	370	M9	M13	30		
ASA-4500-4T	450	900	660	410	251	550	370	M9	M13	30		
ASA-5000-4T	500	1000	660	410	251	550	370	M9	M13	30		
ASA-6000-4T	600	1200	660	410	251	550	370	M9	M13	30		

Note: Rated current refers to line connection.

1.4 Operating panel shape and mounting dimensions



1.5 Pallet dimensions and mounting dimensions



Chapter 2 Installation

2.1 Installation direction

In order to ensure that the soft starter has good ventilation and heat dissipation conditions, the soft starter should be installed vertically

2.2 Installation notes

- Handling, installation, please holds at the bottom of the product, not only hold the shell, to prevent the injured foot or broken soft starter.
- Soft starter to be installed in metal and other flame retardant, away from flammable objects, away from the heat source
- Do not leave the drilling residue in the soft starter when installing the work, otherwise it may cause the soft start failure
- The soft starter is installed in the cabinet, the cabinet should be equipped with fan, air vents, and cabinet construction is conducive to heat the internal air duct.

2.3 Installation space

In order to ensure a good heat sink, there should be enough space for the installation of the soft starter, see Figure 2.1

2.4 Circuit installation

The main circuit adopts the way of going up and down, the wire should ensure sufficient current capacity, and the selection of wire and peripheral accessories refer to schedule two

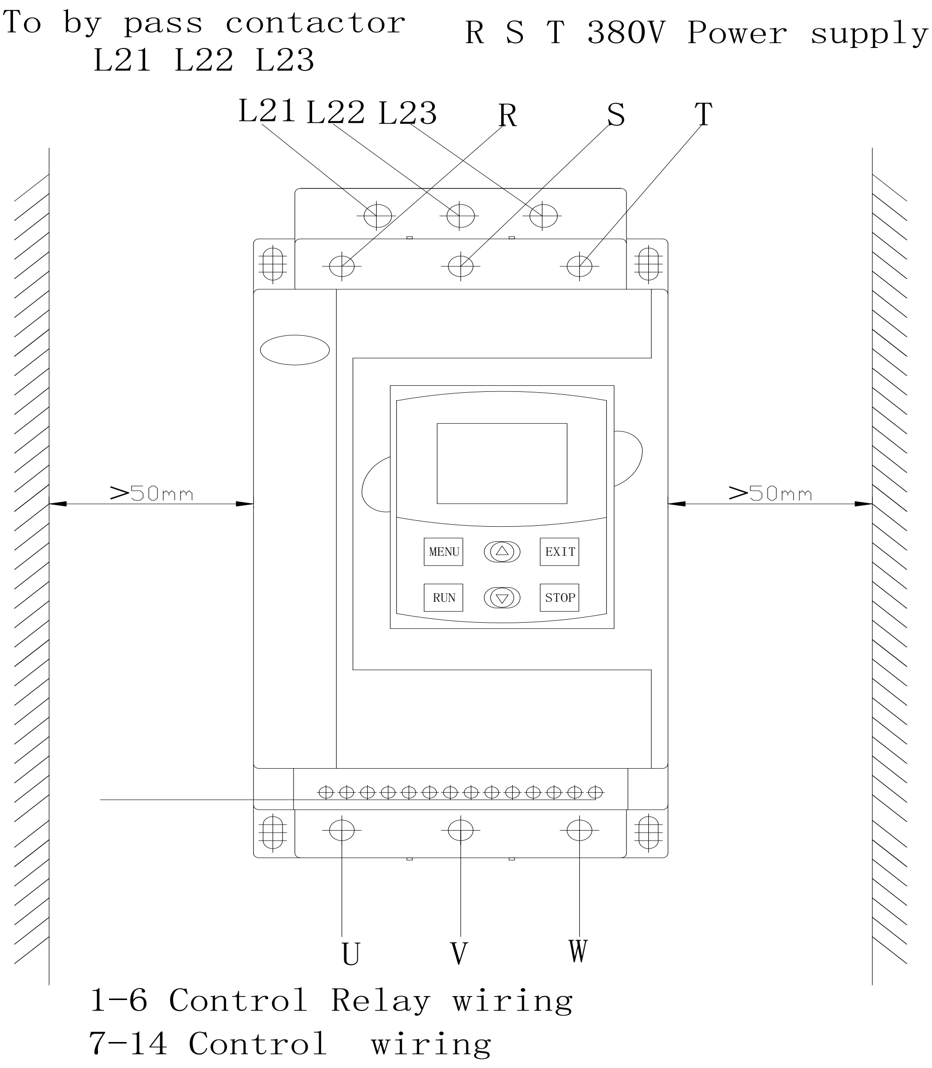


Fig 2.1

Note: As shown above fig 2.1, 1-6 and 7-14 are terminals, terminals 1-6 are for control relay wire, terminals7-14 are for control wire

Chapter 3 Circuit connection

3.1 Working principle of ASA soft starter

The main circuit of ASA motor soft starter with six anti parallel thyristor series stator circuit connected to the AC motor. The use of electronic switching thyristor, the microprocessor controls the trigger angle change to change the conduction angle of the thyristor, thus changing the input voltage of the motor, in order to control the purpose of motor soft starting. When completed, the soft starter output reaches the rated voltage. When the control bypass contactor km three-phase pull motor into service. (see Figure 3.1).

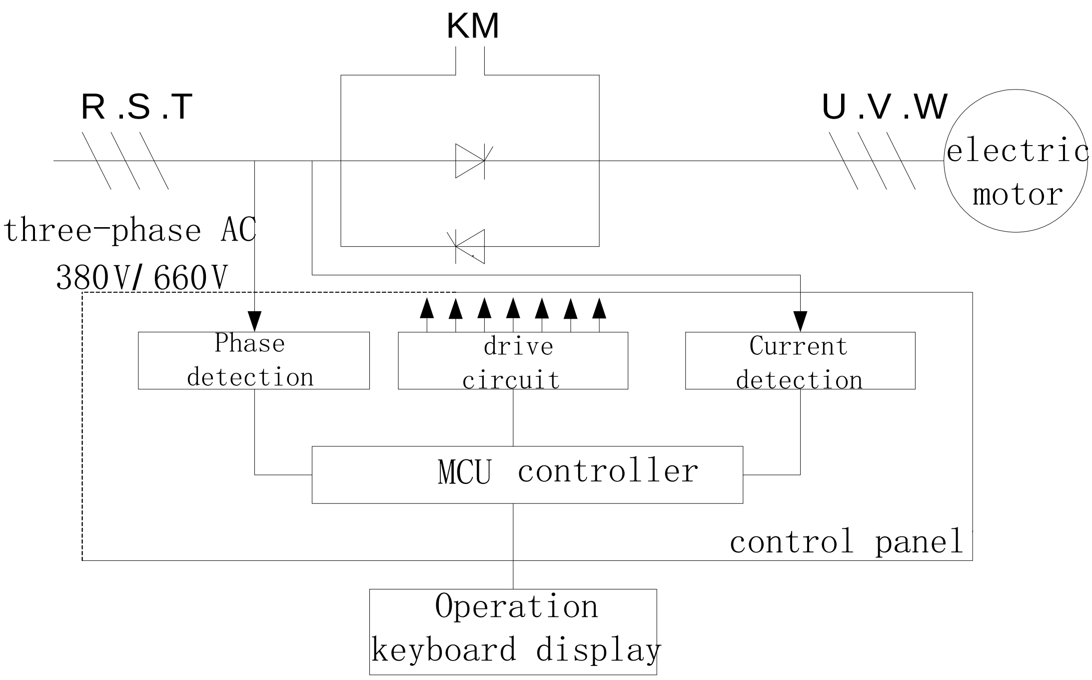


Figure 3.1

3.2 Wiring

Figure 3.2 is the ASA series motor soft starter for the user to use all of the external terminals, detailed functions are shown in table 3.2.4 "external control terminal Descriptions."

3.2.1 Terminal wiring

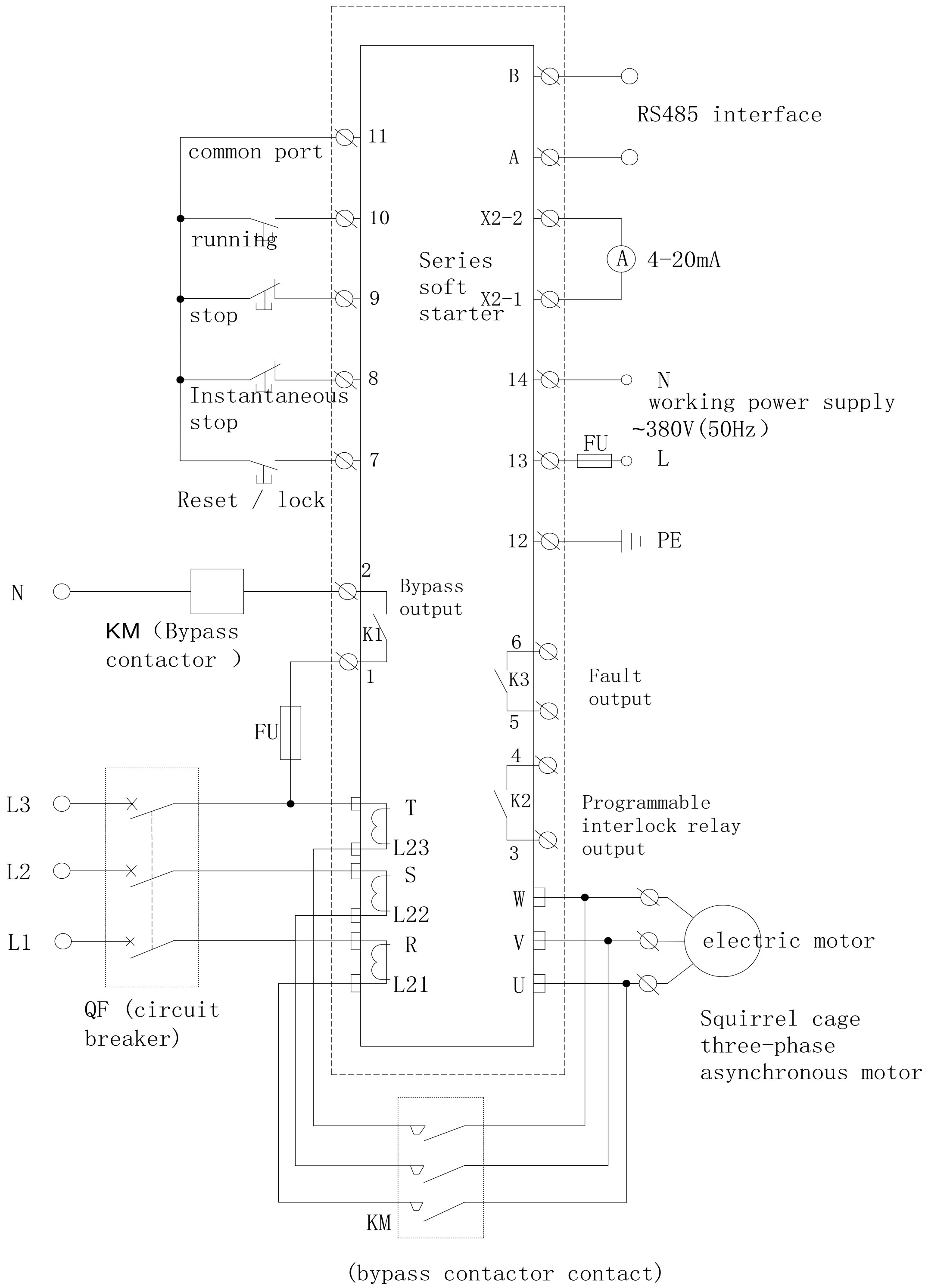


Figure 3.2

3.2.2 Connection between product and peripheral devices

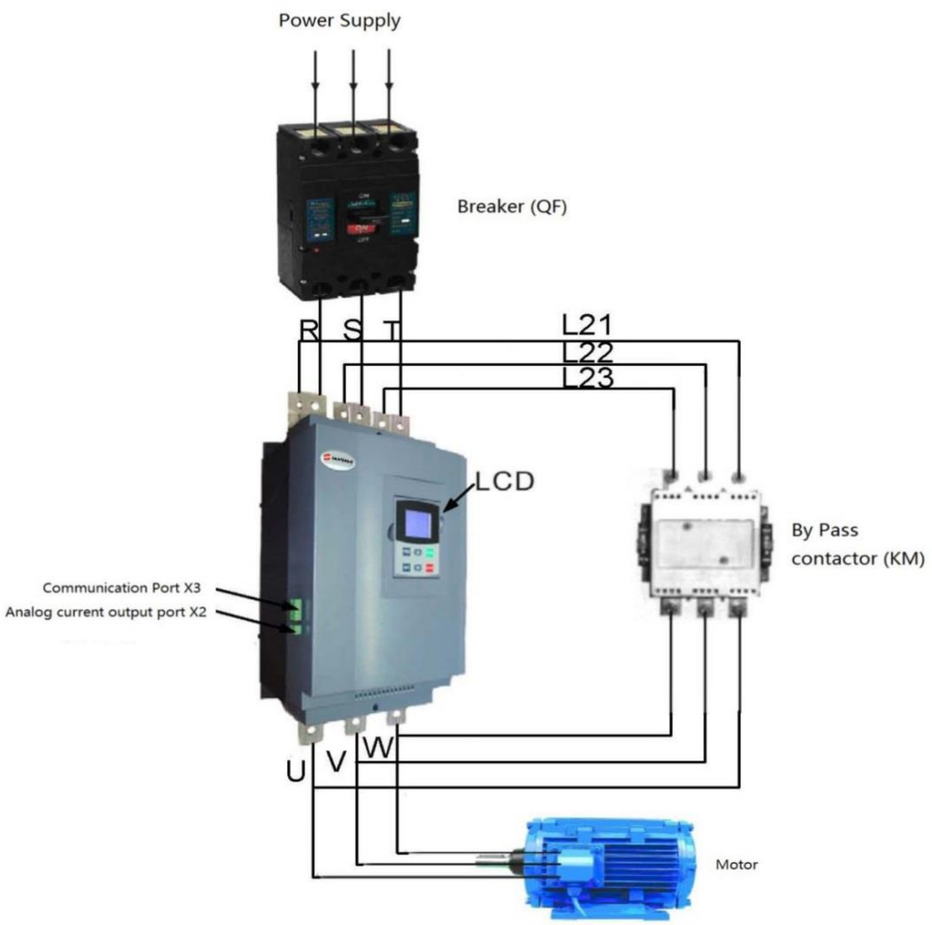


Figure 3.3

3.2.3 External control terminal instruction

Table 3－1

Terminal symbol			Terminal name	Description
main circuit		R.S.T	AC main circuit power input	Three phase AC power supply connected by circuit breaker
		U.V.W	Soft starter output terminal	Three phase asynchronous motor
		L21.L22.L23	Special terminal for external bypass contactor	Refer to figure 3.3 for wiring
control source		X1-13	control AC power input terminal	AC380V
		X1-14	control AC power input terminal	
control circuit	relay output	X1-12	Ground input terminal	ground connection
		X1-1	Bypass contactor input terminal	After the start of the closing capacity of AC220V 5A This output is not adjustable.
		X1-2	Bypass contactor input terminal	
		X1-3	Programmable relay output terminal	See 4.3.11 capacity AC220V 5A by programming control
		X1-4	Programmable relay output terminal	
		X1-5	Fault relay output terminal	Capacity AC220V 5A This output is not adjustable.
		X1-6	Fault relay output terminal	
	digital input	X1-7	External reset terminal	Fault reset
		X1-8	External control E-Stop terminal	Stop when the stop and the common end are disconnected, see 4.3.1. It's effective also when start the soft starter from keypad
		X1-9	External control stop terminal	disconnect Stop and the public then Stop effectively
		X1-10	External control starting terminal	The start and the common end short connection
		X1-11	External digital signal common terminal	
	Analog current output	X2-1	Current signal output terminal Positive	4-20mA can program selected, see 4.3.9
		X2-2	Current signal output terminal negative	

Modbus terminal specification: Table 3.1 continued

Terminal symbol		Terminal name	Description
Modbus terminal	X3-1	GND	Power supply terminal
	X3-2	A	Signal non inverting input
	X3-3	NC	Idle terminal
	X3-4	B	Signal inverting input
	X3-5	5V	Positive power terminal

Note: The matching resistance is less than 200 ohms

3.2.4 Connection and use of control terminals

（1） Wiring preparation

If the user uses the external terminal, it is recommended to use the shielded wire from the terminal row, the shield wire should be connected to the earth.

In order to avoid the interference of electromagnetic interference, the control lead should avoid the motor cable and other inductive electrical wiring

（2） The connection of the outer terminal x1

The 14 terminal is located at the bottom of the starter, with a dangerous voltage when it is used, and the power must be disconnected before disconnecting

- Bypass relay terminal 1,2

When the start-up process is completed, the built-in contacts will be closed, so that the bypass contactor km closed; and when the stop command is issued, the built-in contacts will open (see Figure 3.4)

It is suggested that the two ends of the coil of the contactor are connected with a series circuit of resistance capacitance, which is beneficial to absorb the peak voltage generated when the contactor coil is broken, and reduce the interference to the control circuit of the starter

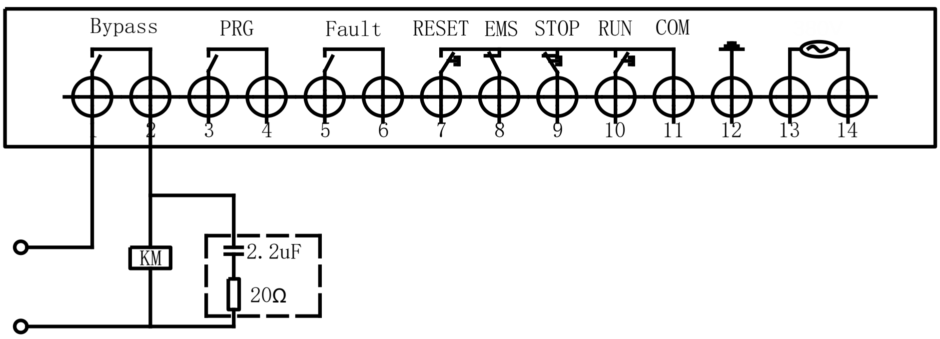


Fig. 3.4 Bypass relay terminal

- Programmable relay output terminal 3,4

  This contactor is mainly used to connect with other control equipment, can be programmed to select the output, see 4.3.11. contactor capacity AC 250V 5A

- Fault output terminal 5,6

  This contactor represents the starter or motor failure, normally open, contact capacity AC 250V 5A

- Reset input terminal 7,11

When the external reset terminal 7 is connected with the public terminal 11, the fault state can be contacted

- Instantaneous stop input terminal 8,11

Belong to the external fault signal input, can be used for external thermal relay and other switch quantity protection, only 8 and 11 when connected to the starter can be run, otherwise the instantaneous stop failure

- Control terminal 9 (stop), 10 (start), 11 (com)

These three terminals are used for external start and stop buttons, which must be programmed when used (see 4.3.1)

Following figure 3.5 shows a three wire connection, often used for external buttons

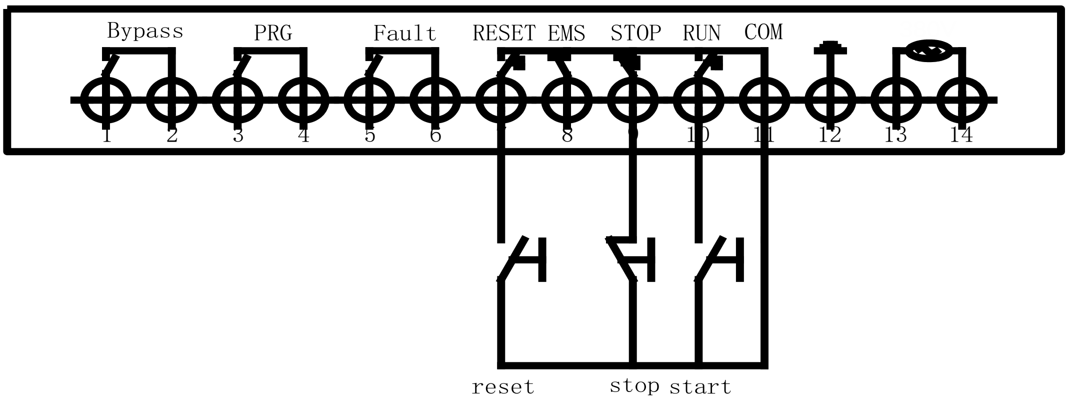


Figure 3.5 three wire connection

But the following scenarios should be two wire connections: (see Figure 3.6)

（1） when a user needs a switch to control the stop of the starter, such as a control point of pc/plc J

（2）when the automatic restart function of the soft starter is used, when the j is closed to start to fail, after a certain period of time, the automatic reset of the starter can be carried out simultaneously (see 4.3.16)

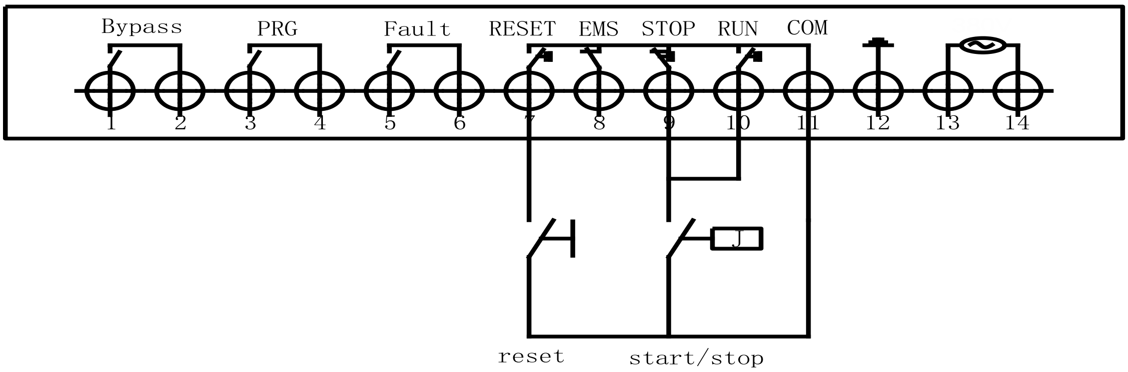


Figure 3.6 two wire connection

- Ground terminal 12

When the ground is installed, the device can be connected to the mounting plate nearby, and the device above 75kW adopts the shell and the 12 terminal to be grounded at the same time

- Working power supply terminal 13,14

External 380V power grid voltage, if the 660V soft starter is the main circuit through the isolation transformer step-down to obtain. (See Figure 3.7)

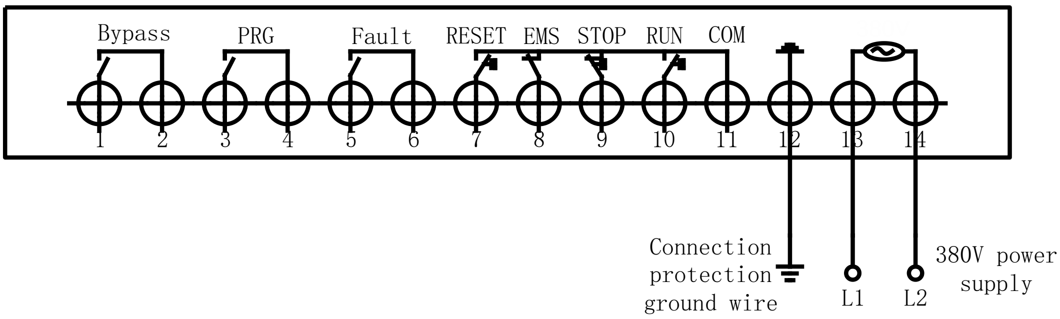


Fig. 3.7 working power supply terminal

- Analog current signal terminal X2

On the left side of the starter, there is a two pin terminal, which is used to reflect the current signal of the main loop current, which is 4 - 20mA, and the output mode can be programmed (see 4.3.9)

Figure 3.8 shows the use of reference

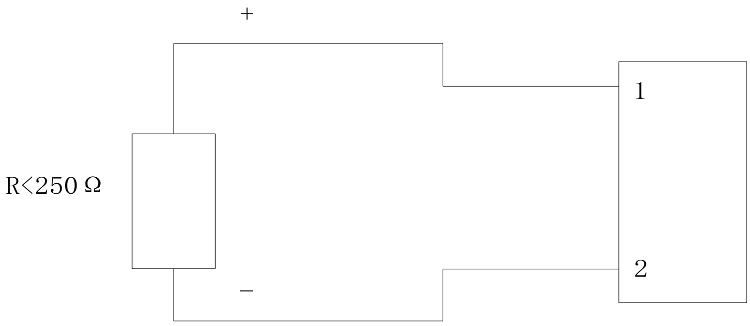


Figure 3.8

- Bus terminal x3

  Select a dedicated field bus cable

Chapter 4 Programming instructions

4.1 Display and keyboard Description

ASA Series of soft starter with LCD display, easy to set up the user, read the parameters, as well as the status of real-time display soft starter

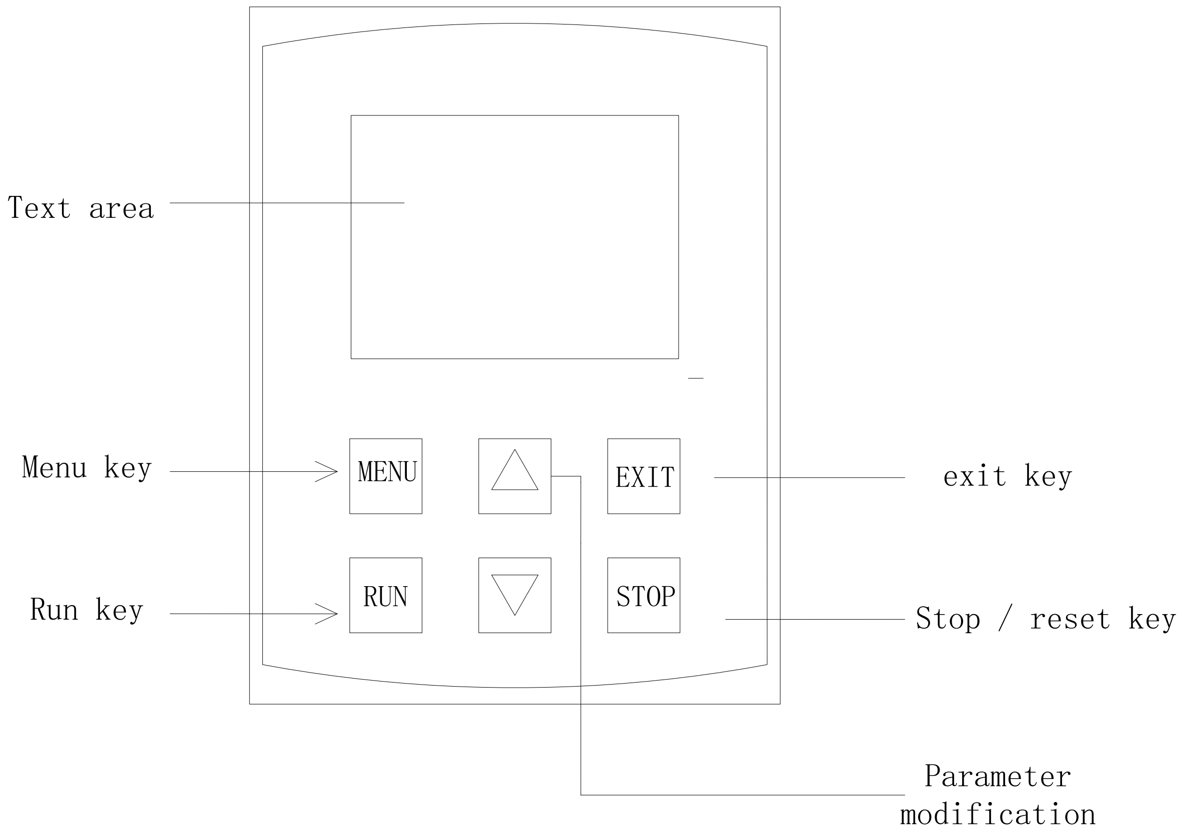


Figure 4.1

Figure 4.1 shows the location of each key, as follows:

Key name	Key function description
RUN –Run key	Use this key to enable the motor to run in the ready state
STOP - Stop / reset key	When the motor is running, press this key to enter the parking。When the fault condition, press this key to return to the ready state
MENU - Menu key	Used to go to the next menu or store parameter settings
EXIT - return key	Used to return to the previous menu
▲ - Up key	Used to add data
▼ - Down key	Used to reduce data

4.2 Function code table and description

Table 4.1

Function code	Function name	Setting range	Default value	Description
00	Control mode	0—5	0	0: keyboard 1: Terminal 2: Modbus 3: Keyboard + terminal 4: Keyboard + bus 5: Terminal + bus
01	Starting mode	0—1	1	0: Current limit 1: Voltage
02	Current limit	150%—500%	210%	Valid in Current limit mode
03	Initial voltage	25%—80%	30%	Valid in Voltage mode
04	Rise time	1—120S	10S	Valid in Voltage mode and Invalid in current limit mode
05	Down time	0—60S	0S	0 means free stop
06	Starting delay	0—240S	0	0 means “starting delay” off
07	Jump starting	0—1	0	0: Disable 1: Enable (Valid in voltage mode)
08	Jump voltage	50—80%	50%	When Pa07 = 1, this parameter is valid
09	Jump time	0.1—1.0S	0.3S	When Pa07 = 1, this parameter is valid
0A	Instantaneous stop setting	0—1	0	0: Disable 1: Enable
0B	Current signal selection	0—3	2	0: 0-20mA 500% 1: 0-20mA 150% 2: 4-20mA 500% 3: 4-20mA 150%
0C	Current display	0—1	0	0: current value 1: percentage
0D	Programming delay	0—240S	0	0 is immediate output, for programmable relay output

0E	Programming output	0—9	7	0 From starting command moment 1 From starting moment 2 bypass running status 3 From stop command moment 4 delay status 5 fault status 6 starting and running 7 ready status 8 starting status 9 running status
0F	Phase loss protection	0—1	0	0: Enable 1: Disable
10	Light load protection	0—1	1	0: Disable 1: Enable
11	Light load rate	50-100%	50%	Start protection after full voltage running, valid when Pa10 = 1
12	Over voltage protection	100-130%	120%	Protection when actual voltage is higher than the setting value
13	Under voltage protection	40—90%	80%	Protection when actual voltage is lower than setting value
14	Trip level	0—4	2	Primary, light load, standard, heavy load, advanced
15	Self-starting	0—1	0	0: Disable 1: Enable (Valid on Two wire type mode)
16	Bus address	1—247	1	
17	Baud rate	0—4	3	0: 1200；1: 2400；2: 4800； 3: 9600；4: 19200
18	Parity check	0—2	0	0: None 1: odd 2: even
19	Load regulation rate	50-100%	100%	
1A	write protection	0-1	0	0: Disable 1: Enable
1B	Language selection	0-1	1	0: reserved 1: English
1C	Current coefficient	60%-160%	100%	100% is rated current of soft starter, if rated current of motor is different. You can change this value to make them same

1D	Parameter Restore Default settings	0-1	0	0: Disable 1: Enable
1E	Bypass function	0-1	0	0: Enable 1: Disable

Note: 1.This function code is keep after power off until next modification.

2. Function code can be modified by the 4.4.2 method to the Default value

3. Function code may vary with the version upgrade, please note that the latest version of the note

4.3 Function code description

4.3.1 Code 00 (control mode)

0: Keyboard, only Control by RUN and STOP key to start or stop on the panel

1: Terminal, only by the terminal RUN/STOP/COM two wire or three wire starting mode

2: Modbus, (X3 terminal) control monitoring operation

3: Keyboard + terminal (Suitable for 3 wire control mode)

Both the terminal and keyboard can operate, but when the keyboard starting, STOP terminal Must be connected to COM

4: Keyboard + bus, both the keyboard and bus can control

5: Terminal + bus, Both X1 terminal RUN, STOP and BUS terminal X3 can control

4.3.2 Code 01 (start mode)

0 is current limit mode, starting current limit see 4.3.3

1 is voltage mode, see 4.3.4

4.3.3 Code 02 (current limit)

When using this function, the code 01 must be set to 0, the starting current starter operation below the set value (150%-500%). When starting after the current drops below the rated value, the greater the set value, the starting time will be shorter.

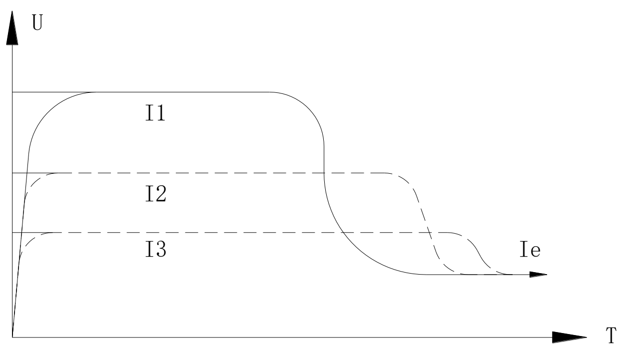


Figure 4.2

4.3.4 Code 03 (initial voltage) 04 (rise time)

They are the starting control parameters in the voltage mode, and increasing the starting voltage is beneficial to overcome the static friction force of the load starting, and the longer the load inertia is, the longer the rise time (see Figure 4.3)

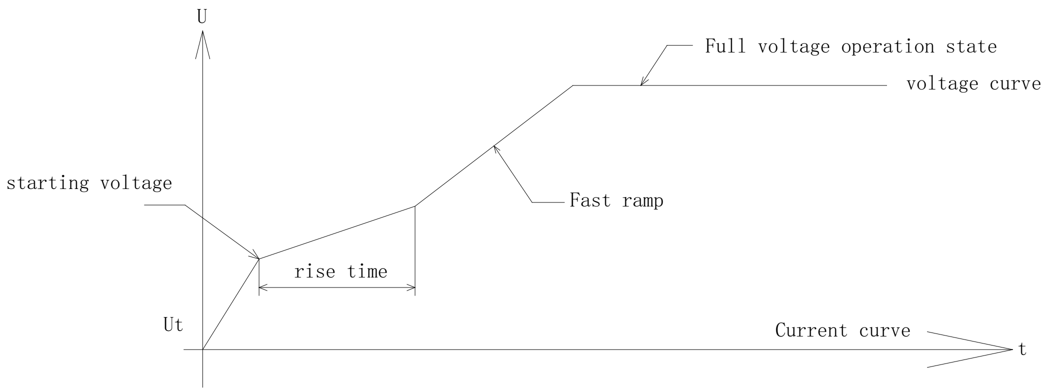


Figure 4.3

4.3.5 Code 05 (Down time)

When the down time is set to 0, it means free stop, and the long downtime will bring instability to the system (see Figure 4.4)

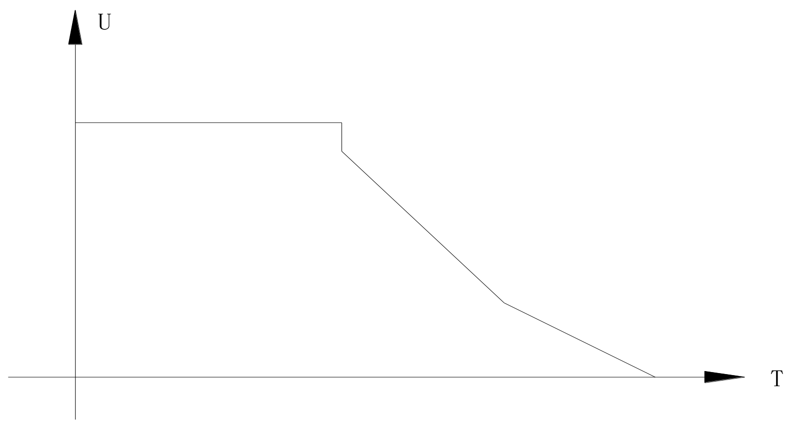


Figure 4.4

4.3.6 Code 06 (Starting delay)

The time between the starting command being sent and the starter starts, The soft starter starts when the countdown shows 0

4.3.7 Code 07 (Jump starting) code 08 (Jump voltage) code of the 09 (Jump

time)

When Code 07 is set to 1, Jump starting is effective. In some heavy occasions, due to the influence of mechanical static friction and not starting motor, can choose this mode. In this mode, you should shut down the Jump startinging, If the motor caused by the static friction force is too large to rotate, and then choose this mode .Otherwise we should avoid using Jump startinging, in order to reduce the large current impact is not necessary.

4.3.8 Code 0A (instantaneous stop setting)

You can open or close the external control instantaneous stop input EMS, set when 0 is closedthis function, 1 is activate this function

4.3.9 Code 0B (current signal selection)

Terminal X2 can be measured the current signal along with the change of load, the user can according to the situation, there are four options, such as table 4.2

table 4.2

set value	0	1	2	3
Output current mA	0~20	0~20	4~20	4~20
calibration value （1）	500%	150%	500%	150%
computational formula ％（2）	D=25Ix	D=7.5Ix	$D = \frac{500}{16}(Ix - 4)$	$D = \frac{150}{16}(Ix - 4)$

（1）the percentage of maximum load current output current corresponding to the number of 20 mA

（2）Ix measured current actual value (mA), D motor load current (%)

Formula interpretation:

1、D=25Ix: When the motor current is 0%, Ix=0; When the motor current is 100%, Ix=4mA, When the motor current is 500%, Ix=20mA;

2、D=7.5Ix: When the motor current is 0%, Ix=0; When the motor current is 30%, Ix=4mA, When the motor current is 150%, Ix=20mA;

3、$D = \frac{500}{16}(Ix - 4)$:When the motor current is 0%, Ix=4mA; When the motor current is 500%, Ix=20mA;

4、$D = \frac{150}{16}(Ix - 4)$: When the motor current is 0%, Ix=4mA; When the motor current is 150%, Ix=20mA;

4.3.10 Code 0C (current display)

0: The actual current value is displayed in the form of current value after starting

1: After the start of the display of the current display by a percentage, that is, 100% of the current on behalf of the motor rated current rating

4.3.11 Code 0D (Programming delay) Code 0E (Programming output)

The programmed output of the starter (terminal 5,6) is controlled by the two programming codes, see table 4.3

0E setting value	0	1	2	3	4
Program timing output time	From Starting command moment	From Starting moment	Bypass running status	From Stop command moment	Delay status
0E setting value	5	6	7	8	9
Program output indication status	fault status	Start +running status	Ready status	Starting status	running status

Table 4.3

0: From Starting command moment: the programable relay output from the moment of starting command, and stop output after soft starter stops

1: From Starting moment: the programable relay output from the moment of soft starter starts, and stop output after soft starter stops

2: Bypass running status: the programable relay output when bypass contactor running, and stop output after bypass contactor stops

3: From Stop command moment: the programable relay output when stop command given to the starter, and and stop output after soft starter stops fully

4: Delay status: the programable relay output from starting delay (Pa06) starts, and and stop output after the delay time finish

5: Fault status: the programable relay output when the starter has fault, and and stop output after the soft starter reset

6: Starting and running: the programable relay output in starting and running stage

7: Ready status: the programable relay output when the starter is ready without alarm before starting

8: starting status: the programable relay output in starting stage

9: running status: the programable relay output in running stage

If you set the item 0D is not 0, from the top of the table at the time as the starting point according to the 0D set time to start the delay. Delay termination, the delay output contact closure, otherwise if 0D is 0 closed immediately

The output of the reset (the contact is broken) at the time of the 0D is set up by the end of time delay and ready for the state, flexible use of programmable relay output function, can effectively simplify the peripheral control logic circuit

0E=49 programmable output function, set at this time 0D delay is invalid.

4.3.12Code 0F (phase loss protection)

0: phase loss function enable, the lack of any phase of the motor will stop running, and display the fault status

1: phase loss function disable, will not stop even lacking phase

4.3.13 Code 10 (light load protection) and code 11 (light load rate)

Light load protection can be used to check the belt tripping accident, Pa10 set start light load (0 is off), 1: beyond the set value to stop running starter and send out alarm signals through fault relay, light load rate control with light load size, the definition of light load rate of kv:

Kv=Iv/Ie*100%   Ie: Rated current value, Iv: Average value of three-phase current

4.3.14 Code 12 (overvoltage protection)

Used to set the protection voltage value, if the input voltage is higher than the set value, protection occurs

4.3.15 Code 13 (under voltage protection)

Used to set the protection voltage value, if the input voltage is lower than the set value, protection occurs

4.3.16 Code 14 (Trip level)

In order to adapt to different applications, ASA series soft starter has five levels, respectively, 0: primary, 1: light load, 2: standard, 3: heavy load, 4: senior, set by the function code 13: as follows

Primary protection prohibits the external instant stop function, while retaining only the overheating, short circuit and the input lacking phase of protection, suitable for the occasion of the need for emergency, such as fire pumps

The light load, the standard, the heavy load protection levels have the complete protection function, the difference is that the motor overload thermal protection time curve is different .See table 4.4 and figure 4.5. for the thermal protection time of the motor

Advanced protection at the start of the protection of the standard is more stringent, other protection parameters and standard protection settings

According to the function code 14 set different protection levels and thermal protection time is as follows:

Table 4.4

14set	0（primary）	1（light load）			2（standard）			3（heavy load）			4（senior）			Description
Overload protection level	No	2level			10level			20level			10level			According to the Iec6094742 standard
Run overload trip time list	Current multiple（I/Ie）	3	4	5	3	4	5	3	4	5	3	4	5	The values in the table are typical values
	tripping time（s）	4.5	2.3	1.5	23	12	7.5	46	23	15	23	12	7.5	

Function code 14 set load adjustment rate is lower, the protection tripping sensitivity error will increase. According to the motor thermal protection tripping time curve IEC60947-4-2 standards are as follows:

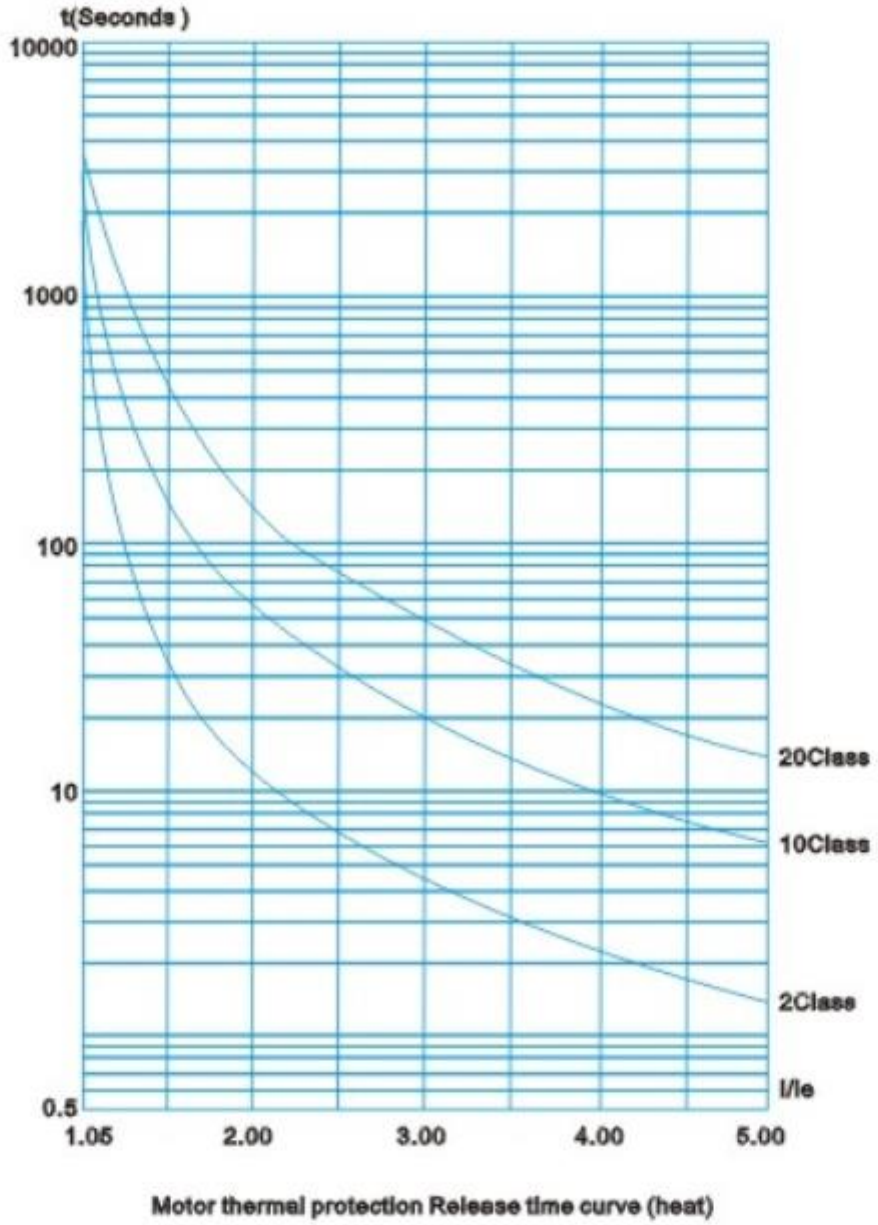


Fig. 4.5 curve of thermal protection tripping time (thermal state)

4.3.17 Code 15 (Self-starting)

After the start of the failure of the starter, it can be put into operation automatically by setting the code 15 to 1 for the delay of about 6 seconds. If it is set to 0, it can only be restart after the reset, and this function is only used in the two wire mode.

4.3.18 Code 16 (bus address)

Used to set the slave station address of the field bus, on the same station for each slave station address is unique, set the principle of 7.2 field bus communication section

4.3.19 Code 17 (baud rate)

Select the communication rate for Modbus communication. Selectable ranges from 1200 to 19200, see also 7.1

4.3.20 Code 18（parity check)

When used for Modbus communication selection check, should be set according to the requirements of the Master.

4.3.21 code 19 (load regulation rate)

In order to make the protection function and display parameters correct, the load regulation rate should be reset when the user selects the soft starter rated parameters which do not match the actual motor

Load regulation rate KT = ps/pr% PS actual motor power, PR soft starter power

For example: the user of the motor is 55kW, select the soft start power of 75kW, the code 19 set to 73%.

4.3.22 Code 1A (write protection)

When the function code 1A is set to 1, the parameter modification is locked, the user can not modify the parameter value, the value must be changed to 0, the user can modify the parameters

4.3.23 Code 1B (language selection)

0: reserved
1: English

.4.3.24 Code 1C (Current coefficient)

60%~160%

100% is rated current of soft starter, if motor rated current is different. You can set this value to make them same

.4.3.25 Code 1D (Restore factory settings)

0: Disable
1: Restore factory settings

.4.3.26 Code 1E (Bypass function)

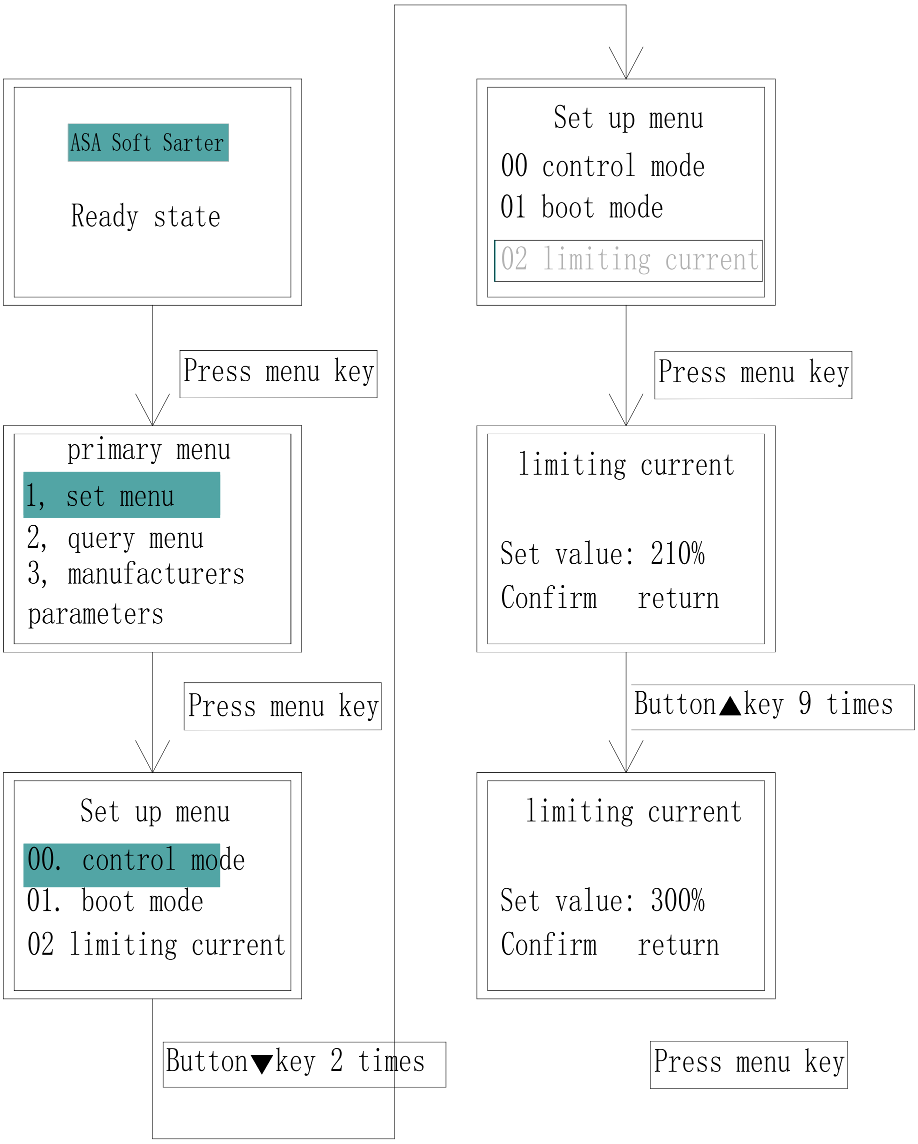
0: Soft starter works in Bypass mode. After the motor starts, it switches to the grid power.

1. Soft starter works without bypass. After the motor starts, the soft starter provides power to the motor.

4.4 How to program

4.4.1 Programming settings

Setting the parameters of the soft starter correctly is the premise of the full implementation of its performance, and the following is to modify the current limit value as an example to introduce the parameter setting method of the ASA series soft starter panel



Note: once the data is written, it will remain in place until the next modification, not affected by power failure.

Chapter 5 Electric operation

5.1 Test run

The main purpose of the test is to allow the user to confirm whether the direction of rotation of the motor and the turning is normal

（1）To control the power supply, the panel should be displayed the company's LOGO for 2 seconds.

（2）The text area shows the ready state

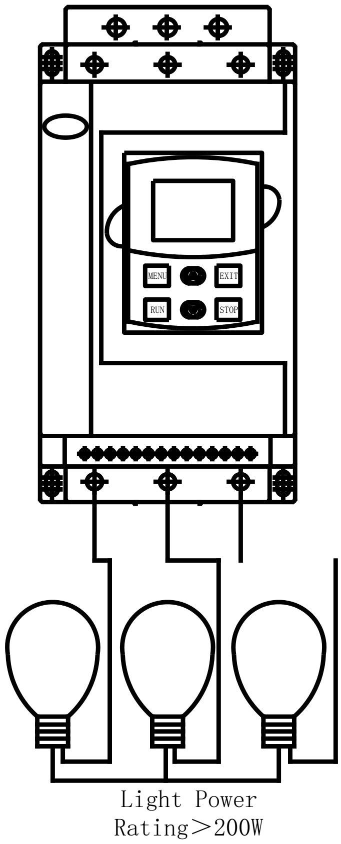
（3）According to the situation of the motor load in the field, the parameters of the soft starter can be adjusted reasonably, so that the motor can reach the optimal starting torque

（4）according to the run key at the same time to observe the direction of rotation of the motor is in line with the requirements, if there is an exception can press the stop key to stop, such as motor rotation can improve the starting voltage value, increase the starting torque

（5）The following methods can also be used to check whether the starter is normal, under normal circumstances, the three light bulbs should be smooth

5.2 Running

- Refer to table 1 for starting parameters
- According to the panel RUN key, the starter starts to run, the motor is stable and no current mutation shows that the parameter is set, the STOP key can be used to stop the machine
- After the failure, press 6.2 to find the cause of the failure
- Can not start, check the value of the code 00 and external control wiring: terminal STOP and COM disconnect when the starter cannot start
- Press the STOP key or close the external control terminal RET to reset the fault state
- When the starting time for a drag two parking time must be set to 0, such as the need for external control terminals RUN and STOP start operation, please set the code 00 to 1or 3。



You can also check whether the starter is normal by using the figure above. Under normal circumstances, the three bulbs should be steadily lit up

5.3 Running time data display

The average value of three-phase current when running is shown in figure 5.2:

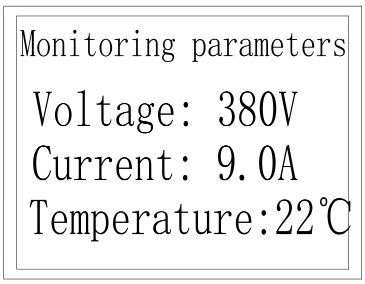


Figure 5.2 Figure 5.3

The operation can also press the MENU key to enter the menu in the main menu, select the monitoring parameters, you can view the voltage, current and SCR temperature, as shown in Figure 5.3

Chapter 6 Fault display

ASA soft starter has protection function; any fault will be shut down, and display and memory fault code. Only with the stop key or the external control reset terminal remove the fault state to reboot. (which can be self starting function, in the two line method to start)

6.1 Panel display

```
      fault
Code: ER03
Phenomenon:
input missing
 phase
```

6.2 Fault code table

Fault phenomenon	fault code	Causes and troubleshooting
Instantaneous stop broken circuit	ER01	Instantaneous stop terminal EMS open circuit to COM
Start timeout	ER02	Current limiting value is too low or too heavy
Input phase defect	ER03	Check whether the input circuit and the bypass contactor is stuck in the closed position and whether the SCR is open or not
Output lacking phase	ER04	Check motor wiring and SCR damage
Parameter error	ER05	Restart or re enter the Default value
Starting over current	ER06	Whether the load is too heavy or the motor power does not match with the soft starter

Operating overload	ER07	Check whether the load is too heavy
Running light load	ER08	Check if the load is too light
SCR overload	ER09	Starting too often or motor power does not match the soft starter
Load short circuit	ER10	Check whether the load or thyristor is short circuited or the load is too large
Bus fault	ER11	485 communication failure, check the external connection terminal
Low Voltage	ER12	Check the input power supply voltage or set the item 12
Voltage high	ER13	Check the input power supply voltage or set the item 11
wiring error	ER14	When the control mode is 3 or 4, the external control terminal is in the open state
Communication failure	ER15	Keyboard communication failure

6.3 Fault memory

Enter the query menu fault records can view the fault, the starter can remember 10 faults for the user to analyze, the user can clear the stored fault

6.3.1 Display memory failure

- The number 1 represents the most recent failure, and the new fault will wash away the previous memory
- You can view the▲▼ key to see all of the fault records.

Fault record
number: 1
ER03: Input
losting phase
Clear return

6.3.2 Fault clearing

After the failure of the query, the boot is best to clear the previous fault memory, the method is in the case of the fault query, press the menu key can be cleared

fault recording
number: 1
Clear return

Chapter 7 Communication protocol

When selecting bus control, the function code 00 must be set to 2,4,5 to activate the bus

7.1 ASA Modbus Protocol Part

This section describes how to use Modbus communication to control the various operations of ASA

7.1.1 Overview of Modbus

Modbus is a serial asynchronous communication protocol. The physical interface for rs485.modbus is designed for Modicon PLC, with PLC structure characteristics of the. Modbus in the network control, ASA can be likened to a soft starter PLC to read and write. ASA will start stop control, state information (fault current, etc.) to keep register area and function parameter mapping (4xxx). Through the use of PLC to read and write control of the master station.

Table 7.1

Register address	action code	Register function specification
40001	06	control word
40002	03	status word
40003	03	Average current (%)
40004	03	Fault code
40257－40281	03&06	Soft starter function code

（1）In addition to the above listed registers are illegal and cannot be read or written. Otherwise, ASA will report an exception code to the controller

（2） All data addresses are based on the reference of 0, i.e., the address of the coil relay 40001 is 000040257 () of 0100

7.1.2 Exception code

ASA supports the standard MODBUS exception code (see table 7.2)

Table 7.2 exception code

code	name	Description
01	Illegal function	Function code cannot be executed, THS1-8000 does not support
02	Invalid data address	The received data address cannot be executed, the address overflow
03	Invalid data value	Received data cannot be executed 1.Parameter out of range

		2.Parameter cannot be modified 3.Parameters cannot be modified at run time

ASA only supports the function code listed in Table 3. If you use the other code, you will give the exception code 1, MODBUS

code	03	06
Function description	Read storage register	Preset single register

Code 03 reads only a single word (word)

7.1.3 Register declaration

- **40001 command register**

bit	value	description
0	1	Starter starting
	0	hold mode
1	1	Starter stop
	0	hold mode
2	0—1	Reset the starter
3—15	0	Unused

For example: from the soft starter station address 02, the controller sends out 020600000001, such as command normal execution, return code 20600000001 to check whether the normal starting starter status register. If a fault exists, should be given 020600000004 reduction.

- **Register address 40002 status register**

The status register reflects the state of the soft starter, represented by a bit

Bit	value	description
0	1	Starting state
	0	Parking state
1	1	running state
	0	Parking state
2	1	Soft stop state
	0	Parking state
3	1	fault condition
	0	normal condition
4—15		Unused

Example: read status code 02 03 00 01 00 01

If the starter is starting, the return code 02 03 02 00 01

Returns 02 03 02 00 08 if the starter fails and the fault type can be read in accordance with 4

- **40003 Average current (sixteen)**

This value indicates the average value of the three-phase actual current of the ASA, according to the setting of the function code 0C, or the current percentage or the actual current value

Example: read current size

Send Code 02 03 00 02 00 01

If the current is 235A, return 02 03 02 00 EB

- **40004 Fault code (sixteen)**

When the status register 40002 bit 3 is 1, the ASA is represented in a fault state. The fault code is consistent with the 7.2

For example: send code 02 03 00 03 00 01

if returns 02 03 02 00 04, the current input is missing, description current input losing phase (fault code 03)

- **Soft starter function parameter register 40xxx**

Among them (xxx-1) with sixteen hexadecimal as 1YY, YY and table 3 - 1 code value is corresponding; for example, with the function code 08 (sudden Jump voltage) corresponding to these functions can be read and write code, the following are examples of its use:

Example 1 read function code 02 (current limit value) size

Controller gives 02 03 01 02 00 01

Returns the value of the 02 function code read. 02 03 02 01 5E indicates the current limit value is 350%

Example 2 read function code 13 (protection level)

Send code 02 03 01 13 00 01, return to 02 03 02 00 03, read the protection level of 3

Example 3 rewrite the soft starter function code 02 (limiting current) to 250%

The host sends the code 02 06 01 02 00 FA, ASA returns the code to 02 06 01 02 00 FA; if returns the 02 86 03 to indicate cannot write, possibly the starter is running

Example 4 the function code 09 is stored at a value of about 10 times, such as the read function code number (Jump time)

Send code 02 03 01 09 00 01, return of 02 03 02 00 03, read the Jump time is 3, the actual value of 0.3s. is the contrary, write Jump time 0.3s, just send the 02 06 01 09 00 03

7.1.4 Connection and setting

The following set of functional code and communication related to the use of the panel must be set

ASA function code	content	set value
16	Bus address	1—247
17	Baud rate	1200~19200bps
18	even-odd check	0: NO 1: odd 2: even

7.1.5 Precautions for use

（1）The address of the ASA (function code 16) must be in accordance with the control address of the controller; the baud rate (function code 17); even-odd check (function code 18) is the same as the controller; the parameter must be reset to power up

（2）If not receiving the response data, the parameters should be set to check the above, the 485 terminal connection is correct, the CRC effect is correct.

（3）More than one ASA communication, should be at the end of the last AB on both ends of the 120 ohm resistance

（4）In connection with other MODBUS devices, as shown in Figure 7-1

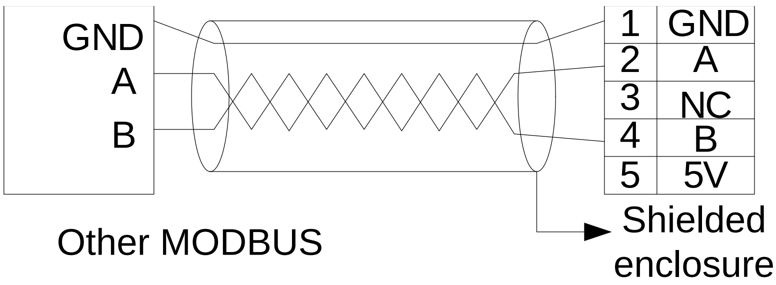


图 7.1

7.1.6 Establishment of communication network

（1）Connection a soft start and a computer connection

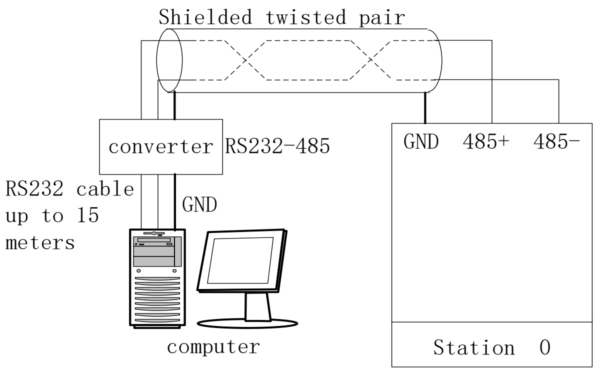


Figure 7.2 the connection between a soft start and a computer

（2）Multiple soft start and computer connections

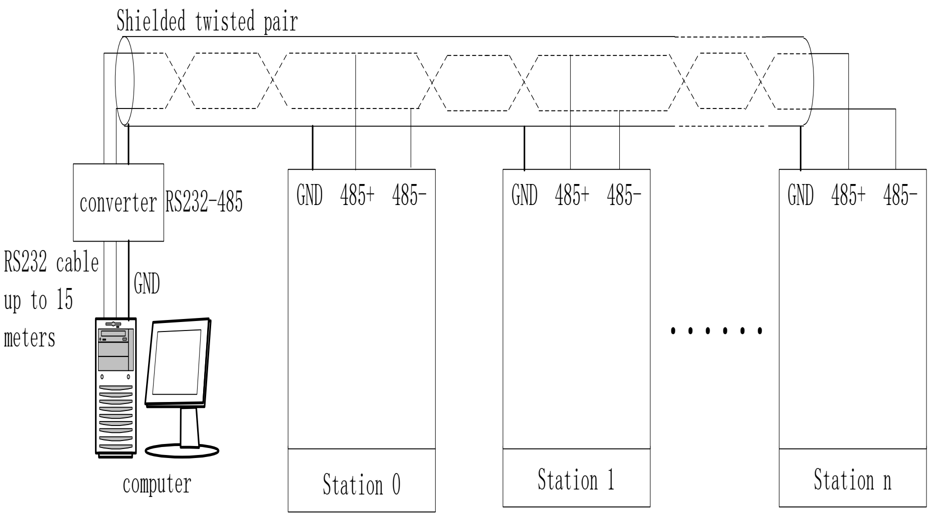


Figure 7.3 the connection between a soft start and a computer

Chapter 8 ASA use precautions and routine maintenance

8.1 Precautions for use

- **Prevent electric shock**

  The input power of ASA soft starter, when the load or open phase, even in the stopped state, its output will still have a very high voltage induction. The output end of the no contact of the soft starter, otherwise there will be the risk of electric shock.

  ASA soft starter control circuit board with 380V voltage, the electric shock risk when debugging

- **Induction voltage**

  Induction voltage soft starter ASA output at no-load is normal phenomenon, does not affect the use of induction voltage by leakage of SCR (silicon controlled rectifier, GTR, IGBT and other solid-state semiconductor devices have different degrees of leakage) exchange pathway and dv/dt resistance capacitance filter loop. Voltage meter to zero measurement, about 100~220v (related to the internal resistance of the voltmeter). The induction voltage of load capacity is very small, disappeared in the output connection after load.

- **Compensating capacitor**

  The reactive power compensation capacitor used to improve the power factor must be connected to the input of the ASA soft starter, not to be connected to the output, otherwise it will damage the SCR power device in the soft starter

- **Meg-ohmmeter**

  The insulation resistance between the input and output of the ASA soft starter shall not be measured with the Meg-ohmmeter, Otherwise the thyristor and the control board of the soft starter may be damaged due to excessive pressure

  ASA can be used to measure the soft phase of the soft starter and relatively insulated, but should be in advance with three short lines will be the three-phase input and output shorted, and unplug all the plugs on the control panel

  Measurement of motor insulation, should also follow the above principles

- **Input and output**

  Do not connect the input and output terminals of the main circuit of the ASA soft starter, otherwise it will result in the unintended action of the soft starter, which may damage the soft starter and the motor

- **Bypass phase sequence**

  When the bypass contactor is used, the phase sequence of the starting circuit should be consistent with the phase sequence of the bypass circuit. Otherwise, the bypass switch will cause an interphase short circuit, which will cause the air circuit breaker to trip or even damage the equipment

- **Low voltage level**

  Terminals 7,8,9,10,11 shall not be connected to other external power sources on the terminals, or they will damage the internal circuit of the soft starter

- **Soft starter voltage rating**

  Terminals 13,14 use external AC380V operating voltage, not on these terminals connected to other voltage rating power supply, otherwise it will damage the internal circuit of the soft starter

8.2 Daily maintenance of soft starter

- **Dust content**

If there is too much dust, the insulation level of the soft starter will be reduced, and the soft starter may not work properly

a.primary circuit creepage, pulling arc, hazard equipment;

b.two circuit leakage, short circuit, control failure;

c.heat sink thermal resistance, SCR temperature rise

- **Cleaning dust**

  a.clean and dry brush gently brush the dust;

  b.use compressed air to blow away the dust

- **Dew condensation**

  If frosting, the insulation level of the soft starter will be reduced, and the soft starter may not work properly

  a.primary circuit creepage, pulling arc, hazard equipment;

  b.two circuit leakage, short circuit, control failure;

  c.aggravates seat corrosion of metal parts

- **Drying up**

  a.With electric or electric stove drying;

  b.Wwet distribution room

Schedule 1, Application

Mechanical type	Load type	Starting mode			Numerical setting		Rise time
		voltage	current	over loading	voltage (%)	current (%)	
centrifugal pump	standard termination		•			250	5
draught fan	Biased load		•	•		400	40
Compressor (piston type)	standard termination		•			300	10
Compressor (centrifugal)	standard termination	•			30		20
transport	standard termination		•			250	10
agitator	standard termination		•	•		350	5
ball crusher	Heavy load		•	•	70	400	50
breaker	Heavy load	•			60		45

Schedule 2, Peripheral parts specification parameters

ASA series soft starter (5.5kw-75kw)

Model	Power rating (kw)	Rated current (A)	SCPD specification	Primary line specification	Note
ASA-0055	5.5	11	20	$2.5mm^2$cable conductor	55kW and below with the cable lead out wiring, the way into the three out of six. Rated power rated current is the maximum value of soft starter。
ASA-0075	7.5	15	30	$4mm^2$cable conductor	
ASA-0110	11	23	50	$6mm^2$cable conductor	
ASA-0150	15	30	80	$10mm^2$cable conductor	
ASA-0185	18.5	37	80	$10mm^2$cable conductor	
ASA-0220	22	43	80	$16mm^2$cable conductor	
ASA-0300	30	60	100	$25mm^2$cable conductor	
ASA-0370	37	75	150	$35mm^2$cable conductor	
ASA-0450	45	90	200	$35mm^2$cable	

				conductor	
ASA-0550	55	110	200	35mm^{2}cable conductor	

Note: the specifications of peripheral accessories list for reference

ASA series soft starter (75kw-320kw)

Model	Rated power (kw)	Rated current (A)	SCPD specification(A)	Primary line specification	Note
ASA-0750	75	150	300	35mm^{2}cable conductor	75kW and above is used to lead the cable wiring, six to the way out of the three. Rated power rated current is the maximum value of soft starter
ASA-0900	90	180	320	30×3mm^{2}Copper bar	
ASA-1150	115	230	480	30×3mm^{2}Copper bar	
ASA-1320	132	260	600	30×4mm^{2}Copper bar	
ASA-1600	160	320	600	30×4mm^{2}Copper bar	
ASA-1850	185	370	700	40×4mm^{2}Copper bar	
ASA-2000	200	400	700	40×4mm^{2}Copper bar	
ASA-2500	250	500	800	40×5mm^{2}Copper bar	
ASA-2800	280	560	1000	40×5mm^{2}Copper bar	
ASA-3200	320	640	1000	40×5mm^{2}Copper bar	
ASA-3550	355	710	1000	40×5mm^{2}Copper bar	

Note: the specifications of peripheral accessories list for reference

ASA series soft starter (400kw~600kw)

Model	Rated power (kw)	Rated current (A)	SCPD specification	Primary line specification	Note
ASA-4000	400	800	/	50×6mm^{2}Copper bar	400KW and above is used to lead the cable wiring, six to the way out of the three. Rated
ASA-4500	450	900	/	50×6mm^{2}Copper bar	
ASA-5000	500	1000	/	60×8mm^{2}Copper bar	
ASA-6000	600	1200	/	60×8mm^{2}Copper bar	

					power rated current is the maximum value of soft starter

Note: the specifications of peripheral accessories list for reference.

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