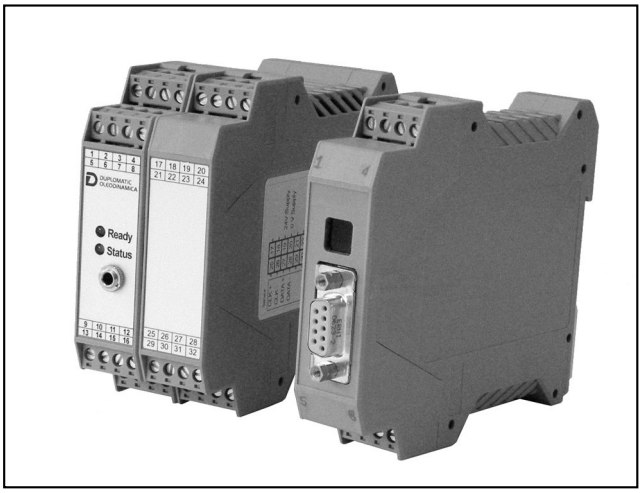


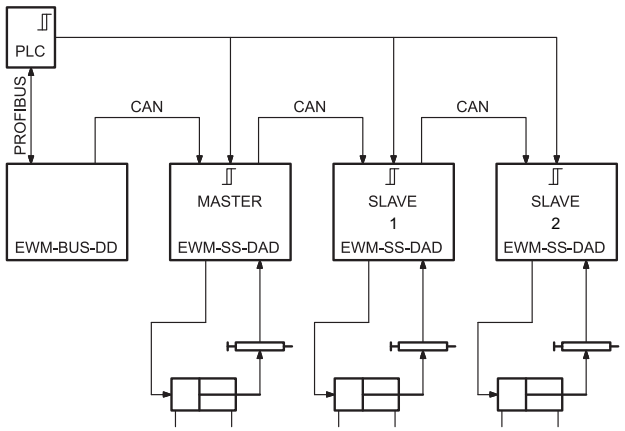
EWM-SS-DAD

CARD FOR AXIS SYNCRONIZATION CONTROL FOR SYSTEMS FROM 2 TO 24 AXES WITH PROFIBUS/CAN COMMUNICATION INTERFACE

SERIES 10

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



— This card has been developed as an axis controller and it is connected to the other cards via Canbus. This bus line has to be coupled with a PLC interface Profibus DP, the EWM-BUS-DD/10 (to be ordered separately).

— The EWM-SS-DAD synchronizes the axes with a high accuracy. The position accuracy is reached using a digital sensor with SSI interface to measure the position. The card can drive only an axis per card, so a EWM-SS-DAD per axis is needed.

— The synchronization controller correct the speed of the slave axis. Positioning failures during the movement will increase or reduce the slave axis velocity, so the synchronization failure will be compensated. The axes speed can be limited by an external analogue speed input.

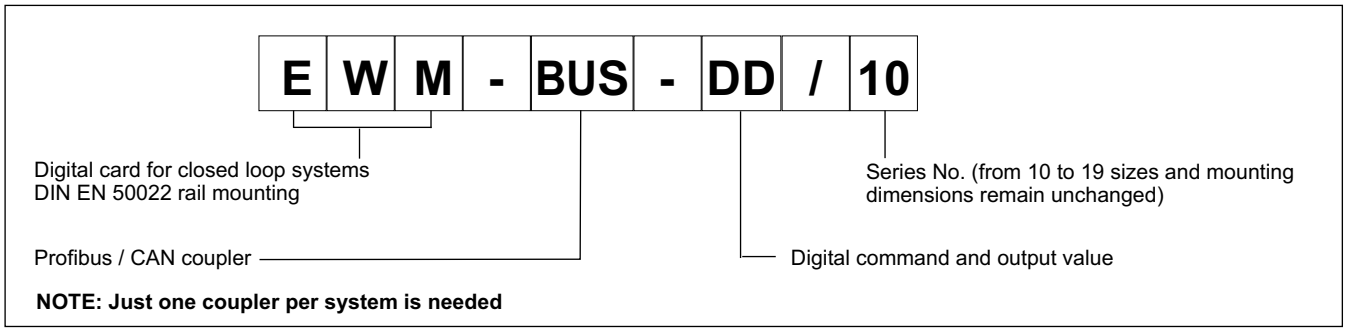
— The card use the RS232C interface, and is easily settable via notebook, using the software kit (EWMPC, see par. 8).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included - external fuse 1,0 A
Current consumption	mA	400 + sensor power consumption
Command value		via Profibus DP - ID number 1810h
Speed input value	V	0 ÷ 10 (R = 90 kΩ)
Feedback value	V mA SSI	0 ÷ 10 (R_I = 33 kΩ) 4 ÷ 20 (R_I = 250 Ω) digital sensor with any SSI interface
Output value: - E0 version - E1 version	V mA	±10 (max load 5 mA) 4 ÷ 20 (max load 390 Ω)
Position accuracy		± 2 bits of digital sensor resolution
Interface		RS 232 C
Electromagnetic compatibility (EMC):		Emissions EN 61000-6-2:8/2002 Immunity EN 61000-6-3:8/2005
Housing material		thermoplastic polyammide PA6.6 combustibility class V0 (UL94)
Housing dimensions - EWM-SS-DAD - EWM-BUS-DD	mm	120 x 99(h) x 46(w) 120 x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

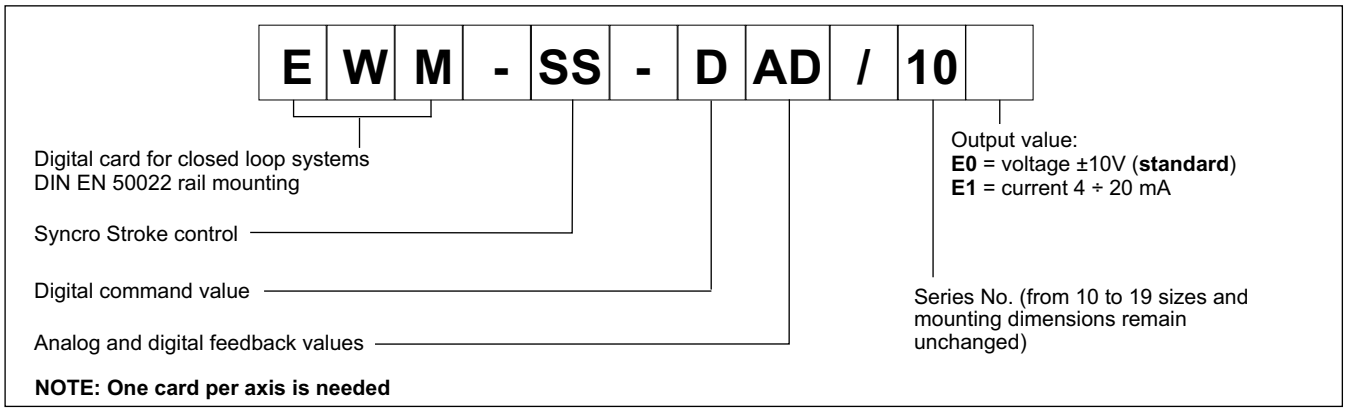
1 - IDENTIFICATION CODES

1.1 - Profibus / CAN coupler code



NOTE: Just one coupler per system is needed

1.2 - Code of the axis drive card



NOTE: One card per axis is needed

This electronic module is developed for controlling of hydraulic drives in synchronization. The communication with the PLC is solved by a standard Profibus DP interface. A typical repeatable positioning accuracy of up to 0,01% with analogue sensors or up to 0,001 mm with digital SSI sensors can be achieved. Proportional valves with integrated electronics (typically with control valves) can be driven by the analogue differential output.

Internal profile generation (acceleration time, max. velocity and stroke depended deceleration) provides fast and excellent positioning. The drive works in open loop mode and is switched over in closed loop during deceleration. This is a time-optimal positioning structure with very high stability. The maximal velocity can be limited by the external velocity input. An extra NC mode can be used for a speed controlled profile generation.

The synchronization control works as a second overriding velocity/position controller. Failure between the axes will be compensated by adjusting the speed of the slave axis.

The adjustment via RS232C is simple and easy to understand (command line input, ASCII format). A standard terminal program or our windows application software (see paragraph 8) can be used.

2 - EWM-SS-DAD FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.
All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).
It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

2.2 - Electrical protections

All inputs and outputs are protected against overvoltage and have filters.

2.3 - Digital Input (ENABLE)

The card accepts digital input. The digital input must have a voltage from 12 to 24 V with current <0,1A. See the block diagram at paragraph 9 for the electric connections. Low level <4V; High level >12V

2.4 - Command value

The card set as Master accepts the input via Profibus, ID number 1810h (see paragraph 4).

2.5 - Input feedback values

The card accepts analog and digital (SSI) feedback input. The digital sensor parameters are settable via software (see available parameters on the example table on next page) The analogue feedback input is 0 ÷ 10V or 4 ÷ 20 mA (250Ω)

2.6 - Output values

The card is designed for two type of output values, voltage ±10V (E0 version) or current 4 ÷ 20 mA (E1 version); standard output value is E0 type.

2.7 - Digital Output

Two digital output are available, INPOS and READY, and their signals are displayed from the leds. The outputs are available on PIN1 and PIN2. The output is 24V. The PIN 4 is used as common potential 0V. (I_{max} 50 mA with load of 200Ω). Low level <4V; High level >10V

EXAMPLE OF PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
inpx	X= SSI|ANA	SSI	-	Selection of the sensor input channel.
num	X= 0… 24	2	-	Number of axes.
sens x	x= on|off	on	-	Activation of the sensor and internal failure monitoring.
ain:i a b c x	i= XL a= -10000… 10000 b= -10000… 10000 c= -10000… 10000 x= V|C	: 10000 : 10000 : 0 : V	- - 0,01% -	Analogue input scaling. **XL** for the input signal. **V** = voltage input and **C** = current input. With the parameters **a**, **b** and **c** the inputs can be scaled (output = a / b * (input - c)). Because of the programming of the **x**-value (x = **C**) the corresponding input will be switched over to current automatically.
a:i x	i= A|B x= 1… 2000	:A 100 :B 100	ms ms	Acceleration time depending on direction. **A** indicates analogue output 15 and **B** indicates analogue output 16. Normally **A** = flow p-A, B-T and **B** = flow P-B, A-T.
d:i x	i= A|B X= 50… 10000	:A 2500 :B 2500	0,01% 0,01%	Deceleration stroke depending on direction. The loop gain is calculated by the deceleration stroke. The shorter the higher. In case of instabilities longer deceleration stroke will be sufficient.
ctrl x	x= lin|sqrt1 |sqrt2	sqrt1	-	Selection of the control function: **lin** = standard linear P-control, **sqrt1** = progressive time optimized deceleration curve **sqrt2** = sqrt1 with a higher gain in position
stroke x	X= 2… 3000	500	mm	Sensor stroke.
ssioffset x	X= -30000… 30000	0	0,01 mm	Zero point adjustment of the sensor.
ssires x	X= 10… 1000	1000	ink/mm	Resolution of the sensor.
ssibits x	X= 8… 31	24	-	Bits of the data word.
ssicode x	X= GRAY|BIN	GRAY	-	Format of the data word.
ssipol x	X= +|-	+	-	Sensor polarity, attention: SSIOFFSET has to be set to compensate negative position values.
syncmode x	X= MS|AV	MS		Synchronization mode. MS is Master-Slave and AV is average calculation.
glp x **t1 x**	X= 0… 10000 X= 0… 100	500 10	0,01 ms	Parameter of the synchronisation control function. GLP is used for the proportional control gain and T1 time constant for damping of the control function. Critical drives can be stabilized with the T1 factor.
vramp x	x= 1… 2000	50	ms	Ramp time for velocity input.
vmode x	x= on|off	off	-	Activation of the NC-generator. The command position is generated by a velocity profile (internal or external preset of v). The axis drives more or less speed controlled.
hand:i x	i= A|B x= -10000… 10000	:A 3300 :B -3300	0,01% 0,01%	Degree of output signal in manual mode
vel x	X= 1… 20000	50	mm/s	Parameter is active in vmode = ON only. VEL defines the maximum speed. Via the external command speed an actual speed between 0,5… 100 % can be selected.
th x	X= 100… 60000	5000	ms	Stroke time for 100% velocity and 100% nominal sensor stroke.
min:i x	i= A|B x= 0… 5000	:A 0 :B 0	0,01% 0,01%	Deadband compensation of positive overlapped proportional valves. Good adjustment will increase positioning accuracy
max:i x	i= A|B X= 5000… 10000	:A 10000 :B 10000	0,01% 0,01%	Maximum output range for adapting control range to maximum flow range.
trigger x	X= 0… 2000	200	0,01%	Point to activate the deadband compensation (**min**). Also useful for reduced sensitivity in position with control valves.
inpos x	X= 2… 2000	200	0,01%	Range for the InPos signal (status output)
offset x	x= -2000… 2000	0	0,01%	The offset will be added to the command value.
glerror x	x= -2000… 2000	200	0,01mm	Range of the sync monitoring.
pol x	x= +|-	+	-	For changing the output polarity. All **A** and **B** adjustments depend on the output polarity. The right polarity should be defined first.
save	-	-	-	Storing the programmed parameter in E²PROM.
loadback	-	-	-	Reloading the parameter from E²PROM in working RAM
help	-	-	-	Help to the commands, for terminal programs only
para	-	-	-	Parameter list with programmed data, for terminal programs only
st				Status of the digital inputs.
-	-	-	-	Actual signals: command value, actual value, process data, control divergence and reference value.
default	-	-	-	Preset values will be set.

3 - LED FUNCTIONS

There are two leds on the EWM-SS-DAD card:

GREEN: Shows if the card is ready.

ON - The card is supplied
OFF - No power supply or the ENABLE parameter is inactive
FLASHING - Failure detected (internal or 4 ÷ 20 mA). Only if the parameter SENS is ON

YELLOW: Is the signal of the control error monitoring.

ON - No control error
OFF - Error detected, depending of a parameter error.

4 - CAN INTERFACE

The CAN interface is wired on all modules in parallel. The terminating resistors have to be activated in the EWM-SS-DAD at the first and last module.

The addressing of the EWM-SS-DAD about the DIL switches must begin with one. The first module has a master functionality and takes over the communication with the interface converter EWM-BUS-DD. The DIL-switch is inside the unit on the interface board opposite of the main board. Position and switch position are marked.

DIL switches (the DIL switch is on the interface board):

1 to 5: Binary coding of the postal address of the node. At the most 24 addresses are managed.
8: Terminal resistance: only at the first and last module the terminal resistance is activate.

5 - PROFIBUS / CAN COUPLER EWM-BUS-DD

The module supports all baud rates from 9,6 kbit/s up to 12000 kbit/s with auto detection of the baud rate. The functionality is defined in IEC 61158. The Profibus address can be programmed by a terminal program, EWMPC/10 or online via the Profibus. A diagnostic LED indicates the online status.

In the EWM-BUS-DD the presetting is to be maintained for the CAN-Bus (address 2 and 1 MBd).

5.1 - Power supply

PIN 5 and PIN 6 = 24 V
PIN 7 and PIN 8 = 0 V

5.2 - Display

The EWM-BUS-DD has a display that shows the module status:

- everything OK, Profibus and CAN Bus in data exchange
1 Error, CAN Bus no data exchange
2 Error, Profibus no communication
3 Error, Profibus no communication, CAN Bus no data exchange
4 Error, Profibus OK, not connected CAN Bus
5 Error, Profibus no communication, not connected CAN Bus
6 Error, hardware fault

5.3 - Profibus connector

A shielded typical Profibus connector (9-polig), possibly with internal terminal resistors, it must be used .

The pre addressing of the module can be changed only by Profibus (DEFAULT is 3).

The reference values are preset here over the Profibus / CAN-Bus. The module worked in this case with full internal resolution. The position resolution corresponds to the sensor resolution.

The velocity resolution 0x3fff (16373) corresponds to 100 % velocity.

The control of the module will be done via two control words with following BITs, the command position and the command velocity:

ENABLE: Must be activated in addition to the hardware signal.
START: In case of increasing edge the current command position is taken over, in case of deactivated START the system about a brake ramp is stopped.
GL-ACTIVE: Over this bit the overlapped synchronism controller is activated.
SEL x: Groups of each four modules with the information about status and positions can be read - by the control of the three select-bits -back.

5.4 - Command values:

Command position: according to the sensor resolution.

Command velocity: 0x3fff corresponds to 100 %.

Two status words, the current command position and the current actual positions are acknowledged:

READY: System is ready.
InPos: In position signal, according to mode it is a simple message InPos, in the NC mode it is also the following error control information.
GL-ERROR: The synchronism error is indicated over this bit by the parameter GLERROR dependently.
Sensor error: If the sensor monitoring is activated, the READY Signal is deactivated with a sensor error.
ComError: Communication error on the CAN Bus. This message will be sent only from the module No. 1. If general communication problems are found or if a module is completely defective this is signalled.

Always the hardware enable signal has to be deactivated at a sensor error (READY Signal) and COM error.

5.5 - Current actual values:

Current command position: This is the current command position which is interpreted according to mode differently.

Standard mode : target command position
NC-mode : calculated command position of the generator,
Actual position: according to the sensor resolution.

5.6 - PROFIBUS pre-set

Totally, 8 data bytes are sent to the modules:

Byte	Function	Comment
1	control word Hi	unsigned int
2	control word Lo	
3	command position Hi	unsigned long
4	command position..	
5	command position ..	
6	command position Lo	
7	velocity 1 Hi	unsigned int
8	velocity 1 Lo	
9	control word 2 Hi	unsigned int
10	control word 2 Lo	
11-24	reserve	no function

the definition of the control word are:

Byte 1 - control word Hi		
bit	**Function**	
8	Enable (with which enable hardware links)	operation 1 = active
7	Sel 0	selection 1 = active
6	Sel 1	selection 1 = active
5	Sel 2	selection 1 = active
4	Axis START 1	start 1 = active
3	Axis START 2	start 1 = active
2	Axis START 3	start 1 = active
1	Axis START 4	start 1 = active

Byte 2 - control word Lo		
bit	**Function**	
8	GL- Active axis 1	synch 1 = active
7	GL- Active axis 2	synch 1 = active
6	GL- Active axis 3	synch 1 = active
5	GL- Active axis 4	synch 1 = active
4	START ext 1 (axis 5 to 8)	1 = start (group 1)
3	START ext 2 (axis 9 to 12)	1 = start (group 2)
2	GL- Active ext 1 (axis 5 to 8)	1 = GL active (group 1)
1	GL- Active ext 2 (axis 9 to 12)	1 = GL active (group 2)

Byte 9 - control word of 2 Hi		
bit	**Function**	
8	Reserved	
7	Reserved	
6	START ext 3 (start of axis 13 to 16)	1 = start (group 3)
5	START ext 4 (start of axis 17 to 20)	1 = start (group 4)
4	START ext 5 (start of axis 13 to 16)	1 = start (group 5)
3	Reserved	
2	Reserved	
1	Reserved	

Byte 10 - control word of 2 Lo		
bit	**Function**	
8	Reserved	
7	Reserved	
6	GL- Active ext 3 (axis 13 to 16)	1 = GL active (group 3)
5	GL- Active ext 4 (axis 17 to 20)	1 = GL active (group 4)
4	GL- Active ext 5 (axis 21 to 24)	1 = GL active (group 5)
3	Reserved	
2	Reserved	
1	Reserved	

The axes from 1 to 4 can be activated separately by the control word (both position control and synchronism control) and can be driven into position. The axes 5 to 8, 9 to 12, 13 to 16, 17 to 20 and 21 to 24 can be activated in groups.

	Controlled axes					
Address	**1 to 4**	**5 to 8**	**9 to 12**	**13 to 16**	**17 to 20**	**21 to 24**
SEL 2	0	0	0	0	1	1
SEL 1	0	0	1	1	0	0
SEL 0	0	1	0	1	0	1

Byte 3, 4, 5 and 6 - command position		
bit	**Function**	
from 25 to 32	command position Hi byte	unsigned long: spec. considering the sensor resolution
from 17 to 24	command position	
from 9 to 16	command position	
from 1 to 8	command position Lo byte	

Byte 7 and 8 - velocity		
bit	**Function**	
from 9 to 16	command velocity Hi byte	max 3f hex
from 1 to 8	command velocity Lo byte	max ff hex

5.7 - Data sent to the profibus

Totally, 24 bytes will be sent to the Profibus.

Byte	**Function**	**Comment**
1 (0)	status word Hi	unsigned int
2 (1)	status word Lo	
3 (2)	control position* Hi	
4 (3)	control position*	
5 (4)	control position*	
6 (5)	control position* Lo	
7 (6)	status word 2 Hi	unsigned int
8 (7)	status word 2 Lo	
9 (8)	actual pos. axes 1,5,9,13,17,21 Hi	unsigned long
10 (9)	actual pos. axes 1,5,9,13,17,21	
11 (10)	actual pos. axes 1,5,9,13,17,21	
12 (11)	actual pos. axes 1,5,9,13,17,21 Lo	
13 (12)	actual pos. axes 2,6,10,14,18,22 Hi	unsigned long
14 (13)	actual pos. axes 2,6,10,14,18,22	
15 (14)	actual pos. axes 2,6,10,14,18,22	
16 (15)	actual pos. axes 2,6,10,14,18,22 Lo	
17 (16)	actual pos. axes 3,7,11,15,19,23 Hi	unsigned long
18 (17)	actual pos. axes 3,7,11,15,19,23	
19 (18)	actual pos. axes 3,7,11,15,19,23	
20 (19)	actual pos. axes 3,7,11,15,19,23 Lo	
21 (20)	actual pos. axes 4,8,12,16,20,24 Hi	unsigned long
22 (21)	actual pos. axes 4,8,12,16,20,24	
23 (22)	actual pos. axes 4,8,12,16,20,24	
24 (23)	actual pos. axes 4,8,12,16,20,24 Lo	

*the control position is the calculated position the average-value control is active. At MASTER/SLAVE is is the command position.

The status word are coded as follow:

Byte 1 - status word Hi		
bit	**Function**	
8	READY axis 1	1= ready
7	READY axis 2	1= ready
6	READY axis 3	1= ready
5	READY axis 4	1= ready
4	INPOS axis 1	1= in position
3	INPOS axis 2	1= in position
2	INPOS axis 3	1= in position
1	INPOS axis 4	1= in position

Byte 2 - status word Lo		
bit	**Function**	
8	axis GL-Error 1	1 = no error
7	axis GL-Error 2	1 = no error
6	axis GL-Error 3	1 = no error
5	axis GL-Error 4	1 = no error
4	reserved	
3	reserved	
2	reserved	
1	COMerror	1 = no error

The status word 2 are coded as follow:

Byte 7 - status word 2 Hi		
bit	**Function**	
8	READY axis 1, 5, 9, 13, 17, 21	1= Ready Corresponding signal indicator through selection bits Sel_0 to Sel_2 in the control word Hi
7	READY axis 2, 6, 10, 14, 18, 22	
6	READY axis 3, 7, 11, 15, 19, 23	
5	READY axis 4, 8, 12, 16, 20, 24	
4	INPOS axis 1, 5, 9, 13, 17, 21	1= no error Corresponding signal indicator through selection bits Sel_0 to Sel_2 in the control word Hi
3	INPOS axis 2, 6, 10, 14, 18, 22	
2	INPOS axis 3, 7, 11, 15, 19, 23	
1	INPOS axis 4, 8, 12, 16, 20, 24	

Byte 8 - status word 2 Lo		
bit	**Function**	
8	GL-Error axis 1, 5, 9, 13, 17, 21	1= no error Corresponding signal indicator through selection bits Sel_0 to Sel_2 in the control word Hi
7	GL-Error axis 2, 6, 10, 14, 18, 22	
6	GL-Error axis 3, 7, 11, 15, 19, 23	
5	GL-Error axis 4, 8, 12, 16, 20, 24	
4	reserved	
3	reserved	
2	reserved	
1	reserved	

6 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

A typical screened Profibus plug (D-Sub 9pol with switchable termination) is mandatory.

Every Profibus segment must be provided with an active bus termination at the beginning and at the end. The termination is already integrated in all common Profibus plugs and can be activated by DIL switches.

The Profibus cable must be screened. .

For the installation of the EWM-BUS-DD only a few steps are necessary (CAN-side).

Electric connection: the CAN Bus of the modules is wired with the CAN Bus of the coupler.

EWM-SS-DAD: PIN 23	at PIN EWM-BUS-DD 1
EWM-SS-DAD: PIN 22	at PIN EWM-BUS-DD 4
EWM-SS-DAD: PIN 21	at PIN EWM-BUS-DD 3

7 - ADJUSTMENTS

On the EWM card family, the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model, and shows a table (see example on page 3) with all the available parameters, with their commands, the default setting, the measuring unit and an explanation of the command and its uses. The parameters changes depending on the card model, and they are fully described in the *Overhaul manual*.

8 - SOFTWARE KIT EWMPC/10 (code 3898401001)

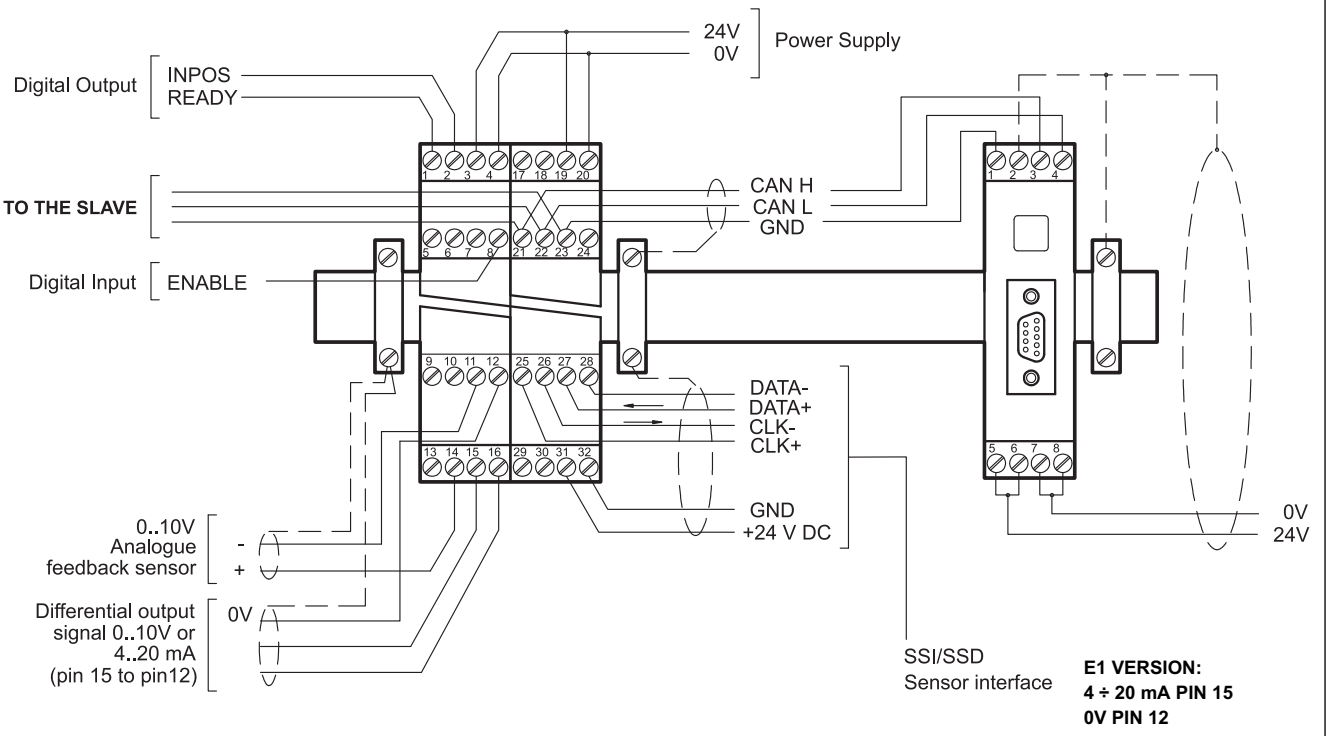
The software kit comprising a USB cable (2.70 mt lenght) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

9 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1 — READY output:
General operationally, ENABLE is active and there is no sensor error (by use of 4 ÷ 20 mA sensors). This output corresponds with the green LED.

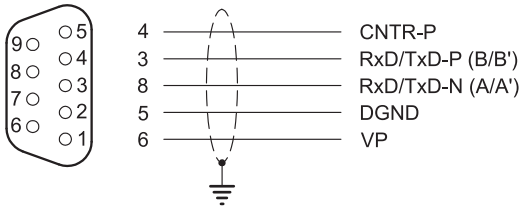
PIN 8 — ENABLE input:
This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Target position is set to actual position and the drive is closed loop controlled.

ANALOGUE INPUT AND OUTPUT

PIN 14 — Analogue feedback value (X),
range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

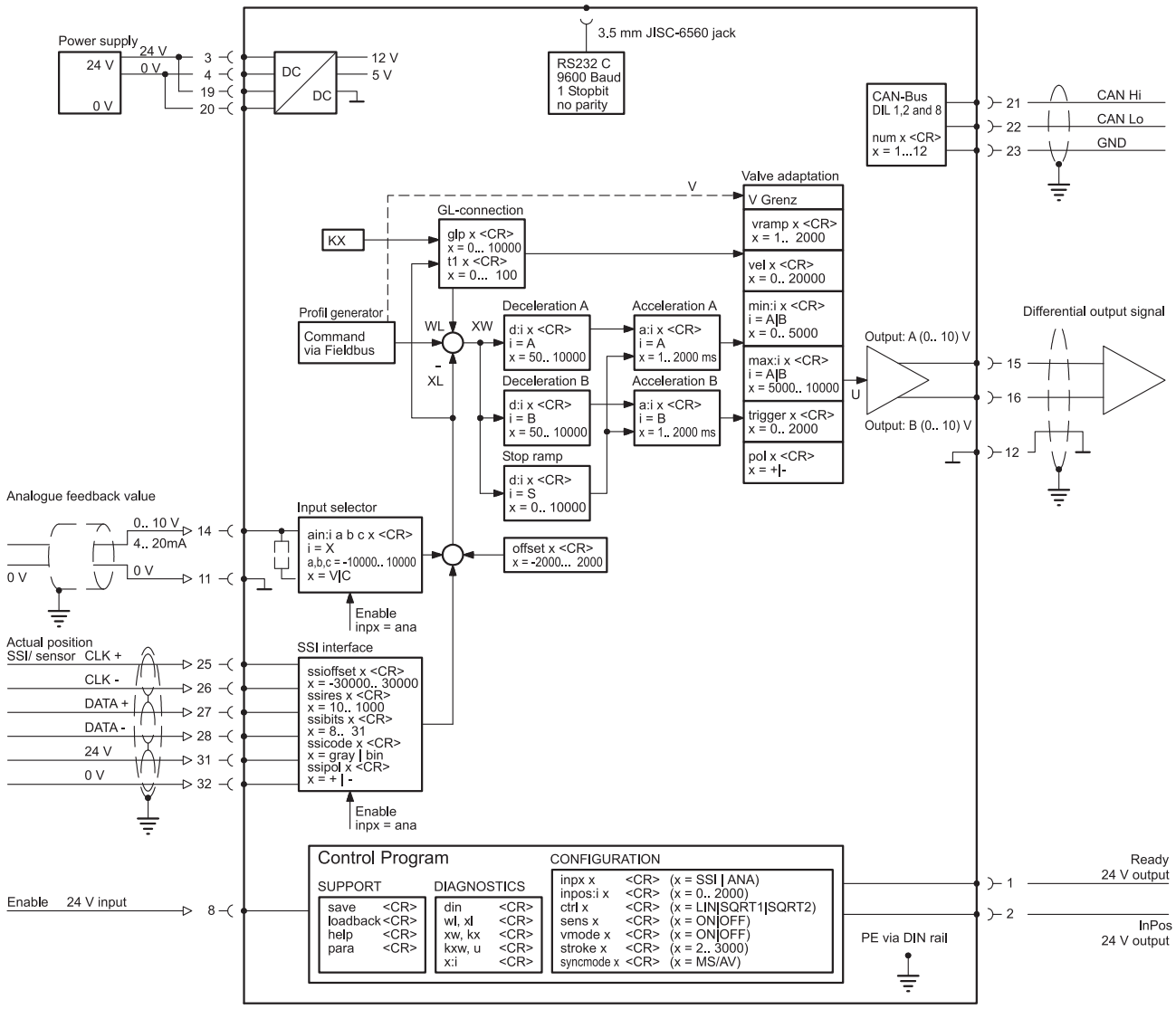
PIN 15/16 — Differential output (U)
±100% corresponds to ± 10V differential voltage, optionally (E1 version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

PROFIBUS PORT WIRING AND LINKING CONFIGURATION

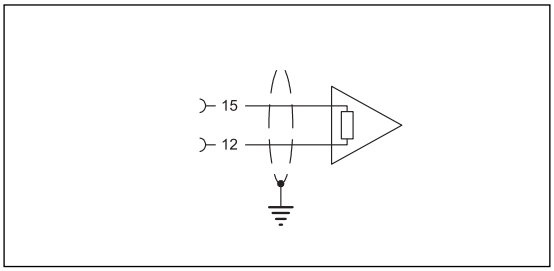


pin	Signal name	Function
1-2-7-9	not used	-
3	RxD/TxD-P (B-Line)	Receive/Send P data
4	CNTR-P/RTS	Request to Send
5	DGND	Data ground
6	VP	+5 V DC for external bus termination
8	RxD/TxD-N (A-Line)	Receive/Send N data

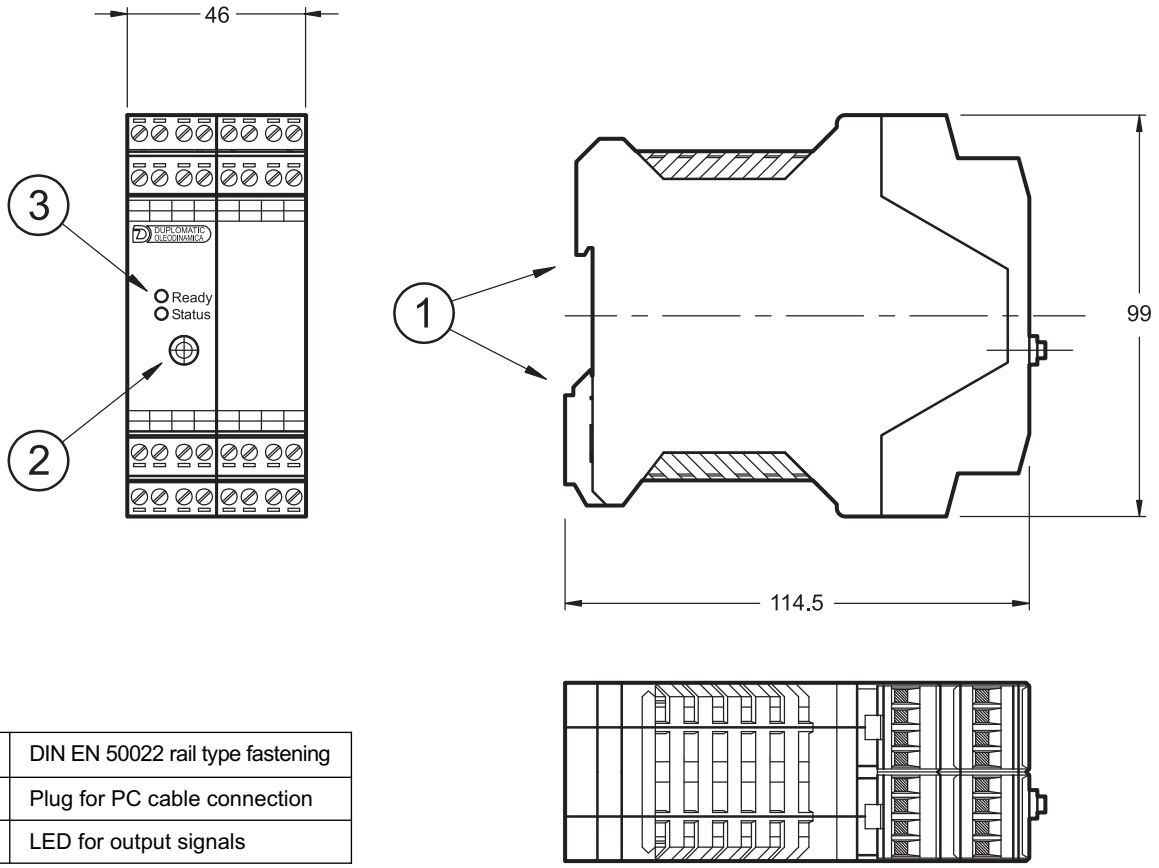
10 - CARD BLOCK DIAGRAM



OUTPUT SIGNAL - E1 VERSION

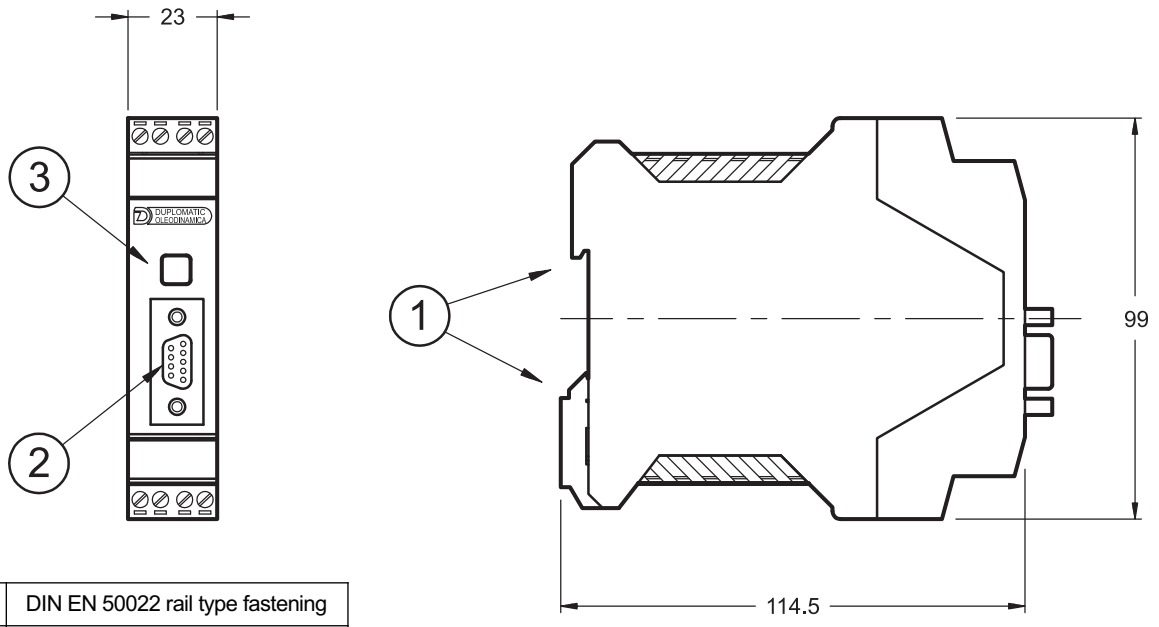


11 - OVERALL AND MOUNTING DIMENSIONS OF EWM-SS-DAD



1	DIN EN 50022 rail type fastening
2	Plug for PC cable connection
3	LED for output signals

12 - OVERALL AND MOUNTING DIMENSIONS OF EWM-BUS-DD



1	DIN EN 50022 rail type fastening
2	Profibus interface port
3	Display

DUPLOMATIC OLEODINAMICA

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