EO312-B

Instruction Manual

PROFIBUS-DP SI units

EX120-SPR1-B

EX121-SPR1-B

EX122-SPR1-B

Index

1. System overview

1.1 System description

The PROFIBUS-DP is an open, manufacturer-independent field bus. This makes it possible to use any PROFIBUS-compatible PLC or PC plug-in card as a Master for the PROFIBUS.

PROFIBUS-DP is a deterministic, decentrally controlled field bus that uses the so-called “Delegated Token”, generally operated with one Master and is suitable for cyclical PLC/IPC control.

The EX12#-SPR1-B SI units described here support the manufacturer-independent **PROFIBUS-DP** protocol concerning IEC 61158 resp. EN 50170.

The PROFIBUS-DP protocol (decentral periphery)

32 active or passive participants can be connected, or 122 when using a maximum of three signal amplifiers (repeaters). Different transmission speeds are possible dependent on the max. bus length. The baud rate is automatically detected by the SI unit and can be between 9.6 kBit/sec and 12 Mbit/sec. The transmission media used are shielded, paired two wire cables in compliance with the above PROFIBUS-DP standard (RS 485).

1.2 SI unit EX12#-SPR1-B

The SI unit makes it possible to control the SMC solenoid valves via the PROFIBUS-DP protocol. All three housing types EX120, EX121 and EX122 contain identical electronics. Only the mounting types are different.

Housing type:	Type of connection:	for SMC valve type:
EX120	Direct mounting without ribbon cable, no DIN rail mounting	VQ, SV
EX121	DIN rail mounting with ribbon cable	SY
EX122	Direct mounting without RC for DIN rails	SY

Each Serial-Interface (SI) unit can control a maximum of 16 single solenoid or 8 double solenoid valves. Combinations of single and double solenoid valves are possible as long as the number of coils does not exceed 16. These SI units do not have sensor inputs.

The SI solenoid valve manifold is already wired internally. This means that the manifold only needs to be connected to the bus line (9 pole D-Sub) and the power supply (5 pole round connector).

The address of the bus participant can either be set via the two rotary switches on the front of the device (hardware addressing - proposed) or via the bus protocol (software addressing). Hardware addressing (default) is recommended in advantage to see the adjusted slave address directly.
An internal selector switch determines which of the two address settings is permitted. It must also be ensured that the correct GSD file which corresponds to used address setting mode is used.

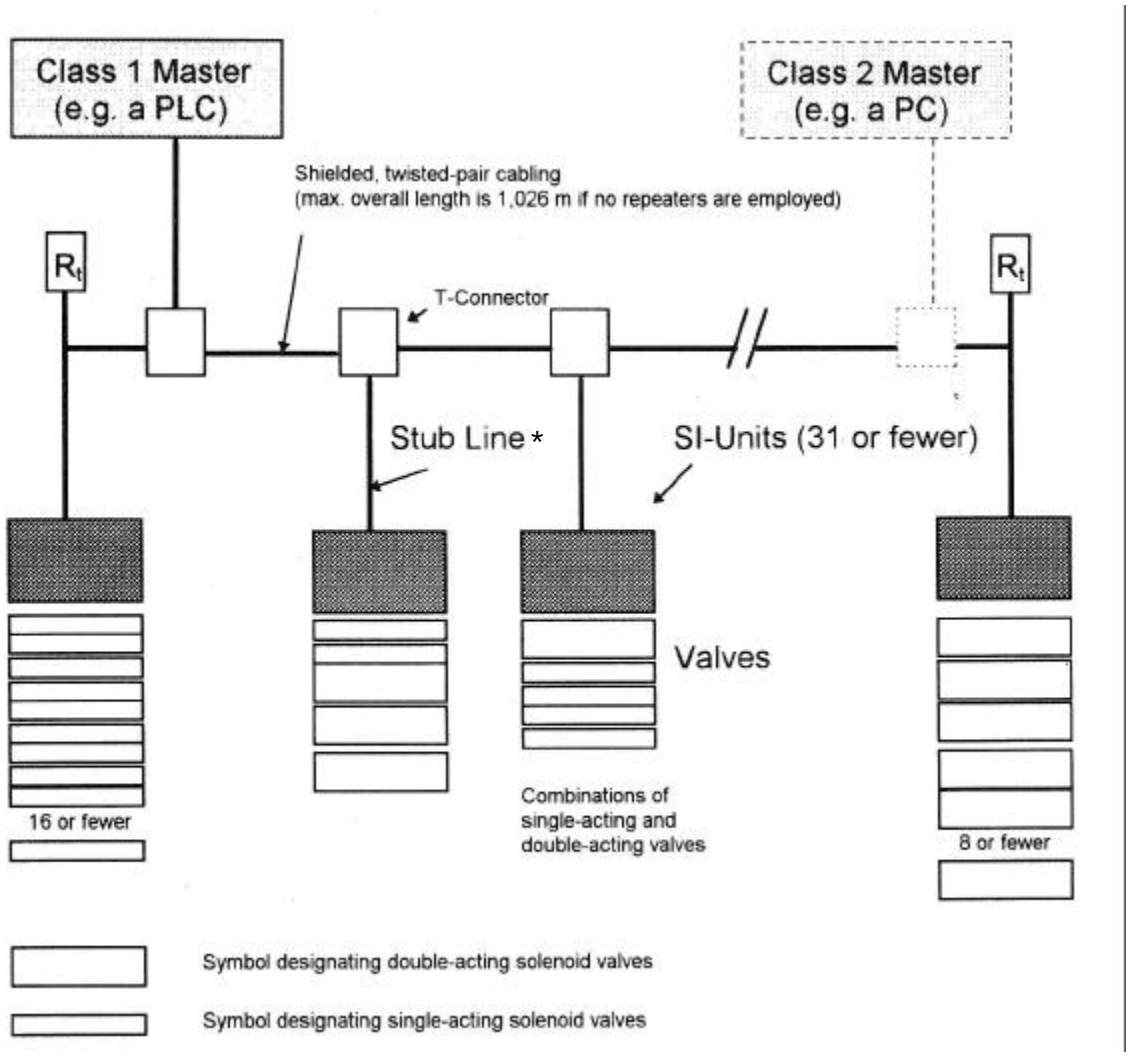
2. System configuration

2.1 Systematic configuration

There are two types of Master for the PROFIBUS-DP:

Master class 1:	Communication with Slaves and with control signal networks, e.g. PLC
Master class 2:	For setup and checkout purposes, e.g. Programming Device (PD)

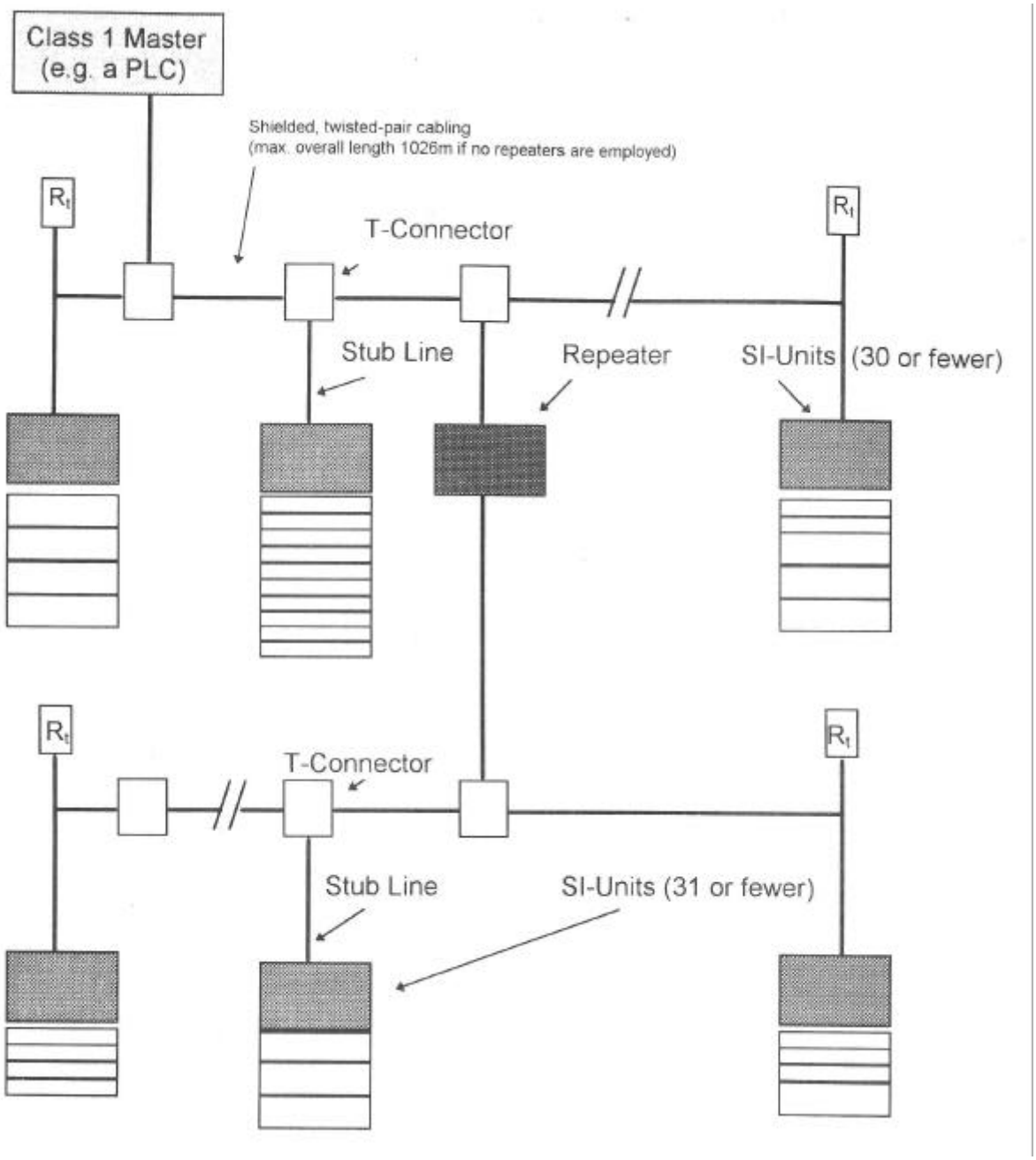
Example a) Operation without repeater



R_t: Termination resistor combination

* for 1.5 MBit/sec, stubs must not be used!

Example b) Configuration with a repeater



The valve configurations shown here are interchangeable under the SI units. A maximum of 16 output drivers are available per SI unit.

The termination resistors must be connected to the start and end of the PROFIBUS-DP cable. This can be implemented by using external resistors or special bus connectors that have an integrated switchable termination resistor. At higher baud rates (> 1.5 MBit/sec), connectors with integrated line inductance must be used due to the capacitive load of the participant and the resultant line reflection (see technical guidelines for PROFIBUS-DP Interconnection Technology).

According to the PROFIBUS-DP standard, a maximum of three repeaters are permitted, i.e. one repeater after every 31 Slaves. The number of repeaters affects the maximum number of bus participants: e.g. a maximum of 30 bus participants can be connected with one repeater and a maximum of 28 participants can be connected with three repeaters per line.

2.2 PLC types and PCs

The SI solenoid valve manifold (SI unit + valve manifold) can be controlled by any PLC, with an appropriate interface component as the bus master, or by a PC plug-in card. The interface component or the PC plug-in card must be designed as a PROFIBUS-DP standard Master.

There are a large variety of such devices or PC plug-in cards available from various manufacturers.

2.3 Connectable SMC solenoid valves

Solenoid valves in the series **VQ1000/2000** can be connected with **EX120-SPR1-B** and solenoid valves in the series **SY3000/5000** can be connected with **EX122/EX121-SPR1-B**. These valve series, in addition to the “SI solenoid valve manifold” design, are also available with 25 pole D-Sub connectors as electrical input.

Order designation of the multi-connection sub-bases for solenoid valve manifolds

EX120 Type:	VV5Q#1-####S**N**-#-Q
	SS5V#-1#S3**N**D-###-##
EX121 Type:	SS5Y#-45S1**N**D-###-##-Q
EX122 Type:	SS5Y#-45S**N**D-###-##-Q

Note:
The letter **N** indicates the field bus system PROFIBUS-DP in the multi-connection sub-base.

Important:

In the VQ series valves, the valves with the “Negative Common” resp. “Minus Common” configuration must be used (i.e. 24 VDC is switched to the valve and the ground is common), e.g. VQ1101**N**-5-Q.

Further technical data regarding the valves and valve sub-bases can be found in the corresponding SMC product catalogues (address directory in appendix).

3. Technical data

3.1 System technical data

Operating temperature	0°C... +50°C
Storage temperature	-20°C... +85°C
Relative humidity	10-95% without condensation
CE marking	Yes
Degree of protection	IP 20 (DIN 40050/IEC 144)

3.2 PROFIBUS-DP technical data (as per EN 50170)

Operating mode of SI solenoid valves	The SI unit is designed as a passive participant (Slave) for the PROFIBUS-DP		
Max. number of participants without repeater:	32 participants (Master, Slave)		
Maximum number of repeaters	3		
Number of bus participants (with three repeaters)	126 participants (Slaves). Operation as mono-master system is recommended.		
Transmission speed (baud rate) and max. cable length without repeater	Dependent on bus length and cable type A or B used		
	Baud rate: [kBaud]	Cable type A [m]	Cable type B [m]
(automatic baud rate detection)	12000	100	Not permitted
	6000	100	Not permitted
	3000	100	Not permitted
	1500	200	Not permitted
	500	400	200
	187.5	1000	600
	93.75	1200	1200
	19.2	1200	1200
	9.6	1200	1200
Hamming distance	4		
Cable type	Cable A as per PROFIBUS-DP standard EN 50170 Cable B as per PROFIBUS-DP standard EN 19245, Part 1		
Cable parameters	Cable A	Cable B	
Impedance [Ω]	135 to 165 (3.. 20MHz)	100 to 130 (>100kHz)	
Capacitance [pF/m]	<30	<60	
Loop resistance [Ω/km]	<110	<160	
Core diameter [mm]	>0.64	>0.53	
Core cross-section [mm²]	>0.34	>0.22	
Transmission media (cable)	Shielded, paired two wire cable, impedance 100 to 130Ω Min. 0.22mm² (24 OVG), approx. 60pF/m		

Bus structure	Line, closed at both ends with terminating resistors, adapted to RS 485. Stubs to participant as short as possible, no branching.
Connection type: Supply voltage: Bus connector:	 5 pole round connector as per DIN 45322 9 pole D-Sub connector
Galvanic isolation	50 V_{eff} rated voltage 500V_{eff} rated surge voltage

3.3 SI unit technical data

Supply voltage	+24V DC rated voltage ± 10% Allowable range 21.6V DC to 26.4 V DC Separate power supply for electronics and load (valves) Common reference potential
Current consumption electronics	Max. 70 mA at rated voltage without load
Current consumption load (valves)	Max. 1.4 A
Outputs: - Number - Output performance per output - Voltage - Polarity of outputs - Fuse protection of outputs	 16 max. 2.1W +24V DC ± 10% Minus Common 1 micro-fuse per Byte, 2Byte
Min. Slave Interval	0.1 ms
Diagnostics functions: - Bus fault display - Diagnosis display e.g. valve voltage too low - Supply status display +24V DC electronics	 LED red “BF” LED red “DIA” LED green “RUN”

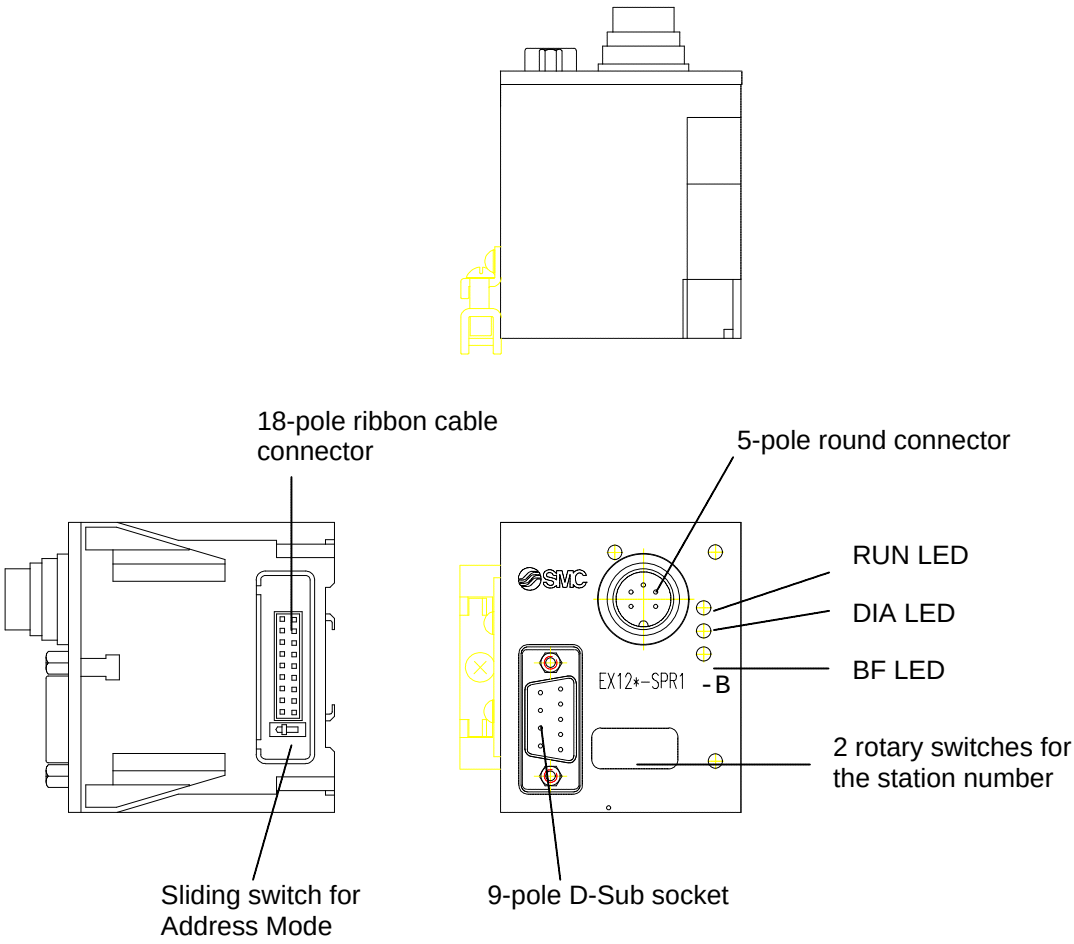
3.4 Electromagnetic compatibility (EMC)

Interference transmission	EN50081-2, 1993 EN55011 Class A Gr. 1	
Resistance to interference	EN50082-2, 1995	
Enclosure	EN61000-4-2 ESD 4kV Contact/8kV air ENV50140 HF-Field 10V/m 80... 1000 MHz ENV50204 HF-Field 10V/m 900 MHz	B A A
Bus connection	EN61000-4-4 Burst 2kV ENV50141 HF-conducted 10V, 0.15... 80 MHz	A A
Mains (DC)	EN61000-4-4 Burst 2kV ENV50141 HF-conducted 10V, 0.15... 80 MHz	A A

Benchmark category A: Normal operating behavior within specified limits
Benchmark category B: Temporary influence of operating behavior or loss of function that the device self-corrects.

4. Description of SI unit EX12#-SPR1-B

4.1 Description of individual components

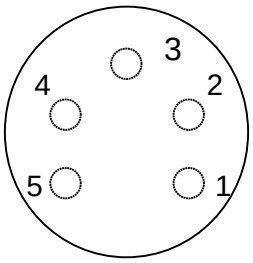


The externally visible individual components are described below.

5 pole round connector

The supply voltage for the electronics (SI unit) and for the valves (load) can both be connected simultaneously through the connection of a 5 pole mating socket. The PS round connector complies with the DIN 45322 standard.

Top view



PIN 1:	+24V DC valve voltage
PIN 2:	0V electronics
PIN 3:	PE, functional protective earth
PIN 4:	+24V DC electronics
PIN 5:	0V valve voltage

Note:
The +24V DC valve voltage and the + 24V DC supply voltage for the electronics are electrically isolated from each other. PIN 3 (PE) must be connected with the shield connection in the mating section of the round plug connector.

9 pole D-Sub socket:

The 9 pole D-Sub socket connects the SI unit with the field bus PROFIBUS-DP. The connections of the 9 pole D-Sub socket are assigned as follows:

PIN 1	Shield	Shield/protective earth
PIN 2	M24	not occupied (reserved for 24V DC supply ground line)
PIN 3	**RxD/TxD-P**	**Receive/transmission data-P; B line**
PIN 4	RTS	Ready to Send
PIN 5	**DGND**	**Digital Ground**
PIN 6	**VP**	**+5V for external bus connection**
PIN 7	P24	not occupied (reserved for 24V DC auxiliary power)
PIN 8	**RxD/TxD-N**	**Receive/transmission data-N; A line**
PIN 9	CNTR-N	not occupied (reserved for repeater control signal, direction control)

The signals shown in bold (Pin 3, 5, 6 and 8) are essential signals for data exchange (mandatory signals).

4.2 Diagnostics display (status LEDs)

The status LEDs **RUN** (green), **DIA** (red) and **BF** (red) on the front plate indicate the status of a SI unit.

LED	Status (after configuration)	Meaning
RUN (green)	lit up not lit up	Supply voltage +24V DC for SI unit OK Not OK
DIA (red)	lit up not lit up	A fault has occurred in the valve control system (e.g. the supply voltage for the solenoid valve has dropped below permitted value) No fault
BF (red)	lit up not lit up	Bus fault! During the set monitoring period, no communication cycle occurred on the bus No fault

4.3 Diagnosis of Slave EX12#-SPR1-B

The parameters specified correspond to the diagnosis telegram according to EN 50 170. The DP Slave diagnosis in hexadecimal format has the following meaning:

Diagnosis telegram	Message/Meaning
0000: 00 0C 00 02 14 01 07 00 00 00 00 00 00	Response monitoring activated i.e. All OK
0000: 01 00 00 02 14 01 00 00 00 00 00 00 00	DP Slave cannot be reached via bus (e.g. electronics voltage too low)
0000: 08 0C 00 02 14 01 07 FF 00 00 00 00 00	Response monitoring activated Slave-specific diagnosis data (e.g. valve voltage too low)

It is assumed here that the DP Master has address 2 and that the SI unit is addressed with the rotary switches, i.e. the GSD file 1401 is used.

5. Settings

5.1 Address settings

The address of the SI unit can be assigned either using both rotary switches (hardware addressing) or via the bus protocol (using a class 2 Master). In general, address 1 is kept for the Master.

A small sliding switch inside the SI unit determines the type of addressing used. The sliding switch is located on the valve connection board to the left of the 18 pole ribbon cable connector. The appropriate GSD file must be used according to the position of the sliding switch.

Selection sliding switch on:		GSD file
+ Default setting	The address is assigned using the rotary switch on the front plate (HW addressing) Valid address range: **02 to 99** (decimal)	**SMCB1401.GSD**
o	The address is assigned via the bus protocol. (SW addressing) Valid address range: **02 to 126** (decimal) The rotary switches are no longer operational	**SMCB1400.GSD**

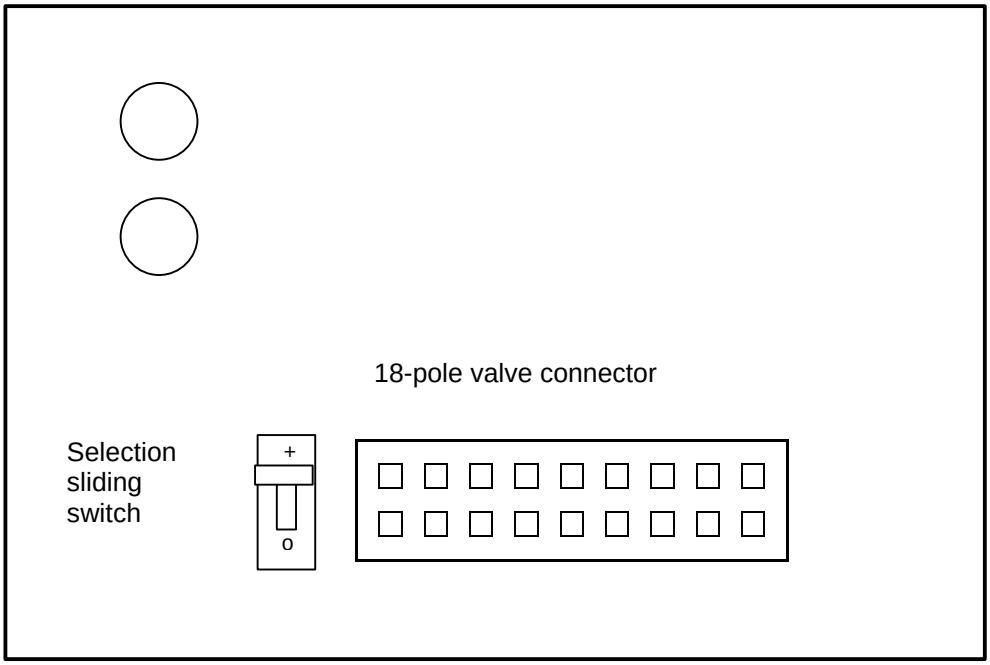
Attention:

Each address may only be assigned once per bus participant.

The address of the SI unit is set by default to 03 (left switch decimal digit, right switch single digit) and the sliding switch is set to +. The SMCB1401.GSD file must be used in this case. This type of addressing should be used because the station address on the device is then visible.

Any modification to the address using the rotary switch is only detected after the electronics are switched back on again and saved in an EEPROM. To set the rotary switch, remove the transparent plastic cover first.

A modification to the address using the bus protocol, i.e. using a class 2 Master, is immediately effective and saved in the internal EEPROM. It is not necessary to start up again. (File: SMCB1400.GSD, sliding switch on o)



Valve connection board with sliding switch for addressing mode.

5.2 Transmission speed (baud rate)

The SI unit automatically detects the baud rate specified by the PROFIBUS-DP Master. The unit supports all transmission speeds specified in the PROFIBUS-DP standard up to 12 MBit/sec.
The maximum permissible length extension of the PROFIBUS-DP network is inversely proportional to the baud rate (see technical data).

6. Installation

All installation and wiring work must be carried out with the system supply voltage switched off.

When installing PROFIBUS-DP participants, comply with the VDE provisions for cable-saving transmission systems (VDE 0113, Part 1 and EN60204, Part 1) and with the PROFIBUS guideline “Interconnection Technology for PROFIBUS”. In addition, the entire configuration must be implemented according to the “Configuration Guidelines PROFIBUS-DP/FMS”.

The valve manifold is equipped with two connectors.

- power supply (5 pole round connector)
- bus connection (9 pole D-Sub plug socket)

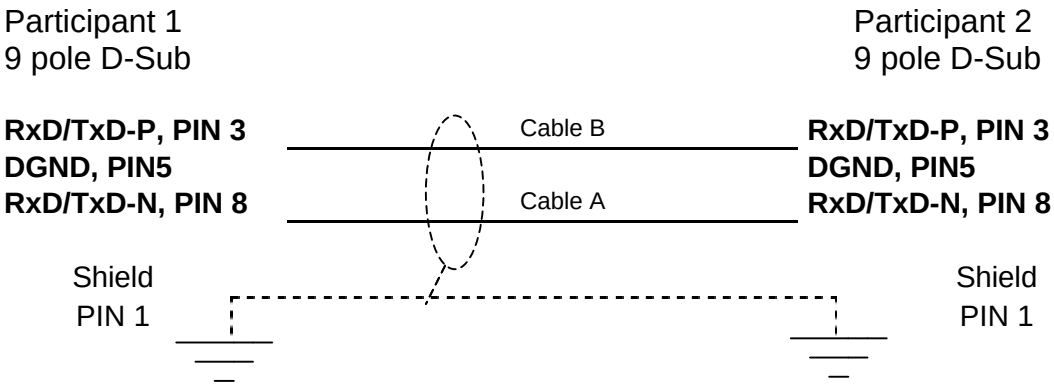
Both connectors must be connected before commissioning. The SI unit must also be connected to the valve block.

6.1 Bus connection

The connection of the bus participants can be implemented as described in Chapter 2.1, “Schematic configuration”. Please comply with the manufacturer instructions for the PLC or PC card used and with EN 50170/DIN 19245.

1. All connections must be implemented with the supply voltage switched off.
2. The SI unit and the bus cable must be located at least 200 mm away from any interference sources (e.g. power inverter) and power lines.
3. Use cable type A as recommended in the Chapter “Technical data”.
4. The bus must be terminated with terminating resistors after the last bus participant (normally a defined, switchable resistor at the bus connector).

Example: Minimum wiring with double-sided shielding between two bus participants



The two signal cables A and B must not be mixed up

6.2 Bus cable

The bus cable must be a shielded, paired two wire (twisted pair) cable as per EN 50170.

Note:
The cable shield in the D-Sub plug must be connected over a large surface with the metal collar. A single-sided earthed shield prevents interfering low frequency earth loops, but has no effect against magnetic HF interference. Pairing is effective against magnetic HF interference, but has no influence on electric HF actions. A double-sided earthed shield is effective against magnetic HF interference, but has no effect against electric HF interference. For this reason, specific recommendations cannot be provided. The applicable industrial ambient influences must be taken in account in each case.

A commercial bus cable of cable type A as per EN 50170 is recommended in general.

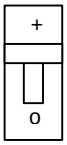
6.3 Bus termination

Both ends of the bus cable must be fitted with a termination resistor combination to avoid interfering line reflections and to ensure a defined quiescent potential. The lines are defined as closed when the termination resistance (R_t) is equal to the impedance of the line. The termination of the PROFIBUS-DP network must be implemented according to the PROFIBUS guideline “Interconnection Technology for PROFIBUS”, Chapter 3.1, or EN 50170.

6.4 Valve wiring

The solenoid valve manifold is already internally wired. It must therefore only be connected to the previously mentioned supply voltage (5 pole round connector) and the bus connection (9 pole D-Sub).

The SI unit has 16 output drivers, therefore a maximum of 16 solenoid valve coils can be actuated. The output drivers are allocated to the solenoids as described below. The 18 pole ribbon cable connector connects the SI unit with the valve block (18 pole ribbon cable for EX121 housing). The pin assignment is shown in the following diagram.



Pin No.:	1	3	5	7	9	11	13	15	17
Bit:	**1**	**3**	**5**	**7**	**9**	**11**	**13**	**15**	**0V**
	0	**2**	**4**	**6**	**8**	**10**	**12**	**14**	**0V**
Pin No.:	2	4	6	8	10	12	14	16	18

The diagram shows a top view of the 18 pole ribbon cable connector, the sliding switch is located to the left. The output drivers are numbered 0 through 15, corresponding to the bits in a word-wise allocation in the control system. Pins 17 and 18 are provided for the common ground of the solenoid valve coils.

<u>VQ series solenoid valves</u>

A solenoid valve manifold **up to 8 stations** is double-solenoid wired by default. If a double-solenoid valve is located on the first station of the valve manifold, i.e. a valve with two coils, then Coil A is controlled with Bit 0 and Coil B with Bit 1. On the valve itself, when Coil A is actuated, a red LED lights up, and when Coil B is actuated, then a green LED lights up. If station 2 has a single-solenoid valve (5/2-way valve only with Coil A), then this is actuated by Bit 2, and Bit 3/Pin 3 is not used.
Any wiring diverging from this must be specified using Option K (special wiring) in the order specifications. In a solenoid valve manifold with 16 single-solenoid valves, the coils from station 1 to 16 are assigned Bits 0 to 15. The maximum number of 16 coils must not be exceeded.

SY series solenoid valves

Double-solenoid valves in the SY series occupy two stations because of the design, i.e. each station is individually wired. The valve stations of the manifold from 1 to 16 are allocated to Bits 0 to 15 (Station 1 = Bit 0, Station 2 = Bit 1, etc.).

7. Programming

7.1 Data link layer (layer 2) and PROFIBUS-DP used Service access points

The so-called ISO/OSI reference model represents open field buses, such as PROFIBUS-DP. This model is defined in 7 layers, from layer 1 (physical layer) to layer 7 (application layer). Layer 2 (data link) is positioned on layer 1. Layers 3 to 6 are generally not used in field bus systems, therefore layer 7 is positioned directly over layer 2.
Up to 244 bytes of net data can be transmitted per telegram (+ 11 bytes for the header).

Communication

After a RESET or after voltage is restored, the Master attempts to contact all assigned Slaves in a communication sequence set from the smallest to the largest address.
The following telegram sequence is maintained during booting:

1. Diagnosis request
2. (Optional station address change, Class 2 Master only)
3. Slave parameterization
4. Slave configuration
5. Diagnosis request before data exchange to ensure that booting phase concluded correctly
6. Data Exchange
7. (Global Control)

Further, more detailed descriptions can be found in the corresponding standards.

7.2 Connection with PROFIBUS-DP Master

7.2.1 GSD file

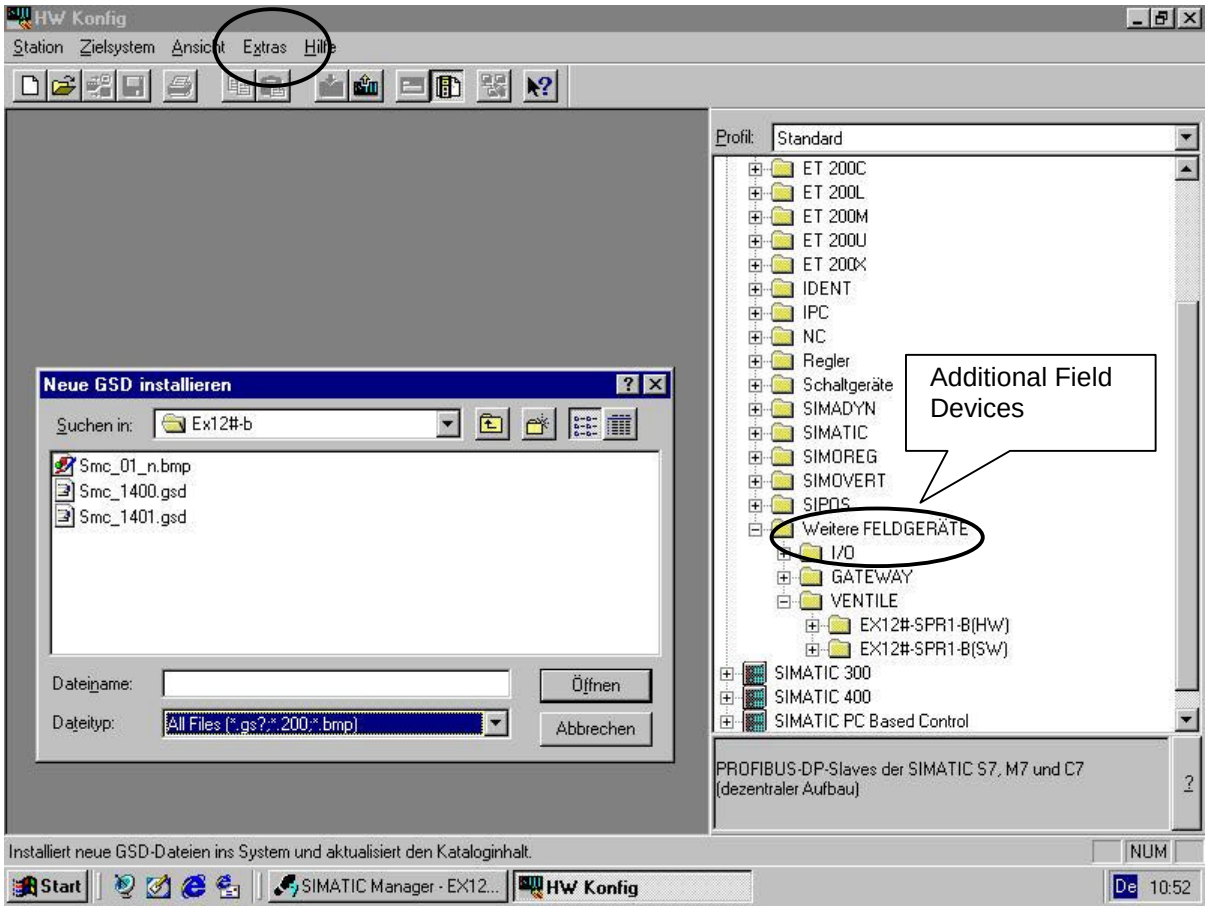
A **GSD file** (**Electronic Data Sheet** [German: “Geräte-Stamm-Datei”]) is necessary for configuring each PROFIBUS-DP participant. This file contains the specific slave data of the SI unit. The GSD file contains data such as, e.g. the number and type of I/O channels or the specification of diagnosis texts. The GSD file is certified within the framework of a PROFIBUS-DP product and must not be modified by the user (read only).

The data of the GSD file refer to the bus protocol chip used in the SI unit with the designation LSPM2 (**L**ean **S**iemens **P**rofibus **M**ultiplexer).

When the LSPM2 has received a fault-free telegram, it automatically generates the required response telegram according to EN 50170. The chip is capable of automatically detecting the baud rate set. During this search (after each RESET and each expiry of the watchdog timer) inputs and outputs are not manipulated. The LSPM2 starts the search at the highest baud rate 12 MBit/sec and works sequentially through each baud rate until it detects a fault-free telegram.

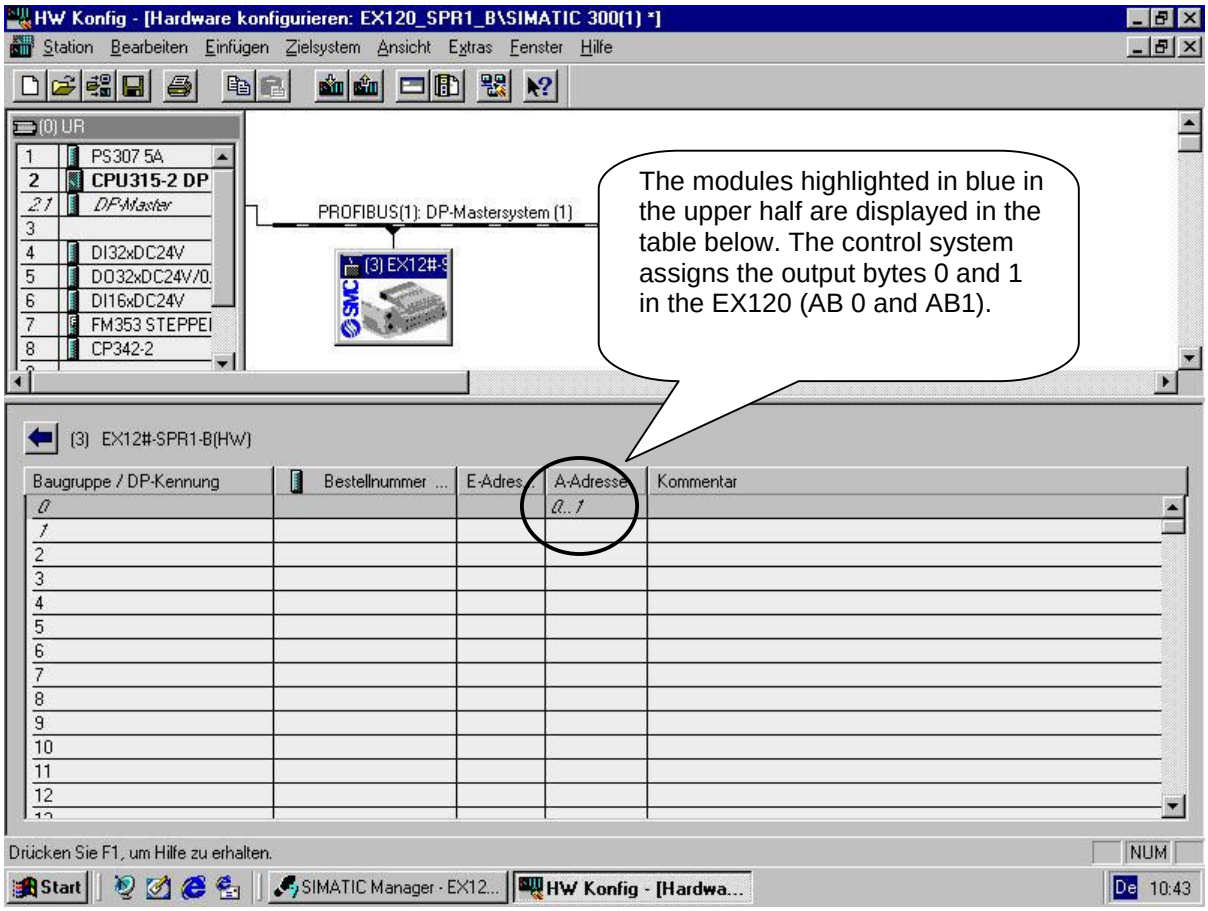
7.2.2 Configuring a PROFIBUS-DP Master

The GSD file must first be included in the programming environment of the respective automating system. This is implemented during hardware configuration in the Siemens SIMATIC Manager. The new GSD file can be installed using the menu item **Extras**.



It is also possible to copy the GSD file to a suitable directory in the configuration tool. It may then be necessary to update the hardware catalogue (here: C:\SIEMENS\STEP7\S7DATA**\GSD**).

The GSD file is now integrated in the configuration tool and a PROFIBUS-DP system can now be created and the SMC valve manifold added. This is implemented by double clicking the corresponding variant (HW or SW) in the catalogue. The SIMATIC Manager automatically provides the addresses of the input and output bytes. The Slave number selected in the hardware configuration must correspond with the number set for the SI unit and must not be assigned twice.



The solenoid valve manifold in this example has the Slave or Station number 3 and is actuated by the **output bytes 0 and 1**. In a fully assigned valve manifold, Coil A of the first station is addressed with the address **A 0.0** and the last solenoid valve coil has the address **A 1.7** (16 Bit: A0.0, A0.1...A0.7 and A1.0, A1.1...A1.7).

7.3 System reaction time

The system reaction time of a PROFIBUS-DP system depends on the following factors:

- Number of bus participants
- TSDR (the reaction time in which a participant can respond)
- the selected baud rate
- the agreed net data length
- Min_Slave_Interval (the time between two poll cycles in which a Slave can exchange data with the Master; in the LSPM2 used here, this period is **0.1 ms**)

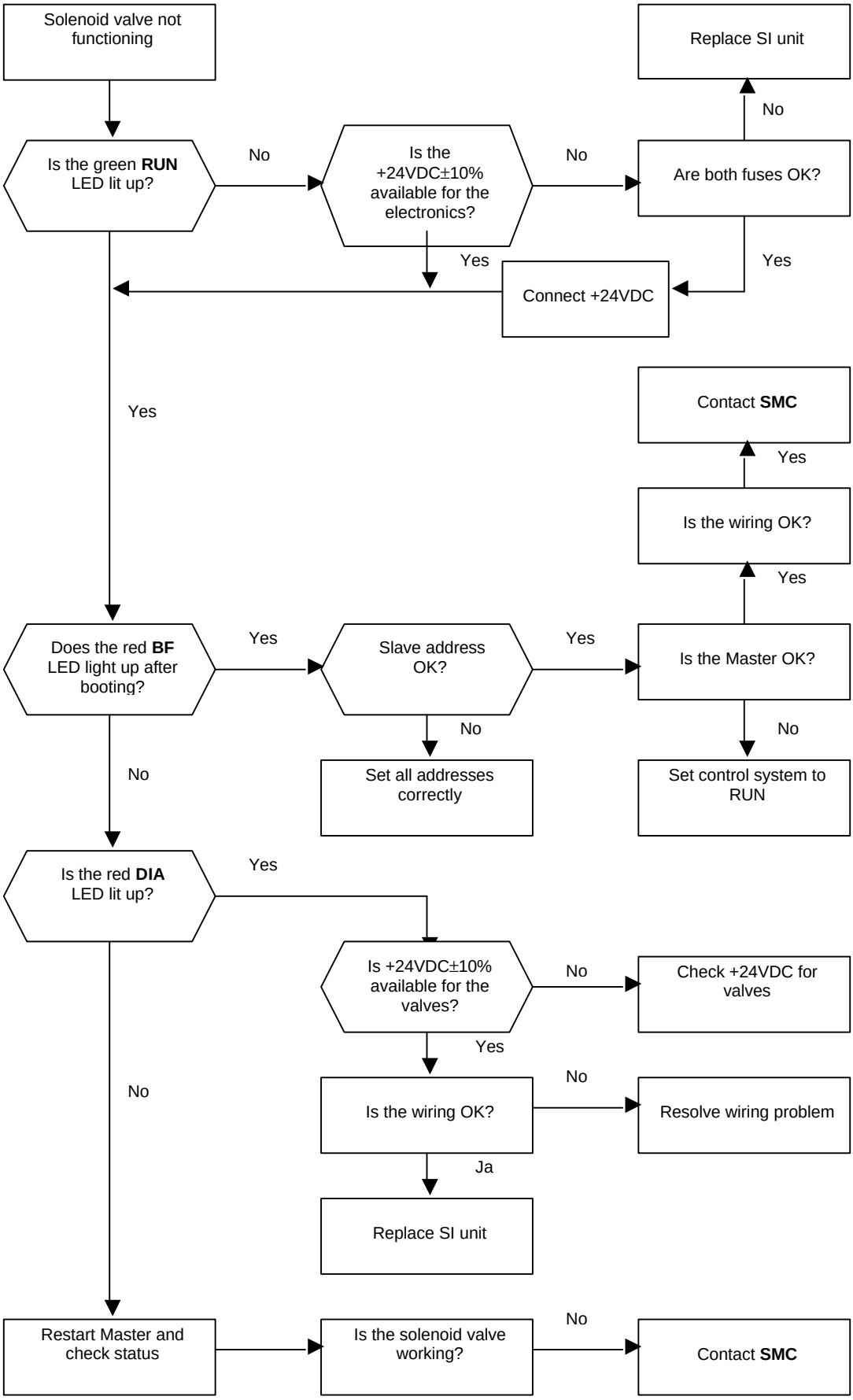
A more detailed calculation of the transmission speed can be found in standard EN 50 170 or in the appropriate specialist literature.

8. Troubleshooting

The following process flow is used in the case where a solenoid in a SI solenoid valve manifold is not working correctly. This process flow uses the three status LEDs of the SI unit. If the fault cannot be found using this method, refer to the more comprehensive diagnostic information provided by the Master (see the user manual and software description of the PLC or PC used).

General Recommendations:

- Connect new SI and check it one after the other.
- Assure +24VDC ± 10% at each SI (i.e. at the end of power supply lines) after connecting all SI-s.
- Assure different addresses of all connected SI-s.


Solenoid valve not functioning
Is the green **RUN** LED lit up?
No
Is the +24VDC±10% available for the electronics?
No
Are both fuses OK?
No
Replace SI unit
Yes
Yes
Connect +24VDC
Yes
Contact **SMC**
Yes
Is the wiring OK?
Yes
Does the red **BF** LED light up after booting?
Yes
Slave address OK?
Yes
Is the Master OK?
No
No
Set all addresses correctly
No
Set control system to RUN
No
Is the red **DIA** LED lit up?
Yes
Is +24VDC±10% available for the valves?
No
Check +24VDC for valves
Yes
No
Is the wiring OK?
No
Resolve wiring problem
Ja
Replace SI unit
Restart Master and check status
Is the solenoid valve working?
No
Contact **SMC**

9. SMC contact addresses

Germany
SMC Pneumatik GmbH
Boschring 13-15
63329 Egelsbach,
Germany
Tel: (0049) 06103/402-0

PO box 12 10
63324 Egelsbach,
Germany
Fax: (0049) 06103/402-139

Austria
SMC Pneumatik GmbH
Girakstrasse 8,
A-2100 Korneuburg
Phone: 02262-62280
Fax: 02262-62285

Greece
S. Parianopoulus S.A.
9, Konstantinoupoleos Street
GR-11855 Athens
Phone: 01-3426076
Fax: 01-3455578

Spain
SMC Espana, S.A:
Zuzobidea 14, Pol. Ind. Jundiz
E-01195 Vitoria
Phone: 945-184 100
Fax: 945-184124

Belgium
SMC Pneumatics N.V./S.A.
Nijverheidstraat 20
B-2160 Wommelgern

Phone: 03-355-1464
Fax: 03-355-1466

Portugal
SMC Espana
(Sucursal Portugal), S.A.
Rua de Eng° Ferreira Dias
452, 4100 Porto
Phone: 02-610-89-22
Fax: 02-610-89-36

Switzerland
SMC Pneumatik AG
Dorfstrasse 7, Postfach 117
CH-8484 Weisslingen

Phone: 052-396-3131
Fax: 052-396-3191

Denmark
SMC Pneumatik A/S
Knudsminde 4 B
DK-8300 Odder
Phone: +4570252900
Fax: +4570252901

Italy
SMC Italia S.p.A
Via Garibaldi 62
I-20061 Carugate, (Milano)
Phone: 02-92711
Fax: 02-92150394

UK
SMC Pneumatics (UK) Ltd
Vincent Avenue, Cronhill,
Milton Keynes, MK8 0AN
Phone: 01908-563888
Fax: 01908-561185

Finland
SMC Pneumatikka OY
Veneentekijantie 7
SF-00210 Helsinki
Phone: 09-681021
Fax: 09-6810233

Netherlands
SMC Pneumatics BV
De Ruyterkade 120
NL-1011 AB Amsterdam
Phone: 020-5318888
Fax: 020-5318880

France
SMC Pneumatique, S. A.
1, Boulevard de Strasbourg,
Parc Gustave Eiffel
Bussy Saint Georges
F-77607 Marne La Vallee
Cedex 3
Phone: 01-6476 1000
Fax: 01-6476 1010

Ireland
SMC Pneumatics Ltd.
2002 Citywest Business
Campus
Nass Road, Saggart,
Co. Dublin

Phone: 01-403 9000
Fax: 01-464 0500