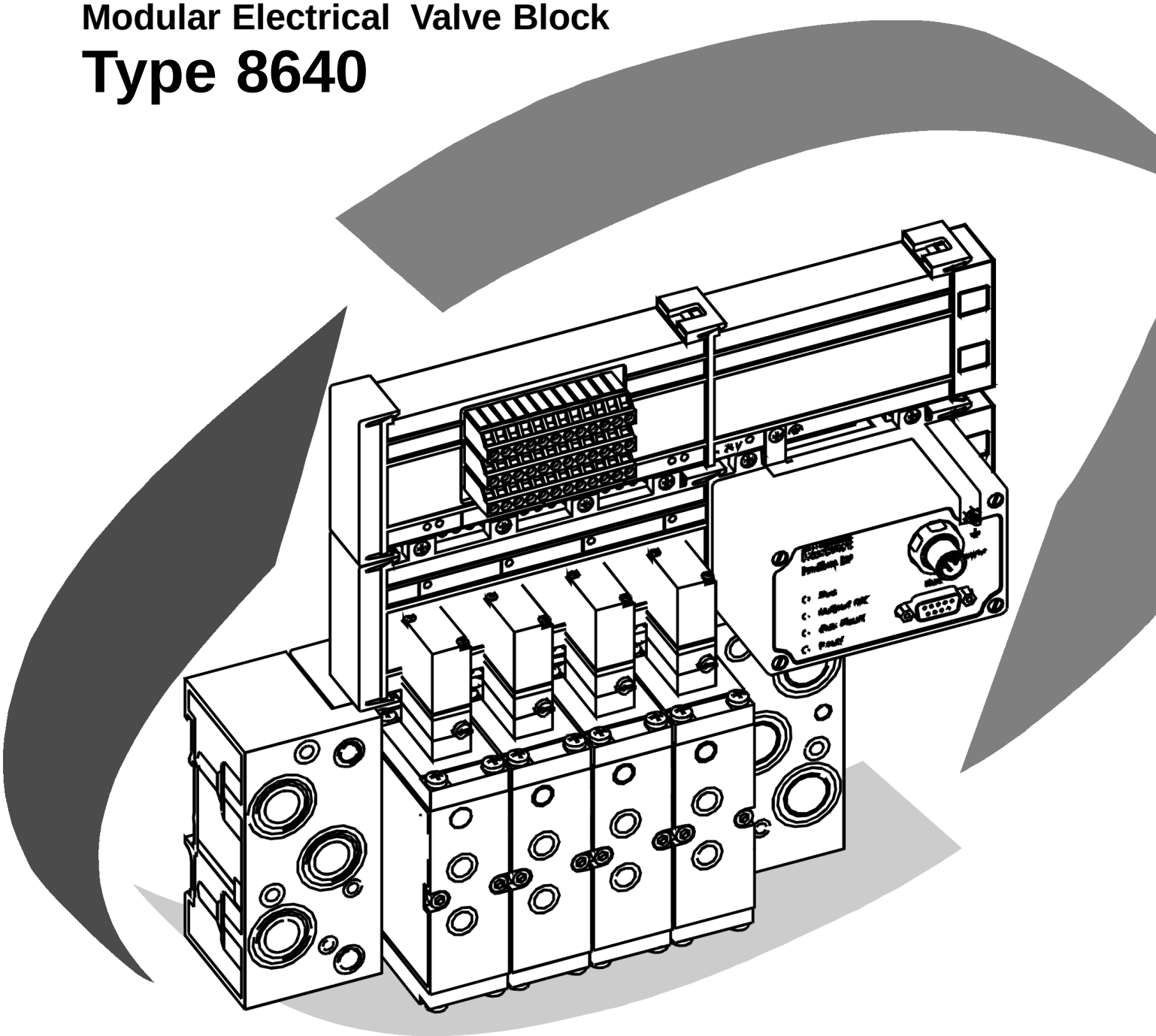
bürkert

Fluid Control Systems

Modular Electrical Valve Block

Type 8640



Operating Manual

Modular Concept - System Assembly

The valve battery is specifically designed for the customer. For optimal adaptation to the tasks, a large selection of electrical and hydraulic components are available. Fig. 1 shows the structure of a valve battery. The individual components are described in the following chapters.

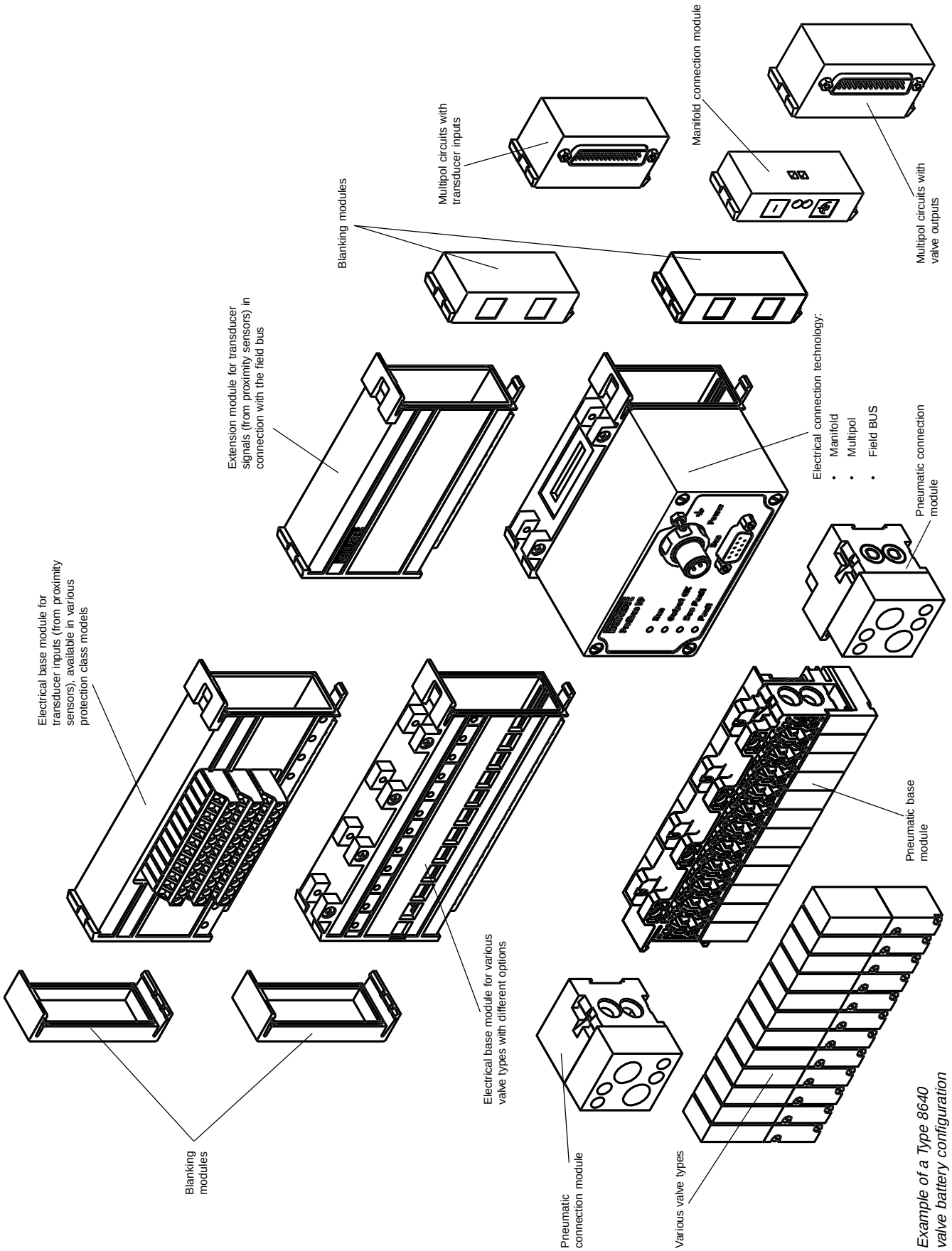


Fig. 1: Example of a Type 8640 valve battery configuration

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- have comments regarding these operating instructions

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Contents

SYMBOLS USED

In these Operating Instructions, the following symbols are used:

→ Indicates a working step that you have to carry on.

ATTENTION! Indicates information which must be followed. Failure to do this could endanger your health or the functionality of the device.

NOTE Indicates important additional information, tips and recommen-dations.

1 GENERAL SAFETY INSTRUCTIONS

To ensure that the device functions correctly, and will have a long service life, please comply with the information in these Operating Instructions, as well as the application conditions and additional data given in the Type 8640 data sheet:

- When planning the application of the device, and during its operation, observe the general technical rules!
- Observe the relevant accident prevention and safety regulations applicable for electrical equipment throughout the operation, maintenance and repair of the device!
- Always switch off the voltage supply before working on the system!
- Take suitable measures to prevent unintentional operation or impermissible impairment.
- If these instructions are ignored, no liability will be accepted from our side, and the guarantee on the device and on accessories will become invalid!

2 ASSEMBLY, COMMISSIONING AND SERVICE OF THE VALVE BATTERY

- Work on the device should only be carried out by specialist staff using the correct tools!
- Always switch off the supply voltage before carrying out repair work!
- When carrying out overhaul work, ensure that safe separation and media blocking equipment are available.
- Faults can result from soiling, short-circuits and loss of electrical power.
- When faults occur, check line connections, voltages and the operational pressure.
- Following an interruption, ensure that a defined and controlled restart of the system takes place according to the instructions.

2.1 Assembly

- The valve battery is assembled in our factory.
- Extensions to the valve battery are possible, but must only be implemented by trained personnel.

2.2 Installation

- When installing the valve battery, take the protection class into consideration. Where necessary, the valve battery must be installed in a control cabinet.
- Never in any circumstances secure the valve battery to the electrical base module! The standard rails of the pneumatic base module or the fixation holes of the pneumatic connection module are provided for this fixation.
- To guarantee the electro-magnetic compatibility (EMC), the TE connection (technical earth) must be connected to the earth potential using a cable that is a short as possible (max. length 30 cm).

2.3 Extensions

- When carrying out extensions and when operating the valve battery, ensure that the maximum permissible power input of the inputs and outputs are not exceeded (see Chapter 3: General Technical Data)!

3 GENERAL TECHNICAL DATA

NOTE

The valve battery meets the requirements of the EMC Law:

Immunity to interference	EN 50082-2
Interference radiation	EN 50081-2

Mounting dimension	**11 mm**	**19 mm**	**33 mm**
Function	C (3/2-Way) Type 6510 H (5/2-Way) Type 6511	C (3/2-Way) Type 5470 G (4/2-Way) Type 5470	C (3/2-Way) Type 6516 H (5/2-Way) Type 6517
Flow	130 l/min	300 l/m	1300 l/min
Pressure range	2,5 - 7 bar	2 - 8 bar	2 - 8 bar
Power (current)	1 Watt (42 mA)	1 Watt (42 mA), 2 Watt (84 mA)	1 Watt (42 mA), 2 Watt (84 mA)
Valve positions*	max. 24	max. 24	max. 24
Transducers*	max. 32	max. 32	max. 32
Electrical modules	6, 9, 12	2, 5, 6	2, 4
Pneumatic modules	2, 3,12	2, 3	2, 3
Protection class	IP 20 (as terminal model) IP 40	IP 20 (as terminal model) IP 65	IP 20 (as terminal model) IP 65
Ambient temperature	0 to +50°C		
Storage temperature	-20 to +60°C		
Nominal operation	Continuous operation (100 % ED)		
Operational voltage*	24 V/DC ±10%; Residual ripple at field bus interface 1 V_{SS}		
Protection classes	3 to VDE 0580		

Power consumption*

The power consumption is dependent on the type of electrical connection technology
Connection technology:

1. For the manifold connection (parallel connection technique) and Multipol interface, the power consumption depends on the type of valve used, but is. however, limited to a total current of max. 3 A. With Multipol together with transducers, an additional summed current also occurs, which must also not exceed 3 A.
2. For the field bus interface, the total current is calculated according to the formula

$$I_{complete} = I_{basic} + (n * I_{valve}) + (m * I_{transducer})$$

I_{basic}	basic current depending on the field bus	
	PROFIBUS-DP	200 mA
	INTERBUS-S	300 mA
	DeviceNet	200 mA
	Selecan	200 mA
	CANopen	200 mA
n:	number of valves	
m:	number of transducers	
I_{valve}	Rated current of the valve type	
$I_{transducer}$	Power consumption of transducer; $(m*I_{transducer})$ = max. 650 mA	

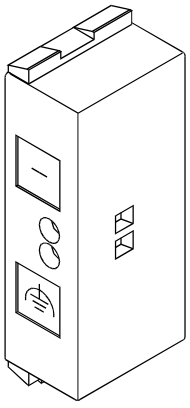
ATTENTION!

Always use low safety voltages according to protection class 3 VDE 0580!

***** For the field bus AS interface, the technical data in Section 5.6 are applicable

4 MODULES FOR CONVENTIONAL CONNECTION TECHNIQUES

4.1 Manifold connection module



Allocation plan

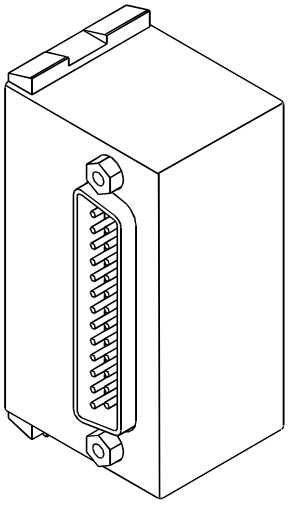
- Ground

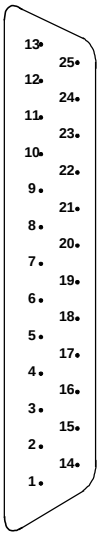
Technical earth

Fig. 2: Manifold connection module for valve outputs

The manifold connection is used as the central connection to ground and the technical earth.

4.2 Multipol circuit valve outputs





Pin 1	Valve 1
Pin 2	Valve 2
Pin 3	Valvel 3
Pin 4	Valve 4
Pin 5	Valve 5
Pin 6	Valve 6
Pin 7	Valve 7
Pin 8	Valve 8
Pin 9	Valve 9
Pin 10	Valve 10
Pin 11	Valve 11
Pin 12	Valve 12
Pin 13	Valve 13
Pin 14	Valve 14
Pin 15	Valve 15
Pin 16	Valve 16
Pin 17	Valve 17
Pin 18	Valve 18
Pin 19	Valve 19
Pin 20	Valve 20
Pin 21	Valve 21
Pin 22	Valve 22
Pin 23	Valve 23
Pin 24	Valve 24
Pin 25	Ground

Fig. 3: Multipol module for D-SUB IP 65 valve outputs and pin allocation of the plug

Accessories

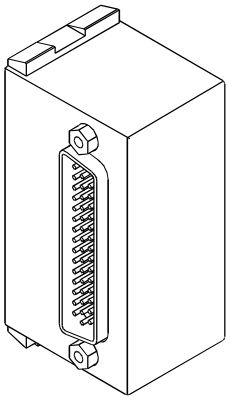
D-SUB connector	25pole	IP 65	5 m cable	Id. Nr. 917 494 H
D-SUB connector	25pole	IP 65	10 m cable	Id. Nr. 917 495 A

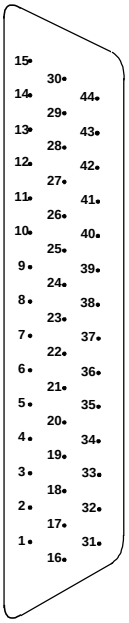
Colour codes for D-SUB cables

The wires are soldered 1:1 to the D-SUB connector, i.e., Wire 1 ws to Pin 1 D-SUB, and so on.

PIN/wire	Wirecolour	Code	PIN/wire	Wirecolour	Code
1	white	ws	14	blue/green	brgn
2	brown	br	15	white/yellow	wsge
3	green	gn	16	qellow/brown	gebr
4	yellow	ge	17	white/grey	wsgr
5	grey	gr	18	grey/brown	grbr
6	rose	rs	19	white/rose	wsrs
7	blue	bl	20	rose/brown	rsbr
8	red	rt	21	white/blue	wsbl
9	black	sw	22	brown/blue	brbl
10	violet	vi	23	white/red	wsrt
11	grey/rose	grrs	24	brown/red	brrt
12	red/blue	rtbl	25	white/black	wssw
13	white/green	wsgn			

4.3 Multipol circuit with transducer inputs (proximity sensors)





Pin 1	Input 1	Pin 20	Input 20
Pin 2	Input 2	Pin 21	Input 21
Pin 3	Input 3	Pin 22	Input 22
Pin 4	Input 4	Pin 23	Input 23
Pin 5	Input 5	Pin 24	Input 24
Pin 6	Input 6	Pin 25	Input 25
Pin 7	Input 7	Pin 26	Input 26
Pin 8	Input 8	Pin 27	Input 27
Pin 9	Input 9	Pin 28	Input 28
Pin 10	Input 10	Pin 29	Input 29
Pin 11	Input 11	Pin 30	Input 30
Pin 12	Input 12	Pin 31	Input 31
Pin 13	Input 13	Pin 32	Input 32
Pin 14	Input 14		:
Pin 15	Input 15	Pin 43	24V
Pin 16	Input 16	Pin 44	Ground
Pin 17	Input 17		
Pin 18	Input 18		
Pin 19	Input 19		

Fig. 4: Multipol module for D-SUB IP 65 transducer inputs and pin allocation of the plug

Asseccories

D-SUB connector	44polig	IP 65	5 m Kabel	Id. Nr. 917 496 B
D-SUB connector	44polig	IP 65	10 m Kabel	Id. Nr. 917 497 C

Colour codes for D-SUB cables

The wires are soldered 1:1 to the D-SUB connector, i.e., Wire 1 ws to Pin 1 D-SUB, and so on.

PIN/wire	Wirecolour	Code	PIN/wire	wirecolour	Code
1	white	ws	23	white/red	wsrt
2	brown	br	24	brown/red	brrt
3	green	gn	25	white/black	wssw
4	yellow	ge	26	brown/black	brsw
5	grey	gr	27	grey/green	grgn
6	rose	rs	28	yellow/grey	gegr
7	blue	bl	29	rose/green	rsgn
8	red	rt	30	yellow/rose	gers
9	black	sw	31	green/blue	gnbl
10	violet	vi	32	yellow/blue	gebl
11	grey/rose	grrs	33	green/red	gnrt
12	red/blue	rtbl	34	yellow/red	gert
13	white/green	wsgn	35	green/black	gnsw
14	brown/green	brgn	36	yellow/black	gesw
15	white/yellow	wsge	37	grey/blue	grbl
16	yellow/brown	gebr	38	rose/blue	rsbl
17	white/grey	wsgr	39	grey/red	grrt
18	grey/brown	grbr	40	rose/red	rsrt
19	white/rose	wsrs	41	grey/black	grsw
20	rose/brown	rsbr	42	rose/black	rssw
21	white/blue	wsbl	43	blue/black	blsw
22	brown/blue	brbl	44	red/black	rtsw

4.4 Multipol circuit with industrial connector

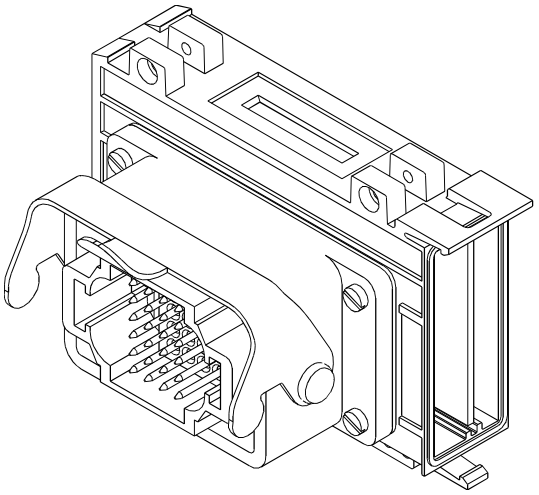
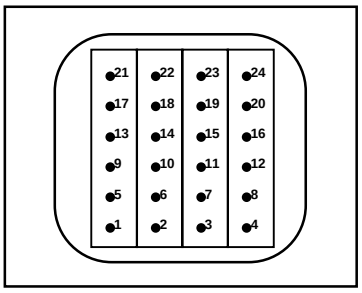


Fig. 5: Multipol module for valve inputs (max. 22) and pin allocation of the industrial connector for the valve outputs



Pin 1	Valve 1	Pin 13	Valve 13
Pin 2	Valve 2	Pin 14	Valve 14
Pin 3	Valve 3	Pin 15	Valve 15
Pin 4	Valve 4	Pin 16	Valve 16
Pin 5	Valve 5	Pin 17	Valve 17
Pin 6	Valve 6	Pin 18	Valve 18
Pin 7	Valve 7	Pin 19	Valve 19
Pin 8	Valve 8	Pin 20	Valve 20
Pin 9	Valve 9	Pin 21	Valve 21
Pin 10	Valve 10	Pin 22	Valve 22
Pin 11	Valve 11	Pin 23	Ground
Pin 12	Valve 12	Pin 24	TE

5 FIELD BUS TECHNOLOGY

5.1 PROFIBUS-DP field bus module

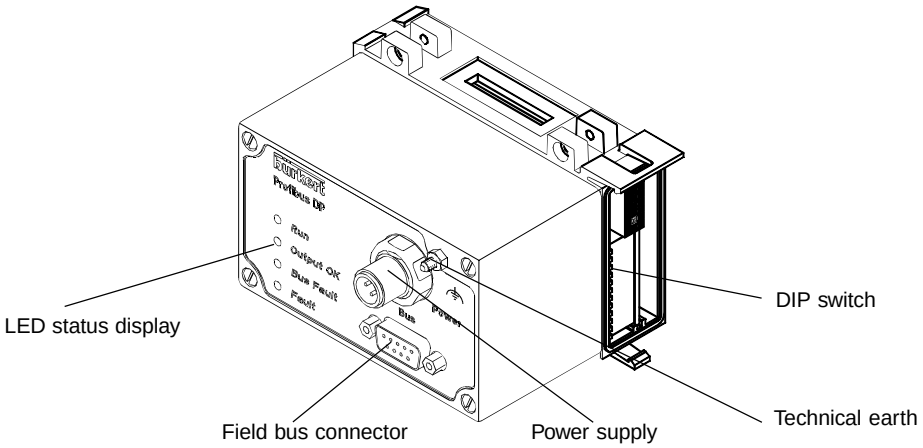
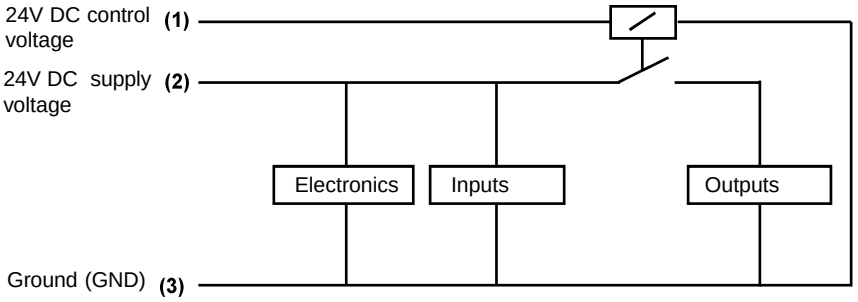


Fig. 6: General view of PROFIBUS-DP field bus module

5.1.1 Power supply

The 4-pole circular connector M12 (plug) for voltage supply is wired as follows:



Pin 1	24V DC control voltage
Pin 2	24V DC supply voltage
Pin 3	Ground (GND)
Pin 4	not used

NOTE Pin 2 of the power supply must be fused with 4A (semi-time lag).

ATTENTION!

To ensure the electro-magnetic compatibility (EMC), connect the screw terminal TE (Technical earth) to the ground potential with a cable that is a short as possible.

Accessories

Plug connector M12+1 (socket) for the power supply Order number 917116 D

5.1.2 Field bus connection

A 9-pole D-SUB connector is used for the field bus connection. The pin allocation laid down by the 19245 Standard, Part 1 is described below.

Pin No.	Signal name (socket in unit, plug on cable)	Description
1	free	-
2	free	-
3	RxD/TxD-P	Receive / Send Data-P
4	CNTR-P (RTS)	Request to Send (repeater control signal)
5	DGND	Data reference potential
6	+5V	Supply voltage-plus
7	free	-
8	RxD/TxD-N	Receive/Send Data-N
9	free	-

5.1.3 LED Status Display

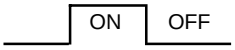
Normal status

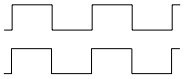
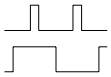
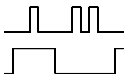
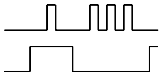
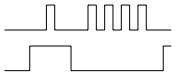
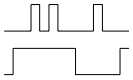
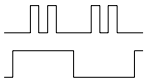
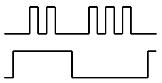
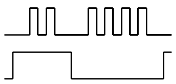
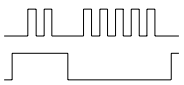
LED	Status	Description
RUN Output OK Bus Fault Fault	ON ON OFF OFF	Error-free operation of the valve battery

Power supply fault

LED	Status	Description	Cause of fault / Rectification
RUN	OFF	No voltage supplied by 24 V power supply	Check the power supply (Power supply connector Pin 2)
Output OK	OFF	No voltage supplied by the 24 V control voltage for the outputs	Check the control voltage (Power supply connector Pin 1)

Faults and warnings will be displayed by the Bus Fault and Fault LEDs

LED status 

LED	Status	Description	Cause of fault / Rectification
BusFault **Fault**	ON OFF	Response monitoring time for the valve battery has elapsed without the Master responding	**In operation:** Check Master (controller) and bus cable **During commissioning:** Check network configuration to master and station address at the valve battery
BusFault **Fault**	ON or OFF 	Fault on an extension battery, complete failure or output voltages not present	Check extension battery Power supply, RIO-BUS
BusFault **Fault**	OFF ON	RIO interface set by DIP switch (SW8), but not inserted or RIO interface faulty	Check RIO interface *
BusFault **Fault**		BusFault and Fault LEDs blinking at same rate. Station address set is outside the permitted range (0 ... 125)	Check the address at the valve battery *
BusFault **Fault**		Parameter Fault Number 1 Too many inputs for one valve battery	Check user parameters and DIP switch *
BusFault **Fault**		Parameter Fault Number 2 Too many outputs for one valve battery	Check user parameters and DIP switch *
BusFault **Fault**		Parameter Fault Number 3 Parameter telegram too small	Check user parameters and DIP switch *
BusFault **Fault**		Parameter Fault Number 4 Parameter telegram too big	Check user parameters and DIP switch *
BusFault **Fault**		Configuration Fault Number 1 Too many inputs for one valve battery	Check identifier bytes and DIP switch *
BusFault **Fault**		Configuration Fault Number 2 Too many outputs for one valve battery	Check identifier bytes and DIP switch *
BusFault **Fault**		Configuration Fault Number 3 Too few inputs for all valve batteries (default from parameter telegram)	Check identifier byte, DIP switch and user parameters *
BusFault **Fault**		Configuration Fault Number 4 Too few outputs for all valve batteries (default from parameter telegram)	Check identifier byte, DIP switch and user parameters *
BusFault **Fault**		Configuration Fault Number 5 A identifier has the wrong code	Check identifier bytes *

* After rectifying the fault, it is necessary to carry out a new start of the valve battery by temporarily disconnecting the power supply.

5.1.4 Setting the DIP switches

Using the DIP switches, you can carry out settings for the field bus module. It is located on the right-hand side, in the lower part of the bus module (see also Fig. 6). In order to access the DIP switch, remove the plugged-in termination module.

NOTE A change of the switch position only becomes active after the field bus module has been restarted.

1	2	3	4	5	6	7	8	9	10	11	12
Address of the PROFIBUS-DP-subscriber 0-125							RIO-Interface ON: aktive	Input mode		Input filter ON: aktive	Profibus address via the bus

5.1.4.1 Address of the PROFIBUS-DP subscribers: DIP switches 1 to 7

Each subscriber on the Profibus has a unique address. This address is set at the valve battery using DIP switches 1 to 7.

DIP-1	DIP-2	DIP-3	DIP-4	DIP-5	DIP-6	DIP-7	Address
OFF	OFF	OFF	OFF	OFF	OFF	OFF	0
ON	OFF	OFF	OFF	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	OFF	OFF	OFF	2
ON	ON	OFF	OFF	OFF	OFF	OFF	3
:							
OFF	OFF	ON	ON	ON	ON	ON	124
ON	OFF	ON	ON	ON	ON	ON	125

5.1.4.2 RIO interface: DIP Switch 8

You can connect extension batteries using the internal bus (RIO). If the internal bus is used, DIP switch 8 must be set to ON. The RIO interface module is inserted onto the PROFIBUS-DP field bus module (see Chapter 7).

5.1.4.3 „Inputs“ mode: DIP switches 9 and 10

NOTE Using the input mode, the inputs (transducers) can be allocated in different ways in the process layout of the inputs (PAE).

	DIP 9	DIP 10
No inputs present	OFF	OFF
Normal mode	ON	OFF
Mode: shifted inputs	OFF	ON
Mode: halved inputs	ON	ON

ATTENTION! If no inputs are present, both switches must be set to OFF.

Normal Mode

In the Normal mode, all inputs are read in from right to left.

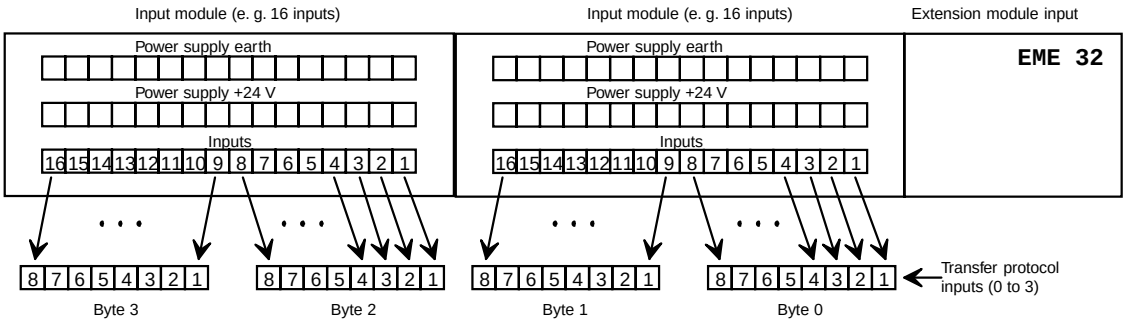


Fig. 7: Normal mode

„Shifted Inputs“ mode

In the „Shifted Inputs“ mode, the first 16 inputs are alternately set in the transfer protocol in Byte 0 and Byte 1. With the next 16 inputs, the same takes place for Byte 2 and Byte 3.

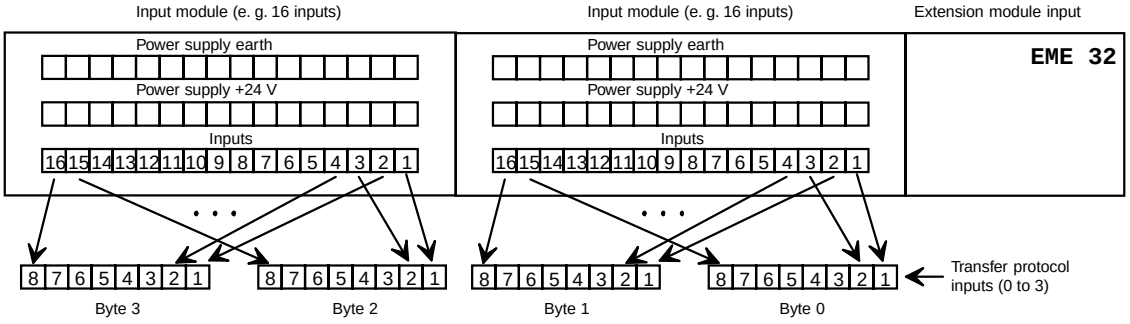


Fig. 8: „Shifted Inputs“ mode

„Halved Inputs“ mode

In the „Halved Inputs“ mode, every second input is missed out. Only inputs 1, 3, 5, ... are transferred; as a result, only 2 Bytes are needed for 32 physically-present inputs.

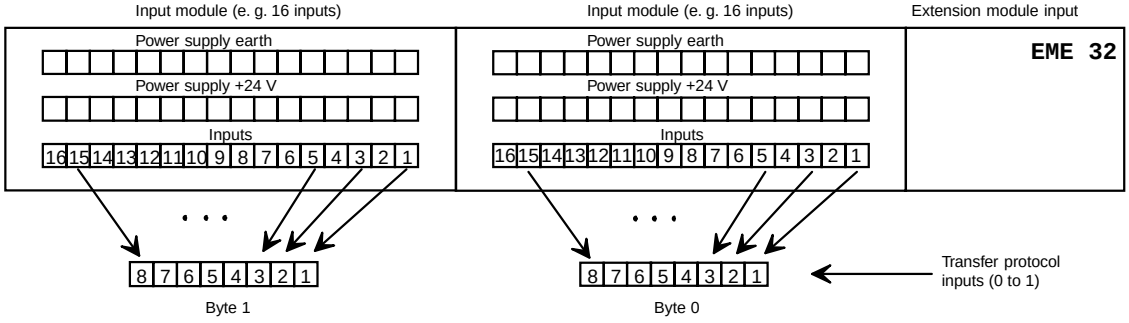


Fig. 9: „Halved Inputs“ mode

5.1.4.4 Input filter: DIP switch 11

With the input filter, disturbances are suppressed that affect the input modules. It is hence recommended to always activate this input filter.

	DIP 11
Input filter inactive	OFF
Input filter active	ON

ATTENTION!

With the filter active, only signals with a duration of ≥ 2 ms will be recognised. In order to comply with the guidelines of the EMC Act, the input filter **must** be activated.

5.1.4.5 Setting the profibus address via the bus: DIP switch 12

	DIP 12
Address via DIP switch	OFF
Address via bus	ON

By setting DIP switch 12, you set the subscriber address and some other characteristics at the valve block via the bus.

DIP switches 1 - 7 and 9 - 11 are rendered inactive.

DIP switch 8 (RIO interface) must still be set before connecting the RIO module.

With the function for changing the subscriber address (DDLM_Set_Slave_Add), the address of the valve block is set (default address: 126).

With this function the following values must be transferred:

- Current address of the slave subscriber
- New address of the slave subscriber
- Maker's number (PNO-ID)
- Block future address changes

The PNO-ID of the valve block is **0081 hex** and is usually taken by the configuration tool from the GSD file. With the setting of the new station address, user data can be transferred. In the case of the valve block, these are the settings of the input mode and the input filter.

5.1.5 Terminal resistance

In the PROFIBUS-DP, the two-wire lines of the field bus must be terminated at both ends with resistances. If the last subscriber is a valve battery, the terminal resistance can be activated through the DIP switch. The DIP switch is located on the underside of the Bus module, underneath a protective cap.

NOTE

With the high data transfer rates used in the field bus technology, there can be signal reflections at the end of the field bus branches which cause interference. This can lead to data errors. By adding terminal resistors, these reflections are suppressed.

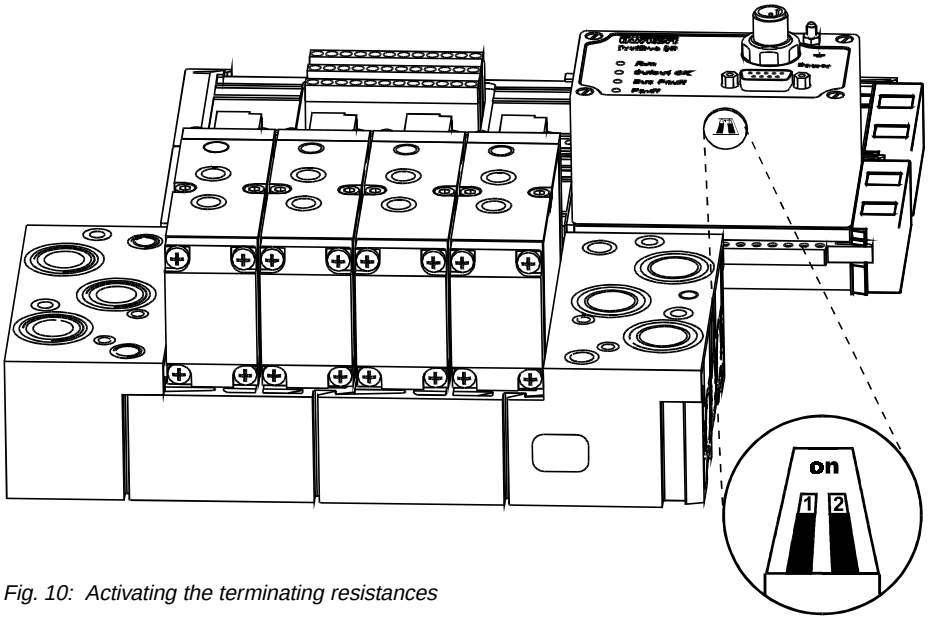


Fig. 10: Activating the terminating resistances

Activating the terminal resistors on the underside of the module

➔ Carefully remove the protective cap!

➔ Slide both switches to the rear, into the ON position!

➔ Replace the protective cap!

5.1.6 PROFIBUS-DP

The purpose of the bus system is the fast serial linkage of de-central peripherals (valve batteries) with the central Master (controller). In addition to the Input/Output data, parameter data, configuration data and diagnosis data is also transferred.
The PROFIBUS-DP is defined in the DIN 19245 T3 standard.

Many Profibus masters (controllers) need a configuration program with which the network structure is described. e.g., SIEMENS COM ET200 for the S5 controller. These programs require the unit master file (GSD file) or, as in the case of the above-mentioned Siemens controller, the Type file. Both files are stored on diskettes, and contain bus-specific data.

5.1.6.1 Extract of important data for the PROFIBUS-DP

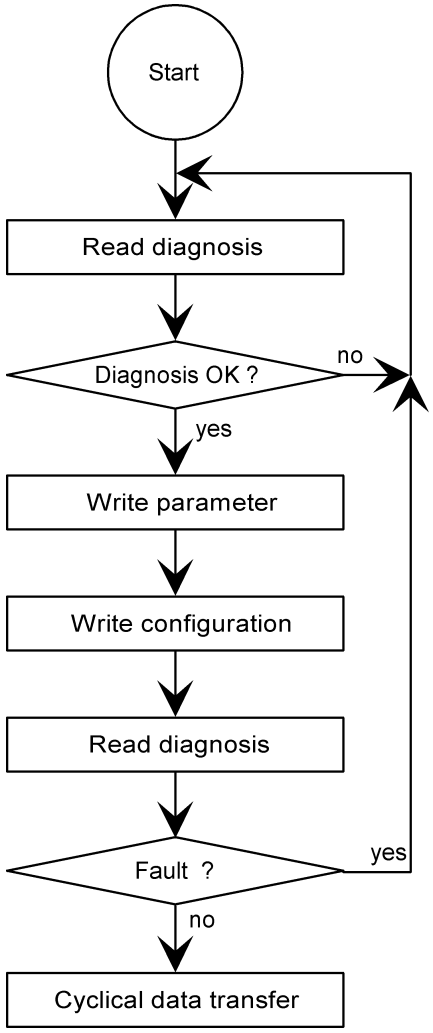
Available Baud rates: 9,6; 19,2; 93,75; 187,5; 500; 1500 kBaud

Manufacture's Number: 0081 Hex

Data quantity without RIO extension:
- 4 input and 3 output bytes
- several identifiers possible (e.g., 10H, 10H, 10H, 10H, 20H, 20H, 20H)
- no user-specific parameters

Data quantity with RIO extension:
- 4 input and 3 output bytes for each battery
- Byte or bit limits between the individual batteries
- with bit limits, user-specific parameters necessary

5.1.6.2 Simplified illustration of the PROFIBUS-DP communication procedure



Read diagnosis The diagnosis is requested until the subscriber logs on, and is not seized by another master

Master sends parametrising
- bus-specific data (e.g., response monitoring)
- user-specific parameter data (only with RIO)
  => Fault indicated in diagnosis

Master sends desired configuration
Desired configuration is compared to the actual configuration in the Slave => Fault indicated in diagnosis

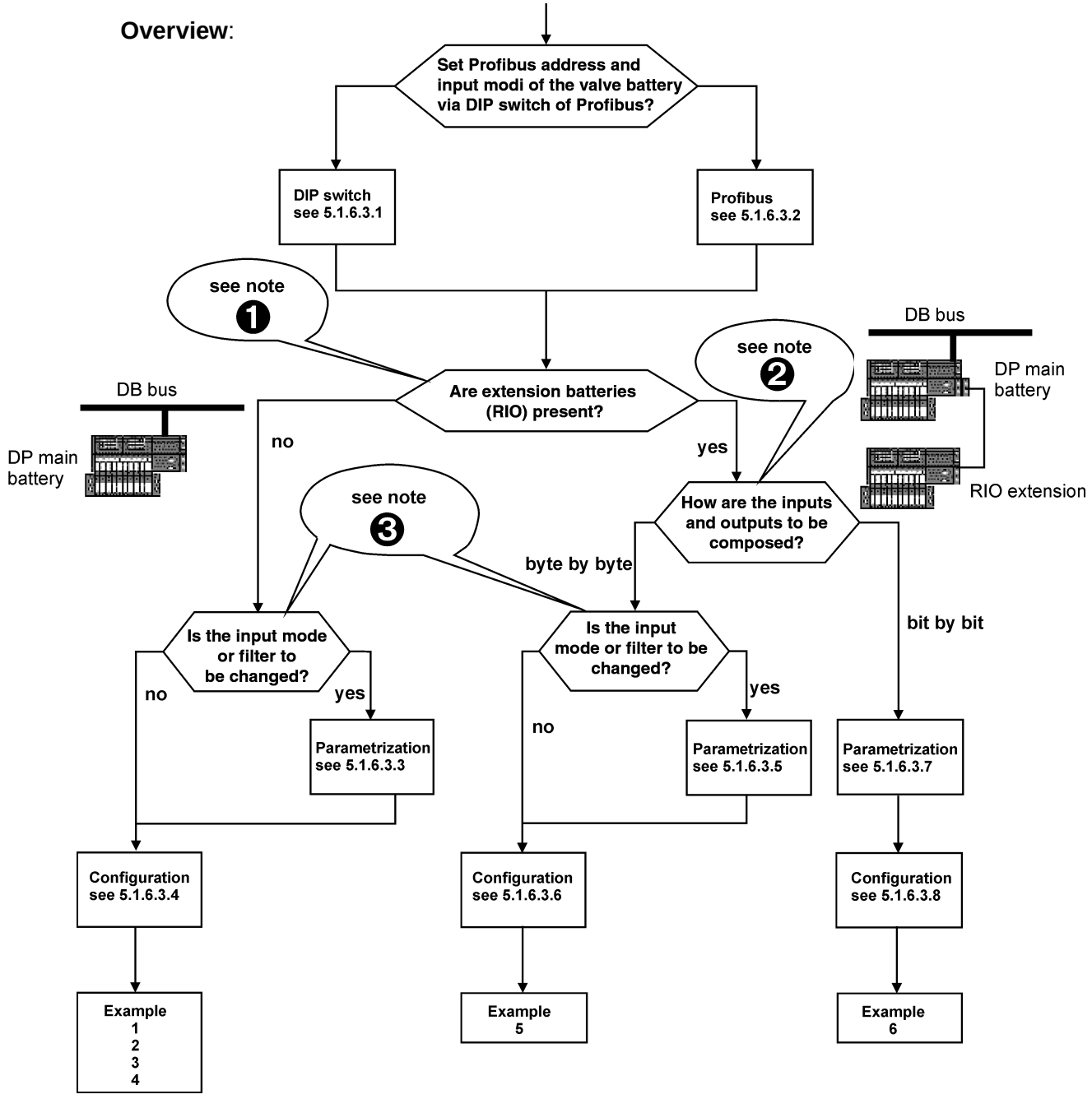
Read diagnosis Master reads diagnosis

If there is a parametrising / configuration fault, the communication restarts from the beginning.

If the Slave is in the data transfer mode, a cyclical data transfer takes place.

5.1.6.3 Commissioning

Overview:



❶ Extension batteries are connected to the valve batteries via the RIO interface.

❷ When is a bit-by-bit separation of advantage?

- If the number of inputs or outputs does not match the byte raster, byte-by-byte configuration results in unused bits. In the case of a valve battery with 4 valves and a valve battery with 10 valves, that is e.g. 10 (4+6) bits with byte-by-byte configuration, since for the first valve battery 1 byte and for the second 2 bytes are necessary. With bit-by-bit separation, the outputs can now be „pushed together“. In this way only 2 bytes are required and 2 bits remain unused.
- Through bit-by-bit concentration, the identifiers or slots (assignment in the process map) may be freely selected in the configuration telegramme.

❸ User parameters (hex parameters) are only required if the input mode or filter are to be changed.

5.1.6.3.1 Setting the Profibus address via DIP switch

DIP switch	Settings
1 - 7	Set the desired Profibus address
8	RIO interface ON / OFF
9 - 10	Set the desired input mode
11	Filter ON / OFF
12	**OFF**

NOTE

- Dip switches 9 - 11 (input mode and input filter) may also be set via the parametrization.
- If extension batteries are connected, the DIP switches must be set as in Section **6.2.4**.

5.1.6.3.2 Setting the Profibus address via Profibus

DIP-Schalter	Einstellungen
1 - 7	not active
8	RIO interface ON / OFF
9 - 10	not active
11	not active
12	**ON**

NOTE

- Dip switches 9 - 11 (input mode and input filter) may also be set via the parametrization.
- If extension batteries are connected, the DIP switches must be set as in Section **6.2.4**.
  The settings on the extension battery cannot be made via the Profibus.

The address, the input mode and the filter setting are read from the internal EEPROM. To write in the EEPROM, the special function for changing the station address of a DP slave (DDLM_Set_Slave_Add) is used.

With this function, the following values must be transferred:

- Current address of the slave subscriber
- New address of the slave subscriber
- Maker's number (PNO-ID)
- Block future address changes

The default address is 126.
The PNO-ID of the valve battery is **0081 hex** and is usually taken by the configuration tool from the GSD file.

With the setting of the new station address, user data can also be transferred, which are also stored in the EEPROM. Via these data, both the input mode and the input filter may be set.

The following user data are permissible:

Input mode	Input filter off	Input filter on
no inputs	00 hex	00 hex
normal inputs	01 hex	05 hex
staggered inputs	02 hex	06 hex
halved inputs	03 hex	07 hex

NOTE

Not all configuration tools support the transfer of user data on use of the address change function. In these cases, the user data (hex parameter, user data parameter) must be transferred during parametrization.

5.1.6.3.3 Parametrization without extension batteries (Hexparameters[1] / User_Prm_Data[2])

By parametrization, the settings chosen for the input mode and the filter **can** be changed. I.e. when you select a setting that does not correspond to the setting of DIP switches 9 - 11 or the setting in the EPROM, you can subsequently set the desired input mode and filter via the user data (hex parameter) during parametrization.

If you retain the settings according to DIP switches 9 - 11 or the values stored in the EPROM, then no user data are required.

The settings via parametrization have the highest priority.

On setting the settings in the parameter telegramme, the following values are permissible:

	Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Byte	**Busparameters** (standard parameter) 7 bytes							
1	**Lock_Rep** 00 min TSDR and slave specific data 01 release for other masters 0 block for other masters 11 release for other masters	**Unlock_Re**	**Sync_Req** Slave is operated in sync mode	**Freeze_Req** Slave is operated in freeze mode	**WD_On** Response monitoring 0:deactivated 1:activated	**reserved**	**reserved**	**reserved**
2	**WD_Fact_1**		(Range 1 - 255 Response monitoring in [s] = 10ms * WD_Fact_1 * WD_Fact_2)					
3	**WD_Fact_2**		(Range 1 - 255 Response monitoring in [s] = 10ms * WD_Fact_1 * WD_Fact_2)					
4	**TSDR**		(Time in Tbit, when the slave may reply. At least 11 Tbit, 0 old value remains)					
5	**Ident_Number high Byte**		(Maker's identifier 00 hex)					
6	**Ident_Number low Byte**		(Maker's identifier 81 hex)					
7	**Group_Ident**		(For group formation, each bit represents a group)					
	User_Prm_Data (user parameters)							
8								

Byte 8 User_Prm_Data (user parameters)

Input mode	Input filter off	Input filter on
no inputs	02 hex	42 hex
normal inputs	12 hex	52 hex
staggered inputs	22 hex	62 hex
halved inputs	32 hex	72 hex

NOTE In many configuration tools, there is no direct access to bytes 1 to 7. With Siemens (Steps 5 and 7), the parameters begin with byte 8.

[1] Siemens
[2] Standard

5.1.6.3.4 Configuration of the valve batteries without extension batteries

The settings of the desired configuration, i.e. the setting of different identifiers, is generally done with the aid of the GSD file. Up to 7 identifiers (slots) may be allocated.

With the writing of the configuration, the number of input and output bytes in the process map is set and the permissible limits checked. By using different identifiers, the user has the possibility of freely assigning the input and output bytes in the process map.

One valve battery has a maximum of 32 inputs and a maximum of 24 outputs. This corresponds to a maximum of 4 input bytes and a maximum of 3 output bytes. For this reason, there may never be configured in the process map of a valve battery more than the abovementioned number of input or output bytes.
While observing the abovementioned limits (32 inputs, 24 outputs, 4 input bytes, 3 output bytes), it is nevertheless possible to configure both fewer and more input or output bytes than are actually physically present on the valve battery.

Examples:

Physically present	Configuration	Effect
16 valves	1 byte	Only valves 1 to 8 may be communicated to
	2 byte	Valves 1 to 16 may be communicated to
	3 byte	Valves 1 to 16 may be communicated to, 1 byte in the process map is occupied but unused
	4 byte	Configuration error

Manual configuration

If no GSD file is available, manual configuration must be performed. The following data apply. A configuration telegramme may contain one or more identifiers, allowing the user to allocate them freely.

The identifiers are built up as follows:

Bit 7	Bit 6	Bit 5 - 4	Bit 3 - 0
Consistency 0 = byte/word 1 = entire length	**Bytes/words** 0 = bytes 1 = words (2 byte)	**Input/output** 00 = special identifier format 01 = input 10 = output 11 = input/output	**Length (number) of data** 0000 = 1 byte/word 0010 = 3 bytes/words : 1111 = 16 bytes/words

Examples:

Hex	Decimal	Meaning
10	016	1 byte input, consistency via byte
11	017	2 byte input, consistency via byte
12	018	3 byte input, consistency via byte
13	019	4 byte input, consistency via byte
20	032	1 byte output, consistency via byte
21	033	2 byte output, consistency via byte
22	034	3 byte output, consistency via byte
00	000	Reserve (blank)

Example 1: Valve battery with 16 valves (outputs) and 32 transducers (inputs)

- PROFIBUS-DP addresses 4
- Valves 1 - 16 occupy „Outputs“ (PAA) Byte 11-12 in the process image
- Transducers 1 - 32 occupy „Inputs“ (PAE) Byte 20-23 in the process image
- Mode: Normal input mode
- Input filter active

DIP Switch:

1	2	3	4	5	6	7	8	9	10	11	12
OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF

Configuration:

	Standard	Siemens
Byte number (Slot)	1 (0)	2 (1)
Identification in Hex (Dez)	13 (019)	21 (033)
Process image output (PAA)		11-12
Process image input (PAE)	20-23	

Allocation of Inputs and Outputs to the Controller Process Image

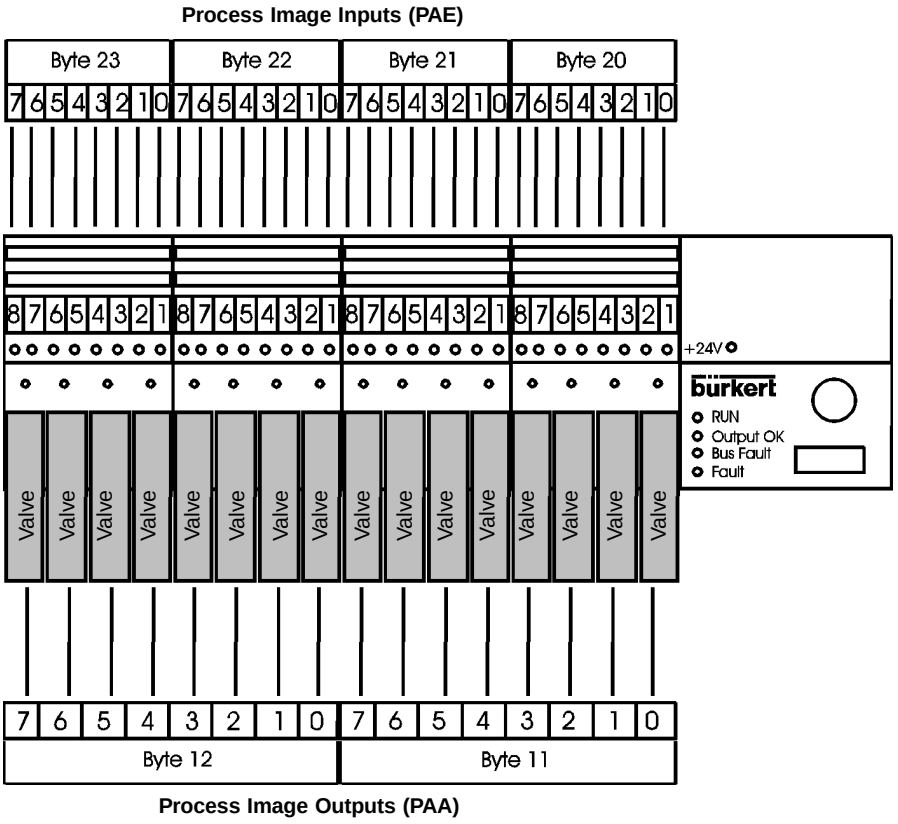


Fig. 11: Allocation of Inputs and Outputs to the Controller Process Image

Example 2: Valve battery with 16 valves (outputs) and 32 transducers (inputs)

- PROFIBUS-DP address 5
- Valves 1 - 8 occupy „Outputs“ (PAA) Byte 11 in the process image
- Valves 9 - 16 occupy „Outputs“ (PAA) Byte 20 in the process image
- Transducers 1 - 8 occupy „Inputs“ (PAE) Byte 10 in the process image
- Transducers 9 - 16 occupy „Inputs“ (PAE) Byte 15 in the process image
- Transducers 17 - 32 occupy „Inputs“ (PAE) Byte 20-21 in the process image
- Mode: Normal input mode
- Input filter active

DIP-Switch:

1	2	3	4	5	6	7	8	9	10	11	12
ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF

Configuration:

Standard
Siemens

Byte number (Slot)	1 (0)	2 (1)	3 (2)	4 (3)	5 (4)
Identification in Hex (Dez)	10 (016)	10 (016)	11 (017)	20 (032)	20 (032)
Process image output (PAA)				11	20
Process image input (PAE)	10	15	20-21		

Allocation of Inputs and Outputs to the Controller Process Image

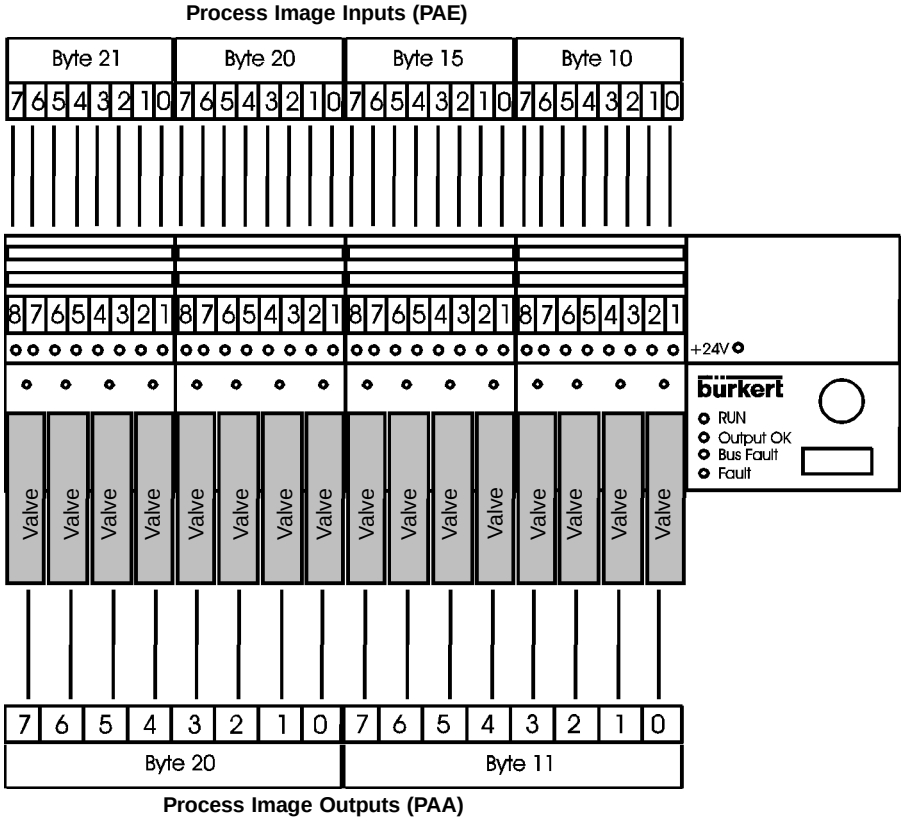


Fig. 12: Allocation of Inputs and Outputs to the Controller Process Image

Example 3: Valve battery with 16 valves (outputs) and 32 transducers (inputs)

- PROFIBUS-DP address 6
- Valves 1 - 16 occupy „Outputs“ (PAA) Byte 11 + 12 in the process image
- Transducers 1, 3, 5...15 occupy „Inputs“ (PAE) Byte 10 in the process image
- Transducers 2, 4, 6, ..16 occupy „Inputs“ (PAE) Byte 16 in the process image
- Transducers 17, 19, .. 31 occupy „Inputs“ (PAE) Byte 11 in the process image
- Transducers 18, 20, .. 32 occupy „Inputs“ (PAE) Byte 17 in the process image
- Mode: „Shifted Inputs“
- Input filter active

DIP Switch:

1	2	3	4	5	6	7	8	9	10	11	12
OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF

Configuration:

	Standard / Siemens				
Byte number (Slot)	1 (0)	2 (1)	3 (2)	4 (3)	5 (4)
Identification in Hex (Dez)	10 (016)	10 (016)	10 (016)	10 (016)	21 (032)
Process image output (PAA)					11-12
Process image input (PAE)	10	16	11	17	

Allocation of Inputs and Outputs to the Controller Process Image

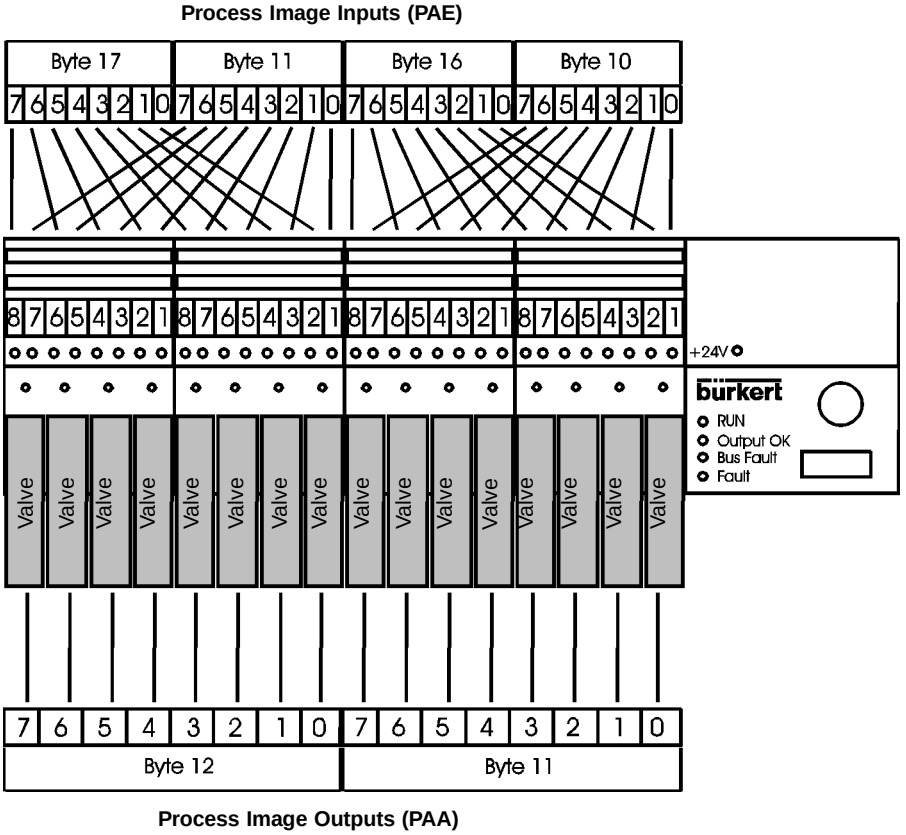


Fig. 13: Allocation of Inputs and Outputs to the Controller Process Image

Example 4: Valve battery with 16 valves (outputs) and 32 transducers (inputs) Every second transducer will not be considered

- PROFIBUS-DP address 7
- Valves 1 - 8 occupy Outputs (PAA) Byte 17 in the process image
- Valves 9 - 16 occupy Outputs (PAA) Byte 10 in the process image
- Transducers 1, 3, 5,..15 occupy „Inputs“ (PAE) Byte 18 in the process image
- Transducers 17, 19, .. 31 occupy „Inputs“ (PAE) Byte 21 in the process image
- Mode: „Halved Inputs“
- Input filter active

DIP Switch:

1	2	3	4	5	6	7	8	9	10	11	12
ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF

Configuration:

Standard
Siemens

Byte number (Slot)	1 (0)	2 (1)	3 (2)	4 (3)
Identification in Hex (Dez)	10 (016)	10 (016)	20 (032)	20 (032)
Process image output (PAA)			17	10
Process image input (PAE)	18	21		

Allocation of Inputs and Outputs to the Controller Process Image

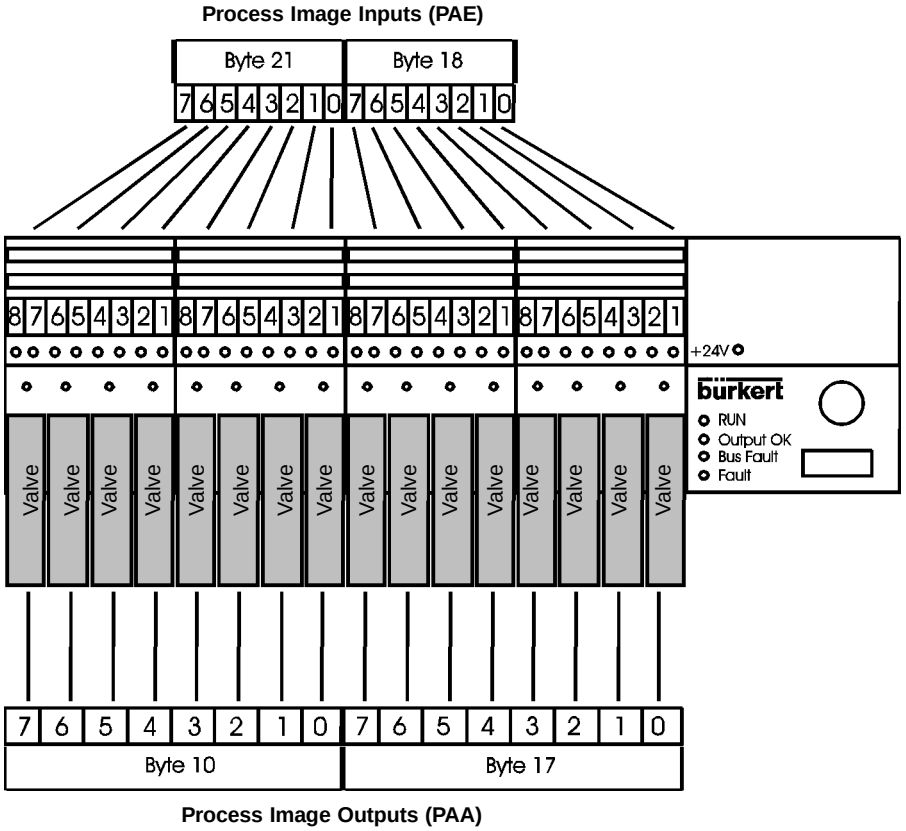


Fig. 14: Allocation of Inputs and Outputs to the Controller Process Image

5.1.6.3.5 Parametrization of the valve batteries with extension battery(ies) - byte-by-byte composition of the inputs and outputs

By parametrization, the settings chosen for the input mode and the input filter of the **main valve battery can** be changed. I.e. if you wish to select a setting that does not correspond to the setting of DIP switches 9 - 11 or the setting in the EEPROM, you can afterwards still set the input mode and the input filter desired through the user data (hex parameters) during parametrization.

Furthermore, you can adjust the length of the device-related diagnosis, whereby the long diagnosis makes sense only when using more than 4 extension batteries.

User data (user parameters) are unnecessary if you retain the settings of DIP switches 9 - 11 or the values deposited in the EEPROM.

The settings via parametrization have the highest priority.

On making the settings, the following user data are permissible:

- without change of the input mode / filter

	short diagnosis	long diagnosis
Byte-by-byte composition	----	80 hex

- with change of the input mode / filter

Input mode	Input filter OFF	Input filter ON	Input filter OFF long diagnosis	Input filter ON long diagnosis
No inputs	03 hex	43 hex	83 hex	C3 hex
Normal inputs	13 hex	53 hex	93 hex	D3 hex
Staggered inputs	23 hex	63 hex	A3 hex	E3 hex
Halved inputs	33 hex	73 hex	B3 hex	F3 hex

5.1.6.3.6 Configuration of the valve batteries with extension battery (ies) - byte-by-byte composition of the inputs and outputs

The settings of the desired configuration, i.e. the setting of different identifiers, is generally done with the aid of the GSD file. Up to 18 identifiers (slots) may be allocated.

Each extension battery begins with a new byte in the process map. For the main battery and each extension battery, 2 identifiers are used, i.e. in the case of byte-by byte configuration, the identifiers of one valve batteriy must be connected.

Each valve battery can be configured with 4 input bytes and 3 output bytes. If no inputs or outputs are present on a valve battery, the identifier 0 (blank) is entered.

Manual configuration

If no GSD file is available, manual configuration must be performed. The following data apply.

The identifiers are built up as follows:

Bit 7	Bit 6	Bit 5 - 4	Bit 3 - 0
Consistency 0 = byte/word 1 = entire length	**Bytes/words** 0 = bytes 1 = words (2 byte)	**Input/output** 00 = special identifier format 01 = input 10 = output 11 = input/output	**Length (number) of data** 0000 = 1 byte/word 0010 = 3 bytes/words : 1111 = 16 bytes/words

Examples:

Hex	Decimal	Meaning
10	016	1 byte input, consistency via byte
11	017	2 byte input, consistency via byte
12	018	3 byte input, consistency via byte
13	019	4 byte input, consistency via byte
20	032	1 byte output, consistency via byte
21	033	2 byte output, consistency via byte
22	034	3 byte output, consistency via byte
00	000	Reserve (blank)

Configuration:

Identifier (slot)	Function	Valve battery
1 (0)	Inputs	Main battery
2 (1)	Outputs	
3 (2)	Inputs	Extension battery 0 (DIP switch on eb 0; S1=OFF, S2=OFF,S3=OFF)
4 (3)	Outputs	
5 (4)	Inputs	Extension battery 1 (DIP switch on eb 1; S1=ON, S2=OFF,S3=OFF)
6 (5)	Outputs	
7 (6)	Inputs	Extension battery 2 (DIP switch on eb 2; S1=OFF, S2=ON,S3=OFF)
8 (7)	Outputs	
9 (8)	Inputs	Extension battery 3 (DIP switch on eb 3; S1=ON, S2=ON,S3=OFF)
10 (9)	Outputs	
11 (10)	Inputs	Extension battery 4 (DIP switch on eb 4; S1=OFF, S2=OFF,S3=ON)
12 (11)	Outputs	
13 (12)	Inputs	Extension battery 5 (DIP switch on eb 5; S1=ON, S2=OFF,S3=ON)
14 (13)	Outputs	
15 (14)	Inputs	Extension battery 6 (DIP switch on eb 6; S1=OFF, S2=ON,S3=ON)
16 (15)	Outputs	
17 (16)	Inputs	Extension battery 7 (DIP switch on eb 7; S1=ON, S2=ON,S3=ON)
18 (17)	Outputs	

Siemens

Standard

Extension battery

Example 5: Main valve battery and 3 extension batteries
Main battery with 8 valves (outputs) and 16 transducers (inputs)

- PROFIBUS-DP address 8
- Valves 1 - 8 occupy Outputs (PAA) Byte 30 in the process image
- Transducers 1 - 16 occupy „Inputs“ (PAE) Byte 15+16 in the process image
- Mode: normal input mode
- Input filter active
- RIO interface

DIP Switch on Main Battery:

1	2	3	4	5	6	7	8	9	10	11	12
OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	ON	OFF	ON	OFF

Extension battery 0 with 8 valves (outputs) and 16 transducers (inputs)

- Address 0 (extension battery 0 always has the Address 0)
- Valves 1 - 8 occupy Outputs (PAA) Byte 12 in the process image
- Transducers 1 - 16 occupy „Inputs“ (PAE) Byte 20+21 in the process image
- Mode: normal input mode
- Input filter active

DIP Switch on extension Battery 0:

1	2	3	4	5	6	7	8	9	10	11	12
OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	ON	OFF	ON	OFF

Extension battery 1 with 8 valves (outputs) and 16 transducers (inputs)

- Address 1 (extension battery 1 always has the Address 1)
- Valves 1 - 8 occupy Outputs (PAA) Byte 15 in the process image
- Transducers 1 - 16 occupy „Inputs“ (PAE) Byte 17+18 in the process image
- Mode: normal input mode
- Input filter active

DIP Switch on extension Battery 1:

1	2	3	4	5	6	7	8	9	10	11	12
ON	OFF	OFF	ON	OFF	OFF	ON	OFF	ON	OFF	ON	OFF

Extension battery 2 with 8 valves (outputs) and 16 transducers (inputs)

- Address 2 (extension battery 2 always has the Address 2)
- Valves 1 - 8 occupy Outputs (PAA) Byte 16 in the process image
- Transducers 1 - 16 occupy „Inputs“ (PAE) Byte 22+23 in the process image
- Mode: normal input mode
- Input filter active

DIP Switch on extension Battery 2:

1	2	3	4	5	6	7	8	9	10	11	12
OFF	ON	OFF	ON	OFF	OFF	ON	OFF	ON	OFF	ON	OFF

Configuration

Byte number (Slot)	1 (0)	2 (1)	3 (2)	4 (3)	5 (4)	6 (5)	7 (6)	8 (7)
Identification in Hex (Dec)	11(017)	20(032)	11(017)	20(032)	11(017)	20(032)	11(017)	20(032)
Process image output (PAA)		30		12		15		16
Process image input (PAE)	15+16		20+21		17+18		22+23	
	Main battery		Extension battery 0		Extension battery 1		Extension battery 2	

Allocation of Inputs and Outputs to the Controller Process Image

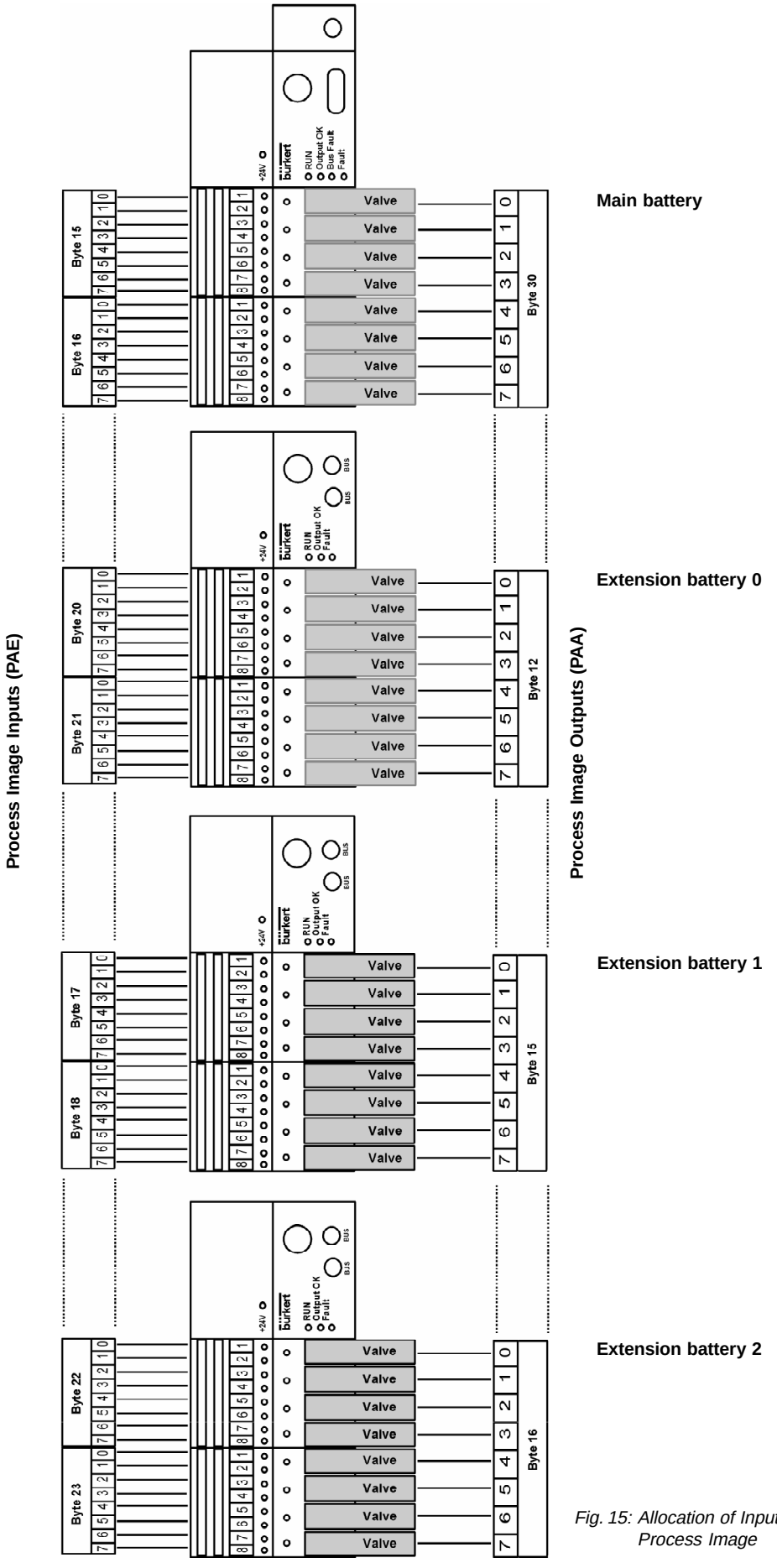


Fig. 15: Allocation of Inputs and Outputs to the Controller Process Image

5.1.6.3.7 Parametrization of the valve battery with extension batteries (hex parameters[1] / User_Prm_Data[2]) - bit-by-bit composition of the inputs and outputs

In the bit-by-bit composition of the inputs and outputs it is absolutely necessary to transfer the user data (hex parameters) through parametrization.

Minimum data, apart from the setting of the composition, are details of how many inputs and outputs are present on the main battery, extension battery 0, etc.

The length of the device-related diagnosis may be set, whereby the long diagnosis is of importance only on using more than four extension battery.

Furthermore, the settings chosen on the **main battery** for the input mode and the input filter **can** be changed. I.e. if you wish to select a setting that does not correspond to the setting of DIP switches 9 - 11 or the setting in the EPROM, you can subsequently set the desired input mode and filter via the user data (hex parameters) during parametrization.

NOTE In many configuration tools, there is no direct access to bytes 1 through 7. With Siemens (Steps 5 and 7), the parameters (hex parameters) begin with byte 8.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte	**Bus parameters** (standard parameters) 7 bytes							
1	**Lock_Rep** 00 min TSDR and slave specific data 01 release for other masters 0 block for other masters 11 release for other masters	**Unlock_Re**	**Sync_Req** Slave is operated in sync mode	**Freeze_Req** Slave is operated in freeze mode	**WD_On** Response monitoring 0:deactivated 1:activated	**reserved**	**reserved**	**reserved**
2	**WD_Fact_1**		(Range 1 - 255 Response monitoring in [s] = 10ms * WD_Fact_1 * WD_Fact_2)					
3	**WD_Fact_2**		(Range 1 - 255 Response monitoring in [s] = 10ms * WD_Fact_1 * WD_Fact_2)					
4	**TSDR**		(Time in Tbit, when the slave may reply. At least 11 Tbit, 0 old value remains)					
5	**Ident_Number high Byte**		(Maker's identifier 00 hex)					
6	**Ident_Number low Byte**		(Maker's identifier 81 hex)					
7	**Group_Ident**		(For group formation, each bit represents a group)					

[1] Siemens
[2] Norm

On making the settings in the parameter telegramme, the following values are permissible:

Byte no.	Description	
8 (0)	Input mode / input filter / diagnosis	see below
9 (1)	No. of bits, inputs, main battery	
10 (2)	No. of bits, outputs, main battery	
11 (3)	No. of bits, inputs, extension battery 0	DIP switch on eb 0: S1=OFF, S2=OFF, S3=OFF
12 (4)	No. of bits, outputs, extension battery 0	
13 (5)	No. of bits, inputs, extension battery 1	DIP switch on eb 1: S1=ON, S2=OFF, S3=OFF
14 (6)	No. of bits, outputs, extension battery 1	
15 (7)	No. of bits, inputs, extension battery 2	DIP switch on eb 2: S1=OFF, S2=ON, S3=OFF
16 (8)	No. of bits, outputs, extension battery 2	
17 (9)	No. of bits, inputs, extension battery 3	DIP switch on eb 3: S1=ON, S2=ON, S3=OFF
18 (10)	No. of bits, outputs, extension battery 3	
19 (11)	No. of bits, inputs, extension battery 4	DIP switch on eb 4: S1=OFF, S2=OFF, S3=ON
20 (12)	No. of bits, outputs, extension battery 4	
21 (13)	No. of bits, inputs, extension battery 5	DIP switch on eb 5: S1=ON, S2=OFF, S3=ON
22 (14)	No. of bits, outputs, extension battery 5	
23 (15)	No. of bits, inputs, extension battery 6	DIP switch on eb 6: S1=OFF, S2=ON, S3=ON
24 (16)	No. of bits, outputs, extension battery 6	
25 (17)	No. of bits, inputs, extension battery 7	DIP switch on eb 7: S1=ON, S2=ON, S3=ON
26 (18)	No. of bits, outputs, extension battery 7	

Siemens

Standard

extension battery

Byte 8 (0)

Byte 8 (0) must be looked at more closely. It is of decisive impotance whether the input mode and filter are retained according to the settings by DIP switch or EEPROM, or whether a further change is to be made during parametrization.

- without change of the input mode / filter

	Short diagnosis	Long diagnosis
Bit-by-bit composition	01 hex	81 hex

- with change of the input mode / filter

Input mode	Input filter OFF	Input filter ON	Input filter OFF long diagnosis	Input filter ON long diagnosis
No inputs	03 hex	43 hex	83 hex	C3 hex
Normal inputs	13 hex	53 hex	93 hex	D3 hex
Staggered inputs	23 hex	63 hex	A3 hex	E3 hex
Halved inputs	33 hex	73 hex	B3 hex	F3 hex

5.1.6.3.8 Configuration of the valve batteries with extension battery (ies) - bit-by-bit composition of the inputs and outputs

The settings of the desired configuration, i.e. the setting of different identifiers, is generally done with the aid of the GSD file.

By using different identifiers, the user has the possibility of freely assigning the input and output bytes in the process map. The identifiers are independent batteries individual valve batteries.

The inputs or outputs are composed from the main battery and the extension batteries of one bit stream each according to the parametrization (previous chapter). Via the identifiers, the bytes can be distributed accordingly in the process map.

Example with inputs:

Main battery	4 bit inputs
Extension battery 0	12 bit inputs
Extension battery 1	6 bit inputs
U = unused bit	

Bit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Assignment	Main battery				Extension battery 0												Extension battery 1						U	U
Identifier	24DE (12 hex)																							

or

Bit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Assignment	Main battery				Extension battery 0												Extension battery 1						U	U
Identifier	8DE (10 hex)								16DE (11 hex)															

or

Bit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Assignment	Main battery				Extension battery 0												Extension battery 1						U	U
Identifier	16DE (11 hex)																8DE (10 hex)							

or

Bit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Assignment	Main battery				Extension battery 0												Extension battery 1						U	U
Identifier	8DE (10 hex)								8DE (10 hex)								8DE (10 hex)							

The same procedure is followed with the outputs

Manual Configuration

If no GSD file is available, manual configuration must be performed. The following data apply. A configuration telegramme may contain one or more identifiers, allowing the user to allocate them freely.

The identifiers are built up as follows:

Bit 7	Bit 6	Bit 5 - 4	Bit 3 - 0
Consistency 0 = byte/word 1 = entire length	**Bytes/words** 0 = bytes 1 = words (2 byte)	**Input/output** 00 = special identifier format 01 = input 10 = output 11 = input/output	**Length (number) of data** 0000 = 1 byte/word 0010 = 3 bytes/words : 1111 = 16 bytes/words

Examples:

Hex	Decimal	Meaning
10	016	1 byte input, consistency via byte
11	017	2 byte input, consistency via byte
12	018	3 byte input, consistency via byte
13	019	4 byte input, consistency via byte
20	032	1 byte output, consistency via byte
21	033	2 byte output, consistency via byte
22	034	3 byte output, consistency via byte
00	000	Reserve (blank)

Example 6: Main valve battery with 3 extension batteries
Main battery with 3 valves (outputs) and 3 transducers (inputs);
every second transducer signal will not be considered

- PROFIBUS-DP address 9
- Mode: „Halved Inputs“
- Input filter active
- RIO interface

DIP Switch on Main Battery:

1	2	3	4	5	6	7	8	9	10	11	12
ON	OFF	OFF	ON	OFF	OFF	OFF	ON	ON	ON	ON	OFF

Extension battery 0 with 4 valves (outputs) and no transducers (inputs)

- Address 0 (extension battery 0 always has the Address 0)

DIP Switch on extension Battery 0:

1	2	3	4	5	6	7	8	9	10	11	12
OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF

Extension battery 1 with 2 valves (outputs) and 4 transducers (inputs)

- Address 1 (extension battery 1 always has the Address 1)
- Mode: normal input mode
- Input filter active

DIP Switch on extension Battery 1:

1	2	3	4	5	6	7	8	9	10	11	12
ON	OFF	OFF	ON	OFF	OFF	ON	OFF	ON	OFF	ON	OFF

Extension battery 2 with 3 valves (outputs) and 6 transducers (inputs);

every second transducer signal will not be considered

- Address 2 (extension battery 2 always has the Address 2)
- Mode: „Halved Inputs“
- Input filter active

DIP Switch on extension Battery 2:

1	2	3	4	5	6	7	8	9	10	11	12
OFF	ON	OFF	ON	OFF	OFF	ON	OFF	ON	ON	ON	OFF

Parameterdiagram:
Only the user parameters are shown here (User_Prm_Data). Counts in brackets start from 0 (most configuration programs only display user parameters). Values in Hex format.

Byte No.	8 (0)	9 (1)	10 (2)	11(3)	12 (4)	13(5)	14(6)	15(7)	16(8)
Value	01	03	03	00	04	04	02	03	03
Meaning	Parameter type	Inputs	Outputs	Inputs	Outputs	Inputs	Outputs	Inputs	Outputs
		Main battery		Extension battery 0		Extension battery 1		Extension battery 2	

Configuration

Byte number (Slot)	1 (0)	2 (1)	3 (2)	4 (3)
Identification in Hex (Dec)	10(016)	10(016)	20(032)	20(032)
Process image output (PAA)			11	14
Process image input (PAE)	15	20		

Allocation of Inputs and Outputs to the Controller Process Image

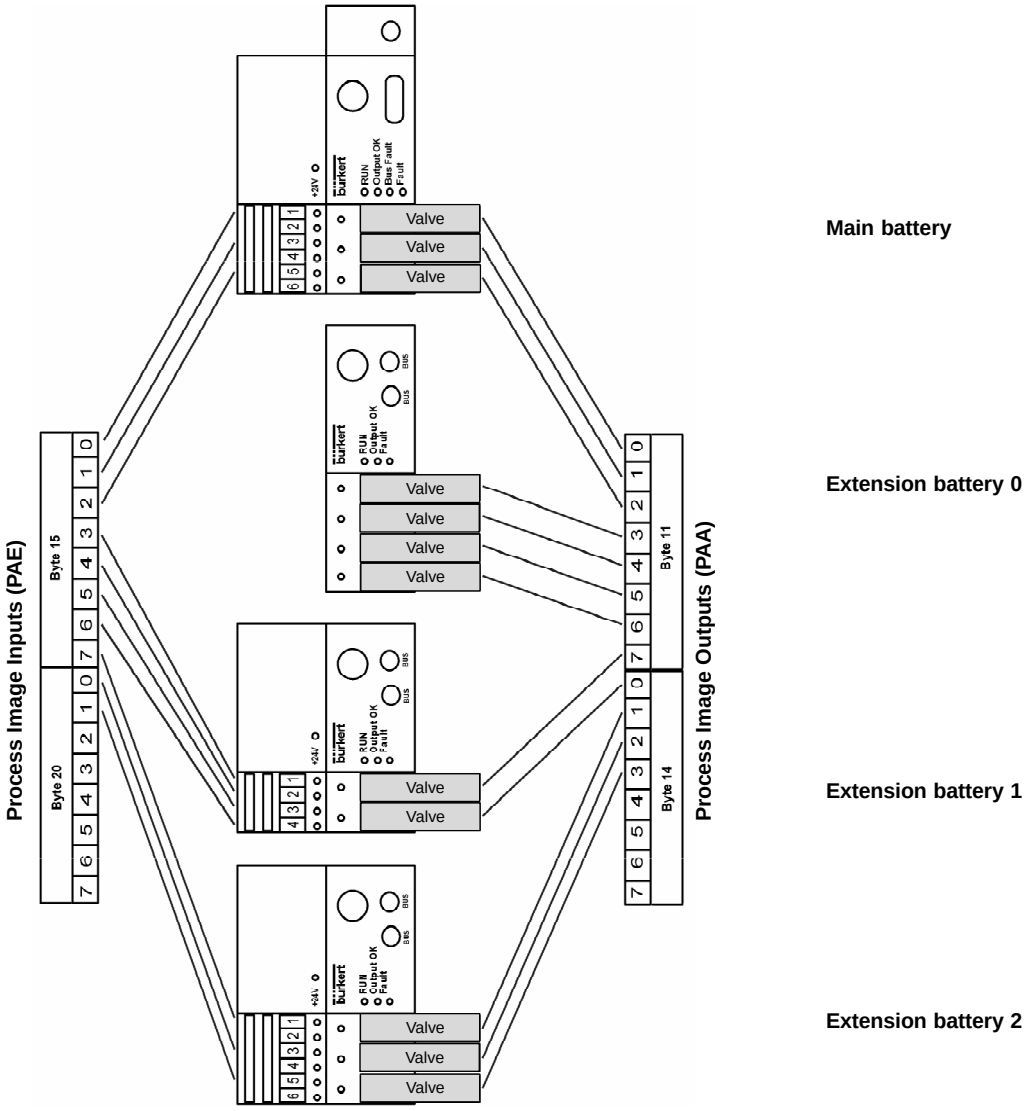


Fig. 16: Allocation of Inputs and Outputs to the Controller Process Image

5.1.6.4 Special functions during parametrizing

Parameter 0x0E : erase EEPROM

If the subscriber address of the valve battery is set via the bus, this address and any additionally transferred user data are stored in the EEPROM of the valve battery.

In order to erase the EEPROM as needed, **0x0E (or 14 dec)** must be transmitted as a user datum (hex parameter).
If later alteration was blocked on setting the address, then erasing of the EEPROM is the only possibility of setting a new address.

After erasing, the valve battery has the default address 126.

Parameter 0x0F: change the default setting for configuration

If during configuration of the valve battery the defaults values are used, the maxima, i.e. 4 byte inputs and 3 byte outputs are set and added to the process map.

To select another default setting, the following user data (hex parameter) must be set:

Byte no.	Description
0	0x0F: parameter for changing the default setting
1	Number of identifiers following (max. 7)
2	Identifier 1
3	Identifier 2
:	:
8	Identifier 7

The following data are permissible as identifiers:

Hex	Decimal	Meaning
10	016	1 byte input, consistency via byte
11	017	2 byte input, consistency via byte
12	018	3 byte input, consistency via byte
13	019	4 byte input, consistency via byte
20	032	1 byte output, consistency via byte
21	033	2 byte output, consistency via byte
22	034	3 byte output, consistency via byte
00	000	Reserve

5.1.6.5 Diagnosis

When the system is running up, or in case of faults, the diagnosis will be read from the Slave by the Master. Most of the controllers make a part of this data available.

In the unit-related diagnosis file (Ext_Diag_Data), the following data is stored:

- Indispensable DIP switch settings
- Fault numbers of the parameter and configuration faults
- Output voltage faults
- Information about the failure of an extension battery
- Data about the configuration of an extension battery

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte	**Standard Diagnosis 6 bytes**							
1	**Master_look** parametrised by other Master	**Prm_ Fault** Parameter faulty	**Invalid_Slave _ Response** Battery sets 0	**Not_ Supported** Function not supported	**Ext_Diag** Diagnosis entry present	**Cfg_ Fault** Diagnosis faulty	**Station_Not_ Ready** Not ready for data exchange	**Station_Non _ Existent** Battery sets 0
2	**Deactivated** Battery sets 0	**Not_ Present** Battery sets 0	**Sync_Mode** Sync command received (Outputs are output and frozen)	**Freeze_Mode** Freeze command received (Inputs are input and frozen)	**WD_On** Watchdog on	**always=1**	**Stat_Diag** Static diagnosis	**Prm_Req** Slave must be re-parametrised and configures
3	**Ext_Diag_**, Overflow more diagnoses present than can be sent	**reserved**	**reserved**	**reserved**	**reserved**	**reserved**	**reserved**	**reserved**
4	**Master_ADD**		(Address of the Master which parametrised the battery [No Master: FF Hex])					
5	**Ident_Number high Byte**		(Manufacturer identifier 00 Hex)					
6	**Ident_Number low Byte**		(Manufacturer identifier 81 Hex)					
			Ext_Diag_Data (Unit-related diagnosis 10 or 14 bytes)					
7	**Headerbyte**		(length of the unit-related diagnosis 10 or 14 bytes)					
			Diagnosis and Switch Position of the Main Battery (MB)					
8	**MB**: DIP-12	**MB**: DIP-11	**MB**: DIP-10	**MB**: DIP-9	**MB**: DIP-8	0	0	**MB**: 24VOut
			Parametrisation and Configuration faults (see next page)					
9	Configuration fault number				Parametrisation fault number			
			Diagnosis extension battery (EB)					
10	**EB**7: 24VOut	**EB**6: 24VOut	**EB**5: 24VOut	**EB**4: 24VOut	**EB**3: 24VOut	**EB**2: 24VOut	**EB**1: 24VOut	**EB**0: 24VOut
11	**EB**7: NOK	**EB**6: NOK	**EB**5: NOK	**EB**4: NOK	**EB**3: NOK	**EB**2: NOK	**EB**1: NOK	**EB**0: NOK
12	**EB**7: Config	**EB**6: Config	**EB**5: Config	**EB**4: Config	**EB**3: Config	**EB**2: Config	**EB**1: Config	**EB**0: Config
			Switch positions of the extension batteries (EI)					
13	EB0: DIP-8	EB0: DIP-7	EB0: DIP-6	EB0: DIP-5	EB0: DIP-4	EB0: DIP-11	EB0: DIP-10	EB0: DIP-9
14	EB1: DIP-8	EB1: DIP-7	EB1: DIP-6	EB1: DIP-5	EB1: DIP-4	EB1: DIP-11	EB1: DIP-10	EB1: DIP-9
15	EB2: DIP-8	EB2: DIP-7	EB2: DIP-6	EB2: DIP-5	EB2: DIP-4	EB2: DIP-11	EB2: DIP-10	EB2: DIP-9
16	EB3: DIP-8	EB3: DIP-7	EB3: DIP-6	EB3: DIP-5	EB3: DIP-4	EB3: DIP-11	EB3: DIP-10	EB3: DIP-9
			Only for the 14 byte User Diagnosis					
17	**EB**4: DIP-8	EB4: DIP-7	EB4: DIP-6	EB4: DIP-5	EB4: DIP-4	EB4: DIP-11	EB4: DIP-10	EB4: DIP-9
18	EB5: DIP-8	EB5: DIP-7	EB5: DIP-6	EB5: DIP-5	EB5: DIP-4	EB5: DIP-11	EB5: DIP-10	EB5: DIP-9
19	EB6: DIP-8	EB6: DIP-7	EB6: DIP-6	EB6: DIP-5	EB6: DIP-4	EB6: DIP-11	EB6: DIP-10	EB6: DIP-9
20	EB7: DIP-8	EB7: DIP-7	EB7: DIP-6	EB7: DIP-5	EB7: DIP-4	EB7: DIP-11	EB7: DIP-10	EB7: DIP-9

MB	Main battery on the PROFIBUS-DP	Example: Hl: DIP-6 main battery DIP switch 6
EBn	Extension battery n on the RIO bus (n = 0 bis 7)	Example: El0: DIP-4 extension battery with Address = Switch 4
DIP-n	DIP switch number of the corresponding valve battery (at the right on the field bus module)	0:= OFF; 1:=ON
24 V Out	The 24V output control voltage is missing on the corresponding valve battery	0:=No fault; 1:=fault
NOK	The corresponding extension battery does not log on at the RIO bus	0:=No fault; 1:=fault
Config	The corresponding extension battery was configured by the Master	0:=Not configured; 1:=configured

Configuration and Parametrisation faults

Configuration fault number		**Parametrisation fault number**	
1	Too many inputs (>32) for one battery	**1**	Too many inputs (>32) entered for one battery
2	Too many outputs (>24) for one battery	**2**	Too many outputs (>24) entered for one battery
3	Too few inputs for all batteries (default from parameter telegram)	**3**	Parametrising telegram too small
4	Too few outputs for all batteries (default from parameter telegram)	**4**	Parametrising telegram too large
5	False configuration byte		

5.2 INTERBUS-S field bus module

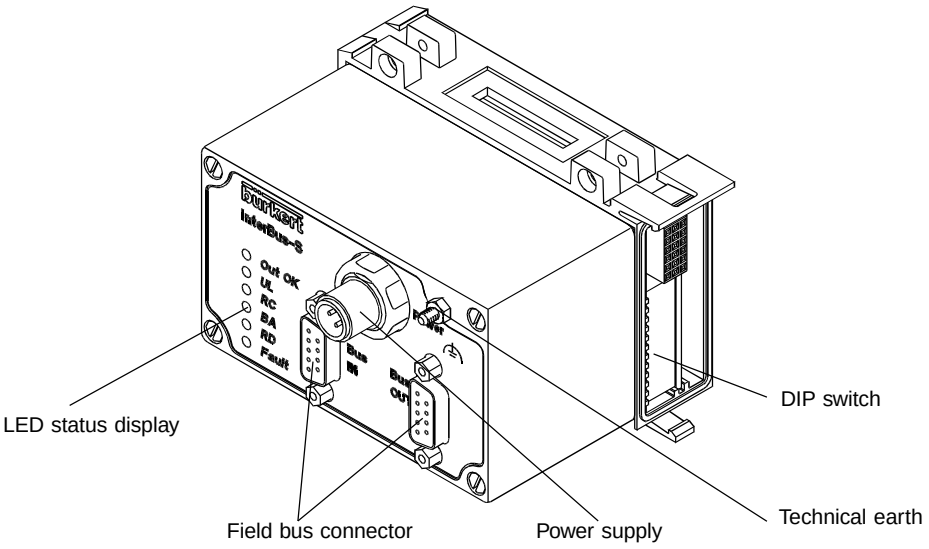
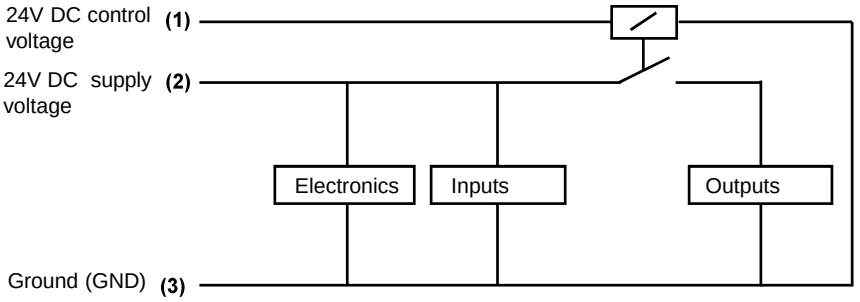


Fig. 17: General view of INTERBUS-S field bus module

5.2.1 Power supply

The 4-pole circular connector M12 (plug) for voltage supply is wired as follows:



Pin 1	24V DC control voltage
Pin 2	24 VDC supply voltage
Pin 3	Ground (GND)
Pin 4	not used

NOTE Pin 2 of the power supply must be fused with 4A (semi-time lag)

ATTENTION! To ensure the electro-magnetic compatibility (EMC), connect the screw terminal TE (Technical earth) to the ground potential with a cable that is a short as possible (30 cm).

Accessories

Plug connector M12+1 (socket) for the power supply Order number 917116D

5.2.2 Field bus connection

A 9-pole D-SUB connector is used for the field bus connection. The pin allocation laid down by the INTERBUS-S for the input and output interfaces is described below:

Pin No.	Signal name Incoming interface (BUS IN) (Plug on unit, socket on cable)	Signal name Ongoing interface (BUS OUT) (Socket on unit, plug on cable)
1	DO 1	DO 2
2	DI 1	DI 2
3	GND	GND
4	not used	not used
5	not used	+ 5V
6	/DO 1	/DO 2
7	/DI 1	/DI 2
8	not used	not used
9	not used	RBST

5.2.3 LED Status Display

LED name	LED Status	Description	Cause of fault / Rectification
Out OK **UL** **RC** **BA** **RD** **Fault**	ON (green) ON (green) ON (green) ON (green) OFF OFF	24 V power supply for outputs OK Internal voltage OK Remote bus cable OK Data transfer is active Remote bus status OK For future expansion	
Out OK	OFF	No 24 V voltage supply available for the outputs	Check the power supply
UL	OFF	Internal voltage for electronics missing	If Out OK = ON, replace field bus module
RC	OFF	Incoming remote bus connection damaged	Check field bus cable, connection and controller
BA	OFF	No data transfer is taking place	IF RC lights up, check the controller, otherwise see RC
RD	On (red)	Ongoing bus has been switched off	Check field bus cable, connection and following field bus module.

5.2.4 Setting the DIP switches

Using the DIP switches, you can carry out settings for the field bus module. They are located on the right-hand side, in the lower part of the bus module (see also Fig. 6). In order to access the DIP switches, remove the plugged-in termination module.

NOTE A change of the switch position only becomes active after the field bus module has been restarted.

1	2	3	4	5	6	7	8	9	10	11	12
No. of output bytes		No. of input bytes			Reserve			Input mode		Input filter ON: active	Reserve

5.2.4.1 Number of Input and Output Bytes: DIP switches 1 to 5

Here, the number of bytes necessary for the transmission of the status information of the inputs and outputs is given. From the larger of the two, the number of process data words reserved in the transfer protocol is determined. The INTERBUS-S thereby has a process data word of 2 bytes (16 bits). The number of process data words needed is described as the Length Code (LC).

	DIP 1	DIP 2	Length Code (LC)
0 Bytes (no outputs)	OFF	OFF	0
1 Byte (max. 8 outputs)	ON	OFF	1
2 Bytes (max. 16 outputs)	OFF	ON	1
3 Bytes (max. 24 outputs)	ON	ON	2

One byte corresponds to 8 outputs. For example, if 12 outputs are present, 2 bytes will have to be set. This corresponds to a length code of 1.

	DIP 3	DIP 4	DIP 5	Length Code (LC)
0 Bytes (keine Eingänge)	OFF	OFF	OFF	0
1 Byte (max. 8 inputs)	ON	OFF	OFF	1
2 Bytes (max. 16 inputs)	OFF	ON	OFF	1
3 Bytes (max. 24 inputs)	ON	ON	OFF	2
4 Bytes (max. 32 inputs)	OFF	OFF	ON	2

One byte corresponds to 8 inputs. For example, if 20 inputs are present, 3 bytes will have to be set. This corresponds to a length code of 2.

Altogether, the two above examples result in a length code of 2. This means that 2 INTERBUS-S process data words will be reserved for the transfer.

5.2.4.2 Identification Code (ID-Code)

The ID code describes the function of the module, and will be automatically determined from the settings for the number of inputs and outputs.

	ID-Code
Digital Output module (no input data)	01
Digital Input module (no output data)	02
Digital Input and Output module (input and output data)	03

5.2.4.3 “Inputs” mode: DIP switches 9 and 10

NOTE Using the input mode, the inputs (transducers) can be allocated in different ways in the process layout of the inputs (PAE).

	DIP 9	DIP 10
No inputs present	OFF	OFF
Normal mode	ON	OFF
Mode: shifted inputs	OFF	ON
Mode: halved inputs	ON	ON

ATTENTION! If no inputs are present, both switches must be set to OFF

Normal Mode

In the Normal mode, all inputs are read in from right to left.

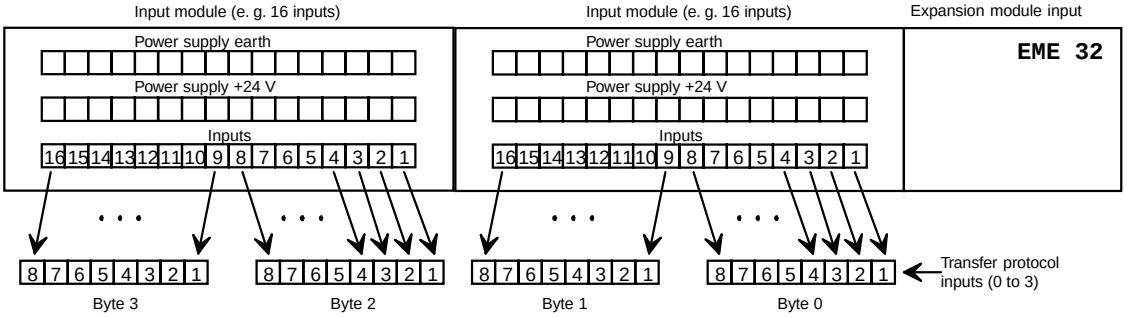


Fig. 18: Normal mode

"Shifted Inputs" mode

In the "Shifted Inputs" mode, the first 16 inputs are alternately set in the transfer protocol in Byte 0 and Byte 1. With the next 16 inputs, the same takes place for Byte 2 and Byte 3.

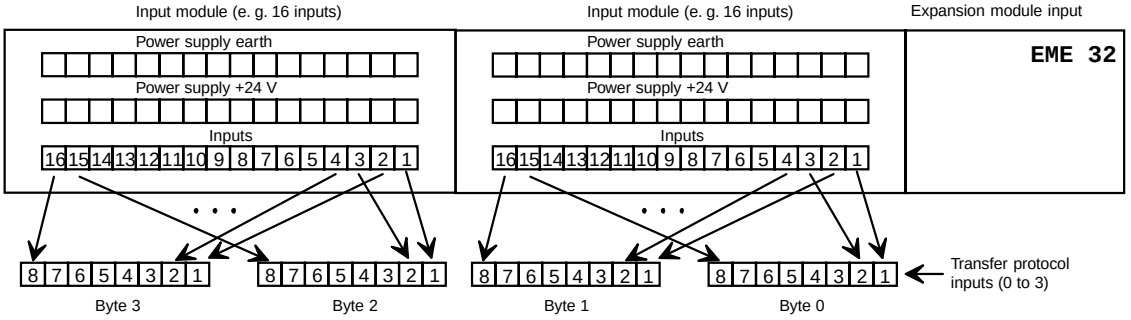


Fig. 19: "Shifted Inputs" mode

"Halved Inputs" mode

In the "Halved Inputs" mode, every second input is missed out. Only inputs 1, 3, 5, ... are transferred; as a result, only 2 Bytes are needed for 32 physically-present inputs.

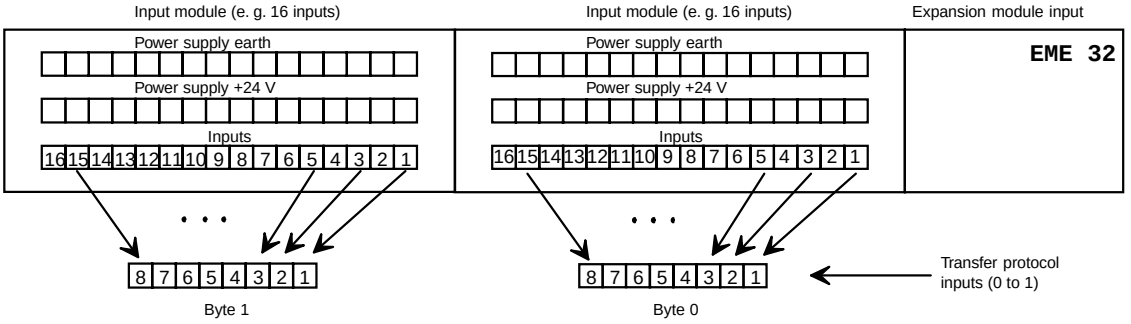


Fig. 20: "Halved Inputs" mode

5.2.4.4 Input filter: DIP switch 11

With the input filter, interference which could affect the input modules is suppressed.

	DIP 11
Input filter inactive	OFF
Input filter active	ON

ATTENTION!

With the filter active, only signals with a duration of ≥ 2 ms will be recognised. In order to comply with the guidelines of the EMC Act, the input filter **must** be activated.

5.3 DeviceNet field bus module

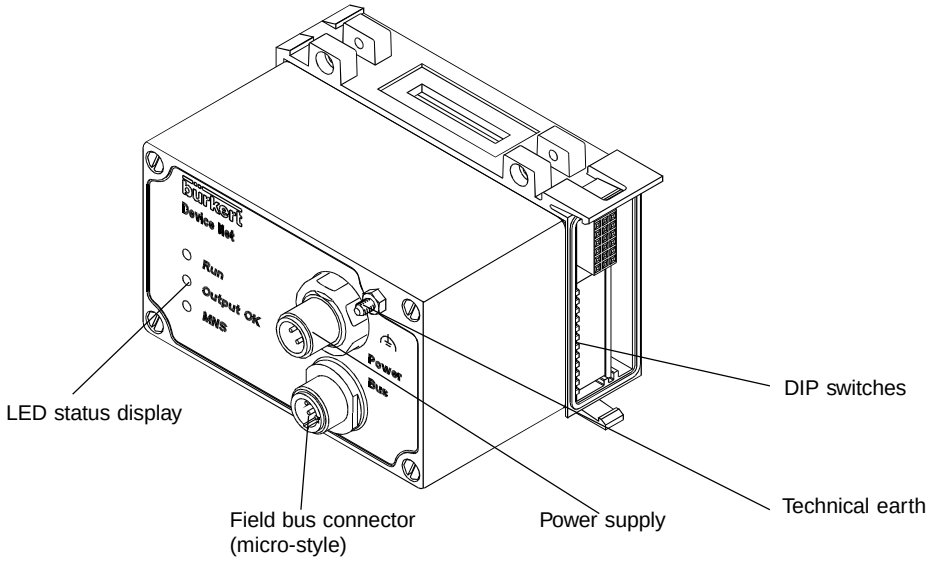
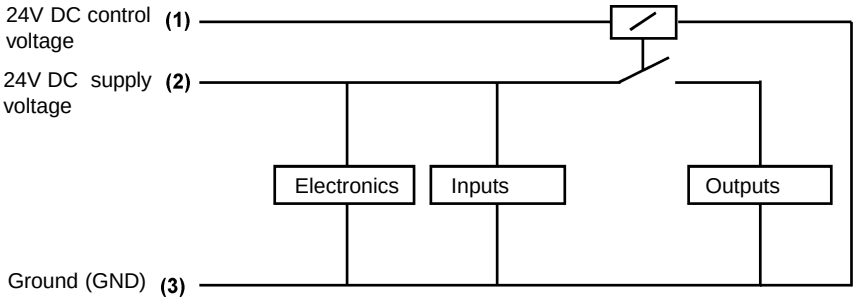


Fig. 21: General view of DeviceNet field bus module

5.3.1 Power supply

The 4-pole circular connector M12 (plug) for voltage supply is wired as follows:



Pin 1	24 VDC control voltage
Pin 2	24 VDC supply voltage
Pin 3	Ground (GND)
Pin 4	not used

NOTE Pin 2 of the power supply must be fused with 4A (semi-time lag)

ATTENTION!

To ensure the electro-magnetic compatibility (EMC), connect the screw terminal TE (Technical earth) to the ground potential with a cable that is a short as possible (30 cm).

Accessory

Plug connector M12+1 (socket) for the power supply Order number 917116D

5.3.2 Field bus connection

For field bus connection, the 5-pole Micro-Style connector M12 (plug) specified by the DeviceNet is employed with the following pin assignment.

Pin No.	Signal name
1	Drain (screen)
2	not used
3	GND
4	CAN HIGH
5	CAN LOW

The bus driver is supplied internally by a voltage which is galvanically isolated from the supply voltage. For this reason, no separate voltages must be provided by the bus on Pins 2 and 3.

5.3.3 LED Status Display

LED name	LED Status	Description	Cause of fault / Rectification
RUN **Out OK** **MNS**	ON (green) ON (green) ON (green)	24 V voltage supply OK 24 V voltage supply for outputs OK Module / network status OK	
RUN	OFF	No voltage present	Check the voltage
Out OK	OFF	No voltage supply available for the outputs	If RUN = ON, replace field bus module
MNS	OFF	Field bus module is not on the bus	If RUN = ON, replace field bus module
	ON (red)	The field bus module indicates an irreparable fault	Replace field bus module
	Blinking (green)	Duplicated MAC ID test OK. No connection to other field bus modules however	Check cables, connectors, baud rate, addresses and controller
	Blinking (red)	Connection time-out. A connection was separated after a specific time	New connection attempt by the controller.
	Blinking (red/green)	Another field bus module with the same MAC ID has been found on the bus	Set another address (see “Setting the DIP switches”)

5.3.4 Setting the DIP switches

Using the DIP switches, you can carry out settings for the field bus module. They are located on the right-hand side, in the lower part of the bus module (see also General View). In order to access the DIP switches, remove the plugged-in termination module.

NOTE A change of the switch position only becomes active after the field bus module has been restarted.

1	2	3	4	5	6	7	8	9	10	11	12
Adress of the field bus modules						Baud rate		Reserve			

5.3.4.1 Address of the Field Bus Module: DIP Switches 1 to 6

The address of the field bus module can be set on the DIP switches 1 ...6, within the range 0...63. The following table should demonstrate the address setting by example:

DIP 1	DIP 2	DIP 3	DIP 4	DIP 5	DIP 6	Address
OFF	OFF	OFF	OFF	OFF	OFF	0
ON	OFF	OFF	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	OFF	OFF	2
ON	ON	OFF	OFF	OFF	OFF	3
						:
ON	ON	ON	ON	ON	ON	63

5.3.4.2 Baud rate: DIP switches 7 and 8

The baud rate can be set on DIP switches 7 and 8

DIP 7	DIP 8	Baud rate
OFF	OFF	125 KBaud
ON	OFF	250 KBaud
OFF	ON	500 KBaud

5.3.5 Terminal resistance

In the DeviceNet bus, the two-wire lines of the field bus must be terminated at both ends with resistances. If the last subscriber is a valve battery, the terminal resistance can be activated through the DIP switch. The DIP switch is located on the underside of the Bus module, underneath a protective cap.

NOTE

With the high data transfer rates used in the field bus technology, there can be signal reflections at the end of the field bus branches which cause interference. This can lead to data errors. By adding terminal resistors, these reflections are suppressed.

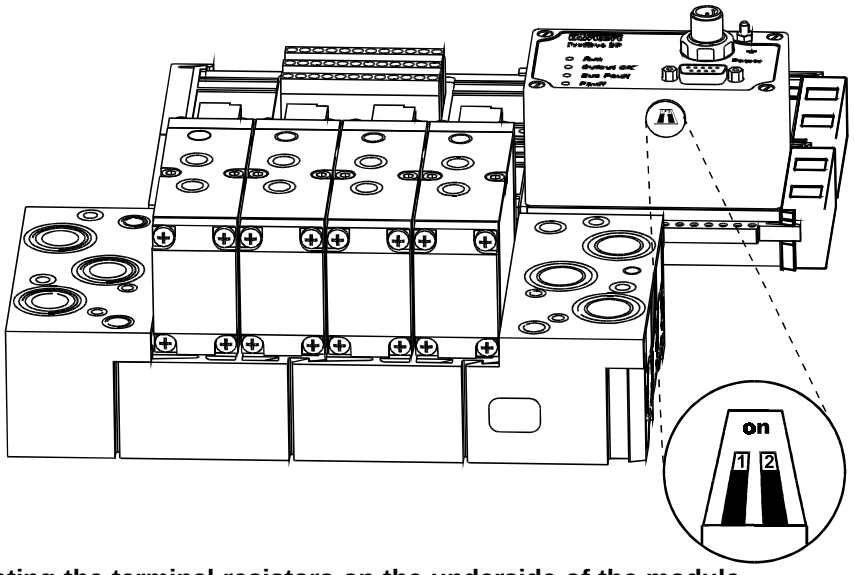


Fig. 22: Activating the terminating resistances

Activating the terminal resistors on the underside of the module

➔ Carefully remove the protective cap!

➔ Slide both switches to the rear, into the ON position!

➔ Replace the protective cap!

5.4 Selecan field bus module

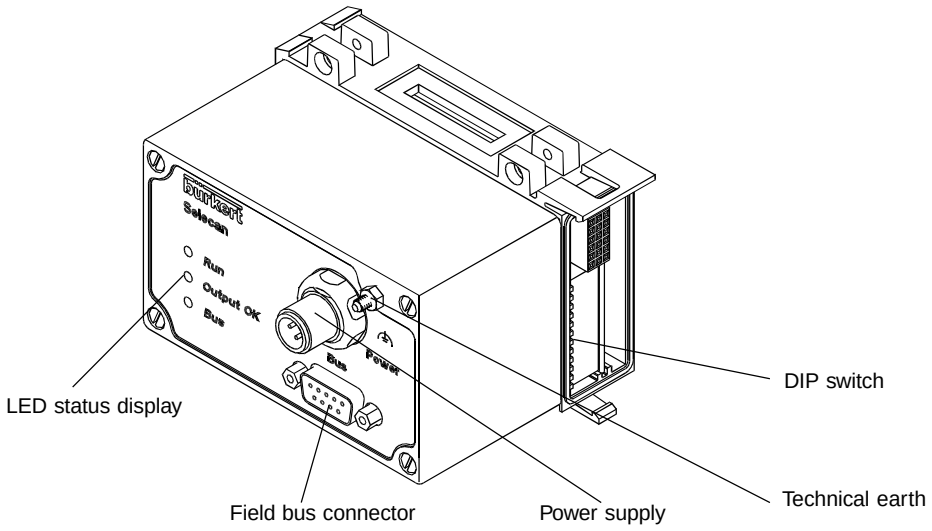
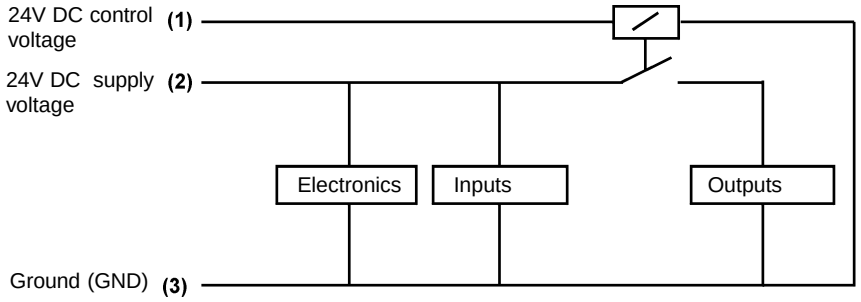


Fig. 17: General view of the Selecan field bus module

5.4.1 Power supply

The 4-pole circular connector M12 (plug) for voltage supply is wired as follows:



Pin 1	24 VDC control voltage
Pin 2	24 VDC supply voltage
Pin 3	Ground (GND)
Pin 4	not used

NOTE Pin 2 of the power supply must be fused with 4A (semi-time lag)

ATTENTION!

To ensure the electro-magnetic compatibility (EMC), connect the screw terminal TE (Technical earth) to the ground potential with a cable that is a short as possible (30 cm).

Accessories

Plug connector M12+1 (socket) for the power supply Order number 917116D

5.4.2 Field bus connection

For field bus connection, a 9-pole D-SUB connector is employed with the following pin assignment (plug on device, socket on cable).

Pin No.	Signal name
1	not used
2	CAN LOW
3	GND
4	not used
5	not used
6	not used
7	CAN HIGH
8	not used
9	not used

5.4.3 LED Status Display

LED name	LED Status	Description	Cause of fault / Rectification
RUN **Out OK** **BUS**	ON (green) ON (green) ON (green)	24 V voltage supply OK 24 V voltage supply for outputs OK Field bus module is active on the bus	
RUN	OFF	No voltage present	Check the voltage
Out OK	OFF	No voltage supply available for the outputs	If RUN = ON, replace field bus module
BUS	OFF	Field bus module is not on the bus	If RUN = ON, replace field bus module
	ON (red)	The field bus module has switched off from the bus due to large numbers of recognised transfer faults (“Bus OFF”)	Check cables, connectors, baud rate, addresses and controller. Restart the field bus module
	Blinking (green)	The field bus module is in the “STANDBY” mode	From the controller, switch the field bus module into the active mode
	Blinking (red)	The field bus module is in the “STANDBY” mode and has recognised a certain number of transfer faults (Warning limit)	Check cables, connectors, baud rate, addresses and controller
	Blinking (red/green)	The field bus module is in the active state and has recognised a certain number of transfer faults (Warning limit)	Check the cable connections and terminating resistors. Possibly lower the baud rate or reduce the bus cable length

5.4.4 Setting the DIP switches

Using the DIP switches, you can carry out settings for the field bus module. They are located on the right-hand side, in the lower part of the bus module (see also General View). In order to access the DIP switches, remove the plugged-in termination module.

NOTE A change of the switch position only becomes active after the field bus module has been restarted.

1	2	3	4	5	6	7	8	9	10	11	12
Address of the field bus module 0 ...31					Baud rate		I/O class	Inputs Mode		Input filter ON: active	Reserve

5.4.4.1 Adress of the field bus module: DIP-Switch 1 to 5

The address of the field bus module can be set on the DIP switches 1 ...5, within the range 0...31. The following table should demonstrate the address setting by example:

DIP 1	DIP 2	DIP 3	DIP 4	DIP 5	Adress
OFF	OFF	OFF	OFF	OFF	0
ON	OFF	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	OFF	2
ON	ON	OFF	OFF	OFF	3
					:
ON	ON	ON	ON	ON	31

5.4.4.2 Baud rate: DIP switches 6 and 7

The baud rate can be set on DIP switches 6 and 7

DIP 6	DIP 7	Baud rate
OFF	OFF	20 KBaud
ON	OFF	100 KBaud
OFF	ON	500 KBaud
ON	ON	1 MBaud

5.4.4.3 I/O Class : DIP Switch 8

With DIP switch 8, the I/O class is set

DIP 8	I/O Class
OFF	I/O Class 1
ON	I/O Class 2

5.4.4.4 “Inputs” mode: DIP switches 9 and 10

NOTE Using the input mode, the inputs (transducers) can be allocated in different ways in the process layout of the inputs (PAE).

	DIP 9	DIP 10
No inputs present	OFF	OFF
Normal mode	ON	OFF
Mode: shifted inputs	OFF	ON
Mode: halved inputs	ON	ON

ATTENTION! If no inputs are present, both switches must be set to OFF

Normal Mode

In the Normal mode, all inputs are read in from right to left.

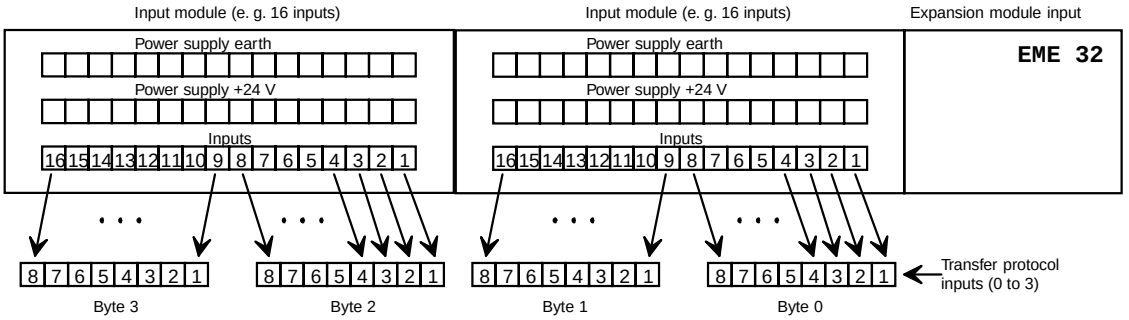


Fig. 24: Normal mode

"Shifted Inputs" mode

In the "Shifted Inputs" mode, the first 16 inputs are alternately set in the transfer protocol in Byte 0 and Byte 1. With the next 16 inputs, the same takes place for Byte 2 and Byte 3.

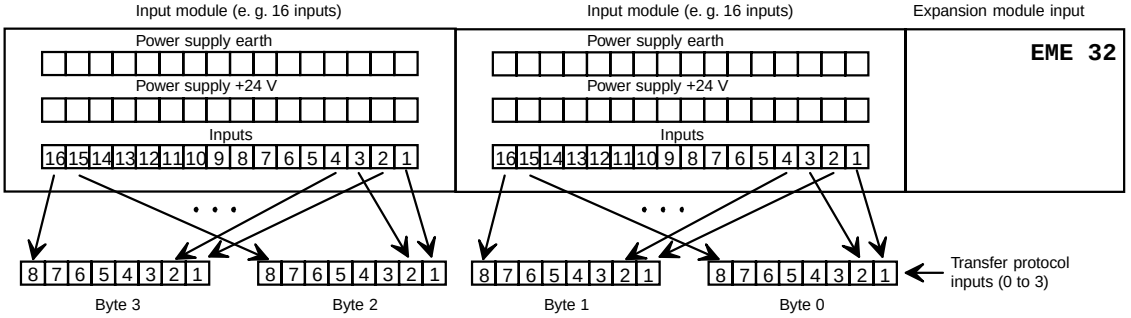


Fig. 25: "Shifted Inputs" mode

"Halved Inputs" mode

In the "Halved Inputs" mode, every second input is missed out. Only inputs 1, 3, 5, ... are transferred; as a result, only 2 Bytes are needed for 32 physically-present inputs.

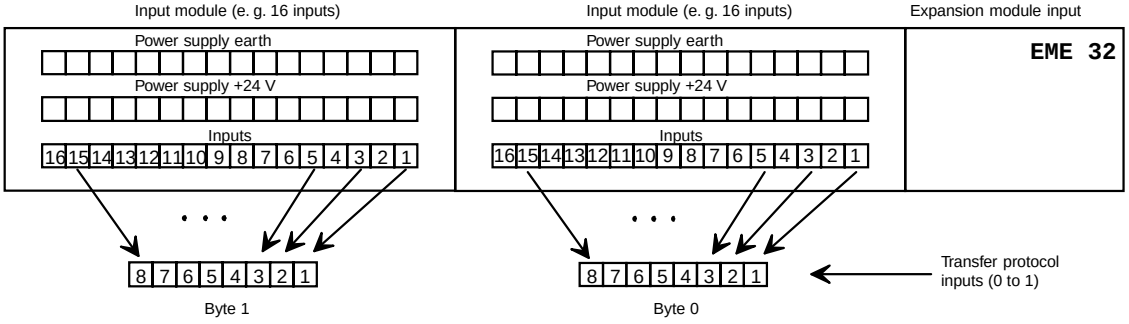


Fig. 26: "Halved Inputs" mode

5.4.4.5 Input filter: DIP switch 11

With the input filter, interference which could affect the input modules is suppressed.

	DIP 11
Input filter inactive	OFF
Input filter active	ON

ATTENTION!

With the filter active, only signals with a duration of ≥ 2 ms will be recognised. In order to comply with the guidelines of the EMC Act, the input filter **must** be activated.

5.4.5 Terminal resistance

In the Selecan bus, the two-wire lines of the field bus must be terminated at both ends with resistances. If the last subscriber is a valve battery, the terminal resistance can be activated through the DIP switch. The DIP switch is located on the underside of the Bus module, underneath a protective cap.

NOTE

With the high data transfer rates used in the field bus technology, there can be signal reflections at the end of the field bus branches which cause interference. This can lead to data errors. By adding terminal resistors, these reflections are suppressed.

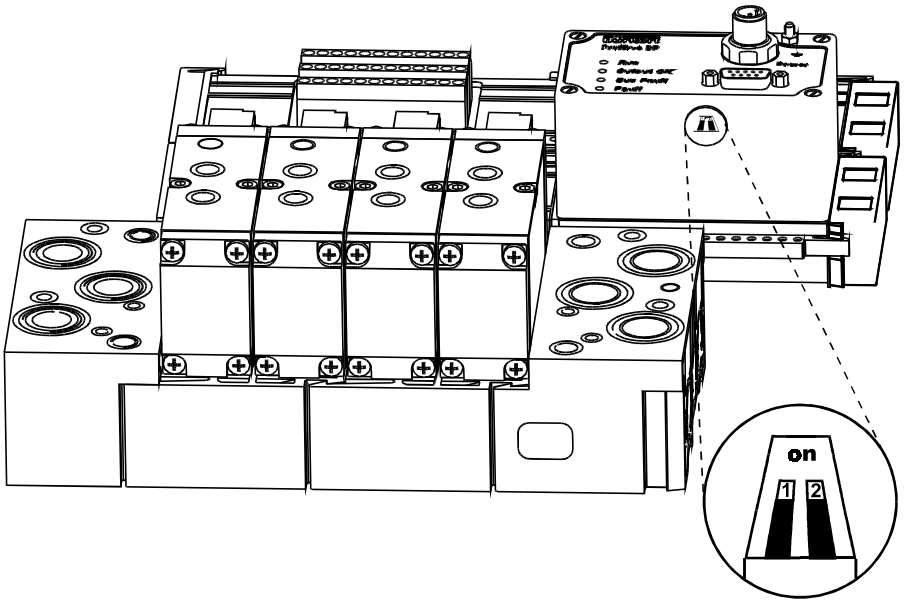


Fig. 27: Activating the terminating resistances

Activating the terminal resistors on the underside of the module

➔ Carefully remove the protective cap!

➔ Slide both switches to the rear, into the ON position!

➔ Replace the protective cap!

5.5 CANopen field bus module

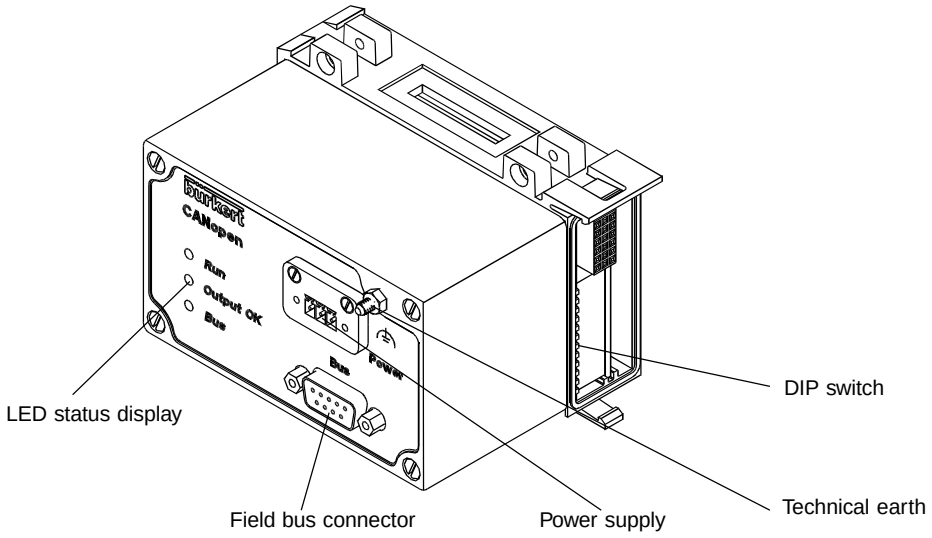
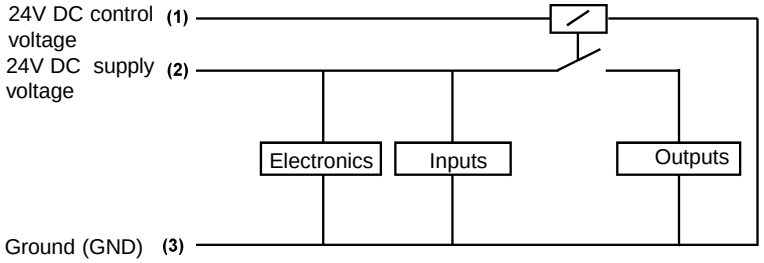


Fig. 28: General view of CANopen field bus module

5.5.1 Power supply

The plug-in connector for the power supply of the CANopen field bus module is included in the delivery!
The plug for the power supply has the following pin allocations:



Pin 1	24 VDC control voltage
Pin 2	24 VDC supply voltage
Pin 3	Ground (GND)

NOTE Pin 2 of the power supply must be fused with 4A (semi-time lag)

ATTENTION!

To ensure the electro-magnetic compatibility (EMC), connect the screw terminal TE (Technical earth) to the ground potential with a cable that is a short as possible (30 cm).

5.5.2 Field bus connection

For field bus connection, a 9-pole D-SUB connector is employed with the following pin assignment (plug on device, socket on cable).

Pin no.	Signal name
1	not used
2	CAN LOW
3	GND
4	not used
5	not used
6	not used
7	CAN HIGH
8	not used
9	not used

5.5.3 LED Status Display

LED name	LED Status	Description	Cause of fault / Rectification
RUN **Out OK** **BUS**	ON (green) ON (green) ON (green)	24 V voltage supply OK 24 V voltage supply for outputs OK Field bus module is active on the bus (“Operational”)	
RUN	OFF	No voltage present	Check the voltage
Out OK	OFF	No voltage supply available for the outputs	If RUN = ON, replace field bus module
BUS	OFF	Field bus module is not on the bus	If RUN = ON, replace field bus module
	ON (red)	The field bus module has switched off from the bus due to large numbers of recognised transfer faults (“Bus Off”)	Check cables, connectors, baud rate, addresses and controller. Restart the field bus module
	Blinking (green)	The field bus module is in the “Pre-Operational” mode	From the controller, activate the field bus module (bring it into the “Operational” status)
	Blinking (red)	The field bus module is in the “ Pre-Operational” mode and has recognised a certain number of transfer faults (Warning limit)	Check cables, connectors, baud rate, addresses and controller
	Blinking	The field bus module is in the “Operational” mode and has recognised a certain number of transfer faults (Warning limit)	Check the cable connections and terminating resistors. Possibly lower the baud rate or reduce the bus cable length

5.5.4 Setting the DIP switches

Using the DIP switches, you can carry out settings for the field bus module. They are located on the right-hand side, in the lower part of the bus module (see also General View). In order to access the DIP switches, remove the plugged-in termination module.

NOTE A change of the switch position only becomes active after the field bus module has been restarted.

1	2	3	4	5	6	7	8	9	10	11	12
Address of the field bus module 1 ... 127							Baud rate		Input Mode ON: active		Input filter

5.5.4.1 Address of the Field Bus Module: DIP Switches 1 to 7

The address of the field bus module can be set on the DIP switches 1 ...7, within the range 1...127. The following table should demonstrate the address setting by example:

DIP 1	DIP 2	DIP 3	DIP 4	DIP 5	DIP 6	DIP 7	Adress
ON	OFF	OFF	OFF	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	OFF	OFF	OFF	2
ON	ON	OFF	OFF	OFF	OFF	OFF	3
OFF	OFF	ON	OFF	OFF	OFF	OFF	4
							:
ON	ON	ON	ON	ON	ON	ON	127

5.5.4.2 Baud rate: DIP switches 8 and 9

The baud rate can be set on DIP switches 8 and 9

DIP 8	DIP 9	Baud rate
OFF	OFF	20 KBaud
ON	OFF	125 KBaud
OFF	ON	250 KBaud
ON	ON	500 KBaud

5.5.4.3 “Inputs” mode: DIP switches 10 and 11

NOTE Using the input mode, the inputs (transducers) can be allocated in different ways in the process layout of the inputs (PAE).

	DIP 10	DIP 11
No inputs present	OFF	OFF
Normal mode	ON	OFF
Mode: shifted inputs	OFF	ON
Mode: halved inputs	ON	ON

ATTENTION! If no inputs are present, both switches must be set to OFF

Normal Mode

In the Normal mode, all inputs are read in from right to left.

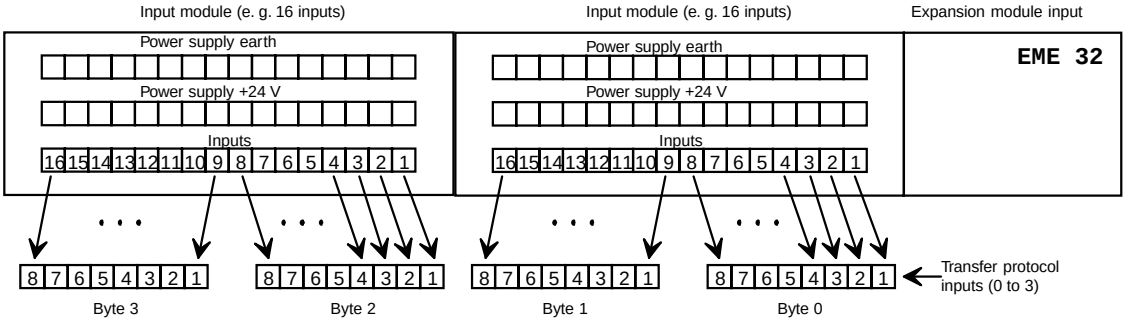


Fig. 29: Normal mode

“Shifted Inputs” mode

In the “Shifted Inputs” mode, the first 16 inputs are alternately set in the transfer protocol in Byte 0 and Byte 1. With the next 16 inputs, the same takes place for Byte 2 and Byte 3.

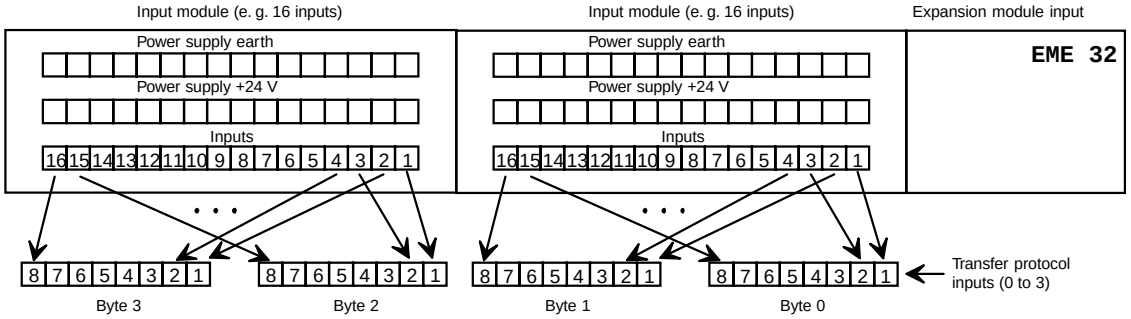


Fig. 30: “Shifted Inputs” mode

“Halved Inputs” mode

In the “Halved Inputs” mode, every second input is missed out. Only inputs 1, 3, 5, ... are transferred; as a result, only 2 Bytes are needed for 32 physically-present inputs.

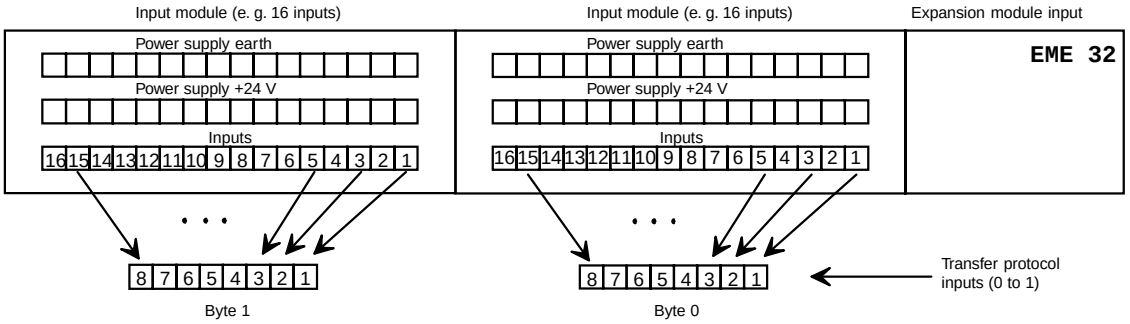


Fig. 31: “Halved Inputs” mode

5.5.4.4 Input filter: DIP switch 12

With the input filter, interference which could affect the input modules is suppressed.

	DIP 12
Input filter inactive	OFF
Input filter active	ON

ATTENTION!

With the filter active, only signals with a duration of ≥ 2 ms will be recognised. In order to comply with the guidelines of the EMC Act, the input filter **must** be activated.

5.5.5 Extended description of the field bus node „CANopen“

The valve island corresponds to the „Pre-defined Device“ to CANopen standard 3.0.
With regard to functions and objects, the „Device Profile 401 (I/O modules) V1.4 applies.

NOTE The terms „Address“ (abbreviated to Addr.“) and Node ID are equivalent in this description.

5.5.5.1 Identifier

The following IDs are used:

Object	Identifier
NMT	0_{hex}
SYNC	80_{hex}
EMERGENCY	80_{hex} + address
1st TPDO	180_{hex} + address
1st RPDO	200_{hex} + address
2nd TPDO	280_{hex} + address
2nd RPDO	300_{hex} + address
TSDO	580_{hex} + address
RSDO	600_{hex} + address
GUARDING	700_{hex} + address

Objects with a grey background are implemented but are not used (conformity).

5.5.5.2 Object overview

Objects supported by the valve island:

Index (hex)	Sub-indices (hex)	Name	Access		
			read	write	constant
1000	0	Device type	X		
1001	0	Error register (Bit 0 & 2 genutzt)	X		
1005	0	COB – ID SYNC	X	X	
1006	0	Communication cycle period	X	X	
1007	0	Synchronous window length	X	X	
1008	0	Manufacturer device name			X
1009	0	Manufacturer hardware version			X
100A	0	Manufacturer software version			X
100B	0	(reserved for compatibility reasons)			
100C	0	Guard time	X	X	
100D	0	Life time factor	X	X	
100E	0	(reserved for compatibility reasons)			
1014	0	COB – ID EMCY	X	X	
1200	0 - 3	1st Server SDO parameter	X	(X)	
1400	0 - 2	1st receive PDO parameter	X	(X)	
1401	0 - 2	2nd receive PDO parameter	X	(X)	
1600	0 - 3	1st receive PDO mapping	X	(X)	
1601	0	2nd receive PDO mapping	X		
1800	0 - 3	1st transmit PDO parameter	X	(X)	
1801	0 - 3	2nd transmit PDO parameter	X	(X)	
1A00	0 - 4	1st transmit PDO mapping	X	(X)	
1A01	0	2nd transmit PDO mapping	X		
6000	0 – 4	Read state 8 input lines	X	(X)	
6200	0 – 3	Write state 8 output lines	X	(X)	
6206	0 – 3	Fault mode 8 output lines	X	(X)	
6207	0 – 3	Fault state 8 output lines	X	(X)	

Xthe feature is applicable

(X)the feature has limited applicability (depending on the sub-index)

Objects with a grey background are implemented but are not used (conformity).

5.5.5.3 Detailed description of the objects supported

Object 1000_{hex} Device type

Describes the device type and the profile used.
Length: 32 bit
Value: $401D_{hex}$

Object 100_{hex} Error register

Register for device error; part of the Emergency Object.
Length: 8 bit

Position in register	Error description
Bit 0	General error
Bit 2	Supply voltage for valves not present
Bit 1; bits 3 - 7	- not used -

Object 1005_{hex} COB - ID SYNC

Defines the COB - ID of the SYNC object and generation of SYNC telegrammes

Object 1006_{hex} Communication cycle period

Defines the communication cycle time in ms, i.e. the interval in which the SYNC telegrammes are generated.
The value „0“ means that the object is not used.
Length: 32 bit
Default value: 0_{hex}

Object 1007_{hex} Synchronous window length

Length of the time window for synchronous PDOs in ms
Length: 32 bit
Default value: 0_{hex}

Object 1008_{hex} Manufacturer device name

Object 1009_{hex} Manufacturer hardware version

Object $100A_{hex}$ Manufacturer software version

Object $100C_{hex}$ Guard time

„Guard time“ value in ms. Multiplied by the „Life time factor“, this gives the „Life time“ for the Guarding Protocoll.
The value „0“ means that the object is not used.
Length: 32 bit
Default value: 500ms

Object $100C_{hex}$ Life time factor

„Life time factor“ value. For description see Object $100C_{hex}$ „Guard time“.
Length: 8 bit
Default value: 3

Object 1014_{hex} COB - ID Emergency

Defines the COB - ID of the Emergency Object.
Length: 32 bit
Default value. (80_{hex} + address)

Objekt 1200_{hex} Server SDO parameter

Sub-index	Contents	Default	Access	
			read	write
00_{hex}	Highest sub-index supported	03_{hex}	X	-
01_{hex}	COB - ID (client to server) for this SDO	600_{hex} + addr.	X	X
02_{hex}	COB - ID (server to client) for this SDO	580_{hex} + addr.	X	X
03_{hex}	Node ID of the SDO client	addr.	X	X

Objekt 1400_{hex} „1^{st} Receive PDO communication parameter

Parametrizes the first Receive PDO.

Sub-index	Contents	Default	Access	
			read	write
00_{hex}	Highest sub-index supported	02_{hex}	X	-
01_{hex}	COB - ID used by the PDO	200_{hex} + addr.	X	X
02_{hex}	„Transmission Type“; values 00_{hex} - FF_{hex}	FF_{hex}	X	X

Objekt 1600_{hex} 1^{st} Receive PDO mapping

Mapping of the first Receive PDO.

Sub-index	Contents	Default	Access	
			read	write
00_{hex}	Number of „mapped“ objects of the PDO	03_{hex}	X	-
01_{hex}	PDO mapping for the nth object	$(6200 / 00)_{hex}$	X	X
02_{hex}		$(6200 / 01)_{hex}$	X	X
03_{hex}		$(6200 / 02)_{hex}$	X	X

Meaning: $(6200 / 02)_{hex}$

Object 6200_{hex} Sub -index 02_{hex}

Objekt 1800_{hex} 1^{st} Transmit PDO communication parameter

Sub-index	Contents	Default	Access	
			read	write
00_{hex}	Highest sub-index supported	03_{hex}	X	-
01_{hex}	COB - ID used by the PDO	180_{hex} + addr.	X	X
02_{hex}	„Transmission Type“; values 00_{hex} - FF_{hex}	FF_{hex}	X	X
03_{hex}	„Inhibit Time“	$12C_{hex}$	X	X

Objekt 1A00$_{hex}$ 1st Transmit PDO mapping

Mapping of the first Transmit PDO

Sub-index	Contents	Default	Access	
			read	write
00_{hex}	Number of „mapped“ objects of the PDO	04_{hex}	X	-
01_{hex}	PDO mapping for the nth object	$(6000 / 00)_{hex}$	X	X
02_{hex}		$(6000 / 01)_{hex}$	X	X
03_{hex}		$(6000 / 02)_{hex}$	X	X
04_{hex}		$(6000 / 03)_{hex}$	X	X

Meaning: $(6000 / 03)_{hex}$

Object 6000_{hex} Sub-index 03_{hex}

Objekt 6000$_{hex}$ Read state 8 Input Lines

The states of inputs configured on the valve battery are transmitted
(Configuration of the inputs by means of DIP switches 10 & 11, cf. Mode „Inputs“)

Sub-index	Contents	Possible values	Access	
			read	write
00_{hex}	Number of object entries (here $4:01_{hex}$ - 04_{hex})		X	-
01_{hex}	State of the first group of inputs	00_{hex} – FF_{hex}	X	X
02_{hex}	State of the second group of inputs	00_{hex} – FF_{hex}	X	X
03_{hex}	State of the third group of inputs	00_{hex} – FF_{hex}	X	X
04_{hex}	State of the fourth group of inputs	00_{hex} – FF_{hex}	X	X

Objekt 6200$_{hex}$ Write state 8 Output Lines

Sets the outputs in each of the groups of 8.

Sub-index	Contents	Possible values	Access	
			read	write
00_{hex}	Number of object entries (here $3:01_{hex}$ - 03_{hex})		X	-
01_{hex}	State of the first group of outputs (valves 1 - 8)	00_{hex} – FF_{hex}	X	X
02_{hex}	State of the second group of outputs (valves 9 - 16)	00_{hex} – FF_{hex}	X	X
03_{hex}	State of the third group of outputs (valves 17 - 24)	00_{hex} – FF_{hex}	X	X

Objekt 6206$_{hex}$ Fault mode 8 Output Lines

Determines the reaction of the outputs on occurrence of a fault (in each of the groups of 8).

Meaning:
0_{bin}: the output retains its current state on fault occurrence;
1_{bin}: on fault occurence, the output is switched to the state that is entered in Object 6207_{hex} at the corresponding location.

Sub-index	Contents	Possible values	Access	
			read	write
00_{hex}	Number of object entries (here $3:01_{hex}$ - 03_{hex})		X	-
01_{hex}	State of the first group of outputs	00_{hex} – FF_{hex}	X	X
02_{hex}	State of the second group of outputs	00_{hex} – FF_{hex}	X	X
03_{hex}	State of the third group of outputs	00_{hex} – FF_{hex}	X	X

Objekt 6207_{hex} Fault state 8 Output Lines

Determines the reaction of the outputs on occurrence of a fault (in each of the groups of 8).
Precondition: corresponding setting in Object 6206_{hex}

Sub-index	Contents	Default	Access	
			read	write
00_{hex}	Number of object entries (here $3:01_{hex}$ - 03_{hex})		X	-
01_{hex}	State of the first group of outputs in case of fault	00_{hex} – FF_{hex}	X	X
02_{hex}	State of the second group of outputs in case of fault	00_{hex} – FF_{hex}	X	X
03_{hex}	State of the third group of outputs in case of fault	00_{hex} – FF_{hex}	X	X

5.5.5.4 Example for commissioning

CANopen command sequence to be able to bring the valve island type 8640 into the „Operational State“, set outputs and to read in inputs.

1. **On entry into the „PreOperational“ state (after power On or network Reset), the slave sends once the emergency message with content 0. In this state, the BUS LED flashes green.**

   SLAVE:

   Identifier = 80_{HEX} + set address (e.g. 81_{HEX} for address 1)
   Length = 5
   Data = 00, 00, 00, 00, 00, xx, xx, xx

2. **Switch all nodes in the network to the „Operational“ state**

   MASTER:

   Identifier = 0;
   Length = 2
   Data = 01, 00, xx, xx, xx, xx, xx, xx

   In the „Operational“ state, the BUS LED lights continuously green.

   On entry into the „Operational“ state, the state of the inputs is sent once.

   SLAVE:

   *Identifier = 180_{HEX} + set address (*e.g. *181_{HEX} for address 1)*
   Length = 4
   Data = yy, yy, yy, yy, xx, xx, xx, xx
   *(*yy: state of the inputs, e.g. 00 10 00 00 when input 9 is set*)*

   The message is also sent when no inputs are activated. In this case, the contents of the 4 data bytes are each 00_{HEX}.

   SLAVE:

   *Identifier = 180_{HEX} + set address (*e.g. *181_{HEX} for address 1)*
   Length = 4
   Data = 00, 00, 00,00 , xx, xx, xx, xx

3. Set outputs

MASTER:

*Identifier = 200_{HEX} + set address (*e.g. *201_{HEX} for address 1)*
Length = 3
Data = yy, yy, yy, xx, xx, xx, xx, xx (yy:output value, e.g. 55 for every second output)

4. Set inputs

The state of the inputs is sent under event control (configuration dependent; cf. Object 1800_{HEX})
=> a message is sent on every change of the output state.

SLAVE:

Identifier = 180_{HEX} + set address (e.g. 181_{HEX} for address 1)
Length = 4
Data = yy, yy, yy, yy, xx, xx, xx, xx
(yy: state of the inputs, e.g. 01 00 00 00 when input 1 is set)

5. Reset nodes to „PreOperational“ state

MASTER:

Identifier = 0;
Length = 2
Data = 80, 00, xx, xx, xx, xx, xx, xx

With this command, the node is reset to the „PreOperational“ state.
The Emergency Message is not sent in this case (see Section 1).

6. Reset node

MASTER:

Identifier = 0;
Length = 2
Data = 81, 00, xx, xx, xx, xx, xx, xx

With this command, the node is reset to the „System Init“ state. Hence the DIP switches are newly read in for baud rate, address, input configuration, ... and evaluated. The node then reconverts automatically to the „PreOperational“ state (see Section 1) and from there can be put into the „Operational“ state again (Section 2).

5.5.5 Terminal resistance

In the CANopen bus, the two-wire lines of the field bus must be terminated at both ends with resistances. If the last subscriber is a valve battery, the terminal resistance can be activated through the DIP switch. The DIP switch is located on the underside of the Bus module, underneath a protective cap.

NOTE

With the high data transfer rates used in the field bus technology, there can be signal reflections at the end of the field bus branches which cause interference. This can lead to data errors. By adding terminal resistors, these reflections are suppressed.

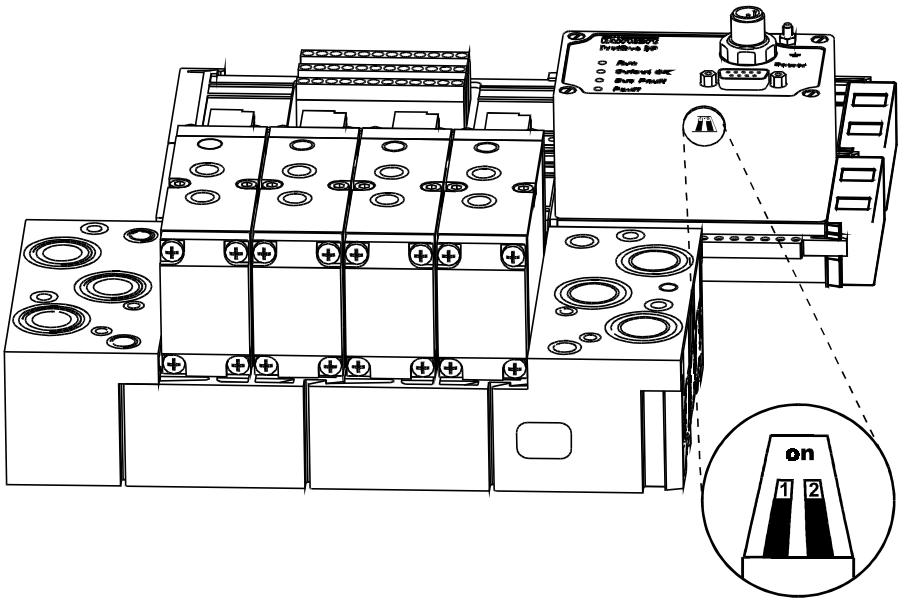


Fig. 32: Activating the terminating resistances

Activating the terminal resistors on the underside of the module

➔ Carefully remove the protective cap!

➔ Slide both switches to the rear, into the ON position!

➔ Replace the protective cap!

5.6 AS Interface field bus module

5.6.1 Field bus module AS interface for 4 outputs

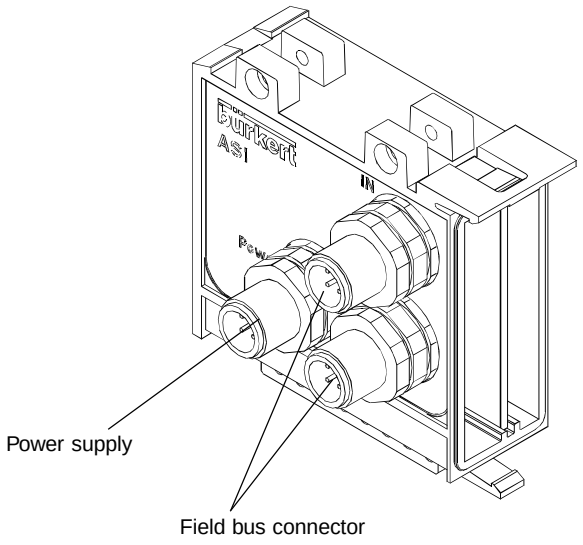


Fig. 33: General view of AS Interface field bus module

5.6.1.1 Technical data

Bus connection

Operating voltage to AS-i specification	29,5 - 31,6 V/DC
Max. current consumption	10 mA

Output

The power supply must contain a reliable isolation to IEC 364-4-41 (PELV or SELV)!

Watchdog function	integrated
Supply voltage	24 VDC ± 10%

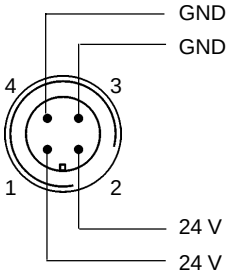
Housing

Operating temperature	0 ... + 50 °C
System of protection	IP 65

5.6.1.2 Power supply

The 4-pole round plug for the power supply has the following pin allocations:

Pin 1	24 VDC supply for outputs
Pin 2	24 VDC supply for outputs
Pin 3	Ground (GND)
Pin 4	Ground (GND)



NOTE

Only the power supply for the outputs (valves) is fed via the power supply connection. The voltage for the electronics is taken from the bus. In this way, the outputs can be switched of without having to disconnect the field bus module from the bus.

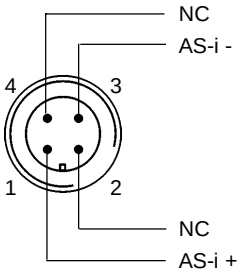
Accessory

Plug connector M12+1 (socket) for the power supply Order number 917116D

5.6.1.3 Field bus connection

A 4-pole round plug is used for the field bus connection, with the following pin allocation:

Pin No.	Signal
1	ASI +
2	not used (NC)
3	ASI -
4	not used (NC)



NOTE

The two bus connectors marked with “IN” and “OUT” are connected together internally. The two connectors therefore have the same pin allocation.

5.6.1.4 Programming instructions

The module has the following settings:

Adress: 00 (preset)

I/O-Code: 8

ID-Code: 0

Significance of the data and parameter bits

Bit	Function
D0	Output (valve) 1
D1	Output (valve) 2
D2	Output (valve) 3
D3	Output (valve) 4

Bit	Function
P0	no function
P1	no function
P2	no function
P3	no function

5.6.2 Field bus module AS interface for 8 valves and 8 inputs

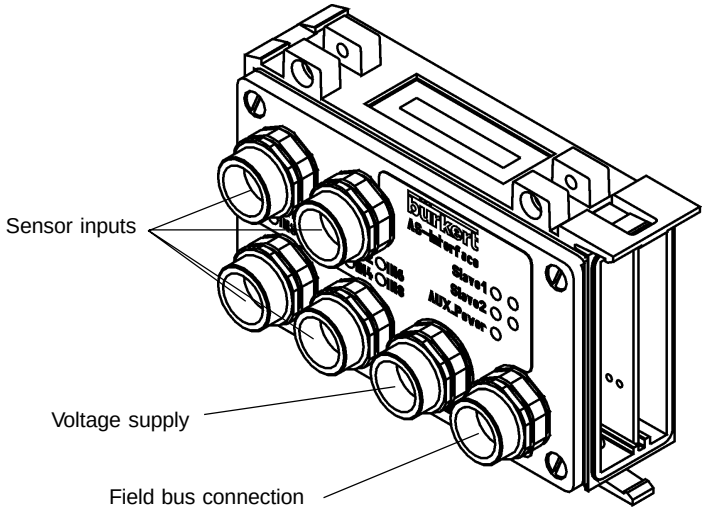


Fig. 34: Overall view of field bus module AS interface for 8 valves and 8 inputs

5.6.2.1 Technical data

Bus connection

Operating voltage to AS-i specification	29.5 - 31.6 VDC
Current consumption without sensors	10 mA per subscriber
Max. current consumption	280 mA
Addressability	min. 15 addressings

Output

The power supply must contain a reliable isolation to IEC 364-4-41 (PELV or SELV)!

Watchdog function	integrated
Supply voltage (AUX)	24 VDC ± 10%

Inputs

Input configuration	PNP
Sensor supply	via AS interface
Sensor voltage supply	24 VDC ± 20%
Current loading capacity	max. 200 mA, short circuit proof
Switching level „1“ signal	≥ 10 V
Limitation of input current	≤ 6.5 mA
Input current „0“ signal	≤ 1.5 mA

State indicators

Bus: LED green / LED red	for function, see 5.6.2.3
AUX POWER: LED green on / off	supply voltage (AUX) on / off
Inputs: LED yellow on / off	connected / not connected

Housing

Operating temperature	0 ... + 50 °C
System of protection	IP 65

5.6.2.2 Characteristics

- 8 valve outputs, electrically isolated from the bus, voltage supply via external 24 V, connection of valves (1 W / 2 W)
- 8 sensor inputs via 4 M12 circular connectors (8 sensors can be connected by means of Y-distributors)
- Diagnosis LEDs
- 2 ASI addresses are occupied

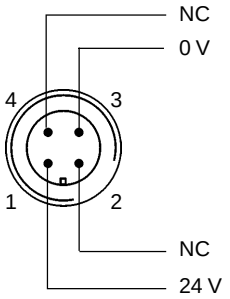
5.6.2.3 Connection and displays

Diagnosis LEDs

LED1 green	LED2 red	State signalled
OFF	OFF	Power off / no operating voltage
OFF	ON	No data traffic / Watchdog expired
ON	OFF	OK
flashes	ON	Slave address = 0
OFF	flashes	External RESET / overload

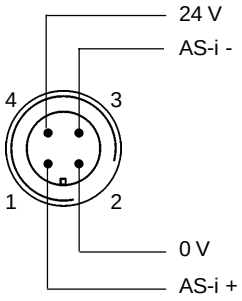
M12 plug for voltage supply to valves (AUX power)

Pin	Description
1	24V (valves)
2	not connected (NC)
3	0V (valves)
4	not connected (NC)



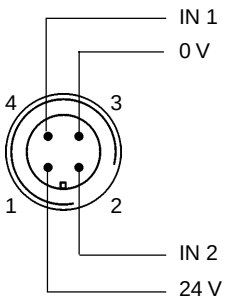
M12 plug for field bus connection (AS-i)

Pin	Description
1	AS-i +
2	0 V (valves)
3	AS-i -
4	24 V (valves)



M12 sockets for sensor inputs

Pin	Description
1	24 V sensor supply
2	Input 2
3	0 V sensor supply
4	Input 1



5.6.2.4 Function of DIP switches

Via 2 DIP switches, the 2 slaves of the device can be isolated independently from the bus. This is necessary e.g. when both slaves are set to the address 0.

Changing the DIP switch settings

➔ Remove the plugged-on termination module on the right hand side.

➔ Change the settings of the DIP switches:

Switch 1 switches Slave 1 from the bus (AS-i line to subscriber is interrupted)

Switch 2 switches Slave 2 from the bus (AS-i line to subscriber is interrupted)

➔ Attach the termination module to the right hand side!

NOTE

In the as-delivered condition and in normal operation, the switches are in the ON position and both slaves set to address „0“.
If Slave 1 is set to address „0“, Slave 2 is automatically put into the RESET state, i.e. the bus master recognizes only Slave 1 on the bus. Only after addressing with an address not equal to „0“ does Slave 2 report with its set address (as-delivered state „0“).

5.6.2.5 Programming notes

Assignment of the data and parameter bits

Data bits:

Slave 1	D3	D2	D1	D0
Output data	Valve 4	Valve 3	Valve 2	Valve 1
Input data	IN4	IN3	IN2	IN 1

Slave 2	D3	D2	D1	D0
Output data	Valve 8	Valve 7	Valve 6	Valve 5
Input data	IN8	IN7	IN6	IN 5

ID code: F

I/O code: 7

Profile: 7.F

Parameter bits:

The parameter bits have no function

5.6.3 Field bus module AS interface for 8 valves

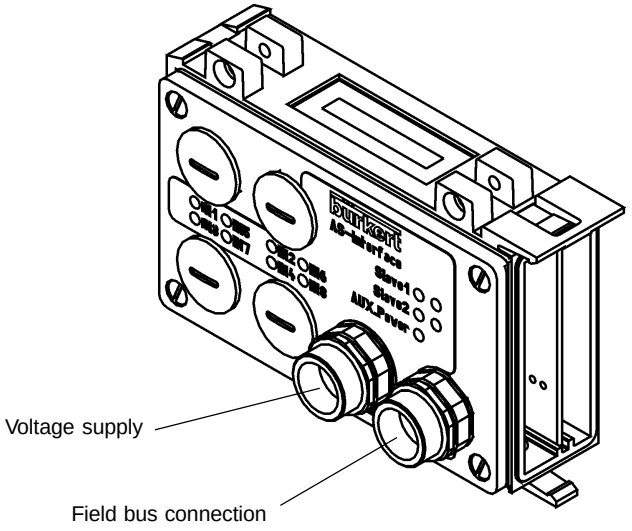


Fig. 35: Overall view of field bus module AS interface for 8 valves

5.6.3.1 Technical data

Bus connection

Operating voltage to AS-i specification	29.5 - 31.6 VDC
Current consumption	10 mA per subscriber
Max. current consumption	20 mA
Addressability	min. 15 addressings

Output

The power supply must contain a reliable isolation to IEC 364-4-41 (PELV or SELV)!

Watchdog function	integrated
Supply voltage (AUX)	24 VDC ± 10%

State indicators

Bus: LED green / LED red	for function, see 5.6.3.3
AUX POWER: LED green on / off	supply voltage (AUX) on / off

Housing

Operating temperature	0 ... + 50 °C
System of protection	IP 65

5.6.3.2 Characteristics

- 8 valve outputs, electrically isolated from the bus, voltage supply via external 24 V, connection of valves (1 W / 2 W)
- Diagnosis LEDs
- 2 ASI addresses are occupied

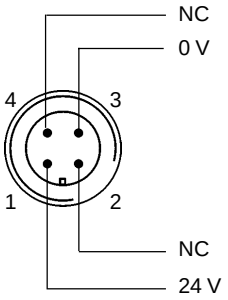
5.6.3.3 Connection and displays

Diagnosis LEDs

LED1 green	**LED2 red**	**State signalled**
OFF	OFF	Power off / no operating voltage
OFF	ON	No data traffic / Watchdog expired
ON	OFF	OK
flashes	ON	Slave address = 0
OFF	flashes	External RESET / overload

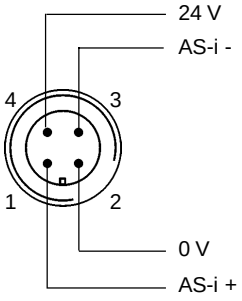
M12 plug for voltage supply to valves (AUX power)

Pin	**Description**
1	24V (valves)
2	not connected (NC)
3	0V (valves)
4	not connected (NC)



M12 plug for field bus connection (AS-i)

Pin	**Description**
1	AS-i +
2	0 V (valves)
3	AS-i -
4	24 V (valves)



5.6.3.4 Function of DIP switches

Via 2 DIP switches, the 2 slaves of the device can be isolated independently from the bus. This is necessary e.g. when both slaves are set to the address 0.

Changing the DIP switch settings

➔ Remove the plugged-on termination module on the right hand side.

➔ Change the settings of the DIP switches:

Switch 1 switches Slave 1 from the bus (AS-i line to subscriber is interrupted)

Switch 2 switches Slave 2 from the bus (AS-i line to subscriber is interrupted)

➔ Attach the termination module to the right hand side!

NOTE

In the as-delivered condition and in normal operation, the switches are in the ON position and both slaves set to address „0“.
If Slave 1 is set to address „0“, Slave 2 is automatically put into the RESET state, i.e. the bus master recognizes only Slave 1 on the bus. Only after addressing with an address not equal to „0“ does Slave 2 report with its set address (as-delivered state „0“).

5.6.3.5 Programming notes

Assignment of the data and parameter bits

Data bits:

Slave 1	D3	D2	D1	D0
Output data	Valve 4	Valve 3	Valve 2	Valve 1
Input data	-	-	-	-

Slave 2	D3	D2	D1	D0
Output data	Valve 8	Valve 7	Valve 6	Valve 5
Input data	-	-	-	-

ID code: F

I/O code: 8

Profile: 8.F

Parameter bits:

The parameter bits have no function

5.6.4 Field bus module AS interface for 4 valves and 4 inputs

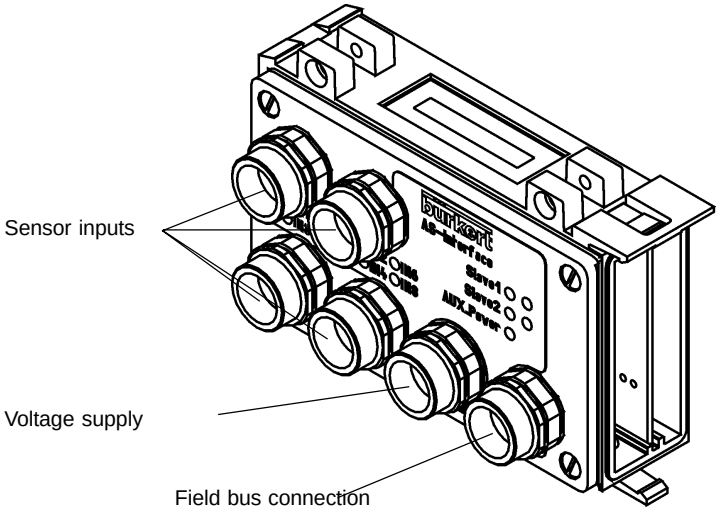


Figure 36 Overall view of field bus module AS interface for 4

5.6.4.1 Technical data

Bus connection

Operating voltage to AS-i specification	29.5 - 31.6 VDC
Current consumption without sensors	10 mA
Max. current consumption	280 mA
Addressability	min. 15 addressings

Output

The power supply must contain a reliable isolation to IEC 364-4-41 (PELV or SELV)!

Watchdog function	integrated
Supply voltage (AUX)	24 VDC ± 10%

Inputs

Input configuration	PNP
Sensor supply	via AS interface
Sensor voltage supply	24 VDC ± 20%
Current loading capacity	max. 200 mA, short circuit proof
Switching level „1“ signal	≥ 10 V
Limitation of input current	≤ 6.5 mA
Input current „0“ signal	≤ 1.5 mA

State indicators

Bus: LED green / LED red	for function, see 5.6.2.3
AUX POWER: LED green on / off	supply voltage (AUX) on / off
Inputs: LED yellow on / off	connected / not connected

Housing

Operating temperature	0 ... + 50 °C
System of protection	IP 65

5.6.4.2 Characteristics

- 4 valve outputs, electrically isolated from the bus, voltage supply via external 24 V, connection of valves (1 W / 2 W)
- 4 sensor inputs via 4 M12 circular connectors (8 sensors can be connected by means of Y-distributors)
- Diagnosis LEDs
- 1 ASI address is occupied

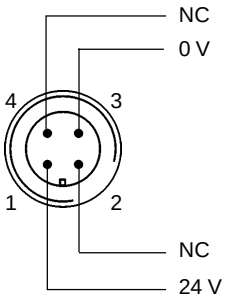
5.6.4.3 Connection and displays

Diagnosis LEDs

LED1 green	LED2 red	State signalled
OFF	OFF	Power off / no operating voltage
OFF	ON	No data traffic / Watchdog expired
Ein	OFF	OK
flashes	ON	Slave address = 0
OFF	flashes	External RESET / overload

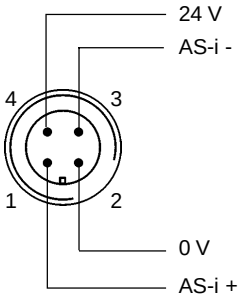
M12 plug for voltage supply to valves (AUX power)

Pin	Description
1	24V (valves)
2	not connected (NC)
3	0V (valves)
4	not connected (NC)



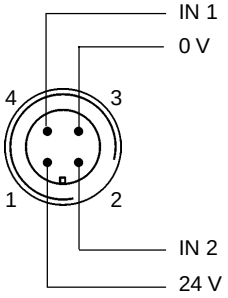
M12 plug for field bus connection (AS-i)

Pin	Description
1	AS-i +
2	0 V (valves)
3	AS-i -
4	24 V (valves)



M12 sockets for sensor inputs

Pin	Description
1	24 V sensor supply
2	Input 2
3	0 V sensor supply
4	Input 1



5.6.4.4 Function of DIP switches

Via DIP switch 1, the slave of the device can be isolated from the bus.

Changing the DIP switch settings

➔ Remove the plugged-on termination module on the right hand side.

➔ Change the settings of the DIP switches:

Switch 1	switches Slave 1 from the bus (AS-i line to subscriber is interrupted) (In the as-delivered condition and in normal operation, the switches are in the ON position, slave address „0“)
Schalter 2	no function

➔ Attach the termination module to the right hand side!

5.6.4.5 Programming notes

Assignment of the data and parameter bits

Data bits:

Slave	D3	D2	D1	D0
Output data	Valve 4	Valve 3	Valve 2	Valve 1
Input data	IN4	IN3	IN2	IN 1

ID code: F

I/O code: 7

Profile: 7.F

Parameter bits:

The parameter bits have no function

5.7 Input Expansion Module for Transducers (proximity sensors)

The expansion module is used for the connection of electrical transducer inputs (proximity sensors) to the field bus module.

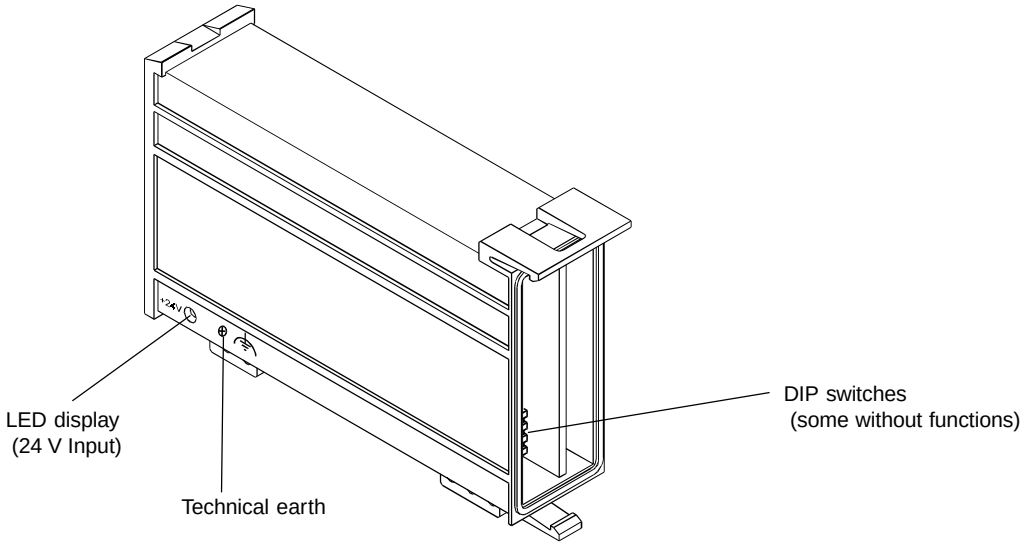


Fig. 34: Input Expansion Module EME-32

Minimum current loading capacity of supply unit

The voltage supply for the repeaters is protected against short circuit by a self-resetting cut-out (700 mA).

The peak current on short circuit may rise briefly to 1.5 A. With insufficient dimensioning of the supply unit, this causes a voltage collapse that may lead to a reset of the field bus module.

On connection of one valve island, the current loading capacity of the supply unit I_{max} is calculated from:

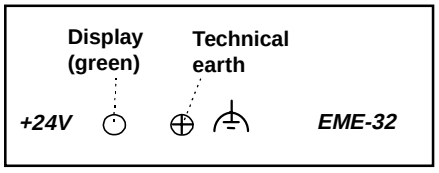
$$I_{max} = I_{total} + 700\ mA$$

If several valve islands are supplied from the same supply unit, the current I_{max} is calculated from:

$$I_{max} = I_{total}\ (\text{valve battery 1} + \text{vi 2} + ... + \text{vi n}) + 700\ mA$$

(see also Chapter 3: Technical Data)

Display of the EME-32 Module



Display of the +24 V LED:

LED	OFF	No supply voltage
LED	ON	Supply voltage present

Fig. 35: Display of the EME-32 module

NOTE The DIP switches on the side of the module have no function at the moment!

6 INTERNAL BUS EXTENSION

6.1 Remote I/O Interface Connection Module (RIO Interface)

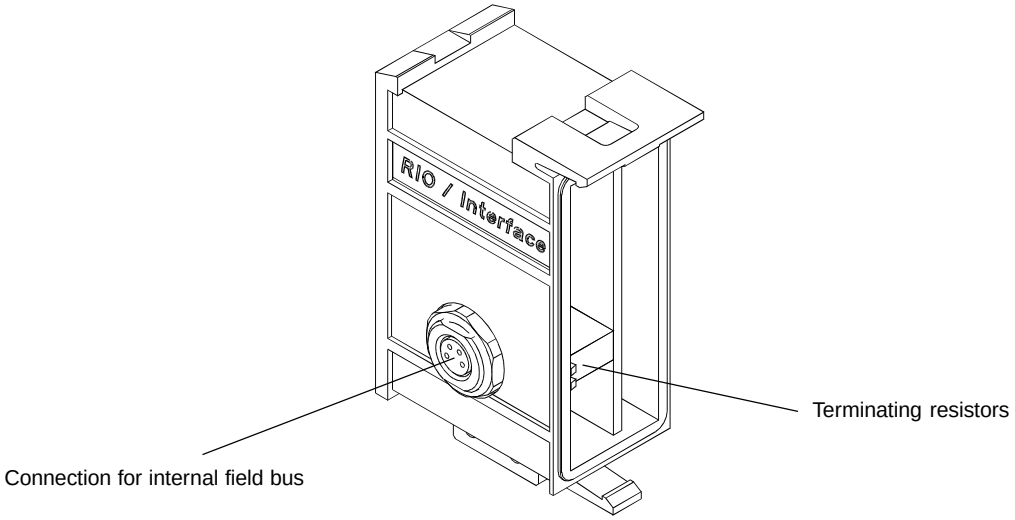


Fig 36: Remote I/O Interface Connection Module

Terminating resistors:

DIP 1	DIP 2	
OFF	OFF	Terminating resistors non-active
ON	ON	Terminating resistors active

For the internal field bus, a 4-pole circular connector M8 (socket) is used.

 **Pin Nr.**	**Signal name (plug on device, socket on cable)**
1	CAN-HIGH
2	CAN-LOW
3	not connected
4	not connected

NOTE The RIO interface module may be combined with the valve control module „RIO-VA“ (see 6.2) or the „Digital E/A module“ (see 6.3)

6.2 Expansion module connection (RIO-VA)

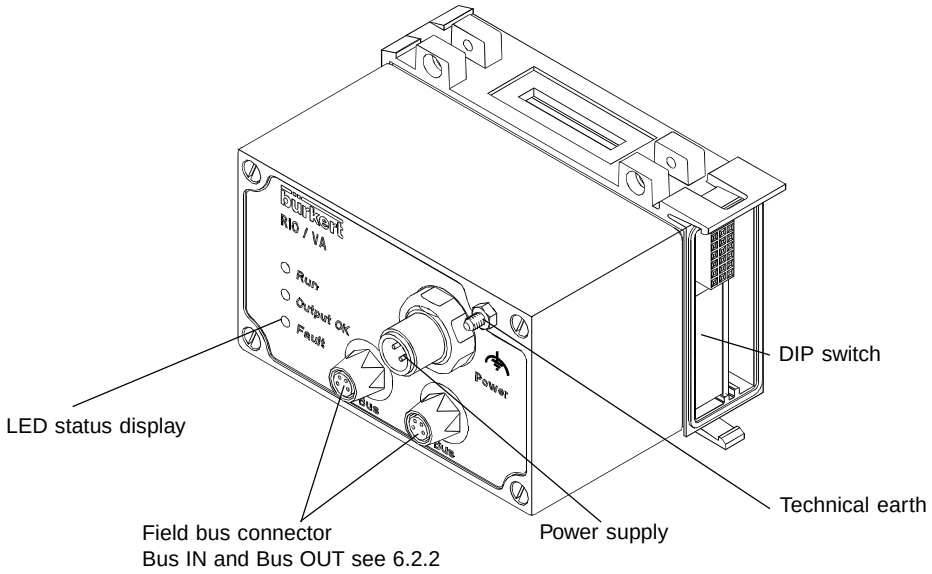


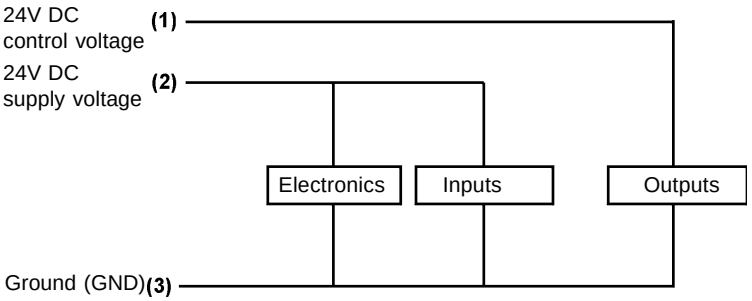
Fig. 37: General view of the Expansion Module Connection

Accessories

Connection line Remote I/O Interface to RIO-VA	1 m	Id. No. 917 498 M
Connection line Remote I/O Interface to RIO-VA	2 m	Id. No. 917 499 N
Plug connector M12+1 (socket) for the power supply		Id. No. 917116D

6.2.1 Power supply

The 4-pole circular connector M12 (plug) for voltage supply is wired as follows:



Pin 1	24 VDC outputs
Pin 2	24 VDC inputs and electronics
Pin 3	Ground (GND)
Pin 4	not used

NOTE Pin 1 of the power supply must be fused with 3A (semi-time lag), and Pin 2 with 1 A (semi-time lag)

ATTENTION! To ensure the electro-magnetic compatibility (EMC), connect the screw terminal TE (Technical earth) to the ground potential with a cable that is a short as possible (30 cm).

6.2.2 Field bus connection

For the internal field bus, 4-pole connectors M8 are used.

NOTE The pin configuration of the two bus connectors are identical.

 Pin No.	**Signal name Incoming interface (BUS IN) (Socket on unit, plug on cable)**	**Signal name Ongoing interface (BUS OUT) (Plug on unit, socket on cable)**
1	CAN-HIGH	CAN-HIGH
2	CAN-LOW	CAN-LOW
3	not connected	not connected
4	not connected	not connected

6.2.3 LED Status Display

LED	**Status**	**Description**
RUN	ON	Error-free operation of the expansion battery
Output OK	ON	
Fault	OFF	

Fault

LED	**Status**	**Description**	**Cause of fault / Rectification**
RUN	OFF	24 V power supply No voltage present	Check the power supply (Power supply connector Pin 2)
Output OK	OFF	24 V control voltage for the outputs No voltage present	Check the control voltage (Power supply connector Pin 1)
Fault	BLINKING	Response monitoring time on the valve battery has expired without a response to the Main battery	**In operation:** Check the Main battery and the bus cable. **During commissioning:** Check the network configuration on the Master and the station address on the battery.

6.2.4 Setting the DIP switches

Using the DIP switches, you can carry out settings for the field bus module. They are located on the right-hand side, in the lower part of the bus module (see also Chapter 6.2: General View). In order to access the DIP switches, remove the plugged-in termination module.

NOTE A change of the switch position only becomes active after the field bus module has been restarted.

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Address on internal RIO-Bus			No. of output bytes		No. of input bytes			Inputs Mode		Input filter ON: active	Reserve

6.2.4.1 Addresses on the internal RIO Bus: DIP Switches 1 to 3

Each expansion battery has a unique address. This address is set up on the expansion battery using the DIP switches 1 to 3.

DIP-1	DIP-2	DIP-3	Adress	Expansion battery
OFF	OFF	OFF	0	0
ON	OFF	OFF	1	1
OFF	ON	OFF	2	2
ON	ON	OFF	3	3
OFF	OFF	ON	4	4
ON	OFF	ON	5	5
OFF	ON	ON	6	6
ON	ON	ON	7	7

6.2.4.2 Number of Output bytes: DIP switches 4 and 5

Here, the number of bytes necessary for the transmission of the additional data of the outputs from the Main battery can be entered

	DIP-4	DIP-5
0 Bytes (no outputs)	OFF	OFF
1 Byte (max. 8 outputs)	ON	OFF
2 Bytes (max. 16 outputs)	OFF	ON
3 Bytes (max. 24 outputs)	ON	ON

6.2.4.3 Number of Input bytes: DIP switches 6 to 8

Here, the number of bytes necessary for the transmission of the additional data of the inputs to the Main battery can be entered

	DIP- 6	DIP- 7	DIP- 8
0 Bytes (no inputs)	OFF	OFF	OFF
1 Byte (max. 8 outputs)	ON	OFF	OFF
2 Bytes (max. 16 outputs)	OFF	ON	OFF
3 Bytes (max. 24 outputs)	ON	ON	OFF
4 Bytes (max. 32 outputs)	OFF	OFF	ON

6.2.4.4 “Inputs” mode: DIP switches 9 and 10

NOTE Using the input mode, the inputs (transducers) can be allocated in different ways in the process layout of the inputs (PAE).

	DIP 9	DIP 10
No inputs present	OFF	OFF
Normal mode	ON	OFF
Mode: shifted inputs	OFF	ON
Mode: halved inputs	ON	ON

ATTENTION! If no inputs are present, both switches must be set to OFF

Normal Mode

In the Normal mode, all inputs are read in from right to left.

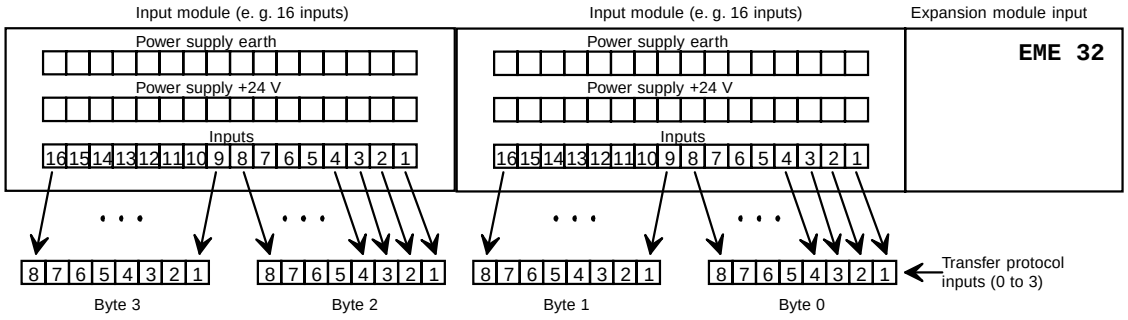


Fig. 38: Normal mode

“Shifted Inputs” mode

In the “Shifted Inputs” mode, the first 16 inputs are alternately set in the transfer protocol in Byte 0 and Byte 1. With the next 16 inputs, the same takes place for Byte 2 and Byte 3.

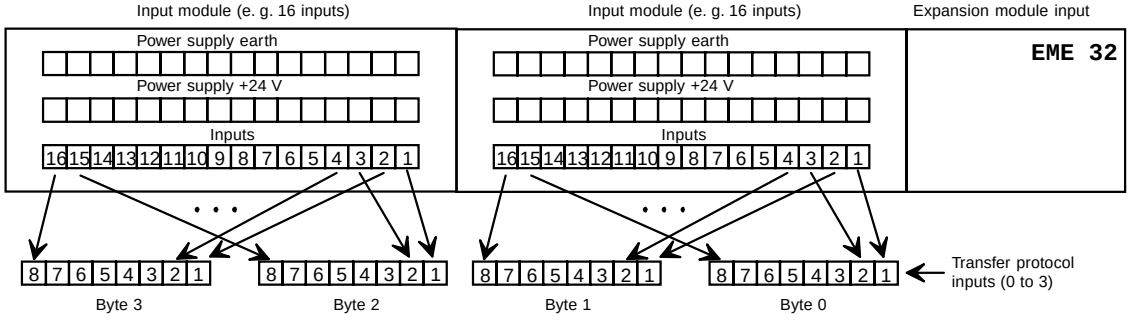


Fig. 39: “Shifted Inputs” mode

Modus “Halved Inputs” mode

In the “Halved Inputs” mode, every second input is missed out. Only inputs 1, 3, 5, ... are transferred; as a result, only 2 Bytes are needed for 32 physically-present inputs.

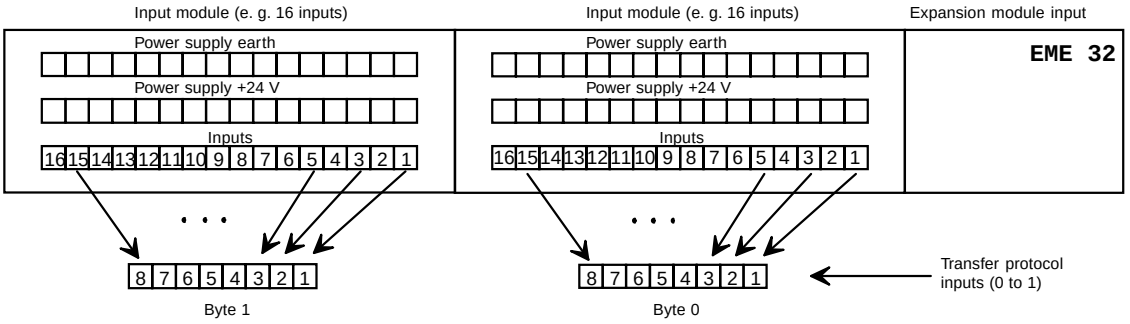


Fig. 40: “Halved Inputs” mode

6.2.4.5 Input filter: DIP switch 11

With the input filter, disturbances are suppressed that affect the input modules. It is hence recommended to always activate this input filter.

	DIP 11
Input filter inactive	OFF
Input filter active	ON

ATTENTION!

With the filter active, only signals with a duration of ≥ 2 ms will be recognised. In order to comply with the guidelines of the EMC Act, the input filter **must** be activated.

6.2.5 Terminal resistance

In the Remote I/O, the two-wire lines of the field bus must be terminated at both ends with resistances. If the last subscriber is a valve battery, the terminal resistance can be activated through the DIP switch. The DIP switch is located on the underside of the Bus module, underneath a protective cap.

NOTE

With the high data transfer rates used in the field bus technology, there can be signal reflections at the end of the field bus branches which cause interference. This can lead to data errors. By adding terminal resistors, these reflections are suppressed.

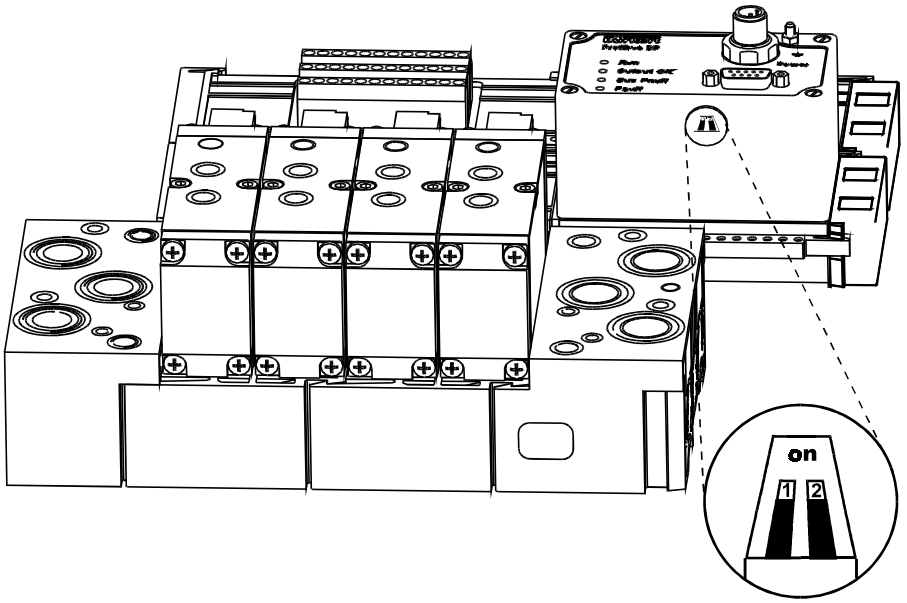


Fig. 41: Activating the terminating resistances

Activating the terminal resistors on the underside of the module

➔ Carefully remove the protective cap!

➔ Slide both switches to the rear, into the ON position!

➔ Replace the protective cap!

6.3 Input / output modules

6.3.1 Digital basic I/O module

6.3.1.1 Function

Input or output of digital signal values, transmission by CAN bus (RIO) to valve island type 8640 (Profibus DP from serial no. 34410 SW version „L“).

6.3.1.2 Technical data

Supply voltage	24 VDC (separate for inputs and outputs)
Power consumption	max. 5 W
Module configuration	1 byte, i.e. 8 digital inputs or 8 digital outputs, as desired

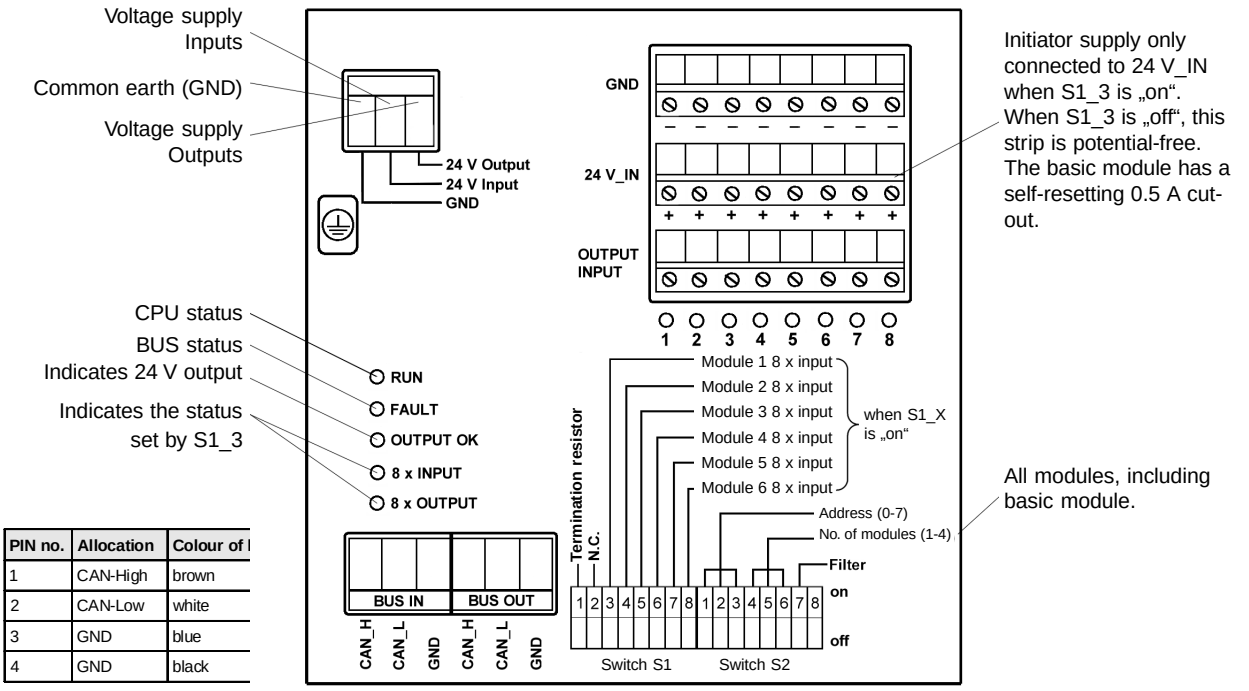
NOTE On one module no mixed configuration is possible, i.e. only 8 digital inputs or 8 digital outputs.

Inputs

Current consumption	10 mA per input
Voltage level	0...4.5 V = LOW 13...28 V = HIGH

Outputs

Max. load current	0.5 A per output
Max. extension	6 byte : 1 basic module, 5 extension modules. With the DIP switches S1_3 through S1_8, the function of the modules can be set byte by byte.
Protection	IP20



PIN no.	Allocation	Colour of
1	CAN-High	brown
2	CAN-Low	white
3	GND	blue
4	GND	black

6.3.1.3 Setting the DIP switches

The DIP switches are accessible after removing the cover (pull out forward).

Switch S1 Configuration of the inputs or outputs

DIP switch	Module
S1_3	Basic module
S1_4	Extension module 1
S1_5	Extension module 2
S1_6	Extension module 3
S1_7	Extension module 4
S1_8	Extension module 5

Switch position „on“: all module terminals „input“

Switch position „off“: all module terminals „output“

Setting the no. of addresses with switch S2

No. of addresses	S2_1	S2_2	S2_3
0	off	off	off
1	on	off	off
2	off	on	off
3	on	on	off
4	off	off	on
5	on	off	on
6	off	on	on
7	on	on	on

Setting the no. of modules with switch S2

No. of modules	S2_4	S2_5	S2_6
1	on	off	off
2	off	on	off
3	on	on	off
4	off	off	on
5	on	off	on
6	off	on	on

6.3.2 Digital I/O extension module

6.3.2.1 Technical data

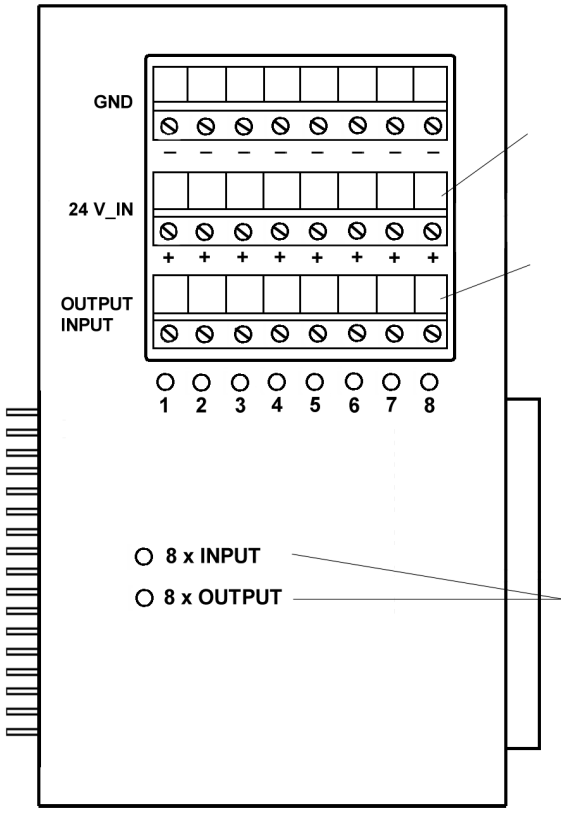
Supply voltage 24 VDC (separate for inputs and outputs)
1 byte (8) digital inputs or outputs (to be selected on the basic module)

Inputs

Current consumption	10 mA per input
Voltage level 13...28 V = HIGH	0...4.5 V = LOW

Outputs

Max. load current	0.5 A per output
• Max. 5 extension modules in a row	6 byte (48) inputs/outputs (incl. basic module)
• Summated current over all outputs	max. 10 A
• Transfer rate of RIO interface	125 kBaud
• Terminal connection	
• Protection	IP20



- **Initiator supply (for third conductor) with 24 VDC**, if DIP switch S1_X on basic module is **„on“**; self-resetting 0.5 A cut-out in each module
- **potential-free**, if DIP switch S1_X on basic module is **„off“**.

Signal strip for inputs or outputs, depending on the position of Dip switch S1_X;
each output is made safe to approx. 0.5 A by „intelligent“ semiconductor switches.

ATTENTION!

Before connection the sensors (initiators), check whether the associated DIP switch S1_X is set to **„on“** (input); otherwise the sensor may be destroyed.

LEDs show the status of module „X“ set on the basic module by switch S1_X.

6.3.3 Digital I/O subscribers for Profibus DP

A subscriber is understood as the coupling of a basic module to 0 to 5 extension modules.

1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte
Basic module	Extension module 1	Extension module 2	Extension module 3	Extension module 4	Extension module 5
8 x output or 8 x intput	8 x output or 8 x intput	8 x output or 8 x intput	8 x output or 8 x intput	8 x output or 8 x intput	8 x output or 8 x intput

NOTE

- 1 module can have only 8 inputs or 8 outputs; a mixed configuration on a module is not possible.
- Configuration of the modules is done with DIP switches S1_3 through S1_8.
- With mixed configuration of modules „inputs“ and modules „outputs“, please arrange modules „outputs“ in front of modules „inputs“.

6.3.4 Configuration of the digital I/O subscribers

(see also Profibus DP commissioning)

6.3.4.1 Configuration, byte by byte

Each RIO extension (valve battery and/or digital I/O module) occupies two slots (identifiers) on the configuration tool of the PLC Simatic S5 or S7. The parameter telegramme is correctly preset by the GSD file.

Slot	Description	
1 (0)	Inputs	Main battery
2 (1)	Outputs	
3 (2)	Inputs	Subscriber 0
4 (3)	Outputs	
5 (4)	Inputs	Subscriber 1
6 (5)	Outputs	
7 (6)	Inputs	Subscriber 2
8 (7)	Outputs	
9 (8)	Inputs	Subscriber 3
10 (9)	Outputs	
11 (10)	Inputs	Subscriber 4
12 (11)	Outputs	
13 (12)	Inputs	Subscriber 5
14 (13)	Outputs	
15 (14)	Inputs	Subscriber 6
16 (15)	Outputs	
17 (16)	Inputs	Subscriber 7
18 (17)	Outputs	

Siemens

Standard

Example:

- **Main battery with 32 inputs and 24 outputs**
- **Extension battery with 32 inputs and 24 outputs**
- **Digital I/O subscriber with 3 input and 3 output bytes (modules)**

Slot	Identifier	Description	
1 (0)	32DE (019)	Inputs	Main battery
2 (1)	24DA (034)	Outputs	
3 (2)	32DE (019)	Inputs	Subscriber 0 (valve battery with address 0
4 (3)	24DA (034)	Outputs	
5 (4)	24DE (018)	Inputs	Subscriber 1 (digital I/O subscriber with address 1)
6 (5)	24DA (034)	Outputs	

Siemens
Standard

6.3.4.2 Configuration, bit by bit

Each RIO extension (valve battery and/or digital I/O module) occupies two bytes in the user area of the parameter telegramme (HEX parameters).

Byte (total)	Byte in the User_Prm_Data	Description	
8	1 (0)	Value = 0: byte-by-byte; value = 1: bit-by-bit	
9	2 (1)	No. of input bits	Main battery
10	3 (2)	No. of output bits	
11	4 (3)	No. of input bits	Subscriber 0
12	5 (4)	No. of output bits	
13	6 (5)	No. of input bits	Subscriber 1
14	7 (6)	No. of output bits	
15	8 (7)	No. of input bits	Subscriber 2
16	9 (8)	No. of output bits	
17	10 (9)	No. of input bits	Subscriber 3
18	11 (10)	No. of output bits	
19	12 (11)	No. of input bits	Subscriber 4
20	13 (12)	No. of output bits	
21	14 (13)	No. of input bits	Subscriber 5
22	15 (14)	No. of output bits	
23	16 (15)	No. of input bits	Subscriber 6
24	17 (16)	No. of output bits	
25	18 (17)	No. of input bits	Subscriber 7
26	19 (18)	No. of output bits	

The configuration of the slots on the configuration tool of the PLC Simatic S5 or S7 may be freely selected in order to better design the distribution in the process map. The required number of input and output bytes must be defined.

Example:

- **Main island with 32 inputs and 24 outputs**
- **Extension island with 32 inputs and 24 outputs**
- **Digital I/O subscriber with 3 input and 3 output bytes (modules)**

Byte in the User_Prm_Data	Value [HEX]	Description	
1 (0)	01	Bit-by-bit	
2 (1)	20	No. of bits, inputs	Main battery
3 (2)	18	No. of bits, outputs	
4 (3)	20	No. of bits, inputs	Subscriber 0 (valve battery)
5 (4)	18	No. of bits, outputs	
6 (5)	18	No. of bits, inputs	Subscriber 1 (digital I/O subscriber)
7 (6)	18	No. of bits, outputs	

Siemens

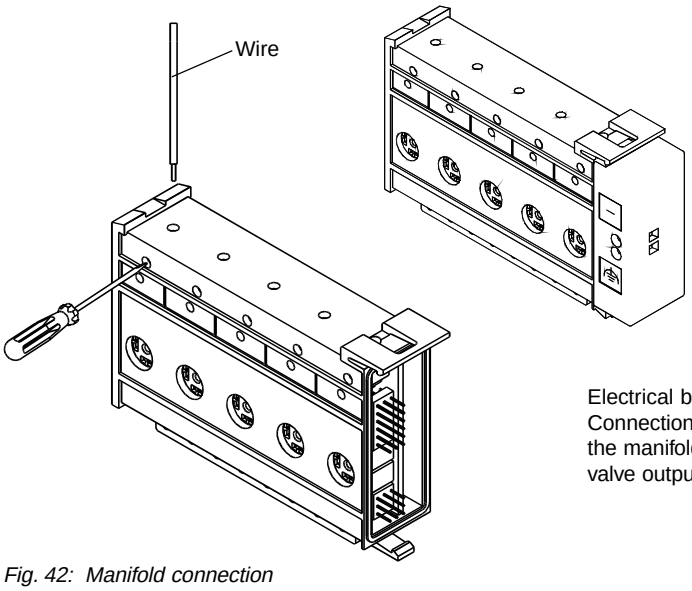
Standard

Definition of the slots on the configuration tool of the PLC:

Slot	0	1	2	3	4	5	6	7
Identifier	32DE (019)	16DE (017)	16DE (017)	8DE (016)	16DE (016)	48DA (037)	16DA (033)	8DA (032)
	Main battery	Extension battery	Extension battery	Digital I/O	Digital I/O	Main and extension battery	Digital I/O	Digital I/O

7 ELECTRICAL BASE MODULE OUTPUT

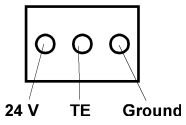
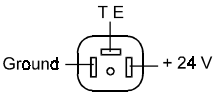
7.1 Manifold connection



Electrical base module “Manifold Connection”, only in connection with the manifold connection module for valve outputs (see 4.1)

Fig. 42: Manifold connection

Allocation plan

Valve types: 6510 6511	Valve types: 5470 6512 6513 6516 6517
	

NOTE The outputs are positive-switching: 24 V is switched
GND is connected.

7.2 Valve outputs

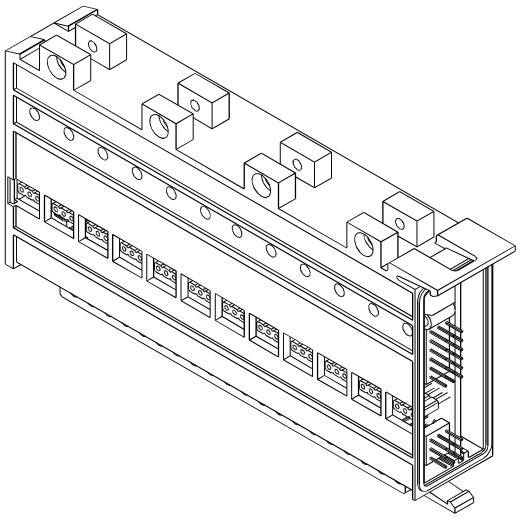
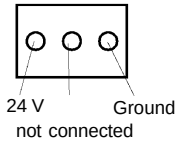
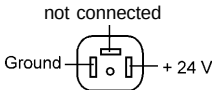


Fig. 43: Electrical base module for valve outputs (12-way)

NOTE The electrical base module contains the connections for the valve control.

Pin allocations for the valve outputs

Valve types: 6510 6511	Valve types: 5470 6512 6513 6516 6517
	

NOTE The outputs are positive-switching: 24 V is switched
GND is connected.

7.3 Valve outputs with Manual / Automatic change-over

With this module, the connected valves can be switched manually or automatically, as wished.

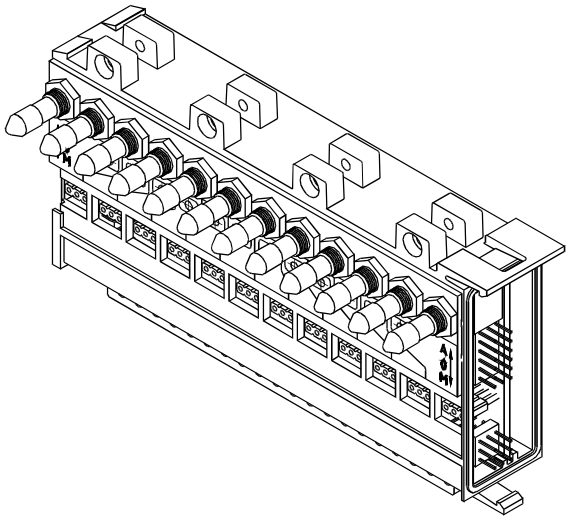
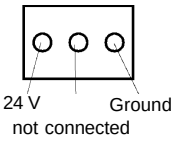
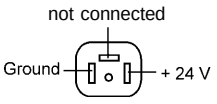


Fig. 44: Electrical base module for valve outputs with manual/automatic change-over (12-way)

NOTE Interlocked switch! The manual / automatic switch is mechanically interlocked. The lever must be pulled before tipping out of the interlock! .

Pin allocations for the valve outputs

Valve types: 6510 6511	Valve types: 5470 6512 6513 6516 6517
	

NOTE The outputs are positive-switching: 24 V is switched
GND is connected.

7.3.1 Switch Function of the Electrical Base Module with Manual / Automatic changeover

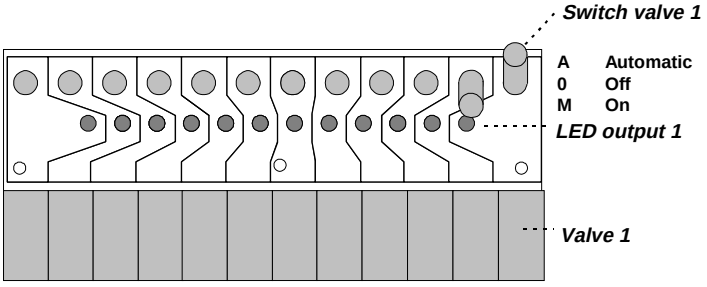


Fig. 45: Module description for the electrical Base Module manual / Automatic switching using the example: Module EGM/HA-10-12

Switch Functions

Switch position		Function	Description
Switch	up:	Automatic	Bus operation: incoming control signal switches the valve
	middle:	Valve “OFF”	Valve is always closed
	down:	Valve “ON”	Valve is always open

7.4 Valve outputs with external control

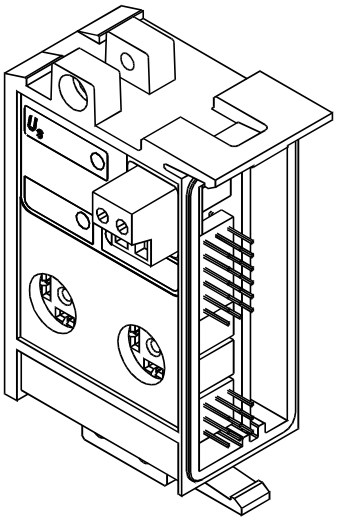


Fig. 46: Valve output with external control

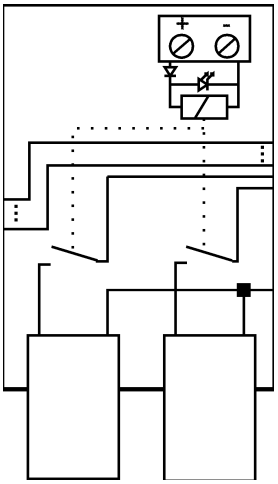
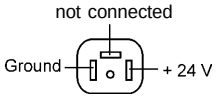


Fig. 47: Switching diagram of the valve outputs.

Nominal voltage U_n	24 V
Pick-up voltage U_{on}	16.8V
Drop-out voltage U_{off}	2.4 V
Input current I_{in}	12 mA

Pin allocations for the valve outputs

Valve types:
5470
6512
6513
6516
6517



NOTE The outputs are positive-switching: 24 V is switched
GND is connected.

8 ELECTRICAL BASE MODULE INPUT

8.1 Terminal inputs for transducers (proximity switches)

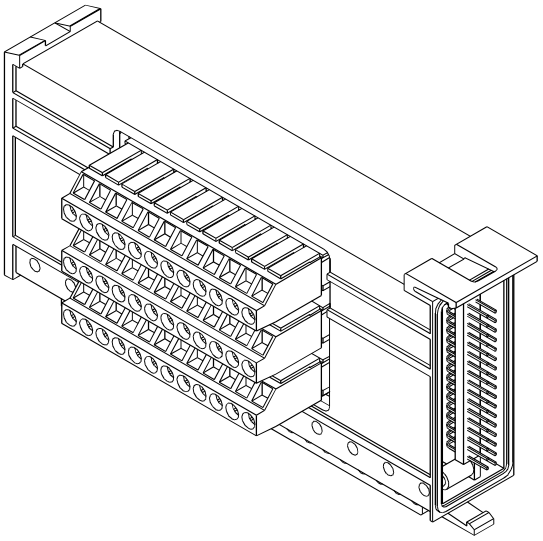


Fig. 48: Electrical base module for transducer inputs (proximity switches) for terminals (IP20)

Terminal allocation

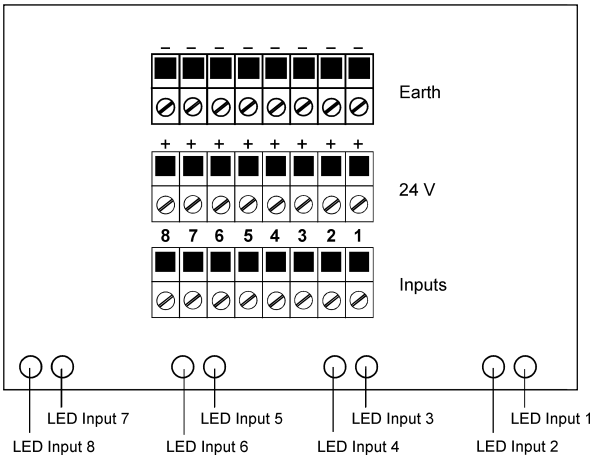


Fig. 4: Terminal allocation

Input voltage:	+ 24 V
Signal:	
0 (logical):	0 to 5 V
1 (logical):	13 to 30 V
Eingangsstrom bei 1-Signal:	≤ 10 mA

8.2 Plug inputs (MS round plug) for transducers (proximity switches)

Electrical base module for transducer inputs (proximity switches) for terminals (IP20)

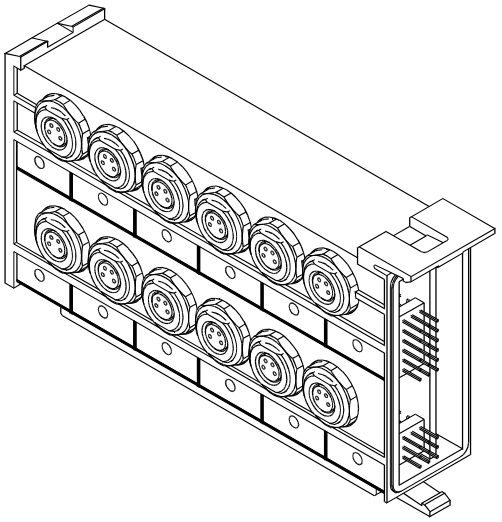


Fig. 50: Electrical base module for transducer inputs

Input voltage:	+ 24 V
Signal:	
0 (logical):	0 to 5 V
1 (logical):	13 to 30 V
Input current for 1 signal:	≤ 10 mA

Inputs of the EGM-SE-19-10 module

10 inputs (round plug) for transducer signals, one LED per input

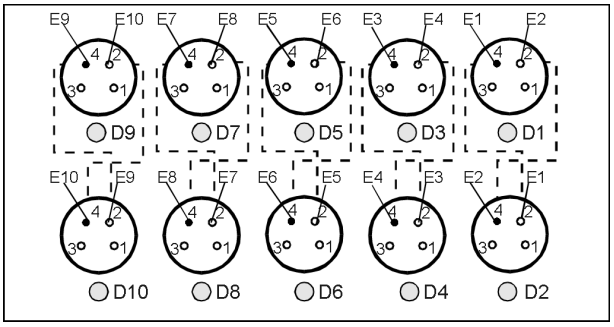
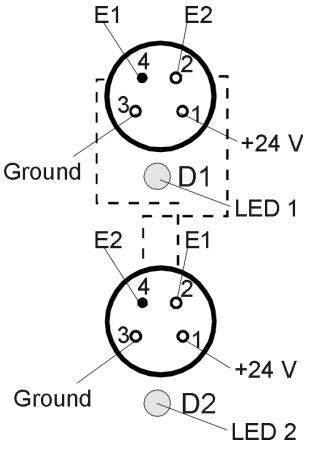


Fig. 51: Pin allocation of the EGM-SE modules, excepting the EGM-SE-19-4



NOTE The internal connection between two plugs lying one above the other is used to direct two transducer signals via one plug.

Inputs of the EGM-SE-19-4 module

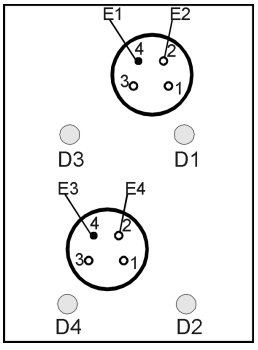


Fig. 52: Pin allocation of the EGM-SE-19-4 module

NOTES

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