E-T-A
ENGINEERING TECHNOLOGY

Instruction Manual Power Distribution System
SVS16-PB-XX

Sicherheitshinweis

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Contents

1 General

The power distribution system SVS16-PB-XX provides selective overcurrent protection, power distribution in load circuits as well as switching and resetting of outputs.

For integral consistent communication of operating and error conditions as well as switching and resetting of individual circuits on the DC 24 V level, the system is fitted with a fully featured PROFIBUS-DP interface.

The track-mountable system has 8 (SVS16-PB-08) or 16 (SVS16-PB-16) slots and accommodates electronic circuit breakers type ESX10-(S)125 (with reset input and status output) and ESX10-(S)115 (with control input and status output) or the solid state remote power controller E-1048-S7xx (with control input and status output).

1.1 General Mounting Guidelines

- The power distribution system must only be installed by qualified personnel.
- Only after proper installation must the device be supplied with electrical power.
- It is only intended for connection to extra low voltage (DC 24 V).
- Connection to higher and/or not reliably disconnected voltage can cause perilous conditions or damages.
- The maximum total current of the power distribution system must not be exceeded. Cable cross section and current rating of the protective elements must be adjusted to the current rating of the connected load in each load path.
- The technical data of the circuit breakers installed have to be observed.
- Provisions have to be made in the system or machine to prevent inadvertent start-up of parts of the system (e.g. by installing a safety PLC) in compliance with the »Machinery Directive 2006/42/EG and EN 60204-1, Safety of Machinery«. In the event of a failure (short circuit / overload) the load circuit will be disconnected by the circuit breaker.
- After tripping of the circuit breaker and before reset, the trip cause (short circuit or overload) has to be remedied.
- The national regulations (e.g. for Germany DIN VDE 0100) have to be observed with regard to installation and selection of input and output lines.

Caution
Electrostatic discharge (ESD).
Device must only be opened by the manufacturer.

Waste management directive
Packaging is capable of recycling and should be led to reuse.

2 PROFIBUS-DP BUS SYSTEM

PROFIBUS-DP is a master-slave-system and can connect up to 126 users. One bus segment can operate max. 32 users.

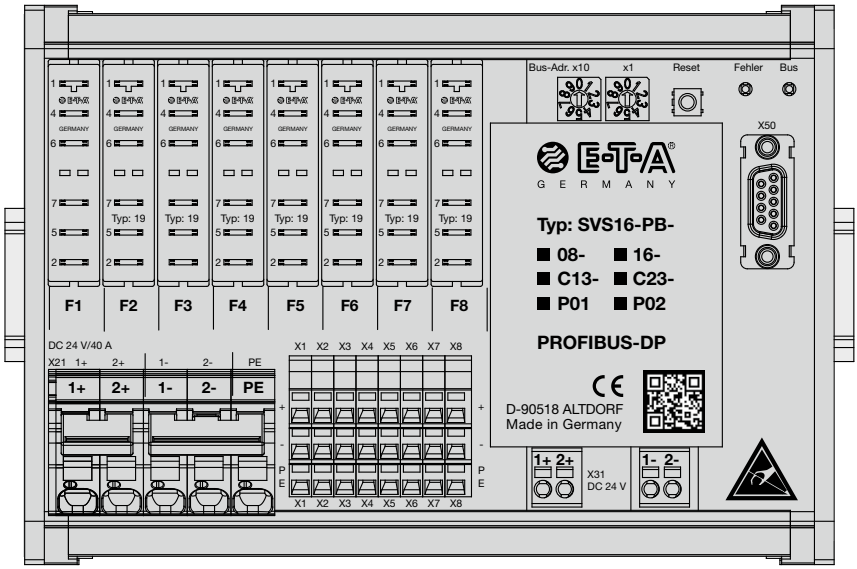
For more information on the bus system, planning, mounting and operation of a PROFIBUS system please see the official documents of the PROFIBUS user organisation (PNO).

The link www.profibus.com/downloads/ leads you to the following documents:

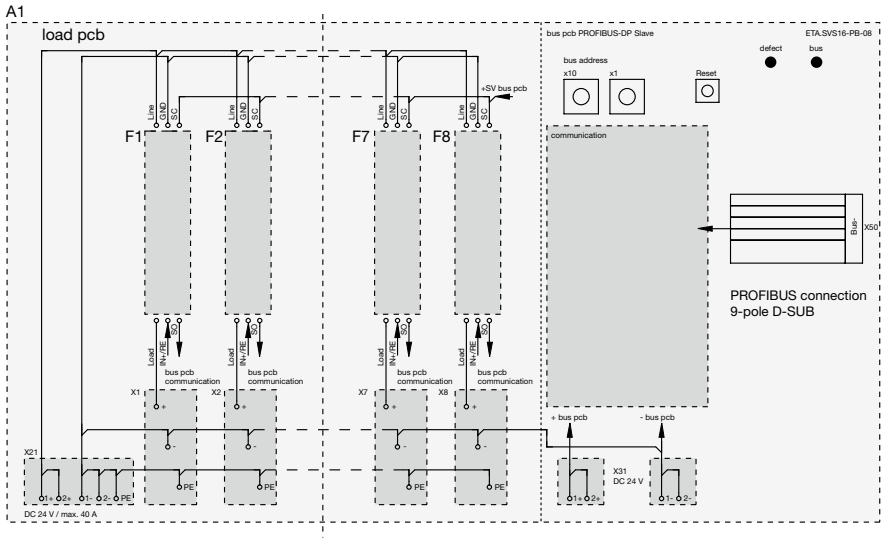
- PROFIBUS (technical guideline)
- PROFIBUS (planning guideline)
- PROFIBUS (mounting guideline)
- PROFIBUS (start-up guideline)

3 SVS16-PB-XX

3.1 Overview



3.1.1 Schematic diagram SVS16-PB-08-xxx



3.2 Terminals

3.2.1 Supply Voltage Load Module

Rated voltage	DC 24 V (18 ... 32 V)
Total current	max. 40 A
DC 24 V (+)	= 1+ / 2+ (2-way)
DC 24 V (-)	= 1- / 2- (2-way)
PE	= PE, connected to DC 24 V (-)
Terminals	X21 with type SVS16-PB-XX-C13-XX: 5-pole print screwless terminals (1+/2+/1-/2-/PE) cable cross section max. 10 mm^2 with type SVS16-PB-XX-C23-XX: 5-pole print screw terminals (1+/2+/1-/2-/PE) cable cross section max. 16 mm^2 screw terminals: M4

3.2.2 Supply Voltage Bus Module

Rated voltage	DC 24 V (18 ... 32 V)
Current consumption	max. 250 mA
Terminals	X31 2-pole push-in-terminal (1+/2+) cable cross section max. 1,5 mm^2 2-pole push-in-terminal (1-/2-) cable cross section max. 1,5 mm^2

3.2.3 Load Outputs

Rated voltage	DC 24 V (18...32 V)
Load current	max. 8A per terminal block / slot (L+) protected load output (+) (L-) minus return load (-) (PE) PE
Terminals	X1…X8 (X16) with type SVS16-PB-XX-C13-XX: three-level print spring-loaded terminals cable cross section max. 1.5 mm^2 with type SVS16-PB-XX-C23-XX: three-level print screw terminals cable cross section max. 1,5 mm^2 screw terminals: M3

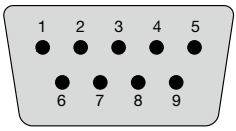
3.2.3 F Slots

Slots for types ESX10-(S)115, ESX10-(S)125 and E-1048-S7xx.

SVS16-PB-08... F1...F8 = terminals X1...X8
SVS16-PB-16... F1...F16 = terminals X1...X16

3.2.5 PROFIBUS-DP Bus Connection

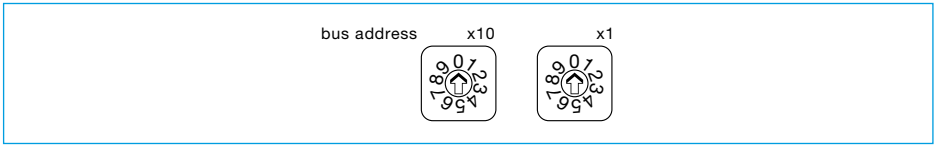
The 9-pole D-Sub connector recommended in the EN 50170 should be used as bus connection. On the SVS16 the bus connection is designed as bushing. Terminal: X50



Pin assignment of 9-pole Sub-D connector

Pin-number	Signal	Definition
1	free	
2	free	
3	B-Line	data line B
4	RTS	control signal for
5	BUS-GND	ground to BUS-5V
6	BUS-5V	Vcc load resistors (max. 100mA)
7	free	
8	A-Line	data line A
9	free	

3.3 Addressing the SVS16-PB



Any user in a PROFIBUS network requires a unique address. The user address on the PROFIBUS will be adjusted directly on the SVS16-PB-XX by means of two rotary switches. The rotary switches have a value range of 0…9. The ones position is marked with x1, the tens position with x10. The valid address range is between 01 and 99.

Caution!
The imported address is only read once after applying the supply voltage. Change of address will therefore only come into effect after removal and repeated application of the supply voltage or by actuation of the reset button.

3.4 Parameterising of the SVS16-PB

For convenience of parameterising and configuration by means of a configuration software a master data file called ETA_0C9E.gsd will be made available for download on the E-T-A homepage. This file will hold all vital and basic characteristics for parameterising/configuration and for the operation at any PROFIBUS-DP master control unit.

3.4.1 Meaning of the Parameters

As requested by the EN 50170, the SVS16-PB processes the parameter bytes 1-7. There are no other user parameter data. Design and meaning of the 7 parameter bytes are described in the following:

Parameter byte 1

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 0	reserved	
Bit 1	reserved	
Bit 2	reserved	
Bit 3	WD_On	If this bit is set to 0, response monitoring (WatchDog) of the SVS16 will be deactivated.
Bit 4	Freeze_Req	This bit signals to the SVS16 that it shall be operated in the Freeze_mode.
Bit 5	Sync_Req	This bit signals to the SVS16 that it shall be operated in the Sync_mode.
Bit 6	Unlock_Req	The Master sets this bit to 1 to release access to the SVS16 for another Master. This bit takes priority over the following bit 7/ Lock_Req.
Bit 7	Lock_Req	The Master sets this bit to 1 to block access to the SVS16 for other Masters.

Parameter byte 2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 0 - Bit 7		WD_Fact_1		Watchdog factor 1			

Parameter byte 3

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 0 - Bit 7		WD_Fact_2		Watchdog factor 2			

The values held in the two bytes above represent factors for adjustment of the response monitoring time. The time of response monitoring will be calculated as follows:

Response monitoring time = WD_Fact_1 * WD_Fact_2 * 10 ms

Thus times from 10 ms to 650 sec. can be realised, independently of the Baud rate.
Response monitoring is switched on or off by the bit WD_On.

Parameter byte 4

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 0 - Bit 7		Min_TSDR		Min. response time of SVS16-PB in t_{Bit}			

Min_TSDR is the time which the SVS16 has at least to wait before it can send its responses back to the Master. 11 t_{Bit} are the minimum requirement as per standard.

Parameter byte 5

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 0 - Bit 7		Ident_Number_High		Ident number of higher valence byte (0x0C)			

Parameter byte 6

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 0 - Bit 7		Ident_Number_Low		Low Ident number of lower valence byte (0x9E)			

The SVS16-PB only accepts parameterising telegrams where the transmitted Ident-Number is identical with its own Ident-Number. Exception: the Min_TSDR, it can also be set in case the two bits Lock_Req and Unlock_Req are zero and the Ident_Number is not identical.

Parameter byte 7

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 0 - Bit 7		Group_Ident		Group assignment			

This byte allows group assignment for the function Global_Control. Each bit represents a group.

7	6	5	4	3	2	1	0	Parameter byte 7: Group assignment
							x	unit is part of group 1
						x		unit is part of group 2
								...
x								unit is part of group 8

Note: will only be adopted if Lock_Req bit is set.

3.5 Configuration of SVS16-PB

The SVS16-PB uses the general identifier format for configuration. This way of configuring will be supported by all Masters.

As the SVS16-PB-XX is designed as a modular slave, the GSD file describes both the power distribution system with 8 and with 16 slots. On type SVS16-PB-08 you can configure one output module and one input module each. The system with 16 slots (SVS16-PB-16) has max. two output modules and 2 input modules selectable. One module describes 8 slots each. The following assignments are valid:

	Output byte 1 (Control/Reset)							
Slot no.	F1	F2	F3	F4	F5	F6	F7	F8
Binary value	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7
Decimal value	1	2	4	8	16	32	64	128

	Output byte 2 (Control/Reset)							
Slot no.	F9	F10	F11	F12	F13	F14	F15	F16
Binary value	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7
Decimal value	1	2	4	8	16	32	64	128

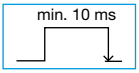
Each output byte controls 8 slots and the lowest-valence bit (LSB) of the output byte 1 is assigned to the slot F1. The highest-valence bit (MSB) of the output byte 1 is assigned to slot F8. Along the lines of output byte 1 the lowest-valence bit (LSB) of output byte 2 is assigned to slot F9 and the highest-valence bit (MSB) is assigned to slot F16.

Depending on the population of the SVS16-PB the following specifications are valid:

a) slot fitted with E-1048-S7xx (with control input and status output)
1 → 24V ON → E-1048-S7xx switch on
0 → 24V OFF → E-1048-S7xx switch off

b) slot fitted with ESX10-(S)115 (with control input and status output)
1 → 24V ON → ESX10-(S)115 switch on
0 → 24V OFF → ESX10-(S)115 switch off

c) slot fitted with ESX10-(S)125 (with reset input and status output)



An ESX10-(S)125 in the OFF condition requires a reset pulse for reset of min. 10 ms. The ESX10-(S)125 cannot explicitly be switched off.

	Input byte 1 (Status)							
Slot no.	F1	F2	F3	F4	F5	F6	F7	F8
Binary value	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7
Decimal value	1	2	4	8	16	32	64	128

	Input byte 2 (Status)							
Slot no.	F9	F10	F11	F12	F13	F14	F15	F16
Binary value	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7
Decimal value	1	2	4	8	16	32	64	128

Any input byte allows importing of status or failure indication of 8 slots. Assignment of the individual slots is identical with the assignment described above of the output bytes (LSB of output byte 1 is assigned to slot F1, MSB to slot F8 etc.).

Independent of the type configurations the following is valid:

1 → unit is ON
0 → unit is OFF or slot is empty

3.6 Baud Rates

The SVS16-PB supports all Baud rates specified in the PROFIBUS standard up to 12,000 Kbit/s. These include:

9.6 Kbit/s	19.2 Kbit/s	45.45 Kbit/s	93.75 Kbit/s	187.5 Kbit/s
500 Kbit/s	1,500 Kbit/s	3,000 Kbit/s	6,000 Kbit/s	12,000 Kbit/s

The SVS16 automatically recognises the Baud rate specified by the Master.

3.7 Status LEDs

LED »Bus«	OFF	Slave is OFF-Line, and/or no supply voltage available
LED »Bus«	**ON**	**Slave is in DATA-EXCHANGE mode**
LED »Bus«	flash mode (1Hz.)	Slave is in CLEAR mode (SVS16-PB is just being parameterised/initialised)
LED »Fehler«	**OFF**	**No error,** and/or no supply voltage available
LED »Fehler«	ON	Error during initialisation of the slave (Hardware failure, SVS16-PB)
LED »Fehler«	flash mode (1Hz.)	Error during configuration/parameterisation of the slave (Network configuration error)

The LED conditions in normal duty are written in bold type.

3.8 Output Behaviour in the Event of PROFIBUS Failures

Behaviour of the outputs in the event of a PROFIBUS failure (failure of the Master, interruption of bus cable etc.) differs in dependence of the type number of the SVS16:

SVS16-PB-XX-XX-**P01.**
A bus failure does not affect the condition of the connected loads. The output byte(s) assigned to the slots remain unchanged.

SVS16-PB-XX-XX-**P02.**
A bus failure affects the condition of the connected loads. The output byte(s) assigned to the slots will be set to 0, i.e. the connected loads will be switched off.

3.9 Diagnostics

The SVS16 provides slave diagnostic data as described in the EN 50170. Set-up and meaning of the 6 Byte standard diagnostic data are described in the following:

3.9.1 Meaning of Diagnostic Data

Byte 0

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 0	Diag.Station_Non_ Existent		This bit is set by the Master , when the SVS16 does not respond. The SVS16 sets this bit to zero.				
Bit 1	Diag.Station_Not_ Ready		This bit is set by the SVS16, when it is not yet ready for the data exchange.				
Bit 2	Diag.Cfg_Fault		This bit is set by the SVS16, when the configuration data received from the Master are not identical with those determined by the SVS16.				
Bit 3	Diag.Ext_Diag		This bit is set by the Slave, when extended diagnostic data are available. The SVS16 does not provide any extended diagnostic data.				
Bit 4	Diag.Not_Supported		This bit is set by the SVS16, when a non-supported function is required.				
Bit 5	Diag.Invalid_Slave_ Resp.		This bit is set by the Master, as soon as a non-plausible reply is received by a slave. The SVS16 sets this bit to zero.				
Bit 6	Diag.Prm_Fault		This bit is set by the SVS16, when the last parameter telegram was faulty.				
Bit 7	Diag.Master_Lock		The slave was parameterised by another Master! This bit is set by the Master when the address in byte 3 is unequal to 0xFF and unequal to the own address. The SVS16 sets this bit to zero.				

Byte 1

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 0	Diag.Prm_Req		If this bit is set by the SVS16, it has to be re-parameterised and re-configured.				
Bit 1	Diag.Stat_Diag		As long as this bit is set by the SVS16, the Master has to pick up diagnostic data. It sets the bit for instance when it cannot provide user data.				
Bit 2	-		This bit is set by the SVS16 firmly to 1.				
Bit 3	Diag.WD_On		This bit is set by the SVS16, as soon as its WatchDog is activated.				
Bit 4	Diag.Freeze_Mode		This bit is set by the SVS16, as soon as it has received the command FREEZE.				
Bit 5	Diag.Sync_Mode		This bit is set by the SVS16, as soon as it has received the command SYNC.				
Bit 6	Diag.Not_Present		This bit is set by the Master, when the slave is not part of the parameter set of the Master. The SVS16 sets this bit to zero.				
Bit 7	Diag.Deactivated		This bit is set by the Master, as soon as the SVS16 is marked as inactive in the Master parameter set. The SVS16 sets this bit to zero.				

Byte 2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 0	reserved						
Bit 1	reserved						
Bit 2	reserved						
Bit 3	reserved						
Bit 4	reserved						
Bit 5	reserved						
Bit 6	reserved						
Bit 7	Diag.Ext_Diag_ Overflow		This bit is set as soon as there is an overflow of diagnostic data. For instance the slave can set this bit when there are more diagnostic data than it can record in the transmission buffer. The Master will set this bit when the slave sends more diagnostic data than the Master can enter into its diagnostic buffer.				

Byte 3

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 0 - Bit 7		Diag.Master_Add		Master address			

This byte holds the address of the Master which has parameterised the SVS16. If the SVS16 has not been parameterised by a Master, the slave will record the value 0xFF into byte 3.

The following 2 bytes hold the 16-bit ident-number of the DP slave. The ident number of the SVS16 is 0x0C9E.

Byte 4

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 0 – Bit 7		Ident_Number_High		Ident number High-Byte (0x0C)			

Byte 5

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit 0 – Bit 7		Ident_Number_Low		Ident number Low-Byte (0x9E)			

Byte 6

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

This byte holds the block length of a possibly available extended diagnosis (Ext_Diag_Data). The SVS16 does not provide any extended diagnostic data.

4 Technical Data

Supply load module: DC 24 V, max. 40 A (screw terminals or screwless terminals)	+24 V (2-way), 0 V (2-way) and PE (1-way) max. 10 mm²
Supply bus module: DC 24 V, max. 250 mA (push-in-terminals)	+24 V (2-way), 0 V (2-way) max. 1.5 mm²
Number of slots	SVS16-PB-08: 8 slots SVS16-PB-16: 16 slots
Population of slots (optional)	• with electronic circuit protectors type ESX10-(S)115 / -(S)125 • with SSRPC type E-1048-S7xx
Load outputs max. 8 A per slot	per load output Load+, Load-, and PE, 1.5 mm² each
Communication interface	PROFIBUS-DP to EN 50170 and/or IEC 61158
LED status	indication module supply, bus status

Notes

Bedienungsanleitung/Instruction manual
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