

PAS 153

PROFIBUS Slave Interface

700-153-1AA03

User Manual

Edition 2 / 19.11.09

HW 1 and FW 1.00 and higher



Order number of manual: 900-153-1AA03/en

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Hannberger Weg 2, 91091 Grossenseebach, Germany

Note:

We have checked the content of this manual for conformity with the hardware and software described. Nevertheless, because deviations cannot be ruled out, we cannot accept any liability for complete conformity. The information in this manual is regularly updated. When using purchased products, please heed the latest version of the manual, which can be viewed in the Internet at www.helmholtz.de, from where it can also be downloaded.

Our customers are important to us. We are always glad to receive suggestions for improvement and ideas.

Revision history of this document:

Edition	Date	Revision
1	17.04.2009	1st version
2	19.11.2009	Restricted use of modules with hardware release smaller 30

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1 Safety Information

For your own safety and for the safety of others, always heed the safety information given here. The safety information indicates possible hazards and provides information about how you can avoid hazardous situations.

The following symbols are used in this manual.



Caution, indicates hazards and sources of error



Gives information



Hazard, general or specific



*Danger of **electric shock***

1.1 General

The PAS 153 module is only used as part of a complete system.



The operator of a machine system is responsible for observing all safety and accident prevention regulations applicable to the application in question.



During configuration, safety and accident prevention rules specific to the application must be observed.



Emergency OFF facilities according to EN 60204 / IEC 204 must remain active in all modes of the machine system. The system must not enter an undefined restart.



Faults occurring in the machine system that can cause damage to property or injury to persons must be prevented by additional external equipment. Such equipment must also ensure entry into a safe state in the event of a fault. Such equipment includes electromechanical safety buttons, mechanical interlocks, etc. (see EN 954-1, risk assessment).



Never execute or initiate safety-related functions using an operator terminal.



Only authorized persons must have access to the modules!

1.2 Restriction of access

The module is an open item of equipment and must only be installed in electrical equipment rooms, cabinets or housings. Access to the electrical equipment rooms, barriers, or housings must only be possible using a tool or key and only permitted to personnel having received instruction or authorization.

1.3 Information for the user

This manual is addressed to anyone wishing to configure, use, or install the PAS 153 module.

It is intended for use as a programming manual and reference work by the configuring engineer. It provides the installing technician with all the necessary data.

The PAS 153 module is for use in a Profibus network only. For that reason, the configuring engineer, user, and installing technician must observe the standards, safety and accident prevention rules applicable in the particular application. The operator of the automation system is responsible for observing these rules.

1.4 Use as intended

The PAS 153 module must only be used as a Profibus interface as described in the manual.

1.5 Avoiding use not as intended!

Safety-related functions must not be controlled using the PAS 153 module alone.

1.6 Installation and mounting instructions

Installation and mounting must be effected in compliance with VDE 0100 IEC 364.



During configuration, safety and accident prevention rules specific to the application must be observed.



Make sure in the software that uncontrolled restarts cannot occur.



Before you start installation work, all systems must be disconnected from their power source.

2 Installation and Mounting



Before you start installation work, all system components must be disconnected from their power source.

Installation and mounting must be effected in compliance with VDE 0100 / IEC 364. Because it is an “OPEN type” module, you must install it in a cabinet.

The maximum ambient temperature of +40°C for vertical installation and +60 °C for horizontal installation must be complied with to ensure reliable operation.

2.1 Mounting orientation

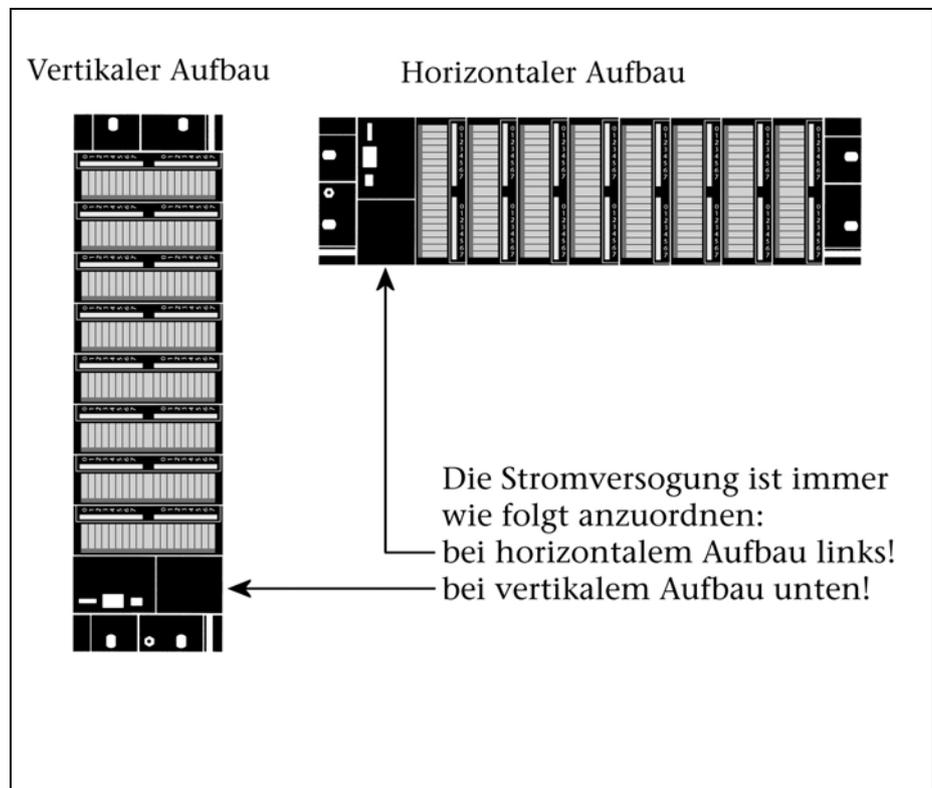
The PAS 153 module can be installed with any orientation.

Permissible ambient temperature:

- for vertical mounting: from 0°C to +40°C
- for horizontal mounting: from 0°C to +60°C



The module can be mounted either vertically or horizontally.

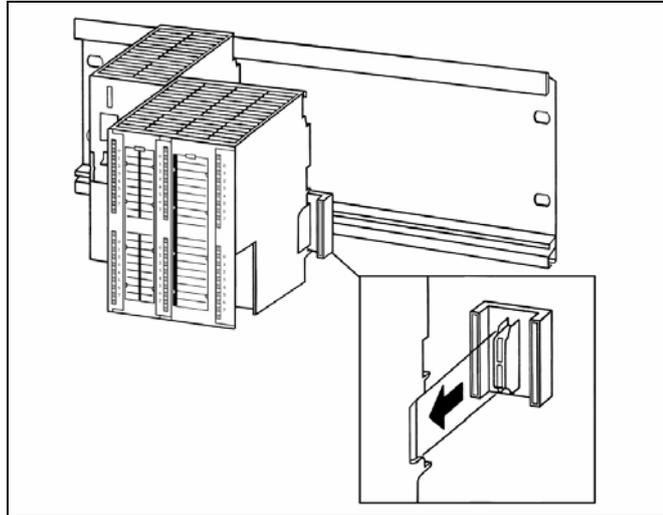


2.3 Mounting of the module on the DIN rail

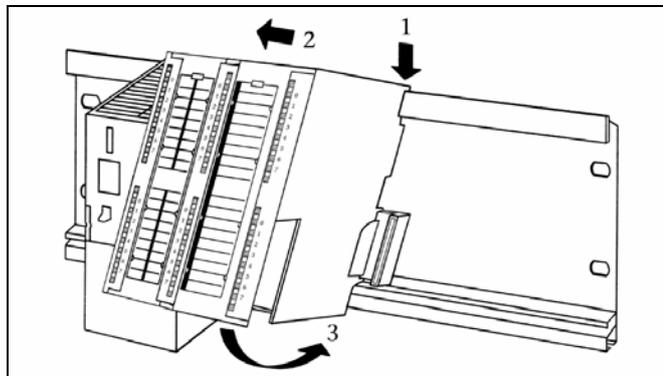
A wall/DIN rail bracket is available as an accessory for mounting on flat surfaces or on DIN rails.

When connecting the bus connector, always start with the PAS 153 module.

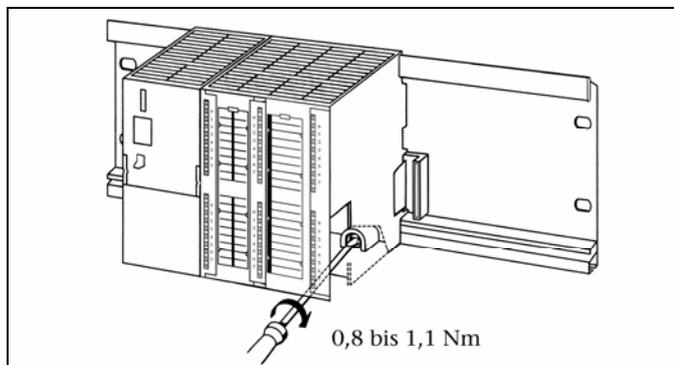
Do not plug a bus connector into the last module of the tier:



Hook on the module (1), slide it up to the left module (2), and click it downward (3).



Screw the modules on with a torque of 0.8 to 1.1 Nm.



The available accessories are listed in Section 3.4 with the corresponding order numbers.

3 System Overview

3.1 Application and function description

The PAS 153 Profibus Slave Interface is for linking digital and analog input and output modules to the Profibus DP. The module can be mounted on a sectional rail.



Up to 16 modules can be connected to the PAS 153, including 8 parameterizable modules.

The PAS 153 is integrated into the hardware configurator of the programming system by a GSD file. The PAS 153 interface performs all communication between the modular I/O device and the higher-level master unit on the Profibus-DP.

The inputs and outputs are assigned to the master during configuration. The PAS 153 module supports all digital and analog input/output modules from Systeme Helmholtz and also numerous modules of the same type from other manufacturers. For more details, see Section 4.7, “Modules supported” on page 25 ff.).

The PAS 153 module works according to DP/V0 and supports baudrates of 9.6 Kbaud to 12 Mbaud. The baudrate is detected automatically.

3.2 Connections

Behind the protective flap on the front of the module, you will find the connectors for the power supply and a SUB-D female connector for the Profibus. Behind the transparent flap, you will find an 8-pole DIL switch for address setting.



Active backplane bus modules are currently not supported.

3.3 LED displays

The PAS 153 module has three LEDs for indicating its operating status. These are labeled

- SF (lights up red),
- BF (lights up red) and
- ON (lights up green).

The meaning of the LEDs for diagnostics is described in Section 4.3 on page 16.



3.4 Accessories

Manual, German/English	900-153-1AA03
Profibus connector 90°	700-972-0BA12
Profibus connector 90° with PG conn. socket	700-972-0BB12
Profibus connector 35°	700-972-0BA41
Profibus connector 35° with PG conn. socket	700-972-0BB41
Profibus connector with axial cable outlet	700-972-0CA12
Insulation stripping tool for Profibus	700-972-6AA00
Compact repeater	700-972-0RB12
Repeater for MPI and Profibus	700-972-0AA02

4 Configuration

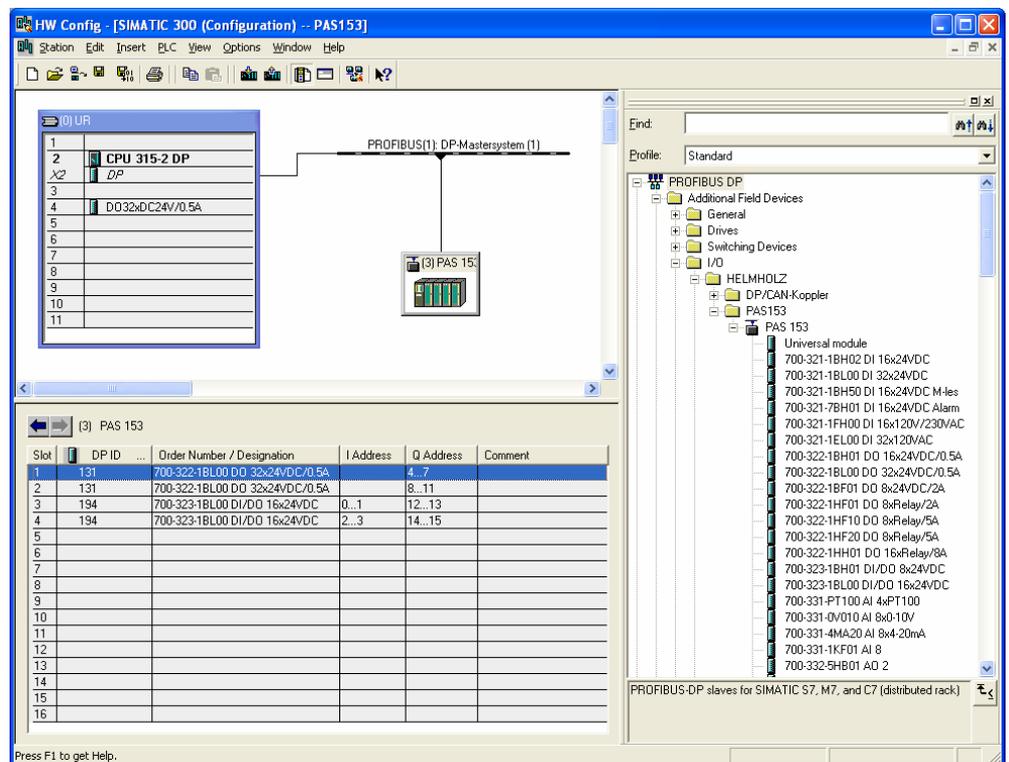
4.1 Hardware configurer

The PAS 153 module is integrated into the programming software of the PLC via a GSD file. This integration is explained below using the Siemens STEP7 programming software.

To be able to use the PAS 153 in the hardware configuration, the GSD file must be installed once. First copy the GSD file (named: "HELMOBED.GSE") supplied to any location on your hard disk.

Then choose the "Install GSD files" function from the "Options" menu in the hardware configuration of STEP7, go to the directory to which you copied the file, and then select the file there.

The information about the PAS 153 module is now added to the selection catalog of the hardware configurer.



You will find the PAS 153 module in the catalog under "PROFIBUS-DP / Additional FIELD DEVICES / I/O / HELMHOLZ / PAS153"

Configuration then continues in the same way as for Profibus stations.

4.2 Device-specific parameters

4.2.1 Diagnostic alarm

Enable diagnostic alarm

In the case of a module/channel error of a digital or analog module, a Profibus diagnosis, consisting of a standard diagnosis, code-related diagnosis, modules status, channel-related diagnosis, and alarm, incl. diagnostic record 1 is output.

Diagnostics alarm disabled

In the case of a diagnostic alarm of a digital or analog module, no Profibus diagnosis is output.

4.2.2 Process alarm

Enable process alarm

In the case of a process alarm of a digital or analog module, a Profibus diagnosis consisting of a standard diagnosis, code-related diagnosis, module status, and alarm is output.

Process alarm disabled

In the case of a process alarm of a digital or analog module, no Profibus diagnosis is output.

4.2.3 Start-up if the actual configuration is not the planned configuration

1) Start-up activated

If a difference is found between the planned and actual configuration, the PAS 153 module starts data exchange with the DP master. Exchange of useful data with modules without a planned/actual deviation is possible. The SF LED lights up red.

2) Start-up deactivated

If a difference is found between the planned and actual configuration, the PAS 153 module does not start data exchange with the DP master. A configuration error is detected and the SF LED lights up and the BF LED flashes.

4.3 Error diagnosis using the indicator LEDs

The PAS 153 module has three LEDs on the front (for LEDs, see also Section 3.3). An initial diagnosis is possible using the indications shown by these LEDs. The LED signals mean:

SF	BF	ON	Meaning	Remedy
OFF	OFF	OFF	No voltage applied to module or module defective	Switch on power supply module or exchange the PAS 153 module.
OFF	OFF	ON	Error-free operation (Data_Exchange) The DP master is in Operate / Run	-
OFF	OFF	FLASHING	Error-free operation (Data_Exchange) The DP master is in Clear / Stop	-
ON	OFF	ON / FLASHING	Impermissible Profibus address Start-up activated if actual config. not equal to planned config.? If so, then deviation between planned and actual configuration. Is the SF LED of a digital or analog module also lit? If so, then error or diagnosis in the corresponding digital or analog module.	Set a valid Profibus address on the PAS 153 (1 - 125) Check the configuration in the hardware configurer. Check the digital or analog module with the diagnosis.
ON	FLASHING	ON	Difference between the actual and planned configuration.	Check the configuration in the hardware configurer.

SF	BF	ON	Meaning	Remedy
OFF	FLASHING	ON	<p>PAS 153 is incorrectly parameterized – there is not data exchange between the DP master and the PAS 153.</p> <p>Causes: Configured and set Profibus addresses do not match Faults on the bus</p>	<p>Check the Profibus address on the PAS 153 and in the hardware configurator</p> <p>Note: The Profibus address of the PAS 153 will only be applied after the next power reset.</p> <p>Check cable lengths with respect to baudrate. Check setting of the terminating resistors</p>
OFF	ON	ON	<p>No connection to the DP master (baudrate search)</p> <p>Causes: Bus communication via PROFIBUS DP to the PAS 153 has been interrupted.</p>	<p>Check the bus structure (connectors and cabling)</p>

4.4 Error diagnosis using Profibus diagnostics

4.4.1 Structure of the Profibus diagnosis

If the diagnostic alarms of the PAS 153 module and the digital and analog modules are enabled and a digital or analog module detects an error, the PAS 153 module outputs a Profibus diagnosis. The detected errors are entered there as a channel-related diagnostic messages. At the same time, the SF LED of the PAS 153 module lights up.



The Profibus diagnosis can contain multiple module error messages at the same time!

The Profibus diagnosis has the following structure:

Byte No.		Meaning
0		Station status 1 to 3 (see Section 4.4.2)
1		
2		
3		Master PROFIBUS address
4		High byte of the manufacturer ID code (in this case: 0x0B for Helmholz)
5		Low byte of the manufacturer ID code (in this case: 0xED for Helmholz)
6		Code-related diagnosis (see Section 4.4.3)
7		
8		
9		Module status (see Section 4.4.2)
:		
16		Channel-related diagnosis (3 bytes per error message; see Section 4.4.5)
17		
18		
19		:
:		(any other necessary channel-related diagnoses, each with 3 bytes)
:		:
x up to last byte (max. 244)	(max. 29 bytes)	Alarms (only 1 alarm possible per slave diagnostic telegram; see Section 4.4.6)

The maximum length of the diagnostic telegram of the PAS 153 module is 244 bytes.

4.4.2 Standard diagnostic information (station status)

The first 3 bytes of the diagnostic telegram contain the station status information.

Byte 0

Bit	7	6	5	4	3	2	1	0	Meaning of "1"
									DP slave not responding
									DP slave not ready
									Configuration error
									External diagnosis available
									Requested function is not supported by the slave
									Invalid response of the slave
									Slave type does not match the configuration
									Slave has been parameterized by another DP master

Byte 1

Bit	7	6	5	4	3	2	1	0	Meaning of "1"
									DP slave must be re-parameterized and re-configured
									Slave cannot provide valid useful data (e.g. during start-up)
									Always "1"
									Response monitoring activated
									Module has received a freeze command
									Module has received a sync command
									DP slave not contained in the master parameter set
									DP slave has been removed from the master parameter set

Byte 2

Bit	7	6	5	4	3	2	1	0	Meaning of "1"
									Reserved (always "1")
									There are more channel-related messages than can be stated in the diagnostic telegram.

4.4.3 Code-related diagnostics

Bytes 6 to 8 contain the code-related diagnosis.

Byte 6	7	6	5	4	3	2	1	0
	0	1	0	0	0	0	1	1
			Length of the code-related diagnostic information (in this case: 3 bytes)					
Code-related diagnosis available								

Byte 7	7	6	5	4	3	2	1	0	Entry for module in slot
								1	
							2		
						3			
				4					
			5						
		6							
	7								
	8								

Byte 8	7	6	5	4	3	2	1	0	Entry for module in slot
								9	
							10		
						11			
					12				
				13					
			14						
		15							
	16								

The bit assigned to slot in question is set to "1" if

- there is no module in it;
- there is a non-configured module in it;
- the module in question has reported a diagnostic alarm;

4.4.4 Module status

The module status signals the status of the configured modules and provides more detail with respect to the configuration than the code-related diagnosis.

The module status begins after the code-related diagnosis and fills 8 bytes.

The module status is structured as follows:

Byte 9	7	6	5	4	3	2	1	0
	0	0	0	0	1	0	0	0
					Length of the module status incl. byte 9 (in this case: 8 bytes)			
	Code for device-related diagnosis							

Byte 10	7	6	5	4	3	2	1	0
	1	0	0	0	0	0	1	0
					2_H = module status			
	Code for status message							

Byte 11	0H		Always "0"					
Byte 12	0H		Always "0"					

Byte 13	7	6	5	4	3	2	1	0
							Status mod. 1	
					Status module 2			
			Status module 3					
	Status module 4							

Byte 14	7	6	5	4	3	2	1	0
							Status mod. 5	
					Status module 6			
			Status module 7					
	Status module 8							

Byte 15	7	6	5	4	3	2	1	0
							Status mod. 9	
					Status module 10			
			Status module 11					
	Status module 12							

Byte 16	7	6	5	4	3	2	1	0
							Status mod 13	
					Status module 14			
			Status module 15					
	Status module 16							

The displayed status values mean:

Value	Meaning
00 _B	Module OK, valid data
01 _B	Module defective, invalid data
10 _B	Incorrect module, invalid data
11 _B	No module, invalid data

4.4.5 Channel-related diagnosis

The channel-related diagnosis provides information about the channel errors of modules and provides details of the code-related diagnosis. It starts after the module status. The channel-related diagnosis does not influence the module status.

Important: The diagnostic alarm must be enabled for every module!

The maximum number of channel-related diagnoses is limited by the maximum total length of the Profibus diagnostic telegram of 244 bytes. The length of the Profibus diagnostic telegram depends on the number of currently available channel-related diagnoses.

Note:

Errors concerning all channels of a module (for example, if the power supply of the module is missing) are only mapped on channel 0 in the channel-related diagnosis. This keeps the number of channel-related diagnoses low and avoids a flood of diagnoses.

Byte 17	7	6	5	4	3	2	1	0
	1	0	x	x	X	x	x	x
			Code number of the module supplying the channel-related diagnosis (000000 _B to 001111 _B) Example: Slot 1 has code number 000000 _B Slot 5 has code number 000100 _B					
Channel-related diagnosis available								

Byte 18	7	6	5	4	3	2	1	0
	x	x	x	x	X	x	x	x
			Number of the channel or the channel group supplying the diagnostic information (000000 _B to 111111 _B)					
01 _B : Input 10 _B : Output 11 _B : Input/output								

Byte 19	7	6	5	4	3	2	1	0
	x	x	x	x	X	x	x	x
				Error type according to Profibus standard				
Channel resolution: 001 _B : 1 bit 010 _B : 2 bits 011 _B : 4 bits 100 _B : 1 bytes 101 _B : 1 word 110 _B : 2 words								

4.4.6 Alarms

The alarm part of the diagnostic telegram includes up to 29 bytes and contains additional information about the alarm type and about the cause that triggered the diagnosis. The content of the alarm part depends on the alarm type. No more than 1 alarm can be signaled per diagnostic telegram.

The position of the alarm part in the diagnostic telegram depends on the structure of the diagnostic telegram and on the number of channel-related diagnoses. The alarm part is, however, always at the end of the diagnostic telegram.

The alarm part is structured as follows:

Byte x	7	6	5	4	3	2	1	0
	0	0	x	x	x	x	x	x
			Length of the alarm part incl. Byte x					
Code for device-related diagnosis								

Byte x+1	7	6	5	4	3	2	1	0
	0	x	x	x	x	x	x	x
		Alarm type 0000001 _b : Diagnostic alarm 0000010 _b : Process alarm						
Code for alarm								

Byte x+2	7	6	5	4	3	2	1	0
	x	x	x	x	x	x	x	x
01 – 16 _p ; slot number of the module supplying the alarm								

Byte x+3	7	6	5	4	3	2	1	0
	x	x	x	x	x	x	x	X
		00 _b : Process alarm 01 _b : at least one error is present 10 _b : cleared error 11 _b : reserved (not used)						
Alarm sequence number								

Byte x+4	Additional information about the type and cause of the alarm;
:	
Byte x+29	

In the case of diagnostic alarms, the diagnostic record 1 for SIMATIC S7 (e.g. 16 bytes) is transmitted as the additional alarm information.

Bytes x+4 to x+19	Diagnostic data (content of records 0 and 1)
--------------------------	--

In the case of process alarms, the length of the additional alarm information is 4 bytes.

Bytes x+4 to x+7	Additional process alarm information
-------------------------	--------------------------------------

If a diagnostic event is already present for channel/channel group 0 of a module, there may be a module error in addition to a channel error. In this case, the entry is made even if diagnostics has not been enabled for channel / channel group 0 of the module.

4.5 Address setting

The PAS 153 module has an 8-pin DIL switch under the transparent front flap that is used to set the address of the module in the Profibus network.



Addresses 0, 126, and 127 must not be set!

Switches 1 to 7 are for the following parts of the address:

Switch position	1	2	3	4	5	6	7
Value when ON	1	2	4	8	16	32	64

The highest permitted Profibus address is 125.

Addresses 0, 126, and 127 are impermissible.

The address set on the DIP switch will only be applied after the next restart (power ON).

Switch 8 has no function.

4.6 Programming

Programming of the PAS 153 module is unnecessary.

Parameterization data for the modules connected to the PAS 153 are automatically transferred to the Profibus. Depending on the PLC system used, the I/O information of the PAS 153 is automatically taken over into the process image.

For error diagnostics of the PAS 153 in the PLC, the usual system modules can be used.

For PLCs of the Simatic S7 range, for example, the diagnostic alarm OB (OB82) and the module rack failure OB (OB86) are supported.



Process alarms (OB40) are not supported via the GSD file.

4.7 Modules supported

The PAS 153 module supports all digital input/output modules from Systeme Helmholtz and also numerous modules of the same type from other manufacturers.

The list of modules supported is constantly expanding. Please inquire about the module you want to use if it is not on the list.

4.7.1 Digital

Typ	Siemens	Systeme Helmholtz
DI 16x24V DC	6ES7-321-1BH0*	700-321-1BH02
DI 16x24V DC, 0.05ms input delay	6ES7-321-1BH10	-
DI 16x24V DC, source input	6ES7-321-1BH50	700-321-1BH50
DI 16x24V DC, diagnostic	6ES7-321-7BH0*	700-321-7BH01
DI 32x24V DC	6ES7-321-1BL00	700-321-1BL00
DI 8x48-125V DC	6ES7-321-1CF00	-
DI 16x24-48V DC	6ES7-321-1CH0*	-
DI 16x48-125V DC	6ES7-231-1CH20	-
DI 16x120V AC	6ES7-321-1EH0*	-
DI 32x120V AC	6ES7-321-1EL00	700-321-1EL00
DI 8x230V AC, 20pol.	6ES7-321-1FF0*	-
DI 8x230V AC, 40pol.	6ES7-321-1FF10	-
DI 16x230V AC	6ES7-321-1FH00	700-321-1FH00
DI 4x24V, NAMUR	6ES7-321-7RD00	-
DO 8x24V DC, 2A	6ES7-322-1BF0*	700-322-1BF01
DO 16x24V DC, 0.5A	6ES7-322-1BH0*	700-322-1BH01
DO 16x24V DC, 0.5A, Highspeed	6ES7-322-1BH10	-
DO 32x24V DC, 0.5A	6ES7-322-1BL00	700-322-1BL00
DO 8x120V/230V AC, 20pol.	6ES7-322-1FF0*	-
DO 8x120V/230V AC, 40pol.	6ES7-322-5FF00	-
DO 16x120V/230V AC, 0.5A	6ES7-322-1FH00	-
DO 16x120V AC, 0.5A	6ES7-322-1EH0*	-
DO 32x120V AC, 1A	6ES7-322-1EL00	-
DO 8xRelais, 2A	6ES7-322-1HF0*	700-322-1HF01
DO 8xRelais, 5A	6ES7-322-1HF10	700-322-1HF10
DO 8xRelais, 5A	6ES7-322-1HF20	700-322-1HF20
DO 16xRelais, 8A	6ES7-322-1HH0*	700-322-1HH01
DO 8xRelais, 5A	6ES7-322-5HF00	-
DI/DO 8x24V DC	6ES7-323-1BH0*	700-323-1BH01
DI/DO 16x24V DC	6ES7-323-1BL0*	700-323-1BL00
DI 8x24V, Dx 8x24V	6ES7-327-1BH00	-
Dummy module, 20pol.	6ES7-370-0AAA*	700-370-0AA01
Dummy module, 40pol.	-	700-370-0AL01

4.7.2 Analog

Typ	Siemens	Systeme Helmholz
AI 2x 0-10V/20mA/PT100	6ES7-331-7KB0*	-
AI 8x 0-10V/20mA/PT100	6ES7-331-1KF0*	700-331-1KF01
AI 8x 0-10V/20mA/PT100	6ES7-331-7KF0*	-
AI 4x PT100	-	700-331-PT100
AI 8x 0-10V	-	700-331-0V010
AI 8x 20mA	-	700 331-4MA20
AI 8x 0-10V/20mA, 14Bit	6ES7-331-7HF00	-
AI 4x 20mA	6ES7-331-7RD00	-
AI 8x Thermocouple, 4x PT100	6ES7-331-7SF00	-
AI 8x 0-10V/20mA, ext. Resolution	6ES7-331-7NF00	-
AO 2x 0-10V/20mA	6ES7-332-5HB0*	700-332-5HB01
AO 4x 0-10V/20mA	6ES7-332-5HD0*	700-332-5HD01
AO 8x 0-10V/20mA	6ES7-332-5HF00	-
AO 4x 0-10V/20mA, 15Bit	6ES7-332-7ND0*	-
AO 4x 20mA	6ES7-332-5RD00	-
AI 4x 0-10V/20mA, AO 2x 0-10V/20mA	6ES7-334-0CE0*	-
AI 4x 0-10V/20mA/PT100, AO 2x 0-10V/20mA	6ES7-334-0KE00	-
AI 4x 0-10V/20mA, AO 4x 0-10V/20mA	6ES7-335-7HG01	-

4.8 Modules not supported

Typ	Siemens	Systeme Helmholz
CAN 300 / CAN 300 PRO	-	700-600-CANxx
AI 8x Thermocouple	6ES7-331-7PF*0	-
AI 8x 0-10V/20mA, 16Bit	6ES7-331-7NF10	-
FM modules	xxx	-
CP modules	xxx	-

4.9 Restricted use

For an extension with more than 8 modules the PAS 153 (700-153-1AA03) needs digital and analog input/output modules from Systeme Helmholz GmbH with a hardware release similar or higher 30, otherwise the maximum extension works only with 8 or less modules.

5 Further Information

5.1 Technical data

Order number PAS 153	700-153-1AA03
Dimensions	116 x 40 x 125 mm ³ (L x W x H)
Weight	Approx. 280 g
Permissible temperature range	
During storage:	-20°C to +85°C
During operation:	0°C to +40°C for vert. mounting 0°C to +60°C for horiz. mounting
Profibus interface	
Type:	RS 485
Transmission rate:	9.6 Kbaud to 12 Mbaud, autodetect
Protocol:	Profibus DP/V0 acc. to EN 50170
Pin:	Connector, SUB D 9-way
Power supply	
Voltage:	+24 V DC via 4-way terminal
Current consumption:	625 mA (typ.), depending on number and type of modules slotted in
Backplane bus	
Output voltage:	5 V DC on backplane bus
Output current:	1 A on backplane bus
Addressing range:	244 bytes for inputs 244 bytes for outputs
Number of modules:	max. 16, incl. max. 8 parameterizable
Special features	
Quality assurance:	according to ISO 9001:2000
Maintenance:	Maintenance-free (no battery, rechargeable or non-rechargeable)

5.2 Pin assignment

Pin	Profibus / SUB D conn. 9-way
1	-
2	-
3	DATA B
4	-
5	GND
6	+5V
7	-
8	DATA A
9	-

Pin	24 V / 3-way
1	+24V
2	GND
3	Shield

5.3 Further documentation

Internet: www.helmholz.de, www.profibus.de

Siemens manuals:

“Installing and Wiring the S7-300/S7-400,”

“S7-300 Module Data,” and *

“System Software for S7-300 and S7-400”

“Profibus DP/DPV1,” Manfred Popp, Hüthig Verlag