TREBING + HIMSTEDT

SERIAL-PROFIBUS-INTERFACE | SPI 3

Doc. Version 2.0

for Fieldbus Devices with Serial Interface

– Sartocheck 4

Dear customer

This online documentation is designed to help you with engineering, connecting up, configuration and parameter setting of the SPI 3. Please feel free to contact our Technical Support department if you need further help:

Trebing & Himstedt Prozessautomation GmbH & Co. KG
Technical Support Dept.
Wilhelm-Hennemann-Str. 13
19061 Schwerin, Germany

Telephone: +49 385 39572-500

Telefax: +49 385 39572-22

E-mail: support@t-h.de

Homepage: http://www.t-h.de

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Introduction

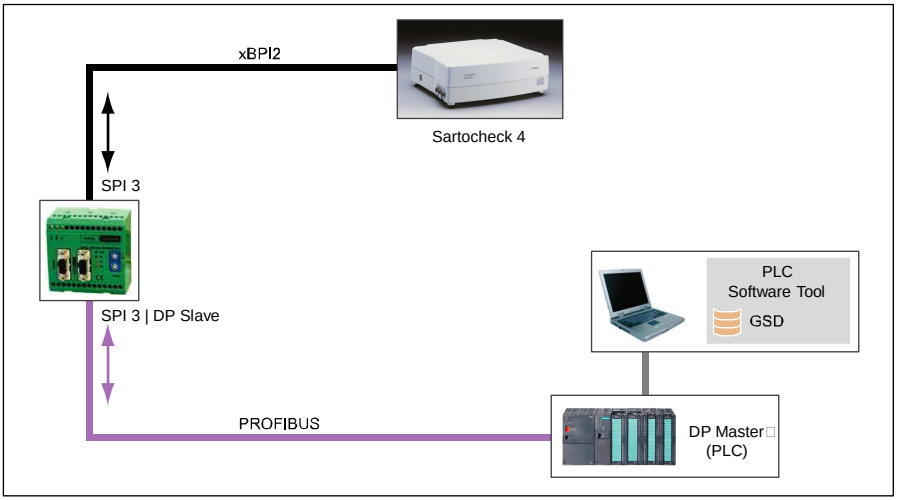
The SPI 3 (SERIAL-PROFIBUS-INTERFACE 3) allows a PROFIBUS-DP master to communicate with a Sartocheck 4 filter test device. This allows the Sartocheck 4 to function as a real PROFIBUS station, whereby the SPI 3 converts the data to be exchanged between the PROFIBUS-DP master and the Sartocheck 4 into a format which is compatible with the other device.

Data are exchanged between the DP master and the SPI 3 in the form of telegrams through a data channel, the size of which can be configured.

The SPI 3 is easy to install and configure and a separate program for configuration or parameter setting is not necessary. Configuration is done using the respective PROFIBUS-DP master.

Features of the SPI 3:

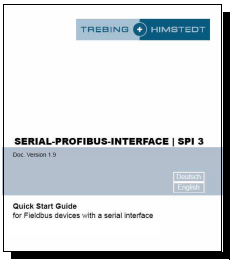
- DP slave at up to 12 Mbit/s
- Does not require special configuration software
- Simple and fast integration in PROFIBUS-DP networks



Example for SPI 3 interface module overview

Scope of delivery

SPI 3



Quick start guide

Documentation & Media Kit (optional, not included in delivery)

The documentation & media kit contains this online documentation and the GSD file. You can download the documentation & media kit from the internet (www.t-h.de). You need the GSD file for the PLC project.

About this online documentation

Please read this online documentation before starting the installation work. It contains important information on planning your system, connecting up and configuring the SPI 3 and on parameter setting.

The online documentation uses the following keywords and symbols:

Danger!
Risk of injury to personnel due to electric shock.

Warning!
Risk of damage to equipment.

Note!
Indicates useful tips.

Safety notes

Safety notes for the planning stage

Observe the general rules for PROFIBUS components when planning the SPI 3 installation.
Please observe the following to avoid risk to personnel and damage to equipment and to ensure that the SPI 3 functions correctly:

Safety regulations	– Observe the guidelines in the VDE 0100 regulations for handling electrical components, – Observe the applicable safety and accident prevention regulations.
Assembly personnel	The SPI 3 must only be installed or de-installed by qualified technical personnel with appropriate electrotechnical qualifications.
PROFIBUS standard	Observe the guidelines in the PROFIBUS standard IEC 61158.
Bus cable	Bus wiring should only take place using special screened, twisted pair PROFIBUS cable. The high data transfer rates can only be guaranteed with the correct cable type.
Cable lengths	Refer to the PROFIBUS norm for information on maximum cable lengths for PROFIBUS.
Terminating resistors	Terminating resistors must be used if the SPI 3 is installed at the beginning or end of the PROFIBUS cable segment. In this case, you should use PROFIBUS connectors which contain an integrated terminating resistor. We recommend use of connectors from ERNI and Siemens. If the bus is incorrectly terminated, this can lead to errors in data transfer or to damage to other stations on the bus.
Bus connectors	You should only use commercially available PROFIBUS connectors for connecting the bus. We recommend using connectors from ERNI and Siemens.
Cable screen	Screened cables are less sensitive to interference due to electromagnetic fields. With screened cables, the interference currents are led to ground through the screening rail, which is electrically connected to the case. To ensure that the interference currents which flow through the screening do not themselves interfere with other devices, it is important to provide a low impedance connection to the protective ground. Observe the following rules for the screens of the PROFIBUS cable and the serial interface cable: – The braiding of the screening should have a degree of

coverage of more than 80 %.
- The screening should include a braided screen and should not consist solely of foil screening, since the latter can be easily damaged by cable tension and pressure.
- To ensure good immunity to interference at high frequencies as well, the screening of the cable should be attached to the screening rail at both ends of the cable.

Safety notes for installation and operation of the SPI 3

Please observe the following before connecting up the SPI 3 to avoid risk to personnel and damage to equipment and to ensure that the SPI 3 functions correctly:

- The SPI 3 is designed as an interface between fieldbus devices with serial interfaces and the PROFIBUS. Do not use the SPI 3 for any other purpose.
- The SPI 3 may only be installed or de-installed by qualified technical personnel with appropriate electrotechnical qualifications. When connecting up the SPI 3, you must observe the guidelines in the VDE 0100 regulations for handling electrical equipment.
- Always mount the SPI 3 on a suitable top-hat rail.
- The cables used to connect up the SPI 3 should not apply any mechanical forces to the device.

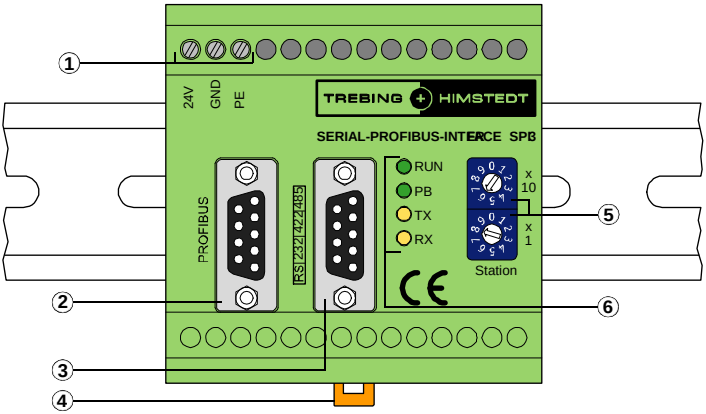
Danger!
Never open the case of the SPI 3 and do not make any modifications to the device.

Warning!
Small objects or liquids must not be allowed to enter the case of the SPI 3 (e.g. through the ventilation slots) since this could damage the device.

Never cover up the ventilation slots in the case.

Large temperature differences between the storage location and installation site can cause condensation to form within the case of the SPI 3, which can damage the device. If large temperature differences are present, you should wait at least 3-4 hours after installing the SPI 3 and before switching on the power.

Overview of the SPI 3



1 Power supply connections
2 PROFIBUS interface
3 Serial interface
4 Stop lever for top-hat rail
5 Turn-switch for PROFIBUS address
6 Display elements

Connections and interfaces

– Power feed ①
  – 24 V Screw terminal for external 24 V power supply
  – GND Signal ground terminal
  – PE Protective ground terminal
– PROFIBUS interface ②
– Serial interface ③ (RS232, RS422 or RS485 see label on SPI 3)

Mounting the device

– Stop lever ④ for releasing/fixing the SPI 3 from/on a 35 mm DIN top-hat rail (top-hat rail not included in delivery)

Operating elements

– Two rotary switches ⑤ for setting the PROFIBUS address
  – Switch for setting the tens value
  – Switch for setting the unit value

Indicating elements

LEDs ⑥ to indicate operating states:

– RUN: lights continuously if supply voltage is present,
flashes in case of errors (see »Error diagnosis and remedies« on page 15)

– PB: lights up if the SPI 3 has been configured by the master and is operational,
flashes in case of errors (see »Error diagnosis and remedies« on page 15)

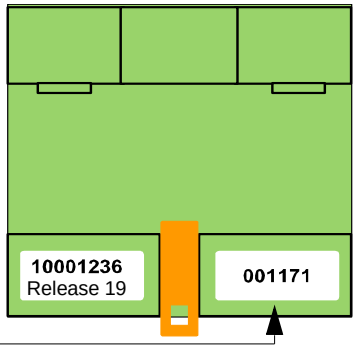
– TX: flashes if data is being sent to the serial interface

– RX: flashes if data is being received from the serial interface

Release

The following information is indicated on the SPI 3 back-panel:

– Article No.
– Release No.
– Serial No.



Implementation guideline

Please procede through the following steps for start-up:

– Mount the SPI 3 (see »Installing the SPI 3« on page 10).

– Connect the SPI 3 to power supply (see »Connecting up the power feed« on page 10).

– Connect the SPI 3 to the serial field device (see »Connecting up to Sartocheck 4« on page 11).

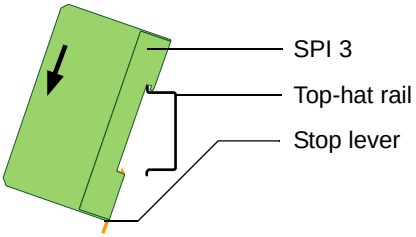
– Connect the SPI 3 to the PROFIBUS (see »Connecting up to the PROFIBUS« on page 11).

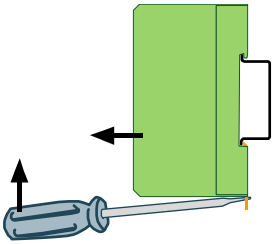
– Configure and parameterize the SPI 3 via PROFIBUS configurator (see »Starting up the SPI 3« on page 13).

Installing the SPI 3

Mounting the SPI 3

– Place the SPI 3 with the gap onto the top-hat rail and swivel the SPI 3 downward until the stop lever locks on the top-hat rail.





Warning!
Head space of 5 cm minimum for heat flow is required above and below the SPI 3.

Dismounting the SPI 3

– Remove the connected supply and signal wires (serial, PROFIBUS, voltage).
– Stick a screwdriver in the slot of the stop lever at the SPI 3.
– Press the screwdriver in the direction of the SPI 3 while at the same time swivelling the SPI 3 away from the top-hat rail.

Connecting up the power feed

Danger!
Incorrect grounding of the SPI 3 can injure personnel and damage equipment.
Make sure that the SPI 3 is correctly grounded.

Warning!
Although the SPI 3 is protected against polarity reversal, connecting up the power feed with incorrect polarity for extended periods can damage the device. Make sure that the power feed is connected with correct polarity.

– Connect the cables for 24 V power feed, ground and protective ground to the corresponding screw terminals 24 V, GND and PE.

Connecting up to Sartocheck 4

Note!
To enable communication with the SPI 3, the Sartocheck 4 filter test device must be version 02.02 or higher.
To ensure that the SPI 3 functions without errors, you should use a screened cable for connecting to the serial fieldbus device.

– Ensure that the Sub-D connector for the Sartocheck 4 uses the pin assignments shown in »Technical specifications« on page 17 (connect the cable screen to the case of the sub-D connector).
– Attach the sub-D connector for the Sartocheck 4 to the serial interface socket ③ on the SPI 3.

Connecting up to the PROFIBUS

Note!
You should only use commercially available PROFIBUS connectors for connecting to the bus. We recommend the use of connectors from ERNI and Siemens.
If the SPI 3 is installed at the beginning or end of the PROFIBUS cable segment, you should use PROFIBUS connectors which contain an integrated terminating resistor. We recommend using connectors from ERNI and Siemens.
To ensure that the SPI 3 functions without errors, you must ground the screen of the PROFIBUS cable.

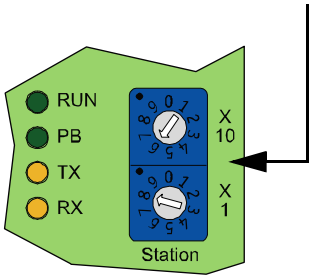
– Ensure that the PROFIBUS connector uses the pin assignments shown in »Technical specifications« on page 17.
– Attach the PROFIBUS connector to the PROFIBUS interface socket ② on the SPI 3 and secure the connector with the retaining screws.

Setting the PROFIBUS address

Note!
The SPI 3 only updates its PROFIBUS address during a restart. Set the PROFIBUS address on the SPI 3 before switching on the power, or turn off the power briefly after changing the PROFIBUS address.
You should only use addresses between 01 and 99.

– The PROFIBUS address is set with the two rotary switches.

Example: In order to set the PROFIBUS address 68, turn the rotary switch for the 10's to 6, and the rotary switch for the units to 8.



Bus terminating resistor

Terminations of a PROFIBUS network must each be terminated with a bus terminating resistor. Use standardized plugs with integrated terminating resistors.

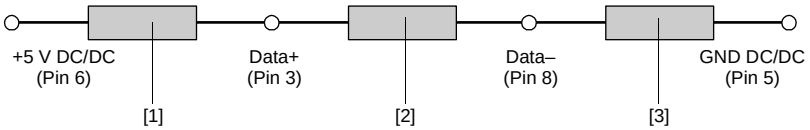


Figure: Bus termination configuration for PROFIBUS (see PROFIBUS Norm)

1 390 Ω Pull-up resistance from Pin 3 to positive supply voltage at Pin 6
2 220 Ω Cable terminating resistor between Pin 3 and Pin 8
3 390 Ω Pull-Down resistor from Pin 8 to data reception potential at Pin 5

Note!
Please observe the following when using the depicted passive terminating resistor: Is the feeding voltage (+5 V) supplied by the device (SPI 3), the PROFIBUS is shorted via the resistors when the device is disconnected from voltage. PROFIBUS communication can be interrupted or completely break down until the device is re-energized.
Use active resistors to avoid this problem, as in this case the terminating resistors are fed with +5 V and GND independently from the device.

Starting up the SPI 3

To start up the SPI 3, you need to configure the device. Configuration is done via PROFIBUS configurator (PLC programming tool).

– Start the PROFIBUS configurator of the DP master (PLC programming tool).
– Load the »THDP0091.GSD« GSD file for the SPI 3 into the configurator (GSD by download: www.t-h.de).
– Configure the SPI 3 as described in the configurator online help or user manual. Select the respective module »SartoCheck« or »SartoCheckExt« for the extended version 2.0 for configuration. Do not parameterize this module with special user parameters.

SPI 3 Configuration

During configuration with the PROFIBUS configurator, you are asked to select a module from the menu. The »SartoCheck« or »SartoCheckExt« module can be used.

Module Name	I/O Field	Data transfer protocol
SartoCheck	39 Byte Input 21 Byte Output	xBPI2
SartoCheckExt	44 Byte Input 21 Byte Output	xBPI2

Note!
The described module SartoCheck is valid for the SPI 3 release 17 and higher. The described module SartoCheckExt is valid for the SPI 3 release 19 and higher.
Module selection depends on the respective SPI 3 application. All further modules (not described herein) cannot be used for SPI 3 application with Sartocheck 4.

Checking the SPI 3 for correct operation

Several checks should be run before using the SPI 3 for data transfer.

Checking SPI 3 power feed

– At this stage, do not attach either the PROFIBUS interface or the serial interface.
– Switch on the power feed for the SPI 3.

The RUN LED should light continuously. If this is not the case, there is a fault in the 24 V power feed. Refer to »Error diagnosis and remedies« on page 15 for details of how to locate the fault.

Checking PROFIBUS communication

– Connect up the PROFIBUS interface cable.
– Switch on the power feed for the SPI 3 (RUN-LED lights up).
– Start the DP master which has previously been configured for the SPI 3.

The PB LED should light continuously. If this is not the case, there is an error in the PROFIBUS communication. Refer to »Error diagnosis and remedies« on page 15 for details of how to locate the fault.

Checking serial interface communication

– Connect up the PROFIBUS interface cable and the serial interface cable.
– Switch on the power feed for the SPI 3 (RUN-LED lights up).
– Start the DP master which has previously been configured for the SPI 3 (PB-LED lights up).

The RUN LED should light continuously. If it does not light, or it only flashes, there is an error in the communication with the serial device. Refer to »Error diagnosis and remedies« on page 15 for details of how to locate the fault.

If no errors were detected, the SPI 3 is ready for use. During data transfer, the TX or RX LEDs will flash (see »Indicating elements« on page 9).

Evaluating PROFIBUS diagnosis telegrams

In case of communication failures (PROFIBUS), the SPI 3 sends a diagnosis telegram on DP master request. The diagnosis telegram contains general PROFIBUS diagnosis data (see PROFIBUS Norm).

You can evaluate the diagnosis telegram through the DP master and/or a PROFIBUS diagnosis tool (e.g. the PROFIBUS Scope).

Error diagnosis and remedies

If errors are detected, the pattern of flashing of the PB and RUN LED's on the SPI 3 can be used for error diagnosis. The LED's can flash with the following patterns:

LED off	LED short	LED medium	LED long	LED on
				
LED off	LED is ¾ off ¼ on	LED is ½ off ½ on	LED is ¼ off ¾ on	LED always on

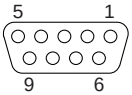
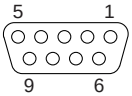
Note!
If the PB LED (PROFIBUS) is off, the RUN LED is on continuously and no longer indicates a valid LED code. Accordingly, the RUN LED can only be used for diagnosis when the PB LED is lit.
The PROFIBUS diagnosis and error statuses are reset when the error is no longer present or when the slave gets new parameter and configuration values.

PB LED code	Status	Significance	Remedy
PB LED off	Correct data transfer rate could not be determined	– No PROFIBUS master in the network	– Connect up the DP master – Check the wiring
PB LED short	DP master available	– A master is available but communication is not taking place with SPI 3	– Check address setting on the SPI 3
PB LED medium	Incorrect configuration	– Configuration telegram faulty	– Use only the module »SartoCheck« from GSD file
PB LED on	Data exchange OK	– Data exchange is currently taking place	– SPI 3 working correctly

RUN LED code	Status	Significance	Remedy
RUN LED off PB LED off	SPI 3 not ready	– 24 V supply not present	– Check external power supply – Check the wiring
RUN LED off PB LED on	Sartocheck 4 is not connected	– no connection to Sartocheck 4	– Check the wiring to Sartocheck 4
RUN LED medium	Interface error	– Error on xBPI2 protocol	– Check version of Sartocheck 4 (02.02 or higher)
RUN LED on	Communication OK	– Sartocheck 4 communicating correctly with the SPI 3	– SPI 3 working correctly

Note!
If errors occur during communication, the DP master runs a PROFIBUS diagnosis. Evaluation of this diagnosis depends on the used DP master. When using a bus monitor (e.g. the PROFIBUS Scope), you can also evaluate diagnosis telegrams.

Technical specifications

Electrical data		
Nominal supply voltage	V DC	24 (20.4…28.8)
Current consumption	mA	200
Galvanic isolation, PROFIBUS interface	V DC	500
Ambient conditions		
Operating temperature	℃	0…60
Case		
Protection class	IP	20
Dimensions W × H × D	mm	75 × 75 × 53
Weight	g	136
PROFIBUS interface		
Interface type		RS 485
Data transfer rate	Bit/s	9,600; 19,200; 93,750; 187,500; 0.5M; 1.5M; 3M; 6M; 12M, automatic detection of the data transfer rate
Pin assignment Sub-D connector 	Pin 1 Pin 2 Pin 3 Pin 4 Pin 5 Pin 6 Pin 7 Pin 8 Pin 9	Screen Unused B-line Request to Send (RTS) Ground for 5 V (M5) +5 V (galvanically isolated P5) Unused A-line Unused
Serial interface		
Interface type		RS 232
Data transfer rate	Bit/s	9,600
Data frame	Bit	8
Parity		odd
Pin assignment Sub-D connector 	Pin 1 Pin 2 Pin 3 Pin 4 Pin 5 Pin 6 Pin 7 Pin 8 Pin 9	Screen TXD (out) RXD (in) Unused GND +5 V CTS (in) RTS (out) Unused
Other		
Certifcates		CE
Connectable field devices	units	1

Appendix

Parameters for Sartocheck 4 test runs

Mapping of serial data from Sartocheck 4 to PROFIBUS DP is structured as follows:

– Data for output:
  · common parameters
  · test parameters

– Data for input:
  · identification
  · status data
  · test results

Note!
To enable communication with the SPI 3, the Sartocheck 4 filter test device must be version 02.02 or higher.

Common parameters

Offset	Name	Internal name	Type	Unit	Visualization
0	Command (see table 2 on page 19)		BYTE	–	Command
1	TestMethod (see table 4 on page 19)	eMethod	BYTE	–	Test method
2	TestOptions (see table 5 on page 19)		BYTE	–	–
3	NetVolumeValue	vVolumeNet_ml	REAL	ml	–

Table 1: Common parameters

Value	Bit	Description	Visualization
0		No change	No change
1		Start Filter Test	Start filter test
2		Abort Filter Test	Abort filter test
3		Clear Alarm	Clear alarm
4		Clear Ready	Clear ready

Table 2: Common parameters »Command« for SartoCheck

Value	Bit	Description	Visualization
0		No change	No change
1		Start Filter Test	Start filter test
2		Abort Filter Test	Abort filter test

Table 3: Common parameters »Command« for SartoCheckExt

Value	Bit	Description	Visualization
0		DIF Diffusion Test	Diffusion Test
1		BPT Bubble Point Test	Bubble Point Test
2		WIT Water Intrusion Test	
3		PDT Pressure Drop Test	
4		WFT Water Flow Test	
5		VOL Volume Test	

Table 4: Common parameters »TestMethod«

Value	Bit	Description	Visualization
	0	Use external Pressure Sensor	
	1	Use external Venting Mode	–
	2	WITFillExternal	–

Table 5: Common parameters »TestOptions«

Test parameters

Test parameters depend on the kind of test. Each new test activates the respective parameter sets. Only parameters required for the selected test are sent.

Diffusion Test – DIF

Offset	Name	Internal name	Type	Unit	Visualization
7	DIFTestPressure	prPressureTest	REAL	mbar	Test pressure
11	DIFStabTime	tTimeStabilization_min	WORD	min	–
13	DIFTestTime	tTestDuration_min	WORD	min	Test time
15	DIFDiffusionMax	dDiffusionMax_mlmin	REAL	ml/min	Limit value

Table 6: Test parameters DIF

Bubble Point Test – BPT

Offset	Name	Internal name	Type	Unit	Visualization
7	BPTMinFactor	cBPMultiplier	REAL	–	– (Range 0,1…1,0)
11	BPTMaxPressure	prBPMax	REAL	mbar	–
15	BPTTestClass (see table 8 on page 20)	eTestClass	BYTE	–	Test class
16	BPTMinPressure	prBPMin	REAL	mbar	Limit value

Table 7: Test parameters BPT

Value	Bit	Description	Visualization
0		Small Filter Housing	Small
1		Standard Filter Housing	Standard
2		Large Filter Housing	Large

Table 8: Bubble Point Test »BPTestClass«

Pressure Drop Test – PDT

Offset	Name	Internal name	Type	Unit	Visualization
7	PDTTestPressure	prPressureTest	REAL	mbar	
11	PDTStabTime	tTimeStabilization_min	WORD	min	
13	PDTTestTime	tTestDuration_min	WORD	min	
15	PDTPressDropMax	prPressureDropMax	REAL	mbar	

Table 9: Test parameters PDT

Water Intrusion Test – WIT

Offset	Name	Internal name	Type	Unit	Visualization
7	WITTestPressure	prPressureTest	REAL	mbar	
11	WITPreStabTime	tWITTimeStabBefore_min	WORD	min	
13	WITStabTime	tWITTimeStabAfter_min	WORD	min	
15	WITTestTime	tTestDuration_min	WORD	min	
17	WITIntrusionMax	iIntrusionMax	REAL	ml/min	

Table 10: Test parameters WIT

Water Flow Test – WFT

Offset	Name	Internal name	Type	Unit	Visualization
7	WFTTestPressure	prPressureTest	REAL	mbar	
11	WFTPreStabTime	tWITTimeStabBefore_min	WORD	min	
13	WFTStabTime	tWITTimeStabAfter_min	WORD	min	
15	WFTTestTime	tTestDuration_min	WORD	min	
17	WFTFlowMax	iIntrusionMax	REAL	ml/min	

Table 11: Test parameters WFT

Volume Test – VOL

Offset	Name	Internal name	Type	Unit	Visualization
7	VOLTestPressure	prPressureTest	REAL	mbar	
11	VOLStabTime	tTimeStabilization_min	WORD	min	

Table 12: Test parameters VOL

Identification data

Offset	Name	Type	Unit	Visualization
0	SerialNumber	ASCII	–	Serial number
10	SoftwareVersion	2 × BYTE	–	Software version
12	CalibrationDateInt	3 × BYTE	–	Calibration date
15	CalibrationDateExt	3 × BYTE	–	

Table 13: Identification data

Status data

Offset	Name	Type	Unit	Visualization
18	TestMethod (see table 16 on page 23)	BYTE	–	Test method
19	DeviceStatus (see table 17 on page 23)	BYTE	–	Device status
20	TestStatus (see table 18 on page 23)	BYTE	–	Test status
21	ErrorCode (see table 19 on page 24)	BYTE	–	Error
22	ErrorNumber	WORD	–	Error number
24	PressMeasValue	REAL	mbar	Pressure (Trend)

Table 14: Status data for SartoCheck

Offset	Name	Type	Unit	Visualization
18	TestMethod (see table 16 on page 23)	BYTE	–	Test method
19	DeviceStatus (see table 17 on page 23)	BYTE	–	Device status
20	TestStatus (see table 18 on page 23)	BYTE	–	Test status
21	ErrorCode (see table 19 on page 24)	BYTE	–	Error
22	ErrorNumber	WORD	–	Error number
24	PressMeasValue	REAL	mbar	Pressure (Trend)
28	DIFTestValue	REAL	ml/min	Diffusion

Table 15: Status data for SartoCheckExt

Value	Bit	Description	Visualization
0		DIF Diffusion Test	Diffusion Test
1		BPT Bubble Point Test	Bubble Point Test
2		WIT Water Intrusion Test	
3		PDT Pressure Drop Trest	
4		WFT Water Flow Test	
5		VOL Volume Test	

Table 16: Status data »TestMethod«

Value	Bit	Description	Visualization
	0	Standby	Standby
	1	Running	Test
	2	Venting	Venting
	3	Warning (Fault)	Warning (Fault)
	4	Alarm (Error)	Alarm (Error)
	5	Ready	Ready
	7	Offline	Offline

Table 17: Status data »DeviceStatus«

Value	Bit	Description	Visualization
0		No Test	–
1		Self Check	Self check
2		Pressurization	Pressurization
3		Stabilization	Stabilization
4		Volume Measurement	Volume measurement
5		Integrity Test	Integrity test

Table 18: Status data »TestStatus«

Value	Bit	Description	Visualization
0		No Error	–
1		System error	System error
2		Abort by user	Abort by user
3		Shut down operating pressure	Shut down operating pressure
4		System Leakage	System leakage
5		Netvolume to large	Netvolume to large
6		Testpressure out of calibration	Testpressure out of calibration
7		No stable pressure	No stable pressure
8		Pressure increase	Pressure increase
9		Pressure drop to high	Pressure drop to high
10		No ventilation	No ventilation
11		Warning: Low operating pressure	Warning: Low operating pressure
12		Warning: System not vented	Warning: System not vented

Table 19: Status data »ErrorCodes«

Test results

Test results depend on the kind of test. Each new test activates the respective parameter sets. Only parameters required for the selected test are received.

Value	Bit	Description	Visualization
0		Test active	Test active
1		Test aborted	Test aborted
2		Test passed	Test passed
3		Test failed	Test failed

Table 20: Test results »TestResult« for SartoCheck

Value	Bit	Description	Visualization
0		no Result	no Result
1		Test aborted	Test aborted
2		Test passed	Test passed
3		Test failed	Test failed

Table 21: Test results »TestResult« for SartoCheckExt

Diffusion Test – DIF

Offset	Name	Internal name	Type	Unit	Visualization
28	DIFTestResult (see table 20 on page 24)	eResult	BYTE	–	Test result
29	DIFTestValue	dDiffusion_mlmin	REAL	ml/min	Test value
33	DIFAbortError	eError	WORD	–	Abort error
35	DIFNetvolume	vVolumeNet_ml	REAL	ml	Net volume

Table 22: Test results DIF for SartoCheck

Offset	Name	Eigenname	Datentyp	Einheit	Visualisierung
32	DIFTestResult (see table 21 on page 25)	eResult	BYTE	–	Test result
33	DIFTestValue	dDiffusion_mlmin	REAL	ml/min	Test value
37	DIFAbortError	eError	WORD	–	Abort error
39	DIFNetvolume	vVolumeNet_ml	REAL	ml	Net volume
43	DIFErrorCode		BYTE	–	First error

Tabelle 23: Testergebnisse DIF for SartoCheckExt

Bubblepoint Test – BPT

Offset	Name	Internal name	Type	Unit	Visualization
28	BPTTestResult (see table 20 on page 24)	eResult	BYTE	–	Test result
29	BPTTestValue	prBubblepoint_mbar	REAL	mbar	Test value
33	BPTAbortError	eError	WORD	–	Abort error
35	BPTNetvolume	vVolumeNet_ml	REAL	ml	Net volume

Table 24: Test results BPT for SartoCheck

Offset	Name	Internal name	Type	Unit	Visualization
32	BPTTestResult (see table 21 on page 25)	eResult	BYTE	–	Test result
33	BPTTestValue	prBubblepoint_mbar	REAL	mbar	Test value
37	BPTAbortError	eError	WORD	–	Abort error
39	BPTNetvolume	vVolumeNet_ml	REAL	ml	Net volume
43	BPTErrorCode		BYTE	–	First error

Table 25: Test results BPT for SartoCheckExt

Water Intrusion Test – WIT

Offset	Name	Internal name	Type	Unit	Visualization
28	WITTTestResult (see table 20 on page 24)	eResult	BYTE	–	
29	WITTestValue	iIntrusion_mlmin	REAL	ml/min	
33	WITAbortError	eError	WORD	–	
35	WITNetvolume	vVolumeNet_ml	REAL	ml	

Table 26: Test results WIT for SartoCheck

Offset	Name	Internal name	Type	Unit	Visualization
32	WITTTestResult (see table 21 on page 25)	eResult	BYTE	–	
33	WITTestValue	iIntrusion_mlmin	REAL	ml/min	
37	WITAbortError	eError	WORD	–	
39	WITNetvolume	vVolumeNet_ml	REAL	ml	
43	WITErrorCode		BYTE	–	First error

Table 27: Test results WIT for SartoCheckExt

Water Flow Test – WFT

Offset	Name	Internal name	Type	Unit	Visualization
28	WFTTTestResult (see table 20 on page 24)	eResult	BYTE	–	
29	WFTTestValue	iIntrusion_mlmin	REAL	ml/min	
33	WFTAbortError	eError	WORD	–	
35	WFTNetvolume	vVolumeNet_ml	REAL	ml	

Table 28: Test results WFT for SartoCheck

Offset	Name	Internal name	Type	Unit	Visualization
32	WFTTTestResult (see table 21 on page 25)	eResult	BYTE	–	
33	WFTTestValue	iIntrusion_mlmin	REAL	ml/min	
37	WFTAbortError	eError	WORD	–	
39	WFTNetvolume	vVolumeNet_ml	REAL	ml	
43	WFTErrorCode		BYTE	–	First error

Table 29: Test results WFT for SartoCheckExt

Pressure Drop Test – PDT

Offset	Name	Internal name	Type	Unit	Visualization
28	PDTTestResult (see table 20 on page 24)	eResult	BYTE	–	
29	PDTTestValue	prPressureDrop_mbar	REAL	mbar	
33	PDTAbortError	eError	WORD	–	
35	PDTNetvolume	vVolumeNet_ml	REAL	ml	

Table 30: Test results PDT for SartoCheck

Offset	Name	Internal name	Type	Unit	Visualization
32	PDTTestResult (see table 21 on page 25)	eResult	BYTE	–	
33	PDTTestValue	prPressureDrop_mbar	REAL	mbar	
37	PDTAbortError	eError	WORD	–	
39	PDTNetvolume	vVolumeNet_ml	REAL	ml	
43	PDTErrorCode		BYTE	–	First error

Table 31: Test results PDT for SartoCheckExt

Volume Test – VOL

Offset	Name	Internal name	Type	Unit	Visualization
28	VOLTestValue	vVolumeNet_ml	REAL	ml	
32	VOLAbortError	eError	WORD	–	

Table 32: Test results VOL for SartoCheck

Offset	Name	Internal name	Type	Unit	Visualization
32	VOLTestValue	vVolumeNet_ml	REAL	ml	
36	VOLAbortError	eError	WORD	–	
38	VOLErrorCode		BYTE	–	First error

Table 33: Test results VOL for SartoCheckExt

Glossary

Address	→ Station address
Bit	Abbreviation for **bi**nary digi**t**, the smallest unit in the binary system; it can have the value 0 or 1.
Bus	Cable with two defined ends which is used for exchanging data between the connected bus stations.
Bus connector	Plug used to connect the bus stations to the bus cable.
Bus segment	→ Segment
Bus station	Device attached to the bus which can send data over the bus (e.g. DP master), receive data over the bus (e.g. DP slave), or amplify signals (e.g. repeater).
Byte	A byte consists of eight bits and is the smallest addressable amount of memory.
Character timeout	Used to detect the end of a telegram in the case of an unstructured flow of ASCII data. The telegram currently being received is considered to be completed when the time between two received characters is larger than the specified character timeout.
Configuration	During configuration, the modules and the addresses of the DP slave are assigned. The actual configuration describes the modules which are actually present in the slave. the required configuration describes the modules which should be present in the slave. This approach allows an incorrect configuration to be detected when the system is booted.
Configurator	Software for configuring PROFIBUS devices and for setting parameters.
CPU	**C**entral **P**rocessing **U**nit
Data block	Special memory area in a PLC which is optimized for storing data; it consists of a specified number of words (or bytes) of memory.
Data channel	A logical channel for exchanging data with the SPI 3. The size of the data channel (i.e. I/O area) is dependent on the

	SPI 3 configuration. If a telegram is larger than the data channel, it needs to be fragmented.
Data transfer rate	Measurement for the speed of data transfer, specified in bits per second.
Data word	16 bit area of memory in a data block.
Diagnosis	Detection, localization, classification and display of errors, faults and messages.
DP	→ PROFIBUS
DP address	ID number used to uniquely identify each bus device (station) in PROFIBUS DP.
DP standard	Bus protocol for PROFIBUS DB which is standardized in EN 50 170.
Floating	Indicates that a component or circuit is not electrically connected to ground
FREEZE	Control command that a DP slave receives from the DP master. It causes the slave to store (freeze) the current states of its inputs and to transfer the frozen values cyclically to the master. The slave only starts to transfer the cyclically updated values to the master again after it receives the UNFREEZE command.
Galvanically isolated	With galvanically isolated I/O devices, the reference potentials of control circuits and power circuits are not electrically interconnected.
Ground	Conductive material (e.g. ground wire) whose electrical potential is considered to be zero; all interconnected inactive components of a device which cannot assume dangerous voltages even in case of faults.
GSD	Device Data Base file (DDB), i.e. electronic device data sheet which describes the features of the PROFIBUS device uniquely and completely in a clearly specified syntax. You can download a GSD file for the SPI 3 from the internet (www.t-h.de); it is required to set up the device.
Handshake	Method used to synchronize data exchange. For example, data can only be exchanged between a master and slave

	after the master and the slave have “agreed” that the exchange should take place.
ID byte	Configures the number and size of the bytes to be transferred in a module.
Input byte	PLC address area which contains the data that the DP slave sends to the DP master.
IP 20	Protection class specification to DIN 40 050. Components of the device which carry voltages are protected against touching with the fingers and against the penetration of solid objects with a diameter of more than 12 mm.
Master	Active bus station that can send data to other bus stations and request data from other bus stations.
Module	Selecting a module during device configuration determines the configuration telegram and thus the size of the PLC I/O area.
MSB	**M**ost **S**ignificant **B**it
Non-floating	With non-floating I/O devices, the reference potentials of control circuits and power circuits are electrically interconnected and are not galvanically isolated.
Non-isolated	With non-isolated I/O devices, the reference potentials of control circuits and power circuits are electrically interconnected.
Output byte	PLC address area which contains data which the DP master sends to the DP slave.
Parameter	Variable used to specify the behavior of a device
Parameter master	When the system is booted, the parameter master passes parameter information to the DP slave. The parameter master can write to and read from the slave and change the configuration of the slave.
Parameter setting	To set the behavior of a DP slave and its modules.
Parameter telegram	Contains all parameters which can be set for a DP slave

Parity	Even parity: The sum of all 1's in a byte must be an even number. Odd parity: the sum of all 1's in a byte must be an odd number. The parity bit which can be 1 or 0 is used to create an even or odd parity to allow detection of errors due to lost bits.
PII (Ger: PAE)	Process input image (PII)
PLC	Programmable logic controller, electronic controller whose control function is controlled by the program in its memory.
POI (Ger: PAA)	Process output image (POI)
Potential equalization	Electrical connection between conducting bodies to bring them to an identical or practically identical potential and thus prevent interfering or dangerous voltages between the bodies.
PROFIBUS	**Pro**cess **Fi**eld **Bus** is an open Fieldbus system used to network PROFIBUS compatible devices. PROFIBUS works with three different protocols: PROFIBUS-DP (Decentral Peripheral), PROFIBUS-FMS (Fieldbus Message Specification), and PROFIBUS-PA (Process Automation). PROFIBUS is standardized in EN 50 170.
Protocol	A set of rules and regulations which control the flow of information in a communication system. The term protocol can refer to either hardware or software.
Receive	The Fieldbus device receives a telegram from the DP master through the SPI 3.
Receive channel	Data channel for data which the SPI 3 receives.
Remote peripheral	I/O device which is not directly integrated in the PLC CPU, but is accessed remotely via the bus.
Response monitoring	If a slave is not accessed within the response monitoring timeout, it switches automatically to a safe status by setting all outputs to 0. The response monitoring timeout is specified during parameter setting.
Response timeout	The duration of time within which the partner device must respond. The response timeout must be configured identically for both partner devices.

Segment	Section of the bus cable between two terminating resistors. A bus segment can support up to 32 bus stations, and several bus segments can be connected together with RS 485 repeaters.
Send	The DP master sends a telegram to a Fieldbus device through the SPI 3.
Send channel	Data channel for data which is sent to the SPI 3.
Slave	Bus station which is only allowed to exchange data with a master, and only on request of the master.
Station address	Address with which the DP master accesses the PROFIBUS DP slave.
Status byte	→ Mirror
Step 5	Programming language used for user programs for SIMATIC S5 controllers.
Step 7	Programming language used for user programs for SIMATIC S7 controllers.
Step 7 tool	Tool for Step 7 which automates particular programming tasks.
SYNC	Control command that a DP slave receives from the DP master. It causes the slave to store (freeze) the current states of its outputs. When following telegrams are received, it stores the output data, but the states of the outputs remain unchanged. The outputs are only cyclically updated again after the slave receives the UNSYNC command.
Telegram	A data flow which is sent or received through the serial interface (SIO), e.g. when you send a text to a text display or receive a bar code from a bar code scanner.
Terminating resistor	Used to stop electrical reflections and thus signal distortion at the end of the bus cable. Terminating resistors are required at each end of the bus cable.
Tool	Software tool used to specify and change the parameters of a parameter block.

Version code	Indicates the version of a product and is always incremented when the hardware or software in the product is updated or modified. The version code can be seen on the first and second page of this online documentation at the bottom left.
Word	→ Data word
Xon	With software flow control, the Xon control character indicates readiness to receive; complement of Xoff.
Xoff	With software flow control, the Xoff control character indicates unreadiness to receive; complement of Xon.

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Trebing & Himstedt Prozessautomation GmbH & Co. KG reserves the right to make changes to this manual and to the specifications of the hardware and software at any time and without warning or prior notice.

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ESD Guidelines

The hardware contains electronic components which are sensitive to electrostatic discharge. Before touching the printed circuit board, you should first discharge electrostatic voltages from your body by using a grounded anti-static wristband or anti-static shoes and a grounded anti-static carpet. A simple precaution is to touch a grounded, electrically conducting surface such as a heating radiator, water pipe or unpainted surface of a grounded control cabinet. Damage due to electrostatic discharge may not be immediately apparent, and can lead to the following types of fault at a later stage:
– premature failure of components and modules,
– fluctuation of typical performance characteristics,
– intermittent faults,
– temperature-dependent faults.
An electrostatic discharge can only be perceived by humans in case of high-level voltage. However, lower electrostatic voltages which are below the limits of perception can still damage or destroy electronic components.

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