SIEMENS

SITRANS P

Interface description for SITRANS P200 and P220 IO-Link interface

Programming Manual

7MF1565
7MF1567

11/2024
A5E54159563-AA

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Siemens Aktiengesellschaft
Digital Industries
Postfach 48 48
90026 NÜRNBERG
GERMANY

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Table of contents

General information

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1.1 Application

The SITRANS P220 transmitter can optionally be supplied with an IO-Link electrical connection; see ordering data in catalog FI01, Section 1.

A description of the SITRANS P200 and SITRANS P220 transmitters can be found in the separate operating instructions:

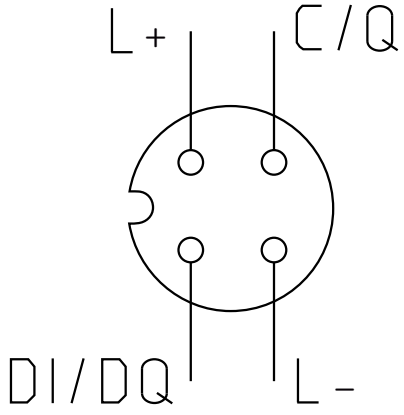
- **SITRANS P200** (7MF1565) Compact Operating Instructions (https://sieportal.siemens.com/su/bjQ28) and
- **SITRANS P220** (7MF1567) Compact Operating Instructions (https://sieportal.siemens.com/su/bjRds).

1.2 Target group

This information is intended for professionally trained personnel and must be read carefully by anyone who assembles, commissions, operates, maintains, dismantles or disposes of the device.

1.3 Electrical connection

The M12 plug is used as electrical connector. The sensor is intended only for port class A.



L+	18-33 V DC
L-	GND
C/Q	IO-Link / Switching output
DI/DQ	Switching output

IO-Link

2

The sensor can be used in IO-Link mode (IOL) as well as in standard-IO mode (SIO). In IO-Link mode, communication takes place via Pin 4 — in SIO mode, Pin 4 is a normal switching output. There is an additional switching output on Pin 2, which is independent of the mode.

2.1 IO Device Description (IODD)

The IODD for the sensor can be downloaded at ioddfinder

2.2 IO-Link Version / Profile

The sensor conforms to the standardized IO-Link specification V1.1, IO-Link Common Profile V1.0 and the Smart Sensor Profile ED2.

For more information, please refer to IO-Link

IO-Link parameter

3

3.1 General parameters / Direct parameters

The "Direct parameters" contain the most important parameters for successful communication with the master. Siemens AG has Vendor ID 0x002A.

Parameter name	Index	Subindex	Bit offset	Unit	Default	
Direct parameter 1	0	0		RecordT		rw
Min cycle time		3	104	UIntegerT_8	3300 us	rw
Process data input length		6	80	UIntegerT_8	4	rw
Process data output length		7	72	UIntegerT_8	0	rw
Vendor ID 1		8	64	UIntegerT_8	0x00	rw
Vendor ID 2		9	56	UIntegerT_8	0x2A	rw
Device ID 1		10	48	UIntegerT_8	0x0B	rw
Device ID 2		11	40	UIntegerT_8	0x14 (P200) 0x16 (P220)	rw
Device ID 3		12	32	UIntegerT_8	Device-specific	rw

3.2 Identification

The sensor is identified according to the IO-Link Common Profile V1.0. In addition, each sensor can be clearly identified via a "Globally Unique Identifier".

Parameter name	Index	Subindex	Unit	Default	
Vendor name	16	0	StringT [64]	Siemens AG	ro
Vendor string	17	0	StringT [64]	www.siemens.com	ro
Product name	18	0	StringT [64]		ro
Product ID	19	0	StringT [64]		ro
Product text	20	0	StringT [64]		ro
Serial number	21	0	StringT [64]		ro
Hardware version	22	0	StringT [64]		ro
Firmware version	23	0	StringT [64]		ro
Application-specific tag	24	0	StringT [16]	***	rw
Function-specific tag	25	0	StringT [16]	***	rw
Location-specific tag	26	0	StringT [16]	***	rw
Globally unique identifier	70	0	StringT [16]		ro

3.3 Smart Sensor Profile – Digital Measuring Sensor SSP 3.1

The process data is transferred as a 32-bit frame. 16 bits are reserved for the measurement data (-32768 to 32767). Another 8 bits represent the scaling of the measurement data as a power of 10 (-128 to 127). The remaining 8 bits are used as status bits. The Smart Sensor Profile recommends using the Pascal unit for pressure sensors. The pressure value can be calculated from the process data using the following formulas.

PDI32.INT16_INT8

IntegerT(16)	IntegerT(8)	8-bit
Measurement value	Scale	Vendor-specific.

Pressure [Pa] = Measurement value * 10^{Scale}
Pressure [bar] = Measurement value * $10^{(Scale-5)}$

Parameter name	Index	Subindex	Bit offset	Unit	
Process value	40			RecordT	ro
Measurement value		1	16	UIntegerT_16	ro
Scale		2	8	IntegerT_8	ro
Switching output 1		3	0	BooleanT	ro
Switching output 2		4	1	BooleanT	ro
Overpressure		5	2	BooleanT	ro
Underpressure		6	3	BooleanT	ro
Short-circuit		7	4	BooleanT	ro
Voltage out of specification		8	5	BooleanT	ro
Temperature critical		9	6	BooleanT	ro
Device fault		10	7	BooleanT	ro

The process data is valid between -25% nominal pressure and 125% nominal pressure. If these limits are exceeded, an out-of-range event is triggered and the process value takes on the value +/- 32,760.

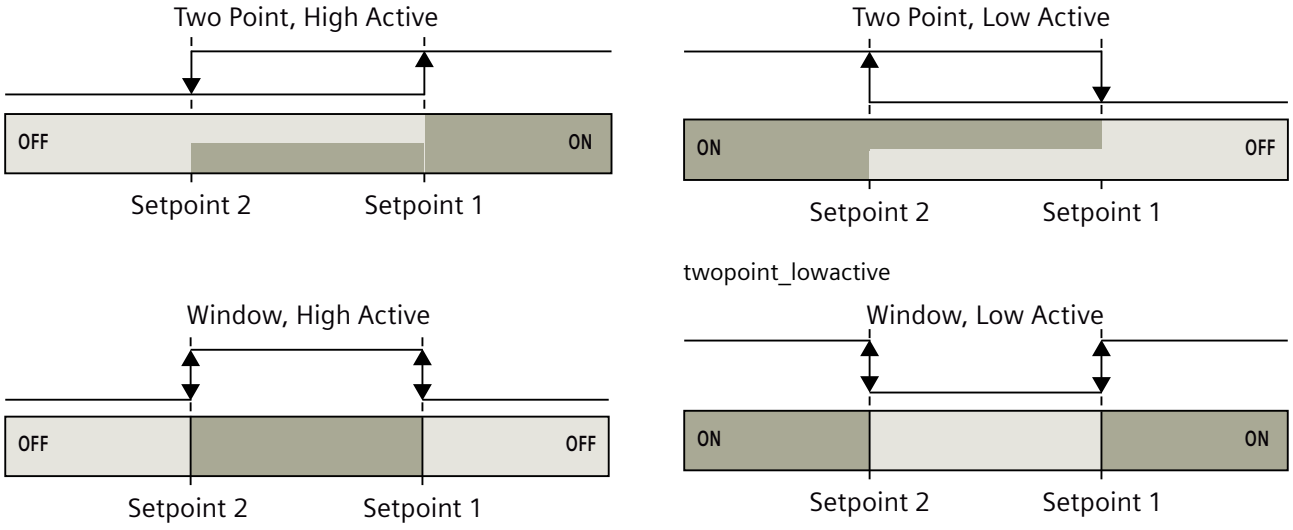
PD Process data
NP Nominal pressure

The "Measurement Data Channel Descriptor" is also part of the Smart Sensor Profile and describes the structure of the process data.

Parameter name	Index	Subindex	Bit offset	Unit	Comment	
MDC descriptor	16512	0		RecordT		ro
Lower value measurement range		1	56	IntegerT_32	100% nominal pressure	ro
Upper value measurement range		2	24	IntegerT_32	0% nominal pressure	ro
Unit code		3	8	UIntegerT_16	1130 for "Pa"	ro
Scale		4	0	IntegerT_8	Device-specific	ro

3.4 Configuration of the switching outputs

Both switching outputs are configured via IO-Link.



twopoint_lowactive

Parameter name	Index	Subindex	Subindex	Unit	Comment
SSC Config	111 / 113			RecordT	
Logic		1	24	UIntegerT_8	High active (0), Low active (1)
Mode		2	16	UIntegerT_8	Deactivated (0), Window (2), Two Point (3)
Hysteresis		3	0	UIntegerT_16	Not supported (0)

Parameter name	Index	Subindex	Subindex	Unit	Comment	
SSC parameters	110 / 112			RecordT		rw
Setpoint 1 (SP1)		1	24	UIntegerT_16	Switching point	rw
Setpoint 2 (SP2)		2	16	UIntegerT_16	Release position	rw

The switching points must meet the following conditions:

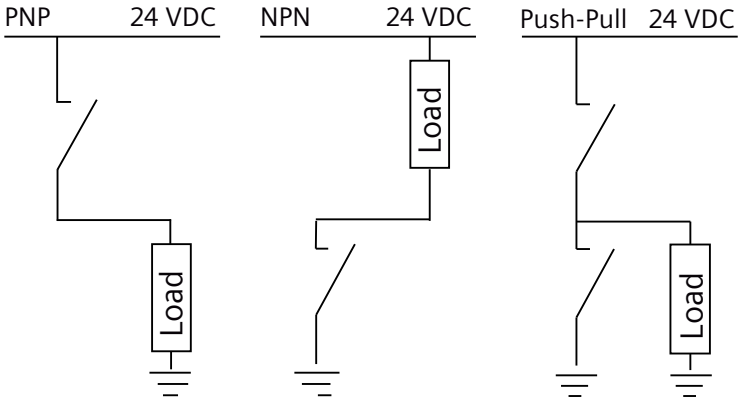
- Setpoint 1 – Setpoint 2 >= 0.5% nominal pressure
- 100% nominal pressure >= Setpoint 1 >= 0.5% nominal pressure
- 99.5% nominal pressure >= Setpoint 2 >= 0% nominal pressure

3.4.1 Switching delay (Index 116-119)

Parameter name	Index	Subindex	Bit offset	Unit	Comment	
Delay Setpoint 1 (SP1)	116 / 118	0	0	UIntegerT_16	Delay switching point 1	rw
Delay Setpoint 2 (SP2)	117 / 119	0	0	UIntegerT_16	Delay switching point 2	rw

3.4.2 Setting the switching function (Index 114 / 115)

Parameter name	Index	Subindex	Bit offset	Unit	Comment	
Switching function	114 / 115	0	0	UIntegerT_8	PNP (0), NPN (1), Push Pull (2)	rw



3.4.3 Teach-in

Parameter name	Index	Subindex	Bit offset	Unit	Comment	
Teach-In Select	108	0	0	UIntegerT_8	PNP (0), NPN (1), Push Pull (2)	rw

Parameter name	Index	Subindex	Bit offset	Unit	Comment
Teach-In Result	109	0	0	RecordT	
Flag SP2 TP2		5	7	BooleanT	Not supported (0)
Flag SP2 TP1		4	6	BooleanT	Not supported (0)
Flag SP1 TP2		3	5	BooleanT	Not supported (0)
Flag SP1 TP1		2	4	BooleanT	Not supported (0)
State		1	0	UIntegerT_4	IDLE (0), SP1 SUCCESS (1), SP2 SUCCESS (2), ERROR (7)

3.4.4 Diagnostic events

The exchange of diagnostics data between IO-Link master and IO-Link sensor is made by events composed of "Event qualifier" and "Event code". This data is exchanged acyclically between master and device.

- The "Event qualifier" defines the type of event (message, warning and error).
- The "Event code" defines the event.

"Standard events" are defined in the IO-Link specification and are used wherever possible.

Standard events			
Code	Type	Name	Default
0x4210	Warning	Device temperature overrun — Clear source of heat	On
0x5000	Error	Device hardware fault – Device exchange	On
0x5111	Warning	Primary supply voltage underrun — Check tolerance	On
0x7710	Error	Short-circuit – Check installation	On
0x8C20	Error	Measurement range overrun – Check application (pressure > 125% nominal pressure or pressure < -25% nominal pressure)	

Non-standard events			
Code	Type	Name	Default
0x8CA2	Warning	Overpressure (set @105% nominal pressure – reset 103% nominal pressure)	Off

Non-standard events			
0x8CA3	Warning	Underpressure (set @-5% nominal pressure – Reset -3% nominal pressure)	Off
0x8CA6	Notification	New max value recorded	Off
0x8CA7	Notification	New min value recorded	Off

All diagnostic events can be switched on or off using the "Event enabled" tab.

Parameter name	Index	Subindex	Bit offset	Unit	Default	
Event enabled	76	0		RecordT		rw
Temperature overrun		1	0	BooleanT	on (true)	rw
Device hardware fault		2	1	BooleanT	on (true)	rw
Supply voltage underrun		3	2	BooleanT	on (true)	rw
Short-circuit		4	3	BooleanT	on (true)	rw
Measurement range over-run		5	4	BooleanT	on (true)	rw
Overpressure		6	5	BooleanT	off (false)	rw
Underpressure		7	6	BooleanT	off (false)	rw
Min value recorded		8	7	BooleanT	off (false)	rw
Max value recorded		9	8	BooleanT	off (false)	rw

3.4.5 Reaction to error

The following table lists the behavior of the switching outputs in the event of an error.

Event name	Switching status
Temperature overrun	No influence on switching status.
Device hardware fault	Response after "Switch n Error State" parameter.
Supply voltage underrun	No influence on switching status.
Short-circuit	The affected switching output is switched off until the short-circuit is eliminated.
Measurement range overrun	No influence on switching status.
Overpressure	No influence on switching status.
Underpressure	No influence on switching status.

In the event of a "Device hardware fault", the behavior can be defined with the following parameter.

Parameter name	Index	Subindex	Unit	Comment	
Switch 1 Error state	86	0	UIntegerT_8	Tri-State (0) (default), NPN/PNP: Open / PushPull: High (1), NPN/PNP: Closed / PushPull: Low (2), Last status (3)	rw
Switch 2 Error state	87	0	UIntegerT_8	Tri-State (0) (default), NPN/PNP: Open / PushPull: High (1), NPN/PNP: Closed / PushPull: Low (2), Last status (3)	rw

3.4.6 Diagnostic parameters

The minimum and maximum pressure values as well as the number of overpressure cycles are stored in the sensor. Operating hours and errors are also counted. The current status of the device can be read at any time from the "Device status" and "Detailed device status" parameters.

Parameter name	Index	Unit	
Minimum value memory	106	IntegerT_16	ro
Maximum value memory	105	IntegerT_16	ro
Overload counter	77	UIntegerT_32	ro
Operating hours counter	75	UIntegerT_32	ro
Error count	32	UIntegerT_16	ro
Device status	36	UIntegerT_8	ro
Detailed device status	37	ArrayT	ro

3.4.7 System settings

Parameter name	Index	Unit	Comment	
System command	2	UIntegerT_8	Device reset (128), Restore factory setting (130), Erase minimum value (160), Erase maximum value (161), Correct zero point (162), Erase overload counter (163), Teach setpoint 1 (165), Teach setpoint 2 (166)	wo
Offset correction	104	IntegerT_16	+/- 5% of the nominal pressure	rw
Filter time constant	90	UIntegerT_16	0 = off, in ms	rw

3.4.7.1 System command (Index 2 / UIntegerT_8)

System commands:

- Device reset (128): Reboots the device.
- Restore factory setting (130): Resets all registers to their initial states.
- Erase minimum value (160): Resets the "Minimum value memory" register (Index 106).
- Erase maximum value (161): Resets the "Maximum value memory" register (Index 105).
- Correct zero point (162): Corrects the offset.
- Erase overload counter (163): Resets the "Overload counter" register (Index 77).
- Teach Setpoint 1 / 2 (165 / 166): Adopts the current value as setpoint 1 / 2 of the switch channel selected with Teach-In Select.

3.4.7.2 Offset correction (Index 104 / IntegerT_16)

An offset can be set with this register. The offset has to be maximum +/- 5% of the nominal pressure. The process value is calculated as follows.

Process value=Bridge value+Offset

3.4.7.3 Tau of filter (index 90 / UIntegerT_16)

Adjust the 1st order low-pass filter (exponential moving average filter) with parameter "Filter time constant". This parameter is used to set the length of a time constant (Tau) in milliseconds. After a time constant (Tau), 63.2% of the input signal is pending at the output.

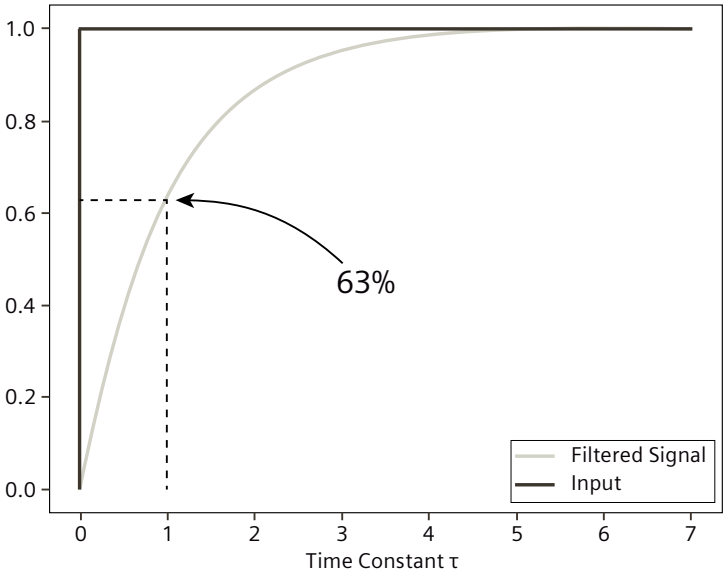


Figure 3-1 Step response of a 1st order low-pass filter

Product documentation and support

A

A.1 Product documentation

Process instrumentation product documentation is available in the following formats:

- Certificates (http://www.siemens.com/processinstrumentation/certificates)
- Downloads (firmware, EDDs, software) (http://www.siemens.com/processinstrumentation/downloads)
- Catalog and catalog sheets (http://www.siemens.com/processinstrumentation/catalogs)
- Manuals (http://www.siemens.com/processinstrumentation/documentation)
  You have the option to show, open, save, or configure the manual.
  - "Display": Open the manual in HTML5 format
  - "Configure": Register and configure the documentation specific to your plant
  - "Download": Open or save the manual in PDF format
  - "Download as html5, only PC": Open or save the manual in the HTML5 view on your PC

You can also find manuals with the Mobile app at Industry Online Support (https://support.industry.siemens.com/cs/ww/de/sc/2067). Download the app to your mobile device and scan the device QR code.

Product documentation by serial number

Using the PIA Life Cycle Portal, you can access the serial number-specific product information including technical specifications, spare parts, calibration data, or factory certificates.

Entering a serial number

1. Open the PIA Life Cycle Portal (ttps://www.pia-portal.automation.siemens.com).
2. Select the desired language.
3. Enter the serial number of your device. The product documentation relevant for your device is displayed and can be downloaded.

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

Scanning a QR code

1. Scan the QR code on your device with a mobile device.
2. Click "PIA Portal".

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

A.2 Technical support

Technical support

If this documentation does not completely answer your technical questions, you can enter a Support Request (http://www.siemens.com/automation/support-request).

For help creating a support request, view this video here (www.siemens.com/opensr).

Additional information on our technical support can be found at Technical Support (http://www.siemens.com/automation/csi/service).

Service & support on the Internet

In addition to our technical support, Siemens offers comprehensive online services at service & support (http://www.siemens.com/automation/serviceandsupport).

Contact

If you have further questions about the device, contact your local Siemens representative at Personal Contact (http://www.automation.siemens.com/partner).

To find the contact for your product, go to "all products and branches" and select "Products & Services > Industrial automation > Process instrumentation".

Contact address for business unit:
Siemens AG
Digital Industries
Process Automation
Östliche Rheinbrückenstr. 50
76187 Karlsruhe, Germany

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