

SIEMENS

Coriolis Flowmeters

Operating Instructions

7ME4633 (SITRANS FC330)

01/2019 A5E44030648-AB

Introduction	1
Safety notes	2
Description	3
Installing/mounting	4
Connecting	5
Commissioning	6
Operating	7
Parameter assignment	8
Service and maintenance	9
Diagnostics and troubleshooting	10
Technical data	11
Dimension drawings	12
Technical reference	Α
HART communication	В
HMI menu structure	С
Zero point adjustment	D
Certificates and support	Ε
I, II, and	

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.



A 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:



▲ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens, Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

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.

Table of contents

1	Introduct	tion	9
	1.1	Purpose of this documentation	9
	1.2	Document history	9
	1.3	Product compatibility	10
	1.4	Items supplied	10
	1.5	Checking the consignment	12
	1.6	Security information	12
	1.7	Transportation and storage	13
	1.8	Notes on warranty	13
2	Safety no	otes	15
	2.1	Preconditions for use	15
	2.2 2.2.1 2.2.2	Laws and directivesFCC Conformity	16
	2.3	Requirements for special applications	17
	2.4 2.4.1 2.4.2	Use in hazardous areas Installation in hazardous areas Maximum temperature specifications for use in hazardous areas	19
3	Descripti	ion	21
	3.1	Overview	21
	3.2 3.2.1 3.2.2 3.2.3 3.2.4	Design Versions Sensor design Transmitter design Wall mount housing transmitter exploded view	22 23
	3.3	Device identification	27
	3.4	Approvals	32
	3.5	Features	33
	3.6	Applications	35
4	Installing	y/mounting	
	4.1 4.1.1 4.1.2	Basic safety notes	39
	4.2 4.2.1	Installation instructionsTransmitter installation	

	4.2.1.1	Remote field mount	
	4.2.1.2	Wall mount housing	
	4.2.1.3	Turning the transmitter (compact version)	
	4.2.1.4	Turning the transmitter (remote version)	
	4.2.1.5	Turning the local display	
	4.2.2	Sensor installation	
	4.2.2.1	Determining a location	
	4.2.2.2	Orientation of the sensor	
	4.2.2.3	Installation in a drop line	
	4.2.2.4	Mounting the sensor	
	4.2.2.5	Hydrostatic testing	
	4.2.2.6	Installing with insulation	
	4.3	Disassembly	55
5	Connecting		57
	5.1	Basic safety notes	57
	5.2	Connecting FC330	
	5.2.1	Cable requirements	
	5.2.2	Transmitter power supply and I/Os connection	
	5.2.2.1	Connecting the DSL and the transmitter	62
	5.2.2.2	Preparing for the transmitter connections	65
	5.2.2.3	Connecting the Current HART, CH1	
	5.2.2.4	Connecting the Modbus (CH1)	69
	5.2.2.5	Connecting the Profibus (CH1)	71
	5.2.2.6	Connecting channels 2 to 4	72
	5.2.2.7	Input/output configuration	
	5.2.2.8	Connecting the power supply - Field mount	
	5.2.2.9	Connecting the power supply - Wall mount	77
	5.2.2.10	Finishing the transmitter connection	78
	5.3	Instructions specific to hazardous area installations	79
	5.3.1	Wiring in hazardous areas	79
6	Commission	ning	81
	6.1	Basic safety notes	81
	6.1.1	Warnings	83
	6.2	General requirements	84
	6.3	Local commissioning via HMI	84
	6.3.1	Local display	
	6.3.2	Wizard introduction	
	6.3.3	Initial startup	
	6.3.4	Zero point adjustment	
	6.3.5	Wizards	
	6.3.5.1	Quick commissioning wizard (menu item 1.1)	
	6.3.5.2	Zero point adjustment wizard (menu item 1.2)	
	6.3.5.3	Process values wizard (menu item 1.3)	
	6.3.5.4	Inputs and outputs wizard (menu item 1.4)	
	6.3.5.5	Gas application wizard (menu item 1.5)	
	6.3.5.6	Pulsating flow wizard (menu item 1.6)	
	6357	Dosing application wizard (menu item 1.7)	101

	6.4	Remote commissioning with PDM	102
7	Operating	g	103
	7.1	Local operation (HMI)	103
	7.1.1	Display view structure	
	7.1.2	Access control	
	7.1.3	Operation view	
	7.1.4	Measurement views	
	7.1.5	Operating views	
	7.1.6	Alarm views	
	7.1.7	Diagnostic views	
	7.1.8	Navigation view	
	7.1.9	Parameter view	
	7.2	Remote operation	123
	7.2.1	Overview of device configuration software	123
	7.2.2	SIMATIC PDM	
8	Paramete	er assignment	127
	8.1	Upper scaling settings	127
	8.2	Functions	127
	8.2.1	Process values	127
	8.2.2	Zero point adjustment	131
	8.2.3	Low flow cut-off	132
	8.2.4	Empty tube monitoring	132
	8.2.5	Process noise damping	133
	8.2.6	Inputs and outputs	134
	8.2.6.1	Current output	135
	8.2.6.2	Pulse output	140
	8.2.6.3	Frequency output	141
	8.2.6.4	Redundancy mode (frequency)	
	8.2.6.5	Digital output	144
	8.2.6.6	Input	144
	8.2.7	Totalizers	145
	8.2.8	Dosing	145
	8.2.8.1	Dosing control configuration	
	8.2.8.2	Valve control configuration	
	8.2.8.3	Dosing operation	
	8.2.8.4	Fault handling	
	8.2.9	Audit trail logging	
	8.2.10	Diagnostic log	
	8.2.11	Custom unit	
	8.2.12	SensorFlash	
	8.2.13	Datalogging on SensorFlash	
	8.2.14	Process peak values on SensorFlash	
	8.2.15	Simulation	
	8.2.16	Maintenance	
9	Service a	and maintenance	159
	9.1	Basic safety notes	159
	9.2	Recalibration	160

	9.3	Cleaning	160
	9.4 9.4.1	Maintenance and repair workService information	
	9.5	Replacing the device	165
	9.6	Ordering of spare parts	165
	9.7	Return procedure	165
	9.8	Disposal	166
	9.9	Ex-approved products	166
10	Diagnostic	cs and troubleshooting	167
	10.1	Device status symbols	167
	10.2 10.2.1 10.2.2	Fault codes and corrective actions	171
	10.3 10.3.1 10.3.2 10.3.3	Operation troubleshooting	189 189
11	Technical	data	195
	11.1	Power	195
	11.2	Performance	195
	11.3 11.3.1 11.3.2	Interface Modbus interface HART interface	197
	11.4	Inputs	198
	11.5	Outputs	198
	11.6 11.6.1 11.6.2	Construction	201
	11.7	Operating conditions	204
	11.8	Process variables	205
	11.9	Bus communication	205
	11.10	Certificates and approvals	206
	11.11	SensorFlash	206
	11.12	PED	207
	11.13 11.13.1 11.13.2	Pressure - temperature ratings Pressure - temperature ratings (stainless steel sensors) Pressure - temperature ratings (nickel alloy sensors)	212
12	Dimension	n drawings	217
	12.1	Concer dimensions	217

	12.2	316L stainless steel - standard	218
	12.3	316L stainless steel polished - hygienic versions	219
	12.4	Nickel alloy	220
	12.5	Transmitter dimensions	221
	12.6	Wall mount enclosure dimensions	222
	12.7	Mounting bracket dimensions	223
Α	Technical	reference	225
	A.1	Theory of operation	225
	A.2 A.2.1 A.2.2 A.2.3 A.2.4 A.2.5	Sensor dimension dependent default settings	226 228 229 231
В	HART com	nmunication	235
	B.1	Mode of operation HART function	235
С	HMI menu	structure	237
	C.1	Main menu	237
	C.2	Menu item 2.1: Sensor	239
	C.3	Menu item 2.2: Process values	239
	C.4	Menu item 2.3: Totalizers	243
	C.5	Menu item 2.4: Inputs and outputs	244
	C.6	Menu item 2.5: Dosing	251
	C.7	Menu item 2.7: Date and time	256
	C.8	Menu item 2.8: Local display	257
	C.9	Menu item 3.1: Identification	259
	C.10	Menu item 3.2: Diagnostic events	260
	C.11	Menu item 3.3: Maintenance	261
	C.12	Menu item 3.4: Diagnostics	261
	C.13	Menu item 3.5: Peak values	263
	C.14	Menu item 3.6: Characteristics	263
	C.15	Menu item 3.7: SensorFlash	264
	C.16	Menu item 3.8: Simulation	265
	C.17	Menu item 3.9: Audit trail	266
	C.18	Menu item 3.10: Self test	266
	C 19	Menu item 3.11: Resets	267

	C.20	Menu item 3.12: Firmware update	267
	C.21	Menu item 4: Communication	267
	C.22	Menu item 5: Security	270
D	Zero point a	adjustment	271
Е	Certificates	and support	275
	E.1	Certificates	275
	E.2	QR code label	275
	E.3	Technical support	275
	Index		277

Introduction

This document is delivered as standard in electronic media with the device. The latest version can be downloaded at www.siemens.com (www.siemens.com).

1.1 Purpose of this documentation

These instructions contain all information required to commission and use the device. Read the instructions carefully prior to installation and commissioning. In order to use the device correctly, first review its principle of operation.

The instructions are aimed at persons mechanically installing the device, connecting it electronically, configuring the parameters and commissioning it, as well as service and maintenance engineers.

See also

Certificates (Page 275)

Technical support (Page 275)

QR code label (Page 275)

1.2 Document history

The following table shows major changes in the documentation compared to the previous edition.

The most important changes in the documentation when compared with the respective previous edition are given in the following table.

Edition	Note	
01/2019	Second edition	
	Chapter Technical data (Page 195) updated	
	Chapter Diagnostics and troubleshooting (Page 167) updated	
	Appendix HMI menu structure (Page 237) updated	
	Overall revision of chapters and contents	
06/2018	First edition	

1.4 Items supplied

NOTICE

Use in a domestic environment

This Class A Group 1 equipment is intended for use in industrial areas.

In a domestic environment this device may cause radio interference.

1.3 Product compatibility

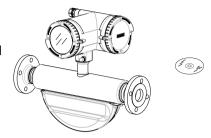
Edition	Remarks	Product compatibility	Compatibility of device integration package	
01/2019	Manual con- tent updated	HW revision 03 Compact FW revision 4.xx.xx-xx	Service channel: SIMATIC V8.2 Service Pack 1 or later	5.00.xx-xx
		Remote FW revision 4.xx.xx-xx	Modbus: SIMATIC V8.2 Service Pack 1 or later	5.00.xx-xx
			HART: SIMATIC V8.2 Service Pack 1 or later	5.00.xx-xx
			HART: SITRANS DTM V4.1	5.00.xx-xx
			HART: AMS Device manager V12	5.00.xx-xx
			PROFIBUS: SIMATIC V8.2 Service Pack 1 or later	1.00.xx-xx
			PROFIBUS: AMS Device manager V12	1.00.xx-xx
			PROFIBUS : SITRANS DTM V4.1	1.00.xx-xx
06/2018	New hardware New sensor	HW revision 03 Compact FW revision 4.xx.xx-xx	Service channel: SIMATIC V8.2 Service Pack 1 or later	5.00.xx-xx
	sizes	Remote FW revision 4.xx.xx-xx	Modbus: SIMATIC V8.2 Service Pack 1 or later	5.00.xx-xx
			HART: SIMATIC V8.2 Service Pack 1 or later	5.00.xx-xx
			HART: SITRANS DTM V4.1	5.00.xx-xx
			HART: AMS Device manager V12	5.00.xx-xx
			PROFIBUS: SIMATIC V8.2 Service Pack 1 or later	1.00.xx-xx
			PROFIBUS: AMS Device manager V12	1.00.xx-xx
			PROFIBUS : SITRANS DTM V4.1	1.00.xx-xx

1.4 Items supplied

The device can be delivered as either a compact or a remote system.

Compact system

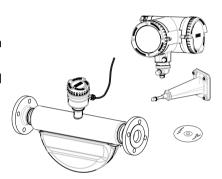
- SITRANS FC330 sensor and compact mounted transmitter
- DVD containing software, certificates and device manuals



Field mount system

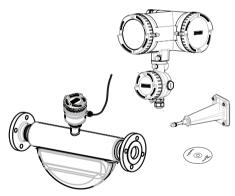
Remote with M12 plug connection

- SITRANS FCS300 sensor
- SITRANS FCT030 transmitter with M12 socket assembled
- Mounting bracket and cushion pad
- Sensor cable
- DVD containing software, certificates and device manuals



Remote with sensor terminal housing

- SITRANS FCS300 sensor
- SITRANS FCT030 transmitter with terminal housing assembled
- Mounting bracket and cushion pad
- Sensor cable
- DVD containing software, certificates and device manuals



Wall mount housing transmitter

- SITRANS FCT030 wall mount housing transmitter
- DVD containing software, certificates and device manuals





1.6 Security information

Note

Supplementary information

Supplementary product and production specific certificates are included on the SensorFlash® SD card in the transmitter socket.

Note

Scope of delivery may vary, depending on version and add-ons. Make sure the scope of delivery and the information on the nameplate correspond to your order and the delivery note.

1.5 Checking the consignment

- 1. Check the packaging and the delivered items for visible damages.
- 2. Report any claims for damages immediately to the shipping company.
- 3. Retain damaged parts for clarification.
- 4. Check the scope of delivery by comparing your order to the shipping documents for correctness and completeness.



WARNING

Using a damaged or incomplete device

Risk of explosion in hazardous areas.

• Do not use damaged or incomplete devices.

1.6 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit

https://www.siemens.com/industrialsecurity.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer

supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under

https://www.siemens.com/industrialsecurity.

1.7 Transportation and storage

To guarantee sufficient protection during transport and storage, observe the following:

- Keep the original packaging for subsequent transportation.
- Devices/replacement parts should be returned in their original packaging.
- If the original packaging is no longer available, ensure that all shipments are properly
 packaged to provide sufficient protection during transport. Siemens cannot assume liability
 for any costs associated with transportation damages.

NOTICE

Insufficient protection during storage

The packaging only provides limited protection against moisture and infiltration.

Provide additional packaging as necessary.

Special conditions for storage and transportation of the device are listed in Technical data (Page 195).

1.8 Notes on warranty

The contents of this manual shall not become part of or modify any prior or existing agreement, commitment or legal relationship. The sales contract contains all obligations on the part of Siemens as well as the complete and solely applicable warranty conditions. Any statements regarding device versions described in the manual do not create new warranties or modify the existing warranty.

The content reflects the technical status at the time of publishing. Siemens reserves the right to make technical changes in the course of further development.

1.8 Notes on warranty

Safety notes 2

2.1 Preconditions for use

Symbol	Explanation
Ŵ	Consult operating instructions

This device left the factory in good working condition. In order to maintain this status and to ensure safe operation of the device, observe these instructions and all the specifications relevant to safety.

Observe the information and symbols on the device. Do not remove any information or symbols from the device. Always keep the information and symbols in a completely legible state.

Use the device only for flow measurement in accordance with this operating instructions and observe the technical data (Page 195).



WARNING

Improper device modifications

Risk to personnel, system and environment can result from modifications to the device, particularly in hazardous areas.

 Only carry out modifications that are described in the instructions for the device. Failure to observe this requirement cancels the manufacturer's warranty and the product approvals.

2.2 Laws and directives

Observe the safety rules, provisions and laws applicable in your country during connection, assembly and operation. These include, for example:

- National Electrical Code (NEC NFPA 70) (USA)
- Canadian Electrical Code (CEC) (Canada)

Further provisions for hazardous area applications are for example:

- IEC 60079-14 (international)
- EN 60079-14 (EU)

2.2.1 **FCC Conformity**

US Installations only: Federal Communications Commission (FCC) rules

Note

- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
- This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the operating instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference to radio communications, in which case the user will be required to correct the interference at his own expense.

Observe the test certification, provisions and laws applicable in your country during connection, assembly and operation. These include, for example:

- National Electrical Code (NEC NFPA 70) (USA)
- Canadian Electrical Code (CEC) (Canada)

Further provisions for hazardous area applications are for example:

- IEC 60079-14 (international)
- EN 60079-14 (EU)
- For Korea only:

이 기기는 업무용(A 급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며 가정 외의

지역에서사용하는 것을 목적으로 합니다

2.2.2 Conformity with European directives

The CE marking on the device symbolizes the conformity with the following European directives:

Electromagnetic compatibility EMC 2014/30/EU

Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility

Low voltage directive LVD 2014/35/EU

Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits

ble ATEX 2014/34/EU

Atmosphère explosi-Directive of the European Parliament and the Council on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres

Pressure equipment Directive of the European Parliament and of the Council on the approxidirective PED mation of the laws of the Member States concerning pressure equipment 2014/68/EU

2011/65/EU RoHS Directive of the European Parliament and the Council on the restriction of the use of certain hazardous substances in electrical and electronic

equipment

The applicable directives can be found in the EC conformity declaration of the specific device.

Note

CE declaration

The CE declaration certificate is available on the SensorFlash SD card delivered with the device.

See also

Certificates (http://www.siemens.com/processinstrumentation/certificates)

2.3 Requirements for special applications

Due to the large number of possible applications, each detail of the described device versions for each possible scenario during commissioning, operation, maintenance or operation in systems cannot be considered in the instructions. If you need additional information not covered by these instructions, contact your local Siemens office or company representative.

Note

Operation under special ambient conditions

We highly recommend that you contact your Siemens representative or our application department before you operate the device under special ambient conditions as can be encountered in nuclear power plants or when the device is used for research and development purposes.

2.4 Use in hazardous areas

Special conditions for safe use

In general, it is required that:

- EN/IEC 60079-14 is considered for installation in hazardous areas.
- Appropriate cable connectors are used.

2.4 Use in hazardous areas

- Sensor is connected to the potential equalization throughout the hazardous area.
- The device is not opened when energized and when an explosive gas or dust atmosphere may be present.

Further information and instructions including approval-specific special conditions for safe use in Ex applications can be found in the certificates on the documentation disk and at the product web page (www.siemens.com/FC330).



WARNING

Substitution of components

Substitution of components may impair Intrinsic Safety.



WARNING

Laying of cables

Risk of explosion in hazardous areas.

Cable for use in hazardous areas must satisfy the requirements for having a proof voltage of at least 500 V AC applied between the conductor/ground, conductor/shield and shield/ground.

Connect the devices that are operated in hazardous areas as per the stipulations applicable in the country of operation.



WARNING

Field wiring installation

Ensure that the national requirements of the country in which the devices are installed are met.

Qualified personnel for hazardous area applications

Persons who install, connect, commission, operate, and service the device in a hazardous area must have the following specific qualifications:

- They are authorized, trained or instructed in operating and maintaining devices and systems
 according to the safety regulations for electrical circuits, high pressures, aggressive, and
 hazardous media.
- They are authorized, trained, or instructed in carrying out work on electrical circuits for hazardous systems.
- They are trained or instructed in maintenance and use of appropriate safety equipment according to the pertinent safety regulations.



WARNING

Use in hazardous area

Risk of explosion.

- Only use equipment that is approved for use in the intended hazardous area and labeled accordingly.
- Do not use devices that have been operated outside the conditions specified for hazardous areas. If you have used the device outside the conditions for hazardous areas, make all Ex markings unrecognizable on the nameplate.

See also

Technical data (Page 195)



WARNING

Loss of safety of device with type of protection "Intrinsic safety Ex i"

If the device or its components have already been operated in non-intrinsically safe circuits or the electrical specifications have not been observed, the safety of the device is no longer ensured for use in hazardous areas. There is a risk of explosion.

- Connect the device with type of protection "Intrinsic safety" solely to an intrinsically safe
- Observe the specifications for the electrical data on the certificate and/or in Technical data (Page 195).



WARNING

Signal wiring

Input/output connections to the transmitter are required to be protected by intrinsic safe barriers at all times.

2.4.1 Installation in hazardous areas

Hazardous area approvals

The device is approved for use in hazardous areas and has the approvals listed in Certificates and approvals. (Page 206) Special conditions for safe installation and operation specified by each approval authority are included in the relevant certificate.

2.4 Use in hazardous areas

Installation variations

Note

Requirements for safe installation

- Remote sensor FCS300 can be installed in Zone 1, Div. 1 as Intrinsically Safe or Flameproof.
- Standard remote installation with FCT030 because the connection is certified Intrinsically Safe. Flameproof seals and conduit (for IS cable) can be used.
- Requirement for IS circuit is that the maximum input voltage Vi to DSL is 20 VDC, Ii is maximum 484 mA, Pi < 2.3 W

2.4.2 Maximum temperature specifications for use in hazardous areas

Temperature classification is related to the process temperature and ambient temperature as listed below.

The maximum allowable process fluid temperatures with respect to temperature class for the device when used with potentially explosive gases in a maximum ambient temperature of +60°C are:

FCS300 Sensor and Pedestal Adapter:

- T4 at process temperature ≤ 100°C and Ta ≤ 53°C
- T3 at process temperature ≤ 150°C and Ta ≤ 33°C
- Temperature classes T6 and T5 are not applicable

FCT030 remote transmitter

Temperature classification with and without dust is as follows:

- Potentially explosive gases: T6 (85°C surface temperature)
- Dust environment (Zone 21): T85°C

The maximum dust layer shall be no greater than 5 mm (T5 85 °C).

If Tprocess ≤ 85°C, maximum surface temperature = 85°C

If Tprocess > 85°C, maximum surface temperature = process temperature

Description 3

3.1 Overview

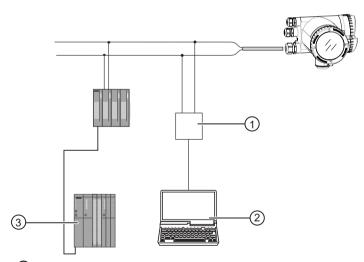
SITRANS Coriolis flowmeter systems consist of a transmitter and a sensor. The following table lists the available combinations of transmitters and sensors.

Transmitter	Sensor type
FCT030	FCS300
	DN 15 to DN 150 (0.5" to 6")

You can use the flowmeter for the following measuring tasks:

- Mass flow
- Volume flow
- Standard volume flow
- Density
- Medium temperature
- depending on product variants: fraction, including industry-specific fractions

Operate the device according to the specifications in section Technical data (Page 195).



- ① Communication modem
- 2 PC with SIMATIC PDM or similar application
- SIMATIC PLC system with HART interface

The Coriolis flowmeter can be used in a number of system configurations:

- · as a field mounted transmitter supplied with various optional inputs and outputs
- as part of a system environment, for example SIMATIC S7

3.2 Design

3.2.1 Versions

The flowmeter is available in a compact and a remote version.

• Compact version: The SITRANS FC330 is a single mechanical unit where the transmitter is directly mounted on the sensor.

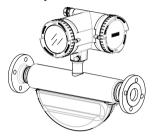


Figure 3-1 Compact version

 Remote version: The SITRANS FCS300 sensor unit is remotely connected to a SITRANS FCT030 transmitter. Directly mounted on the sensor, its Digital Sensor Link (DSL) performs the signal processing of all measured signals in the sensor. The 4-wire connection between the transmitter and the sensor provides power and high-integrity digital communication between the DSL and the transmitter.

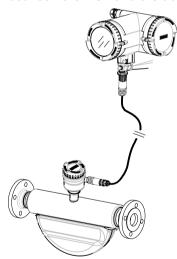


Figure 3-2 Remote version - M12 connection

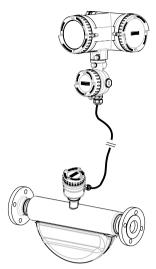


Figure 3-3 Remote version - terminated cable

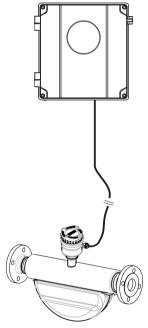


Figure 3-4 Remote version with wallmount housing transmitter

3.2.2 Sensor design

All primary process measurements of mass flow, volume flow, density and process temperature are made in the DSL.

The sensor comprises two parallel bent tubes welded directly to the process connections at each end via a manifold. The sensor is available in an intrinsically safe (IS) design for hazardous area installations.

The sensors are available in AISI 316L stainless steel and C4 (2.4610) nickel alloy or C22 (2.4602) nickel alloy. The enclosure is made of Stainless steel 1.4404 (AISI 316L), 1.4301 (AISI

3.2 Design

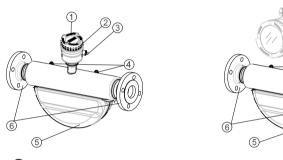
304), 1.4308 (ASTM CF8). The maximum permissible operating pressure is determined by the respective process connection, considering the process temperature.

Note

Ex certification requires that the threaded ports always remain closed.

In the remote version, the DSL is available in a painted aluminum with an ingress protection grade of IP67/NEMA 4X. For communication and supply voltage a 4-wire connection can be made via M12 plug and socket or cable gland/conduit entry for cable termination.

Sensor overview



- DSL (remote version only)
- 2 Lid-lock
- 3 Cable feed-through (M12 socket or gland)
- 4 Plug and threaded port for e.g. pressure guard
- Sensor enclosure
- 6 Process connections

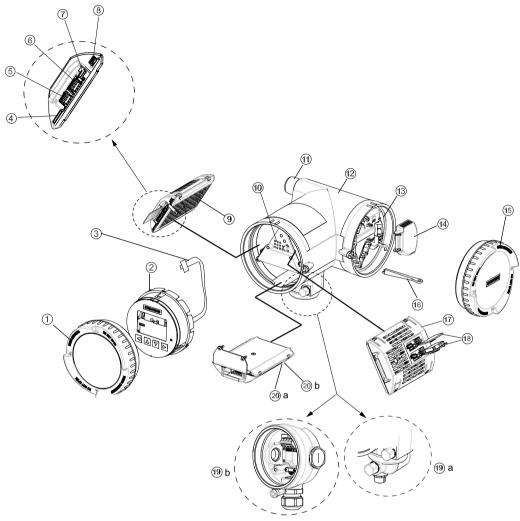
Figure 3-5 Overview remote and compact configuration

3.2.3 Transmitter design

The transmitter reads the primary values from the sensor and calculates derived values. It provides up to four configurable I/Os. On channel 1, HART communication, PROFIBUS DP, PROFIBUS PA or Modbus RTU RS-485 is possible. On channel 2, 3, 4 each I/O can be individually configured. A local display (human machine interface - HMI) is available, which consists of a display and four buttons for user interaction. The transmitter adds functionalities such as Standard volume flow, fractions, totalizers, dosing, access control, diagnostics, configuration and logging.

The transmitter has a modular design with discrete, replaceable electronic modules and connection boards to maintain separation between functions and facilitate field service. All modules are fully traceable and their provenance is included in the transmitter setup.

Transmitter exploded view



- ① Display cover
- 2 Local display (HMI)
- 3 Connector for HMI
- 4 SD card (SensorFlash)
- DIP switch (for custody transfer)
- 6 DIP switch (for HART and Modbus)
- 7 HMI port
- 8 USB service port
- 9 Transmitter cassette
- 10 Heatsink cover for power supply module
- 11 Cable entry

Figure 3-6 Transmitter exploded view

- Transmitter housing
- Terminal compartment
- 14 Power supply terminal protection cover
- 15 Lid for terminal compartment
- (6) Wiring tool
- 1/O cassette (optional)
- I/O configuration keys (optional)
- M12 socket
- (9)b Terminal housing
- 20 a Sensor module (compact version)
- ②b Barrier module (remote version)

3.2.4 Wall mount housing transmitter exploded view

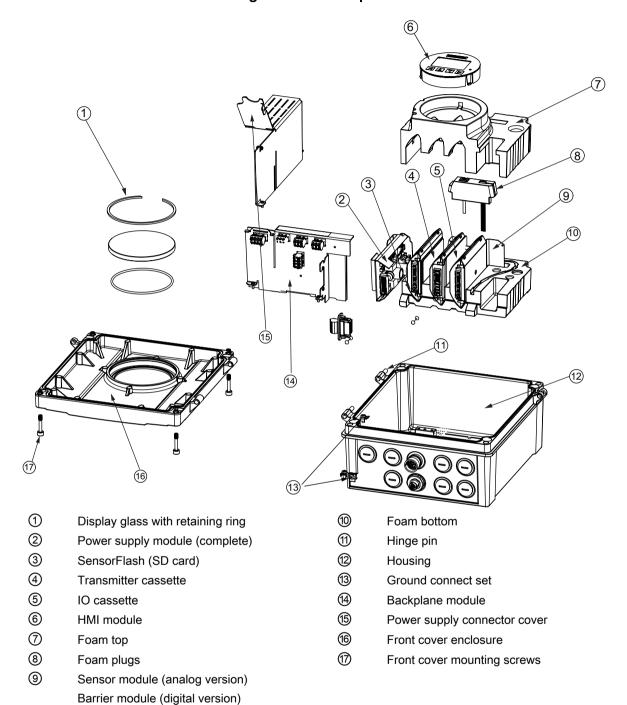


Figure 3-7 Wall mount housing transmitter exploded view

3.3 Device identification

Each part of the FC330 Coriolis flowmeter has 3 nameplate types which show the following information:

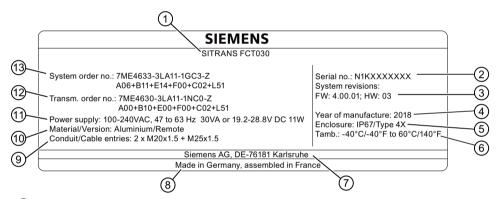
- product identification
- product specifications
- certificates and approvals

Note

Identification

Identify your device by comparing your ordering data with the information on the product and specification nameplates.

Transmitter identification nameplate example



1	SITRANS FCT0301)	Product name
2	Serial no.	Serial number

System revisions System revision numbers firmware (FW) and hardware (HW)

Year of manufacture Manufacturing yearEnclosure Degree of protection

Tamb.Range of ambient temperatureManufacturerManufacturer name and location

8 Country Manufacturing country

Onduit / Cable entries Type of conduit / cable entries

Material / Version Transmitter housing material and version (compact/remote)

1 Power supply Power supply

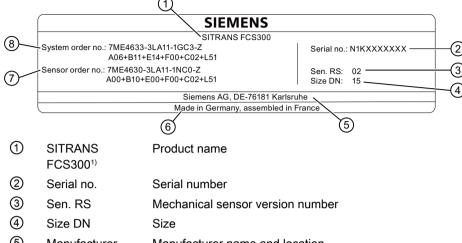
Transm. order no. Device-specific transmitter order number

System order no. Device-specific system order number (transmitter and sensor)

With remote versions, the transmitter is identified as 'SITRANS FCT030' and the sensor as 'SITRANS FCS300'.

¹⁾ With compact versions, the transmitter and sensor product identifications are both given as 'SITRANS FC330'.

Sensor identification nameplate example



(5) Manufacturer Manufacturer name and location

6 Country Manufacturing country

Sensor order no. Sensor replacement order number

8 System order no. Flowmeter system order number (transmitter and sensor)

¹⁾ With compact versions, the transmitter and sensor product identifications are both given as 'SITRANS FC330'.

With remote versions, the transmitter is identified as 'SITRANS FCT030' and the sensor as 'SITRANS FCS300'.

Flowmeter serial number construction

The flowmeter serial number consists of the following:

PPYMDDXXXX

where

PP = Production factory (Siemens Flow Instruments: N1)

Y = Production year (for encryption, see below)

M = Production month (for encryption, see below)

DD = Production day (for encryption, see below)

XXXX = Sequential number

Encryption:

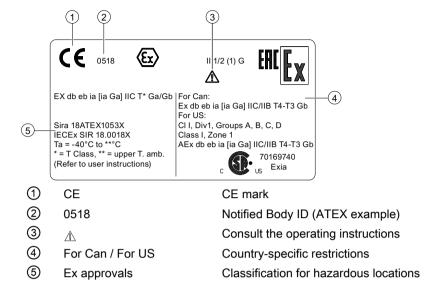
Calendar year (Y)	Code
1950, 1970, 1990, 2010	Α
1951, 1971, 1991, 2011	В
1952, 1972, 1992, 2012	С
1953, 1973, 1993, 2013	D
1954, 1974, 1994, 2014	E
1955, 1975, 1995, 2015	F
1956, 1976, 1996, 2016	H (G)
1957, 1977, 1997, 2017	J

3.3 Device identification

1958, 1978, 1998, 2018	K
1959, 1979, 1999, 2019	L
1960, 1980, 2000, 2020	M
1961, 1981, 2001, 2021	N
1962, 1982, 2002, 2022	P
1963, 1983, 2003, 2023	R
1964, 1984, 2004, 2024	S
1965, 1985, 2005, 2025	Т
1966, 1986, 2006, 2026	U
1967, 1987, 2007, 2027	V
1968, 1988, 2008, 2028	W
1969, 1989, 2009, 2029	X
Month (M)	Code
January	1
February	2
March	3
April	4
May	5
June	6
July	7
August	8
September	9
October	0
November	N
December	D
Day (DD)	Code
Day 01 to 31	01 to 31 (corresponding to the actual date)

3.3 Device identification

FCT030 transmitter specification nameplate example

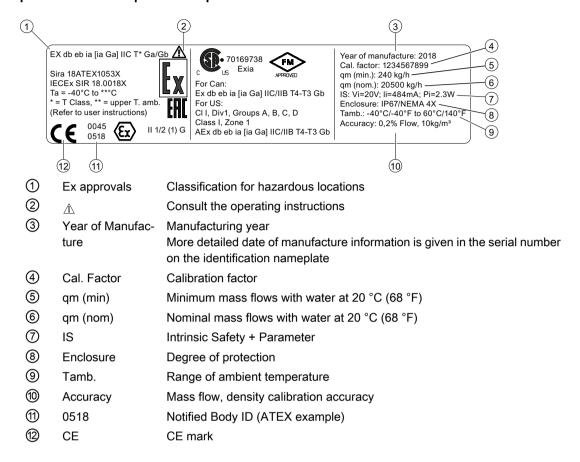


Note

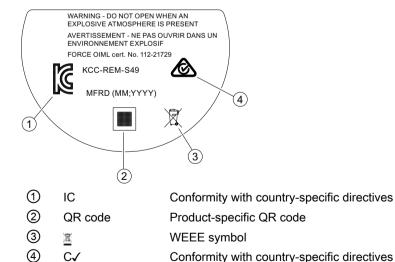
Approvals and identifications

Approval certificates and notified body identifications are available for download at www.siemens.com (http://www.siemens.com/processinstrumentation/certificates).

FCS300 sensor specification nameplate example

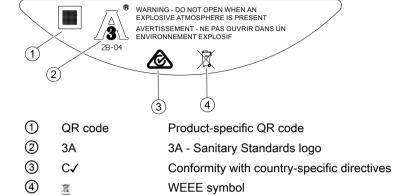


FCT030 transmitter approval nameplate example



3.4 Approvals

FCS300 sensor approval nameplate example



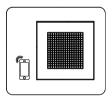
Note

Logos and warnings

Logos and warnings are only shown on the product where applicable. The combination shown in the example above is relevant for a hygienic sensor installed in hazardous area in Canada.

The Australian C-tick mark is mandatory on all products.

QR code



With the use of a smart phone, the QR code provides a direct link to

- the product support portal
- the product and production-specific documentation maintained in the production database.

3.4 Approvals

Note

For further details see Certificates and approvals (Page 206).

The device is available with approvals for general purpose and for hazardous areas. In all cases, check the nameplate on your device, and confirm the approval rating.

3.5 Features

- The flowmeter can be used as HART, Modbus RTU RS-485 or PROFIBUS PA/DP slave in operation on SIEMENS SIMATIC S7/PCS 7 or third party automation systems
- Available in compact and remote version
- Full graphical local display (HMI), with 6 user views and trend curves
- SensorFlash (SD card) for memory backup, logging and documentation storage (certificates etc.)
- USB service interface
- · High immunity against process noise
- Fast response to step changes in flow
- High update rate (100 Hz) on all process values
- Measurement of:
 - Mass flow
 - Volume flow
 - Standard volume flow
 - Density
 - Medium temperature
 - Fraction A (mass flow or volume flow)
 - Fraction B (mass flow or volume flow)
 - Fraction A%
 - Fraction B%
- Totalizer control (resetting of totalizers)
 - Zero point adjustment
 - Freezing of process values
 - Forcing of outputs
- 3 totalizers for summation of mass flow, volume flow and standard volume flow, depending on setting of:
 - Mass flow measurement
 - Volume flow measurement
 - Standard volume flow
 - Fraction A and B measurement (mass flow or volume flow)
- Configurable upper and lower alarms and warning limits for process values
- Independent low flow cut-off settings for volume flow and mass flow
- Zero point adjustment (initiated locally on HMI panel or by host system)
- Process noise damping using digital signal processing (DSP)
- 3 totalizers for summation of flow process values

3.5 Features

- Empty tube monitoring
- Simulation of process values
- Simulation of outputs
- Simulation of diagnostics
- Enabling alarms for visibility on all outputs (HMI, status and communication)
- Comprehensive diagnostics (NAMUR or Siemens standard) for troubleshooting and sensor checking
- Firmware update
- Use in hazardous areas according to specification
- USB mass storage* (not available in the USA)
- Data logging of process values and parameter value change in SensorFlash
- Peak indicators logging of min & max process peak values with time stamp information
- Alarm delay
- Damping filtering system for process values at HMI or outputs
- Spare part replacement
- Selection of active or passive output signals in non-hazardous areas
- Intelligent filtering system for aerated flow

- Up to 4 input/output channels optionally available: Channel 1 can be parameterized as:
 - PROFIBUS DP 9.6 kbit/s to 12 Mbit/s or
 - PROFIBUS PA profile 4.0 or
 - Current HART output (4-20 mA) (HART 7.5) or
 - Modbus RTU RS-485

Channel 2 Signal output can be parameterized as:

- Current output (0/4-20 mA)
- Pulse output
- Frequency output
- Status output

Channel 3 and 4 Signal output can be parameterized as:

- Current output (0/4-20 mA)
- Pulse output
- Frequency output
- Status output
- Pulse or frequency redundancy mode (channel 2 together with channel 3)

Channels 3 and 4 Relay output can be parameterized as:

- Status output

Channels 3 and 4 Signal input can be parameterized as:

- Totalizer control
- Dosing control
- Zero point adjustment
- Freezing of process values
- Forcing of outputs
- Current, frequency, and pulse outputs with configurable fail-safe mode
- * The SD card mass storage function is not available for use in the USA. This option is not available for ordering or shall not be ordered if end user may be located within USA.

3.6 Applications

The main applications of the Coriolis flowmeter can be found in all industries, such as:

- Chemical & Pharma: detergents, bulk chemicals, acids, alkalis, pharmaceuticals, blood products, vaccines, insulin production
- Food & Beverage: dairy products, beer, wine, soft drinks, "Brix/"Plato, fruit juices and pulps, bottling, CO₂ dosing, CIP/SIP-liquids, mixture recipe control

3.6 Applications

- Automotive: fuel injection nozzle & pump testing, filling of AC units, engine consumption, paint robots
- Oil & Gas: filling of gas bottles, furnace control, test separators, bore-hole plasticizer dosing, water-cut metering
- Water & Waste Water: dosing of chemicals for water treatment

Installing/mounting

This chapter gives detailed instructions on mounting the transmitter and sensor to take best advantage of the flexible arrangements built into the product, and to aid in planning the physical locations of the flowmeter parts.

With compact versions the transmitter can be rotated on the sensor pedestal up to 330°.

For remote versions, as well as 330° rotation on the support post, 360° rotation in the perpendicular plane is provided. The display can be rotated up to 360° in 30° steps. The remote mounted transmitter can therefore be oriented in practically any direction. It is advisable to mount the remote transmitter in a location convenient for using the display, with a firm backing from a wall, beam or post.

If the process piping is subjected to high vibration, remote installation is recommended to shield the electronics from shaking.

Flow direction should always be the same as that shown by the arrow on the pedestal if possible.

4.1 Basic safety notes



WARNING

Wetted parts unsuitable for the process media

Risk of injury or damage to device.

Hot, toxic and corrosive media could be released if the wetted parts are unsuitable for the process medium.

 Ensure that the material of the device parts wetted by the process medium is suitable for the medium. Refer to the information in Technical data (Page 195).

Note

Material compatibility

Siemens can provide you with support concerning selection of sensor components wetted by process media. However, you are responsible for the selection of components. Siemens accepts no liability for faults or failures resulting from incompatible materials.

4.1 Basic safety notes



MARNING

Unsuitable connecting parts

Risk of injury or poisoning.

In case of improper mounting, hot, toxic, and corrosive process media could be released at the connections.

Ensure that connecting parts (such as flange gaskets and bolts) are suitable for connection and process media.

See also

Technical data (Page 195)



WARNING

Exceeded maximum permissible operating pressure

Risk of injury or poisoning.

The maximum permissible operating pressure depends on the device version, pressure limit and temperature rating. The device can be damaged if the operating pressure is exceeded. Hot, toxic and corrosive process media could be released.

Ensure that maximum permissible operating pressure of the device is not exceeded. Refer to the information on the nameplate and/or in Technical data (Page 195).



CAUTION

Hot surfaces resulting from hot process media

Risk of burns resulting from surface temperatures above 65 °C (149 °F).

- Take appropriate protective measures, for example contact protection.
- Make sure that protective measures do not cause the maximum permissible ambient temperature to be exceeded. Refer to the information in Technical data (Page 195).



WARNING

Unprotected cable ends

Risk of explosion through unprotected cable ends in hazardous areas.

Protect unused cable ends in accordance with IEC/EN 60079-14.



WARNING

Loss of explosion protection

Risk of explosion in hazardous areas if the device is open or not properly closed.

Close the device as described in Installation instructions (Page 41).



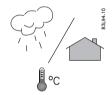
CAUTION

External stresses and loads

Damage to device by severe external stresses and loads (e.g. thermal expansion or pipe tension). Process media can be released.

Prevent severe external stresses and loads from acting on the device.

4.1.1 Installation location requirements



SITRANS F flowmeters with minimum IP67/NEMA 4X enclosure rating are suitable for indoor and outdoor installations.

Process pressure and medium temperature

If applicable, make sure that specifications for rated process pressure (PS) and medium temperature (TS) plus ambient temperature that are indicated on the device nameplate / label will not be exceeded.

Aggressive atmospheres

Ensure that the device is suitable for the application and that it is installed where there is no risk of penetration of aggressive vapors.

Direct sunlight

Prevent the device from overheating or materials becoming brittle due to UV exposure by protecting it from direct sunlight. Make sure that the maximum permissible ambient temperature is not exceeded. Refer to the information in Installation in hazardous areas (Page 19).



WARNING

Equipment used in hazardous areas

Risk of explosion in hazardous areas.

Special requirements apply to the location and installation of the device. See Use in hazardous areas (Page 19).

4.1 Basic safety notes



WARNING

Strong vibrations

Risk of explosion in hazardous areas.

In plants with strong vibrations, mount the transmitter in a low vibration environment.

See also

Operating conditions (Page 204)

NOTICE

Strong vibrations

Damage to device.

In installations with strong vibrations, mount the transmitter in a low vibration environment.

4.1.2 **Proper mounting**



WARNING

Incorrect mounting at Zone 0

Risk of explosion in hazardous areas.

- Ensure sufficient tightness at the process connection.
- Observe the standard IEC/EN 60079-14.



1 WARNING

Loss of type of protection

Risk of explosion. Damage to device if the enclosure is open or not properly closed. The type of protection specified on the nameplate or in Technical data (Page 195) is no longer guaranteed.

Make sure that the device is securely closed.

NOTICE

Incorrect mounting

The device can be damaged, destroyed, or its functionality impaired through improper mounting.

- Before installing ensure there is no visible damage to the device.
- Make sure that process connectors are clean, and suitable gaskets and glands are used.
- Mount the device using suitable tools. Refer to the information in Technical data (Page 195).

4.2 Installation instructions

4.2.1 Transmitter installation



CAUTION

Opening lid

Care must be taken when opening the lid to avoid the lid falling.

Note

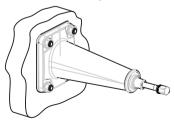
Hygienic applications

If the device is wall or pipe-mounted in a hygienic application, always use domed nuts.

4.2.1.1 Remote field mount

Mounting on wall

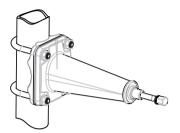
- 1. Prepare holes with aid of mounting bracket, see Mounting bracket dimensions (Page 223).
- 2. Fasten mounting bracket with black cushion pad to wall (torque 10 Nm).



4.2 Installation instructions

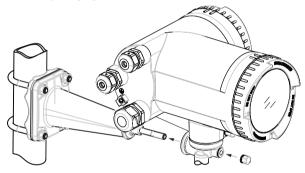
Mounting on pipe

- Mount mounting bracket with cushion pad on pipe using fastening brackets/U-bolts and supplied pipe adaptor. Note: U-bolts and other miscellaneous hardware are not supplied with the flowmeter.
- 2. Tighten nuts (torque: 10 Nm).



Mounting the transmitter

- 1. Remove locking cap from mounting bracket.
- 2. Mount transmitter on mounting bracket taking care that the flutes on the mating faces are correctly engaged.



3. Firmly tighten locking cap on mounting bracket (torque: 25 Nm).

4.2.1.2 Wall mount housing

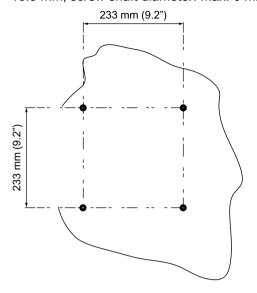
Mounting on wall

Note

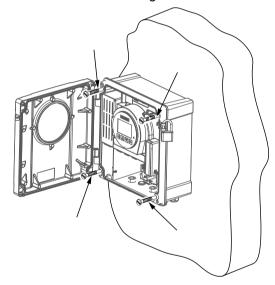
Mounting screws are not included

You will need four screws, able to support at least 55 lbs (25 kg). Siemens recommends M6x100 screws with appropriate anchors for the wall material.

1. Prepare holes for the four screws (M6x100 or equivalent). Screw head diameter: max. 13.5 mm; screw shaft diameter: max. 6 mm.



2. Mount transmitter and tighten screws.



Note

Mounting on pipe or in panel

For mounting on pipe or in panel see the installation instructions given in A5E45462317 Instructions "Pipe/panel mount kit" which is provided with the optional pipe/panel mount kit.

4.2 Installation instructions

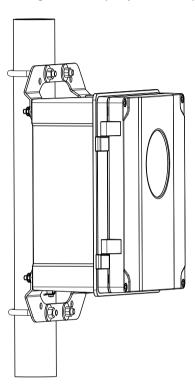
Mounting on pipe

1. Mount mounting bracket on pipe using fastening brackets/U-bolts.

Note

U-bolts and other miscellaneous hardware are not supplied with the flowmeter.

2. Tighten nuts (torque: 10 Nm).



Mounting in front panel

1. Cut out a hole in panel as shown.

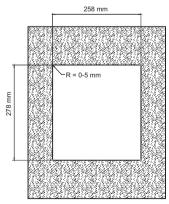
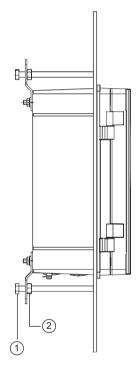


Figure 4-1 Panel cut-out dimensions

2. Remove lid from transmitter wall mount housing.

- 3. From the front of the panel:
 - Insert housing in cut-out hole.
- 4. From the back of the panel:
 - Mount mounting bracket on transmitter housing using four hex socket screws (M6 x 60 or equivalent), four hexagon nuts (M6) with flanges, a 5 mm Allen key, and a 10 mm wrench.
- 5. Use four hex head screws (M8 x 100), four hexagon nuts (M8), and two wrenches (13 mm); and repeat the following for each of the four mounting screws:
 - From front side of mounting bracket: Put screw ① into one of the outer holes.
 - From back side of mounting bracket: Screw nut ② on screw.
 - Bolt until screw lies against panel wall.



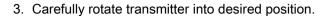
- 6. Tighten screws.
- 7. Remount lid.

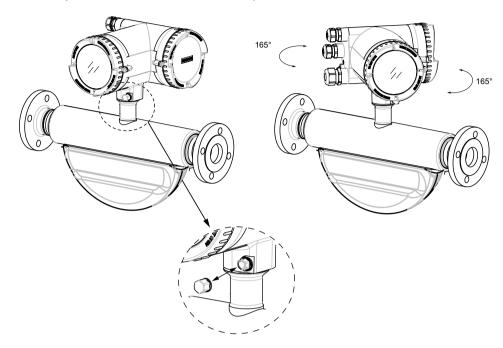
4.2.1.3 Turning the transmitter (compact version)

Horizontal rotation

- 1. Unscrew cap from lock screw.
- 2. Loosen lock screw at transmitter pedestal using 5 mm Allen key.

4.2 Installation instructions





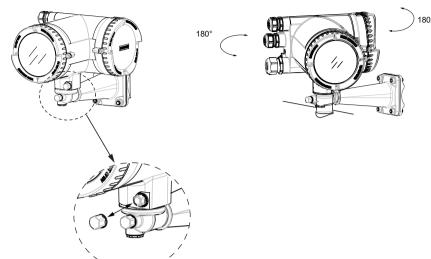
- 4. Firmly tighten lock screw (torque: 10 Nm).
- 5. Replace cap onto lock screw (torque: 10 Nm).

4.2.1.4 Turning the transmitter (remote version)

In a configuration with external DSL the transmitter can be turned horizontally and tilted vertically.

Horizontal rotation

- 1. Unscrew cap from lock screw.
- 2. Loosen lock screw at transmitter pedestal using 5 mm Allen key.

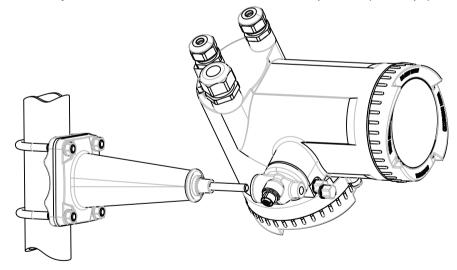


3. Carefully rotate transmitter into desired position.

- 4. Firmly tighten lock screw (torque: 10 Nm).
- 5. Replace cap onto lock screw (torque: 10 Nm).

Vertical rotation

- 1. Loosen locking cap at end of mounting bracket by three turns.
- 2. Carefully loosen and rotate transmitter into desired position (15° steps).



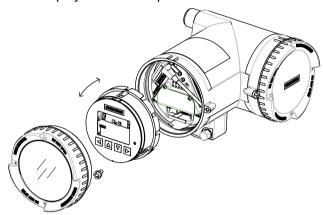
3. Firmly tighten locking cap (torque: 25 Nm).

4.2 Installation instructions

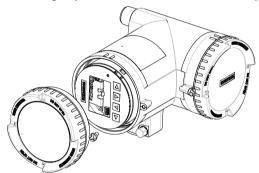
4.2.1.5 Turning the local display

The local display can be turned in steps of 30° in order to optimize the viewing angle.

- 1. Remove lid lock screw of display cover.
- 2. Remove display cover.
- 3. Use a small screwdriver or blade to loosen the three retaining clips within the transmitter.
- 4. Carefully pull out local display.
- 5. Turn display into desired position.



6. Carefully push display back into housing. Use a small screwdriver or blade to open the three retaining clips within the transmitter when pushing the display back into place.



- 7. Remove O-ring from lid.
- 8. Reinstall display cover until mechanical stop. Wind back lid by one turn.
- 9. Mount O-ring by pulling it over the display cover and turn display cover until you feel friction from the O-ring on both sides. Wind display cover further by one quarter of a turn to seal on the O-ring.
- 10. Reinstall and tighten lid lock screw.

4.2.2 Sensor installation

4.2.2.1 Determining a location



Electromagnetic fields

Do not install the flowmeter in the vicinity of strong electromagnetic fields, for example near motors, variable frequency drives, transformers etc.

Upstream / downstream

- No pipe run requirements, that is straight inlet/outlet sections, are necessary.
- Avoid long drop lines downstream from the sensor to prevent process media separation causing air / vapor bubbles in the tube (min. back pressure: 0.2 bar).
- Avoid installing the flowmeter immediately upstream of a free discharge in a drop line.

Location in the system

The optimum location in the system depends on the application:

- Liquid applications
 Gas or vapor bubbles in the fluid may result in erroneous measurements, particularly in the
 density measurement.
 - Do not install the flowmeter at the highest point in the system, where bubbles will be trapped.
 - Install the flowmeter in low pipeline sections, at the bottom of a U-section in the pipeline.

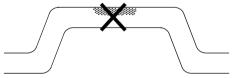


Figure 4-2 Liquid applications, wrong location with trapped air/gas

- Gas applications
 - Vapor condensation or oil traces in the gas may result in erroneous measurements.
 - Do not install the flowmeter at the lowest point of the system.
 - Install a filter.

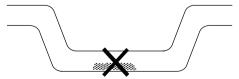


Figure 4-3 Gas applications, wrong location with trapped oil

4.2 Installation instructions

4.2.2.2 Orientation of the sensor

Flow direction

The calibrated flow direction is indicated by the arrow on the sensor. Flow in this direction will be indicated as positive by default. The sensitivity and the accuracy of the sensor do not change with reverse flow.

The indicated flow direction (positive/negative) is configurable.



CAUTION

Accurate measurement

The sensor must always be completely filled with process media in order to measure accurately.

NOTICE

Orienting the sensor

To avoid water or moist ingress, transmitters should be oriented with cable entrances aiming downwards.

Orienting the sensor

The sensor operates in any orientation. The optimal orientation depends on the process fluid and the process conditions. Siemens recommends orienting the sensor in one of the following ways:

1. Vertical installation with an upwards flow (self-draining)

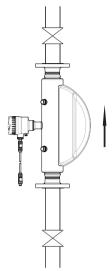


Figure 4-4 Vertical orientation, upwards flow

2. Horizontal installation, tubes down (recommended for liquid applications)

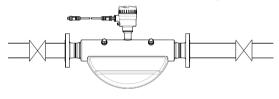


Figure 4-5 Horizontal orientation, tubes down

3. Horizontal installation, tubes up (recommended for gas applications)

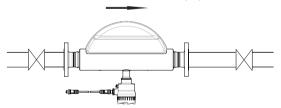


Figure 4-6 Horizontal orientation; tubes up

Note

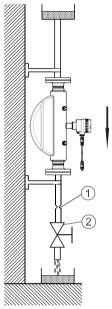
Hygienic applications

In EHEDG certified applications the flowmeter must be installed vertically as shown in 1 above. (EHEDG certificate in preparation)

4.2 Installation instructions

4.2.2.3 Installation in a drop line

Installation in a drop line is only recommended if a pipeline reduction or orifice with a smaller cross-section can be installed to create back-pressure and prevent the sensor from being partially drained while measuring.



- Back pressure orifice
- 2 On / off valve

Figure 4-7 Installation in drop line

4.2.2.4 Mounting the sensor

- Install the sensor in well-supported pipelines in order to support the weight of the flowmeter.
- Center the connecting pipelines axially in order to assure a stress-free installation. The flowmeter must not be used to bring the rest of the pipework into line. Make sure the pipework is aligned correctly before inserting the flow sensor.
- Install two supports or hangers symmetrically and stress-free on the pipeline closely to the process connections.

Note

Handling

Lift the flowmeter by the sensor body. Do not lift the flowmeter by the housing.

Avoid vibrations

- Make sure that any valves or pumps upstream of the sensor do not cavitate and do not send vibrations into the sensor.
- Decouple vibrating pipeline from the flow sensor using flexible tube or couplings.

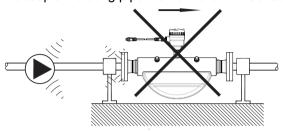


Figure 4-8 Non-flexible pipes not recommended in vibrating environment

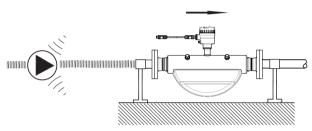


Figure 4-9 Flexible pipes recommended in vibrating environment

Avoid cross talk

When operating more than one flowmeter in one or multiple interconnected pipelines, there is a risk of cross talk.

4.2 Installation instructions

Prevent cross talk in one of the following ways:

- Mount sensors on separate frames
- Decouple the pipeline using flexible tube or couplings

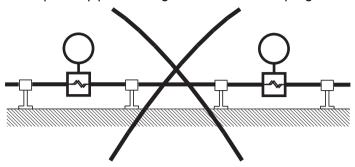


Figure 4-10 High risk of cross talk when using non-flexible pipes

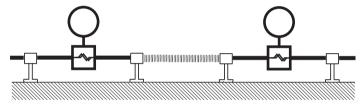


Figure 4-11 Low risk of cross talk when using flexible pipes and separate frames

4.2.2.5 Hydrostatic testing

The flowmeter is pressure-tested before delivery to 1.5 times the rated working pressure of the sensor.

In all cases the maximum allowed hydrostatic test pressure (MATP) of the flowmeter is 1.5 times the marked MAWP (PS) at 20 °C.

Pressure test of a completed flow system with piping and other components can be done at pressures no higher than 1.5 times the marked MAWP (PS) at 20 °C of the lowest rated system component.

4.2.2.6 Installing with insulation

Insulation is added to pipes and equipment for two reasons:

- To protect personnel from exposure to hot or cold surfaces, thereby preventing burns and other injuries
- To prevent heat loss into or out of the process, thereby preserving the process temperature and process medium conditions.

In both cases, insulation can have the unexpected effect of shrouding other attached components not intended or designed for the process temperatures. When installing an FCS300 sensor with insulation, observe the following rules:

- Do not cover any part of the transmitter pedestal. The pedestal is designed to separate the process temperature from the ambient around the DSL or transmitter electronics housing.
- Form a 90° cone around the pedestal.
- Allow free movement of air around the electronics housing to allow temperature equalisation to occur at all times.

Note

The pedestal has sufficient internal separation from the measuring tubes such that if the main body of the sensor is insulated, the process medium will not be unduly exposed by the cone around the pedestal.

4.3 Disassembly



WARNING

Incorrect disassembly

The following risks may result from incorrect disassembly:

- Injury through electric shock
- Risk through emerging media when connected to the process
- Risk of explosion in hazardous area

In order to disassemble correctly, observe the following:

- Before starting work, make sure that you have switched off all physical variables such as pressure, temperature, electricity etc. or that they have a harmless value.
- If the device contains hazardous media, it must be emptied prior to disassembly. Make sure that no environmentally hazardous media are released.
- Secure the remaining connections so that no damage can result if the process is started unintentionally.

4.3 Disassembly

Connecting

5.1 Basic safety notes



WARNING

Unsuitable cables, cable glands and/or plugs

Risk of explosion in hazardous areas.

- Use only cable glands/plugs that comply with the requirements for the relevant type of protection.
- Tighten the cable glands in accordance with the torques specified in Technical data (Page 195).
- Close unused cable inlets for the electrical connections.
- When replacing cable glands, only use cable glands of the same type.
- After installation, check that the cables are seated firmly.



WARNING

Incorrect conduit system

Risk of explosion in hazardous areas as result of open cable inlet or incorrect conduit system.

 In the case of a conduit system, mount a spark barrier at a defined distance from the device input. Observe national regulations and the requirements stated in the relevant approvals.



▲ WARNING

Hazardous contact voltage

Risk of electric shock in case of incorrect connection.

- For the electrical connection specifications, refer to the information in Technical data (Page 195).
- At the mounting location of the device observe the applicable directives and laws for installation of electrical power installations with rated voltages below 1000 V.

5.1 Basic safety notes



MARNING

Missing PE/ground connection

Risk of electric shock.

Depending on the device version, connect the power supply as follows:

- Power plug: Ensure that the used socket has a PE/ground conductor connection. Check that the PE/ground conductor connection of the socket and power plug match each other.
- Connecting terminals: Connect the terminals according to the terminal connection diagram. First connect the PE/ground conductor.



WARNING

Improper power supply

Risk of explosion in hazardous areas as result of incorrect power supply.

Connect the device in accordance with the specified power supply and signal circuits. The
relevant specifications can be found in the certificates, in Technical data (Page 195) or on
the nameplate.



WARNING

Lack of equipotential bonding

Risk of explosion through compensating currents or ignition currents through lack of equipotential bonding.

• Ensure that the device is potentially equalized.

Exception: It may be permissible to omit connection of the equipotential bonding for devices with type of protection "Intrinsic safety Ex i".



WARNING

Unprotected cable ends

Risk of explosion through unprotected cable ends in hazardous areas.

• Protect unused cable ends in accordance with IEC/EN 60079-14.



WARNING

Improper laying of shielded cables

Risk of explosion through compensating currents between hazardous area and the non-hazardous area.

- Shielded cables that cross into hazardous areas should be grounded only at one end.
- If grounding is required at both ends, use an equipotential bonding conductor.

WARNING

Uncovered non-intrinsically safe circuits

Risk of explosion in hazardous areas or electric shock when working on non-intrinsically safe circuits.

If intrinsically safe and non-intrinsically safe circuits are operated in an enclosure with the type of protection "Increased safety Ex e", the connections of the non-intrinsically safe circuits must be additionally covered.

- Ensure that the cover of the non-intrinsically safe circuits complies with degree of protection IP30 or higher according to IEC/EN 60529.
- Separate connections of the non-intrinsically safe circuits in accordance with IEC/ EN 60079-14.



WARNING

Insufficient isolation of intrinsically safe and non-intrinsically safe circuits

Risk of explosion in hazardous areas.

- When connecting intrinsically safe and non-intrinsically safe circuits ensure that isolation is carried out properly in accordance with local regulations for example IEC 60079-14.
- Ensure that you observe the device approvals applicable in your country.



WARNING

Connecting device in energized state

Risk of explosion in hazardous areas.

Connect devices in hazardous areas only in a de-energized state.

Exceptions:

- Devices having the type of protection "Intrinsic safety Ex i" may also be connected in energized state in hazardous areas.
- Exceptions for type of protection "Increased safety ec" (Zone 2) are regulated in the relevant certificate.



WARNING

Incorrect selection of type of protection

Risk of explosion in areas subject to explosion hazard.

This device is approved for several types of protection.

- 1. Decide in favor of one type of protection.
- 2. Connect the device in accordance with the selected type of protection.
- 3. In order to avoid incorrect use at a later point, make the types of protection that are not used permanently unrecognizable on the nameplate.

5.2 Connecting FC330

NOTICE

Ambient temperature too high

Damage to cable sheath.

 At an ambient temperature ≥ 60 °C (140 °F), use heat-resistant cables suitable for an ambient temperature at least 20 °C (36 °F) higher.

NOTICE

Condensation in the device

Damage to device through formation of condensation if the temperature difference between transportation or storage and the mounting location exceeds 20 °C (36 °F).

 Before taking the device into operation, let the device adapt for several hours in the new environment.

Note

Electromagnetic compatibility (EMC)

You can use this device in industrial environments, households and small businesses.

For metal housings there is an increased electromagnetic compatibility compared to high-frequency radiation. This protection can be increased by grounding the housing, see Connecting (Page 57).

Note

Improvement of interference immunity

- Lay signal cables separate from cables with voltages > 60 V.
- Use cables with twisted wires.
- Keep device and cables at a distance from strong electromagnetic fields.
- Take account of the conditions for communication specified in the Technical data (Page 195).
- Use shielded cables to guarantee the full specification according to HART/PA/FF/Modbus/ EIA-485/Profibus DP.

5.2 Connecting FC330

This chapter describes how to wire up the device.

The following steps must be carried out:

- Connecting the DSL and the transmitter (Page 62) (only remote version)
- Preparing for the transmitter connections (Page 65)

- Choose the following connection to either HART, Modbus or Profibus
 - Connecting the Current HART, CH1 (Page 67)
 - Connecting the Modbus (CH1) (Page 69)
 - Connecting the Profibus (CH1) (Page 71)
- Connecting the power supply Field mount (Page 75)
- Finishing the transmitter connection (Page 78)

5.2.1 Cable requirements

Cable specifications

- When installing sensor cable, use cable with at least same degree of protection as the sensors. It is recommended to use cables supplied by Siemens:
 - blue cables for installation of intrinsically safe circuits in hazardous areas
 - gray cables for installation of non-intrinsically safe circuits

Further information on Siemens-supplied cables, see Technical data (Page 195).

- The wire length inside the connection compartment, from the cable gland to the terminals, must be kept as short as possible. Wire loops in the terminal compartment must be avoided.
- To guarantee the degree of ingress protection, ensure that both ends of the cables are given equivalent protection from ingress of moisture.



WARNING

Cable requirements

Cables must be suitable for the temperature (at least 70 °C) and be flammability-rated to at least V-2.

Note

Output cables

If long cables are used in noisy environments, it is recommended to use shielded cables.

See also

Sensor cable specifications HART (Page 202)

5.2 Connecting FC330

5.2.2 Transmitter power supply and I/Os connection

5.2.2.1 Connecting the DSL and the transmitter

The following only applies to remote configurations.

Wiring DSL (sensor) and transmitter (M12)

The DSL is provided with a preformed cable terminated with M12 style stainless steel weather-proof plugs.

The cable screen is physically and electrically terminated within the body of the plug.

Take care when handling the cable and passing it through cable ducting that the plug is not subjected to excessive tension (pulling) as the internal connections may be disengaged.

Note

Never pull the cable by the plug - only by the cable itself.

1. Connect DSL using the supplied 4-wire cable with M12 connectors.

Note

Grounding

The DSL cable screen is mechanically connected to the grounding terminal (PE), only when the M12 plug is correctly tightened.

Wiring sensor and transmitter (sensor terminal compartment)

A: Prepare the cable by stripping it at both ends.

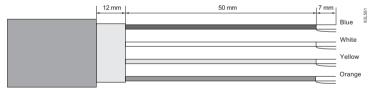


Figure 5-1 Cable end

B: Connecting sensor terminal compartment

- 1. Remove lock screw and remove lid.
- 2. Remove one of the blind plugs and fit cable gland.
- 3. Remove cap and ferrule from cable gland and slide onto cable.
- 4. Push cable through open gland; anchor cable with clamp bar. Ensure that the clamp does not earth the screen. Apply heat-shrink sleeve to make sure the screen is only earthed at the sensor end.

5. Connect wires to terminals according to list below.

Terminal number	Description	Wire color (Siemens)						
1	20 V	Orange						
2	0 V	Yellow						
3	RS-485 / B	White						
4	RS-485 / A	Blue						



- 6. Assemble and tighten cable gland
- 7. Remove O-ring from lid.
- 8. Reinstate lid and screw in until mechanical stop. Wind back lid by one turn.
- 9. Mount O-ring by pulling it over the lid and tighten lid until you feel friction from the O-ring on both sides. Wind lid further by one quarter of a turn to seal on the O-ring.
- 10. Reinstate and tighten lid lock screw

Connecting sensor DSL

- 1. Remove lock screw and remove DSL lid.
- 2. Undo the flexible strap.
- 3. Disconnect sensor connection from DSL cassette.
- 4. Loosen mounting screw using a TX10 Torx driver and remove DSL cassette from housing.
- 5. Remove cap and ferrule from cable gland and slide onto cable.
- 6. Push cable through open gland; anchor cable screen and wires with clamp bar.
- 7. Remove terminal block from DSL cassette.

5.2 Connecting FC330

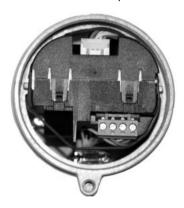
8. Connect wires to terminals according to list below.

Terminal number	Description	Wire color (Siemens cable)
1	20 V	Orange
2	0 V	Yellow
3	RS-485 / B	White
4	RS-485 / A	Blue





- 9. Ensure the DIP switches are all set to OFF.
- 10. Reinstate DSL cassette including mounting screw.
- 11. Connect sensor connection and sensor cable plugs.
- 12. Restore flexible strap around all wires.



- 13. Assemble and tighten cable gland.
- 14. Remove O-ring from DSL lid.
- 15. Reinstate lid and screw in until mechanical stop. Wind back lid by one turn.
- 16. Mount O-ring by pulling it over the DSL lid and tighten lid until you feel friction from the O-ring on both sides. Wind lid further by one quarter of a turn to seal on the O-ring.
- 17. Reinstate and tighten lid lock screw.
- 18. Close and secure DSL lid including lock screw. Turn the lid until you can feel the friction of the O-ring. From this point turn the lid ¼ turn to be tight.

5.2.2.2 Preparing for the transmitter connections



WARNING

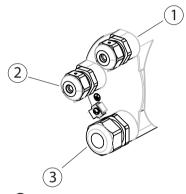
Access to terminal compartment

As long as the device is energized, the lid of the housing on the sensor connection area may only be opened by qualified personnel.

Before removing the terminal cover, the auxiliary power must be switched off from all poles.

Following installation, the terminal cover must be screwed back on again.

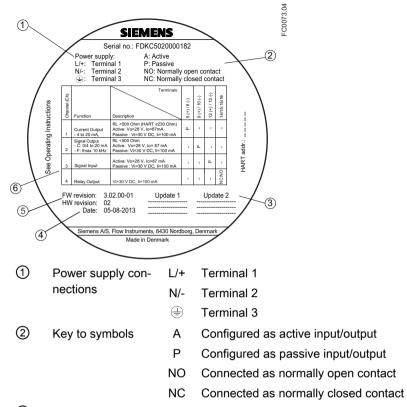
1. Remove blind plugs where required and mount cable glands.



- ① Input/output connection (channels 2 to 4)
- 2 Power supply connection
- 3 Current output/communication outputs (channel 1)
- 2. Remove lid lock screw for terminal connections lid.
- 3. Remove lid for terminal connections.

A label showing the configuration is placed at the back of the terminal connections lid.

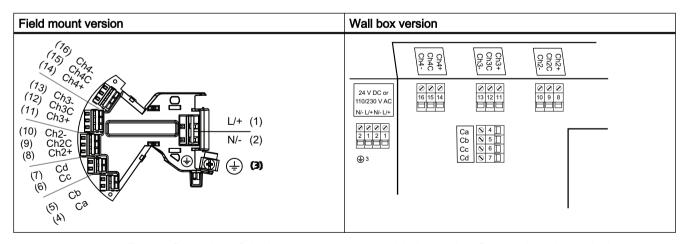
5.2 Connecting FC330



- 3 Updates (to be filled in on firmware and hardware updates)
- 4 Device configuration date
- 5 Initial firmware and hardware revisions
- 6 Configuration of channels 1, 2, 3 and 4

Figure 5-2 Configuration label

Terminal layout



For configuration of the inputs/outputs, see table in section Connecting channels 2 to 4 (Page 72).

The following table shows:

- Which cable with which terminal
- Hardware and software configuration of the channels

		Terminals															
HW configuration	SW configuration	Power Supply			Channel 1			Channel 2			Channel 3			Channel 4			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Power Supply		L/+	N/-	(1)													
Channel 1 HART	Current output HART				+ Active	Common +	- Passive										
Channel 1 Modbus					In - A	In-B	Out - A	Out - B									
Channel 1 Profibus					In - A	In-B	Out - A	Out - B									
Channel 2 Output	Current, Frequency, Pulse and Status									Common +	- Passive						
Channels 3 and 4 Input/output	Outputs: Current, Frequency, Pulse and status Inputs: Digital											+ Active	Common +	- Passive	+ Active	Common +	- Passive
Channels 3 and 4 Relay	Status output											NO	O NO		NC	, NC)

Figure 5-3 Termination/configuration overview

5.2.2.3 Connecting the Current HART, CH1

Note

4 to 20 mA output

It is not required to use shielded cables for the pure 4 to 20 mA current output.

Note

HART communication

It is recommended by the FieldComm Group (FCG) to use shielded cables for the HART communication.

Note

Passive channels only

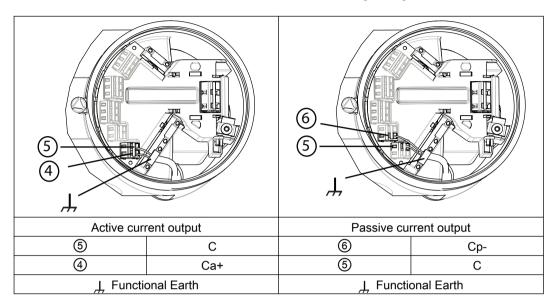
Channel 1 power supply must be separated from that for channels 2 to 4.

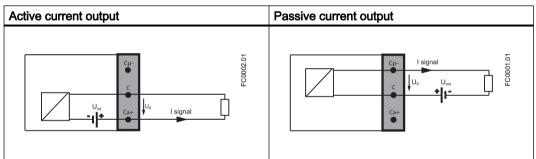
Signal return (or common) can be joined.

- 1. Remove cap and ferrule from cable gland and slide onto cable.
- 2. Push cable through open gland and cable path.
- 3. Restore ferrule and tighten cap to lightly hold cable in place.

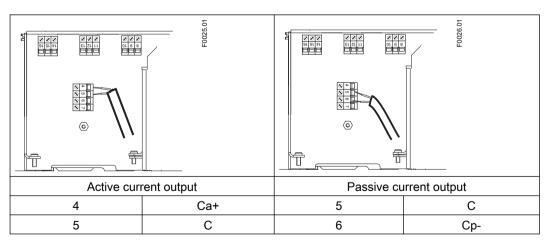
5.2 Connecting FC330

- 4. Signal cable screen is folded back over outer sheath and grounded beneath cable clamp.
 - Field mount transmitter: Connect wires to terminals using wiring tool.





- Wall mount transmitter: Connect wires to terminals using wiring tool.



5. Tighten cable gland.

Note

For Ex versions active or passive current output is preselected at ordering and cannot be changed.

Non-Ex versions can be connected as either active or passive.

Note

Load

Signal output: $< 500 \Omega$ at 14 to 24 VDC (active), 14 to 30 VDC (passive)

Relay output: 30 VAC/VDC, 100 mA

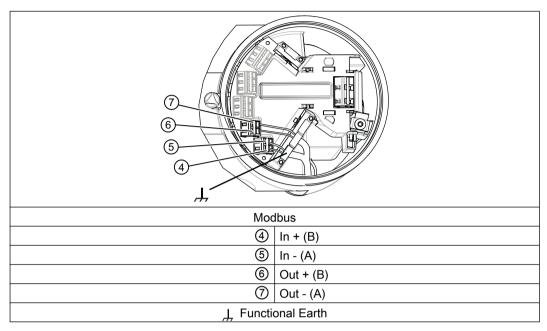
Passive signal input: 15 to 30 VDC, 2 to 15 mA

5.2.2.4 Connecting the Modbus (CH1)

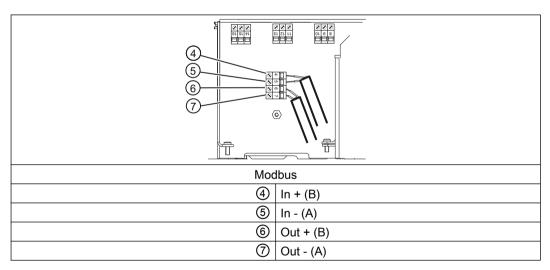
- 1. Remove cap and ferrule from cable gland and slide onto cable.
- 2. Push cable through open gland and cable path.
- 3. Restore ferrule and tighten cap to lightly hold cable in place.

5.2 Connecting FC330

- 4. Signal cable screen is folded back over outer sheath and grounded beneath cable clamp.
 - Field mount transmitter: Connect wires to terminals using wiring tool.



- Wall mount transmitter: Connect wires to terminals using wiring tool.



5. Tighten cable gland.

5.2.2.5 Connecting the Profibus (CH1)



Passive channels only

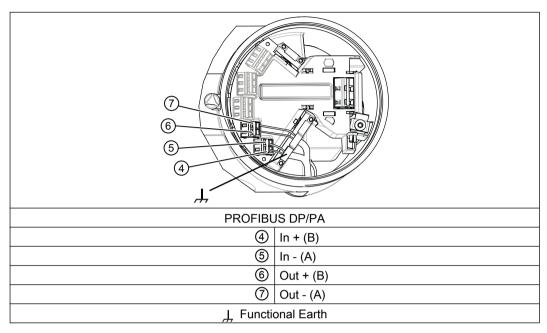
Channel 1 power supply must be separated from that for channels 2 to 4.

Signal return (or common) can be joined.

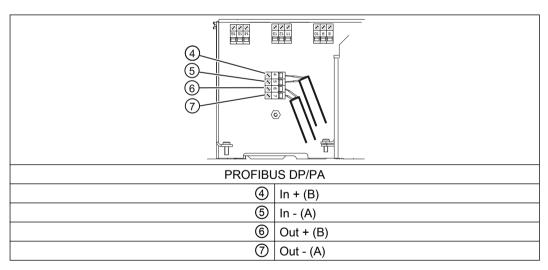
- 1. Remove cap and ferrule from cable gland and slide onto cable.
- 2. Push cable through open gland and cable path.
- 3. Restore ferrule and tighten cap to lightly hold cable in place.
- 4. Signal cable screen is folded back over outer sheath and grounded beneath cable clamp.

5.2 Connecting FC330

- 5. Connect wires to terminals using wiring tool.
 - Field mount transmitter:



Wall mount transmitter:



6. Tighten cable gland.

5.2.2.6 Connecting channels 2 to 4

Channel 2 is for output only and channels 3 to 4 can be connected as either inputs/outputs or relays, see Input/output configuration (Page 74).

Connect wires

- 1. Remove cap and ferrule from cable gland and slide onto cable. Wall mount enclosure: Remove blind plug and fit cable gland.
- 2. Push cable through open gland and cable path.
- 3. Restore ferrule and tighten cap to lightly hold cable in place.
- 4. Fold signal cable screen back over outer sheath and ground beneath cable clamp. In case of shielded cables, use metal cable glands for proper connection.
- 5. Connect wires to terminals using screwdriver.
- 6. Tighten cable gland.

The numbers in the graphics below refer to table Figure 5-3 Termination/configuration overview (Page 67).

If connected as input or output - Field mount

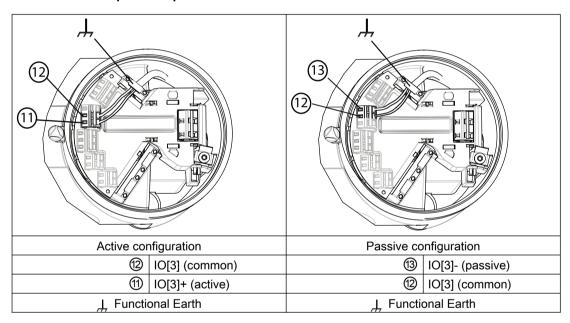
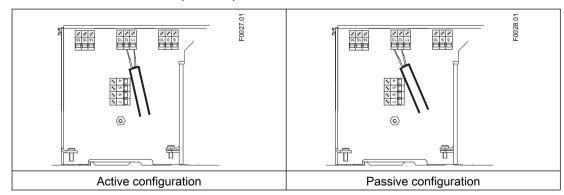


Table 5-1 If connected as input or output - Wall mount

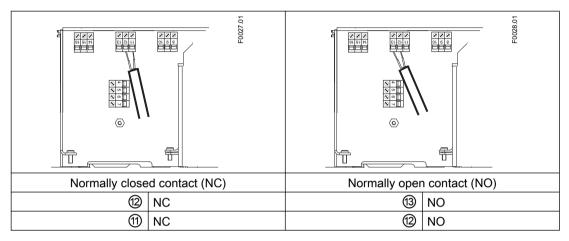


5.2 Connecting FC330

12	IO[3] (common)	(3)	IO[3]- (passive)
11)	IO[3]+ (active)	12	IO[3] (common)

Termination example for channel 3

If connected as relay (channels 3 and 4 only)



Termination example for channel 3 - relay connection

5.2.2.7 Input/output configuration

All pressure values are handled as absolute pressure. If connected pressure transmitters measure the pressure in gauge pressure, then please convert to absolute pressure by using the scaling functionality of the flow transmitters current input channel.

Configura-	Software configuration	С	hann	el	
tion		2	3	4	
Output	Current output	Х	Х	Х	
Active	Frequency output				ChXp-
	Pulse output				
	Digital output				ChXC
	Alarm class				U _{int} ChXa+ U ₀ I signal
	Alarm item				
	NAMUR status signals				Active
Output	Current output	Х	Х	Х	
Passive	Frequency output				ChX- I signal
	Pulse output Digital output				
	Alarm class				chxc U ₀ +
	Alarm item				ChX+
	NAMUR status signals				Passive

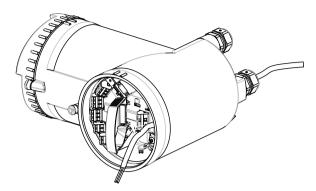
Configura-	Software configuration	С	hann	el	
tion		2	3	4	
Input Active	Digital input Reset totalizer 1 Reset totalizer 2 Reset totalizer 3 Reset all totalizers Force outputs Freeze process values Zero adjust		X	X	Active
Input Passive	Digital input Reset totalizer 1 Reset totalizer 2 Reset totalizer 3 Reset all totalizers Force outputs Freeze process values Zero adjust		X	X	ChX- ChXC U _{ost} U _{ost} Passive
Relay output Normally open	Alarm class Alarm item NAMUR status signals		X	X	ChX-ChX-ChX-Normally open
Relay output Normally closed	Alarm class Alarm item NAMUR status signals		X	X	ChX-ChX-ChX-ChX+Normally closed

5.2.2.8 Connecting the power supply - Field mount

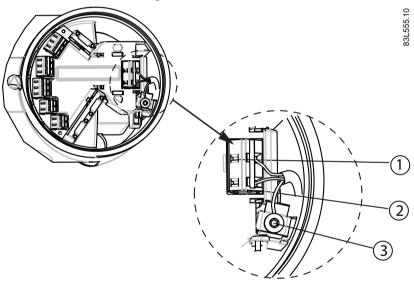
- 1. Flip open power supply terminal protection cover.
- 2. Remove cap and ferrule from cable gland and slide onto cable.

5.2 Connecting FC330

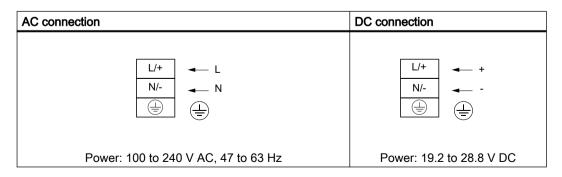
3. Push cable through open gland and cable path.



- 4. Restore ferrule and tighten cap to lightly hold cable in place.
- 5. Connect ground to terminal \oplus and power to terminals L/+ and N/- using wiring tool in the manner shown below at right.



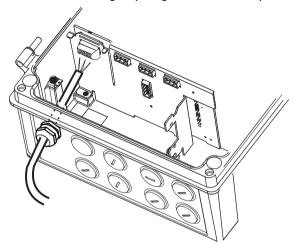
1	L/+
2	N/-
3	⊕ Protective Earth (PE)



- 6. Close and latch power supply terminal protection cover.
- 7. Tighten cable gland.

5.2.2.9 Connecting the power supply - Wall mount

- 1. Open enclosure lid, unscrew power supply terminal protection cover screw, and remove protection cover.
- 2. Remove blind plug and fit cable gland.
- 3. Push cable through open gland and cable path



4. Restore ferrule and tighten cap to lightly hold cable in place.

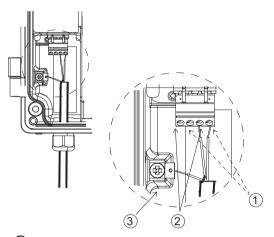
5.2 Connecting FC330

5. Connect ground to terminal \oplus and power to terminals L/+ and N/- in the manner shown below at right using a screwdriver.

Note

The terminal box is detachable

For easier access unplug the terminal box. After connecting the wires, plug the terminal box back in.



- ① L/+
- (2) N/-
- ③ Protective Earth (PE)

AC connection	DC connection
L/+	L/+ + + N/
Power: 85 to 264 V AC, 47 to 63 Hz	Power: 19.2 to 28.8 V DC

- 6. Tighten cable gland.
- 7. Mount power supply protection cover and fasten protection cover screw.

5.2.2.10 Finishing the transmitter connection

Connection check-up

- 1. Check individual wire installation by tugging firmly.
- 2. Firmly tighten cable glands and insert blanking plugs in unused cable entries.
- 3. Close lid.
- 4. Tighten the four spring screws.
- 5. Ensure that moisture does not penetrate to inside of electronics enclosure.

Your device is now ready for commissioning.

5.3 Instructions specific to hazardous area installations

5.3.1 Wiring in hazardous areas

Hazardous area applications

Special requirements apply to the location and interconnection of sensor and transmitter. See Installation in hazardous areas (Page 19).



WARNING

Transmitter housing

Before opening the terminal box check that:

- No explosion hazard exists
- All connection leads are potential free

5.3 Instructions specific to hazardous area installations

Commissioning

6.1 Basic safety notes

DANGER

Toxic gases and liquids

Danger of poisoning when venting the device: if toxic process media are measured, toxic gases and liquids can be released.

Before venting ensure that there are no toxic gases or liquids in the device, or take the appropriate safety measures.

WARNING

Improper commissioning in hazardous areas

Device failure or risk of explosion in hazardous areas.

- Do not commission the device until it has been mounted completely and connected in accordance with the information in Installing/mounting (Page 37).
- Before commissioning take the effect on other devices in the system into account.

WARNING

Commissioning and operation with pending error

If an error message appears, correct operation in the process is no longer guaranteed.

- Check the gravity of the error.
- Correct the error.
- If the error still exists:
 - Take the device out of operation.
 - Prevent renewed commissioning.

WARNING

Hot surfaces

Risk of burns resulting from hot surfaces.

Take corresponding protective measures, for example by wearing protective gloves.

Note

Hot surface is only an issue for media or ambient temperature above 50 °C.

6.1 Basic safety notes



MARNING

Hazardous contact voltage

Risk of injury through hazardous contact voltage when the device is open or not completely closed.

The degree of protection specified on the nameplate or in Technical data (Page 195) is no longer guaranteed if the device is open or not properly closed.

• Make sure that the device is securely closed.



WARNING

Loss of explosion protection

Risk of explosion in hazardous areas if the device is open or not properly closed.

• Close the device as described in Installing/mounting (Page 37).



WARNING

Opening device in energized state

Risk of explosion in hazardous areas

- Only open the device in a de-energized state.
- Check prior to commissioning that the cover, cover locks, and cable inlets are assembled in accordance with the directives.

Exception: Devices having the type of protection "Intrinsic safety Ex i" may also be opened in energized state in hazardous areas.



WARNING

Hazardous gases in the enclosure

Risk of explosion.

Hazardous gases are gases that can explode and have a gas concentration of more than 25% of the lower explosion limit (LEL). Under normal ambient conditions the LEL is the risk threshold when handling these gases. However, special operating conditions can lower the potential risk from these gases under the LEL. A value of 25% of the LEL is regarded as definitely safe.

 Do not introduce combustible or hazardous gases into a restricted-breathing enclosure (type of protection Ex nR).



▲ WARNING

Dust in pressurized enclosure "Type of protection Ex p"

An explosive dust atmosphere inside an enclosure can result in an explosion.

- In Zones 21 and 22: Remove the dust layers manually from the enclosure.
- Cleaning by pre-purging is not permitted.



WARNING

Loss of type of protection

Risk of explosion. Damage to device if the enclosure is open or not properly closed. The type of protection specified on the nameplate or in Technical data (Page 195) is no longer guaranteed.

Make sure that the device is securely closed.

6.1.1 Warnings



CAUTION

Sensor and transmitter ordered separately

If the sensor and the transmitter are ordered separately, a "Set To Default" routine must be performed. This can be done via SIMATIC PDM or via menu item 3.3.3 in HMI.



WARNING

Dangerous high voltage

Certain parts inside the device carry dangerous high voltage. The housing must be closed and grounded before switching on the device.



WARNING

Improper handling

The sensor connected to this device can be operated with high pressure and corrosive media. Therefore improper handling of the device can lead to serious injuries and/or considerable material damage.

6.2 General requirements

Before commissioning it must be checked that:

- The device has been installed and connected in accordance with the guidelines provided in Installing/mounting (Page 37) and Connecting (Page 57).
- Device installed in hazardous areas meets the requirements described in Use in hazardous areas (Page 17).

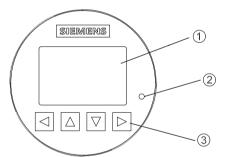
Power up the device. Devices with local display show a screen for initial startup (Page 85).

6.3 Local commissioning via HMI

6.3.1 Local display

The device is commissioned/operated with the touch keypad on the local display.

The elements are actuated by touching the glass panel on the appropriate key. Pressing harder will not activate the key, but using a thumb instead of a finger tip will help. The text display above the operating elements gives a menu-guided operation of the individual device function/parameters. Successful operation of the key is confirmed by a small green LED at the right of the display.



- 1 Full graphical display
- 2 LED (for indication of key operation)
- 3 Touch keypad

Figure 6-1 Local display

Note

Calibration of the keypad

When the lid is closed, all keys are calibrated (< 5 seconds). During calibration the LED is on and the keys cannot be operated.

If one of the keys is pressed for more than 10 seconds, the calibration of this key begins which has a duration of less than 10 seconds. Release the key for further operation.

Note

HMI timeout

If no key is pressed for 10 minutes, the display switches to show operation view. If Backlight is set to Automatic, display backlight goes off automatically 30 seconds after the last keypress.

Note

Operation does not require opening of the device. This means that the high degree of protection of IP67 and safety in hazardous areas are guaranteed at all times.

6.3.2 Wizard introduction

In this chapter it is described how to commission the device via the local display (HMI) using the Quick Commissioning wizard.

For further information on how to navigate the wizards, refer to Wizards (Page 88).

In the wizard graphics below, the HMI view numbers are stated to the left.

The first view in each wizard (About - view 1) is a description of what settings/actions can be performed using the specific wizard.

The last view in each wizard (Finished) shows that the last step of the wizard was completed.

Any parameter changes confirmed with pare saved immediately.

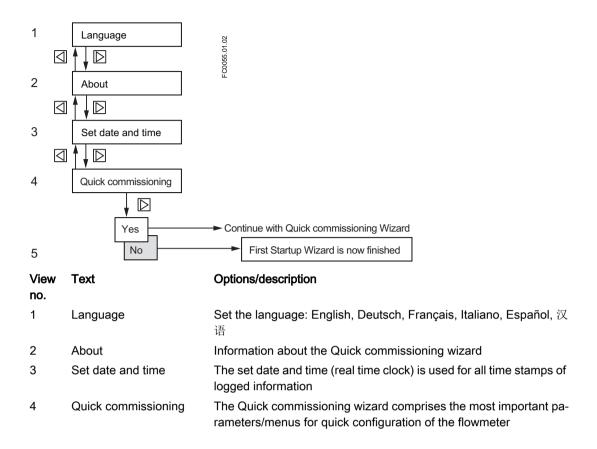
At any time in any wizard selecting Exit will bring you back to the main wizard menu without discarding changes.

6.3.3 Initial startup

The first time the device is powered up, you will be prompted to set the language. The device always starts up showing language in English. When the language has been set, you will be prompted to set the date and time.

After confirming/changing the date and time you will be asked if you want to start the Quick commissioning wizard. If you choose Yes (recommended), the Quick commissioning wizard will start. If you choose No, you accept the default values of the device, and the next HMI view will be the operation view 1.

6.3 Local commissioning via HMI



6.3.4 Zero point adjustment

The flowmeter system is optimized through a zero point adjustment which is performed via the Zero point adjustment wizard (Page 90).

Performing a zero point adjustment



1. Flush out any gases and obtain stable temperature conditions by running flow at operational conditions (pressure and temperature) for minimum 30 minutes.

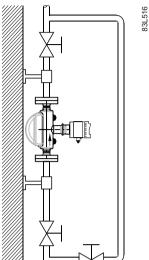


Figure 6-2 Best practice zero point adjustment with a by-pass line and two shut-off devices

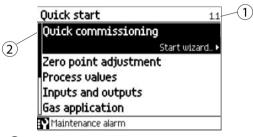
- 2. Close the outlet shut-off valve while maintaining the system pressure. If bypass flow is necessary, open the bypass valve. If the pressure can be increased by 1 to 2 bars with stopped flow, this should be applied.
- 3. Wait 1 to 2 minutes for the system to settle, and then perform zero adjustment. Waiting longer can change the temperature.
- 4. During the process a progress bar is visible in the HMI display.
- 5. At the end of the zero adjustment, the outcome is displayed as an offset and a standard deviation.

Note

If you get an error message after the zero point adjustment, refer to Zero point adjustment (Page 131).

6.3.5 Wizards

The HMI wizard graphics show an overview of each HMI wizard and of the keys used to navigate through the wizards. In the upper left corner of each view the wizard name (for example "Process values") and the step name (for example "Unit") of the wizard is shown. In the upper right corner the view number (for example 5 of 18 in the Process values wizard) is shown.



- 1 View number
- Wizard name

The purpose of the HMI wizards is to guide you through a quick set-up of various parameters.

The following HMI wizards are available:

- Quick commissioning
- Zero point adjustment
- Process values
- Inputs and outputs
- Gas application
- Pulsating flow
- Dosing application

Use the \triangle and $\overline{\bigcirc}$ keys to highlight the desired HMI wizard and press right key to enter the wizard. The first view shows a short description of which settings can be done.

Key operation

Basic navigation in the HMI wizards is shown in the graphics.

To change settings, use the \triangle and ∇ keys to highlight wanted setting, then press \triangleright key to select. Confirm selection by pressing \triangleright key again.

When you reach the end of the wizard, e.g. "Process values wizard is now finished", press key to go back to wizard list.

6.3.5.1 Quick commissioning wizard (menu item 1.1)

The Quick commissioning wizard will guide you through configuration of parameters essential for your application. You configure parameters essential for your application by selecting the configuration path and subwizards appropriate for your application.

See also

Zero point adjustment wizard (menu item 1.2) (Page 90)

Process values wizard (menu item 1.3) (Page 92)

Inputs and outputs wizard (menu item 1.4) (Page 94)

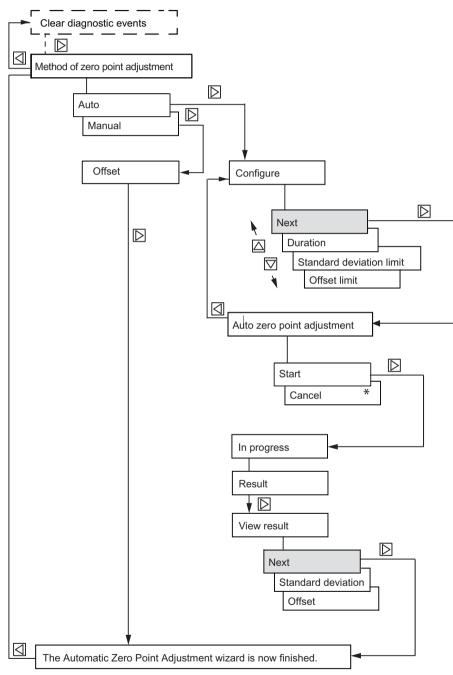
Gas application wizard (menu item 1.5) (Page 99)

Pulsating flow wizard (menu item 1.6) (Page 100)

Dosing application wizard (menu item 1.7) (Page 101)

6.3.5.2 Zero point adjustment wizard (menu item 1.2)

The flowmeter system is optimized through an automatic zero point adjustment. Before you start the zero point adjustment flush the pipe and keep it filled at an absolute flowrate of zero. Ensure that the sensor has the same temperature as the process media. Perform at operating pressure or at least 0.2 barg.



Text

Options/Description

Clear diagnostic events

"Clear diagnostic events" and alarm list are only shown if alarms are present.

Select zero point adjust- Auto, Manual

ment method

Configure Configure duration and limits

Auto zero point adjustment Cancel, Start (progress, result, standard deviation and offset)

In progress The progress bar is shown

Result Information on success or failure of zero point adjustment

View result Standard Deviation and Offset values

Note

View result

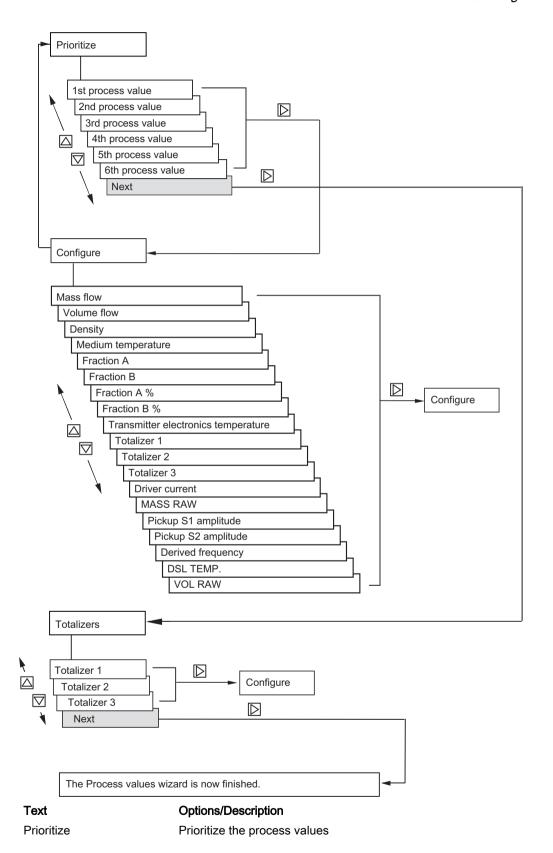
Standard deviation and Offset values are only updated if the zero point adjustment was completed successfully. Otherwise the previous values are used.

^{*:} Selecting Cancel will bypass the Zero point adjustment and end the wizard.

6.3 Local commissioning via HMI

6.3.5.3 Process values wizard (menu item 1.3)

The Process values wizard will guide you through the setup of process values for your application. The prioritizing of the process values automatically configures the measurement views on the display. The process value configured as 1st process value is set as first display view.

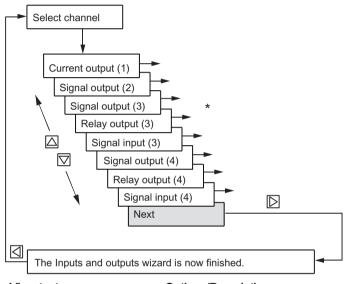


6.3 Local commissioning via HMI

Configure	Configure the process values (unit, low flow cut-off, limits, and hysteresis)
Totalizer	Configure totalizers (if activated in operating view, it is possible to reset
	totalizer without password access)

6.3.5.4 Inputs and outputs wizard (menu item 1.4)

The Inputs and outputs wizard will guide you through setup of inputs and outputs on channels 1 to 4. The availability of channels 2 to 4 depends on the product configuration.



View textOptions/DescriptionSelect channelSelect the channel to be configured

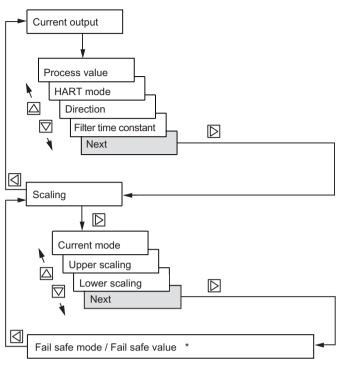
Channels 3 and 4 can only be assigned to one function (signal output, relay output or signal input).

*: See appropriate graphic for configuration of the input/output function.

Current output wizard

Current output - channel 1

The Current output on Channel 1 is a 4 to 20 mA output with Profibus, HART, Modbus. Channel 1 can be used in Functional Safety applications if ordered with SIL option.



Text Options/Description

Current output Configure current output basic settings

Scaling Configure current mode, upper and lower scaling
Fail Safe Mode / Fail Safe Select current output reaction in case of a fault

Value

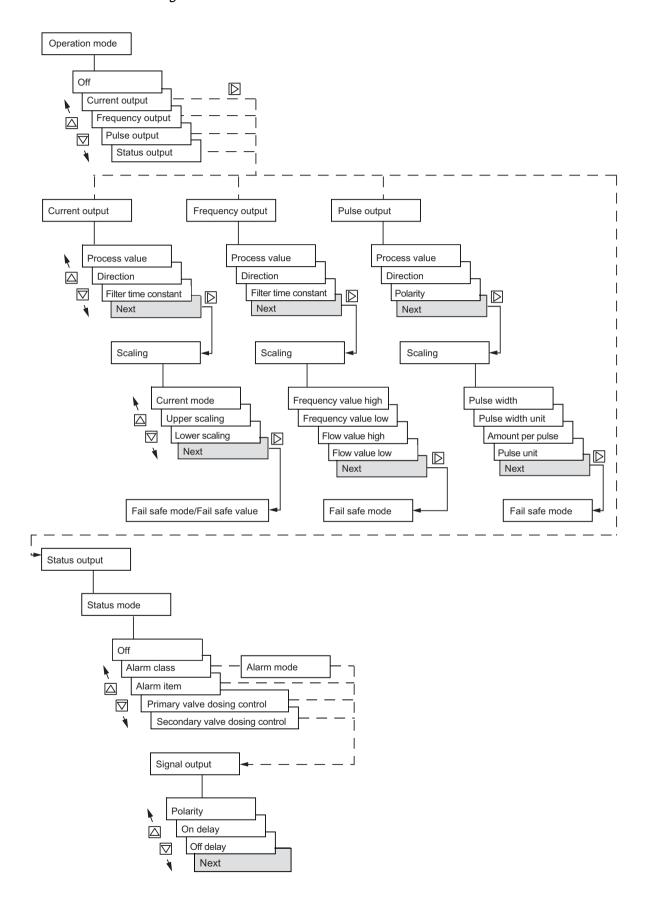
Signal output wizard

Signal output - channels 2 to 4

The signal output can be configured to either current (0/4-20 mA), frequency, pulse, three-stage analog valve dosing control, discrete one or two-valve dosing control or alarm/status.

^{*:} When pressing pyou will return to view "Select channel".

6.3 Local commissioning via HMI



Current/Frequency/Pulse

Text Options/Description

Operation mode Select the output functionality
Output function Configure the output basic settings

Scaling Configure the output scaling

Fail safe mode / Fail safe value Select the signal output reaction in case of a fault

Status

Text Options/Description

Status mode Select the digital output functionality

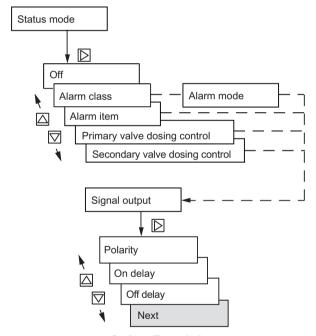
Configuration Configure the alarm (only if Alarm class or Individual alarms is selected)

Output polarity and delay Set the output polarity and delay

Relay output wizard

Relay output - channels 3 to 4

The Relay output can be configured to either discrete one or two-valve dosing control or alarm/ status.



Text Options/Description

Status mode Select the status output functionality

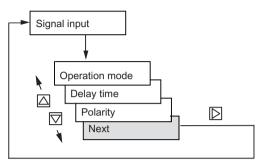
Configuration Configure the alarm (only if Alarm class or Individual alarms is selected)

Output polarity and delay Set the output polarity and delay

Signal input wizard

Signal input - channels 3 to 4

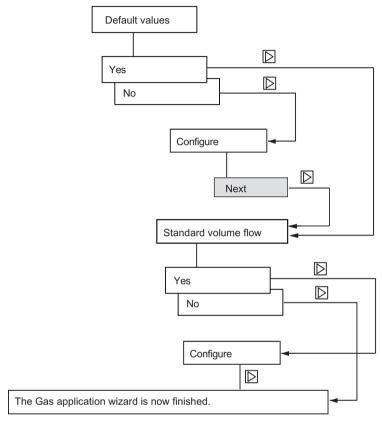
The Signal Input can be configured to either Dosing control, Totalizer reset, Remote zero adjust or Force/Freeze output(s).



View no.	Text	Options/Description
4	Operation Mode	Select the signal input functionality
5	Delay Time	Set the signal input delay time
6	Polarity	Set the signal input polarity

6.3.5.5 Gas application wizard (menu item 1.5)

The Gas application wizard will guide you through configuration of essential parameters for measuring gas flow. As default Low flow cut-off and Empty tube detection are disabled. Actual volume flow is difficult to use with low pressure; hence we recommend to use Standard volume flow.



Text Options/Description

Default values

Configure

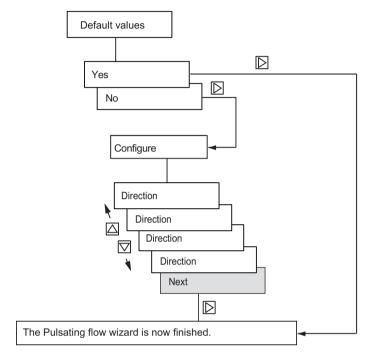
Configure empty tube detection and limit

Standard volume flow

Configure settings for standard volume flow

6.3.5.6 Pulsating flow wizard (menu item 1.6)

The Pulsating flow wizard will guide you through configuration of essential parameters for applications with pulsating flow. As default the Totalizer will be set to Balanced, the Process noise damping is set to 4 and the Low flow cut-off value will be increased.



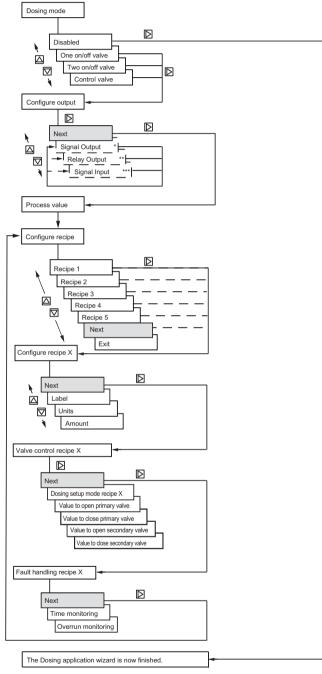
Text Options/Description

Default values Select whether or not to use the default values

Configure Configure totalizer direction

6.3.5.7 Dosing application wizard (menu item 1.7)

The Dosing application wizard will guide you through configuration of each recipe for dosing control including valve control (discrete/analog) and fault handling. The valve control is done using channels 2, 3 and 4.



View	Text	Options/Description
no.		
2	Dosing Mode	Select the dosing mode to control the valve(s) on the output
3	Dosing options	Setup instructions for the selected dosing mode

6.4 Remote commissioning with PDM

4-6	Configure Output	Configure the output to control the valves

7 Process Value Select the process value

8-15 Configure recipe Configure the recipe (valve control and fault handling)

16 Active Recipe Select a dosing recipe

For dosing setup, see Dosing (Page 145).

6.4 Remote commissioning with PDM

For commissioning with SIMATIC PDM, see separate function manuals for FCT030 Modbus, HART or PROFIBUS.

See also

Remote operation (Page 123)

SIMATIC PDM (www.siemens.com/simatic-pdm)

^{*:} Set Operation Mode to Status Mode and set Status Mode to control Primary Valve or Secondary Valve.

^{**:} Set Status Mode to Primary Valve or Secondary Valve.

^{***:} Set Operation Mode to Dosing Control.

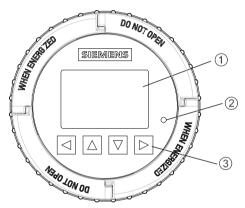
Operating

7.1 Local operation (HMI)

Operation via HMI

The device is operated with the capacitive proximity keypad on the HMI.

The text display above the operating elements gives a menu-guided operation of the individual device functions and parameters. Successful operation of the key is indicated by a small green LED next to the display.



- 1 Full graphical display
- 2 LED (for indication of key operation)
- 3 Capacitive proximity keypad

Figure 7-1 Local user interface

Note

Calibration of the keypad

When the lid is mounted, all keys are calibrated (approximately 40 seconds). During calibration the LED is on and the keys cannot be operated.

If one of the keys is pressed for more than 10 seconds, this key is calibrated (duration less than 10 seconds). Release the key for further operation.

Note

HMI timeout

If no key is pressed for 10 minutes, the display switches to show operation view.

7.1 Local operation (HMI)

Note

Operation does not require opening of the device. This means that the high degree of protection of IP67 and safety in hazardous areas are guaranteed at all times.

Note

Motor fuel dispensers

The Local User Interface is not suitable as an indication device for motor fuel dispensers.

Note

Display backlight

The display backlight goes off automatically 30 seconds after the last keypress.

7.1.1 Display view structure

There are three view types:

Operation view

The operator view shows up to six operation views (Page 110). The operation views are fully configurable to show different process values in different operation view types. Depending on the operation view type configuration the view is either measurement view, alarm view, operating view or diagnostic view.

- Measurement view: Displays the measurement values, see Measurement views (Page 111).
- Alarm view: Displays the active alarms in a list, see Alarm views (Page 115).
- Operating view: Enables the totalizer reset and the dosing control, see Operating views (Page 114).
- Diagnostic view: Displays six configurable measurement/diagnostic values, see Diagnostic views (Page 117).

Navigation view

The Navigation view (Page 117) shows the menus and parameters. The navigation view is used to navigate through the menus and parameters in the device.

Parameter view

The Parameter view (Page 119) can be entered from the navigation view. The parameter view is used to view and edit the parameters.

Navigating the operation view

Browse the operation views and menu items using the control buttons as follows:

Table 7-1 Measurement view

Key	Function
	No functionality
	Go to the previous menu in the operation view
\Box	Go to the next menu in the operation view
	Enter the navigation view

Table 7-2 Alarm view level 1

Key	Function
	No functionality
	Go to the previous menu in the operation view
\Box	Go to the next menu in the operation view
	Enter alarm view level 2

Table 7-3 Alarm view level 2

Key	Function
	Enter alarm view level 1
	Select the item above in the list; keep pressing the key to accelerate scrolling up the selection list
	Select the item below in the list; keep pressing the key to accelerate scrolling down the selection list
	Enter alarm view level 3

Table 7-4 Alarm view level 3

Key	Function
	Enter alarm view level 2
	No functionality
\Box	No functionality
	No functionality

7.1 Local operation (HMI)

Table 7-5 Operating view level 1

Key	Function
	No functionality
	Previous view
\Box	Next view
	Enter operating view level 2

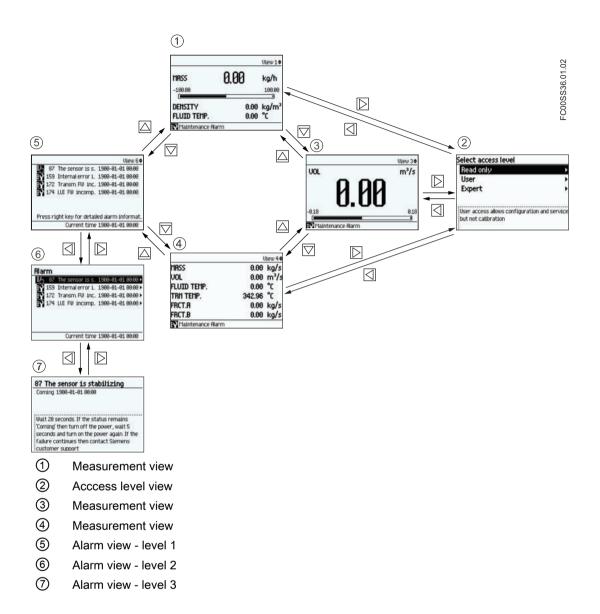
Table 7-6 Operating view level 2

Key	Function
◁	Enter operating view level 1
	Select action to perform
\Box	Select action to perform
	Perform selected action

Table 7-7 Diagnostic view

Key	Function
	No functionality
	Go to the previous menu in the operation view
	Go to the next menu in the operation view
	Enter the navigation view

The following graphic shows an example of how to navigate between measurement views and alarm views with measurement views 1, 3, and 4 as well as alarm view 5 enabled.



Navigating the navigation view

Browse the navigation view and menu items using the control buttons as follows:

Table 7-8 Navigation view

Key	Function
	Enter the next higher level of the navigation view (for example from level 2 to level 1). If located on level 1 in the navigation view then enter the operation view.
	Select the item above in the list; keep pressing the key to accelerate scrolling up the selection list. If the key is pressed when the top item is selected, the bottom item will be highlighted.

7.1 Local operation (HMI)

Key	Function
	Select the item below in the list; keep pressing the key to accelerate scrolling down the selection list. If the key is pressed when the bottom item is selected, the top item will be highlighted.
	Enter the next lower level of the navigation view (for example from level 1 to level 2). If a parameter is selected in the navigation view then enter the parameter view.

Editing the parameters

When this symbol \diamondsuit is shown in the graphics, the four buttons on the HMI are used for changing the parameters as described below.

Table 7-9 Parameter edit view

Key	Function
	Select the next left position. If the most left position is selected, exit the parameter edit view without confirming the changes. Keep pressing the key to jump to the most left position.
	Change the selected number/character. Numeric characters: increase the number by one (for example from 7 to 8) ASCII characters: select the previous character in the alphabet.
	Change the selected number/character. Numeric characters: decrease the number by one (for example from 8 to 7) ASCII characters: select the next character in the alphabet.
	Select the next right position. If most right position is selected, confirm the change and exit the parameter edit view. Keep pressing the key to jump to the most right position.

Table 7-10 Parameter edit view in access level read only

Key	Function
	Exit parameter edit view
	No functionality
	No functionality
	No functionality

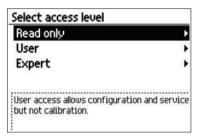
The exact structure of the operating menu is explained in the HMI menu structure (Page 237).

7.1.2 Access control

When entering the navigation view you need to select one of the following access levels:

- Read Only
 Allows no configuration. The parameter values can be viewed only (indicated by a symbol). No PIN code required.
- User
 Allows configuration and service of all parameters except calibration parameters. Default PIN code is 2457.
- Expert
 Allows configuration and service of all parameters including flow and density calibration parameters. Default PIN code is 2834.

PIN codes can be changed in menu 5 "Security".



Note

Lost PIN code

If the PIN code is lost, provide Siemens customer support with the transmitter serial number (see nameplate). Siemens customer support will provide a code to be entered in "Change user PIN" (menu item 5.1).

Disable access level control

If logged in as "Expert" you can "Deactivate user PIN" (menu item 5.6) meaning that you will always be logged in as "User" and will not be prompted to enter the password. Enabling the access level control requires entering the "Expert" password.

Auto logout function

Enabled: You will be prompted for password 10 minutes after the last key press.

Disabled: You will **not** be prompted for password 10 minutes after the last key press.

NOTICE

Device restart

Whenever the device is restarted, the access level is reset to Read only.

7.1 Local operation (HMI)

See also

HMI menu structure (Page 237)

7.1.3 Operation view

• The operation view can be displayed in up to six user-configured views. Switch manually between the enabled views with the keys △ and ▽. The actual operator view number (1 to 6) is shown in the upper right corner of the figures below.

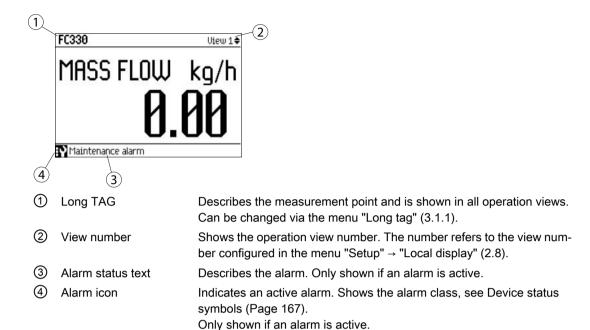
The view types including the number of process values shown in the operation view are configured in HMI menu structure (Page 237).

In view 1 only measurement or diagnostic views can be selected. In views 2 to 6 all view types can be selected.

Navigation view can only be accessed by pressing the right key in a measurement or a diagnostic view.

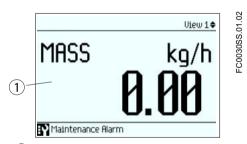
- Measurement views
 - Single value
 - Three values
 - One value and bargraph
 - One value and graph
 - Six values
- · Operating views
 - Totalizer
 - Dosing
- Alarm view
 - Alarm List
- Diagnostic view
 - Six Diagnostic Values

In general, all of the HMI views show the following:



7.1.4 Measurement views

Single value

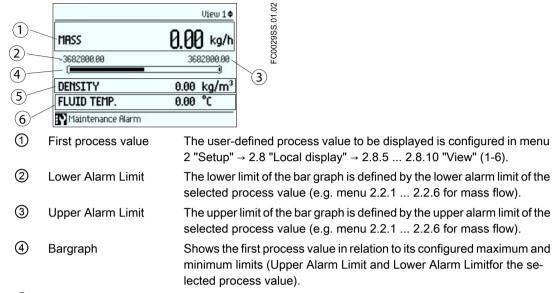


1 Process value

The user-defined process value to be displayed is configured in menu 2 "Setup" \rightarrow 2.8 "Local display" \rightarrow 2.8.5 ... 2.8.10 "View" (1-6).

7.1 Local operation (HMI)

Three values



Second process value The user-defined process value to be displayed is configured in menu 2 "Setup" → 2.8 "Local display" → 2.8.5 ... 2.8.10 "View" (1-6).

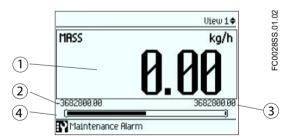
Third process value The user-defined process value to be displayed is configured in menu 2 "Setup" \rightarrow 2.8 "Local display" \rightarrow 2.8.10 "View" (1-6).

Note

Bargraph

The bargraph limits are defined as the lower and upper alarm values.

One value and bargraph



The user-defined process value to be displayed is configured in menu 2 "Setup" \rightarrow 2.8 "Local Display" \rightarrow 2.8.5 ... 2.8.10 "View" (1-6).

2 Lower Alarm Limit The lower limit of the bar graph is defined by the lower alarm limit of the selected process value (e.g. menu 2.2.1 ... 2.2.6 for mass flow).

3 Upper Alarm Limit The upper limit of the bar graph is defined by the upper alarm limit of the selected process value (e.g. menu 2.2.1 ... 2.2.6 for mass flow).

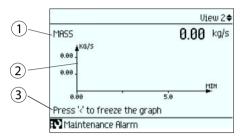
4 Bargraph Shows "1st Process value" in relation to its configured maximum and minimum limits (Upper Alarm LimitandLower Alarm Limitfor the selected process value).

Note

Bargraph

The bargraph limits are defined as the lower and upper alarm values.

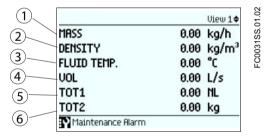
One value and graph



- 1 Process Value
- ② Graph
- ③ Instruction

Press to freeze/unfreeze display

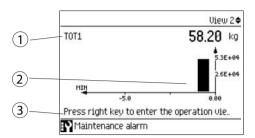
Six values



- The user-defined process value to be displayed is configured in menu 2 "Setup" → 2.8 "Local Display" → 2.8.5 ... 2.8.10 "View" (1-6).
- ② Second process value The user-defined process value to be displayed is configured in menu 2 "Setup" → 2.8 "Local Display" → 2.8.5 ... 2.8.10 "View" (1-6).
- Third process value The user-defined process value to be displayed is configured in menu 2 "Setup" \rightarrow 2.8 "Local Display" \rightarrow 2.8.5 ... 2.8.10 "View" (1-6).
- ④ Fourth process value The user-defined process value to be displayed is configured in menu 2 "Setup" → 2.8 "Local Display" → 2.8.5 ... 2.8.10 "View" (1-6).
- (5) Fifth process value The user-defined process value to be displayed is configured in menu 2 "Setup" → 2.8 "Local Display" → 2.8.5 ... 2.8.10 "View" (1-6).
- 6 Sixth process value The user-defined process value to be displayed is configured in menu 2 "Setup" → 2.8 "Local Display" → 2.8.5 ... 2.8.10 "View" (1-6).

7.1.5 Operating views

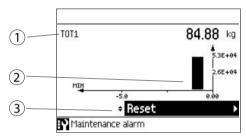
Totalizer (level 1)



- 1 Process value
- ② Graph
- ③ Instruction

Press to enter the operation view.

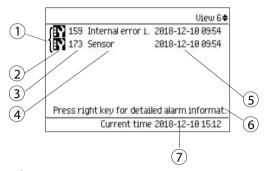
Totalizer (level 2)



- ① Process value
- ② Graph
- 3 Control

7.1.6 Alarm views

Alarm List (level 1)



① List of alarms List of all active alarms in device.

② Alarm icon Shows the alarm class, see Device status symbols (Page 167).

3 Alarm identification number, see Device status symbols ber (Page 167).

4 Alarm text Short alarm name.

The complete alarm text can be viewed in the detailed alarm infor-

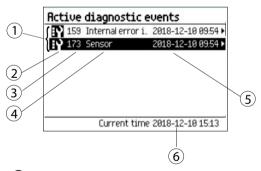
mation view.

6 Instruction Press right key for detailed alarm information.

O Current time Shows the current date and time.

In the alarm list (level 1) the active alarms are listed. Press \subseteq to access the alarm list (level 2).

Alarm List (level 2)



① List of alarms List of all active alarms in device. Each Alarm can be selected for detailed information.

2 Alarm icon Shows the alarm class, see Device status symbols (Page 167).

3 Alarm identification number, see Device status symbols ber (Page 167).

Alarm text Short alarm name.

The complete alarm text can be viewed in the detailed alarm infor-

mation view.

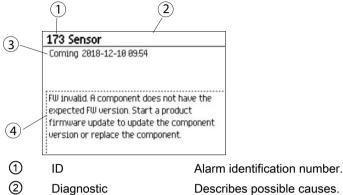
S Alarm time stamp Timestamp with the actual date and time when the alarm occurred.

6 Current time Shows the current date and time.

7.1 Local operation (HMI)

In thealarm list (level 2) it is possible to select any of the active alarms. Press △ or ▽ to scroll through the alarm list. Press ▷ to access detailed information of the highlighted alarm (level 3).

Alarm List (level 3)



Coming Time stamp for alarm occurrence.

 Astistance Describes possible causes.

 Time stamp for alarm occurrence.

4 Action Describes corrective action.

In the detailed alarm information view (level 3) the diagnostic and action texts are displayed. Press (1) to exit the detailed information view.

Alarm acknowledgement

There are two ways to have the alarms removed from the alarm list.

- Manual: The alarm remains in the alarm list until the alarm is manually acknowledged (ack.).
 The time of the acknowledgement is shown in the history log.
- Auto: The alarm is removed from the alarm list when the cause is removed (going)

7.1.7 Diagnostic views

Six Diagnostic Values

1				
_ \	HOSS ELOUI	2222.22	View 5¢	
2	MASS FLOW	3600.00	- CO	
3	TOT2 Medium Temp.	61453.98 4.00		
4	UOL.FLOW		m³/h	
(5)—	DENSITY	1000.00		
6	TOT2	61453.98		
0	Maintenance alarm			
1	First process/dia value	ignostic		er-defined process value to be displayed is configured in View" (1-6) located at "Setup" → "Local display" (menu item
2	Second process/diag- nostic value			er-defined process value to be displayed is configured in View" (1-6) located at "Setup" → "Local display" (menu item
3	Third process/diagnostic value			er-defined process value to be displayed is configured in View" (1-6) located at "Setup" → "Local display" (menu item
4	Fourth process/diagnostic value			er-defined process value to be displayed is configured in View" (1-6) located at "Setup" → "Local display" (menu item
(5)	Fifth process/diagnostic value			er-defined process value to be displayed is configured in View" (1-6) located at "Setup" → "Local display" (menu item
6	Sixth process/dia value	agnostic		er-defined process value to be displayed is configured in View" (1-6) located at "Setup" → "Local display" (menu item

7.1.8 Navigation view

The navigation views present the menu structure of the device. All menu items are uniquely identified with menu item number.

2.8).

Level 1 of the navigation view (entered from the operation view) is standardized for all Siemens Process Instrumentation devices and covers the following groups:

- 1. Quick Start (menu): Lists the most important parameters for quick configuration of the device. All parameters in this view can be found elsewhere in the menu.
- 2. Setup (menu): Contains all parameters which are needed to configure the device.
- 3. Maintenance & Diagnostics (menu): Contains parameters which affect the product behavior regarding maintenance, diagnostics and service.

 Examples: Verification, failure prediction, device health, data logging, alarm logging, report, condition, monitoring, tests, etc.
- 4. Communication (menu): Contains parameters which describe the Profibus, Profinet, HART, Modbus, X-bus communication settings of the device.

7.1 Local operation (HMI)

- 5. Security (menu): Contains parameters which describe all security settings of the device.
- 6. Language (parameter): Parameter for changing the language of the HMI. Regardless of the language setting, the term for this parameter is always the English term (Language).



- ① List of menus and parameters
- 2 Name of the previously selected menu
- Menu item number of highlighted menu
- 4 Alarm status text
- (5) Alarm icon

Figure 7-2 Example of display in navigation view

Menu item

In navigation view menus are identified by an arrow in the most right position.

When a menu is selected, the background turns black.



Figure 7-3 Menu in navigation view

For further information on how to gain access to the menus, see Access control (Page 109).

Parameter item

In navigation view parameters are shown without an arrow in the most right position except when the parameter is selected. When selected, the parameter is expanded into two lines. The second line shows the value of the parameter, a lock icon ($_{\Theta}$) (only for read access level of the parameter), and an arrow in most right position.

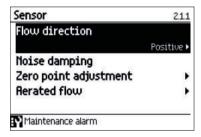


Figure 7-4 Navigation view ReadWrite

The selected parameter can be edited in the parameter view.

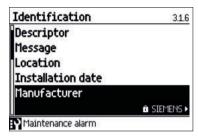


Figure 7-5 Navigation view Read only

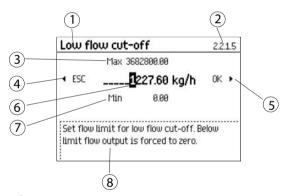
The selected parameter can only be viewed in the parameter view.

7.1.9 Parameter view

Depending on your access level, you can edit the value of the selected parameter or read the current value.

Numeric parameters edit view

Numeric parameters in edit view are displayed as shown below.



- 1 Parameter name
- 2 Parameter item number
- 3 Maximum value
- Escape without saving (frame around ESC is only shown when cursor is in left-most position)
- ⑤ Confirm and save (frame around OK is only shown when cursor is in right-most position)
- 6 Value to be edited
- Minimum value
- 8 Help text describing the parameter function. The help text appears if no key is pressed for three seconds.

Figure 7-6 Numeric parameter edit view

7.1 Local operation (HMI)

Note

signs in display

The display is unable to show the measured value. Change the measurement unit or the resolution.

Changing a value:

- 1. Select the digit to be changed by pressing \(\subseteq \) and \(\subseteq \) keys.
- 2. Use △ key to increase the value and ▽ key and decrease the values.
- 3. Press key in the rightmost position to confirm the changes, or press key in the leftmost position to escape the view without changing the value.

Note

Ensure that the new value is within the minimum/maximum range.

Changing the resolution:

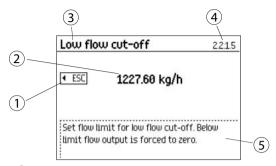
- 1. Select decimal point by pressing \(\subseteq \) and \(\subseteq \) keys.
- 2. Move decimal point by pressing △ key (moves decimal point to the left) or ▽ key (moves decimal point to the right).

In order to change the resolution of the process value shown in the operation view (for example mass flow), change the resolution of one configuration parameter for this process value (for example "Low Flow Cut-off" (menu item 2.2.1.5)). Any changes in resolution will change the resolution of all configuration parameters for this process value as well.

The resolution can also be changed by setting the decimal places parameter for the selected process value, for example the decimal places for process value mass flow is defined in parameter menu item 2.2.1.4.

Numeric parameter read only view

Numeric parameters in read only view are displayed as shown below.



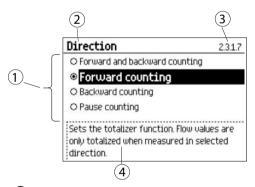
- ① Escape
- (2) The set value
- ③ Parameter name
- Parameter item number
- 5 Help text describing the parameter function.

Figure 7-7 Numeric parameter read only view

The read only view is shown if you do not have access to edit parameters. The view shows the set value. Press \textstyle to escape the view.

Parameter list edit view

Lists of parameters in edit view are displayed as shown below.



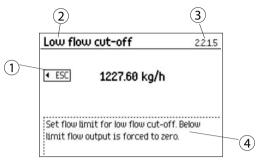
- Parameter list
- 2 Parameter name
- 3 Parameter item number
- 4 Help text describing the parameter function. The help text appears if no key is pressed for three seconds.

Figure 7-8 List Selection edit view

7.1 Local operation (HMI)

Parameter list read only view

Lists of parameters in read only view are displayed as shown below.



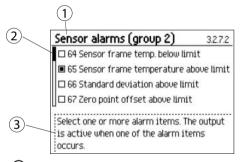
- 1 Parameter value selected
- 2 Parameter name
- ③ Parameter item number
- 4 Help text describing the parameter function. The help text appears if no key is pressed for three seconds.

Figure 7-9 List selection read only view

The read only view is shown if you do not have access to edit parameters. Press ◀ to escape the view.

Multiselection view

It is possible to select/deselect multiple alarms to be enabled under menu item 3.2.7 "Enable alarms".



- Parameter name
- 2 Alarm list
- 3 Help text describing the parameter function. The help text appears if no key is pressed for three seconds.

Use \square and \square to scroll through the alarms. Use \square to select/deselect the alarm.

The marked alarms will NOT be suppressed.

Note

Save settings

To activate the selections, press to save settings before leaving the view.

7.2 Remote operation

7.2.1 Overview of device configuration software

There are currently two competing technologies for configuring field devices:

- Electronic Device Description Language (EDDL)-based software
- Field Device Tool / Device Type Manager (FDT/DTM)-based software

From a practical point of view, both EDDL and FDT/DTM solutions do the same thing: provide a way of reading and writing configuration parameters to field devices and viewing advanced diagnostics.

Note

- SIMATIC PDM (an EDDL-based software) configures a field device using the Electronic Device Description (EDD) for that device.
- PACTware and Fieldcare (FDT-based software) use the DTM for that field device.

In addition, there is a new standard called Field Device Integration (FDI) which is a merger of these two technologies. Many of the major vendors have stated that their configuration software will evolve into being an FDI host. At the time this manual was written, Siemens had announced that SIMATIC PDM will become a FDI host system in the near future.

7.2.2 SIMATIC PDM

SIMATIC PDM (Process Device Manager) is a general-purpose, manufacturer-independent tool for the configuration, parameter assignment, commissioning, diagnostics and maintenance of intelligent field devices and field components. Follow-up installations and additional information on SIMATIC PDM are available on the Internet at SIMATIC PDM (www.siemens.com/simatic-pdm).

SIMATIC PDM monitors the process values, alarms and status signals of the device. It allows you to display, compare, adjust, verify, and simulate process device data; also to set schedules for calibration and maintenance.

For information on, for example, how to install and integrate devices, commission the software, see Operating Manual 'Help for SIMATIC PDM'. The manual is delivered with SIMATIC PDM software. Once the SIMATIC PDM is installed on your computer you find the manual under: Start > All programs > Siemens Automation > SIMATIC > Documentation. Link at our website:

7.2 Remote operation

'Help for SIMATIC PDM' (https://support.industry.siemens.com/cs/ww/de/view/109482406/en).

Note

Field device parameters

- Consult chapter "Parameter assignment (Page 127)" for a list of parameters and more information.
- The field device remains in measurement mode during the time you configure the field device.

If problems occur while using SIMATIC PDM check the Internet at www.simatic.com/simatic-pdm (www.simatic.com/simatic-pdm) to make sure you have the most recent version of SIMATIC PDM, the most recent Service Pack (SP) and the most recent hot fix (HF).

Procedure

The EDD revision must match the Firmware revision in the device according the table in Product compatibility (Page 10). To install a new EDD:

- 1. Go to Internet support page via Software downloads (http://www.siemens.com/ processinstrumentation/downloads).
- Enter in field "Enter search term..." the product name.Select "Download" in dropdown menu of field "Entry type".
- 3. Download the EDD of your device.
- 4. Launch "Device Integration Manager" of SIMATIC PDM, browse to the EDD file and select it.

See also

Device identification (Page 27)

Mobile App "Industry Online Support" (https://support.industry.siemens.com/cs/ww/de/sc/2067)

Procedure

Note

If you click on "Cancel" during an upload from the device to SIMATIC PDM some parameters will be updated.

- 1. Check with table in Product compatibility (Page 10) if you have the most recent version of the EDD. If necessary, update the EDD as described in SIMATIC PDM (Page 123).
- 2. Set "Address" via handheld programmer (default for PROFIBUS PA is 126).
 - In "PROGRAM mode", navigate to your field device, for example to: "Product name" > Communication > Device Address.
 - Press RIGHT arrow twice, to open parameter view and enable "Edit mode".
 - If required, key in a new value and press RIGHT arrow to accept it.
 The display shows the new value.
 - Press "Mode" to return to "Measurement mode".
- 3. Launch SIMATIC Manager and create a new project.
- 4. Go to the menu "Device > Master Reset".
- 5. Click on "Factory Defaults".
- 6. After the reset is complete click on "Close".
- 7. Upload parameters to the PC/PG.
- 8. Configure the device via the Quick Start wizard.

Open in SIMATIC PDM the menu Device – Set Address, enter a value for New Address, and click on Assign Address.

7.2 Remote operation

Parameter assignment

8.1 Upper scaling settings

Setting	The range is shown as minimum and maximum values in the HMI.
Default See HMI menu structure (Page 237).	

Process value (2.2) is set to Mass flow, Volume flow, Standard volume flow, Fraction A (Mass flow or Volume flow) or Fraction B (Mass flow or Volume flow)

Setting	The range is shown as minimum and maximum values in the HMI.	
Default 1600.0 [kg/m³]		

Process value (2.4.2.2) is set to Density

Related

The Mass flow, Volume flow, Standard volume flow or Fraction range and default setting are dependent on the selected **Process value** (2.2), the selected process value **Unit** (2.2.1.1 for Mass flow, 2.2.2.1 for Volume flow, 2.2.3.1 for Standard volume flow, 2.2.7.2 for Fraction (Mass flow), or 2.2.7.3 for Fraction (Volume flow)) and the sensor size.

The Density or Fluid temperature range and default setting are dependent on the selected **Process value** (2.2) and the selected process value **Unit** (2.2.5.1 for Density and 2.2.6.1 for Medium temperature).

See also

Dimension drawings (Page 217)

Parameters are identified by name and organized into function groups.

Parameters accessible via the local display are followed by the device menu number in parenthesis. Parameters not followed by a number are accessible only via remote operation.

8.2 Functions

8.2.1 Process values

The process values are updated every 10 ms (100 Hz update rate) synchronous with the DSP update cycle.

Process value parameters

The process values are:

- Mass flow
- Volume flow
- Standard volume flow
- Density
- Process media temperature
- Fraction

For SIL ordered flowmeters, mass flow, volume flow and density are available to be allocated to the current output on Channel 1.

For non SIL ordered flowmeters, all process values are available to be located to the current output, Modbus RS-485 and Profibus on Channel 1.

For Channel 2 to 4 all process values are available.

Limits and hysteresis

Limits

Limit alarms and warnings can be assigned to all process values. The following limit parameters are available for each process value:

- Upper Limit Alarm
- Upper Limit Warning
- Lower Limit Warning
- Lower Limit Alarm
- Alarm Hysteresis

The system reports a process alarm when the process value exceeds the Upper Limit Alarm or the Lower Limit Alarm. Likewise, the system reports a process warning when the process value exceeds the Upper Limit Warning or the Lower Limit Warning. Process value alarms and warnings are displayed in the HMI as well as at the communication interfaces.

Hysteresis

The hysteresis functions as follows:

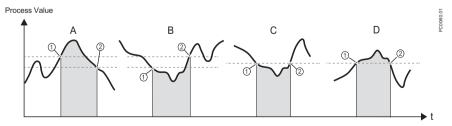


Figure 8-1 Hysteresis

A: Upper Alarm Limit with hysteresis

The alarm is triggered when the process value overshoots the Upper Alarm Limit (1). The alarm is cleared when the process value undershoots the Upper Alarm Limit minus hysteresis (2).

B: Lower Alarm Limit with hysteresis

The alarm is triggered when the process value undershoots the Lower Alarm Limit (1). The alarm is cleared when the process value overshoots the Lower Alarm Limit plus hysteresis (2).

C: Lower Alarm Limit without hysteresis

The alarm is triggered when the process value undershoots the Lower Alarm Limit (1). The alarm is cleared when the process value overshoots the Lower Alarm Limit (2).

D: Upper Alarm Limit without hysteresis

The alarm is triggered when the process value overshoots the Upper Alarm Limit (1). The alarm is cleared when the process value undershoots the Upper Alarm Limit (2).

Note

Flow direction warning

The limit function can be used to signal the flow direction by setting the Lower Limit Warning for the Process Value to 0. A warning will occur in case of negative flow.

All alarms and warnings can be signaled on the output if Status Mode is set to Individual alarms, see Digital output (Page 144).

Limit behavior on the outputs

Process Alarms can trigger Fail Safe behavior on the Signal Output, whereas Process Warnings are only used as information available in HMI and on the communication. Process value will bring the Signal output to Fail Safe mode if:

- Signal Output is configured to Current, Pulse or Frequency
- Fail Safe Mode is configured to react on a failure
- Process Alarm occurs on a process value selected on the output

The alarm behavior is described in detatail in Device status symbols (Page 167).

Hysteresis is used to adjust the tolerance by undershooting or overshooting the limit as described below.

Process value derivations

The front-end of the device measures time and derives the values of certain process variables from those measurements. The time period of vibration of the two measuring tubes is inversely proportional to their frequency, which is used to determine density. The average difference in phase of the two measuring tubes is dependent upon the mass flow rate of the process medium. In this measurement context, phase difference is expressed not in degrees of rotation but as an absolute time measurement. For this reason the result of zero offset correction is displayed in μ s, being the unit of the true measurement.

8.2 Functions

The process variables are interrelated and derived in the following fashions:

- Mass flow: proportional to the phase difference between pickup 1 and pickup 2, with compensations for changes in the metal characteristics due to tube and frame metal temperatures¹⁾.
- Volume flow: derived directly from the ratio of mass flow and media density.
- Standard volume flow: derived from the ratio of mass flow and standard density²).
- Density: derived from the average frequency of sensor tube vibration with compensation for changes in the metal characteristics with tube temperature. The relationship between density and vibration frequency is an inverse square-law curve which can be fitted to 3 reference points being the densities of air, hot water and cold water.
- Process media temperature: derived from the tube metal temperature. This is a legitimate measurement outcome since the tube walls are thin and they are within a sealed, protected environment, thereby giving similar sensitivity as an insertion thermometer.
- Frame temperature: Derived from the sensor frame temperature
- Fraction A (mass flow or volume flow): derived from the combination of media density and temperature, and compared with a stored table of fraction percentage against a wide range of both process values through a fifth-order polynomial³⁾
- Fraction B (mass flow or volume flow): ditto but fraction B is "Flow A"
- Fraction A %: as for fraction A quantity but A% is the ratio between Fraction A flow and Total flow
- Fraction B %: ditto but B% is "100% A%"
- ¹⁾ Metal temperatures are measured using precision Pt1000 sensors. The accuracy of the temperature measurement is ±0.5 °C.
- ²⁾ Standard density is the density of the media at reference conditions, normally atmospheric pressure and 20 °C. Standard density can be programmed into the flowmeter menu in two forms, either as a fixed reference or with a selection of linear or square-law temperature dependence. The choice of fixed or calculated standard density and of linear or square-law temperature dependency is according to the application and user preferences.
- ³⁾ The customer-specified density/temperature tables may be derived from the mass fraction or volume fraction of any two-part mixture. Fraction calculations are naturally performed in the ratio provided, or in mass ratio when using the built-in tables. Volume or mass ratios derived from the fraction table are calculated through the composite media density.

8.2.2 Zero point adjustment

In the following the automatic zero point adjustment function is described. For further details, see the appendix Zero point adjustment (Page 271).

Note

Preconditions

Before a zero point adjustment is initiated, the pipe must be flushed, filled and at an absolute flowrate of zero preferably also at operating pressure and temperature. Refer to "Zero point adjustment" via HMI (Page 86) or PDM (Page 102) for more details.

Note

Change of parameters during zero point adjustment

Do not change any other parameter during the zero point adjustment procedure.

Automatic zero point adjustment

The device measures and calculates the correct zero point automatically.

The automatic zero point adjustment of the flowmeter is set by the following parameters:

- Duration
- Start Zero Point Adjustment

When zero adjust is initiated by selecting "Start Zero Point Adjustment", the mass flow values are acquired and totalized for the configured period (Duration). The default zero point adjustment period (30 s.) is normally sufficient for a stable zero point measurement.

Note

Extremely low flow quantity

If the flow quantity is extremely small, extremely precise measurement is necessary. In this case, a long zero point adjustment period can be selected for improved zero point adjustment.

Zero point calculation

During zero point adjustment, an average value is automatically calculated from a large number of samples. The resultant flow value represents an offset from true zero flow. The standard deviation is also calculated which represents the stability of the zero offset value.

Successful automatic zero point adjustment

If the new zero point offset value is valid, it is automatically stored as the new zero point for the sensor. It remains stored in the case of a power failure.

8.2 Functions

Manual zero point adjustment

In case an automatic zero point adjustment cannot be performed, it is possible to do a manual zero point adjustment by entering the zero point offset value.

- 1. Select "Manual" in "Zero point adjustment" (menu item 2.1.3).
- 2. Enter the desired value in "Offset" (menu item 2.1.3.7).

8.2.3 Low flow cut-off

In certain applications, as for instance dosing applications, 0% flow signals below a certain flowrate are desired. In these applications, the flow signal can be forced to zero, when the flow is lower than a predefined flow value (Low Flow Cut-Off).

The device provides two parameters for setting the low flow cut-off:

- Low Mass Flow Cut-Off
- Low Volume Flow Cut-Off

The low flow cut-off parameters influence all outputs of the device, for example Local User Interface, Channel 1 to 4, and bus communication outputs.

Depending on the process values selection of the output either Low Mass Flow Cut-Off or Low Volume Flow Cut-Off will influence the output.

8.2.4 Empty tube monitoring

The empty tube monitoring function uses the process density for detecting an empty tube. Use of this function is recommended for all standard applications.

Note

Gas applications

Deactivate the empty tube monitoring function.

Empty tube monitoring parameters

Two parameters for setting the empty tube monitoring function are available:

- Empty Tube Detection (Modbus address 2129)
- Empty Tube Limit (Modbus address 2127)

The empty tube monitoring is activated via the Empty Tube Detection parameter. When the empty tube monitoring function is on, the mass flow / volume flow value is forced to zero if the tube is empty.

The tube is defined as empty if the measured density value is lower than the value defined via the Empty Tube Limit parameter.

Note

Process media density

Risk of unintentionally forcing flow values to zero if the difference between the empty tube limit density value and the density of the process media is not sufficient.

 Ensure sufficient difference between the empty tube limit density value and the process media density.

8.2.5 Process noise damping

Noise damping function

The dynamic sensitivity of the flow measurement signal to rapid changes in process flows can be reduced by use of the process noise damping function. The function is typically used in environment with:

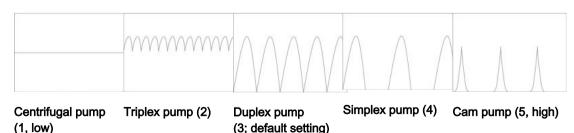
- Strongly pulsating flow
- Changing pump speeds
- Large pressure variations

Process noise damping settings

Reduce interfering process noise by increasing the setting of the parameter **Process Noise Damping**.

- Centrifugal pump (1: low)
- Triplex pump (2)
- Duplex pump (3)
- Simplex pump (4)
- Cam pump (5: high)

The default value is **Duplex pump**. The damping affects all functions and outputs of the sensor.



8.2 Functions

Note

Increased reaction time

The reaction time of the sensor increases when the process noise is damped.

8.2.6 Inputs and outputs

The hardware functionality of input and output is fixed when ordering the product. The available configuration is described in the following table:

Channel	HW configuration (fixed when ordering)	SW configuration available to the user
1	Current output (4-20 mA) HART, Modbus, PROFIBUS DP, PROFIBUS PA	
2	Signal output	• Current (0/4-20 mA)
		Frequency or pulse
		Three-stage analog valve dosing control
		Discrete one or two-valve dosing control
		Operational and alarm status
3	Signal output	• Current (0/4-20 mA)
		Frequency or pulse
		Redundant frequency or pulse (together with channel 2)
		Three-stage analog valve dosing control
		Discrete one or two-valve dosing control
		Operational and alarm status
	Relay output	Discrete one or two-valve dosing control
		Operational and alarm status
	Signal input	Dosing control
		Totalizer reset
		Remote zero adjust
		Force or freeze output(s)

Channel	HW configuration (fixed when ordering)	SW configuration available to the user
4	Signal output	• Current (0/4-20 mA)
		Frequency or pulse
		Three-stage analog valve dosing control
		Discrete one or two-valve dosing control
		Operational and alarm status
	Relay output	Discrete one or two-valve dosing control
		Operational and alarm status
	Signal input	Dosing control
		Totalizer reset
		Remote zero adjust
		Force or freeze output(s)

8.2.6.1 Current output

All four channels can be configured as current output.

Current output configuration

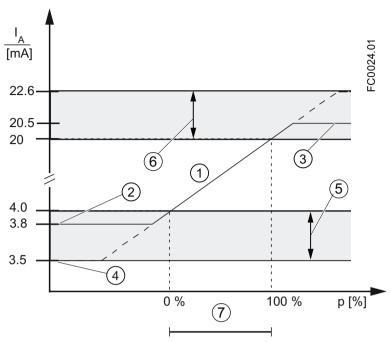
The following process values can be assigned to the current output:

- Mass flow
- Volume flow
- Standard volume flow
- Density
- Temperature
- Fraction A (Volume flow or Mass flow)
- Fraction B (Volume flow or Mass flow)
- Fraction A %
- Fraction B %
- Control valve *

The process variable listed above with * is not available to be allocated to the 4 to 20 mA output on Channel 1. All process variables are available through bus communication (SV, TV and QV variables) and on all of Channels 2 to 4.

The accuracy specified for the analog output signal applies only within the range 4 to 20 mA. Lower limit (4 mA) and upper limit (20 mA) can be assigned to any specific flow values.

8.2 Functions



- Linear control range
- ② Measuring range lower limit
- 3 Measuring range upper limit
- 4 Lower fault current value
- Secommended setting range for lower fault current
- 6 Recommended setting range for upper fault current
- Measuring range

Figure 8-2 Current limits for NAMUR configuration

The fail safe current output signal can be selected to:

- Minimum Current (defined in the Current Mode selection)
- Maximum Current (defined in the Current Mode selection)
- Last Good Value (the last process value before the failure occurred)
- Current Value (actual measured value)
- User defined (within the range of 0 mA to 25 mA 1)

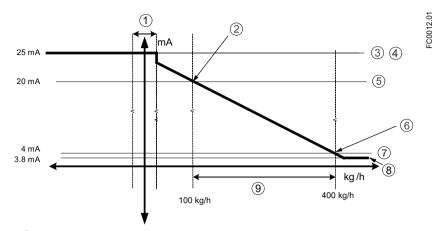
In the alarms lists inDevice status symbols (Page 167) it is listed which alarms bring the output to fail safe current.

Output scaling configuration

Below are four examples describing configuration possibilities for a current output.

¹⁾ For channel 1 the range is 3.5 mA to 25 mA

Positive flow with negative scaling

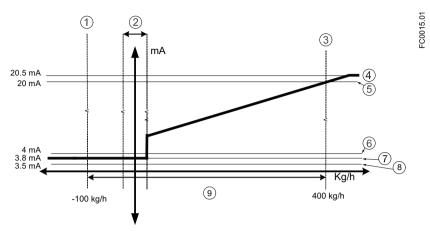


- 1 Low-flow cut-off
- 2 Upper scaling
- 3 Maximum output current
- 4 Upper alarm current
- ⑤ Upper range
- 6 Lower scaling
- O Lower range
- 8 Minimum output current
- Measurement range

Current output setting

- Process value = Mass flow
- Direction = Symmetric
- Current Mode = 4-20 mA (maximum 25 mA)
- Upper Scaling = 100 kg/h
- Lower Scaling = 400 kg/h
- Fail Safe Mode = Maximum current
- Low-Flow Cut-Off = 25 kg/h

Positive flow across zero with positive scaling

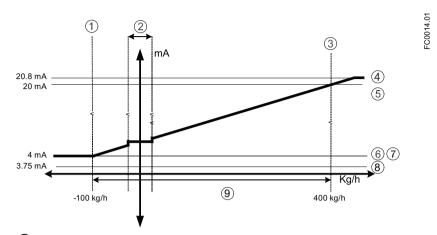


- Lower scaling
- 2 Low flow cut-off
- 3 Upper scaling
- 4 Maximum measurement value
- ⑤ Upper range
- 6 Lower range
- 7 Minimum measurement value
- 8 Lower alarm value
- Measurement range

Current output setting

- Process value = Mass flow
- Direction = Bidirectional
- Current Mode = 4-20 mA NAMUR
- Upper Scaling = 400 kg/h
- Lower Scaling = -100 kg/h
- Fail Safe Mode = Maximum current
- Low Flow Cut-Off = 25 kg/h

Bidirectional flow across zero with positive scaling

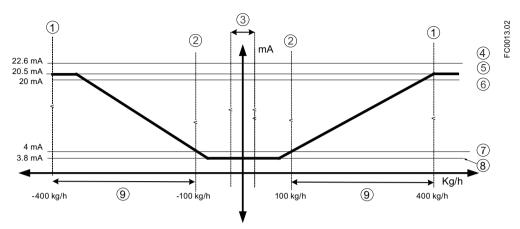


- 1 Lower scaling
- 2 Low flow cut-off
- 3 Upper scaling
- 4 Maximum measurement value
- ⑤ Upper range
- 6 Lower range
- 7 Minimum measurement value
- 8 Lower alarm value
- Measurement range

Current output setting

- Process value = Mass flow
- Direction = Bidirectional
- Current Mode = 4-20 mA US
- Upper Scaling = 400 kg/h
- Lower Scaling = -100 kg/h
- Fail Safe Mode = Minimum current
- Low Flow Cut-Off = 25 kg/h

Bidirectional flow with symmetrical scaling



- ① Upper scaling
- 2 Lower scaling
- 3 Low flow cut-off
- 4 Upper alarm value
- Maximum measurement value
- 6 Upper range
- O Lower range
- 8 Minimum measurement value
- Measurement range

Current output setting

- Process value = Mass flow
- Direction = Bidirectional (Symmetric)
- Current Mode = 4-20 mA NAMUR
- Upper Scaling = 400 kg/h
- Lower Scaling = 100 kg/h
- Fail Safe Mode = Maximum current
- Low Flow Cut-Off = 25 kg/h

8.2.6.2 Pulse output

The pulse output function supplies pulses equivalent to a configured amount of accumulated volume or mass. The pulse width is configured and the pulse repetition is proportional to the selected flow rate.

Pulse repetition

Pulse repetition is calculated as follows:

Note

Pulse width must be selected with the view that remaining time is always greater than pulse width at the highest measured flow.

Example

- Pulse output configuration (channels 2 to 4)
 - Operation mode = Pulse output
 - Process value = Mass flow
 - Amount = 1 kg
 - Pulse width = 1 ms
- Measured mass flow value = 10 kg/s (constant)

Result:

- Pulse repetition = 100 ms
- Output frequency = 10 pulses per second with a pulse width of 1 ms
- Remaining time between pulses is 99 ms

8.2.6.3 Frequency output

The frequency output function supplies a frequency (50% duty cycle) proportional to the selected process value.

Frequency is calculated as follows:

Example

This example shows how to calculate the output frequency for any measured flowrate:

Frequency output configuration:

- Operation Mode = Frequency Output (Channel 2 to 4)
- Process value = Mass flow
- Direction = Positive

8.2 Functions

- Frequency Value High = 12 kHz
- Frequency Value Low = 2 kHz
- Flow Value High = 15 kg/s
- Flow Value Low = 5 kg/s

Measured mass flow value = 7.5 kg/s (constant)

Result:

• Frequency = 4.5 kHz

Note

The connected equipment must be capable of registering the full range of frequencies configured.

8.2.6.4 Redundancy mode (frequency)

Redundancy mode

If both channel 2 and channel 3 are configured as frequency outputs, channel 3 can be configured for redundancy mode to follow channel 2 shifted by 90° or 180°. If set to redundancy mode, channel 3 inherits all channel 2 settings. The flow direction will determine whether channel 3 is shifted before or after channel 2 at 90° shift.

The following examples describe the frequency functionalities for channel 2 and 3 in redundancy mode:

Channel 2 configured as positive direction and channel 3 set to redundancy mode 90°

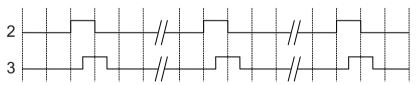


Figure 8-3 Positive flow - channel 3 leads by 90°

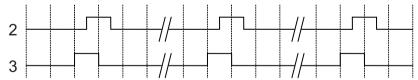


Figure 8-4 Negative flow - channel 3 lags by 90°

Channel 2 configured as positive direction and channel 3 set to redundancy mode 180°

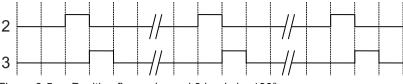


Figure 8-5 Positive flow - channel 3 leads by 180°



Figure 8-6 Negative flow - channel 3 lags by 180°

Redundancy mode (pulse)

If both channel 2 and channel 3 are configured as pulse outputs, channel 3 can be configured for redundancy mode to follow channel 2 shifted by 90° or 180° of the functional width of the pulse. If set to redundancy mode, channel 3 inherits all channel 2 settings. The functional width of the pulse is two times the pulse "On" duration. The flow direction will determine whether channel 3 is shifted before or after channel 2.

The following examples describe the pulse functionalities for channel 2 and 3 in redundancy mode:

Channel 2 configured as positive direction and channel 3 set to redundancy mode 90°

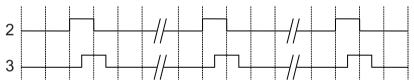


Figure 8-7 Positive flow - channel 3 leads by 90°

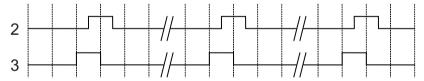


Figure 8-8 Negative flow - channel 3 lags by 90°

Channel 2 configured as positive direction and channel 3 set to redundancy mode 180°

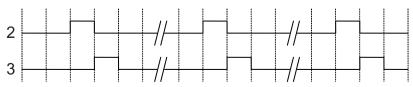


Figure 8-9 Positive flow - channel 3 leads by 180°

8.2 Functions

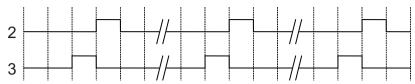


Figure 8-10 Negative flow - channel 3 lags by 180°

8.2.6.5 Digital output

The status output can be used to show alarm status or to control the dosing and it can be signaled on Signal Output or Relay Output.

Depending on the Alarm Mode setting, multiple alarms can be signaled on the output and selected from the alarm class or the Individual alarms lists.

- Alarm Class: Alarm will be signaled if alarm within the selected alarm class occurs.
- Individual alarms: Alarm will be signaled if selected Individual alarms occurs. It is possible
 to select more multiple alarms to be signaled.

Note

Alarm class

The alarm class options depend on the Alarm Mode setting, either NAMUR or Standard (Siemens Standard), selected in menu item 2.8.11. Both NAMUR and Siemens Standard alarms and their messages are described in more detail in Fault codes and corrective actions (Page 171).

The control output can be used for controlling discrete valve dosing and analog valve dosing as described in Dosing (Page 145).

8.2.6.6 Input

If the input is activated with a logic signal (15 - 30 V DC), the meter carries out an activity selected in the menu.

The following input options are available:

- Start dosing
- Hold / continue dosing
 - When this function is activated, it will pause the dosing. When it is deactivated, the dosing will continue
- Stop dosing
 - Sets the digital output to "Off" and resets the dosing counter
- Zero adjust
 - Starts the automatic zero point adjustment. This function employs the existing configurations and presumes that the process conditions are prepared for the zero point adjustment routine

- Reset totalizer
 - Resets one of the internal totalizers 1, 2 or 3 (depending on configuration)
- Resets all totalizers simultaneously
- Freeze signal
 - Freezes all currently measured values in the display and outputs
- Force signal
 - Forces all outputs to adopt the value selected in the menu. If the value 100% is selected, the current output will show 20 mA and the frequency output will show 10.000 kHz when the external output is activated



WARNING

Changing polarity

Changing the polarity triggers the signal input to execute the set functionality.

8.2.7 Totalizers

Totalizer functions

The device has three independent totalizers that can be used to total the mass flow, volume flow, corrected volume flow, fraction A (volume flow or mass flow) or fraction B (volume flow or mass flow).

The totalizers can be configured to count balance (net flow), positive flow or negative flow.

In case of failure in the system, the totalizer fail safe mode can be set to:

- Hold (default): the totalizer holds the last value before the failure occurred
- Run: the totalizer continues counting the actual measured value
- Memory: the totalizer continues counting based on the last input value (for example mass flow) before the failure occurred.

The totalizers can be operated via the Local User Interface or bus communication (for example SIMATIC PDM). The totalizers can be reset or preset.

8.2.8 Dosing

The dosing function controls the sequence of flow through one or two valves into a container. The user can set the Amount and the sequence of controlling the valve(s). The dosing function then controls the valves to open and close in sequence to achieve the Amount.

The process values for dosing control are updated with 100 Hz to ensure maximum response time of 10 ms to rapidly changing flows.

8.2 Functions

The flow sequence can be paused, resumed and ended by the user at any point in the flow sequence.

Transmitter outputs therefore change state according to the dosing sequence or operator commands. For optimal dosing control the minimum number of components between the flowmeter and the dosing valves must be employed. The dosing function must be configured for the type of valve used for dosing:

• One on/off valve:

Dosing controlled by a single discrete (Open/Closed) valve. The valve opens completely when the dosing begins, and closes completely when the dosing Amount is reached.

Two on/off valves:

Dosing controlled by two discrete valves (a primary valve and a secondary valve). One valve opens at the beginning of the dosing; the other opens at a user-defined amount. One valve stays open until the end of the dosing; the other closes at a user-defined amount. See examples below (Page 148) of some different opening and closing options.

Control valve:

Dosing controlled by an analog valve configured in three stages as fully open, partially closed, and fully closed. See example below (Page 148) of the three-positional Control valve.

Dosing setup procedure

The dosing functionality is configured via HMI. Menu 2.4 "Inputs/Outputs" determines how the transmitter will use the inputs and outputs for dosing control. Menu 2.5 "Dosing" independently determines the sequencing of the outputs to achieve the user's desired result.

The dosing function provides:

- three dosing valve control mechanisms (One on/off valve, Two on/off valves or Control valve)
- dosing of mass flow, volume flow, standard volume flow or fraction (mass flow or volume flow)
- five independently configurable recipes
- · flexible discrete or analog valve control
- fault handling time and amount monitoring

Configure the dosing function as follows:

- 1. Basic dosing parameters common for all recipes in "Dosing" (menu item 2.5)
 - Select valve control functionality at parameter "Dosing Mode"
 - Select measured process value for dosing at parameter "Process Values"
- 2. Individual recipe(s) in menu items 2.5.5 to 2.5.9 as required
 - Setup dosing name, amount, unit and compensation
 - Select valve control sequence
 - Select fault handling configuration
- 3. Output(s) in "Inputs/Outputs" (menu item 2.4).
- 4. Input for dosing control in "Inputs/Outputs" (menu item 2.4).

8.2.8.1 Dosing control configuration

Dosing control includes valve control (discrete/analog) and fault handling. The valve control is done using channels 2, 3 and 4. Dosing control can be configured to:

- One on/off valve
- Two on/off valves
- Control valve

One on/off valve

Use one Signal or one Relay output to control the one-stage dosing. Set the Operating Mode of signal output to Status. Assign Status Mode to control the Primary Valve. A Signal Input can be assigned to start the dosing.

Two on/off valves

Use two Signal or two Relay outputs to control the two-stage dosing. Set the Operating Mode of signal output to "Status". Assign one Status Mode to control the Primary Valve and the other to control the Secondary Valve. A Signal Input can be assigned to start the dosing.

Control valve

Use one Signal output to control the Control valve. Assign the Operating Mode to Current Output. A Signal Input can be assigned to start the dosing.

Process Values

The following process values can be used for dosing control:

- Mass flow
- Volume flow
- Standard volume flow
- Fraction A
- Fraction B

Recipes

Five recipes can be configured individually, however only one of the recipes can be active at a time.

8.2.8.2 Valve control configuration

Valve control dosing

Dosing is controlled with either one or two discrete valves or a single analog valve. The transmitter provides up to three input/output channels which can be used for dosing control. The selection of channels is fixed when ordering the system. The channels can be setup for dosing functionality in parameter 2.5.1 "Dosing Mode" as shown in the table below. Allocation of the output to a specific dosing sequence element is performed in the software configuration as follows:

One on/off valve

Configuration of one valve (primary valve).

One of the following channels must be assigned to control the discrete primary valve.

Table 8-1 One on/off valve

Valve control	Channel HW con-	Output	Channel SW configuration				
	figuration	channel	Menu item		Value		
Discrete valve control - Primary Valve	- 5	2	2.4.2.1	"Operation Mode"	Status Output		
			2.4.2.27	"Status Mode"	Primary Valve Dosing		
		3	2.4.3.1	"Operation Mode"	Status Output		
			2.4.3.29	"Status Mode"	Primary Valve Dosing		
		4	2.4.6.1	"Operation Mode"	Status Output		
			2.4.6.27	"Status Mode"	Primary Valve Dosing		
	Relay output	3	2.4.4.1	1 "Status Mode" Primary Valve D			
		4	2.4.7.1	"Status Mode"	Primary Valve Dosing		

Two on/off valves

Configuration of two valves (primary and secondary valves)

One of the following channels must be assigned to control the discrete primary valve and one must be assigned to control the secondary discrete valve.

Table 8-2 Two on/off valves

Valve control	Channel HW con-	Output	Channel S	Channel SW configuration					
	figuration	channel	Menu item		Value				
Discrete valve con-	Signal output	2	2.4.2.1	"Operation Mode"	Status Output				
trol - Primary Valve			2.4.2.27	"Status Mode"	Primary Valve Dosing				
		3	2.4.3.1	"Operation Mode"	Status Output				
			2.4.3.29	"Status Mode"	Primary Valve Dosing				
		4	2.4.6.1	"Operation Mode"	Status Output				
			2.4.6.27	"Status Mode"	Primary Valve Dosing				
	Relay output	3	2.4.4.1	"Status Mode"	Primary Valve Dosing				
		4	2.4.7.1	"Status Mode"	Primary Valve Dosing				
Discrete valve con-	Signal output	2	2.4.2.1	"Operation Mode"	Status Output				
trol - Secondary			2.4.2.27	"Status Mode"	Secondary Valve Dosing				
Valve		3	2.4.3.1	"Operation Mode"	Status Output				
			2.4.3.29	"Status Mode"	Secondary Valve Dosing				
		4	2.4.6.1	"Operation Mode"	Status Output				
			2.4.6.27	"Status Mode"	Secondary Valve Dosing				
	Relay output	3	2.4.4.1	"Status Mode"	Secondary Valve Dosing				
		4	2.4.7.1	"Status Mode"	Secondary Valve Dosing				

Control valve

Configuration of one analog valve.

One of the following channels must be assigned to control the analog valve.

Table 8-3 Control valve

Dosing mode	Valve control	Channel HW	Output	Channel SW configuration					
		configuration	channel	Menu iten	n	Value			
Control valve	Analog	Signal output	2	2.4.2.1	"Operating Mode"	Current Output			
		2.4.		2.4.2.2	"Process Value"	Control valve			
			3	2.4.3.1	"Operating Mode"	Current Output			
				2.4.3.2	"Process Value"	Control valve			
			4	2.4.6.1	"Operating Mode"	Current Output			
				2.4.6.2	"Process Value"	Control valve			

Note

If the output channels including current output are configured for valve control, they cannot report alarm status or fault levels.

8.2 Functions

Table 8-4 Parameter settings for Two on/off valves valve control

Valve control parameter configured in each recipe	Default values	Description			
Stage 1 Primary Open	0.00 % of Amount	The quantity or percent of the Amount at which the primary valve will open			
Stage 1 Primary Close	80.00 % of Amount	The quantity or percent of the Amount at which the primary valve will close			
Stage 2 Secondary Open	20.00 % of Amount	The quantity or percent of the Amount at which the secondary valve will open			
Stage 2 Secondary Close	100.00 % of Amount	The quantity or percent of the Amount at which the secondary valve will close			

Either Stage 1 Primary Open or Stage 2 Secondary Open must be set to 0. For controlling the valves via the outputs, two of channels 2, 3 and 4 must be assigned to Primary Valve Dosing Control and Secondary Valve Dosing control, respectively.

Either Stage 1 Primary Close or Stage 2 Secondary Close must be set to Amount.

In the examples below the primary valve, the secondary valve, and the flow are indicated as follows:

① — ② —		FC0023.01
1	Primary valve	
(2)	Secondary valve	

Examples of valve control configuration

Example 1: Open primary valve at 0 %; close primary valve before closing secondary valve configured in recipe 1

Parameter configuration:

Menu 2.5 Dosing

- 2.5.1 Dosing Mode = Two on/off valves

Menu 2.5.5.6 Valve Control

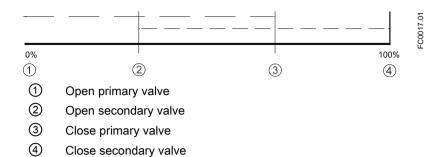
- 2.5.5.6.1 Stage Setup Format = Relative

- 2.5.5.6.2 Stage 1 Primary Open = 0 %

- 2.5.5.6.3 Stage 1 Primary Close = 66 %

- 2.5.5.6.4 Stage 2 Secondary Open = 33 %

- 2.5.5.6.5 Stage 2 Secondary Close = 100 %



Example 2: Open primary valve at 0 %; close primary valve after closing secondary valve configured in recipe 1

Parameter configuration:

Menu 2.5 Dosing

- 2.5.1 Dosing Mode = Two on/off valves

Menu 2.5.5.6 Valve Control

- 2.5.5.6.1 Stage Setup Format = Relative
- 2.5.5.6.2 Stage 1 Primary Open = 0 %
- 2.5.5.6.3 Stage 1 Primary Close = 100 %
- 2.5.5.6.4 Stage 2 Secondary Open = 33 %
- 2.5.5.6.5 Stage 2 Secondary Close = 66 %



- Open primary valve
- ② Open secondary valve
- 3 Close secondary valve
- 4 Close primary valve

Example 3: Open secondary valve at 0 %; close primary valve before closing secondary valve configured in recipe 1

Parameter configuration:

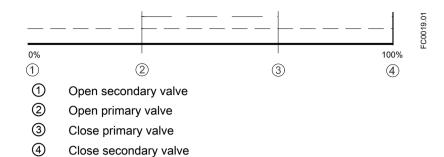
Menu 2.5 Dosing

- 2.5.1 Dosing Mode = Two on/off valves

Menu 2.5.5.6 Valve Control

- 2.5.5.6.1 Stage Setup Format = Relative
- 2.5.5.6.2 Stage 1 Primary Open = 33 %
- 2.5.5.6.3 Stage 1 Primary Close = 66 %
- 2.5.5.6.4 Stage 2 Secondary Open = 0 %
- 2.5.5.6.5 Stage 2 Secondary Close = 100 %

8.2 Functions



Example 4: Open secondary valve at 0 %; close primary valve after closing secondary valve configured in recipe 1

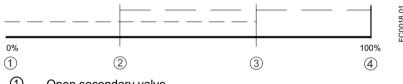
Parameter configuration:

Menu 2.5 Dosing

- 2.5.1 Dosing Mode = Two on/off valves

Menu 2.5.5.6 Valve Control

- 2.5.5.6.1 Stage Setup Format = Relative
- 2.5.5.6.2 Stage 1 Primary Open = 33 %
- 2.5.5.6.3 Stage 1 Primary Close = 100 %
- 2.5.5.6.4 Stage 2 Secondary Open = 0 %
- 2.5.5.6.5 Stage 2 Secondary Close = 66 %



- (1) Open secondary valve
- 2 Open primary valve
- (3) Close secondary valve
- 4 Close primary valve

Control valve:

Dosing controlled by an analog valve configured in three stages as fully open (high flow), partially open, and fully closed. During the open stage the valve may be not fully open but controlled to a high flow condition.

Valve control parameter configured in each recipe	Default value	Description
Fully Closed Current Level	0 mA	The output current which defines the closed valve state
Partial Open Current Level	10 mA	The output current which defines the partially open valve state
Fully Open Current Level	20 mA	The output current which defines the high flow valve state
Fully Open	0.00 % of Amount	The quantity or percent of amount at which the valve will transition from partial to full flow
Partially Closed	100.00 % of Amount	The quantity or percent of amount at which the valve will transition from full flow to partial flow

Three-positional Control valve configured in recipe 1

Parameter configuration:

Menu 2.5 Dosing

2.5.1 Dosing Mode = Control valve

Menu 2.5.5.6 Valve Control

2.5.5.6.1 Stage Setup Format = Relative

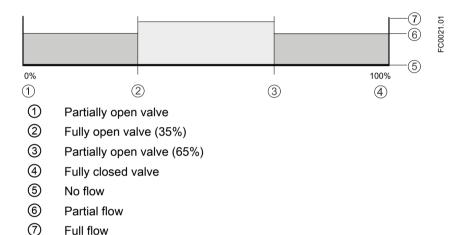
2.5.5.6.6 Current value to close = 0 mA

2.5.5.6.7 Current value to partially open = 10 mA

2.5.5.6.8 Current value to fully open = 20 mA

2.5.5.6.9 Amount for fully open = 35 %

2.5.5.6.10 Amount for partially open = 65 %



8.2.8.3 Dosing operation

When the transmitter recipes have been configured, the active recipe is selected in parameter 2.5.3 "Active Recipe". The transmitter output changes according to the dosing operation and controls the valve in the dosing process. The digital input can be configured to start dosing. HMI provides dosing control via the dosing operating view, see Menu item 2.5: Dosing (Page 251). All dosing setup and control can be performed via bus communication using SIMATIC PDM.

Dosing compensation

In static applications the flowrate is constant. Thus, the dosing compensation, if required, is fixed. Use the fixed compensation by entering the amount in menu item 2.5.5.5.2 (Fixed Compensation).

8.2.8.4 Fault handling

The transmitter fault handling provides monitoring of both dosing time and amount. The configuration of the fault handling is done in Fault handling (menu item 2.5.5.6 for Recipe 1).

Dosing timeout monitoring

The dosing timeout monitoring checks whether the dosing procedure has been finished within the configured Duration time (menu item 2.5.5.7.2 for Recipe 1). If the duration time is exceeded, an alarm will be triggered, see Fault codes and corrective actions (Page 171).

Dosing overrun monitoring

The dosing overrun monitoring checks if the flow amount exceeds the defined Overrun value (menu item 2.5.5.7.4 for Recipe 1). If the overrun value is exceeded, an alarm will be triggered, see Fault codes and corrective actions (Page 171).

This function can detect a valve malfunction (non-closure) caused by a blockage, wear, etc.

8.2.9 Audit trail logging

The audit trail includes any values or settings changed by users. The audit trail is automatically stored with information on the change as well as the time (real-time) and by which interface (display, bus communication or USB) the change was made.

Audit trail information is logged on the SensorFlash card, as a parameter and command change file which include below informations:

- Timestamp
- Modbus register
- Previous value
- New value
- Data type
- Interface ID

Example: 2017-06-08 13:48:05;9003;73;74;Uint8;HMI

The transmitter can log up to 100 entries in each of the audit trail log lists:

- "Parameter change log" (menu item 3.9.1)
- "FW update change log" (menu item 3.9.3)

Each audit trail list can be cleared by the user.

See also "Diagnostic log (Page 154)" (menu item 3.2.2)

8.2.10 Diagnostic log

All unacknowledged diagnostic information are listed in the "Diagnostic log" (menu item 3.2.2).

The diagnostic alarm list is default available in operating view 6.

There are two ways to have the alarms removed from the "Diagnostic log" (menu item 3.2.2).

- Manual: The alarm remains in the diagnostic list until the alarm is manually acknowledged (ack.).
 - The time of the acknowledgement is shown in the Diagnostic log as long as the log is not cleared.
- Auto: The alarm is removed from the Diagnostic log when the cause is removed (going).

8.2.11 Custom unit

Units can be defined/customized for all process values. This function can be used if the wanted unit cannot be found in the list of units.

Custom unit is defined under each process value, and is available for mass flow, volume flow, standard volume flow, density, fraction and medium temperature. Custom units menu is not available in Custody transfer mode (CT).

8.2.12 SensorFlash

SensorFlash is a high-performance micro SD card (4 GB) with the ability to be updated by inserting it in a PC. It is supplied with each sensor with the complete set of certification documents including a calibration report. Material, pressure test, factory testing and order conformance certificates are optional at ordering.

Further is contains parameter backup files, firmware logs, alarm history log, parameter change log and data logging of process values and parameters.

The Siemens SensorFlash memory unit offers a permanent database with backup of all parameter settings.

The SensorFlash supports copy and transfer of user settings from one flowmeter to another to simplify commissioning. Only setup parameters are copied; no data are changed in the receiving flowmeter.

Copying application setup from one device to another.

- 1. Remove the SensorFlash from the source device and insert the SensorFlash into the destination device. The destination device disables the backup and signals an alarm.
- 2. Enter Copy configuration (menu item 1.8) and press to execute the copying. Move all the application setup parameters from the SensorFlash to the device. Backup is still disabled and alarm signaled.
- 3. Remove the SensorFlash from the destination device and insert the original SensorFlash. The device synchronizes the parameters to the SensorFlash and the alarm is cleared.
- 4. If there is no SD-card inserted: Insert SD-Card with backup data. Press right key to continue.
- 5. Please wait.
- Copy/restore parameterization succeeded. Press right key to continue. Or:
 - Copy/restore parameterization failed. Press right key to continue.

8.2.13 Datalogging on SensorFlash

Datalogging of process values can be activated under SensorFlash (menu item 3.7).

Data logging can be selected in different logging intervals for Process values and for advanced logging of parameters.

Values with timestamp information is stored on the SensorFlash.

8.2.14 Process peak values on SensorFlash

Process peak values can be activated under "Peak values" (menu item 3.5).

Minimum and maximum process peak value is stored with timestamp information on the SensorFlash, and also under menu item 3.5.

8.2.15 Simulation

Simulation is used for testing purposes, typically for checking that the readings of the control system are correct.

The simulation can be activated in HMI (menu item 3.8) or via SIMATIC PDM.

Inputs/outputs simulation

Depending on the configuration of each input/output the following values can be simulated:

Table 8-5 Inputs/outputs simulation

HW configura- tion	Channel 1	Channel 2	Channel 3	Channel 4	Simulation value
Current output	•				4 to 20 mA
Relay output			•	•	0 (low) or 1 (high)
Signal input			•		0 (low) or 1 (high)
Signal output		•	•	•	
Current					• 0 to 25 mA
Pulse					• 0 to 12.5 kHz
Frequency	• Frequency				• 0 to 12.5 kHz
Status					• 0 (low) or 1 (high)

Process value simulation

The following process values can be simulated:

- Mass flow
- Volume flow
- Standard Volume flow

- Density
- Process Media Temperature
- Fraction A %
- Fraction B %

Enabling simulation for the process values sets the simulated value for all outputs.

Alarm simulation

It is possible to simulate either specific alarms (ID numbers) or alarm classes. The alarm classes are either Siemens or NAMUR depending on the configuration of Alarm Mode, menu item 2.8.11.

Any simulated alarms will be time-stamped 1900-01-01 00:00 if the alarms have not previously appeared as real alarms. Any real alarms will be time-stamped with the actual date and time of each alarm occurrence.

All alarms mentioned in Diagnostics and troubleshooting (Page 167) can be simulated; except ID 51 (Malfunction in Pickup Amplitude) and ID 165 (Ref. density simulated).

8.2.16 Maintenance

- Set date and time
 The device has a built-in real-time clock used for time stamps of various events (for example alarms and configuration changes). The date and time can be set in menu item 2.7.2.
- Factory reset
 The device can be reset to its default settings in menu item 3.11.1.
- Device restart

 The device can be restarted without disconnecting the power in menu item 3.11.2.

8.2 Functions

Service and maintenance

9.1 Basic safety notes

Note

The device is maintenance-free.

The device is maintenance-free. However, a periodic inspection according to pertinent directives and regulations must be carried out.

An inspection can include, for example, check of:

- Ambient conditions
- Seal integrity of the process connections, cable entries, and cover
- Reliability of power supply, lightning protection, and grounds



WARNING

Dust layers above 5 mm

Risk of explosion in hazardous areas.

Device may overheat due to dust build up.

Remove dust layers in excess of 5 mm.



WARNING

Leaks in the sample gas path

Risk of poisoning.

When measuring toxic process media, these can be released or collect in the device if there are leaks in the sample gas path.

- Purge the device as described in Commissioning (Page 81).
- Dispose of the toxic process media displaced by purging in an environmentally friendly manner.



⚠ WARNING

Use of a computer in a hazardous area

If the interface to the computer is used in the hazardous area, there is a risk of explosion.

• Ensure that the atmosphere is explosion-free (hot work permit).

9.3 Cleaning



A CAUTION

Releasing button lock

Improper modification of parameters could influence process safety.

Make sure that only authorized personnel may cancel the button locking of devices for safety-related applications.

NOTICE

Penetration of moisture into the device

Device damage.

Make sure when carrying out cleaning and maintenance work that no moisture penetrates the inside of the device.

9.2 Recalibration

Siemens S.A.S. Flow Instruments offers to recalibrate the sensor at our works in France. The following calibration types are offered as standard according to configuration:

- Standard calibration
- Density calibration

Note

SensorFlash

For sensor recalibration the SensorFlash memory unit must always be returned with the sensor.

Cleaning 9.3

Cleaning the enclosure

- Clean the outside of the enclosure with the inscriptions and the display window using a cloth moistened with water or a mild detergent.
- Do not use any aggressive cleansing agents or solvents, e.g. acetone. Plastic parts or the painted surface could be damaged. The inscriptions could become unreadable.



WARNING

Electrostatic charge

Risk of explosion in hazardous areas if electrostatic charges develop, for example, when cleaning plastic surfaces with a dry cloth.

Prevent electrostatic charging in hazardous areas.

Maintenance and repair work 9.4

The device is maintenance-free. However, a periodic inspection according to pertinent directives and regulations must be carried out.

An inspection can include check of:

- Ambient conditions
- Seal integrity of the process connections, cable entries, and cover screws
- Reliability of power supply, lightning protection, and grounds

NOTICE

Repair and service must be carried out by Siemens authorized personnel only.

Note

Siemens defines flow sensors as non-repairable products.



WARNING

Impermissible repair of the device

Repair must be carried out by Siemens authorized personnel only.



WARNING

Impermissible repair and maintenance of the device

Repair and maintenance must be carried out by Siemens authorized personnel only.



WARNING

Impermissible repair of explosion protected devices

Risk of explosion in hazardous areas

Repair must be carried out by Siemens authorized personnel only.

9.4 Maintenance and repair work



MARNING

Maintenance during continued operation in a hazardous area

There is a risk of explosion when carrying out repairs and maintenance on the device in a hazardous area.

- Isolate the device from power.
- or -
- Ensure that the atmosphere is explosion-free (hot work permit).



MARNING

Impermissible accessories and spare parts

Risk of explosion in areas subject to explosion hazard.

- Only use original accessories or original spare parts.
- Observe all relevant installation and safety instructions described in the instructions for the device or enclosed with the accessory or spare part.



WARNING

Humid environment

Risk of electric shock.

- Avoid working on the device when it is energized.
- If working on an energized device is necessary, ensure that the environment is dry.
- Make sure when carrying out cleaning and maintenance work that no moisture penetrates the inside of the device.



CAUTION

Hot surfaces

Risk of burns during maintenance work on parts having surface temperatures exceeding 70 °C (158 °F).

- Take corresponding protective measures, for example by wearing protective gloves.
- After carrying out maintenance, remount touch protection measures.



CAUTION

Hot parts in the device

Temperatures that can burn unprotected skin may be present for some time after the device has been switched off.

Observe the waiting time specified in Technical data (Page 195) or on the device before starting with maintenance work.



WARNING

Enclosure open

Risk of explosion in hazardous areas as a result of hot components and/or charged capacitors inside the device.

To open the device in a hazardous area:

- 1. Isolate the device from power.
- 2. Observe the wait time specified in Technical data (Page 195) or on the warning sign before opening the device.
- 3. Visually inspect sensor inlet and outlet.

Exception: Devices exclusively having the type of protection "Intrinsic safety Ex i" may be opened in an energized state in hazardous areas.



CAUTION

Hazardous voltage at open device

Risk of electric shock when the enclosure is opened or enclosure parts are removed.

- Before you open the enclosure or remove enclosure parts, de-energize the device.
- If maintenance measures in an energized state are necessary, observe the particular precautionary measures. Have maintenance work carried out by qualified personnel.



WARNING

Hot, toxic or corrosive process media

Risk of injury during maintenance work.

When working on the process connection, hot, toxic or corrosive process media could be released.

- As long as the device is under pressure, do not loosen process connections and do not remove any parts that are pressurized.
- Before opening or removing the device ensure that process media cannot be released.



WARNING

Improper connection after maintenance

Risk of explosion in areas subject to explosion hazard.

- Connect the device correctly after maintenance.
- Close the device after maintenance work.

Refer to Cable requirements (Page 61).

9.4 Maintenance and repair work

Maintenance information parameters

The basic maintenance information parameters are:

- Current Date and Time
- Operating Time Total
- · Operating Time
- Configuration Counter
- Transmitter Hardware Revision
- HMI Hardware Revision
- Sensor Hardware Revision

9.4.1 Service information

Service information is information about the condition of the device used for diagnostics and service purposes.

Service information parameters

The basic service information parameters are:

- Driver Current
- Pickup 1 Amplitude
- Pickup 2 Amplitude
- Sensor Frequency
- Frame Temperature
- Process Media Temperature
- Zero Point Adjustment Auto/Manual
- Zero Point Offset Value
- Manual Zero Point
- Zero Point Standard Deviation

9.5 Replacing the device



CAUTION

Corrosive substances

Risk of chemical burns when replacing the sensor.

The sensor in the device contains corrosive substances that result in burns on unprotected skin.

- Make sure that the sensor enclosure is not damaged when replacing the sensor.
- If contact with the corrosive substances occurs, rinse the affected skin immediately with large amount of water to dilute substance.

9.6 Ordering of spare parts

Ensure that your ordering data is not outdated. The latest ordering data is always available on the Internet: Catalog process instrumentation (http://www.siemens.com/ processinstrumentation/catalogs)

9.7 Return procedure

Enclose the bill of lading, return document and decontamination certificate in a clear plastic pouch and attach it firmly to the outside of the packaging.

Required forms

- Delivery note
- Return goods delivery note (http://www.siemens.com/processinstrumentation/returngoodsnote)

with the following information:

- Product (item description)
- Number of returned devices/replacement parts
- Reason for returning the item(s)
- Decontamination declaration (http://www.siemens.com/sc/declarationofdecontamination)
 With this declaration you warrant "that the device/replacement part has been carefully cleaned and is free of residues. The device/replacement part does not pose a hazard for humans and the environment."

If the returned device/replacement part has come into contact with poisonous, corrosive, flammable or water-contaminating substances, you must thoroughly clean and decontaminate the device/replacement part before returning it in order to ensure that all hollow areas are free from hazardous substances. Check the item after it has been cleaned. Any devices/replacement parts returned without a decontamination declaration will be cleaned at your expense before further processing.

9.8 Disposal



Devices described in this manual should be recycled. They may not be disposed of in the municipal waste disposal services according to the Directive 2012/19/EC on waste electronic and electrical equipment (WEEE).

Devices can be returned to the supplier within the EC, or to a locally approved disposal service for eco-friendly recycling. Observe the specific regulations valid in your country.

Further information about devices containing batteries can be found at: Information about battery / product return (WEEE) (https://support.industry.siemens.com/cs/document/109479891/)

Note

Special disposal required

The device includes components that require special disposal.

 Dispose of the device properly and environmentally through a local waste disposal contractor.

9.9 Ex-approved products

Note

Repair of Ex-approved products

It is the customer's responsibility that repair of Ex-approved products fulfill national requirements.

Diagnostics and troubleshooting 10

10.1 Device status symbols

Device status is shown using symbols and text on the local display. Additionally, the symbol and respective text message for each device status can be seen in remote engineering, asset management or process control systems.

Messages are shown on the display.

- In the operation view, alarms are shown as a combination of symbol and text in the lower line
 of the display. If several diagnostic messages are active at the same time, the most critical
 is shown.
- In the alarm list view all active alarms are shown as a list. The alarm list combines a symbol, text and an alarm ID number. The alarms are arranged according to the alarm ID numbers. The alarm list view can also be accessed via parameter "Active diagnostic events" (menu item 3.2.1).
- In the alarm history view the most recent alarms (up to 100) are listed. The alarm history log can be viewed in parameter "Diagnostic log" (menu item 3.2.2). The alarm history log can be reset in parameter "Clear diagnostic log" (menu item 3.2.3).

Device status characteristics

The following table provides possible cause of device status, and actions for the user or service.

The device provides two types of alarm formats; symbols used on the local display are based on NAMUR status signals or Siemens standard alarm classes, selected in parameter "Status icons" (menu item 2.8.11).

In SIMATIC PDM, symbols are based on Siemens standard alarm classes.

Note

Device status priority conflict - Namur vs Siemens standard

When more than one diagnostic event is active simultaneously, a conflict in priorities may arise. In this case, the Namur symbol on the local display will differ from that shown in SIMATIC PDM.

Be aware of the priority for each device status, depending on the interface used.

Device status symbols

Local dis	splay R NE 107		NAMUR - HCF	Local dis	play s standard		SIMATIC PDM/PLC		
Symbol	Device status	Priority *	Priority *	Symbol	Device status	Priority **	Symbol	Device status	Priority **
×	Failure	1	1	: Y	Mainte- nance alarm	1		Maintenance alarm	1
	Output signal Maintenance				vice or in the	peripherals			
	Mainte- nance re- quired	3	4	:Y	Mainte- nance de- manded	2	.	Maintenance demanded	2
					almost exhaun as possible		a function	will be limited so	on.
\$ T->	Mainte- nance re- quired	3	4	.¥	Mainte- nance re- quired	3	-3	Maintenance required	3
	Dutput signal Naintenance				tion detected	but end of v	vear reserv	ve expected in ne	ext weeks.
	Function check	2	2	I (h)	Manual operation	4	: 23	Manual operation	4
	Dutput signal Disable manu			-	due to work b	eing perforn	ned on the	device.	
W	Function check	2	2	=(^b)	Simula- tion or substitute value	5	: <u>%</u>	Simulation or substitute value	5
				•		-		on a simulation va	alue.
	Out of specifica-	4	3	i ‡	Process value	8	i ‡	Process value alarm	8

Cause: Deviations from permissible ambient or process conditions detected by the device (through self-monitoring, or warnings / faults in the device) indicate that the measured value is unreliable or deviations from the set value in the actuators is most likely greater than anticipated under normal operating conditions. Process or ambient conditions will damage the device or result in unreliable output.

alarm

Action: Check ambient temperature or process conditions. If possible, install device at different location.

Local display - NAMUR NE 107			NAMUR - HCF	Local disp	•		SIMATIC PDM/PLC		
Symbol	Device status	Priority *	Priority *	Symbol	Device status	Priority **	Symbol	Device status	Priority **
?	Out of specification	4	3	:‡	Process value warning	10	:	Process value warning	10

Cause: Deviations from permissible ambient or process conditions detected by the device (through self-monitoring, or warnings / faults in the device) indicate that the measured value is unreliable or deviations from the set value in the actuators is most likely greater than anticipated under normal operating conditions. Process or ambient conditions can damage the device or result in unreliable output.

Action: Check ambient temperature or process conditions. If possible, install device at different location.

no sym-		±	Process	11	<u>.</u>	Process value	11
bol		- T	value tol-		*	tolerance	
shown			erance				

Cause: At least one process value has exceeded or fallen below a process tolerance limit parameter set in device.

Action: Check that limit parameter settings are suitable for application.

no sym-		no sym-	Configura-	12	no sym-	Configuration	12
bol		bol	tion		bol	changed	
shown		shown	changed		shown		

Cause: The device configuration has changed due to a work process.

Action: Reset configuration flag to clear diagnostic message.

no sym-	Good - OK		no sym-	no assign-	13	no sym-	no assignment	13	
bol			bol	ment		bol			
shown			shown			shown			

Cause: Device status ok. No active diagnostic errors.

Action: No action required.

Messages are shown in the display.

- In the operation view the alarms are shown as a combination of symbol and text in the lower line of the display. If several diagnostic messages are active at the same time, the most critical is shown.
- In the alarm list view all active alarms are shown as a list. The alarm list combines a symbol, text and an alarm ID number. The alarms are arranged according to the alarm ID numbers. The alarm list view can also be accessed via **Active diagnostic events**.
- In the alarm history view the most recent alarms (up to 100) are listed. The alarm history log can be viewed in **Diagnostic log**. The alarm history log can be reset in **Reset log**.

^{*} Lowest priority number equals highest fault severity.

^{**} Both the Siemens standard symbol and its corresponding Namur symbol (from device display) will be shown in SIMATIC PDM.

10.1 Device status symbols

Characteristics of messages

The device provides two types of alarm formats, Siemens standard alarm classes and NAMUR status signals, selected in **Status icons**.

The following tables summarize the two types of alarm formats in an overview.

The sequence of the symbols corresponds to the priority of the messages, beginning with the most critical.

Siemens standard alarm classes

Icon	Priority level	Name	Description
:0	1	Maintenance failure	Maintenance alarm: maintenance demanded immediately
			Measurement values are not valid
:V	5	Maintenance warning	Maintenance warning
			Measured signal still valid
٠,٧	6	Maintenance required	Maintenance required
• •			Measured signal still valid
! ≢	3	Process value alarm	Process value has reached an alarm limit
: ‡	4	Process value warning	Process value has reached a warning limit
	2	Function check	Change of configuration, local operation, or substitute value entered
			Output signals are temporarily invalid

NAMUR status signals

Icon	Priority level	Name	Description
×	1	Failure	FailureInvalid output signal
?	3	Out of specification	 Out of specification Device will still work, but output signals may be invalid
	4	Maintenance required	Maintenance request Measured signal still valid
W	2	Function check	Function checkOutput signal temporarily invalid

Info icons

Icon	Name	Description
0	Read only	Write access disabledIndicate read only parameters
#	Data exchange	Device is communicating
CT	Custody transfer enabled	N/A
	Memory card	Capacity is 25 % used
	Memory card	Capacity is 50 % used
	Memory card	Capacity is 75 % used
	Memory card	Capacity is 100 % used

10.2 Fault codes and corrective actions

10.2.1 Sensor diagnostics

ID	Icons	Message	Cause/Action
36	P	Sensor supply volt. out of range	Contact your local Siemens representative.
	(X)		
37	1	Sensor supply volt. out of range	Contact your local Siemens representative.
	×		
38	P	Temperature measure- ment fault	Turn off the power, wait 5 seconds and turn on the power again. If the problem persists, contact your local Siemens representative.
	X		representative.

ID	Icons	Message	Cause/Action
39		Temperature measurement fault	Turn off the power, wait 5 seconds and turn on the power again. If the problem persists, contact your local Siemens representative.
40		Temperature measure- ment fault	Turn off the power, wait 5 seconds and turn on the power again. If the problem persists, contact your local Siemens representative.
41		Temperature measure- ment fault	Turn off the power, wait 5 seconds and turn on the power again. If the problem persists, contact your local Siemens representative.
42	!	Flow values not valid	Can be due to problems with measured fluid or hardware malfunction. If the problem persists, contact your local Siemens representative.
43	!	Flow values not valid	Can be due to problems with measured fluid or hardware malfunction. If the problem persists, contact your local Siemens representative.
44	!	Flow values not valid	Can be due to problems with measured fluid or hardware malfunction. If the problem persists, contact your local Siemens representative.
45	!	Flow values not valid	Can be due to problems with measured fluid or hardware malfunction. If the problem persists, contact your local Siemens representative.
46		Invalid calibration data	Contact your local Siemens representative for recalibration.
47		Invalid compensation data	Contact your local Siemens representative.

ID	Icons	Message	Cause/Action
49		Malfunction in Pickup Amplitude	Contact your local Siemens representative.
50		Malfunction in Pickup Amplitude	Contact your local Siemens representative.
55		Malfunction in sensor driver	Contact your local Siemens representative.
56		Malfunction in sensor driver	Contact your local Siemens representative.
57		Malfunction in sensor driver	Contact your local Siemens representative.
58		Unstable driver oscillation	Contact your local Siemens representative.
59	!	Mass flow out of specification	Reduce the flow. If the problem persists, contact your local Siemens representative.
60	!	Volume flow out of specification	Reduce the flow. If the problem persists, contact your local Siemens representative.
61	!	Density out of specification	Contact your local Siemens representative.

ID	Icons	Message	Cause/Action
62	!	Fluid temp. below limit	Increase the fluid temperature. If the problem persists, contact your local Siemens representative.
63	!	Fluid temp. above limit	Reduce the fluid temperature. If the problem persists, contact your local Siemens representative.
64	!	Frame temp. below limit	Increase fluid temperature and check that ambient temperature is within specified limits. If the problem persists, contact your local Siemens representative.
65	!	Frame temp. above limit	Reduce fluid temperature and check that ambient temperature is within specified limits. If the problem persists, contact your local Siemens representative.
66	: ‡	Standard Deviation above limit	Measurement continues with values from last successful zero point adjustment. Improve conditions for automatic zero point adjustment and repeat adjustment.
67	: ‡	Zero Point Offset above limit	Measurement continues with values from last successful zero point adjustment. Improve conditions for automatic zero point adjustment and repeat adjustment.
68	: ‡	Zero point adjustment failed	Measurement continues with values from last successful zero point adjustment. Improve conditions for automatic zero point adjustment and repeat adjustment.
69	♣	Empty Tube Limit' exceeded	Make sure that the sensor is filled with liquid and that the liquid density is within the specified 'Empty Tube Limit'.
70	!	Too little fluid in tube	Make sure that the sensor is filled with liquid.

ID	Icons	Message	Cause/Action
71		Parameter storage mal- function	Turn off the power, wait 5 seconds and turn on the power again. If the problem persists, contact your local Siemens representative.
72		Internal error in sensor	Contact your local Siemens representative.
73		Internal error in sensor	Contact your local Siemens representative.
74		Internal error in sensor	Contact your local Siemens representative.
75		Internal error in sensor	Contact your local Siemens representative
76		Internal error in sensor	Contact your local Siemens representative.
77		Internal error in sensor	Contact your local Siemens representative.
78	:‡	Unstable measurement condition	Check if air is present in the liquid and that the flowmeter is operated within its specifications.

ID	Icons	Message	Cause/Action
79	: ‡	Auto filtering	Check that the flowmeter is operated within its specifications. Check other alarms to rule out HW malfunction.
87		Sensor startup	Unplug and reconnect the sensor cable. If the diagnostic persists after the specified startup time, restart the device. If the problem persists, contact Technical Support.

10.2.2 Transmitter diagnostics

ID	Icons	Message	Cause/Action
96	!	Mass flow above alarm limit	Check process conditions. Adjust the parameter value 'Upper alarm limit' to normal process conditions.
97	: ? 	Mass flow above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.
98	: \$	Mass flow below warning limit	Check process conditions. Adjust parameter value 'Lower warning limit' to normal process conditions.
99	!	Mass flow below alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.
100	!	Volume flow above alarm limit	Check process conditions. Adjust parameter value 'Upper alarm limit' to normal process conditions.
101	:?	Volume flow above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.

ID	Icons	Message	Cause/Action
102	:?	Volume flow below warning limit	Check process conditions. Adjust the parameter value 'Lower warning limit' to normal process conditions.
103	!	Volume flow below alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.
104	!	Density above alarm limit	Check process conditions. Adjust the parameter value 'Upper alarm limit' to normal process conditions.
105	:?	Density above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.
106	:‡	Density below warning limit	Check process conditions. Adjust the parameter value 'Lower warning limit' to normal process conditions.
107	!	Density below alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.
108	!	Medium temperature above alarm limit	Check process conditions. Adjust the parameter value 'Upper alarm limit' to normal process conditions.
109	: ‡	Medium temperature above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.
110	:?	Medium temperature be- low warning limit	Check process conditions. Adjust the parameter value 'Lower warning limit' to normal process conditions.

ID	Icons	Message	Cause/Action
111	?	Medium temperature below alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.
112	1	Fraction A % above alarm limit	Check process conditions. Adjust the parameter value 'Upper alarm limit' to normal process conditions.
113	:‡	Fraction A % above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.
114	: ‡	Fraction A % below warning limit	Check process conditions. Adjust the parameter value 'Lower warning limit' to normal process conditions.
115	!	Fraction A % below alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.
116	!	Fraction B % above alarm limit	Check process conditions. Adjust the parameter value 'Upper alarm limit' to normal process conditions.
117	: ? 	Fraction B % above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.
118	:‡	Fraction B % below warning limit	Check process conditions. Adjust the parameter value 'Lower warning limit' to normal process conditions.
119	!	Fraction B % below alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.

ID	Icons	Message	Cause/Action
120	!	Fraction A above alarm limit	Check process conditions. Adjust the parameter value 'Upper alarm limit' to normal process conditions.
121	:‡	Fraction A above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.
122	÷	Fraction A below warning limit	Check process conditions. Adjust the parameter value 'Lower warning limit' to normal process conditions.
123	!	Fraction A below alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.
124	!	Fraction B above alarm limit	Check process conditions. Adjust the parameter value 'Upper alarm limit' to normal process conditions.
125	:‡ ⚠	Fraction B above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.
126	÷	Fraction B below warning limit	Check process conditions. Adjust the parameter value 'Lower warning limit' to normal process conditions.
127	!	Fraction B below alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.
128	!	Standard density above alarm limit	Check process conditions. Adjust the parameter value 'Upper alarm limit' to normal process conditions.

ID	Icons	Message	Cause/Action
129	:‡	Standard density above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.
130	: ‡	Standard density below warning limit	Check process conditions. Adjust the parameter value 'Lower warning limit' to normal process conditions.
131	!	Standard density below alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.
132	!	Standard volume flow above alarm limit	Check process conditions. Adjust the parameter value 'Upper alarm limit' to normal process conditions.
133	: ‡	Standard volume flow above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.
134	: ‡	Standard volume flow below warning limit	Check process conditions. Adjust the parameter value 'Lower warning limit' to normal process conditions.
135	!	Standard volume flow be- low alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.
136	!	Totalizer 1 above alarm limit	Check process conditions. Adjust the parameter value 'Upper alarm limit' to normal process conditions.
137	÷	Totalizer 1 above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.

ID	Icons	Message	Cause/Action
138	:‡ ⚠	Totalizer 1 below warning limit	Check process conditions. Adjust the parameter value 'Lower warning limit' to normal process conditions.
139	!	Totalizer 1 below alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.
140	!	Totalizer 2 above alarm limit	Check process conditions. Adjust the parameter value 'Upper alarm limit' to normal process conditions.
141	:‡ ⚠	Totalizer 2 above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.
142	: ♣	Totalizer 2 below warning limit	Check process conditions. Adjust the parameter value 'Lower warning limit' to normal process conditions.
143	!	Totalizer 2 below alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.
144	!	Totalizer 3 above alarm limit	Check process conditions. Adjust the parameter value 'Upper alarm limit' to normal process conditions.
145	:‡	Totalizer 3 above warning limit	Check process conditions. Adjust the parameter value 'Upper warning limit' to normal process conditions.
146	:‡	Totalizer 3 below warning limit	Check process conditions. Adjust the parameter value 'Lower warning limit' to normal process conditions.

ID	Icons	Message	Cause/Action
147	!	Totalizer 3 below alarm limit	Check process conditions. Adjust the parameter value 'Lower alarm limit' to normal process conditions.
148	!	Transmitter electronics temperature too high	Decrease the ambient temperature. If possible, reposition the device in a different location. Inspect the device for heat-related damages.
149	!	Transmitter electronics temperature too low	Increase the ambient temperature. If possible, reposition the device in a different location. Inspect the device for cold-related damages.
150		Sensor signal disrupted	Turn off the power. Unplug and reconnect the sensor cable. If the error still exists, contact your local Siemens representative.
151		SensorFlash parameter backup disabled	A SensorFlash of another device has been inserted. Either copy the settings from the SensorFlash to the device or remove this SensorFlash and insert the original SensorFlash.
152		SensorFlash parameter backup disabled	A SensorFlash of another device has been inserted. Either copy the settings from the SensorFlash to the device or remove this SensorFlash and insert the original SensorFlash.
153	!	CH1 loop current in lower saturation	The process value is so low that the loop current reaches the lower saturation limit and cannot decrease any further. Check process conditions. Adjust parameter value 'Lower range value'.
154	!	CH1 loop current in upper saturation	The process value is so high that the loop current reaches the upper saturation limit and cannot increase any further. Check process conditions. Adjust parameter value 'Upper range value'.
155		CH1 loop current error	Invalid loop current deviation detected. Check current output cable connection. Passive operation: check external power supply.

ID	Icons	Message	Cause/Action
158		CH1 cable break	Check current output cable connection. Passive operation: check external power supply.
159		Internal error	Internal error in transmitter. Turn off the power, wait 5 seconds and turn on the power again. If the error still exists, contact your local Siemens representative.
160	: <u></u>	Mass flow simulated	Disable the simulation to return to normal operation.
161	₽	Volume flow simulated	Disable the simulation to return to normal operation.
162	: ∱	Density simulated	Disable the simulation to return to normal operation.
164	: ∱	Fraction simulated	Disable the simulation to return to normal operation.
165	: <u></u>	Standard density simulated	Disable the simulation to return to normal operation.
166	• <u>•</u> •	Standard volume flow simulated	Disable the simulation to return to normal operation.
167	: ∱	Totalizer 1 simulated	Disable the simulation to return to normal operation.

ID	Icons	Message	Cause/Action
168	₩	Totalizer 2 simulated	Disable the simulation to return to normal operation.
169	: <u></u> ;	Totalizer 3 simulated	Disable the simulation to return to normal operation.
170	:(h)	Loop current simulated	Disable the simulation to return to normal operation.
172		Transmitter firmware incompatible	The component does not have the expected firmware version. Update the product firmware or replace the component.
173		Sensor firmware incompatible	The component does not have the expected firmware version. Update the product firmware or replace the component.
174		Firmware local operation incompatible	The component does not have the expected firmware version. Update the product firmware or replace the component.
175		I/O firmware incompatible	The component does not have the expected firmware version. Update the product firmware or replace the component.
177		Device startup	Wait until the startup is finished. The startup time is specified in the operating instructions. If the diagnostic persists after the specified startup time, restart the device. If the problem persists, contact Technical Support.
178		Transmitter firmware incompatible	The component does not have the expected firmware version. Update the product firmware or replace the component.

ID	Icons	Message	Cause/Action
179	Icons de- pend- ing on simula- tion	Alarm class simulated	Disable the simulation to return to normal operation.
180		Internal error in transmitter	Restart the device. If the problem persists, replace the component.
181		SensorFlash error	Replace the SensorFlash.
182		Transmitter firmware incompatible	The component does not have the expected firmware version. Update the product firmware or replace the component.
192	!	Dosing monitoring time exceeded	Check the dosing system. If it is ok, increase the parameter value 'Duration time'.
193	!	Dosing overrun limit exceeded	Check the dosing system. If it is ok, increase the parameter value 'Overrun value'.
194	!	Dosing possibly inaccurate	Invalid process value during dosing. For further information, check the diagnostic log.
195	!	CH2 loop current in lower saturation	The process value is so low that the loop current reaches the lower saturation limit and cannot decrease any further. Check process conditions. Adjust parameter value 'Lower range value'.
196	!	CH2 loop current in upper saturation	The process value is so high that the loop current reaches the upper saturation limit and cannot increase any further. Check process conditions. Adjust parameter value 'Upper range value'.

ID	Icons	Message	Cause/Action
197		CH2 cable break	Check current output cable connection. Passive operation: check external power supply.
198	!	CH2 output frequency too low	The process value is below the parameter 'Lower range value'. The output frequency cannot decrease any further. Check process conditions. Adjust parameter value 'Lower range value'.
199	!	CH2 output frequency too high	The process value is above the parameter 'Upper range value'. The output frequency cannot increase any further. Check process conditions. Adjust parameter value 'Upper range value'.
200	!	CH2 pulse overflow	Pulse output has insufficient pulse separation. Increase Amount per pulse, or reduce Pulse width, or reduce Pulses per amount.
201	!	CH3 loop current in lower saturation	The process value is so low that the loop current reaches the lower saturation limit and cannot decrease any further. Check process conditions. Adjust parameter value 'Lower range value'.
202	!	CH3 loop current in upper saturation	The process value is so high that the loop current reaches the upper saturation limit and cannot increase any further. Check process conditions. Adjust parameter value 'Upper range value'.
203		CH3 cable break	Check current output cable connection. Passive operation: check external power supply.
204	!	CH3 output frequency too low	The process value is below the parameter 'Lower range value'. The output frequency cannot decrease any further. Check process conditions. Adjust parameter value 'Lower range value'.
205	!	CH3 output frequency too high	The process value is above the parameter 'Upper range value'. The output frequency cannot increase any further. Check process conditions. Adjust parameter value 'Upper range value'.

ID	Icons	Message	Cause/Action
206	1	CH3 pulse overflow	Pulse output has insufficient pulse separation. Increase Amount per pulse, or reduce Pulse width, or reduce Pulses per amount.
207	!	CH4 loop current in lower saturation	The process value is so low that the loop current reaches the lower saturation limit and cannot decrease any further. Check process conditions. Adjust parameter value 'Lower range value'.
208	!	CH4 loop current in upper saturation	The process value is so high that the loop current reaches the upper saturation limit and cannot increase any further. Check process conditions. Adjust parameter value 'Upper range value'.
209		CH4 cable break	Check current output cable connection. Passive operation: check external power supply.
210	!	CH4 output frequency too low	The process value is below the parameter 'Lower range value'. The output frequency cannot decrease any further. Check process conditions. Adjust parameter value 'Lower range value'.
211	!	CH4 output frequency too high	The process value is above the parameter 'Upper range value'. The output frequency cannot increase any further. Check process conditions. Adjust parameter value 'Upper range value'.
212	!	CH3 pulse overflow	Pulse output has insufficient pulse separation. Increase Amount per pulse, or reduce Pulse width, or reduce Pulses per amount.
213	• • ••	Invalid dosing settings	Correct settings.
214	• • ••	CH2 simulated	Disable the simulation to return to normal operation.

ID	Icons	Message	Cause/Action
215	•	CH3 simulated	Disable the simulation to return to normal operation.
216	· · ·	CH4 simulated	Disable the simulation to return to normal operation.
217	: ∱)	Process values frozen	Freezing of the process values is enabled either via a digital input or the fieldbus. Disable the freezing of the process values to return to normal operation.
218	: ∱	Output channels forced	Forcing is enabled either via a digital input or the fieldbus. Disable forcing to return to normal operation.
219		CH2 loop current error	Invalid loop current deviation detected. Check current output cable connection. Passive operation: check external power supply.
220		CH3 loop current error	Invalid loop current deviation detected. Check current output cable connection. Passive operation: check external power supply.
221		CH4 loop current error	Invalid loop current deviation detected. Check current output cable connection. Passive operation: check external power supply.
222		Invalid Modbus register mapping	At least one source register has been used multiple times. Correct the register mapping.
223		Invalid Modbus coil configuration	A coil has multiple assignments. Correct the coil configurations.

ID	Icons	Message	Cause/Action
285	.¥	Data logging, < 30 days remaining	Low available memory, which is full in 30 days at the latest. Save logged data and free up memory space on the SensorFlash. Increase the parameter value 'Logging interval.
286	· · ·	Data logging, < 7 days remaining	Low available memory, which is full in 7 days at the latest. Save logged data and free up memory space on the SensorFlash. Increase the parameter value 'Logging interval.
287	: ₽	Data logging memory full	Save logged data and free up memory space on the SensorFlash.
288	• • ••	Sensor frame temperature simulated	Disable the simulation to return to normal operation.

10.3 Operation troubleshooting

10.3.1 Copying the application setup from one device to another

- 1. Remove the SensorFlash from the source device and insert the SensorFlash into the destination device. The destination device disables the backup and signals an alarm.
- 2. Enter "Copy configuration" (menu item 1.8), select "OK" and press to execute the copying. All application setup parameters are moved from the SensorFlash to the device. Backup is still disabled and alarm signaled.
- 3. Remove the SensorFlash from the destination device and insert the original SensorFlash. The device synchronizes the parameters to the SensorFlash. The alarm is cleared.

10.3.2 Updating the firmware

- 1. Download the new firmware bundle from www.siemens.com/FC330 (www.siemens.com/FC330 (www
- 2. Access the flowmeter with access level Expert (the default PIN code is 2834).
- 3. Enter "Firmware update" (menu item 3.12), select the saved firmware bundle version and press . The firmware update progress is shown on the display.

10.3 Operation troubleshooting

Note

Firmware update

FW update is to be done only by authorized and trained service personnel.

10.3.3 Troubleshooting sensor-related problems

Incorrect and unstable measurements, especially at low flows, are typically a result of an unstable zero point due to:

- Incorrect installation
- Bubbles in the liquid
- Vibrations or cross talk
- Solid particles settling in the liquid

Follow the 4-step guide to troubleshooting:

Step 1	Preliminary application inspection (Page 190)
Step 2	Zero point adjustment (Page 190)
Step 3	Measurement error calculation (Page 190)
Step 4	Application improvement (Page 190)

The guide enables you to trace the reason for incorrect measurements and to improve the application.

Step 1: Inspecting the application

Ensure that:

- 1. The sensor is installed as described in Installing/mounting (Page 37).
- 2. The sensor is located in a vibration-free position. Vibrations can disturb the sensor and therefore cause measurement error.

Depending on application, you should furthermore ensure the following:

Liquid application

Ensure that the sensor is filled with liquid and liquid only.

Air or gas bubbles in the liquid cause instability and can result in measurement errors. Flush the pipe systems and the sensor for several minutes at maximum flowrate to remove any air bubbles which may be present.

Note

The liquid must be homogeneous in order to measure with high accuracy. If the liquid contains solid particles of greater density than the liquid, then these solids can settle, especially at low flow rates, which will cause instability in the sensor and lead to measurement errors.

For pastes or process fluids with suspended solids always orient the sensor vertically with flow in upward direction to maintain solids suspension.

Gas application

Ensure that the gas pressure/temperature conditions contain sufficient superheat to prevent dewing or precipitation. If the gas contains vapor or droplets then these may precipitate, causing instability.

Step 2: Performing a zero point adjustment

The second step in the troubleshooting procedure is to zero point adjust the device. For further information on zero point adjustment, see Commissioning (Page 81).

Step 3: Calculating the measurement error

The result of the zero point adjustment will show you if the zero point was set under good and stable conditions.

The lower the obtained value of the parameter **Zero point standard deviation**, the lower is the achievable measuring error. For a well-installed flowmeter, the Zero point standard deviation corresponds to the specified zero point stability for the sensor size, see Performance (Page 195).

The parameter **Zero point standard deviation** is located in the **Maintenance & Diagnostics** menu in SIMATIC PDM.

Calculating the measurement error

• The error curve is plotted from the formula:

$$E = \pm \sqrt{(Cal)^2 + \left(\frac{z \times 100}{qm}\right)^2}$$

E = Error [%]

Z = Zero point [kg/h]

qm = Mass flow [kg/h]

Cal. = Calibrated flow accuracy: 0.10 or 0.2

10.3 Operation troubleshooting

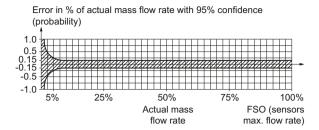


Table 10-1 Reference conditions for flow calibrations (ISO 9104 and DIN/EN 29104)

Flow conditions Fully developed flow profile Temperature, 20 °C ± 2 °C (68 °F ± 3.6 °F)

medium

Temperature, 20 °C ± 2 °C (68 °F ± 3.6 °F)

ambient

Liquid pressure 2 ± 1 bar

Density 0.997 g/cm3

Brix 40 °Brix

Supply voltage Un ± 1 %

Warming-up time 30 min.

Cable length 5 m between transmitter and sensor

Table 10-2 Additions in the event of deviations from reference conditions

Current output As pulse output ± (0.1% of actual flow +0.05 % FSO)

Effect of ambient • Display/frequency/pulse output: < ± 0.003%/K act. ± 3.6 °F)

temperature • Current output: < ± 0.005 %/ K act.

Effect of supply < 0.005 % of measuring value on 1 % alteration voltage

Step 4: Improving the application

In the following it is described how to find the causes of a high Zero point standard deviation and how to improve the installation.

Setting Low flow cut-off

In order to see if the zero point becomes more stable when making changes / adjustments, the Low Mass flow cut-off (MassFlowCutOff) must be set to 0.0 kg/s.

When Low flow cut-off has been set, it is possible to see the instability directly from the mass flow in the online window ("View → Process variables")

This information can be used to troubleshoot. For example, tightening the brackets which hold the sensor, or turning off the pump to check if vibrations from the pump are disturbing the sensor, etc.

Incorrect installation of the sensor

 Has the sensor been correctly installed, that is fastened to the floor / wall or frame with good mounting brackets as shown in the instructions?

Especially for low flowrates, that is flowrates less than 10% of the maximum capacity of the flowmeter, it is important that the sensor is correctly and stably installed.

If the sensor is not correctly fixed in place, the zero point of the sensor will change, leading to measuring errors.

Try to tighten up the sensor brackets to see whether the flow instability is reduced.

Vibrations and cross talk

Vibrations in the pipe system are normally generated by pumps.

Typically, cross talk is generated by two sensors of identical size and positioned in close proximity in the same pipe, or installed on the same rail or frame.

Vibrations / cross talk have a greater or lesser effect upon the zero point stability and therefore also the measurement accuracy.

- 1. Check whether there are vibrations.
 - Turn off the pump and check whether the zero point stability improves, that is if the flowrate fluctuation in kg/h is reduced.
 - If the sensor is disturbed by vibration from the pump or by pressure pulsations, the installation should be improved or the pump should be exchanged, for example to another type.
- 2. Check for cross talk.

Turn off the power to the other flow meter(s) and wait approximately 2 minutes, so the vibrating tubes in the sensor have stopped vibrating. Then check if the zero point stability has improved, that is that the fluctuation in kg/h has been reduced. If this is the case, the sensors disturb one another and the installation should be improved.

Air in the liquid

When air is present in the liquid, the zero point becomes unstable, which leads to a poor measurement accuracy.

Checking for air:

- Check the Driver current (View → Device diagnostics → Advanced diagnostic)
- Check if the Driver current varies more than ±1 mA. If this is the case, it is usually due to the
 presence of air or gas bubbles in the liquid.
- Increase the pressure in the sensor, creating a large back pressure upon the sensor by
 reducing the opening of the outlet valve or by increasing the pump pressure. Thereby the
 size of air bubbles inside the sensor will be minimized. If the Driver Current value increases
 and/or the stability of the Driver current decreases, it is proof that the liquid contains air or
 gas bubbles.

Typical causes of air in the liquid

- The entry pipe and sensor have not been properly filled with liquid.
- The pump cavitates, the rotary speed of the pump is too high in relation to the supply of liquid to the pump.

10.3 Operation troubleshooting

- The flow rate in the pipe is too high, so components sitting in front of the flowmeter can cause cavitation.
- If there is a filter installed before the flowmeter, it may be close to blocking, which also can cause cavitation.
- Liquid flashes to vapor bubbles while passing through partially open valves or orifices.
- The piping on the pump suction side, pump gaskets or the pump itself is not tight. Air gets sucked into the system due to a low pressure on the pump suction side.
- The piping on the pump suction side, pump gaskets or the pump itself is not tight. Air gets sucked into the system due to a low pressure on the pump suction side.

Solid particles in the liquid

If the solid particles in a liquid have a density higher than that of the liquid, they can precipitate inside the sensor and cause instability which leads to a measurement error.

If solid particles are present in the liquid, they must be homogeneously distributed and have similar density as the liquid. Otherwise they can cause relatively large measurement errors.

It is important that the sensor is installed so that solid particles can easily run out of the sensor.

- 1. Ensure that the sensor is installed vertically with an upwards flow.
- 2. Check if solid particles are present in the liquid:

 Take a sample of the liquid, fill a glass and see if the solids precipitate.

Technical data

Note

Device specifications

Siemens makes every attempt to ensure the accuracy of these specifications but reserves the right to change them at any time.

11.1 Power

Table 11-1 Power supply

Description	Specification
Supply voltage	• 100 to 240 V AC, 47 to 63 Hz 30 VA
	• 19,2 - 28,8 V DC 11 W
Environmental conditions:	Transient over voltages up to the levels of overvoltage category II
	Temporary over voltages occurring on mains supply only
	POLLUTION DEGREE 2.
	MAINS AC supply voltage fluctuations up to ±10 % of the nominal voltage.
	Altitude up to 2 000 m
Reverse polarity protection (y / n)	Υ
Galvanic isolation	2500 V AC

11.2 Performance

Table 11-2 Reference conditions

Description	Specification
Process media	Water
Process media temperature	20 °C (68 °F)
Ambient temperature	25 °C (77 °F)
Process media pressure	2 bar (29 psi)
Process media density	0.997 g/cm³ (62.2 lb/ft³)
Reference device orientation	Horizontal installation, tubes down, flow in direction of arrow on casing, see Installing/Mounting (Page 37).

11.2 Performance

Table 11-3 Mass flow accuracy

Specification	Unit	Sensor si	Sensor size				
		DN15	DN25	DN50	DN80	DN100	DN150
Qmin - minimum flowrate	kg/h	70	240	800	2000	4000	6900
	(lb/min)	(2.57)	(8.92)	(29.4)	(73.5)	(146.9)	(253.5)
Qnom - nominal flowrate	kg/h	4500	20500	49000	122000	273000	459200
	(lb/min)	(163.3)	(753.2)	(1800)	(4483)	(10031)	(16873)
Qmax - maximum flowrate	kg/h	8000	35000	90000	250000	520000	860000
	(lb/min)	(294)	(1286)	(3307)	(9186)	(19107)	(31600)
Measuring accuracy for liquids - 0.1% version	%	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1
Measuring accuracy for liquids - 0.2% version	%	±0.2	±0.2	±0.2	±0.2	±0.2	±0.2
Measuring accuracy for gases (additional)	%	±0.4	±0.4	±0.4	±0.4	±0.4	±0.4
Max. zero point stability	kg/h	0.6	2.16	7.2	20.0	41.6	68.8
	(lb/min)	(0.0235)	(0.0792)	(0.264)	(0.735)	(1.628)	(2.528)
Repeatability error	%	±0.05	±0.05	±0.05	±0.05	±0.05	±0.05

Table 11-4 Density accuracy

Specification	Unit	Sensor size					
		DN15	DN25	DN50	DN80	DN100	DN150
Density accuracy - 0.1% version	kg/m³	±2	±2	±2	±2	±2	±2
Density accuracy - 0.2% version	kg/m³	±10	±10	±10	±10	±10	±10
Density repeatability	kg/m³	±0.25	±0.25	±0.25	±0.25	±0.25	±0.25
Density, media pressure effect	kg/m³	no effect	±0.35	±0.27	±0.19	±0.24	±0.45
Density, media temperature effect	kg/m³	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1

Table 11-5 Media temperature accuracy

Specification	Unit	Sensor size					
		DN15	DN25	DN50	DN80	DN100	DN150
Media temperature accuracy	°C	±0.5	±0.5	±0.5	±0.5	±/-0.5	±/-0.5
Media temperature repeatability	°C	±0.25	±0.25	±0.25	±0.25	±/-0.5	±/-0.5

Table 11-6 Additional error by deviations from reference conditions

Specification	Unit	Sensor s	ize				
		DN15	DN25	DN50	DN80	DN100	DN150
Current output		ası	pulse outpu	ut ±(0.1% d	of actual flo	w + 0.05%	FSO)
Effect of process pressure	% of actual flowrate per bar	<-0.002	<-0.013	<-0.01	-0.006	<-0.009	<-0.035

Specification	Unit	Sensor siz	ze				
Effect of ambient temperature: Display/Frequency/Pulse/Communication output:	% / K actual flowrate	<±0.003	<±0.003	<±0.003	<±0.003	<±0.003	<±0.003
Effect of ambient temperature: Current output:	% / K actual flowrate	<±0.005	<±0.005	<±0.005	<±0.005	<±0.005	<±0.005
Effect of power supply fluctuations		<	±0.005% of	f measurin	yalue on	1% alteration	on

11.3 Interface

11.3.1 Modbus interface

Table 11-7 Modbus communication

Description	Specification
Protocol version	Modbus RTU
Default transmission rate	19200 bit/s
Default parity	Even
Default device address	1

11.3.2 HART interface

Table 11-8 HART communication

Description	Specification
HART revision	7.5

PROFIBUS interface

Table 11-9 Profibus DP/PA

Description	Specification
Profile version	V4.0 - compatible with version 3
Default transmission rate	Automatic baud rate detection

11.4 Inputs

Table 11-10 Digital input

Description	Channels 3 to 4
Load	15 to 30 VDC, R _{in} 7 kOhm
Functionality	Start/stop/hold/continue dosing
	Reset totalizer 1, 2 or 3
	Reset all totalizers
	Freeze output

11.5 Outputs

Table 11-11 Current output (Channel 1)

Description	Channel 1				
Signal range	4 to 20 mA	4 to 20 mA			
Resolution	0.4 μΑ				
Load	• Ex i: <470 Ω (HART ≥ 230 Ω)				
	• Non-Ex: <770 Ω (HART ≥ 230	Ω)			
Time constant (adjustable)	0.0 to 100 s				
Fault current	4 - 20 NAMUR	4 - 20 US			
Measurement range (mA)	3.8 - 20.5	4.0 - 20.8			
Lower fault current (mA)	3.5	3.75			
Upper fault current (mA)	22.6				
Customized fail-safe mode	Last reliable value				
	Lower fault current	Lower fault current			
	Upper fault current				
	Fail-safe value				
	Current value				
Galvanic isolation	All inputs and outputs are galvanically isolated PELV circuits with 60 V DC isolation from each other and ground. Maximum test voltage: 500 V AC				
Cable	Standard industrial signal cable with up to 3 twisted pairs with overall screen can be connected between the transmitter and the control system. Individual pair or overall screen is optional depending on user requirements.				
Voltage range	Max. 24 V DC (active) 14 to 30 V DC (passive)	Max. 24 V DC (active)			

Table 11-12 Current output (Channels 2 to 4)

Description	Channels 2 to	4				
Signal range	0/4 to 20 mA	0/4 to 20 mA				
Resolution	0.4 μΑ).4 μA				
Load	• Ex i: <470	Ω				
	• Non-Ex: <7	770 Ω				
Time constant (adjustable)	0.0 to 100 s					
Fault current	4-20 NAMUR	4-20 US	4-20 NAMUR	4-20 US	0-20 NAMUR	0-20 US
Measurement range (mA)	3.8 - 20.5	4.0 - 20.8	4.0 - 20.5	4.0 - 24.0	0.0 - 20.5	0.0 - 24.0
Lower fault current (mA)	3.5	3.75	2.0	2.0	0.0	0.0
Upper fault current (mA)	22.6	22.6	22.0	25.0	22.0	25.0
Customized fail-safe mode	Last reliab	Last reliable value				
	- Lower	 Lower fault current 				
	- Upper	Upper fault current				
	Fail-safe value	alue				
	Current va	lue				
Galvanic isolation	All inputs and outputs are galvanically isolated PELV circuits with 60 V DC isolation from each other and ground. Maximum test voltage: 500 V AC					
Standard industrial signal cable with up to 3 twisted pairs with overall screen can be connected between the transmitter and the control system. Individual pair or overall screen is optional depending on user requirements.						
Voltage range	Max. 24 V DC 14 to 30 V DC					

Table 11-13 Digital output

Description	Channels 2 to 4
Pulse	41.6 µs to 5 s pulse duration
Resolution	1 μs
Frequency	0 to 12.5 kHz, 50 % duty cycle, 120 % overscale provision
Resolution	0.2 Hz
Load	< 750 Ω
Time constant (adjustable)	0 to 100 s
Active	0 to 24 V DC, 87 mA, short-circuit-protected
Passive	3 to 30 V DC, 100 mA, short-circuit-protected
Functions	Pulse
	Frequency
	Alarm class / NAMUR status
	Individual alarms

11.6 Construction

Table 11-14 Relay output

Description	Channels 3 to 4
Туре	Change-over voltage-free relay contact
Load	30 V AC, 100 mA
Functions	Alarm class / NAMUR status
	Individual alarms

11.6 Construction

Table 11-15 Designated use

Description	Specification	
Measurement of process medium	Fluid Group 1 (suitable for dangerous fluids)	
	Aggregate state: Paste/light slurry, liquid and gas	

Table 11-16 System design

Description	Specification
Measuring principle	Coriolis
System architecture	Compact version
	Remote version

Device design

Table 11-17 Transmitter design

Description	Specification
Dimension and weight	See "Sensor dimensions" (Page 217)
Design	Compact or remote
Material	Aluminum with corrosion-resistant coating
Ingress protection	IP67/NEMA 4X to EN/IEC 60529 (1 mH ₂ O for 30 min.)
Mechanical load	18 to 1000 Hz random, 3.17 g RMS, in all directions, to IEC 68-2-36

Torques

Table 11-18 Installation torques

Description	Torque (Nm)
Pressure guard fittings	
G 1/4 inch	80
Wall bracket screws	10
Transmitter to wall bracket	25

Description		Torque (Nm)
Transmitter pedestal lock screw	Compact version:	10
	Remote version:	6
Pedestal lock screw cap		10
Cable gland to housing (Siemens supplied, metric)		10

Note

NPT glands

When using NPT glands, the user must take care to use the supplied NPT thread adaptors.

11.6.1 Sensor design

Description	Specification
Dimension and weight	See "Sensor dimensions" (Page 217)
Process connectors	• EN1092-1 B1 PN16, PN40
	 EN1092-1 B2 PN63, PN100
	 EN1092-1 D (gasket groove), PN40
	 ASME B16.5 RF, CI 150, CI 300, CI 600, CI 900, CI1500
	• ISO 228-1 G *
	 ASME B1.20.1 NPT *
	 DIN 11851 Hyg. Screw **
	 DIN 32676 (ISO) Clamp Row B *
	SMS1145 - Hyg. Screwed
	• JIS B 2220, 10K, 20K
	 EN 1092-1 PN 16, PN40, NAMUR length
Electrical connection	M12 connector with 4-wire cable
	 Standard cable with polymer / brass / stainless steel cable glands (metric or NPT)
	 Armored cable with stainless steel armored cable glands (metric or NPT)
	 Conduit entries (metric or NPT)
Material	
Measuring tubes	AISI 316L / EN1.4404
	 C4 (2.4610) nickel alloy or C22 (2.4602) nickel alloy
Process connectors	Standard:
	 AISI 316L / EN1.4435 or EN1.4404
	 C4 (2.4610) nickel alloy or C22 (2.4602) nickel alloy
Sensor enclosure	Stainless steel 1.4404 (AISI 316L), 1.4301 (AISI 304), 1.4308 (ASTM CF8)
DSL enclosure	Aluminum with corrosion-resistant coating

11.6 Construction

Description	Specification
Measuring tube design	Split flow through 2 parallel tubes with combined cross-section area 50% of the nominal pipe
	The measuring tubes are bent in a trapezoidal curve
Self-draining design	Yes, when mounted vertically

11.6.2 Sensor cable specifications HART

Table 11-19 Sensor cable, basic data

Description	Specification
Number of conductors	4
Square area [mm²]	0.326 (AWG 22/7)
Screen	Yes
Outside color	Standard version: gray (RAL 7001)
	• Ex version: light-blue (RAL 5015)
External diameter [mm]	6.5 (standard); 12 (armored)
Maximum length [m (ft.)]	150 (492)
Installation environment	Industrial including chemical processing plants
Insulation material	Special polyolefin
Halogen-free	Yes
RoHS compliant	Yes
Torsional strength	 >3 million cycles at ± 180° on 200 mm
	Not adapted for garland mounting (festoon)
Permissible temperature range [°C (°F)]	-40 to +80 (-40 to +176)
Min. bending radius allowed	Single 5 X ø

Table 11-20 Signal cable recommendations

Description	Specification
Square area [mm²]	0.5 (AWG 20)
Linear resistance [Ohm/km]	≤ 120
Max. length [Ohm] (depends on total linear resistance)	< 500
Signal run time [ns/m]	≤ 5.3
Insulation resistance [MOhm*km]	≥ 200
Characteristic impedance 1 – 100 MHz [Ohm]	100 (±5)
Attenuation @ 1 Mhz	< 2.9 dB/100 m
Operating voltage (peak) [V]	≤ 300
Test voltage (wire/wire/screen rms 50 Hz 1 min) [V]	= 700

Electrical data at reference temperature (20 °C)

Table 11-21 Power supply cable recommendations

Description	Specification
Square area [mm²]	1.3 (AWG 16)
Max. length [m]	300 (AWG 16)

Note

Size the cable length and diameter to provide 19,2 VDC at power terminals at load current of 0,75~A

Table 11-22 Transmitter cable glands and entries

Description	Specification
Glands	Material
	– Nylon¹)
	 Brass/Ni plated
	 Stainless steel AISI 316/1.4404
	 Cable cross section
	Ø 8 to 17 mm (0.31" to 0.67")
	Ø 5 to 13 mm (0.20" to 0.51")
Entries	1 x M25 (for current output/communication, channel 1) and
	2 x M20 (for supply and channels 2 to 4) or
	1 x $\frac{1}{2}$ " NPT (for current output/communication, channel 1) and
	2 x 1/2" NPT (for supply and channels 2 to 4)

¹⁾: If operating temperature is below -20 °C (-4 °F), use Brass/Ni plated or stainless steel cable glands.

Note

For hygienic applications (EHEDG) the cable glands and blind plugs must be made from corrosion resistant material like nickel brass, stainless steel or plastic, the exposed threads must be minimized when they are tightened up on the cable and they must have a seal (plastic or rubber) under the threads where they screw into the terminal housing or enclosure.

11.7 Operating conditions

11.7 Operating conditions

Table 11-23 Basic conditions

Description		Specification
Ambient temperature (°C[°F]) (Humidity max. 90 %)	Operation: Transmitter without display Transmitter with display	-40 to +60 [-40 to +140] -20 to +60 [-4 to +140]
Ambient temperature (°C[°F]) (Humidity max. 90 %)	Storage: Transmitter without display Transmitter with display	-40 to +70 [-40 to +158] -40 to +70 [-40 to +158]
Climate class		DIN 60721-3-4
Altitude		Up to 2000 m (6560 ft)
Relative humidity [%]		95
EMC performance	Emission	• EN 55011 / CISPR-11
	Immunity	 EN/IEC 61326-1 (Industry) NAMUR NE 21

Table 11-24 Cleaning and sterilizing conditions

Description	Specification
Cleaning method	• CIP
	• SIP
Cleaning temperature	On request
Cleaning frequency	On request
Cleaning duration	On request

Table 11-25 Process media conditions

Description	Specification		
Process media temperature (T _s) (min to max) [°C (F)]	-10 to +140		
 DIN11851/ SMS1145/ DIN32676 			
Process media temperature (T _s) (min to max) [°C (F)]	-50 up to +205 (-58 to +401)		
• DN15 - DN150			
Process media density (min to max) [kg/m³ (lb/ft³]	1 to 5000 (0.06 to 312)		
Process media gauge pressure (min to max) [bar (psi)]	0 to 100 (0 to 1450)		
Process media absolute pressure (min to max) [bar (psi)]	Stainless steel: 1 to 101 (14.5 to 1465)		
Process media viscosity	Gases and non-compressible liquids		
Pressure drop	See Siemens Sizing & Calculation tool (www.siemens.com/pisizer). Select "Flow" > "SITRANS F C sizing".		
Pressure temperature ratings	See "Pressure - temperature ratings" (Page 211)		

11.8 Process variables

Table 11-26 Process variables

Description	Specification			
Primary process varia-	Mass flow			
bles	• Density			
	Fluid temperature			
Derived process variables	Volume flow			
	Corrected volume flow			
	Fraction A:B			
	Fraction % A:B			

11.9 Bus communication

Table 11-27 HART, Modbus and Profibus communication

Specification	More information
42 (2A Hex)	Manufacturer ID parameter
34 (22 Hex)	Device type parameter
7.5	HART protocol revision parameter
4.0	Profibus protocol revision parameter
-	-
11	Number of process values, both measured and derived
FSK	Frequency Shift Keyed
No	4-wire device
	42 (2A Hex) 34 (22 Hex) 7.5 4.0 - 11

Note

Device-specific approvals

Always refer to nameplates on the device for device-specific approvals.

11.10 Certificates and approvals

Specification	Ex marking ATEX/IECEx	Ex marking FM/CSA						
Flameproof and Intrinsic Safety								
FCT030 transmitter (can be installed in Zone 1 for gas and	Ex db eb ia [ia Ga] IIC T6 Gb	Class I, II, III Division 1 Gp A, B, C, D, E, F, G						
Zone 21 for dust)	Ta = -40°C to +60°C	Class I Zone 1: AEx db eb ia [ia Ga] IIC T6 Gb						
	Ex tb [ia Da] IIIC T85°C Db	Zone 21: AEx tb [ia Da] IIIC T85°C Db						
		Ta = -40°C to +60°C						
Flameproof, Increased Safety and Intrins	sically Safe							
FC330 compact system	€ II 1/2 (1) G	Class I Division 1 Gp A, B, C, D						
(can be installed in Zone 1 for gas)	Ex db eb ia [ia Ga] IIC/IIB T* Ga/Gb Ta = -40°C to +60°C * Temperature class (dependent on the process temperature and the ambient temperature, see Use in hazardous areas (Page 17))	Class I, Zone 1 AEx db eb ia [ia Ga] IIC/ IIB Gb Ta = -40°C to +60°C						

Hygienic version	EHEDG (in preparation)
Pressure equipment	2014/68/EU Pressure Equipment Directive (PED)
	Canadian Registration Number (CRN) (in preparation)

11.11 SensorFlash

Table 11-28 SensorFlash

Description	Specification		
	SD card		
Capacity	4 GB		
File system support	FAT32 / 8.3		
Temperature range Operation: Storage:	-40 to +85 °C (-40 to 185 °F) -40 to +100 °C (-40 to 212 °F)		

Note

SensorFlash functions support

Only the supplied 4 GB SD cards are supported for backup, restore, logging, and firmware update.

11.12 PED

The pressure equipment directive 2014/68/EU applies to the alignment of the statutory orders of the European member states for pressure equipment. Such equipment in the sense of the directive includes vessels, pipelines and accessories with a maximum allowable pressure of more than 0.5 bar above atmospheric. Flowmeters are considered as piping.

A detailed risk analysis of the flowmeter has been performed in accordance with the PED 2014/68/EU. All risks are assessed to be "none" provided that the procedures and standards referenced in these operating instructions are observed.

Division according to the danger potential

Flowmeters which are categorized as piping are divided into categories according to danger potential (medium, pressure, nominal diameter). The flowmeters fall into the categories I to III or they are manufactured according to Paragraph 3 - Sound Engineering Practice (SEP).

The following criteria are decisive for assessment of the danger potential and are also shown in Diagrams 1 to 4, see Diagrams (Page 207).

Fluid group	Group 1 or 2
Aggregate state	Liquid or gaseous
Type of pressurized equipment	Product of pressure and volume (PS * V [barL])
Pipeline	

The maximum allowable temperature for the used liquids or gases is the maximum process temperature which can occur, as defined by the user. This must be within the limits defined for the equipment.

Division of media (liquid/gaseous) into the fluid groups

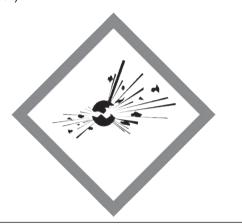
Fluids are divided according to Article 13 into the following fluid groups:

11.12 PED

Group 1 fluids

Explosive

R phrases: for example: 2, 3 (1, 4, 5, 6, 9, 16, 18, 19, 44)



Very toxic

R phrases: for example: 26, 27, 28, 39 (32)



Extremely flammable

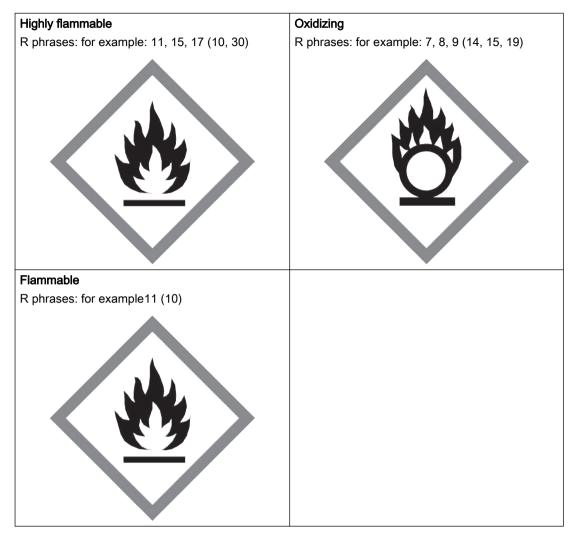
R phrases: for example: 12 (17)



Toxic

R phrases: for example: 23, 24, 25 (29, 31)





Group 2 fluids

All fluids not belonging to Group 1.

Also applies to fluids which are for example dangerous to the environment, corrosive, dangerous to health, irritant or carcinogenic (if not highly toxic).

Conformity assessment

Flowmeters of categories I to III comply with the safety requirements of the directive. They are affixed with the CE mark and an EC declaration of conformity is provided.

The flowmeters are subjected to the conformity assessment procedure - Module H.

Flowmeters according to Article 4 Paragraph 3 are designed and manufactured in accordance with sound engineering practice in Denmark. PED conformity reference is not affixed to the CE mark.

Diagrams

Gases of fluid group 1

- Pipelines according to Article 4 (a) (i) First dash
- Exception: unstable gases belonging to Categories I and II must be included in Category III.

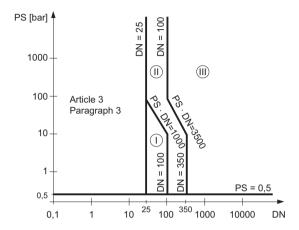


Figure 11-1 Diagram 1

Gases of fluid group 2

- Pipelines according to Article 4 (a) (i) Second dash
- Exception: liquids at temperatures > 350 °C belonging to Category II must be included in Category III.

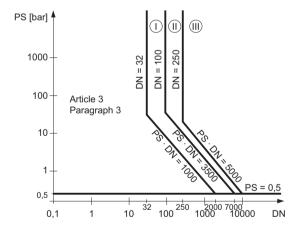


Figure 11-2 Diagram 2

Liquids of fluid group 1

Pipelines according to Article 4 (a) (ii) First dash

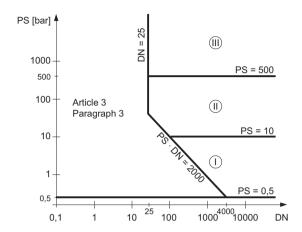


Figure 11-3 Diagram 3

Liquids of fluid group 2

• Pipelines according to Article 4 (a) (ii) Second dash

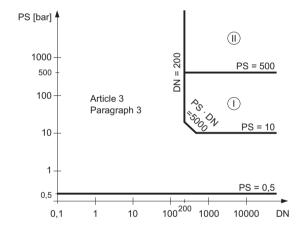


Figure 11-4 Diagram 4

11.13 Pressure - temperature ratings

Pressure - temperature ratings are determined by process connection material and applicable standards. The tables below detail the allowed maximum process pressure for sensor variants with stainless steel and Hastelloy measuring tubes.

With two major exceptions, the pressure rating of the flow sensors is independent of the process medium temperature. Design rules for flange connections in both the EN1092-1 and ASME B16.5 standards dictate pressure derating with increasing temperature. The charts below show the effect of process medium temperature on the pressure ratings for the flanges within the product program.

11.13 Pressure - temperature ratings

Note

Maximum operating pressure

The maximum operating pressure is limited to 100 bar.

11.13.1 Pressure - temperature ratings (stainless steel sensors)

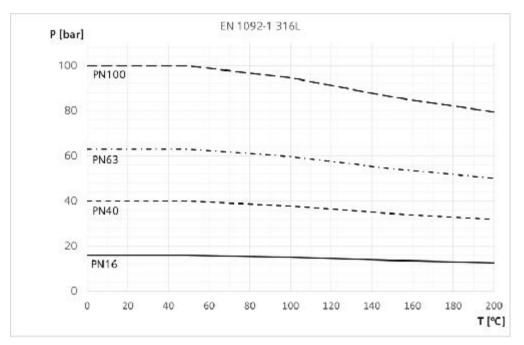


Figure 11-5 Stainless steel: Metric flange ratings, EN 1092-1 (P: Process pressure; T: Process temperature)

Table 11-29 EN1092-1 [bar]

PN (bar)		Temperature TS (°C)							
	-50	-50 0 50 100 150 180 200							
16	16.0	16.0	16.0	15.2	13.7	13.1	12.7		
40	40.0	40.0	40.0	37.9	34.5	32.9	31.8		
63	63.0	63.0	63.0	59.7	54.3	51.8	50.1		
100	100.0	100.0	100.0	94.8	86.1	82.1	79.5		

Table 11-30 ISO228-G and ASME B1.20.1 NPT [bar]

PN (bar)		Temperature TS (°C)							
	-50	-50 0 50 100 150 200							
110		110							

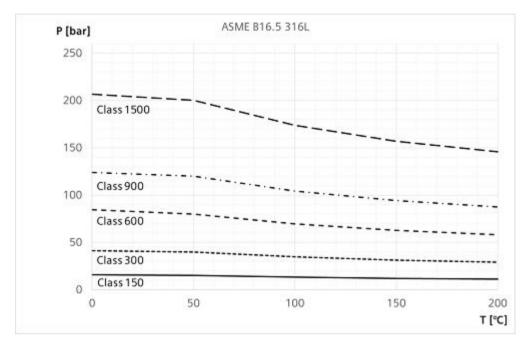


Figure 11-6 Stainless steel: ANSI flange ratings, ASME B16.5 (P: Process pressure; T: Process temperature)

Table 11-31 ASME B16.5 [bar]

Class /			Tempe	erature TS (°C)		
Group	-50	0	50	100	150	200
150 / 2.2	19	19	18.4	16.2	14.8	13.7
300 / 2.2	49.6	49.6	48.1	42.2	38.5	35.7
600 / 2.2	99.3	99.3	96.2	84.4	77.0	71.3
900 / 2.2	110	124.1	120.1	104.4	94.2	87.5
1500 / 2.2		206.8	200.1	173.9	157	145.8

Table 11-32 JIS [bar]

PN (bar)	Temperature TS (°C)						
	-50	0	50	120	150	200	
10K	14	14	14	14	13.4	12.4	
20K	34	34	34	34	33.1	31.6	

11.13 Pressure - temperature ratings

Table 11-33 DIN 11851 [bar]

PN (bar) / DN			Temperature TS (°C)			
	-10	0	50	100	140	
25 / 50-100	25	25	25	25	25	
40 / 10-40	40	40	40	40	40	

Table 11-34 DIN 32676 & ISO 2852 [bar]

PN (bar) / DN	Temperature TS (°C)						
	-10	0	50	100	140		
10 / 85-219.1	10	10	10	10	10		
16 / 48.3-76.2	16	16	16	16	16		
25 / 6.35-42.4	25	25	25	25	25		

Note

Test pressure

Maximum allowable test pressure (MATP) for the flowmeter and process connection is 1.5 times the nominal pressure up to 150 bar (2176 psi).

11.13.2 Pressure - temperature ratings (nickel alloy sensors)

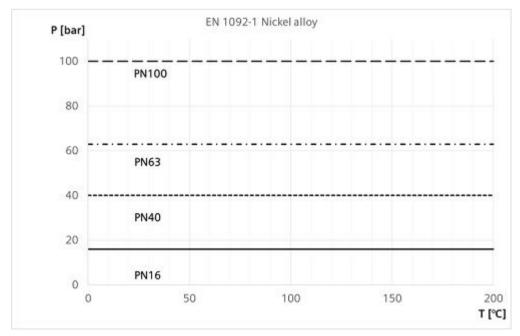


Figure 11-7 Nickel alloy: Metric flange ratings, EN 1092-1 (P: Process pressure; T: Process temperature)

Table 11-35	EN1092-1	[bar]
-------------	----------	-------

PN (bar)	Temperature TS (°C)						
	-50	0	50	100	150	200	
16	16.0	16.0	16.0	16.0	16.0	16.0	
40	40.0	40.0	40.0	40.0	40.0	40.0	
63	63.0	63.0	63.0	63.0	63.0	63.0	
100	100.0	100.0	100.0	100.0	100.0	100.0	

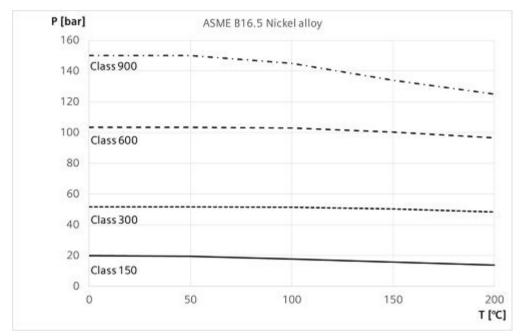


Figure 11-8 Nickel alloy: ANSI flange ratings, ASME B16.5 (P: Process pressure; T: Process temperature)

Table 11-36 ASME B16.5 [bar]

Class	Temperature TS (°C)						
	-50	0	50	100	150	200	
150	20.0	20	19.5	17.7	15.8	13.8	
300	51.7	51.7	51.7	51.5	50.3	48.6	
600	103.4	103.4	103.4	103.0	100.3	97.2	
900	150	150	150	145.0	134.0	125.0	

11.13 Pressure - temperature ratings

Dimension drawings 12

12.1 Sensor dimensions

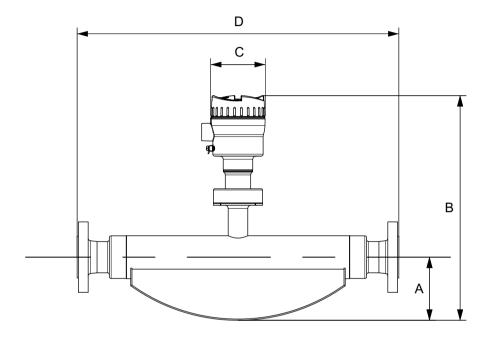


Table 12-1 Basic dimensions

Sensor DN	A in mm (inch)	B in mm (inch)	C in mm (inch)	Weight in kg (lb)
15 (½")	80 (3.15)	358 (14.09)	90 (3.54)	4.6 (10.1)
25 (1")	103 (4.06)	398 (15.67)	90 (3.54)	7.9 (17.4)
50 (2")	126 (4.96)	435 (17.13)	90 (3.54)	25.7 (56.7)
80 (3")	181 (7.13)	525 (20.67)	90 (3.54)	66.5 (147)
100 (4")	262 (10.31)	622 (24.49)	90 (3.54)	128 (282.19)
150 (6")	317 (12.48)	714 (28.11)	90 (3.54)	207 (456.36)

Note

The built-in length (D) depends on the flange

12.2 316L stainless steel - standard

Note

D dimension tolerance:

- Meter tube nominal diameter DN 15 ... 50 (1/2" ... 2"): +0 / -3 mm (+0 / -0.018 in.)
- Meter tube nominal diameter DN 80 (3"): +0 / -5 mm (+0 / -0.2 in.)
- Meter tube nominal diameter DN 100 ... 150 (4" ... 6"): +0 / -8 mm (+0 / -0.31 in.)

7ME463 - sensor sizes Flange connection DN15 to DN150

Sensor AISI 316L		DN15 (½"	")		DN25 (1")		DN50 (2"))
Connection	DN10	DN15	DN20	DN20	DN25	DN40	DN40	DN50	DN60
	(3.8")	(½")	(¾")	(¾")	(1")	(1½")	(1½")	(2")	(2½")
EN 1092-1 B1, PN 16									
EN 1092-1 B1, PN 40	385	385	421	576	525	576	763	715	763
	(15.16)	(15.16)	(16.57)	(22.86)	(20.67)	(22.68)	(30.04)	(28.15)	(30.04)
EN 1092-1 B2, PN 63		403			564	572	745	745	
		(15.87)			(22.20)	(22.52)	(29.33)	(29.33)	
EN 1092-1 B2, PN 100		403			564	576	745	745	
		(15.87)			(22.20)	(22.68)	(29.33)	(29.33)	
EN 1092-1 D, PN 40		385			525			715	
		(15.16)			(20.67)			(28.15)	
ASME B16.5, class 150		435	421	575	575	576	763	715	756
		(17.13)	(16.57)	(22.64)	(22.64)	(22.68)	(30.04)	(28.15)	(29.76)
ASME B16.5, class 300		421			576	576	756	763	
		(16.57)			(22.68)	(22.68)	(29.76)	(30.04)	
ASME B16.5, class 600		421			576		756	773	
		(16.57)			(22.68)		(29.76)	(30.43)	
ASME B16.5, class 900		421			576		780	790	800
		(16.57)			(22.68)		(30.71)	(31.10)	(31.50)
ASME B16.5, class		421					780	790	800
1500		(16.57)					(30.71)	(31.10)	(31.50)

Dimensions in mm (inch)

Sensor AISI 316L		DN80 (3")			DN100 (4")		DN150 (6"))
Connection	DN65 (2½")	DN80 (3")	DN100 (4")	DN80 (3")	DN100 (4")	DN150 (6")	DN100 (4")	DN150 (6")	DN200 (8")
EN 1092-1 B1, PN 16			875	1222	1122	1260	1569	1421	
			(34.45)	(48.11)	(44.17)	(49.61)	(61.77)	(55.94)	
EN 1092-1 B1, PN 40	910	870	875	1222	1144	1260	1599	1461	1650
	(35.83)	(34.25)	(34.45)	(48.11)	(45.04)	(49.61)	(62.95)	(57.52)	(64.96)

Sensor AISI 316L		DN80 (3")			DN100 (4")		DN150 (6"))
Connection	DN65 (2½")	DN80 (3")	DN100 (4")	DN80 (3")	DN100 (4")	DN150 (6")	DN100 (4")	DN150 (6")	DN200 (8")
EN 1092-1 B2, PN 63	910	910	1060	1234	1304				
	(35.83)	(35.83)	(41.73)	(48.58)	(51.34)				
EN 1092-1 B2, PN 100	910	910	1080	1234	1334				
	(35.83)	(35.83)	(42.52	(48.58)	(52.52)				
EN 1092-1 D, PN 40		870							
		(34.25)							
ASME B16.5, class 150		880	880	1244	1144	1330	1630	1485	1650
		(34.65)	(34.65)	(48.98)	(45.04)	(52.36)	(64.17)	(58.46)	(64.96)
ASME B16.5, class 300	920	895	1075		1324			1505	1670
	(36.22)	(35.24)	(42.32)		(52.13)			(59.25)	(65.75)
ASME B16.5, class 600	920	920	1100	1244	1354		1675	1555	
	(36.22)	(36.22)	(43.31)	(48.98)	(53.31)		(65.94)	(61.22)	
ASME B16.5, class 900	965	1100	1130	1470	1380		1705	1605	
	(37.99)	(43.34)	(44.49)	(57.87)	(54.33)		(67.13)	(63.19)	
ASME B16.5, class	965	1300	1150	1500	1400		1725	1665	
1500	(37.99)	(51.18)	(45.28)	(59.06)	(55.12)		(67.91)	(65.55)	

Dimensions in mm (inch)

7ME463 - sensor sizes DN15 - Threaded

Sensor AISI 316L	DN 15 (1/2")
Connection	DN 15 (1/2")
ISO 228-1 G female pipe thread	450 (17.72)
ASME B1.20.1 NPT female pipe thread	450 (17.72)

Dimensions in mm (inch)

12.3 316L stainless steel polished - hygienic versions

Note

D dimension tolerance:

- Meter tube nominal diameter DN 15 ... 50 (1/2" ... 2"): +0 / -3 mm (+0 / -0.018 in.)
- Meter tube nominal diameter DN 80 (3"): +0 / -5 mm (+0 / -0.2 in.)
- Meter tube nominal diameter DN 100 ... 150 (4" ... 6"): +0 / -8 mm (+0 / -0.31 in.)

12.4 Nickel alloy

Sensor AISI 316L	С	DN15 (½'	")	I	DN25 (1"	')	I	DN50 (2")	[ON 80 (3'	")
Connection	DN10 (3.8")	DN15 (½")	DN20 (¾")	DN20 (¾")	DN25 (1")	DN40 (1½")	DN40 (1½")	DN50 (2")	DN60 (2½")	DN 65 (2 1/2")	DN 80 (3")	DN 100 (4")
DIN 11851 Hygienic screwed	413 (16.26)	413 (16.26)	413 (16.26)	590 (23.23)	590 (23.23)	590 (23.23)	763 (30.04)	740 (29.13)	740 (29.13)	990 (38.98)	940 (37.01)	940 (37.01)
DIN 32676 (ISO 2852) Clamp	413 (16.26)	413 (16.26)	413 (16.26)	590 (23.23)	590 (23.23)	590 (23.23)	763 (30.04)	740 (29.13)	740 (29.13)	950 (37.40)	910 (35.83)	910 (35.83)
SMS 1145 Hy- gienic screwed					590 (23.23)	590 (23.23)	763 (30.04)	740 (29.13)	740 (29.13)	990 (38.98)	940 (37.01)	

Dimensions in mm (inch)

12.4 Nickel alloy

Note

D dimension tolerance:

- Meter tube nominal diameter DN 15 ... 50 (1/2" ... 2"): +0 / -3 mm (+0 / -0.018 in.)
- Meter tube nominal diameter DN 80 (3"): +0 / -5 mm (+0 / -0.2 in.)
- Meter tube nominal diameter DN 100 ... 150 (4" ... 6"): +0 / -8 mm (+0 / -0.31 in.)

Sensor Nickel-Alloy C4		DN15 (1/2"	')		DN25 (1'	')		DN50 (2'	')
Connection	DN10 (3.8")	DN15 (½")	DN20 (¾")	DN20 (¾")	DN25 (1")	DN40 (1½")	DN40 (1½")	DN50 (2")	DN60 (2½")
EN 1092-1 B1, PN 16									
EN 1092-1 B1, PN 40	449 (17.7)	442 (17.4)	428 (16.9)	646 (25.4)	614 (24.2)	576 (22.7)	814 (32.0)	764 (30.1)	819 (32.2)
EN 1092-1 B2, PN 63	449 (17.7)	442 (17.4)	428 (16.9)	646 (25.4)	614 (24.2)	576 (22.7)	814 (32.0)	764 (30.1)	819 (32.2)
EN 1092-1 B2, PN 100	449 (17.7)	442 (17.4)	428 (16.9)	646 (25.4)	614 (24.2)	576 (22.7)	814 (32.0)	764 (30.1)	819 (32.2)
ANSI B16.5, class 150		442 (17.4)	428 (16.9)	646 (25.4)	614 (24.2)	576 (22.7)	814 (32.0)	764 (30.1)	819 (32.2)
ANSI B16.5, class 300		442 (17.4)	428 (16.9)	646 (25.4)	614 (24.2)	576 (22.7)	814 (32.0)	764 (30.1)	819 (32.2)
ANSI B16.5, class 600		442 (17.4)	428 (16.9)	646 (25.4)	614 (24.2)	576 (22.7)	814 (32.0)	764 (30.1)	819 (32.2)

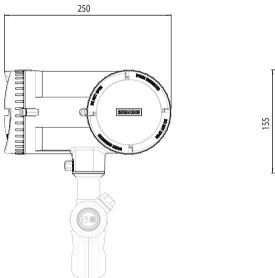
Dimensions in mm (inch)

Sensor Nickel-Alloy C4		DN80 (3"))		DN100 (4'	')		DN150 (6'	')
Connection	DN65 (2½")	DN80 (3")	DN100 (4")	DN80 (3")	DN100 (4")	DN150 (6")	DN100 (4")	DN150 (6")	DN200 (8")
EN 1092-1 B1, PN 16			971 (38.2)	1357 (53.4)	1280 (50.4)	1261 (49.6)	1592 (62.7)	1502 (59.1)	
EN 1092-1 B1, PN 40	1021 (40.2)	971 (38.2)	971 (38.2)	1357 (53.4)	1280 (50.4)	1261 (49.6)	1592 (62.7)	1502 (59.1)	
EN 1092-1 B2, PN 63	1021 (40.2)		971 (38.2)	1357 (53.4)	1280 (50.4)	1261 (49.6)	1632 (64.3)	1542 (60.7)	
EN 1092-1 B2, PN 100	1021 (40.2)	971 (38.2)	971 (38.2)	1357 (53.4)	1280 (50.4)	1261 (49.6)	1632 (64.3)	1542 (60.7)	
ANSI B16.5, class 150	1021 (40.2)	971 (38.2)	971 (38.2)	1357 (53.4)	1280 (50.4)	1261 (49.6)	1592 (62.7)	1502 (59.1)	
ANSI B16.5, class 300	1021 (40.2)	971 (38.2)	971 (38.2)	1357 (53.4)	1280 (50.4)	1261 (49.6)	1632 (64.3)	1542 (60.7)	
ANSI B16.5, class 600	1021 (40.2)	971 (38.2)	971 (38.2)	1357 (53.4)	1280 (50.4)	1261 (49.6)	1632 (64.3)	1542 (60.7)	

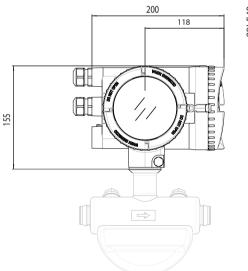
Dimensions in mm (inch)

12.5 Transmitter dimensions

Compact version

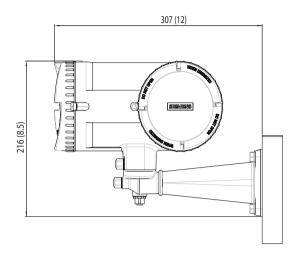


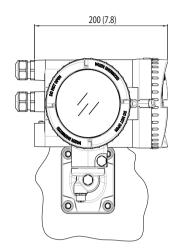




12.6 Wall mount enclosure dimensions

Remote version



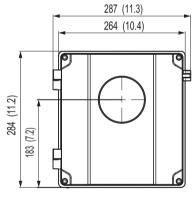


Dimensions in mm

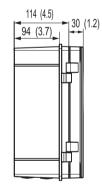
Weight: 4.8 kg (10.6 lbs)

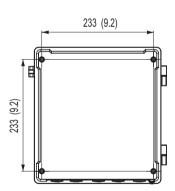
12.6 Wall mount enclosure dimensions

Wall mount housing



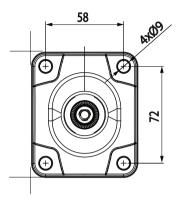






12.7 Mounting bracket dimensions

For compact housing



Dimensions in mm

Weight: 4.8 kg (10.6 lbs)

12.7 Mounting bracket dimensions

Technical reference



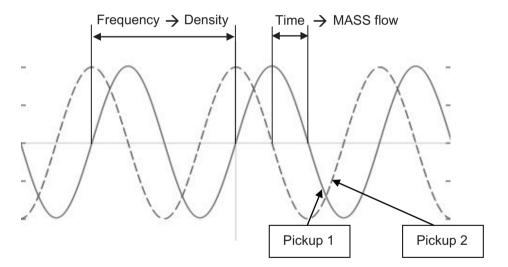
A.1 Theory of operation

The Coriolis principle of measurement

The flow measurement is based on the Coriolis law of motion. Particles moving in a rotating / oscillating system will resist imposed oscillations in a manner consistent with their mass and velocity (momentum).

The SITRANS F C sensors are energized by an electromagnetic driver circuit which oscillates the pipes at their resonant frequency. Two pickups are placed symmetrically on either side of the driver to provide position signals for digital processing.

When the media flows through the sensor, Coriolis force will act on the measuring tubes and cause deflection which can be measured as a phase shift between Pickup 1 and Pickup 2. The phase shift is proportional to the mass flowrate.



The frequency (or period) of the vibration is a direct function of the process media density.

The frequency and amplitude of the driver is regulated to ensure a stable output from the 2 pickups. The temperature of the sensor tubes is measured to provide accurate compensation for changes in the material stiffness. As a result the process media temperature is also accurately measured.

The flow proportional phase signal from the pickups, the temperature measurement and the driver frequency enable calculation and reporting of mass, density, volume, and temperature.

A.2 Sensor dimension dependent default settings

Digital signal processing (DSP)

The analog to digital conversion takes place in an ultra low noise sigma delta converter with high signal resolution. With fast digital signal processing mass flow and density values are calculated using a patented DFT technology (Discrete Fourier Transformation). The combination of this patented DFT technology and the fast DSP enables short response time (< 10 ms) to changes in the measured values.

The built-in noise filter is configurable and can be used for improving the performance of the flowmeter, in case the installation and application conditions are not ideal. Typical process noise such as gas bubbles (two-phase-flow) can be reduced through the filter functions.

A.2 Sensor dimension dependent default settings

A.2.1 Mass flow: Sensor dimension dependent default settings (Process values)

Mass flow

Sensor dimension	Default value	Range
	kg/s	
Lower warning limit		
DN 15	-2.22	
DN 25	-9.72	
DN 50	-25	
DN 80	-69.44	
DN 100	-144.44	
DN 150	-238.89	
Lower alarm limit		
DN 15	-2.22	-8.84 to +8.84
DN 25	-9.72	-24.5 to +24.5
DN 50	-25	-98.2 to +98.2
DN 80	-69.44	-251 to +251
DN 100	-144.44	
DN 150	-238.89	

Sensor dimension	Default value	Range
	kg/s	
Upper warning limit		
DN 15	2.22	
DN 25	9.72	
DN 50	25	
DN 80	69.44	

A.2 Sensor dimension dependent default settings

Sensor dimension	Default value	Range
	kg/s	
DN 100	144.44	
DN 150	238.89	
Upper alarm limit		
DN 15	2.22	-8.84 to +8.84
DN 25	9.72	-24.5 to +24.5
DN 50	25	-98.2 to +98.2
DN 80	69.44	-251 to +251
DN 100	144.44	
DN 150	238.89	

Sensor dimension	Default value	Range	
	kg/h	kg/s	
Hysteresis			
DN 15	0	0 to +8.84	
DN 25	0	0 to +24.5	
DN 50	0	0 to +98.2	
DN 80	0	0 to +251	
DN 100			
DN 150			

Sensor dimension	Sensor size	Default value kg/h	Range kg/s
Low flow cut-off		n.g.n	1.9.0
DN 15	0.012333333	44.4	0 to +8.84
DN 25	0.056166667	202.2	0 to +24.5
DN 50	0.14044444	505.6	0 to +98.2
DN 80	0.368611111	1327	0 to +351
DN 100	0.783333333	2820	
DN 150	1.26944444	4570	

A.2.2 Standard volume flow: Sensor dimension dependent default settings (Process values)

Standard volume flow

Sensor dimension	Default value	Range
	kg/s	
Lower warning limit		
DN 15	-0.0225	
DN 25	-0.0626	
DN 50	-0.250	
DN 80	0.641	
DN 100	-1	
DN 150	-2.25	
Lower alarm limit		
DN 15	-8.84	-8.84 to +8.84
DN 25	-24.5	-24.5 to +24.5
DN 50	-98.2	-98.2 to +98.2
DN 80	-251	-251 to +251
DN 100		
DN 150		

Sensor dimension	Default value	Range
	kg/s	
Upper warning limit		
DN 15	0.0225	
DN 25	0.0626	
DN 50	0.250	
DN 80	0.641	
DN 100	1	
DN 150	2.25	
Upper alarm limit		
DN 15	8.84	-8.84 to +8.84
DN 25	24.5	-24.5 to +24.5
DN 50	98.2	-98.2 to +98.2
DN 80	251	-251 to +251
DN 100		
DN 150		

Sensor dimension	Default value normal m³/s	Range		
Hysteresis				
DN 15	0	0 to +8.84		
DN 25	0	0 to +24.5		
DN 50	0	0 to +98.2		
DN 80	0	0 to +251		
DN 100				
DN 150				
Low flow cut-off				
DN 15	0.000010278	0 to +8.84		
DN 25	0.000031944	0 to +24.5		
DN 50	0.000144444	0 to +98.2		
DN 80	0.000377778	0 to +251		
DN 100	0.000783333			
DN 150	0.001269444			

Sensor dimension	m³/s	m³/h	
Low flow cut-off			
DN 15	1.23333E-05	0.0444	
DN 25	0.00005617	0.2022	
DN 50	0.000140444	0.5056	
DN 80	0.000368611	1.327	
DN 100	0.000783333	2.82	
DN 150	0.001269444	4.57	

A.2.3 Volume flow: Sensor dimension dependent default settings (Process values)

Volume flow

Sensor dimension	Default value	Range
	kg/s	
Lower warning limit		
DN 15	-0.005	-0.005 to +0.005
DN 25	-0.015	-0.015 to +0.015
DN 50	-0.059	-0.059 to +0.059
DN 80	-0.249	-0.249 to +0.249
DN 100		
DN 150		
Lower alarm limit		

A.2 Sensor dimension dependent default settings

Sensor dimension	Default value	Range
	kg/s	
DN 15	-0.0225	
DN 25	-0.0626	
DN 50	-0.250	
DN 80	-0.641	
DN 100	-1	
DN 150	-2.3	

Sensor dimension	Default value	Range
	kg/s	
Upper warning limit		
DN 15	0.005	-0.005 to +0.005
DN 25	0.015	-0.015 to +0.015
DN 50	0.059	-0.059 to +0.059
DN 80	0.249	-0.249 to +0.249
DN 100		
DN 150		
Upper alarm limit		
DN 15	0.0225	
DN 25	0.0626	
DN 50	0.250	
DN 80	0.641	
DN 100	1	
DN 150	2.3	

Sensor dimension	Default value	Range
	m³/s	
Hysteresis		
DN 15	0	0 to +0.005
DN 25	0	0 to +0.015
DN 50	0	0 to +0.059
DN 80	0	0 to +0.249
DN 100		
DN 150		
Low flow cut-off		
DN 15	0.010277778	0 to +8.84
DN 25	0.031944444	0 to +24.5
DN 50	0.144444444	0 to +98.2
DN 80	0.377777778	0 to +351
DN 100	0.783333333	
DN 150	1.269444444	

Sensor dimension	m³/s	m³/h	
Low flow cut-off			
DN 15	1.23333E-05	0.0444	
DN 25	0.00005617	0.2022	
DN 50	0.000140444	0.5056	
DN 80	0.000368611	1.327	
DN 100	0.000783333	2.82	
DN 150	0.001269444	4.57	

A.2.4 Fraction: Sensor dimension dependent default settings (Process values)

Fraction (if available)

Sensor dimension	Unit	Default value	
Lower warning limit			
DN 15	Mass flow kg/s	-2.7777778	
	Volume flow m ³ /s		
DN 25	Mass flow kg/s	-12.152778	
	Volume flow m ³ /s		
DN 50	Mass flow kg/s	-31.25	
	Volume flow m ³ /s		
DN 80	Mass flow kg/s	-86.805556	
	Volume flow m ³ /s	-0.641	
DN 100	Mass flow kg/s	-180.56	
	Volume flow m ³ /s	-1	
DN 150	Mass flow kg/s	-298.61	
	Volume flow m ³ /s	-2.3	

Sensor dimension	Unit	Default value	Range
Lower alarm limit			
DN 15	Mass flow kg/s	-8.84	-8.84 to +8.84
	Volume flow m³/s	-0.005	-0.005 to +0.005
DN 25	Mass flow kg/s	-24.5	-24.5 to +24.5
	Volume flow m³/s	-0.015	-0.015 to +0.015
DN 50	Mass flow kg/s	-98.2	-98.2 to +98.2
	Volume flow m³/s	-0.059	-0.059 to +0.059
DN 80	Mass flow kg/s	-251	- 251 to +251
	Volume flow m/s	-0.249	-0.249 to +0.249
DN 100	Mass flow		
	Volume flow		

A.2 Sensor dimension dependent default settings

Sensor dimension	Unit	Default value	Range
DN 150	Mass flow		
	Volume flow		

Sensor size	Unit	Default value
Upper warning limit		
DN 15	Mass flow kg/s	2.7777778
	Volume flow m ³ /s	
DN 25	Mass flow kg/s	12.152778
	Volume flow m ³ /s	
DN 50	Mass flow kg/s	31.25
	Volume flow m ³ /s	
DN 80	Mass flow kg/s	86.805556
	Volume flow m ³ /s	0.641
DN 100	Mass flow kg/s	180.56
	Volume flow m ³ /s	1
DN 150	Mass flow kg/s	298.61
	Volume flow m ³ /s	2.3

Sensor dimension	Unit	Default value	Range
Upper alarm limit			
DN 15	Mass flow kg/s	8.84	-8.84 to +8.84
	Volume flow m ³ /s	0.005	-0.005 to +0.005
DN 25	Mass flow kg/s	24.5	-24.5 to +24.5
	Volume flow m ³ /s	0.015	-0.015 to +0.015
DN 50	Mass flow kg/s	98.2	-98.2 to +98.2
	Volume flow m ³ /s	0.059	-0.059 to +0.059
DN 80	Mass flow kg/s	251	- 251 to +251
	Volume flow m ³ /s	0.249	-0.249 to +0.249
DN 100	Mass flow kg/s		
	Volume flow m ³ /s		
DN 150	Mass flow kg/s		
	Volume flow m ³ /s		

Sensor dimension	Unit	Range
Hysteresis	·	
DN 15	Mass flow kg/s	0 to +8.84
	Volume flow m ³ /s	0 to +0.005
DN 25	Mass flow kg/s	0 to +24.5
	Volume flow m ³ /s	0 to +0.015
DN 50	Mass flow kg/s	0 to +98.2
	Volume flow m ³ /s	0 to +0.059

Sensor dimension	Unit	Range
DN 80	Mass flow kg/s	0 to +251
	Volume flow m ³ /s	0 to +0.249
DN 100	Mass flow kg/s	
	Volume flow m ³ /s	
DN 150	Mass flow kg/s	
	Volume flow m ³ /s	

A.2.5 Zero point adjustment: Sensor dimension dependent default settings (Process values)

Zero point adjustment

Sensor dimension	Default value	Default value				
	kg/s	kg/h				
Standard deviation limit						
DN 15	0.0008	2.88				
DN 25	0.0027	9.72				
DN 50	0.009	32.4				
DN 80	0.04	144				
DN 100	0.0832	299.52				
DN 150	0.1376	495.36				
Offset limit						
DN 15	0.012333333	44.4				
DN 25	0.056166667	202.2				
DN 50	0.140444444	505.6				
DN 80	0.368611111	1327				
DN 100	0.783	2820				
DN 150	1.269	4570				

Sensor dimension	Default value
	m³/s
Hysteresis	
DN 15	0
DN 25	0
DN 50	0
DN 80	0
DN 100	0
DN 150	0

A.2 Sensor dimension dependent default settings

Sensor dimension	Default value	Default value
	kg/s	kg/h
Low flow cut-off		
DN 15	0.012333333	44.4
DN 25	0.056166667	202.2
DN 50	0.140444444	505.6
DN 80	0.368611111	1327
DN 100	0.783	2820
DN 150	1.269 4570	

HART communication

Highway Addressable Remote Transducer, HART, is an industrial protocol. The HART protocol is an open standard. Full details about HART can be obtained from the HART communication website (https://fieldcommgroup.org/technologies/hart).

The device can be configured over the HART network using either a Field Communicator or a software package. The recommended software package is the SIMATIC Process Device Manager (PDM) (Page 123) by Siemens. Use HART Device Description (EDD) to integrate HART devices in engineering systems as SIMATIC PDM and AMS.

HART Communicator menu structures are available in HART Communication Foundation (https://fieldcommgroup.org/technologies/hart).

B.1 Mode of operation HART function

Note

Priority of operation and failure of power supply

- Operation at the positioner has priority over specifications from the HART communicator.
- Failure of the auxiliary power to the positioner also interrupts communications.

Function

The device is also available with built-in HART functionality. The HART protocol allows you to communicate with your device using a HART communicator, PC, or programming unit. You can do the following with your device:

- Convenient configuration
- Store configurations
- Call up diagnostic data
- Show online measured values

Communication takes place as frequency modulation on the existing signal lines for the setpoint of 4 to 20 mA.

The device is integrated into the following parameter assignment tools:

- HART communicator
- PDM (Process Device Manager)
- AMS (Asset Management System)

B.1 Mode of operation HART function

HMI menu structure

How to read the tables

In the following tables the menus are entered in **bold** text and the parameters in *italic*.

The first table shows the main HMI menu, that is HMI menu levels 1 and 2. The following tables show the HMI submenus, that is HMI menu levels 3 to 5.

The visibility of some parameter/menu items depends on previous selections. For example, if Frequency is selected on the output, only the frequency setup parameter/menu items are visible, and the current, pulse, and status output setup parameter/menu items are hidden.

C.1 Main menu

In the following table only the menus and parameters of the first two levels of the HMI menu structure are listed.

Table C-1 Main menu

Level 1		el 1 Level 2		More information
No.	Name	No.	Name	
1	Quick Start	1.1	Quick commissioning	Quick commissioning wizard (menu item 1.1) (Page 88)
		1.2	Zero point adjustment	Zero point adjustment wizard (menu item 1.2) (Page 90)
		1.3	Process values	Process values wizard (menu item 1.3) (Page 92)
		1.4	Inputs and outputs	Menu item 2.4: Inputs and outputs (Page 244)
		1.5	Gas application	Gas application wizard (menu item 1.5) (Page 99)
		1.6	Pulsating flow	Pulsating flow wizard (menu item 1.6) (Page 100)
		1.7	Dosing application	Dosing application wizard (menu item 1.7) (Page 101)
		1.8	Copy configuration	Copying the application setup from one device to another (Page 189)
		1.9	Communication	Menu item 4: Communication (Page 267)

C.1 Main menu

Level	 1	Level 2		More information
No.	Name	No.	Name	
2	Setup	2.1	Sensor	Menu item 2.1: Sensor (Page 239)
		2.2	Process values	Menu item 2.2: Process values (Page 239)
		2.3	Totalizers	Menu item 2.3: Totalizers (Page 243)
		2.4	Inputs and outputs	Menu item 2.4: Inputs and outputs (Page 244)
		2.5	Dosing	Menu item 2.5: Dosing (Page 251)
		2.7	Date and time	Menu item 2.7: Date and time (Page 256)
		2.8	Local display	Menu item 2.8: Local display (Page 257)
3	Maintenance & Diagnostics	3.1	Identification	Menu item 3.1: Identification (Page 259)
		3.2	Diagnostic events	Menu item 3.2: Diagnostic events (Page 260)
		3.3	Maintenance	Menu item 3.3: Maintenance (Page 261)
		3.4	Diagnostics	Menu item 3.4: Diagnostics (Page 261)
		3.5	Peak values	Menu item 3.5: Peak values (Page 263)
		3.6	Charateristics	Menu item 3.6: Characteristics (Page 263)
		3.7	SensorFlash	Menu item 3.7: SensorFlash (Page 264)
		3.8	Simulation	Menu item 3.8: Simulation (Page 265)
		3.9	Audit trail	Menu item 3.9: Audit trail (Page 266)
		3.10	Self test	Menu item 3.10: Self test (Page 266)
		3.11	Resets	Menu item 3.11: Resets (Page 267)
		3.12	Firmware update	Menu item 3.12: Firmware update (Page 267)
4	Communication	4.1	USB (Service channel)	
		4.2	HART (CH 1)	
		4.3	Modbus (CH 1)	
		4.4	Profibus DP/PA	
5	Security	5.1	Change user PIN	
		5.2	Change expert PIN	
		5.3	Recovery ID	
		5.4	PIN recovery	
		5.5	Activate user PIN	
		5.6	Deactivate user PIN	
		5.7	Auto logout	
		5.8	Logout	
6	Language			

C.2 Menu item 2.1: Sensor

Table C-2 Sensor

Level 3	Level 3			More information
No.	Name	No.	Name	
2.1.1	Flow direction			
2.1.2	Noise damping			
2.1.3	Zero point adjustment			
		2.1.3.1	Method of zero point adjust- ment	
		2.1.3.2	Zero point adjustment	
		2.1.3.3	Duration	
		2.1.3.4	Standard deviation limit	
		2.1.3.5	Standard deviation	
		2.1.3.6	Offset limit	
		2.1.3.7	Offset	
2.1.4	Aerated flow	2.1.4.1	Aerated flow filter	
		2.1.4.2	Filter time constant	
		2.1.4.3	Alarm limit	
		2.1.4.4	Warning limit	
		2.1.4.5	Measurement sample time	
		2.1.4.6	Filter hysteresis	
		2.1.4.7	Minimum filter time	

Table C-3 Process values

Level 3		Level 4	Level 5		
No.	Name	No.	Name	No.	Name
2.2.1	Mass flow	2.2.1.1	Units		
		2.2.1.2	Custom units		
		2.2.1.3	Custom conversion factor		
		2.2.1.4	Decimal places		
		2.2.1.5	Low flow cut-off		
		2.2.1.6	Alarm and warning limits	2.2.1.6.1	Upper alarm limit
				2.2.1.6.2	Upper warning limit
				2.2.1.6.3	Lower warning limit
				2.2.1.6.4	Lower alarm limit
				2.2.1.6.5	Hysteresis
		2.2.1.7	Flow adjustment	2.2.1.7.1	Adjustment factor

Level 3		Level 4		Level 5	Level 5	
No.	Name	No.	Name	No.	Name	
2.2.2	Volume flow	2.2.2.1	Units			
		2.2.2.2	Custom units			
		2.2.2.3	Custom conversion factor			
		2.2.2.4	Decimal places			
		2.2.2.5	Low flow cut-off			
		2.2.2.6	Alarm and warning limits	2.2.2.6.1	Upper alarm limit	
				2.2.2.6.2	Upper warning limit	
				2.2.2.6.3	Lower warning limit	
				2.2.2.6.4	Lower alarm limit	
				2.2.2.6.5	Hysteresis	
2.2.3	Standard volume flow	2.2.3.1	Units			
		2.2.3.2	Custom units			
		2.2.3.3	Custom conversion factor			
		2.2.3.4	Decimal places			
		2.2.3.5	Alarm and warning limits	2.2.3.5.1	Upper alarm limit	
				2.2.3.5.2	Upper warning limit	
				2.2.3.5.3	Lower warning limit	
				2.2.3.5.4	Lower alarm limit	
				2.2.3.5.5	Hysteresis	
		2.2.3.6	Standard density	2.2.3.6.1	Units	
				2.2.3.6.2	Standard density source	
				2.2.3.6.3	Fixed reference density	
				2.2.3.6.4	Linear expansion coeff.	
				2.2.3.6.5	Square expansion coeff.	
				2.2.3.6.6	Standard temperature	
				2.2.3.6.7	Upper alarm limit stand- ard density	
				2.2.3.6.8	Upper warning limit standard density	
				2.2.3.6.9	Lower warning limit standard density	
				2.2.3.6.10	Lower alarm limit stand- ard density	
				2.2.3.6.11	Alarm hysteresis stand- ard density	

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
2.2.5	Density	2.2.5.1	Units		
		2.2.5.2	Custom units		
		2.2.5.3	Custom conversion factor		
		2.2.5.4	Decimal places		
		2.2.5.5	Alarm and warning limits	2.2.5.5.1	Upper alarm limit
				2.2.5.5.2	Upper warning limit
				2.2.5.5.3	Lower warning limit
				2.2.5.5.4	Lower alarm limit
				2.2.5.5.5	Hysteresis
		2.2.5.6	Density adjustment	2.2.5.6.1	Adjustment factor
				2.2.5.6.3	Adjustment offset
		2.2.5.7	Empty tube detection		
2.2.6	Medium temperature	2.2.6.1	Units		
		2.2.6.2	Decimal places		
		2.2.6.3	Alarm and warning limits	2.2.6.3.1	Upper alarm limit
				2.2.6.3.2	Upper warning limit
				2.2.6.3.3	Lower warning limit
				2.2.6.3.4	Lower alarm limit
				2.2.6.3.5	Hysteresis
2.2.7	Sensor frame tempera-	2.2.7.1	Units		
	ture	2.2.7.2	Decimal places		
		2.2.7.3	Alarm and warning limits	2.2.7.3.1	Upper alarm limit
				2.2.7.3.2	Upper warning limit
				2.2.7.3.3	Lower warning limit
				2.2.7.3.4	Lower alarm limit
				2.2.7.3.5	Hysteresis

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
2.2.8	Fraction (if available)	2.2.8.1	Active fraction table		
		2.2.8.2	Units		
		2.2.8.3	Measurement mode		
		2.2.8.4	Fraction Name		
		2.2.8.5	Fraction A	2.2.8.5.1	Fraction A label
				2.2.8.5.2	Upper Limit Alarm
				2.2.8.5.3	Upper Limit Warning
				2.2.8.5.4	Lower Limit Warning
				2.2.8.5.5	Lower Limit Alarm
				2.2.8.5.6	Alarm Hysteresis
				2.2.8.5.7	Decimal Places
		2.2.8.6	Fraction B	2.2.8.6.1	Fraction B label
				2.2.8.6.2	Upper Limit Alarm
				2.2.8.6.3	Upper Limit Warning
				2.2.8.6.4	Lower Limit Warning
				2.2.8.6.5	Lower Limit Alarm
				2.2.8.6.6	Alarm Hysteresis
				2.2.8.6.7	Decimal Places
		2.2.8.7	Fraction A %	2.2.8.7.1	Upper Limit Alarm
				2.2.8.7.2	Upper Limit Warning
				2.2.8.7.3	Lower Limit Warning
				2.2.8.7.4	Lower Limit Alarm
				2.2.8.7.5	Alarm Hysteresis
				2.2.8.7.6	Decimal Places
		2.2.8.8	Fraction B %	2.2.8.8.1	Upper Limit Alarm
				2.2.8.8.2	Upper Limit Warning
				2.2.8.8.3	Lower Limit Warning
				2.2.8.8.4	Lower Limit Alarm
				2.2.8.8.5	Alarm Hysteresis
				2.2.8.8.6	Decimal Places
		2.2.8.9	Fraction Adjustment	2.2.8.9.1	Adjustment Factor
				2.2.8.9.2	Fraction offset

C.4 Menu item 2.3: Totalizers

Table C-4 Totalizers

Level 3		Level 4		Level 5	
No. Name		No.	Name	No.	Name
2.3.1	Totalizer 1	2.3.1.1	Process value		
		2.3.1.2	Units		
		2.3.1.3	Custom units		
		2.3.1.4	Custom conversion factor		
		2.3.1.5	Decimal places		
		2.3.1.6	Direction		
		2.3.1.7	Fail-safe behaviour		
		2.3.1.8	Reset		
		2.3.1.9	Preset		
		2.3.1.10	Alarm and warning limits	2.3.1.10.1	Upper alarm limit
				2.3.1.10.2	Upper warning limit
				2.3.1.10.3	Lower warning limit
				2.3.1.10.4	Lower alarm limit
				2.3.1.10.5	Hysteresis
2.3.2	Totalizer 2	2.3.2.1	Process value		
		2.3.2.2	Units		
		2.3.2.3	Custom units		
		2.3.2.4	Custom conversion factor		
		2.3.2.5	Decimal places		
		2.3.2.6	Direction		
		2.3.2.7	Fail-safe behaviour		
		2.3.2.8	Reset		
		2.3.2.9	Preset		
		2.3.2.10	Alarm and warning limits	2.3.2.10.1	Upper alarm limit
				2.3.2.10.2	Upper warning limit
				2.3.2.10.3	Lower warning limit
				2.3.2.10.4	Lower alarm limit
				2.3.2.10.5	Hysteresis
2.3.3	Totalizer 3	2.3.3.1	Process value		
		2.3.3.2	Units		
		2.3.3.3	Custom units		
		2.3.3.4	Custom conversion factor		
		2.3.3.5	Decimal places		
		2.3.3.6	Direction		
		2.3.3.7	Fail-safe behaviour		
		2.3.3.8	Reset		
		2.3.3.9	Preset		

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
		2.3.3.10	Alarm and warning limits	2.3.3.10.1	Upper alarm limit
				2.3.3.10.2	Upper warning limit
				2.3.3.10.3	Lower warning limit
				2.3.3.10.4	Lower alarm limit
				2.3.3.10.5	Hysteresis
2.3.4	Reset All Totalizers				

C.5 Menu item 2.4: Inputs and outputs

Table C-5 Current output on CH1

Level 3	Level 3		Level 4		
No.	Name	No.	Name	No.	Name
2.4.1	CH1 - output with HART	2.4.1.1	Loop current mode		
		2.4.1.2	Active operation		
		2.4.1.3	PV selection		
		2.4.1.4	Direction		
		2.4.1.5	Loop current scale		
		2.4.1.6	Upper range value		
		2.4.1.7	Lower range value		
		2.4.1.8	Fail safe activation condition		
		2.4.1.9	Damping value		
		2.4.1.10	Fail-safe Behaviour		
		2.4.1.11	Fail Safe Value		
		2.4.1.12	Fail-safe minimum duration		

Note

Menu item visibility

The availability in the HMI of the menu items for channels 2, 3 and 4 depend on the I/O configuration.

Table C-6 Signal output on CH2

Level 3		Level 4	Level 4		Level 5		
No.	Name	No.	Name	No.	Name		
2.4.2	CH2 - output	2.4.2.1	Operation mode				
		2.4.2.3	Active operation				
		2.4.2.4	Fail-safe activation condition				
		2.4.2.5	Current output	2.4.2.5.1	Process value		
				2.4.2.5.2	Flow direction		
				2.4.2.5.3	Loop current scale		
				2.4.2.5.4	Upper range value		
				2.4.2.5.5	Lower range value		
				2.4.2.5.6	Damping value		
				2.4.2.5.7	Fail-safe behavior		
				2.4.2.5.8	Fail-safe value		
				2.4.2.5.9	Fail-safe minimum duration		
		2.4.2.6	Frequency output	2.4.2.6.1	Process value		
				2.4.2.6.2	Flow direction		
				2.4.2.6.3	Upper frequency value		
				2.4.2.6.4	Lower frequency value		
				2.4.2.6.5	Upper range value		
				2.4.2.6.6	Lower range value		
				2.4.2.6.7	Damping value		
				2.4.2.6.8	Fail-safe behavior		
				2.4.2.6.9	Fail-safe value		
				2.4.2.6.10	Fail-safe minimum duration		
		2.4.2.7	Pulse output	2.4.2.7.1	Process value		
				2.4.2.7.2	Flow direction		
				2.4.2.7.3	Pulse units		
				2.4.2.7.4	Amount		
				2.4.2.7.5	Pulses per amount		
				2.4.2.7.6	Pulse width units		
				2.4.2.6.7	Pulse width		
				2.4.2.7.8	Polarity		
				2.4.2.7.9	Fail-safe behavior		
				2.4.2.7.10	Fail-safe value		
				2.4.2.7.11	Fail-safe minimum duration		
		2.4.2.8	Digital output	2.4.2.8.1	Mode		
				2.4.2.8.2	Sensor alarms (group 1)		
				2.4.2.8.3	Sensor alarms (group 2)		
				2.4.2.8.4	Process alarms (1)		
				2.4.2.8.5	Process alarms (2)		
				2.4.2.8.8	Totalizers alarms		
				2.4.2.8.9	Device alarms		

Level 3	Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name	
				2.4.2.8.10	Channel 1 alarms	
				2.4.2.8.11	Input/output alarms (1)	
				2.4.2.8.13	Simulation alarms (1)	
				2.4.2.8.14	Simulation alarms (2)	
				2.4.2.8.15	Alarm class	
				2.4.2.8.16	NAMUR status signal	
				2.4.2.8.17	Polarity	
				2.4.2.8.18	On-delay	
				2.4.2.8.19	Off-delay	

Table C-7 Input/output on CH3

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
2.4.3	CH3 - input/output	2.4.3.1	Operation mode		
		2.4.3.3	Active operation		
		2.4.3.4	Fail-safe activation condition		
		2.4.3.5	Current Output	2.4.3.5.1	Process value
				2.4.3.5.2	Flow direction
				2.4.3.5.3	Loop current scale
				2.4.3.5.4	Upper range value
				2.4.3.5.5	Lower range value
				2.4.3.5.6	Damping value
				2.4.3.5.7	Fail-safe behavior
				2.4.3.5.8	Fail-safe value
				2.4.3.5.9	Fail-safe minimum duration
		2.4.3.6	Frequency output	2.4.3.6.1	Redundancy mode
				2.4.3.6.2	Process value
				2.4.3.6.2	Flow direction
				2.4.3.6.4	Upper frequency value
				2.4.3.6.5	Lower frequency value
				2.4.3.6.6	Upper range value
				2.4.3.6.7	Lower range value
				2.4.3.6.8	Damping value
				2.4.3.6.9	Fail-safe behavior
				2.4.3.6.10	Fail-safe value
				2.4.3.6.11	Fail-safe minimum duration
		2.4.3.7	Pulse output	2.4.3.7.1	Redundancy mode
				2.4.3.7.2	Process value
				2.4.3.7.3	Flow direction
				2.4.3.7.4	Pulse units
				2.4.3.7.5	Amount
				2.4.3.7.6	Pulses per amount
				2.4.3.7.7	Pulse width units
				2.4.3.7.8	Pulse width
				2.4.3.7.9	Polarity
				2.4.3.7.10	Fail-safe behavior
				2.4.3.7.11	Fail-safe value
				2.4.3.7.12	Fail-safe minimum duration
		2.4.3.8	Digital output	2.4.3.8.1	Mode
				2.4.3.8.2	Sensor alarms (group 1)
				2.4.3.8.3	Sensor alarms (group 2)
				2.4.3.8.4	Process alarms (1)
				2.4.3.8.5	Process alarms (2)

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
				2.4.3.8.8	Totalizers alarms
				2.4.3.8.9	Device alarms
				2.4.3.8.10	Channel 1 alarms
				2.4.3.8.11	Input/output alarms (1)
				2.4.3.8.13	Simulation alarms (1)
				2.4.3.8.14	Simulation alarms (2)
				2.4.3.8.15	Alarm class
				2.4.3.8.16	NAMUR status signal
				2.4.3.8.17	Polarity
				2.4.3.8.18	On-delay
				2.4.3.8.19	Off-delay
		2.4.3.9	Digital input	2.4.3.9.1	Input function
				2.4.3.9.2	CH1 forced current value
				2.4.3.9.3	CH2 forced current value
				2.4.3.9.4	CH3 forced current value
				2.4.3.9.5	CH4 forced current value
				2.4.3.9.6	Debounce time
				2.4.3.9.7	Polarity
2.4.4	CH3 - relay	2.4.4.1	Operation Mode		
		2.4.4.2	Mode		
		2.4.4.3	Sensor alarms (group 1)		
		2.4.4.4	Sensor alarms (group 2)		
		2.4.4.5	Process alarms (1)		
		2.4.4.6	Process alarms (2)		
		2.4.4.9	Totalizers alarms		
		2.4.4.10	Device alarms		
		2.4.4.11	Channel 1 alarms		
		2.4.4.12	Input/output alarms (1)		
		2.4.4.14	Simulation alarms (1)		
		2.4.4.15	Simulation alarms (2)		
		2.4.4.16	Alarm class		
		2.4.4.17	NAMUR status signal		
		2.4.4.18	Polarity		
		2.4.4.19	On-delay		
		2.4.4.20	Off-delay		

Table C-8 Input/output on CH4

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
2.4.4	CH4 - input/output	2.4.5.1	Operation Mode		
		2.4.5.3	Active operation		
		2.4.5.4	Fail-safe activation condition		
		2.4.5.5	Current output	2.4.5.4.1	Process value
				2.4.5.4.2	Flow direction
				2.4.5.4.3	Loop current scale
				2.4.5.4.4	Upper range value
				2.4.5.4.5	Lower range value
				2.4.5.4.6	Damping value
				2.4.5.4.7	Fail-safe behavior
				2.4.5.4.8	Fail-safe value
				2.4.5.4.9	Fail-safe minimum duration
		2.4.5.6	Frequency output	2.4.5.6.1	Process value
				2.4.5.6.2	Flow direction
				2.4.5.6.3	Upper frequency value
				2.4.5.6.4	Lower frequency value
				2.4.5.6.5	Upper range value
				2.4.5.6.6	Lower range value
				2.4.5.6.7	Damping value
				2.4.5.6.8	Fail-safe behavior
				2.4.5.6.9	Fail-safe value
				2.4.5.6.10	Fail-safe minimum duration

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
		2.4.5.7	Pulse output	2.4.5.7.1	Process value
				2.4.5.7.2	Flow direction
				2.4.5.7.3	Pulse units
				2.4.5.7.4	Amount
				2.4.5.7.5	Pulses per amount
				2.4.5.7.6	Pulse width units
				2.4.5.7.7	Pulse width
				2.4.5.7.8	Polarity
				2.4.5.7.9	Fail-safe behavior
				2.4.5.7.10	Fail-safe value
				2.4.5.7.11	Fail-safe minimum duration
		2.4.5.8	Digital output	2.4.5.8.1	Mode
				2.4.5.8.2	Sensor alarms (group 1)
				2.4.5.8.3	Sensor alarms (group 2)
				2.4.5.8.4	Process alarms (1)
				2.4.5.8.5	Process alarms (2)
				2.4.5.8.8	Totalizers alarms
				2.4.5.8.9	Device alarms
				2.4.5.8.10	Channel 1 alarms
				2.4.5.8.11	Input/output alarms (1)
				2.4.5.8.13	Simulation alarms (1)
				2.4.5.8.14	Simulation alarms (2)
				2.4.5.8.15	Alarm class
				2.4.5.8.16	NAMUR status signal
				2.4.5.8.17	Polarity
				2.4.5.8.18	On-delay
				2.4.5.8.19	Off-delay
		2.4.5.9	Digital input	2.4.5.9.1	Input function
				2.4.5.9.2	CH1 forced current value
				2.4.5.9.3	CH2 forced current value
				2.4.5.9.4	CH3 forced current value
				2.4.5.9.5	CH4 forced current value
				2.4.5.9.6	Debounce time
				2.4.5.9.7	Polarity

Level 3		Level 4	Level 4		Level 5	
No.	Name	No.	Name	No.	Name	
2.4.6	CH4 - relay	2.4.6.1	Operation Mode			
		2.4.6.2	Mode			
		2.4.6.3	Sensor alarms (group 1)			
		2.4.6.4	Sensor alarms (group 2)			
		2.4.6.5	Process alarms (1)			
		2.4.6.6	Process alarms (2)			
		2.4.6.9	Totalizers alarms			
		2.4.6.10	Device alarms			
		2.4.6.11	Channel 1 alarms			
		2.4.6.12	Input/output alarms (1)			
		2.4.6.14	Simulation alarms (1)			
		2.4.6.15	Simulation alarms (2)			
		2.4.6.16	Alarm class			
		2.4.6.17	NAMUR status signal			
		2.4.6.18	Polarity			
		2.4.6.19	On-delay			
		2.4.6.20	Off-delay			

C.6 Menu item 2.5: Dosing

Table C-9 Dosing

Level 3		Level 4	Level 4		
No.	Name	No.	Name	No.	Name
2.5.1	Dosing mode				
2.5.2	Process value				
2.5.3	Active recipe				

C.6 Menu item 2.5: Dosing

Table C-10 Recipe 1

Level 3		Level 4	Level 4		Level 5	
No.	Name	No.	Name	No.	Name	
2.5.5	Recipe 1	2.5.5.1	Name			
		2.5.5.2	Units			
		2.5.5.3	Amount			
		2.5.5.4	Decimal places			
		2.5.5.5	User calibration	2.5.5.5.2	Fixed compensation	
		2.5.5.6	Valve control	2.5.5.6.1	Stage setup format	
				2.5.5.6.2	Value to open primary valve	
				2.5.5.6.3	Value to close primary valve	
				2.5.5.6.4	Value to open secondary valve	
				2.5.5.6.5	Value to close secondary valve	
				2.5.5.6.6	Current value to close	
				2.5.5.6.7	Current value to partially open	
				2.5.5.6.8	Current value to fully open	
				2.5.5.6.9	Amount for fully open	
				2.5.5.6.10	Amount for partially open	
		2.5.5.7	Fault handling	2.5.5.7.1	Duration mode	
				2.5.5.7.2	Duration time	
				2.5.5.7.3	Overrun mode	
				2.5.5.7.4	Overrun value	

Table C-11 Recipe 2

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
2.5.6	Recipe 2	2.5.6.1	Name		
		2.5.6.2	Units		
		2.5.6.3	Amount		
		2.5.6.4	Decimal places		
		2.5.6.5	User calibration	2.5.6.5.2	Fixed compensation
		2.5.6.6	Valve control	2.5.6.6.1	Stage setup format
				2.5.6.6.2	Value to open primary valve
				2.5.6.6.3	Value to close primary valve
				2.5.6.6.4	Value to open secondary valve
				2.5.6.6.5	Value to close secondary valve
				2.5.6.6.6	Current value to close
				2.5.6.6.7	Current value to partially open
				2.5.6.6.8	Current value to fully open
				2.5.6.6.9	Amount for fully open
				2.5.6.6.10	Amount for partially open
		2.5.6.7	Fault handling	2.5.6.7.1	Duration mode
				2.5.6.7.2	Duration time
				2.5.6.7.3	Overrun mode
				2.5.6.7.4	Overrun value

C.6 Menu item 2.5: Dosing

Table C-12 Recipe 3

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
2.5.7	Recipe 3	2.5.7.1	Name		
		2.5.7.2	Units		
		2.5.7.3	Amount		
		2.5.7.4	Decimal places		
		2.5.7.5	User calibration	2.5.7.5.2	Fixed compensation
		2.5.7.6	Valve control	2.5.7.6.1	Stage setup format
				2.5.7.6.2	Value to open primary valve
				2.5.7.6.3	Value to close primary valve
				2.5.7.6.4	Value to open secondary valve
				2.5.7.6.5	Value to close secondary valve
				2.5.7.6.6	Current value to close
				2.5.7.6.7	Current value to partially open
				2.5.7.6.8	Current value to fully open
				2.5.7.6.9	Amount for fully open
				2.5.7.6.10	Amount for partially open
		2.5.7.7	Fault handling	2.5.7.7.1	Duration mode
				2.5.7.7.2	Duration Ttme
				2.5.7.7.3	Overrun mode
				2.5.7.7.4	Overrun value

Table C-13 Recipe 4

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
2.5.8	Recipe 4	2.5.8.1	Name		
		2.5.8.2	Units		
		2.5.8.3	Amount		
		2.5.8.4	Decimal places		
		2.5.8.5	User calibration	2.5.8.5.2	Fixed compensation
		2.5.8.6	Valve control	2.5.8.6.1	Stage setup format
				2.5.8.6.2	Value to open primary valve
				2.5.8.6.3	Value to close primary valve
				2.5.8.6.4	Value to open secondary valve
				2.5.8.6.5	Value to close secondary valve
				2.5.8.6.6	Current value to close
				2.5.8.6.7	Current value to partially open
				2.5.8.6.8	Current value to fully open
				2.5.8.6.9	Amount for fully open
				2.5.8.6.10	Amount for partially open
		2.5.8.7	Fault handling	2.5.8.7.1	Duration mode
				2.5.8.7.2	Duration time
				2.5.8.7.3	Overrun mode
				2.5.8.7.4	Overrun value

C.7 Menu item 2.7: Date and time

Table C-14 Recipe 5

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
2.5.9	Recipe 5	2.5.9.1	Name		
		2.5.9.2	Units		
		2.5.9.3	Amount		
		2.5.9.4	Decimal places		
		2.5.9.5	User calibration	2.5.9.5.4	Fixed compensation
		2.5.9.6	Valve control	2.5.9.6.1	Stage setup format
				2.5.9.6.2	Value to open primary valve
				2.5.9.6.3	Value to close primary valve
				2.5.9.6.4	Value to open secondary valve
				2.5.9.6.5	Value to close secondary valve
				2.5.9.6.6	Current value to close
				2.5.9.6.7	Current value to partially open
				2.5.9.6.8	Current value to fully open
				2.5.9.6.9	Amount for fully open
				2.5.9.6.10	Amount for partially open
		2.5.9.7	Fault handling	2.5.9.7.1	Duration mode
				2.5.9.7.2	Duration time
				2.5.9.7.3	Overrun mode
				2.5.9.7.4	Overrun value

C.7 Menu item 2.7: Date and time

Table C-15 Date and time

Level 3		Level 4		Level 5	
No.	Name	No. Name		No.	Name
2.7.1	Current date and time				
2.7.2	Set date and time				

C.8 Menu item 2.8: Local display

Table C-16 Local display

Level 3		Level 4		Level 5		
No.	Name	No.	Name	No.	Name	
2.8.1	Brightness					
2.8.2	Backlight					
2.8.3	Contrast					
2.8.5	View 1	2.8.5.1	Туре			
		2.8.5.2	1 st value			
		2.8.5.3	2 nd value			
		2.8.5.4	3 ^d value			
		2.8.5.5	4 th value			
		2.8.5.6	5 th value			
		2.8.5.7	6 th value			
		2.8.5.8	Scale mode			
		2.8.5.9	Log time window			
		2.8.5.10	Scale lower limit			
		2.8.5.11	Scale upper limit			
2.8.6	View 2	2.8.6.1	Enable or disable			
		2.8.6.2	Туре			
		2.8.6.3	1 st value			
		2.8.6.4	2 nd value			
		2.8.6.5	3 ^d value			
		2.8.6.6	4 th value			
		2.8.6.7	5 th value			
		2.8.6.8	6 th value			
		2.8.6.9	Scale mode			
		2.8.6.10	Log time window			
		2.8.6.11	Scale lower limit			
		2.8.6.12	Scale upper limit			
2.8.7	View 3	2.8.7.1	Enable or disable			
		2.8.7.2	Туре			
		2.8.7.3	1 st value			
		2.8.7.4	2 nd value			
		2.8.7.5	3 ^d value			
		2.8.7.6	4 th value			
		2.8.7.7	5 th value			
		2.8.7.8	6 ^h value			
		2.8.7.9	Scale mode			
		2.8.7.10	Log time window			
		2.8.7.11	Scale lower limit			
		2.8.7.12	Scale upper limit			

C.8 Menu item 2.8: Local display

Level 3		Level 4		Level 5		
No.	Name	No.	Name	No.	Name	
2.8.8	View 4	2.8.7.1	Enable or disable			
		2.8.7.2	Type			
		2.8.7.3	1 st value			
		2.8.7.4	2 nd value			
		2.8.7.5	3 ^d value			
		2.8.7.6	4 th value			
		2.8.7.7	5 th value			
		2.8.7.8	6 th value			
		2.8.7.9	Scale mode			
		2.8.7.10	Log time window			
		2.8.8.11	Scale lower limit			
		2.8.8.12	Scale upper limit			
2.8.9	View 5	2.8.9.1	Enable or disable			
		2.8.9.2	Type			
		2.8.9.3	1 st value			
		2.8.9.4	2 nd value			
		2.8.9.5	3 ^d value			
		2.8.9.6	4 th value			
		2.8.9.7	5 th value			
		2.8.9.8	6 th value			
		2.8.9.9	Scale mode			
		2.8.9.10	Log time window			
		2.8.9.11	Scale lower limit			
		2.8.9.12	Scale upper limit			
2.8.10	View 6	2.8.10.1	Enable or disable			
		2.8.10.2	Type			
		2.8.10.3	1 st value			
		2.8.10.4	2 nd value			
		2.8.10.5	3 ^d value			
		2.8.10.6	4 th value			
		2.8.10.7	5 th value			
		2.8.10.8	6 th value			
		2.8.10.9	Scale mode			
		2.8.10.10	Log time window			
		2.8.10.11	Scale lower limit			
		2.8.10.12	Scale upper limit			
2.8.11	Status icons					

C.9 Menu item 3.1: Identification

Table C-17 Identification

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
3.1.1	Long tag				
3.1.2	Descriptor				
3.1.3	Message				
3.1.4	Location				
3.1.5	Installation date				
3.1.6	Manufacturer				
3.1.7	Product name				
3.1.8	Product variant				
3.1.9	Order number				
3.1.10	Serial number				
3.1.11	FW revision				
3.1.12	HW revision				
3.1.13	Final assembly number				
3.1.15	Transmitter electronics	3.1.15.1	HW version		
		3.1.15.2	FW version		
		3.1.15.3	Serial number		
		3.1.15.4	Order number		
		3.1.15.5	Communication interface HW version		
		3.1.15.6	Communication interface serial number		
3.1.16	Local display	3.1.16.1	HW version		
		3.1.16.2	FW version		
		3.1.16.3	Local operation content version		
3.1.17	I/O electronics	3.1.17.1	HW version		
		3.1.17.2	FW version		
		3.1.17.3	Serial number		
3.1.19	Sensor	3.1.19.1	Туре		
		3.1.19.2	Size		
		3.1.19.3	Order number		
		3.1.19.4	Serial number		

C.10 Menu item 3.2: Diagnostic events

Table C-18 Diagnostic events

Level 3	Level 3		Level 4		
No.	Name	No.	Name	No.	Name
3.2.1	Active diagnostic events				
3.2.2	Diagnostic log				
3.2.3	Clear diagnostic log				
3.2.4	Alarm acknowledge mode				
3.2.5	Transmitter detail alarms				
3.2.6	Suppression time				
3.2.7	Enable alarms	3.2.7.1	Sensor alarms (group 1)		
		3.2.7.2	Sensor alarms (group 2)		
		3.2.7.3	Process alarms (group 1)		
		3.2.7.4	Process alarms (group 2)		
		3.2.7.7	Totalizers alarms		
		3.2.7.8	Device alarms		
		3.2.7.9	Simulation alarms (group 1)		
		3.2.7.10	Simulation alarms (group 2)		
		3.2.7.11	Input/output alarms (group 1)		
		3.2.7.13	Dosing alarms		
3.2.8	Alarm class assignment	3.2.8.8	148 Transm. temp above alarm limit		
		3.2.8.9	149 Transm. temp above alarm limit		

Note

Transmitter detail alarms

Menu item 3.2.5 Transmitter detail alarms is only visible in case an alarm with detailed alarm information is pending.

C.11 Menu item 3.3: Maintenance

Table C-19 Maintenance

Level 3		Level 4	Level 4		
No.	Name	No.	Name	No.	Name
3.3.1	Copy configuration				
3.3.2	Spare part replacement	3.3.2.1	Transmitter	3.3.2.1.1	Replace transmitter
				3.3.2.1.2	Replace transmitter cas- sette
				3.3.2.1.3	Replace sensor cassette
		3.3.2.2	Sensor	3.3.7.2.1	Replace DSL
				3.3.7.2.2	Replace sensor
3.3.3	Operating time	3.3.3.1	Operating time		
		3.3.3.2	Operating time total		

Note

Spare part replacement

Menu item 3.3.2 Spare Part Replacement is only visible if access level is Expert.

C.12 Menu item 3.4: Diagnostics

Table C-20 Diagnostics

Level 3		Level 4	Level 4		
No.	Name	No.	Name	No.	Name
3.4.1	Sensor	3.4.1.1	Driver current		
		3.4.1.2	Pickup S1 amplitude		
		3.4.1.3	Pickup S2 amplitude		
		3.4.1.4	Max. Pickup Amplitude diff		
		3.4.1.5	Derived frequency		
		3.4.1.7	Offset		
3.4.2	Temperature monitoring	3.4.2.1	Medium temperature	3.4.2.1.1	Current value
		3.4.2.2 Transmitter electronics temperature		3.4.2.2.1	Current value
			3.4.2.2.2	Minimum	
				3.4.2.2.3	Timestamp at minimum
				3.4.2.2.4	Maximum
				3.4.2.2.5	Timestamp at maximum
		3.4.2.3	DSL temperature	3.4.2.3.1	Current value
		3.4.2.4	Sensor frame temperature	3.4.2.4.1	Current value

C.12 Menu item 3.4: Diagnostics

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
3.4.3	Inputs and outputs	3.4.3.1	Channel 1 – output with	3.4.3.1.1	Loop current
			HART	3.4.3.1.2	Error status
		3.4.3.2	Channel 2 – output	3.4.3.2.1	Operation mode
				3.4.3.2.2	Loop current
				3.4.3.2.2	Digital output signal
				3.4.3.2.2	Totalized amount
				3.4.3.2.2	Output frequency
				3.4.3.2.3	Error status
				3.4.3.2.4	Pulse counter
				3.4.3.2.5	Reset pulse counter
		3.4.3.3	Channel 3 – input/output	3.4.3.3.1	Operation mode
				3.4.3.3.2	Digital input value
				3.4.3.3.2	Totalized amount
				3.4.3.3.2	Output frequency
				3.4.3.3.2	Digital output signal
				3.4.3.3.2	Loop current
				3.4.3.3.3	Error status
				3.4.3.3.4	Pulse counter
				3.4.3.3.5	Reset pulse counter
		3.4.3.4	Channel 3 – relay	3.4.3.4.1	Digital output signal
		3.4.3.5	Channel 4 – input/output	3.4.3.5.1	Operation mode
				3.4.3.5.2	Digital input value
				3.4.3.5.2	Totalized amount
				3.4.3.5.2	Output frequency
				3.4.3.5.2	Digital output signal
				3.4.3.5.2	Loop current
				3.4.3.5.3	Error status
				3.4.3.5.4	Pulse counter
				3.4.3.5.5	Reset pulse counter
		3.4.3.6	Channel 4 – relay	3.4.3.6.1	Digital output signal

C.13 Menu item 3.5: Peak values

Table C-21 Peak values

Level 3		Level 4	Level 4		
No.	Name	No.	Name	No.	Name
3.5.1	Process value 1	3.5.1.1	Process value		
		3.5.1.2	Minimum		
		3.5.1.3	Timestamp at minimum		
		3.5.1.4	Maximum		
		3.5.1.5	Timestamp at maximum		
		3.5.1.6	Reset		
3.5.2	Process value 2	3.5.2.1	Process value		
		3.5.2.2	Minimum		
		3.5.2.3	Timestamp at minimum		
		3.5.2.4	Maximum		
		3.5.2.5	Timestamp at maximum		
		3.5.2.6	Reset		
3.5.3	Process value 3	3.5.3.1	Process value		
		3.5.3.2	Minimum		
		3.5.3.3	Timestamp at minimum		
		3.5.3.4	Maximum		
		3.5.3.5	Timestamp at maximum		
		3.5.3.6	Reset		
3.5.3	Process value 4	3.5.4.1	Process value		
		3.5.4.2	Minimum		
		3.5.4.3	Timestamp at minimum		
		3.5.4.4	Maximum		
		3.5.4.5	Timestamp at maximum		
		3.5.4.6	Reset		

C.14 Menu item 3.6: Characteristics

Table C-22 Characteristics

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
3.6.1	SIL variant				
3.6.2	Customer transfer (CT) variant				
3.6.3	Customer transfer (CT) active				
3.6.4	Transmitter	3.6.4.1	Composition		
		3.6.4.2	Hazardous area approval		

C.15 Menu item 3.7: SensorFlash

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
3.6.6	Sensor	3.6.6.1	Hazardous area approval		
		3.6.6.2	Maximum mass flow capacity		
		3.6.6.3	Calibration factor		
		3.6.6.4	Density calibration offset		
		3.6.6.5	Density calibration factor		
		3.6.6.6	Density compensation tube temperature		
		3.6.6.7	Density compensation sen- sor frame temperature		
		3.6.6.8	Material of wetted parts		
3.6.7	Fraction order code				

Note

Menu item 3.6.7 "Fraction order code" is only visible if fraction has been ordered.

C.15 Menu item 3.7: SensorFlash

Table C-23 SensorFlash

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
3.7.1	Eject				
3.7.2	SensorFlash installed				
3.7.3	Capacity				
3.7.4	Free space				
3.7.5	Data logging	3.7.5.1	Activation		
		3.7.5.2	Data logging mode		
		3.7.5.3	Logging interval		
		3.7.5.4	Process values	3.7.5.4.1	Logging value 1
				3.7.5.4.2	Logging value 2
				3.7.5.4.3	Logging value 3
				3.7.5.4.4	Logging value 4
				3.7.5.4.5	Logging value 5
				3.7.5.4.6	Logging value 6
				3.7.5.4.7	Logging value 7
				3.7.5.4.8	Logging value 8
				3.7.5.4.9	Logging value 9
		3.7.5.5	Advanced logging	3.7.5.5.1	Register 1

Level 3		Level 4	Level 4		Level 5	
No.	Name	No.	Name	No.	Name	
				3.7.5.5.2	Register 2	
				3.7.5.5.3	Register 3	
				3.7.5.5.50	Register 50	

C.16 Menu item 3.8: Simulation

Table C-24 Input/Outputs

Level 3		Level 4		Level 5	
No.	No. Name		Name	No.	Name
3.8.1 Inputs and output	Inputs and outputs	3.8.1.1	CH1 - output with HART	3.8.1.1.1	Simulation
				3.8.1.1.2	Simulation value
		3.8.1.2	CH2 - output	3.8.1.2.1	Operation mode
				3.8.1.2.2	Simulation
				3.8.1.2.3	Simulation value
		3.8.1.3	CH3 - input/output	3.8.1.3.1	Operation mode
				3.8.1.3.2	Simulation
				3.8.1.3.3	Simulated Value
		3.8.1.4	CH3 - relay	3.8.1.4.1	Simulation
				3.8.1.4.2	Simulation Value
		3.8.1.5	CH4 - input/output	3.8.1.5.1	Operation mode
				3.8.1.5.2	Simulation
				3.8.1.6.3	Simulation value
		3.8.1.6	CH4 - relay	3.8.1.6.1	Simulation
				3.8.1.6.2	Simulated value
3.8.2	Process values	3.8.2.3	Mass flow	3.8.2.3.1	Simulation
				3.8.2.3.6	Simulation value
		3.8.2.4	Volume flow	3.8.2.4.1	Simulation
				3.8.2.4.2	Simulation value
		3.8.2.5	Standard volume flow	3.8.2.5.1	Simulation
				3.8.2.5.2	Simulation value
		3.8.2.6	Density	3.8.2.6.1	Simulation
				3.8.2.6.2	Simulation value
		3.8.2.7	Medium temperature	3.8.2.7.1	Simulation
				3.8.2.7.4	Simulation value
		3.8.2.9	Fraction	3.8.2.9.1	Simulation
				3.8.2.9.2	Fraction A %
				3.8.2.9.3	Fraction B %

C.18 Menu item 3.10: Self test

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
3.8.3	Alarms	3.8.3.1	Simulation mode		
		3.8.3.2	Alarms	3.8.3.2.1	Sensor alarms (group 1)
				3.8.3.2.2	Sensor alarms (group 2)
				3.8.3.2.4	Process alarms (group 1)
				3.8.3.2.5	Process alarms (group 2)
				3.8.3.2.6	Process alarms (group 3)
				3.8.3.2.7	Process alarms (group 4)
				3.8.3.2.8	Totalizers alarms
				3.8.3.2.9	Device alarms
				3.8.3.2.10	CH1 alarms
				3.8.3.2.11	Input/output alarms (group 1)
				3.8.3.2.12	Input/output alarms (group 2)
				3.8.3.2.13	Dosing alarms
		3.8.3.3	NAMUR status signal		

C.17 Menu item 3.9: Audit trail

Table C-25 Audit trail

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
3.9.1	Parameter change log				
3.9.2	Clear parameter change log				
3.9.3	FW update change log				
3.9.4	Clear FW update change log				

C.18 Menu item 3.10: Self test

Table C-26 Self test

Level 3		Level 4		Level 5	
No.	Name	No. Name		No. Name	
3.10.1	Display test				

C.19 Menu item 3.11: Resets

Table C-27 Resets

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
3.11.1	Factory reset				
3.11.2	Device restart				

C.20 Menu item 3.12: Firmware update

Table C-28 Firmware update

Level 3		Level 4		Level 5	
No. Name		No. Name No.		Name	
3.12	Firmware update				

C.21 Menu item 4: Communication

Table C-29 Communication

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
4.1	USB (Service channel)	4.1.1	USB mode		
		4.1.2	Auto connection		
		4.1.3	Mass storage access		

C.21 Menu item 4: Communication

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
4.2	HART (CH1)	4.2.1	Polling address (SW)		
		4.2.2	Polling address (HW)		
		4.2.3	Tag		
		4.2.4	Hart device type		
		4.2.5	HART revision		
		4.2.6	Number of response pre- ambles		
		4.2.7	Dynamic variable map-	4.2.7.1	SV selection
			ping	4.2.7.2	TV selection
				4.2.7.3	QV selection
		4.2.8	HART units	4.2.8.1	Mass flow units
				4.2.8.2	Volume flow units comms
				4.2.8.3	Standard volume flow units comms
				4.2.8.4	Fraction units
				4.2.8.5	Fraction units
				4.2.8.8	Density units
				4.2.8.9	Kinematic viscosity units
				4.2.8.10	Pressure units
				4.2.8.11	Temperature units
				4.2.8.13	Totalizer 1 units
				4.2.8.13	Totalizer 1 units
				4.2.8.13	Totalizer 1 units
				4.2.8.14	Totalizer 2 units
				4.2.8.14	Totalizer 2 units
				4.2.8.14	Totalizer 2 units
				4.2.8.15	Totalizer 3 units
				4.2.8.15	Totalizer 3 units
				4.2.8.15	Totalizer 3 units
		4.2.9	Damping	4.2.9.1	Damping value
				4.2.9.2	Process values

Level 3		Level 4		Level 5	
No.	Name	No.	Name	No.	Name
4.3	Modbus (Channel 1)	4.3.1	Slave address (SW)		
		4.3.2	Slave address (HW)		
		4.3.3	Change Modbus settings		
		4.3.4	Data rate		
		4.3.5	Parity and stopbits		
		4.3.6	Floating point byte order		
		4.3.7	Integer byte order		
		4.3.8	Register mapping		
		4.3.9	Modbus units	4.3.9.1	Mass flow units
				4.3.9.2	Volume flow units comms
				4.3.9.3	Standard volume flow units comms
				4.3.9.4	Fraction units
				4.3.9.5	Fraction units
				4.3.9.8	Density units
				4.2.9.9	Kinematic viscosity units
				4.3.9.10	Pressure units
				4.3.9.11	Temperature units
				4.3.9.12	Totalizer 1 units
				4.3.9.12	Totalizer 1 units
				4.3.9.12	Totalizer 1 units
				4.3.9.13	Totalizer 2 units
				4.3.9.13	Totalizer 2 units
				4.3.9.13	Totalizer 2 units
				4.3.9.14	Totalizer 3 units
				4.3.9.14	Totalizer 3 units
				4.3.9.14	Totalizer 3 units
		4.3.10	Damping	4.3.10.1	Damping value
				4.3.10.2	Process values
4.4	PROFIBUS DP/PA	4.4.1	Slave address		
		4.4.2	Configuration flag ac- knowledge mode		
		4.4.3	GSD (General Station Description)		
		4.4.4	Active GSD (General Station Description)		

^{* =} only visible with ordering option S30. Not available for US customers.

C.22 Menu item 5: Security

Note

Menu items 4.1.2 "Auto connection" and 4.1.3 "Mass storage access" are only visible with ordering option S30 (SD-card accessibility via USB). Not allowed in USA by Patent.

C.22 Menu item 5: Security

Table C-30 Security

Level 3		Level 4	Level 4	
No.	Name	No.	Name	
5.1	Change user PIN			
5.2	Change expert PIN			
5.3	Recovery ID			
5.4	PIN recovery			
5.5	Activate user PIN			
5.6	Deactivate user PIN			
5.7	Auto logout			
5.8	Logout			

Zero point adjustment



In the following the automatic zero point adjustment function is described in detail.

Note

Preconditions

Before a zero point adjustment is initiated, the pipe must be flushed, filled and at an absolute flowrate of zero preferably also at operating pressure and temperature. Refer to "Zero point adjustment" via HMI (Page 86) or SIMATIC PDM (Page 102) for instructions.

Note

Change of parameters during zero point adjustment

Do not change any other parameter during the zero point adjustment procedure.

Automatic zero point adjustment

SITRANS FC330 measures and calculates the correct zero point automatically.

The automatic zero point adjustment of the flowmeter is set by the following parameters:

- Zero Point Adjustment Period
- Start Zero Point Adjustment

When zero adjust is initiated by selecting "Start Zero Point Adjustment", the mass flow values are acquired and totalized for the configured period (Zero Point Adjustment Period). The default zero point adjustment period (30 s.) is normally sufficient for a stable zero point measurement.

Note

Extremely low flow quantity

If the flow quantity is extremely small, extremely precise measurement is necessary. In this case, a long zero point adjustment period can be selected for improved zero point adjustment.

Zero point calculation

During zero point adjustment, an average value is automatically calculated using the following formula:

Zero Point Offset Value		
Average of N flow values	$\overline{x} \equiv \frac{\sum_{i=1}^{N} x_i}{N}$	 x_i is an instantaneous flow value sampled in the time domain N = Number of samples during zero point adjustment

The offset value must be within the determined "Offset limit" (menu item number 2.1.3.6).

Note

Exceeded zero point offset limit

If the offset value is greater than the configured limit, proceed as follows:

- Check that the tube is completely filled and that the flowrate is absolute zero.
- Check the validity of the configured zero point offset limit.
- · Repeat the zero point adjustment.

Zero point standard deviation

After completion of the procedure, the standard deviation is calculated in accordance with the following formula:

Zero Point Standard Deviation

Standard deviation of N values

$$s = \sqrt{\frac{\sum_{i=1}^{N} (x_i - \bar{x})^2}{N - 1}} = \sqrt{\frac{-N\bar{x}^2 + \sum_{i=1}^{N} x_i^2}{N - 1}}$$

The standard deviation contains important feedback on the homogeneity of the fluid, for example on the presence of bubbles or particles.

The standard deviation must be within the determined "Standard deviation limit" (menu item number 2.1.3.4).

Note

Exceeded standard deviation limit

If the standard deviation is greater than the configured limit, proceed as follows:

- Check that the tube is completely filled and that the flow rate is absolute zero.
- Check that the installation is vibration-free.
- Check the validity of the configured standard deviation limit in parameter 2.1.3.4 "Standard deviation limit".
- Repeat the zero point adjustment.

Successful automatic zero point adjustment

If the new zero point offset value is valid, it is automatically stored as the new zero point for the sensor. It remains stored in case of a power failure.

Manual zero point adjustment

In case an automatic zero point adjustment cannot be performed, it is possible to do a manual zero point adjustment by entering the zero point offset value.

- 1. Select "Manual" in "Select Zero Point Adj." (menu item 2.1.3).
- 2. Enter the desired value in "Offset" (menu item 2.1.3.7).

Certificates and support



E.1 Certificates

You can find certificates on the Internet at Industry online support portal (http://www.siemens.com/processinstrumentation/certificates) or on an included DVD.

Certification documents including calibration report are supplied with each sensor included on the SensorFlash. Material, pressure test, and factory conformance certificates are optional at ordering.

Note

EAC declaration

The EAC declaration is available on the SensorFlash SD card delivered with the device.

E.2 QR code label

A QR code label can be found on the device. With the use of a smart phone, the QR code provides a direct link to a website with information specific to the device, such as manuals, FAQs, certificates, etc.

E.3 Technical support

Technical support

If this documentation does not provide complete answers to any technical questions you may have, contact Technical Support at:

- Support request (http://www.siemens.com/automation/support-request)
- More information about our Technical Support is available at Technical Support (http://www.siemens.com/automation/csi/service)

Internet Service & Support

In addition to our documentation, Siemens provides a comprehensive support solution at:

Service & Support (http://www.siemens.com/automation/service&support)

E.3 Technical support

Personal contact

If you have additional questions about the device, please contact your Siemens personal contact at:

• Partner (http://www.automation.siemens.com/partner)

To find the personal contact for your product, go to "All Products and Branches" and select "Products & Services > Industrial Automation > Process Instrumentation".

Documentation

You can find documentation on various products and systems at:

• Instructions and manuals (http://www.siemens.com/processinstrumentation/documentation)

Index

	Identification, 27
A	Diagnostic events, 260
	Diagnostic views, 117
Accuracy	Diagnostics, 261
Density, 196	Sensor, 171
Mass flow, 196	Transmitter, 176
Media temperature, 196	Digital output, 199
Alarm classes, overview, 170	Dimensions and weight, 217
Alarm symbols, overview, 170	Disassembly, 55
Alarm views, 115	Disposal, 166
Applications, 35	Document history, 9
Approval nameplate	
Sensor, 32	Documentation, 276
Transmitter, 31	Edition, 9
Audit trail, 266	Dosing, 251
	E
В	–
Bus communication, 205	Electrical connection
Dus communication, 203	Cable specifications, 61
	In hazardous area, 79
С	Safety, 60
C	Empty tube monitoring, 132
Cable specifications, 61, 202	
Certificates, 15, 16, 275	
Certificates and approvals, 206	F
Characteristics, 263	Firmware undete 267
Cleaning, 160	Firmware update, 267
Commissioning	Flow direction, 50
HMI, 85	
Safety, 83	11
Wizard, 85	Н
Communication, 267	Handling, 52
Compact Operating Instructions, 276	HART
Connecting, 67, 71	connecting, 67
Coriolis	HART communication, 197
Measurement principle, 225	details, 235
Cross talk, 53, 193	HART module, 235
Current output, 198, 244	Hazardous area
Customer Support, (Refer to Technical support)	Electrical connection, 79
Customer Support, (Neich to Teenmour Support)	Laws and directives, 15, 16
	Qualified personnel, 18
D	Hazardous locations
	Approvals, 19
Design, 23	
sensor, 201, 202	HMI, 103
Design, transmitter, 200	Zero point adjustment, 86
Designated use, 200	Hotline, (Refer to Support request)

Device

I	N
Icons, (see Symbol) Identification, 259 Identification nameplate	NAMUR status signals, 170 Navigation view, 117
Sensor, 28	
Transmitter, 27 Info icons, 171 Installation Gas, 49 Incorrect, 193 Indoor/outdoor, 39	O Operating Instructions, 276 Operating views, 114 Operation, 103 Operation views, 110
Inlet / Outlet conditions, 49 Liquid, 49	_
Location in the system, 49 Mounting of sensor, 52 Orienting the sensor, 51 Rotate transmitter, 46 Transmitter mounting, 42 Upstream / Downstream, 49	P Panel cut-out dimensions, 44 Parameter view, 119 Peak values, 263 Performance, 195 Power supply, 195
Installation torques, 200 Instructions and manuals, 276 Interface HART communication, 197 Modbus communication, 197 Items supplied, 11	Process noise damping, 133 Process values, 239 Process variables, 205 PROFIBUS connecting, 71
	Q
L Laws and directives Disassembly, 15 Personell, 15	QR code label, 275 Qualified personnel, 18
Local display, 257	R
Turning, 48 Low flow cut-off, 132, 192	Rated operating conditions, 204 Recalibration, 160 Recipe 1, 252
M	Recipe 2, 253 Recipe 3, 254
Main menu, 237 Maintenance, 159, 161, 261 device status symbols, 168	Recipe 4, 255 Recipe 5, 256 Reference conditions, 195
Manuals, 276 Measurement views, 111	Relay output, 200, 249 Repair, 161
Modbus communication, 197 Modifications correct usage, 15	Resets, 267 Return procedure, 165
improper, 15 Mounting, (See Installation)	S
	Scope of delivery, 12

Security, 270 Self test, 266 Sensor diagnostics, 171 Sensor orientation, (See Installation) Sensor settings, 239 SensorFlash, 206, 264 Service, 161, 275 Service & Support, 275 Internet, 275 Service information, 164 Siemens standard alarm classes, 170 Signal output, 245, 247 Signal processing, 226 Simulation, 156, 265	V Vibrations, 53, 193 Views alarm, 115 diagnostic, 117 measurement, 111 navigation, 117 operating, 114 operation, 110 parameter, 119
Specification nameplate	W
Sensor, 31 Transmitter, 30 Support, 275 Support request, 275 Symbol configuration, 168 device status, 168 diagnostics, 168 maintenance, 168 operating mode, 168 process value, 168 Symbols, (Refer to warning symbols) System design, 200	Wall mount housing transmitter Panel mounting, 44 Warning symbols, 15 Warranty, 13 Wiring, (See Electrical connection) Z Zero point adjustment, 86, 131, 271 Automatic, 131, 271 HMI, 86
т	
Technical data, 195, 206 Current output, 198 Designated use, 200 Digital output, 199 Interface, 197 Power supply, 195 Relay output, 200 System design, 200 Technical support, 275 Partner, 276 Personal contact, 276 Temperature specifications, 20 Test certificates, 15, 16 Totalizers, 243 Transmitter Mounting, 42 Panel cut-out dimensions, 44 Pipe mounting, 42, 44 Rotate transmitter, 46 Wall mounting, 41, 43 Transmitter diagnostics, 176	

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