Brief Operating Instructions Liquipoint FTW23 IO-Link

Capacitance point level measurement

🚷 IO-Link



These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

Detailed information about the device can be found in the Operating Instructions and the other documentation: Available for all device versions via:

- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: Endress+Hauser Operations App





A0023555

Table of contents

1	Document information	3
1.1	Document function	2
1.2	Symbols	4 5
1.5	Registered trademarks	5
1.1		2
2	Basic safety instructions	6
2.1	Requirements for personnel	6
2.2	Designated use	6
2.3	Operational safety	. 6
2.4	Product safety	. 7
3	Product description	7
3.1	Product design	7
,	· · · · · · · · · · · · · · · · · · ·	~
4	Incoming acceptance and product identification	8
4.1	Incoming acceptance	0
4.2	Product Identification	a a
4.5		9
5	Installation	10
5.1	Installation conditions	10
5.2	Mounting the measuring device	11
5.3	Post-installation check	11
6	Floatnical connection	17
0		10
6.1 6.2	Connecting the measuring device	14
0.2	rost-connection thetk	14
7	Operation options	14
7.1	Operation with an operating menu	14
8	System integration 1	15
a	Commissioning	15
01		15
9.1	Commissioning with an operating manu	15
93	Unimissioning with an operating menu	16
9.4	Window function, media detection/differentiation	17
9.5	Application example	18
9.6	Light signals (LEDs)	19
9.7	Function of LEDs	20
9.8	Function testing of switch output	21

1 Document information

1.1 Document function

The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

1.2 Symbols

1.2.1 Safety symbols

Symbol	Meaning
	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE	NOTE! This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2 Electrical symbols

Symbol	Meaning
<u>+</u>	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.

1.2.3 Symbols for certain types of information

Symbol	Meaning
	Preferred Procedures, processes or actions that are preferred.
	Permitted Procedures, processes or actions that are permitted.
×	Forbidden Procedures, processes or actions that are forbidden.
i	Tip Indicates additional information.
	Reference to page
1. , 2. , 3	Series of steps

Symbol	Meaning
4	Result of a step
	Visual inspection

1.2.4 Symbols for graphics

Symbol	Meaning
1, 2, 3	Item numbers
A, B, C,	Views

1.2.5 Symbols for tools

Symbol	Meaning
Ŕ	Open-ended wrench

1.3 Documentation

The following document types are also available in the Download Area of the Endress+Hauser website: www.endress.com \rightarrow download

Documentation	Purpose and content of the document
Technical Information TI01202F/00/EN	This document contains all the technical data for the device and provides an overview of the accessories that can be ordered.
Operating Instructions BA01792F/00	The Operating Instructions contains all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.
Additional documentation	
TI00426F/00/EN SD01622Z/00/YY BA00361F/00/A6	Weld-in adapter, process adapter and flanges (overview) Weld-in adapter G 1", G ¾" (installation instructions) Weld-in adapter M24x1.5 (installation instructions)

1.4 Registered trademarks

IO-Link

is a registered trademark of the IO-Link company group.

2 Basic safety instructions

2.1 Requirements for personnel

Personnel involved in installation, commissioning, diagnostics and maintenance must meet the following requirements:

- Trained, qualified specialists must have a relevant qualification for this specific function and task
- Are authorized by the plant owner/operator
- Are familiar with federal/national regulations
- Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application)
- Follow instructions and comply with basic conditions

Operating personnel must meet the following requirements:

- Be instructed and authorized by the plant operator with regard to the requirements of the task
- Follow the instructions in this manual

2.2 Designated use

The measuring device described in this manual may be used only as a point level switch for water-, alcohol- or oil-based liquids or for powdered products. Incorrect use may pose a hazard. To ensure that the measuring device remains in perfect condition during the operating time:

- Measuring devices must be used only for media to which the process-wetted materials have an adequate level of resistance.
- The relevant limit values must not be violated, see TI01202F/00/EN.

2.2.1 Incorrect use

The manufacturer is not liable for damage caused by improper or non-designated use.

Residual risks

Due to heat transfer from the process, the temperature of the electronics housing and the assemblies contained therein may rise to 80 $^\circ C$ (176 $^\circ F)$ during operation.

Danger of burns from contact with surfaces!

▶ For elevated fluid temperature, ensure protection against contact to prevent burns.

2.3 Operational safety

Risk of injury!

- Operate the device in proper technical condition and fail-safe condition only.
- ► The operator is responsible for interference-free operation of the device.

2.4 Product safety

This measuring device is designed in accordance with good engineering practice to meet stateof-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. It meets general safety standards and legal requirements. It also complies with the EC directives listed in the device-specific EC Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

3 Product description

Compact point level switch, preset for water-based liquids; can be adjusted to alcohol- or oilbased liquids and powdered products; to be used preferably in pipes and in storage, mixing and process vessels with or without an agitator.

3.1 Product design



- I Product design of Liquipoint FTW23
- 1 M12 connector
- 2 Plastic housing cover IP65/67
- 3 Metal housing cover IP66/68/69
- 4 Housing
- 5 Process connection (G ¹/₂", G ³/₄", G 1", M24x1.5)
- 6 Sensor

4 Incoming acceptance and product identification

4.1 Incoming acceptance





A0016051

Is the order code on the delivery note (1) identical to the order code on the product sticker (2)?

Are the goods undamaged?





A0024330

Do the data on the nameplates correspond to the order specifications on the delivery note?

If one of these conditions is not satisfied, contact your Sales Center.

4.2 Product identification

The following options are available for identification of the measuring device:

- Nameplate data
- Order code with breakdown of the device features on the delivery note
- Enter serial number from nameplates in *W@M Device Viewer*
- (www.endress.com/deviceviewer): All information on the measuring device is displayed

The serial number on the nameplate can also be used to obtain an overview of the technical documentation supplied with the device in *W@MDevice Viewer* (www.endress.com/deviceviewer)

4.2.1 Manufacturer address

Endress+Hauser GmbH+Co. KG Hauptstraße 1 79689 Maulburg, Germany Address of the manufacturing plant: See nameplate.

4.2.2 Nameplate



The test magnet is not included in the scope of delivery and can be ordered as an optional accessory .

4.3 Storage and transport

4.3.1 Storage conditions

- Permitted storage temperature: -40 to +85 °C (-40 to +185 °F)
- Use original packaging.

4.3.2 Transportation to measuring point

Transport the device to the measuring point in the original packaging.

5 Installation

5.1 Installation conditions

- Installation is possible in any position in a vessel, pipe or tank.
- For measuring points that are difficult to access, use a socket wrench.

The socket wrench 32 AF can be ordered as an optional extra.



Installation examples

- 1 Overfill protection or upper level detection (MAX)
- *2 Pump dry running protection (MIN)*
- 3 Lower level detection (MIN)

Installation in horizontal pipes:





Vertical installation:

If the sensor is not completely covered by the medium or if there are air bubbles on the sensor, this may interfere with the measurement.

5.2 Mounting the measuring device

5.2.1 Required tools

Open-ended wrench or socket wrench 32 AF

- When screwing in, turn by the hex bolt only.
- Torque: 15 to 30 Nm (11 to 22 lbf ft)

5.2.2 Installation



- A Thread G ½"
- B Thread G 3/4"
- C Thread M24x1.5

Take account of metallic or non-metallic vessels or pipes in accordance with EMC guidelines, see Technical Information TI01202F.

5.3 Post-installation check

Is the device undamaged (visual inspection)?
Is the device adequately protected from wet conditions and direct sunlight?
Is the device properly secured?

6 Electrical connection

The measuring device has two modes of operation:

- Maximum point level detection (MAX): e. g. for overfill protection The device keeps the electrical switch closed as long as the sensor is not yet covered by liquid or the measured value is within the process window.
- Minimum point level detection (MIN): e.g. to protect pumps from dry running The device keeps the electrical switch closed as long as the sensor is covered by liquid or the measured value is outside the process window.

Choosing the MAX or MIN mode of operation ensures that the device switches in a safetyoriented manner even in an alarm condition, e.g. if the power supply line is disconnected. The electronic switch opens if the point level is reached, if a fault occurs or if the power fails (quiescent current principle).

- IO-Link: communication on Q1; switch mode on Q2.
 - SIO mode: if there is no communication, the device switches to the SIO mode = standard IO mode.

The factory-set functions for the MAX and MIN modes can be changed via IO-Link.

6.1 Connecting the measuring device

- Supply voltage 10 to 30 V DC to a DC power supply.
 IO-Link communication is guaranteed only if the supply voltage is at least 18 V.
- In accordance with IEC/EN61010 a suitable circuit breaker must be provided for the measuring device.
- Voltage source: non-hazardous contact voltage or Class 2 circuit (North America).
- The device must be operated with a fine-wire fuse 500 mA (slow-blow).



Electrical connection	Operating mode (SIO mode with factory setting)		
M12 connector	MAX	MIN	
	$K = \frac{2}{3} + \frac{1}{4} + 0.5A$ $L = L + \frac{1}{2} + \frac{1}{2} = \frac{1}{2}$	$\begin{array}{c} 2 \\ 3 \\ 4 \\ K \\ - \\ L^{+} \end{array} = 0.5A$	
	Ū <u>1∕2</u> ☆		
Symbols Description ☆ Yellow LED (ye) lit • Yellow LED (ye) nc K external load	t lit		

Function monitoring

With two-channel evaluation, functional monitoring of the sensor is also possible in addition to level monitoring provided that no other monitoring option has been configured via IO-Link.

When both outputs are connected, the MIN and MAX outputs assume opposite states (XOR) when the device is operating fault-free. In an alarm condition or in the event of a line break, both outputs are de-energized, see following table:

Connection for function monitoring using XOR operation		Yellow LED (ye)	Red LED (rd)		
3	2 3 4 K2 L- L+	Sensor covered	1 /_2	-☆-	
К1		Sensor uncovered	1 <u>2</u> 1 <u>4</u>	•	
L		Fault	$\int \frac{1}{\frac{1}{4}}$	٠	-ċ-
Symbols * • K1 / K2	Description LED lit LED not lit Fault or warning external load				

6.2 Post-connection check

Is the device or cable undamaged (visual check)?
Do the cables comply with the requirements ?
Do the cables have adequate strain relief?
Are the cable glands mounted and firmly tightened?
Does the supply voltage match the specifications on the nameplate?
If supply voltage is present, is the green LED lit? With IO-Link communication: is the green LED flashing?

7 Operation options

7.1 Operation with an operating menu

7.1.1 IO-Link

IO-Link information

IO-Link is a point-to-point connection for communication between the measuring device and an IO-Link master. The measuring device features an IO-Link communication interface type 2 with a second IO function on pin 4. This requires an IO-Link-compatible assembly (IO-Link master) for operation. The IO-Link communication interface enables direct access to the process and diagnostic data. It also provides the option of configuring the measuring device while in operation.

Physical layer, the measuring devices supports the following features:

- IO-Link specification: version 1.1
- IO-Link Smart Sensor Profile 2nd Edition
- SIO mode: yes
- Speed: COM2; 38.4 kBaud
- Minimum cycle time: 6 msec.
- Process data width: 16 bit
- IO-Link data storage: yes
- Block configuration: no

IO-Link download

http://www.endress.com/download

- Select "Software" as the media type.
- Select "Device Driver" as the software type. Select IO-Link (IODD).
- In the "Text Search" field enter the device name.

https://ioddfinder.io-link.com/

Search by

- Manufacturer
- Article number
- Product type

7.1.2 Structure of the operating menu

The menu structure has been implemented according to VDMA 24574-1 and complemented by Endress+Hauser-specific menu items.

For an overview of the operating menu, see operating instructions.

8 System integration

See operating instructions.

9 Commissioning

If an existing configuration is changed, measuring operation continues! The new or modified entries are only accepted once the setting has been made.

WARNING

Risk of injury and damage to property due to uncontrolled activation of processes!

▶ Make sure that downstream processes are not started unintentionally.

9.1 Function check

Before commissioning your measuring point, ensure that the post-installation and postconnection checks have been performed:

- "Post-installation check" checklist $\rightarrow \square 11$
- "Post-connection check" checklist \rightarrow 🖺 14

9.2 Commissioning with an operating menu

IO-Link communication

- Commissioning with factory settings: The device is configured for use with aqueous media. The device can be commissioned directly when used with aqueous media. Factory setting: output 1 and output 2 are configured for XOR operation. The Standard option is selected in the **Active switchpoints** parameter.
- Commissioning with customer-specific settings, e.g. non-conductive media (oils, alcohols) or powdered products: the device can be configured differently from the factory setting via IO-Link. Select User in the **Active switchpoints** parameter.
- Each change must be confirmed with Enter to ensure that the value is accepted.
 - Incorrect switching is suppressed by adjusting the settings in the switch/switchback delay (Switch point value/Switchback point value parameters).

9.3 Hysteresis function, level detection

9.3.1 Wet calibration

- 1. Navigate to the Application menu level
 - └ Setting: Active switchpoints = User
- 2. Immerse the device in the medium to be detected.
- 3. Accept the measured value shown for the switch output in question.
 - └→ Setting: Calibrate coverage, Output 1/2 (OU1/2) The automatically generated switch limits can be adjusted accordingly.

9.3.2 Dry calibration

This calibration is suitable if the medium values are known.

- 1. Navigate to the Application menu level
 - └ Setting: Active switchpoints = User
- 2. Configure the behavior of the switch output.
 - Setting: Output 1/2 (OU1/2) = Hysteresis normally open (MIN) (HNO) or Hysteresis normally closed (MAX) (HNC)
- 3. Enter the measured values for the switch point and switchback point. The set value for the switch point "SP1"/"SP2" must be greater than the switchback point "rP1" /"rP2".
 - └→ Setting: Switch point value (Coverage), Output 1/2 (SP1/2 or FH1/2) and Switchback point value (Coverage), Output 1/2 (rP1/2 or FL1/2)



☑ 3 Calibration (default)

- 0 0-signal, output open
- 1 1-signal, output closed
- A Hysteresis (difference between the value of the switch point "SP1" and the value of the switchback point "rP1")
- % Coverage of sensor

HNO Normally open contact (MIN)

- HNC Normally closed contact (MAX)
- *SP1 Switch point* 1 / *SP2*: *Switch point* 2
- rP1 Switchback point 1 / rP2: Switchback point 2

Recommended assignment of switch outputs:

- MAX mode for overfill protection (HNC)
- MIN mode for dry running protection (HNO)

9.4 Window function, media detection/differentiation

Unlike the hysteresis, media are detected only if they are within the defined window. Depending on the medium, a switch output can be used here.

9.4.1 Wet calibration

- 1. Navigate to the Application menu level
 - Setting: Active switchpoints = User
- 2. Configure the behavior of the switch output.
 - └→ Setting: Output 1/2 (OU1/2) = Window normally open (FNO) or Window normally closed (FNC)

- 3. Immerse the device in the medium to be detected.
 - Setting: Calibrate coverage, Output 1/2 (OU1/2)
 Setting: Switch point value (Coverage), Output 1/2 (FH1/2) and Switchback point value (Coverage), Output 1/2 (FL1/2)
 The automatically generated switch limits can be adjusted accordingly.

9.4.2 Dry calibration

This calibration is suitable if the measured values of the medium are known.

For reliable detection of the medium, the process window must be sufficiently large.

- 1. Navigate to the Application menu level
 - └ Setting: Active switchpoints = User
- 2. Configure the behavior of the switch output.
 - └→ Setting: Output 1/2 (OU1/2) = Window normally open (FNO) or Window normally closed (FNC)
- 3. Define the window around the calibrated value for the switch point/switchback point of the output (percentage coverage). The set value for the switch point "FH1"/"FH2" must be greater than the switchback point "FL1" /"FL2".
 - Setting: Switch point value (Coverage), Output 1/2 (SP1/2 or FH1/2) and Switchback point value (Coverage), Output 1 (rP1/2 or FL1/2)

9.5 Application example

Differentiating between milk and cleaning agent (CIP cleaning) using the example of wet calibration in the process.

- 1. Navigate to the Application menu level
 - Setting: Active switchpoints = User
- 2. Assign switch function to the switch outputs:
 - Switch output active if medium detected → Setting: Output 1 (OU1) = Window normally open (FNO) Switch output active if medium detected → Setting: Output 2 (OU2) = Window

Switch output active if medium detected \rightarrow Setting: **Output 2 (OU2)** = Window normally closed (FNC)

- 3. Medium 1: Sensor is covered by milk.
 - └ Setting: Calibrate coverage, Output 1 (OU1)
- 4. Medium 2: Sensor is covered by CIP cleaning agent.
 - └ Setting: Calibrate coverage, Output 2 (OU2)



4 Medium detection/Process window

- 0 0-signal, output open
- 1 1-signal, output closed
- % Coverage of sensor
- A Medium 1, process window 1
- B Medium 2, process window 2
- FNO Closing
- FNC NC contact
- FH1 / FH2 Upper value process window
- FL1 / FL2 Lower value process window

9.6 Light signals (LEDs)



☑ 5 Position of LEDs in housing cover

Endress+Hauser

Position	LEDs	Description of function				
1	Green LED (gn)	Measuring device is operational lit: SIO mode flashing: active communication, flash frequency VVVV flashes with increased luminosity: device search (device identification), flash frequency MVLVV				
2	Yellow LED (ye)	Indicates the sensor status lit: Sensor is covered by liquid.				
3	Red LED (rd)	Warning/Maintenance required flashing: error remediable, e.g. invalid calibration Fault/device failure lit: error not remediable, e.g. Electronics error Diagnostics and troubleshooting (see Operating Instructions)				

-

On the metal housing cover (IP69¹⁾) there is no external signaling via LEDs. A connecting cable with M12 connector and LED display can be ordered as an accessory. The functions of the green and red LEDs as described cannot be replicated on the M12 connector with LED.

9.7 **Function of LEDs**

Any configuration of the switch outputs is possible. The following table shows the behavior of the LEDs in the SIO mode:

¹⁾ The IP69K protection class is defined in accordance with DIN 40050 Part 9. This standard was withdrawn on November 1, 2012 and replaced by DIN EN 60529. As a result, the name of the IP protection class has changed to IP69.

Operating modes	MAX		MIN		Warning	Problem
Sensor	free	covered	free	covered		
					Ч	Ц
1 ye gn	● - <u>\</u> .	-☆☆-	● -☆-	- <u>☆</u> ☆-	• -\\	● - <u>☆</u> -
rd	•	•	•	•	N -	-兴-
2 yel ye2 gn	-☆- ● -☆-	÷ ب	-☆- ● -☆-	÷ ÷	—	• • <u>`</u> ;;;
1: LEDs on housing cove 2: LEDs on M12 connec LED colors: gn = green, ye = yellow,	Symbols/Desc ● not lit ☆ lit ☆ flashing └ Fault/war - no signal	ription ning ing				

9.8 Function testing of switch output

Carry out a function test while the device is in operation.

- ▶ Hold the test magnet against the marking on the housing for at least 2 seconds.
 - └ This inverts the current switch status, and the yellow LED changes state. When the magnet is removed, the switching status valid at that time is adopted.

If the test magnet is held against the marking for longer than 30 seconds, the red LED will flash: The device returns automatically to the current switch status.



The test magnet is not included in the scope of delivery. It can be ordered as an optional accessory.



Image: Position for test magnet on housing



71404321

www.addresses.endress.com

