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wenglor
the innovative family

LevelTech – FXPL0xx and FXSL0xx

Fill-Level Sensors with IO-Link

Operating Instructions

Table of Contents

1. General

1.1 Information Concerning these Instructions

• These instructions apply to the products FXPL0xx and FXSL0xx.
• They make it possible to use the product safely and efficiently.
• These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
• Local accident prevention regulations and national work safety regulations must be complied with as well.
• The product is subject to further technical development, and thus the information contained in these operating instructions may also be subject to change. The current version can be found at www.wenglor.com in the product's separate download area.

NOTE!
The operating instructions must be read carefully before using the product and must be kept on hand for later reference.

1.2 Explanations of Symbols

• Safety precautions and warnings are emphasized by means of symbols and attention-getting words
• Safe use of the product is only possible if these safety precautions and warnings are adhered to

The safety precautions and warnings are laid out in accordance with the following principle:

ATTENTION-GETTING WORD
Type and Source of Danger!
Possible consequences in the event that the hazard is disregarded.
• Measures for averting the hazard.

The meanings of the attention-getting words, as well as the scope of the associated hazards, are listed below.

DANGER!
This word indicates a hazard with a high degree of risk which, if not avoided, results in death or severe injury.

WARNING!
This word indicates a hazard with a medium degree of risk which, if not avoided, may result in death or severe injury.

CAUTION!
This word indicates a hazard with a low degree of risk which, if not avoided, may result in minor or moderate injury.

ATTENTION!
This word draws attention to a potentially hazardous situation which, if not avoided, may result in property damage.

NOTE!
A note draws attention to useful tips and suggestions, as well as information regarding efficient, error-free use.

1.3 Limitation of Liability

• The product has been developed in consideration of the current state-of-the-art and applicable standards and guidelines. Subject to change without notice.

• A valid declaration of conformity can be accessed at www.wenglor.com in the product's separate download area.

• wenglor sensoric elektronische Geräte GmbH (hereinafter referred to as "wenglor") excludes all liability in the event of:

   • Non-compliance with the instructions
   • Use of the product for purposes other than those intended
   • Use by untrained personnel
   • Use of unapproved replacement parts
   • Unapproved modification of products

• These operating instructions do not include any guarantees from wenglor with regard to the described procedures or specific product characteristics.

• wenglor assumes no liability for printing errors or other inaccuracies contained in these operating instructions, unless wenglor was verifiably aware of such errors at the point in time at which the operating instructions were prepared.

1.4 Copyrights

2. For Your Safety

2.1 Use for Intended Purpose

This product is used to monitor fill-levels and for the detection of media.

The LevelTech works in accordance with the frequency sweep principal: Together with its environment, an electrode integrated into the tip of the sensor functions as a capacitor. The medium determines the capacitance value depending on its dielectric constant. A resonant circuit is created in combination with a coil in the sensor's electronics. The switching signal is triggered depending on the measured resonant frequency and the programmable switching window. The sensor may only be used for detecting the fill-levels of liquids and solids with a dielectric constant of at least 1.5. The sensor may only be used for media to which the housing material and the tip of the sensor are resistant.
The FXPL0xx/FXSL0xx LevelTech Sensors have an IO-Link interface, with which the sensor can be configured and read out.

This product can be used in the following industry sectors:

- Special machinery manufacturing
- Heavy machinery manufacturing
- Logistics
- Automotive industry
- Food industry
- Packaging industry
- Clothing industry
- Plastics industry
- Woodworking industry
- Paper industry
- Electronics industry
- Glass industry
- Steel industry
- Construction industry
- Chemicals industry
- Agriculture industry
- Alternative energy
- Raw materials extraction

2.2 Use for Other than the Intended Purpose

- Not a safety component in accordance with 2006/42/EC (Machinery Directive).
- The product is not suitable for use in potentially explosive atmospheres.
- The product may only be used with accessories supplied or approved by wenglor, or combined with approved products. A list of approved accessories and combination products can be accessed at www.wenglor.com on the product detail page.

⚠	**DANGER!** **Risk of personal injury or property damage in case of use for other than the intended purpose!** Use for other than the intended purpose may lead to hazardous situations. • Observe instructions regarding use for intended purpose.

2.3 Personnel Qualifications

• Suitable technical training is a prerequisite.

• In-house electronics training is required.

• Trained personnel who use the product must have uninterrupted access to the operating instructions.

DANGER!
Risk of personal injury or property damage in case of incorrect initial start-up and maintenance!
Personal injury and damage to equipment may occur.
• Adequate training and qualification of personnel.

2.4 Modification of Products

DANGER!
Risk of personal injury or property damage if the product is modified!
Personal injury and damage to equipment may occur. Non-observance may result in loss of the CE marking and the guarantee may be rendered null and void.
• Modification of the product is impermissible.

2.5 General Safety Precautions

NOTE!
• These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.

• In the event of possible changes, the respectively current version of the operating instructions can be accessed at www.wenglor.com in the product's separate download area.

• Read the operating instructions carefully before using the product.

• Protect the sensor against contamination and mechanical influences.

• Installation and removal of the product is only permissible in pressure-free piping systems which have been allowed to cool down.

2.6 Approvals and protection class

3. Technical Data

Technical Data ⟍ Order No.	FXxL0xx
Sensor-Specific Data	
Measuring range	DK > 1,5
Media temperature TM (TU < 50 °C)	–40…115 °C
Media temperature TM brief (TU < 50 °C, t < 1 h)	–40…135 °C
Medium	Liquids, Granulate, powder
Response Time	0,04 s typ.
Ambient Conditions	
Ambient temperature	–40…85 °C
Storage temperature	–40…85 °C, rh < 98 %
Pressure resistance	see section "5.2 Installation" on page 13
EMV	DIN EN 61326 (mounted in closed metal tank)
Vibration resistance DIN EN 60068-2-6	1,6 mm p-p (2…25 Hz), 4 g (25…100 Hz)
Electrical Data	
Supply Voltage	8…36 V DC
Current Consumption	< 35 mA typ., 50 mA max.
Number of switching outputs	2
Power-up time	< 3 s
Switching Output / Switching Current	100 mA
Switching Output Voltage Drop	< 0,7 V
Leakage current	< 100 μA
Short Circuit Protection	Yes
Reverse Polarity Protection	Yes
Interface	IO-Link V1.1
Mechanical Data	
Setting method	IO-Link, contactless teach-in (FXPLxxx only)
Housing Material	1.4404
Material in contact with media	PEEK Natura 1.4404
Roughness of surfaces with process contact	< 0,8 Ra
Degree of Protection	IP67/IP69K
Connector type	M12×1; 4-pin, Polycarbonate (FXPL0xx) M12×1; 4-pin, Stainless steel (FXSL0xx)
Process connection	G½", G½" NPT, G½" hygienic
Output Function	
Switchable to NC or NO	Yes
Configurable as PNP, NPN or push-pull	Yes
IO-Link	Yes
Attenuation	0,0...10,0 s (adjustable)

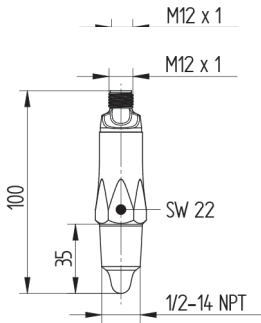The following table specifies the tightening torques of the plugs and mounting options in order to assure compliant, error-free operation:

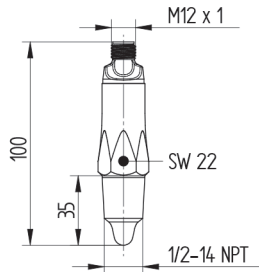| Connection Type	Tightening torque (Nm)
M12	0,4

The tightening torques of the respective process connections are specified in section "5.2 Installation" on page 13.
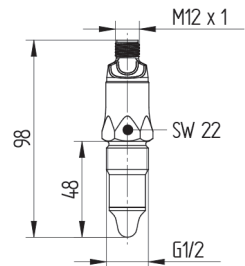
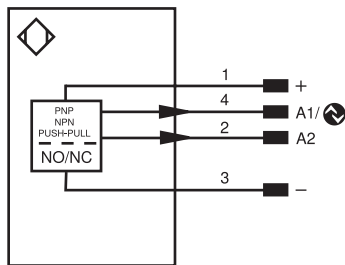## 3.1 Dimensional Drawings

G1/2"

G1/2" NPT

G1/2" hygienic

3.2 Connection Diagram

704

Legend

+	Supply Voltage +
−	Supply Voltage 0 V
~	Supply Voltage (AC Voltage)
A	Switching Output (NO)
Ā	Switching Output (NC)
V	Contamination/Error Output (NO)
V̄	Contamination/Error Output (NC)
E	Input (analog or digital)
T	Teach Input
Z	Time Delay (activation)
S	Shielding
RxD	Interface Receive Path
TxD	Interface Send Path
RDY	Ready
GND	Ground
CL	Clock
E/A	Output/Input programmable
⬙	IO-Link
PoE	Power over Ethernet
IN	Safety Input
OSSD	Safety Output
Signal	Signal Output
BI_D+/−	Ethernet Gigabit bidirect. data line (A-D)
EN0RS422	Encoder 0-pulse 0-0̄ (TTL)

PT	Platinum measuring resistor
nc	not connected
U	Test Input
Ū	Test Input inverted
W	Trigger Input
W−	Ground for the Trigger Input
O	Analog Output
O−	Ground for the Analog Output
BZ	Block Discharge
AMW	Valve Output
a	Valve Control Output +
b	Valve Control Output 0 V
SY	Synchronization
SY−	Ground for the Synchronization
E+	Receiver-Line
S+	Emitter-Line
⏚	Grounding
SnR	Switching Distance Reduction
Rx+/−	Ethernet Receive Path
Tx+/−	Ethernet Send Path
Bus	Interfaces-Bus A(+)/B(−)
La	Emitted Light disengageable
Mag	Magnet activation
RES	Input confirmation
EDM	Contactor Monitoring

ENARS422	Encoder A/Ā (TTL)
ENBRS422	Encoder B/B̄ (TTL)
ENA	Encoder A
ENB	Encoder B
AMIN	Digital output MIN
AMAX	Digital output MAX
AOK	Digital output OK
SY In	Synchronization In
SY OUT	Synchronization OUT
OLT	Brightness output
M	Maintenance
rsv	reserved

Wire Colors according to IEC 60757

BK	Black
BN	Brown
RD	Red
OG	Orange
YE	Yellow
GN	Green
BU	Blue
VT	Violet
GY	Grey
WH	White
PK	Pink
GNYE	Green/Yellow

3.3 Complementary Products

wenglor offers Connection Technology for field wiring.

Suitable Mounting Technology No.	G½":	903 916
	G½" hygienic	918
	G½" NPT:	917
Suitable Connection Technology No.	2	

S02

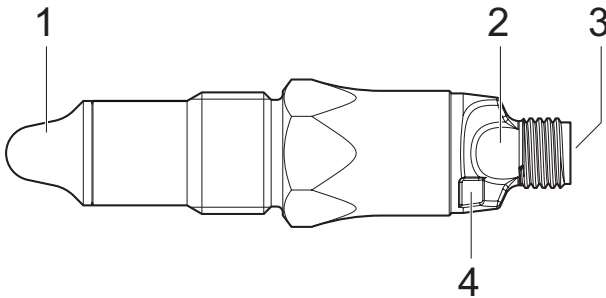| | 1 | BN |
	4	BK
	3	BU
	2	WH
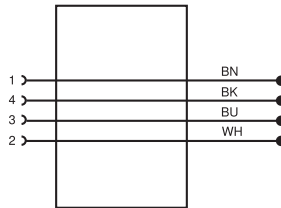
IO-Link-Master	ZAI72AN01 EFBL001, EFBL003

3.4 Setting up

① = tip of the sensor
② = LED
③ = connection with M12 plug
④ = contactless detector or teach-in

NOTE!
In the case of FXSL0xx sensors, the entire housing is made of stainless steel for which reason no LEDs are visible and contactless teach-in cannot be used.

3.5 Scope of Delivery

• Fill-Level Sensor LevelTech FXPL0xx or FXSL0xx
• Quickstart

4. Transport and Storage

4.1 Transport

Upon receipt of shipment, inspect the goods for damage in transit. In the case of damage, conditionally accept the package and notify the manufacturer of the damage. Then return the device making reference to damage in transit.

4.2 Storage

The following points must be taken into condition with regard to storage:
• Do not store the product outdoors.
• Store the product in a dry, dust-free place.
• Protect the product against mechanical impacts.
• Protect the product against exposure to direct sunlight.
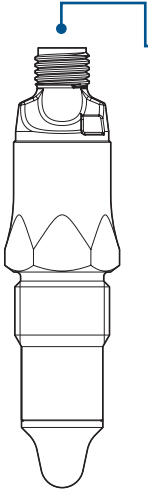

⚠️ **ATTENTION!**
Risk of property damage in case of improper storage!
The product may be damaged.
• Comply with storage instructions.

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5. Installation and Electrical Connection

5.1 System Overview

Connection Lines
ZCCL001 (straight, PVC, IP69K) 10 m
S23-2M (straight, PVC) 2 m
S23-2MPUR (straight, PUR) 2 m
S23-5M (straight, PVC) 5 m
S23-5MPUR (straight, PUR) 5 m
S23-10M (straight, PVC) 10 m
S23-10MPUR (straight, PUR) 10 m
S29-2M (angled, PVC) 2 m
S29-5M (angled, PVC) 5 m
S29-5MPUR (angled, PUR) 5 m
S29-10M (angled, PVC) 10 m

Complementary Products
IO-Link Master EFBL001/EFBL003, ZAI72AN01

NOTE!
Further accessories and mounting technology (e.g. weld-in adapters) are available on the relevant product detail page at www.wenglor.com.

5.2 Installation

• Protect the product from contamination during installation.
• Observe all applicable electrical and mechanical regulations, standards, and safety rules.
• Protect the product against mechanical influences.
• Make sure that the sensor is mounted in a mechanically secure fashion.
• Specified torque values must be complied with (see section "3. Technical Data", page 8).

Installation Instructions
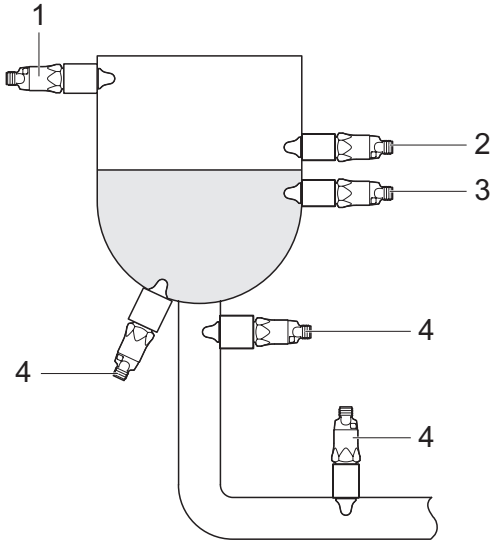
1: Overfill protection
2: Upper limit level
3: Lower limit level
4: Dry-running protection

The sensor can be mounted to the tank at any desired position.

The sensor mounted at the top of the tank (1) protects against overfilling. Sensors mounted farther down detect upper (2) and lower (3) limit levels. The sensor mounted at the bottom of the tank or in the discharge pipe (4) is used to protect any connected pump from running dry.

NOTE!
LevelTech sensors should only be installed to closed metal containers in order to comply with EMC directive DIN EN 61326.

ATTENTION!
Risk of property damage in case of improper installation!
The product may be damaged.
• Comply with installation instructions.

CAUTION!
Risk of personal injury or property damage during installation!
Personal injury and damage to the product may occur.
• Ensure a safe installation environment.
• Before dismantling, make sure that the system is pressure-free.

DANGER!

Danger of injury due to hazardous medium!

• Wear personal protective equipment in the case of hazardous media (e.g. acid or lye).

• Empty tanks and piping before installation.

NOTE!

Fundamentally, the LevelTech sensor can be mounted and sealed in 2 different ways depending on the process connection:

• Sealing by means of PTFE tape

• Sealing by means of PEEK on metal

Installing the LevelTech with G½" or G½" NPT Process Connection

1. Sealing by means of PTFE tape
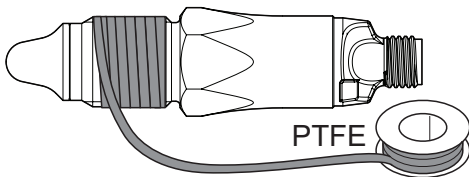
• The tank and the piping must be free of media.

• Seal the thread on the sensor with Teflon tape (PTFE).

• Screw in the sensor.

• G½" tightening torque: max. 30 Nm

• G½" NPT tightening torque: max. 20 Nm

• Compressive load of up to 100 bar

2. Sealing by means of PEEK on metal
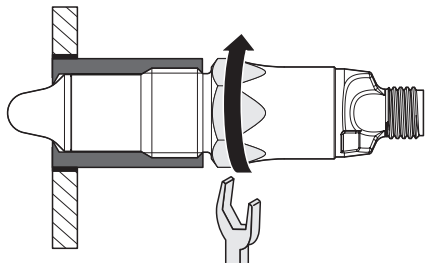
- The tank and the piping must be free of media.
- The adapter or weld-in sleeve must be mounted without any dead space and in a fully drainable position.
- Screw in the sensor.
- Tightening torque: 15…20 Nm
- Compressive load of up to 10 bar

NOTE!
When mounting with PEEK on a metal seal, only original accessories from wenglor should be used. The corresponding components can be found at www.wenglor.com under mounting technology on the respective product page.
Accessories for this type of installation are correspondingly identified.

Installing the LevelTech with G½" NPT Hygienic Process Connection

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⚠️ **WARNING!**
Health hazard due to contaminated medium.
- Only use weld-in sleeves or adapters from wenglor.
- Do not seal the process connection with Teflon tape (PTFE) or elastomers.
- Welding may only be conducted by welders who have been trained for hygienic applications.
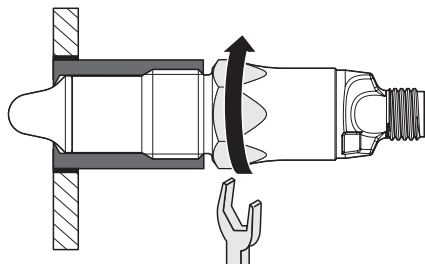
- Weld-in sleeves or adapters must be hygienically installed and flush-mounted to the inside.
- Welding seems must be smoothed to a value of Ra < 0.8 µm.
- The leakage hole must point down.
- Screw in the sensor.
- Tightening torque: 15…20 Nm
- Compressive load of up to 10 bar

5.3 Electrical Connection

• Connect the sensor to 8...36 V DC
• When operated with IO-Link:
  – An IO-Link master with class A port must be used because pin 5 is not connected in the case of a class A port.
  – In the case of excessive interference, a shielded cable should be used.

⚠ **DANGER!**
Risk of personal injury or property damage due to electric current!
Voltage conducting parts may cause personal injury or damage to equipment.
• The electric device may only be connected by appropriately qualified personnel.

5.4 Diagnostics

Fault	Cause	Corrective Measure
LED does not light up.	Sensor connected incorrectly	Check plug and power supply.
LED lights up red.	Short-circuit Unsuitable media characteristics	Eliminate the short-circuit. Check signal quality with wTeach2.
LED blinks red.	Device error	Remove and return the sensor.

Required action in case of fault:

ℹ **NOTE!**
• Shut down the machine.
• If the error cannot be eliminated, please contact wenglor's support department.
• Do not operate in case of indeterminate malfunctioning.
• The machine must be shut down if the error cannot be unequivocally clarified or reliably eliminated.

⚠ **DANGER!**
Risk of personal injury or property damage in case of non-compliance!
The system's safety function is disabled. Personal injury and damage to equipment.
• Conduct in case of fault as specified.

5.5 Cleaning

The sensor can be cleaned, disinfected or sterilized if required (CIP/SIP).

6. Functions

6.1 Default Settings

Function A1 (Pin 4)	Output	Switching output
	Output function	Push-Pull NO
Switching output color: White	Min. switching window	0 %
	Max. switching window	75 %
	Switching window hysteresis	3 %
	Attenuation	0,1 s
Function A2 (Pin 2)	Output	Switching output
	Output function	Push-Pull NC
Switching output color: Violet	Min. switching window	75 % *
	Max. switching window	100 % *
	Switching window hysteresis	3 %
	Attenuation	0,1 s
Color, O1+O2 active: Yellow		

* Default settings apply as of FW 2.00.23. In previous versions, A2 was set to 0 to 75 %.

The LEDs indicate the electrical status of the switching output (also FW 2.00.23):

NO inactive: → LED off
NO active: → LED on

NC inactive: → LED on
NC active: → LED off

Configuration via contactless teach-in is activated as a default setting and can be deactivated by the user if desired (IO-Link).

7. Configuration

The sensor can be configured using either contactless teach-in, wTeach2 or IO-Link. Configuration with wTeach2 is recommended in the event that foaming or the build-up of media deposits has to be detected.

7.1 Configuration with Contactless Teach-In (FXPL0xx)

Switching outputs O1 and O2 can be configured independently of each other by means of contactless teach-in.
O1 is normally open and O2 is normally closed.
Configuration is only possible during the first 5 minutes after connection to supply power. Contactless teach-in is disabled after this time period has elapsed.

• Sensor is connected.

• Hold a screwdriver or another metallic object against the teach-in detector:
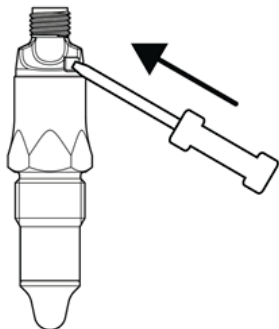
The LED blinks green for three seconds at a frequency of 1 Hz. The color of the LED alternates every two seconds between white and violet for the purpose of switching output selection.
• When the LED is illuminated in the color of the desired switching output, remove the screwdriver or metallic object from the teach-in detector in order to select the respective switching output:

     – O1: white
     – O2: violet

The LED blinks in the desired color at a frequency of 0.5 Hz.

• Immerse the tip of the sensor into the medium and contact the teach-in area with the object.

The LED blinks in the selected color during the teach-in process.
In order to be able to subsequently select the switching window, remove the screwdriver or metal object from the teach-in detector.

The color of the LED alternates every two seconds between white and violet for the purpose of switching window selection.

- Hold a screwdriver or another metallic object against the teach-in detector:
- When the LED is illuminated in the color of the desired switching window, remove the screwdriver or metallic object from the teach-in detector in order to select the respective switching window:

  – Switching window ±12 %, hysteresis 4 %: light blue
  – Switching window ±6 %, hysteresis 2 %: white
  – Switching window ±3 %, hysteresis 1 %: violet

Configuration has been completed and changes are saved.

When the dielectric constant of the medium is close to that of air, the smallest switching window must be selected. If the LED blinks red (error indication) or the configuration time limit of 5 minutes has been exceeded, no changes are saved.

- Supply power must be disconnected and reconnected in order to restart the configuration procedure.

Graphic representation:

A1 3 s

A2 5 s

1

2

Switching Window 1

Switching Window 2
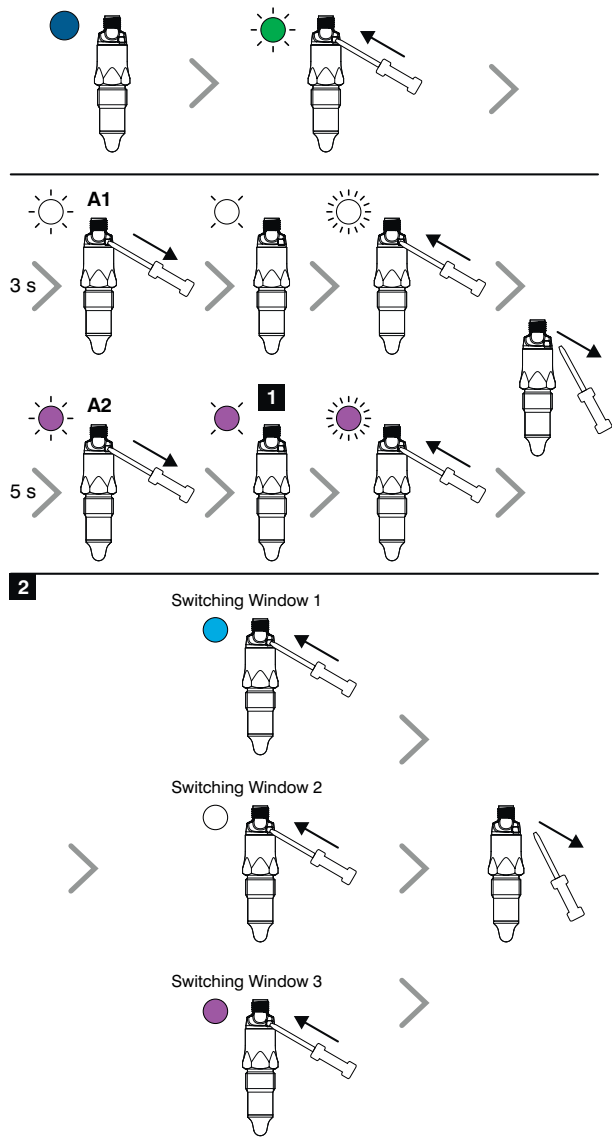
Switching Window 3

1   Ready for teach-in – immerse the sensor into the medium.
2   Switching window: Hold the tool in place until the desired switching window is obtained.

7.2 Configuration with wTeach 2

The LevelTech sensor can be configured directly with the help of wTeach2 software. In addition to configurations which can be set up via IO-Link, wTeach2 reads out the signal's measured amplitude as a graphic. This makes it easy to ascertain the resonant frequency of the respective medium and the switching points can be set above and below the resonant frequency by entering the corresponding numbers or directly in the diagram.
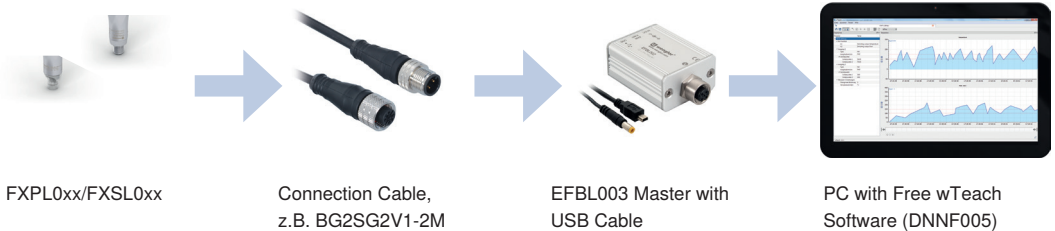
The LevelTech sensor can also be quickly and easily taught in for more complex applications with the help of wTeach2 software.

NOTE!
wenglor's EFBL003 USB master is required when setting up and evaluating the LevelTech sensor via wTeach2.

Required components:

FXPL0xx/FXSL0xx   Connection Cable,   EFBL003 Master with   PC with Free wTeach
                         z.B. BG2SG2V1-2M   USB Cable   Software (DNNF005)

Cables Required when Using wTeach

7.3 Configuration with IO-Link

Switching points, hysteresis, attenuation, output mode etc. can be configured via IO-Link with an IO-Link master.
• Connect the IO-Link master to the sensor.
• Connect the IO-Link master to the PC and configure the parameters.

Process and parameters data can be found at www.wenglor.com in the product's separate download area.

8.   Maintenance Instructions

NOTE!
- This wenglor sensor is maintenance-free.
- Cleaning and inspection of the plug connections at regular intervals is advisable.
- Do not clean the sensor with solvents or cleansers which could damage the product.
- The product must be protected against contamination during initial start-up.

9.   Returns

Due to legal regulations and for the protection of employees, wenglor sensoric GmbH requires a signed declaration of decontamination before processing your order.
The corresponding form is available at www.wenglor.com → Download → General Terms and Conditions and Returns.

10.   Proper Disposal

wenglor sensoric GmbH does not accept the return of unusable or irreparable products. Respectively valid national waste disposal regulations apply to product disposal.

11.   Appendix

11.1 List of Abbreviations

Abbreviation	Meaning
DK	Dielectric constant

11.2 Change Index, Operating Instructions

Version	Date	Description/Change
1.0.0	13.03.2019	Initial version of the operating instructions
1.1.0	13.06.2019	Updates of "6.1 Default Settings" on page 19
1.2.0	09.11.2022	New section "5.5 Cleaning" on page 18