

# Potentiometric Level Sensor NSL-F

## Application/intended use

- Continuous level monitoring in metallic vessels up to 3 m in height
- Ideally suited for highly adhesive and pasty media
- Level measurement of foaming media
- Minimum product conductivity typically from 50  $\mu\text{S}/\text{cm}$  (available on request for lower values)
- Hygienic substitute for float sensors

## Application examples

- Level monitoring in feed vessels
- Level measurement in storage tanks
- Content measurement in pressurized vessels

## Hygienic design/process connection

- Hygienic process connection with CLEANadapt
- Versions available with EHEDG approval
- Versions compliant to 3-A Standard 74- available
- All wetted materials are FDA-conform
- Sensor completely made of stainless steel
- Complete overview of process connections: see order code
- The Anderson-Negele CLEANadapt system offers a flow-optimized, hygienic and easily sterilizable installation solution for sensors.

## Special features/advantages

- CIP/SIP cleaning up to 143 °C (289 °F) max. 120 minutes
- Protection class IP 69 K (with cable connection)
- Short response time for precise measured values with fast level changes
- Due to the potentiometric measuring principle, no new adjustment is necessary when changing the medium
- Insensitive to adhesion
- Adjustment of the display by means of the twistable sensor head
- Mounting in vessels from the below or above
- Installation from the side through curved rod possible
- Adjustable current signal for measurement range, dry run signal and error signal

## Options/accessories

- Pre-assembled cable for M12 plug
- Programming adapter MPI-200 with PC software
- Display module Simple User Interface (SUI) and Large User Interface (LUI)
- Remote version with cable length up to 30 m
- Add-On Instructions are available at [www.anderson-negele.com/aoi](http://www.anderson-negele.com/aoi)

## Communication

 **IO-Link**  **4...20 mA**

## Government-funded

Supported by:



on the basis of a decision by the German Bundestag

## Continuous level sensor NSL-F-00



## Head unit remote version (HUR)



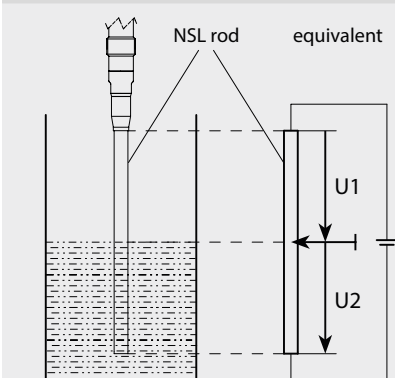
Specification		
<b>Rod length EL</b>	Product contacting	3000 mm max. (NSL-F-00, NSL-FR-00) 1500 mm max. (NSL-F-01, NSL-FR-01)
<b>Measurement range MB</b>	NSL-F-00, NSL-FR-00 NSL-F-00, NSL-FR-00 NSL-F-01, NSL-FR-01	50...199 mm (rod diameter 6 mm) 200...3000 mm (rod diameter 10 mm) L2 see drawing on page 5 (rod diameter 10 mm)
<b>Process connection</b>	Thread Tri-Clamp Varivent	CLEANadapt G1/2", G1" hygienic 1...1½", 2", 2½", 3" DN 10/15 (type B), DN 25 (type F), DN 40/50 (type N)
<b>Process pressure</b>		16 bar max.
<b>Tightening torque</b>		10 Nm
<b>Materials</b>	Connecting head Plastic cap/viewing window Threaded connector Insulating part Rod	Stainless steel 1.4308 (AISI CF-8) Polycarbonate Stainless steel 1.4305 (AISI 303) PEEK (FDA approval number: 21CFR177.2415) Stainless steel 1.4404 (AISI 316L), $R_a \leq 0.8 \mu\text{m}$
<b>Temperature range</b>	Ambient Storage temperature Process CIP/SIP cleaning	0...70 °C (32...158 °F) -40...85 °C (-40...185 °F) -10...140 °C (14...284 °F) 143 °C (289 °F) max. 120 min
<b>Resolution</b>	Rod length > 500 mm Rod length < 500 mm	< 0.1 % of upper range value (= rod length) < 0.5 mm
<b>Accuracy</b>	Media with conductivity > 50 $\mu\text{S/cm}$ (e.g. beer, milk, beverages) Media with conductivity < 50 $\mu\text{S/cm}$	< 1 % of rod length  On request since dependent on installation situation and tank design
<b>Linearity</b>		< 1.0 % of the upper range value (= rod length)
<b>Reproducibility</b>	Rod length > 500 mm Rod length < 500 mm	< 0.2 % of upper range value (= rod length) < 1.0 mm
<b>Temperatur drift</b>	At 25 °C (77 °F)	$\leq 0.1 \%$
<b>Response time</b>		< 100 ms
<b>Electrical connection</b>	Cable gland Cable connection Supply Protection class	2x M16x1.5 2x M12 connector 1.4301 (AISI 304) 18...36 V DC max. 190 mA IP69K
<b>Communication</b>	Analog Digital	1x Analog output 4...20 mA, potential-free IO-Link

### Functional principle

The potentiometric measuring principle measures the change in the voltage ratio between the electrode rod of the sensor and the metallic wall of the filled tank. An electric flow field arises in the medium due to the electrical conductivity of the medium and its capacitive properties. This gives rise to a voltage ratio that is proportional to the immersed part of the rod.

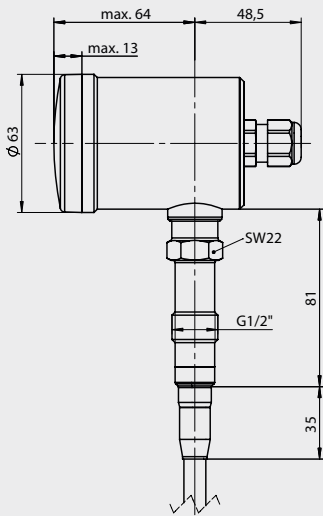
Because only the ratio of the voltages is considered, the properties of the medium, in particular the electrical conductivity, do not enter into the measurement result. Using a second measuring procedure, the sensor also provides information on the submersion state of the electrode rod.

### Functional principle

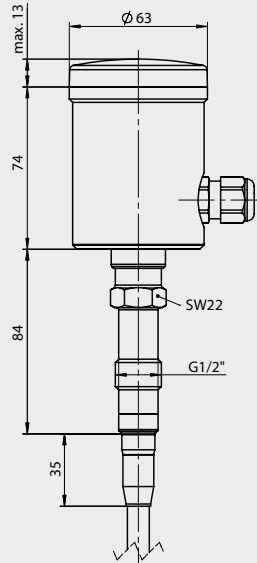




## NSL-F ... with horizontal head



## NSL-F ... with vertical head



## Rod diameter

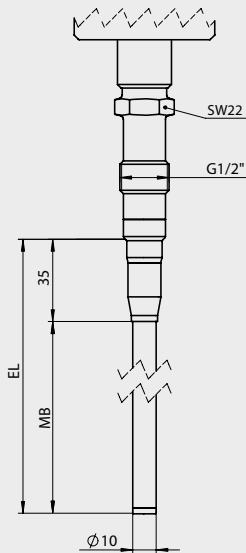
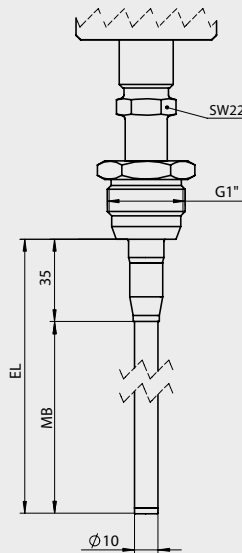
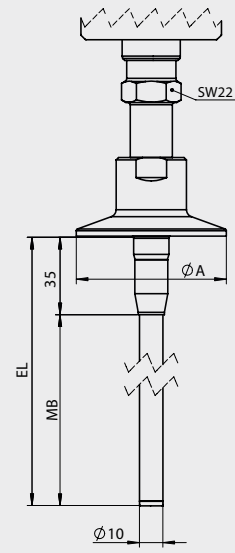
Rod diameter is depending on rod length (EL). For exact diameter see below-mentioned tables.

## Rod diameter NSL-F-00, NSL-FR-00

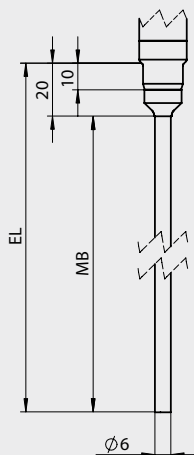
EL	$\phi D$
50...199 mm	6 mm
200...3000 mm	10 mm

## Rod diameter NSL-F-01, NSL-FR-01

EL	$\phi D$
400...1500 mm	10 mm

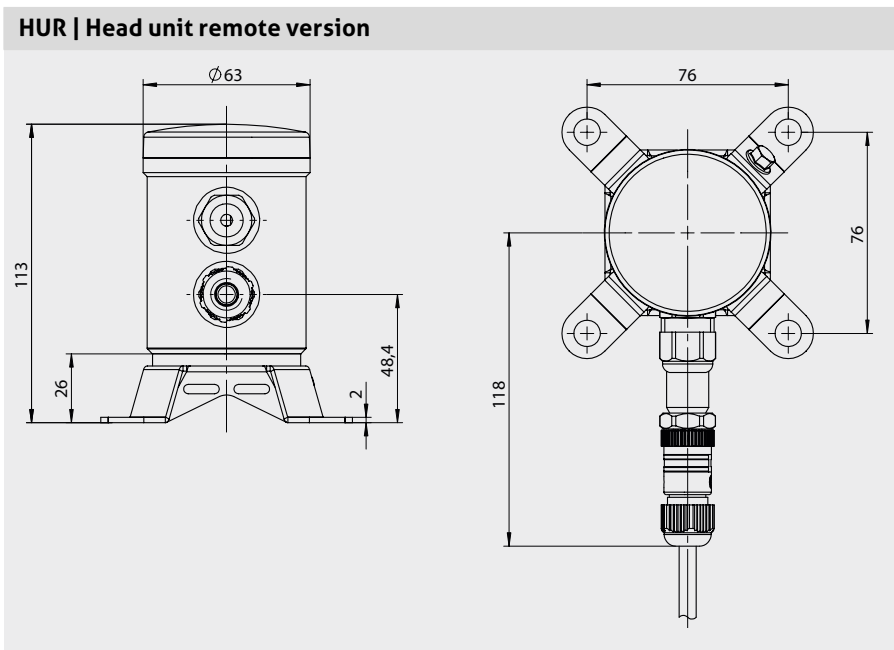
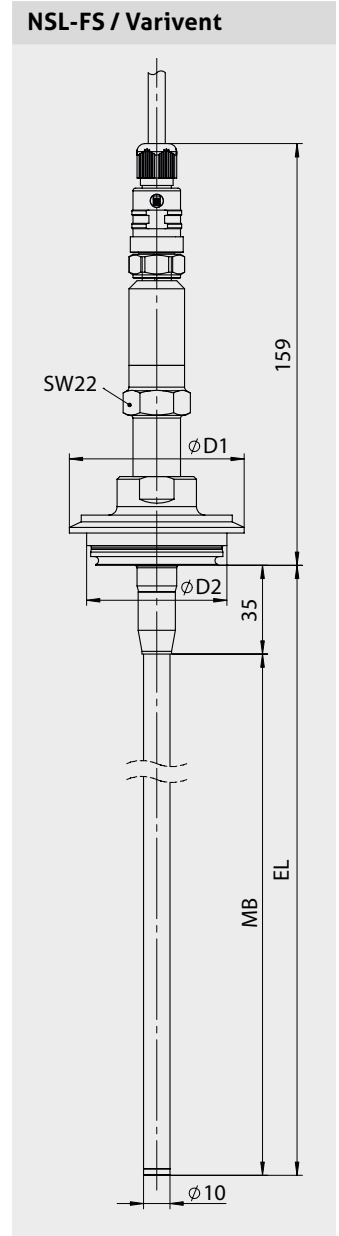
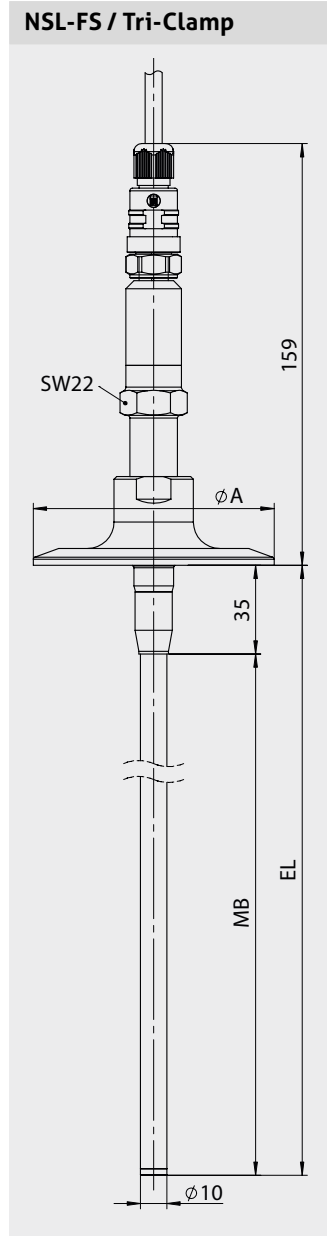
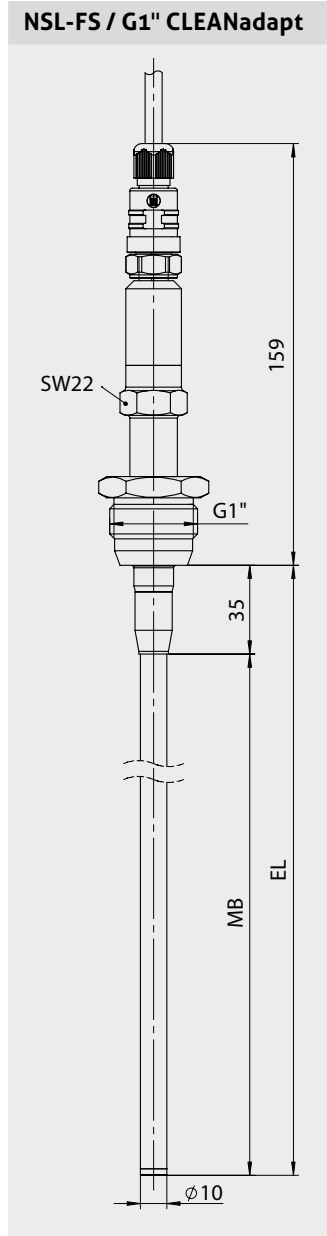
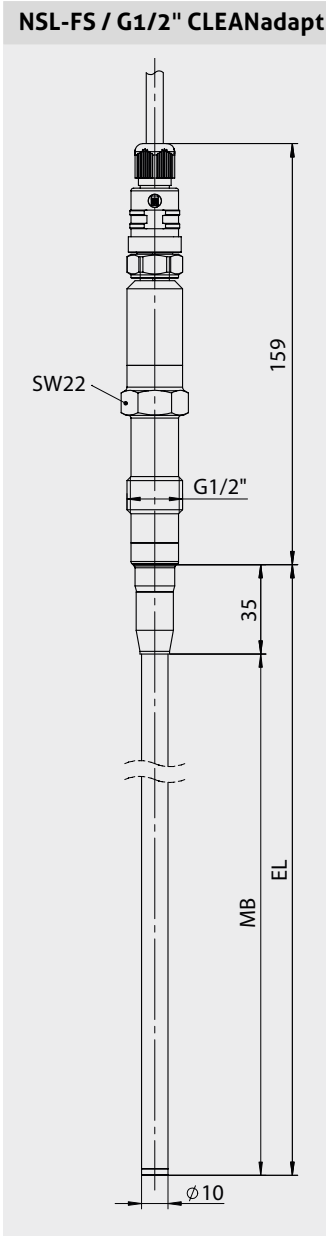
NSL-F-00/.../S00/... with EL  $\geq$  200 mmNSL-F-00/.../S01/... with EL  $\geq$  200 mmNSL-F-00/.../TC1/... with EL  $\geq$  200 mm

## NSL-F-00/... with EL &lt; 200 mm



## Tri-Clamp diameter

Typ	$\phi A$
TC1	50.5 mm
TC2	64.0 mm
T25	77.5 mm
TC3	91.0 mm

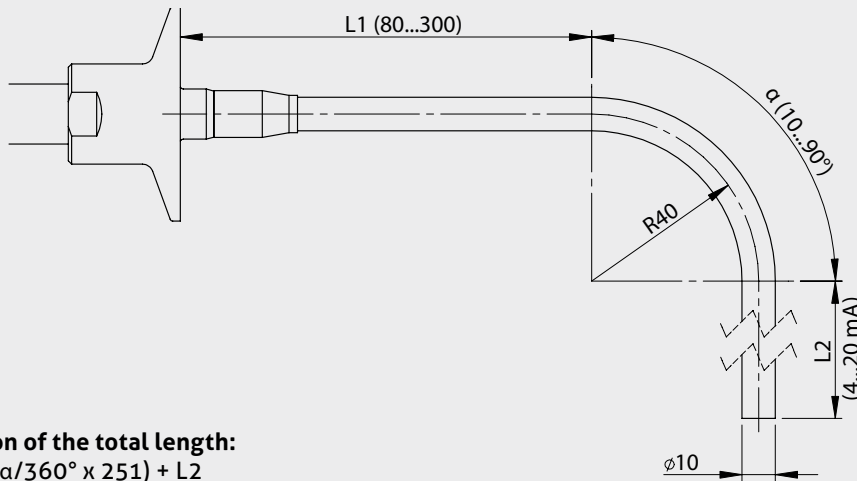


**Dimensions table Varivent**

Type	Varivent Type	D1 [mm]	D2 [mm]
V10	B	52.7	31.0
V25	F	66.0	50.0
V40	N	84.0	68.0

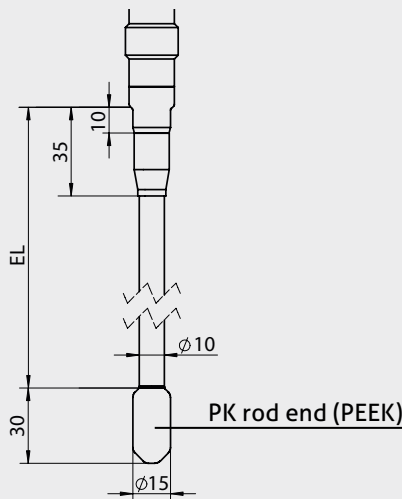
## Version NSL-F-01, NSL-FR-01

The NSL-F sensor is optionally available as version NSL-F-01 and NSL-FR-01 with a curved rod.

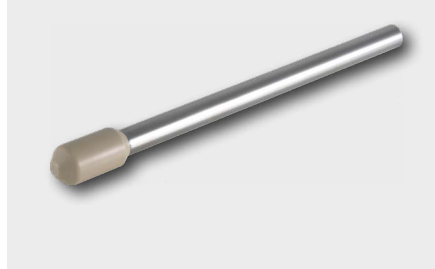


**Calculation of the total length:**  
 $EL = L1 + (\alpha/360^\circ \times 251) + L2$

## Drawing option PK



## Insulation at rod end (option PK)



## Insulation at top



## Mounting position



If the sensor is mounted into a vessel from below, there is a range of 20 mm or 35 mm from the sealing edge (see dimensional drawing) where the level cannot be reliably measured. The 4 mA/20 mA signal starts with the bottom weld seam of the rod.

## Conventional usage



- Not suitable for applications in explosive areas.
- Not suitable for applications in security-relevant equipment (SIL).

## Note on 3-A Sanitary Standard 74-



Information on installation according to 3-A standard is available on our website:  
[www.anderson-negele.com/3A74.pdf](http://www.anderson-negele.com/3A74.pdf)

Click on the PDF icon to download the document.

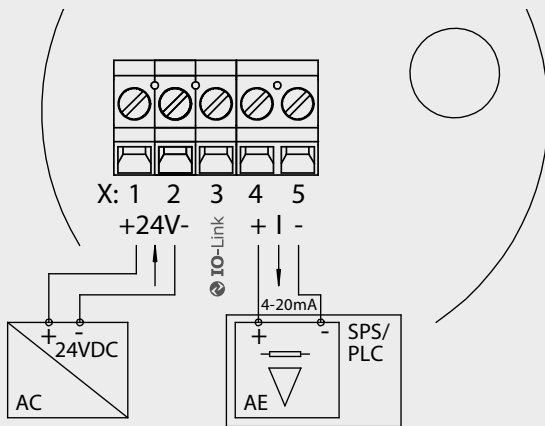
## Note on EHEDG Hygienic Standard Type EL Class I



Information on installation according to EHEDG standard is available on our website:  
[www.anderson-negele.com/EHEDG.pdf](http://www.anderson-negele.com/EHEDG.pdf)

Click on the PDF icon to download the document.

### Electrical connection (signal module I42)

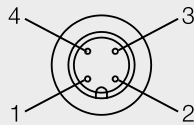


- 1: Power supply +24 V DC  
 2: Power supply -  
 3: IO-Link  
 4: Analog output X45 +  
 5: Analog output X45 -

### Electrical connection "M" (Signal module I42)

M12 connector (4 pin)

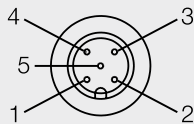
- 1: Power supply +24 V DC  
 2: Analog output X45 +  
 3: Analog output X45 -  
 4: Power supply -



### Electrical connection "L" (Signal module I42)

M12 connector (5 pin)

- 1: Power supply +24 V DC  
 2: Power supply -  
 3: Analog output X45 -  
 4: Not assigned  
 5: Analog output X45 +



### Settings using the MPI-200 programming adapter

The MPI-200 programming adapter is connected to the NSL-F level sensor via the external MPI-200-F adapter piece. It must be ensured that the NSL-F level sensor is permanently connected to the supply voltage while the parameters are being set.

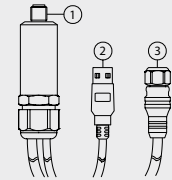
### Programming adapter MPI-200-F connection



Connection plug for MPI-200-F adapter as an intermediate plug between the NSL-F electronics and the MPI-200 connection 3 (see next figure).

### Connection of programming adapter MPI-200

- 1: Connection for M12 connector  
 2: USB port for connecting to a PC  
 3: Connection cable to adapter for NSL-F

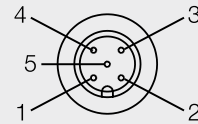


### Electrical connection "C" (Signal module I42)

M12 connector (5 pin)

- 1: Power supply +24 V DC  
 2: Analog output X45 -  
 3: Power supply -  
 4: IO-Link  
 5: Analog output X45 +

IO-Link



### Creating settings with the User Interface (SUI or LUI)

The software structure of the User Interface is similar to that of the PC version. The system is operated using two control buttons to the left and right of the display. These buttons can be used to navigate to the required parameter. The button functions are as follows:

Button	Press briefly	Press and hold
R (right)	Jump to next node, parameter	Edit a node, parameter
L (left)	Jump back to previous node, parameter	Leave editing mode without saving, return to next higher level
R/L	Scroll up and down	
R and L simultaneously		Press both buttons for 10 seconds: the menu jumps back to the beginning (attention: this is not a reset)

**Transport/storage**

- Do not store outside
- Store in an area that is dry and dust-free
- Do not expose to corrosive media
- Protect against solar radiation
- Avoid mechanical shock and vibration
- Storage temperature -40...85 °C (-40...185 °F)
- Relative humidity maximum 98 %

**Reshipment**

- Sensors and process connection shall be clean and must not be contaminated with dangerous media and/or heat-conductive paste! Note the advice for cleaning!
- To avoid damage of the equipment, use suitable transport packaging only.

**Cleaning/maintenance**

- In case of using pressure washers, don't point nozzle directly to electrical connections!

**Standards and guidelines**

- Compliance with the applicable regulations and directives is mandatory.

**Note on CE**

- Applicable directives:  
Electromagnetic Compatibility Directive 2014/30/EU
- Compliance with the applicable EU directives is identified by the CE label on the product.
- The operating company is responsible for complying with the guidelines applicable to the entire installation.

**Disposal**

- Electrical devices should not be disposed of with household trash. They must be recycled in accordance with national laws and regulations.
- Take the device directly to a specialized recycling company and do not use municipal collection points.

**Note on IO-Link**

Information on parameters and events are available on our website:

[www.anderson-negele.com/iodd](http://www.anderson-negele.com/iodd)

Click on the IO-Link icon to open the website.

## Accessories

**PVC-cable with M12 connection, brass nickel-plated, IP69K, shielded**

<b>M12-PVC/5G-8m</b>	5 pin, length 8 m
<b>M12-PVC/5G-15m</b>	5 pin, length 15 m
<b>M12-PVC/5G-30m</b>	5 pin, length 30 m

**Programming adapter/PC interface**

**MPI-200** Including PC software

**CERT / 2.2 / NSL** Factory certificate 2.2 acc. to EN10204  
(only product contacting surface)

## Programming adapter MPI-200



## Remote cable for remote version

**PVC-cable, 8 pin, twisted pair unshielded, IP69K**  
Length selectable in steps of 1 meter, 30 m max.

<b>M12-PVC / 8-PBT</b>	M12 plug/coupling made of PBT plastic
<b>M12-PVC / 8-SS</b>	M12 plug/coupling made of stainless steel

## Remote cable





## Order code

**NSL-F-00** Potentiometric level sensor, straight version

**Rod length EL**

**0050...3000** In steps of 10 mm, intermediate sizes at extra charge

**Process connection** (Ⓐ: 3-A compliant, Ⓔ: EHEDG approval)

- S00** CLEANadapt G1/2" hygienic Ⓐ Ⓔ
- S01** CLEANadapt G1" hygienic
- TC1** Tri-Clamp 1½" Ⓐ Ⓔ
- TC2** Tri-Clamp 2" Ⓐ Ⓔ
- T25** Tri-Clamp 2½" Ⓐ Ⓔ
- TC3** Tri-Clamp 3" Ⓐ Ⓔ
- V10** Varivent type B, DN 10/15
- V25** Varivent type F, DN 25 Ⓐ Ⓔ
- V40** Varivent type N, DN 40/50 Ⓐ Ⓔ

**Material certificate**

- O** No certificate
- Z** With 3.1 material certificate

**Mounting position**

- 1** Installation from top, head orientation horizontal
- 2** Installation from top, head orientation vertical
- 3** Installation from bottom, head orientation horizontal
- 4** Installation from bottom, head orientation vertical
- 5** Installation from top, head orientation horizontal, 40 mm insulation, only for EL ≥ 200 mm
- 6** Installation from top, head orientation vertical, 40 mm insulation, only for EL ≥ 200 mm

**Signal module**

**I42** IO-Link and 1x 4...20 mA level

**Electrical connection**

- P** Cable gland M16x1.5
- M** 1x M12 plug, 4 pin output/power supply
- L** 1x M12 plug, 5 pin, wiring according to LN sensor
- C** 1x M12 plug, 5 pin analog output and IO-Link

**Display**

- X** Without display
- S** Simple User Interface with small display
- L** Large User Interface with display

**Cap**

- X** Opaque plastic
- P** Clear plastic
- M** Stainless steel without control window
- W** Stainless steel with control window

**Insulation at rod end**

- XX** Without insulation
- PK** With PEEK insulation >> EL + 30 mm

**Configuration**

- X** Factory setting
- S** Special customer setting

NSL-F-00 / 1500 / S00 / O / 1 / I42 / P / X / X / XX / X

## Order code

NSL-F-01 Potentiometric level sensor, angled version

## Rod length EL

0400...

1500 In steps of 10 mm, intermediate sizes at extra charge

## Process connection (Ⓐ: 3-A compliant, Ⓔ: EHEDG approval)

TC1 Tri-Clamp 1½" Ⓐ Ⓔ

TC2 Tri-Clamp 2" Ⓐ Ⓔ

T25 Tri-Clamp 2½" Ⓐ Ⓔ

TC3 Tri-Clamp 3" Ⓐ Ⓔ

V10 Varivent type B, DN 10/15

V25 Varivent type F, DN 25 Ⓐ Ⓔ

V40 Varivent type N, DN 40/50 Ⓐ Ⓔ

## Material certificate

O No certificate

Z With 3.1 material certificate

## Installation

1 Installation from top, head orientation horizontal

2 Installation from top, head orientation vertical

3 Installation from bottom, head orientation horizontal

4 Installation from bottom, head orientation vertical

5 Installation from top, head orientation horizontal, 40 mm insulation, only for EL ≥ 200 mm

6 Installation from top, head orientation vertical, 40 mm insulation, only for EL ≥ 200 mm

## Signal module

I42 IO-Link and 1x 4...20 mA level

## Electrical connection

P Cable gland M16x1.5

M 1x M12 plug, 4 pin output/power supply

L 1x M12 plug, 5 pin, wiring according to LN sensor

C 1x M12 plug, 5 pin analog output and IO-Link

## Display

X Without display

S Simple User Interface with small display

L Large User Interface with display

## Cap

X Opaque plastic

P Clear plastic

M Stainless steel without control window

W Stainless steel with control window

## Insulation at rod end

XX Without insulation

PK PEEK insulation &gt;&gt; EL + 30 mm

## Configuration

X Factory setting

S Special customer setting

## Details on angled version

80...300 Length L1 in mm

10...90 Angle α in °

NSL-F-01 / 1500 / S00 / O / 1 / I42 / P / X / X / XX / X / 150-90

## Order code

**NSL-FR-00** Potentiometric level sensor, straight version - remote version, remote cable must be ordered separately

## Rod length EL

**0050...3000** In steps of 10 mm, intermediate sizes at extra charge

## Process connection (Ⓐ: 3-A compliant, Ⓔ: EHEDG approval)

- S00** CLEANadapt G1/2" hygienic Ⓐ Ⓔ
- S01** CLEANadapt G1" hygienic
- TC1** Tri-Clamp 1½" Ⓐ Ⓔ
- TC2** Tri-Clamp 2" Ⓐ Ⓔ
- T25** Tri-Clamp 2½" Ⓐ Ⓔ
- TC3** Tri-Clamp 3" Ⓐ Ⓔ
- V10** Varivent type B, DN 10/15
- V25** Varivent type F, DN 25 Ⓐ Ⓔ
- V40** Varivent type N, DN 40/50 Ⓐ Ⓔ

## Material certificate

- O** No certificate
- Z** With 3.1 material certificate

## Mounting position

- 2** Installation from top
- 4** Installation from bottom
- 6** Installation from top, 40 mm insulation, only for EL ≥ 200 mm

## Signal module

- I42** IO-Link and 1x 4...20 mA level

## Electrical connection

- P** Cable gland M16x1.5
- M** 1x M12 plug, 4 pin output/power supply
- L** 1x M12 plug, 5 pin, wiring according to LN sensor
- C** 1x M12 plug, 5 pin analog output and IO-Link

## Display

- X** Without display
- L** Large User Interface with display

## Cap

- X** Opaque plastic
- P** Clear plastic
- M** Stainless steel without control window
- W** Stainless steel with control window

## Insulation at rod end

- XX** Without insulation
- PK** With PEEK insulation >> EL + 30 mm

## Configuration

- X** Factory setting
- S** Special customer setting

NSL-FR-00 / 1500 / S00 / O / 2 / I42 / P / X / X / XX / X

## Information

The components NSL-FS / sensor and HUR / Head Unit Remote can be purchased as spare parts separately. The valid configuration can be seen on the product labels.



## Order code

**NSL-FR-01** Potentiometric level sensor, angled version - remote version, remote cable must be ordered separately

**Rod length EL****0400...****1500** In steps of 10 mm, intermediate sizes at extra charge**Process connection** (Ⓐ: 3-A compliant, Ⓔ: EHEDG approval)**TC1** Tri-Clamp 1½" Ⓐ Ⓔ**TC2** Tri-Clamp 2" Ⓐ Ⓔ**T25** Tri-Clamp 2½" Ⓐ Ⓔ**TC3** Tri-Clamp 3" Ⓐ Ⓔ**V10** Varivent type B, DN 10/15**V25** Varivent type F, DN 25 Ⓐ Ⓔ**V40** Varivent type N, DN 40/50 Ⓐ Ⓔ**Material certificate****O** No certificate**Z** With 3.1 material certificate**Installation****2** Installation from top**4** Installation from bottom**6** Installation from top, 40 mm insulation, only for EL ≥ 200 mm**Signal module****I42** IO-Link and 1x 4...20 mA level**Electrical connection****P** Cable gland M16x1.5**M** 1x M12 plug, 4 pin output/power supply**L** 1x M12 plug, 5 pin, wiring according to LN sensor**C** 1x M12 plug, 5 pin analog output and IO-Link**Display****X** Without display**L** Large User Interface with display**Cap****X** Opaque plastic**P** Clear plastic**M** Stainless steel without control window**W** Stainless steel with control window**Insulation at rod end****XX** Without insulation**PK** PEEK insulation >> EL + 30 mm**Configuration****X** Factory setting**S** Special customer setting**Details on angled version****80...300** Length L1 in mm**10...90** Angle α in °

NSL-FR-01 / 1500 / TC1 / O / 2 / I42 / P / X / X / XX / X / 150-90