

**Product Information NSL-F-00, NSL-FR-00, NSL-F-01, NSL-FR-01**
**FOOD**

# Continuous 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

- Use of Negele **CLEANadapt** build-in system results in a hygienic installation situation that is free of gaps and dead space and is easy to sterilize.
- Process connection G1/2" and G1" hygienic or Tri-Clamp, adapters available for milk pipe (DIN 11851), Varivent, DRD, ... (see CLEANadapt product information)
- EHEDG-certified hygienic CLEANadapt process connection
- Compliant with 3-A standard
- All materials in contact with the product have FDA approval
- Sensor made entirely of stainless steel (protection class IP 69 K)
- CIP/SIP cleaning up to 143 °C/120 min (289 °F/120 min)

## Special features/advantages

- 4-wire sensor with 4...20 mA output signal
- Due to potentiometric measurement principle, no adjustment needed after media change
- Individual parameter adjustment and programming via PC interface
- Adjustment of the M12 plug by means of the twistable sensor head
- Mounting in vessels from the below or above
- Mounting on the side with angled sensor
- 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

## Authorizations



## 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)



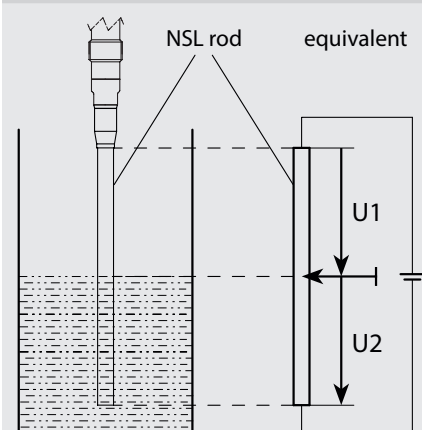
Specification		
<b>Rod length EL</b>	Product contacting	3000 mm max. (NSL-F-00, NSL-FR-00) 1500 mm max. (NSL-F-01, NSL-FR-01)
<b>Measurement range MB</b>	NSL-F-00, NSL-FR-00 NSL-F-00, NSL-FR-00 NSL-F-01, NSL-FR-01	50...199 mm (rod diameter 6 mm) 200...3000 mm (rod diameter 10 mm) L2 see drawing on page 5 (rod diameter 10 mm)
<b>Process connection</b>	Thread Tri-Clamp Varivent	CLEANadapt G1/2", G1" hygienisch 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 (CF-8) Polycarbonate Stainless steel 1.4305 (303) PEEK (FDA approval number: 21 CFR 177 2415) Stainless steel 1.4404, $R_a \leq 0.8 \mu\text{m}$
<b>Temperature range</b>	Ambient Storage temperature Process CIP/SIP cleaning	0...70 °C -40...85 °C -10...140 °C 143 °C 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	$\leq 0.1 \%$
<b>Response time</b>		< 100 ms
<b>Electrical connection</b>	Supply Protection class Output signal  Ohmic resistance	18...36 V DC IP 69 K Analog 4...20 mA, galvanically separated from housing, 2-wire loop 0...750 $\Omega$
<b>Connection cable (only for NSL-FR-xx)</b>	PVC cable	8-pin, twisted-pair, unshielded, with M12 coupling/straight plug

### 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.

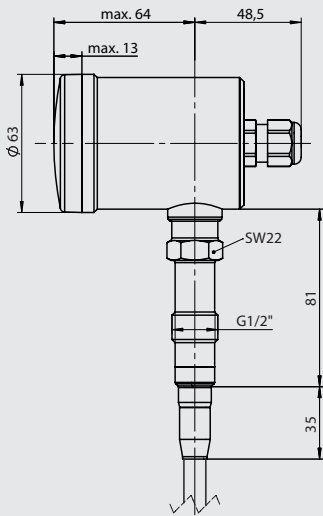
Because only the ratio of the voltages is considered, the properties of the medium, in particular the electrical conductivity, do not enter into the measurement result. Using a second, patent-pending measuring procedure, the sensor also provides information on the submersion state of the electrode rod. This system analyzes electrical resonance properties to detect foam and suppress it partly in the results, and to reliably prevent erroneous measurements due to adhesions.

### Functional principle

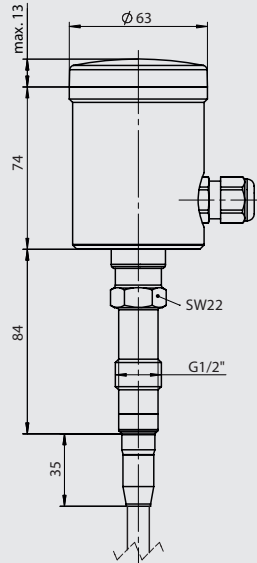




## NSL-F ... with horizontal head



## NSL-F ... with vertical head



## Rod diameter

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

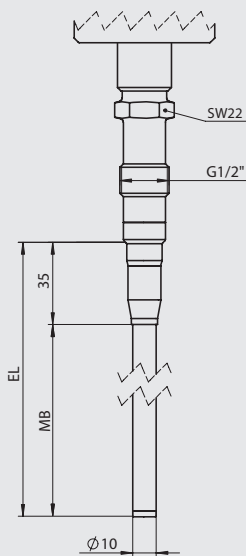
## Rod diameter NSL-F-00

EL	Ø D
50...199 mm	6 mm
200...3000 mm	10 mm

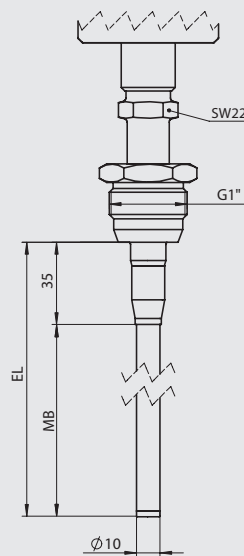
## Rod diameter NSL-F-01, NSL-FR-01

EL	Ø D
80...1500 mm	10 mm

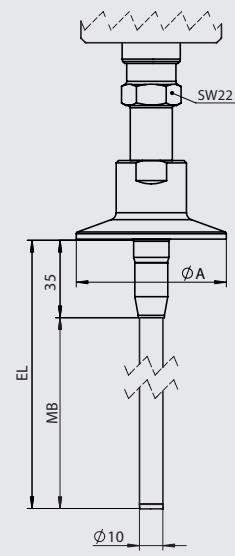
## NSL-F-00/.../S00/... with EL &gt; 200 mm



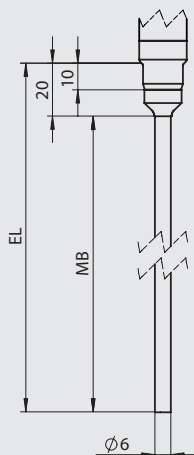
## NSL-F-00/.../S01/... with EL &gt; 200 mm



## NSL-F-00/.../TC1/... with EL &gt; 200 mm

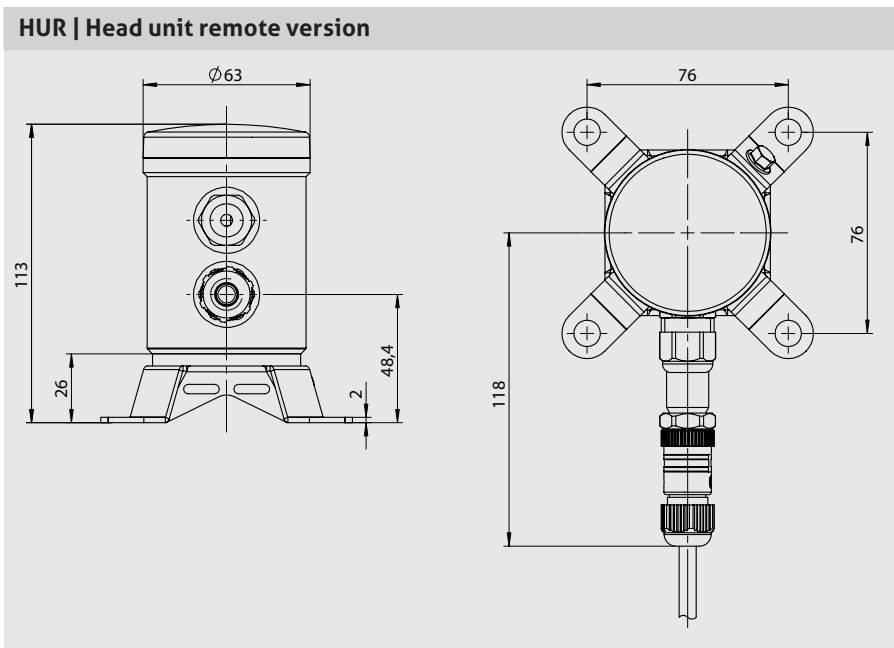
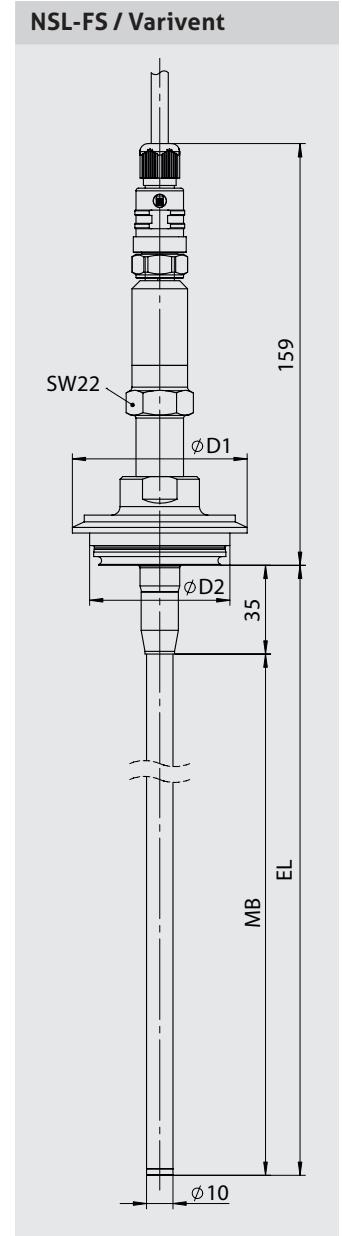
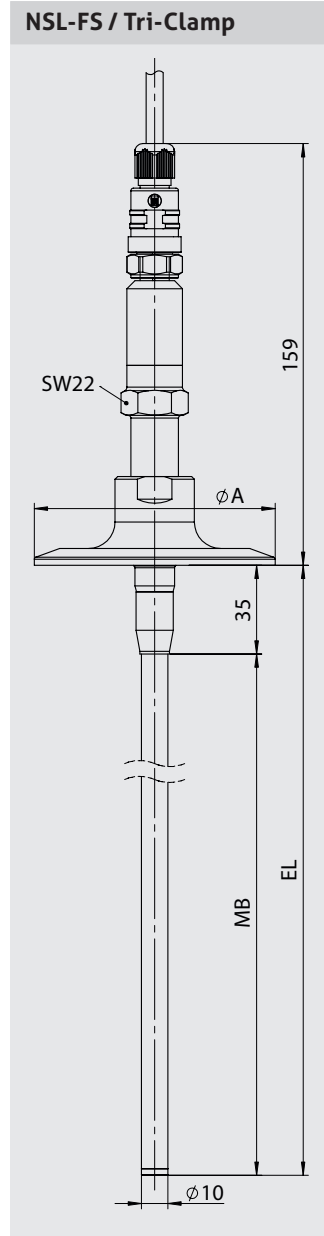
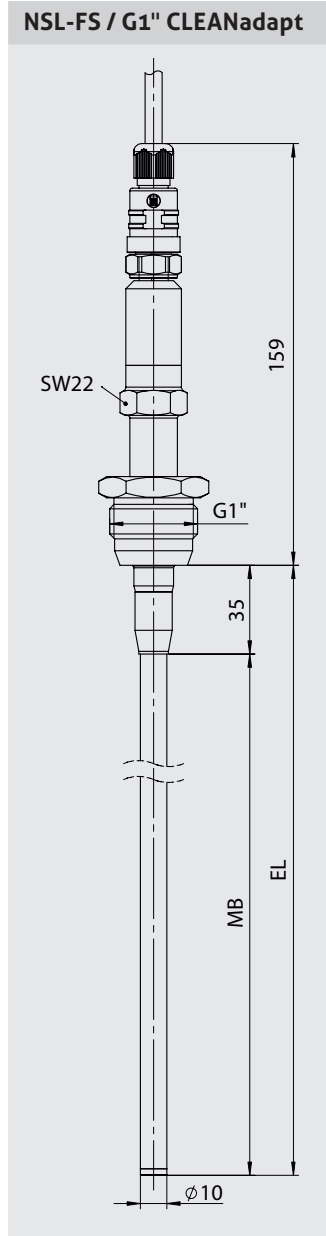
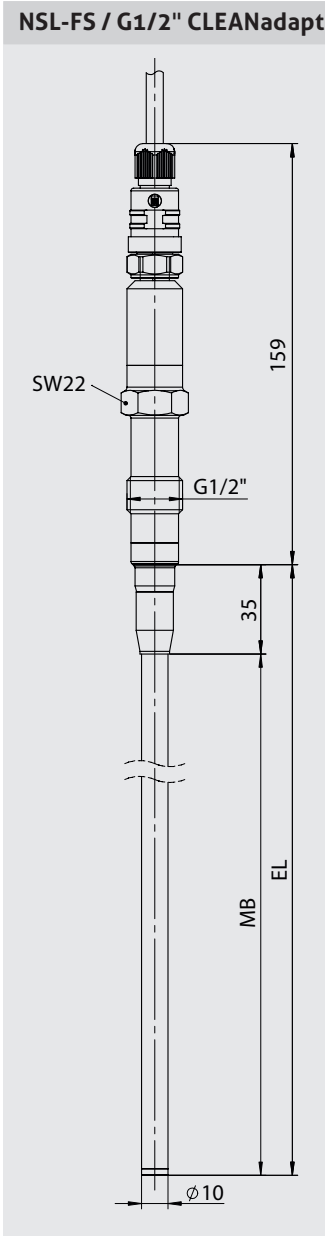


## NSL-F-00/... with EL &lt; 200 mm



## Tri-Clamp diameter

Typ	Ø A
TC1	50.5 mm
TC2	64.0 mm
T25	77.5 mm
TC3	91.0 mm

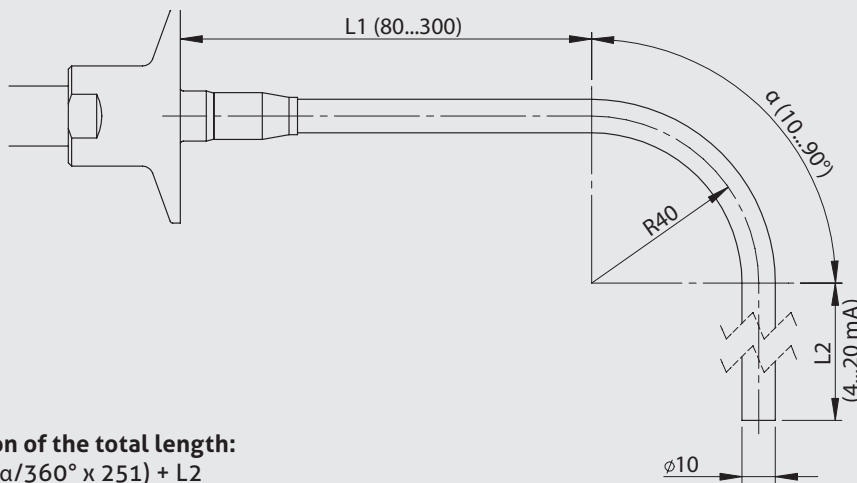


**Dimensions table Varivent®**

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

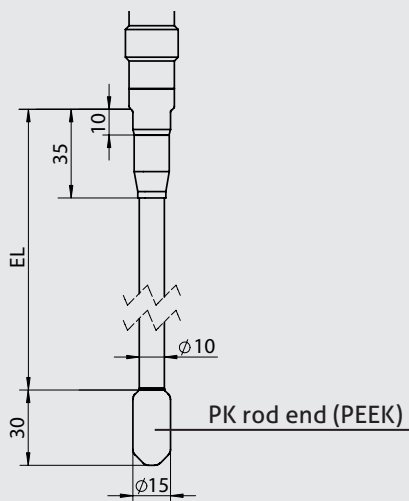
## Version NSL-F-01

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

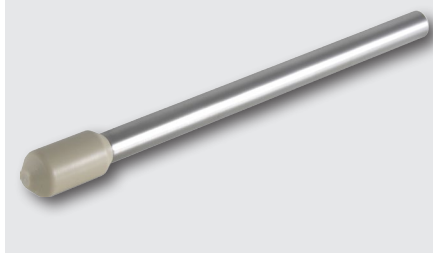


Calculation of the total length:  
 $EL = L1 + (\alpha/360^\circ \times 251) + L2$

## Drawing option PK



## Insulation at rod end (option PK)



## Conventional usage

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



## 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.

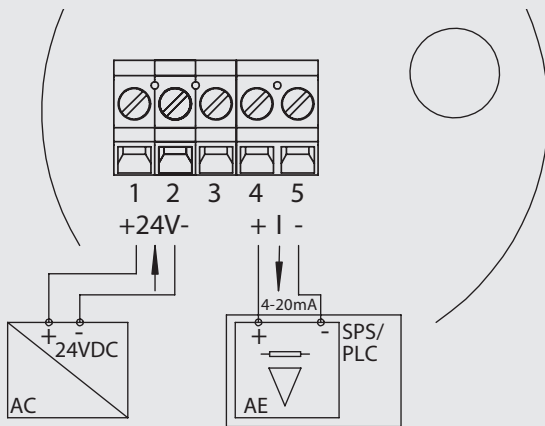


## Conditions for a measuring point according to 3-A Sanitary Standard 74-06

- The sensors NSL-F conforming to the 3-A Sanitary Standard.
- The sensors are designed for CIP-/ SIP-cleaning. Maximum 143 °C / 120 minutes (289 °F for 120 minutes).
- Only permitted with the **CLEANadapt** build-in system (EMZ-xx1, EMK-xx1, adapter AMC-xx1 and AMV-xx1).
- When using the EMZ and EMK weld-in sleeves, the weld must comply with the requirements of the current 3-A Sanitary Standard.
- Mounting position: The mounting position, self-draining properties and the position of the leakage hole must be in accordance with the current 3-A Sanitary Standard.



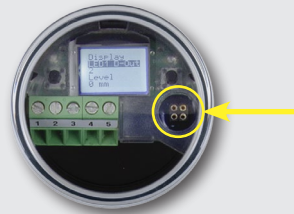
## Electrical connection with cable gland



## 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



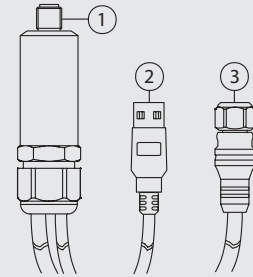
Connection plug for MPI-200-F adapter as an intermediate plug between the NSL-F electronics and the MPI-200 connection 3 (see next figure).

## Electrical connection with M12 plug

<b>1: brown</b>	+ power supply	
<b>2: white</b>	+ output 4...20 mA	
<b>3: blue</b>	- output	
<b>4: black</b>	- power supply	

## 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



## Adjustment of parameters that have already been set

Using the self-explanatory PC-based software and the MPI-200 programming adapter, the following NSL-F parameters can easily be adjusted on-site (at the vessel with filling medium) or alternatively in the office with a dry simulation. For example:

**4...20 mA signal**

- Level height for (4/20) mA signal
- "Dry run" warning signal
- "Failure" error signal
- Signal limit for underrange and overrange
- "Underflow/overflow" error signal
- Signal simulation (3.95...20.05 mA)

**Level measurement**

- Level zero/offset
- level slope/gain
- Damping/filter
- Physical unit

**Mounting position**

The default setting of the NSL-F level sensor is intended for operation with aqueous media without requiring adjustments. In exceptional cases involving highly critical media or special tank contours (with internal structures such as a pipe), it may be necessary to make adjustments to some of the parameters. The parameterization can be adjusted using the PC-based MPI-200 or the Simple User Interface.

## Possible parameter/settings

**4...20 mA current signal**

<b>Underrange</b>	2.40; 3.20; 3.40; 3.60; 3.80; 3.95; 4.00 mA
<b>Overrange</b>	20.00; 20.05; 20.50; 21.00; 21.40; 21.60; 21.80; 22.00 mA
<b>Warning and error signal (e.g. dry run)</b>	2.40; 3.20; 3.40; 3.60; 3.95; 4.00; 20.00; 20.05; 20.50; 21.00; 21.20; 21.40; 21.60; 21.80; 22.00 mA

**Level measurement**

<b>Zero/slope</b>	-50...50 % / 50...150 %
<b>Damping</b>	0; 0.1; 0.2; 0.5; 1; 2; 5 s

**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
- 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.

**Advice to EMC**

- Applicable guidelines:
- Electromagnetic compatibility 2014/30/EC
  - The CE label confirms compliance of this product with the applicable EC directives.
  - The operator is responsible for ensuring compliance with the directives that are applicable to the overall system.

**Disposal**

- This instrument is not subject to the WEEE directive 2002/96/EC and the respective national laws.
- Give the instrument directly to a specialized recycling company and do not use the municipal collecting points.

## Accessories

**PVC cable with M12 connection, made of 1.4305 (303), IP 69 K, unshielded**

<b>M12-PVC / 4-5 m</b>	PVC cable, 4-pin, length 5 m
<b>M12-PVC / 4-10 m</b>	PVC cable, 4-pin, length 10 m
<b>M12-PVC / 4-25 m</b>	PVC cable, 4-pin, length 25 m

**PVC cable with M12 connection, nickel-plated brass, IP 67, shielded**

<b>M12-PVC / 4G-5 m</b>	PVC cable, 4-pin, length 5 m
<b>M12-PVC / 4G-10 m</b>	PVC cable, 4-pin, length 10 m
<b>M12-PVC / 4G-25 m</b>	PVC cable, 4-pin, length 25 m

**Programming adapter/PC interface  
MPI-200**

Including PC software

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

## PVC cable with M12 connection



## Programming adapter MPI-200



## Connection cable for NSL-FR (remote version)

<b>M12-PVC/8-5 m</b>	PVC cable, M12 coupling both-sided, 8-pin, IP69K, 5 m
<b>M12-PVC/8-10 m</b>	PVC cable, M12 coupling both-sided, 8-pin, IP69K, 10 m
<b>M12-PVC/8-25 m</b>	PVC cable, M12 coupling both-sided, 8-pin, IP69K, 25 m
<b>M12-PVC/8-xx m</b>	PVC cable, M12 coupling both-sided, 8-pin, IP69K, special length

## Connection cable for NSL-FR





## Order code

**NSL-F-00** (Potentiometric continuous level sensor, compact version in 4-wire technology, straight design)

**Rod length EL, choose length in a 10-mm raster, e.g.: 0220, 0230, 0240 etc., max. length 3000 mm.**  
(intermediate sizes in 1-mm steps on request.)

**0050...3000** (material 1.4404)

**Process connection**

**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, standard)  
**Z** (With 3.1 material certificate for 1.4404)

**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)  
**6** (Installation from top, head orientation vertical, 40 mm insulation)

**Output signal**

**A42** (4...20 mA, analog, 4-wire)

**Electrical connection**

**P** (Cable gland M16x1.5)  
**M** (M12 plug 1.4305, standard)  
**L** (M12-plug, 5-pins, wiring according to LN sensor)

**Interface/Display**

**X** (Without interface)  
**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, standard)  
**PK** (With PEEK insulation >> EL + 30 mm)

**Parameter configuration**

**X** (Standard)  
**S** (Write out details)

NSL-F-00/ 1500/ S00/ O/ 1/ A42/ P/ X/ X/ XX/ X

## Order code

**NSL-F-01** (Potentiometric level sensor for food application, compact version in 4-wire technology, angled version)

**Rod length EL, please order in 10-mm steps, e.g.: 0220, 0230, 0240, etc., max length 1500 mm.**  
(intermediate sizes in 1-mm steps available on request)

**0400...**

**1500** (Material 1.4404)

**Process connection**

- 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, standard)
- Z** (With 3.1 material certificate for 1.4404)

**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)

**Output signal**

- A42** (4...20 mA, analog, 4-wire)

**Electrical connection**

- P** (Cable gland M16x1.5)
- M** (M12 plug 1.4305, standard)
- L** (M12-plug, 5-pins, wiring according to LN sensor)

**Interface/Display**

- X** (Without interface)
- 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, standard)
- PK** (PEEK insulation >> EL + 30 mm)

**Parameter configuration**

- X** (Standard)
- S** (Write out details)

**Details on angled version  
(max. EL 1500 mm)**

- 80...300** (Length L1 in mm)
- 10...90** (Angle α in °)

NSL-F-01/ 1500/ S00/ O/ 1/ A42/ P/ X/ X/ XX/ X/ 150-90

## Order code

**NSL-FR-00** (Potentiometric continuous level sensor, remote version in 4-wire technology, straight design)

**Rod length EL, choose length in a 10-mm raster, e.g.: 0220, 0230, 0240 etc., max. length 3000 mm.**  
(intermediate sizes in 1-mm steps on request.)

**0050...3000** (material 1.4404)

**Process connection**

**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, standard)  
**Z** (With 3.1 material certificate for 1.4404)

**Mounting position**

**2** (Installation from top)  
**4** (Installation from bottom)  
**6** (Installation from top, 40 mm insulation)

**Output signal**

**A42** (4...20 mA, analog, 4-wire)

**Electrical connection**

**P** (Cable gland M16x1.5)  
**M** (M12 plug 1.4305, standard)  
**L** (M12-plug, 5-pins, wiring according to LN sensor)

**Interface/Display**

**X** (Without interface)  
**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, standard)  
**PK** (With PEEK insulation >> EL + 30 mm)

**Parameter configuration**

**X** (Standard)  
**S** (Write out details)

NSL-FR-00/ 1500/ S00/ O/ 1/ A42/ 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 for food application, remote version in 4-wire technology, angled version)

**Rod length EL, please order in 10-mm steps, e.g.: 0220, 0230, 0240, etc., max length 1500 mm.**  
(intermediate sizes in 1-mm steps available on request)

**0400...**

**1500** (Material 1.4404)

**Process connection**

**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, standard)  
**Z** (With 3.1 material certificate for 1.4404)

**Installation**

**2** (Installation from top)  
**4** (Installation from bottom)

**Output signal**

**A42** (4...20 mA, analog, 4-wire)

**Electrical connection**

**P** (Cable gland M16x1.5)  
**M** (M12 plug 1.4305, standard)  
**L** (M12-plug, 5-pins, wiring according to LN sensor)

**Interface/Display**

**X** (Without interface)  
**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, standard)  
**PK** (PEEK insulation >> EL + 30 mm)

**Parameter configuration**

**X** (Standard)  
**S** (Write out details)

**Details on angled version  
(max. EL 1500 mm)**

**80...300** (Length L1 in mm)  
**10...90** (Angle α in °)

NSL-FR-01/ 1500/ S00/ O/ 1/ A42/ P/ X/ X/ XX/ X/ 150-90