

## Product Information NCS-x1, NCS-x2, NCS-L-11, NCS-L-12

## FOOD

# Capacitive Limit Switch Food NCS



## Application/Specified usage

- Limit detection of media with low or no water content like syrup, fruit concentrates, alcohols und oils with a dielectric constant  $\epsilon_r$  ( $D_k$ )  $\geq 2$

## Application examples

- Limit detection in vessels (build-in position sidewise) or pipes
- High alarm in vessels and tanks with build-in position from top (type NCS-L)
- Empty alarm in vessels and tanks with build-in position from bottom (type NCS-L)
- Product monitoring in pipes
- Pump / dry running protection

## Hygienic design/Process connection

- Hygienic process connection with CLEANadapt
- Conforming to 3-A Sanitary Standard
- All wetted materials are FDA-conform
- Sensor completely made of stainless steel, sensor tip made of PEEK
- 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.

## Features

- CIP-/ SIP-cleaning up to 143 °C / maximum 120 minutes
- Independent of the conductivity
- NCS-L: Insensitive to foam and adherence, reliable at pasty media
- Short response time ( $< 1$  s)
- Reversible output (full / empty active)
- Heated electronic to avoid condensation
- Simulation of sensor status possible

## Options/Accessories

- LED state indicator with inspection window lid
- Version with spacer (option H) for isolated vessels or permanent process temperatures up to 143 °C (available for NCS-x1 and NCS-x2)
- NPN output (Open Collector)
- M12-plug and matching cable assembly
- Heating element switched off for extension of the temperature range

## Measuring principle

The capacity of a capacitor is affected by 3 factors: **Distance** and **size of the electrodes** as well as the **kind of medium** between the electrodes. Using the capacitive sensors only the kind of medium is of interest.

The electrode of the sensor and surface of tank can be seen as capacitor, the medium as dielectric fluid. Caused by the higher  $D_k$ -value of the medium compared to air the capacity increases if the sensor is covered with the medium. The change of capacity is evaluated by electronics and converted into a corresponding switching order. This functional principle requires that the sensor tip is completely covered with medium. That way the sensor is insensitive to foam and adherences.

## Authorizations



### NCS-01



### NCS-12



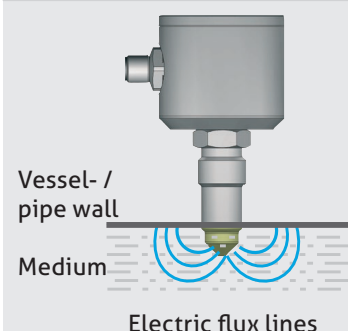
### NCS-L-11/50



### NCS-L-11/150

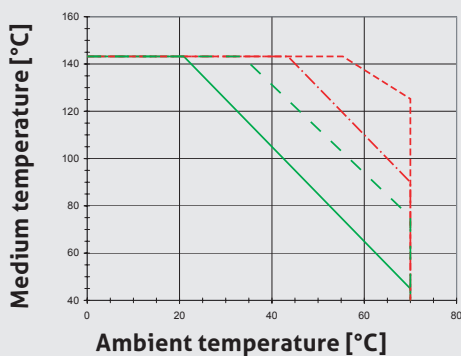


## Measuring principle



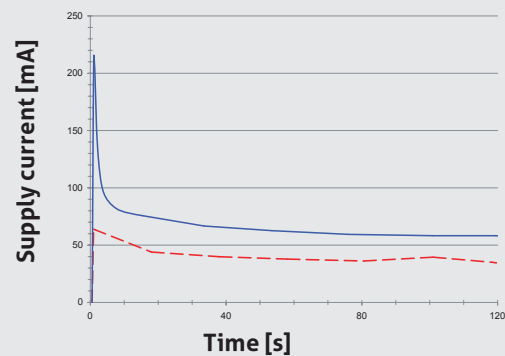
Specification		
Process connection	thread	M12 x 1,5, G1/2" CLEANadapt, combined with Negele weld-in sleeves, build-in systems, adapter sleeves
	tightening torque	max. 5...10 Nm
Materials	connection head	stainless steel 1.4301 (AISI 304)
	connection piece spacer	stainless steel 1.4305 (AISI 303)
Surface quality	sensor tip NCS-1x	PEEK (FDA approval number 21 CFR 177.2415)
	sensor tip NCS-0x	stainless steel 1.4404 (AISI 316L)
Weight		$R_a \leq 0,8 \mu\text{m}$
Operating pressure		ca. 500 g
Electrical connection		max. 10 bar
Electrical connection	cable gland	M16 x 1,5 (PG)
	cable connection	M12-plug stainless steel 1.4301 (AISI 304)
Protection class		IP 69 K (with cable connection) IP 67 (with cable gland)
Supply		16...32 V DC (see graphic)
Output		PNP (active 50 mA, short-circuit-proof)
	optional	NPN (active 50 mA, short-circuit-proof)
Switching function	adjustable by polarity of supply	high active (sensor wetted: 'high')
		low active (sensor free: 'high')
Status display		LED
Measuring range	NCS-x1, NCS-L-11	$Dk \geq 20$
	NCS-02	$Dk \geq 5$
	NCS-12, NCS-L-12	$Dk \geq 2$
Switching threshold	NCS-x1, NCS-L-11	threshold stepwise adjustable $Dk = 20 \dots Dk = 70$
	NCS-02	threshold stepwise adjustable $Dk = 5 \dots Dk = 20$
	NCS-12, NCS-L-12	threshold stepwise adjustable $Dk = 2 \dots Dk = 20$
	NCS-02, NCS-12, NCS-L-12	threshold external switchable to $Dk = 50$

### Temperature range



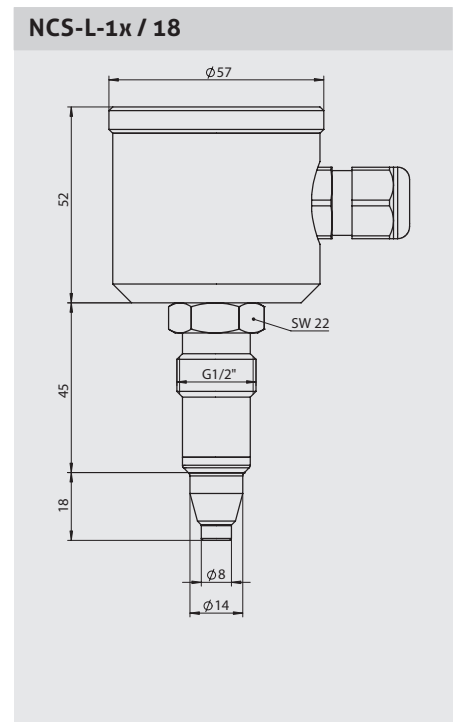
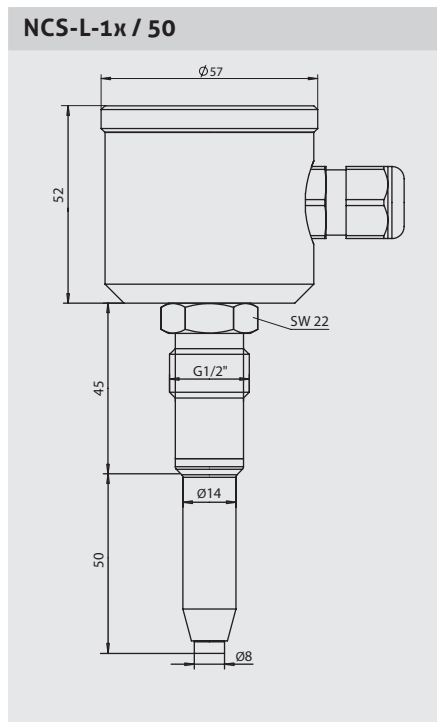
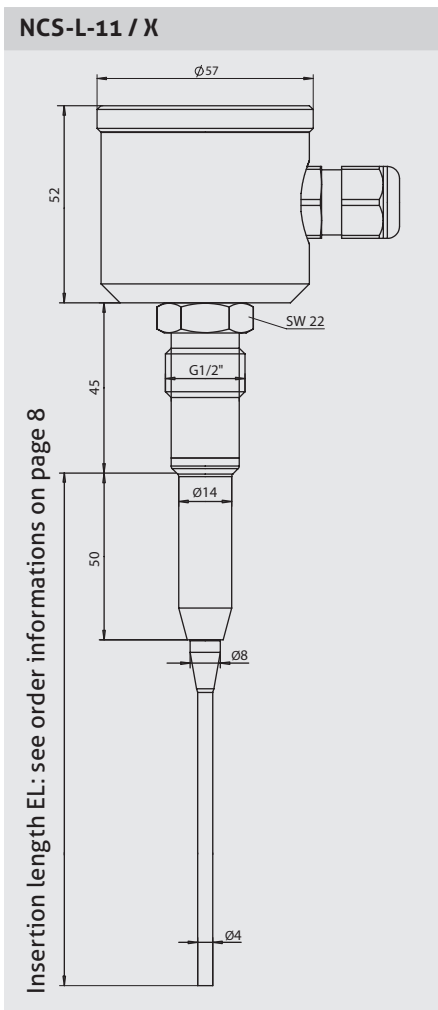
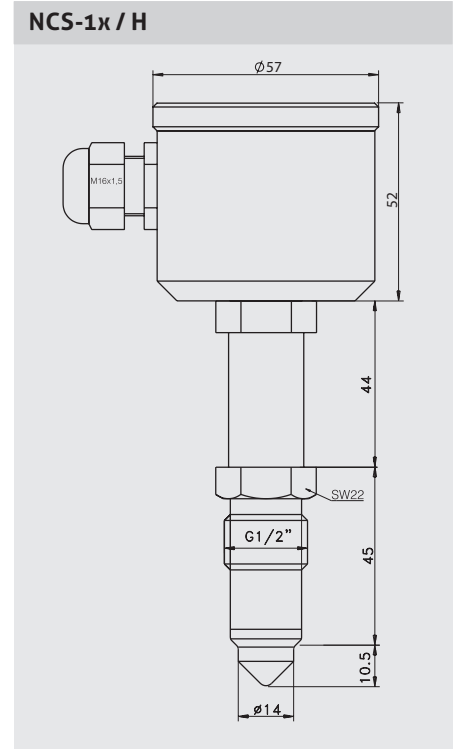
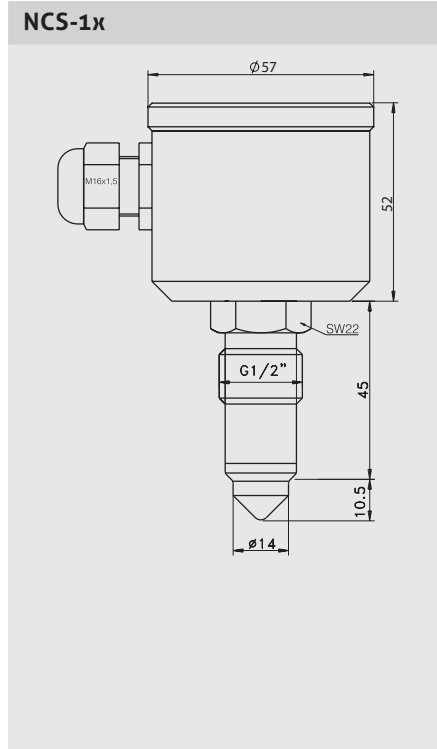
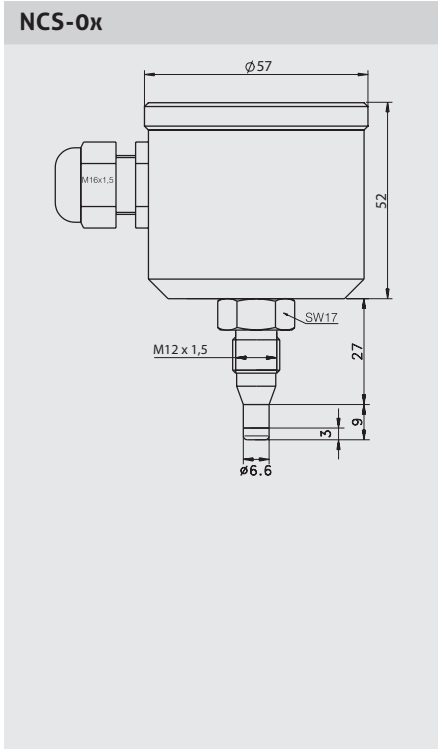
- Continuous temperature limit with heater
- - - Temperature excursion (60 min) with heater
- - - Continuous temperature limit without heater
- - - Temperature excursion (60 min) without heater

### Supply/Power input



- - -  $U_b = 24 \text{ V}, T_u = 20 \text{ °C}$
- $U_b = 33 \text{ V}, T_u = -15 \text{ °C}$

$U_b$ : Supply voltage  
 $T_u$ : Ambient temperature



**Belated shortage of sensor rod**

Sensor length can be shortened by up to 50 mm. Thereby immersion length needed for switching can vary after cut down. These is about 5 mm at watery media.



## Conventional usage



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

## Electrical connection NCS-x1, NCS-L-11

Strip terminal	High active	Low active
	1: +24 V DC 2: 0 V 3: output	1: 0 V 2: +24 V DC 3: output
M12-plug	High active	Low active
	1: +24 V DC 2: not connected 3: 0 V 4: output	1: 0 V 2: not connected 3: +24 V DC 4: output

## Electrical connection NCS-x2, NCS-L-12

Strip terminal	High active	Low active
	1: control input 2: +24 V DC 3: 0 V 4: output	1: control input 2: 0 V 3: +24 V DC 4: output
M12-plug	High active	Low active
	1: +24 V DC 2: control input 3: 0 V 4: output	1: 0 V 2: control input 3: +24 V DC 4: output

## Mechanical connection/Installation in pipes



To guarantee a definite function, the sensor tip must be completely covered by the medium! A minimum filling level in the pipe is necessary to ensure that the sensor operates. This varies according to the mounting position (see figure "Build-in Position" on page 5):

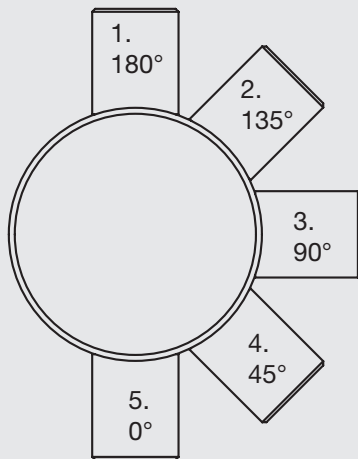
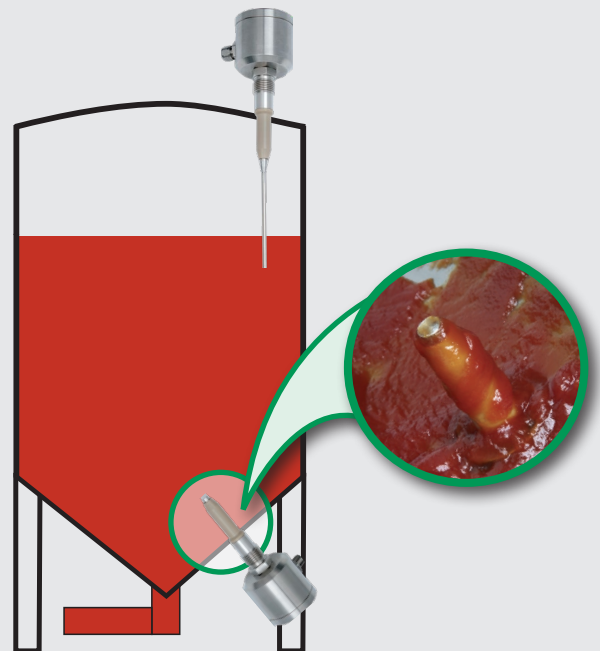
for position 1: 100 %		Position 2: Ideal installation as high alarm in horizontal lines; ensures that isolation of sensor tip by air bubble is prevented.
for position 2: ca. 92 %		Position 4: Ideal installation as low alarm in horizontal lines; ensures that sensor tip is not covered with residues of medium.
for position 3: ca. 60 %		
for position 4: ca. 30 %		
for position 5: min. 11 mm		

Use Negele CLEANadapt system for all types of NCS to ensure safe operation of measuring point!

- Attention: The maximum tightening torque for mounting is 10 Nm!
- Use a welding mandril for correct installation of CLEANadapt weld-in fittings. Please pay attention to the weld-in and installation details in the CLEANadapt product information.
- Do not use non-conducting sealants such as PTFE (Teflon) or similar.

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

- The sensors NCS-x1, NCS-x2, NCS-L-11, NCS-L-12 conforming to the 3-A Sanitary Standard.
- The sensors are designed for CIP-/ SIP-cleaning. Maximum 143 °C / 120 minutes.
- Only with the build-in system CLEANadapt (EMZ, EMK, EHG with pipe diameter > DN25, ISO 20 and 1", Adapter AMC and AMV) allowed.
- Using the weld in sleeve EMZ, EMK the weld must comply to the requirements of the current 3-A Sanitary Standard.
- Mounting position, self draining and the position of the leakage hole must be in accordance to current 3-A Sanitary Standard.

**Fig.: Build-in position in pipes****Fig.: Build-in schema for NCS-L ...**













## Handling/operation



With the control input, the threshold of the limit switches with enhanced measurement range can be switched to threshold of  $Dk = 50$  while operating. This could be useful to avoid false alarm at process steps with increasing frothing, CIP-cycles or similar.

Control input	Threshold
0 V or not connected	like setting with rotary switch
+24 V DC	$Dk = 50$ fix

## LED status display

Sensor Tip	NCS-x1 NCS-L-11	NCS-x2 NCS-L-12 control input 0 V	NCS-x2 NCS-L-12 control input 24 V
covered	 	 	 
not covered	 	 	 

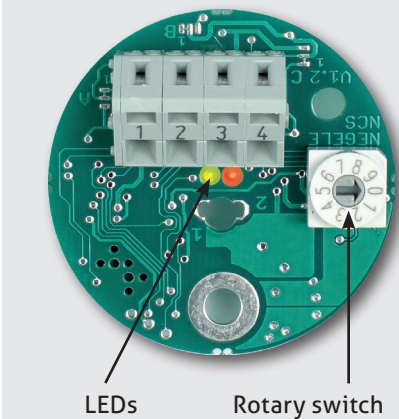
## Adjustment of threshold with rotary switch

Switch setting	$Dk$ -value $\geq 20$ NCS-x1 NCS-L-11	$Dk$ -value $\geq 5$ NCS-02	$Dk$ -value $\geq 2$ NCS-12 NCS-L-12
0	output off	output off	output off
1	output on	output on	output on
2	20	5	2
3	25	6	3
4	30	7	4
5	35	8	5
6	40	9	10
7	50	10	12
8	60	15	15
9	70	20	20

## Example

At switch setting 5 ( $Dk = 35$ ) the NCS-x1 will detect media with a dielectric constant of  $Dk \geq 35$ .

## Electronics NCS-x2



Showcase of media and specific  $Dk$ -value:

(the exemplarily  $Dk$ -values can vary acc. to different outside influences like temperature, fabrication, source etc.)

Medium	$Dk$ -value
water	81
methanol	33
water (demineralized)	29
ethanol	25
honey, ketchup, mustard	24
acetone	21
skin cream	19
toothpaste	18
draff (residual moisture 20 %)	7
butter	6
milkfat	4
chocolate	3
vegetable oil	2



### Information process connection

The complete assortment as well as the order code for build-in systems, weld-in sleeves and adapters you will find in the product information CLEANadapt.

### Samples of possible process connections

NCS-1x NCS-L-1x					
Process connection	Build-in system EHG (DIN 11850 series 2)	Weld-in sleeve	Weld-in sleeve	Weld-in sleeve	Collar sleeve

### Samples of possible process connections

NCS-1x NCS-L-1x					
Process connection	Weld-in ball	Tri-Clamp	Dairy flange (DIN 11851)	Varivent-Inline	Adapter for tuning fork

### Cleaning/Maintenance



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

### Transport/Storage



- No outdoor storage
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration
- Storage temperature 0...40 °C
- Relative humidity max. 80 %

### Reshipment



- Sensors shall be clean and must not be contaminated with dangerous media!
- Use suitable transport packaging only to avoid damage of the equipment!

### Standards and guidelines



- You have to comply with applicable regulations and directives.

### 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.

## Order code

NCS-01	(measurement range for watery media with $D_k \geq 20$ ; CLEANadapt M12)
NCS-11	(measurement range for watery media with $D_k \geq 20$ ; CLEANadapt G1/2")
NCS-L-11	(measurement range for watery media with $D_k \geq 20$ ; CLEANadapt G1/2")
NCS-02	(measurement range for critical media with $D_k \geq 5$ ; CLEANadapt M12)
NCS-12	(measurement range for critical media with $D_k \geq 2$ (e.g. Oil, Fat, ...); CLEANadapt G1/2")
NCS-L-12	(measurement range for critical media with $D_k \geq 2$ (e.g. Oil, Fat, ...); CLEANadapt G1/2")

**Note: Only with insertion length 18 mm and 50 mm available!**

## Insertion length EL

18	(insertion length 18 mm / only selectable for NCS-L-1x)
50	(insertion length 50 mm / only selectable for NCS-L-1x)
100	(insertion length 100 mm / only selectable for NCS-L-11)
150	(insertion length 150 mm / only selectable for NCS-L-11)
200	(insertion length 200 mm / only selectable for NCS-L-11)
250	(insertion length 250 mm / only selectable for NCS-L-11)
xxx	special length (only between 60...250 mm selectable!)

**Pay attention for the information to belated shortage of sensor rod on page 3!**

## Output

PNP	(standard, active 24 V DC)
NPN	(NPN)

## Temperature version (see diagram on page 2)

X	(standard, for process temp. up to 100 °C, CIP/SIP 143 °C / 120 min)
H	(high temperature version with spacer, for process temperatures up to 143 °C; not for NCS-L11 and NCS-L-12)
D	(heater deactivated at higher ambient temperature)
HD	(for process temperatures up to 143 °C at higher ambient temperature, with spacer and heater deactivated; not for NCS-L11 and NCS-L-12)

## Status-LED

X	(without)
KF	(window in the lid, LED visible from outside)
KKF	(lid with cone-shaped window, LED visible from outside)

## Electrical connection

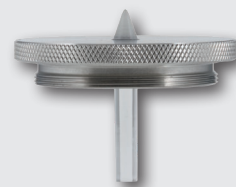
X	(cable gland M16x1.5)
M12	(M12-plug)

NCS-01 / / PNP / H / KF / M12

## Accessories

M12-K/4	M12-connection 4-pin, IDC technique, with plastic knurled screw
PVC-cable with M12-connection made of 1.4305, IP 69 K, unshielded	
M12-PVC / 4-5 m	PVC-cable 4-pin, length 5 m
M12-PVC / 4-10 m	PVC-cable 4-pin, length 10 m
M12-PVC / 4-25 m	PVC-cable 4-pin, length 25 m
PVC-cable with M12-connection, brass nickel-plated, IP 67, shielded	
M12-PVC / 4G-5 m	PVC-cable 4-pin, length 5 m
M12-PVC / 4G-10 m	PVC-cable 4-pin, length 10 m
M12-PVC / 4G-25 m	PVC-cable 4-pin, length 25 m

## Lid with cone-shaped control window (option KKF)



## Lid with control window (option KF)

