Climatic Independent Level Sensor LCN

CLEANadapt

Application/Specified usage

· Hydrostatic level measurement for humid and wet environments
· Specially designed for exterior storage vessels

Application examples

· Level measurement with **LCN**, linearization and evaluation with **PEM-DD** (6 standard geometries, 1 geometry programmable; see separate product information)
· Difference pressure measurement with **2 x LCN** and evaluation device **PEM-DD**

Hygienic design/Process connection

· By using the Negele weld-in sleeve **EMZ-352** or the build-in system **EHG-.../1"** a front-flush, hygienic and easy cleanable measurement point will be achieved.
· EHEDG certificate for hygienic process connection **CLEANadapt (LCN...160)**
· Conform to 3-A Sanitary Standard 74-05 with Tri-Clamp **DIRECTadapt**
· CIP-/ SIP-cleaning up to 140 °C (284 °F) / maximum 30 minutes
· Front-flush stainless steel sensor cell
· All wetted materials are FDA-conform
· Sensor completely made of stainless steel
· Protection class IP 69 K (with cable connection)
· Available process connections (adapter):
Tri-Clamp, SMS, DRD, Varivent, BioControl

Features/Advantages

· **Measurement cell without any contact to atmosphere, fully closed measurement system**
· No drift problems caused by condensation
· Very high accuracy and long term stability
· Measurement up to 130 °C (265 °F) process temperature
· Oil filling, FDA approved
· Factory or field calibration
· Integrated two-wire measurement transducer 4...20 mA

Options/Accessories

· Material certificate 3.1
· Special pressure ranges, specific pressure calibration ex works
· Electrical connection with M12 plug-in connector
· Preassembled cable for M12 plug-in connector

Measuring principle

The pressure sensor utilizes an internal piezoelectric transducer to convert the mechanical pressure into a corresponding mV signal. The mV signal then passes through custom linearization and conditioning circuitry. The resulting signal is an industry standard 4...20 mA, according to the specified range.
In addition, onboard circuitry handles temperature compensation to ensure a stable reading during all phases of operation.

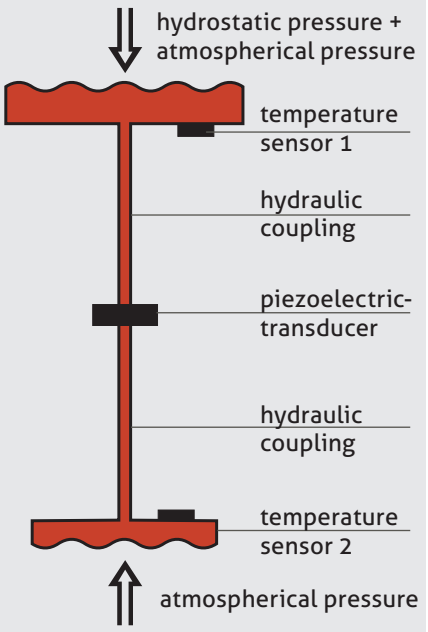
Authorizations

FDA

CERTIFIED EHEDG TYPE EL

LCN...004

Measuring principle



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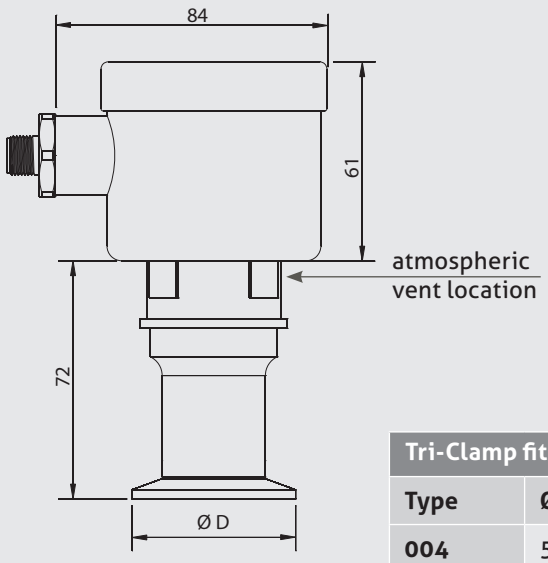
Specification		
Pressure ranges, standard	relativ	0...350/1040/2070/3500 mbar
Over-range rating	factor	2 times base range
Process connection	LCN...004: **DIRECTadapt** LCN...005: **DIRECTadapt** LCN...007: **DIRECTadapt** LCN...160: **CLEANadapt**	Tri-Clamp 1½" Tri-Clamp 2" Tri-Clamp 3" Thread G1" sensor, combined with Negele CLEANadapt process connection, torque max. 20 Nm
Materials	connector head thread connection diaphragm oil filling	316 (1.4305), Ø 65 mm 316L (1.4404) 316L (1.4404), $R_a \leq 0.4$ µm medical white oil, FDA approval number 21CFR172.878, 21CFR178.3620, 21CFR573.680
Temperature ranges	ambient process compensated CIP/SIP	-10...+50 °C (15...120 °F) -20...+130 °C (0...265 °F) -20...120 °C (0...250 °F) 140 °C (284 °F) max. 30 min.
Temperature compensation time t_{90}		30 s/10 K
Accuracy	hysteresis linearity reproduceability	≤ 0.075 % of full scale ≤ 0.05 % of full scale ≤ 0.075 % of full scale
Temperature drift	zero span	< 0.036 % of full scale / K < 0.036 % of full scale / K
Electrical connection	cable gland cable connection	1/2" NPT M12 plug-in 316 (1.4305)
Protection class	cable gland cable connection	IP 67 IP 69 K
Supply voltage		12...40 V DC
Output	2-wire current loop	analog 4...20 mA short circuit proof
Max. loop resistance (not incl. LCN)	power supply 18 V DC 24 V DC 40 V DC	max. resistive load 300 Ω 600 Ω 1200 Ω
Weight		approx. 1050 g

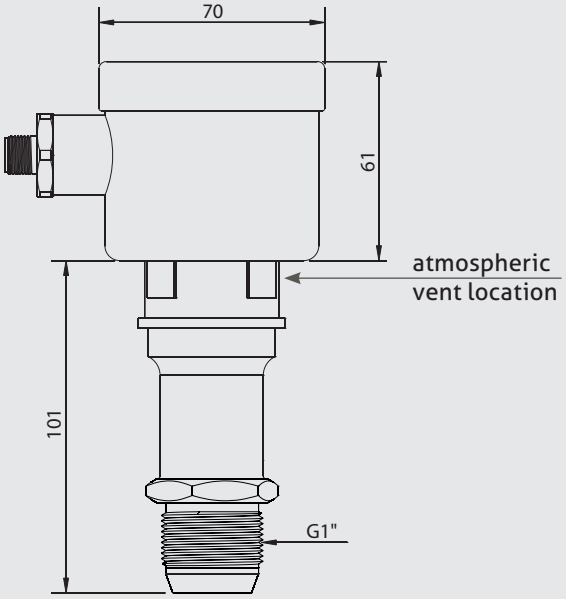
Pressure ranges			
Type	**min. operation range**	**max. operation range**	**over-range rating**
LCN5	0...75.0 mbar	0...350.0 mbar	600 mbar
LCN6	0...350.1 mbar	0...1040.0 mbar	2000 mbar
LCN7	0...1040.0 mbar	0...2070.1 mbar	4000 mbar
LCN8	0...2070.1 mbar	0...3500.0 mbar	6600 mbar

LCN...004, LCN...005, LCN...007 | Tri-Clamp



Tri-Clamp fitting	
Type	**Ø D**
004	50.5 mm
005	64.0 mm
007	91.0 mm

LCN...160 | G1" CLEANadapt

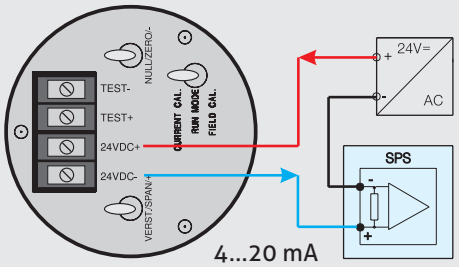


Mechanical connection/Installation

· Pay attention to the maximum tightening torque of 20 Nm if using Negele CLEANadapt system!

· Pay attention to remain open the 4 ports of atmospheric vent location.

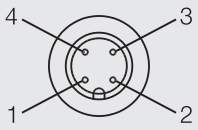
Electrical connection



With M12-plug

Configuration M12-plug

1: supply +24 V DC
2: output 4...20 mA
3: not connected
4: not connected



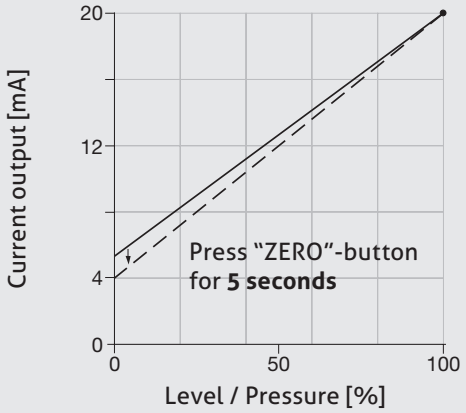
Start up

- Connect the sensor with power supply (12...36VDC) -> see "electrical connection LCN".
- The sensor is now ready for use.
- At standard factory-setting 0...100 % of the full range are equivalent to 4...20 mA of the current output.
  Example: LCN6 = 0...1040 mbar -> 0 bar = 4 mA; 1040 mbar = 20 mA
- In case of specific factory calibration the customized measurement range is equal to 4...20 mA of the current output.
  Example: LCN6 calibrated to 0...800 mbar -> 0 bar = 4 mA; 800 mbar = 20 mA
- Calibration is on-site customizable for special measurement tasks.
- Settings of ZERO (4 mA) and SPAN (20 mA) are non-interactive, having no effect on each other.

Zero adjustment (with empty vessel)

- After mounting an empty adjustment is **strongly recommended**, because mounting position can affect the ZERO setting.
- Empty vessel completely (no pressure or product on diaphragm, vessel is vented to atmosphere).
- Switch in position "RUN MODE".
- Actuate key switch "ZERO" for 5 seconds.
- Empty adjustment is done.
- Output current is 4 mA.
- For maximum accuracy we advice an zero adjustment one more time after 3 weeks.
- After that an annual zero adjustment is recommended.

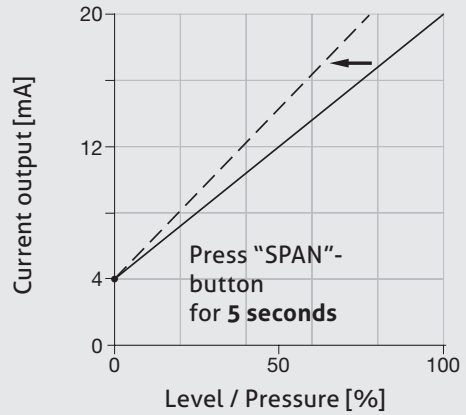
Zero adjustment



1. Full adjustment (with filled vessel utilizing level in vessel)

- Fill vessel to desired maximum level.
- Please pay attention that hydrostatic pressure must be between min. and max. range of sensor. (see table of pressure ranges page 2).
- Switch in position "RUN MODE".
- Actuate key switch "SPAN" for 5 seconds.
- Full adjustment is done.
- Output current is 20 mA.

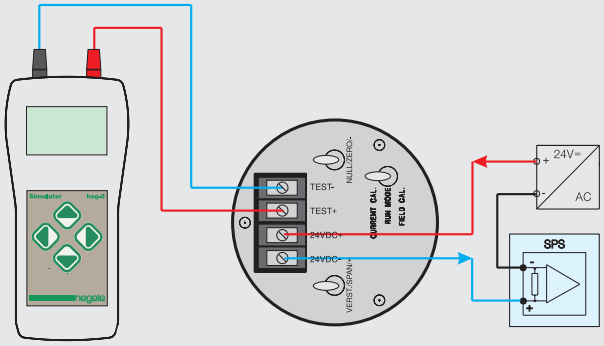
Full adjustment



2. Utilizing on-board setup

If "wet calibration" (by vessel filling) is not possible, full adjustment can be done by on-board setup.
First of all, the desired range (full value) must be calculated to a corresponding current value.
Afterwards, the calculated current will be adjusted by multimeter to perform new calibration.
In the following, a current calibration procedure is described as an example.

Calibration hookup



Multimeter

4...20 mA
2-wire current loop

LCN calibration values

Type	Base range in bar	Upper linearization value in bar	Current CAL at base range in mA
LCN5	0.35	0.3612	19.50
LCN6	1.00	1.0462	19.29
LCN7	2.00	2.0799	19.39
LCN8	3.30	3.4623	19.25

2.1 Calculating the current to adjust

For calculating the current to adjust the "upper linearization value" is needed (see table calibration values).
This linearization value is greater than the base range. LCN needs this value to calculate the characteristic line.

Calculation formula:
((desired range / upper linearisation value) x 16) + 4 = current to adjust

Example:
LCN6 needs to be calibrated to 0.8 bar: **((0.8 / 1.0462) x 16) + 4 = 16.23 mA**

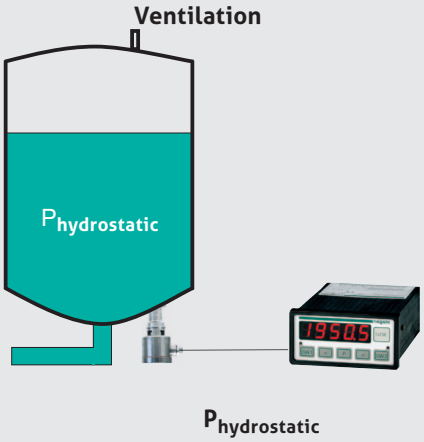
2.2 LCN adjustment

- Connect LCN with power supply -> see figure calibration hookup above.
- Perform meter hookup with test points (setting mA/DC).
- Set MODE SWITCH to "FIELD CAL".
- Meter output will automatically move to 19.99 mA – LCN is waiting for entry of new calibration range.
- Using the switches "SPAN" and "ZERO", raise or lower the current until the calculated value (see above) has been reached.
- Once the proper value has been reached, simultaneously depress both the "SPAN" and the "ZERO" switch for one second – this will lock in new sensor calibration.
- Place MODE SWITCH in "CURRENT CAL" position and verify meter is reading calculated value. (When switching to "CURRENT CAL" position, current output is equal to actual calibration).
- Set MODE SWITCH to "RUN MODE"
- LCN is now ready for use with new calibration setting.

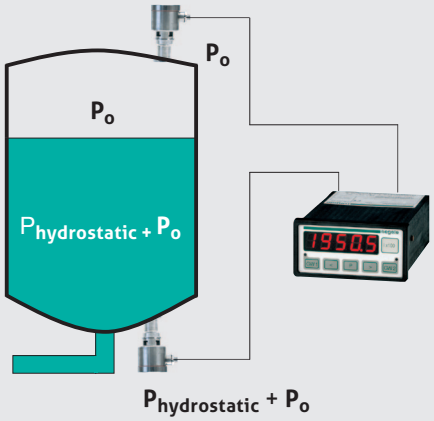
2.3 Reset to factory setting

If factory reset to base range is needed, perform calibration shown in procedure 2.2 and adjust current acc. to table "LCN calibration values" (CURRENT CAL at base range).

Hydrostatic Level Measurement and Linaerization with LCN and PEM-DD



Difference Pressure Measurement and Linearization with 2 x LCN and PEM-DD



$P_{difference} = (P_{hydrostatic} + P_o) - P_o$
$P_{difference} = P_{hydrostatic}$

Advice for differential pressure measurement in pressurized vessels

$P_o < 4 \times P_{hydrostatic}$!
To guarantee a stable differential pressure measurement in pressurized vessels the overpressure must not be higher than 4 times of the hydrostatic pressure!

Cleaning

- Cleaning with fluids does not effect operation
- Metal diaphragm (process and reference) mustn´t be cleaned mechanically
- In case of using pressure washers, don't point nozzle directly to electrical connection or reference diaphragm!
- No pressure washing of mebrane with more than 2 x nominal pressure.
- In case of inside cleaning with pressure washers, don't point nozzle directly to the diaphragm!

Advice to EMC

Applicable directives:
- Electromagnetic Compatibility Directive 2004/108/EC
- The CE label confirms compliance of this product with the applicable EC directives.
- You have to guarantee the compliance of all guidelines applicable for the entire equipement.

Conventional usage

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

Reshipment

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

Transport/Storage

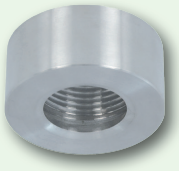
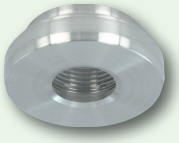
- Do not store outside
- Store in an area that is dry and dust-free
- Do not expose to corrosive media
- Protected against solar radiation
- Avoid mechanical shock and vibration
- Storage temperature 0...40 °C
- Relative humidity max. 80 %

Disposal

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

Troubleshooting	
Symptom	**Action**
1. No output current (0 mA) in any Mode.	Loop may be broken - Measure voltage across LOOP+ and LOOP- terminals. If not between 12...40 V DC, check connector and external loop wiring. Check if mA fuse in DMM is blown. This frequently occurs during testing.
2. Current output less than 4 mA and does not increase with level, or if mode switch set to "FIELD CAL".	Connect milliammeter across LOOP+ terminal and TEST- testpoint. If loop now works, sensor circuitry has been damaged. Contact factory.
3. Output stuck between 4 and 20 mA	Verify that MODE switch is in RUN mode. Empty vessel and perform Sensor Rezero Procedure as described on page 4.
4. Performing sensor rezero procedure does not return output to 3.96...4.04 mA	Verify that CUR CAL output is between 7.2 and 20 mA. If current is less than 4 mA, follow instructions for Symptom No. 2. If current is greater than 4 mA, sensor is damaged. Contact factory.
5. Sensor output is not stable. 6. Output drifts over time.	Verify that CUR CAL value is between 7.2 and 20 mA. Check for signs of moisture or water in housing. Contact factory.
7. Sensor mA output not as expected for specified level. 8. Output signals are not accurate.	Perform Sensor Rezero procedure when vessel is empty. Verify proper CUR CAL output according to page 4.
9. Sensor output signal is greater than 20 mA.	Sensor may have been zeroed with product in the vessel. Perform Sensor Rezero Procedure as described on page 4. Sensor maybe over-ranged. Verify CUR CAL value, and that it is appropriate for the application. Contact factory for assistance.
10. Sensor output does not increase with the level, but does increase to 20 mA if mode switch set to "FIELD CAL".	Sensor may have been dropped or over-ranged and permanently damaged. Contact factory for assistance.

Overview of possible process connections for LCN...160.
The complete overview of all available adapters you will find at product information CLEANadapt.

LCN...160					
Process connection	**Build-in system EHG** (DIN 11850 series 2)	**Negele weld-in sleeve**	**Dairy flange** (DIN 11851)	**Varivent**	**APV-Inline**
DN40	**EHG-DIN2-40/1"**	**EMZ-352** suitable for installation in vessels	**AMK-352/DN40**	**AMV-352/DN40**	**AMA-352**
DN50	**EHG-DIN2-50/1"**		**AMK-352/DN50**	**AMV-352/DN40**	**AMA-352**
DN65	**EHG-DIN2-65/1"**		**AMK-352/DN65**	**AMV-352/DN40**	**AMA-352**
DN80	**EHG-DIN2-80/1"**		**AMK-352/DN80**	**AMV-352/DN40**	**AMA-352**
DN100	**EHG-DIN2-100/1"**		**AMK-352/DN100**	**-**	**AMA-352**

Order code

LCN (Climatic independent level sensor)

Span range (relative)

5	(0...75.0 mbar min to 0...350.0 mbar max)
6	(0...350.1 mbar to 0...1040.0 mbar)
7	(0...1040.1 mbar to 0...2070.0 mbar)
8	(0...2070.1 mbar to 0...3500.0 mbar)

Fitting

004	(Tri-Clamp 1½")
005	(Tri-Clamp 2")
007	(Tri-Clamp 3")
160	(G1" CLEANadapt hygienic)

Diaphragm

1	316L electropolished
2	Hastelloy C (not for G1" CLEANadapt, for Tri-Clamp on request)

Mounting

0	(horizontal)
1	(vertical)
2	other (specify angle from vertical or from horizontal)

Sensor Wiring

00	(M12 plug-in connector w/no Cable)
01	(M12 plug-in connector & Field Wiring Connector w/no Cable)
99	(Cable gland 1/2" NPT)

Calibration

00000	(acc. to span range or field calibrated)
XXXXX	(height im millibar to nearest tenth)

Example: 00750 = 75.0 mbar
35000 = 3500.0 mbar

Fixed Character

OEM

LCN	5	004	1	0	00	00750	OEM

Accessories

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, nickel-plated brass, 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

M12-EVK	M12 plug-in screw cap, 1.4305 (303), with o-ring,as a protection against humidity and dirt
CERT / 2.2	factory certificate 2.2 acc. to EN10204 (only product contacting surface)
CERT / 3.1	inspection certificate 3.1 acc. to EN10204 (only product contacting surface)

PVC-cable with M12-connection

M12 plug-in screw cap

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