

Ceramic Pressure Sensor

Application / Specified Usage

- Hydrostatic level measurement of vessels and tanks
- Precise pressure measurement in pipes

Application Examples

- Level measurement with DAC-341, linearization and evaluation with PEM-DD (6 standard styles, 1 style programmable)
- Differential pressure measurement with 2 x DAC-341 and evaluation device PEM-DD

Hygienic Design / Process Connection

- Front-flush, hygienic and easy sterilizable installation by sleeve EMZ-352 or build-in system EHG-.../1"
- CIP-/ SIP-cleanable up to 140 °C / maximum 30 minutes
- Product contacting materials compliant to FDA
- Sensor made of stainless steel, measurement cell of ultrapure ceramics Al_2O_3
- Additional process connections:
TriClamp, diary flange (DIN 11851), Varivent, APV, DRD et al.

Features

- High accuracy and reproducibility
- Dry and capacitive sensor without separating diaphragm or oil filling
- High overload stability and vacuum-proof
- Easy to operate and fast adjustment with pushbuttons
- Selectively as relative- or absolute measuring sensor available
- Defined cable gland position
- Integrated two-wire measurement transmitter 4...20 mA

Options / Accessories

- Special pressure ranges, customized adjustment ex works
- Integrated display (AZM) incl. window in lid
- Electrical connection with M12 plug-in connector
- Preassembled cable for M12 plug-in connector

Measuring Principle of the Capacitive Pressure Sensor

The measurement cell works like a plate capacitor whose membrane will be deformed in case of changing the pressure. This deformation causes a change of the capacity which is a measuring value for the change of pressure.

With relative (gauge) pressure sensors, the back of the diaphragm is vented, i.e. this sensor measures the gauge pressure relative to the atmospheric pressure.

With absolute pressure sensors, the vacuum created in the production process between the diaphragm and the body of the cell remains permanently. This permits pressure measurements related to the vacuum.

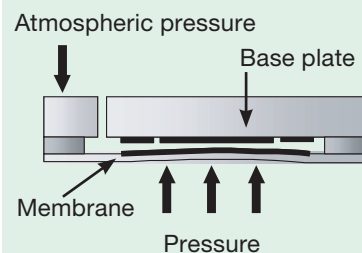
Authorizations



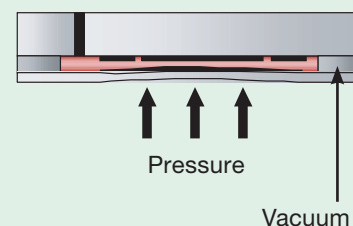
DAC-341 with EMZ-352



Relative Pressure Cell



Absolute Pressure Cell

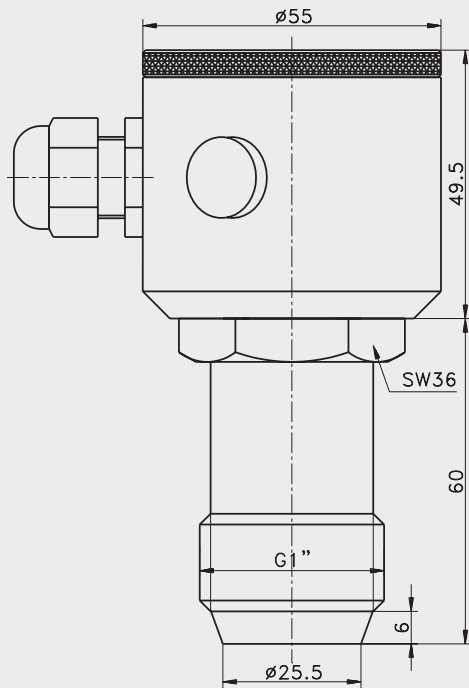


Specification		
Pressure ranges	relative, standard [bar] absolut, standard [bar]	0...0,2 / 0,4 / 1,0 / 2,0 / 4,0 / 10,0 / 20,0 1,0 / 2,0 / 4,0 / 10,0 / 20,0
Overload stability	factor	see table below
Vacuum stability		vacuum-proof
Process	connection torque	thread G1" sensor, combined with Negele-weld-in sleeves, build-in-systems, adapter sleeves maximum 20 Nm
Materials	connector head thread connection measurement cell ≤ 1,0 bar: measurement cell ≤ 20,0 bar: sealing window in lid (optional) pressure compensation element (only with relative pressure cell)	stainless steel 1.4305 (303) stainless steel 1.4404 (316L) 99,6 % Al ₂ O ₃ 96,0 % Al ₂ O ₃ EPDM (FDA-number 21 CFR 177.2600) PMMA polyamide
Protection class		IP69K (with electrical connection M12 plug-in)
Temperature ranges	ambient process compensated	-20...60 °C 0...100 °C up to 85 °C
Humidity	ambient	< 80 % relative humidity no condensation in the sensor!
Rise time Temperature compensation time	T90 T90	ca. 1 second ≤ 91 seconds
Accuracy		≤ 0,25 % of full scale
Temperature drift	zero span	< 0,02 % full scale / K < 0,02 % full scale / K
Electrical connection	cable entry cable connection output	M16 x 1,5 M12-plug stainless steel current loop 4...20 mA
Supply		12...36 V DC
Weight		ca. 600 g

Range [bar]	Factor	Overload stability [bar]
0,2	25	5,0
0,4	15	6,0
1,0	10	10,0
2,0	7,5	15,0
4,0	6,25	25,0
10,0	4	40,0
20,0	2	40,0



Dimensioned Drawing DAC-341



Option: Display AZM

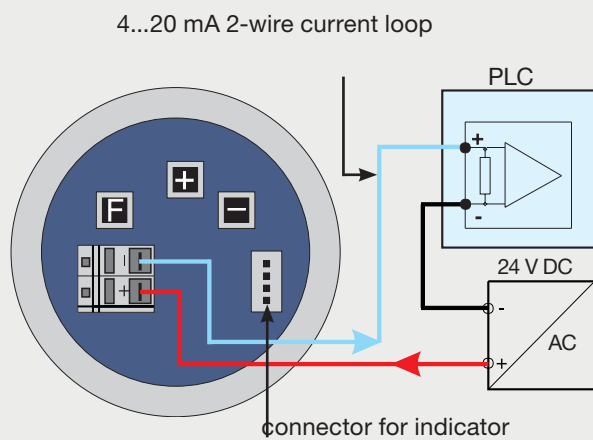


Conventional Usage



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

Electrical Connection DAC-341

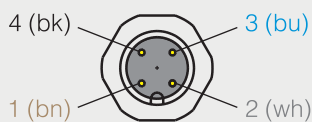


Mechanical Connection / Installation



- Please take notice of the general resistance of ceramics Al_2O_3 .
- Attention: The maximum torque for mounting is 20 Nm!
- Use Negele **CLEANadapt** system for safe operation of measuring point.
- Use a welding mandril for correct installation of **CLEANadapt** weld-in-fittings. Please pay attention to the weld-in and installation details in the **CLEAN-adapt** product information.

With M12 plug-in



Configuration

M12-plug

- 1: + 24 V DC
- 2: Output 4...20 mA
- 3: not connected
- 4: not connected

Advice to EMC



- The device agrees to following standards:
89/336/EWG electromagnetic compatibility
EN 50081-2 generic emission standard 03/94
EN 50082-2 generic immunity standard 02/96
- You have to guarantee the EMC directives for the entire equipment.

Handling / Operation

- Connect the sensor with power supply (12...36 V DC) -> see chapter "Electrical Connection DAC".
- If the display AZM is plugged it indicates the messages "dAC", the program version, "AbS" or "rEL" and the factory setted measurement end value in quick succession.
After this, the sensor is ready for use immediately. The level / pressure will be displayed in the unit wich was set at last.
- The level will be displayed in % (depending on full- / empty adjustment) or in bar. The units can be set at the device.
-> See chapter "Switching the Indicator".
- Note at level measurement: indicated 0...100 % is always equivalent to 4...20 mA. If the pressure is indicated in bar, the indicator always shows the pressure measured directly at the measurement cell.

Status message (only with display AZM)

current output low ($I_{out} \leq 3,6$ mA)

current output high ($I_{out} \geq 21$ mA)

Cause: False setting of measurement range.
-> Reset the sensor to default standard settings and conduct a new full- / empty adjustment.

Status message (only with display AZM)

Pressure is under the permitted measurement range! ($I_{out} \leq 3,7$ mA)

Pressure is over the permitted measurement range! ($I_{out} \geq 21$ mA)

Cause: Pressure overload.
-> Reset the sensor to default standard settings and conduct a new full- / empty adjustment. If the message is displayed further on, the measurement cell is damaged.

Advice for parameterization of the pressure sensor



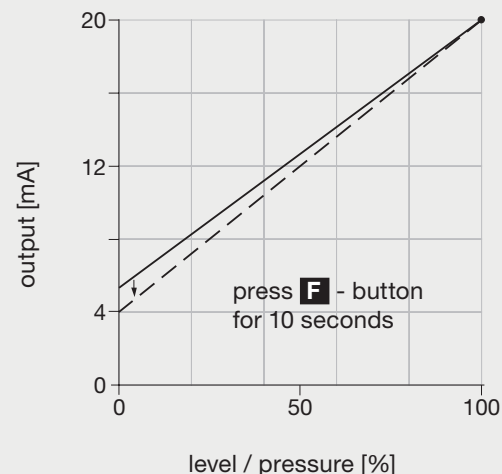
The standard setting of the DAC-341 is: 0...100,0 % of the measurement range (e.g. 0...400 mbar) are equivalent to 4...20 mA of the current output. If it is necessary to change these settings for special measurement tasks, perform the following steps:

1. Empty adjustment

1.1 Level measuring

- Empty vessel completely.
- Connect ammeter into the current output loop.
- The ammeter displays 4,0 mA, the internal indicator, AZM displays 0,0 %.
- In this case no adjustment is necessary.
- In other case make the adjustment in the following way:
- Press button **F** circa 10 seconds, the indicator shows shortly "Stor", the setting is done.
- Ammeter displays 4,0 mA, the internal indicator AZM displays 0,0 %.
- If ammeter displays a significant deviation after empty adjustment, an offset adjustment has to be done.
-> See chapter "Offset adjustment".

Empty adjustment



1.2 Process pressure measuring (relative / absolute)

- Set the pressure to the desired value at 4,0 mA.
- Connect ammeter into the current loop. The ammeter displays 4,0 mA. In this case no adjustment is necessary.
- In other case make the adjustment in the following way:
- Press button **F** 10 seconds. The indicator shows shortly "Stor", the setting is done.
- Ammeter displays 4,0 mA.
- If ammeter displays a significant deviation after empty adjustment, an offset adjustment has to be done.
-> See chapter "Offset adjustment".

2. Full adjustment

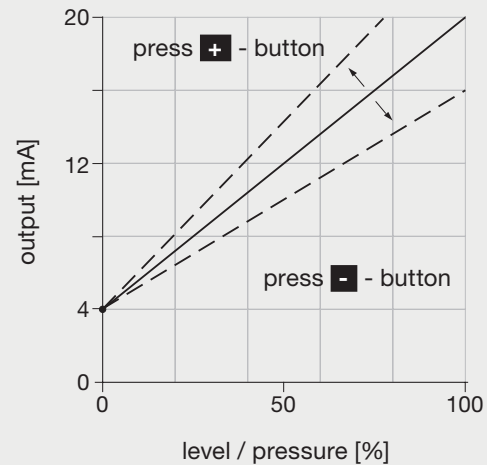
2.1 Level measuring

- Fill vessel completely (height of vessel at least 25 % of full range).
- Connect ammeter into the current output loop.
- The ammeter displays a value lower than 20 mA, e.g. 14 mA, the internal display AZM displays a value lower than 100,0 %
- Press buttons **+** or **-** until ammeter displays 20 mA resp. internal display indicates 100 %.
- After about 10 seconds the settings will be stored, the display indicates "Stor" shortly.

2.2 Process pressure measuring (relative / absolute)

- Set the pressure to high-value (at least 25 % of full range)
- Connect ammeter into the current output loop
- The ammeter displays a value lower than 20 mA, e.g. 14 mA, the internal indicator AZM displays the measured pressure in bar.
- Press buttons **+** or **-** until ammeter displays 20 mA.
- After about 10 seconds the settings will be stored, the display indicates "Stor" shortly.

Full adjustment



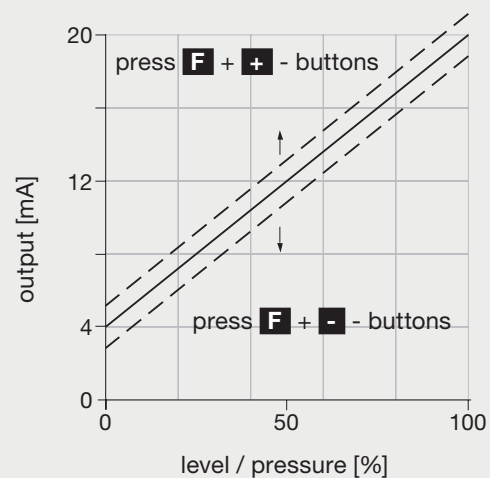
3. Offset adjustment

The offset adjustment is independent of empty- / full adjustment!

- Hold button **F** pressed and modify with buttons **+** or **-** the standard characteristic parallel to compensate offset. Adjustment range is limited to +/- 0,5 mA.
- The setting will be stored about 10 seconds after the last adjustment, the display shows "Stor".

This function is needed only in exceptional cases!

Offset adjustment



4. Switching the indicator (% , bar)

- By double-pressing the button **F** you can switch between relative measurement indication in % and pressure measurement indication in bar.

Reset to factory settings



- Press buttons **F**, **+** and **-** together approx. 10 seconds. When the indicator displays "rES", the standard settings are stored immediately.
- All your settings will be deleted with this function. The pressure sensor will be reset to the standard factory settings.

Cleaning and Maintenance



- Please note: some materials can cause adhesions to the ceramic membrane of the measurement cell. For safe and reliable operation of the sensor with critical media please clean the membrane at regular intervals.
- Don't use sharp items or aggressive detergents for cleaning.
- In case of using pressure washers, don't point nozzle directly to electrical connection!

Transport



- 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.

Storage



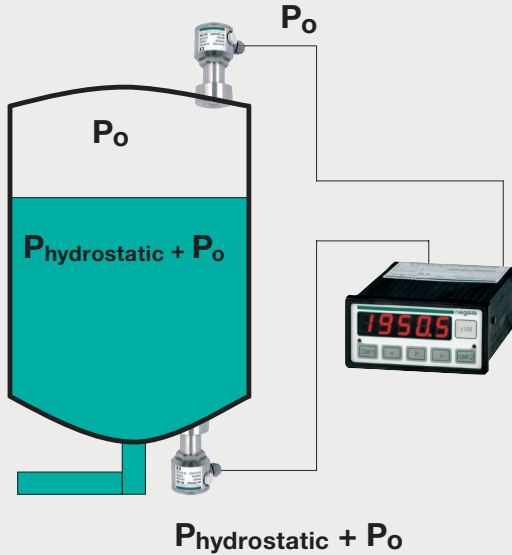
- No outdoor storage
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration
- Storage temperature 0...40 °C
- Relative humidity max. 80 %

Disposal



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

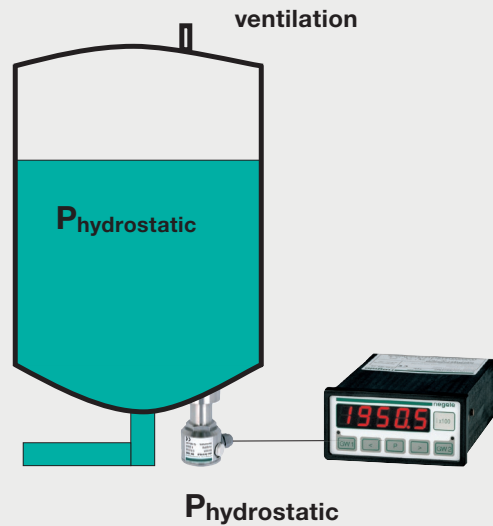
Differential pressure measurement with 2 x DAC-341 and PEM-DD



$$P_{\text{Difference}} = (P_{\text{hydrostatic}} + P_o) - P_o$$

$$P_{\text{Difference}} = P_{\text{hydrostatic}}$$

Tank linearisation with DAC-341 and PEM-DD



Reference note for differential pressure measurement in pressurized vessels



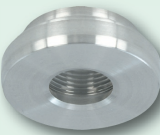
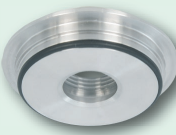
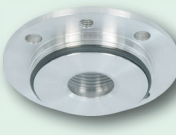


$P_o < 4 \times P_{\text{hydrostatic}}$

To guarantee a stable differential pressure measurement in pressurized vessels the overpressure must not be higher than 4 times of the hydrostatic pressure!

Overview of further possible process connections (adapter must be ordered separately!)
The complete overview of all available adapters you will find at product information **CLEANadapt** in chapter 1.

DAC-341					
Process Connection	Build-in system EHG (DIN 11850 series 2)	Negele weld-in sleeve	Negele weld-in sleeve	Negele weld-in sleeve	TriClamp
DN25	-	EMZ-352 suitable for installation in vessels	EMZ-351 suitable for vessels with leakage detection	EMS-352 suitable for installation in pulled-out pipes	AMC-352/1"-1,5"
DN40	EHG-40/1"				AMC-352/1"-1,5"
DN50	EHG-50/1"				AMC-352/2"
DN65	EHG-65/1"				AMC-352/3"
DN80	EHG-80/1"				AMC-352/80
DN100	EHG-100/1"				AMC-352/100

Overview of further possible process connections (adapter must be ordered separately!)

DAC-341					
Process Connection	Diary flange (DIN 11851)	Variet	APV-Inline	Adapter G1½" to G1"	Dummy flange
DN25	AMK-352/25	-	-	AMG-352 suitable for existing G1½" connection	BST-350 to close existing measurement points
DN40	AMK-352/40	AMV-352	AMA-352		
DN50	AMK-352/50	AMV-352	AMA-352		
DN65	AMK-352/65	AMV-352	AMA-352		
DN80	AMK-352/80	AMV-352	AMA-352		
DN100	AMK-352/100	-	AMA-352		

Order Code

DAC-341 process connection CLEANadapt G1" hygienic

Measuring Range

- 0,2REL** (relative pressure cell 0...0,2 bar)
- 0,4REL** (relative pressure cell 0...0,4 bar)
- 1,0REL** (relative pressure cell 0...1,0 bar)
- 2,0REL** (relative pressure cell 0...2,0 bar)
- 4,0REL** (relative pressure cell 0...4,0 bar)
- 10,0REL** (relative pressure cell 0...10,0 bar)
- 20,0REL** (relative pressure cell 0...20,0 bar)
- 1,0ABS** (absolute pressure cell 0...1,0 bar)
- 2,0ABS** (absolute pressure cell 0...2,0 bar)
- 4,0ABS** (absolute pressure cell 0...4,0 bar)
- 10,0ABS** (absolute pressure cell 0...10,0 bar)
- 20,0ABS** (absolute pressure cell 0...20,0 bar)

[end value] REL: other relative pressure range, specify required in "bar" with "REL"

[end value] ABS: other absolute pressure range, specify required range in "bar" with "ABS"

Display

- X** (without)
- AZM** (with display and viewing window)

Electrical Connection

- X** (cable gland M16 x 1,5)
- M12** (M12 plug 1.4305)



DAC-341 / 0,4 REL / AZM / M12

Notes