

# PCM-1

**Programmable precision pressure transmitter**

Ceramic diaphragm sensor

Voltage and current output



OPM-PCM-1-01, Revision: A, October 2018



**Operating manual**

Our passion | Your value™



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## General information

Thank you for purchasing this Sens4 product. This operating manual contains important safety information, and we encourage you to read this manual and the quick start guide prior to installation and use of this product.

## Symbols used

The following symbols are used in this manual:



**WARNING!** Critical information to prevent dangerous situations that can result in serious injury or death.



**CAUTION!** Important information to prevent dangerous situations that can damage the device or auxiliary equipment.



**ACTION!** Requires action or attention.



**INFORMATION:** Important recommendations and information for efficient use and best practice.

## Intended use

The PCM-1 pressure transmitter is intended for gas and liquid pressure measurement and control within the limits listed in this manual and specifications on page 24. The device is designed for screw-in fittings mounting.

The device complies to EMC (Electro Magnetic Compatibility) class B immunity requirements for industrial environments.

## Safety information

This product should be installed and operated by technically skilled or trained personnel only.



**WARNING!** This product is not intended for installation and use in the presence of flammable gases or other explosive environments.



**WARNING!** Ensure that the gases or liquids exposed to the wetted materials are compatible with the wetted materials described in the specifications table and the used sealing materials.



**WARNING!** The pressure rating of the sensor element, connecting process fittings and sealing must comply with the maximum possible pressure in the application.

The CE marking on the device does not apply to the pressure equipment directive (PED) (2014/68/EU).

Special precautions must be taken if pressure peaks by water hammering can occur.



**WARNING!** Ensure that the process connection is tightened according to the recommended torque specification. Ensure that there are no leaks from the process connection before pressurizing the installation.



**WARNING!** Do not remove the transmitter from the installation when the installation is pressurized or contains hazardous fluids.

## Disposal in the European Union

At the end-of-life of this product, it must be disposed according to the European Directive 2012/19/EU (WEEE). This product should not be mixed with general household waste.



**WARNING!** If the product has been exposed to humanly or environmentally hazardous materials during its use, ensure proper decontamination before disposal.



For proper treatment, recovery and recycling, please take this product to designated collection points. Please contact your local authority for further details of your nearest designated collection point.

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## Warranty

Sens4 warrants this product under normal use and service to be free from defects in materials and workmanship for a period of twenty-four (24) months from the date of the delivery.

Warranty does not cover mechanical damage, corrosive damage, physical contamination, deposition contamination, damage caused by shipping, normal wear and tear, incorrect use, misuse, incorrect installation or operation beyond the published design limits and specifications.

In case of warranty claim the customer should notify Sens4 immediately and no later than 3 weeks after the defect has been discovered. The warranty claim must specify the failure mode and other relevant information about the product defect and the application use. Sens4 can request return of a failed product for examination and root cause analysis that arises from a warranty claim. Sens4 will at its discretion credit, repair or replace the failed products that are accepted to be covered by warranty.

Warranty is void, regardless of the root cause of defect, if a product has been exposed to or contaminated with radioactive, chemical, biological or other harmful or dangerous substances.

Warranty does not apply to products that have been hardware modified, altered or dismantled by the customer or third party.

Software provided by Sens4 is supplied "as is" without warranty of any kind or guaranteed compatibility with customer IT systems and environment.

## Returns

All returns to Sens4 must be authorized by Sens4 by issuing an RMA (Returned Material Authorization) prior to shipping. Contact Sens4 support to obtain an RMA number and fill out the form on page 23.

Sens4 will not accept return of products that have been exposed to or contaminated with radioactive, chemical, biological or any other harmful or dangerous substances.

Return of unpacked and unused products for credit requires written acceptance from Sens4 and will be subject to a handling fee.

## Liability

The customer is solely responsible for determining the suitability and compatibility of the product for the customers application, environment and intended use. Sens4 is not liable for any claims arising from improper use, incorrect installation or use with gases or liquid not compatible with the media wetted materials described in the specifications table. To the extent permitted by law, Sens4 is not liable for incidental and consequential damages, including but not limited to loss of profits or revenue, overheads, loss of data, reinstallation costs, damage to other equipment or any incidental or consequential damages of any nature.

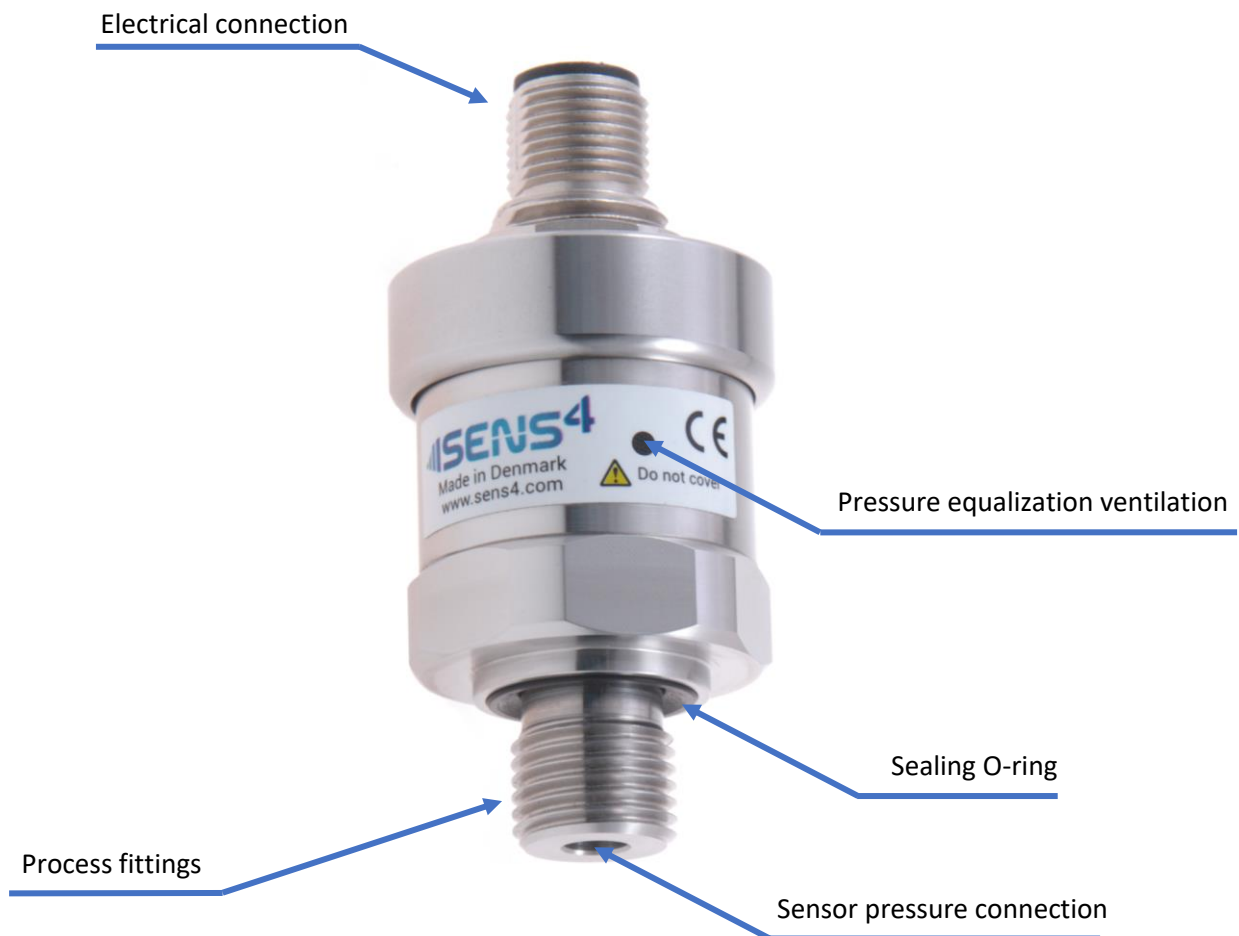
Sens4 has taken reasonable care to ensure that the content of its published information and specifications is accurate and up-to date. However, Sens4 does not guarantee or warrant that the content of the published information is error-free. Sens4 reserves the right to change its product specifications without prior notice.

## Trade restrictions and export control

Sens4 products and software may be subject to European Union and/or Danish trade and transfer laws and restrictions. In the event that the product is exported, transferred or in any way distributed to another country or territory than delivered to by Sens4, the customer is responsible for compliance to export restrictions, regulations or applicable law of Denmark, local law and/or the law of European Union.

## PCM-1 Transmitter

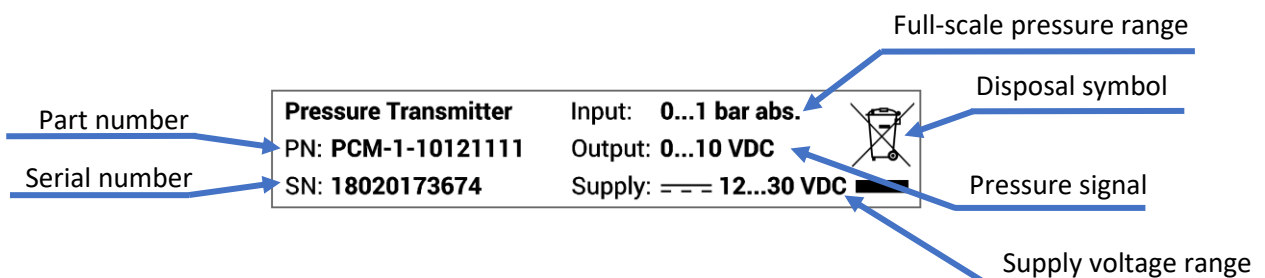
The PCM-1 is available with different electrical connections and process fittings. The illustration below is an example of the PCM-1 with M12 connector and ¼" DIN3852-E process connection.



**WARNING!** Do not cover the pressure equalization ventilation. Cover of ventilation can impact pressure measurement performance for products with a gauge sensor.

## Labelling

If the serial label should become unreadable, the serial- and part number is also stored in the internal non-volatile memory and can be read using the S4-Connect™ USB programmer and communicator. See page 17.



## About the PCM-1 pressure transmitter

The PCM-1 is based on a ceramic aluminum oxide sensor diaphragm that converts the applied pressure to an electric signal. The sensor element is a dry cell diaphragm design without filling oil.



It is available as either an absolute or gauge pressure sensor. The absolute sensor diaphragm measures relative to a perfect reference vacuum. A perfect vacuum pressure is defined as zero pressure and consequently a fixed reference for measuring the absolute pressure.

The gauge sensor diaphragm measures relative to the ambient atmospheric pressure. The gauge diaphragm sensor has one side of the diaphragm exposed to the pressure media that is to be measured, while the other side is exposed to the ambient atmospheric pressure. When measuring gauge pressure, it should be noted that the measured gauge pressure will change with variations in barometric pressure due to changes in weather patterns, unless the measuring point itself is exposed to ambient atmospheric pressure.

The ceramic sensor surface in combination with the 316 stainless steel flange offers excellent chemical resistance and compatibility with a wide range of aggressive gases, solvents and acids.



The IP67 sealed 316 stainless steel enclosure with an integrated hydrophobic membrane is designed for extreme environments. The innovative moisture control barrier prevents internal moisture accumulation and water condensation when changes in ambient pressure, temperature and humidity occur. The gauge pressure sensor measures relative to ambient pressure and the hydrophobic membrane provides pressure equalization when pressure changes due to weather changes.

## Measurement performance

The PCM-1 has a measurement range of 3 decades below full scale and a digital pressure output resolution of 1/10,000 in damping mode "none", "low" or "mid" and 1/100,000 in "high" damping mode.

Each product is individually temperature compensated for drift and individually multi-point calibrated to eliminate sensor non-linearity.

## Part numbers

The PCM-1 is available with different electrical connections and process fittings. The illustration below is an example of the PCM-1 with M12 connector and ¼" DIN3852-E process connection

PCM-1-	1	1	1	2	1	2	1	1		
<b>Process connection</b>									<b>Connection</b>	
DIN 3852-E, G¼" A	1								1	M12 x 1, 4 pin
DIN 3852-E, G½" A	2								2	DIN175301-803 Form A
ANSI B1.20.1, ¼" NPT	3								3	Cable 1 meter (3.3 feet)
ANSI B1.20.1, ½" NPT	4								4	Cable 3 meter (9.9 feet)
EN 837, G¼" B	5								5	Cable 5 meter (16.4 feet)
EN 837, G½" B	6									
SAE J514E, 7/16"-20 UNF BOSS	7									
<b>Range</b>									<b>Setpoints</b>	
0 .... 1 bar	0	1							0	None
0 .... 1.6 bar	0	2							1	On/Off Solid State Relay
0 .... 2 bar	0	3								
0 .... 2.5 bar	0	4							<b>Digital interface</b>	
0 .... 4 bar	0	5							1	S4-Connect
0 .... 6 bar	0	6							2	USB
0 .... 10 bar	0	7							3	IO-Link
0 .... 16 bar	0	8							4	RS232/RS485
0 .... 20 bar	0	9								
0 .... 40 bar	1	0							<b>Analog Output</b>	
0 .... 50 bar	1	1							1	0-10 VDC
0 .... 15 psi	1	2							2	0-5 VDC
0 .... 20 psi	1	3							3	1-10 VDC
0 .... 30 psi	1	4							4	4-20 mA
0 .... 50 psi	1	5							5	1-5 VDC
0 .... 100 psi	1	6							6	1-6 VDC
0 .... 200 psi	1	7							7	0.5-4.5 VDC
0 .... 250 psi	1	8								
0 .... 500 psi	1	9							<b>Sensor type</b>	
									1	Gauge sensor
									2	Absolute sensor

## Accessory for configuration

To configure the various digital and analog parameters of the PCM-1, the S4-Connect USB programmer and configurator is required.

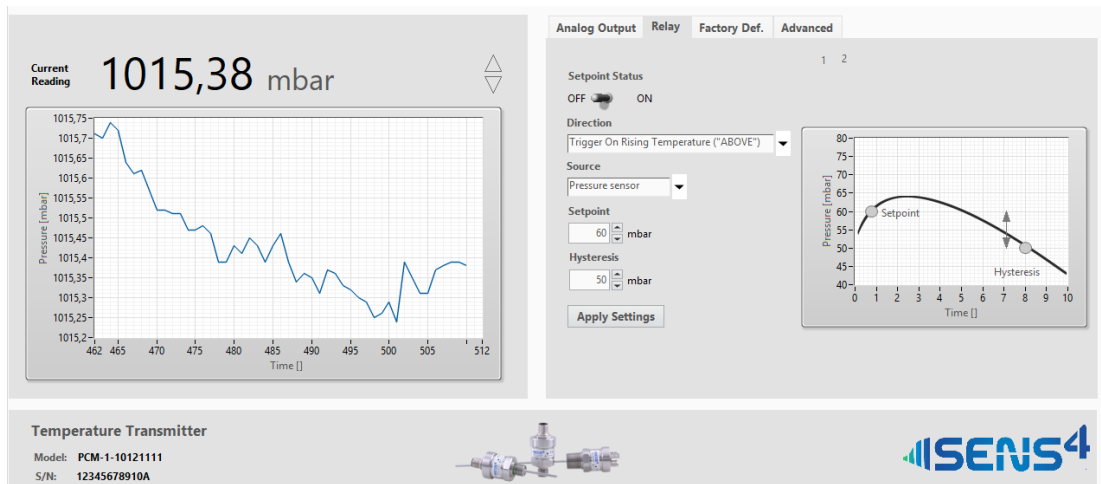
The S4-Connect USB programmer and configurator is not included with the transmitter and must be ordered separately. Two connector versions are available:

Part number	Description
PRG-S4-M12	S4-Connect programmer, 1.5 m cable, M12 connector
PRG-S4-DIN	S4-Connect programmer, 1.5 m cable, DIN angle connector



## Software for configuration and on-screen measurement

The S4-Connect software is freeware and can be downloaded from [www.sens4.com/s4-connect.html](http://www.sens4.com/s4-connect.html)



## Mechanical installation

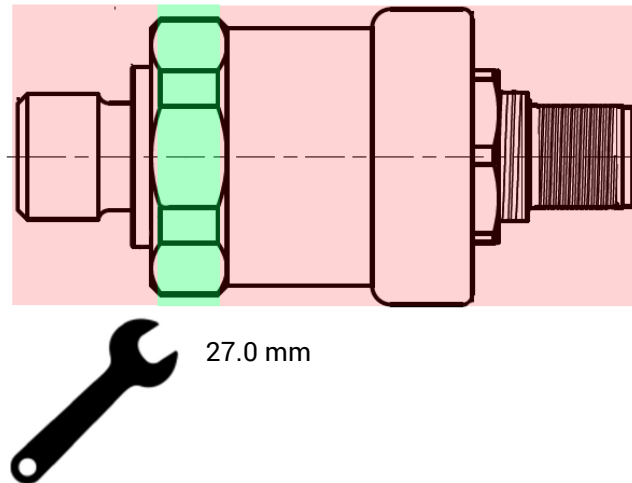
The transmitter is intended for installation in a screw-in process fitting.



**WARNING!** Refer to maximum allowed pressure, sealing method and assembly practices for the different process connector types and installations.



**CAUTION!** Do not exceed tightening torque values. Only use the area highlighted with green to tighten the flange installation (see illustration below).



### DIN 3852-E installation

The DIN 3852-E flange is delivered with a sealing elastomer O-ring. Fiber or metal sealing compatible with DIN3852-E flange can alternatively be used.



**CAUTION!** Do not use additional thread seal material.

Ensure that the maximum allowed pressure rating of the sealing type is adequate for application.

1. Ensure that the O-ring and its sealing surfaces are clean and free of scratches or other damages.
2. Screw the transmitter into the corresponding flange thread by hand.
3. Tighten it with a wrench. For G1/4": approx. 5 Nm; for G1/2": approx. 10 Nm.

Ensure that the process connection is leak tight using proper leak testing methods.

### NPT flange installation

The NPT flange requires a suitable thread seal tape.

4. Screw the transmitter into the corresponding flange thread by hand.
5. Tighten it with a wrench. For 1/4" NPT: approx. 30 Nm; for 1/2" NPT: approx. 70 Nm.

Ensure that the process connection is leak tight using proper leak testing methods.

### EN837 flange installation

The EN837 flange is intended for gasket metal or fiber sealing compatible with EN837 flange.



**CAUTION!** Do not use additional thread seal material.

Ensure that the maximum allowed pressure rating of the sealing type is adequate for application.

1. Ensure that the gasket and its sealing surfaces are clean and free of scratches or other damages.
2. Screw the transmitter into the corresponding flange thread by hand.
3. Tighten it with a wrench. For G1/4": approx. 5 Nm; for G1/2": approx. 10 Nm.



## Electrical installation

The PCM-1 requires an external power supply supplying in the range 12-30 VDC. The external power supply shall be with safe isolation according to PELV (Protective Extra Low Voltage) requirements of EN60204-1. The transmitter is protected against momentary overvoltage on the supply line. The internal 100 mA thermal fuse will limit current draw in case of overvoltage to limit overheating.

Additionally, the transmitter is protected against reverse polarity caused by incorrect wiring to the power supply.

The transmitter electronics have a high level of immunity against external electromagnetic interference. It is not required to use braided shielded cables to comply with the immunity requirements according to EN61326-1 industrial locations, but it is recommended for best measurement performance.



**WARNING!** To ensure that the product complies with its IP (ingress protection) rating, proper mating connectors with original sealing material must be used. Always make sure that the sealing O-rings are clean and free from surface damages.

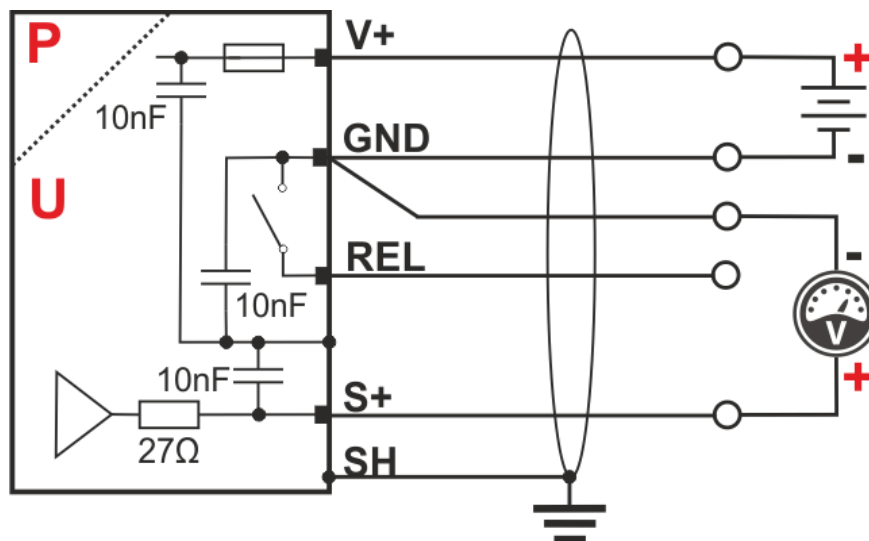
The integrated hydrophobic membrane prevents internal moisture accumulation and water condensation when changes in ambient pressure, temperature and humidity occur.

The M12, IEC61076-2-101 connector has a screw lock that should be tighten by hand.

The DIN175301-803A connector has a center screw that should be tighten using a screwdriver.

## Electrical connection (0-10 VDC voltage output)

The voltage output version provides a voltage signal proportional to the measured pressure.



The high resolution 16-bit voltage signal can be interfaced to a PLC, A/D converter, voltmeter or other readout devices.

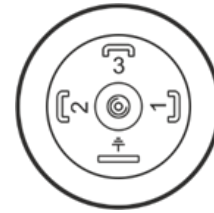


**INFORMATION:** It is recommended to use a differential input to measure the output signal that uses a separate signal return wire connected to the transmitter connector. If power supply return and signal return share the same wire connection the voltage drop as function of supply current will cause a measurement deviation. In that case, the measurement deviation will increase with the cable length.

## Connector pinout and cable wiring (0-10 VDC voltage output)

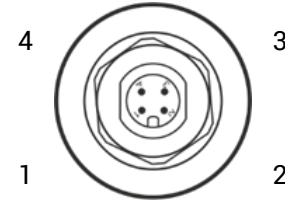
### Connector pinout 4 pin DIN175301-803A

Pin	Symbol	Description
1	V+	Positive supply voltage
2	GND	Supply voltage return
3	S+	Signal output
⊥	SH	Shield
SH	SH	Shield



### Connector pinout 4 pin M12, IEC61076-2-101

Pin	Symbol	Description
1	V+	Positive supply voltage
2	REL	Solid-state relay <sup>(1)</sup> or Not connected
3	GND	Supply voltage return
4	S+	Voltage signal output
SH	SH	Shield



### Cable (Color code DIN41700)

Color	Symbol	Description
White	V+	Positive supply voltage
Brown	GND	Supply voltage return
Green	S+	Voltage signal output
Grey	GND	Voltage signal return
Pink	REL	Solid-state relay or NC
Yellow	SH	Shield



The solid-state relay is a hardware option and needs to be specified when ordering the part. The setpoint value can be programmed using the S4-Connect™ interface.

## Signal to pressure conversion (0-10 VDC voltage output)

The transmitter with 0-10 VDC voltage output is available with different pre-configured output scaling options.

The voltage signal ( $u$ ) can be converted to pressure using the following linear expression:

Voltage to pressure conversion:  $P(u) = a \cdot u + b$

Calculation of constants:

$$a = \frac{P_{max} - P_{min}}{u_{max} - u_{min}}$$

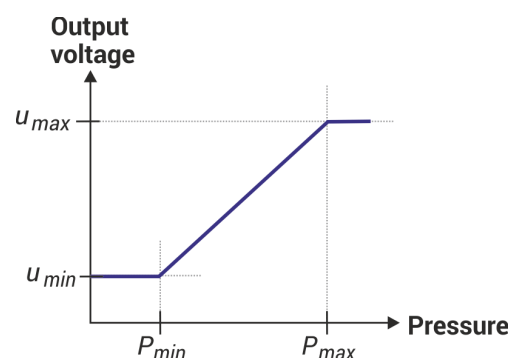
$$b = -a \cdot u_{min} + P_{min}$$

Where  $P_{min}$  and  $P_{max}$  are the minimum and maximum pressure, respectively;  $u_{min}$  and  $u_{max}$  are the minimum and maximum voltage, respectively.

### User configuration of voltage output scaling

The S4-Connect™ interface enables flexible user configuration of the analog voltage output. The minimum and maximum output voltage and pressure can be set to any value within the valid range for the transmitter.

For user configuration of analog output refer to page 19.



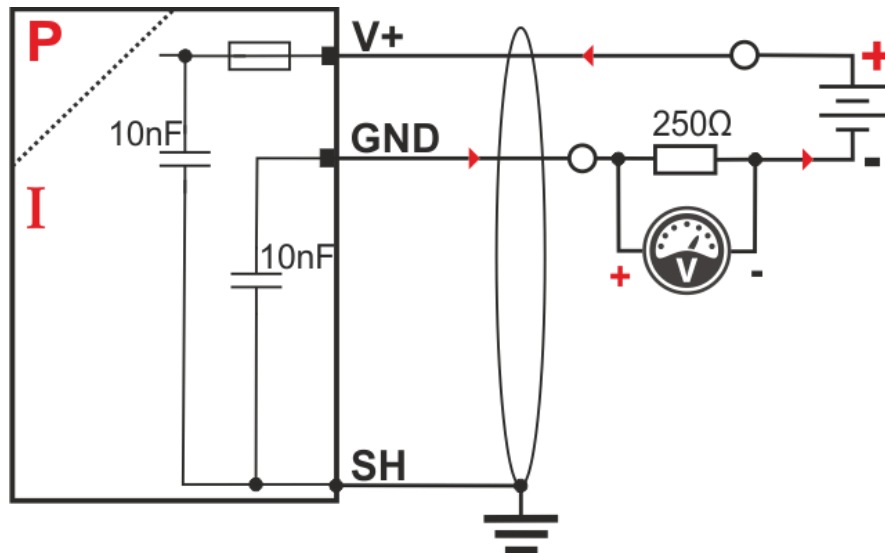
### Electrical connection (4-20 mA current output)

The 2-wire 4-20 mA current loop combines the transmitter output signal and supply voltage in one cable where the current consumption represents the measurement signal. The 4-20 mA signal complies with the NAMUR NE 43 standard.

A current loop resistor (r) value of 250 ohms is commonly used and will provide a 1-5 VDC across the resistor. The current loop resistor value can be chosen freely up to a maximum of 800 Ohm, provided that the minimum and maximum supply voltage range is respected.



**INFORMATION:** The loop current resistor should have a low temperature drift coefficient to ensure best measurement performance.



Calculation of current (i):  $i = \frac{u}{r}$

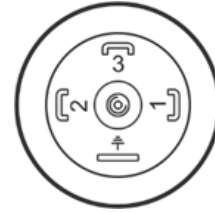
Calculation of voltage (u):  $u = r \cdot i$

Calculation of resistor (r):  $r = \frac{u}{i}$

## Connector pinout and cable wiring (4-20 mA current output)

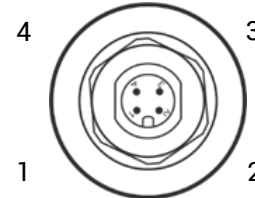
### Connector pinout 4 pin DIN175301-803A

Pin	Symbol	Description
1	V+	Positive supply voltage
2	GND	Supply voltage return
3	NC	Not connected
⏏	SH	Shield
SH	SH	Shield



### Connector pinout 4 pin M12, IEC61076-2-101

Pin	Symbol	Description
1	V+	Positive supply voltage
2	NC	Not connected
3	GND	Supply voltage return
4	NC	Not connected
SH	SH	Shield



### Cable (Color code DIN41700)

Color	Symbol	Description
White	V+	Positive supply voltage
Brown	GND	Supply voltage return
Green	SH	Shield



## Signal to pressure conversion (4-20 mA current output)

The transmitter with 4-20 mA current output is available with different pre-configured output scaling options.

The current signal ( $i$ ) can be converted to pressure using the following linear expression:

Current to pressure conversion:  $P(i) = a \cdot i + b$

Calculation of constants:

$$a = \frac{P_{max} - P_{min}}{i_{max} - i_{min}}$$

$$b = -a \cdot i_{min} + P_{min}$$

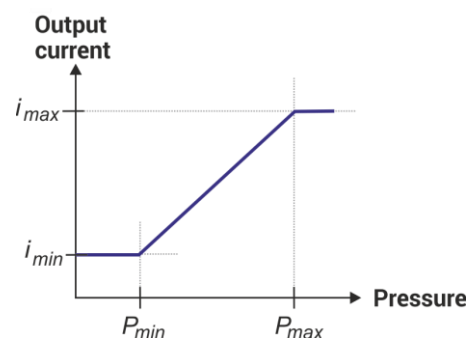
Where  $P_{min}$  and  $P_{max}$  are the minimum and maximum pressure, respectively;  $i_{min}$  and  $i_{max}$  are the minimum and maximum current, respectively.



**ATTENTION!** The PCM-1 has built-in self-diagnostics features, and in case of product failure the current output will provide a fault signal in the range of 3.2 - 3.6 mA in compliance with the NAMUR NE43 recommendation. Replace the unit in case of receiving a fault signal.

### User configuration of current output scaling

The S4-Connect™ interface enables flexible user configuration of the analog current output. The minimum and maximum output current and pressure can be set to any value within the valid range for the transmitter. For user configuration of analog output refer to page 19.



## S4-Connect™ communication protocol



The S4-Connect™ USB programmer and communicator provides access from PC software via a USB interface to the digital core of the transmitter. It is compatible with both 4-20 mA current output and 0-10 VDC voltage output transmitters from Sens4.

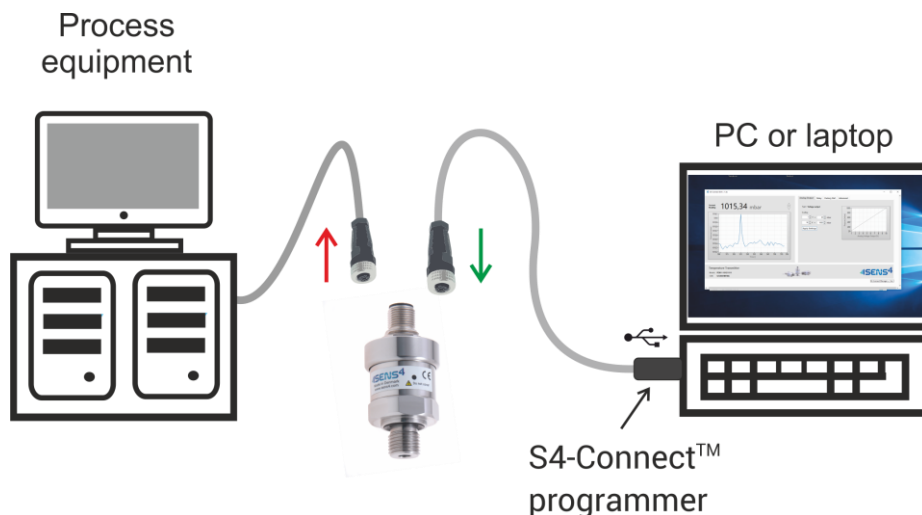
It is intended for configuration, calibration and setup of the unit, but it can also be used to acquire measurement data and perform diagnostics using a PC.

The S4-Connect™ USB programmer and communicator is required to communicate with the digital core of the transmitter. The S4-Connect™ interface enables easy and cost-optimized access to perform calibration, adjustments and individual configuration of the transmitter product to fit the customer application and requirements.

During the power-up cycle the transmitter will detect if there is a S4-Connect™ programmer connected and if so the transmitter will enter the S4-Connect™ service mode.



**WARNING!** The S4-Connect™ interface is not intended for digital communication between process equipment and the PCM-1 transmitter unit. Disconnect the transmitter from any external installation before enabling the S4-Connect™ service mode. During the S4-Connect™ service mode the analog voltage output or analog current output will be disabled, and the analog output will be used for digital communication between transmitter and S4-Connect™ programmer.



### Getting started:

1. Remove the electronics connection to the transmitter so that it is disconnected from any process equipment.
2. Download the S4-Connect™ software from [www.sens4.com](http://www.sens4.com) and install the software. A standard serial terminal software can be used instead of the S4-Connect™ software.
3. Connect the programmer to the PC and the S4-Connect™ software. The S4-Connect™ programmer will then enter a state where it searches for the transmitter. During this period the LED on the programmer will alternate between green and blue.
4. Connect the transmitter to the S4-Connect™ cable. The S4-Connect™ programmer's LED will turn green if a current output transmitter is connected and blue if a voltage output transmitter is connected.
5. When the S4-Connect™ programmer's LED turns solid blue or green, it's ready for communication.

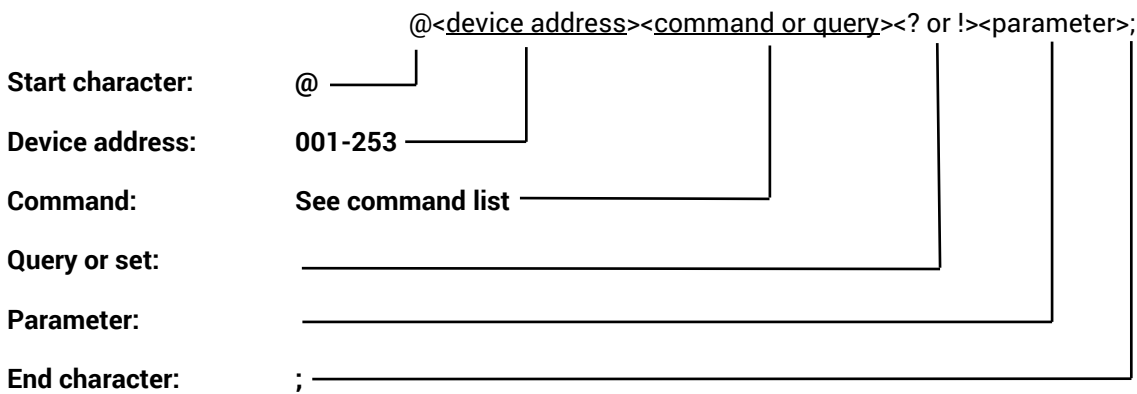
### LED signals

The S4-Connect™ USB programmer has an LED indicator that provides the following signals:

- |     |                      |   |
|-----|----------------------|---|
| ● ● | Blue to green flash: | Searching for transmitter.                              |
| ●   | Blue:                | Voltage output transmitter connected.                   |
| ●   | Green:               | Current output transmitter connected.                   |
| ○   | White flash:         | Location mode for S4-Connect™ programmer (see page 14). |

## Command set

The S4-Connect™ communication is based on an ASCII protocol that includes a start character, device address, command or query and an end character for termination:



**INFORMATION!** Throughout this manual the signs <> are written for separation of command name and values and are for informational purposes only. These signs should not be entered in the actual command

Example of how to send a command to the transmitter:

Programming a setpoint value of 123.4 (using the default unit setting of the transmitter, e.g. mbar):

Send: @254SPV!123.4;

Reply: @ACK123.4;

Command	Description	Query	Set	Valid input parameter
ADR	Communication address	X	X	3 digits (range 001-253)
AOC	Analog output configuration	X	X	<P <sub>min</sub> >,<I <sub>min</sub> or U <sub>min</sub> >,<P <sub>max</sub> >,<I <sub>max</sub> or U <sub>max</sub> >
FD	Factory default	X	X	ADR,AOC,FS,DAMP,U,SP,ZERO,<NONE>
FV	Firmware version	X		-
FS	User full scale adjustment	X	X	<PRESSURE VALUE>
MF	Manufacturer	X		-
MD	Model name	X		-
DAMP	Measurement damping	X	X	NONE, LOW, MID, HIGH
P	Pressure measurement	X		-
PN	Part number	X		-
SP	Setpoint settings	X		
SPD	Setpoint direction <sup>(1)</sup>	X	X	ABOVE, BELOW
SPE	Setpoint enable <sup>(1)</sup>	X	X	OFF, ON
SPH	Setpoint hysteresis <sup>(1)</sup>	X	X	<PRESSURE VALUE>
SPV	Setpoint value <sup>(1)</sup>	X	X	<PRESSURE VALUE>
SPS	Setpoint source <sup>(1)</sup>	X	X	P, T
SN	Serial number	X		-
STAT	Statistics	X	X	-
T	Transmitter temperature	X		-
U	Pressure unit	X	X	MBAR, BAR, PASCAL, PSI, TORR
ZERO	Zero adjustment	X	X	No input or <PRESSURE VALUE>

General note: all valid input parameters written in *italics* are to be entered as a number. These numbers will vary with the type and model number of the transmitter. Refer to the specific commands for details.

(1) Setpoint solid-state relay is optional and is not relevant for all part numbers.

## Address

The PCM-1 has an addressable communication protocol, and so it will only accept commands or queries with the following addresses. All queries or commands sent to all other addresses are simply ignored.

<device address>	Pre-configured to 253, this value may be changed at any time to anything in the range 1-253 using the ADR command.
254	This is the "global" address. The PCM-1 will always respond to commands or queries at address 254, regardless of the device address setting.
255	This is the broadcast address, which may be used for performing the same operation on multiple PCM-1s at once. The PCM-1 will not issue any replies to broadcast commands. Note that broadcasting requires a multidrop communication interface such as RS-485.

Example: Change the device address from 253 (default) to 123 using the global address.

Send: @254ADR!123;

Reply: @253ACK123;

All replies after this one will begin with the new device address, 123.

## S4-Connect™ USB programmer and communicator locate function

The locate function can be used to visually identify the S4-Connect™ USB programmer and communicator. When the locate function is on, the LED will flash white until the power is cycled or locate is turned off.

Send: @254S4C!LOCATE,ON;

Reply: @ACKLOCATE;

## Pressure measurement

The pressure measurement is available through the analog output in normal operation but can also be read digitally using the S4-Connect™ programmer.

For conversion of analog signal to pressure refer to page 9 for voltage output transmitters and page 11 for current output transmitters.

Reading the digital pressure value:

Send: @254P?;

Reply: @ACK1013.12;

## Measurement damping

The PCM-1 has an active digital damping filter that actively suppresses measurement noise without impacting the measurement response time when large and fast pressure changes occur. The measurement damping sets three different filter levels and digital output resolutions; low, mid and high. The damping can also be turned off by using the "none" setting.

The digital output resolution is the same for the three lightest damping settings. The high damping setting has ten times better digital resolution. The resolution is given in the table below for all the available options.

Command	Digital output resolution
NONE	1/10000 of full scale
LOW	1/10000 of full scale
MID	1/10000 of full scale
HIGH	1/100000 of full scale

Example of setting the damping filter to the highest level:

Send:           **@254DAMP!HIGH;**

Reply:          **@ACKHIGH;**

## Pressure unit

The PCM-1 can be configured to five different pressure units.

Units				
mbar	bar	Pascal	PSI	Torr

Example of setting pressure unit to Pascal:

Send:           **@254U!PASCAL;**

Reply:          **@ACKPASCAL;**



**INFORMATION:** All values related to pressures like setpoint values and full-scale must be entered in the current unit for the transmitter. When changing unit all setpoint values are converted to the new unit and consequently setpoint functionality will remain intact when changing unit.

## Temperature measurement

The PCM-1 has a built-in precision temperature sensor that provides a temperature measurement in degrees Celsius with a typical accuracy of better than  $\pm 0.3$  °C. The internal sensor is located on-board the measuring electronics circuit board and consequently the sensor measures an elevated temperature because the electronics are self-heating.

Reading the temperature:

Send:           **@254T?;**

Reply:          **@ACK25.22;**



## Switch function (Optional)

The solid-state setpoint relay function can be used for controlling and surveillance by external equipment. The solid-state relay is a hardware option that must be ordered when ordering the transmitter.

The switch is per default controlled by the pressure measurement but can also be configured to be controlled by the internal temperature sensor.

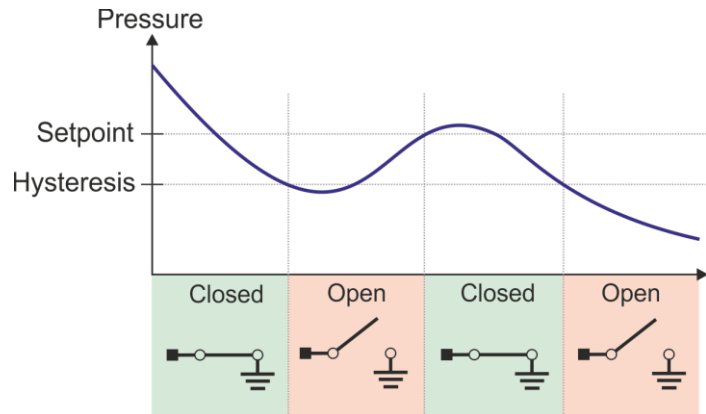


**WARNING!** Do not exceed maximum load rating of 250 mA, 50 VDC / VAC peak on relay contacts. Special precautions must be taken when driving an inductive load. Ensure that inrush peak current does not exceed relay contact ratings.

The switch can be configured to close the relay contact either above or below the setpoint value.

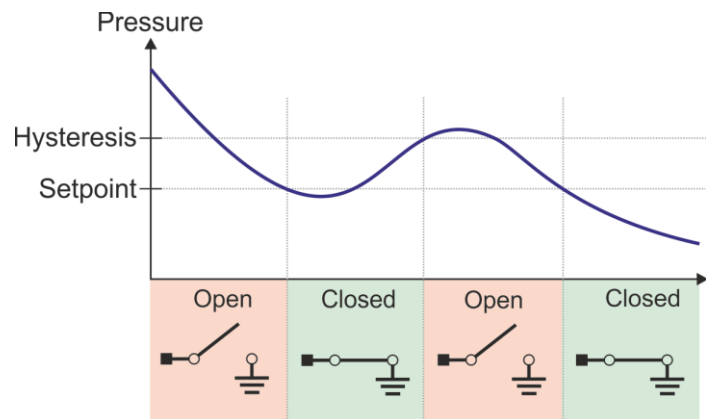
### Above

When the switch direction is configured to above, the relay contact will remain in the closed state until the hysteresis value is exceeded. Then it will change to open state. The relay contact will close again when the setpoint value is exceeded.



### Below

When the switch direction is configured to below, the relay contact will maintain the open state until the setpoint value is exceeded. Then it will change to the closed state. The relay contact will open again when the setpoint value is exceeded.



## Configuration of setpoint

The setpoint can be configured using the S4-Connect™ software or with terminal software using the command protocol.

The setpoint value must be entered in the configured pressure unit. The pressure unit can be read by the command: @254U?;

Command sequence example:

```
@254SPS!P;  
@254SPD!ABOVE;
```

```
@254SPV!600;
```

```
@254SPH!500;  
@254SPE!ON;
```

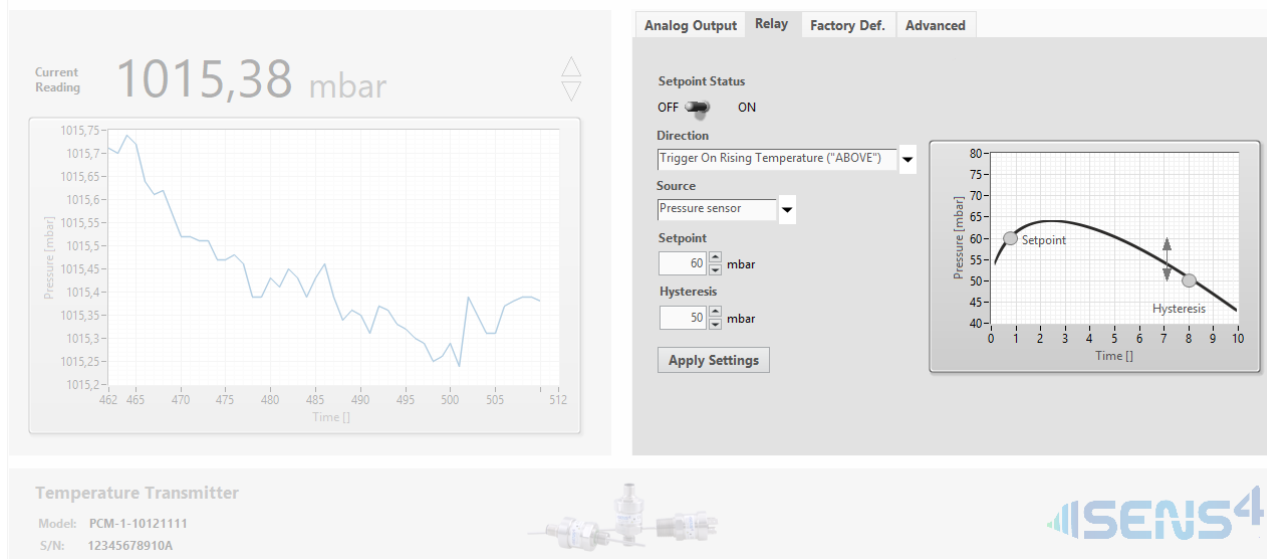
Assign the setpoint source to follow the pressure measurement. Configure relay to be active above the setpoint limit. Whenever this value is changed, the hysteresis is automatically calculated to either -10% of the current setpoint value (when direction = ABOVE) or +10% of the current setpoint value (when direction = BELOW).

Set setpoint limit to 600 and auto-calculate hysteresis value. As the direction is set to ABOVE, the hysteresis value will be automatically set to 540 (the setpoint value -10%). Had the direction been BELOW, the hysteresis would have been automatically set to 660 (the setpoint value +10%).

Set new setpoint hysteresis value to 500.  
Enable setpoint.

Command	Description	Valid input
SPD	Setpoint relay direction	ABOVE, BELOW
SPE	Setpoint enable	OFF, ON
SPH	Setpoint hysteresis	<PRESSURE VALUE>
SPV	Setpoint value	<PRESSURE VALUE>
SPS	Setpoint source (pressure or temperature)	P, T
SP	Read setpoint settings	-

### Configuration of setpoint using S4-Connect™ software



### Product information and identification

The PCM-1 has a serial number, product part number, manufacturer identity and firmware version programmed in the internal non-volatile memory.

#### Serial number:

Send: @254SN?;  
Reply: @ACK191230123456;

#### Part number:

Send: @254PN?;  
Reply: @ACKPCM-1-123456;

#### Manufacturer identity:

Send: @254MF?;  
Reply: @ACKSENS4;

#### Firmware version:

Send: @254FV?;  
Reply: @ACK1.00;

## Adjustment of the zero point

The PCM-1 has an active and individual temperature compensation to account for zero-point drift. In many applications, a user adjustment of the zero point is not required during the lifetime of the product.

If drift of the zero-point is observed, it can be adjusted using the S4-Connect™ USB programmer and communicator.

### Zero-point adjustment of an absolute sensor

For absolute transmitters with an absolute pressure sensor the zero-point adjustment should be adjusted under vacuum. Evacuate the transmitter to a pressure lower than the recommended maximum absolute pressure for zero-point adjustment (see table below).

Pressure sensor full scale range	Recommended maximum absolute pressure for zero point adjustment				
	bar	mbar	Torr	PSI	Pascal
1 bar	0.00005	0.05	0.037	0.00072	5
1.6 bar	0.00008	0.08	0.060	0.0011	8
2 bar	0.0001	0.1	0.075	0.0014	10
2.5 bar	0.000125	0.125	0.093	0.0018	12.5
4 bar	0.0002	0.2	0.15	0.0029	20
6 bar	0.0003	0.3	0.22	0.0043	30
10 bar	0.0005	0.5	0.37	0.0072	50
16 bar	0.0008	0.8	0.60	0.011	80
20 bar	0.001	1	0.75	0.014	100
40 bar	0.002	2	1.5	0.029	200
50 bar	0.0025	2.5	1.8	0.036	250
15 psi	0.00005	0.051	0.038	0.00075	5.17
20 psi	0.000068	0.068	0.051	0.0010	6.89
30 psi	0.00010	0.10	0.077	0.0015	10.34
50 psi	0.00017	0.17	0.12	0.0025	17.23
100 psi	0.00034	0.34	0.25	0.0050	34.47
200 psi	0.00068	0.68	0.51	0.010	68.94
250 psi	0.00086	0.86	0.64	0.012	86.18
500 psi	0.0017	1.72	1.29	0.025	172.36

### Zero-point adjustment procedure for an absolute sensor

1. Evacuate the transmitter using a vacuum pump to reach a pressure lower than the recommended maximum pressure for zero-point adjustment
2. Send command: @254ZERO!;
3. Reply: @254ACK<value>;

The reply <value> is the calculated offset pressure as function of the factory default zero offset subtracted from the user offset adjustment.

If the recommended vacuum pressure cannot be achieved due to inadequate vacuum pumping capacity, the zero-point adjustment can be performed at a higher pressure by entering the actual pressure value measured by a reference transmitter. Following command example will perform a zero adjustment at 5.00 mbar:

1. Send command: @254ZERO!5.00;

### Zero-point adjustment procedure of a gauge pressure sensor

A gauge pressure sensor measures relative to the atmospheric pressure. Zero-point adjustment should be executed at ambient atmospheric pressure.

1. Remove the pressure transmitter or otherwise ensure pressure equalization between pressure port and the transmitter enclosure.
2. Send command: @254ZERO!;
3. Reply: @254ACK<value>;

The reply <value> is the calculated offset pressure as function of the factory default zero offset subtracted from the user offset adjustment.

## Adjustment of full-scale

The full-scale adjustment allows change of the full-scale reading. In many applications, adjustment of the full-scale is not required during the lifetime of the product. A reference pressure transmitter or dead weight tester is required to perform a full-scale adjustment.



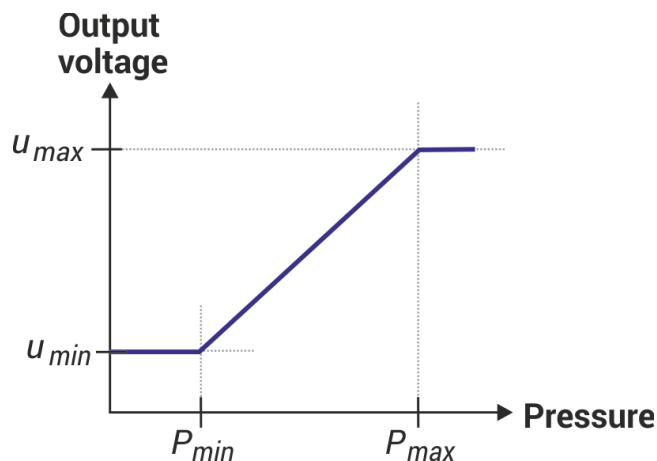
**INFORMATION:** Do not use full-scale adjustment to change the pressure unit scaling. The pressure unit can be changed using the unit setting command.

### Full-scale adjustment procedure

1. Adjust the pressure so that it represents the full-scale pressure of the transmitter. The full-scale pressure is written on the serial label.
2. Read the actual pressure using a reference transmitter. Example: 1013.12 mbar.
3. Send command: @254FS!1013.12;
4. Reply: @254ACK1.01;

## Analog output configuration

The PCM-1 can be ordered and delivered with different pre-configured analog output scaling types. The analog output configuration allows the user to change the pre-configured scaling to any linear scaling within the sensor's measuring range and output limitation. This feature allows magnification of a specific pressure range.

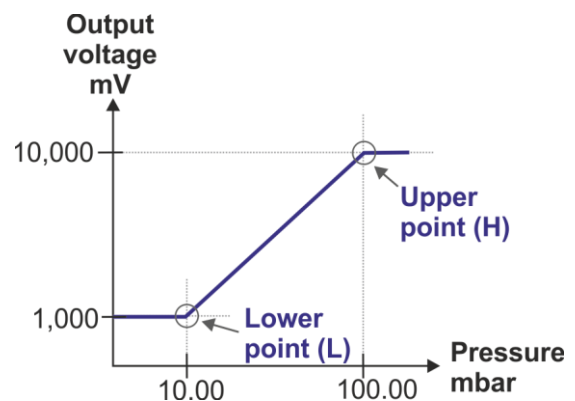


### Configuration of the voltage output:

When programming the voltage output scaling, the minimum and maximum output voltage must be entered in millivolt and the minimum and maximum pressure in the transmitter pressure unit.

Example: Configure the analog output linear expression between 1 VDC @ 10 mbar and 10 VDC @ 100 mbar.

Send: @254AOC!10,1000,100,10000;  
Reply: @253ACKAOC  
p#: PRESSURE, AOUT [mV /  $\mu$ A]  
L: 10, 1000  
H: 100, 10000;



### Overrange voltage output

The analog voltage can exceed the upper limit to provide an overrange signal. The absolute maximum output signal where the pressure voltage signal is capped is calculated using following expression:

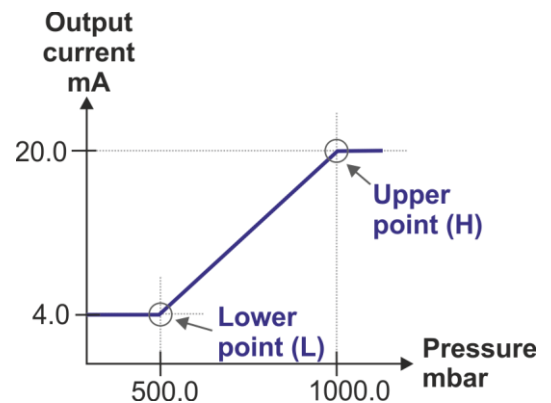
$$\text{Overrange pressure cap value} = 1.02 \times (\text{Upper pressure point} - \text{Lower pressure point})$$

### Configuration of the current output:

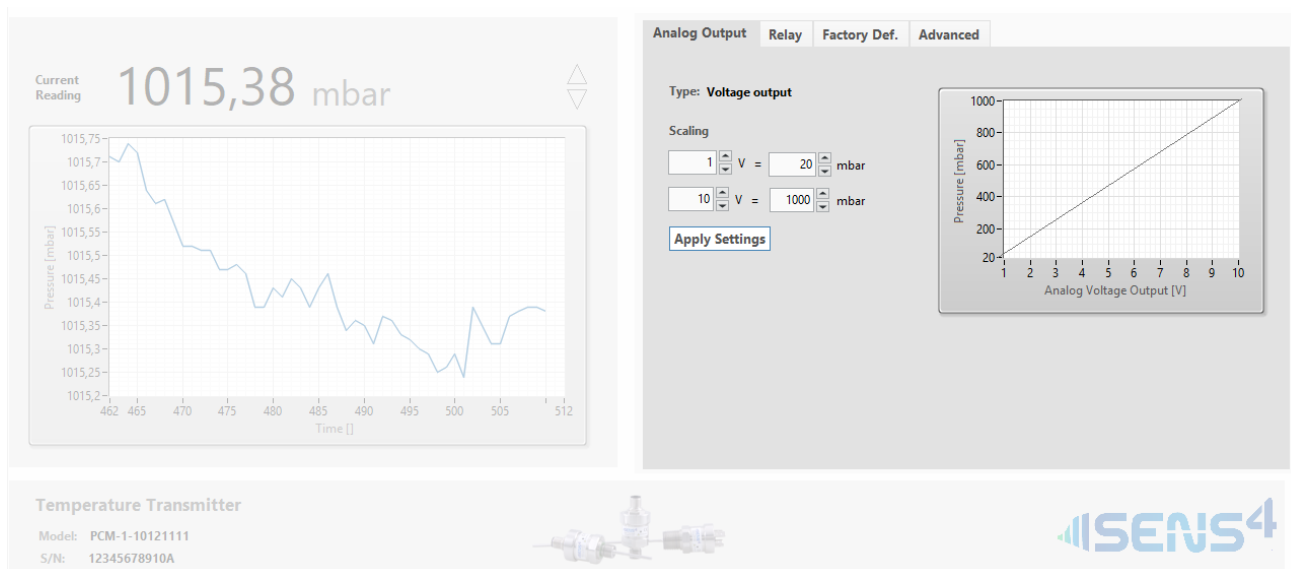
When programming the current output scaling, the minimum and maximum output current must be entered in microampere and the minimum and maximum pressure in the transmitter pressure unit. The output will be capped at the minimum and maximum values.

Example of configuration of analog output linear expression between 4 mA @ 500.0 mbar and 20 mA @ 1000.0 mbar.

Send: @254AOC!500,4000,1000,20000;  
Reply: @253ACKAOC  
p#: PRESSURE, AOUT [mV /  $\mu$ A]  
L: 500, 4000  
H: 1000, 20000;



### Configuration of analog output using S4-Connect™ software



### Resetting to factory default

The factory default reset will reset all user settings to factory default including setpoint settings, pressure unit and user adjustment of zero point and full-scale.

Sens4 offers pre-configuration of user parameters and if the product is delivered with a special user configuration, the factory default command will reset to the original user configuration as delivered.

Reset to factory default:

Send: @254FD!;  
Reply: @ACKFD;

Parameter	Value
Zero adjustment	0
Full scale adjustment	1
Unit	As delivered
Measurement damping	Mid
Address	253
Analog output configuration	As delivered
Setpoint direction	Above
Setpoint enable	Off

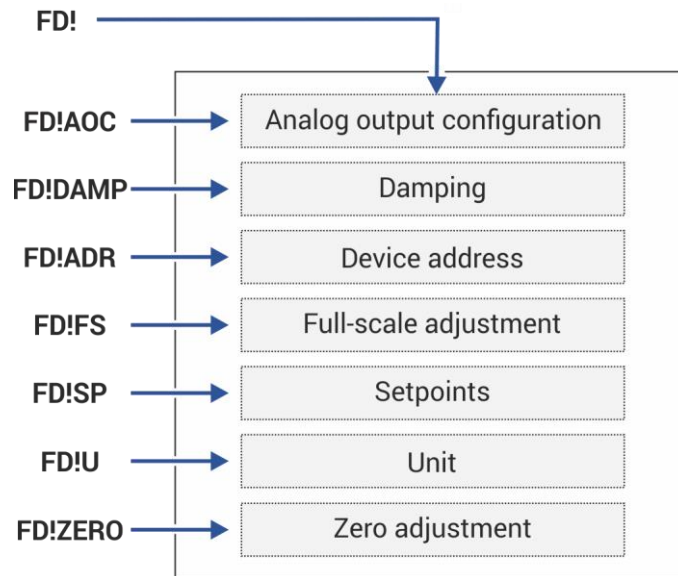
Setpoint hysteresis	60% of full scale or as delivered
Setpoint value	50% of full scale or as delivered
Setpoint source	Pressure

## Individual reset to factory default

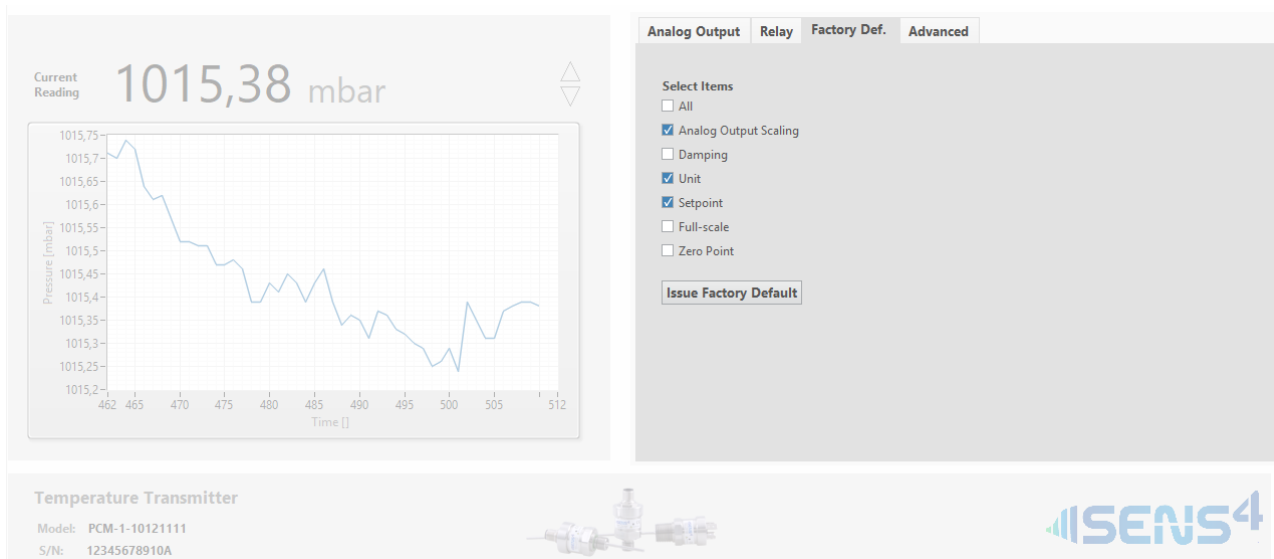
It is possible to reset only certain settings to their factory default values. This is done by adding an optional argument to the FD command. If the argument is left blank, all parameters will be reset to their default values.

Send: **@254FD!<ARGUMENT>;**

Reply: **@ACKFD;**



## Reset to factory default using S4-Connect™ software



## Maintenance

Maintenance is not required in many applications during the lifecycle of this product. The calibration may shift during the life-time and re-calibration by adjusting the zero point and full-scale value can be performed by the user.

The PCM-1 can be user configured, calibrated and tested using the S4-Connect™ USB adapter.

### Contamination

If the transmitter becomes contaminated and the measurement performance is impacted, the internal sensor connection tube can be cleaned using liquid solvents compatible with stainless steel 316, Ceramic Al<sub>2</sub>O<sub>3</sub> and Viton®.



**WARNING!** Do not attempt to clean products that have been exposed to or contaminated with radioactive, chemical, biological and other harmful or dangerous substances.

Recommend cleaning procedure:

1. Pour alcohol or another compatible cleaning solvent into the sensor connection tube.
2. Turn the transmitter carefully back and forth.
3. Leave it with cleaning solvent for 30-60 minutes.
4. Empty out the sensor connection tube
5. Pour distilled water into the connection tube and turn the transmitter carefully back and forth and pour out the water. Repeat this step two or three times.
6. Leave the sensor to dry naturally or place it in an oven at ~80 °C.



**WARNING!** Do not attempt to mechanically clean the sensor diaphragm by inserting any solid object into the sensor pressure connection tube.

The transmitter contains a thin ceramic sensor diaphragm and mechanical deformation of the sensor diaphragm will cause permanent damage to the product.



## Failure mode

If the sensor diaphragm breaks the PCM-1 will output following:

Output type	Error output
Voltage output	0 VDC
Current output	3.2 - 3.6 mA (NE 43)
Digital pressure output	NAKERR

## Return

Before returning a product to Sens4 proper return forms and a return materials authorization (RMA) must be filled out. The RMA procedure can be found on: [www.sens4.com/support.html](http://www.sens4.com/support.html)



**INFORMATION:** Sens4 does not accept return of products without return materials authorization. Sens4 does not accept any return of products that has been exposed to or contaminated with radioactive, chemical, biological or other harmful or dangerous substances.

## RMA – Return Material Authorization

This form should be filled out and enclosed with the package

Please contact Sens4 to obtain RMA # email: [support@sens4.com](mailto:support@sens4.com)



Sens4 A/S  
Ndr. Strandvej 119G  
3150 Hellebaek  
Denmark

RMA#: \_\_\_\_\_ Date: \_\_\_\_\_

Company name \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Contact name: \_\_\_\_\_

Phone: \_\_\_\_\_

Email: \_\_\_\_\_

Part number: \_\_\_\_\_ Serial number: \_\_\_\_\_

### Reason for the return:

Warranty  
Repair

☐

Chargeable  
Repair

☐

Exchange

☐

Loan

☐

Demo

☐

Other

☐

*If other, please list:*

\_\_\_\_\_

### Has the product been contaminated with or exposed to the following?

	No	Yes
Biological hazard	<input type="checkbox"/>	<input type="checkbox"/>
Radioactivity	<input type="checkbox"/>	<input type="checkbox"/>
Toxic gases or materials	<input type="checkbox"/>	<input type="checkbox"/>
Other harmful substances	<input type="checkbox"/>	<input type="checkbox"/>

*If other, please list:*

\_\_\_\_\_



If "yes" has been answered to any of the above questions please note that **Sens4 does not accept any return of products that have been exposed to or contaminated with radioactive, chemical, biological and other harmful or dangerous substances.**

For questions regarding our return policy please contact email: [support@sens4.com](mailto:support@sens4.com)

### If the product is being returned for service repair, please describe failure mode and application:

Application: \_\_\_\_\_

Failure mode: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

I, the undersigned, hereby acknowledge that the information provided on this form is legally binding and declare that the information supplied is accurate and adequate to judge any harmful contamination.

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name

\_\_\_\_\_  
Signature



## Specifications

Specifications	
Measuring range (0 bar to full-scale)	1, 2, 5, 10, 20 or 50 bar
Measuring range (0 psi to full-scale)	15, 20, 30, 50, 100, 200, 250 or 500 psi
Measuring principle	Ceramic membrane absolute or gauge
Accuracy, IEC 61298-2	+/- 0.1 % BFSL
Thermal drift (offset, base: 22°C)	+/- 0.01 % of full-scale per °C (from 10 to 50 °C)
Output signal (Voltage version)	0-10 VDC (Programmable scaling) (10.2 VDC max)
Output resolution (Voltage version)	16 bit / 150 nV
Output signal (Current version)	4-20 mA <sup>(1)</sup> (Programmable scaling)
Output resolution (Current version)	16 bit / 244 nA
Solid state relay contact rating (optional)	250 mA, 50 VDC / VAC peak
Environment conditions	
Operating ambient temperature	-40 to +100 °C
Media temperature	-40 to +125 °C
Storage ambient temperature	-40 to +125 °C
Maximum media pressure	Refer to table on page 25-26
Burst media pressure	Refer to table on page 25-26
Mounting position	Any
Protection rating, EN 60529/A2:2013	IP67 <sup>(2)</sup> , IP65 <sup>(3)</sup>
Humidity	98%, non-condensing
Power supply	
Supply voltage	12-30 VDC
Power consumption (voltage version)	240 mW (max)
Power consumption (current version)	600 mW (max)
Reverse polarity protection	Yes
Overvoltage protection	Yes
Internal fuse	100 mA (thermal recoverable)
Materials	
Enclosure	SS 1.4404 / AISI 316L
Electrical connector DIN 175301-803A	PA Nylon
Electrical connector M12 IEC 61076-2-101	PA Nylon, Nickel plated Zinc alloy
Process connection (media wetted)	SS 1.4404 / AISI 316L
Sensor diaphragm (media wetted)	Ceramic Al <sub>2</sub> O <sub>3</sub> 96%
Sealing (media wetted)	FKM (Viton®)
Process leak tightness (ISO 27895:2009)	<1·10 <sup>-9</sup> mbar·l/sec.
Approvals	
CE	EN61000-6-2, EN 61000-6-3
RoHS compliance	Directive EU 2015/863

Contact [sales@sens4.com](mailto:sales@sens4.com) for other approvals and certifications.

- (1) 4-20 mA NAMUR NE43 compliant signal.
- (2) IP67 for product versions with IEC 61076-2-101 M12 connector
- (3) IP65 for product versions with DIN EN 175301-803 A connector

## Pressure limit specification

The maximum pressure limit defines the upper limit of the pressure range that the pressure sensor is designed to operate within. Exceeding this limit may permanently damage the sensor element and cause an irrecoverable shift of repeatability, linearity and full-scale adjustment.

The burst pressure is the maximum allowed pressure that can be exposed to the pressure port without rupture of the sensor diaphragm or transmitter structure. Ensure that the pressure media never exceeds the burst pressure.



**WARNING!** Exceeding the burst pressure can cause catastrophic structural failure of the transmitter which can cause sudden release of the pressure media to the ambient environment that may result in serious injury or death.

The transmitter full-scale and sensor type can be found on the transmitter product label.

The minimum pressure specification is only applicable for gauge sensors. Absolute sensors can be used in vacuum applications with no limitations to the vacuum pressure range.

Transmitter Full-scale	Sensor Type	Minimum Pressure	Maximum Pressure	Burst Pressure
1 bar	Absolute	N/A	2 bar absolute	3 bar absolute
1.6 bar	Absolute	N/A	4 bar absolute	6 bar absolute
2 bar	Absolute	N/A	4 bar absolute	6 bar absolute
2.5 bar	Absolute	N/A	4 bar absolute	6 bar absolute
4 bar	Absolute	N/A	10 bar absolute	12 bar absolute
5 bar	Absolute	N/A	10 bar absolute	12 bar absolute
6 bar	Absolute	N/A	10 bar absolute	12 bar absolute
10 bar	Absolute	N/A	15 bar absolute	20 bar absolute
16 bar	Absolute	N/A	35 bar absolute	50 bar absolute
20 bar	Absolute	N/A	35 bar absolute	50 bar absolute
40 bar	Absolute	N/A	100 bar absolute	120 bar absolute
50 bar	Absolute	N/A	100 bar absolute	120 bar absolute
15 psi	Absolute	N/A	29 psi absolute	43 psi absolute
20 psi	Absolute	N/A	58 psi absolute	87 psi absolute
30 psi	Absolute	N/A	58 psi absolute	87 psi absolute
50 psi	Absolute	N/A	145 psi absolute	174 psi absolute
100 psi	Absolute	N/A	217 psi absolute	290 psi absolute
200 psi	Absolute	N/A	500 psi absolute	725 psi absolute
250 psi	Absolute	N/A	500 psi absolute	725 psi absolute
500 psi	Absolute	N/A	1,400 psi absolute	1,700 psi absolute
1 bar	Gauge	- 0.5 bar gauge	2 bar gauge	3 bar gauge
1.6 bar	Gauge	- 0.5 bar gauge	4 bar gauge	6 bar gauge
2 bar	Gauge	- 0.5 bar gauge	4 bar gauge	6 bar gauge
2.5 bar	Gauge	- 0.5 bar gauge	4 bar gauge	6 bar gauge
4 bar	Gauge	- 1 bar gauge	10 bar gauge	12 bar gauge
5 bar	Gauge	- 1 bar gauge	10 bar gauge	12 bar gauge
6 bar	Gauge	- 1 bar gauge	10 bar gauge	12 bar gauge
10 bar	Gauge	- 1 bar gauge	15 bar gauge	20 bar gauge
16 bar	Gauge	- 1 bar gauge	35 bar gauge	50 bar gauge
20 bar	Gauge	- 1 bar gauge	35 bar gauge	50 bar gauge
40 bar	Gauge	- 1 bar gauge	100 bar gauge	120 bar gauge
50 bar	Gauge	- 1 bar gauge	100 bar gauge	120 bar gauge
15 psi	Gauge	- 7.25 psi gauge	29 psi gauge	43 psi gauge

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20 psi	Gauge	- 7.25 psi gauge	58 psi gauge	87 psi gauge
30 psi	Gauge	- 7.25 psi gauge	58 psi gauge	87 psi gauge
50 psi	Gauge	- 15 psi gauge	145 psi gauge	174 psi gauge
100 psi	Gauge	- 15 psi gauge	217 psi gauge	290 psi gauge
200 psi	Gauge	- 15 psi gauge	500 psi gauge	725 psi gauge
250 psi	Gauge	- 15 psi gauge	500 psi gauge	725 psi gauge
500 psi	Gauge	- 15 psi gauge	1,400 psi gauge	1,700 psi gauge

---

## Declaration of Conformity

This declaration of conformity has been made in accordance with EN ISO/IEC 17050-1:2010

Manufacturer: Sens4 A/S  
Address: Nordre Strandvej 119G  
3150 Hellebaek  
Denmark

We hereby declare under our sole responsibility that the following products:

Product description: Pressure Transmitter  
Product part number: PCM-1-xxxx1x

Complies with the requirements of following relevant European Union harmonization directive:

Electromagnetic Compatibility (EMC) Directive 2014/30/EU  
RoHS Directive EU 2015/863

Conformity is assessed in accordance to the following standards:

Reference: Date	Title
EN61326-1: 2013	Product family standard, Measurement, control and laboratory equipment
EN50581: 2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Signed on behalf of: Sens4 A/S  
Place of issue: Hellebaek, Denmark  
Date of issue: April 11<sup>th</sup> 2018  
Signature:



Name, Title 

---

Ole Wenzel, Chief Executive Officer

This declaration of conformity is available online at: [www.sens4.com/doc.htm](http://www.sens4.com/doc.htm)

---

## Contact and support

This product has been engineered and made in Denmark by:

Sens4 A/S  
Nordre Strandvej 119G  
3150 Hellebaek  
Denmark

Phone: +45 88447044  
Email: [info@sens4.com](mailto:info@sens4.com)

Website: [www.sens4.com](http://www.sens4.com)

## Other featured products from Sens4

### TDM-1 Programmable temperature transmitter

- Programmable configuration with S4-Connect™
- -50 to +150 °C / -58 to +302 °F
- Class AA accuracy
- Dual MEMS temperature sensor probe
- Switch point with solid state relay
- 4-20 mA and 0-10 VDC output



### S4-Connect™ programmer

- Easy configuration of digital transmitter parameters
- Plug and play USB hardware
- Free software for configuration and measurement data acquisition
- Smart digital access through analog transmitter front end



For more information visit:

[www.sens4.com](http://www.sens4.com)



Our passion | Your value™