GEFRAN

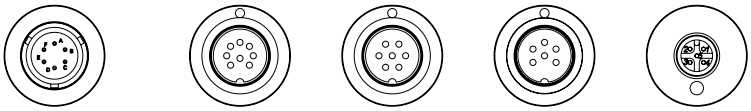
# IJ

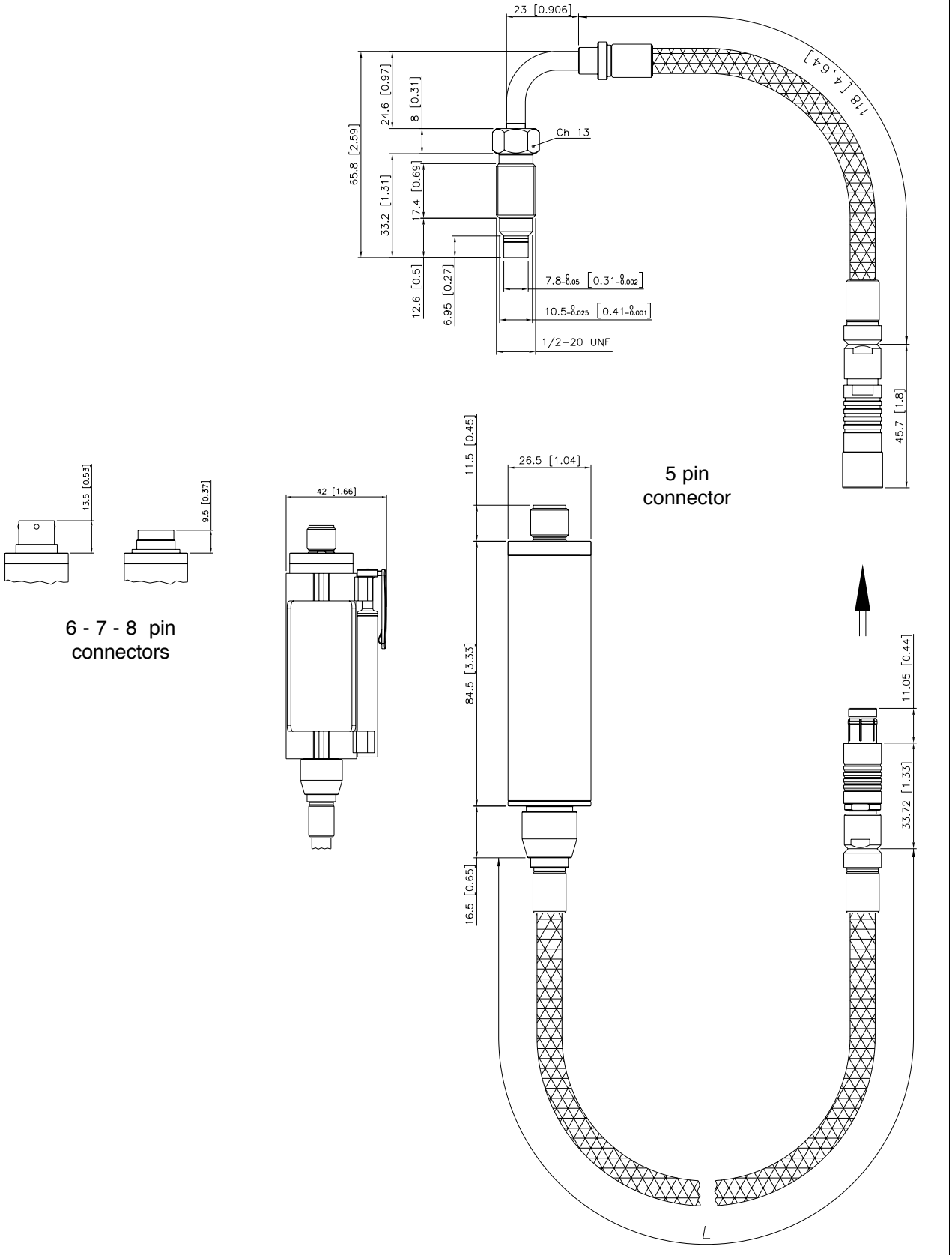
## INSTRUCTION MANUAL

***cod.*** *85179A Edit.* ***02 - 09-2010****-ENG*

**Contents**

# 1. MECHANICAL DIMENSIONS



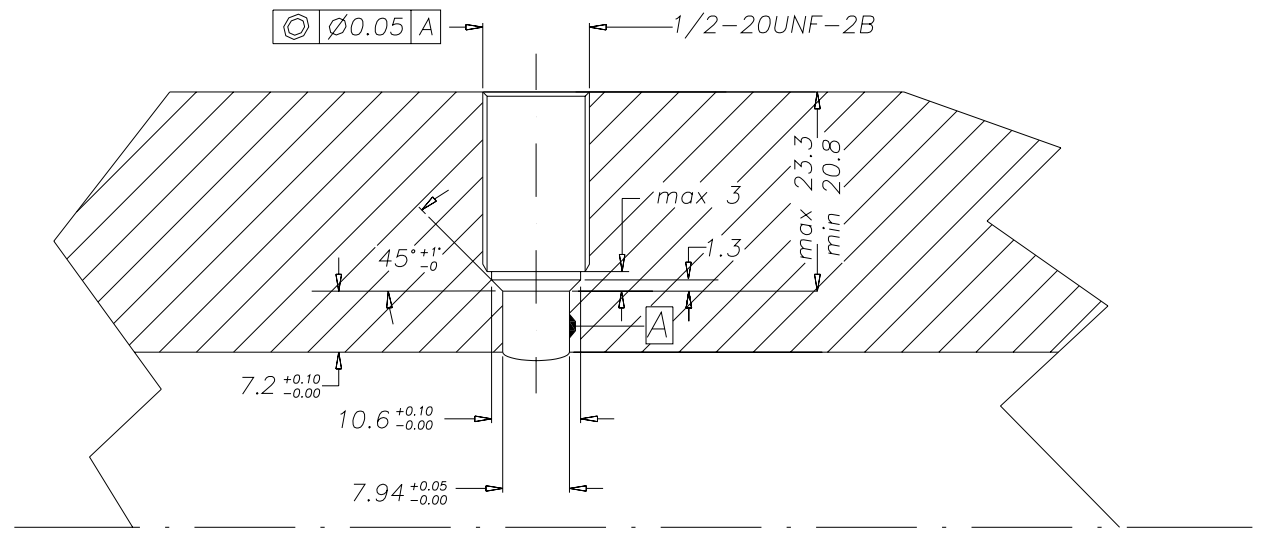


# 2. INSTALLATION AND POSITIONING ON THE MACHINE

## 2.a - Installation and positioning on the machine

The installation side should be as follow

**DETAIL OF HOUSINGS**




Incorrect working or shape of the side can result in properties out of specification, bad behaviour or damage to the sensor.

The side should be clean and without any polymer residual.

## 2.b - Torquing the sensor

After checking the correct shape of the side, screw the primary part of the IJ transducer.

Hold the flexible part while screwing the jam bushing.

For safety operations at least 10 pitch of the jam bushing must be screwed into the hole

The torque must be between 35 and 50 Nm.

## 2.c - Connecting amplifier

The electronics must be connected to the primary part by aligning the 2 red points on each connector.

Take care not to force the connectors together: check the correct aligning of the 2 red points

Fix the flexible sheath to the machine. Take care not to fix the sheath to parts heated at over than 200 °C.

Screw the electrical cable connector to the electronics and switch on the sensor.

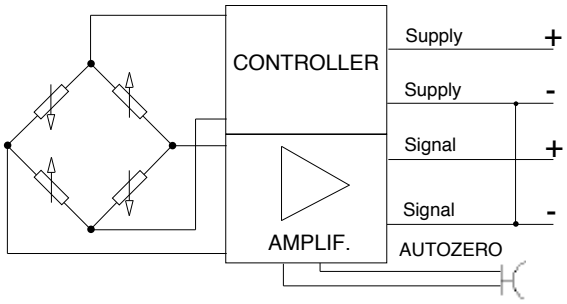
Wait 60 seconds before starting to operate the transducer.

To disconnect the electronics from the primary sensor, take care to handle the two connectors next to the red points and not to force the disconnection.

**NOTE**: in the modular versions, the decoupling between the electronics and the primary element is not allowed.

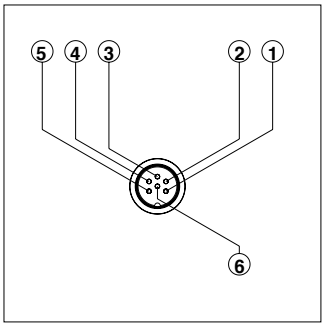
## OUTPUT VOLTAGE (N)

*15...30VDC power supply*

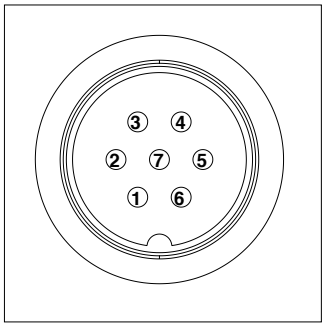



| 6-pin | 7-pin | 8-pin |
|---|---|---|
| 4 white | 4 white | 8 white |
| 5 green | 5 green | 2 black |
| 6 red | 6 red | 4 red |
| 1 black | 1 black | 2 black |
| 2 blue autozero -<br>3 orange autozero + | 2 blue autozero -<br>3orange autozero + | 1 blue<br>6 orange |
| | 7 NC | 3 - 5 - 7 NC |

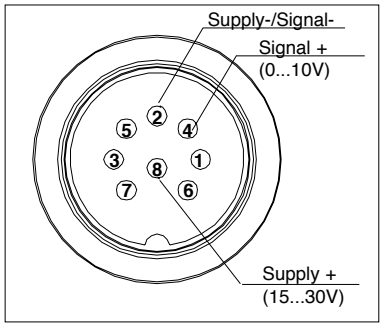
The shield is connected to the transducer body.




6 pin connector (Binder)
M16 DIN/EN45322
(09-0323-00-06)

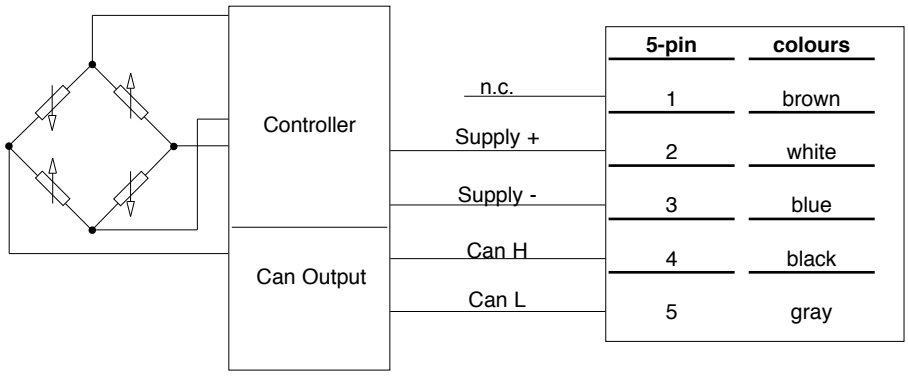



7 pin connector (Binder)
M16 DIN/EN50044
(09-0127-09-07)



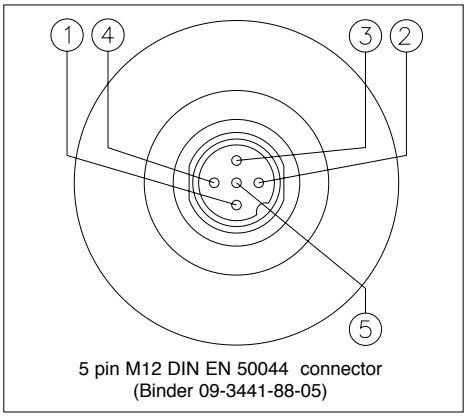

8 pin connector (Binder)
M16 DIN/EN45326
(09-0173-00-08)

## CAN BUS DP404 DIGITAL OUTPUT (D)




| 5-pin | colours |
|---|---|
| 1 | brown |
| 2 | white |
| 3 | blue |
| 4 | black |
| 5 | gray |

The shield is connected to the transducer body. We advise connection to mass and from instrument side.




5 pin M12 DIN EN 50044 connector
(Binder 09-3441-88-05)

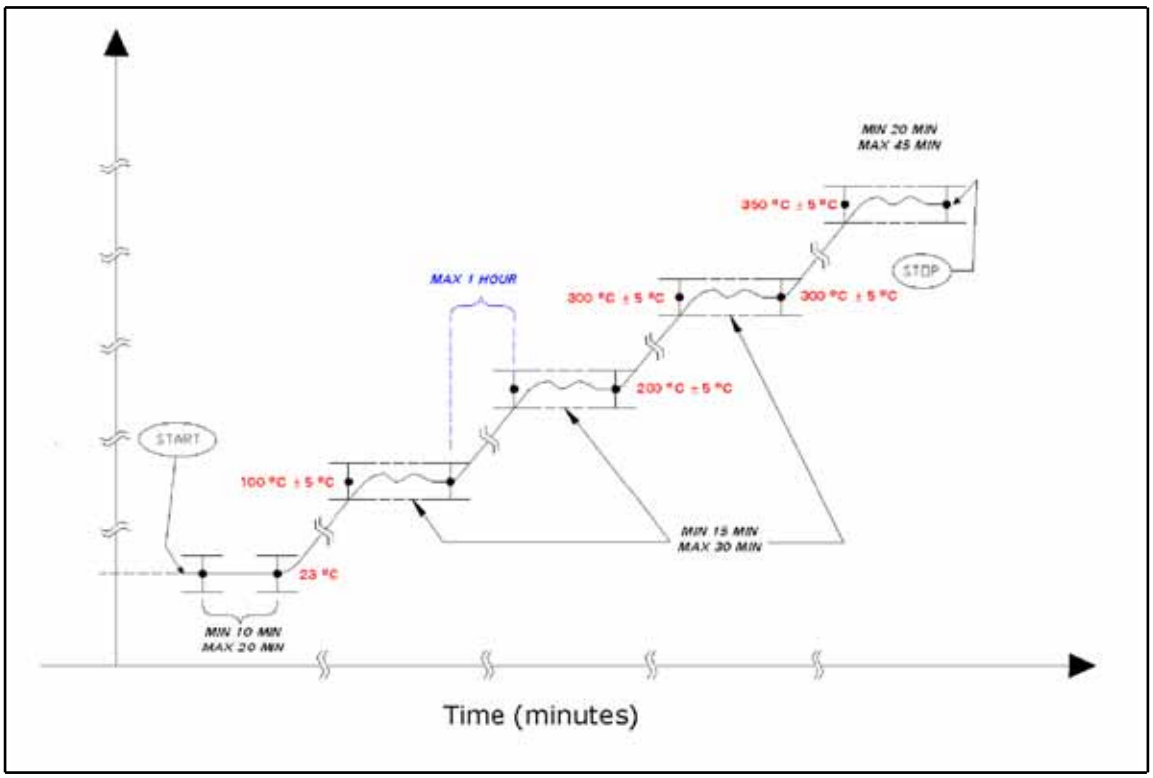
# 3. ELECTRONICS FEATURES AND PROCEDURES

## 3.a - Self learnign procedure to adjust the zero in temperature

This electronic new feature was developed to assure a reliable and accurate zero drift thermal compensation of the transducer into every single process.

Take care that the pressure inside the machine must be zero all the procedure long.

To complete the process the temperature profile at the sensor position should be set as follow:




Take care that the temperature gap between the set point and the real temperature on the sensor must be less than ± 10 °C

Take care to follow both temperature and time profile: unkept respect will result in aborting the procedure.

**0...10 V signal output**

The self learning is started by shorting the output pins E and F (or keeping in position the magnet) for a time between 10 and 15 seconds.
The LED next to the output electronics connector flashes three times to signal the start of the procedure.
During the self learning process the output of the transducer changes to point out the present state as in the following table:

| Present state | Electronic Output |
|---|---|
| Room temperature step | 2500 mV |
| 100 °C step | 3750 mV |
| 200 °C step | 5000 mV |
| 300 °C step | 6250 mV |
| 350 °C step | 10000 mV |

During the self learning process the led next to the output electronics connector signals the status:

1. Slow flashing: the temperature is under the set point
2. Quick flashing: the temperature is in the tolerance band of the set point but not still stable
3. Continuous light: the electronics is acquiring the zero value
4. Normal flashing: the temperature is above the set point

At the end the led flashes one time for signal the end of the procedure.

**CANOpen output**

The self learning is started by a write-access on Index 4002h subindex C8h.
This object is write-only and has the following structure:

| Index | Sub-Index | Parameter | Access |
|---|---|---|---|
| 4002h | C8h | Self learning | Wo |

The start of the self learning process will be generated by transmitting the code “auto” as ASCII in the data area of Index 4002h sub C8h.
The message has to look like the following example:
**Example**: Write-Access, Node-ID = 2, Index 4002h, Sub-Index = C8h

| ID | DLC | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1538 | 8 | 23h | 02h | 40h | C8h | 61h | 75h | 74h | 6Fh |

**Data-area = 6175746Fh --> 61h = “a”, 75h = “u”, 74h = “t”, 6Fh = “o”**

The answer after successful loading you will receive is:

| ID | DLC | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1410 | 8 | 60h | 02h | 40h | C8h | 00 | 00 | 00 | 00 |

The status of the Self Learning process can be checked into byte 6 of PDO2.
Firstly the user must enable PDO2 transmission (PDO2 is disabled by default) by a write-access on Index 1801h subindex 01h. The value on Sub-Index 1 defines the identifier that is used for PDO 2.
The default identifier is 280h + module-address.

The 32-bit value has the following structure:

| Bit 31 | Bit 30 – 11 | Bit 10 – 0 |
|---|---|---|
| 0 / 1 | 0 | ID 11 bit |

In order to enable the PDO the most significant bit (Bit 31) must be set to 0.

**Example**: Write-Access, Node-ID = 2, Index 1801h, Sub-Index = 01h

| ID | DLC | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1538 | 8 | 23h | 01h | 18h | 01h | 82h | 02h | 00h | 00h |

As answer you will receive from the transducer:

| ID | DLC | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1410 | 8 | 60h | 01h | 18h | 01h | 00h | 00h | 00h | 00h |

The identifier of the PDO 2 is now 00000282h and the PDO is active.

By sending the “OPERATIONAL” command, both PDO1 and PDO2 are sent.
In Byte 6 of PDO2 the status of the Self Learning process can be checked:

Byte 6 = 02h --> The process reached the 23°C point
Byte 6 = 03h --> The process went out of the 23°C point
Byte 6 = 04h --> The process went out of the 100°C point
Byte 6 = 05h --> The process went out of the 200°C point
Byte 6 = 06h --> The process went out of the 300°C point
Byte 6 = 07h --> The transducer is calculating
Byte 6 = 00h --> The process stopped

When the process ends the transducer sends an EMCY message that shows the result of the process:

Byte 1 – Byte 2 = 0000h --> NO ERROR, the process ran out correctly.
Byte 1 – Byte 2 = FF00h --> DEVICE ERROR, the process aborted.

After this procedure, the electronics use the new self learned parameters instead of that calibrated in factory. To reset the parameters and set the original ones, follow the instruction at paragraph “Reset to factory parameters”.

## 3.b - Autozero procedure

Every time it's necessary to zero the output signal of the transducer, follow the present procedure.

Take care that the pressure inside the chamber must be actually zero before doing the operation. Unkept respect can lead to hidden pressure dynamic range.

The output range that can be corrected by this feature is ± 30 % FSO.

**0...10 V signal output**

The autozero is started by shorting the output pins E and F (or keeping in position the magnet) for a time between 2 and 5 seconds.
The LED next to the output electronics connector flashes two times to signal the start of the procedure.
The output range that can be corrected by this feature is ± 30 % FSO.
After releasing the short circuit between pin E-F, the output signal of the sensor will be zero.

**CANOpen output**

The autozero process is started by writing on Index 6125h. The actual measuring value will be interpreted as zero. Internally the actual measuring value will be monitored to the manufacturer threshhold value. If the threshhold is exceeded, the autozero-access will lead to an error-message.
The object has the following structure:

| Index | Sub-Index | Parameter | Access |
|---|---|---|---|
| 6125h | 0 | Number of Sub-Index supported | Ro |
| | 1 | Autozero | Rw |
| | 2 | Reset Autozero | Rw |

The autozero process is started by transmitting the code "zero" as ASCII in the data area of Index 6125h sub1.
The message has the following format:

**Example**: Write-Access, Node-ID = 2, Index 6125h, Sub-Index = 01h

| ID | DLC | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1538 | 8 | 23h | 25h | 61h | 01h | 7Ah | 65h | 72h | 6Fh |

**Data-area = 7A65726Fh --> 7Ah = "z", 65h = "e", 72h = "r", 6Fh = "o"**

The answer (after successful storing of the message) you will receive is:

| ID | DLC | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1410 | 8 | 60h | 25h | 61h | 01h | 00h | 00h | 00h | 00h |

At the end of the autozero process an EMCY message is sent in order to show the result of the operation.The value of Byte 8 of the EMCY message shows the autozero process result:

Byte 8 = 02h --> autozero process ran out correctly.
Byte 8 = FEh --> autozero process aborted because the process value exceeded the allowed threshold.
Byte 8 = FFh --> autozero process aborted because another AUTO_ZERO process was already running.

This procedure is necessary at the first installation of the sensor: it should be done at stable temperature and after the first working cycles of the machine to compensate the torque effect and the stabilization of the sensor in its side.
To reset all the autozero operations, follow the instruction at paragraph "Reset autozero".

## 3.c - Reset Autozero procedure

**0...10V signal output**

The autozero is started by shorting the output pins E and F (or keeping in position the magnet) for a time between 20 and 25 seconds.
The LED next to the output electronics connector flashes two times to signal the start of the procedure.
The transducer is set to factory parameters, except for the zero drift self learned parameters.

**CANOpen output**

The reset autozero process is started by writing on Index 6125h.
The object has the following structure:

| Index | Sub-Index | Parameter | Access |
|---|---|---|---|
| 6125h | 0 | Number of Sub-Index supported | Ro |
| | 1 | Autozero | Rw |
| | 2 | Reset Autozero | Rw |

The reset autozero will be generated by transmitting the code “resz” as ASCII in the data area of Index 6125h sub2.
The message has the following format:

**Example**: Write-Access, Node-ID = 2, Index 6125h, Sub-Index = 02h

| ID | DLC | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1538 | 8 | 23h | 25h | 61h | 02h | 72h | 65h | 73h | 7Ah |

**Data-area = 7265737Ah --> 72h = “r”, 65h = “e”, 73h = “s”, 7Ah = “z”**

The answer (after successful storing of the message) you will receive is:

| ID | DLC | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1410 | 8 | 60h | 25h | 61h | 02h | 00h | 00h | 00h | 00h |

The transducer is set to factory parameters, except for the zero drift self learned parameters.

## 3.d - Reset to factory parameters

**0...10V signal output**

The reset to factory parameters is started by shorting the output pins E and F (or keeping in position the magnet) for a time between 30 and 35 sec.
The LED next to the output electronics connector flashes five times to signal the start of the procedure.
The transducer is set to factory parameters.

**CANOpen output**

*1. CAN DEFAULT PARAMETERS.*
By writing on Index 1011h the CAN default parameters can be loaded.
The object has the following struc-ture:

| Index | Sub-Index | Parameter | Access | Type |
|---|---|---|---|---|
| 1011h | 0 | Number of Sub-Index supported | Ro | Unsigned 8 |
| | 1 | Restore Default Parameters | Rw | Unsigned 32 |

The default parameters values are shown in the list below.

| Index | Name | Default |
|---|---|---|
| 6112h | Operating Mode | 1 (Channel On) |
| 6144h | Analog Input Lower limit | 0 |
| 6145h | Analog Input Upper limit | 0 |
| 2000h | Node – ID | 127d OR according to customer order |
| 2001h | Baudrate setting | 7d (500KB) |
| 6509h | Alarm 1 Action | 0 |
| 6519h | Alarm 2 Action | 0 |
| 750Ah | Alarm 1 Level | 0 |
| 750Bh | Alarm 1 Hysteresis | 0 |
| 751Ah | Alarm 2 Level | 0 |
| 751Bh | Alarm 2 Hysteresis | 0 |
| 7124h | Input Offset | 0 |
| 1014h | Emergency ID | 80h + ID |
| 1017h | Producer Time / Heart Beat | 0 ms |
| 1005h | SYNC-ID | 80 h |
| 1800h | PDO 1 – Parameter | PDO active, ID 180h + Node-ID, Transmission type FEh, Timer 14h |
| 1801h | PDO 2 – Parameter | PDO not active, ID 280h + Node-ID, Transmission type FEh, Timer 14h |

The loading will be generated by transmitting the code “load” as ASCII in the data-area of Index 1011h. The message has to look like the following example:

**Example**: Write-Access, Node-ID = 2, Index 1011h, Sub-Index = 01h

| ID | DLC | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1538 | 8 | 23h | 11h | 10h | 01h | 6Ch | 6Fh | 61h | 64h |

**Data-area = 6C6F6164h --> 6Ch = “l”, 6Fh = “o”, 61h = “a”, 64h = “d”**

The answer after successful loading you will receive is:

| ID | DLC | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1410 | 8 | 60h | 11h | 10h | 01h | 00h | 00h | 00h | 00h |

The transducer is set to factory CAN parameters.

*2. CALIBRATION DEFAULT PARAMETERS.*

By a write-access on Index 2241h the calibration value can be reloaded to default factory values.
This object is write-only and has the following structure:

| Index | Sub-Index | Parameter | Access |
|---|---|---|---|
| 2241h | C8h | Reset Calibration | Wo |

The loading will be generated by transmitting the code “rest” as ASCII in the data-area of Index 2241h subindex C8h. The message has to look like the following example:

**Example**: Write-Access, Node-ID = 2, Index 2241h, Sub-Index = C8h

| ID | DLC | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1538 | 8 | 23h | 41h | 22h | C8h | 72h | 65h | 73h | 74h |

**Data-area = 72657374h --> 72h = “r”, 65h = “e”, 73h = “s”, 74h = “t”**

The answer after successful loading you will receive is:

| ID | DLC | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 | Byte 6 | Byte 7 | Byte 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1410 | 8 | 60h | 41h | 22h | C8h | 00h | 00h | 00h | 00h |

The transducer is set to factory calibration parameters.

**0...10V signal output**

| Time for activation | Led flashing | Operation |
|---|---|---|
| 2 to 5 seconds | 2 flashes | Autozero function |
| 10 to 15 seconds | 3 flashes | Self learning function |
| 20 to 25 seconds | 4 flashes | Reset autozero |
| 30 to 35 seconds | 5 flashes | Reset to factory parameters |
| -- | 1 flash | Self learning procedure ended |
| -- | Slow flashing | Temperature under set point |
| -- | Normal flashing | Temperature above set point |
| -- | Quick flashing | Temperature in tolerance but not stable |
| -- | Continuous light | Acquiring data |

**CANOpen output**

*1. CAN MESSAGES*

| SDO sent | SDO received | PDO 2 | EMCY | OPERATION |
|---|---|---|---|---|
| 6125h sub 1h “zero” | 6125h sub1h data = 0 | - | Byte 8 = 02h | Autozero OK |
| | | | Byte 8 = FEh | Autozero aborted (out of threshold) |
| | | | Byte 8 = FFh | Autozero aborted |
| 4002h sub C8h “auto” | 4002h sub C8h data=0 | Byte 6 = 02h | - | Self learning 23 °C |
| | | Byte 6 = 03h | - | Self learning 100 °C |
| | | Byte 6 = 04h | - | Self learning 200 °C |
| | | Byte 6 = 05h | - | Self learning 300 °C |
| | | Byte 6 = 06h | - | Self learning 350 °C |
| | | Byte 6 = 07h | - | Self learning calculating |
| | | Byte6= 00h | Byte 1-2 = 0000h | Self learning stopped --> OK |
| | | Byte6= 00h | Byte 1-2 = FF00h | Self learning stopped --> ABORT |
| 6125h sub 2h “resz” | 6125 sub 2h data = 0 | - | - | Reset autozero OK |
| 1011h sub 1h “load” | 1011h sub 1h data = 0 | - | - | Restore CAN parameters |
| 2241h sub C8h “rest” | 2241h sub C8h data = 0 | - | - | Restore CALIBRATION parameters |

*2. LED STATUS*

After power-on the LED present on the top of the transducer will be turned on and off for a short moment and turned on again.

**Diagnosis in Pre-Operational State.**

| **Status of the LED** | **Meaning** |
|---|---|
| Quick flashing (2 times per second) | Device is in Pre-Operational state |
| Off | Supply voltage not ok, hardware not ok |
| Short Flashes every second (10ms flashes) | Input is left open or wrong sensor type |
| On | Supply Voltage ok but no CAN connection; maybe the wrong baudrate is selected or any other physical error on the bus |

**Diagnosis in Operational State.**

| **Status of the LED** | **Meaning** |
|---|---|
| Quick flashing (2 times per second) | Device is in Pre-Operational state |
| Slow blinking (1 Hz) | Device is in Operational State and there is communication with the device via CANbus |
| Short Flashes every second (10ms flashes) | Input is left open or wrong sensor type |
| On | Device is in Operational State but there is no communication |

# 4. TRANSDUCER TECHNICAL SPECIFICATIONS

## Technical Specifations

| | |
|---|---|
| Accuracy (**1**) | ±0,5%FSO |
| Repeatability | ±0,2%FSO |
| Measurement range | 3000bar / 40000psi |
| Overpressure without degrading | 3500 bar |
| Measurement principle | Piezoresistive |
| Power supply | 15...30Vdc (N), 12...40Vdc (D) |
| Maximum current absorption | 25mA (N) 40mA (D) (**2**) |
| Insulation resistance (at 50Vdc) | >1000 MOhm |
| Output signal Full Scale FSO | 10Vdc (N) Depends on FSO (D) |
| Zero balance tollerance (tolerance ± 0.25% FSO) | 0Vdc (N) - O (D) |
| Zero signals adjustment (tolerance ± 0.25% FSO) | "Autozero" function |
| Maximum allowed load | 1mA |
| Response time (10...90% FSO) | 1ms (N) 0,5ms - 2kHz (D) |
| Output noise (RMS 10-400Hz) | < 0.025% FSO |
| Output short circuit ingress and reverse polarity protection | YES |
| Voltage spike protection | > 2KV burst test, to EN61000-4-4 |
| CE conformity (standard 89/336) | EMC Emission EN61000-6-3<br>EMC Immunity EN61000-6-2 (10V/m) |
| Housing compensed temperature range | 0...+85°C |
| Housing operating temperature range | -30...+105°C |
| Housing storage temperature range | -40...+125°C |
| Sensor compensated temperature range | +20...+350°C |
| Maximum diaphragm temperature | 350°C / 660°F |
| Zero signal variation due to process temperature variation in range (100-350°C) | < ± 1%FSO |
| Full-scale signal variation due to process temperature variation in range (20-350°C) | < ± 1%FSO |
| Contact diaphragm with process | 15-5 PH GTP |
| Protection degree | IP65 |
| Electrical connection (0-10 V output) | 6-pin / 7-pin / 8-pin connector |
| Tightening torque | 30...45Nm |
| **CANopen OUTPUT (D)** | |
| Sampling | 16 bit (**3**) |
| Protocol | DP404 CANopen, with Baudrate selectable from 10k to 1MB (Default 500KB) |
| Electrical connection | 5 pin M12, DIN EN50044 connector |