

Data sheet

# Pressure transmitters

## EMP 2



The high accuracy pressure transmitter EMP 2 is designed for monitoring and control in marine and industrial applications and offers a reliable pressure measurement, even under harsh environmental conditions.

The flexible pressure transmitter programme covers absolute or gauge (relative) versions with zero and span adjustment with a 4 – 20 mA output signal.

It has all the necessary marine approvals. Special versions with integrated pulse-snubber available, designed for use in hydraulic applications with severe medium influences like cavitation, liquid hammer or pressure peaks.

\* For use in zone 2 explosive atmospheres.

### Features

- For use in Zone 2 explosive atmosphere

### Approvals

Lloyds Register of Shipping, LRS  
Germanischer Lloyd, GL  
Det Norske Veritas, DNV  
Registro Italiano Navale, RINA  
Bureau Veritas, BV

Nippon Kaiji Kyokai, NKK  
American Bureau of Shipping, ABS  
Korean Register of Shipping, KR  
China Classification Society, CCS  
Russian Maritime Register of Shipping, RMRS

**Technical data**
*Performance (EN 60770)*

|  |   |                            |               |
|--|---|----------------------------|---------------|
| Sensor temperature range                       | Normal  | -10 – 70 °C, (Ref. Fig. 1) |               |
|  | ATEX Zone 2   | -10 – 85 °C                |               |
| Transport / storage temperature                | -50 – 70 °C   |                            |               |
| Media temperature                              | -40 – 100 °C, (Ref. Fig. 1)   |                            |               |
| Media  | Water, fuel, oil, lubricating oil, refrigerants, ammonia, gas etc.  |                            |               |
| Voltage supply                                 | Max. 32 V and min. 12 V d.c. between terminals N and P  |                            |               |
| Load resistance                                | A. max. 410 Ω at 24 V d.c. 50% / -20%   |                            |               |
|  | B. max. 650 Ω at 24 V d.c. 50% / 0%   |                            |               |
| Zero point adjustment                          | - 5 – 20% range span; but max. -1–1.5 bar (kp/cm <sup>2</sup> )   |                            |               |
| Span adjustment                                | ± 5% of range span; max. ± 5 bar (kp/cm <sup>2</sup> )  |                            |               |
| Combination of span and zero point adjustments | - 5 – 20% of range span   |                            |               |
| Noise – immunity                               | Complies with the standard for industrial apparatus EN 61000-6-2. The standard contains tests for the following: HF fields, mains transmitted HF, voltage transients, electrostatic immunity, supply voltage variations, low-frequency radiation and transient protection in accordance with Germanischer Lloyd |                            |               |
| Noise – emission                               | Complies with standard EN 61000-6-3   |                            |               |
| Accuracy                                       |   |                            | < 0.3 % of FS |
|  | In vacuum (below 0 bar)   |                            | < 2.3 % of FS |
| Temperature dependence                         | Thermal zero point shift  | ≤ ± 0.06 % FS / °C         |               |
|  | Thermal sensitivity (span) shift  | ≤ ± 0.06 % FS / °C         |               |
| Voltage dependence                             | ≤ ± 0.1% FS / 10 V  |                            |               |
| Vibration stability                            | 3 – 30 Hz amplitude 1.13 mm and 30 – 300 Hz acceleration 4G according to IEC 60068-2-6. The requirements of the ship classification societies are up to 100 Hz, acceleration 4G. Extended specifications by prior arrangement   |                            |               |
| Time constant                                  | Liquids with viscosity < 100 cSt  | < 4 ms                     |               |
|  | Air and gas in combination with pulse snubber:  | < 35 ms                    |               |
| Shock stability                                | 500 g for 1 ms to IEC 60068-2-27  |                            |               |
| Enclosure                                      | IP67<br>Housings are made of enamelled pressure-die-cast aluminium (GD-AISI 12)   |                            |               |
| Pressure connection                            | G ¼, G ½ A standard, G 3/8 A mano   |                            |               |
| Net weight                                     | approx. 1 kg  |                            |               |
| Cable entry                                    | Pg 13.5 for cable diameters 5 – 14 mm   |                            |               |

*Explosive atmospheres*

|                     |   |                       |
|---------------------|---|-----------------------|
| Zone 2 applications | <b>II 3G</b><br><b>Ex nA IIA T3 Gc</b><br><b>-20C&lt;Ta&lt;+85C</b> | EN60079-0; EN60079-15 |
|---------------------|---|-----------------------|

When used in ATEX Zone 2 areas at temperatures <-10 °C the cable and plug must be protected against impact

*Identification*

The type designation and code number of the transmitter is embossed on the side of the housing at the bottom close to the pressure connector.

**Ordering**

(When ordering please state type and code number)

*Pressure in bar*

| Operating pressure<br>$p_e$ [bar] | Test pressure<br>$p_e$ [bar] | Min. burst pressure<br>$p_e$ [bar] | Code no. EMP 2 |          |
|-----------------------------------|------------------------------|------------------------------------|----------------|----------|
|                                   |                              |                                    | G ½ A          | G 3/8 A  |
| -1 – 1.5 <sup>2)</sup>            | 5                            | 100                                | 084G2100       | -        |
| -1 – 5 <sup>2)</sup>              | 35                           | 200                                | 084G2101       | -        |
| 0.2 – 1                           | 3.2                          | 100                                | 084G2102       | -        |
| 0 – 1.6                           | 3.2                          | 100                                | 084G2104       | -        |
| 0 – 2.5                           | 5                            | 200                                | 084G2105       | -        |
| 0 – 4                             | 8                            | 200                                | 084G2106       | 084G2206 |
| 0 – 6                             | 18                           | 400                                | 084G2107       | 084G2207 |
| 0 – 6                             | 60 <sup>1)</sup>             | 400                                | 084G2108       | -        |
| 0 – 10                            | 20                           | 400                                | 084G2109       | 084G2209 |
| 0 – 10                            | 60 <sup>1)</sup>             | 400                                | 084G2110       | -        |
| 0 – 16                            | 32                           | 400                                | 084G2111       | 084G2211 |
| 0 – 25                            | 50                           | 400                                | 084G2112       | -        |
| 0 – 40                            | 80                           | 400                                | 084G2113       | 084G2213 |
| 0 – 60                            | 120                          | 400                                | 084G2114       | -        |
| 0 – 100                           | 200                          | 400                                | 084G2115       | -        |
| 0 – 160                           | 260                          | 640                                | 084G2116       | -        |
| 0 – 250                           | 375                          | 1000                               | 084G2117       | -        |
| -1 – 9 <sup>2)</sup>              | 20                           | 400                                | 084G2120       | -        |

<sup>1)</sup> With pulse snubber

<sup>2)</sup> Sealed gauge

*Pressure in kp/cm<sup>2</sup>*

| Operating pressure<br>$p_e$ [kp/cm <sup>2</sup> ] | Test pressure<br>$p_e$ [kp/cm <sup>2</sup> ] | Min. burst pressure<br>$p_e$ [kp/cm <sup>2</sup> ] | Code no. EMP 2 |          |
|---|--|--|----------------|----------|
|   |  |  | G ½ A          | G 3/8 A  |
| -1 – 5 <sup>2)</sup>                              | 35   | 200  | 084G2131       | -        |
| 0 – 4   | 8  | 200  | 084G2136       | 084G2157 |
| 0 – 6   | 18   | 400  | 084G2137       | 084G2158 |
| 0 – 10  | 20   | 400  | -              | 084G2179 |
| 0 – 15  | 32   | 400  | 084G2141       | 084G2159 |
| 0 – 25  | 50   | 400  | 084G2142       | -        |
| 0 – 40  | 80   | 400  | 084G2143       | 084G2169 |
| 0 – 50  | 120  | 400  | 084G2144       | -        |
| 0 – 20  | 50   | 400  | 084G2154       | -        |

<sup>1)</sup> With pulse snubber

<sup>2)</sup> Sealed gauge

Installation conditions

Max. ambient temperature as a function of temperature

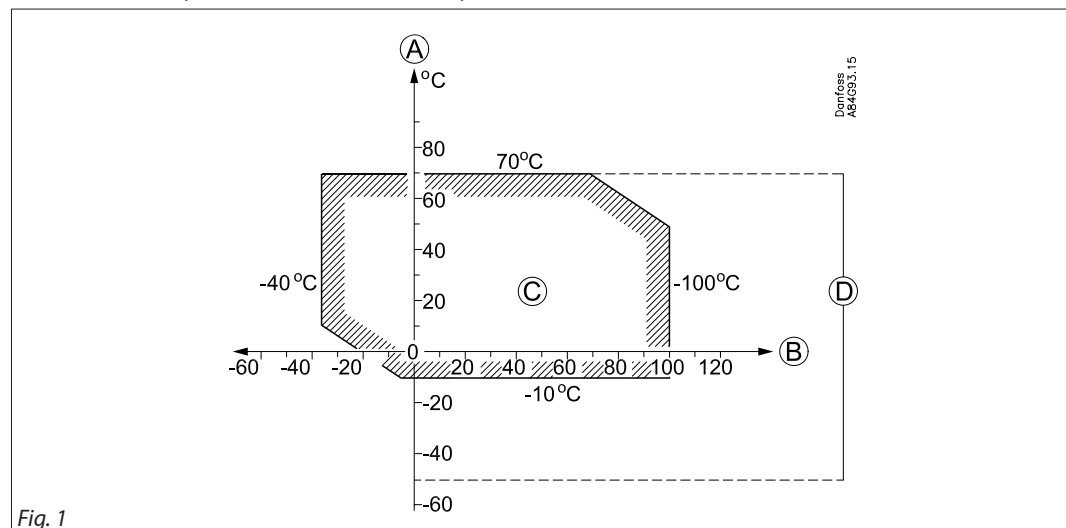


Fig. 1

- A: Ambient temperature
- B: Temperature and medium
- C: Operating range
- D: Transport and storage temperature

Mounting

Type EMP 2 is equipped with a 3 mm steel bracket for mounting.

Pressure connection

Connector with outside cylindrical thread G 1/2, some types available with G 3/8 A mano, and inside cylindrical thread G 1/4, to ISO 228.

The primary insertion length of the connector corresponds to EN 837. Connection to the transmitter is made through a connector with a spanner flat, 14 mm across flats.

When fitting or removing pressure lines, the spanner flats on the pressure connector should be used to apply counter-torque.

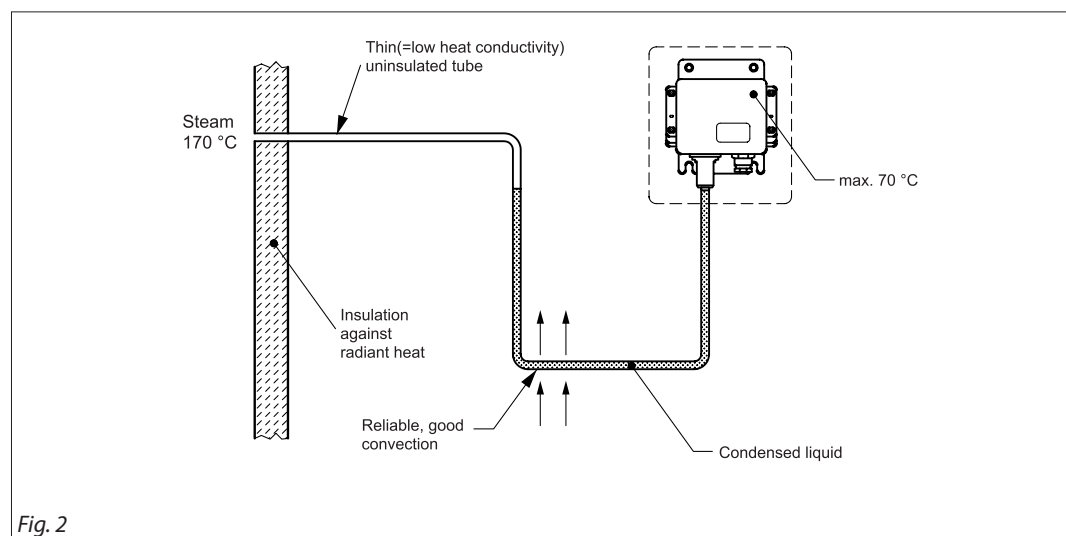


Fig. 2

Water systems

Water in the pressure element is not harmful, but in the event of frost a water-filled pressure element may burst. To prevent this the transmitter should be allowed to operate on an air cushion.

Steam plant

To protect the pressure element against temperatures in excess of the maximum temperature for the medium (100 °C), the insertion of a water-filled loop is recommended. In the example, fig. 2, insulation against radiant heat is also shown.

**Application and media conditions**

- 1: Surge damper
- 2: Pump
- 3: Valve
- 4: Tank

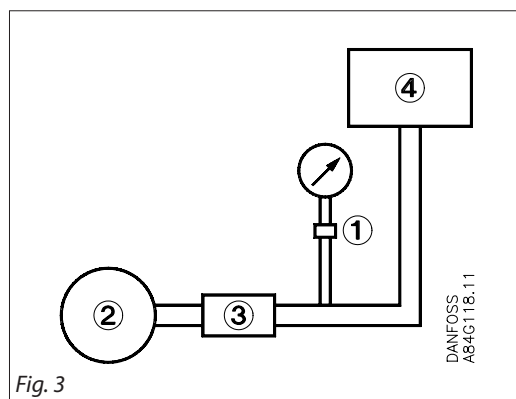


Fig. 3

In cases where valves are closed momentarily, surges of a value in excess of that for which the pressure element is designed can occur. To avoid damage to the pressure element, a damper should be fitted.

The device can consist of a flexible pipe, a throttle, a shock valve, or a combination of these items. The amplitude of surges should never exceed the maximum pressure range of the pressure transmitter.

**Electrical connection**

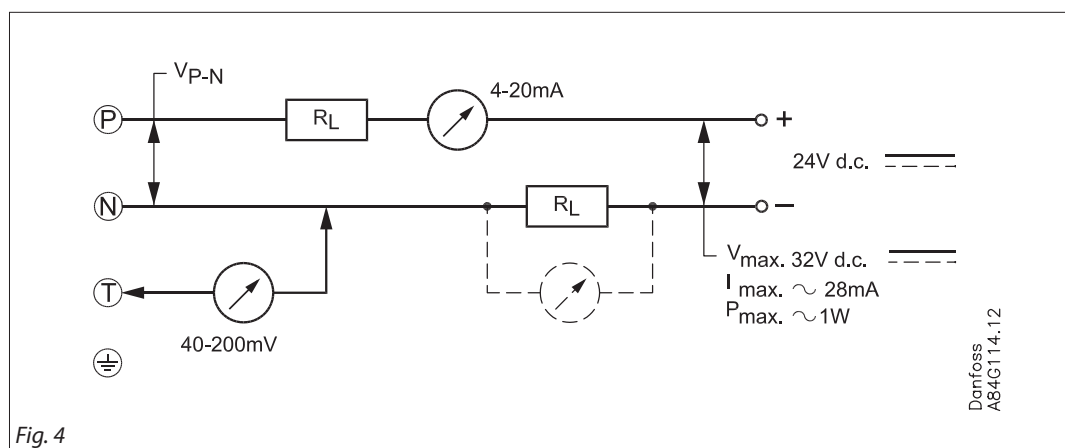
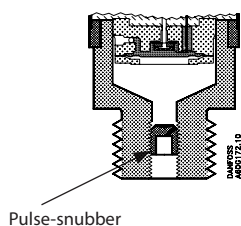


Fig. 4

The transmitter has a wiring diagram, see fig. 4. Terminals P (positive) and N (negative) are connection terminals for the supply voltage.

The same leads are used for supply voltage and output signal. A function test can be performed between terminals N and T without cutting off the current loop.

**Pulse snubber**



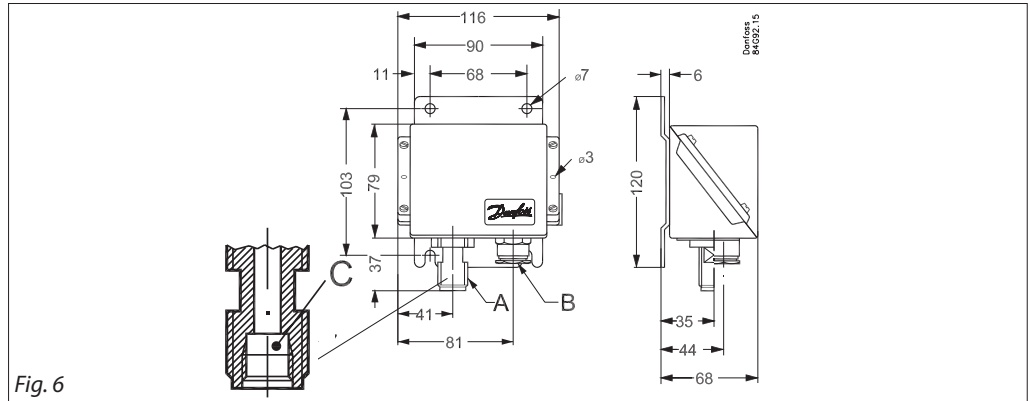
Pulse-snubber

EMP 2 with the pressure range 0 – 6 bar and 0 – 10 bar at extended test pressure is provided with an integrated pulse snubber for protection of the sensor element against cavitations and air bubbles in the media due to extreme pressure peaks and pulsations. Such conditions may be caused by pumps or fast operation valves in both high and low pressure systems.

The integrated pulse snubber is designed as an 0.3 mm orifice mounted in the pressure connection. The medium should not contain particles which may clog up in the orifice.

The viscosity has only little effect on the response time. Even at liquid viscosities up to 100 Cst the response time will not exceed 4 ms.

**Dimensions and weight**



A: G 1/2 A (G 3/8 A mano)  
 B: Pg 13.5  
 C: G 1/4  
 Net weight 1 kg

**Accessories**

| Part                   | Symbol | Description  | Material        | Code no.          |
|------------------------|--------|--|-----------------|-------------------|
| Damping coil           |        | Damping coil with G 3/8 unions and 1.5 m copper capillary tube.                                  | Copper          | <b>060-104766</b> |
| Damping coil           |        | Damping coil with G 1/2 unions and 1 m capillary tube. Standard washers supplied                 | Stainless steel | <b>060-016966</b> |
| Damping coil, armoured |        | Damping coil with G 3/8 unions and 1 m armoured copper capillary tube. Standard washers supplied | Copper          | <b>060-333366</b> |
| Nipple                 |        | G 1/4 A x G 3/8 A with copper washer   | Brass           | <b>060-333266</b> |
|                        |        | G 1/4 A x M10 ext. x 1 with copper washer  | Brass           | <b>060-333866</b> |

**Conversion table**

|                      | Pascal<br>(= Newton per square metre)<br>[N/m <sup>2</sup> ] Pa | Newton per square [mm]<br>[N/mm <sup>2</sup> ] | [bar]                    | Kilopond per square metre<br>[mm] H <sub>2</sub> O<br>[kp/m <sup>2</sup> ] | Meter water gauge<br>[m] H <sub>2</sub> O | Technical atmosphere<br>[kp/cm <sup>2</sup> ]<br>[at] | Physical atmosphere<br>[atm] | Torr<br>[0 °C]<br>[mm] Hg | Inches Hg [0 °C]<br>[in] Hg | Poundforce per Square inch<br>[lbf/in <sup>2</sup> ] psi |
|----------------------|---|--|--------------------------|--|---|---|------------------------------|---------------------------|-----------------------------|--|
| 1 Pa                 | 1   | 10 <sup>-6</sup>                               | 10 <sup>-5</sup>         | 0.1020   | 1.020 · 10 <sup>-4</sup>                  | 1.020 · 10 <sup>-5</sup>                              | 9.869 · 10 <sup>-5</sup>     | 7.500 · 10 <sup>-3</sup>  | 2.953 · 10 <sup>-4</sup>    | 1.450 · 10 <sup>-4</sup>                                 |
| 1 N/mm <sup>2</sup>  | 10 <sup>6</sup>   | 1  | 10                       | 1.020 · 10 <sup>5</sup>  | 10.20                                     | 10.20   | 9.869                        | 7.5 · 10 <sup>3</sup>     | 295.3                       | 145.0  |
| 1 bar                | 10 <sup>5</sup>   | 0.1  | 1                        | 10.197 · 10 <sup>3</sup>   | 10.20                                     | 1.020   | 0.9869                       | 750                       | 29.53                       | 14.50  |
| 1 kp/m <sup>2</sup>  | 9.80665   | 9.807 · 10 <sup>-6</sup>                       | 9.807 · 10 <sup>-5</sup> | 1  | 10 <sup>-3</sup>                          | 10 <sup>-4</sup>                                      | 0.9678 · 10 <sup>-4</sup>    | 0.07355                   | 2.896 · 10 <sup>-3</sup>    | 1.422 · 10 <sup>-3</sup>                                 |
| 1 m H <sub>2</sub> O | 9806.7  | 9.807 · 10 <sup>3</sup>                        | 0.09807                  | 1000   | 1   | 0.1   | 0.09678                      | 73.55                     | 2.896                       | 1.422  |
| 1 at                 | 98.066 · 10 <sup>3</sup>  | 0.09807  | 0.9807                   | 10 <sup>4</sup>  | 10  | 1   | 0.9678                       | 735.5                     | 28.96                       | 14.22  |
| 1 atm                | 101.325 · 10 <sup>3</sup>                                       | 0.1013   | 1.013                    | 10.333 · 10 <sup>3</sup>   | 10.33                                     | 1.033   | 1                            | 760                       | 29.92                       | 14.70  |
| 1 mm Hg              | 133.32  | 1.333 · 10 <sup>-4</sup>                       | 1.333 · 10 <sup>-3</sup> | 13.60  | 0.01360                                   | 1.360 · 10 <sup>-3</sup>                              | 1.316 · 10 <sup>-3</sup>     | 1                         | 0.03937                     | 1.934 · 10 <sup>-2</sup>                                 |
| 1 in Hg              | 3387  | 3.387 · 10 <sup>-3</sup>                       | 0.03387                  | 345.3  | 0.3453                                    | 0.03453   | 0.03342                      | 25.4                      | 1                           | 0.4912   |
| 1 psi                | 6895  | 6.895 · 10 <sup>-3</sup>                       | 0.06895                  | 703.1  | 0.7031                                    | 0.07031   | 0.06804                      | 51.71                     | 2.036                       | 1  |

Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without consequential changes being necessary in specifications already agreed. All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.