

## Data Sheet

# Intrinsically safe pressure transmitter

## Type **MBS 4201** and **MBS 4251**



The intrinsically safe pressure transmitter program is designed for use in hazardous environments and offers a reliable pressure measurement, even in harsh applications with severe medium influences like cavitation, liquid hammer or pressure peaks.

The MBS 4201 and MBS 4251 are Ex ia IIC T5...T4 explosion protected according to the ATEX directive 2014/34/EU. The series come with 4 – 20 mA output signal, absolute or gauge (relative) versions, measuring ranges from 0 – 1 to 0 – 600 bar, plug connection and a wide range of pressure connections.

Excellent vibration stability, robust construction, and a high degree of EMC/EMI protection equip the pressure transmitter to meet the most stringent industrial requirements.

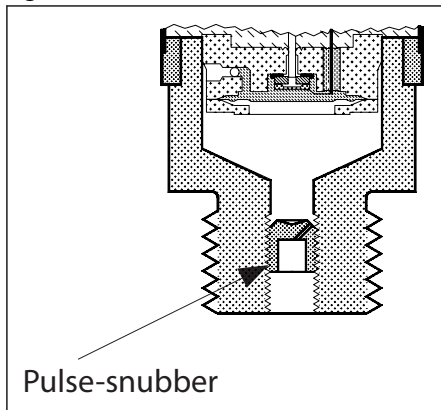
## Features

- In compliance with ATEX directive 2014/34/EU:
  - Ex ia IIC T5...T4
- Applicable in potentially explosive atmosphere:
  - Zone 0, Zone 1, Zone 2 (gases and vapour)
- Enclosure and wetted parts of acid-resistant stainless steel (AISI 316L)
- Pressure ranges in relative (gauge) or absolute from 0 up to 600 bar
- Output signal: 4 – 20 mA
- Marine approved
- A wide range of pressure connections
- Fully digitally compensated
- MBS 4251 with integrated pulse snubber for protection against cavitation and liquid hammering
- Certification:
  - ATEX
  - IECEx
  - UKCA Ex

## Application

### **Application and media conditions for MBS 4251**

Figure 1: Pulse-snubber



#### Application

Cavitation, liquid hammer and pressure peaks may occur in hydraulic systems with changes in flow velocity, e.g. fast closing of a valve or pump starts and stops.

The problem may occur on the inlet and outlet side, even at rather low operating pressures.

#### Media condition

Clogging of the nozzle may occur in liquids containing particles. Mounting the transmitter in an upright position minimizes the risk of clogging, because the flow in the nozzle is restricted to the start-up period when the dead volume behind the nozzle orifice is relatively big (0.3 mm). The media viscosity has only little effect on the response time. Even at a viscosities up to 100 cSt, the response time will not exceed 4 ms.

**Product specification**

**Technical data**

**Performance (EN 60770)**

Table 1: Performance (EN 60770)

MBS type	Standard version	
	MBS 4201	MBS 4251
Accuracy at 20 °C	–	with pulse snubber
	± 1% FS	± 1% FS
Total Error Band (incl. non-linearity, hysteresis, repeatability, thermal)		
Figure 2: Total error band ≤ 500 bar		
Figure 3: Total Error Band >500 bar		
Response time	Liquids with viscosity < 100 cSt	< 4 ms
	Air and gases	< 4 ms
Overload pressure (static)	6 × FS (max. 1500 bar)	
Burst pressure	> 6 × FS (max. 2000 bar)	
Power-up time	< 50 ms	
Durability, P: 10 – 90% FS	> 3 × 10 <sup>6</sup> cycles	

Figure 2: Total error band ≤ 500 bar

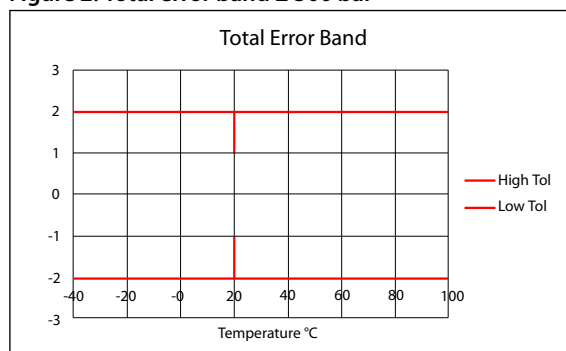
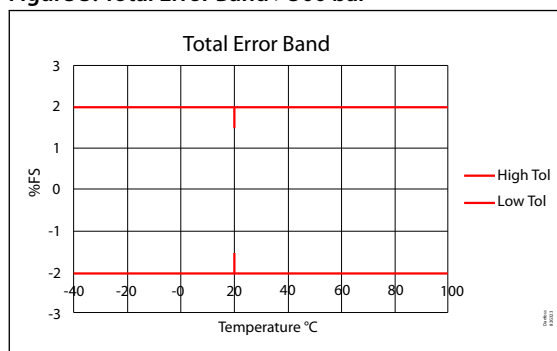


Figure 3: Total Error Band >500 bar



**Electrical specification**

Table 2: Electrical specifications

Nom. output signal (short circuit protected)	4 – 20 mA
Supply voltage, U <sub>B</sub> (polarity protected)	10 – 28 V DC
Output limitation	22.4 mA
Load [R <sub>L</sub> ] (load connected to 0 V)	$R_L \leq \frac{U_B - 10V}{0.02 A} [\Omega]$

**Environmental conditions**

Table 3: Environmental conditions

Media temperature range	See <a href="#">Electrical connections</a>	
Ambient temperature range (depending on electrical connection)	See <a href="#">Electrical connections</a>	
Compensated temperature range	0 – 100 °C	
Transport temperature range	Plug version / cable version	-50 – 100 °C / -30 – 80 °C
EMC - Emission	EN 61000-6-3	
EMC - Immunity	EN 61000-6-2	
Insulation resistance	> 100 MΩ at 500 V	
Vibration stability	Sinusoidal	20 g, 5 Hz – 2 kHz
	Random	7.5 g <sub>rms</sub> , 5 Hz – 1 kHz
Shock resistance	Shock	500 g / 1ms
	Free fall	1 m
Enclosure (depending on electrical connection)	See page 6	

## Mechanical characteristics

Table 4: Mechanical characteristics

<b>Materials</b>	<b>Wetted parts</b>	EN 10088-1; 1.4404 (AISI 316 L)
	<b>Enclosure</b>	EN 10088-1; 1.4404 (AISI 316 L)
<b>Net weight (depending on pressure connection)</b>		0.2 – 0.3 kg

## Electrical connections

Table 5: Electrical connections

Type code page 5	A1	DB	DC
	EN 175301-803-A	Cable versions, 2m	Cable versions, 5m
Material	Glass filled polyamid, PA 6.6	PVC cable	PVC cable
Enclosure <sup>(1)</sup>	IP65	IP67	IP67
<b>Ex-certification - Conformity specifications</b>			
<b>Ambient temperature</b>			
Ex ia IIC T4	-40 – 100 °C	-40 – 100 °C <sup>(2)</sup> / -5 – 70 °C <sup>(3)</sup>	-40 – 100 °C <sup>(2)</sup> / -5 – 70 °C <sup>(3)</sup>
Ex ia IIC T5	-40 – 75 °C	-40 – 75 °C <sup>(2)</sup> / -5 – 70 °C <sup>(3)</sup>	-40 – 75 °C <sup>(2)</sup> / -5 – 70 °C <sup>(3)</sup>
<b>Media temperature</b>			
Ex ia IIC T4	-40 – 100 °C	-40 – 100 °C	-40 – 100 °C
Ex ia IIC T5	-40 – 75 °C	-40 – 75 °C	-40 – 75 °C
Power supply U <sub>i</sub>	28 V dc	28 V dc	28 V dc
Max. input current I <sub>i</sub>	100 mA	100 mA	100 mA
Max. input power P <sub>i</sub>	0.7 W	0.7 W	0.7 W
Internal capacity C <sub>i</sub>	< 66 nF	< 66 nF incl. 0.2 nF / meter cable	< 66 nF incl. 0.2 nF / meter cable
Internal inductivity L <sub>i</sub>	< 8 μH	< 8 μH incl. 0.8 μH / meter cable	< 8 μH incl. 0.8 μH / meter cable
Electrical connection, 4 – 20 mA output (2 wire)	Pin1: + supply Pin 2: - supply Pin 3: not used  Earth: Connected to MBS enclosure	Black 1: + supply Black 2: - supply Screen: not connected to MBS enclosure	Black 1: + supply Black 2: - supply Screen: not connected to MBS enclosure

<sup>(1)</sup> IP protection fulfilled together with mating connector

<sup>(2)</sup> Fixed installation

<sup>(2)</sup> Fixed installation

<sup>(3)</sup> Cables flexed during operation

<sup>(3)</sup> Cables flexed during operation

## Dimensions/Combinations

Figure 4: Dimensions/Combinations

Type code	A1	DB	DC		
	EN175301-803-A, Pg 9	2 m screened ex cable	5 m screened ex cable		
	G ¼ (DIN 3852-E)	G ½ A (EN 837)	¼ – 18 NPT	½ – 14 NPT	ISO 6149-2 M14 x 1.5 - 6g Incl. O-ring NBR
Type code	GB04	AB08	AC04	AC08	FA08
Recommended torque <sup>1)</sup>	30 – 35 Nm	30 – 35 Nm	2 – 3 turns after finger tightened	2 – 3 turns after finger tightened	30 – 35 Nm

<sup>1)</sup> Depends of different parameters such as gasket material, mating material, thread lubrication and pressure level

## Ordering

### Ordering special versions

Figure 5: Ordering special versions

MBS 4201 MBS 4251	1 - - - - - - - - - -																				
											<p><b>Gasket material</b></p> <table border="1" style="width: 100%;"> <tr><td style="width: 20px; text-align: center;">0</td><td>No gasket</td></tr> <tr><td style="text-align: center;">1</td><td>Gasket, Viton -20 – 125°C</td></tr> </table>	0	No gasket	1	Gasket, Viton -20 – 125°C						
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1	Gasket, Viton -20 – 125°C																				
											<p><b>Pressure connection</b></p> <table border="1" style="width: 100%;"> <tr><td style="width: 20px; text-align: center;">A B 0 8</td><td>G ½ A (EN 837)</td></tr> <tr><td style="text-align: center;">A C 0 4</td><td>¼ – 18 NPT</td></tr> <tr><td style="text-align: center;">A C 0 8</td><td>½ – 18 NPT</td></tr> <tr><td style="text-align: center;">G B 0 4</td><td>G ¼ (DIN 3852-E);</td></tr> <tr><td style="text-align: center;">F A 0 8</td><td>ISO 6149-2, M14 × 1.5 – 6 g</td></tr> </table>	A B 0 8	G ½ A (EN 837)	A C 0 4	¼ – 18 NPT	A C 0 8	½ – 18 NPT	G B 0 4	G ¼ (DIN 3852-E);	F A 0 8	ISO 6149-2, M14 × 1.5 – 6 g
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											<p><b>Electrical connection</b></p> <p>Figures refer to plug and standard PIN configuration - see page 6</p> <table border="1" style="width: 100%;"> <tr><td style="width: 20px; text-align: center;">A1</td><td>Angular connector (EN 175301-803-A) Pg 9</td></tr> <tr><td style="text-align: center;">DB</td><td>Screened ex cable, 2m</td></tr> <tr><td style="text-align: center;">DC</td><td>Screened ex cable, 5m</td></tr> </table>	A1	Angular connector (EN 175301-803-A) Pg 9	DB	Screened ex cable, 2m	DC	Screened ex cable, 5m				
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<b>Measuring range</b>																					
0 – 1.0 bar											1 0										
0 – 1.6 bar											1 2										
0 – 2.5 bar											1 4										
0 – 4.0 bar											1 6										
0 – 6.0 bar											1 8										
0 – 10 bar											2 0										
0 – 16 bar											2 2										
0 – 25 bar											2 4										
0 – 40 bar											2 6										
0 – 60 bar											2 8										
0 – 100 bar											3 0										
0 – 160 bar											3 2										
0 – 250 bar											3 4										
0 – 400 bar											3 6										
0 – 600 bar											3 8										
											1										
<b>Pressure reference</b>																					
Gauge (relative)											1										
Absolute											2										
Sealed gauge											3										
<p><span style="display: inline-block; width: 15px; height: 10px; background-color: #cccccc; border: 1px solid black; margin-right: 5px;"></span> Preferred vesions</p>																					

**NOTE:** Non-standard build-up combinations may be selected. However, minimum order quantities may apply. Please contact your local Danfoss office for further information.

## Certificates, declarations and approvals

The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

Some approvals may change over time. You can check the most current status at [danfoss.com](http://danfoss.com) or contact your local Danfoss representative if you have any questions.

### Valid approvals

- Det Norske Veritas/Germanischer Lloyd, DNV GL
- Lloyds Register of Shipping, LR
- Bureau Veritas; BV

### **Safety instructions**

The transmitter must always be supplied from an intrinsic safety barrier. All national safety regulations must be complied with in connection with installation, start-up and operation of Danfoss pressure transmitters type MBS 4201 and MBS 4251. Furthermore, the requirements of the Declaration of Conformity and national regulations for installation in explosion areas apply. Disregarding such regulations involves a risk of serious personal injury or extensive material damage. Work in connection with the pressure transmitters mentioned must be performed only by suitably qualified persons.

### **Ex requirements are fulfilled through certificates No :**

- Ex ia IIC T5...T4 Ga/Gb
  - DEMKO 01 ATEX 127938X
  - IECEX ULD 12.0005X
  - UKEX UL22UKEX2660X

### **Special Ex protection instructions:**

In the event of damage to enclosure or diaphragm, the pressure transmitter must be replaced. The end user must ensure the installation is made in accordance to EN/IEC60079-25 and EN/IEC60079-14.

#### **⚠ WARNING:**

Potential Electrostatic Charging Hazard. The transmitter must only be installed in surroundings with low wind speed, and where rubbing on the plug is unlikely. Cleaning with a damp cloth is recommended. To avoid build-up of electrostatic discharge it must be ensured the pressure connection of the pressure transmitter is having a reliable connection to earth with an impedance no exceeding 1 Gohm.

MBS transmitters contain 1.2 nF capacitance from any input terminal to earth.

### **Demands on the medium**

Parts in contact with the medium are made of stainless steel, EN 1088-1 1.4404 (AISI 316L). The user is responsible for a careful analysis of all process parameters when materials have to be specified and for ensuring the process medium is neutral to stainless steel as some media can be corrosive.

The end user must ensure that the process connection is gas tight (as required by EN/IEC60079-26) which may require the use of a suitable gasket/seal in combination with the process connection to obtain a gas-tight connection. Gaskets and seals used at the pressure connection, including those supplied with the transmitters, must be determined as being suitable for use with the process medium and process pressure/temperature before use and alternative gasket material chosen if necessary. The end user must ensure the transmitter pressure connection is tightened with the correct torque as required for the specific thread type.

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