

Data sheet

# Intrinsically safe pressure transmitter

## MBS 4201, MBS 4251, MBS 4701 and MBS 4751



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 T6...T4 explosion protected according to the ATEX directive 94/9/EC whereas the MBS 4701 and MBS 4751 are Ex ia IIC T4 explosion protected. Both series come with 4 – 20 mA output signal, absolute or gauge (relative) versions, measuring ranges from 0 – 1 to 0 – 600 bar, zero point and span adjustment, 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.

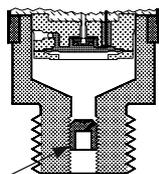
### Features

- In compliance with ATEX directive 94/9/EC:
  - Ex ia IIC T6...T4 (MBS 42xx series)
  - Ex ia IIC T4 (MBS 47xx series)
- 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
- Temperature compensated and laser calibrated
- MBS 4251 and MBS 4751 with integrated pulse snubber for protection against cavitation and liquid hammering
- MBS 4701 and MBS 4751 zero and span adjustment

### Approvals

#### MBS 4201 and MBS 4251:

- Bureau Veritas, BV
- Det Norske Veritas, DNV
- Lloyds Register of Shipping, LR
- American Bureau of Shipping ABS

**Application and media conditions for MBS 4251 and MBS 4751**


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.

**Ordering standard versions MBS 4701**

Plug: Pg 9 (EN 175301-803-A)

Output: 4 – 20 mA

Pressure connection: G ½ A (EN 837)

Type no.	Measuring range Pe <sup>1)</sup> [bar]	Code number
MBS 4701-1011-1AB08	0 – 1	060G4303
MBS 4701-1211-1AB08	0 – 1.6	060G4300
MBS 4701-1411-1AB08	0 – 2.5	060G4304
MBS 4701-1611-1AB08	0 – 4	060G4305
MBS 4701-1811-1AB08	0 – 6	060G4306
MBS 4701-2011-1AB08	0 – 10	060G4307
MBS 4701-2211-1AB08	0 – 16	060G4301
MBS 4701-2411-1AB08	0 – 25	060G4308
MBS 4701-2611-1AB08	0 – 40	060G4309
MBS 4701-2811-1AB08	0 – 60	060G4302

**MBS 4751 with pulse snubber**

Type no.	Measuring range Pe <sup>1)</sup> [bar]	Code number
MBS 4751-3211-1AB08	0 – 160	060G4311
MBS 4751-3411-1AB08	0 – 250	060G4312
MBS 4751-3611-1AB08	0 – 400	060G4313
MBS 4751-3811-1AB08	0 – 600	060G4314

<sup>1)</sup> Relative / gauge

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

MBS type		Standard version		With zero point and span adjustment	
		MBS 4201	MBS 4251	MBS 4701	MBS 4751
		-	with pulse snubber	-	with pulse snubber
Accuracy (incl. non-linearity, hysteresis and repeatability)		± 1% FS	± 1% FS	± 0.5% FS	± 0.5% FS
Non-linearity BFSL (conformity)		≤ ± 0.2% FS			
Hysteresis and repeatability		≤ ± 0.1% FS			
Thermal error band (compensated temperature range)		≤ ± 1% FS			
Response time	Liquids with viscosity < 100 cSt	< 4 ms	< 4 ms	< 4 ms	< 4 ms
	Air and gases	< 4 ms	< 35 ms	< 4 ms	< 35 ms
Overload pressure (static)		6 × FS (max. 1500 bar)			
Burst pressure		> 6 × FS (max. 2000 bar)			
Durability, P: 10 – 90% FS		> 3 × 10 <sup>6</sup> cycles			
Zero point adjustment	0 – 1 to 0 – 10 bar measuring range	-	-	-5 – 20 % FS	
	0 – 16 to 0 – 40 bar measuring range	-	-	-5 – 10% FS	
	0 – 60 to 0 – 600 bar measuring range	-	-	-2.5 – 2.5% FS	
Span adjustment	0 – 1 to 0 – 600 bar measuring range	-	-	-5 – 5% FS	

**Electrical specifications**

Nom. output signal (short circuit protected)	4 – 20 mA
Supply voltage, U <sub>B</sub> (polarity protected)	10 – 28 V dc
Supply voltage dependency	≤ ± 0.05% FS / 10 V
Current limitation (linear output signal up to 1.5 × rated range)	30 – 35 mA
Load [R <sub>L</sub> ] (load connected to 0 V)	$R_L \leq \frac{U_B - 10V}{0.02 A} [\Omega]$

**Environmental conditions**

Sensor temperature range		See page 6		
Media temperature range		115 - (0.35 x ambient temp.)		
Ambient temperature range (depending on electrical connection)		See page 6		
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	Electrostatic discharge	Air mode	8 kV	EN 61000-6-2
		Contact mode	4 kV	EN 61000-6-2
	RF	Field	10 V/m, 26 MHz – 1 GHz	EN 61000-6-2
		Conducted	10 V <sub>rms</sub> , 150 kHz – 30 MHz	EN 61000-6-2 <sup>1)</sup>
	Transient	Burst	4 kV (CM), Clamp	EN 61000-6-2
Surge		1 kV (CM, DM) R <sub>g</sub> = 42 Ω	EN 61000-6-2	
Insulation resistance		> 100 MΩ at 100 V		
Vibration stability	Sinusoidal	20 g, 25 Hz – 2 kHz		
	Random	7.5 g <sub>rms</sub> , 5 Hz – 1 kHz		
Shock resistance	Shock	500 g / 1 ms		
	Free fall	1 m		
Enclosure (depending on electrical connection)		See page 6		

<sup>1)</sup> In the frequency range of 150 kHz – 3 MHz the error is > 1% FS

**Technical data**  
(continued)

*Mechanical characteristics*

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

**Ordering special versions**

<p><b>MBS 4201</b> <b>MBS 4251</b> <b>MBS 4701</b> <b>MBS 4751</b></p> <p><b>Measuring range</b></p> <table border="1"> <tr><td>0 – 1.0 bar</td><td>10</td></tr> <tr><td>0 – 1.6 bar</td><td>12</td></tr> <tr><td>0 – 2.5 bar</td><td>14</td></tr> <tr><td>0 – 4.0 bar</td><td>16</td></tr> <tr><td>0 – 6.0 bar</td><td>18</td></tr> <tr><td>0 – 10 bar</td><td>20</td></tr> <tr><td>0 – 16 bar</td><td>22</td></tr> <tr><td>0 – 25 bar</td><td>24</td></tr> <tr><td>0 – 40 bar</td><td>26</td></tr> <tr><td>0 – 60 bar</td><td>28</td></tr> <tr><td>0 – 100 bar</td><td>30</td></tr> <tr><td>0 – 160 bar</td><td>32</td></tr> <tr><td>0 – 250 bar</td><td>34</td></tr> <tr><td>0 – 400 bar</td><td>36</td></tr> <tr><td>0 – 600 bar</td><td>38</td></tr> </table> <p><b>Pressure reference</b></p> <table border="1"> <tr><td>Gauge (relative)</td><td>1</td></tr> <tr><td>Absolute</td><td>2</td></tr> </table>	0 – 1.0 bar	10	0 – 1.6 bar	12	0 – 2.5 bar	14	0 – 4.0 bar	16	0 – 6.0 bar	18	0 – 10 bar	20	0 – 16 bar	22	0 – 25 bar	24	0 – 40 bar	26	0 – 60 bar	28	0 – 100 bar	30	0 – 160 bar	32	0 – 250 bar	34	0 – 400 bar	36	0 – 600 bar	38	Gauge (relative)	1	Absolute	2		<p><b>Pressure connection</b></p> <table border="1"> <tr><td>A B 0 8</td><td>G ½ A (EN 837)</td></tr> <tr><td>A C 0 4</td><td>¼ – 18 NPT</td></tr> <tr><td>A C 0 8</td><td>½ – 18 NPT</td></tr> <tr><td>G B 0 4</td><td>DIN 3852-E-G ¼; Gasket: DIN 3869-14 NBR</td></tr> <tr><td>F A 0 8</td><td>ISO 6149-2, M14 x 1.5 – 6 g, O-ring NBR</td></tr> </table> <p><b>Electrical connection</b> Figures refer to plug and standard PIN configuration - see page 6</p> <table border="1"> <tr><td>1</td><td>Plug Pg 9 (EN175301-803-A)</td></tr> <tr><td>3</td><td>Screened cable, 2 m <sup>1)</sup></td></tr> <tr><td>7</td><td>ISO 15170-A1-3.2-Sn, male <sup>1)</sup>(Bayonet plug)</td></tr> </table> <p><b>Output signal</b></p> <table border="1"> <tr><td>1</td><td>4 – 20 mA</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	DIN 3852-E-G ¼; Gasket: DIN 3869-14 NBR	F A 0 8	ISO 6149-2, M14 x 1.5 – 6 g, O-ring NBR	1	Plug Pg 9 (EN175301-803-A)	3	Screened cable, 2 m <sup>1)</sup>	7	ISO 15170-A1-3.2-Sn, male <sup>1)</sup> (Bayonet plug)	1	4 – 20 mA
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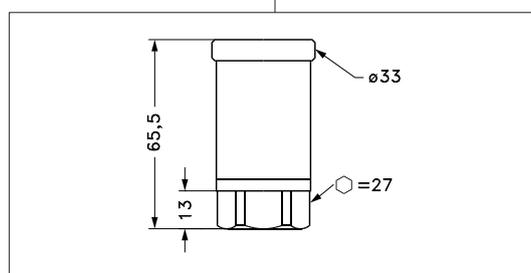
<sup>1)</sup> MBS 4201 and MBS 4251 only

Preferred version

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

Dimensions/Combinations

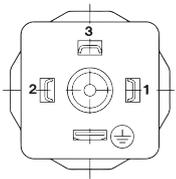
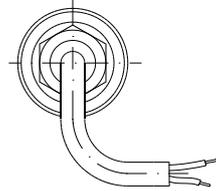
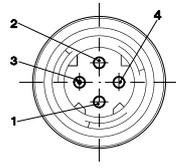
Type code	1	3	7	1
	Non adjustable versions MBS 4201, MBS 4251			Adjustable versions MBS 4701, MBS 4751
	EN175301-803-A, Pg 9	2 m cable	ISO 15170-A1-3.2-Sn (Bajonet plug)	EN175301-803-A, Pg 9



	DIN 3852-E-G 1/4 Gasket: DIN 3869-14-NBR	G 1/2 A (EN 837)	1/4 - 18 NPT	1/2 - 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

**Electrical connections**

Type code page 5	1	3	7
	EN 175301-803-A, 	Cable versions 	ISO 15170-A1-3-2-Sn (bayonet plug) 
Ambient temperature	-40 – 85 °C	-30 – 85 °C	-40 – 85 °C
Material	Glass filled polyamid, PA 6.6	PVC cable	Glass filled polyester, PBT
Enclosure <sup>1)</sup>	IP65	IP67	IP67 / IP69K
<b>Ex-certification - Conformity specifications</b>			
<b>Ambient temperature</b>			
Ex ia IIC T4	-40 – 100 °C	-40 – 80 °C <sup>2)</sup> / -5 – 70 °C <sup>3)</sup>	-40 – 100 °C
Ex ia IIC T5	-40 – 75 °C	-40 – 75 °C <sup>2)</sup> / -5 – 70 °C <sup>3)</sup>	-40 – 75 °C
Ex ia IIC T6	-40 – 50 °C	-40 – 50 °C <sup>2)</sup> / -5 – 70 °C <sup>3)</sup>	-40 – 50 °C
<b>Medium temperature</b>			
Ex ia IIC T4	-40 – 125 °C	-40 – 125 °C	-40 – 125 °C
Ex ia IIC T5	-40 – 95 °C	-40 – 95 °C	-40 – 95 °C
Ex ia IIC T6	-40 – 50 °C	-40 – 50 °C	-40 – 50 °C
Power supply	Ui	28 V dc	28 V dc
Max. input current	Ii	100 mA	100 mA
Max. input power	Pi	0.7 W	0.7 W
Internal capacity	Ci	< 50 nF	< 50 nF
Internal inductivity	Li	< 8 µH	< 8 µH
Electrical connection, 4 – 20 mA output (2 wire)	Pin 1: + 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	Pin 1: + supply Pin 2: - supply Pin 3: ventilation Pin 4: not used

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

<sup>2)</sup> Fixed installation

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

### **Safety instructions**

All national safety regulations must be complied with in connection with installation, start-up and operation of Danfoss pressure transmitters type MBS 4201, MBS 4251, MBS 4701 and MBS 4751. 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.

Basic safety and health requirements are fulfilled through compliance with:

EN60079-0: 2012, IEC60079-0: 6th edition, EN60079-11: 2012, IEC60079-11: 6th edition, EN60079-26: 2007, IEC60079-26: 2nd edition.

**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.

The MBS transmitters do not provide isolation meeting the dielectric strength requirements of IEC/EN60079-11.

MBS transmitters contain 10 nF capacitance from any input terminal to earth.

### **Special instruction when adjusting MBS 47xx series:**

If possible only adjust the MBS in non-hazardous area or take precaution to avoid electrostatic discharge and ensure the earthing of the transmitter housing is maintained. The transmitter must all ways be supplied from an intrinsic safety barrier.

### **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.