Sensors, Valves & Switches

Off-Highway Equipment
Focus segments and equipment areas

**Agricultural equipment**
- Balers
- Choppers, combines and conveyors
- Cotton pickers and cotton strippers
- Cultivators and cutters
- Dung cleaners
- Grain augers
- Harvesters
- Mowers
- Pickers, planters and plows
- Rakes and rippers
- Seeders and sprayers
- Spreaders and shredders
- Tedders and tractors
- Windrowers

**Forestry machinery**
- Crane (timber)
- Forestry forwarder (log skidder)
- Forestry harvester (feller buncher)
- Knuckle Boom Loaders
- Planting machines
- Sawmill (mobile)
- Swing machines
- Veener cutting machine
- Winch (industry)
- Wood chipper (tree chopping cutter)

**Construction equipment**
- Asphalt scraper
- Concrete caster
- Ditch cleaner
- Drill (rock/earth)
- Dumper
- Excavators
- Grader
- Hydraulic braker
- Loader
- Mobile cranes
- Pavement layer
- Paver finisher
- Piling rig
- Post hole borer
- Railway construction
- Road making and marking machine
- Screens
- Stone crusher and dresser
- Stone/concrete hammer and saw
- Tar spraying machine
- Trencher

**Mining machines**
- Conveyor/elevator
- Drill (rock/stone)
- Dumper
- Loader
- Multi purpose mining vehicle

**Material handling and lifting equipment**
- Aerial work platform (scissor)
- Cranes
- Electrical reach stackers
- Fork lift trucks
- Telehandler
- Lifts
- Winch

**Hydraulic systems and equipment**
- Weighing and safe load
- Control systems and components

**Pressure transducers**

**Temperature sensors and transducers**
A host of applications

The Danfoss range of pressure and temperature sensors, industrial valves and switches are being applied in markets such as agriculture, forestry, construction, material handling, mining and many others, on a variety of applications:

**Hydraulic Power**
- Electronic load sensing
- Hydraulic pump pressure
- Oil filter pressure
- Oil temperature

**Transmission and Steering**
- Electronic load sensing
- Oil temperature
- Brake system pressure
- Transmission pressure

**Weighing, Safety & Monitoring Systems**
- Cylinder pressure
- Hydraulic pump pressure
- Oil temperature

**Engine**
- Oil pressure and temperature
- Lube oil filter pressure
- Air and coolant pressure and temperature
- Turbo charge pressure
- Fuel pump pressure
- Emergency shut-off systems for diesel engines

**Auxiliary Systems**
- Central lubrication systems
- Filtration systems
- Water spray
Pressure transducers for your every need

Manufacturers of off-highway equipment for agriculture, forestry, mining, material handling and construction are faced with ever increasing challenges such as:

• High pressure peaks
• Liquid hammer
• Cavitation
• High oil temperatures
• Heavily fluctuating temperatures
• Strict EMC requirements
• High vibration and mechanical impact

Danfoss is one of the world’s largest manufacturers of pressure transducers for heavy-duty applications. The MBS range of pressure transducers contains a wide range of products drawing on extensive product and application knowledge gained over many years in the field.

With full customization capabilities, we can deliver the right pressure transducers and right solutions for heavy-duty and industrial applications. Our pressure transducer platform enables you to specify:

• Electrical connection
• Level of accuracy
• Output signal
• Pressure connection

The piezo-resistive silicon sensor, available on most of the pressure transducers we produce is the most suitable in applications with pressure peaks. The pressure overload is typically six times (max. 1500 bar / 21700 psi) the measuring range and performs millions of cycles. We also offer a thin-film sensor on the MBS 1200/1250 series that allows fast response time and a compact size of the transducer.

Heavy duty versions with a damping nozzle (pulse snubber) in the pressure transducer are available to prevent dangerous cavitation and liquid hammer at the diaphragm.

We designed the pressure transducer for long-term stability at temperatures of 125 °C (257 °F). Moreover, the tight enclosure design ensures that the pressure transducer is protected against moisture caused by fluctuating temperature.

The range of Danfoss pressure transducers also includes models with Can-Bus communication system and models for high pressure operation up to 3000 bar (43500 psi).

We designed our products to comply with the EU directives on EMC. In addition, we observe a range of industry-specific EMC standards, like ISO 13766 (earth-moving machinery) and DIN 40389 (EMC in road vehicles).

Fig. 1:
Problems with pressure surge/liquid hammer occur mainly on the outlet side after a valve or pump because of the vacuum produced by closing/shut off.

Fig. 2:
The damping nozzle ensures that cavitation never occurs at the transducer’s diaphragm.
Temperature sensors and transducers meet versatile requirements

Nowhere is the packaging of temperature sensors more important than in off-highway equipment applications. Today, Danfoss offers a versatile range of high quality temperature sensors and transducers for a multitude of applications, featuring three sensing technologies: RTD, NTC and PTC.

RTD elements (Resistance Temperature Detectors) – either Pt 100 or Pt 1000 – are accurate, stable and cover a broad temperature range. Additionally, Danfoss RTD temperature sensors offer fast response times thanks to innovative design, replacing the traditional ceramic element with a thin-film element in a built-in construction.

NTC’s are thermistors with Negative Temperature Characteristics while PTC’s are thermistors with Positive Temperature Characteristics. Both thermistor types are well suited for use with customized controllers and meet demands for sensors in large quantities.

Irrespective of your application and technological requirements, Danfoss is capable of meeting your demands with a versatile range of standard temperature sensors and transducers as well as customized sensors designed according to your specifications:

- OEM Temperature Sensor program
- Versions with integrated plug or cable available
- Various sensor elements available (RTD, NTC, PTC)
- Robust, high protection against moisture
- Fixed measuring insert
- Brass or stainless steel
- Low response times
- Current or voltage output versions

Due to special designed element fixture the reaction time of the temperature sensor is decreased dramatically.
Industrial valves build quality into your product from the start

In mobile hydraulic applications as well as in most other industries, manufacturers often encounter the challenge of combining high performance with limited space. Danfoss direct operated solenoid valves are designed for optimum performance.

Mobile hydraulic equipment is often used in dusty or dirty environments. Compact valves often are sensitive to dirt due to the small dimensions. The Danfoss direct operated solenoid valves have two slots in the armature which make it possible for dirt particles to be effectively displaced to a harmless position. The pressed-in orifice is designed with an optimized sealing surface making it difficult for particles to stick and thereby give internal leaks.

In addition to the direct operated solenoid valves, Danfoss has a strong and customer-oriented program of other industrial valve types, designed to suit virtually every industrial application.

Thermostatically operated valve type AVTA
- Self acting – needs no electricity
- Exact temperature control
- Insensitive to dirt – the reliable fit and forget valve
- Insensitive to pressures
- From zero differential pressure
- Good external tightness even at high differential pressures
- Broad range of different body materials, connections and temperatures
- Accessories and options

High performance solenoid valves types EV220B
- The best water hammer damped solenoid valve
- Insensitive to dirt
- Broad range of different body and sealing materials
- Temperature range from brine to steam
- Wide coil range up to IP67 / NEMA 6

Solenoid valve type EV210A
- Wide coil range up to IP65 / NEMA 13
- Compact and optimized design
- Simple modular design to ensure reliable function, and easy service
- Compact solenoid
- Long lifetime
- Less sensitive to dirt
- Increased resistance against corrosion and cavitation
- Optimum $K_v$ ($C_v$) values
- Several $K_v$ ($C_v$) values for each tube size

Long lifetime
- Circular shape of the armature exactly suiting the armature tube to reduce internal wear
- Valve plate resistant to extreme conditions with high temperature and pressure.

Less sensitive to dirt
- Two slots in the armature to displace dirt particles to a harmless position.
- Pressed-in orifice is designed with an optimized sealing surface to avoid particles to stick and prevent internal leaks.

Increased resistance against corrosion and cavitation
- Valve orifices in stainless steel
Pressure and temperature switches manage the demanding environment of mobile hydraulic equipment

Off-highway equipment calls for the most stringent requirements on pressure and temperature controls. Danfoss developed a series of MBC pressure and temperature On/Off switches that fully complement our product portfolio.

During the design process, special emphasis was placed on:
• Robustness
• Optimal compact design
• Vibration and shock stability
• Long operating life time
• High switching point accuracy for repeating cycles

On/Off controls can endure and work properly in the most demanding environments. They are intended for alarm indication, shut down, control and diagnostics in many applications.

Pressure Switches
The Danfoss MBC 5000 block style pressure switches operate on two different types of technology that cover a broad pressure range.

1. Diaphragm type of technology
   • Used for pressure peaks and pulsations
   • Tolerates high over pressure
   • Suitable for high number of switching operations
   • Covers pressure ranges from 1 to 100 bars (14.5 to 1450 psi)

2. Piston type of technology
   • Used for high pressure ranges
   • Covers pressure up to 400 bars (5800 psi)
   • Permissible operating pressure up to 600 bars (8700 psi)
   • Properly operates over 1 million switching cycles

The Danfoss MBC 8000 block style temperature switches are suitable for monitoring and alarm control. A wide range of temperatures, varying from -10° to 200 °C (14° to 392 °F) can be controlled. The sensor of the MBC temperature switches contains an adsorption charge. Therefore, its function is not affected whether the sensor is placed in a warmer or colder place than the remaining part of the thermostatic element (bellows and capillary).

MBC 8000 temperature switches can be equipped with rigid or remote sensors. Remote sensors have the option of being equipped with an armored capillary tube for additional protection of the tube. Different sizes of sensor pockets can be ordered as accessories specially designed for our temperature switches.

Features:
• Block design
• Connection: 1/4 - 18 NPT female
• Function: ON/OFF
• Measuring range: -0.2 to 400 bar (-2.9 to 5800 psi)
• Media max. temperature: 85 °C (185 °F)
• Contact system: SPDT – microswitch
• Sensor type: diaphragm/piston
• Setting range: -0.2 to 400 bar (-2.9 to 5800 psi)

Both Danfoss pressure and temperature controlled switches are part of an integrated block control program that includes MBS transducers and MBV test valves.
<table>
<thead>
<tr>
<th>Product</th>
<th>Pressure Transducers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>MBS1200</td>
</tr>
<tr>
<td>Type with pulse snubber</td>
<td>MBS1250</td>
</tr>
<tr>
<td>Measuring range</td>
<td>0 to 1 bar - 0 to 600 bar (0 to 145 - 0 to 8700 psi)</td>
</tr>
<tr>
<td>Pressure reference</td>
<td>Gauge</td>
</tr>
<tr>
<td>Max. overpressure</td>
<td>2xFS (max. 1400 bar / 20000 psi)</td>
</tr>
<tr>
<td>Sensor element</td>
<td>Thin film</td>
</tr>
<tr>
<td>Accuracy / Repeatability</td>
<td>0.5%</td>
</tr>
<tr>
<td>Media temperature</td>
<td>-40 °C to 125 °C (-40 °F to 257 °F)</td>
</tr>
<tr>
<td>Output signals</td>
<td>4 to 20 mA, voltage or ratiometric</td>
</tr>
<tr>
<td>Process connection</td>
<td>NPT, BSPP, UNF or Metric</td>
</tr>
<tr>
<td>Electrical connection</td>
<td>Various plugs</td>
</tr>
<tr>
<td>Enclosure</td>
<td>IP65 to IP69K (NEMA 13/6)</td>
</tr>
<tr>
<td>Wetted parts material</td>
<td>17-4 PH Stainless Steel</td>
</tr>
<tr>
<td>Housing material</td>
<td>17-4 PH Stainless St.</td>
</tr>
<tr>
<td>Flow factor</td>
<td></td>
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<tr>
<td>Pressure range</td>
<td></td>
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<tr>
<td>Valve body material</td>
<td></td>
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<tr>
<td>Seal material</td>
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<td>Temperature Sensors &amp; Transducers</td>
<td>Pressure &amp; Temperature Switches</td>
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<tr>
<td><strong>MBS 3270</strong></td>
<td><strong>MBT 5250</strong></td>
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<td><img src="image" alt="transducer" /></td>
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<tr>
<td><strong>-50°C to 200°C</strong> (18°F to 392°F)</td>
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</tr>
<tr>
<td><strong>Pressure range</strong></td>
<td><strong>Pressure range</strong></td>
</tr>
<tr>
<td><strong>0 to 14.5 psi</strong></td>
<td><strong>0 to 14.5 psi</strong></td>
</tr>
<tr>
<td><strong>Type</strong></td>
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</tr>
<tr>
<td><strong>MBS1200</strong></td>
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</tr>
<tr>
<td><strong>Seal material</strong></td>
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<tr>
<td><strong>1.4401 (AISI 316)</strong></td>
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<td><strong>IP65 to IP65</strong> (NEMA 13)</td>
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<tr>
<td><strong>Brass, SS</strong></td>
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<tr>
<td><strong>K_1 = .04 to .06 m^3/hr (C_1 = .05 to .31 UsGal/min)</strong></td>
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</tr>
<tr>
<td><strong>0 to 30 bar</strong> (0 to 435 psi)</td>
<td><strong>0 to 420 bar</strong> (1400 bar / 20000 psi)</td>
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<td><strong>Brass / SS</strong></td>
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</tr>
<tr>
<td><strong>EPDM/FKM</strong></td>
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</tbody>
</table>
| * = Maximum temperature when media is water

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### Additional Notes

- PTC, NTC, Pt100/Pt1000
- Pt class B other on request
- Other on request
- Diaphragm or piston
- Adsorption charge
- 1% FS
- Diaphragm: 0.5%
- Piston: 1%
- 4 to 20 mA or ratiometric
- SPDT
- Remote or rigid sensor
- 1/8” to 1/4” NPT, BSPP or flange
- 1/2” to 2” NPT or BSPP
- 1/2” to 2” NPT or BSPP
- SS, Diaphragm: Viton, Piston: HSS 1.3342
- Brass, SS
- **K_1 = 4 to 40 m^3/hr (C_1 = 4.7 to 46.8 UsGal/min)**
- **K_1 = 2.59 to 7.53 m^3/hr (C_1 = 2.2 to 6.4 UsGal/min)**
- **0 to 10 bar** (0 to 145 psi)
- **Brass / SS**
- **EPDM/FKM**
- **EPDM/NBR**

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### Pressure & Temperature Switches

- **MBC 5000**
- **MBC 8000**
- **EV210A**
- **EV220B**
- **AVTA**

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### Industrial Valves

- **MBS 3270**
- **MBT 5250**
- **MBT 3560**
- **MBC 5000**
- **MBC 8000**
- **EV210A**
- **EV220B**
- **AVTA**
With Danfoss Automation, your safety, performance and satisfaction are ensured

Danfoss Automation provides a long lifetime of safe, accurate and reliable performance for hydraulic applications. Our line of state-of-the-art components for monitoring and controls systems includes:

- Solenoid valves
- Externally operated valves
- Thermostatically operated valves
- Pressure and temperature switches
- Pressure transducers
- Temperature sensors and transducers

To learn more about our hydraulic solutions, please contact us.

Danfoss also provides solutions for drives, water hydraulics, refrigeration and air-conditioning applications and more. Visit our website at www.danfoss.com/North_America.