



# Automation for the marine sector

## Save energy and reduce emissions

Danfoss pressure transmitters, temperatur sensors, switches and valves

2%

reduction

of fuel costs and  
CO<sub>2</sub> emissions enabled by  
measuring cylinder pressure  
with MBS 1800

10

international

maritime certifications  
are your guarantee for  
safety at sea



# By land and by sea, Danfoss has been making modern living possible for 80 years

## **Maritime expertise**

Look around a modern ship, and you'll find Danfoss hard at work reducing energy costs and emissions in the engine room and beyond.

In fact, several Danfoss divisions bring a particular range of technical benefits to the marine sector. On their own, each division is at the forefront of its field, with industry-leading insight and innovation. Together, Danfoss's many divisions provide a comprehensive array of products that keep major fleets running efficiently.

## **Refrigeration, A/C and heating:**

Maintain desired temperatures in reefers, storage rooms and living quarters

**Hydraulic solutions:** Robust design and rugged reliability keep hydraulic equipment running longer.

## **High-pressure pumps and energy**

**recovery devices:** Convert salt water into fresh water for drinking, cooling and firefighting.

**Frequency converters:** Save energy in countless applications throughout the ship.





### **Small controls...**

Constant improvement of reliability and efficiency is not an option. It's a prerequisite for success no matter what role you play in today's increasingly competitive shipping industry.

That's why Danfoss continues to work on the details of the components that are small in size but big in impact.

### **... that enable big gains**

Danfoss controls empower operators to sail smarter, faster and more efficiently. They monitor temperature and pressure in the places that matter most. And they put you in control of the processes that let you fine-tune performance.

### **All approved for marine**

Controls for marine applications must be as dependable as they are safe. That's why the Danfoss range of controls have all achieved independent type approval and certification.

#### **PRESSURE TRANSMITTER**

*Read more on page 8*



#### **TEMPERATURE SENSOR**

*Read more on page 9*



#### **PRESSURE AND TEMPERATURE SWITCHES**

*Read more on page 10*



#### **SOLENOID VALVES**

*Read more on page 11*



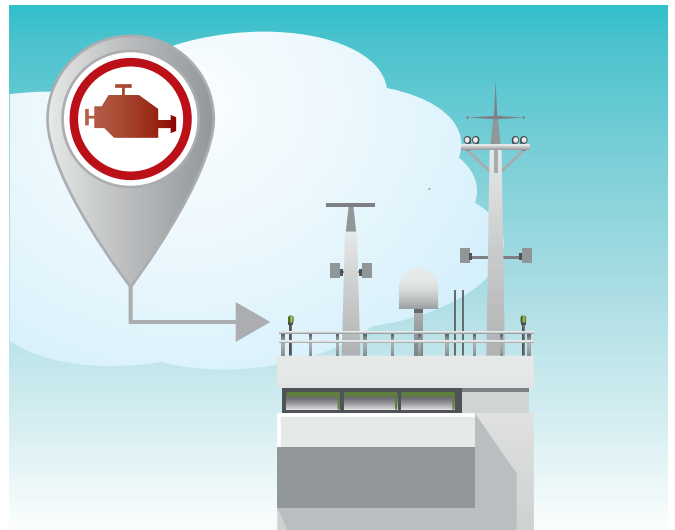
# The benefits of intelligent control: Measureable improvements that you can rely on



## SMARTER SERVICE

Preventive maintenance keeps engines running efficiently and eliminates costly downtime. That's why a broad range of Danfoss controls make it easier than ever to base service procedures on real-time information for the parameters matter most for service.

For example, our MBS 9300 monitors pressure in turbocharger filters. Pressure increases are a reliable indicator of filter stoppage – and knowing exactly when to change the filter saves time, parts and fuel.



## PREDICTABLY RELIABLE PERFORMANCE

Trusting cooling and lubricating systems to work is one thing. Controlling them with sensors, mechanical switches and alarms is quite another. Danfoss components let crews lift performance reliability to another level – whether seas are calm or there is a storm on the horizon.

For example, our KPS switch resists engine room jolts and vibrations to monitor pressure in lubricating oil systems. Then they raise the alarm if pressure deviates from acceptable parameters, so crews have the knowledge to react and prevent performance variations and engine damage.

## Quality you can count on

Our zero-defect policy is your guarantee. But don't just take our word for it – ask the world's leading marine approval agencies and our customers.

Danfoss Industrial Automation uses the same production processes and quality assurance standards worldwide. All procedures are ISO/TS 16949:2009 approved, so no matter

where we produce we follow the same stringent guidelines for what to do and how to do it.

The Danfoss culture of quality depends on best-in-class systems, tools and certifications. Most of all, it depends on people who care.

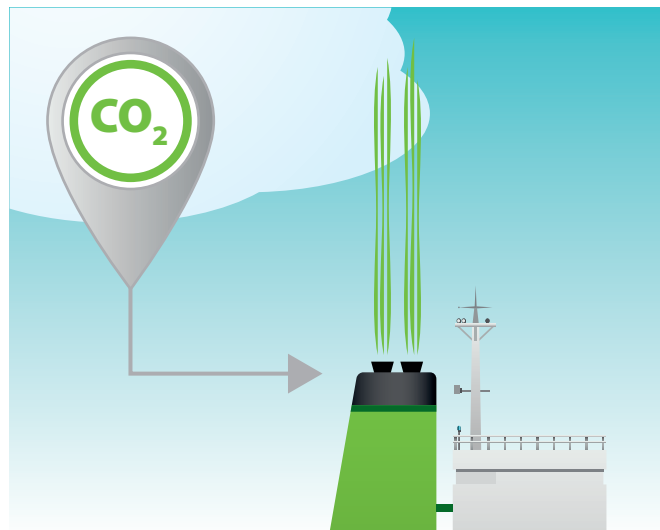
If it matters, measure it. Danfoss helps operators monitor and control the performance parameters that matter most throughout the engine room and propulsion system. And we do it day in and day out in some of the most extreme environments on a modern ship.



#### IMPROVED ENGINE EFFICIENCY

Smoother combustion means better engine efficiency and lower fuel costs. Danfoss controls contribute to this ongoing effort all around the engine room, every day.

For example, common rail engines rely on fuel injection under high pressure to atomize diesel into tiny droplets and achieve better combustion and improved fuel efficiency. Our MBS 6300 keeps pressure stable even at very high levels, and is engineered to keep up as pressure levels increase in the future.



#### REDUCED CO<sub>2</sub> EMISSIONS

As emission regulations continue to become more and more stringent, marine applications increasingly rely on advanced electronic controls to fine tune performance.

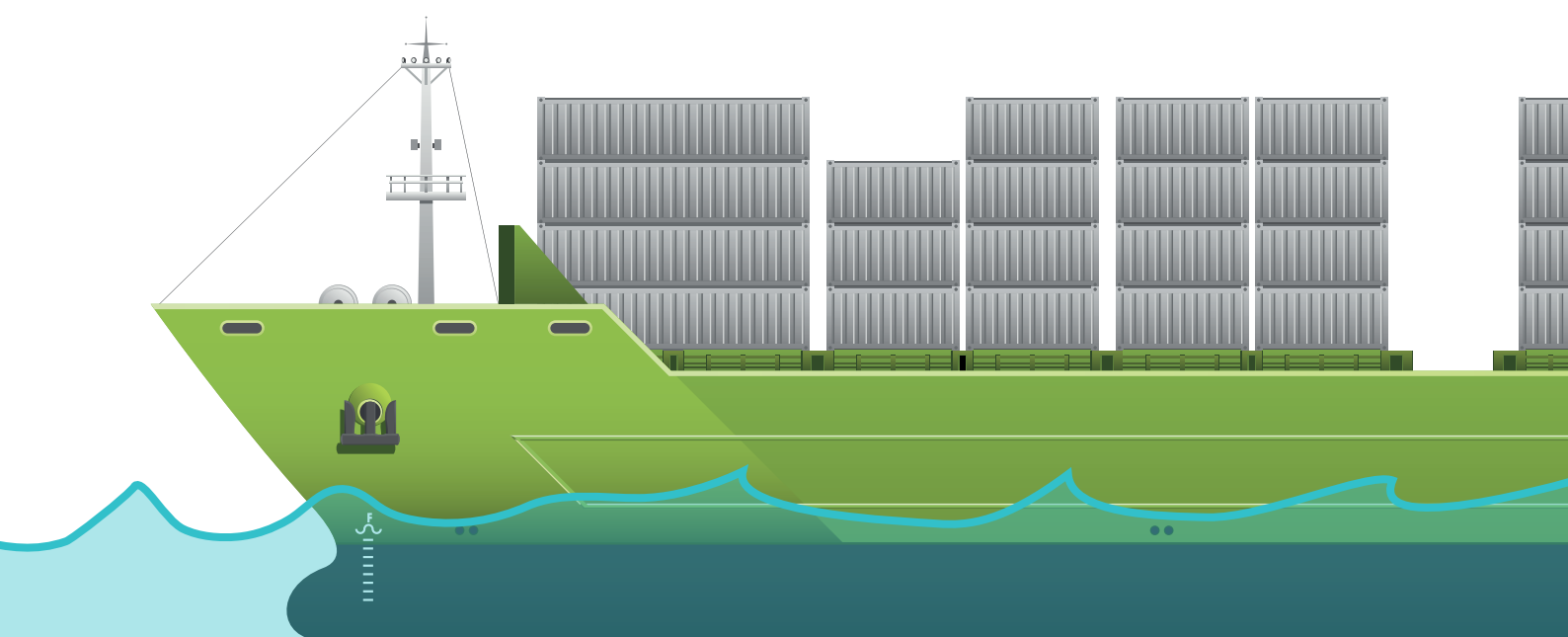
Our MBS 1800 cylinder pressure sensor helps you meet or exceed growing demands. It keeps you informed of what's happening inside the combustion chamber as the engine is running. This information not only allows you to save fuel and reduce emissions – it also helps you to balance cylinder performance and extend crankshaft lifetime.





# Wherever performance matters, automation matters even more

Danfoss adds automation throughout your ship – so you can start adding up savings in fuel, emissions and downtime.



## Fuel treatment

- Fuel pressure & temperature
- Sludge oil pressure & temperature
- Oil filter differential pressure
- Common rail pressure

## Engines

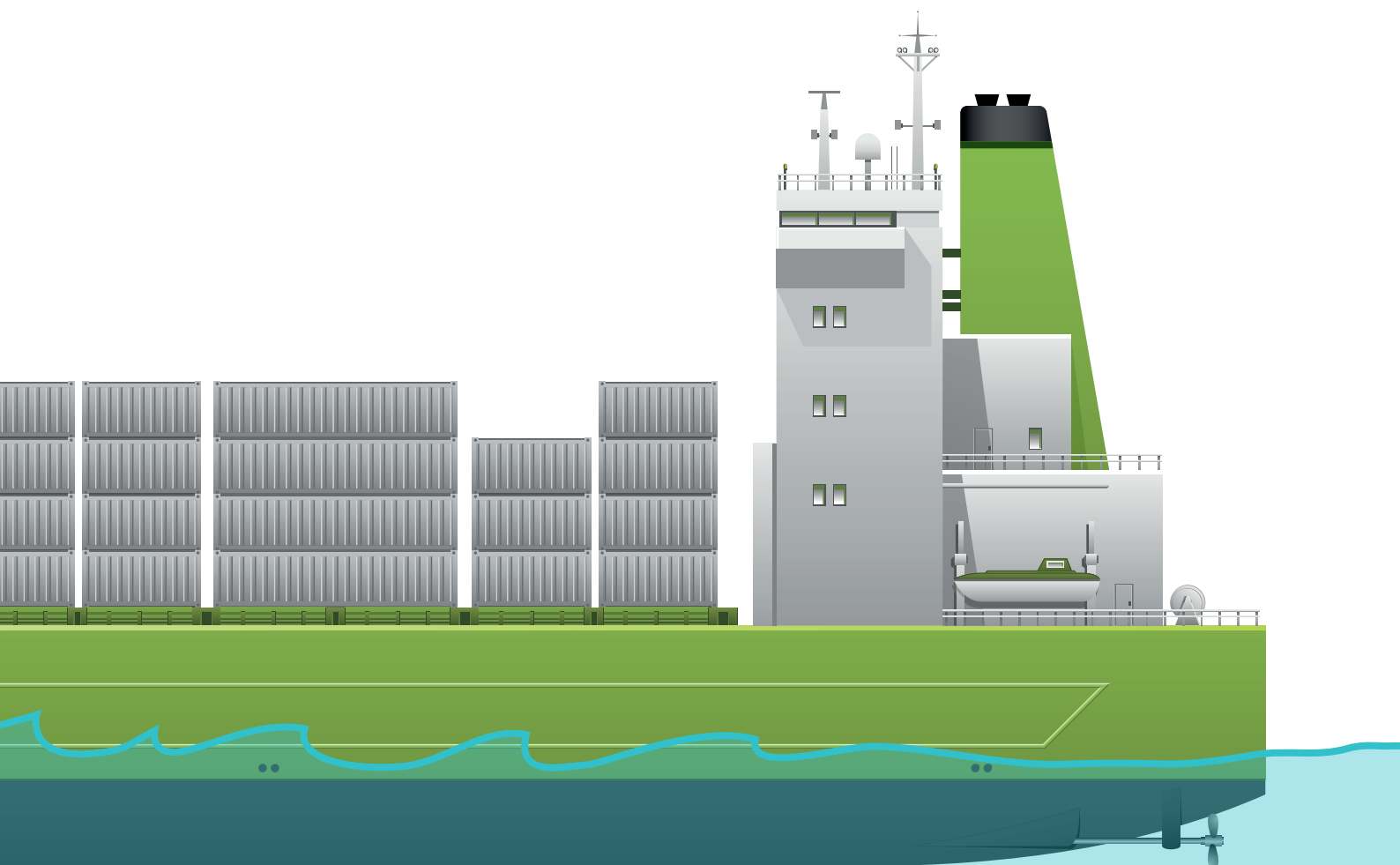
- Lube-oil pressure & temperature
- Cooling water system
- Common-rail pressure
- Crankcase pressure
- Bearing temperature
- Exhaust gas temperature
- EGR temperature
- Start air pressure
- Charge air pressure & temperature
- Cylinder pressure

## Gearboxes

- Clutch switching pressure
- Lube-oil pressure & temperature
- Oil filter differential pressure
- Bearing temperature
- Hydraulic oil pressure & temperature

## Power packs

- Cooling water temperature
- Hydraulic oil pressure & temperature
- Oil filter differential pressure



#### **Air compressors**

- Air pressure
- Lube oil pressure
- Air temperature

#### **Pump systems**

- Water pressure
- Inlet/outlet temperature

#### **Boilers & incinerators**

- Steam pressure
- Exhaust gas temperature
- Steam control
- Pump & fan soft-start control

#### **Propulsion systems**

- Lube-oil pressure monitor & alarm
- Bearing temperature
- Oil filter differential pressure
- Hydraulic pressure for pitch control

# Pressure transmitters



## Compact pressure transmitters

- 0 – 1 bar to 0 – 600 bar
- 4 – 20 mA, absolute voltage, ratiometric output
- Various electrical connections
- Various pressure connections incl. flange connections
- Up to 125 °C
- Versions also available with pulse-snubber
- Available in cartridge or block version
- Block versions can be used with our test valves

*General applications where robustness and space are an issue*

## Low pressure transmitters

- 40 – 250 mbar pressure span
- Bidirectional ranges available (zero point flexible)
- 4 – 20 mA output
- EN 175301-803-A, Pg 9 plug
- Up to 100 °C
- Different pressure connections

*Turbocharger filter monitoring  
Crankcase monitoring*

## High pressure transmitters

- 0 – 2000 bar to 0 – 2500 bar
- 4 – 20 mA, absolute voltage, ratiometric output
- Cable version
- M18 x 1.5 (ISO 2974 / SAEJ 1949)
- Up to 125 °C

*Common rail pressure monitoring*

## Cylinder pressure sensors

- Integrated charge amplifier
- In-line charge amplifier
- 0 – 250 bar
- 4 – 20 mA or 0.5 – 4.5 V outputs
- 3 m cable (In-line)
- M10 & M14 (In-line)
- Customer-specific versions available

*Cylinder pressure monitoring*

## The Danfoss range of pressure transmitters for marine applications



MBS 2100  
MBS 2150



MBS 3100  
MBS 3150



MBS 3300  
MBS 3350



MBS 33M



MBS 5100  
MBS 5150



EMP



# Temperature sensors



## Thermocouple exhaust gas sensors

- Up to 800 °C
- Adjustable insertion length
- Straight or angle measuring element
- Versions with B-head available
- Availability for versions with transmitter

*Measuring exhaust gas in diesel, gas & dual fuel engines*

## RTD exhaust gas sensors

- Up to 600 °C
- B-head, slim-line, plug or cable versions
- Versions with 1 or 2 Pt 1000 elements (no need for compensation cable)
- Adjustable insertion length

*Measuring exhaust gas in diesel, gas & dual fuel engines*

## RTD sensors

- Up to 400 °C
- Versions with B-head available
- Availability for versions with transmitter
- Fixed or changeable measuring inserts

*General applications, e.g., lube-oil monitoring among others*

## Bearing temperature sensors

- Up to 200 °C
- Sensing element Pt 100 or Pt 1000
- Various electrical connections
- Various process connections
- Spring loaded to ensure excellent contact to bearing

*Temperature measuring of bearings in engines and gearboxes*

## The Danfoss range of temperature sensors for marine applications



MBT 5111

MBT 5113

MBT 5114

MBT 5116  
Slim-line

MBT 5116  
with B-head

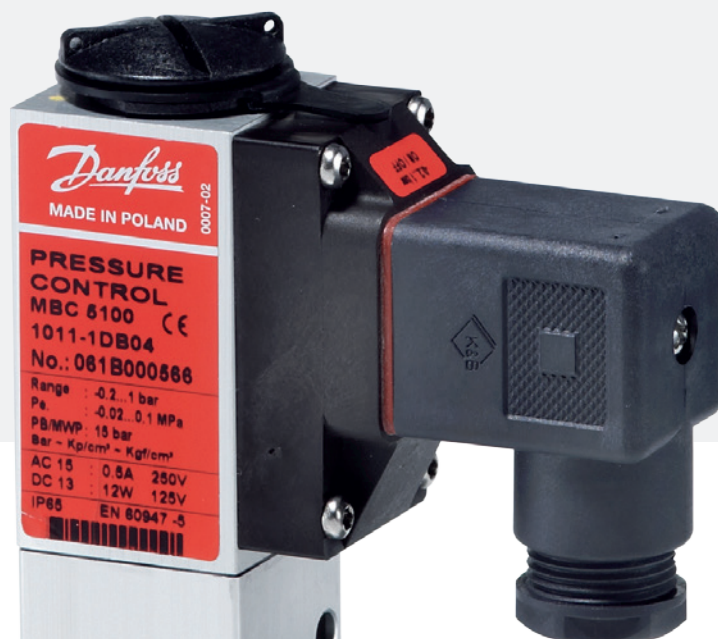
MBT 5250

MBT 5252

MBT 5310

MBT 5560

# Pressure and temperature switches



## Block pressure switches

- 0.2 – 400 bar measuring range
- SPDT contact system
- DIN plug
- Ag contact material
- Fixed differential

*General applications where robustness and space are an issue*

*Can be used in connection with the range of test valves*

## Box pressure switches

- -1 – 60 bar pressure span
- SPDT contact system
- Screw terminals
- Ag and Au contact material
- Fixed or adjustable differential

*General applications*

## Block temperature switches

- -10 – 200 °C
- SPDT contact system
- DIN plug
- Ag contact material
- Fixed differential

*General applications where robustness and space are an issue*

*Can be used in connection with the range of test valves*

## Box temperature switches

- -60 °C – 300 °C
- SPDT contact system
- Screw terminals
- Ag or Au contact material
- Fixed or adjustable differential

*General applications*

## The Danfoss range of switches for marine applications



# Solenoid valves



## Direct-operated 2/2 way valves

- G1/8 – G1 connection ISO 228/1
- NC/NO function
- 0 – 30 bar differential pressure
- 0 – 8 m<sup>3</sup>/h flow range
- Up to 80°C ambient temperature
- -30 – 140 °C media temperature

*General marine applications*

## Servo-operated 2/2 way valves

- G1/4 – G1 connection ISO 228/1
- NC/NO function
- 1 – 30 bar differential pressure
- 0.2 – 19 m<sup>3</sup>/h flow range
- Up to 80°C ambient temperature
- -30 – 100 °C media temperature

*General marine applications*

## Servo-operated 2/2 way valves – high pressure

- G1/2 – G2 connection ISO 228/1
- NC/NO function
- 0.3 – 16 bar differential pressure
- 1.3 – 160 m<sup>3</sup>/h flow range
- Up to 80°C ambient temperature
- -30 – 140 °C media temperature

*General marine applications*

## Assisted lift operated 2/2 way valves

- G1/2 – G1 connection ISO 228/1
- NC/NO function
- Up to 40 bar differential pressure
- Up to 60°C ambient temperature
- -10 – 60 °C media temperature

*General marine applications*

## The Danfoss range of solenoid valves for marine applications



**EV210B**  
2/2-way



**EV220B 6-22**  
2/2-way



**EV220B 15-50**  
2/2-way



**EV224B**  
2/2-way





Here **today.** Here **tomorrow.**

Danfoss is a leading global player in the development and production of mechanical and electronic products and controls.

Since 1933, our extensive know-how has made modern life easier, and we continue to break new ground in our core business areas.

We produce more than 250,000 items at 70 factories in 25 countries – every day. Impressive as these figures are, we are most proud of the way our dedicated employees apply the high quality components in customer solutions, adding value to the end product. Building strong partnerships is of great importance to us, because it is purely by understanding our customers' needs that we can meet the expectations of tomorrow.

This is also true in Industrial Automation, a Danfoss entity dedicated to focusing on the industrial world of today.

Through us, you gain access to the entire Danfoss pool of technologies, with special emphasis on sensors and controls.

We offer safer, more reliable and more efficient solutions in a close cooperation based on firm values.

## **Danfoss A/S, Industrial Automation**

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