Railway Technology

Innovative solutions for your success
Dear Reader,

A large number of people use rail vehicles every day. But only the manufacturers of these vehicles or their components know the extreme demands to which they are exposed.

Regardless of whether high-speed traffic, local passenger services, or freight transport is involved, JUMO – your reliable partner – is at your side. JUMO quickly provides solutions for all your temperature and pressure measurement technology requirements in the vehicles.

So how do we do it? By applying years of experience and professional expertise. JUMO has been a leading manufacturer of measurement and control systems for more than 70 years. This has helped us become an expert partner for the railway industry.

We place great value on steady new developments, continuous improvement of existing products, and on production methods that are always becoming more economical. Only this path allows us to achieve the highest degree of innovation for you.

In the field of railway technology JUMO also only offers you the best – a wide variety of products that have been checked according to relevant railway standards for a wide variety of solutions for the most varied applications.

This brochure provides an overview of JUMO products and systems for railway technology. Of course, we would also be happy to develop individual solutions that are completely customized to your requirements.

PS: Detailed information about our products can be found under the product group number at www.industry.jumo.info.

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# Table of contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drive technology</strong></td>
<td>4</td>
</tr>
<tr>
<td>Electric traction</td>
<td></td>
</tr>
<tr>
<td>Diesel traction</td>
<td></td>
</tr>
<tr>
<td>Hydraulic power transfer</td>
<td></td>
</tr>
<tr>
<td>Wheelset transmission</td>
<td></td>
</tr>
<tr>
<td><strong>Climate control</strong></td>
<td>8</td>
</tr>
<tr>
<td>Air-conditioning systems</td>
<td></td>
</tr>
<tr>
<td>Climate monitoring</td>
<td></td>
</tr>
<tr>
<td><strong>Pneumatics</strong></td>
<td>10</td>
</tr>
<tr>
<td>Compressed-air system</td>
<td></td>
</tr>
<tr>
<td>Brake</td>
<td></td>
</tr>
<tr>
<td>Service water, wastewater, and fire-fighting water tanks</td>
<td></td>
</tr>
<tr>
<td>Other compressed air consuming units</td>
<td></td>
</tr>
<tr>
<td><strong>Infrastructure</strong></td>
<td>14</td>
</tr>
<tr>
<td>Point heating</td>
<td></td>
</tr>
<tr>
<td><strong>Product highlights</strong></td>
<td>16</td>
</tr>
<tr>
<td><strong>Extract from the reference list</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Services &amp; Support</strong></td>
<td>19</td>
</tr>
</tbody>
</table>
Drive technology

In rail vehicles, generating movement by means of power transmission imposes some extreme loads on the components of the drive system. As a result, some mechanical components are exposed to high temperatures that have to be constantly monitored. Reliable measurement technology from JUMO helps you monitor temperature and pressure in drive systems.
Electric traction

Temperature-dependent control and monitoring of transformer cooling with surface-mounted thermostats of the AMTHF series

The electric driving motors of locomotives or railcars are designed for a far lower voltage than that which is available in the overhead contact wires of the traction lines. So transformers are used to transform the voltage down to a value that the motor can take. The temperature of an oil-filled transformer will vary, depending on the power consumption during vehicle operation. To counteract overheating, a temperature-dependent cooling system that can incorporate the different power levels is used. The exact switching point of the cooling system is highly significant, particularly when there are vast fluctuations in ambient temperature (e.g. when traveling through a tunnel).

AMTHF series surface-mounted thermostats monitor the oil temperature of the transformer and reliably operate the individual power levels of the cooling system. A further option is to use a temperature sensing element to regulate the motor power in accordance with the oil temperature. In other words, the driving performance is adjusted to the maximum operating temperature of the transformer. The pressure in the cooling system can be measured with the JUMO MIDAS S19 R or the JUMO MIDAS S06.
**Diesel traction**

**Monitoring temperature in diesel engines**
To achieve optimum drive power and best possible efficiency the heat balance in modern diesel engines has to be right. Precise temperature measurement is imperative, as tight restrictions are imposed on temperature. The screw-in RTD temperature probe distinguishes itself due to its robustness in demanding installation situations. It provides accurate temperature values for the engine or lubricating oil as well as for the engine control charge-air. Data is also transmitted from the main cooling circuit to the controller for engine cooling management.

**Fuel, lubricating oil, and charge-air pressure measurement in diesel engines with the JUMO MIDAS S19 R**
Common rail technology is increasingly being relied on as the method of fuel injection for diesel engines. Other than temperature measurement, pressure monitoring is primarily imperative for perfect engine operation. With the JUMO MIDAS S19 R pressure transmitter you can monitor the feed pressure and rail pressure of the fuel, the pressure of the lubricating oil, and the charge-air pressure of the turbocharger. The air filters are monitored with the JUMO MIDAS DP10 differential pressure transmitter.

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**JUMO eTRON T100**
Electronic thermostat
Type 701052

**JUMO screw-in RTD temperature probe**
For railway applications
Type 902815

**JUMO MIDAS DP10**
Differential pressure transmitter
Type 401050

**JUMO MIDAS S19 R**
Pressure transmitter
Type 401008
Hydraulic power transfer

Monitoring of the oil temperature in hydrodynamic transmissions
Hydrodynamic gear units are a combination of torque converters and fluid couplings that convert the mechanical energy of the diesel engine into the fluid energy of a liquid, which is usually oil. The oil temperature must be continuously monitored to prevent an admissible maximum temperature value being exceeded. Use the particularly robust RTD temperature probe JUMO VIBR0temp for measuring the temperature of the transmission oil.

Retarder monitoring with the JUMO MIDAS S19 R and a screw-in RTD temperature probe
You can use the JUMO MIDAS S19 R pressure transmitter and the screw-in RTD temperature probe to monitor hydrodynamic brakes (retarder), the brake force of which acts on the vehicle drive shaft via a rotor by filling the retarder with oil.

Wheelset transmission and axle bearing

Monitoring the oil temperature in hydrodynamic transmissions
Wheelset gears transfer the drive force to the drive wheelset. In diesel-powered vehicles the drive force is transferred from the main transmission whereas in electric-powered vehicles the drive force is transferred from the traction motor. The enormous loads on the bearings and the gear tooth flanks generate heat and are made manageable by lubricating with oil. For safety reasons temperature monitoring is essential to ensure reliable transmission operation. The bearing temperature is measured by a temperature probe that has been specifically developed and certified for this demanding measurement task. For example: with the JUMO RTD temperature probe for wheelset transmissions [patent pending]
Climate control

To provide passengers with the most comfortable journey possible, all modern railroad cars are now fitted with powerful air conditioners. High-quality measuring devices from JUMO are the ideal solution to ensure that air conditioners perform their heating and cooling functions perfectly regardless of whether the outside temperatures are extremely high or low.
Air conditioning system

Monitoring temperature and pressure in an air-conditioning system

Modern air-conditioning systems are responsible for generating both hot and cold temperatures in passenger compartments. As a result, the monitoring of pressure and temperature is particularly important. Sensor technology from JUMO ensures that every air-conditioning system runs smoothly. Other than RTD temperature probes you can also use JUMO thermostats to monitor and control the temperature.

Air heating, hot-water heating, and convection heating are often used to assist the air-conditioning system. Here, too, JUMO can provide reliable devices for you to monitor and control your heating system.

Climate monitoring

Indoor temperature monitoring

For optimum control and regulation of air conditioning systems, reliable data about the climatic conditions inside the railroad cars or driver’s cabs must be available. JUMO’s RTD temperature probes provide reliable temperature values to help you maintain a pleasant ambient temperature.

The electronic thermostat JUMO eTRON T100 is suited exactly for this application. It monitors and controls the interior temperatures in railroad cars and complies with the standards and specifications for use in rail vehicles according to DIN EN 50155, DIN EN 50121, and DIN EN 45545.

JUMO panel-mounted thermostat
EM/EMF series
Type 602021

JUMO MIDAS S19 R
Pressure transmitter
Type 401008

JUMO MIDAS 506
Pressure transmitter
low pressure
Type 401011

JUMO MIDAS DP10
Differential pressure transmitter
Type 401050

JUMO MIDAS S06
Pressure transmitter
low pressure
Type 401011

JUMO eTRON T100
Electronic thermostat
Type 701052

JUMO surface-mounted thermostat
AMTHF series
Type 603051

JUMO screw-in
RTD temperature probe
For railway applications
Type 902815

JUMO MIDAS DP10
Differential pressure transmitter
Type 401050

JUMO push-in
RTD temperature probe
With connecting cable for railway applications
Type 902150
Pneumatics

In virtually all rail vehicles, compressed air is the most important source of energy (along with electric current) because compressed air is responsible for many of the basic functions of a train. Reliable pressure monitoring throughout the system is vital for the generation, distribution, and use of the compressed air. Pressure transmitters from JUMO can help you in this task.
Compressed-air system

Temperature and pressure monitoring in the compressor
Compressors supply the compressed-air systems of rail vehicles with the compressed air they require. Regardless of whether you use screw or piston compressors as your main or auxiliary compressor, you can reliably monitor the pressure and temperature inside the compressor with JUMO sensor technology.

Inspecting the compressed-air system with JUMO MIDAS S19 R
The pressure in the main air reservoir line and in the storage tanks can also be monitored using the JUMO MIDAS pressure transmitter. If the pressure falls below a certain value the compressor is switched on and switched off again once a maximum value is reached. This maintains a constant pressure in the storage tanks.

Brake

Pressure monitoring in the brake circuit with the JUMO MIDAS S19 R
In rail vehicles, pneumatic wheel brakes take the form of block brakes or disc brakes. Both these design types have in common that when the brake system operates, compressed air flows into the brake cylinder and acts on the piston via a brake linkage to push the brake blocks against the wheels or the brake shoes against the brake disc.

To monitor pressure in the brake circuit, use the JUMO MIDAS S19 R which has been specifically developed and certified for the harsh ambient conditions found in rail vehicles.
Service water, wastewater, and fire-fighting water tanks

Vacuum toilets as an example of pressure condition monitoring with the JUMO MIDAS S06

The toilet systems in modern rail vehicles are cut off from the surrounding environment. In these airtight systems, a vacuum brings the wastewater and feces to the wastewater tank. When flushing, the vacuum pump generates a vacuum in an intermediate tank, the inlet valve opens, and the contents of the toilet bowl are sucked into the tank. The inlet valve then closes, excess pressure builds up in the intermediate tank, the outlet valve opens, and the content of the intermediate tank is pushed into the wastewater tank. To ensure a smooth rinsing process, the operating pressure of the system in the air pressure supply line and the vacuum as well as excess pressures in the intermediate tank can be measured during the flush cycle with the JUMO MIDAS S06.

Anti-freeze protection monitoring in service water, wastewater, and fire-fighting water tanks

To protect rail vehicle water tanks against frost damage during the cold season, the heating systems in the tanks are switched on when the outdoor temperatures are low. Here, JUMO thermostats ensure accurate as well as reliable temperature monitoring and heating element operation. Temperature values can also be recorded by RTD temperature probes and processed accordingly in the electronic controller. Level monitoring of the water tanks can also be performed with the differential pressure transmitter JUMO MIDAS DP 10 or the JUMO MIDAS S06, which is predestined for small pressures. The JUMO eTRON T100 electronic thermostat is used for fill level monitoring in the individual tanks and water temperature monitoring.
Other compressed air consuming units

Pressure monitoring on compressed air consuming units with JUMO MIDAS S19 R

The pneumatic braking system and the toilet systems are not the only basic devices in a rail vehicle that are operated by compressed air. Other devices include the current collector, the entry and intermediate doors, the pneumatic suspension, the wheel flange lubrication system, and the sander. All these loads can be monitored with JUMO pressure transmitters. JUMO MIDAS S19 R with its distinctive long-term stability and excellent price-performance ratio is very suitable for this task. The JUMO MIDAS S19 R has been specifically developed and certified for the special requirements in railway technology.
Infrastruktur

JUMO does not only provide devices for actual automotive technology applications in the field of railway technology, it also provides devices to be used outside the rail vehicles. Wherever temperatures have to be measured or pressure patterns monitored, JUMO – your professional partner – is at your side.
Point heating

Measuring the outdoor and rail temperatures with JUMO temperature probes

Cold outdoor temperatures as well as snowfall can cause the individual elements of the railway switches to freeze together if the railway switches are not heated. In cold weather, heating comes into play to clear the ice and snow from between the switch rails and the stock rails or the movable centerpiece. They allow the railway switches to continue to operate, thus preventing disruptions to the service. Modern electrical railway switch heating design types now work fully automatically. For this task the system control unit needs reliable data about the local climatic conditions in the railway switch environment. Temperature sensors from JUMO provide measured values for the ambient and rail temperatures to ensure optimum control of the timing for switching the heating on and off. The JUMO eTRON T100 electronic thermostat is suitable for monitoring the temperature.
Product highlights for railway technology at a glance

**JUMO surface-mounted thermostat**

*With 2, 3, or 4 single-pole snap-action switches*

- Protection type IP65
- Operating temperature (ambient temperature) -50 to +80 °C
- Tested according to DIN EN 61373 category 1B as well as further relevant railway standards such as DIN EN 50155

- Microswitch with snap-action system
- Robust, versatile, and reliable
- Outstanding long service life through more than 5.3 million switching cycles

**JUMO panel-mounted thermostat**

*EM/EMF series*

- Tested according to DIN EN 61373 category 1B as well as further relevant railway standards such as DIN EN 50155
- Robust, versatile, and reliable
- Outstanding long service life through more than 5.3 million switching cycles

- 1, 2, 3, or 4 single-pole snap-action switches possible
- Self-monitoring in the event of a pressure drop
- Safety switch-off at -20 °C

**JUMO MIDAS S19 R**

*Pressure transmitter for railway applications*

- Measuring ranges:
  - 1.6 to 60 bar relative
  - 1.6 to 40 bar absolute
- Welded measuring system
- Tested according to DIN EN 61373 category 1B as well as further relevant railway standards such as DIN EN 50155

- Vibration and shock resistant
- Tested acc. to railway standards
- Highly resistant to overload
- For maximum EMC requirements

**JUMO MIDAS DP10**

*Differential pressure transmitter – differential pressure*

- Measuring ranges:
  - 0 to 400 mbar up to 0 to 16 bar differential pressure
- Silicon sensor with stainless steel separating diaphragm
- Tested according to DIN EN 61373 category 1B as well as further relevant railway standards such as DIN EN 50155

- Compact design type: as of 78 mm in length
- Parts in contact with media: PBT plastic, option with full stainless steel
- Overload pressure up to 30 bar on one side
JUMO MIDAS S06
Pressure transmitter – low pressure
- Measuring range as of 0 to 100 mbar relative
- High degree of process reliability due to a welded measuring system with no seals
- Tested according to DIN EN 61373 category 1B as well as further relevant railway standards such as DIN EN 50155
- Compact design type: as of 58 mm in length
- Robust and maintenance-free measurement technology due to extreme overload resistance
- Parts in contact with medium made of stainless steel
- For temperatures from -50 to +270 °C
- Tested according to DIN EN 61373 category 3 as well as further relevant railway standards such as DIN EN 50155

JUMO RTD temperature probe for wheelset transmission
Push-in RTD temperature probe with connecting cable
- For temperatures from -60 to +180 °C
- Tested according to DIN EN 61373 category 1B as well as further relevant railway standards such as DIN EN 50155
- As single and double RTD temperature probe
- Vibration and shock resistant
- Test acc. to railway standards
- In two-wire, three-wire, or four-wire circuit
- Halogen-free connecting cable
- Patent pending

JUMO screw-in RTD temperature probe
For railway applications
- For temperatures from -50 to +270 °C
- Tested according to DIN EN 61373 category 1B as well as further relevant railway standards such as DIN EN 50155
- Vibration-resistant construction
- Plug connection is locked against contact, protection type IP67 (IP69K)
- Temperature probe with J head with suitable transmitter 4 to 20 mA

JUMO eTRON T100
Electronic thermostat
- Meets the standards and specifications for use in rail vehicles according to DIN EN 50155, DIN EN 50121, and DIN EN 45545
- Fast acquisition of the process status through plain text information on the display
- Relay output with 10 A change-over contact for switching high-performance loads
- Fast and reliable wiring through the use of PUSH IN terminals
- Simple startup and operation through plain text support
- Space-saving mounting in control cabinets and in sub-distribution boards
Our portfolio includes even more products and services
JUMO provides the entire measuring chain from sensor to automation solution for temperature, pressure, liquid analysis, flow, level, and humidity. Our goal is always to offer our worldwide customers the optimum solution in matters of process reliability, energy efficiency, and cost optimization.

As a result, we rely on our perfectly functioning after-sales service for an extensive range of services.

Do you still have questions or would you like to know more about our products? If so, please don’t hesitate to contact us.

Other industry brochures
If you are interested in one of the other industries that we supply you can now order the respective brochure. Simply call (0)661 6003-0 or send an email to mail@jumo.net.

A selection
- Food technology
- Chemical industry
- Pharmaceuticals and biotechnology
- Water and wastewater engineering
- Dairy technology
- Meat processing industry
- Wind power plants
- Plastics and packaging technology
- Heating and air-conditioning industry
- Industrial furnace construction
Services & Support

It is the quality of our products that is responsible for such a high level of customer satisfaction. But our reliable after-sales service and comprehensive support are also appreciated. Let us introduce you to the key services we provide for our innovative JUMO products. You can count on them – anytime, anywhere.

*JUMO Services & Support – so that it all comes together!*

**Information & training courses**

Would you like to increase the process quality in your company or optimize a plant? Then use the offers available on the JUMO website and benefit from the expertise of a world-renowned manufacturer. For example, under the menu item “Support/Services” you will find a broad range of seminars. Videos are available under the keyword “E-Learning” about topics specifically dealing with measurement and control technology. Under “Literature” you can learn valuable tips for beginners and professionals. And, of course, you can also download the current version of any JUMO software or technical documentation for both newer and older products.

**Product service**

We have an efficient distribution network on all five continents available to all of our customers so that we can offer expert support for everything concerning our product portfolio. Our team of professional JUMO employees is near you, ready to help with consultations, product selection, engineering, or optimum use of our products. Even after our devices are put to use you can count on us. You will receive fast responses from our telephone support team. If a malfunction needs to be repaired on-site, our Express Repair Service and our 24-hour replacement part service are available to you. That provides peace of mind.

**Maintenance & calibration**

Our maintenance service helps you to maintain optimum availability of your devices and plants. This prevents malfunctions and downtimes. Together with the responsible parties in your company, we develop a farsighted maintenance concept and are happy to create all required reports, documentation, and protocols. Because we know how important precise measurement and control results are for your processes, we naturally also professionally calibrate your JUMO devices – on-site at your company or in our accredited DAkkS calibration laboratory for temperature. We record the results for you in a calibration certificate according to DIN EN 10204.