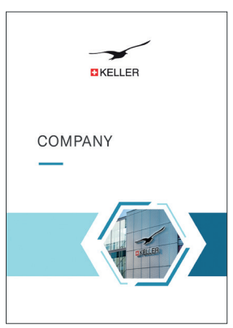
KELLER

INDUSTRIES

PRECISION PRESSURE SENSORS
INVENTED BY KELLER
EST. 1974
PRODUCED IN SWITZERLAND

CONTENT

MORE BROCHURES



HYDROGEN PRESSURE TRANSMITTERS

WE. DEVELOP. FUTURE.

23SY-Ei-H2

KELLER PRESSURE H2-PORTFOLIO

- Different accuracy classes depending on application
- Selected stainless steel alloy for minimal material embrittlement
- Gold-plated diaphragm to reduce H2 diffusion
- Metal-to-metal seal process connection
- Fully welded construction, no elastomer in contact with the medium
- Excellent long-term stability and durability
- ATEX-certified

keller-pressure.com

INDUSTRY OVERVIEW

Learn about the wide range of possible applications of our products. Our application reports show different real-life examples of customers trusting in the precision and reliability of KELLER Pressure sensors.

Vehicles

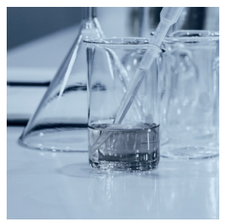
Aviation and Space-flight

Oil and Gas

Water and Environment

HVAC

Raw Material Extraction



Chemistry, Food and Pharma

Consumer Products

Structural Measuring

System and Device Construction

VEHICLES

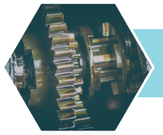
KELLER Pressure supplies components to the automotive industry for seamless execution of exhaust pressure measurements, gearbox and brake control, and engine test monitoring.

Automotive Industry

Paint Industry

Heavy-Duty Vehicles

Pumps and Compressors



Military Vehicles

Rail Vehicles

Mobile Hydraulics

Shipping

Monitoring and Testing

APPLICATION REPORTS

- Travelling the Seven Seas
- Putting Engines Through Their Paces
- Rotary Atomisers for Efficient Paint Spraying
- Paint Pistols for a Wide Range of Uses

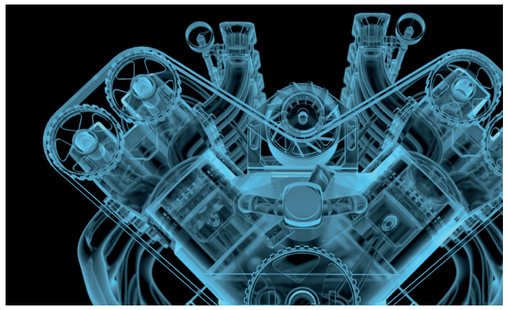
APPLICATION REPORT

PUTTING ENGINES THROUGH THEIR PACES

FPT Motorenforschung AG is based in the Swiss town of Arbon and develops engines destined for the vehicles and machinery of CNH Industrial's Powertrain segment. The engines are put through their paces on a total of 30 test benches. To measure their efficiency, FPT uses tools such as the Series M5 pressure transmitters from KELLER Pressure.

The focus of development is on reducing exhaust emissions and achieving a high power density, low fuel consumption, a long service life and maximum reliability. An engine's efficiency depends largely on the extent to which the flow of air into the combustion chamber and that of the exhaust gases back out again are unimpeded. The pressure here will be under 10 bar. The main priority is to get extremely accurate and highly dynamic measurements using absolute sensors. KELLER Pressure developed its M5 series to meet these specific engine testing requirements and several of these devices are used at various places on the engine during tests. To obtain a reliable analysis of pressure conditions and losses, it is important to take measurements as close as possible to the individual cylinders on the inlet side. The varying geometry of the intake manifold poses an additional challenge as it means that each cylinder is supplied with a different amount of air, something that has to be avoided as much as possible. On the outlet side, too, the combustion gases in the individual cylinders can cause unwanted interactions between pressure surges or pulses. The pressure sensors measure these processes on the inlet and outlet sides locally and with a high level of phase fidelity.

When testing engines, it is important for the sensors not to be sensitive to structure-borne noise as the sounds and vibrations from the engine cannot be allowed to interfere with the measurements. The measuring slot should be sealable with a plug once measurements have been taken and should be as resistant as possible to air flows. This application can also lead to compensating currents of up to 40 A being generated by the engine battery – these must not be allowed to influence the sensor.



The pressure sensors in the M5HB series deliver extremely fast and precise measurements to an accuracy of 0,1 %FS up to 180 °C. The pressure connection to the M5 fine thread is designed for both static and dynamic measurements such as pressure pulses. Their miniature size makes these sensors ideal for local measurements.

The sensor's main attributes are its very low dead volume and its good venting capability. It uses a rear-side technology without a transfer medium that also helps to minimise the attenuation of the measurement signal. No sealants, adhesives or capillaries are needed either. To prevent any unnecessary impact on flow conditions, the process connection should be as short as possible and, in terms of handling, able to be installed easily even in narrow tubes. The sensor is thus also very lightweight and able to withstand rapid acceleration.

The M5 series is available with or without an electronic system. The KELLER Pressure team's top priority when developing its electronic system was signal fidelity up to the limit frequency of 50 kHz. The M5HB pressure transmitters (i.e. with an electronic system) were optimised in line with FPT Motorenforschung AG's technical specifications and have been in use for many years now.

MORE APPLICATION REPORTS AT KELLER-PRESSURE.COM

AVIATION AND SPACEFLIGHT

Since 1997, KELLER Pressure has been supplying its pressure sensors to a wide range of sectors within the aerospace industry to help regulate cabin pressure, control pilots' emergency oxygen supply and check fuel pumps.

Aviation

Pumps and Compressors

Military Aviation

Space

Monitoring and Testing

APPLICATION REPORTS

- **Security for Aviation**
- **Aircraft De-icing**
- **Pressure Transmitters in Spaceflight**
- **Flying High Into the Thermosphere**

APPLICATION REPORT

SECURITY IN AVIATION

Many people get an uneasy feeling when they board an airplane, even though the statistical probability of being killed in a plane crash averaged 1 in 264'000 in the 1970s and stood at around 1 in 92'750'000 last year. This success is due to the improvement in aviation technology, airport infrastructure and air traffic control. This success can also be due down to the careful selection and strict screening of suppliers and their products.

KELLER Pressure has been supplying pressure sensors to all manner of aircraft fleet sectors since 1997. The main application areas are:

- Cabin pressure control
- Hydraulic distributors and filters
- Valve control
- Fuel pumps
- Refueling systems
- Air conditioning systems
- Ventilation
- Emergency oxygen supply for pilots

Depending on the type of aircraft, either all application areas are handled by KELLER Pressure, or only certain parts of them. The specific application description is subject to an obligation of secrecy. Pressure measurement technology needs to fulfil an extremely wide range of requirements, as shown in the example of the Boeing 787.

The so-called «Dreamliner» is a twin-engined long-haul aircraft with space for up to 300 passengers. It is the first «twin-aisle» wide-bodied aircraft whose body is made primarily of carbon-fibre reinforced plastic (CFRP). In view of the reduced weight, the newly developed engines and improved aerodynamics should save 20 % of fuel and be significantly quieter. Yet, despite the lightweight design, the «Dreamliner» stil meets the specified cabin noise limits. The special feature of the engines is that they do not release any bleed air into the air conditioning system. This means that engine oil cannot contaminate the cabin air. Each engine has two starter generators, each 250 kVA, that are used to start up the engines and generate electricity. The air conditioning system works electrically too. The 787 has a so-called inerting system as standard. This extracts nitrogen from the air using a special filter system and directs it into the tanks. This reduces the oxygen percentage to such an extent that a fire cannot be triggered, even in the event of flying sparks.

There are currently around 40'000 pressure sensors from us in the air – 30'000 or so of which are just for regulating cabin pressure.

Error-free operating times of between 200'000 and 400'000 hours, for example, are required for cabin pressure sensors and KELLER Pressure has proven that its sensors are reliable over hundreds of thousands of flying hours. Some time ago, one of the major clients confirmed that, over an observed year, an MTBF (mean time between failure) of more than 1 million hours could be detected.

MORE APPLICATION REPORTS AT KELLER-PRESSURE.COM

OIL AND GAS

KELLER Pressure is a specialist in the use of pressure measurement technology in the oil and gas industry. Whether for monitoring the pressure of gas tanks, checking the fill level of tanker trucks or measuring temperatures at the measurement head of boring bars, KELLER Pressure offers the perfect products.

Exploration

Hydrogen

Fuel

Oil and Gas Extraction

Gas Supply

Pumps and Compressors

APPLICATION REPORTS

- Pressure Control Means Outstanding Process Control
- LoRa System for Monitoring High Pressure Gas
- Portable Leak-Tightness Testing System for Hydrogen Fuel Cells
- Monitored Pressure Peaks
- Smart Fuel Tank Management
- Monitoring Diesel Generators
- Chemical Distribution

APPLICATION REPORT

MONITORED PRESSURE PEAKS – SECURITY FOR EVERY EVENTUALITY

Pressure surges in liquid- or gas-filled pipes are unavoidable. The damage they cause can be avoided, however. With the LEO5 manometer, pressure peaks can be detected early and the necessary precautions can be taken.

The effects of pressure surges can prove fatal: pipelines can burst, supports and other system components can be damaged and fittings, pumps and foundations can suffer too. The unpleasant consequences are expensive repairs and machine downtime, resulting in production stoppages, likewise, damage to pipelines is not always discovered immediately. This is why such systems are fitted with pressure dampers and sensors. However, this is unfortunately not enough, because this combination is not suitable for detecting and recording extreme pressure peaks.

The cause of the pressure surges is the fact that the pressure of moving liquids in pipelines rises sharply due to the effects of inertia. As water is practically impossible to compress, its pressure increases particularly rapidly. The effect is similar to that of a solid object hitting a wall with full force. In general, pressure surges cannot be avoided, whether in liquid- or gas-filled pipe systems, because valves cannot close infinitely slowly. So all that remains is to minimise the severe impact of this type of pressure surge, which is why pressure dampers are installed in pipe systems.

Pressure dampers alone are not enough to protect systems from damage. Although the overpressure valves in pressure dampers respond when a certain pressure limit is exceeded, they are too slow for overpressure peaks, which can arise in milliseconds. It is therefore sensible to install a special manometer like the LEO5 from KELLER Pressure to monitor the system. This manometer measures the pressure trend up to 5000 times a second, detecting any extreme pressure with a high temporal resolution. As the analysis shows the exact pressure trend over days, hours, minutes and seconds, it is easy to investigate the causes of pressure peaks.

Gas- or liquid-filled pipelines play a key role in industry. Whether they are transporting and dispensing liquids, being used for compressed air and hydraulics or just supplying water within companies, no pipes are safe from dynamic pressure fluctuations caused by abrupt changes in flow rates due to everyday operation.

The LEO5 brings security, helping you save money. You will no longer incur any costs for additional tests if traditional systems cannot determine the causes of pressure surges or costs due to downtime, production stoppage and repairs as a result of pressure-peak-related incidents, which can quickly add up to five or six figures depending on the sector. You will also be able to perform maintenance based on condition, as the pressure trend or pressure peaks recorded show whether the relevant machine could be damaged in the foreseeable future. This is why investing in using a LEO5 soon pays off, regardless of the application.

MORE APPLICATION REPORTS AT KELLER-PRESSURE.COM

WATER AND ENVIRONMENT

There are few industries as diverse as the water and environmental industry. Here, KELLER Pressure sensors can be found in all manner of applications. For instance, they are used to measure the sea depth, monitor the water pressure at the bottom of dams, calculate flow quantities and regulate water levels. Thanks to its many years of experience, KELLER Pressure can offer broad expertise in these areas.

Biology

Pumps and Compressors

Groundwater

Sewage

Hydrology

Surface Water

Metrology, Climate Research

Water Supply

Oceanography

APPLICATION REPORTS

- Without Water Everything Comes to a Halt
- CO2 Recycling
- Pore-Water Pressure Monitoring in Ice-Rich Permafrost
- Upcycling Sensors
- Monitoring the Seabed – The Subtle Distinction
- How to Measure the Pressure on our Eco-System
- Tracking Devices for Marine Animals
- Measuring Wave Impact Pressure
- Cryoegg Glacier Research

APPLICATION REPORT

REDUCING DRINKING WATER LOSSES

Accurate data are one of the keys to establishing intelligent water distribution networks. Many countries across the world are afflicted by drought and, not long ago, as much as 60% of the water supply in major cities was being lost to pipeline leakages.

These losses are mostly due to problems with dilapidated pipeline networks, such as burst pipes going undetected and cracks forming in pipes, although leaky taps are also a frequent cause. This constant dripping in numerous households is hard to identify, and the losses tend to become apparent only after comparisons are made between water supply figures and the water consumption data registered by meters. Local governments often have no other choice but to pay the cost differences or pass them on to consumers. It therefore pays to invest in intelligent measurement technology.

One company that offers such measurement technology is i2O, which links together sensor heads from KELLER Pressure to create smart network solutions. The transmitters provide accurate measurements for relevant points in the pipeline network. The network management system sends the processed data in predefined intervals to various nodes, which then forward the data to a control centre. The control centre analyses the data, identifies anomalies and then looks for the causes. Control parameters can be adjusted remotely if necessary. Teams of technicians only have to be sent out if defective components need to be repaired.

The two companies began cooperating extensively on the development of a new range of i2O pressure loggers. These needed to have a very compact design and be highly accurate and easy to install and remove.

The 20D pressure transmitter was able to meet key requirements here: The digitisation of the measurement values is managed by a microchip integrated directly into the pressure sensor. The logger can read out the pressure values directly from the transmitter via the I2C-Bus interface. There's no need for an additional electronic circuit, which saves a lot of space.

The pressure connection was equipped with an additional quick release coupling especially for the i2O application, and the housing was also made more compact. Specialised calibration by KELLER Pressure was required in order to achieve the high accuracy required by i2O. Here, it was possible was to reduce the total error band as compared to the standard product from 0,5 % to 0,2 % full scale.

This solid foundation enables i2O to offer accurate, reliable and affordable loggers that provide the relevant data for intelligent water networks in a timely manner. Those who utilise these smart solutions can therefore quickly repair damages in a targeted manner while simultaneously conserving a valuable resource – and saving a substantial amount of money in the process.

MORE APPLICATION REPORTS AT KELLER-PRESSURE.COM

HVAC

Air-conditioning technology is used in office buildings, homes, warehouses and production facilities, as well as in process technology and vehicles. KELLER Pressure sensors regulate air conditioners and other devices, measure coolant pressure and control air-conditioning compressors.

Air-Conditioning Systems

Heating and Cooling

Pumps and Compressors

Ventilation

APPLICATION REPORTS

- **Pressure Measurements Are Helping Refrigeration Evolve**
- **No Air-Conditioning Systems Without Sensors**

APPLICATION REPORT

NO SENSORS, NO AIR-CONDITIONERS

It provides fresh air when it's hot and raises the room temperature when it's cold. We're talking about air-conditioning. Although it has been around for many years already, it is still a luxury in some places. Air-conditioning systems come in various designs with different output levels and are available as both fixed installations and mobile units.

The fundamental principle is easy to explain: warm air is sucked in and cooled down with a refrigerant. The cold air is then released again to regulate the room temperature as desired.

Four main components are needed to build an air-conditioning system: a compressor, a condenser, a valve and an evaporator. A refrigerant that circulates constantly is also necessary.

The compressor is needed to suck in the gaseous refrigerant and heavily compress it. This increases the temperature and pressure of the refrigerant. The refrigerant is then pumped to the condenser, where it is cooled with ambient air sucked in by a fan. This condenses and liquefies the refrigerant. The liquid refrigerant is still under high pressure and is passed through the valve to the evaporator. As the refrigerant builds up in front of the valve, it suddenly loses pressure. The reduction in pressure turns the refrigerant back into a gas and causes it to lose heat. The warm ambient air that is sucked in is blown across the evaporator and its heat is extracted. The heat is absorbed by the cooled refrigerant. This turns the liquid refrigerant back into a gas, which returns to the compressor to be compressed again. The cooled air is blown back into the room.

Sensors help with regulation

Since people first and foremost need the right temperature to feel comfortable, most air-conditioning systems come with controllers, known as speed controllers, for setting the desired temperature. The temperature set affects the speed at which the in-built fans rotate and the strength of the airflow. These parameters also affect the pressure control of the refrigerant. The current pressure in the system can be measured using pressure transmitters that are mounted on analogue inputs of the control system. If the system's pressure rises, the control system increases the speed of the fan, which cools the condenser with the ambient air.

MORE APPLICATION REPORTS AT KELLER-PRESSURE.COM

RAW MATERIAL EXTRACTION

Raw materials are products that occur in nature in their unprocessed form. They often have to be extracted under tough conditions. With its products, KELLER Pressure is helping to ensure that raw materials can be extracted from harsh and potentially explosive environments.

Chemical Raw Material

Oil and Gas Extraction

Exploration

Plant-Based Raw Materials

Mining

Pumps and Compressors

APPLICATION REPORTS

- **Water Monitoring in Open-Pit Mining**
- **Dewatering a Diamond Mine**
- **Mining in a Diamond Deposit**
- **Lithium Brine Production**

APPLICATION REPORT

WATER MONITORING IN OPEN-PIT MINING

The «Novageo» exploration crew specialises in technological testing, geomechanical and hydrogeological well boring and the monitoring of the level and temperature of underground water. The crew monitors the groundwater in the Chernogorsk open-pit mine, which contains deposits of precious metals such as gold and platinum.

The open-pit mining operation has already extended deep into the ground, with the lowest level located far below the groundwater level. The pit would soon be flooded if not for the nearby wells, where water is constantly pumped out.

Groundwater monitoring systems in open-pit mining
Chernogorsk is located in the Norilsk region in the northern part of the Siberian tundra. Average temperatures near the mine in the winter hover at around -31 °C, but can get as low as -45 °C. Within the framework of experimental filtration work and hydrological research, the water wells in the area were equipped with autonomous DCX-22SG data loggers. The sensors monitor the level and temperature of underground water under perpetually frozen soil at a depth of 400 – 500 metres.

The sensors themselves are mounted in the lower perforated section of a column made of metal that has a diameter of 33 to 40 mm, whereby the sensor wires run through the column. The upper parts of the wells are frozen in permafrost. The wellheads are equipped with a protective metal covering and are connected electrically to the data loggers, which transmit their data via a K-114-A converter.

The parameters of the groundwater supply are identified on the basis of the results of water level and temperature monitoring under the permafrost. These results also help clarify the filtration parameters and the characteristics of the tectonic fault line, which in turn can provide important information on the remaining deposits of precious metals.

MORE APPLICATION REPORTS AT KELLER-PRESSURE.COM

CHEMISTRY, FOOD AND PHARMA

IoT processes are in high demand in the chemical and pharmaceutical industries, as well as in the food industry. These processes require sensors, because states cannot be captured or actions carried out without them. KELLER Pressure is a leading manufacturer of pressure sensors, making it the ideal partner when it comes to implementing IoT solutions.

Agriculture

Laboratory Technology

Autoclaves

Medical Technology

Chemical Distribution

Pumps and Compressors

Food Production

APPLICATION REPORTS

- **Sterilising Bottling Machines**
- **Management of Medical Oxygen**
- **Networked Beer Tanks**
- **Fish Farm Water Level Monitoring**
- **Chemical Distribution**
- **Digital Oxygen Valve**
- **Steam Sterilisers**
- **Sensors for the Perfect Coffee**

APPLICATION REPORT

STEAM STERILISERS FOR STERILE TOOLS

Sterility as the goal
Sterilisation is defined as the killing of microorganisms (including bacterial spores) with the aim of achieving absolute sterility. An item is deemed sterile if the theoretical probability of a living germ existing on the object in question is less than 1 in a million. Sterile devices and tools are mainly used in the medical sector and other related sectors, but they can also be used in the pharmaceutical and the food industries.

Steam sterilisation is the surest method of sterilisation and is therefore favoured above other methods. A steam steriliser is a device which applies pressure and heat and utilises steam vapour. It is also known as an autoclave.

The operating principle of a steam steriliser is similar to that of a steamer for cooking. Water is heated in a sealed vessel and is gradually brought to the boil until it is filled with saturated steam. Because the steam in the vessel cannot escape, it achieves a temperature higher than 100 °C. As the pressure in the vessel increases at the same time, a «saturated vapour» forms. The heat held by the «saturated vapour» is transferred through condensation on the cooler instrument to be sterilised to the instrument itself, destroying any microorganisms present.

For successful sterilisation, it is essential that steam is able to occupy all of the space in the steriliser. The air must first be removed in order to achieve this. This is sucked out using a vacuum pump, to create a vacuum or a negative pressure within the steriliser. Negative pressure is a pressure lower than that of normal air pressure. The steam can then expand through the vacuum. This process is gradually repeated until the entire vessel is filled with «saturated steam».

Sensors guarantee the pressure and temperature
For a client who manufactures products for the medical industry, KELLER Pressure was able to supply transmitters from the 35XHT series which were specifically adjusted to the respective autoclaves. These pressure transmitters guarantee the regulation and monitoring of the two parameters of pressure and temperature which are necessary for successful sterilisation.

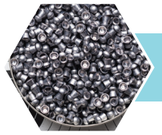
The following two practices are followed most widely in steam sterilisation:

- A sterilisation time of 15 minutes with a temperature of 121 °C and an absolute pressure absolute pressure of 2,1 bar.
- A sterilisation time of 3 minutes with a temperature of 134 °C and an absolute pressure of 3,04 bar.

MORE APPLICATION REPORTS AT KELLER-PRESSURE.COM

CONSUMER PRODUCTS

KELLER Pressure sensors can be found in all manner of everyday objects. For instance, they monitor the pressure in scuba tanks or coffee machines. In this way, KELLER Pressure brings benefits not just to the world of industry but to the domestic sphere too.



Airsoft

Coffee Machines

Digital Pressure Gauges

Pumps and Compressors

APPLICATION REPORTS

- Pressure Sensors on Water Pipelines
- Monitored Pressure Peaks
- Sensors for the Perfect Coffee

APPLICATION REPORT

PRESSURE SENSORS FOR THE PERFECT COFFEE

Coffee is one of the most consumed drinks in Europe, which is why it is no surprise that so many coffee machines can be found where people live and work. Coffee from bean-to-cup machines is enjoyed most often.

Bean-to-cup coffee machines are devices which can produce a range of coffee types completely automatically. A fully automatic machine is fundamentally made up of a grinder, an instant water heater, a pump and a brewing assembly. In addition to making coffee, some bean-to-cup machines are equipped with extra modules which use steam to heat up and foam milk.

The grinder has the task of producing freshly ground powder from whole coffee beans. A mobile piston then transports this to the brewing chamber which is part of the brewing assembly and therefore the heart of the machine. The instant water heater is responsible for heating up the water that is going to be used.

A pump is connected to this which transports the hot water. The coffee grounds and the hot water are combined within the brewing assembly. In order to produce the coffee, the coffee grounds are first pre-brewed, where they are moistened with a small quantity of water at low pressure and swell up, allowing the flavours to be released. Then, the chosen quantity of hot water is forced at high pressure through the layer of swollen coffee grounds and a highly concentrated coffee is produced. The light cream foam on the surface of the coffee comes from the coffee oils released through this process.

Pressure is essential for an aromatic coffee. Within the brewing assembly and during coffee production, a specific pressure is used in most bean-to-cup machines. In order to create this pressure, it is paramount that the built-in pump carrying the hot water into the brewing chamber produces a high pressure itself. The reason for this is that the pressure reduces over the course of the process. In order to guarantee this system, it is necessary to install sensors. The sensors do more than measure the steam pressure – they also regulate the temperature of the water. A sensor is also required to prevent overpressure. Should overpressure occur, a valve is switched allowing the steam to escape.

Rex-Royal AG from Dällikon in the Canton of Zurich, Switzerland, manufactures such bean-to-cup coffee machines and they continuously develop new products and technologies for the perfect coffee. Rex-Royal has sourced pressure transducers from the 21C series from KELLER Pressure to implement the S300 model range. Alongside the pressures described above, these pressure transducers also measure and control the temperature of the milk heated to make latte macchiato and cappuccino coffees. With Rex-Royal's professional coffee machines, the perfectly brewed coffee is no longer out of reach.

MORE APPLICATION REPORTS AT KELLER-PRESSURE.COM

STRUCTURAL MEASURING

Swiss quality and precision is highly sought-after when monitoring roads or building sites. These can be found in abundance at KELLER Pressure and are one of the reasons why the products are so popular in the structural measuring technology sector.

Geotechnical Investigation

Structural Monitoring

Tunnel Construction

APPLICATION REPORTS

- Monitoring Bridge Loads
- Keeping Floods at Bay
- Cone Penetration Testing

APPLICATION REPORT

EFFICIENTLY MONITORING THE BRIDGE LOADS

In addition to numerous examples of fill level monitoring systems, power measurement on building sites is another area where sensors enable «smart» monitoring. A good example of this is recording the load distribution on bridges.

The volume of traffic on our roads is an unknown quantity and the growing proportion of lorries (or trucks) places increasing loads on bridges. But the ground is not a static feature either, since plate tectonics cause everything on the planet to move and the ground beneath our feet to change on a daily basis. These two variables will cause the load distribution on a bridge to change. To ensure continuing safety, it is necessary to continuously monitor and identify changes in the load distribution using sensors.

Previously, bridge loads were displayed using a mechanical indicator on the bridge bearings, which had to be read on site. KELLER Pressure has focused its attention on this central supporting element of the bridge and integrated a networked pressure measurement solution into the bearing. The bridge transfers the loads to an elastomer cushion. Between the pressure sensor and the elastomer is a layer of grease that functions as a pressure transfer medium and makes it possible to measure the internal pressure due to loading. This change in pressure is determined by a pressure transmitter whose customer-specific design integrates perfectly into the bridge bearing.

The Remote Transmission Unit ARC1 reads the data directly via a digital interface and sends a warning message to those responsible depending on the measured value. The use of stainless-steel-covered pressure sensors with an especially long service life guarantees decades of reliable measurements and functional safety. With the Internet of Things, bridges can be reliably and continuously monitored for changes in load distribution that pose a threat and closed off if necessary.

MORE APPLICATION REPORTS AT KELLER-PRESSURE.COM

SYSTEM AND DEVICE CONSTRUCTION

System and device construction is an important technological sector that produces equipment for a wide range of specialist applications. By working closely with device manufacturers, KELLER Pressure can make sure that its broad expertise is put to good use right from the product development stage.

Device & Machine Construction

Production Monitoring

System Construction

APPLICATION REPORTS

- **Pressure Control Means Outstanding Process Control**
- **Sterilising Bottling Machines**
- **High-End Automation in Sensor Manufacturing**
- **Pressure Monitoring for Tempering Machines**
- **Customized Differential Pressure Module**
- **Large Wind Turbines Full of Small Sensors**

APPLICATION REPORT

LARGE WIND TURBINES FULL OF SMART SENSORS

In a wind turbine, a proportion of the kinetic energy generated by the wind is transformed into electric energy and fed into the closed power network.

The wind's usable kinetic energy increases with the wind's speed. Wind turbines therefore use kinetic energy to generate torque and therefore the rotational movement. The rotor, generally consisting of three rotor blades, creates the kinetic energy and passes it on to the generator, which produces electric current from it. The large majority of wind turbines use adjustable gearboxes which match the wind-dependent speed of the rotor to the constant speed of the generator within a housing called a nacelle. While the rotor only turns slowly at very high torque, the torque of the quickly rotating generator is rather low.

The necessary transmission ratio between both torques determines the overall size of the gearbox. The efficiency of the gearbox in a wind turbine is very high. Because the transferred power output is extremely high, there are also significant energy losses.

This mostly concerns loss through heat, which is why the gearbox has to be cooled. This is achieved with sophisticated lubrication technology in the gearbox. Oil pressure and oil temperature measurements are required in this process. The oil pressure is monitored by sensors. KELLER Pressure was able to provide several pressure transmitters from the 21Y series to a client who supplies these gearboxes for wind turbines.

MORE APPLICATION REPORTS AT KELLER-PRESSURE.COM

KELLER PRESSURE – YOUR SWISS PRESSURE SENSING SPECIALIST

A market leader in the production of isolated pressure transducers and transmitters.

KELLER Pressure was established in 1974 by Hannes W. Keller, the inventor of the integrated silicon measuring cell. Today, his sons Tobias and Michael Keller run the business. The company is wholly family-owned and employs 500 staff from over 20 nations.

KELLER Pressure feels a strong connection to its home of Switzerland. Its headquarters are where the value is added and where most of our employees work. All products bear a quality seal that stands for «Swiss Made», among other things, which is associated with expertise, quality, tradition and being grounded approach all across the world. These are the core values as a business – values embodied by the company and its products.

PRECISION PRESSURE SENSORS · INVENTED BY KELLER · EST. 1974 · PRODUCED IN SWITZERLAND

Zertifiziertes Managementsystem · SQS · ISO 9001

KELLER Pressure is certified to ISO 9001. This means that our measured values can be fully traced to national standards.

Find out more exciting details about the seal of quality here:

PRODUCT OVERVIEW

KELLER Pressure is known for Swiss quality and precision. Ever since being established, the company has developed and produced its products at its facilities in Winterthur. For more than 50 years, we have been pairing expertise with innovative spirit to find the right solutions for each individual application. The customer's wishes are our key focus.

Pressure Transducers

Pressure Transmitters

Level Probes

Data Loggers

Digital Pressure Gauges

Wireless Solutions

Custom Solutions

Software and Accessories

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