



# KEM – Your Partner for Flow Measurement Technologies

DESIGN | PRODUCTION | DISTRIBUTION | CALIBRATION

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KEM Küppers Elektromechanik GmbH (KEM)

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## COMPETENCE IS MEASURABLE

Satisfied customers around the world put their trust in us and our reliable measuring solutions.

We develop and produce reliable flow measuring technology with a special focus on quality and precision. Thanks to our competent and motivated employees, comprehensive application know-how, and extensive vertical integration, we have the flexibility to respond quickly, even in case of individual customer requests.

### TOP QUALITY ACCORDING TO INTERNATIONAL STANDARDS

Quality is an important business objective. Its level is always being redefined. We continuously and effectively question, review, and improve quality at KEM.

KEM has consistently maintained its quality management system certified by TÜV Süd since 1994. Environmental protection and occupational health and safety are defined in our documented processes along with energy-efficient operation. We meet special requirements for our products (e.g. PED, explosion protection, metrological certificates) as well as requirements for the materials used (e.g. CMRT, REACH, and RoHS).

### WE ARE KEM. KEEN, EXPERT, MOTIVATED

KEM is a competent and reliable partner in the fields of flow measuring technology and calibration. We have been assisting our customers around the world with the optimization of their individual processes since 1965, not only helping them with the conservation of resources and cost reduction, but also the compliance with legal requirements and standards.

Our business success is based on the motivation to inspire our customers with durable, user-friendly products and to offer individual solutions when needed. This includes, for example, special materials such as duplex steel or Hastelloy, high-temperature and high-pressure versions, compact and lightweight construction versions, and the construction of special connections and OEM designs. Learn more about the many existing practical applications of our Flow Meters in this brochure.

Among other things, product quality is increasingly dependent on reliable measurements. We guarantee the accuracy of our Flow Meters and traceability to national standards documented in the form of detailed calibration records. We also recalibrate measuring equipment of our competitors in addition to our own products.



#### **KEM stands for**

- Innovation
- Application knowledge
- Solution-oriented thinking
- Flexibility
- Fast response time
- Reliability
- Experience
- High-precision devices
- Audited production processes
- Audited quality management
- Good service
- Fair price/performance ratio

## KEM & TASI GROUP -A STRONG GLOBAL NETWORK



The TASI Group is a global enterprise consisting of four strategic business areas:

- Flow
- Product Integrity
- Package Integrity
- Automation

Every TASI company delivers world-class products and services, focusing on offering complete technical solutions. These range from IIoTcapable products such as industrial wireless and real-time process monitoring to leakage test devices and systems, bottle and can inspection, and automated assembly lines to the latest flow measuring technologies.



As part of the Flow business area, KEM has been a member of the TASI Group since 2005. The business segment supplies flow measuring instruments and control units using various flow measuring technologies.

The products are developed, produced, adapted to customer-specific requirements, and maintained in technical centers in the USA and Europe. TASI Flow operates distribution channels and service centers around the world.

Our customers utilize the advantages of a strong global network with expertise in a variety of technologies.



KEM as a midsize enterprise with an international orientation offers various entry-level, development, and career advancement opportunities.

Our doors are open to qualified, motivated, and responsible specialists and managers. We also put our trust in motivated career starters and career changers from day one, gladly assigning them responsibilities. Our experienced employees stand by you in words and deeds, helping you put theoretical knowledge into practice. They are happy to share their knowledge and skills. Secondary school and university students can get to know the working world and KEM through training, a cooperative course of study, internship, or thesis.

We offer our employees more than exciting tasks, attractive compensation, and development opportunities. With us you can also harmonize your career and your personal life thanks to flexible hours of work and home office.

## **KEM AS AN EMPLOYER**

## CONTRIBUTION TO THE **ENERGY REVOLUTION**

Renewable energy harvested from the wind, water, and sun represents the future of the energy supply. With more than 55 years of experience in measuring and control technology, we at KEM are proud to make our contribution to the energy revolution and climate protection.



### ROTOR BLADE BONDING PROCESS

Glass fiber and carbon fiber composites have established themselves as materials for wind turbine rotor blades. The upper and lower sections are separately cast and then joined in a bonding process to form a single unit. High-viscosity, abrasive adhesives are used. Quickly obtaining a lasting bond is the objective. The smallest errors can lead to significant additional costs.

KEM Helical Flow Meters withstand considerable abrasion forces and supply exact measurement data, even at high viscosities. A special measuring technology and mounting concept ensures precise measurement results, high reproducibility, and durability.



### HYDROGEN REFUELING

The infrastructure is one of the key factors for the success of fuel cell technology in vehicles for hydrogen refueling. Hydrogen filling stations are being built today without a counter calculation for required vehicles. Measurement technology is needed to bill the dispensed hydrogen. This is a challenge for the entire measurement chain.

A TRICOR Coriolis Mass Flow Meter is installed directly in the dispenser, upstream of the heat exchanger and at constant pressure. Thus, there is no more undefined gas volume in the pipe system, the flow meter is not exposed to the temperature gradient.



### ELECTROSTATIC SPRAY SYSTEMS

Coatings are highly conductive due to the water content of modern paints. Today's efficient electrostatic bells and spray guns charge the paint directly with 50 to 90 KV. The paint, now with a negative charge, is attracted by the positively grounded components being coated. More paint ends up on the component so less is wasted in the form of overspray. But none of this is possible when the highly conductive coating itself causes a direct short-circuit to ground. Insulating the paint supply from the ground is the solution.

The ESTA system (electrostatic application) uses a combination of components to operate an electronic Coriolis measuring device at the same voltage potential as the paint supply, regardless of whether the high voltage is active or the system is at ground potential.

# **ELECTRIC VEHICLE BATTERIES**

Lithium batteries used in electric vehicles are based on the battery stacking technology. The entire assembly process not only has to comply with the battery specifications but also meet the requirements for heat dissipation, strength, and lightweight con-

Here the high-resolution KEM Helical Flow Meter is the ideal solution. Thanks to a specialized mounting concept, long-term durability, and high reproducibility, it meets the quality standard

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## MEASURING PRINCIPLES

### CORIOLIS MASS FLOW METERS

use the Coriolis force. It is one of the three physical inertia forces in a rotating reference system, proportional to the mass, the speed of the body, and the angular velocity. The rotation is represented by oscillating pipes, the flowing mass in the pipe is the body. A different deformation of the pipes on the intake and discharge ends is produced due to the Coriolis effect. The change in the pipe oscillation over time and in space causes what is known as a phase shift, which is proportionate to the mass flow. This can be measured and evaluated.

The density of the flowing medium can be determined from the resonance frequency and oscillation frequency. Integrated temperature measurement is used to compensate for the temperature dependency of the oscillating system. Thus a Coriolis Flow Meter always provides the mass flow, density, and temperature of the medium as the primary measurements. The volume flow can be determined from the mass flow and density. Standard volume and multiple phase measurements can be carried out if other substance properties are known.





### GEAR FLOW METERS

are displacement meters that record the volume flow of liquids using the gearwheel principle. Two interlocking precision gearwheels are contained in a measuring chamber. Self-contained cavities filled with the medium are formed between the teeth and the housing. The flowing measured medium causes the free and unrestricted rotation of the gearwheel pair. The rotational speed of the pair of gearwheels is proportional to the flow rate and is sampled by contactless measuring elements through the housing wall.

Different measuring ranges and resolutions of the measuring signal can be obtained by using different gearwheel dimensions. Various material pairings, mounting types, and configurations are available to meet the requirements for most measurement applications and liquids. Therefore even non-lubricating, filled, abrasive, and corrosive liquids with different viscosities can be measured with high precision. The variable design makes it possible to tailor Gear Flow Meters to a variety of applications according to the respective customer requirements.

### TURBINE FLOW METERS

are volume counters that measure the volume flow of liquids according to the Woltmann impeller counter principle. They determine the mean flow rate of the liquid flowing through a pipe cross-section.

A high-precision turbine wheel with a low mass is concentrically mounted in the pipe body of the Turbine Flow Meter. The flow of the medium is directed at the turbine wheel in the axial direction, causing its rotation. Flow straighteners position the turbine wheel and produce a consistent flow profile. The rotational speed of the turbine wheel is proportional to the mean flow rate and therefore also to the flow. Contactless measuring elements record the rotational speed of the turbine wheel through the housing wall.

The physical principle of the Woltmann impeller counter is particularly well suited for measuring low-viscosity media. It features a low pressure loss. Different nominal widths of the turbines cover a variety of measuring ranges. The solid construction is reliable even under challenging operating conditions.





### HELICAL FLOW METERS

are displacement meters that record the volume flow of liquids using the helical gear principle. The elongated measuring chamber contains two overlapping, interlocking screw spindles. Self-contained cavities filled with the medium are formed between the spindle flanks and the housing. The flowing measured medium causes the free and unrestricted rotation of the spindle pair. The rotational speed of the pair of screw spindles is proportional to the flow rate and is sampled by contactless measuring elements through the housing wall.

A variety of measuring ranges and resolutions can be obtained by using different spindle sizes. The elongated structural shape and the spindle design of the measuring element are favorable for measuring media that have a high viscosity and are sensitive to shearing.

Various material pairings, mounting types, and designs ensure that our Helical Flow Meters are suitable for most measuring demands and a variety of liquids.

## **TRICOR CORIOLIS** MASS FLOW METER

View 2\$

### FIELDS OF APPLICATION

INDUSTRY	MEDIUM	APPLICATION
Plant Construction Mechanical Engineering	Coatings Critical UV coatings	Paint shops ESTA systems (high water content)
Process Industry	Additives	Powder metallurgy
Oil & Gas	Polymers Inhibitors Oil, DRA (drag reduction agent)	Oil/water separators Oil production
Renewable Energy	Gases (liquefied)	Hydrogen fueling
Marine	Fuels	Fuel monitoring
Mining/Steel	Fuels	Smelting furnace control
Aviation & Aerospace	Coatings	Surface finishing
Conventional Energy	Condensate Oils	Condensate measurement Loading/unloading Burner monitoring
Chemistry	Flavorings Conditioning agents Vinyl acetate	Benzene hydrogenation Dosing of media for surface coating Filling processes

#### TRICOR



#### **PRO Plus series**

Unique sensor design combined with the advantages of the DSP transmitter

- Mechanical stress decoupling
- Extremely stable zero point
- High process noise immunity
- Highly dynamic measuring range
- Ultra-compact design
- Fully welded construction

#### CLASSIC Series | TCM





#### RO Series | TCMP





#### Benefits and advantages:

#### Entire TRICOR Coriolis family

• Experience through 20,000 installations worldwide

#### **CLASSIC Series**

- Precision Coriolis Mass Flow Meters
- Very user friendly, straightforward menu navigation
- Little to no maintenance
- Broad range of applications
- Triple explosion protection approval: ATEX/IECEx/cCSAus
- OEM version with compact electronics and no display
- Pressures up to 345 bar [5,000 psi]
- Short delivery times

#### **SPECIALITY Series**

Benefits of the CLASSIC Series plus:

- Special versions for electrostatic applications
- High-pressure versions for hydrogen filling stations (up to 1,050 bar [15,200 psi])
- MID (MI002) OIML R137 approval
- Pressure versions (414/690/1,050 bar [6,000/10,000/15,200 psi])

#### **PRO** Series

Benefits of the CLASSIC Series plus:

- Extended range of applications
- TCD transmitter with modern diagnosis functionality
- AUDIT functionality for logging and traceability
- Measurement of fraction concentrations
- Profibus PA/DP
- Very fast response behavior
- EGM (entrained gas management)

## **TRICOR CORIOLIS** MASS FLOW METER



### CHEMICAL MANUFACTURING DMF -PU COATING AGENT

DMF is a clear, liquid, organic solvent used in a number of industrial processes, particularly in the production of polyurethane (PU) products, pesticides, electrical equipment, pharmaceutical products, and synthetic leather and fibers.

To create optimal working conditions for the product and process, the product is heated to a temperature of 100 °C [212 °F] or more during reactor feeding. The high viscosity and product particles pose added challenges for pump control.

TRICOR Coriolis Mass Flow Meters make a very accurate batch process possible. With the direct measurement of the mass flow, production engineers can easily prepare a mass balance of the product with the raw materials to optimize the process.

### FOAM CONDITIONING AND PUMP MONITORING

Plasticized styrene polymer is mixed with a propellant mixture and additives by heating in an extruder. This mixture passes through a calming zone where it is cooled before being extruded through a nozzle to make foam panels.

A TRICOR Coriolis Mass Flow Meter monitors the actual flow. It serves to verify the actual flow compared to the required flow based on the rotational speed of the pump. It also provides indirect feedback on the amount of material conveyed by the pump. It immediately indicates when a tank in the supply system gets empty.





Vinyl acetate polymer (Veova) is often used as a color binding agent in the coating industry. Such polymers are used for alkaliresistant emulsion paints with outstanding abrasion resistance.

TRICOR Coriolis Mass Flow Meters monitor the actual flow. Comparing the actual and nominal flow also ensures the best product quality. Highly accurate density measurement supplies additional information for reliable process control.

## **GEAR FLOW METERS**



### CHASSIS COATING AND PAINTING

KEM has been a reliable and renowned partner for flow measuring technology in the automobile sector for decades. We pursue the further development of proven technologies or develop groundbreaking innovations in close cooperation with leading automobile manufacturers and suppliers.

Our patented Gear Flow Meters in the cartridge design offer a weight-optimized concept and can be installed directly in the spraying head on the robot arm without restricting the robot's dynamic behavior. Since they are easy to flush, colors can be changed quickly without interfering with subsequent coating due to color residues.

### FIELDS OF APPLICATION

INDUSTRY	MEDIUM	APPLICATION
Plant Construction Mechanical Engineering	Waxes Binding agents/hardeners Coatings	Paint shops (low water content) Test stands Cavity preservation Dosing systems Clamping system monitoring
Process Industry	Polyurethane/isocyanate	Polyurethane systems
Oil & Gas	Additives/inhibitors Odorant – THT	Chemical injection Natural gas odorant systems
Renewable Energy	Hydrogen carrier oil Coatings	LOHC hydrogen systems Low-VOC coatings
Marine	Lubricants	Consumption and monitoring systems
Mining/Steel	Hydraulic oils	Stone hardness testing
Aviation & Aerospace	Hydraulic oils	Steering module monitoring
Conventional Energy	Fossil fuels	Fossil fuel consumption measurement
Chemistry	Additives	Mixing of additives





### **ODORIZATION**

Natural gas, liquefied petroleum gas, and other fuel ga ses are odor-neutral but potentially dangerous. Gas leaks have to be identified promptly. That is why gas is commonly odorized as an important safety measure Our Gear Flow Meters with ball bearings feature a special design that permits the measurement of low-viscosity volatile odorants. They meet the accuracy requirements for very small dosage quantities and extremely short dosage cycles. Manufacturers of gas pressure regulating and measuring systems can therefore specify their odorizing systems with an accuracy bette than ±1.0 %.

	Benefits and advantages:
	<ul> <li>Experience through 200,000 installations worldwide</li> </ul>
	<ul> <li>High-precision volume flow sensors</li> </ul>
	<ul> <li>High-quality materials</li> </ul>
	<ul> <li>Excellent corrosion resistance</li> </ul>
	<ul> <li>Application-specific mounting concepts</li> </ul>
	<ul> <li>Broad range of applications</li> </ul>
)_	• Use for electrostatic applications (ESTA)
S	• Durability
S	<ul> <li>Flow rate calibration at the highest level</li> </ul>
Э.	<ul> <li>High reproducibility</li> </ul>
;- )-	<ul> <li>Explosion protection and encapsulated electronics</li> </ul>
)-	Bidirectional measurement
У	Worldwide approvals/certificates
e	Customer-specific solutions
;- 9r	<ul> <li>Short delivery times thanks to modular production technology</li> </ul>

## TURBINE FLOW METERS

#### Benefits and advantages:

- Experience through 200,000 installations worldwide
- High-precision volume flow sensors
- Very short response time and visualization of process changes
- High-quality materials
- Low pressure loss
- Flow rate calibration at the highest level
- Customer-specific calibration for various measuring ranges and viscosities
- Explosion protection and encapsulated electronics
- Bidirectional measurement
- Use at high temperatures up to 350 °C [662 °F]
- Worldwide approvals/certificates
- Customer-specific solutions
- Short delivery times thanks to modular production technology





### DISPLAY OF THE VALVE POSITIONING

Blowout preventers (BOPs) are installed in offshore drilling to protect the process against sporadic pressure fluctuations and an uncontrolled flow (formation kick) from a well reservoir. They are installed on the well opening and consist of a series of hydraulically operated valves used to safely seal the well.

Our Turbine Flow Meters are used to precisely record the hydraulic fluid flow during activation of the BOP on the ocean floor. The excellent repeatability and precise measurement data of our instruments allow the customer to compare a baseline to verify the valve settings.

### FIELDS OF APPLICATION

INDUSTRY	MEDIUM	APPLICATION
Plant Construction Mechanical Engineering	Solvents Deionized water Water Oils/lubricants Urea	Solvents Purging process monitoring Coating viscosity adjustment Water jet cutting systems Engine test stands
Process Industry	Heat transfer fluids Coolants Water-glycol	Temperature control systems Cooling system monitoring
Oil & Gas	Hydraulic fluids Ethylene glycol	Subsea control modules Well control Hydraulic system monitoring
Renewable Energy	Alcohol/cleaning agents Heating oils Deionized water	Cleaning of photovoltaic laminators Generating plant consumption monitoring Turbine injector control
Marine	Low-viscosity fuels	Fuel measurement
Mining/Steel	Hydraulic oils Additives	Monitoring Hydraulic supply Conversion coating
Aviation & Aerospace	Hydraulic oils	Hydraulic system monitoring
Conventional Energy	Condensate	Fossil fuel condensate monitoring
Chemistry	Solvents Deionized water Water Oils/lubricants Urea	Cleaning Production



# MULTI-CHANNEL TEMPERATURE

Multi-channel temperature control is used in the industry for both plastic injection molding and metal die casting. It guarantees exact control of each temperature control zone in the die casting mold, so that products of high quality can be produced consistently with the shortest cycle times. The cooling impulses are recalculated for each cycle depending on the return temperature of the thermal oil. A corresponding layout of the distributor components is required since the thermal oil reaches high temperatures of up to 350°C [662°F]. Thanks to their high quality construction (appropriate selection of components and materials), the high medium temperature is unproblematic for the KEM Turbine Flow Meters. This makes them ideal for temperature control using thermal oil. What's more, the low weight of the impeller supports fast response times and short cycle times.



## HELICAL FLOW METERS

### ENGINE OIL PUMP TESTING

Engine oil pumps are designed for the non-foaming conveying and circulation of engine oils in all conventional grades. Even fully synthetic fuel-efficient engine oils can be conveyed with the highest efficiencies. The engine oil pumps complete a test cycle on special test stands. Helical Flow Meters are installed on both the suction and the pressure side.

#### Benefits and advantages:

- Experience through 50,000 installations worldwide
- High-precision volume flow sensors
- *High-resolution (optional)*
- Very short response time and visualization of process changes
- *High-quality materials*
- Suitable for high-viscosity, abrasive, and filled media
- Low pressure loss
- Reduced stress on the medium (shearing)
- Insensitive to pulsating flows
- Flow rate calibration at the highest level
- Suitable for the harshest operating conditions
- Calibration in the customer-specific measuring range with individual viscosity is possible
- Explosion protection (optional)
- Bidirectional measurement
- Worldwide approvals/certificates
- Customer-specific solutions
- Short delivery times thanks to modular production technology



### FIELDS OF APPLICATION

INDUSTRY	MEDIUM
Plant Construction Mechanical Engineering	Insulating materials Silicones/sealants Adhesives/sealing compounds
Process Industry	Resins Polymers
Oil & Gas	Fuel oils
Renewable Energy	Epoxy resins Sealing compounds
Marine	Lubricants Consumable liquids
Mining/Steel	Hydraulic oils
Aviation & Aerospace	Adhesives
Conventional Energy	Fuels Lubricants Consumable liquids
Chemistry	Oil amine



### CAVITY SEALING AND CAR BODY SEALING

In the automobile industry, cavities in the chassis and underbody have to be effectively and permanently protected against corrosion. This is done by injecting waxes into areas at risk of corrosion using injection nozzles and robot lances. KEM Helical Flow Meters are used for process monitoring thanks to their robustness and low pressure loss. They also allow the material consumption to be optimized and minimized.



#### APPLICATION

Heat insulation Seam sealing Adhesive and sealing compound dosing Undercoating

Injection molding systems Semi-finished products/plastic production

Consumption measurement of generators and boilers

Resin dosing for wind turbine rotors Casting of lithium batteries

Consumption and monitoring systems

Cylinder position monitoring in tunnel drilling machines

Adhesive dosing (composite material joining technology)

Hydraulics Cylinder monitoring

Lubricant production







## **PICK-UP ELECTRONICS**

KEM is focused on continuously optimizing the signal processing for our mechanical flow meters according to the current state of the art. The methodical development of modular product families ensures that we are ready for the challenges of tomorrow, today.

Contactless signal capturing from the operating medium is realized through the rotation of the KEM Flow Meter's measuring insert, offering rapid system integration combined with an operating interface and parametrization options. Modular products enable our customers to provide the required data interfaces of frequency, analog, and digital outputs. They cover the scope of performance and expectations of users in various markets and applications. At the same time, we ensure that our products comply with legal explosion protection and EMC directives.

#### Benefits and advantages:

- · Compliance with the strictest requirements of industry standards
- Further development of our proven pick-up portfolio
- Modular construction
- User-based platform
- Low power consumption
- User-controlled functions
- Inherently safe two-conductor version available
- User friendly
- Coverage of the greatest possible range of applications with a small number of versions
- Straightforward ordering structure
- Optimized for stock-keeping
- Short delivery times



## **SERVICES**

#### SERVICE

KEM provides you with comprehensive support - from technical consulting, commissioning, and maintenance to customer-specific training.

### DAKKS CALIBRATION LABORA-TORY

The KEM calibration laboratory accredited according to the international DIN EN ISO/IEC 17025:2018 standard uses a high-precision load cell system. With an accuracy of 0.05 % for the mass and 0.1 % for the volume of flowing liquids, we occupy a leading position worldwide.

The laboratory with its engineers, processes, and measuring equipment is accredited by the DAkkS (German national accreditation body). The KEM calibration stand operates at the highest technical level. Its unique performance characteristic is that calibrations can be carried out with various types of hydrocarbons in order to reproduce the viscosity under operating conditions as accurately as possible with different temperatures.

A certificate from KEM not only verifies the accuracy of a flow meter, but also guarantees its traceability to national standards. The benefit for the customer is that all requirements of the applicable international quality standards are met. Statements of conformity can also be included as part of the calibration certificate.

### KEM FACTORY CALIBRATION

We perform calibrations for the preparation of detailed calibration records with precise information about the min/max frequency, K-factor (Imp/I), and linearity. Calibrations at different viscosities and with two flow directions are possible on request.



#### Calibration service

- Calibration certificate
- Calibration for different viscosities
- Flow rates up to 2,000 l/min
- Certification according to various standards
- Conformity assessment

#### **Advantages**

- Highest calibration accuracy
- Traceability to national measurement standards
- Internationally recognized results including documentation





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