KEM-CS

Coriolis mass flowmeter with integrated TCA1000 signal processing for mass flow, density, and temperature

TECHNICAL ADVANTAGES

- **Direct high-accuracy Coriolis mass measurement** with a measurement accuracy of up to ±0.1 %.
- **Simultaneous measurement of mass flow, density, and temperature** in one measuring system.
- **High repeatability** for reproducible process measurements.
- **Integrated signal processing with Modbus RTU and frequency output** for flexible plant integration.
- **Multicolor status indication directly at the device** for rapid identification of operating states, warnings, and errors.

APPLICATIONS

- Mass measurement in process and production plants.
- Dosing, filling, and batch processes.
- Density and temperature monitoring.
- Process control and quality monitoring.
- Bidirectional flow measurement.
- Applications requiring high accuracy and repeatability.

Key Specifications

Measuring range[2]	DN15: 370 to 6,400 kg/h DN25: 1,150 to 17,700 kg/h DN50: 5,000 to 70,700 kg/h
Measured variables	direct: mass flow, density, process temperature indirect: volume flow, standard volume flow
Accuracy	Mass (liquids)[2]: ±0.1 % of reading Mass (gases)[3]: ±0.5 % of reading Density: ±5 kg/m^3 Temperature: ±1 °C
Repeatability	Mass (liquids)[2]: ±0.05 % of reading Mass (gases)[3]: ±0.25 % of reading
Process temperature	-40 °C to +180 °C
Operating pressure	up to 100 barg



Performance characteristics

Sensor design	Coriolis sensor design optimized for low pressure loss and bidirectional operation
Process connections	wide range of process connection options for flexible installation, including flanges according to EN 1092-1, ASME B16.5, and JIS B2220
Plant integration	Modbus RTU via RS-485 and configurable frequency output up to 10 kHz
Device diagnostics	multicolor LED for operating, warning, and error states as well as digital diagnostic information

[2] Reference conditions for liquid mass flow: water, +20 °C, at least 1 bar backpressure.
[3] Reference conditions for gas mass flow: air or natural gas, +20 °C process fluid and ambient temperature, 34 to 100 barg operating pressure.

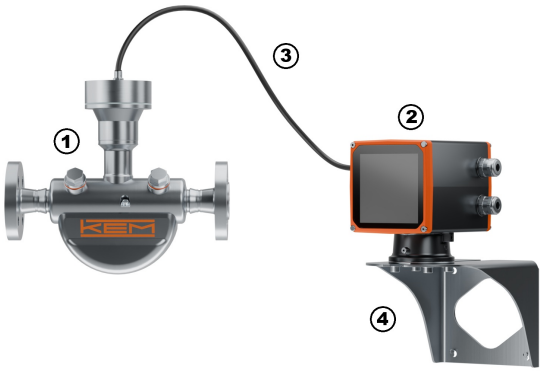
System overview

KEM-CS with integrated signal processing

The KEM-CS (KEM Coriolis Sensor) is a Coriolis measuring system consisting of a sensor and an integrated TCA1000 signal processor (TCA). The measuring system directly measures mass flow, density, and process temperature and derives volume flow and standard volume flow using a configurable reference density. The TCA performs measurement processing, signal filtering, diagnostics, and plant communication. For plant integration, Modbus RTU via RS-485 and a frequency output configurable for various process variables up to 10 kHz are available. Via Modbus RTU, the TCA can be parameterized with the KEM-PCT (product configuration tool) and adapted to the application. No separate indication and operating unit is required for measurement.

Optional extension with KEM-CT

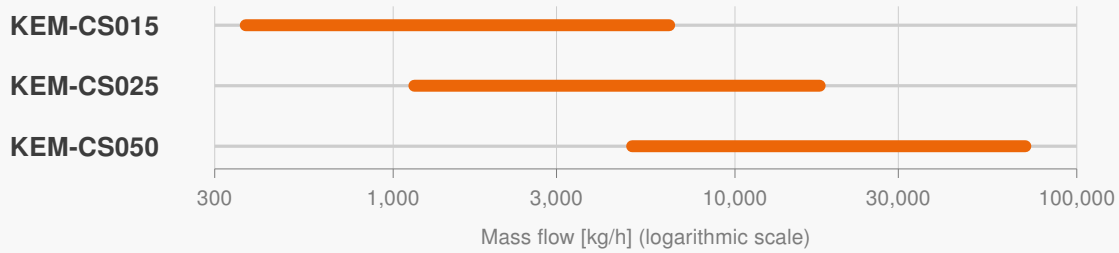
The KEM-CS can optionally be extended with the KEM-CT (KEM Coriolis Transmitter) using a connecting cable up to 100 m. The KEM-CT adds a fully graphical touch display to the Coriolis measuring system for indication, operation, and parameterization at an easily accessible location. Configurable interface modules allow adaptation to plant-specific requirements and, depending on the version, provide additional 4–20-mA analog outputs as well as digital inputs and outputs. This makes measured values, diagnostic information, and configuration options available where they are needed in the process.



① KEM-CS with TCA ② KEM-CT ③ Connecting cable ④ Wall/pipe bracket

Mass flow range comparison

Measuring ranges of the KEM-CS versions.



Technical Specifications

General

General technical data for use of the KEM-CS

Product function	Coriolis mass flowmeter with integrated TCA1000 signal processing
Measuring principle	Coriolis measuring principle
Measured variables	direct: mass flow, density, and process temperature indirect: volume flow and standard volume flow
Sensor sizes	DN15, DN25, and DN50
Flow direction	bidirectional, calibration direction marked on the sensor
Mounting orientation	horizontal and vertical
Compliance	CE marking in accordance with the applicable requirements: EMC Directive 2014/30/EU Pressure Equipment Directive (PED) 2014/68/EU RoHS Directive 2011/65/EU further EU requirements: REACH (EC) No. 1907/2006 and WEEE 2012/19/EU
PED classification	DN15 and DN25: sound engineering practice (SEP) DN50: Category II a higher classification may apply depending on the process connection

Flow ranges

Measuring range[2]	DN15: 370 to 6,400 kg/h DN25: 1,150 to 17,700 kg/h DN50: 5,000 to 70,700 kg/h
Nominal mass flow rate[1]	DN15: 3,700 kg/h DN25: 11,500 kg/h DN50: 50,000 kg/h

Mass flow measurement

Accuracy, liquids[2]	±0.1 % of reading
Accuracy, gases[3]	±0.5 % of reading
Repeatability, liquids[2]	±0.05 % of reading
Repeatability, gases[3]	±0.25 % of reading
Temperature effect on zero point	max. ±0.0015 % of nominal mass flow per °C

[1] Reference conditions Q_{nom}: water, +20 °C, 1 bar pressure drop, at least 1 bar backpressure.
[2] Reference conditions for liquid mass flow: water, +20 °C, at least 1 bar backpressure.
[3] Reference conditions for gas mass flow: air or natural gas, +20 °C process fluid and ambient temperature, 34 to 100 barg operating pressure.

Density measurement

Measuring range	up to 3,000 kg/m^3
Accuracy	±5 kg/m^3
Repeatability	±2.5 kg/m^3
Temperature effect	max. ±0.3 kg/m^3 per °C

Volume flow and standard volume flow

Volume flow	indirect from mass flow and density
Standard volume flow	indirect from mass flow and configurable reference density
Reference conditions	The gas reference density for the required reference conditions must be specified

Process temperature measurement

Measuring range	-60 °C to +200 °C
Accuracy	±1 °C
Repeatability	±0.2 °C

Operating conditions

The permissible operating limits depend on sensor size, material, process connection, and installation conditions.

Process temperature	-40 °C to +180 °C
Operating pressure	up to 100 barg at +20 °C depending on process connection, material, and process temperature
Ambient temperature	-40 °C to +60 °C
Maximum ambient temperature	+60 °C at process temperatures up to +120 °C +40 °C at +180 °C, linear in between
Storage temperature	-40 °C to +70 °C
Degree of protection	IP68 for the complete device, including integrated electronics 1.5 m water depth, 60 min

Materials and construction

Material selection depends on the fluid and operating conditions.

Wetted parts	Stainless steel 1.4404 (AISI 316L)
Construction	fully welded design without brazed wetted joints

Process connections

Availability depends on sensor size and version. Additional process connections are available on request.

EN 1092-1	Form B1, PN16 or PN40
ASME B16.5	Class 150 RF or Class 300 RF
JIS B2220	16K RF or 20K RF
Female thread	G according to ISO 228-1 or NPT according to ASME B1.20.1, available on request
Clamp	DIN 32676 Series A or Series C, available on request

Electronics and signal processing

The integrated TCA1000 performs measurement processing, parameterization, diagnostics, and plant communication.

Supply voltage	12 to 28 V DC nominal voltage 24 V DC, reverse-polarity protection
Power consumption	typ. < 2 W
Electrical connection	M12 connector, 5-pin, A-coded, male contacts

Communication Modbus RTU

Standard communication is via Modbus RTU RS-485.

Physical connection	RS-485, multidrop capable, switchable 120 Ω terminating resistor [factory setting: disabled]
Device address range	1 [factory setting] to 247
Baud rates	2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200 [factory setting] baud
Data format	8 data bits parity Even [factory setting] / Odd: 1 stop bit
Modbus function codes	0x03 Read Holding Registers, 0x10 Write Multiple Registers
Modbus register mapping	user-configurable via KEM-PCT

Frequency output

Configurable output variables	Mass flow, volume flow, standard volume flow, density, temperature
Output frequency	max. 10 kHz, freely scalable
Output circuit	Push-pull (PP)
Duty cycle	1 to 99 %, configurable
Update rate	100 Hz for process values and frequency output

Signal processing and process functions

Signal filtering	10 configurable process filter stages for mass flow and density with step response times from 0 to 9 s separate output filters for the individual process variables
Process functions	Low-flow cutoff, upper mass flow limit, and empty-pipe detection using a configurable density threshold selection of various metric and imperial units
Totalizers	2 freely configurable totalizers, each assignable to mass, volume, or standard volume nonvolatile storage

Parameterization and diagnostics

KEM-PCT support	Device configuration, zero adjustment, and live display data logging and CSV export configuration backup and restore firmware update
Status and diagnostics	Multicolor LED for normal operation, commissioning, warnings, and critical errors monitoring of supply voltage, sensor signals, empty-pipe condition, process limits, and device and process temperatures warnings, errors, and diagnostic values via Modbus RTU and KEM-PCT
Optional system extension	KEM-CT as a remotely mountable indication, operating, and interface unit connecting cable up to 100 m

Ordering information

The model code describes the orderable configuration of the Coriolis measuring system.

KEM-CS	015	C1	E2	M1	S1	T1	S1	A2	05	S1	XX	ZZ
	Sensor size	Connection size	Connection type	Material	Installation length	Temperature	Measurement performance	Electronics	Cable	Approval	Sensor option	Factory option

Sensor size

Size of the Coriolis sensor.

015	DN15
025	DN25
050	DN50

Process connection size

Nominal size of the process connection.

C1	DN15 (1/2 inch)
C2	DN25 (1 inch)
C3	DN50 (2 inch)

Process connection

Connection standard, version, and pressure rating. Availability depends on sensor size and material.

E1	EN 1092-1, Form B1, PN16
E2	EN 1092-1, Form B1, PN40
U1	ASME B16.5, Class 150 RF
U2	ASME B16.5, Class 300 RF
J1	JIS B2220, 16K RF
J2	JIS B2220, 20K RF
B1	G female thread according to ISO 228-1, available on request
B2	NPT female thread according to ASME B1.20.1, available on request
H1	Clamp according to DIN 32676, Series A, available on request
H2	Clamp according to DIN 32676, Series C, available on request

Wetted-parts material

Material of the wetted parts.

M1	Stainless steel 1.4404 (AISI 316L)

Installation length

Mechanical installation length of the sensor.

S1	Standard length

Temperature version

Version according to the permissible process temperature.

T1	Standard version, process temperature up to +180 °C

Measurement performance

Measurement performance for mass flow, density, volume flow, and standard volume flow.

S1	Standard measurement performance according to the technical specifications

Electronics version

Mounting and functional scope of the electronics unit.

A2	Integrated TCA1000 signal processing with configurable frequency output up to 10 kHz and Modbus RTU via RS-485 12 to 28 V DC, nominal voltage 24 V DC M12 connector, 5-pin, A-coded, male contacts

Connecting cable

Cable for remote mounting of the KEM-CT.

01	1 m
03	3 m
05	5 m

Approvals and certificates

Standard version without a special approval or certificate option.

S1	no special approval

Sensor option

Additional physical sensor options.

XX	Standard, no additional sensor option

Factory option

Factory configuration settings and customer-specific presets.

ZZ	Standard, no additional factory option

Additional versions are available on request. Please contact sales.

Subject to technical changes and errors. Only released product data, order documents, and the applicable technical documentation are binding.