

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Flowmeter**with type designation(s)
OMP

Issued to

KRAL AG
Lustenau, Austriais found to comply with
DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems**Application :****Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.****Temperature range:** -20° to 200°C
Max. working press.: 40 bar
Sizes: OMP-020; OMP-032; OMP-052This Certificate is valid until **2021-06-01**.Issued at **Hamburg** on **2016-06-02**DNV GL local station: **Augsburg**Approval Engineer: **Guido Friederich**for **DNV GL**

Olaf Drews
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Product description

The KRAL universal flowmeters OMP type may be used for versatile flow measurement of liquids, lubricative fluids and non abrasive and non corrosive media.

The Kral volume flow meters are designed and fabricated in different sizes.

The OMP flow meter design provides a volume flow measurement done by two geared screw spindles integrated in a compact housing. Each full rotation of the two geared screw spindles causes an amount of liquid flow volume to be measured in a unique integrated flow chamber of the OMP housing. An electronic sensor converts the specific measured flow chamber volume to an electronic signal corresponding to an industrial standard.

Application/Limitation

OMP universal flow meters to be used e.g. for the following applications:

Shipping / Marine-Fuel consumption measurement

Fuel oil measurement, e.g. HFO, MDO, MGO

Flow rate 0,3 to 350 litres /minute; maximum 525 litres /minute

Maximum operating pressure: 40 bar

Operating temperature range: -20°C to 200°C

Viscosity range: 1 to 1*10⁶ mm²/s

Precision: ± 0,1% of measured flow measurement value

Type Approval documentation

Design drawings

OMP-020 ; OMP-032 ; OMP-052

Parts Lists with material specifications

Operating instructions

OMP-020 ; OMP-032 ; OMP-052

Data sheets electrical sensors

Test documentation

Calibration protocols: OMP 20.43; OMP 32.43; OMP 52.43

Tests carried out

The OMP flow meters have been tested and calibrated in presence of a DNV GL Surveyor

Standard test of volume flow meter performed on KRAL Master test facility VPP08.

Flow rate measurement carried out with test fluid Exxsol D120 at a test temperature between 20 °C and 30 °C at a viscosity range between 5,29 and 4,11 mm²/s.

The following technical parameters and units apply: Flow rate (Q - l/min); temperature (T - °C), viscosity (v - mm²/s); max. pressure (p - bar); test pressure (pp - bar), measured volume (V - l), Puls (P); K-Factor (P/l); measurement error (% of measured value). The K-Factor adjusts any uncertainty of volume flow measurement of OMP type to be tested compared to a reference volume flow meter corresponding to the same OMP type size and calibrated at an independent test institute.

Calibration of flow rate can be carried out acc. to ISO / IEC 17025.

The calibration of volume flow meters are to be performed and controlled within two linearity classes.

All flow meters for calibration have to comply as minimum with Linearity class II.

The following table shows an overview about optional flow ranges available for OMP size 20 to OMP size 52 within linearity class I and linearity class II.

Size	Linearity class I			Linearity class II		
	Flow range [l/min]		max. allow. linearity [%]	Flow range [l/min]		max. allow. linearity [%]
	from	to		from	to	
OM 20	0,6	30,0	$\pm 1,0$	1,2	30,0	$\pm 2,0$
	3,0	30,0	$\pm 0,3$	3,0	30,0	$\pm 2,0$
OM 32	2,0	100,0	$\pm 1,0$	4,0	100,0	$\pm 2,0$
	10,0	100,0	$\pm 0,3$	10,0	100,0	$\pm 2,0$
OM 52	7,0	350,0	$\pm 1,0$	14,0	350,0	$\pm 2,0$
	35,0	350,0	$\pm 0,3$	35,0	350,0	$\pm 1,0$

Marking of product

Each OMP flow meter is labelled with a KRAL rating plate showing a specific KRAL manufacturer's type code. The OMP type code consists of the specific OMP size which corresponds to the diameter of the measurement screw spindle. Further labelling comprises numbers for KRAL's internal version indexes, end connection and code for electronic signal.

The OMP rating plate provides the OMP type, serial number, year of construction, K-Factor, preferred flow direction, maximum temperature, maximum pressure.

Periodical assessment

A condition for retention of the Type Approval Certificate in its validity period is that periodical assessments are successfully carried out. Periodical assessments will be carried out bi-yearly.

The objective of the periodical assessment is to verify that the conditions for the type approval have not been altered. The main scope of the periodical assessment will normally include:

- verification of the TA applicant's production and quality system w.r.t. ensuring continued consistent production of the type approved products at the TA applicant's own premises and at other companies that are given the responsibility for manufacturing of the products.
- review of the TA documentation and that this is still used as basis for the production
- review of possible changes to the design, the material and the performance of the product
- verification of the product marking.