OPTIMASS 8000

Technical Datasheet

Sensor for mass flow

- For process temperatures from -180°C to 230°C
- Pressure range up to 200 bar possible (depending on size)
- Sensor in Hastelloy® and stainless steel
- Modular electronics concept
- For liquids and gases

KROHNE

The solution for high pressure and elevated temperatures

The **OPTIMASS 8000 series** reliably measures the mass flow of gases and liquids in standard applications up to 230°C / 440°F.

1. Comprehensive diagnosis capabilities
2. All standard process connections available, including hygienic type connections
3. Same electronics for all sensors with redundant storage of calibration and sensor data
4. Modular electronics with all output options, see separate data sheet for details

Highlights

- Rugged design
- Regardless of type of installation and external factors
- Optional heating/insulating jacket
- Modular electronics concept: electronics and sensor easy to replace
- Data redundancy: accurate plug & play replacement of electronics

Industries

- Chemical
- Oil & Gas
- Petrochemistry
- Pharmaceutical
- Water
- Wastewater

Applications

- Crystallizing and cryogenic products
- Tanker loading

Mass flowmeter product family

All meters consist of a sensor and a converter, which may be mounted integral to the sensor, or remotely, either with a field mount kit, a wall mount housing or a 19" rack mount module.

A sensor mount converter (MFC 010) with a Modbus® output only is also possible for OEM manufacturers or where the user does not require a converter with analogue outputs.

Converter: Common hardware for all converters makes spares holding simpler

1. **MFC 300 C:** Compact or integrally mounted on sensor
2. **MFC 300 F:** Field mount up to 300 m / 1000 ft from sensor
3. **MFC 300 W:** Wall mount for non-hazardous areas
4. **MFC 300 R:** 19" Rack mount module for control room installation
5. **MFC 010:** Sensor electronics with Modbus ® output

Sensor: Sensors for any applications

1. **OPTIMASS 1000:** The general purpose solution for the process industry
2. **OPTIMASS 3000:** The meter for low flow applications
3. **OPTIMASS 7000:** The optimum solution for the chemical, food & beverage and pharmaceutical industry
4. **OPTIMASS 8000:** The meter for high pressure and elevated temperatures
5. **OPTIMASS 9000:** The high temperature solution up to 350°C / 660°F

Technical Data

Hastelloy® (H) and stainless steel (S) versions

Operating data

Size	S / H15	S / H25	S / H40	S / H80	S100

Flow rate

Nominal flow rate [kg/h]	2700	9000	32000	85000	250000
Nominal flow rate [lbs/min]	100	300	1200	3000	9300
Maximum flow rate	130% of the nominal flow rate for the corresponding sensor size; depending on the application.				
Minimum flow rate	Depending on measuring error required.				

Accuracy

Accuracy, liquid	±0.1% of actual measured flow rate
Accuracy, gas	±0.5% of actual measured flow rate
Repeatability	Better than 0.05% plus zero stability (includes the combined effects of repeatability, linearity and hysteresis)
Zero stability	±0.008% of nominal flow rate with respective sensor size

Reference conditions

Product	Water
Temperature	20°C / 68°F
Operating pressure	1 $bar_{rel.}$ / 14.5 psig

Density

Measuring range	500...2000 kg/m³ / 30...125 lbs/ft³
Accuracy	±2 kg/m³ / ±0.13 lbs/ft³
Accuracy (on-site calibration)	±0.5 kg/m³ / ±0.033 lbs/ft³

Temperature

Measuring range - safe area (compact or remote version)	-180 ...+230°C / -300 ...+440°F
Measuring range - ATEX / FM / CSA (compact version only)	-40 ...+190°C / -40 ...+370°F
Measuring range - ATEX / FM / CSA (remote version only)	-40 ...+230°C / -40 ...+445°F
Accuracy	±1°C ±0.5% of the value / ±1.8°F ±0.5% of the value

Device specifications

Size	S / H15	S / H25	S / H40	S / H80	S100

Materials

Measuring tube	Stainless steel 1.4435 / AISI 316L or Hastelloy® C-22
Flanges	Stainless steel 1.4435 / AISI 316L or stainless steel 1.4435 / AISI 316L, backing with Hastelloy® C-22 flange raised face
Outer cylinder (secondary pressure containment)	Stainless steel 1.4301 / AISI 304
Sensor electronics housing	Stainless steel 1.4435 / AISI 316L

Pressure

Measuring tube	See following pressure-temperature table
Outer cylinder	Rupture pressure typically in excess of 50 $bar_{rel.}$ / 725 psig at 20°C / 68°F. Burst disc option recommended for gas measurement > 50 $bar_{rel.}$ / 725 psig at 20°C / 68°F. Max. temperature for burst disc is 150°C / 300°F.
Max. pressure - hygienic connections (DIN 11851, TriClamp, DIN 11864-2)	10 $bar_{rel.}$ / 145 psig

Temperature

Process temperature - safe area (compact and remote version)	-180...+230°C / -300...+440°F
Process temperature - ATEX / FM / CSA (compact version only)	-40...+190°C / -40...+370°F
Process temperature - ATEX / FM / CSA (remote version only)	-40...+230°C / -40...+440°F
Max. process temperature - hygienic connections (DIN 11851, TriClamp, DIN 11864-2)	+150°C / +300°F
Ambient temperature (compact version)	-40...+55°C / -40...+130°F
Ambient temperature (remote version)	-40...+60°C / -40...+140°F

Process effects on the sensor

Temperature	0.002% of the nominal flow rate per 1°C / 0.001% of the nominal flow rate per 1°F
Pressure	0.015% of the nominal flow rate per 1 $bar_{rel.}$ / 0.001% of the nominal flow rate per 1 psig

Measuring tube pressure range

Size	Process temperature			
	150°C / 300°F maximum		230°C / 440°F maximum	
	$bar_{rel.}$	psig	$bar_{rel.}$	psig
DN 15	210	3045	185	2680
DN 25	165	2390	145	2100
DN 40	140	2030	120	1740
DN 80	125	1810	110	1595
DN 100	85	1230	75	1085

Approvals

Size	S / H15	S / H25	S / H40	S / H80	S 100

Mechanical

Protection category (acc. to EN 60529)	IP 67; NEMA 4X
European Pressure Equipment directive	PED 97-23 EC (acc. to AD 2000 Regelwerk)

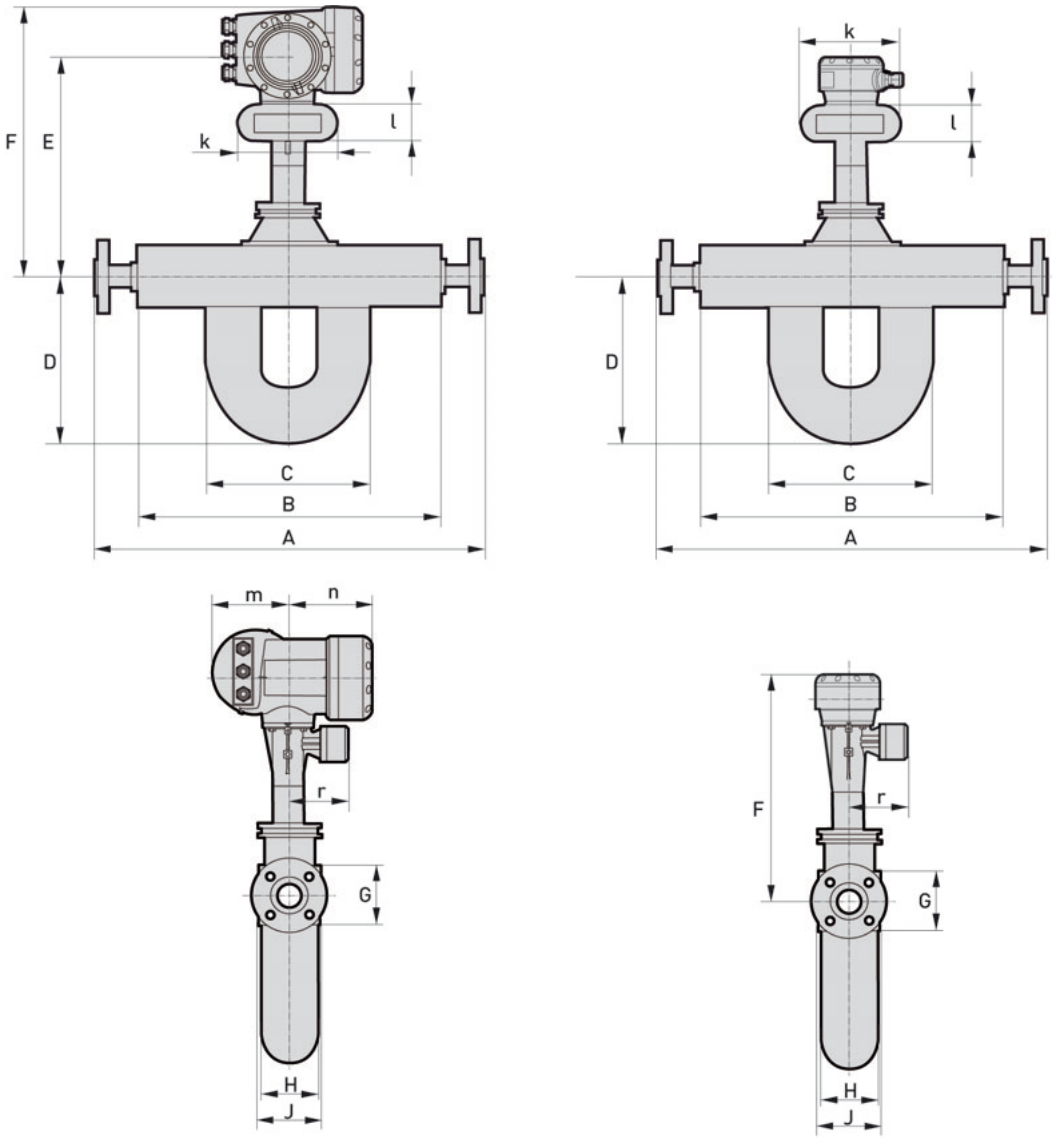
ATEX (acc. to 94/9/EC)

OPTIMASS 8300 C - With "flameproof" terminal compartment	II 2 G EEx d ib IIC T4...T1
	II 2 D Ex tD A21 IP6x T275°C
	II 2(1) G EEx d ib[ia] IIC T4...T1
	II 2(1) D Ex tD [iaD] A21 IP6x T275°C
OPTIMASS 8300 C - With "increased safety" terminal compartment	II 2 G EEx de ib IIC T4...T1
	II 2 D Ex tD A21 IP6x T275°C
	II 2(1) G EEx de ib[ia] IIC T4...T1
	II 2(1) D Ex tD [iaD] A21 IP6x T275°C
OPTIMASS 8000 and 8010 C	II 2 G EEx ib IIC T4...T1
	II 2 D Ex ibD 21 T280°C
MFC 300 F- With "flameproof" terminal compartment	II 2(1) G EEx d [ia] IIC T6
	II 2(1) D Ex tD [iaD] A21 IP6x T85°C
MFC 300 F- With "increased safety" terminal compartment	II 2(1) G EEx de [ia] IIC T6
	II 2(1) D Ex tD [iaD] A21 IP6x T85°C
Factory Mutual / CSA (pending)	Class I, Div 1 groups A, B, C, D
	Class II, Div 1 groups E,F,G
	Class III, Div 1 hazardous areas
	Class I, Div 2 groups A, B, C, D
	Class II, Div 2 groups F,G
	Class III, Div 2 hazardous areas

Electromagnetic compatibility (EMC)

to CE	Namur NE 21/5.95;
	89/336/EEC (EMC);
	72/73/EEC (Low Voltage Directive)

Dimensions



1 Compact version
2 Remote version

Dimensions in mm

Size	Dimensions [mm]													
	A	B	C	D	E	F	G	H	J	k	l	m	n	r
Compact														
15	❶	272	212	180	338	417	80	60	80	160	60	123.5	137	98.5
25	❶	400	266	233	338	417	80	76	90	160	60	123.5	137	98.5
40	❶	490	267	274	348	427	100	89	110	160	60	123.5	137	98.5
80	❶	850	379	430	365	444	135	129	160	160	60	123.5	137	98.5
100	❶	870	455	453	398	477	200	155	200	160	60	123.5	137	98.5
Remote														
15	❶	272	212	180	-	217	80	60	80	160	60	-	-	98.5
25	❶	400	266	233	-	217	80	76	90	160	60	-	-	98.5
40	❶	490	267	274	-	281	100	89	110	160	60	-	-	98.5
80	❶	850	379	430	-	298	135	129	160	160	60	-	-	98.5
100	❶	870	455	453	-	331	200	155	200	160	60	-	-	98.5

❶ depending on the process connection; see tables for dimension A

Dimensions in inches

Size	Dimensions [inches]													
	A	B	C	D	E	F	G	H	J	k	l	m	n	r
Compact														
15	❶	10.7	8.3	7.1	13.3	16.4	3.1	2.4	3.1	6.3	2.4	4.9	5.4	3.9
25	❶	15.7	10.5	9.2	13.3	16.4	3.1	3.0	3.5	6.3	2.4	4.9	5.4	3.9
40	❶	19.3	10.5	10.8	13.7	16.8	3.9	3.5	4.3	6.3	2.4	4.9	5.4	3.9
80	❶	33.5	14.9	16.9	14.4	17.5	5.3	5.1	6.3	6.3	2.4	4.9	5.4	3.9
100	❶	34.3	17.9	17.8	15.7	18.8	7.9	6.1	7.9	6.3	2.4	4.9	5.4	3.9
Remote														
15	❶	10.7	8.3	7.1	-	8.5	3.1	2.4	3.1	6.3	2.4	-	-	3.9
25	❶	15.7	10.5	9.2	-	8.5	3.1	3.0	3.5	6.3	2.4	-	-	3.9
40	❶	19.3	10.5	10.8	-	11.1	3.9	3.5	4.3	6.3	2.4	-	-	3.9
80	❶	33.5	14.9	16.9	-	11.7	5.3	5.1	6.3	6.3	2.4	-	-	3.9
100	❶	34.3	17.9	17.8	-	13.0	7.9	6.1	7.9	6.3	2.4	-	-	3.9

❶ depending on the process connection; see tables for dimension A

Dimensions in mm for A with flanged connections

Flange		Material	Size 15		Size 25		Size 40			Size 80		Size 100	
			DN15	DN25	DN25	DN40	DN40	DN50	DN80	DN80	DN 100	DN 100	DN 150
			½"	1"	1"	1½"	1½"	2"	3"	3"	4"	4"	6"
Dimensions [mm]													
EN 1092-1	PN40	Stainless steel	370	370	500	500	600	600	610	1000	1000	1100	1100
		Hastelloy®	-	390	500	520	-	620	620	1000	1000	-	-
	PN 63	Stainless steel	-	-	-	-	-	620	620	-	-	-	-
		Hastelloy®	-	-	-	-	-	-	-	-	-	-	-
	PN100	Stainless steel	380	390	520	560	620	660	730	-	-	-	-
		Hastelloy®	-	-	-	-	-	-	-	-	-	-	-
ASME B16.5	150 lb	Stainless steel	370	370	500	500	600	600	610	1000	1000	1100	1100
		Hastelloy®	-	390	500	520	-	620	620	1000	1000	-	-
	300 lb	Stainless steel	-	370	-	510	-	600	620	-	-	-	-
		Hastelloy®	-	390	-	520	-	620	620	-	-	-	-
	600 lb	Stainless steel	380	390	520	560	620	630	640	-	-	-	-
		Hastelloy®	-	-	-	-	-	-	-	-	-	-	-
	900 lb	Stainless steel	-	-	-	-	640	720	760	-	-	-	-
		Hastelloy®	-	-	-	-	-	-	-	-	-	-	-
	1,500 lb	Stainless steel	400	450	540	600	-	-	-	-	-	-	-
		Hastelloy®	-	-	-	-	-	-	-	-	-	-	-
JIS B 2220	10K	Stainless steel	370	370	500	500	600	600	600	1000	1000	1100	1100
	20K	Stainless steel	370	370	500	500	600	600	600	1000	1000	1100	1100

Dimensions in mm for A with hygienic type connections

Connection type	Material	Size 15	Size 25	Size 40		Size 80
		DN25	DN40	DN50	DN65	DN100
		1"	1½"	2"	3"	4"
Dimensions [mm]						
Triclamp DIN32676 & ISO2852	Stainless steel	370	500	600	600	1020
Triclover Triclamp	Stainless steel	370	500	600	600	1020
DIN 11851 male thread	Stainless steel	380	510	600	-	1050

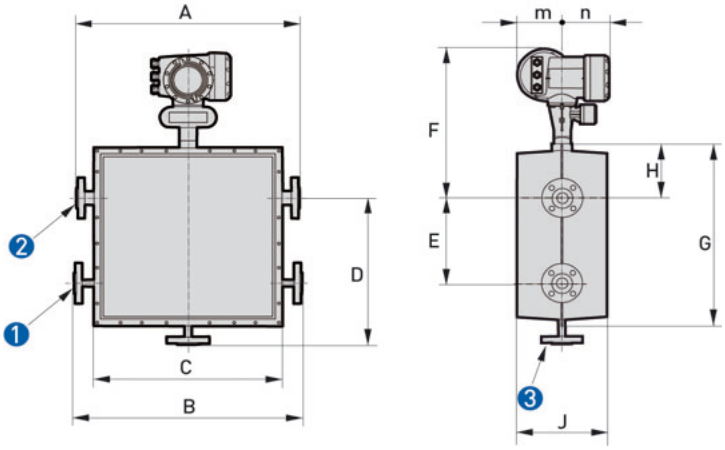
Dimensions in mm for A with flanged connections

Flange		Material	Size 15		Size 25		Size 40			Size 80		Size 100	
			DN15	DN25	DN25	DN40	DN40	DN50	DN80	DN80	DN 100	DN 100	DN 150
			½"	1"	1"	1½"	1½"	2"	3"	3"	4"	4"	6"
Dimensions [inches]													
EN 1092-1	PN40	Stainless steel	14.6	14.6	19.7	19.7	23.6	23.6	24.0	39.4	39.4	43.3	43.3
		Hastelloy®	-	15.4	19.7	20.5	-	24.4	24.4	39.4	39.4	-	-
	PN 63	Stainless steel	-	-	-	-	-	24.4	24.4	-	-	-	-
		Hastelloy®	-	-	-	-	-	-	-	-	-	-	-
	PN100	Stainless steel	15.0	15.4	20.5	22.0	24.4	26.0	28.7	-	-	-	-
		Hastelloy®	-	-	-	-	-	-	-	-	-	-	-
ASME B16.5	150 lb	Stainless steel	14.6	14.6	19.7	19.7	23.6	23.6	24.0	39.4	39.4	43.3	43.3
		Hastelloy®	-	15.4	19.7	20.5	-	24.4	24.4	39.4	39.4	-	-
	300 lb	Stainless steel	-	14.6	-	20.1	-	23.6	24.4	-	-	-	-
		Hastelloy®	-	15.4	-	20.5	-	24.4	24.4	-	-	-	-
	600 lb	Stainless steel	15.0	15.4	20.5	22.0	24.4	24.8	25.2	-	-	-	-
		Hastelloy®	-	-	-	-	-	-	-	-	-	-	-
	900 lb	Stainless steel	-	-	-	-	25.2	28.3	29.9	-	-	-	-
		Hastelloy®	-	-	-	-	-	-	-	-	-	-	-
	1.500 lb	Stainless steel	15.7	17.7	21.3	23.6	-	-	-	-	-	-	-
		Hastelloy®	-	-	-	-	-	-	-	-	-	-	-
JIS B 2220	10K	Stainless steel	14.6	14.6	19.7	19.7	23.6	23.6	23.6	39.4	39.4	43.3	43.3
	20K	Stainless steel	14.6	14.6	19.7	19.7	23.6	23.6	23.6	39.4	39.4	43.3	43.3

Dimensions in inches for A with hygienic type connections

Connection type	Material	Size 15	Size 25	Size 40		Size 80
		DN25	DN40	DN50	DN65	DN100
		1"	1½"	2"	3"	4"
Dimensions [inches]						
Triclamp DIN32676 & ISO2852	Stainless steel	14.6	19.5	23.6	23.6	40.2
Triclover Triclamp	Stainless steel	14.6	19.5	23.6	23.6	40.2
DIN 11851 male thread	Stainless steel	15.0	20.1	23.6	-	41.3

Version with heating jacket



1 Heating connection
2 Process connection
3 Ventilation (optional)

Dimensions in mm

Size	Dimensions [mm]										
	A	B	C	D	E	F	G	H	J	m	n
15	1	420	310	330	200	417	411	138	240	123,5	137
25	1	540	439	380	250	417	464	138	260	123,5	137
40	1	640	530	430	250	427	524	148	260	123,5	137
80	1	1000	884	580	350	444	684	165	304	123,5	137
100	1	1040	932	590	350	477	730	200	343	123,5	137

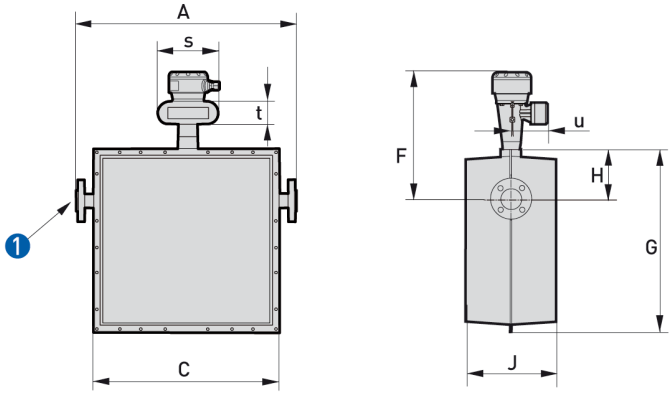
1 depending on the process connection; see tables for dimension A

Dimensions in inches

Size	Dimensions [inches]										
	A	B	C	D	E	F	G	H	J	m	n
15	1	16.5	12.2	13.0	7.9	16.4	16.2	5.4	9.4	4.9	5.4
25	1	21.3	17.3	15.0	9.8	16.4	18.3	5.4	10.2	4.9	5.4
40	1	25.2	20.9	16.9	9.8	16.8	20.6	5.8	10.2	4.9	5.4
80	1	39.4	34.8	22.8	13.8	17.5	26.9	6.5	12.0	4.9	5.4
100	1	40.9	36.7	23.2	13.8	18.8	28.7	7.9	13.5	4.9	5.4

1 depending on the process connection; see tables for dimension A

Version with insulating jacket



1 Process connection

Dimensions in mm

Size	Dimensions [mm]								
	A	C	F	G	H	J	s	t	u
15	1	310	271	411	138	240	160	60	98.5
25	1	439	271	464	138	260	160	60	98.5
40	1	530	281	524	148	260	160	60	98.5
80	1	884	298	684	165	304	160	60	98.5
100	1	932	331	730	200	343	160	60	98.5

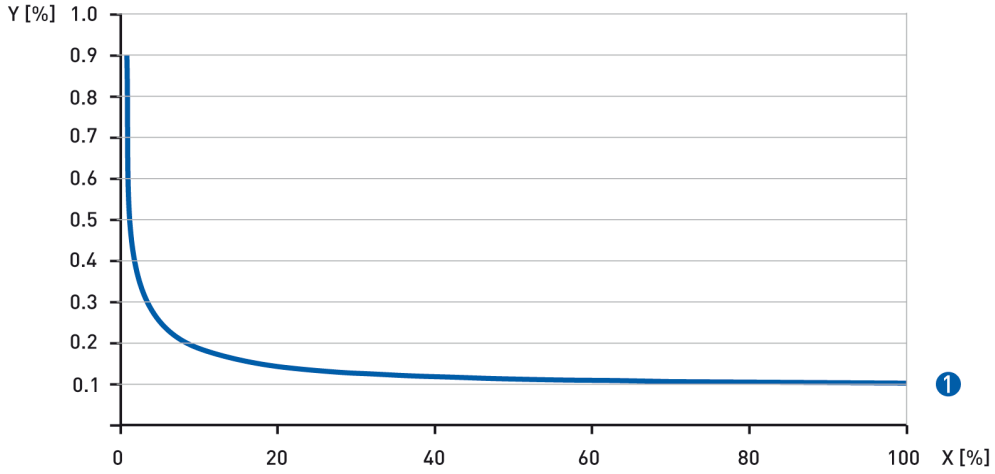
1 depending on the process connection; see tables for dimension A

Dimensions in inches

Size	Dimensions [inches]								
	A	C	F	G	H	J	s	t	u
15	1	12.2	10.7	16.2	5.4	9.4	6.3	2.4	3.9
25	1	17.3	10.7	18.3	5.4	10.2	6.3	2.4	3.9
40	1	20.9	11.1	20.6	5.8	10.2	6.3	2.4	3.9
80	1	34.8	11.7	26.9	6.5	12.0	6.3	2.4	3.9
100	1	36.7	13.0	28.7	7.9	13.5	6.3	2.4	3.9

1 depending on the process connection; see tables for dimension A

Measuring accuracy



Y[%]: measuring error; X[%]: nominal flow rate

❶ All tube materials

Measuring error

The measuring error is obtained from the combined effects of accuracy and zero stability; measured at various points over the nominal flow range of each sensor size. The values are applicable both for the 8000 and 9000 series with a stainless steel or Hastelloy® C-22 measuring tube.

Full-scale ranges and measuring errors

Full-scale ranges	100 : 1	20 : 1	10 : 1	5 : 1	2 : 1	1 : 1

Hastelloy® C-22, stainless steel 316L

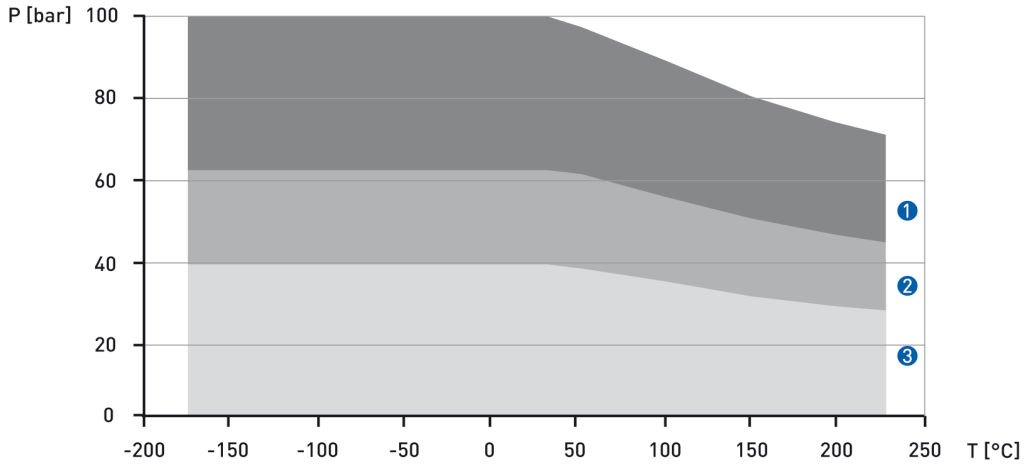
Typical measuring error %	0.90	0.26	0.18	0,14	0.12	0.11

Guidelines for maximum operating pressure

Note:

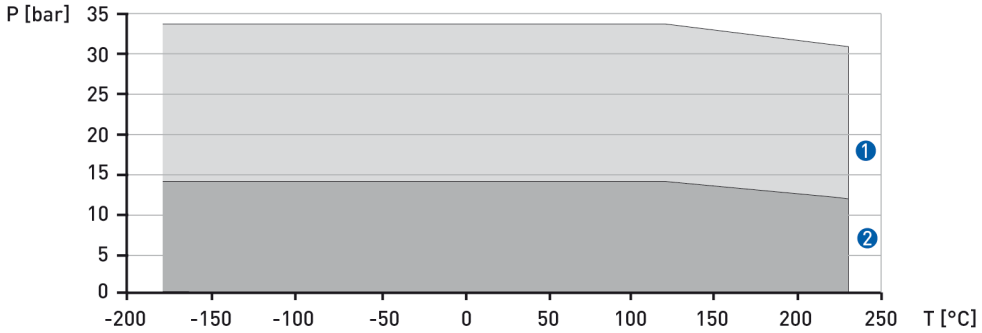
Ensure that the meters are used within their operating limits. Observe the following illustrations.

DIN flanged connections as per EN 1092-1



1. PN100 flanges
2. PN63 flanges
3. PN40 flanges

Flanged connections as per JIS 2220 B

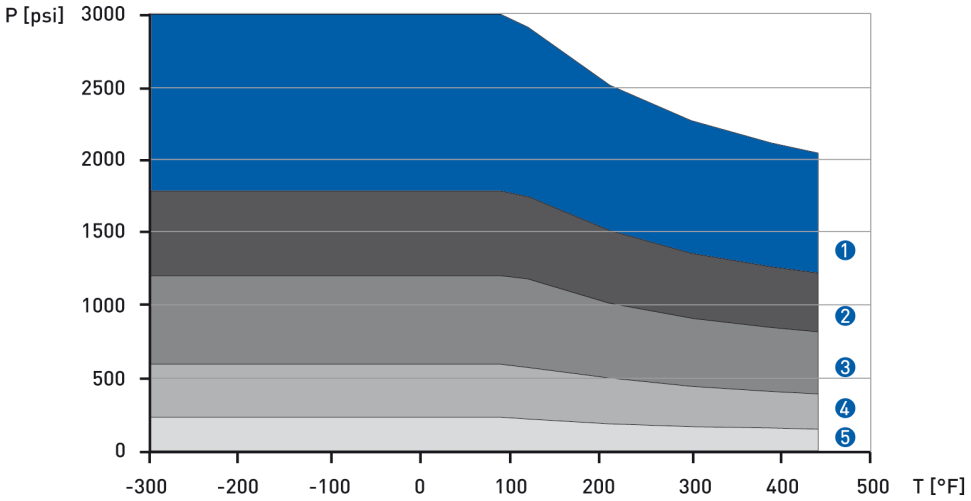


1. 20K flanges
2. 10K flanges

Note:

All hygienic type process connections rated to 10 barg / 145 psig at 20°C / 68°F.

Flanged connections as per ASME B16.5



1. ASME 1500 lbs
2. ASME 900 lbs
3. ASME 600 lbs
4. ASME 300 lbs
5. ASME 150 lbs

Note:

All hygienic type process connections rated to 10 barg / 145 psig at 20°C / 68°F.

KROHNE Product Overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Mass flowmeters
- Ultrasonic flowmeters
- Vortex flowmeters
- Flow controllers
- Level measuring instruments
- Pressure gauges
- Temperature measuring instruments
- Water solutions & analysis
- Oil and gas turnkey solutions

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Instrumentation and control equipment catalog

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