



OPTISWIRL 4070 C

Technical Datasheet

Vortex flowmeter

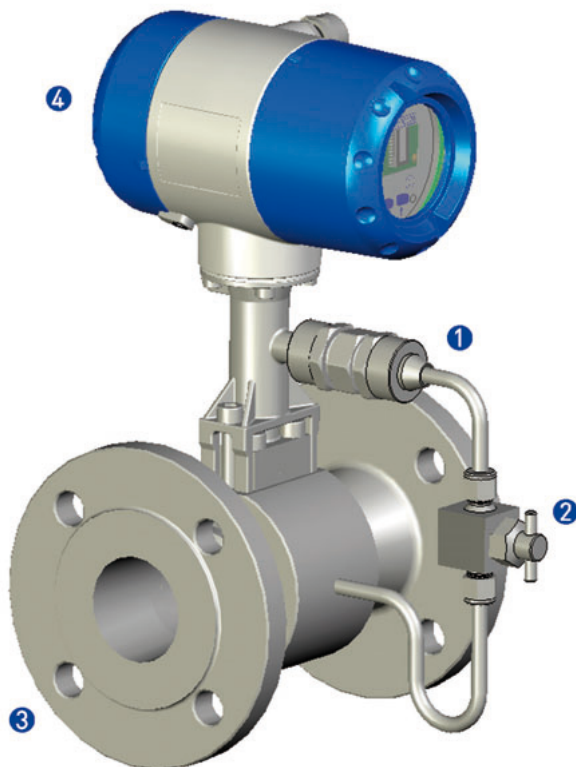
- Integrated pressure and temperature compensation
- Temperature compensation for saturated steam included as standard
- All OPTISWIRL versions in 2-wire technology
- Excellent long-term stability due to rugged design
- Optimum process reliability thanks to new type of signal processing (ISP)
- Easy to start up (plug & play)



KROHNE

The all-in-one solution

OPTISWIRL 4070 C is the only vortex flowmeter with integrated pressure and temperature compensation in 2-wire technology. OPTISWIRL 4070 C provides accurate measurement of operating, standard volumetric and mass flow of conductive and non-conductive liquids, gases and vapors even with fluctuating pressures and temperatures.



- ① Pressure sensor
- ② Shut-off valve
- ③ Fully welded stainless steel design
- ④ Converter with Intelligent Signal Processing (ISP)

Highlights

- 2-wire device with integrated pressure and temperature compensation
- Non-wearing, fully welded stainless steel structure with high corrosion, pressure and temperature resistance
- Optimum process reliability thanks to Intelligent Signal Processing (ISP) - stable readings, free of external perturbations
- Ready to use immediately due to plug & play feature
- Maintenance-free sensor design
- PACTware included at no extra cost

Industries

- Automotive
- Chemical
- Iron, Steel & Metal
- Power plants
- Oil & Gas
- Paper & Pulp
- Water

Applications

- Vapor and saturated steam measurement
- Steam boiler monitoring
- Control of compressor output
- Consumption measurement in compressed air systems
- Measurement of industrial gases
- Burner consumption measurement
- SIP and CIP processes in the food, beverage and pharmaceutical industries

The OPTISWIRL range

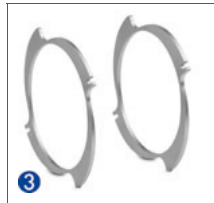
OPTISWIRL 4070 C consists of the OPTISWIRL 4000 sensor and the VFC 070 converter

OPTISWIRL VFC 070 • converter



- ❶ OPTISWIRL VFC 070: The all-in-one solution for flow; pressure- and temperature-compensated

OPTISWIRL 4000 • sensor



- ❶ OPTISWIRL 4000 as a flange version with integrated temperature compensation for saturated steam
 ❷ OPTISWIRL 4000 as a sandwich version, including centering rings for easier installation
 ❸ Centering rings for simple installation

OPTISWIRL 4000 • options



- ❶ OPTISWIRL 4000 with integrated pressure and temperature compensation for industrial gases and vapors
 ❷ Pressure- and temperature compensation
 ❸ Der OPTISWIRL 4000 with optional shut-off valve for changing the pressure sensor under process conditions
 ❹ Shut-off valve

Technical Data

Input

Field of application	Flow measurement of liquids, gases and vapors
Operating method / measuring principle	Karman vortex street
Measured value	
Primary measured value:	Number of separated vortices
Secondary measured value:	Operating and standard volumetric flow, mass flow

Measuring accuracy

Accuracy	Re $\geq$ 20000 $\pm$ 0.75% for liquids
	Re $\geq$ 20000 $\pm$ 1% for gases and vapors
	10000 < Re < 20000 $\pm$ 2% for liquids, gases and vapors ①
Repeatability	$\pm$ 0,1%
Stability	$\pm$ 0.1% over a period of 1 year

Product conditions

Ambient temperature	-40 to +65°C (Ex version)
	-40 to +85°C (non-Ex version)
Storage temperature	-50 to +85°C
Product temperature	-40 to +240°C
Process products	liquid, gaseous, vaporous
Density	is taken into consideration when rating
Viscosity	< 10 cP
Reynolds' number	10000...2300000
Product pressure limit	max. 100 bar, higher pressures on request

Design

Inlet run	$\geq$ 20 x DN
Outlet run:	$\geq$ 5 x DN
Dimensions and weights	see tables on page 6 ff.

Materials

Sensor	1.4404/316L; 1.4539/904L in preparation; Hastelloy C-2000 in preparation
Electronics housing	Aluminum; 1.4404/316L in preparation
Connection	EN or ASME flanges
Flange version	DN 15 to DN 300, 1/2" to 12"
Sandwich version	DN 15 to DN 100, 1/2" to 4"
Sensor gasket	1.4435/316L

① Accuracy pressure- and temperature-compensated Re $\geq$ 20000 $\pm$ 1.5% for gases and vapors; 10000 < Re < 20000 $\pm$ 2.5% for gases and vapors

Electrical connection

Ex version	14 VDC to 30 VDC
Non-Ex version	14 VDC to 36 VDC
Protection category	IP 66/67

Current output

Measuring range	4 to 20mA
Over Range	20.8 mA +/- 1 %
Load:	minimum 100 ohms; maximum $R = [(U_b - 14 V) / 22 \text{ mA}]$
Error signal	NAMUR NE43
Maximum	22.0 mA
Multidrop mode	4.0 mA

Digital output

HART	
Name of manufacturer (code)	Krohne Messtechnik (69)
Name of model (type code)	VFC 070 (222)
Physical layer	FSK
Equipment category	Transmitter

Pulse output

Pulse output	Pulse frequency max. 0.5 Hz
Power supply non-Ex	24 V DC as NAMUR, or open < 1 mA, maximum 36 V, closed 100 mA, $U < 2 V$
Power supply Ex	24 V DC as NAMUR, or open < 1 mA, maximum 30 V, closed 100 mA, $U < 2 V$

Display and operating interface

Local display	2 lines, 10 characters
Operating and display languages	German, English, French

Approvals

ATEX	ATEX II 2G EEx d [ia] IIC T6 ❶
FM	Class 1 Div. 1 ❶

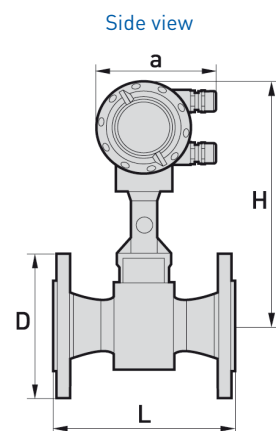
❶ In preparation

Dimensions and weights

Size	Pressure rating	Dimensions [mm]					Weight [kg]	
DN	PN	d	D	L	H	l	With pressure sensor	Without pressure sensor

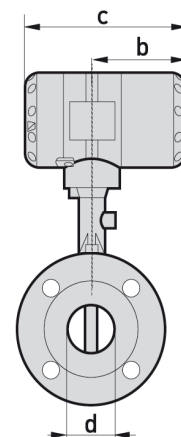
Flange version EN 1092-1

15	40	17,3	95	200	265	144	6,1	5,5
15	100	17,3	105	200	265	144	7,1	6,5
25	40	28,5	115	200	265	144	7,9	7,3
25	100	28,5	140	200	265	144	9,9	9,3
40	40	43,1	150	200	270	144	10,8	10,2
40	100	42,5	170	200	270	144	14,8	14,2
50	16	54,5	165	200	275	144	12,7	12,1
50	40	54,5	165	200	275	144	12,9	12,3
50	63	54,5	180	200	275	144	16,9	16,3
50	100	53,9	195	200	275	144	18,4	17,8
80	16	82,5	200	200	290	154	17,4	16,8
80	40	82,5	200	200	290	154	19,4	18,8
80	63	81,7	215	200	290	154	23,4	22,8
80	100	80,9	230	200	290	154	27,4	26,8
100	16	107,1	220	250	310	164	22	21,4
100	40	107,1	235	250	310	164	25	24,4
100	63	106,3	250	250	310	164	30	29,4
100	100	104,3	265	250	310	164	36	35,4
150	16	159,3	285	300	325	174	35,8	35,2
150	40	159,3	300	300	325	174	41,8	41,2
150	63	157,1	345	300	325	174	59,8	59,2
150	100	154,1	355	300	325	174	67,8	67,2
200	10	206,5	340	300	350	194	54,4	53,8
200	16	206,5	340	300	350	194	54,4	53,8
200	25	206,5	360	300	350	194	63,4	62,8
200	40	206,5	375	300	350	194	72,4	71,8
200	63	204,9	415	300	350	194	92,4	91,8
200	100	199,1	430	300	350	194	114,4	113,8
250	10	260,4	395	380	370	224	83,4	82,8
250	16	260,4	405	380	370	224	85,4	84,8
250	25	258,8	425	380	370	224	97,4	96,8
250	40	258,8	450	380	370	224	113,4	112,8
250	63	255,4	470	380	370	224	134,4	133,8
250	100	248	505	380	370	224	179,4	178,8
300	10	309,7	445	450	395	244	113,4	112,8
300	16	309,7	460	450	395	244	118,4	117,8
300	25	307,9	485	450	395	244	134,4	133,8
300	40	307,9	515	450	395	244	158,4	157,8
300	63	301,9	530	450	395	244	184,4	183,8
300	100	295,5	585	450	395	244	260,4	259,8



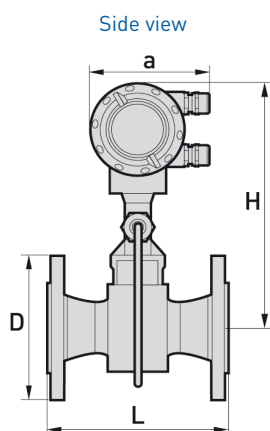
a = 133 mm / 5.24 inch

Front view

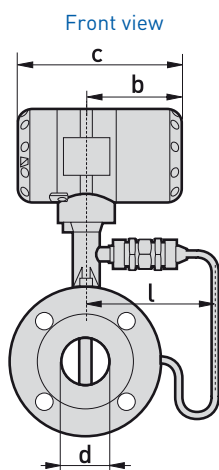


b = 105 mm / 4.13 inch

c = 179 mm / 7.05 inch



a = 133 mm / 5.24 inch



b = 105 mm / 4.13 inch

c = 179 mm / 7.05 inch

Size	Pressure rating	Dimensions [mm]					Weight [kg]	
DN	PN	d	D	L	H	l	With pressure sensor	Without pressure sensor

Flange version ASME B16.5

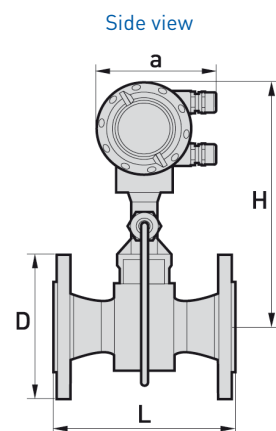
1/2	150	15,8	90	200	265	144	5,1	4,5
1/2	300	15,8	95	200	265	144	5,5	4,9
1/2	600	13,9	95	200	265	144	5,7	5,1
1	150	26,6	110	200	265	144	6,8	6,2
1	300	26,6	125	200	265	144	7,8	7,2
1	600	24,3	125	200	265	144	8,1	7,5
1 1/2	150	40,9	125	200	270	144	8,9	8,3
1 1/2	300	40,9	155	200	270	144	11	10,4
1 1/2	600	38,1	155	200	270	144	12	11,4
2	150	52,6	150	200	275	144	11,6	11
2	300	52,6	165	200	275	144	13	12,4
2	600	49,3	165	200	275	144	14,5	13,9
3	150	78	190	200	290	154	20,4	19,8
3	300	78	210	200	290	154	23,4	22,8
3	600	73,7	210	200	290	154	24,4	23,8
4	150	102,4	230	250	310	164	24	23,4
4	300	102,4	255	250	310	164	32	31,4
4	600	97,2	275	250	310	164	41	40,4
6	150	154,2	280	300	325	174	36,8	36,2
6	300	154,2	320	300	325	174	51,8	51,2
6	600	146,3	355	300	325	174	76,8	46,2
8	150	202,7	345	300	350	194	66,4	65,8
8	300	202,7	380	300	350	194	86,4	85,8
8	600	193,7	420	300	350	194	150,4	149,8
10	150	254,5	405	380	370	224	89,4	88,8
10	300	254,5	455	380	370	224	114,4	108,8
10	600	242,9	510	380	370	224	190,4	189,8
12	150	304,8	485	450	395	244	144,4	143,8
12	300	304,8	520	450	395	244	188,4	187,8
12	600	288,9	560	450	395	244	246,4	245,8

Dimensions and weights

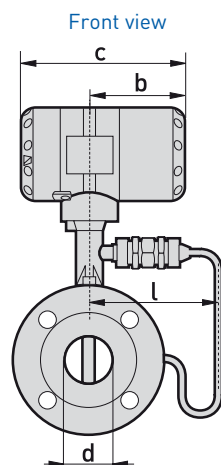
Size	Pressure rating	Dimensions [inch]					Weight [lb]	
DN	PN	d	D	L	H	l	With pressure sensor	Without pressure sensor

Flange version ASME B16.5

1/2	150	0,62	3,54	7,87	10,43	5,67	11,24	9,92
1/2	300	0,62	3,74	7,87	10,43	5,67	12,13	10,8
1/2	600	0,54	3,74	7,87	10,43	5,67	12,57	11,24
1	150	1,05	4,33	7,87	10,43	5,67	14,99	13,67
1	300	1,05	4,92	7,87	10,43	5,67	17,2	15,87
1	600	0,96	4,92	7,87	10,43	5,67	17,86	16,53
1 1/2	150	1,61	4,92	7,87	10,63	5,67	19,62	18,3
1 1/2	300	1,61	6,1	7,87	10,63	5,67	24,25	22,93
1 1/2	600	1,5	6,1	7,87	10,63	5,67	26,46	25,13
2	150	2,07	5,91	7,87	10,83	5,67	25,57	24,25
2	300	2,07	6,5	7,87	10,83	5,67	28,66	27,34
2	600	1,94	6,5	7,87	10,83	5,67	31,97	30,64
3	150	3,07	7,48	7,87	11,42	6,06	44,97	43,65
3	300	3,07	8,27	7,87	11,42	6,06	51,59	50,26
3	600	2,9	8,27	7,87	11,42	6,06	52,79	52,47
4	150	4,03	9,06	9,84	12,21	6,46	52,91	51,59
4	300	4,03	10,04	9,84	12,21	6,46	70,55	69,22
4	600	3,83	10,83	9,84	12,21	6,46	90,39	89,07
6	150	6,07	11,02	11,81	12,8	6,85	81,13	79,81
6	300	6,07	12,6	11,81	12,8	6,85	114,2	112,88
6	600	5,76	13,98	11,81	12,8	6,85	169,31	101,85
8	150	7,98	13,58	11,81	13,78	7,64	146,39	145,65
8	300	7,98	14,96	11,81	13,78	7,64	190,32	189,65
8	600	7,63	16,54	11,81	13,78	7,64	331,57	330,25
10	150	10,02	15,51	14,96	14,57	8,82	197,09	195,77
10	300	10,02	17,91	14,96	14,57	8,82	252,21	239,86
10	600	9,56	20,08	14,96	14,57	8,82	419,76	418,43
12	150	12	19,09	17,72	15,55	9,61	318,34	317,02
12	300	12	20,47	17,72	15,55	9,61	415,35	414,02
12	600	11,37	22,05	17,72	15,55	9,61	543,21	541,89



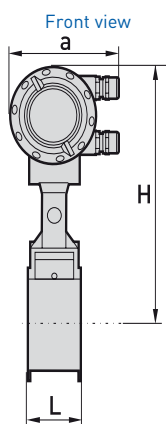
a = 133 mm / 5.24 inch



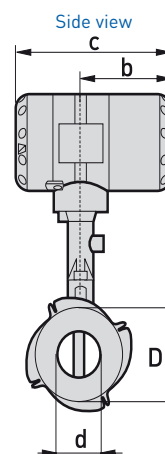
b = 105 mm / 4.13 inch

c = 179 mm / 7.05 inch

Dimensions and weights



a = 133 mm / 5.24 inch

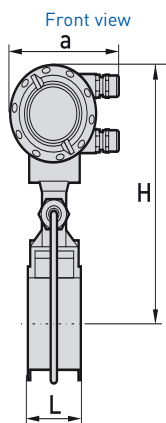


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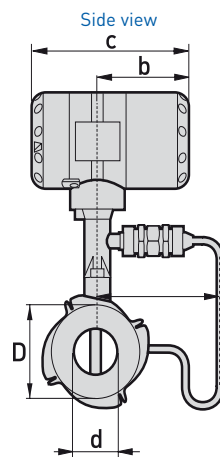
Size	Pressure rating	Dimensions [mm]				Weight [kg]	
		d	D	L	l	With pressure sensor	Without pressure sensor

Sandwich version EN

15	100	16	45	65	144	4,1	3,5
25	100	24	65	65	144	4,9	4,3
40	100	38	82	65	144	5,5	4,9
50	100	50	102	65	144	6,6	6
80	100	74	135	65	155	8,8	8,2
100	100	97	158	65	164	10,1	9,5



a = 133 mm / 5.24 inch



b = 105 mm / 4.13 inch
c = 179 mm / 7.05 inch

Size	Pressure rating	Dimensions [inch]				Weight [lb]	
DN	PN	d	D	L	l	With pressure sensor	Without pressure sensor

Sandwich version ASME

1/2	150	0,63	1,77	2,56	5,67	9,04	7,72
1/2	300	0,63	1,77	2,56	5,67	9,04	7,72
1/2	600	0,55	1,77	2,56	5,67	9,04	7,72
1	150	0,94	2,56	2,56	5,67	10,8	9,48
1	300	0,94	2,56	2,56	5,67	10,8	9,48
1	600	0,94	2,56	2,56	5,67	10,8	9,48
1 1/2	150	1,5	3,23	2,56	5,67	12,13	10,8
1 1/2	300	1,5	3,23	2,56	5,67	12,13	10,8
1 1/2	600	1,5	3,23	2,56	5,67	12,13	10,8
2	150	1,97	4,02	2,56	5,67	14,55	13,23
2	300	1,97	4,02	2,56	5,67	14,55	13,23
2	600	1,97	4,02	2,56	5,67	14,55	13,23
3	150	2,91	5,31	2,56	6,1	19,4	18,08
3	300	2,91	5,31	2,56	6,1	19,4	18,08
3	600	2,91	5,31	2,56	6,1	19,4	18,08
4	150	3,82	6,22	2,56	6,46	22,27	20,94
4	300	3,82	6,22	2,56	6,46	22,27	20,94
4	600	3,82	6,22	2,56	6,46	22,27	20,94

Flow table

Measuring range limits

Size		Qmin	Qmax
DN to EN 1092-1	DN to ASME B16.5	[m ³ /h]	[m ³ /h]

Water

15	1/2	0,36	5,07
25	1	0,81	11,4
40	1 1/2	2,04	28,58
50	2	3,53	49,48
80	3	7,74	108,38
100	4	13,3	186,22
150	6	30,13	421,89
200	8	52,66	737,23
250	10	81,43	1140,02
300	12	114,83	1607,61
Values based on water at 20°C			

Air

15	1/2	4,34	57,91
25	1	9,77	130,29
40	1 1/2	24,5	326,63
50	2	42,41	565,49
80	3	92,9	1238,64
100	4	159,62	2128,27
150	6	361,62	4821,57
200	8	631,91	8425,53
250	10	977,16	13028,81
300	12	1377,95	18372,66
Values based on air at 20°C and 1,013 bar abs			

Flow rate limits

Product	Nominal diameters	Nominal diameters	Minimum flow rates		Maximum flow rates	
	to EN	to ASME	[m/s]		[m/s]	
Liquids	DN15 to DN300	DN 1/2" to DN12"	$0.5 \times (998 / \rho)^{0.5}$	or 0.4 ①	$7 \times (998 / \rho)^{0.47}$	or 10 ②
Gas, vapor	DN15 to DN300	DN 1/2" to DN12"	$6 \times (1.29 / \rho)^{0.5}$	or 2 ①	$7 \times (998 / \rho)^{0.47}$	or 80 ②

① Please utilize the greater of the two values

② Please utilize the smaller of the two values

Measuring range saturated steam

Overpressure [bar]		1		3,5		5,2		7	
Density [kg/m3]		1,12482		2,39175		3,22667		4,10067	
Flow rate [kg/h]		min	max	min	max	min	max	min	max
DN to EN 1092-1	DN to ASME B16.5								
15	1/2	5,23	65,13	7,63	138,5	8,86	186,84	9,99	237,45
25	1	11,77	146,55	17,16	311,62	19,93	420,4	22,47	534,26
40	1 1/2	29,51	367,39	43,03	781,2	49,98	1053,91	56,34	1339,38
50	2	51,08	636,07	74,5	1352,5	86,52	1824,84	97,55	2318,87
80	3	111,9	1393,25	163,18	2962,52	189,53	3996,69	213,66	5079,26
100	4	192,27	2393,91	280,38	5090,27	325,66	6867,21	367,12	8727,32
150	6	435,59	5423,39	635,19	11531,97	737,77	15557,6	831,71	19771,65
200	8	761,19	9477,2	1109,97	20151,75	1289,22	27186,37	1453,38	34550,3
250	10	1177,07	14655,07	1716,4	31161,66	1993,6	42039,68	2247,44	53426,86
300	12	1659,85	20665,94	2420,39	43942,81	2811,29	59282,52	3169,24	75340,22

Measuring range for saturated steam

Overpressure [bar]		10,5		14		17,5		20	
Density [kg/m3]		5,78855		7,47056		9,15131		0,3542	
Flow rate [kg/h]		min	max	min	max	min	max	min	max
DN to EN1092-1	DN to ASME B16.5								
15	1/2	12,57	293,62	16,22	336,12	19,87	374,28	22,48	399,6
25	1	26,7	660,65	30,33	756,27	33,57	842,14	35,71	899,1
40	1 1/2	66,94	1656,22	76,05	1895,92	84,17	2111,2	89,53	2254
50	2	115,9	2867,41	131,66	3282,41	145,72	3655,12	155	3902,36
80	3	253,86	6280,78	288,39	7189,79	319,19	8006,18	339,52	8547,74
100	4	436,19	10791,79	495,52	12353,69	548,43	13756,42	583,36	14686,93
150	6	988,19	24448,7	1122,59	27987,16	1242,47	31165,04	1321,61	33273,11
200	8	1726,83	42723,28	1961,69	48906,62	2171,17	54459,88	2309,46	58143,65
250	10	2670,28	66065,16	3033,45	75626,77	3357,4	84214,04	3571,24	89910,45
300	12	3765,52	93162,2	4277,65	106645,56	4737,45	118754,96	5036,01	126787,78

Measuring range for saturated steam

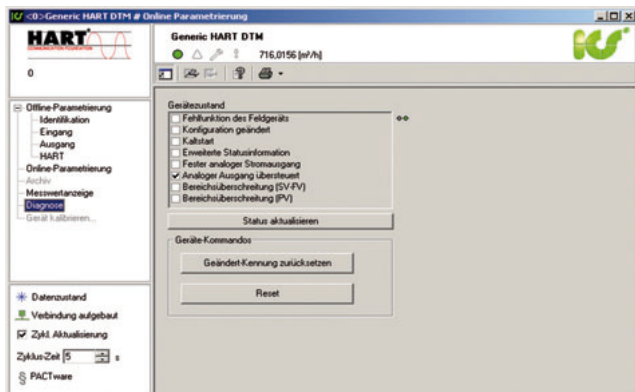
Overpressure [psig]		15		50		75		100	
Density [lbs/ft ³]		0,072		0,1498		0,2036		0,2569	
Flow rate [lbs/h]		min	max	min	max	min	max	min	max
DN to EN 1092-1	DN to ASME B16.5								
15	1/2	11,39	143,59	16,79	305,33	19,43	411,92	21,98	523,49
25	1	25,63	323,09	37,78	687	43,72	926,82	49,46	1177,86
40	1 1/2	64,25	809,97	94,71	1722,26	109,6	2323,47	123,99	2952,83
50	2	111,23	1402,29	163,97	2981,75	189,74	4022,64	214,67	5112,24
80	3	243,64	3071,59	359,16	6531,24	415,61	8811,18	470,22	11197,84
100	4	418,62	5277,67	617,11	11222,13	714,12	15139,59	807,94	19240,41
150	6	948,38	11956,52	1398,07	25423,63	1617,83	34298,6	1830,38	43588,97
200	8	1657,27	20893,62	2443,07	44426,95	2827,11	59935,66	3198,52	76170,28
250	10	2562,72	32308,86	3777,85	68699,63	4371,7	92681,52	4946,03	117785,93
300	12	3613,84	45560,54	5327,35	96877,61	6164,78	130695,42	6974,68	166096,57

Measuring ranges for saturated steam

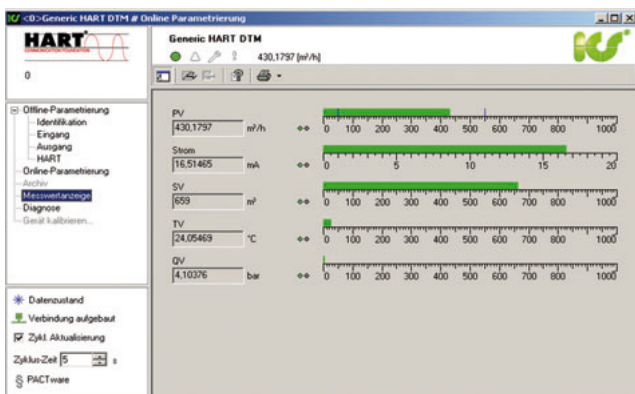
Overpressure [psig]		150		200		250		300	
Density [lbs/ft ³]		0,3627		0,4682		0,5736		0,6793	
Flow rate [lbs/h]		min	max	min	max	min	max	min	max
DN to EN 1092-1	DN to ASME B16.5								
15	1/2	27,71	647,32	35,76	741,01	43,81	825,16	49,57	880,97
25	1	58,76	1456,48	66,75	1667,28	73,87	1856,6	76,8	1982,18
40	1 1/2	147,31	3651,32	167,33	4179,78	185,19	4654,39	192,54	4969,22
50	2	255,05	6321,55	289,69	7236,47	320,61	8058,16	333,34	8603,23
80	3	558,66	13846,72	634,55	15850,77	702,27	17650,59	730,15	18844,51
100	4	959,9	23791,79	1090,29	27235,18	1206,66	30327,68	1254,56	32379,11
150	6	2174,63	53900,08	2470,04	61701,05	2733,67	68707,08	2842,2	73354,56
200	8	3800,1	94188,6	4316,32	107820,52	4777	120063,33	4966,64	128184,65
250	10	5876,29	145648,57	6674,55	166728,29	7386,91	185659,96	7680,16	198218,37
300	12	8286,49	205387,25	9412,15	235112,94	10416,7	261809,55	10830,22	279518,87

PACTware • simple and intuitive

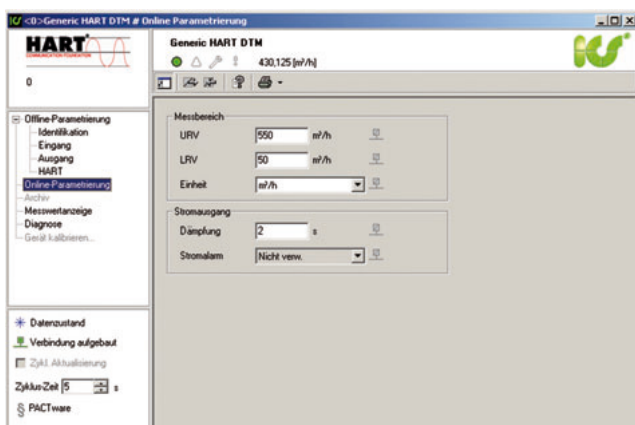
PACTware diagnosis



PACTware reading display



PACTware online parameter configuration



PACTware

OPTISWIRL 4070 is PACTware-ready. Each device is supplied ex factory with the appropriate DTM (Device Type Manager). A DTM is a device driver making available the device functionality independent from the FIELDBUS protocol and providing a graphical user interface optimized for device operation and configuration.

Graphic HMI permits operation and setup of the meter. Simple and program-based setup of devices without a display or keyboard is thus possible from the Central Control Room. The best possible operating concepts have been implemented. These optimally reflect user requirements.

Features:

- Displays measured values
- Records measured information during operation
- Shows status of device
- Stepwise setup
- Displays summary of setup selection for final supervision



KROHNE Overview

- Electromagnetic flowmeters
- Variable area flowmeters
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- Oil and gas turnkey solutions

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