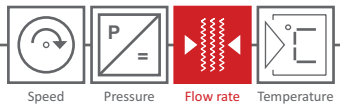
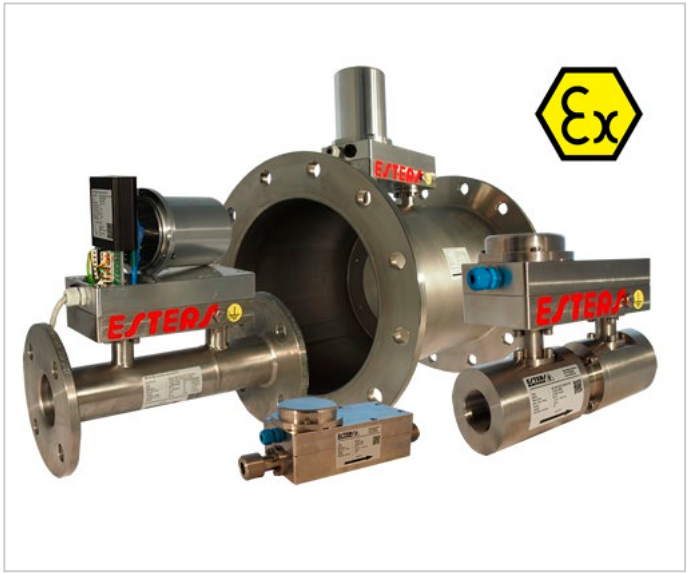


Gas Flowmeter GD 300/GD 500 Ex

for measuring of all technical and medical gases from DN 15 to DN 400, especially polluted and wet gases like biogas, landfill gas and digester gas



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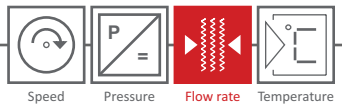

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Overview

GD 300 Ex-05017SIR1000-AL-P0R0


GD 300 with ball valve (option AVF)

- measuring of all technical and medical gases from DN 15 to DN 400, especially polluted and wet gases like biogas, landfill gas and digester gas
- measurement of all gases and gas mixtures with equal accuracy
- use with extremely corrosive and inert gases
- oscillating measurement principle, without moving parts
- resistant to dirt, e.g. oil, rust, sulphur
- measuring housing, orifice and measuring labyrinth made of stainless steel, also available as heavy duty construction
- excellent results measuring moist gases with condensate
- mounting in falling direction into gas lines even for 100 % damp biogas due to integrated condensate discharge
- optional integrated ball valve (blocking valve) in the GD 300 for removal/installation of the platinum sensor without emptying the system
- integrated calculator HB 300 in the measuring head with mA- (normalization optional) or pulse output
- optional redundant measuring method with two independent platinum wire sensors and two separate flow computer
- lowest measurable flow rates
- short response time T90 ≤ 50 ms with a flow velocity ≥ 0,25 m/s
- high accuracy (±1,5 % of true value)
- high reproducibility (0,1 % of true value)
- low pressure loss
- each flowmeter with calibration report
- recalibration not required
- Ex II 1 / 2 G Ex ia / e mb IIC T4 Ga / Gb (certificate no. EX5 13 07 14689 003)

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Application Range

The product family GD 300/GD 500 is used in a variety of applications that require the measurement of technical and medical gases.

Digester and mine gas

The insensitivity to particles and moisture is one of the strengths of this gas measurement method. Especially in the areas of biogas and sewage gas outstanding measurement results are achieved with the GD 300/ GD 500 despite of condensate. The occurring sulphur pollution of more than 100 ppm in these gases does not influence the measurement process.

Medical gases

The devices in stainless steel are excellently suited for the measurement of oxygen, nitrous oxide, compressed air, nitrogen, carbon dioxide, argon and helium in medical applications. Especially the GD 500 with a resolution of 1 litre/min is ideal for the billing of small units (licensed beds) in hospitals and contributes to more transparency in billing.

In addition to the gas flowmeter in stainless steel there is an economic solution made of aluminium for consumption measuring in industrial production. The devices are suitable for technical gases, e.g. compressed air, carbon dioxide, argon, nitrogen, oxygen and natural gas.

In the industrial sector the devices are designed for the gas flow measurement of technical gases, e.g. compressed air, carbon dioxide (fermentation and cooling), argon (steel production), nitrogen, oxygen and natural gas (burner control, intake screening of boilers). In respect to the very fast response of the GD 300/GD 500 (T90 ≤ 50 ms) the gas flowmeters are especially suited for monitoring and logging of product cycles based on pneumatic energy.

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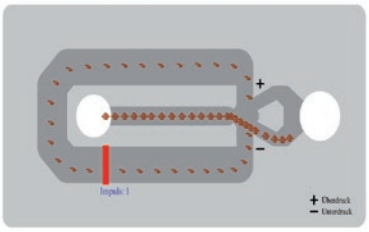
Principle of Measurement

The flowmeter GD 300/GD 500 operates according to the principle of a „Fluidistor oscillator“. The gas passes the Fluidistor measuring head either directly or via an orifice in the main pipe.

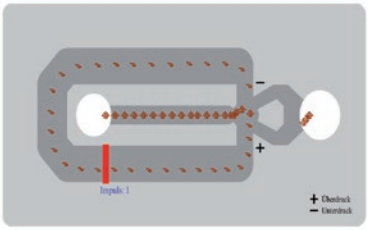
The gas is discharged through the orifice into the Fluidistor measuring chamber. Directly behind the inlet there is a triangular damming body, which, due to the unstable middle position, forces the gas either to flow past on the right or left. At the level of the damming body in the right and left wall of the Fluidistor measuring chamber are two openings which are connected to each other by a channel. If the gas flows to the left from the damming body, a negative pressure is created on the left side wall or at the opening of the connecting channel. This negative pressure is balanced through the right opening of the connecting channel. The pressure equalization of the negative pressure causes a change of flow direction from the left to the right side. The entire process is then repeated on the right side.

The period of time required for pressure equalization corresponds to a special amount of gas (litre/pulse), which has passed through the GD 300/GD 500. The frequency of the pressure equalization is proportional to the flow velocity.

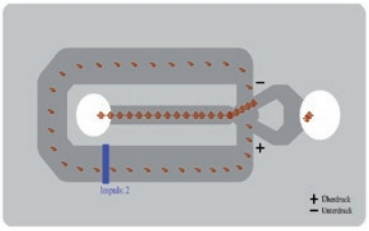
The changing flow through the connecting channel is detected by a platinum wire (diameter 15 µ) in the connecting channel. A constant voltage is applied to the wire, which is permanently monitored. At the moment when the pressure equalization occurs in the connecting channel, the wire is not circulated around by gas for a short time and heats up due to the current flowing through the wire. This causes a temporary rise of the resistance in the platinum wire (like a Pt100 sensor) and the voltage drop (V=R*I) increases. This increase in voltage is detected by the signal conditioner SC 300/SC 310/HB 300 and transmitted to connected flow computers (e.g. GDR 1203, GDR 1403, GDR 1404, GDR 1407, GDR 1408 or PAC 1201).



- outflow of the gas through the right outlet
- active pressure equalization in the connecting channel from right to left



- pressure compensation in the connecting channel with an incipient change of direction from left to right



- short-term nonoperating of the gas flow in the connection channel
- heating of the platinum wire

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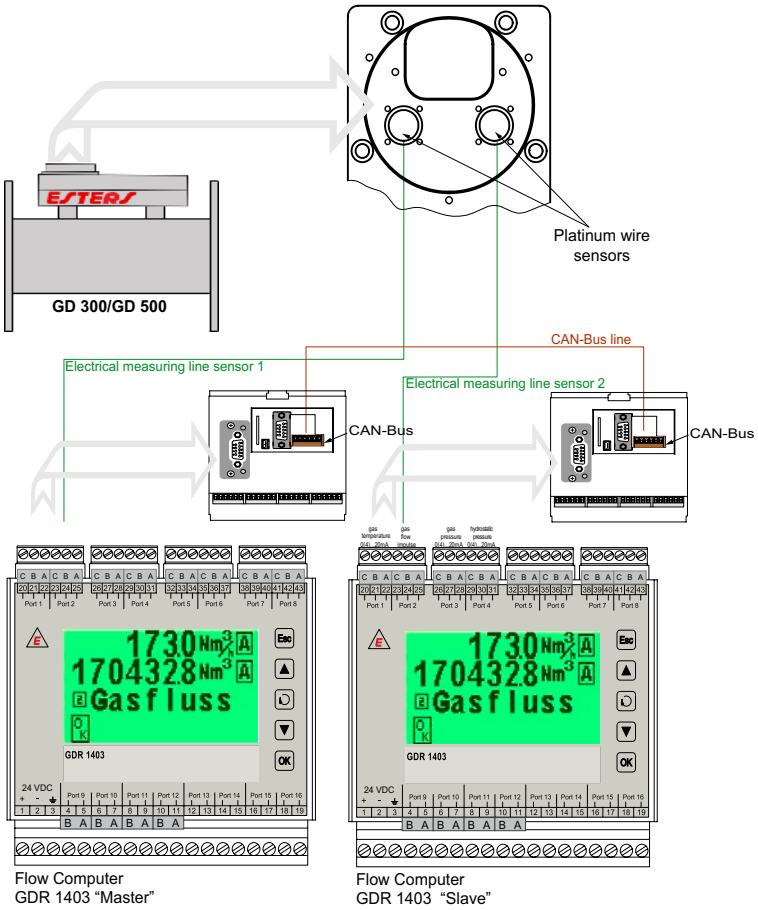
Redundant Measurement Method (optional)

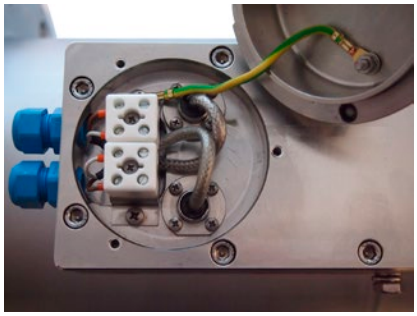
The redundant measurement method relies on two separate platinum wire sensors which are integrated in the measuring head of the GD 300/GD 500 (only devices without ATEX certification). The sensors are connected with two separate cables to two separate monitors.

The evaluation devices operate in hot stand-by mode. In trouble-free operation the secondary unit takes over the current counter reading of the primary device via CAN-bus in a 100 ms cycle.

In case of an incident of the primary system (platinum wire sensor break damage, loss of pressure and temperature measurement, failure of the primary volume corrector) the secondary system takes over all functions within 100 ms. After repair of the primary system it automatically resumes the current counters from the secondary system. In the event of a failure of the secondary system, it can be changed without affecting the primary system.



measuring head with two sensors



connectors of redundant system in the measuring head

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Technical Details

	GD 500 WITH EXTERNAL PIPE THREAD	GD 300 WITH INTERNAL PIPE THREAD	GD 300 WITH FLANGE
			
NOMINAL SIZE	DN 15	DN 25 to DN 50	DN 50 to DN 400
PROCESS CONNECTION	external pipe thread R 1/2” G 1”	internal pipe thread Rp 1”, Rp 1 1/4”, Rp 1 1/2”, Rp 2”	flange acc. to DIN EN-1092-2 or DIN 2576 depending on availability flange acc. to ASME B 16.5
PRESSURE RANGE	0,5 bar, 10 bar, 16 bar, 40 bar	0,5 bar, 10 bar, 16 bar, 40 bar	0,5 bar, 10 bar, 16 bar, 40 bar (ISO flange) class 150, class 300 (ASME flange)
TEMPERATURE	-20 bis +120°C; gas as well as environment, max. 80°C for the Ex version		
MEASURING HEAD	material stainless steel 1.4571 (V4A), aluminium		
MEASURING LABYRINTH	material stainless steel 1.4571 (V4A), aluminium		
TUBE BODY	-	material stainless steel 1.4571 (V4A), aluminium	material stainless steel 1.4571 (V4A)
SENSOR	material platinum		
PROTECTION CLASS	IP 65		
OUTPUT (STANDARD)	pulse output: pulse 24 V, DC, max. 200 Hz (pulse width 1 - 2 ms) status output for sensor break detection: 24 V, DC (pollution monitoring with redundant platinum wire sensor)		
OUTPUT WITH INTEGRATED CALCULATOR	pulse output: pulse 24 V, DC, 1 pulse=0.01, 0. 1, 1, 10 or 100 m³ current interface: (0)4 - 20 mA = 0 - x Nm³/h , status output for sensor break detection: 24 V, DC (pollution monitoring with redundant platinum wire sensor) standard: DIN 1343, DIN 6358, DIN ISO 2533, DIN 102/ISO 1-1975 fixed value temperature: -50 °C to 200°C fixed value absolute pressure: -0,8 bar to 100 bar		
ATEX CERTIFICATION	Ex II 1 / 2 G Ex ia / e mb IIC T4 Ga / Gb, EG certificate no: TPS 13 ATEX 14689 003 X (certificate no. EX5 13 07 14689 003)		
REDUNDANT VERSION (OPTIONAL)	redundant sensors in measuring head only devices without ATEX certification): R1: redundant platinum sensor		
BALL VALVE (OPTIONAL)	AVF - ball valve (blocking valve) for GD 300 with flange removal/installation of the platinum wire sensor without emptying the system		

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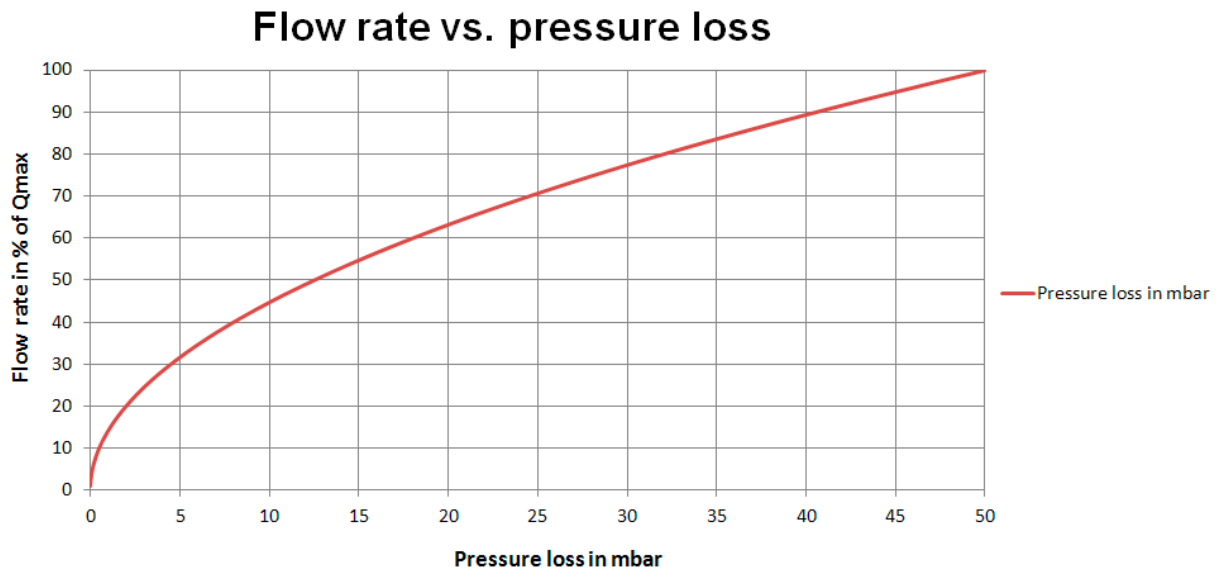
Pressure Loss / Flow

The diagram applies to gases with a density of air at NTP (0°C and 1013 mbar). The decrease of pressure is always proportional to the gas density. If e.g. the operating pressure rises by 100% the pressure drop doubles.



Accuracy of Measurement

At low flow rates the density (or actually the viscosity) of the gas influences the accuracy.

Above the limit value (Q_t), the accuracy is 1,5 % of the measured value. Below Q_t the accuracy is 5 % of the measured value.

Example measurement range:

Q_t with 1,5% accuracy

DN (mm)	inches	m³/h		kg/Nm³	m³/h	
		$Q_{min\ (5\ \%)}$	$Q_{t\ (1,5\ \%)}$	density	%	Q_{max}
15	1/2“	0,06	3,52	0,5	16	22
80	3“	8,00	64	1,0	8	800
80	3“	8,00	48	1,2	6	800
150	6“	30,0	240	1,0	8	3.000
150	1“	30,0	180	1,2	6	3.000

Example:

At a density of x kg/m³ the limit value is Q_t = y % of Q_{max}.

density kg/m³		limit value Q_t
0,5	=	16%
1,0	=	8%
1,2	=	6%
2,0	=	4%
4,0	=	2%
8,0	=	1%

For natural gas with a methane component of 85 % a density of 0,85 kg/m³ is assumed.

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Measuring Range

GD 500 with external pipe thread

DN (mm)	inches	m³/h	
		Q_{min}	Q_{max}
15	1/2“	0,06	22
25	1“	0,06	22

GD 300 with internal pipe thread

DN (mm)	m³/h					
	orifice 13		orifice 15		orifice 17	
	Q_{min}	Q_{max}	Q_{min}	Q_{max}	Q_{min}	Q_{max}
25	0,20	20	0,35	35	0,7	70
32	0,20	20	0,60	60	1,00	100
40	0,20	20	0,90	90	2,00	200
50	0,20	20	1,10	110	2,50	250

GD 300 with flange

DN (mm)	m³/h					
	orifice 13		orifice 15		orifice 17	
	Q_{min}	Q_{max}	Q_{min}	Q_{max}	Q_{min}	Q_{max}
50	0,20	20	1,10	110	2,50	250
65	0,90	90	1,70	170	4,50	450
80	1,40	140	4,50	450	8,00	800

DN (mm)	m³/h					
	orifice 25		orifice 27		orifice 30	
	Q_{min}	Q_{max}	Q_{min}	Q_{max}	Q_{min}	Q_{max}
100	2,70	270	6,50	650	10,00	1.000
125	4,00	400	8,00	800	15,00	1.500
150	6,00	600	12,00	1.200	30,00	3.000
200	12,00	1.200	25,00	2.500	60,00	6.000
250	20,00	2.000	40,00	4.000	75,00	7.500
300	30,00	3.000	50,00	5.000	113,00	13.000
350	40,00	4.000	70,00	7.000	140,00	14.000
400	50,00	5.000	100,00	10.000	160,00	16.000

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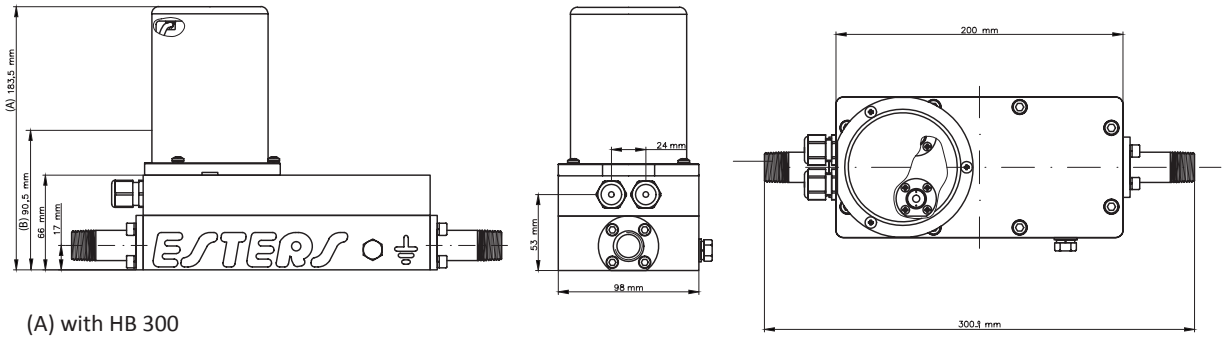
Dimensions and Weight

GD 500 with external pipe thread

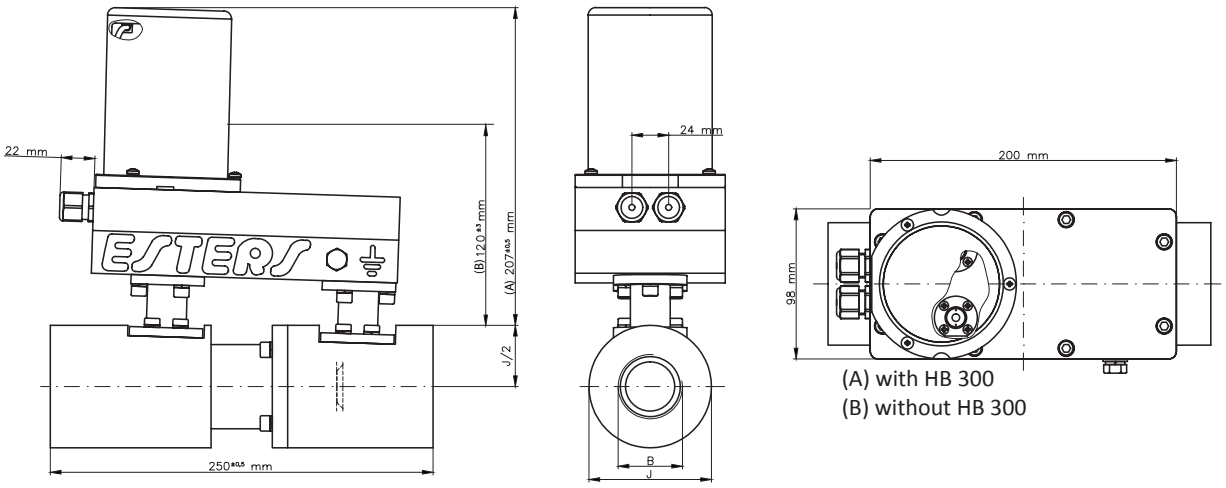
inches	weight (kg) ±5 %
1/2“	8
1“	8



(A) with HB 300
(B) without HB 300

GD 300 with internal pipe thread

mm^{+0-1} DN (nominal size)	inches thread	mm^{+0-1} J	weight (kg) + - 5%
25	Rp 1“	80	16
32	Rp 1 1/4“	80	12
40	Rp 1 1/2“	100	18
50	Rp 2“	100	14



(A) with HB 300
(B) without HB 300

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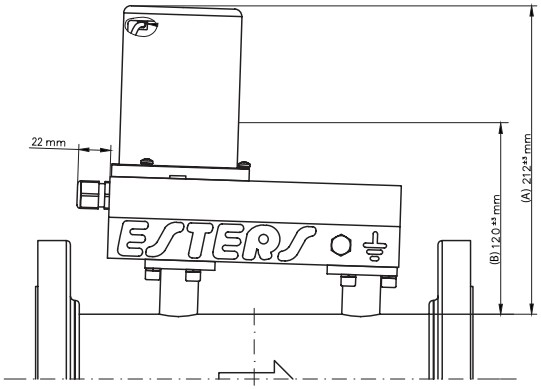
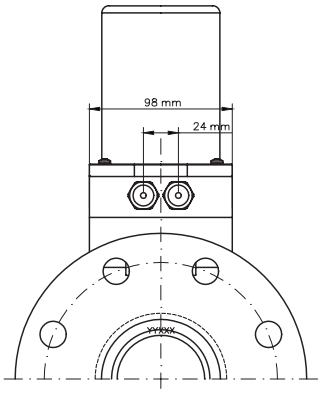
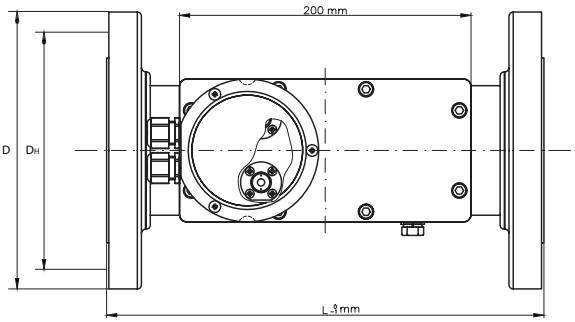
GD 300 with flange

mm^{+0-1} DN (nominal size)	mm^{+0-1} L (S/L)	mm^{+0-1} D	mm^{+0-1} D_H	weight (kg) ±5 % reduced flange	weight (kg) ±5 % solid flange
50	300	165	125	11	13
65	300	185	145	14	16
80	300	200	160	14	16
100	300/360	220	180	16/18	17/18
125	300	250	210	17	19
150	350/500	285	240	21/24	29/31
200	350	340	295	25	35
250	450	405	355	35	49
300	500	460	410	41	51
350	500	520	470	55	68
400	500	580	525	70	91







(A) with HB 300
(B) without HB 300

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Installation Instructions / Maintenance

Planning the project it has to be ensured that the pipe width is not increased by the gas meter to avoid measurement errors. The defined measurement ranges for individual nominal diameters must not be exceeded. A straight inlet zone of 10 x DN and an outlet zone of 5 x DN is required.

In the pipe network in front of the flowmeter, the gas velocity may not exceed supersonic speed. Supercritical pressure drops and pulsating flows must be avoided.

When installing the GD 300/GD 500 under the ceiling, a distance of at least 25 cm from the lid to the ceiling must be complied, that the lid can be removed for connecting the sensor cable.

In case of falling below the Q_{min} (measuring range) display of measured values is not possible.

The flow meter GD 300/GD 500 can be installed in horizontal or vertical position. A condensate discharge is integrated into the measuring head, which guarantees the outflow of condensate of 100 % moist gas without sediments.

The inclined measuring head ensures the outflow of condensate when installed in horizontal pipes.

The oscillating measuring method of the Fluidistor principle requires no moving parts or sensitive sensor materials, creating a virtually maintenance-free operation of the GD 300/GD 500. The platinum wire sensor integrated in the head may be exchanged without removing the device from the pipe. A sensor change has no effect on the calibration of the flowmeter.

Installation of the GD 300 in a vertically falling line

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Ordering Information

GD 500 with external pipe thread

GD 500							Description
EX-VERSION	Ex						with ATEX certification
PROCESS CONNECTION		-PA1					R 1/2“
		-PA2					G 1“
PRESSURE RANGE			00				0,5 bar
			10				10 bar
			16				16 bar
			40				40 bar
MATERIAL CONNECTION				-V4			V4A stainless steel
MATERIAL MEASURING HEAD					-AL		aluminium
					-V4		V4A stainless steel
REDUNDANT VERSION						-P0RO	without
						-POR1	redundant platinum sensor *

* only devices without ATEX certification

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GD 500-PA100-V4-AL-P0R0

GD 500-PA200-V4-AL-P0R0

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GD 300 - DN 25 to DN 50 with internal pipe thread

GD 300								DESCRIPTION
EX-VERSION	Ex							with ATEX certification
PRESSURE RANGE		-025						DN 25 (thread Rp 1“)
		-032						DN 32 (thread Rp 1 1/4“)
		-040						DN 40 (thread Rp 1 1/2“)
		-050						DN 50 (thread Rp 2“)
ORIFICE			13					measurement range see table page 9
			15					
			17					
PROCESS CONNECTION				RP				internal pipe thread (Rp)
PRESSURE RANGE					00			0,5 bar
					10			10 bar
					16			16 bar
					40			40 bar
MATERIAL						-AL		aluminium
						-V4		V4A stainless steel
REDUNDANT VERSION							-P0R0	without
							-P0R1	redundant platinum sensor *

* only devices without ATEX certification

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GD 300 - DN 50 to DN 80 with flange

GD 300												DESCRIPTION
EX-VERSION	Ex											with ATEX certification
NOMINAL SIZE		-050										DN 50
		-065										DN 65
		-080										DN 80
ORIFICE			13									measurement range see table page 9
			15									
			17									
PIPE LENGTH				S								standard pipe length
				L								version with extra length, see dimensions
PROCESS CONNECTION					I							flange acc. to DIN EN-192-2/DIN2576
					A							flange acc. to ASME B 16.5
FLANGE VERSION						R						reduced flange (only ISO flange with a pressure range up to PN 10, bolt circle diameter PN 10)
						F						solid flange
BOLT CIRCLE DIAMETER							10					standard (ISO flange)
							16					(ISO flange)
							20					class 150 (ASME flange)
							50					class 300 (ASME flange)
PRESSURE RANGE								00				0,5 bar
								10				10 bar
								16				16 bar
								40				40 bar
								20				class 150 (ASME flange)
								50				class 300 (ASME flange)
MATERIAL									-AL			aluminium
									-V4			V4A stainless steel
REDUNDANT VERSION										-P0RO		without
										-P0R1		redundant platinum sensor *
BALL VALVE												without
											-AVF	ball valve (blocking valve)

* only devices without ATEX certification

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GD 300 - DN 100 to DN 400 with flange

GD 300												DESCRIPTION
EX-VERSION	Ex											with ATEX certification
		-100										DN 100
		-125										DN 125
NOMINAL SIZE		-150										DN 150
		-200										DN 200
		-250										DN 250
		-300										DN 300
		-350										DN 350
		-400										DN 400
ORIFICE			25									measurement range see table page 9
			27									
			30									
PIPE LENGTH				S								standard pipe length
				L								version with extra length, see dimensions
PROCESS CONNECTION					I							flange acc. to DIN EN-192-2/DIN2576
					A							flange acc. to ASME B 16.5
FLANGE VERSION						R						reduced flange (only ISO flange with a pressure range up to PN 10, bolt circle diameter PN 10)
						F						solid flange
BOLT CIRCLE DIAMETER							10					standard (ISO flange)
							16					(ISO flange)
							20					class 150 (ASME flange)
							50					class 300 (ASME flange)
PRESSURE RANGE								00				0,5 bar
								10				10 bar
								16				16 bar
								40				40 bar
								20				class 150 (ASME flange)
								50				class 300 (ASME-flange)
MATERIAL									-AL			aluminium
									-V4			V4A stainless steel
REDUNDANT VERSION										-P0R0		without
										-P0R1		redundant platinum sensor *
BALL VALVE												without
											-AVF	ball valve (blocking valve)

* only devices without ATEX certification

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HB 300 - integrated calculator in the measuring head of the GD 300/GD 500

The gas flow meter GD 300/GD 500 can be equipped with an integrated calculator in the measuring head. This calculator converts the m³/h to Nm³/h in conjunction with pressure (fixed value) and temperature (fixed value).

Using the current output the measured value is directly transferred to a superior PLC system. Using the pulse output the signal is transferred to an external flow computer of the Esters series for application specific functions.

HB 300							DESCRIPTION
EX-VERSION	Ex						with ATEX certification
VERSION		-R0					standard
		-R1					redundant sensor *
STANDARDISATION			0				without standardisation
			1				DIN 1343
			2				DIN 6358
			3				DIN ISO 2533
			4				DIN 102/ISO 1-1975
CURRENT OUTPUT				0			without current output
				1			0 - 20 mA, load resistance 500 Ohm
				2			4 - 20 mA, load resistance 500 Ohm
OUTPUT RANGE CURRENT OUTPUT 0 (4) - 20 mA					00		without current output
					01		0 - 5 m³/h or Nm³/h
					02		0 - 10 m³/h or Nm³/h
					03		0 - 20 m³/h or Nm³/h
					04		0 - 50 m³/h or Nm³/h
					05		0 - 100 m³/h or Nm³/h
					06		0 - 200 m³/h or Nm³/h
					07		0 - 400 m³/h or Nm³/h
					08		0 - 800 m³/h or Nm³/h
					09		0 - 1.000 m³/h or Nm³/h
					10		0 - 1.500 m³/h or Nm³/h
					11		0 - 2.000 m³/h or Nm³/h
					12		0 - 3.000 m³/h or Nm³/h
					13		0 - 5.000 m³/h or Nm³/h
					14		0 - 7.000 m³/h or Nm³/h
					15		0 - 10.000 m³/h or Nm³/h
PULSE WEIGHTING						0	pulse output (standard)
						3	0,01 m³ or Nm³
						4	0,1 m³ or Nm³
						5	1 m³ or Nm³
						6	10 m³ or Nm³
						7	100 m³ or Nm³
						8	1.000 m³ or Nm³

* only devices without ATEX certification

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External flow computers of the Esters series with application specific funtions

The connection of an external flow computer of the Esters series allows an extended use of the measured values due to additional functions:

- connection of pressure and temperature sensors for standardisation of the measured values
- integrated recorder to log measured values in a ring buffer for fast identification of faults during operation
- storage of logged data in an external SQL-database using the Energy Management and Configuration Software E3DM
- visualisation of data in time series using the Energy Management and Configuration Software E3DM
- daily status report via e-mail using the Esters Infoserver
- integration into IT-networks via Ethernet TCP/IP
- data transfer via PROFIBUS DP, Modbus RTU, Modbus TCP, Ethernet TCP/IP

The external flow computers have further specific application functions, which are described in the following.

1-/2-Channel Flow Computer GDR 1403 for all technical or medical gases

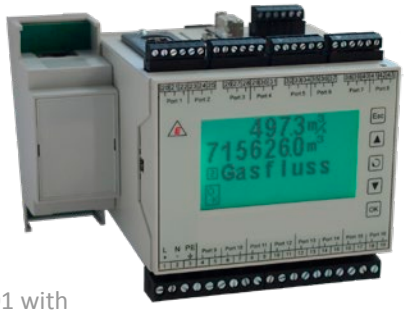
The flow computer detects the impulse signals of up to two fluidistor gas flow meters GD 300/GD 500 using 1 or 2 channels. According to the assignment it converts the impulse signals into m³/h , Nm³/h, l/h or Nl/h. The actual flow rate is displayed in m³/h (l(/h) resp. Nm³/h (Nl/h) and the quantity in m³ (l) resp. Nm³ (Nl) on the LC display.

For further information see datasheet DS 303 E.

Compressed Air Controller PAC 1201

The Compressed Air Controller detects the pulse signals of up to two gas flow-meters GD 300/GD 500 with 1 or 2 channels. This allows the precise measurement of the quantity of consumed litres of compressed air on plant or machine level (level 4). The device monitors single production cycles regarding consumed quantity in a production cell.

For further information see datasheet DS 315 E.



PAC 1201 with Ethernet TCP/IP

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The following devices are specially designed for the requirements of measuring biogas.

LP Flow Computer GDR 1404

The GDR 1404 calculates the flow and integrates various gas analysis devices

For further information see datasheet DS 307 E.

CHP Efficiency Flow Computer GDR 1407

In addition to the calculation of flow the GDR 1407 offers the following functions:

- calculation of efficiency of the CHP
- integration of ripple control systems to record the energy supplier´s energy release
- integration of various gas analysis devices

For further information see datasheet DS 318 E.

Calorific Value Flow Computer GDR 1408 for the sector biogas

Besides the calculation of the flow rate the GDR 1408 provides the following functions:

- continuous determination of the firing thermal capacity out of gas quantity (gas flow measurement) and gas quality (gas analysis)
- display of the current heat value in kJ/Nm³
- display of the current firing thermal capacity in MW
- quantity counter of firing thermal capacity in MW/h
- detection of the gas composition (CH_4, H_2S, CO_2, O_2)
- calculation of the primary energy of the flowing medium

For further information see datasheet DS 311 E.

GDR 1408 with option Ethernet TCP/IP, Profibus DP and CAN-Bus

Gas subcontracting of two biogas stations to an entry station with integration of gas analysis and accounting of the gas based on thermal input.

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Compressed Air Controller PAC 1201

precise compressed air consumption on plant or machine level with integrated monitoring of production cycles

External flow computers for the sector biogas

LP Flow Computer GDR 1404 for direct calculation of the gas consumption in Nm^3

CHP Efficiency Flow Computer GDR 1407 continuous monitoring and control of energy generation

Calorific Value Flow Computer GDR 1408 for direct calculation of thermal capacity in MWh

1-/2-Channel Flow Computer GDR 1403

exact gas consumption per litre for billing purpose in the medical field

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