Ultrasonic Gas Flowmeters for Permanent Installation in Hazardous Areas

Especially designed for the stationary use in hazard areas (ATEX Zone 1 and 2)

Features

- Non-invasive measurement using the clamp-on method for precise bi-directional, highly dynamic flow mesurement
- All stainless steel and seawater resistant FLUXUS G801 is ATEX certified and thus suited for offshore applications
- ATEX certified FLUXUS G800 is presented in a flameproof housing (IP 66) and can be operated by a magnet pen without opening the housing
- Automatic loading of calibration data and transducer detection, reduces set-up times and provides precise, long-term stable results
- Proven clamp-on method; transducers are certified for ATEX zone 1 and available for a wide range of rated diameters (DN 30…1600) and temperatures in the range of -40...+140 °C; resistant to dust and humidity
- Measurement is unaffected by gas density, viscosity and composition, dust, humidity, temperature or pressure
- User-friendly design
- Transducers for the use ind ATEX zone 1 and 2 as well as for FM Div. 2 available

Applications

- Designed for industrial use in harsh environments, in gas processing and natural gas extraction, chemical industry and in the petroleum industry. Practical applications:
  - Measurement on natural gas pipelines and in natural gas storage installations
  - Measurement of synthesized gas and injection gas
  - Measurement for the gas supply industry

FLUXUS G800

FLUXUS G801

Measurement with explosion proof transducers

List of Contents

Function

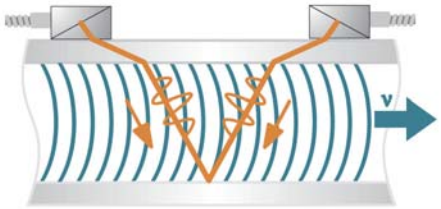
Measuring Principle

For the flow measurement of the medium, ultrasonic signals are used, employing the transit time difference principle. Ultrasonic signals are emitted by a transducer installed on one side of a pipe, reflected on the opposite side and received by a second transducer. These signals are emitted alternatively in flow direction and against it.

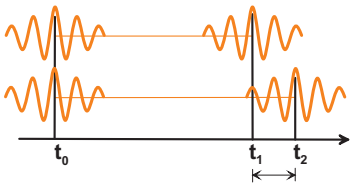
As the medium in which the signals propagate is flowing, the transit time of the ultrasonic signals in flow direction is shorter than against the flow direction.

The transit time difference Δt is measured and allows to determine the average flow velocity on the propagation path of the ultrasonic signals. A flow profile correction is then performed in order to obtain the area average of the flow velocity, which is proportional to the volume flow.

The received ultrasonic signals will be checked for their usefulness for the measurement and the plausibility of the measured values will be evaluated. The complete measuring cycle is controlled by the integrated microprocessors. Disturbance signals will be eliminated by statistical signal processing.



Path of the ultrasonic signal



Transit time difference Δt

Calculation of the Volume Flow

$Q = k_{Re} \cdot A \cdot k_{\alpha} \cdot \Delta t/(2 \cdot t_t)$

with:

Q - volume flow
k_{Re} - fluid mechanics correction factor
A - cross-sectional area of the pipe
k_{α} - flowmeter constant
Δt - transit time difference
t_t - transit time of the medium

Number of Sound Paths

The number of sound paths is the number of transits of the ultrasonic signals through the medium in the pipe.

reflection mode: number of sound paths = even, the transducers are mounted on the same side of the pipe, correct positioning of the transducers easier

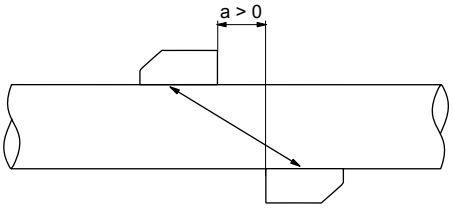
diagonal mode: number of sound paths = odd, the transducers are mounted on opposite sides of the pipe

The mode to be used depends on the application. If the number of sound paths is increased, the accuracy of the measurement will be better, but the signal attenuation is increased.

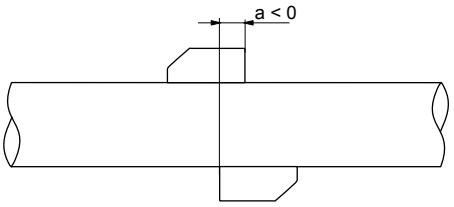
In case of a high signal attenuation by medium, pipe and coatings, diagonal mode with 1 sound path will be used.

The optimum number of sound paths for the parameters of the application will be detemined automatically by the flowmeter

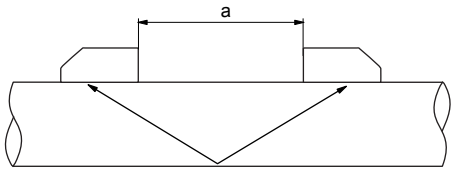
As the transducers can be mounted with the transducer mounting fixture (option) in reflection mode or diagonal mode the number of sound paths can be adjusted optimally to the application.



Diagonal mode, 1 sound path



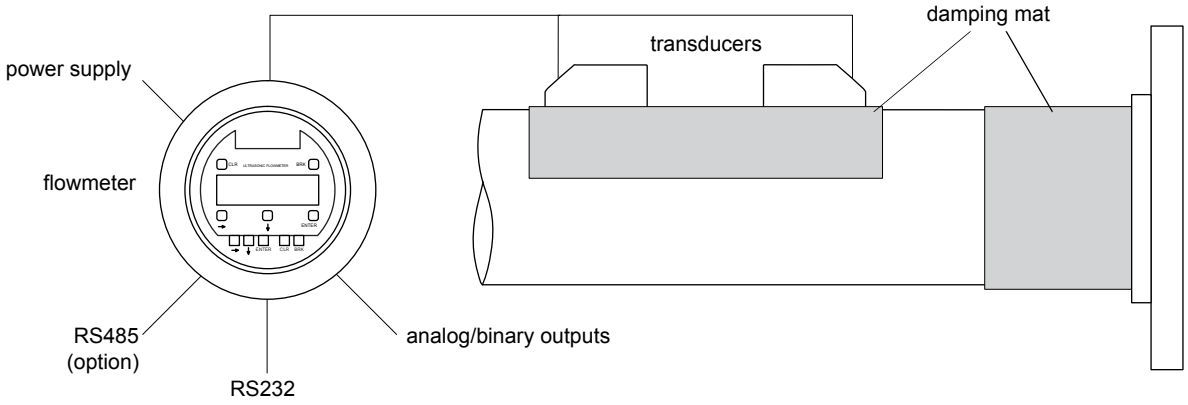
Diagonal mode, 1 sound path, negative transducer distance



Reflex mode, 2 sound paths

a - transducer distance

Typical Measurement Setup



Example for a gas flow measurement in reflection mode with FLUXUS G801 with standard volume flow output

Standard Volume Flow

The standard volume flow of the medium can be selected as physical quantity to be measured. It will be calculated internally by:

$V_N = V \cdot p/p_N \cdot T_N/T \cdot 1/K$

with:

V_N - standard volume flow
V - operational volume flow
p_N - standard pressure (absolute value)
p - operational pressure (absolute value)
T_N - standard temperature in K
T - operational temperature in K
K - gas compressibility factor

The operational pressure p and the operational temperature T of the medium will be entered directly as fixed values into the flowmeter.
The gas compressibility factor K will be entered in the flowmeter:

- as fixed value or
- as approximation according to e.g. AGA8 or GERG

Flowmeter

Technical Data

FLUXUS	G800 G800L G800P G800LP	G800C24 G800LC24	G801 G801P	G801C24
design	explosion proof field device		explosion proof offshore device	
				
measurement				
measuring principle	transit time difference correlation principle			
flow velocity	0.01...35 m/s, pipe diameter dependent			
repeatability	0.15 % of reading ±0.01 m/s			
accuracy				
- volume flow	± 1...3 % of reading ± 0.01 m/s depending on application ± 0.5 % of reading ± 0.01 m/s with field calibration			
medium	gases with a ratio of the characteristic acoustic impedances of pipe wall and gas < 3000, e.g. nitrogen, air, oxygen, hydrogen, argon, helium, ethylene, propane			
flowmeter				
power supply	100...240 V/50...60 Hz or 20...32 V DC oron request: 11...16 V DC	24 V DC ±10 %	100...240 V/50...60 Hz or 20...32 V DC oron request: 11...16 V DC	24 V DC ±10 %
power consumption	< 15 W	< 4 W	< 15 W	< 4 W
number of flow measuring channels	1, option: 2			
signal damping	0...100 s, adjustable			
measuring cycle (1 channel)	100...1000 Hz			
response time	1 s (1 channel), option: 70 ms			
material	cast aluminum G800, G800P: powder coated G800L, G800LP: 4 special coatings		stainless steel 316Ti (1.4571)	
degree of protection according to EN 60529	IP 66			
dimensions	see dimensional drawing			
weight	6 kg		8.5 kg	
fixation	wall mounting, option: 2 " pipe mounting			
operating temperature	-20...+60 °C	-20...+50 °C		
display	2 x 16 characters, dot matrix, backlit			
menu language	English, German, French, Dutch, Spanish			

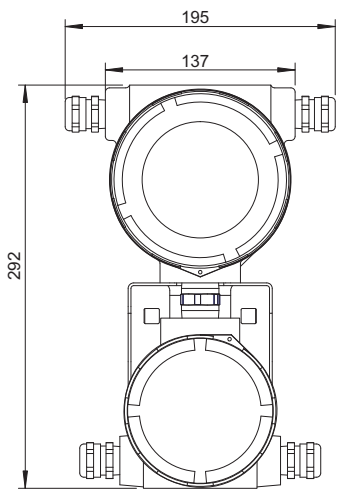
FLUXUS	**G800** **G800L** **G800P** **G800LP**	**G800C24** **G800LC24**	**G801** **G801P**	**G801C24**
explosion protection				
ATEX zone	1	1	1	1
marking	**G800**: CE 0044; Ex II 2G Ex de IIC T6 T_a -20...+60 °C **G800L**: CE 0044; Ex II 2G Ex de IIB T6 T_a -20...+60 °C **G800P**: CE 0044; Ex II 2G Ex de IIC T4 T_a -20...+60 °C **G800LP**: CE 0044; Ex II 2G Ex de IIB T4 T_a -20...+60 °C	**G800C24**: CE 0044; Ex II 2G Ex de [ib] IIC T4 T_a -20...+50 °C **G800LC24**: CE 0044; Ex II 2G Ex de [ib] IIB T4 T_a -20...+50 °C	**G801**: CE 0044; Ex II 2G Ex de IIC T6 T_a -20...+50 °C **G801P**: CE 0044; Ex II 2G Ex de IIC T4 T_a -20...+50 °C	CE 0044; Ex II 2G Ex de [ib] IIC T4 T_a -20...+50 °C
certification	IBExU01ATEX1064	IBExU01ATEX1064	IBExU05ATEX1078	IBExU05ATEX1078
type of protection	electronics enclosure: flameproof enclosure connection enclosure: increased safety	electronics enclosure: flameproof enclosure connection enclosure: increased safety output circuits: intrinsic safety	electronics enclosure: flameproof enclosure connection enclosure: increased safety	electronics enclosure: flameproof enclosure connection enclosure: increased safety output circuits: intrinsic safety
measuring functions				
physical quantities	operational volume flow, standard volume flow, mass flow, flow velocity			
totalizers	volume, mass			
calculation functions	average, difference, sum			
data logger				
loggable values	all physical quantities and totalized values			
capacity	> 100 000 measured values			
communication				
interface	- process integration: option: RS485 (Modbus, emitter) - diagnosis: RS232[1]	- diagnosis: RS232[1]	- process integration: option: RS485 (Modbus, emitter) - diagnosis: RS232[1]	- diagnosis: RS232[1]
serial data kit (option)				
software (all Windows™ versions)	- FluxData: download of measured data, graphical presentation, conversion to other formats (e.g. for Excel™) - FluxKoeff: creating medium data sets			
cable	RS232[1]			
adapter	RS232 - USB[1]			

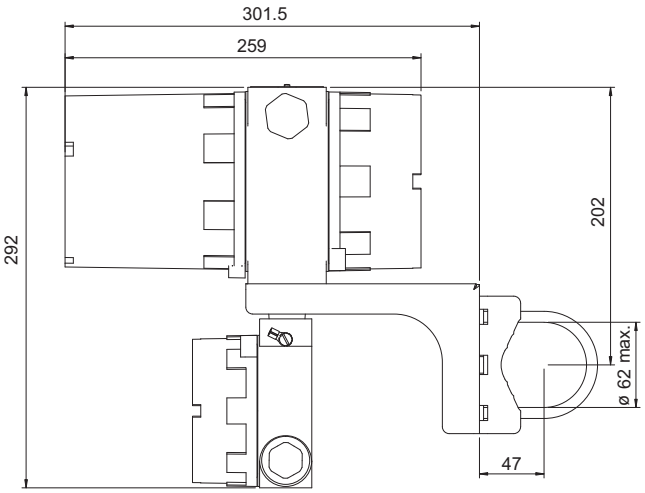
[1] connection of the interface RS232 outside of explosive atmosphere (housing cover open)

FLUXUS	**G800** **G800L** **G800P** **G800LP**	**G800C24** **G800LC24**	**G801** **G801P**	**G801C24**
outputs (option)				
	The outputs are galvanically isolated from the flowmeter.			
			current output	
number	1, option: additionally 1	1	1, option: additionally 1	1
range	0/4...20 mA	4...20 mA	0/4...20 mA	4...20 mA
accuracy	0.1 % of reading ±15 µA	0.1 % of reading ±15 µA	0.1 % of reading ±15 µA	0.1 % of reading ±15 µA
active output	R_{ext} < 500 Ω	-	R_{ext} < 500 Ω	-
passive output	**G800P, G800LP**: U_{ext} = 4...26.4 V, dependent on R_{ext} R_{ext} < 1 kΩ	U_i = 26.4 V P_i = 0.7 W	**G801P:** U_{ext} = 4...26.4 V, dependent on R_{ext} R_{ext} < 1 kΩ	U_i = 26.4 V P_i = 0.7 W
			binary output	
number	1 OC option: additionally 1 OC and max. 2 relay OR max. 3 OC	1	1 OC option: additionally 1 OC and max. 2 relay OR max. 3 OC	1
Reed relay	48 V/0.25 A	-	48 V/0.25 A	-
open collector (OC)	24 V/4 mA	-	24 V/4 mA	-
passive output	-	U_i = 26.4 V P_i = 0.7 W	-	U_i = 26.4 V P_i = 0.7 W
binary output as alarm output				
- functions	limit, change of flow direction or error	limit, change of flow direction or error	limit, change of flow direction or error	limit, change of flow direction or error
binary output as pulse output				
- pulse value	0.01...1000 units	0.01...1000 units	0.01...1000 units	0.01...1000 units
- pulse width	1...1000 ms	1...1000 ms	1...1000 ms	1...1000 ms

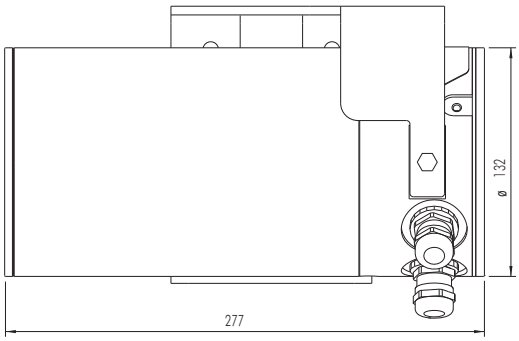
Dimensions and Fixation

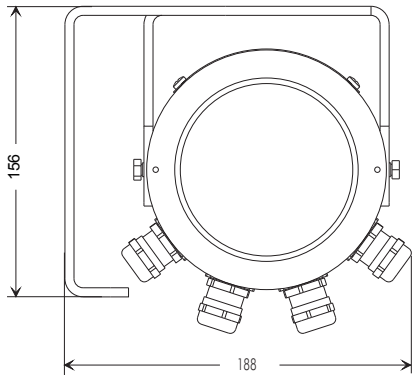
FLUXUS G800





FLUXUS G801

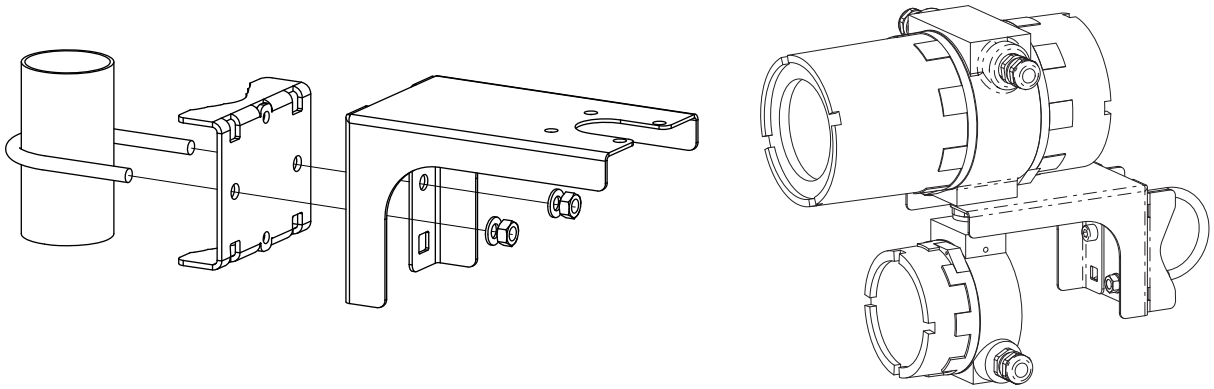




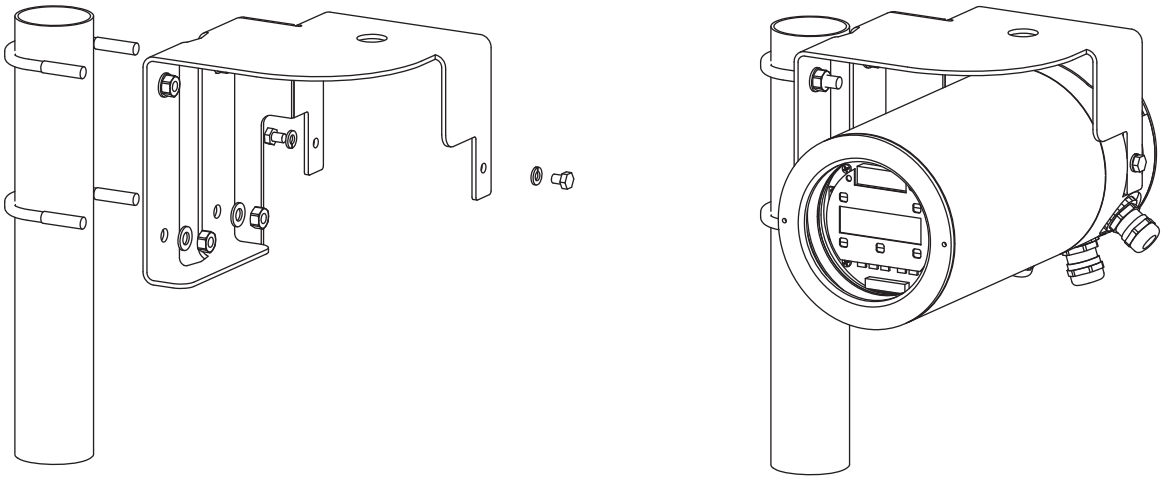
in mm

Wall and 2 " Pipe Mounting Kit

FLUXUS G800

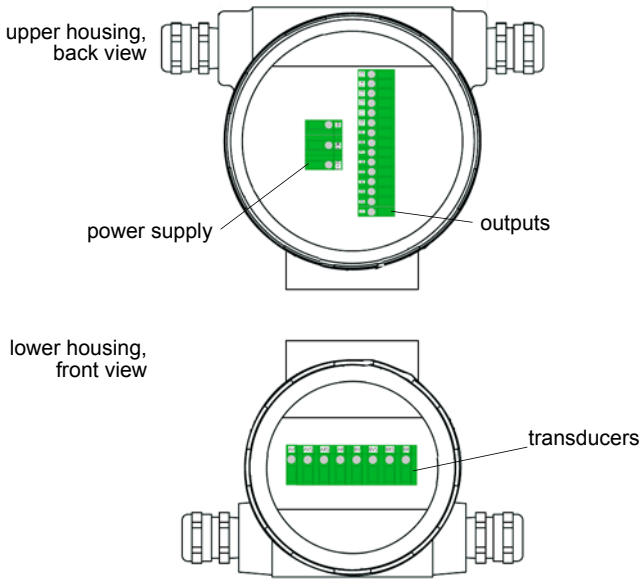


FLUXUS G801

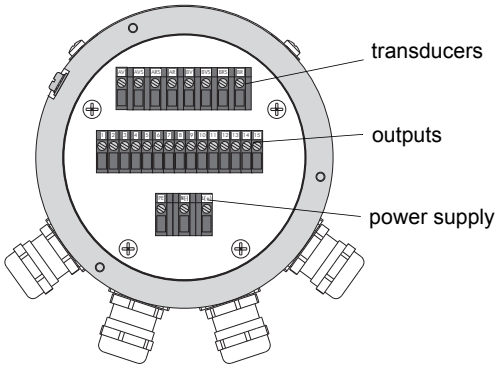


Terminal Assignment

FLUXUS G800



FLUXUS G801



power supply (terminal strip KL1)			
AC		**DC**	
terminal	connection	terminal	connection
PE	earth		
N	neutral	L+	+
L1	phase	L-	-

transducers (terminal strip KL3)			
measuring channel A		**measuring channel** B	
terminal	connection	terminal	connection
AV	signal	BV	signal
AVS	shield	BVS	shield
ARS	shield	BRS	shield
AR	signal	BR	signal

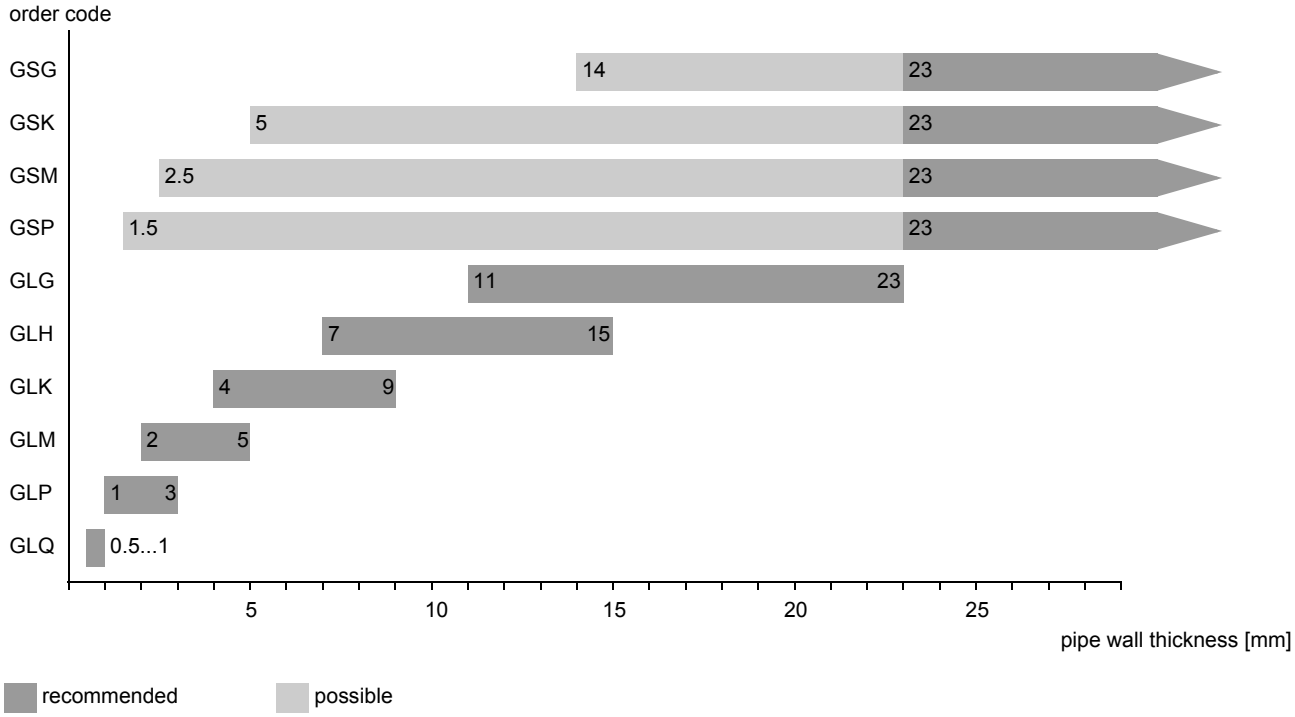
outputs (terminal strip KL2)	
terminal	connection
1(-), 2(+)	current output I1
3(-), 4(+)	current output I2 (option)
5(-), 6(+)	binary output B1 (open collector)
7(-), 8(+)	binary output B2 (open collector, option)
9(a), 10(b)	binary output B2 (Reed relay, option)
11(a), 12(b)	binary output B2 (Reed relay, option)
13(B-), 14(A+)	RS485 (option)

Transducers

Transducer Selection

Step 1:

pipe wall thickness ≤ 23 mm: Lamb wave transducers
pipe wall thickness > 23 mm: shear wave transducers



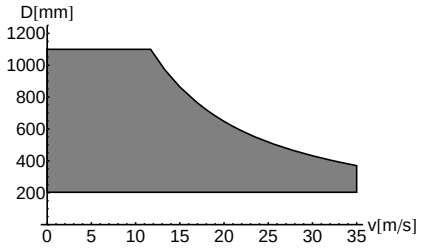
Step 2:

outer pipe diameter D dependent on the flow velocity v of the medium in the pipe

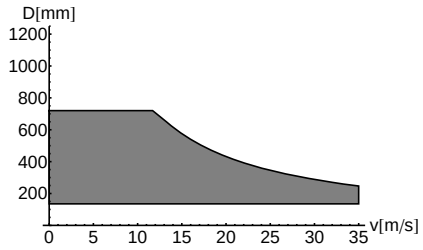
The transducers are selected from the characteristics (see next page). Lamb wave transducers are selected from the left column, shear wave transducers from the right column.

Lamb wave transducers: If the values D and v are not in the range, diagonal mode with 1 sound path may be used, i.e. the same characteristics can be used with doubling the outer pipe diameters. If the values are still not in the range, shear waves transducers regarding the pipe wall thickness have to be selected in step 1.

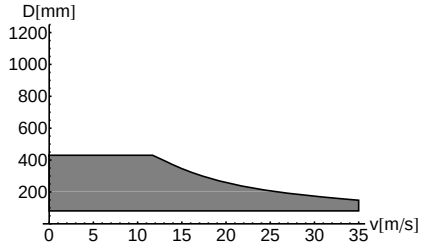
Lamb wave transducers[1]



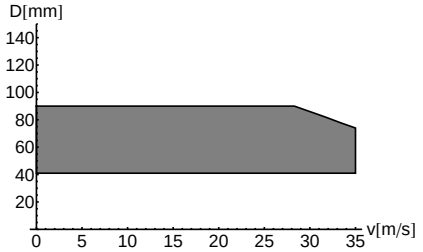
GLG



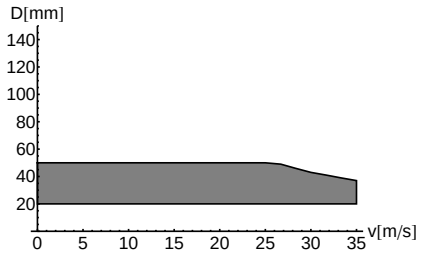
GLH



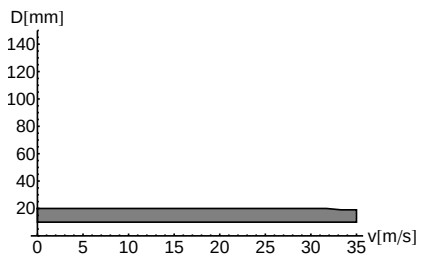
GLK



GLM

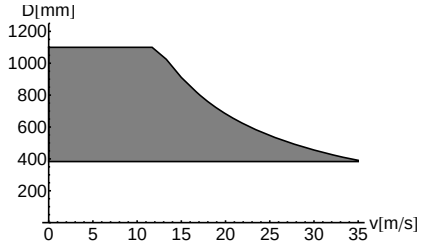


GLP

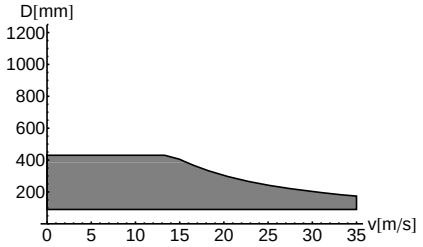


GLQ

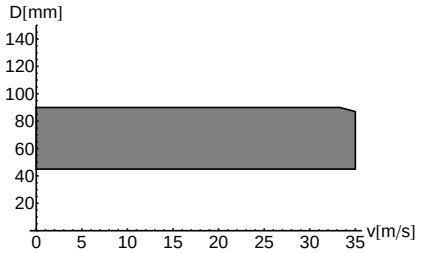
shear wave transducers[1]



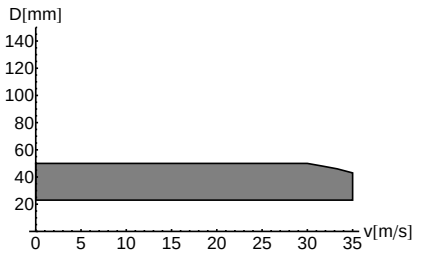
GSG



GSK



GSM



GSP

[1] outer pipe diameter and max. flow velocity for a typical application with natural gas, N_2, O_2 in reflection mode with 2 sound paths (Lamb wave transducers)/1 sound path (shear wave transducers)

Step 3:

min. medium pressure

Lamb wave transducers			
order code	medium pressure [bar]		
	metal pipe		plastic pipe
	min.	min. extended	min.
GLG	15	10	1
GLH	15	10	1
GLK	15 (> DN 120) 10 (< DN 120)	10 (> DN 120) 5 (< DN 120)	1
GLM	10 (> DN 60) 5 (< DN 60)	-	-
GLP	10 (> DN 35) 5 (< DN 35)	-	-
GLQ	10 (> DN 15) 5 (< DN 15)	-	-

shear wave transducers			
order code	medium pressure [bar]		
	metal pipe		plastic pipe
	min.	min. extended	min.
GSG	30	20	1
GSK	30	20	1
GSM	30	20	1
GSP	30	20	1

Examples

step						
1	selected transducer	mm	12 GLG or GLH	12 GLG or GLH	12 GLG or GLH	30 GS
2	outer pipe diameter max. flow velocity selected transducer	mm m/s	800 15 GLG	600 15 GLG or GLH	800 30 values not in the range of the characteristics, but by using diagonal mode with 1 sound path, the outer pipe diameter in the characteristics is doubled: GLG	300 15 GSK
3	min. medium pressure selected transducer	bar	17 GLG	17 GLG or GLH influence of noise is reduced with increased transducer frequency, thus recommended: **GLH**	17 GLG	35 GSK

Step 4:

for determination of character 4...11 of the transducer order code (temperature, explosion protection, connection system, extension cable) see page 15

Step 5:

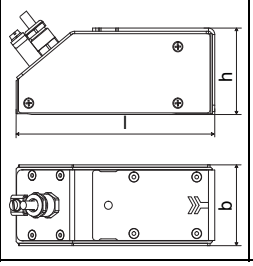
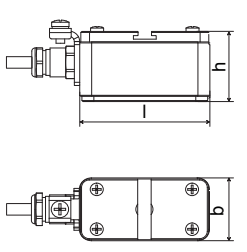
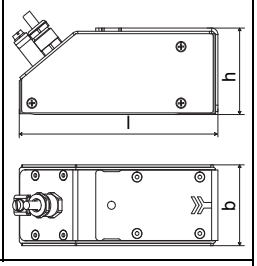
for the technical data of the selected transducer see page 16 et seqq.

Order Code Key for Transducers

1, 2	3		4	5, 6	7, 8		9...11	no. of character
transducer model	transducer frequency	-	temperature	explosion protection	connection system	-	extension cable	description
GL								set of ultrasonic flow transducers for gas measurement, Lamb wave
GS								set of ultrasonic flow transducers for gas measurement, shear wave
	G							0.2 MHz
	H							0.3 MHz (Lamb wave only)
	K							0.5 MHz
	M							1 MHz
	P							2 MHz
	Q							4 MHz (Lamb wave only)
			N					normal temperature range
				A1				ATEX zone 1 (with connection system TS)
					TS			direct connection or connection via junction box
							XXX	cable length in m, for max. length of extension cable see page 25 connection system TS: 0 m: without junction box > 0 m: with junction box JB01 (ATEX zone 1)
example								
GL	K	-	N	A1	TS	-	030	Lamb wave transducer 0.5 MHz, normal temperature range, for ATEX zone 1, connection system TS with junction box JB01 and 30 m extension cable
		-				-		

Technical Data

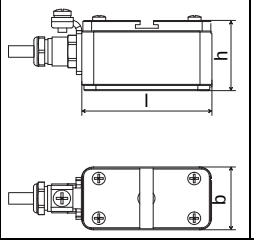
Shear Wave Transducers (for ATEX zone 1)

technical type		GDK1N31	GDM1N31	GDG1N31
order code		**GSK-NA1TS**	**GSM-NA1TS**	**GSG-NA1TS**
transducer frequency	MHz	0.5	1	0.2
medium pressure[1]				
min. extended min.	bar bar	20 metal pipe: 30 plastic pipe: 1	20 metal pipe: 30 plastic pipe: 1	20 metal pipe: 30 plastic pipe: 1
outer pipe diameter[2]				
min. extended min. recommended max. recommended max. extended	mm mm mm mm	70 80 500 720	30 40 80 120	250 380 810 1100
pipe wall thickness				
min. max.	mm mm	5 -	2.5 -	14 -
material				
housing contact surface		PEEK with stainless steel cap304 (1.4301) PEEK	stainless steel 316 Ti (1.4571) PEEK	PEEK with stainless steel cap304 (1.4301) PEEK
degree of protection according to EN 60529		IP 65	IP 65	IP 65
transducer cable				
type length	 m	2549 5	2549 4	2549 5
dimensions				
length l width b height h	mm mm mm	126.5 50 53.5	60 30 33.5	129.5 50 64
dimensional drawing				
operating temperature				
min. max.	°C °C	-40 +130	-40 +130	-40 +130
explosion protection				
ATEX transducer		GSK-NA1TS	GSM-NA1TS	GSG-NA1TS
ATEX zone		1	1	1
ATEX **explosion protection temperature**				
ATEX min. **ATEX** max.	°C °C	-40 +180	-20 +120	-40 +180
ATEX marking		CE 0044; Ex II 2G Ex q II T6...T3 Ta -40...+180 °C Ex II 2D Ex tD A21 IP65 TX	CE 0044; Ex II 2G EEx m II T6...T4 Ta -20...+120 °C	CE 0044; Ex II 2G Ex q II T6...T3 Ta -40...+180 °C Ex II 2D Ex tD A21 IP65 TX
ATEX certification		IBExU04ATEX1011 X	IBExU98ATEX1012 X	IBExU04ATEX1011 X
ATEX type of protection		powder filling	encapsulation	powder filling
ATEX transducer shoe necessary		-	-	-

[1] depending on application, typical value for natural gas, N_2, compressed air

[2] shear wave transducers:
typical values for natural gas, N_2, O_2, pipe diameters for other gases on request
pipe diameter min. recommended/max. recommended/max. extended: in diagonal mode and for a flow velocity of 15 m/s

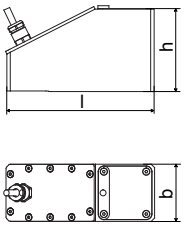
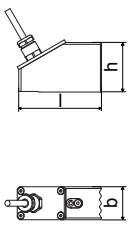
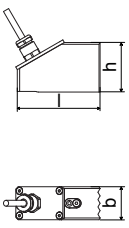
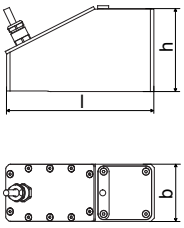
Shear Wave Transducers (for ATEX zone 1)

technical type			GDP1N31
order code			**GSP-NA1TS**
transducer frequency		MHz	2
medium pressure[1]			
min. extended		bar	20
min.		bar	metal pipe: 30 plastic pipe: 1
outer pipe diameter[2]			
min. extended		mm	15
min. recommended		mm	20
max. recommended		mm	40
max. extended		mm	60
pipe wall thickness			
min.		mm	1.5
max.		mm	-
material			
housing			stainless steel 316 Ti (1.4571)
contact surface			PEEK
degree of protection according to EN 60529			IP 65
transducer cable			
type			2549
length		m	4
dimensions			
length l		mm	60
width b		mm	30
height h		mm	33.5
dimensional drawing			
operating temperature			
min.		°C	-40
max.		°C	+130
explosion protection			
ATEX	transducer		GSP-NA1TS
	zone		1
	explosion protection temperature		
	min.	°C	-20
	max.	°C	+120
	marking		CE 0044; Ex II 2G EEx m II T6...T4 Ta -20...+120 °C
	certification		IBExU98ATEX1012 X
	type of protection		encapsulation
	transducer shoe necessary		-

[1] depending on application, typical value for natural gas, N_2, compressed air

[2] shear wave transducers:
typical values for natural gas, N_2, O_2, pipe diameters for other gases on request
pipe diameter min. recommended/max. recommended/max. extended: in diagonal mode and for a flow velocity of 15 m/s

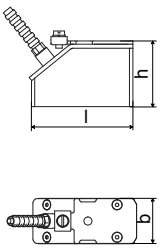
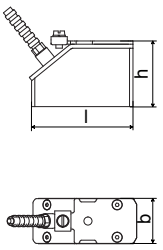
Shear Wave Transducers (for ATEX zone 1, IP 68)

technical type		GDK1LI1	GDM2LI1	GDP2LI1	GDG1LI1
order code		**GSK-NA1TS/IP68**	**GSM-NA1TS/IP68**	**GSP-NA1TS/IP68**	**GSG-NA1TS/IP68**
transducer frequency	MHz	0.5	1	2	0.2
medium pressure[1]					
min. extended	bar	20	20	20	20
min.	bar	metal pipe: 30 plastic pipe: 1	metal pipe: 30 plastic pipe: 1	metal pipe: 30 plastic pipe: 1	metal pipe: 30 plastic pipe: 1
outer pipe diameter[2]					
min. extended	mm	70	30	15	250
min. recommended	mm	80	40	20	380
max. recommended	mm	500	80	40	810
max. extended	mm	720	120	60	1100
pipe wall thickness					
min.	mm	5	2.5	1.5	14
max.	mm	-	-	-	-
material					
housing		PEEK with stainless steel cap316Ti (1.4571)	PEEK with stainless steel cap316Ti (1.4571)	PEEK with stainless steel cap316Ti (1.4571)	PEEK with stainless steel cap316Ti (1.4571)
contact surface		PEEK	PEEK	PEEK	PEEK
degree of protection according to EN 60529		IP 68	IP 68	IP 68	IP 68
transducer cable					
type		2550	2550	2550	2550
length	m	12	12	12	12
dimensions					
length l	mm	128.5	70	70	128.5
width b	mm	50	28	28	50
height h	mm	72	42	42	75
dimensional drawing					
operating temperature					
min.	°C	-40	-40	-40	-40
max.	°C	+100	+100	+100	+100
explosion protection					
ATEX transducer		GSK-NA1TS/IP68	GSM-NA1TS/IP68	GSP-NA1TS/IP68	GSG-NA1TS/IP68
ATEX zone		1	1	1	1
ATEX **explosion protection temperature**					
ATEX min.	°C	-55	-55	-55	-55
ATEX max.	°C	+180	+180	+180	+180
ATEX marking		CE 0044; Ex II 2G Ex q II T6...T3 Ta -55...+180 °C Ex II 2D Ex tD A21 IP68 TX	CE 0044; Ex II 2G Ex q II T6...T3 Ta -55...+180 °C Ex II 2D Ex tD A21 IP68 TX	CE 0044; Ex II 2G Ex q II T6...T3 Ta -55...+180 °C Ex II 2D Ex tD A21 IP68 TX	CE 0044; Ex II 2G Ex q II T6...T3 Ta -55...+180 °C Ex II 2D Ex tD A21 IP68 TX
ATEX certification		IBExU07ATEX1168 X	IBExU07ATEX1168 X	IBExU07ATEX1168 X	IBExU07ATEX1168 X
ATEX type of protection		powder filling	powder filling	powder filling	powder filling
ATEX transducer shoe necessary		x	x	x	x

[1] depending on application, typical value for natural gas, N_2, compressed air

[2] shear wave transducers:
typical values for natural gas, N_2, O_2, pipe diameters for other gases on request
pipe diameter min. recommended/max. recommended/max. extended: in diagonal mode and for a flow velocity of 15 m/s

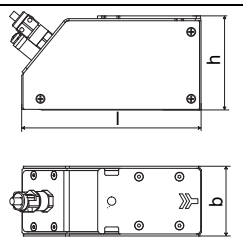
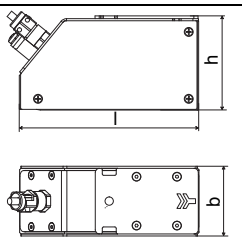
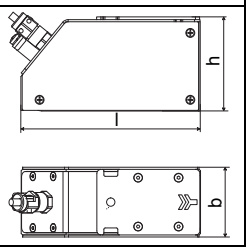
Shear Wave Transducers (for ATEX zone 1/2 (gas/dust), high temperature)

technical type		GDM2E85	GDP2E85
order code		**GSM-EA1TS**	**GSP-EA1TS**
transducer frequency	MHz	1	2
medium pressure[1]			
min. extended	bar	20	20
min.	bar	metal pipe: 30 plastic pipe: 1	metal pipe: 30 plastic pipe: 1
outer pipe diameter[2]			
min. extended	mm	30	15
min. recommended	mm	40	20
max. recommended	mm	80	40
max. extended	mm	120	60
pipe wall thickness			
min.	mm	2.5	1.5
max.	mm	-	-
material			
housing contact surface		PI with stainless steel cap304 (1.4301) PI	PI with stainless steel cap304 (1.4301) PI
degree of protection according to EN 60529		IP 56	IP 56
transducer cable			
type		6111	6111
length	m	4	4
dimensions			
length l	mm	69.5	69.5
width b	mm	32.5	32.5
height h	mm	61	61
dimensional drawing			
operating temperature			
min.	°C	-30	-30
max.	°C	+200	+200
explosion protection			
ATEX transducer		GSM-EA1TS	GSP-EA1TS
zone		1	1
explosion protection temperature			
min.	°C	-45	-45
max.	°C	+225	+225
marking		CE 0044; Ex II 2G Ex eq II T6...T2 Ta -45...+225 °C Ex II 3D Ex tD A22 IP56 TX	CE 0044; Ex II 2G Ex eq II T6...T2 Ta -45...+225 °C Ex II 3D Ex tD A22 IP56 TX
certification		IBExU07ATEX1168 X	IBExU07ATEX1168 X
type of protection		powder filling	powder filling
transducer shoe necessary		x	x

[1] depending on application, typical value for natural gas, N_2, compressed air

[2] shear wave transducers:
typical values for natural gas, N_2, O_2, pipe diameters for other gases on request
pipe diameter min. recommended/max. recommended/max. extended: in diagonal mode and for a flow velocity of 15 m/s

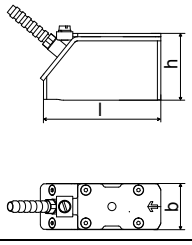
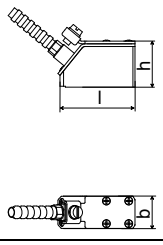
Lamb Wave Transducers (for ATEX Zone 1)

technical type		GRH1N33	GRK1N33	GRG1N33
order code		**GLH-NA1TS**	**GLK-NA1TS**	**GLG-NA1TS**
transducer frequency	MHz	0.3	0.5	0.2
medium pressure[1]				
min. extended	bar	metal pipe: 10	metal pipe: 10 (> DN 120) 5 (< DN 120)	metal pipe: 10
min.	bar	metal pipe: 15 plastic pipe: 1	metal pipe: 15 (> DN 120) 10 (< DN 120) plastic pipe: 1	metal pipe: 15 plastic pipe: 1
outer pipe diameter[2]				
min. extended	mm	120	60	190
min. recommended	mm	140	80	220
max. recommended	mm	600	300	900
max. extended	mm	1000	500	1600
pipe wall thickness				
min.	mm	7	4	11
max.	mm	15	9	23
material				
housing		PPSU withwith stainless steel cap304 (1.4301)	PPSU with stainless steel cap304 (1.4301)	PPSU with stainless steel cap304 (1.4301)
contact surface		PPSU	PPSU	PPSU
degree of protection according to EN 60529		IP 65	IP 65	IP 65
transducer cable				
type		2549	2549	2549
length	m	5	5	5
dimensions				
length l	mm	128.5	128.5	128.5
width b	mm	50	50	50
height h	mm	67.5	67.5	67.5
dimensional drawing				
operating temperature				
min.	°C	-40	-40	-40
max.	°C	+170	+170	+170
explosion protection				
ATEX transducer		GLH-NA1TS	GLK-NA1TS	GLG-NA1TS
zone		1	1	1
explosion protection temperature				
min.	°C	-40	-40	-40
max.	°C	+140	+140	+140
marking		CE 0044; Ex II 2G Ex q II T6...T3 Ta -40...+140 °C Ex II 2D Ex tD A21 IP65 TX	CE 0044; Ex II 2G Ex q II T6...T3 Ta -40...+140 °C Ex II 2D Ex tD A21 IP65 TX	CE 0044; Ex II 2G Ex q II T6...T3 Ta -40...+140 °C Ex II 2D Ex tD A21 IP65 TX
certification		IBExU04ATEX1011 X	IBExU04ATEX1011 X	IBExU04ATEX1011 X
type of protection		powder filling	powder filling	powder filling
transducer shoe necessary		-	-	-

[1] depending on application, typical value for natural gas, N_2, compressed air

[2] Lamb wave transducers:
typical values for natural gas, N_2, O_2, pipe diameters for other gases on request
pipe diameter min. recommended/max. recommended: in reflection mode and for a flow velocity of 15 m/s
pipe diameter max. extended: in diagonal mode and for a flow velocity of 25 m/s

Lamb Wave Transducers (for ATEX Zone 1)

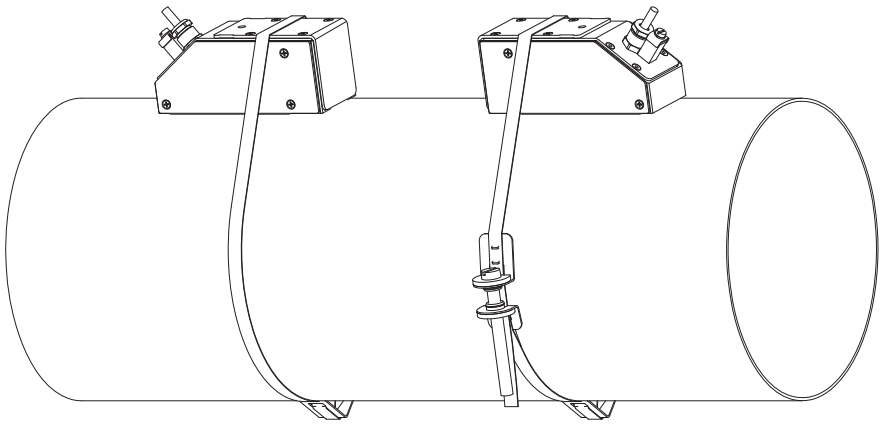
technical type		GRM1N83	GRP1N83	GRQ1N83
order code		**GLM-NA1TS**	**GLP-NA1TS**	**GLQ-NA1TS**
transducer frequency	MHz	1	2	4
medium pressure[1]				
min. extended	bar	-	-	-
min.	bar	metal pipe: 10 (> DN 60) 5 (< DN 60)	metal pipe: 10 (> DN 35) 5 (< DN 35)	metal pipe: 10 (> DN 15) 5 (< DN 15)
outer pipe diameter[2]				
min. extended	mm	30	15	7
min. recommended	mm	40	20	10
max. recommended	mm	90	50	22
max. extended	mm	150	70	35
pipe wall thickness				
min.	mm	2	1	0.5
max.	mm	5	3	1
material				
housing		PPSU with stainless steel cap304 (1.4301)	PPSU withwith stainless steel cap304 (1.4301)	PPSU with stainless steel cap304 (1.4301)
contact surface		PPSU	PPSU	PPSU
degree of protection according to EN 60529		IP 65	IP 65	IP 65
transducer cable				
type		1699	1699	1699
length	m	4	4	3
dimensions				
length l	mm	74	74	42
width b	mm	28	28	18
height h	mm	42.9	42.9	25.5
dimensional drawing				
operating temperature				
min.	°C	-40	-40	-40
max.	°C	+170	+170	+170
explosion protection				
ATEX transducer		GLM-NA1TS	GLP-NA1TS	GLQ-NA1TS
zone		1	1	1
explosion protection temperature				
min.	°C	-55	-55	-55
max.	°C	+140	+140	+140
marking		CE 0044; Ex II 2G Ex eq II T6...T3 Ta -55...+140 °C Ex II 2D Ex tD A21 IP65 TX	CE 0044; Ex II 2G Ex eq II T6...T3 Ta -55...+140 °C Ex II 2D Ex tD A21 IP65 TX	CE 0044; Ex II 2G Ex eq II T6...T3 Ta -55...+140 °C Ex II 2D Ex tD A21 IP65 TX
certification		IBExU07ATEX1168 X	IBExU07ATEX1168 X	IBExU07ATEX1168 X
type of protection		powder filling	powder filling	powder filling
transducer shoe necessary		x	x	x

[1] depending on application, typical value for natural gas, N_2, compressed air

[2] Lamb wave transducers:
typical values for natural gas, N_2, O_2, pipe diameters for other gases on request
pipe diameter min. recommended/max. recommended: in reflection mode and for a flow velocity of 15 m/s
pipe diameter max. extended: in diagonal mode and for a flow velocity of 25 m/s

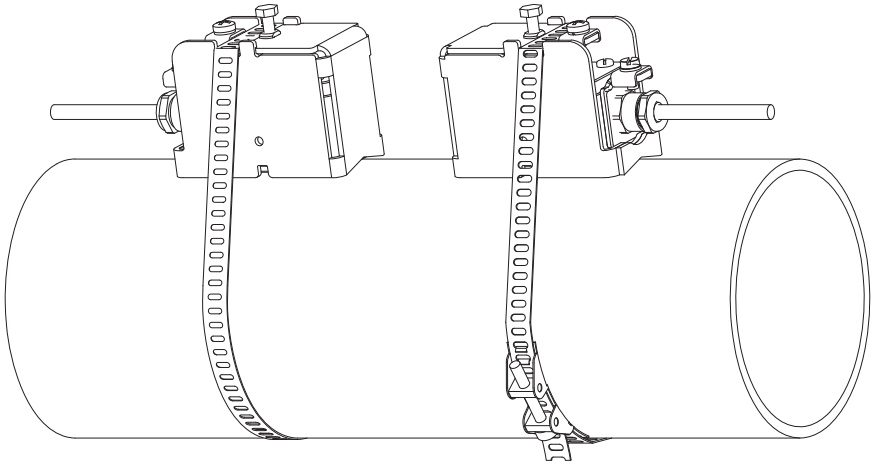
Transducer Mounting Fixtures

Tension Straps and Clasps



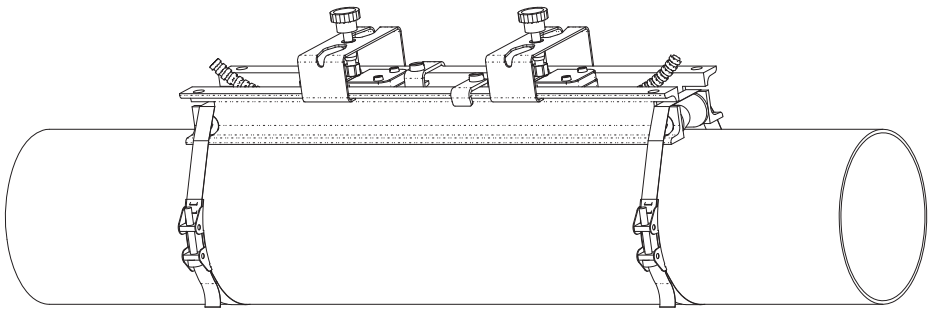
material: stainless steel 304 (1.4301), 303 (1.4305)
length: 10/20 m

Tension Straps, Clasps and Mounting Shoes



material: stainless steel 304 (1.4301), 303 (1.4305)
length: 10/20 m

Variofix Rail VFX with Tension Straps and Clasps[1]



material: stainless steel 304 (1.4301), 303 (1.4305)
dimensions: 220/320/520/1020 x b x h mm
(b - transducer width + 30 mm
h - dependent on transducer)
length: 10/20 m

[1] on request

Coupling Materials for Transducers

		normal temperature range (4th character of transducer order code = N)		**extended temperature range (4th character of transducer order code = E)**	
		< 100 °C	100...170 °C	< 150 °C	150...200 °C
< 2 h		coupling compound type N	coupling compound type E	coupling compound type E	coupling compound type E or H
< 24 h		coupling compound type N	coupling compound type E	coupling compound type E	coupling foil type VT
long time measurement	indoor	coupling compound type N	coupling compound type E	coupling foil type VT[1]	coupling foil type VT[2]
	outdoor	coupling foil type VT	coupling foil type VT	coupling foil type VT[1]	coupling foil type VT[2]

[1] < 5 years

[2] < 6 months

Technical Data

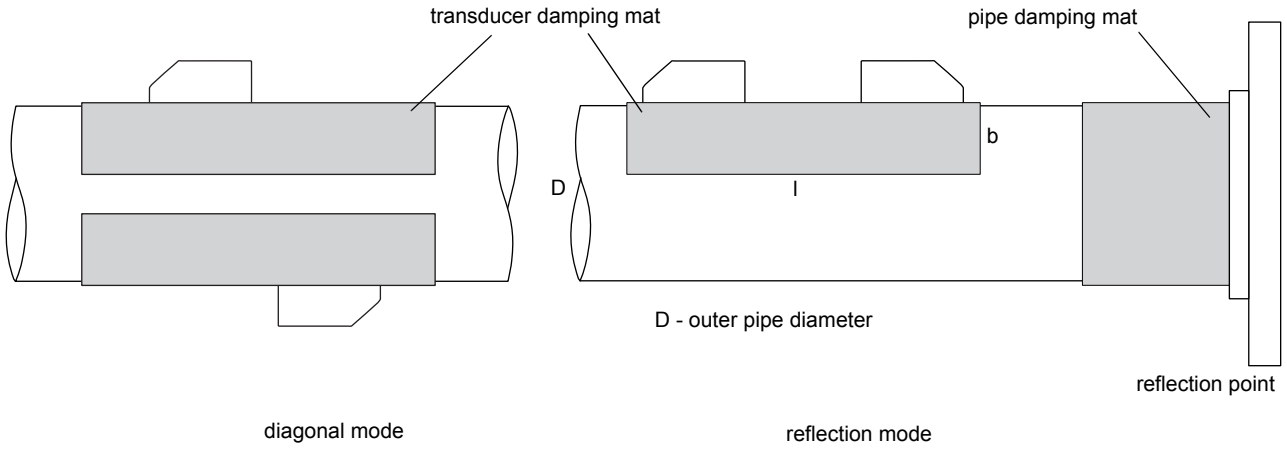
type	**order code**	**temperature °C**	**material**	**remark**
coupling compound type N	990739-1	-30...+130	mineral grease paste	
coupling compound type E	990739-2	-30...+200	silicone paste	
coupling compound type H	990739-3	-30...+250	fluoropolymer paste	
coupling foil type VT	990739-0	-10...+150, peak max. 200 °C	fluoroelastomer	for transducers with transducer frequency G, H, K
	990739-6			for transducers with transducer frequency M, P
	990739-5			for transducers with transducer frequency Q
	990739-10			for transducers with transducer frequency S

Damping Mats (Option)

Damping mats will be used for the gas measurement to reduce noise influences on the measurement.

Transducer damping mats will be installed below the transducers.

Pipe damping mats will be installed at reflection points, e.g. flange, weld.



Selection of Damping Mats

type	description	outer pipe diameter	dimensions l x b x h	transducer frequency (3rd character of transducer order code)					techni-cal type	temperature	remark
		mm	mm	G	H	K	M	P		°C	
transducer damping mat											
C	self-adhesive, for stationary installation	< 80	450 x 115 x 0.5	-	-	-	x	x	C20S3	-25...+60	
		≥ 80	900 x 230 x 0.5	-	-	x	x	-	C20S2		
			900 x 230 x 1.3	x	x	-	-	-	C50S2		
pipe damping mat											
B	self-adhesive, for stationary installation		l x 100 x 0.9	x	x	x	x	x	B35R2	-35...+50	l - see table below

Length of Pipe Damping Mat Type B

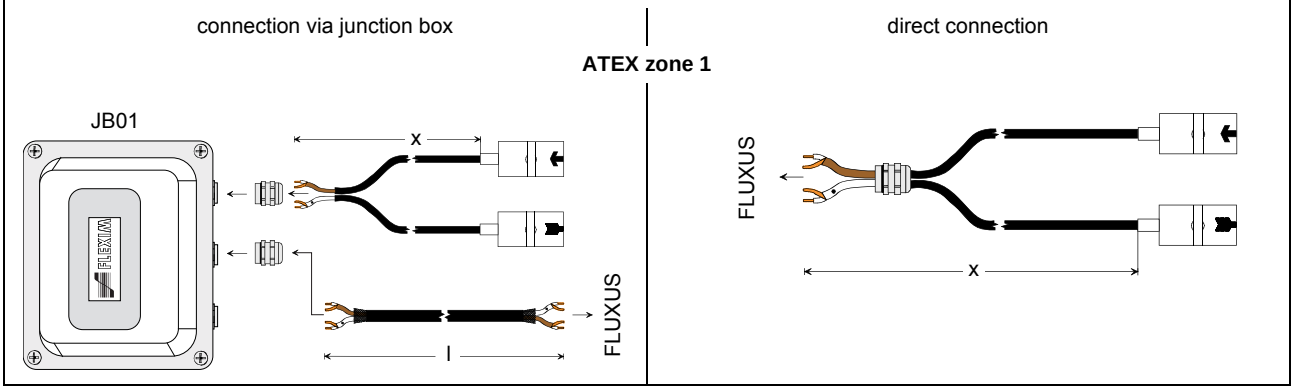
(length l depending on transducer frequency and outer pipe diameter)

outer pipe diameter D	transducer frequency	
mm	G, H	K, M, P
100	2 m	1 m
200	6 m	3 m
300	12 m	6 m
500	32 m	16 m
1000	126 m	63 m

Connection Systems

Connection System TS

transducer frequency (3rd character of transducer order code)		G, H, K		M, P		Q		S	
		x	l	x	l	x	l	x	l
cable length	m	5	≤ 300	4	≤ 300	3	≤ 90	2	≤ 40



x - transducer cable length

l - max. length of extension cable

Transducer Cables

Technical Data

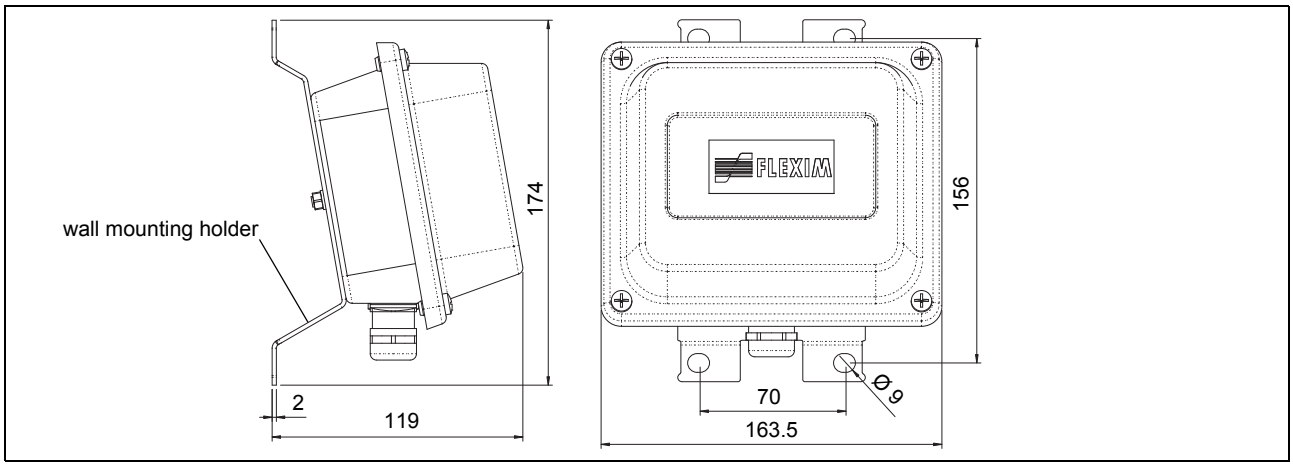
		transducer cable		extension cable	
item number		1699	2549	2552	2615
application		ATEX zone 2, FM and not explosion proof transducers	ATEX zone 1	connection system TS	connection system TS
standard length	m	see table above		-	-
max. length	m	-	-	see table above	see table above
temperature	°C	-55...+200	-100...+200	< 80	-40...+70
properties					halogen free fire propagation test according to IEC 60332-1 combustion test according to IEC 60754-2
sheath					
material		stainless steel 304 (1.4301)	-	-	-
outer diameter	mm	8	-	-	-
cable jacket					
material		PTFE	PTFE	TPV	PUR
outer diameter	mm	2.9	5.3	12	12
thickness	mm	0.3	0.5		2
color		brown	black	black	black
shield		x	x	x	x

Junction Box

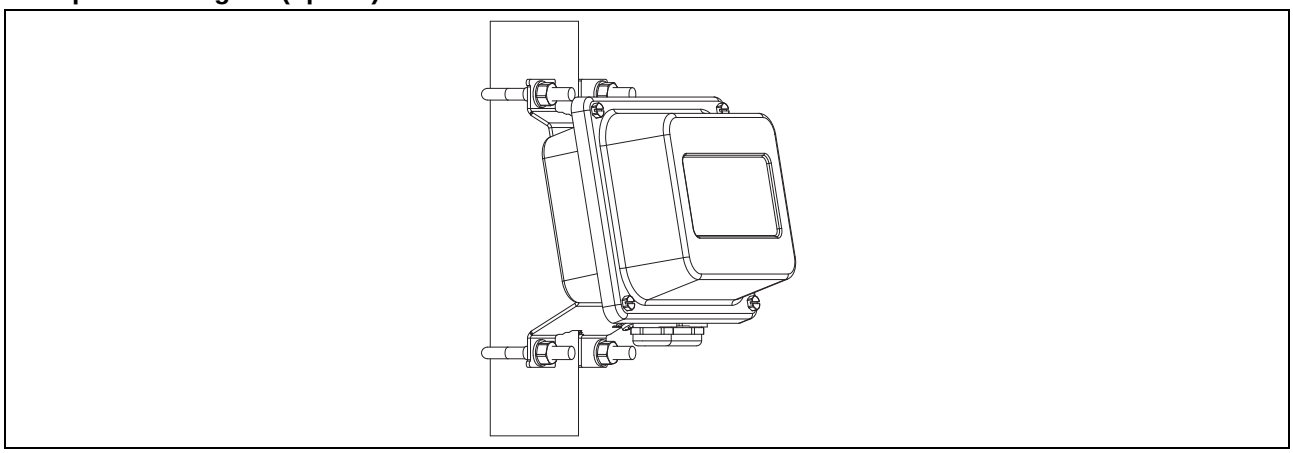
Technical Data

technical type		**JB01S4E3M**
dimensions		see dimensional drawing
fixation		wall mounting option: 2 " pipe mounting
material		
housing		stainless steel 316L (1.4404)
gasket		silicone
degree of protection according to EN 60529		IP 67
operating temperature		
min.	°C	-40
max.	°C	+80
explosion protection		
ATEX zone		1
marking		CE 0044 Ex II2G Ex e mb II (T6)...T4 T_a -40...+(70) 80 °C Ex II 2D Ex tD A21 IP 67 T 100 °C
certification		IBExU06ATEX1161
type of protection		junction box: increased safety decoupled network: encapsulation

Dimensions

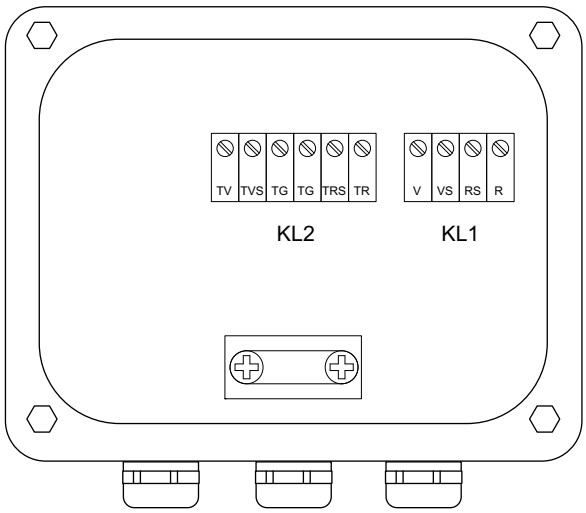


2 " Pipe Mounting Kit (option)



Terminal Assignment

JB01



Transducers

terminal strip KL1

terminal	connection
V	signal
VS	shield
RS	shield
R	signal

Extension Cable (Flowmeter)

terminal strip KL2

terminal	connection
TV	signal
TVS	shield
TRS	shield
TR	signal

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