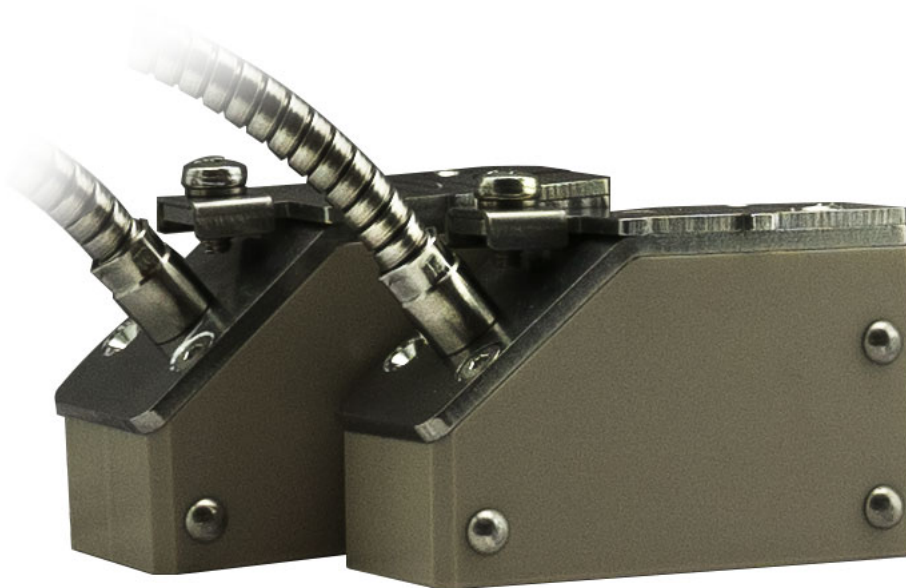


**Transducers for FLUXUS F73\*, H73\*, PIOX S731**



FLEXIM AMERICAS Corporation  
Edgewood, NY 11717  
USA

Tel.:(631) 492-2300  
Fax:(631) 492-2117

internet: [www.flexim.com](http://www.flexim.com)  
e-mail: [usinfo@flexim.com](mailto:usinfo@flexim.com)  
1-888-852-7473

TS \_F7xx-transducersV1-0US\_Lus, 2023-02-01

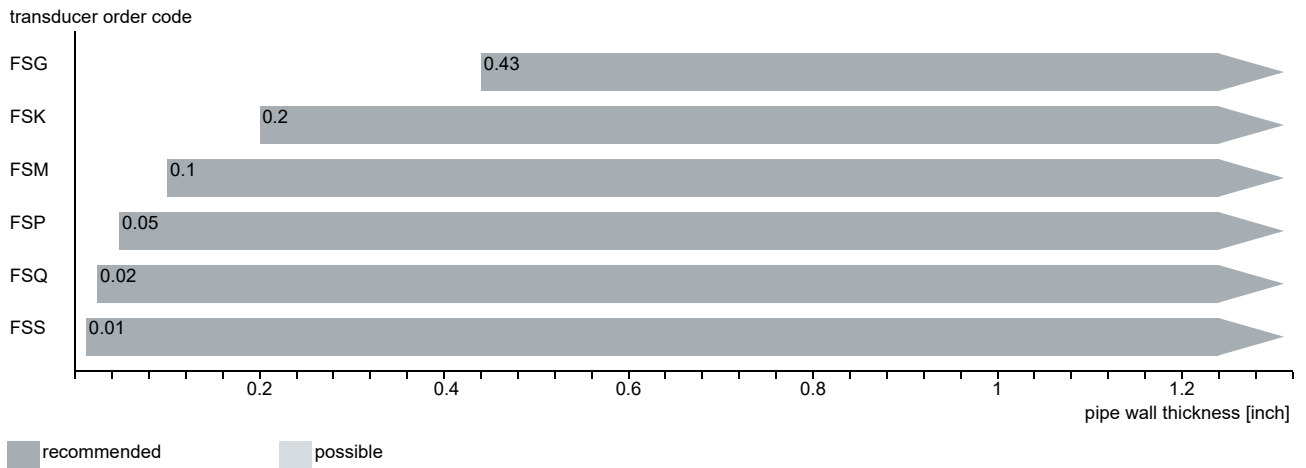
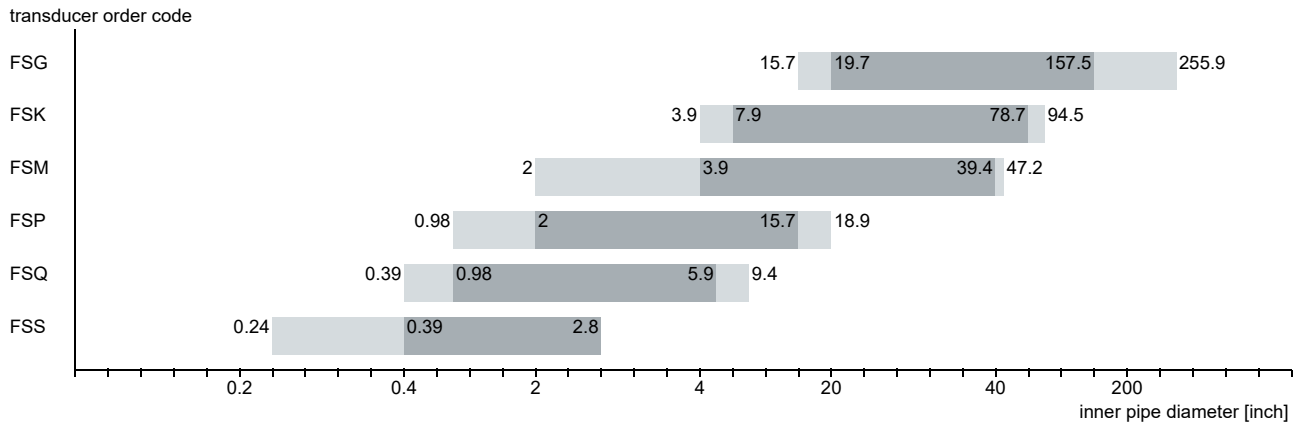
Subject to change without prior notice.  
Errors excepted.  
is a registered trademark of FLEXIM GmbH.

Copyright (©) FLEXIM GmbH 2023

<b>Transducer selection</b> .....	3
Shear wave transducers .....	3
Lamb wave transducers .....	4
<b>Transducer order code</b> .....	5
Technical data .....	6
<b>Transducer mounting fixture</b> .....	19
<b>Coupling materials for transducers</b> .....	21
<b>Connection systems</b> .....	22
<b>Junction box</b> .....	24
Technical data .....	24
Dimensions .....	25
2" pipe mounting kit .....	25

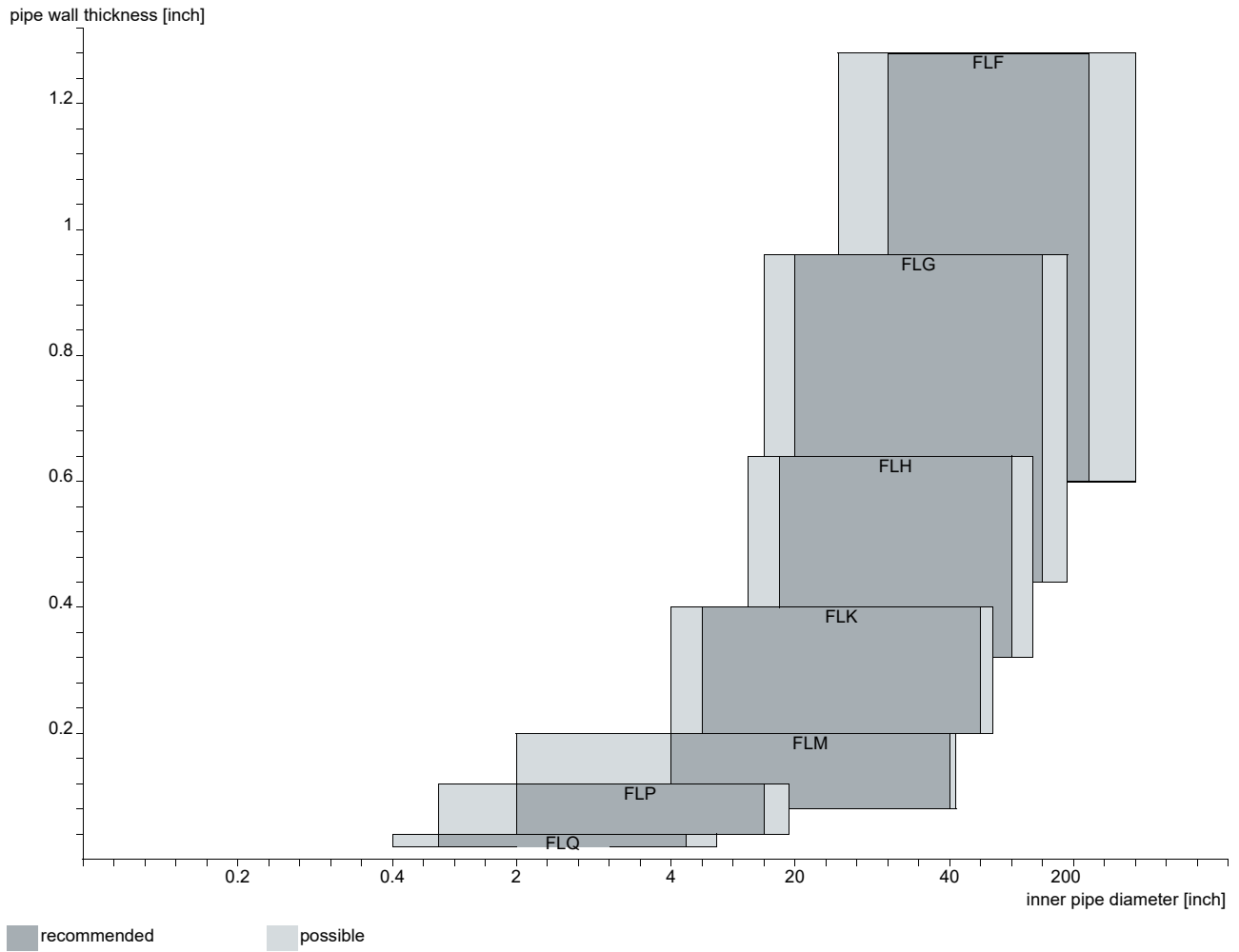
# Transducer selection

## Shear wave transducers



### Lamb wave transducers

If the the damping of the fluid is high or the sound velocity fluctuates strongly, Lamb wave transducers might be preferred. Please contact FLEXIM.

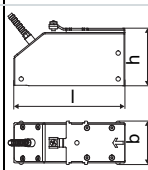
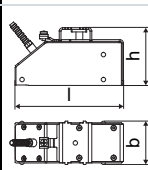
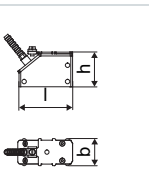
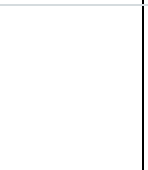
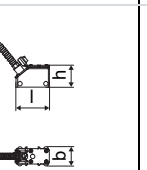



### Transducer order code

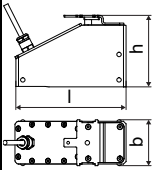
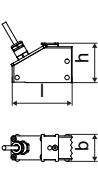
1, 2	3	4	5, 6	7, 8	9 to 11	no. of character				
transducer	transducer frequency	-	ambient temperature	explosion protection	connection system	-	extension cable	/	option	description
FS										set of ultrasonic flow transducers for measurement of liquids, shear wave
FL										set of ultrasonic flow transducers for measurement of liquids, Lamb wave
	F									0.15 MHz
	G									0.2 MHz
	H									0.3 MHz
	K									0.5 MHz
	M									1 MHz
	P									2 MHz
	Q									4 MHz
	S									8 MHz
		N								normal temperature range
		E								extended temperature range
		S								higher temperatures
			NN							not explosion-proof
			A2							ATEX zone 2/IECEx zone 2
			A1							ATEX zone 1/IECEx zone 1
			F2							FM Class I Div. 2
				TS						with SMB connector
				T1						with stripped cable ends
						XXX				0 m: without extension cable > 0 m: with extension cable
								LC		long transducer cable
								IP68		degree of protection IP68
								OS		housing with stainless steel 316

## Technical data

### Shear wave transducers (zone 2 - FM Class I Div. 2 - nonEx, TS)

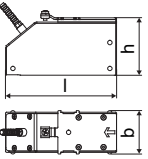
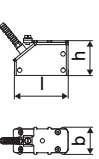
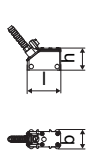

order code		FSG-N**TS/**	FSK-N**TS/**	FSM-N**TS/**	FSP-N**TS/**	FSQ-N**TS/**	FSS-N**TS/**	
technical type		C(DL)G1N52	C(DL)K1N52	C(DL)M2N52	C(DL)P2N52	C(DL)Q2N52	CDS1N52	
transducer frequency	MHz	0.2	0.5	1	2	4	8	
<b>inner pipe diameter d</b>								
min. extended	inch	15.7	3.9	2	0.98	0.39	0.24	
min. recommended	inch	19.7	7.9	3.9	2	0.98	0.39	
max. recommended	inch	157.5	78.7	39.4	15.7	5.9	2.8	
max. extended	inch	255.9	94.5	47.2	18.9	9.4	2.8	
<b>pipe wall thickness</b>								
min.	inch	0.43	0.2	0.1	0.05	0.02	0.01	
<b>material</b>								
housing		PEEK with stainless steel cover 304, ***-*****/OS: 316L					stainless steel 304	
contact surface		PEEK					PEI	
Schutzart		IP66				IP66/IP67	IP66	
<b>transducer cable</b>								
type		1699						
length	ft	16		13	9		6	
length (***)-*****/LC)	ft	29						
<b>dimensions</b>								
length l	inch	5.1	4.98	2.52	1.57		0.98	
width b	inch	2.01	2.01	1.26	0.87		0.51	
height h	inch	2.64	2.66	1.59	1		0.67	
dimensional drawing								
weight (without cable)	lb	1	0.79	0.15	0.04		0.01	
<b>pipe surface temperature</b>								
min.	°F	-40					-22	
max.	°F	+266					+266	
<b>ambient temperature</b>								
min.	°F	-40					-22	
max.	°F	+266					+266	
temperature compensation		x						
<b>explosion protection</b>								
<b>• ATEX/IECEx</b>								
order code		FSG-NA2TS/**	FSK-NA2TS/**	FSM-NA2TS/**	FSP-NA2TS/**	FSQ-NA2TS/**	-	
pipe surface temperature (Ex)								
• min.	°C	-55						
• max.	°C	gas: +190, dust: +180						
marking		CE 0637 Ex II 3G II 2D Ex nA IIC T6...T3 Gc Ex tb IIIC T80 °C...T185 °C Db						
certification		IBExU10ATEX1163 X, IECEx IBE 12.0005X						
<b>• FM</b>								
order code		FSG-NF2TS/**	FSK-NF2TS/**	FSM-NF2TS/**	FSP-NF2TS/**	FSQ-NF2TS/**	FSS-NF2TS/**	
pipe surface temperature (Ex)								
• min.	°F	-40						
• max.	°F	+257				+374		+257
degree of protection		IP66						
marking		 NI/CI. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860						

**Shear wave transducers (zone 2 - nonEx, T1, IP68)**

order code		FSG-N**T1/IP68	FSK-N**T1/IP68	FSM-N**T1/IP68	FSP-N**T1/IP68
technical type		CDG1LI8	CDK1LI8	CDM2LI8	CDP2LI8
transducer frequency	MHz	0.2	0.5	1	2
<b>inner pipe diameter d</b>					
min. extended	inch	15.7	3.9	2	0.98
min. recommended	inch	19.7	7.9	3.9	2
max. recommended	inch	157.5	78.7	39.4	15.7
max. extended	inch	255.9	94.5	47.2	18.9
<b>pipe wall thickness</b>					
min.	inch	0.43	0.2	0.1	0.05
<b>material</b>					
housing		PEEK with stainless steel cover 316Ti			
contact surface		PEEK			
degree of protection		IP68 <sup>1</sup>			
<b>transducer cable</b>					
type		2550			
length	ft	39			
<b>dimensions</b>					
length l	inch	5.12		2.76	
width b	inch	2.13		1.26	
height h	inch	3.29		1.81	
dimensional drawing					
weight (without cable)	lb	0.95		0.19	
pipe surface temperature	°F	-40 to +212			
ambient temperature	°F	-40 to +212			
temperature compensation		x			
<b>explosion protection</b>					
<b>• ATEX/IECEx</b>					
order code		FSG-NA2T1/IP68	FSK-NA2T1/IP68	FSM-NA2T1/IP68	FSP-NA2T1/IP68
pipe surface temperature (Ex)	°C	gas: -40 to +90 dust: -40 to +80			
marking		CE 0637 Ex II 3G II 2D Ex nA IIC T6...T5 Gc Ex tb IIIC T80 °C...T85 °C Db			
certification		IBExU10ATEX1163 X, IECEx IBE 12.0005X			

<sup>1</sup> test conditions: 3 months/29 psi (65 ft)/36 °F

## Shear wave transducers (zone 2 - FM Class I Div. 2 - nonEx, TS, extended temperature range)

order code		FSG-ENNTS/**	FSK-ENNTS/**	FSM-E**TS/**	FSP-E**TS/**	FSQ-E**TS/**
technical type		C(DL)G1E52	C(DL)K1E52	C(DL)M2E52	C(DL)P2E52	C(DL)Q2E52
transducer frequency	MHz	0.2	0.5	1	2	4
<b>inner pipe diameter d</b>						
min. extended	inch	15.7	3.9	2	0.98	0.39
min. recommended	inch	19.7	7.9	3.9	2	0.98
max. recommended	inch	157.5	78.7	39.4	15.7	5.9
max. extended	inch	255.9	94.5	47.2	18.9	9.4
<b>pipe wall thickness</b>						
min.	inch	0.43	0.2	0.1	0.05	0.02
<b>material</b>						
housing		PPSU with stainless steel cover 304, ***-*****/OS: 316L		PI with stainless steel cover 304, ***-*****/OS: 316L		
contact surface		PPSU		PI		
Schutzart		IP66		IP66/IP67		
<b>transducer cable</b>						
type		1699		6111		
length	ft	16		13		
length (***/*****/LC)	ft	29		9		
<b>dimensions</b>						
length l	inch	5.1		2.52		1.57
width b	inch	2.01		1.26		0.87
height h	inch	2.64		1.59		1
dimensional drawing						
weight (without cable)	lb	1.8		0.15		0.04
pipe surface temperature	°F	-40...+356		-22...+450 <sup>1</sup>		-22...+392
ambient temperature	°F	-40...+356		-22...+104 -22...+140 <sup>2</sup> -22...+392 <sup>3</sup>		-22...+392
temperature compensation		x		x		
<b>explosion protection</b>						
<b>• ATEX/IECEx</b>						
order code		-	-	FSM-EA2TS/**	FSP-EA2TS/**	FSQ-EA2TS/**
pipe surface temperature (Ex)	°C	-	-	gas: -45...+235 <sup>1</sup> dust: -45...+225 <sup>1</sup>		
marking		-	-	CE 0637 Ex II 3G II 2D Ex nA IIC T6...T2 Gc Ex tb IIIA T80 °C...230 °C Db		
certification		-	-	IBEXU10ATEX1163 X, IECEx IBE 12.0005X		
<b>• FM</b>						
order code		-	-	FSM-EF2TS/**	FSP-EF2TS/**	FSQ-EF2TS/**
pipe surface temperature (Ex)	°F	-	-	-40...+455 <sup>1</sup>		
degree of protection		-	-	IP66		
marking		-	-	 NI/CI, I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860		

<sup>1</sup> > +200 °C/+392 °F:

quick release clasps and tension straps (nonEx) or Variofix L (nonEx, Ex)

observe the insulation instruction

Ex: ambient temperature max. +40 °C/+104 °F

<sup>2</sup> pipe surface temperature +200...+232 °C/+392...+450 °F: quick release clasps and tension straps

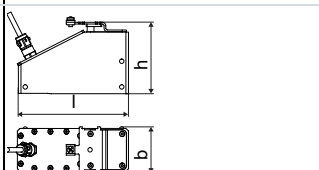
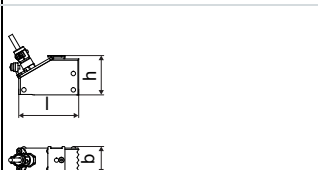
<sup>3</sup> pipe surface temperature max. +200 °C/+392 °F



**Shear wave transducers (zone 1, T1)**

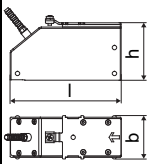
order code		FSG-N*1T1/**	FSK-N*1T1/**	FSM-N*1T1/**	FSP-N*1T1/**	FSQ-N*1T1/**
technical type		C(DL)G1N81	C(DL)K1N81	C(DL)M2N81	C(DL)P2N81	C(DL)Q2N81
transducer frequency	MHz	0.2	0.5	1	2	4
<b>inner pipe diameter d</b>						
min. extended	inch	15.7	3.9	2	0.98	0.39
min. recommended	inch	19.7	7.9	3.9	2	0.98
max. recommended	inch	157.5	78.7	39.4	15.7	5.9
max. extended	inch	255.9	94.5	47.2	18.9	9.4
<b>pipe wall thickness</b>						
min.	inch	0.43	0.2	0.1	0.05	0.02
<b>material</b>						
housing		PEEK with stainless steel cover 304 , ***_*****/OS: 316L				
contact surface		PEEK				
Schutzart		IP66		IP66/IP67		
<b>transducer cable</b>						
type		1699				
length	ft	16		13		9
length (***_***/LC)	ft	29				
<b>dimensions</b>						
length l	inch	5.1	4.98	2.52	1.57	
width b	inch	2.01	2.01	1.26	0.87	
height h	inch	2.64	2.66	1.59	1	
dimensional drawing						
weight (without cable)	lb	1	0.79	0.15	0.04	
pipe surface temperature	°F	-40 to +266				
ambient temperature	°F	-40 to +266				
temperature compensation		x				
<b>explosion protection</b>						
<b>• ATEX/IECEX</b>						
order code		FSG-NA1T1/**	FSK-NA1T1/**	FSM-NA1T1/**	FSP-NA1T1/**	FSQ-NA1T1/**
pipe surface temperature (Ex)	°C	-55 to +180				
marking		CE 0637 Ex II 2G II 2D Ex q IIC T6...T3 Gb Ex tb IIIC T80 °C...T185 °C Db				
certification		IBExU07ATEX1168 X, IECEx IBE 08.0007X				

**Shear wave transducers (zone 1, T1, IP68)**

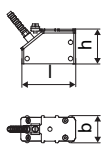
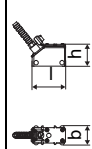
order code		FSG-N*1T1/IP68	FSK-N*1T1/IP68	FSM-N*1T1/IP68	FSP-N*1T1/IP68
technical type		CDG1L11	CDK1L11	CDM2L11	CDP2L11
transducer frequency	MHz	0.2	0.5	1	2
<b>inner pipe diameter d</b>					
min. extended	inch	15.7	3.9	2	0.98
min. recommended	inch	19.7	7.9	3.9	2
max. recommended	inch	157.5	78.7	39.4	15.7
max. extended	inch	255.9	94.5	47.2	18.9
<b>pipe wall thickness</b>					
min.	inch	0.43	0.2	0.1	0.05
<b>material</b>					
housing		PEEK with stainless steel cover 316Ti			
contact surface		PEEK			
degree of protection		IP68 <sup>1</sup>			
<b>transducer cable</b>					
type		2550			
length	ft	39			
<b>dimensions</b>					
length l	inch	5.12		2.76	
width b	inch	2.13		1.26	
height h	inch	3.29		1.81	
dimensional drawing					
weight (without cable)	lb	0.95		0.19	
pipe surface temperature	°F	-40 to +212			
ambient temperature	°F	-40 to +212			
temperature compensation		x			
<b>explosion protection</b>					
<b>• ATEX/IECEX</b>					
order code		FSG-NA1T1/IP68	FSK-NA1T1/IP68	FSM-NA1T1/IP68	FSP-NA1T1/IP68
pipe surface temperature (Ex)	°C	-40 to +80			
marking		CE 0637 Ex II 2G II 2D Ex q IIC T6...T5 Gb Ex tb IIIC T80 °C...T85 °C Db			
certification		IBExU07ATEX1168 X, IECEx IBE 08.0007X			

<sup>1</sup> test conditions: 3 months/29 psi (65 ft)/36 °F

**Shear wave transducers (zone 1, T1, extended temperature range)**

order code		FSG-E*1T1/**	FSK-E*1T1/**
technical type		CDG1E83	CDK1E83
transducer frequency	MHz	0.2	0.5
<b>inner pipe diameter d</b>			
min. extended	inch	15.7	3.9
min. recommended	inch	19.7	7.9
max. recommended	inch	157.5	78.7
max. extended	inch	255.9	94.5
<b>pipe wall thickness</b>			
min.	inch	0.43	0.2
<b>material</b>			
housing		PPSU with stainless steel cover 304, ***/OS: 316L	
contact surface		PPSU	
Schutzart		IP66	
<b>transducer cable</b>			
type		1699	
length	ft	16	
length (***/LC)	ft	29	
<b>dimensions</b>			
length l	inch	5.1	
width b	inch	2.01	
height h	inch	2.64	
dimensional drawing			
weight (without cable)	lb	1.8	
pipe surface temperature	°F	-40 to +356	
ambient temperature	°F	-40 to +356	
temperature compensation		x	
<b>explosion protection</b>			
<b>• ATEX/IECEX</b>			
order code		FSG-EA1T1/**	FSK-EA1T1/**
pipe surface temperature (Ex)	°C	-50 to +155	
marking		CE 0637 Ex II2G II2D Ex q IIC T6...T3 Gb Ex tb IIIC T80 °C...T160 °C Db	
certification		IBExU07ATEX1168 X, IECEx IBE 08.0007X	

## Shear wave transducers (zone 1, T1, extended temperature range)

order code		FSM-E*1T1/**	FSP-E*1T1/**	FSQ-E*1T1/**
technical type		C(DL)M2E85	C(DL)P2E85	C(DL)Q2E85
transducer frequency	MHz	1	2	4
<b>inner pipe diameter d</b>				
min. extended	inch	2	0.98	0.39
min. recommended	inch	3.9	2	0.98
max. recommended	inch	39.4	15.7	5.9
max. extended	inch	47.2	18.9	9.4
<b>pipe wall thickness</b>				
min.	inch	0.1	0.05	0.02
<b>material</b>				
housing		PI with stainless steel cover 304, ***-*****/OS: 316L		
contact surface		PI		
Schutzart		IP66/IP67		
<b>transducer cable</b>				
type		6111		
length	ft	13		9
length (***/*****/LC)	ft	29		
<b>dimensions</b>				
length l	inch	2.52		1.57
width b	inch	1.26		0.87
height h	inch	1.59		1
dimensional drawing				
weight (without cable)	lb	0.15		0.04
pipe surface temperature	°F	-22 to +450 <sup>1</sup>		-22 to +392
ambient temperature	°F	-22 to +104 -22 to +392 <sup>2</sup>		-22 to +392
temperature compensation		x		
<b>explosion protection</b>				
• ATEX/IECEx				
order code		FSM-EA1T1/**	FSP-EA1T1/**	FSQ-EA1T1/**
pipe surface temperature (Ex)	°C	-45 to +225 <sup>1</sup>		
marking		CE 0637 Ex II 2G II 2D Ex q IIC T6...T2 Gb Ex tb IIIA T80 °C...T230 °C Db		
certification		IBExU07ATEX1168 X, IECEx IBE 08.0007X		

<sup>1</sup> > +200 °C/+392 °F:

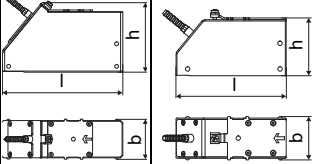

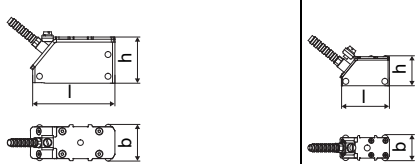

Variofix L

observe the insulation instruction

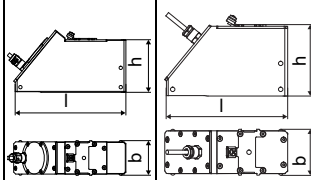
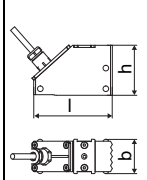
ambient temperature max. +40 °C/+104 °F

<sup>2</sup> pipe surface temperature max. +200 °C/+392 °F

**Lamb wave transducers (zone 2 - FM Class I Div. 2 - nonEx, TS)**

order code		FLF-N**TS/**	FLG-N**TS/**	FLH-N**TS/**	FLK-N**TS/**	FLM-N**TS/**	FLP-N**TS/**	FLQ-N**TS/**	
technical type		C(RT)F1N52	C(RT)G1N52	C(RT)H1N52	C(RT)K1N52	C(RT)M1N52	C(RT)P1N52	C(RT)Q1N52	
transducer frequency	MHz	0.15	0.2	0.3	0.5	1	2	4	
<b>inner pipe diameter d<sup>1</sup></b>									
min. extended	inch	25.2	15.7	13.8	3.9	2	0.98	0.39	
min. recommended	inch	31.5	19.7	17.7	7.9	3.9	2	0.98	
max. recommended	inch	216.5	157.5	118.1	78.7	39.4	15.7	5.9	
max. extended	inch	259.8	189	141.7	94.5	47.2	18.9	9.4	
<b>pipe wall thickness</b>									
min.	inch	0.59	0.43	0.31	0.2	0.1	0.05	0.02	
max.	inch	1.3	0.94	0.63	0.39	0.2	0.12	0.05	
<b>material</b>									
housing		PPSU with stainless steel cover 316Ti	PPSU with stainless steel cover 304, ***-*****/OS: 316L						
contact surface		PPSU							
Schutzart		IP66/IP67	IP66						
<b>transducer cable</b>									
type		1699							
length	ft	16					13		9
length (**-*****/LC)	ft	29							
<b>dimensions</b>									
length l	inch	6.42	5.06				2.91	1.65	
width b	inch	2.13	2.01				1.26	0.87	
height h	inch	3.59	2.66				1.59	1	
dimensional drawing									
weight (without cable)	lb	2.1	1				0.17	0.04	
pipe surface temperature	°F	-40 to +266							
ambient temperature	°F	-40 to +266							
temperature compensation		x							
<b>explosion protection</b>									
<b>• ATEX/IECEX</b>									
order code		FLF-NA2TS/**	FLG-NA2TS/**	FLH-NA2TS/**	FLK-NA2TS/**	FLM-NA2TS/**	FLP-NA2TS/**	FLQ-NA2TS/**	
pipe surface temperature (Ex)									
pipe surface temperature (Ex)	°C	gas: -50 to +165 dust: -50 to +155							
• max.	°C								
marking		CE 0637 Ex II3G II2D Ex nA IIC T6...T3 Gc Ex tb IIIA T80 °C...T160 °C Db	CE 0637 Ex II3G II2D Ex nA IIC T6...T3 Gc Ex tb IIIA T80 °C...T160 °C Db						
certification		IBExU10ATEX1163 X, IECEX IBE 12.0005X							
<b>• FM</b>									
order code		FLF-NF2TS/**	FLG-NF2TS/**	FLH-NF2TS/**	FLK-NF2TS/**	FLM-NF2TS/**	FLP-NF2TS/**	FLQ-NF2TS/**	
pipe surface temperature (Ex)	°F	-40 to +329							
degree of protection		IP66							
marking		 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860							

**Lamb wave transducers (zone 2 - nonEx, T1, IP68)**

order code		FLF-N**T1/IP68	FLG-N**T1/IP68	FLH-N**T1/IP68	FLK-N**T1/IP68	FLM-N**T1/IP68	FLP-N**T1/IP68	
technical type		CRF1LI8	CRG1LI8	CRH1LI8	CRK1LI8	CRM1LI8	CRP1LI8	
transducer frequency	MHz	0.15	0.2	0.3	0.5	1	2	
<b>inner pipe diameter d<sup>1</sup></b>								
min. extended	inch	25.2	15.7	13.8	3.9	2	0.98	
min. recommended	inch	31.5	19.7	17.7	7.9	3.9	2	
max. recommended	inch	216.5	157.5	118.1	78.7	39.4	15.7	
max. extended	inch	259.8	189	141.7	94.5	47.2	18.9	
<b>pipe wall thickness</b>								
min.	inch	0.59	0.43	0.31	0.2	0.1	0.05	
max.	inch	1.3	0.94	0.63	0.39	0.2	0.12	
max. extended	inch	1.4	-	-	-	-	-	
<b>material</b>								
housing		PPSU with stainless steel cover 316Ti						
contact surface		PPSU						
degree of protection		IP68 <sup>2</sup>						
<b>transducer cable</b>								
type		2550						
length	ft	39						
<b>dimensions</b>								
length l	inch	6.81	5.65				2.87	
width b	inch	2.13	2.13				1.24	
height h	inch	3.6	3.29				1.81	
dimensional drawing								
weight (without cable)	lb	3	1.4				0.21	
pipe surface temperature	°F	-40 to +212						
ambient temperature	°F	-40 to +212						
temperature compensation		x						
<b>explosion protection</b>								
• ATEX/IECEx								
order code		FLF-NA2T1/IP68	FLG-NA2T1/IP68	FLH-NA2T1/IP68	FLK-NA2T1/IP68	FLM-NA2T1/IP68	FLP-NA2T1/IP68	
pipe surface temperature (Ex)	°C	gas: -40 to +90 dust: -40 to +80						
marking		CE 0637 Ex II 3G II 2D Ex nA IIC T6...T5 Gc Ex tb IIC T80 °C...T85 °C Db						
certification		IBExU10ATEX1163 X, IECEx IBE 12.0005X						

<sup>1</sup> Lamb wave transducer:

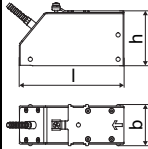
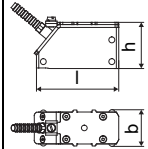

typical values for water; pipe diameters for other fluids on request

inner pipe diameter max. recommended: in reflect arrangement (diagonal arrangement) and for a flow velocity of 23 ft/s (46 ft/s)

inner pipe diameter max. extended: in reflect arrangement (diagonal arrangement) and for a flow velocity of 16 ft/s (33 ft/s)

<sup>2</sup> test conditions: 3 months/29 psi (65 ft)/36 °F

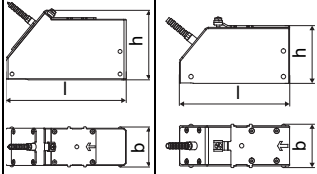
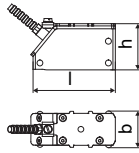
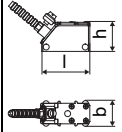


**Lamb wave transducers (zone 2 - FM Class I Div. 2 - nonEx, higher temperatures, TS)**

order code		FLG-S**TS/**	FLH-S**TS/**	FLK-S**TS/**	FLM-S**TS/**	FLP-SNNTS/**
technical type		C(RT)G1S52	C(RT)H1S52	C(RT)K1S52	C(RT)M1S52	C(RT)P1S52
transducer frequency	MHz	0.2	0.3	0.5	1	2
<b>inner pipe diameter d<sup>1</sup></b>						
min. extended	inch	15.7	13.8	3.9	2	0.98
min. recommended	inch	19.7	17.7	7.9	3.9	2
max. recommended	inch	157.5	118.1	78.7	39.4	15.7
max. extended	inch	189	141.7	94.5	47.2	18.9
<b>pipe wall thickness</b>						
min.	inch	0.42	0.28	0.17	0.08	0.04
max.	inch	0.93	0.62	0.37	0.19	0.09
<b>material</b>						
housing		PPSU with stainless steel cover 316Ti				
contact surface		PPSU				
Schutzart		IP66				
<b>transducer cable</b>						
type		1699				
length	ft	16			13	
length (**-****/LC)	ft	29			29	
<b>dimensions</b>						
length l	inch	5.06			2.91	
width b	inch	2.01			1.3	
height h	inch	2.66			1.59	
dimensional drawing						
weight (without cable)	lb	1.8			0.35	
storing temperature	°F	-40 to +311				
operating temperature	°F	212 to 356 (nonEx)				
warm-up time	h	3			1	
temperature compensation		x				
<b>explosion protection</b>						
<b>• ATEX/IECEx</b>						
order code		FLG-SA2TS/**	FLH-SA2TS/**	FLK-SA2TS/**	FLM-SA2TS/**	-
pipe surface temperature (Ex)	°C	gas: -50 to +165 dust: -50 to +155				
marking		CE 0637 Ex II 3G II 2D Ex nA IIC T6...T3 Gc Ex tb IIIC T80 °C...T160 °C Db				
certification		IBExU10ATEX1163 X, IECEx IBE 12.0005X				
<b>• FM</b>						
order code		FLG-SF2TS/**	FLH-SF2TS/**	FLK-SF2TS/**	FLM-SF2TS/**	-
pipe surface temperature (Ex)	°F	-40 to +329				
degree of protection		IP66				
marking		 NI/CI, I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860				

completely thermally insulated transducer installation necessary

<sup>1</sup> Lamb wave transducer:  
 typical values for water; pipe diameters for other fluids on request  
 inner pipe diameter max. recommended: in reflect arrangement (diagonal arrangement) and for a flow velocity of 23 ft/s (46 ft/s)  
 inner pipe diameter max. extended: in reflect arrangement (diagonal arrangement) and for a flow velocity of 16 ft/s (33 ft/s)

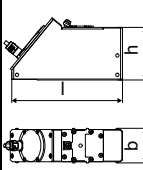
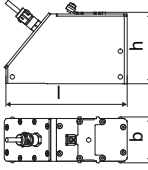
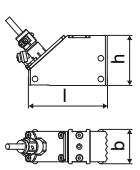
## Lamb wave transducers (zone 1, T1)

order code		FLF-N*1T1/**	FLG-N*1T1/**	FLH-N*1T1/**	FLK-N*1T1/**	FLM-N*1T1/**	FLP-N*1T1/**	FLQ-N*1T1/**
technical type		C(RT)F1N83	C(RT)G1N83	C(RT)H1N83	C(RT)K1N83	C(RT)M1N83	C(RT)P1N83	C(RT)Q1N83
transducer frequency	MHz	0.15	0.2	0.3	0.5	1	2	4
<b>inner pipe diameter d<sup>1</sup></b>								
min. extended	inch	25.2	15.7	13.8	3.9	2	0.98	0.39
min. recommended	inch	31.5	19.7	17.7	7.9	3.9	2	0.98
max. recommended	inch	216.5	157.5	118.1	78.7	39.4	15.7	5.9
max. extended	inch	259.8	189	141.7	94.5	47.2	18.9	9.4
<b>pipe wall thickness</b>								
min.	inch	0.59	0.43	0.31	0.2	0.1	0.05	0.02
max.	inch	1.3	0.94	0.63	0.39	0.2	0.12	0.05
<b>material</b>								
housing		PPSU with stainless steel cover 304, ***-*****/OS: 316L, 316Ti				PPSU with stainless steel cover 304, ***-*****/OS: 316L		
contact surface		PPSU						
Schutzart		IP66/IP67		IP66				
<b>transducer cable</b>								
type		1699						
length	ft					13		9
length (**-*****/LC)	ft	29						
<b>dimensions</b>								
length l	inch	6.42	5.06				2.91	1.65
width b	inch	2.13	2.01				1.26	0.87
height h	inch	3.59	2.66				1.59	1
dimensional drawing								
weight (without cable)	lb	2.1	1				0.17	0.04
pipe surface temperature	°F	-40 to +266						
ambient temperature	°F	-40 to +266						
temperature compensation		x						
<b>explosion protection</b>								
<b>• ATEX/IECEx</b>								
order code		FLF-NA1T1/**	FLG-NA1T1/**	FLH-NA1T1/**	FLK-NA1T1/**	FLM-NA1T1/**	FLP-NA1T1/**	FLQ-NA1T1/**
pipe surface temperature (Ex)	°C	-50 to +155						
marking		CE0637  II2G II2D Ex q IIC T6...T3 Gb Ex tb IIIA T80 °C...T160 °C Db		CE0637  II2G II2D Ex q IIC T6...T3 Gb Ex tb IIIC T80 °C...T160 °C Db				
certification		IBExU07ATEX1168 X, IECEx IBE 08.0007X						

<sup>1</sup> Lamb wave transducer:  
 typical values for water; pipe diameters for other fluids on request  
 inner pipe diameter max. recommended: in reflect arrangement (diagonal arrangement) and for a flow velocity of 23 ft/s (46 ft/s)  
 inner pipe diameter max. extended: in reflect arrangement (diagonal arrangement) and for a flow velocity of 16 ft/s (33 ft/s)



**Lamb wave transducers (zone 1, T1, IP68)**

order code		FLF-N*1T1/IP68	FLG-N*1T1/IP68	FLH-N*1T1/IP68	FLK-N*1T1/IP68	FLM-N*1T1/IP68	FLP-N*1T1/IP68
technical type		CRF1LI3	CRG1LI3	CRH1LI3	CRK1LI3	CRM1LI3	CRP1LI3
transducer frequency	MHz	0.15	0.2	0.3	0.5	1	2
<b>inner pipe diameter d<sup>1</sup></b>							
min. extended	inch	25.2	15.7	13.8	3.9	2	0.98
min. recommended	inch	31.5	19.7	17.7	7.9	3.9	2
max. recommended	inch	216.5	157.5	118.1	78.7	39.4	15.7
max. extended	inch	259.8	189	141.7	94.5	47.2	18.9
<b>pipe wall thickness</b>							
min.	inch	0.59	0.43	0.31	0.2	0.1	0.05
max.	inch	1.3	0.94	0.63	0.39	0.2	0.12
<b>material</b>							
housing		PPSU with stainless steel cover 316Ti	PPSU with stainless steel cover 316Ti				
contact surface		PPSU	PPSU				
degree of protection		IP68 <sup>2</sup>	IP68 <sup>2</sup>				
<b>transducer cable</b>							
type		2550	2550				
length	ft	39	39				
<b>dimensions</b>							
length l	inch	6.81	5.65			2.877	
width b	inch	2.13	2.13			1.24	
height h	inch	3.6	3.29			1.81	
dimensional drawing							
weight (without cable)	lb	3	1.4			0.21	
pipe surface temperature	°F	-40 to +212		-40 to +212			
ambient temperature	°F	-40 to +212		-40 to +212			
temperature compensation		x		x			
<b>explosion protection</b>							
<b>• ATEX/IECEx</b>							
order code		FLF-NA1T1/IP68	FLG-NA1T1/IP68	FLH-NA1T1/IP68	FLK-NA1T1/IP68	FLM-NA1T1/IP68	FLP-NA1T1/IP68
pipe surface temperature (Ex)	°C	-40 to +80					
marking		CE 0637 Ex II2G II2D Ex q IIC T6...T5 Gb Ex tb IIIC T80 °C...T85 °C Db					
certification		IBExU07ATEX1168 X, IECEx IBE 08.0007X					

<sup>1</sup> Lamb wave transducer:  
 typical values for water; pipe diameters for other fluids on request  
 inner pipe diameter max. recommended: in reflect arrangement (diagonal arrangement) and for a flow velocity of 23 ft/s (46 ft/s)  
 inner pipe diameter max. extended: in reflect arrangement (diagonal arrangement) and for a flow velocity of 16 ft/s (33 ft/s)

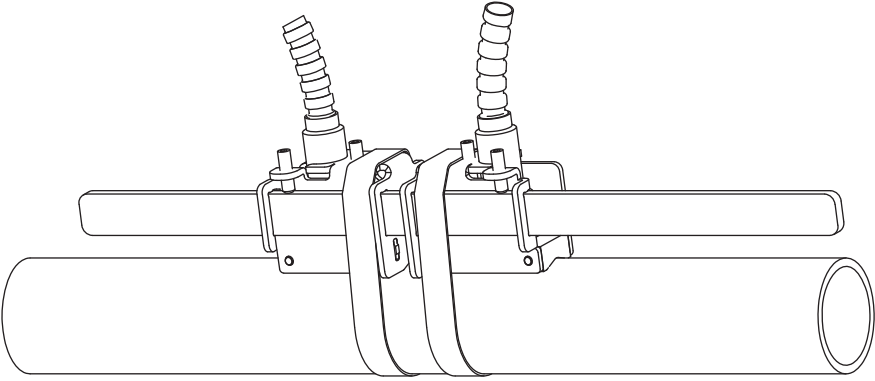
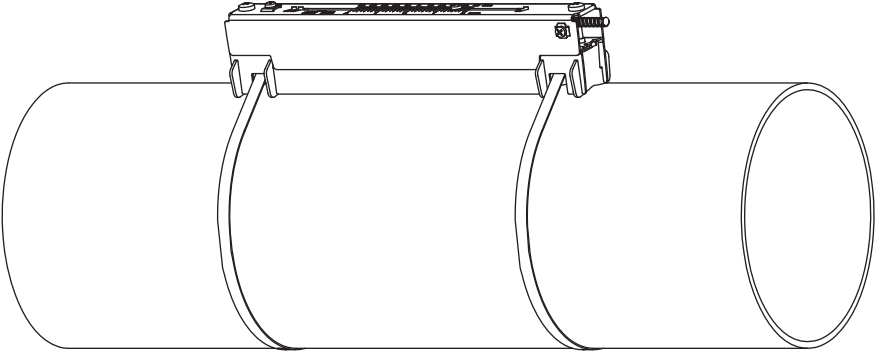
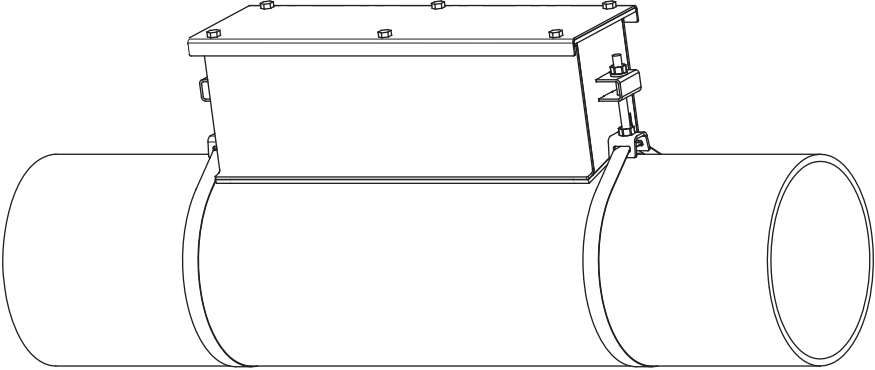
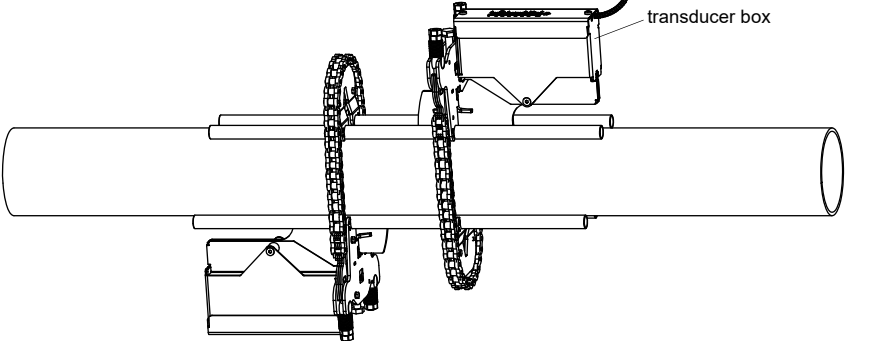
<sup>2</sup> test conditions: 3 months/29 psi (65 ft)/36 °F



# Transducer mounting fixture

## Order code

1, 2	3	4	5	6	7 to 9	no. of character
transducer mounting fixture	transducer	measurement arrangement	size	fixation	outer pipe diameter	option
						description
VL						PermaRail
PL						PermaLok
WI						transducer box for WaveInjector
	F					transducers with transducer frequency F
	K					transducers with transducer frequency G, H, K
	M					transducers with transducer frequency M, P
	Q					transducers with transducer frequency Q
	S					transducers with transducer frequency S
		D				reflect arrangement or diagonal arrangement/direct mode
		R				reflect arrangement
			S			small
			M			medium
			L			large
				S		tension straps
				W		welding
				N		without fixation
					SK1	0.5 to 2.5 inch
					SK2	3 to 6 inch
					SK3	8 to 10 inch
					SK4	12 to 18 inch
					SK5	20 to 36 inch
					SK6	42 to 100 inch
					SK7	100 to 170 inch
					SK8	170 to 370 inch
					NDR	any
						IP68 for transducers with degree of protection IP68
						OS housing with stainless steel 316
						Z special design

<p><b>PermaRail (VLS)</b></p> 	<p>transducer frequency: S material: stainless steel 304, 303</p>
<p><b>PermaRail (VLK, VLM, VLQ)</b></p> 	<p>material: stainless steel 304, 301, 410 option OS: 316Ti, 316L, 17-7PH inner length: <b>VLK:</b> 13.7 inch, option IP68: 14.5 inch <b>VLM:</b> 9.2 inch <b>VLQ:</b> 6.9 inch dimensions: <b>VLK:</b> 16.65 x 3.54 x 3.66 inch option IP68: 17.44 x 3.7 x 4.13 inch <b>VLM:</b> 12.17 x 2.24 x 2.48 inch <b>VLQ:</b> 9.72 x 1.69 x 1.85 inch</p>
<p><b>PermaLok (PL)</b></p> 	<p>material: stainless steel 316 dimensions: <b>PLK-RL:</b> 19.25 x 3.9 x 3.95 inch <b>PLK-DS:</b> 13.25 x 3.85 x 3.95 inch <b>PLM:</b> 25.25 x 3.08 x 3.15 inch <b>PLQ:</b> 13.37 x 2.68 x 2.4 inch weight: <b>PLK-RL:</b> 6 lb <b>PLK-DS:</b> 4.2 lb <b>PLM:</b> 6.6 lb <b>PLQ:</b> 2.8 lb</p>
<p><b>transducer box WI for WaveInjector</b></p> 	<p>see Technical specification TSWaveInjectorVx-x</p>

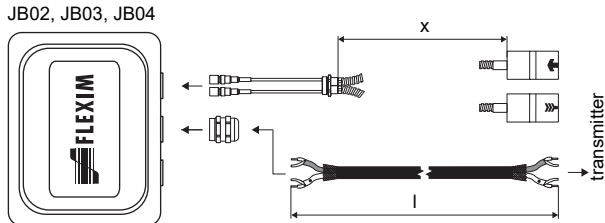
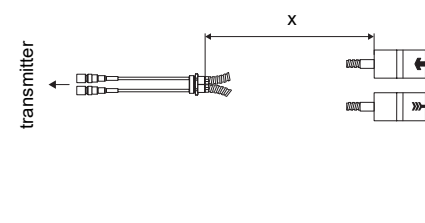
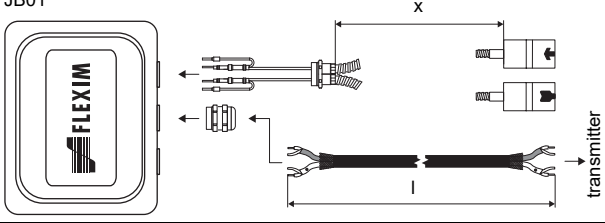
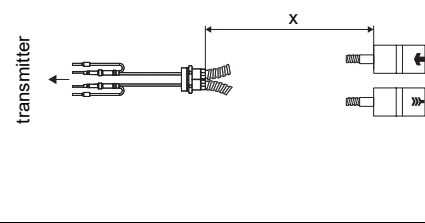
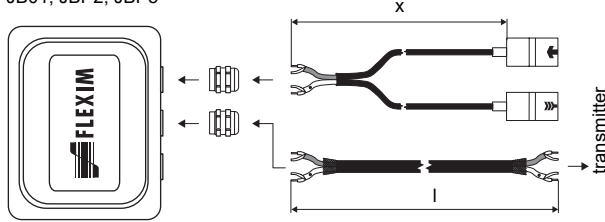
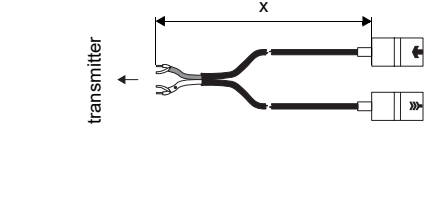
## Coupling materials for transducers

	normal temperature range (4th character of transducer order code = N)		extended temperature range (4th character of transducer order code = E)			WaveInjector	
	< 212 °F	< 338 °F	< 302 °F	< 392 °F	392 to 464 °F	< 536 °F	536 to 1166 °F
< 24 h	coupling compound type N or coupling pad type VT	coupling compound type E or coupling pad type VT	coupling compound type E or coupling pad type VT	coupling compound type E or H or coupling pad type VT	coupling pad type TF	coupling pad type A and coupling pad type VT	coupling pad type B and coupling pad type VT
long time measurement	coupling pad type VT	coupling pad type VT	coupling pad type VT	coupling pad type VT	coupling pad type TF	coupling pad type A and coupling pad type VT	coupling pad type B and coupling pad type VT

### Technical data

type	ambient temperature °F	remark
coupling compound type N	-22 to +266	
coupling compound type E	-22 to +392	
coupling compound type H	-22 to +482	
coupling pad type A	max. 536	
coupling pad type B	536 to 1166	
coupling pad type VT	14 to +392	fluid temperature 392 °F: min. 2 years
coupling pad type TF	392 to 464	

## Connection systems

connection system TS		
connection with extension cable	direct connection	transducers technical type
<p>JB02, JB03, JB04</p> 		****52
connection system T1		
connection with extension cable	direct connection	transducers technical type
<p>JB01</p> 		****8*
<p>JB01, JBP2, JBP3</p> 		****L*

### Cable

transducer cable				
type		1699	2550	6111
weight	lb/ft	0.06	0.02	0.06
ambient temperature	°F	-67 to +392	-40 to +212	-148 to +437
properties			longitudinal watertight	
cable jacket				
material		PTFE	PUR	PFA
outer diameter	inch	0.11	0.2 ±0.01	0.11
thickness	inch	0.01	0.04	0.02
color		brown	gray	white
shield		x	x	x
sheath				
material		stainless steel 304 option OS: 316Ti	-	stainless steel 304 option OS: 316Ti
outer diameter	inch	0.31	-	0.31

extension cable				
type		2615	5245	
weight	lb/ft	0.12	0.26	
ambient temperature	°F	-22 to +158	-22 to +158	
properties		halogen-free fire propagation test according to IEC 60332-1 combustion test according to IEC 60754-2	halogen-free fire propagation test according to IEC 60332-1 combustion test according to IEC 60754-2	
cable jacket				
material		PUR	PUR	
outer diameter	inch	max. 0.47	max. 0.47	
thickness	inch	0.08	0.08	
color		black	black	
shield		x	x	
sheath				
material		-	steel wire braid with copolymer sheath	
outer diameter	inch	-	max. 0.61	

### Cable length

transducer frequency		F, G, H, K	M, P	Q	S
connection system TS					
transducers technical type		x		x	
*(DR)***5*	ft	16	≤ 984	13	≤ 984
option LC:	ft	29	≤ 984	29	≤ 984
*(LT)***5*					
				9	≤ 295
					6
					≤ 131
					-
					-
connection system T1					
transducers technical type		x		x	
*(DR)***8*	ft	16	≤ 984	13	≤ 984
option LC:	ft	29	≤ 984	29	≤ 984
*(LT)***8*					
option IP68:	ft	39	≤ 984	39	≤ 984
****L1*					
					-
					-
					-

x = transducer cable length

l = max. length of extension cable (depending on the application)

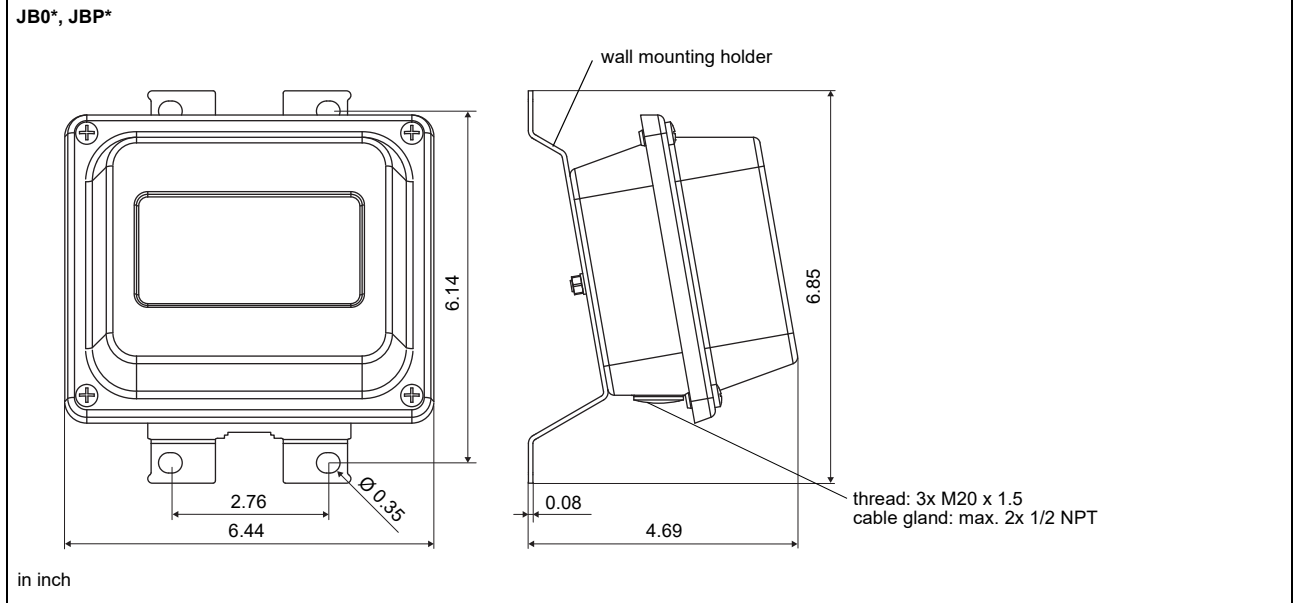
# Junction box

## Technical data

JB01S4E3M, JBP2, JBP3			
weight	lb	2.6 lb	
fixation		wall mounting optional: 2" pipe mounting	
<b>material</b>			
housing		stainless steel 316L	
gasket		silicone	
degree of protection		IP66/IP67	
ambient temperature °F		-40 to +176	
<b>explosion protection</b>			
• ATEX/IECEX (zone 1)			
junction box		JB01S4E3M	
marking		CE 0637 Ex II 2G II 2D Ex eb mb IIC T6...T4 Gb Ex tb IIIC T100 °C Db Ta -40...+70/80 °C	
certification		IBEXU06ATEX1161, IECEX IBE 08.0006	
type of protection		gas: increased safety decoupling network: encapsulation dust: protection by enclosure	
• ATEX (zone 2)			
junction box		JBP2	
marking		CE Ex II 3G Ex nA IIC T6...T4 Gc II 3D Ex tc IIIC T 100 °C Dc Ta -40...+70/80 °C	
<b>Connection</b>			
<b>Transducers</b>			
<b>terminal strip</b>	<b>terminal</b>	<b>connection</b>	<b>transducer</b>
KL1	V	signal	↑
	VS	internal shield	
	RS	internal shield	⬇
	R	signal	
<b>Extension cable</b>			
<b>terminal strip</b>	<b>terminal</b>	<b>connection</b>	
KL2	TV	signal	
	TVS	internal shield	
	TRS	internal shield	
	TR	signal	
JB02, JB03, JB04			
weight	lb	2.6 lb	
fixation		wall mounting optional: 2" pipe mounting	
<b>material</b>			
housing		stainless steel 316L	
gasket		silicone	
degree of protection		JB02, JB03: IP66/IP67 JB04: Type 4X, IP66	
<b>ambient temperature</b>			
min. °F		-40	
max. °F		+176	
<b>explosion protection</b>			
• ATEX			
junction box		JB02	
marking		CE Ex II 3G Ex nA IIC T6...T4 Gc II 3D Ex tc IIIC T 100 °C Dc Ta -40...+70/80 °C	
• FM			
junction box		JB04	
marking		F73 APPROVED NI/CI. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ T6 Ta = -40...+60 °C	
<b>Connection</b>			
<b>Transducers</b>			
	<b>terminal</b>	<b>connection</b>	<b>transducer</b>
	XV	SMB connector	↑
	XR	SMB connector	⬇
<b>Extension cable</b>			
<b>terminal strip</b>	<b>terminal</b>	<b>connection</b>	
KL2	TV	signal	
	TVS	internal shield	
	TRS	internal shield	
	TR	signal	



## Dimensions



## 2" pipe mounting kit

