

### Ultrasonic flowmeter for upstream water flow measurement

Stationary ultrasonic clamp-on system for flow measurement of water

The F502FM meter is especially designed to support upstream water flow measurements for reservoir management in oil and gas upstream business.

From the well head to processing and disposal it is necessary to track water for production, environmental and regulatory reasons. Many different types of applications require water flow measurement from fracking, to produced water, to water disposal.

That meter can replace other mechanical and invasive flow measurement technologies. Non-invasive flow measurement solves the problems associated with invasive meters that are challenged to withstand the harsh application conditions.

#### Features

- Installation and commissioning possible every time without any influence on the process, no process stop, no pipe work necessary
- One set fits several pipe materials, diameters and schedules
- Installation without shutdown
- Fit & forget installation, practically no maintenance through
  - Permanent coupling pads
  - Robust and solid mounting
- No moving parts: wear-free operation
- Very high turndown ratio > 1000:1
- No media contact: not affected by corrosion
- Independent from pressure rating
- Measures very low flow velocities down to 0.03 ft/s
- Reliable flow measurement even with up to 6 % solids content
- Rapid response time for quick start and stop flow conditions






FLUXUS F502FM



PermaRail

# Transmitter

## Technical data

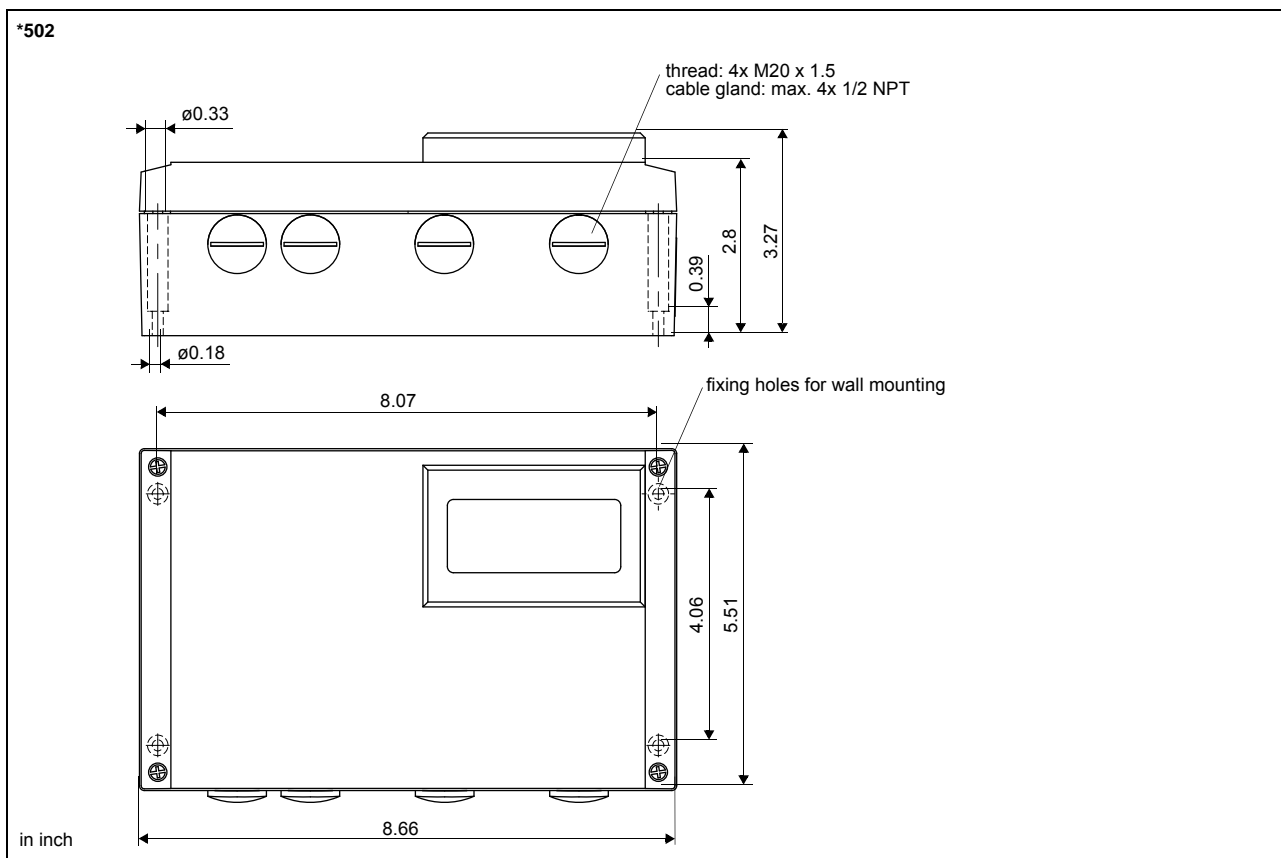
		<b>FLUXUS F502FM</b>
		
design		field device with 1 measuring channel, FM Class I Div. 2
<b>measurement</b>		
measurement principle		transit time difference correlation principle
flow velocity	ft/s	0.03 to 82
repeatability		0.25 % of reading $\pm 0.03$ ft/s
fluid		water
measurement uncertainty (volumetric flow rate) <sup>1</sup>		$\pm 1.5$ % of reading $\pm 0.03$ ft/s
<b>transmitter</b>		
power supply		<ul style="list-style-type: none"> <li>• 100 to 230 V/50 to 60 Hz or</li> <li>• 20 to 32 V DC or</li> <li>• 11 to 16 V DC</li> </ul>
power consumption	W	< 10
number of measuring channels		1
damping	s	0 to 100 (adjustable)
measuring cycle	Hz	10
response time	s	1
housing material		aluminum, powder coated
degree of protection		IP66
dimensions	in	see dimensional drawing
weight	lb	4.2
fixation		wall mounting, optional: 2" pipe mounting
ambient temperature	°F	14 to +140
display		2 x 16 characters, dot matrix, backlight
menu language		English, German, French, Dutch, Spanish
<b>explosion protection</b>		
• FM		
FM code		F502BT-F2
marking		 Cl. I, II, III/Div. 2/ GP. A, B, C, D, E, F, G/   Cl. I/Div. 2/ GP. A, B, C, D/  T4 Ta = 60 °C
<b>measuring functions</b>		
physical quantities		volumetric flow rate, mass flow rate, flow velocity
totalizer		volume, mass
<b>communication interfaces</b>		
service interfaces		<ul style="list-style-type: none"> <li>• RS232</li> <li>• USB (with adapter)</li> </ul>
process interfaces		max. 1 option: <ul style="list-style-type: none"> <li>• RS485 (sender)</li> <li>• Modbus RTU, sender (switchable)</li> </ul>
<b>accessories</b>		
serial data kit		
• cable		RS232
• adapter		RS232 - USB
software		<ul style="list-style-type: none"> <li>• FluxDiagReader: download of measured values and parameters, graphical presentation</li> <li>• FluxDiag (optional): download of measurement data, graphical presentation, report generation</li> </ul>
<b>data logger</b>		
loggable values		all physical quantities and totalized values
capacity		> 100 000 measured values

<sup>1</sup> for reference conditions and  $v > 0.82$  ft/s, with sensor module

FLUXUS F502FM	
<b>outputs</b>	
The outputs are galvanically isolated from the transmitter.	
<b>• current output</b>	
number	1, optional: 2
range	mA 0/4 to 20
accuracy	0.1 % of reading $\pm 15 \mu\text{A}$
active output	$R_{\text{ext}} < 500 \Omega$
<b>• binary output</b>	
number	1, optional: 2
optorelay	28 V/100 mA
binary output as alarm output	
• functions	limit, change of flow direction or error
binary output as pulse output	
• functions	mainly for totalizing
• pulse value	units 0.01 to 1000
• pulse width	ms 80 to 1000

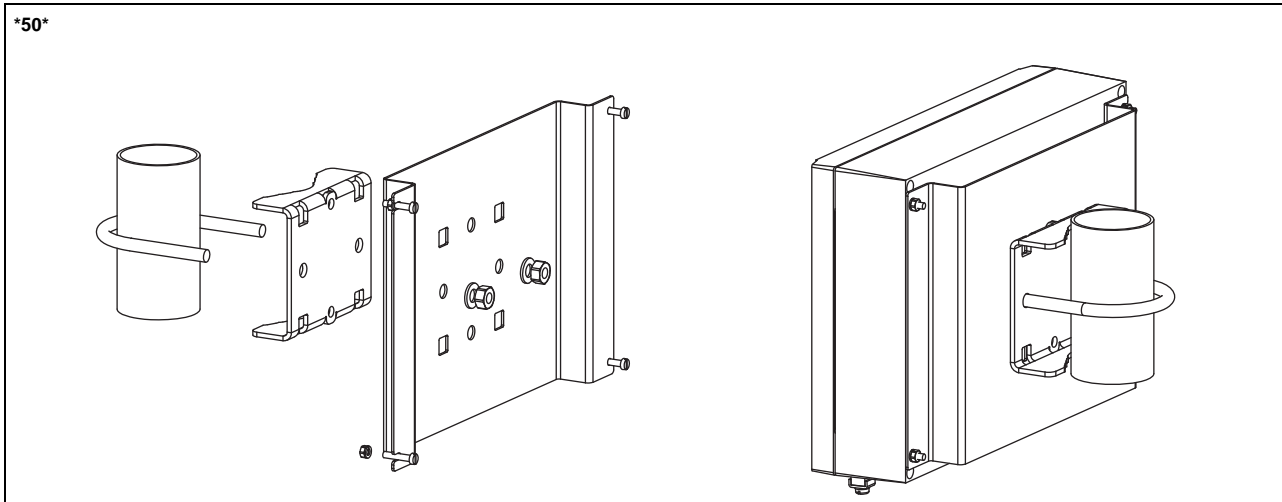
<sup>1</sup> for reference conditions and  $v > 0.82 \text{ ft/s}$ , with sensor module

## Dimensions

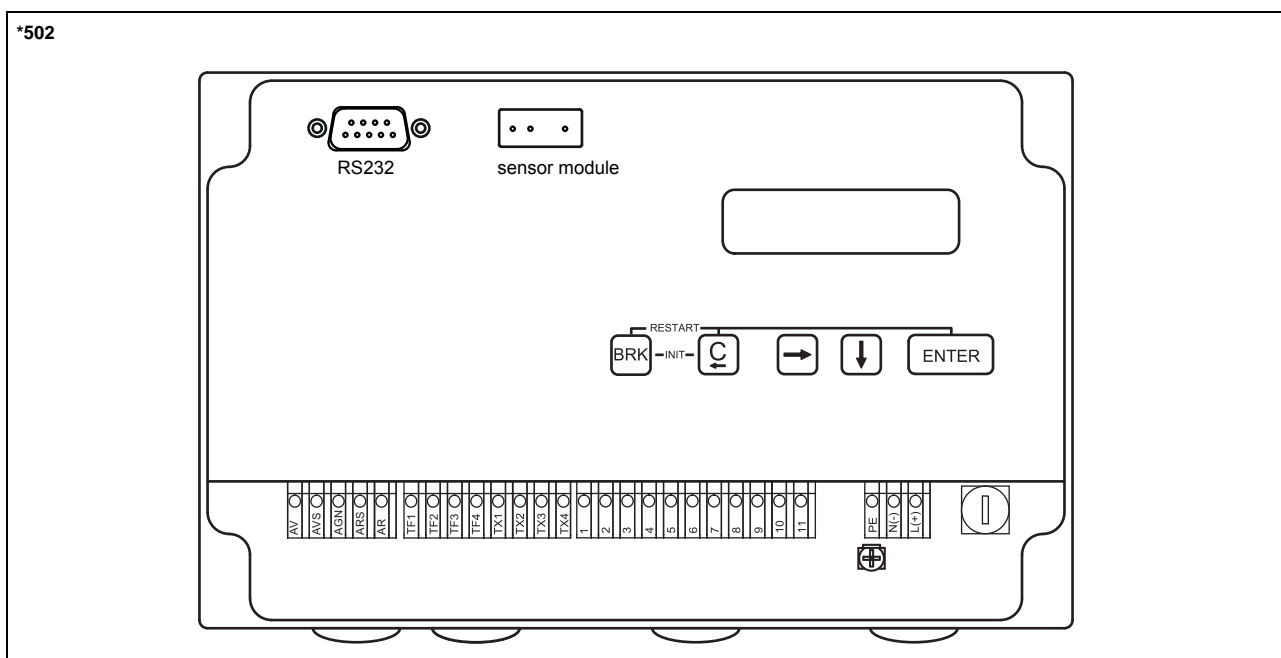


## 2" pipe mounting kit

\*50\*



## Terminal assignment



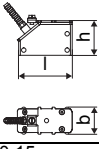
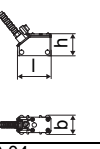

power supply <sup>1</sup>					
terminal	connection (AC)		connection (DC)		
PE	earth		earth		
N(-)	neutral		-		
L(+)	phase		+		
transducers, extension cable					
terminal	connection		transducer		
AV	signal				
AVS	internal shield				
ARS	internal shield				
AR	signal				
cable gland	external shield				
outputs <sup>1</sup>					
terminal	connection		terminal	connection	communication interface • RS485 • Modbus RTU
1(-), 2(+)	binary output B1		10	signal +	
3(-), 4(+)	binary output B2		9	signal -	
5(-), 6(+)	current output I1		11	shield	
7(-), 8(+)	current output I2				

<sup>1</sup> cable (by customer): e.g., flexible leads, with insulated wire end ferrules, lead cross sectional area: AWG14 to 24

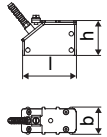
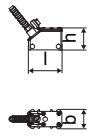

## Transducers

### Technical data

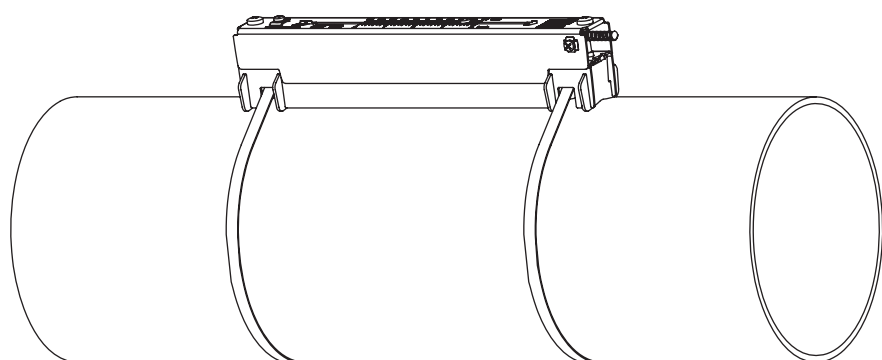
#### Shear wave transducers

technical type		C(DL)M2N52	C(DL)P2N52	C(DL)Q2N52
transducer frequency	MHz	1	2	4
<b>inner pipe diameter d</b>				
min. extended	in	2	0.98	0.39
min. recommended	in	3.9	2	0.98
max. recommended	in	39.4	15.7	5.9
max. extended	in	47.2	18.9	9.4
<b>pipe wall thickness</b>				
min.	in	0.1	0.05	0.02
<b>material</b>				
housing		PEEK with stainless steel cap 304, ***-****/OS: 316L		
contact surface		PEEK		
degree of protection		IP66		
<b>transducer cable</b>				
type		1699		
length	ft	13		9
length (**-****/LC)	ft	29		
<b>dimensions</b>				
length l	in	2.52		1.57
width b	in	1.26		0.87
height h	in	1.59		1
dimensional drawing				
weight (without cable)	lb	0.15		0.04
<b>pipe surface temperature</b>				
min.	°F	-40		
max.	°F	+266		
<b>ambient temperature</b>				
min.	°F	-40		
max.	°F	+266		
<b>explosion protection</b>				
• FM				
pipe surface temperature (Ex)				
• min.	°F	-40		
• max.	°F	+257		
marking		 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860		

**Shear wave transducers (extended temperature range)**

technical type		C(DL)M2E52	C(DL)P2E52	C(DL)Q2E52
transducer frequency	MHz	1	2	4
<b>inner pipe diameter d</b>				
min. extended	in	2	0.98	0.39
min. recommended	in	3.9	2	0.98
max. recommended	in	39.4	15.7	5.9
max. extended	in	47.2	18.9	9.4
<b>pipe wall thickness</b>				
min.	in	0.1	0.05	0.02
<b>material</b>				
housing		PI with stainless steel cap 304, ***.*****/OS: 316L		
contact surface		PI		
degree of protection		IP66		
<b>transducer cable</b>				
type		6111		
length	ft	13		9
length (***.*****/LC)	ft	29		
<b>dimensions</b>				
length l	in	2.52		1.57
width b	in	1.26		0.87
height h	in	1.59		1
dimensional drawing				
weight (without cable)	lb	0.15		0.04
<b>pipe surface temperature</b>				
min.	°F	-22		
max.	°F	+392		
<b>ambient temperature</b>				
min.	°F	-22		
max.	°F	+392		
temperature compensation		x		
<b>explosion protection</b>				
• FM				
pipe surface temperature (Ex)				
• min.	°F	-40		
• max.	°F	+455		
degree of protection		IP66		
marking		 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860		

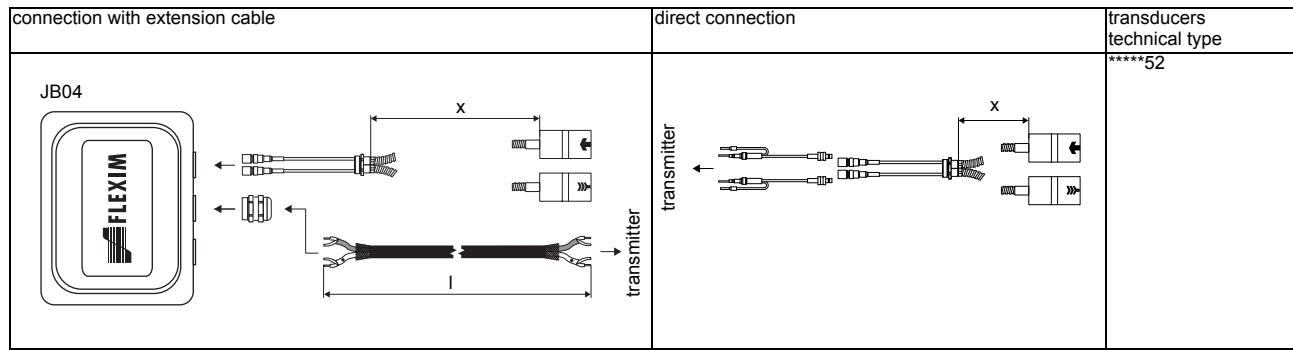
**Transducer mounting fixture**

<p>PermaRail (VLM, VLQ)</p> 	<p>material: stainless steel 304, 301, 410              inner length:  <b>VLM:</b> 9.2 in  <b>VLQ:</b> 6.9 in              dimensions:  <b>VLM:</b> 12.17 x 2.24 x 2.48 in  <b>VLQ:</b> 9.72 x 1.69 x 1.85 in</p>
--	---

**Coupling materials for transducers**

type	ambient temperature °F
coupling compound type N	-22 to +266
coupling pad type VT	14 to +392

### Connection systems



### Cable

transducer cable			
type		1699	6111
weight	lb/ft	0.06	0.06
ambient temperature	°F	-67 to +392	-148 to +437
cable jacket			
material		PTFE	PFA
outer diameter	in	0.11	0.11
thickness	in	0.01	0.02
color		brown	white
shield		x	x
sheath			
material		stainless steel 316Ti	stainless steel 304
outer diameter	in	0.31	0.31

extension cable	
type	2615
weight	lb/ft 0.12
ambient temperature	°F -22 to +158
properties	halogen free fire propagation test according to IEC 60332-1 combustion test according to IEC 60754-2
cable jacket	
material	PUR
outer diameter	in 0.47
thickness	in 0.08
color	black
shield	x

### Cable length

transducer frequency	M, P		Q	
<b>connection system TS</b>				
transducers technical type	x	l	x	l
*D***5*	ft 13	≤ 295	9	≤ 295


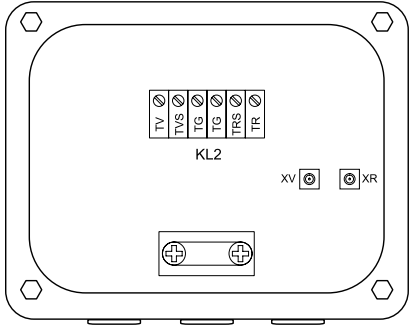
x = transducer cable length

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

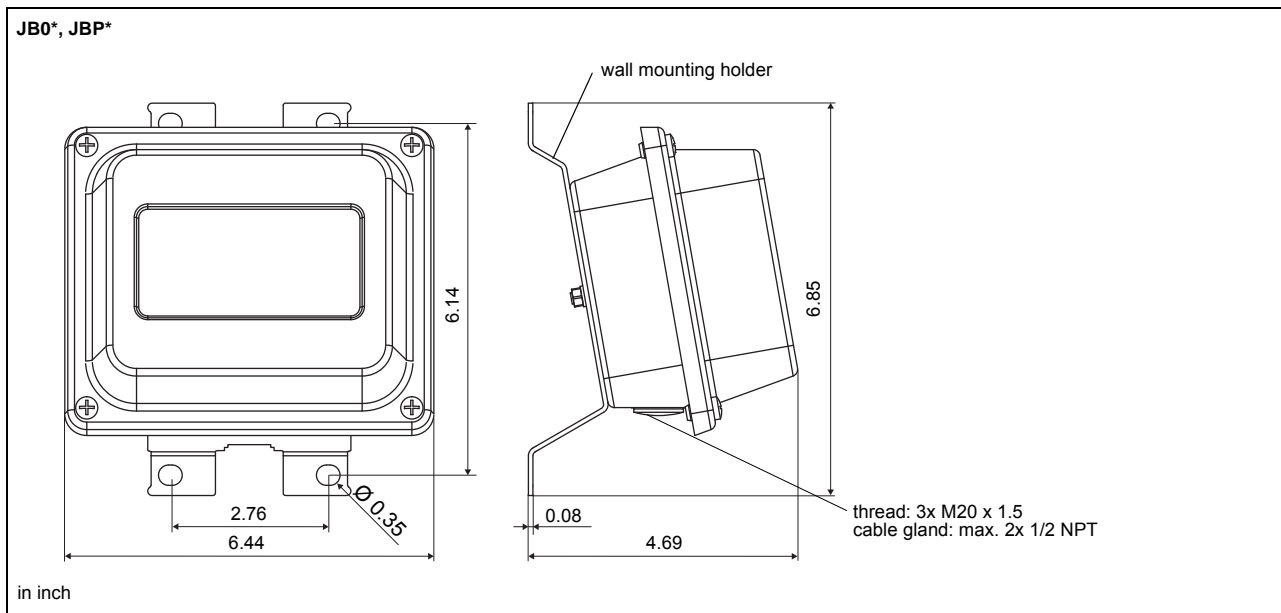


# Junction box

## Technical data

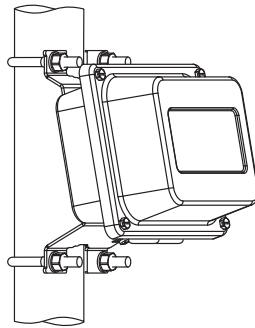
<b>JB04</b>																									
weight	lb 2.6 lb																								
fixation	wall mounting optional: 2" pipe mounting																								
<b>material</b>																									
housing	stainless steel 316L																								
gasket	silicone																								
degree of protection	IP67																								
<b>ambient temperature</b>																									
min.	°F -40																								
max.	°F +176																								
• <b>FM</b>																									
marking	 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ T6 Ta = -40...+60 °C																								
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>Connection</b></p>  </div> <div style="width: 45%;"> <p><b>Transducers</b></p> <table border="1"> <thead> <tr> <th></th> <th>terminal</th> <th>connection</th> <th>transducer</th> </tr> </thead> <tbody> <tr> <td></td> <td>XV</td> <td>SMB connector</td> <td>↑</td> </tr> <tr> <td></td> <td>XR</td> <td>SMB connector</td> <td>⤴</td> </tr> </tbody> </table> <p><b>Extension cable</b></p> <table border="1"> <thead> <tr> <th>terminal strip</th> <th>terminal</th> <th>connection</th> </tr> </thead> <tbody> <tr> <td rowspan="4">KL2</td> <td>TV</td> <td>signal</td> </tr> <tr> <td>TVS</td> <td>internal shield</td> </tr> <tr> <td>TRS</td> <td>internal shield</td> </tr> <tr> <td>TR</td> <td>signal</td> </tr> </tbody> </table> </div> </div>			terminal	connection	transducer		XV	SMB connector	↑		XR	SMB connector	⤴	terminal strip	terminal	connection	KL2	TV	signal	TVS	internal shield	TRS	internal shield	TR	signal
	terminal	connection	transducer																						
	XV	SMB connector	↑																						
	XR	SMB connector	⤴																						
terminal strip	terminal	connection																							
KL2	TV	signal																							
	TVS	internal shield																							
	TRS	internal shield																							
	TR	signal																							

## Dimensions



## 2" pipe mounting kit

JB\*\*



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

Subject to change without notification. Errors excepted.  
FLUXUS is a registered trademark of FLEXIM GmbH.

Copyright (©) FLEXIM GmbH 2019