

### FGR200 – Positive Displacement Flow Meter (Gear Flow Meter)

- ▶ High pressure rating
- ▶ Applicable to various viscous media
- ▶ High repeatability and accuracy
- ▶ Pulse / analog output selectable
- ▶ Wide measuring range



FGR200 positive displacement flow meter measures the flow on the volumetric principle, in which gearwheels is moved proportional to the flow rate. The movement of the gearwheels is measured through the enclosing housing wall by a sensor. No straight tap needed.

Immune to medium viscosity. Higher turndown ratio, accuracy, resolution and responsibility, as well as for measuring the very-low flow.

FGR200 flow meters are bi-directional and can be used to measure the cylinder position without damaging internal parts.

Assembled with journal bearings FGR200 can measure low or non-lubricating fluids, such as paints, glues, resin, sealant etc.

The FGR200 series of positive displacement flow meters have 8 measuring ranges from 0.006 ... 1L/min through 4.0 ... 450L/min. Optional pickoffs for pulse output, current analog output and voltage analog output.

#### Specifications

<b>Applicable Medium</b>	Liquids
<b>Accuracy</b> (at 30cst )	±0.5% of reading (turndown ratio of 1:10); ±1% of reading (measuring range)
<b>Repeatability</b>	±0.1% of reading
<b>Pressure Rating</b>	420bar (stainless steel); 100bar (aluminum)
<b>Ambient Temperature</b>	-40...85°C
<b>Medium Temperature</b>	-40...100°C (Max. 200°C for high temperature type)
<b>Materials</b>	
Body	316 stainless steel or aluminum
Gear	Stainless steel
Sealing	FPM ( NBR, PTFE optional)
Bearing	Stainless steel ball bearing Tungsten carbide journal bearing

#### Applications

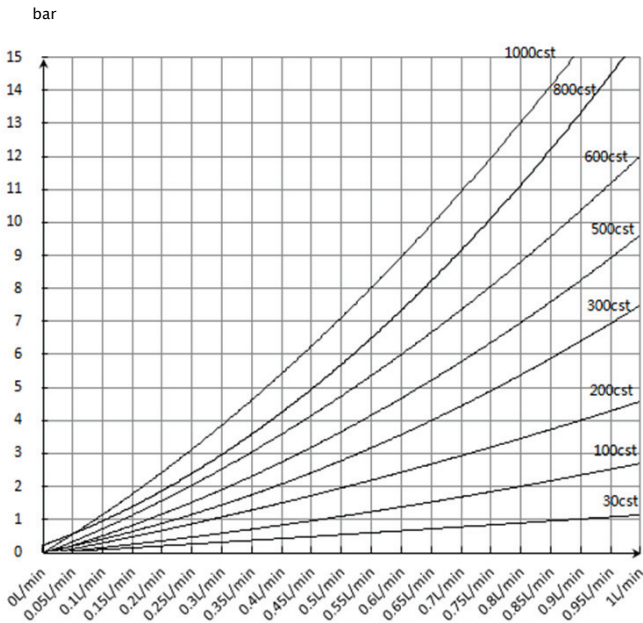
- ▶ Printing ink measurement
- ▶ Resin/glue/silica gel measurement
- ▶ Hydraulic oil/lubricating oil/grease measurement
- ▶ Cooling liquid measurement
- ▶ Solvent measurement
- ▶ Fuel oil measurement
- ▶ Polyurethane measurement
- ▶ Braking fluid measurement
- ▶ Cylinder position measurement

#### Parameter Table

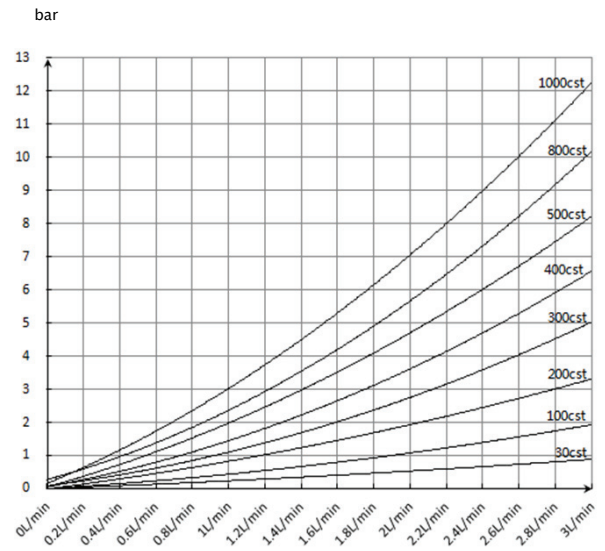
Parameter of Meter	Measuring Range (L/Min)	K Coefficient (IMPULSE/L)	Max. Pressure Rating (bar)		Connection BSP/NPT	Max. Filter Diameter (micron)	
			316 Steel	Aluminum		Journal Bearing	Ball Bearing
FGR200...1L	0.006—1.0	40000	420	100	G1/8 or NPT1/8	120	30
FGR200...3L	0.02—3.0	13500	420	100	G1/4 or NPT1/4	120	30
FGR200...7.5L	0.05—7.5	4200	420	100	G1/4 or NPT1/4	120	30
FGR200...25L	0.2—25	1400	420	100	G1/2 or NPT1/2	120	30
FGR200...75L	0.5—75.0	450	420	100	G3/4 or NPT3/4	175	30
FGR200...150L	1.5—150.0	190	420	100	G1 or NPT1	300	200
FGR200...225L	2.0—225.0	110	420	100	G1-1/4 or NPT1-1/4	300	200
FGR200...450L	4.0—450.0	55	420	100	G1-1/4 or NPT1-1/4	300	200

Pressure Loss / Viscosity / Flow Rate

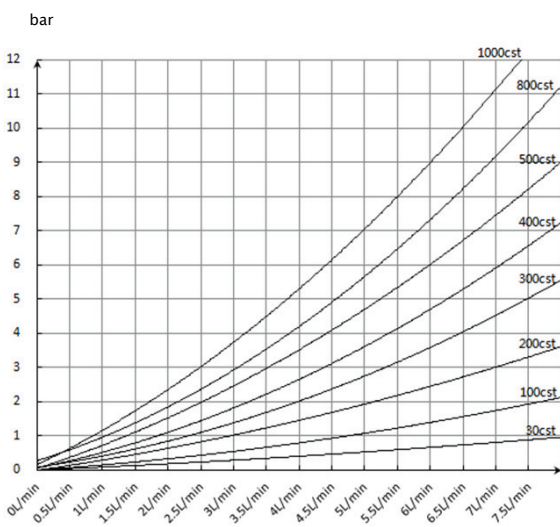
**FGR200...001**



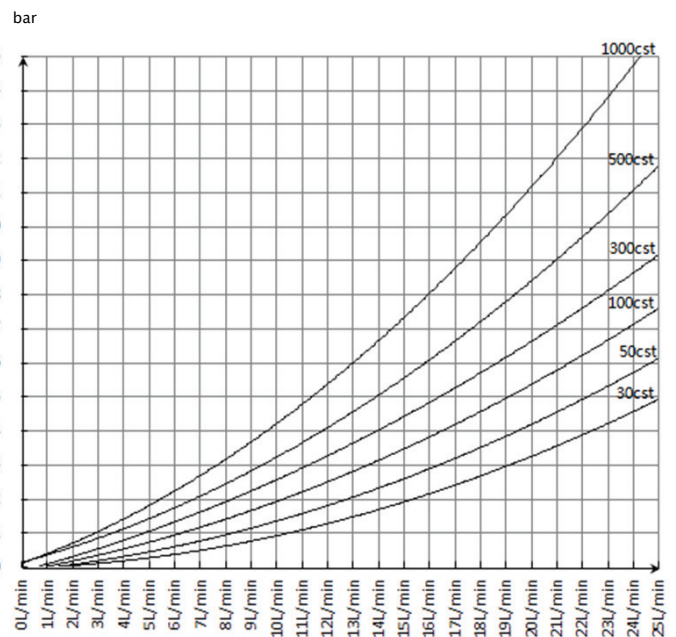
**FGR200...003**



**FGR200...007.5**

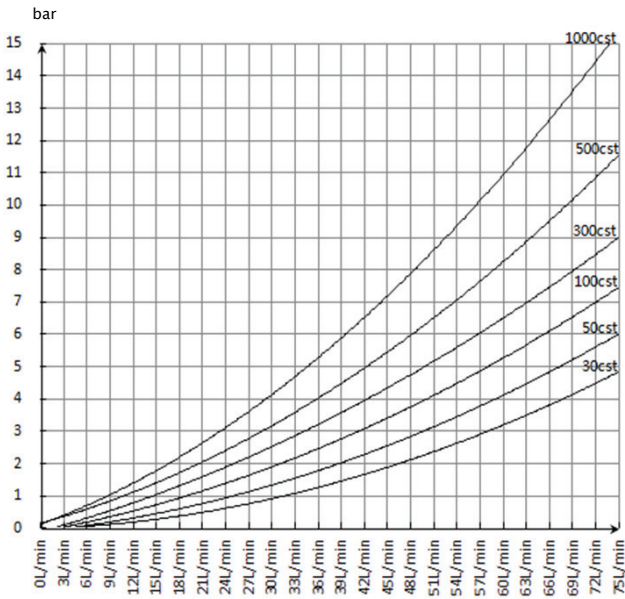


**FGR200...025**

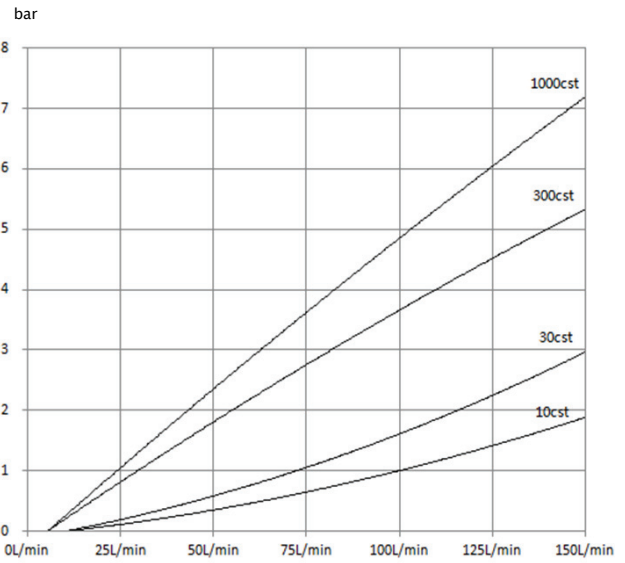


### Pressure Loss / Viscosity / Flow Rate

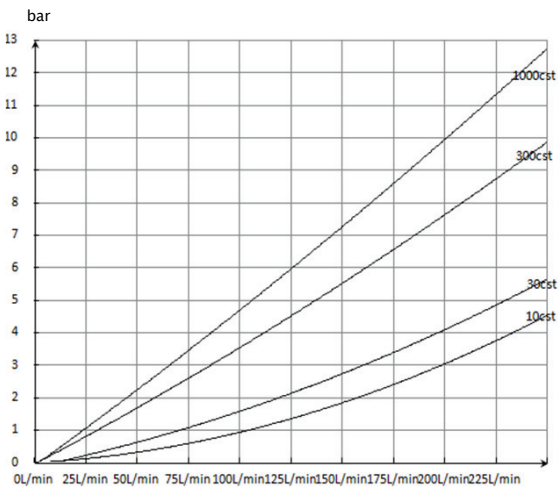
FGR200...075



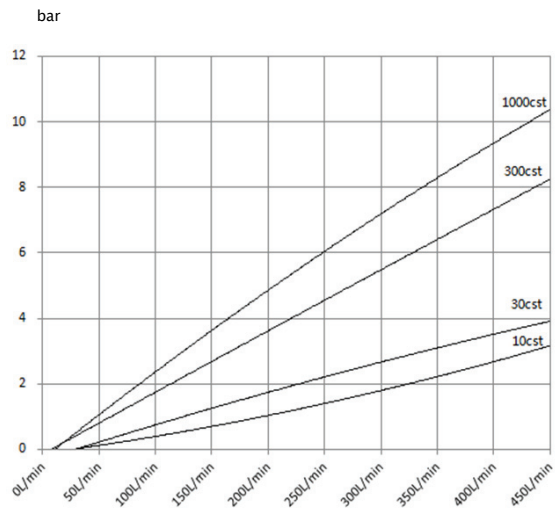
FGR200...150



FGR200...225



FGR200...450



### Electronics

FGR200 series assembled with below pickoffs:

#### GS – Single hall effect pickoff with pulse output amplifier



<b>Power Supply</b>	12...30VDC
<b>Current Consumption</b>	8mA
<b>Outputs</b>	NPN OC output; NPN OC output+pull-up resistor
<b>Reverse Polarity Proof</b>	Yes
<b>Short-circuit Proof</b>	Yes
<b>Operating Temperature</b>	-40...120°C
<b>Ambient Temperature</b>	-40...85°C
<b>Electrical Connection</b>	M12x1 plug
	DIN43650-A plug (solenoid plug)
<b>Protection Class</b>	M12X1 plug: IP67
	DIN43650-A plug: IP65

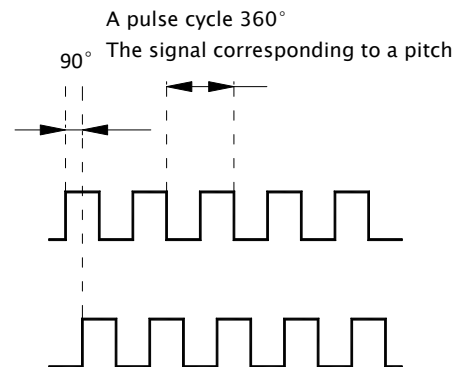
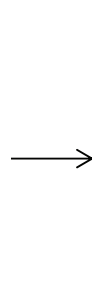
#### GH – Single high temperature hall effect pickoff with pulse output amplifier

<b>Ambient Temperature</b>	-40...85°C
<b>Operating Temperature</b>	-40...200°C
<b>Other parameters please refer to the above</b>	

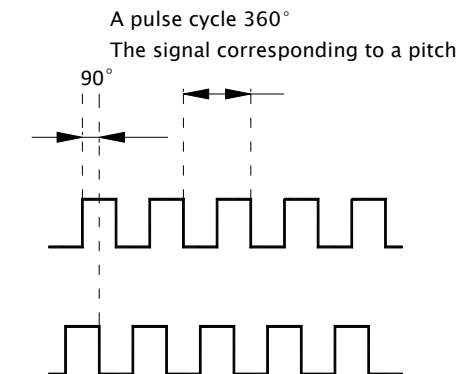
#### GD – Dual hall effect pickoffs with pulse output amplifiers

##### GDH – Dual high temperature hall effect pickoffs with pulse output amplifiers

Direction 1: Output 1 is rising 90° ahead of output 2.



Direction 2: Output 1 is rising 90° behind output 2.



**AS – Hall effect pickoff with analog output amplifier**

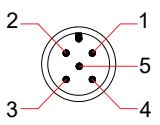
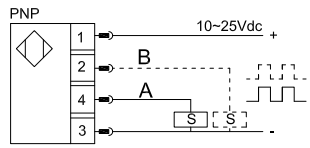
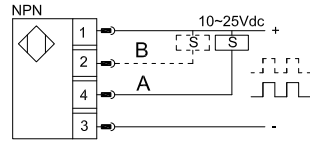
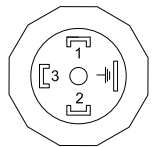
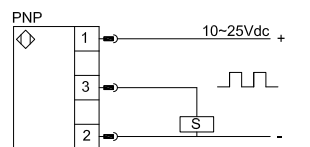
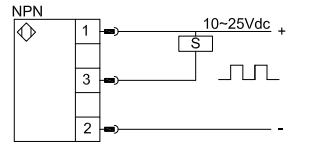


<b>Power Supply</b>	12...30VDC
<b>Current Consumption</b>	Voltage analog output: 7mA
	Current analog output: <12mA
<b>Outputs</b>	0...10V
	3-wire (0) 4...20mA
<b>Reverse Polarity Proof</b>	Yes
<b>Short-circuit Proof</b>	Yes
<b>Operating Temperature</b>	-40...120°C
<b>Ambient Temperature</b>	-40...85°C
<b>Electrical Connection</b>	M12x1 plug
	DIN43650-A plug (solenoid plug)
<b>Protection Class</b>	M12X1 plug: IP67
	DIN43650-A plug: IP65

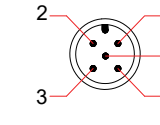
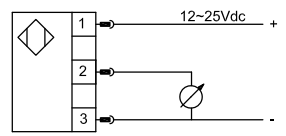
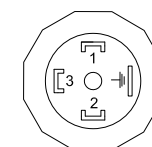
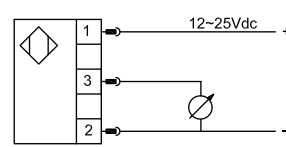
**AH – High temperature hall effect pickoff with analog output amplifier**

<b>Ambient Temperature</b>	-40...85°C
<b>Operating Temperature</b>	-40...200°C
<b>Other parameters please refer to the above</b>	

**Wiring 1 – Pulse Output**

Wiring	PNP output	NPN output												
 <table border="1"> <thead> <tr> <th>Signal</th> <th>Plug</th> <th>Cable</th> </tr> </thead> <tbody> <tr> <td>U+</td> <td>1</td> <td>Brown</td> </tr> <tr> <td>Pulse</td> <td>4</td> <td>Black</td> </tr> <tr> <td>U-</td> <td>3</td> <td>Blue</td> </tr> </tbody> </table> <p>M12x1 Plug</p>	Signal	Plug	Cable	U+	1	Brown	Pulse	4	Black	U-	3	Blue		
Signal	Plug	Cable												
U+	1	Brown												
Pulse	4	Black												
U-	3	Blue												
 <table border="1"> <thead> <tr> <th>Signal</th> <th>Plug</th> </tr> </thead> <tbody> <tr> <td>U+</td> <td>1</td> </tr> <tr> <td>Pulse</td> <td>3</td> </tr> <tr> <td>U-</td> <td>2</td> </tr> </tbody> </table> <p>Solenoid Plug</p>	Signal	Plug	U+	1	Pulse	3	U-	2						
Signal	Plug													
U+	1													
Pulse	3													
U-	2													

**Wiring 2 – Analog Output : 3-wiring 4...20mA/0...10V**

Wiring	4...20mA/0...10V ( 3-wire)												
 <table border="1"> <thead> <tr> <th>Signal</th> <th>Plug</th> <th>Cable</th> </tr> </thead> <tbody> <tr> <td>U+</td> <td>1</td> <td>Brown</td> </tr> <tr> <td>output</td> <td>2</td> <td>White</td> </tr> <tr> <td>U-</td> <td>3</td> <td>Blue</td> </tr> </tbody> </table> <p>M12x1 Plug</p>	Signal	Plug	Cable	U+	1	Brown	output	2	White	U-	3	Blue	
Signal	Plug	Cable											
U+	1	Brown											
output	2	White											
U-	3	Blue											
 <table border="1"> <thead> <tr> <th>Signal</th> <th>Plug</th> </tr> </thead> <tbody> <tr> <td>U+</td> <td>1</td> </tr> <tr> <td>output</td> <td>3</td> </tr> <tr> <td>U-</td> <td>2</td> </tr> </tbody> </table> <p>Solenoid Plug</p>	Signal	Plug	U+	1	output	3	U-	2					
Signal	Plug												
U+	1												
output	3												
U-	2												

**DWEG – Smart control unit with hall effect pickoff**



<b>Power Supply (Us)</b>	12...30Vdc
<b>Current Consumption</b>	<20mA
<b>Switching Output</b>	
Output	Push-pull (compatible with PNP / NPN)
Current	500mA(power supply 24Vdc)
<b>Current Analog Output</b>	
Output	3/2-wire 4...20mA programable
Load RA (Ω)	$RA \leq (Us - 10) / 0.02$
Linearity	$\leq \pm 0.5\%$ of reading
<b>Voltage Analog Output</b>	
Output	3-wire 0...5V/1...5V programable
Load RA (Ω)	$RA \geq 5K\Omega$
Linearity	$\leq \pm 0.5\%$ of reading
<b>Accuracy</b>	$\leq \pm 0.5\%$ of reading
<b>Temperature</b>	
Operating Temperature	-40...120°C
Ambient/Storage	-40...85°C
<b>Display</b>	8mm height, red 4-digit LED
<b>Material</b>	
Display Head	304 stainless steel (316L customized) + PP
Housing	304 stainless steel (316L customized)
<b>Protection Class</b>	IP67
<b>Electrical Connection</b>	M12×1 plug

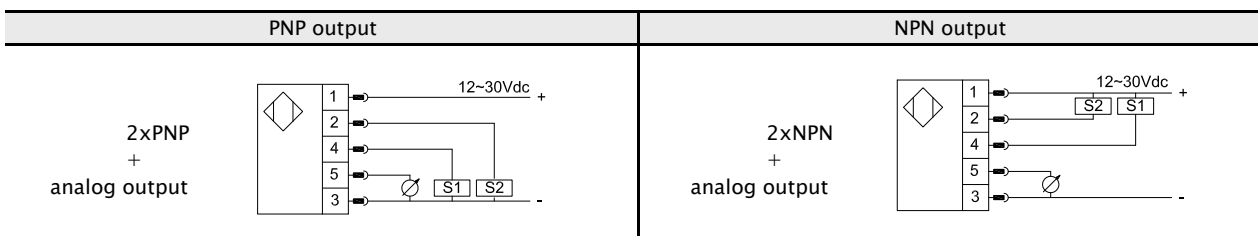
**DWEGH – Smart control unit with high temperature hall effect pickoff**

<b>Ambient Temperature</b>	-40...85°C
<b>Operating Temperature</b>	-40...200°C
<b>Other parameters please refer to the above</b>	

**DWEGD – Smart control unit with dual hall effect pickoffs (recognition of flow direction)**

**DWEGDH – Smart control unit with dual high temperature hall effect pickoffs (recognition of flow direction, for details please refer to GD)**

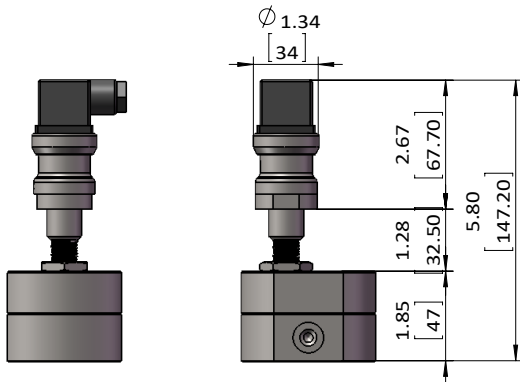
**Wiring**



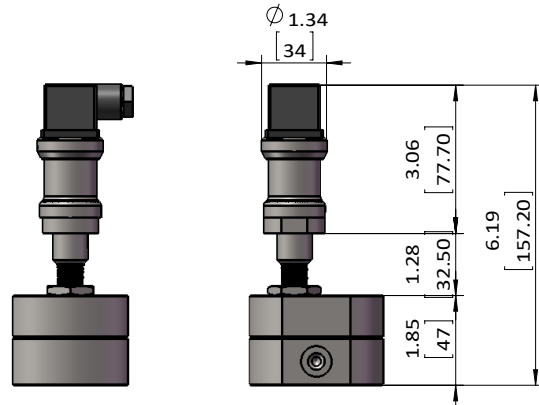
Dimensions in inches (mm) FGR200 ... 1L

FLOW

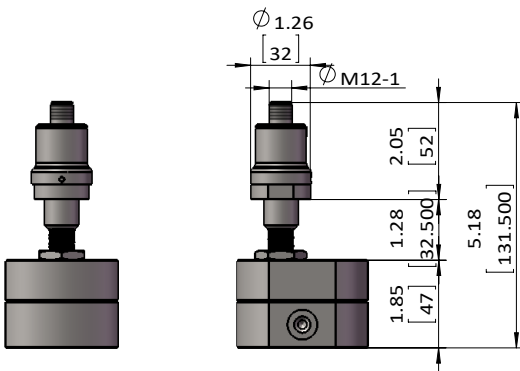
DIN43650-A plug for pulse output



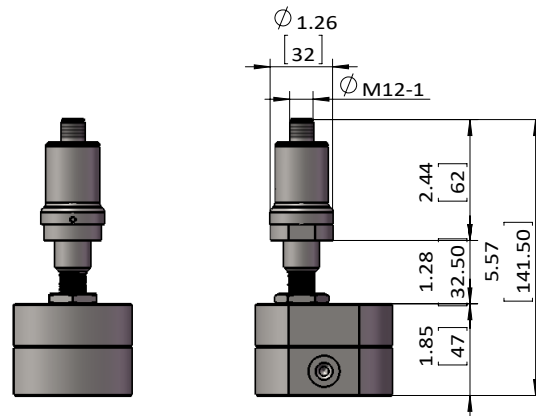
DIN43650-A plug for analog output



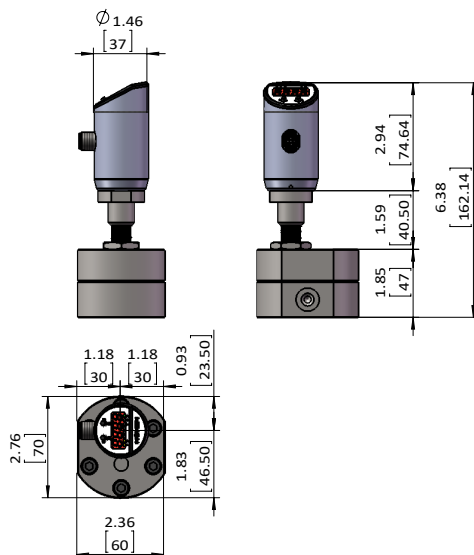
M12X1 plug for pulse output



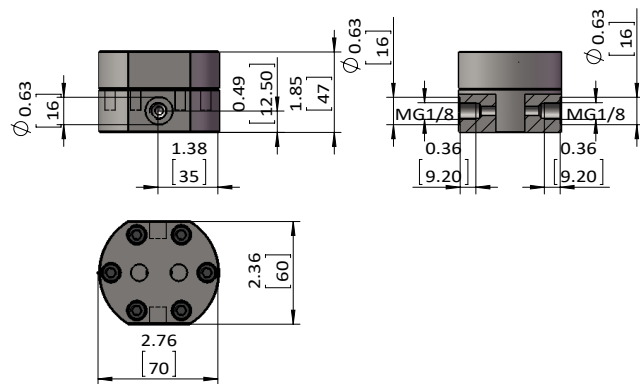
M12X1 plug for analog output



Smart control unit

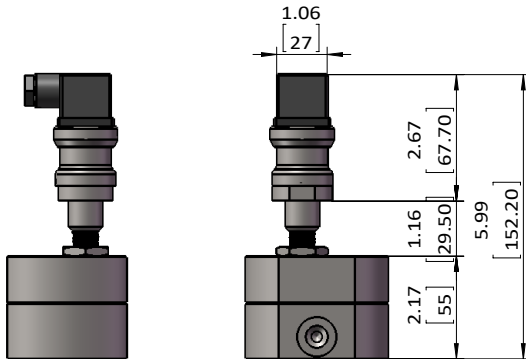


Body sizes

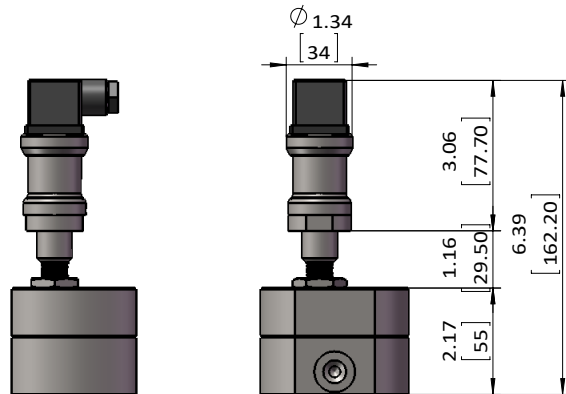


Dimensions in inches (mm) FGR200 ... 3L

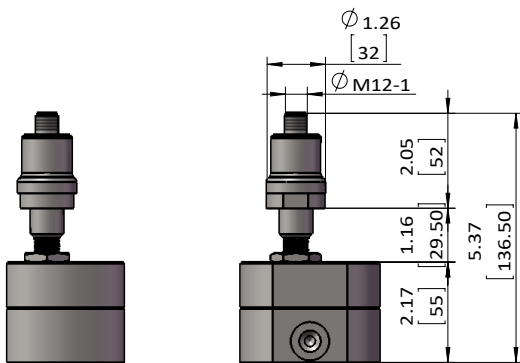
DIN43650-A plug for pulse output



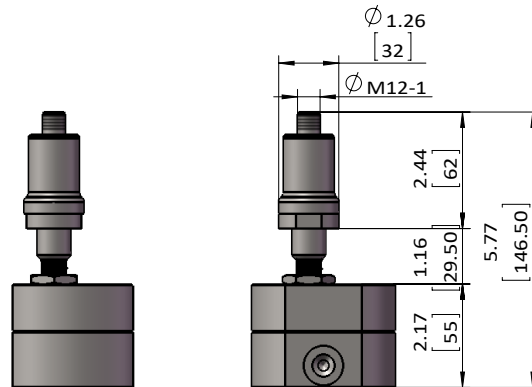
DIN43650-A plug for analog output



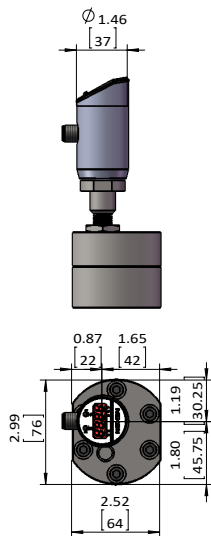
M12X1 plug for pulse output



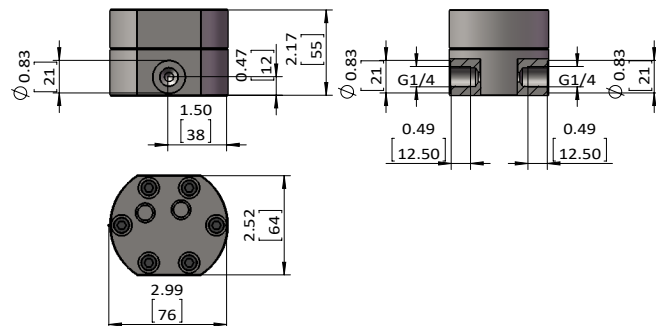
M12X1 plug for analog output



Smart control unit



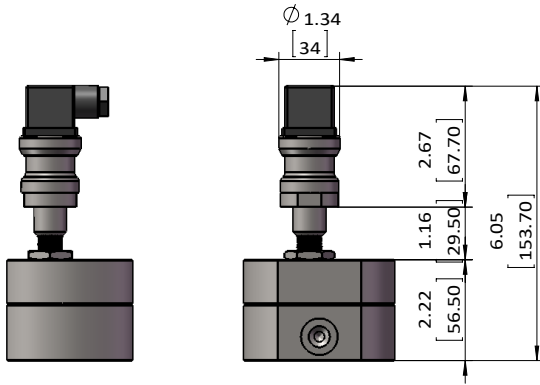
Body sizes



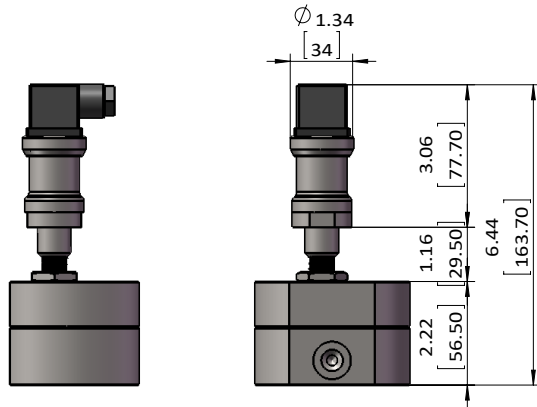


Dimensions in inches (mm) FGR200 ... 7.5L

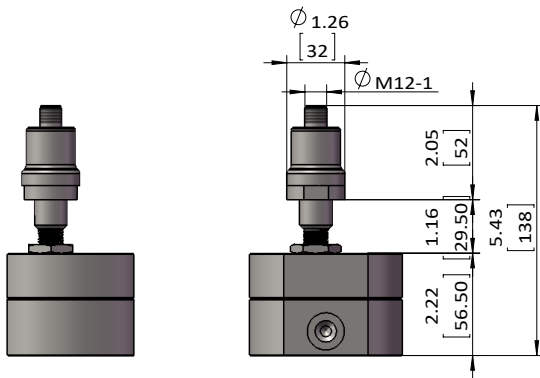
DIN43650-A plug for pulse output



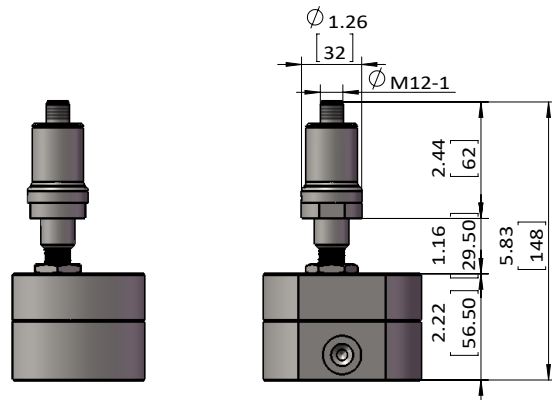
DIN43650-A plug for analog output



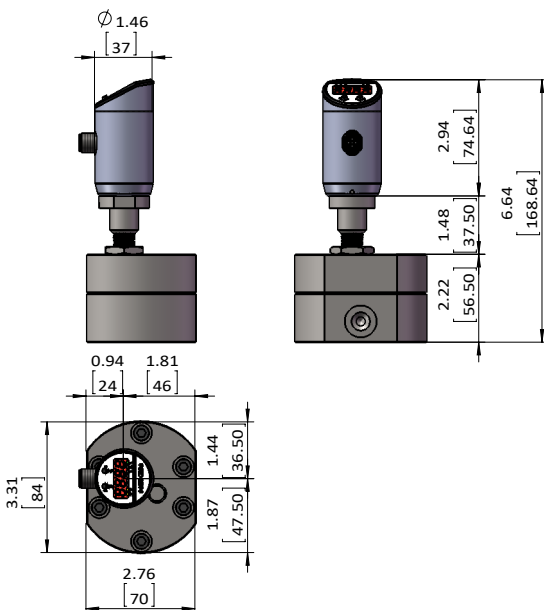
M12X1 plug for pulse output



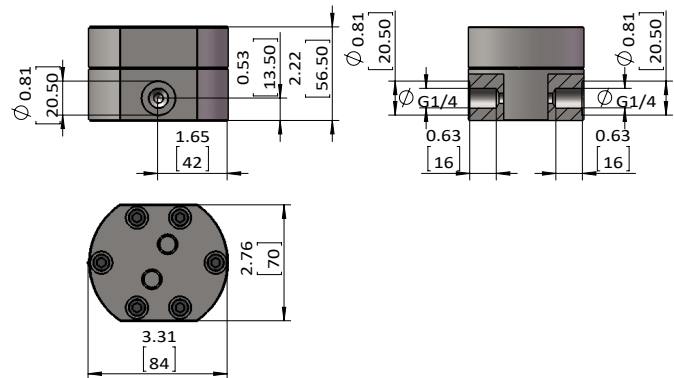
M12X1 plug for analog output



Smart control unit

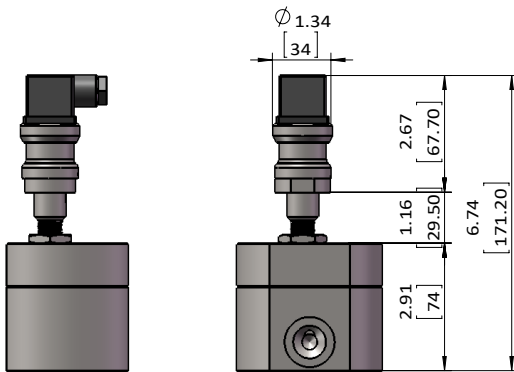


Body sizes

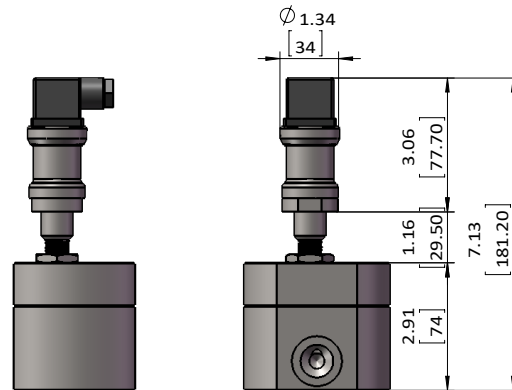


Dimensions in inches (mm) FGR200 ... 25L

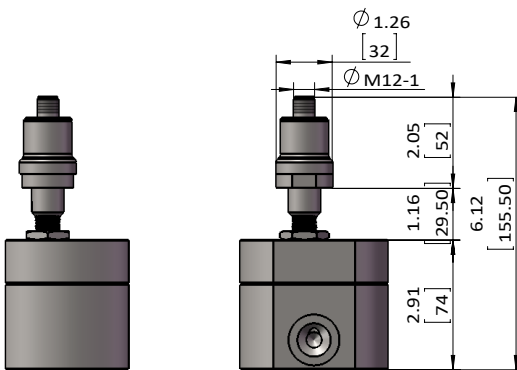
DIN43650-A plug for pulse output



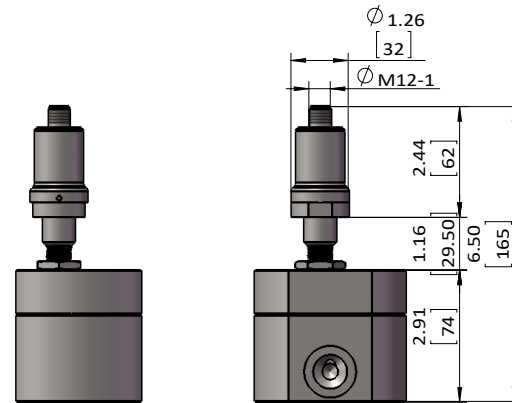
DIN43650-A plug for analog output



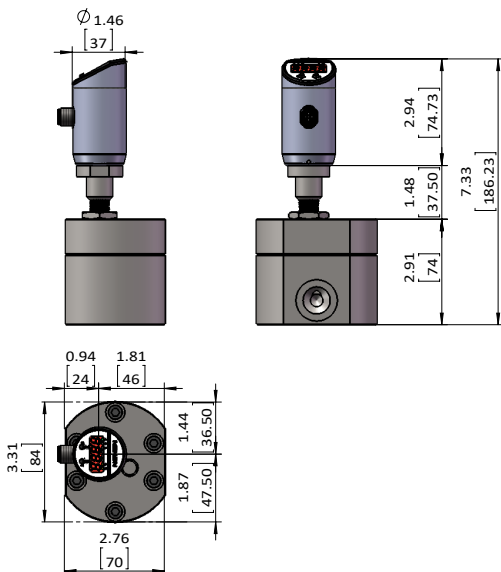
M12X1 plug for pulse output



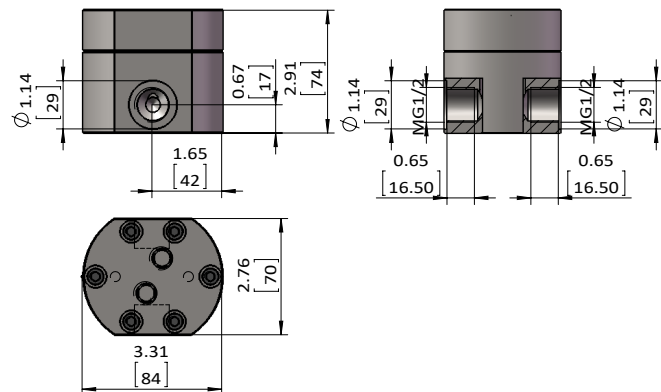
M12X1 plug for analog output



Smart control unit

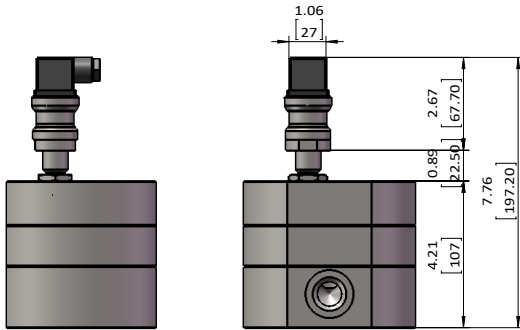


Body sizes

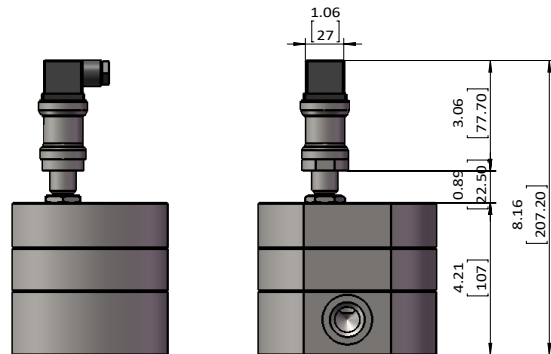


Dimensions in inches (mm) FGR200 ... 75L

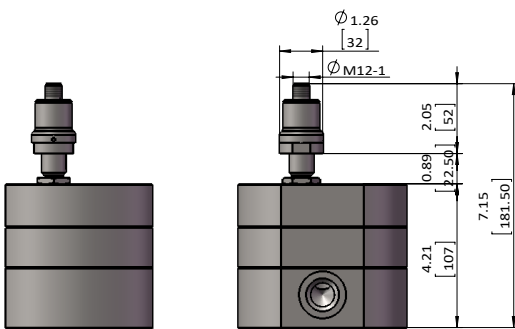
DIN43650-A plug for pulse output



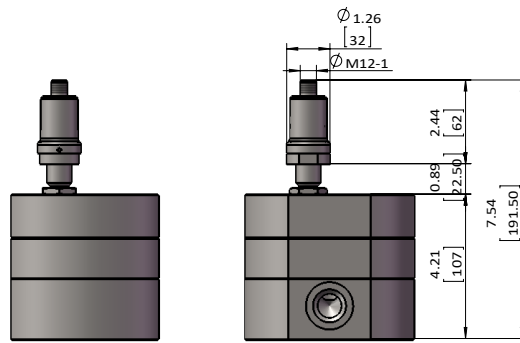
DIN43650-A plug for analog output



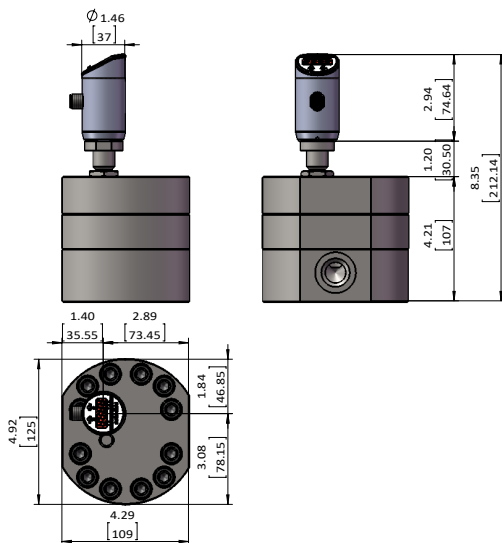
M12X1 plug for pulse output



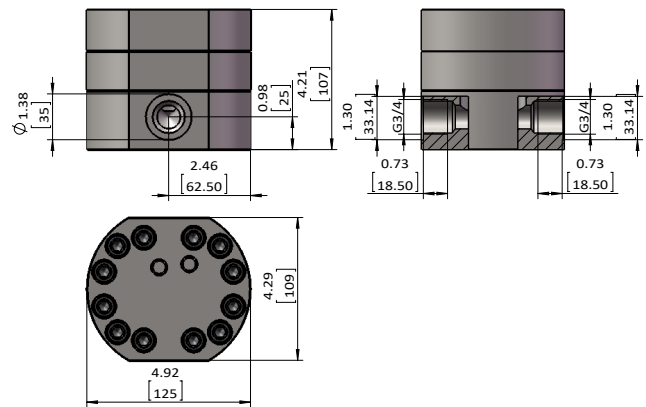
M12X1 plug for analog output



Smart control unit

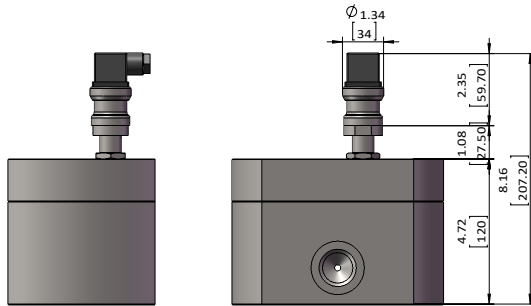


Body sizes

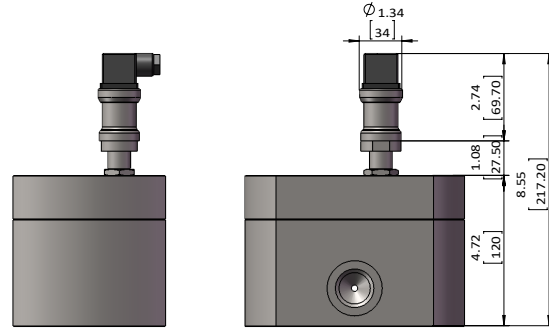


Dimensions in inches (mm) FGR200 ... 150L

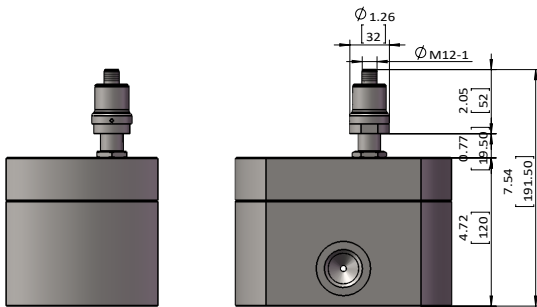
DIN43650-A plug for pulse output



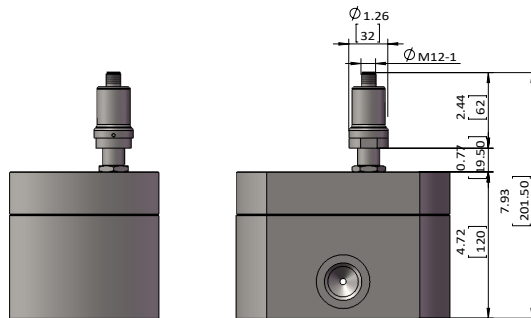
DIN43650-A plug for analog output



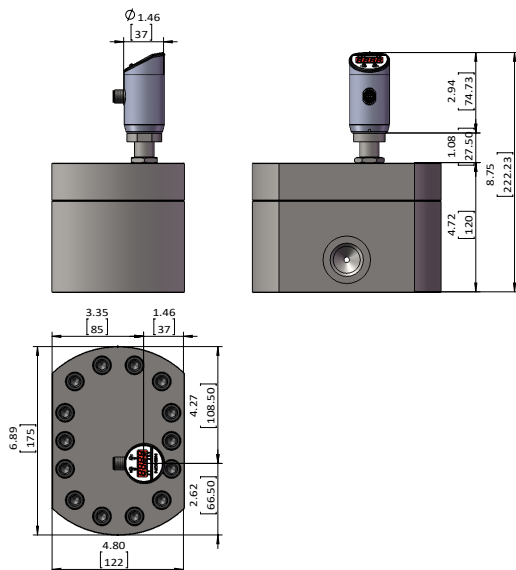
M12X1 plug for pulse output



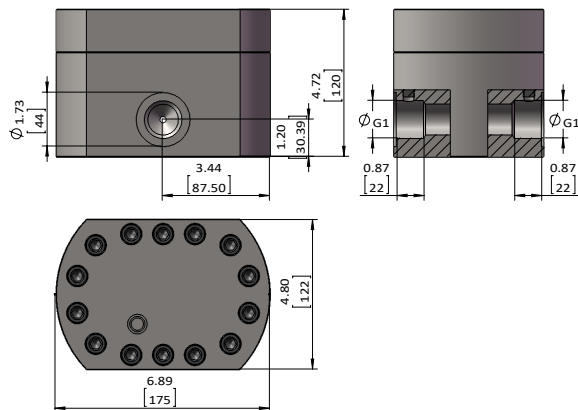
M12X1 plug for analog output



Smart control unit

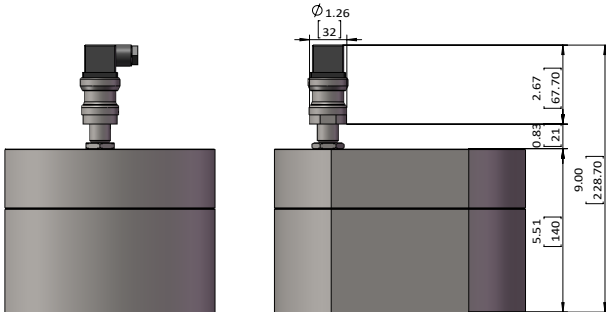


Body sizes

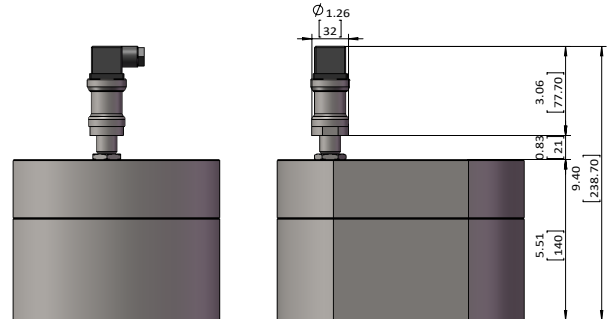


Dimensions in inches (mm) FGR200 ... 225L

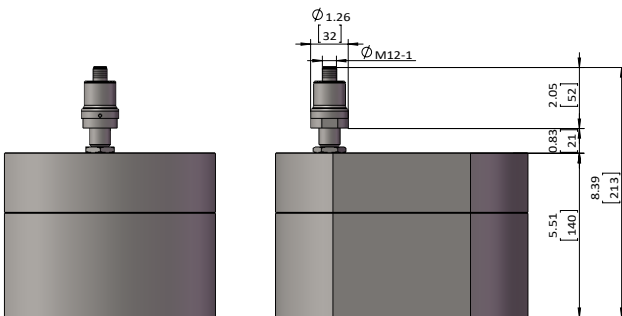
DIN43650-A plug for pulse output



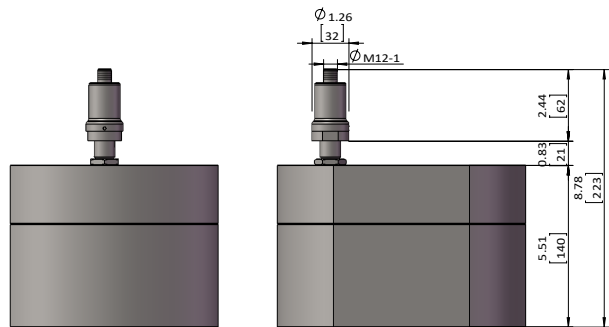
DIN43650-A plug for analog output



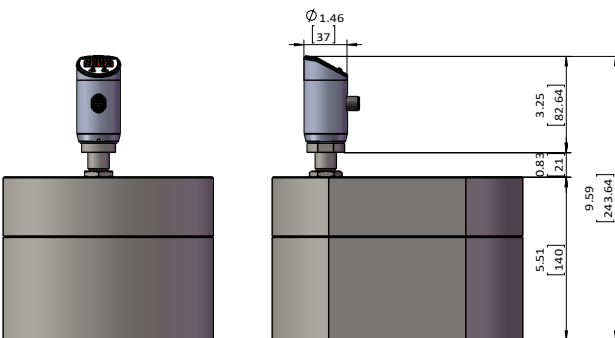
M12X1 plug for pulse output



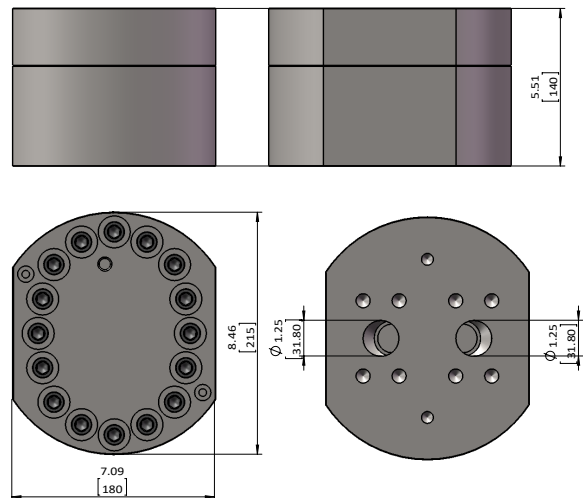
M12X1 plug for analog output



Smart control unit

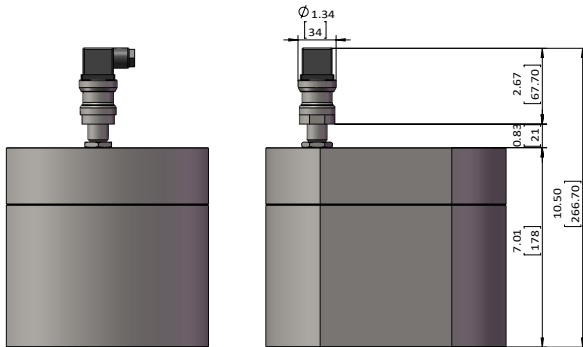


Body sizes

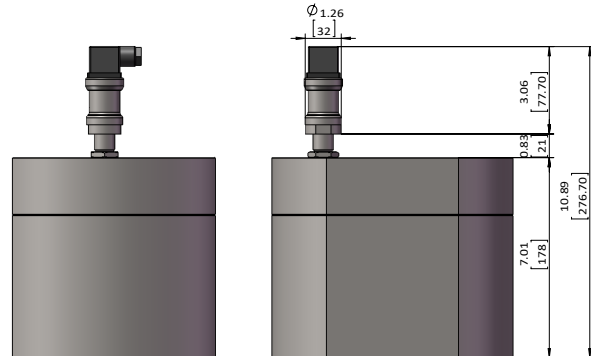


Dimensions in inches (mm) FGR200 ... 450L

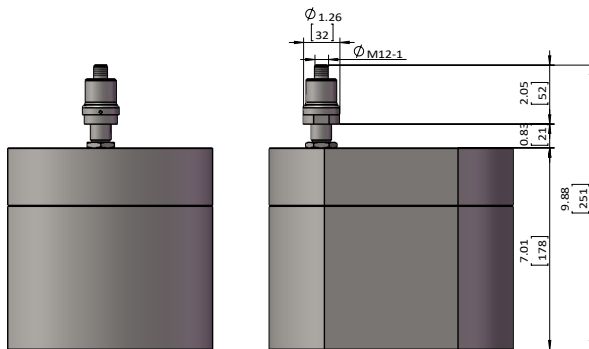
**DIN43650-A plug for pulse output**



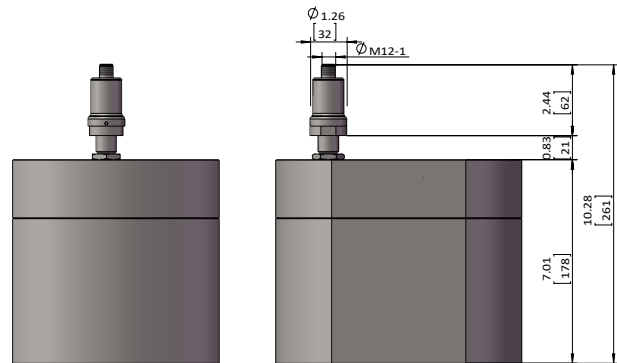
**DIN43650-A plug for analog output**



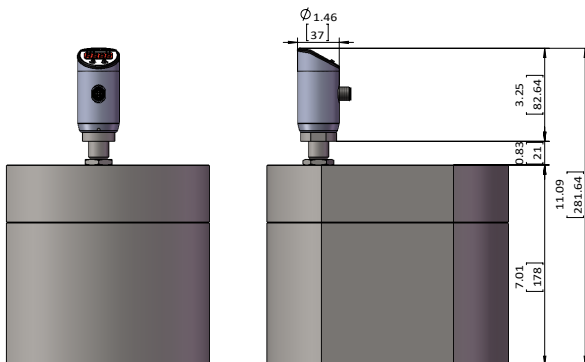
**M12X1 plug for pulse output**



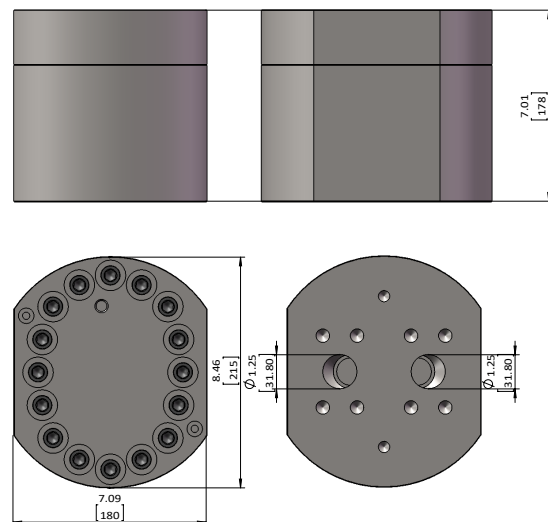
**M12X1 plug for analog output**



**Smart control unit**



**Body sizes**



Order Code

FLOW

**FGR200 :** Positive displacement flow meter (Gear flow meter)

**Process connection**

- G1/4 :** Thread size G1/4 (corresponding measuring range 1L/ 3L/7.5L)
- G1/2 :** Thread size G1/2 (corresponding measuring range 25L)
- G3/4 :** Thread size G3/4 (corresponding measuring range 75L)
- G1 :** Thread size G1 (corresponding measuring range 150L)
- G1-1/4 :** Thread size G1-1/4 (corresponding measuring range 225L/450L)
- NPT1/4 :** Thread size NPT1/4 (corresponding measuring range 1L/ 3L/7.5L)
- NPT1/2 :** Thread size NPT1/2 (corresponding measuring range 25L)
- NPT3/4 :** Thread size NPT3/4 (corresponding measuring range 75L)
- NPT1 :** Thread size NPT1 (corresponding measuring range 150L)
- NPT1-1/4 :** Thread size NPT1-1/4 (corresponding measuring range 225L/450L)

**Body material**

- S :** 316 stainless steel
- A :** Aluminum

**Bearing**

- BB :** Stainless steel ball bearing
- TC :** Tungsten carbide journal bearing

<b>FGR200</b>	<b>G1/4</b>	<b>S</b>	<b>BB</b>	<b>N</b>	<b>7.5L</b>	<b>DWEG</b>	<b>A420</b>	<b>H</b>
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**Sealing material**

- F :** FPM
- N :** NBR
- T :** PTFE

**Measuring range** (see technical data for details)

- |                             |                              |
|-----------------------------|------------------------------|
| <b>1L :</b> 0.006—1L/min    | <b>75L :</b> 0.5—75.0L/min   |
| <b>3L :</b> 0.02—3.0L/min   | <b>150L :</b> 1.5—150L/min   |
| <b>7.5L :</b> 0.05—7.5L/min | <b>225L :</b> 2.0—225.0L/min |
| <b>25L :</b> 0.2—25L/min    | <b>450L :</b> 4.0—450.0L/min |

**Pickoffs type** (see technical data for details)

- GS :** Single hall effect pickoff with pulse output amplifier
- GH :** Single high temperature hall effect pickoff with pulse output amplifier
- GD :** Dual hall effect pickoffs with pulse output amplifiers  
(recognition of flow direction)
- GDH :** Dual high temperature hall effect pickoffs with pulse output amplifiers  
(recognition of flow direction)
- AS :** Hall effect pickoff with analog output amplifier
- AH :** High temperature hall effect pickoff with analog output amplifier
- DWEG :** Smart control unit with hall effect pickoff
- DWEGH :** Smart control unit with high temperature hall effect pickoff
- DWEGD :** Smart control unit with dual hall effect pickoffs (recognition of flow direction)
- DWEGDH :** Smart control unit with dual high temperature hall effect pickoffs  
(recognition of flow direction)

**Outputs**

- |                        |                       |
|------------------------|-----------------------|
| <b>- :</b> Pulse       | <b>V005 :</b> 0...5V  |
| <b>A020 :</b> 0...20mA | <b>V105 :</b> 1...5V  |
| <b>A420 :</b> 4...20mA | <b>V010 :</b> 0...10V |

**Electrical connection**

- H :** DIN43650-A plug (unavailable for DWE series)
- S :** M12X1 plug

### Electronic Evaluation Units

#### MST300 – Ratemeter, totalizer



- ▶ Case dimensions 72 x 36 x 97 mm
- ▶ 6-digit LED display
- ▶ Flow meter/totalizer
- ▶ Flow rate/total flow display
- ▶ 1 pulse input
- ▶ 1 relay (or OC) output
- ▶ Power supply output 24V DC
- ▶ RS-485 / Modbus RTU

#### MST200 – Ratemeter, batcher, totalizer



- ▶ Case dimensions 96 x 48 x 100 mm
- ▶ 6-digit LED display
- ▶ Flow meter/totalizer/batcher
- ▶ Flow rate/total flow display
- ▶ 1 pulse counting input + 3 control inputs
- ▶ 0/2 or 4 REL / OC outputs
- ▶ Analog output optional
- ▶ Power supply output 24V DC
- ▶ RS-485 / Modbus RTU

#### MST100 – Ratemeter, batcher, totalizer



- ▶ Protection class IP67
- ▶ Case dimensions 110 x 80 x 67mm
- ▶ 6-digit LED display
- ▶ Flow meter/totalizer/batcher
- ▶ Flow rate/total flow display
- ▶ 1 pulse counting input + 3 control inputs
- ▶ 0/2 or 4 REL / OC outputs
- ▶ Analog output optional
- ▶ Power supply output 24V DC
- ▶ RS-485 / Modbus RTU

#### MCN100 – Controller, Recorder



- ▶ Max. 72 inputs with the flow/temperature /pressure/level
- ▶ Optional outputs with 24 analog outputs /72 SSR outputs
- ▶ Data recording and display
- ▶ Case dimensions 144X144X100
- ▶ Communication interfaces: RS-485/Modbus RTU, USB, Earthnet 10MB, enhanced ACM version
- ▶ 5.7" , TFT color graphic display with Touch-panel, 320X240 pixels
- ▶ Recording speed: from 0.1s upto 24h, resolution 0.1s
- ▶ Memory capacity: 1.5 GB
- ▶ Free configuration software