F111.HT.01 Turbine Flow Sensor for Hot Tap Installation

INSTRUCTION MANUAL

EN 10-11

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1. Introduction

CAUTION

1.1. Safety Instructions

General Statements

- The sensor F111.HT.01 has only been designed to measure the flow of liquids.
- Do not install and service the sensor without following the Instruction Manual.
- This sensor is designed to be connected to other instruments which can be hazardous if used improperly. Read and follow all associated instrument manuals before using with this sensor.
- Sensor installation and wiring connections should only be performed by qualified staff.
- Do not modify product construction.

Installation and Commissioning Statements

- Remove power to the sensor before wiring any connection.
- Remove pressure from the pipe if an hot-tap installation adapter is NOT used.
- Do not exceed maximum temperature/pressure data.
- For hot tap installation the pressure limitations are related to the minimum maximum value of the used components (like saddles or valves).
- To clean the sensor, use only chemical compatible products.

1.2. Unpacking

Please verify the product is complete and without any damage. The package should include:

- A steel tube rod with flow sensor integrated
- A steel joint for screwing the sensor to the saddle
- A safety chain
- An instruction manual

2. Description

The new turbine flow sensor F111.HT.01 is designed for use with every kind of solid –free liquids. The sensor can measure flow from 0.08 m/s (0.26 ft/s) producing a frequency output signal highly repeatable. A stainless steel rugged construction and a proven technology guarantee exceptional performances with little or no maintenance required.
The electronic is entirely encapsulated in epoxy resin which ensures that the instrument is suitable for corrosive or high humidity atmospheres.
The sensor can be assembled in pressurised pipes using a proper fitting (clamp saddle or weld-on adapter with valve enclosed).

2.1. Main Features

- Adjustable sensor position
- Stainless Steel construction with insertion turbine technology
- PVDF turbine with ceramic shaft and bearings
- Wet-tap installation
- Pressure intake
- Suitable for assembling on a wide range of wet-tap clamp saddles with 1 1/4” GAS branch
- Safety chain
- Compatible with most data logger on the market

2.2. Technical Data

General

Flow Rate Range: 0.08 to 8 m/s (0.26 to 4.9 ft./s)
Linearity: ± 0.75 % of full scale
Repeatability: ± 0.5 % of full scale
Pipe Size Range: DN 50 to DN 1200 (2” to 48”), for sizes bigger than DN 600 (24”) contact the factory
Minimum Reynolds Number Required: 4500
Enclosure: IP68
Max. operating pressure/temperature: 20 bar (290 psi) @ 80°C (176°F)
Wetted Materials:
Sensor Body: 304 SS
O-rings: EPDM or FPM
Turbine: PVDF
Shaft: Ceramic (Al_2O_3)
Bearings: Ceramic (Al_2O_3)
measuring rod: 304 SS
fixing joint: 304 SS
Pressure intake: quick connection 1/4”
Thread of the fixing joint to the saddle: GAS 1 1/4”

Electrical

Supply voltage: 5 to 24 VDC ±10% regulated
Supply current: < 30 mA @ 24 VDC
Output signal: square wave
Output frequency: 20 Hz/ms nominal
Output type: transistor NPN open collector
Output current: 10 mA max.
Cable length: 8 m (26.4 ft) standard, 100 m (330 ft) maximum

Standards & Approvals

Manufactured under ISO 9001 (Quality)
Manufactured under ISO 14000 (Environmental Management)
CE

3. Installation

3.1. Location

Different pipe configurations and obstacles in the flow line such as valves, elbows, pipe bends and strainers create variations on the flow profile.
Whenever possible follow the EN ISO 5167-1 installation recommendations to locate the sensor.

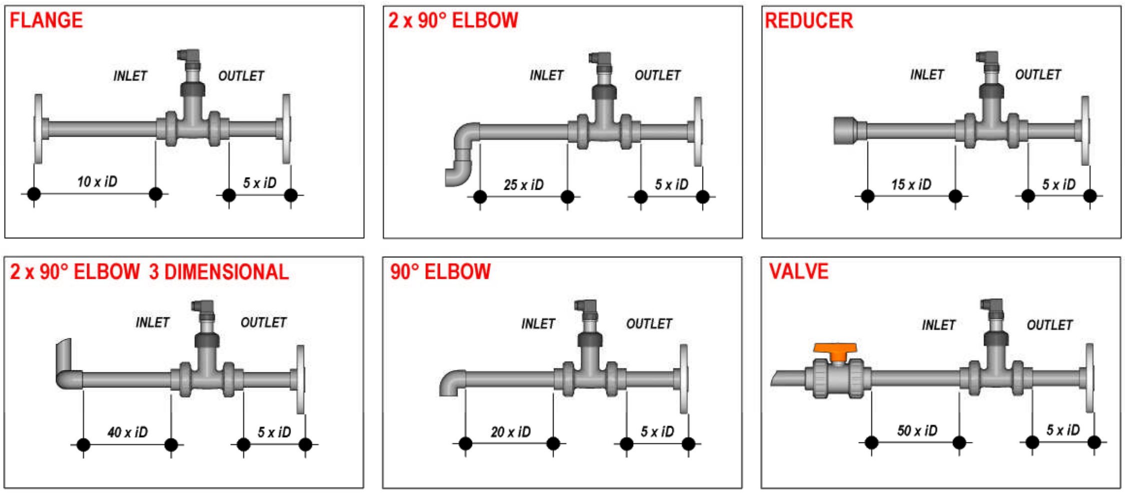
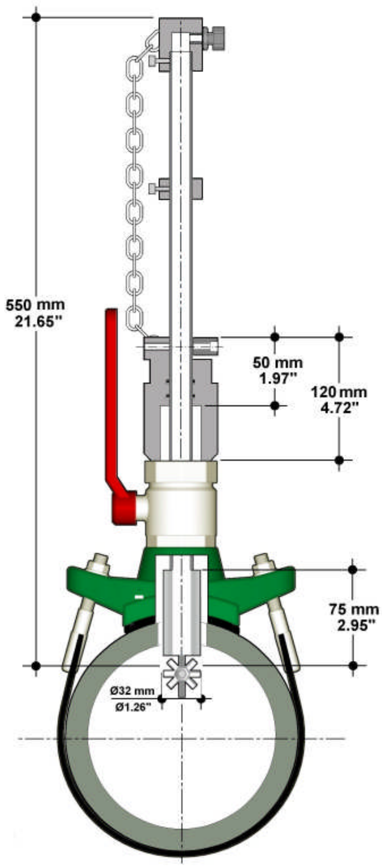


Fig 1

Always maximize distance between flow sensor and pump.

3.2. Dimensions



3.3. Set the sensor to work

The assembly and set to work of the instrument are carried out by two simple steps that allow a quick and precise installation:

1. **INSTALLATION OF THE SENSOR ON THE WET-TAP CLAMP SADDLE**
2. **VERTICAL POSITIONING OF THE SENSOR INTO THE PIPE**

Warning: the FLS F111.HT.01 allows installation into pressurised pipes without system shutdown; we recommend to pay maximum attention when screwing the clamping bolts of the measuring rod. The rod is pushed upwards by the internal pressure, for this reason not work up the rob.

Note: lubricate the steel rod to reduce frictions with the O-rings. This will help the installation, measurement and positioning operations.

1. INSTALLATION OF THE SENSOR ON THE WET-TAP CLAMP SADDLE

Warning: these installations steps can be applied to every wet-tap clamp saddle with the following properties:

- Branch minimum diameter : 35 mm
- Branch thread : 1 1/4” GAS (cylindrical)

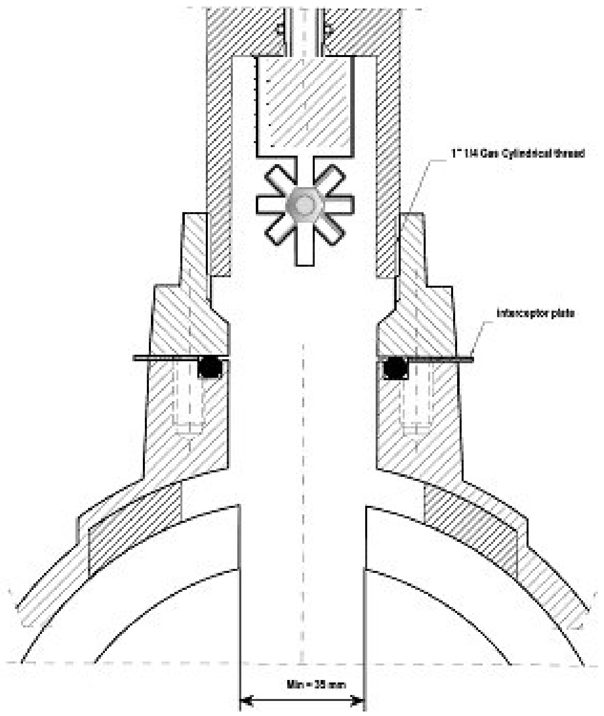


Fig 2

a) Assemble the saddle in the desired position to install the sensor.
Drill the pipe. Use a 35 mm (in.) milling cutter.
Remove the drilling machine. Be careful to block the fluid using the proper intercepting plate or ball valve.

b) Wrap several turns of Teflon tape around the steel joint threads to prevent leaks. Screw the Stainless Steel joint, together with the measuring rod and the sensor, in the saddle branch.

c) Be careful to fix the sensor body in the upper position.

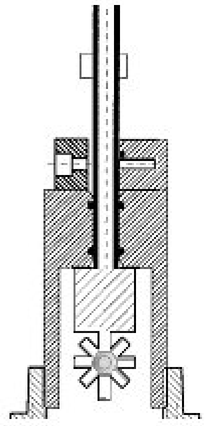


Fig 3

d) Tight the safety chain and fix it.

e) Remove the intercepting plate or open the ball valve to the full open position (perpendicular to pipe).

2. VERTICAL POSITIONING OF THE SENSOR INTO THE PIPE

a) Be sure the sensor is in the upper position.

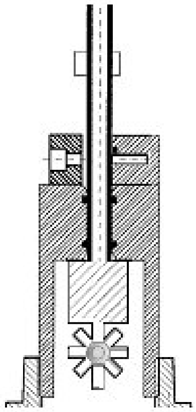


Fig 4

b) Calculate DISTANCE between sliding bush and sensor body:

- For pipe sizes smaller than DN 250 (10"):
  DISTANCE (mm) = [0.5 x Internal Diameter] + S + K

- For pipe sizes equal or greater than DN 250 (10"):
  DISTANCE (mm) = [0.12 x Internal Diameter] + S + K

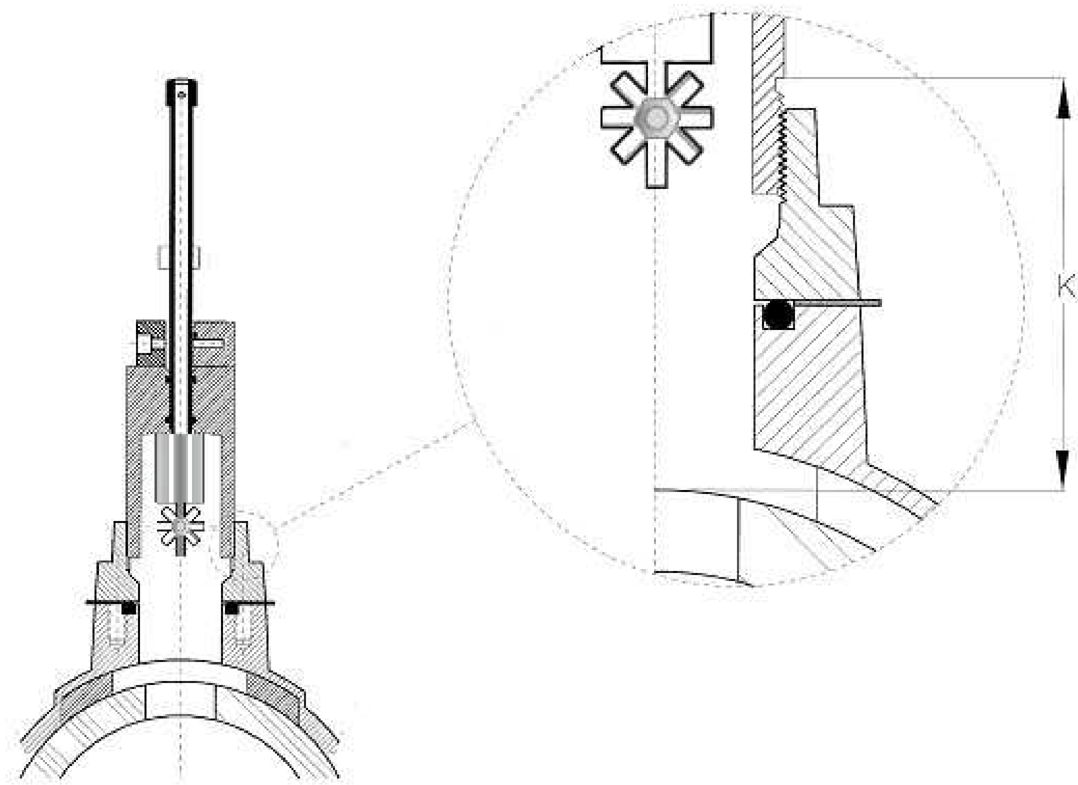


Fig 5

S = thickness pipe
K = distance between external pipe and end of the thread

c) Move and fix the sliding bush at the calculated DISTANCE from the Stainless Steel joint:

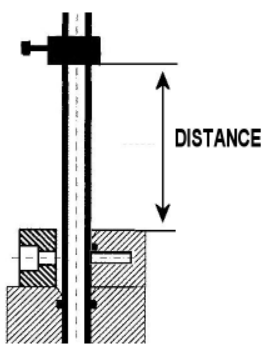


Fig 6

d) Turn the special screws out and push the rod downwards to get the sliding bush being in contact with the Stainless Steel joint. Make sure the reference screw on the top of the rod is PARALLEL to the axis of the pipe and fix again the sensor tightening the special screws.

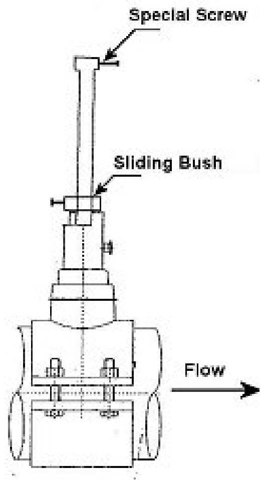


Fig 7

The sensor will be positioned:

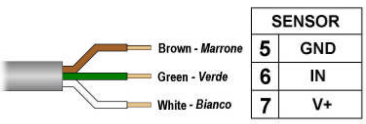
- **at 50% of internal diameter of the pipe ready to measure when pipe is smaller than DN250 (10")**
- **at 12% of internal diameter of the pipe ready to measure when pipe is equal or greater than DN250 (10")**

e) IMPORTANT

CAUTION

Tight the safety chain and fix it.
The safety chain prevents the rod to be pushed upwards by the internal pressure.

3.4. Wiring



- Always ensure the power supply is switched off before working on the sensor.
- Always use a high quality (regulated) DC voltage supply.

4. K-Factor Tables

K-Factor values for sensor central positioning

DN(mm)	k-Factor
80 (3")	4.08
100 (4")	2.60
110	2.14
125	1.62
150 (6")	1.12
180	0.88
200 (8")	0.62
225	0.48

K-Factor values for sensor 12% positioning

DN(mm)	k-Factor
250 (10")	0.28
300 (12")	0.20
350 (14")	0.14
400 (16")	0.12
450 (18")	0.10
500 (20")	0.08
600 (24")	0.06
700 (28")	0.04
800 (32")	0.02
900 (36")	On request
1000 (40")	On request
1100 (44")	On request
1200 (48")	On request

Correction formula for K-Factor calculation according to real internal diameter

K-Factor_NEW = (K-Factor x ID^2) / ID_NEW^2

where:
ID = Value in the table for the internal diameter (in mm)
ID_NEW = New value for the real internal diameter (always in mm)
K-Factor = Value in the table
K-Factor_NEW = New K-Factor value for the specified internal diameter

EXAMPLE:
Nominal Pipe Size (DN) = 40 mm
New Internal Diameter = 44,7 mm

Using the formula: K-Factor_NEW = (32,74 x $45{,}3^2$) / $44{,}7^2$ = 33,62

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