Fuji Electric

Innovating Energy Technology

Single point PITOT TUBE 5RB series

for flow measurement

- Pipe : Circular inner pipe : Ø50 to Ø1600 mm or rectangular
- Drift : Zero drift for better long-term stability
- Type of fluid : Gas
- Process pressure : Up to 50 bar max
- Process température : Up to 350°C
- High accuracy : ±1% of actual flow
- Measurement repeatability : ±0.1%

Fuji Electric France S.A.S.

ECNO612d

■Pitot tube operation principle

Flow measurement is calculated via the maximum velocity measurement. Pitot tube is placed at the centre of the pipe.
The shape speed depends of the number of the Raynolds. Velocity is equal to ± 2% and to maximum velocity x0,84 (this coefficient can be calculated with Vennard and Blasius's formula) if the flow is turbulent.
Pitot tube enables the measurement of this flowrate by generating a differential pressure proportional to the dynamic pressure of the fluid, when the pitot tube is placed in the flowing fluid.
The differential pressure generated is function of the axial velocity, fluid density and the characteristics of the probe (K_0 factor of the probe).

This differential pressure is measured with FCX series pressure transmitter connected the HP and LP side.
Pitot tubes 5RB series are available for all kind of circular pipe from Ø 50mm to Ø 1600mm and rectangular duct. They are single point Pitot tube allowing flow measurement by differential pressure.
Prefect for difficult application.
Pitot tube are speed / flow sensors that deliver a differential pressure proportional to the square root of the speed.
Inserted into a pipe, these probes are used to measure the fluid velocity in one point on the pipe.
Due to their design, they generate a differential pressure > 20% to the dynamic pressure.
Suitable for gas measurement and generating low pressure loss.
Robust construction, long service life, easy and economical set up.

■Advantages and strengths

Appropriate use

The accuracy of the k factor of 5RB pitot Tube is less than ±1% over a range greater than 10:1 (results coming from test in a laboratory).
Flow measurement possible in rectangular duct and large diameter pipe.
They are suitable for regulation system, even under difficult conditions thanks to high repeatability.

Designed for difficult erection

5RB pitot tubes have been designed to fit real world problems, such as growth or shrinkage resulting from site welding, pipe ovalisation and standard pipeline tolerances.

Ideal for difficult applications and polluted atmospheres (dust)

Particularly studied for measurements in highly loaded atmospheres dust particles. The orifices of Ø 8 mm on the upstream face and 4 mm on the downstream face reduce the fooling. The importance of orifices' section used to associate them the automatic cleaning system DEV 200 which, supplied with compressed air prevents any obstruction and preserves the accuracy of the measurement.

Construction

Manufacture of 5RB pitot tube series in stainless steel 316L with material traceability available.
One downstream hole to be positioned in the center of the pipe or duct generates the High pressure (HP) to the differential pressure transmitter FCX series.
One upstream hole generates the low pressure (LP) to the transmitter FCX series.
Connection to HP and BP of the differential pressure transmitter FCX series can measure the differential pressure which is proportional to the dynamique pressure of the fluide (and so proportional of the square of the volumetric flowrate).

The fixation on the pipe or duct can be made with:

- Gland or weld boss

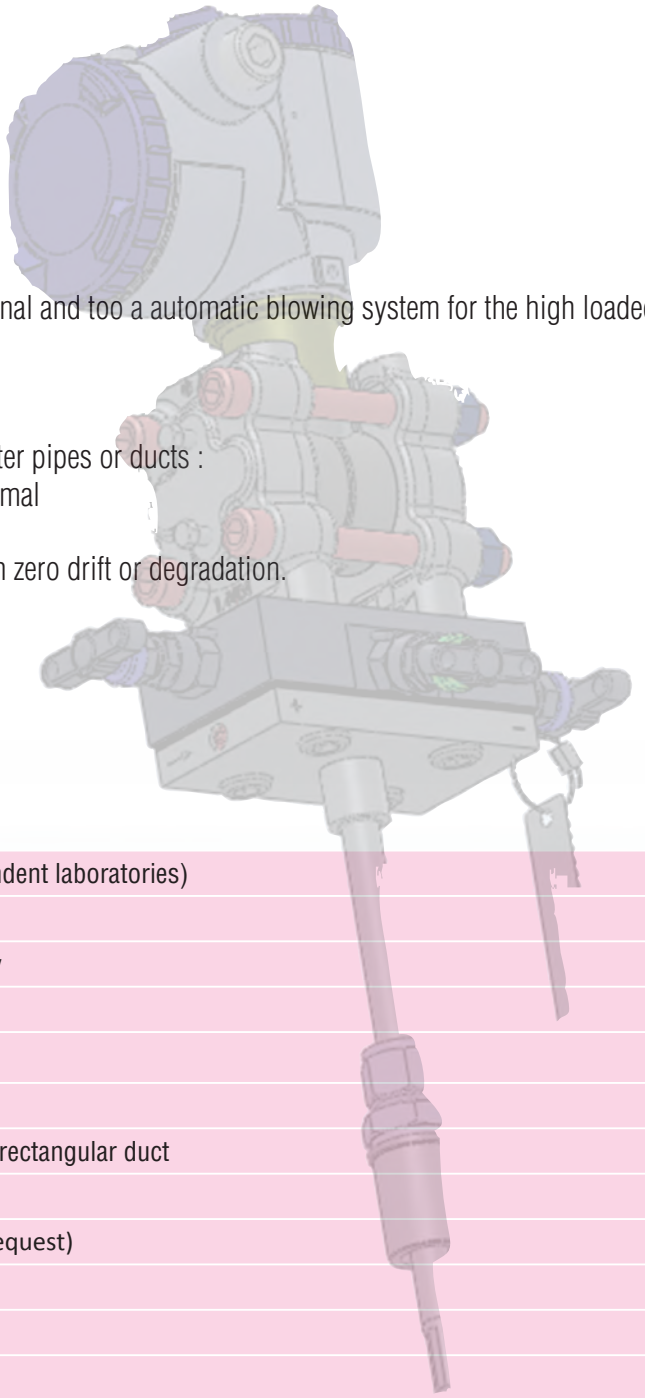
Or

- Flange, adaptater etc…

Available process connections:

- 1/2" NPT or 1/4"NPT screw connection
- 3 valves manifold integrated to the pitot tube's head

2 isolating valves G1/4" (PN 16 or PN40) are available at optional and too a automatic blowing system for the high loaded gas and a charged mounting system.



Economical

It provides a low cost solution for measurement in large diameter pipes or ducts :

- Low permanent pressure loss : Energy lost use is minimal
- Robust construction : Long service life
- Negligible wear : Long term stability with zero drift or degradation.

■ Technical specifications

Accuracy	± 1% of real flow (tested by independent laboratories)
Repeatability	± 0.1%
Drift	Zero drift for better long-term stability
Reynolds number	Re mini : 12 000
Rangeability	10:1
Fluid	Gas
Pipe	Circular Pipe Ø50 to Ø1600 mm or rectangular duct
Pressure application	50 bar max
Process temperature	350°C (higher temperature upon request)
Viscosity	500 centipoises max
Long term accuracy	Independante of wear
Plate	Stainless steel (standard)
Material	316L stainless steel
Fixation	Gland or flange

FORMULA

GENERAL FORMULA :

$$DP = \frac{\rho \times Vmax^2}{K0}$$

$$Q_N = A \times \frac{CO \times Kt \times S \times \sqrt{(\rho \times DP)}}{\rho 0}$$

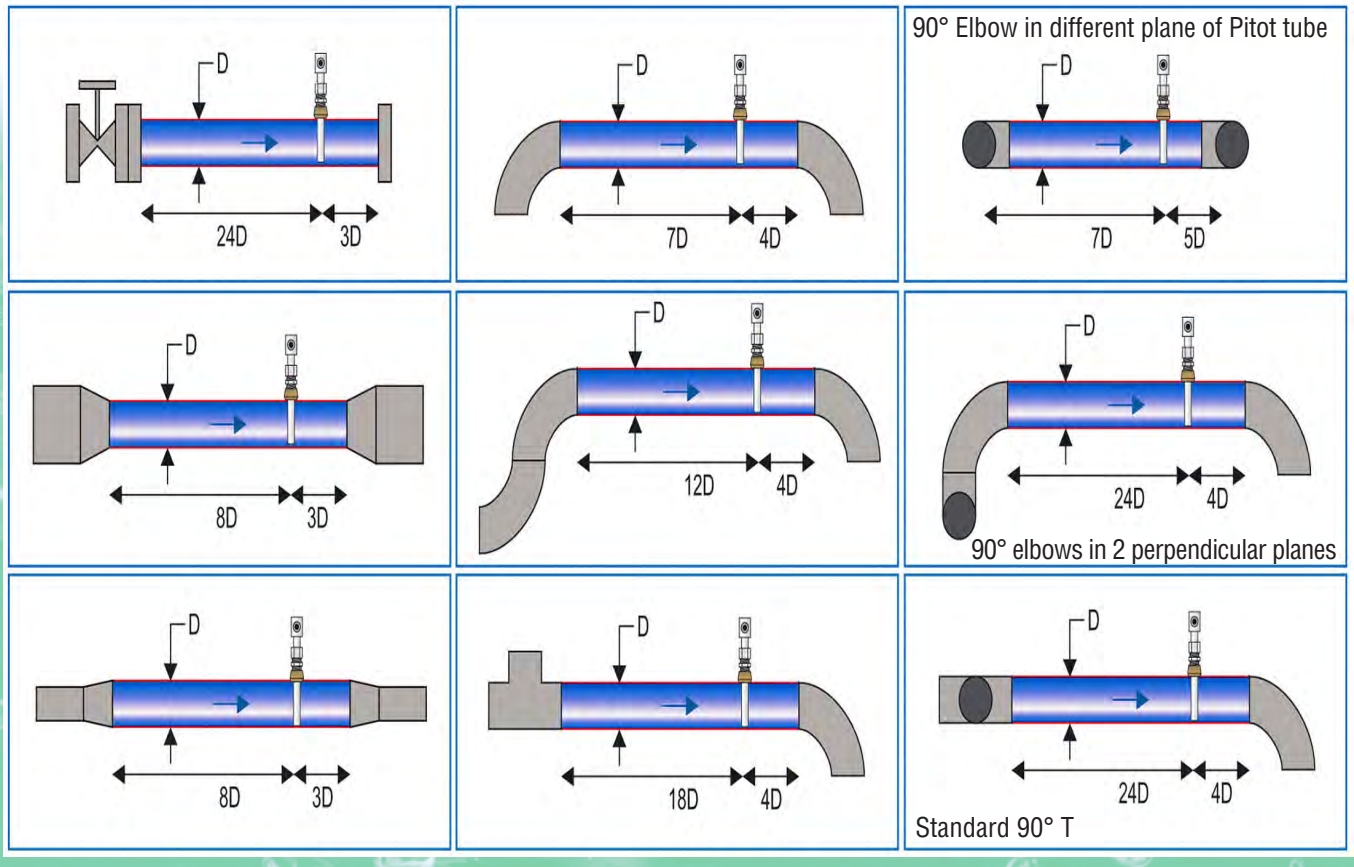
UNITS :

DP : Maximum differential pressure (daPa)
ρ : Density under terms of service (kg/m^3)
Vmax : Flow rate at the measurement point (m/s)
Q_N : Flow under normal terms of service (Nm^3/h)
CO : Velocity coefficient
Kt : Thermal coefficient
K0 : Mounting coefficient
ρ0 : Density under normal terms of service (0°c and 1013 mbar abs)
A : Pitot flow coefficient
S : Section (m^2)

INSTALLATION & ORIENTATION

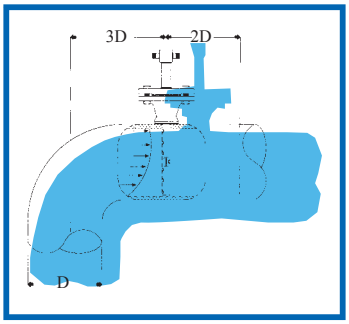
■ Recommended upstream and downstream straight length

This figure shows straight length in diameter numbers (D) to observe between 5RB Pitot tube series and disruptive components located upstream and downstream.



INSTALLATION & ORIENTATION

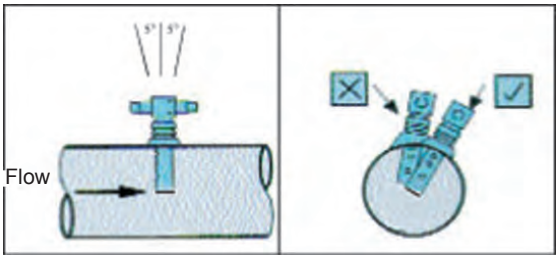
Chosen location for 5RB Pitot tube series set up in piping systems really matters because of the aerodynamic turbulence (secondary flow) in the flow created by the pipe configuration which can compromise the measurement accuracy. If the 5RB Pitot tube series is set up on shorter distance than advised, accuracy might be compromise but measurement repeatability will remain exact.



If mounted distances advised can't be observed and maximum accuracy is mandatory, it is advised to set up a flow stabilizer.

■ Orientation

Pitot tube must be installed perpendicular to the duct diameter according to allowance as shows in the figure and in conformity of the upstream and downstream length.
Important : upstream orifice must be face the flux.

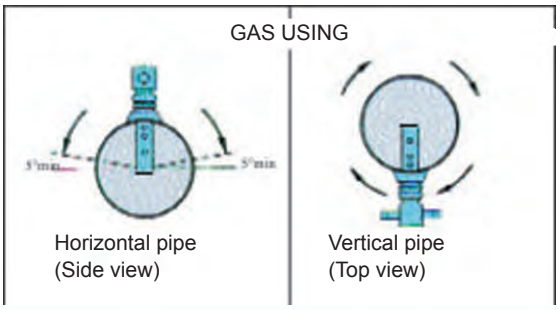


Installation in a rectangular duct is also possible.
The place must offer flow conditions following flow defined and without gyration. All upstream control valves must be open. For configuration it is advised to use downstream manifolds.

GAS :

Installation must not allow condensate accumulation in lower situated points, neither in connection pipe of FCX series differential pressure transmitter.

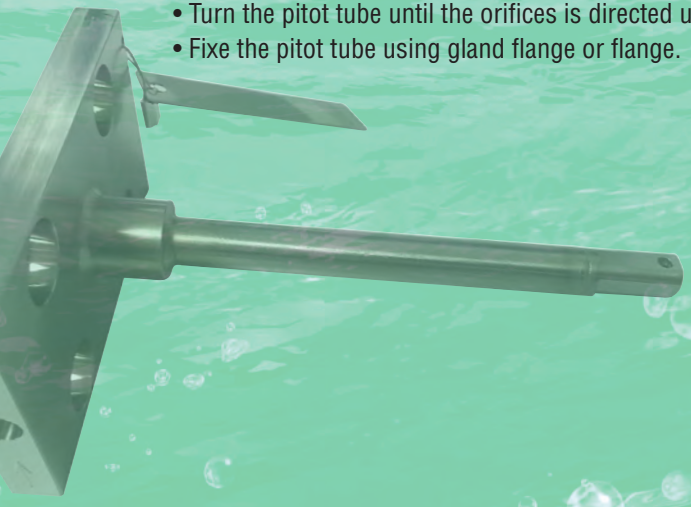
- Valves must be directed upward
- Transmitter must be installed higher than the Pitot tube with connection without low point.



■ Installation condition

Drill the pipe on the insertion point.

- Weld on the pipe or duct the gland boss or the adaptater. Be careful of the pitot tube orientation for the version without gland and flange B21 and B33.
- Position the sensor in the pipe.
- Turn the pitot tube until the orifices is directed upstream, facing the flow.
- Fixe the pitot tube using gland flange or flange.



CODIFICATIONS

Codification - Single point Pitot Tube 5RB type

1	2	3	4	5	6	-	7	8	9	10		11	12	13	14
5	R	B									-			1	

Type

Single point Pitot tube 5RB type

Connection

F	*(1)	DN25 PN10/16 + plate (for 5RB_33)
G	*(1)	DN150 PN16 + plate (for 5RB_33)
H	*(1)	DN25 PN10/16 + 1/2 NPT block (for 5RB_33)
J	*(1)	Bride DN150 PN16 + 1/2 NPT block (for 5RB_33)
K	*(1)	P.E. 1/2 NPT + 1/4 NPT block (for 5RB_12)
L	*(1)	P.E. G 1/2 + 1/4 NPT block (for 5RB_12)
M	*(1)	P.E. 3/4 NPT + 1/4 NPT block (for 5RB_18)
N	*(1)	P.E. G 3/4 + 1/4 NPT block (for 5RB_18)
P	*(1)	P.E. 1/2 NPT + 1/2 NPT block (for 5RB_12)
Q	*(1)	P.E. G 1/2 + 1/2 NPT block (for 5RB_12)
R	*(1)	P.E. 3/4 NPT + 1/2 NPT block (for 5RB_18)
S	*(1)	P.E. G 3/4 + 1/2 NPT block (for 5RB_18)
T	*(1)	P.E. 1/2 NPT + plate (for 5RB_12)
U	*(1)	P.E. G 1/2 + platine (pour 5RB_12)
V	*(1)	P.E. 3/4 NPT + plate (for 5RB_18)
W	*(1)	P.E. G 3/4 + plate (for 5RB_18)
X		DN25 PN10/16 + 2 G1/4 tips (for 5RB_33)
Y		Bride DN150 PN16 + 2 G1/4 tips (for 5RB_33)
*		On demand

Diameter, diameter of the pipe & material

							Probe Ø	Pipe diameter	Material	Gasket
1	2	-	0	0	6	5	12mm	65mm	SS 316L	KG
1	2	-	0	0	8	0	12mm	80mm	SS 316L	KG
1	2	-	0	1	0	0	12mm	100mm	SS 316L	KG
1	2	-	0	1	2	5	12mm	125mm	SS 316L	KG
1	2	-	0	1	5	0	12mm	150mm	SS 316L	KG
1	2	-	0	2	0	0	12mm	200mm	SS 316L	KG
1	8	-	0	0	8	0	18mm	80mm	SS 316L	KG
1	8	-	0	1	0	0	18mm	100mm	SS 316L	KG
1	8	-	0	1	2	5	18mm	125mm	SS 316L	KG
1	8	-	0	1	5	0	18mm	150mm	SS 316L	KG
1	8	-	0	2	0	0	18mm	200mm	SS 316L	KG
3	3	-	0	2	0	0	33,4mm	200mm	SS 316L	KG
3	3	-	0	2	5	0	33,4mm	250mm	SS 316L	KG
3	3	-	0	3	0	0	33,4mm	300mm	SS 316L	KG
3	3	-	0	3	5	0	33,4mm	350mm	SS 316L	KG
3	3	-	0	4	0	0	33,4mm	400mm	SS 316L	KG
3	3	-	0	4	5	0	33,4mm	450mm	SS 316L	KG
3	3	-	0	5	0	0	33,4mm	500mm	SS 316L	KG
3	3	-	0	6	0	0	33,4mm	600mm	SS 316L	KG
3	3	-	0	7	0	0	33,4mm	700mm	SS 316L	KG
3	3	-	0	8	0	0	33,4mm	800mm	SS 316L	KG
3	3	-	0	9	0	0	33,4mm	900mm	SS 316L	KG
3	3	-	1	0	0	0	33,4mm	1000mm	SS 316L	KG
*	*	-	*	*	*	*	On demand	On demand	SS 316L	KG

Stainless steel parts

				Tag plate with engraving		Screws	Mounting
				Datas	Customer tag		
-	A			With	Without	M10-20 (without manifold)	Compact
-	B			With	With	M10-20 (without manifold)	
-	C		*(2)	With	Without	M10-50 (with manifold)	
-	D		*(2)	With	With	M10-50 (with manifold)	
-	E			With	Without	Without (block and tips)	Remote
-	F			With	With	Without (block and tips)	

Condensation chamber

Y	Without
C	With

Revision

1

Nota :
* (1) Use "plate" for a compact erection and "block" for remote erection
* (2) Order the manifold separately

Codification - Automatic unclogging cabinet system for Pitot probes

1	2	3	4	5	6	-	7	8							
D	E	V	2	0	0										

Description

Type

Automatic unclogging cabinet system for Pitot probes 5RB & 5RD

Thermocontrol

Y	Without
A	With

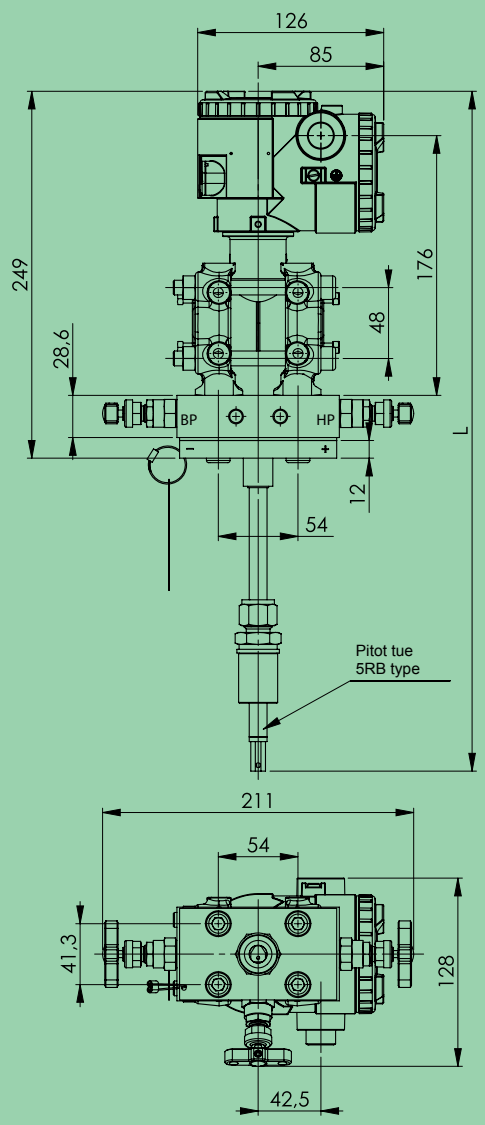
Supply voltage

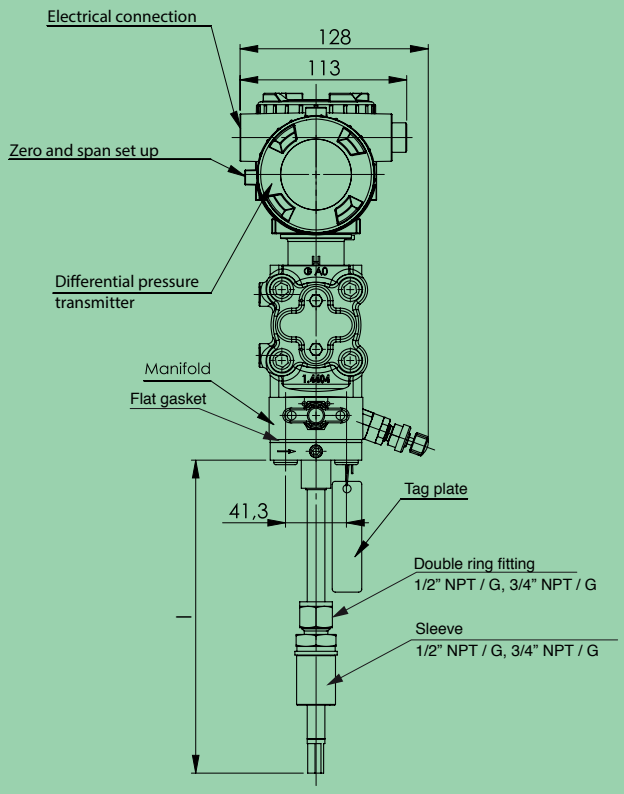
Y	230Vac - 50/60Hz
A	115Vac - 50/60Hz

Note : Remote mounting (block) required with the unclogging cabinet system

DIMENSIONS [MM]

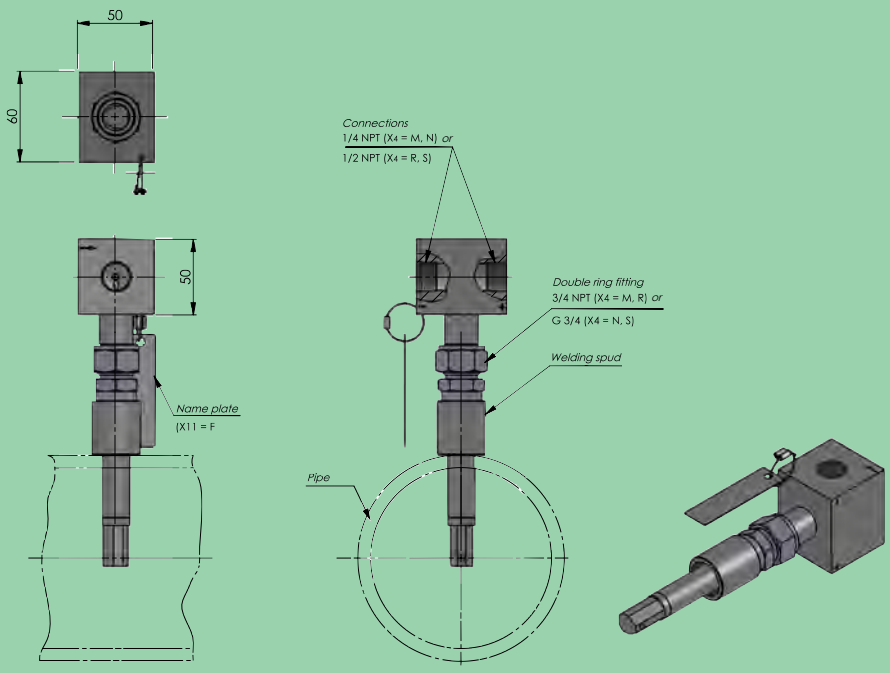
Plate type compact mounting





Ø (pipe)	Lenght L	Lenght l
DN 65	393	144
DN 80	400	155
DN 100	412	163
DN 125	423	174
DN 150	436	187
DN 200	461	212

Block type remote mounting



APPLICATIONS

- Flow gas or atmospheric emission flue gas measurement
- Can be installed on all kind of chimney (cement, sturdy brick, made of iron sheeting …) until DN 1600 mm
- Biogas flow measurement
- Measurement of oxygenation of water treatment plant's aerations tanks
- Air and gas measurement on combustion burner
- Air Flow measurement of High-temperature combustion boiler
- Air Flow measurement on compressor and HVAC

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