BanksiaControls

Turbine Flowmeters (TFM)

Operation Manual

Receiving Inspection

Inspect the shipping package for signs of damage which may have occurred during shipping. After removing the equipment from the package, carefully examine for mechanical damage.
If the equipment is found to be damaged, immediately notify both the carrier and Banksia Controls or their representative.

> ***WARNING***
>
> ***DO NOT ATTEMPT TO OPERATE EQUIPMENT WHICH HAS BEEN DAMAGED DURING SHIPPING!!***

Examine the shipping list to verify that the item listed correspond to those ordered. If any discrepancies between the equipment and the documentation are found, immediately notify Banksia Controls or their representative.

Table of Contents

1. Introduction

Banksia Controls Turbine Flowmeters are designed specifically for volume measurement of fluids over wide flow ranges.

The information contained in this manual is applicable to all Banksia Controls inline flowmeters and is not affected by the type of end connection with which individual flowmeters are provided.

For specific detail of the type available, operating ranges, special application, physical dimensions etc. reference should be made to the current product catalogue.

2. Theory of Operation

The Turbine Flowmeter is essentially a velocity measuring device which is calibrated to indicate volumetric flow of liquid or gas in a pipeline. The operation of the flowmeter is. based upon the speed (angular velocity) of a freely supported rotor which revolves at a rate which is directly proportional to the medium flow.

The rotor blades cut a magnetic field set up by a permanent magnet assembly which is installed in a pick up unit in the flowmeter body.

As each rotor blade cut a magnetic field, a pulse is indicated in the coil of the pick up unit. The turbine flowmeter thus generates a number of pulses precisely proportional to each unit volume of flow. The number of pulses per unit volume is . established during calibration and termed "the meter factor". The variation of this factor over a specified flow range is defined as the linearity.

The pulses are fed to appropriate electronic units for processing to provide totalized and rate of flow readouts.

The pulse density (number of pulses) per rotor revolution depends on the number of blades on the rotor; however increasing the pulse density by increasing the number of rotor blades is only possible within certain limits. Where increased revolution is required other means of artificially producing a high frequency output are employed.

Regardless of how closely controlled manufacturing processes are maintained it is not possible to accurately complete the meter calibration characteristic. This means that each meter must be individually calibrated over the required flow range in a flow laboratory.

The hydraulic calibration facility includes a 500 mm and a 100 mm positive displacement prover loop. The maximum flow capacity being 3200 cubic meter per hour. Meter up to 300mm nominal diameter may be calibrated on these facilities. The provers are designed to current API standards and have repeatability of better than ± 0.003%. These have been independently certified by our local government metrology department.

2.1 Calibration Factor

A turbine meter calibration constant is Reynolds Number dependent. That is to say that a value may change as a result of changing viscosity and changing rate of flow. Fortunately, at high Reynolds Number this dependency is small thus minimizing the extent of meter non linearity.

As viscosity increases for any given size of meter, the lower limit of linear flow range is increased. Additionally, the number of output pulses per unit volume changes slightly on the linear part of the range. These effects are directly related to the Reynolds Number, and under these conditions, better linearity is obtained by selecting a meter to operate at the higher end of its flow range.

3. Mechanical Installation

The flowmeters have been designed to give high accuracy with long term stability and operational life. To ensure this, it is recommended that the following points be considered during installation.

3.1 Flow Straightening

Where possible a minimum length of ten flowmeter diameters of straight pipe should be installed upstream of the flowmeter, except where the flowmeter is inserted directly after a valve or centrifugal pump when the minimum straight length should be increased to twenty diameters.
Where this is not possible it is recommended that flow straightener be fitted.

3.2 Pipe Line Flushing

If the turbine meter is installed into a newly fabricated pipe system, the system must be purged of foreign matters such as slag, loose welding beads, sand and other solid --matter by flushing before installation of the flowmeter. Failure to do so will result in serious damage to the flowmeter internals.

3.3 Pipe Reduction

Where it is necessary to reduce the pipe diameter to accommodate the flowmeter, it is recommended that this can be achieved by the use of a tapered cone section with maximum included angle of 30 degree.

3.3 Installation on Tank

Where the flowmeter is installed in a line fitted to the bottom of a storage vessel, it is advisable to fit a baffler plate over the hole in the tank in order to prevent the liquid vortexing through the flowmeter.

3.4 Air Entrainment

3.4.1 Air Detection probe

Hygienic flowmeters can be fitted with an air detection probe for applications on conductive liquids e.g. milk and beer, so that air pockets in the liquid are not totalized.

The air detection probe will not account for any air bubbles entrained in the liquid and to work correctly, it requires a finite interface between the air and the liquid, therefore, where feasible the flowmeter should be installed in a vertical position where it acts as a natural air separator, but the direction of the flow should be from bottom to top, up through the flowmeter.

3.4.2 Custody Transfer

In custody transfer applications it is imperative that all air entrainment be removed from the liquid before it reaches the flowmeter and this can be achieved by fitting an Air/ Gas separator.

3.5 Filtration

Extremely fine filtration is not required. However, a suitable strainer should be installed at least ten diameters upstream of the flowmeter. It is to minimize the risk of damage to the meter by pipe scale, welding splatter, fine highly abrasive particles or strands of fibrous materials which tend to collect in h e flowmeter bearings thus accelerating wear and affecting free rotor movement.

3.6 Downstream Pressure

It should be sufficient to prevent vaporization of metering fluid. This condition should always be followed to safeguard both the meter and the fluid. As a rule the operating pressure of 2 bar above the corresponding vapor pressure of the liquid is desirable.

3.7 General

Under normal circumstances the ten diameter length of straight pipe upstream of the flowmeter is satisfactory. Care must be taken however in design of the upstream pipe, particularly with respect to bends etc. and it is recommended that bends upstream of the flowmeter have a minimum inside radius of twice the diameter of the pipe.

4. Electrical Installation

Banksia Controls turbine flowmeters are supplied with magnetic pick up assembly as standard. To ensure proper signal generation, it is important that the pick off coil is fully screwed but finger tight only, in the well of the meter housing. Suitable connector or coil cases are provided in weather proof pick up assembly boxes. Mating connectors, where applicable are included in supply.

4.1 Pick off Coil

The purpose of the pick off coil is to convert the rotation of the turbine rotor into a sine wave signal. The strength of the signal varies between I 0 and 200 m V depending upon turbine rotor. The pick off is wound over a permanent magnet. It is vacuum impregnated and epoxy sealed in a housing. The connections are made via amphenol military standard connector, flying leads, or terminal block housed in weather proof safe enclosure. The pick off coil may be tested by measuring resistance between two leads. It should be around 700 -- I200 Ohms. The resistance between these leads and the housing of the coil should be more than 100M Ohms.

4.2 Exd rated Magnetic Pickoff

The TFM meter can be supplied with an Exd rated pickoff, approved to ATEX and IECex to Exd IIC T6 to T4, and wired to directly via an approved potted cable gland.

4.3 Intrinsically Safe -- Magnetic Pick Off

Intrinsically safe magnetic pick up coil may be used in a hazardous area as defined, in conjunction with an approved 10 volt 47 ohm zener barrier unit, or equivalently approved indicator.

The cubic L/R ratio must not exceed 70 microhenries/ohm or have a capacitance greater than 3 microfarads and an inductance greater than 0.9 millihenries.

Where applicable the interconnection diagram is shown.

4.4 Interconnection Cable

The recommended interconnection cable between pick off assembly and electronic readout unit is twin core screened cable. Each core shall be of 16/0.20 wires. For Exd rated coils, steel wire armoured cable should be used, along with an approved potted cable gland to connect to the coil.

For interconnection of the ordered equipment please refer to the drawing appended. Signal cable is provided by the purchaser unless otherwise specified.

4.5 Pre-Amplifier Module

An amplifier module is available that will amplify the sine wave signal from the pickoff to a square wave, allowing the signal to be transmitted longer distances than a pure pickoff output. The preamplifier is housed in a Junction box and either mounted directly onto the meter body, or remotely. Weatherproof or Exd rated enclosures are available.

5. Maintenance

The degree of servicing necessary to maintain the turbine meter at factory accuracy will depend largely on the fluid being metered and installation conditions. It is generally recommended that a policy of preventive maintenance should be adopted, thereby possibly preventing serious component damage due to foreign bodies and contaminating fluids. It should be noted that customer inspection should only lead to removal of foreign bodies and general cleaning. Service problems beyond this should be referred to Banksia Controls, or its representatives.

The following instructions are included to facilitate dismantling of the flowmeter for component inspection and subsequent re-assembly.

5.1 General notes on Removal and Refitting of bearing supports

5--500mm Meters

By heating the body of the flowmeter around its external surface sufficient Differential expansion is normally obtained to allow bearing supports to be withdrawn or refitted manually.

The heat should not be excessive and should be applied uniformly around the circumference of the flowmeter body adjacent to the bearing housing for a period sufficient to heat the flowmeter body without raising the temperature of the bearing support to the same level.

If it is not possible to obtain a suitable means of heating, It is recommended that a soft aluminum drift be used. The drift should be applied to the bearing support and should have a diameter small enough to enable it to be passed between the blades of the rotor without jamming or crushing damage in the case of 75mm meter.

5.2 Flowmeters Nominally Sized 5--10mm

5.2.1 Removal of Bearing Support and Rotor Assembly

>a) Refer to section 5.1

>b) Unscrew and remove the support retaining nut.

>c) Remove the front support assembly.

>d) Remove the rotor and shaft assembly.

>e) Remove the rear support assembly in the same direction.

> f) Where applicable, the bearing, spacer and the shaft may then be removed for inspection.

5.2.2 Refitting of Bearing Support and Rotor Assembly

>a) Refer to section 5.1

>b) insert the rear end support assembly into the bore, (this support has a smaller diameter than the front support assembly) and ensure that it is seated.

>c) Fit the rotor and shaft assembly into the bore, ensuring correct facing of the rotor (refer cross sectional drawing).

> d) Insert the front support assembly into the bore and then feed the shaft into the support and ensure that it is correctly located.

>e) Screw in the support retaining nut.

> f) Check that the rotor rotates freely by blowing air through the bore.

CAUTION: Do not use excessive air pressure or the rotor may overspeed and sustain damage.

5.3 Flowmeters Nominaly Sized 10-- 50 mm

5.3.1 Removal of bearing support and rotor assembly

NOTE: It is not possible to remove the rear bearing support without first removing the front bearing support and rotor assembly.

>a) Refer to section 5.1

> b) Remove the circlip.

> c) Remove the front bearing support.

>d) Remove the rotor and the shaft assembly.

>e) Remove the rear bearing support assembly in the same direction.

> f) Where applicable, the bearings, spacer and the shaft may be removed for inspection.

5.3.2 Refitting of Bearing Support and Rotor assembly

>a) Refer to section 5.1

> b) fit the rear end support assembly (this has a smaller bore than the front bearing support) into the bore ensuring that it is correct way round and is correctly seated.

> c) Insert the rotor and shaft assembly into the bore ensuring that the rotor is correct way round and feed the shaft into the bearing support (refer cross sectional drawing).

> d) Fit the front bearing support into the bore and ensure the shaft has ·· entered the support and that the bearing support is correctly seated.

>e) Fit the circlip into the groove and ensure that it is correctly seated.

> f) check that the rotor rotates freely by blowing air through the bore.

CAUTION: Do not use excessive air pressure or the rotor may overspeed and sustain damage.

5.4 Flowmeters Nominally Sized 75 mm

5.4.1 Removal of Rotor Assembly

>a) Remove the retaining ring on either upstream or down stream of the flowmeter.

> b) Support the flowmeter in a vice and gently pullout the entire internal assembly.

>c) Bearing housing and rotor assemblies can be inspected.

5.4.2 Refitting of Bearing Support and Rotor Assembly

> a) Assemble the central tube of the capsule with the bearing support and flow straightener assembly.

>b) Insert the rotor and shaft assembly into the bore and feed the shaft into the bearing. Ensure that the rotor is facing the correct way (refer cross Sectional drawing).

> c) Fit the retaining ring into the flowmeter housing and ensure it is Properly tightened.

> d) Check that the rotors rotates freely by blowing air through the bore.

5.5 Flowmeters Nominally Sized 100 -- 500mm

5.5.1 Removal of rotor assembly and front bearing housing

> a) Remove the bearing nut locking taps and unscrew the slotted front bearing nut. (it will be necessary to use a special plate spanner which can be made locally.

> b) Remove the support plates which are sliding fit in the slotted support tube.

>c) The support assembly may now be released. Tap the upstream edge of the plates with a soft hammer then withdraw the vanes and the tube.

>d) Withdraw the bearing housing and rotor assembly.

5.5.2 Removal of Rear Bearing Housing

> a) Before this is done, it better to remove the pick up coil and the conduit box.

> b) Removal of rear bearing housing can be achieved by following the procedure outlined for front bearing housing removal. The ball bearing where used can be removed from the rotor assembly for inspection.

5.5.3 Refitting of Bearing Support and Rotor Assembly

>a) Refer to section 5.1

>b) place the body of the flowmeter so that the axis of the bore is vertical and the downstream end is up.

>c) position the rear support vanes in the tapered grooves in the support tube, ensuring that they are correct way round, and holding the tube and vanes together lower the assembly into the bore until the vanes rest on the machined rebate. Align one of the vanes with the pick-- off holes.

> d) Carefully turn the flowmeter body onto its side (the vane and support tube should stillremain in position) and insert the rear bearing housing into the support tube from the upstream end.

>e) Fit the stepped support plate into the support tube and fit the slotted rear bearing nut and tighten.

> f) Check that the pick off hole in the rear housing where provided is aligned with the pick off hole in the flowmeter body and tighten the bearing nut using the special spanner. Re -- check the alignment of the pick off holes after tightening.

> g) Place the flowmeter body in an upright position with the upstream end uppermost and lower the rotor and shaft assembly into the bore with the phonic wheel (where provided) nearest to the rear bearings. Insert the shaft into the sleeve bearing and check that it rotates freely.

> h) Place the front bearing housing in position on the rotor shaft.

> i) position the front support vanes in the tapered grooves in the support tube, ensuring that they are the correct way round, and holding the tube and vanes together lower the assembly into the bore, with the vanes aligned with rear support vanes.

> j) Align the bearing housing with the bore of the support tube and push the tube and front bearing.

> k) Check that the rotor assembly rotates freely, then fit the stepped support plate and front bearing.

> l) Tighten the front bearing nut and recheck the rotor for freedom of rotation.

> m) Fit and secure the locking tab.

> n) Refit the pick up ensuring that the correct amounts of shims are fitted to obtain the necessary clearance between the phonic wheel (where possible) and the pick up. Check that there is clearance by slowly rotating the rotor assembly.

6. Component Inspection

6.1 Bearings

6.1.1 Sleeve Bearings

Sleeve bearings should not show signs of excessive scoring or ovality. They should be free from wear, scoring of abrasion.

6.1.2 Ball Bearings

Ball bearings should be replaced as a matter or course on meters sized 75mm and below. On large meters they must be inspected visually and if required, rep laced.

6.2 Shafts

These should be free from wear, scoring or abrasion.

6.3 Pick up Assembly

The coil of standard magnetic pick up should have a dc resistance of approximately 700 -- 1200 ohms and resistance between any coil lead and housing should be more than 100 M ohms.

6.4 Rotor Assembly

When positioned correctly with the bearing housing secured firmly in the meter tube, the rotor should spin freely. It should also be possible to detect a small amount of radial movement at all circumferential positions of rest (dependent on flowmeter size equal to radial clearance of bearing).

7. Spare Parts

Details of individual components together with the corresponding part numbers are available and can be supplied on request with individual orders. Components may be ordered directly from Banksia Controls, or its representatives, as part numbers.

However, it is important to quote the meter MODEL NUMBER and INSTRUMENT NUMBER on all spare orders.

8. Trouble Shooting

Trouble and Possible Causes	Suggested Remedy
8.1 No Flow Indication:	
1. Rotor Binding:	
a: Foreign materials in bearings o r between rotor and rotor supports or rotor and housing.	a. Disassemble and clean the meter.
b. bearing seizure resulting from wear.	b. Replace bearings or internals.
2. Pick off Coil Assembly:	
a. Pick off coil assembly not seated. in the well.	a. Screw pickup coil assembly into well, finger tight only tighten locknut.
b. pick off coil open or shorted.	b. Measure resistance across the two pick off terminals (without) Connection to loop). It should Measure 700 ohms to 1.2 kilo Ohms. In case it does not, replace pick off coil assembly.
3. Interconnection Cable:	
a. Inter connection cable terminated incorrectly.	a. Refer to system wiring diagram.
b. Open or intermittent connection.	b. Re-solder, repair or replace cable.
c. Interconnection cable shorted.	c. Repair or replace cable.
4. No Flow Through System:	
a . Clogged strainer.	a. Clean or replace strainer.
b. Pump inoperative	b. Repair or replace pump as required.
c. Closed valve in metered section.	c. Correct valve for flow through meter.
d. Improper power supply.	d. restore supply.
5. Problems with integrated electronic readout.	
	a. Refer to separate readout manual for troubleshooting

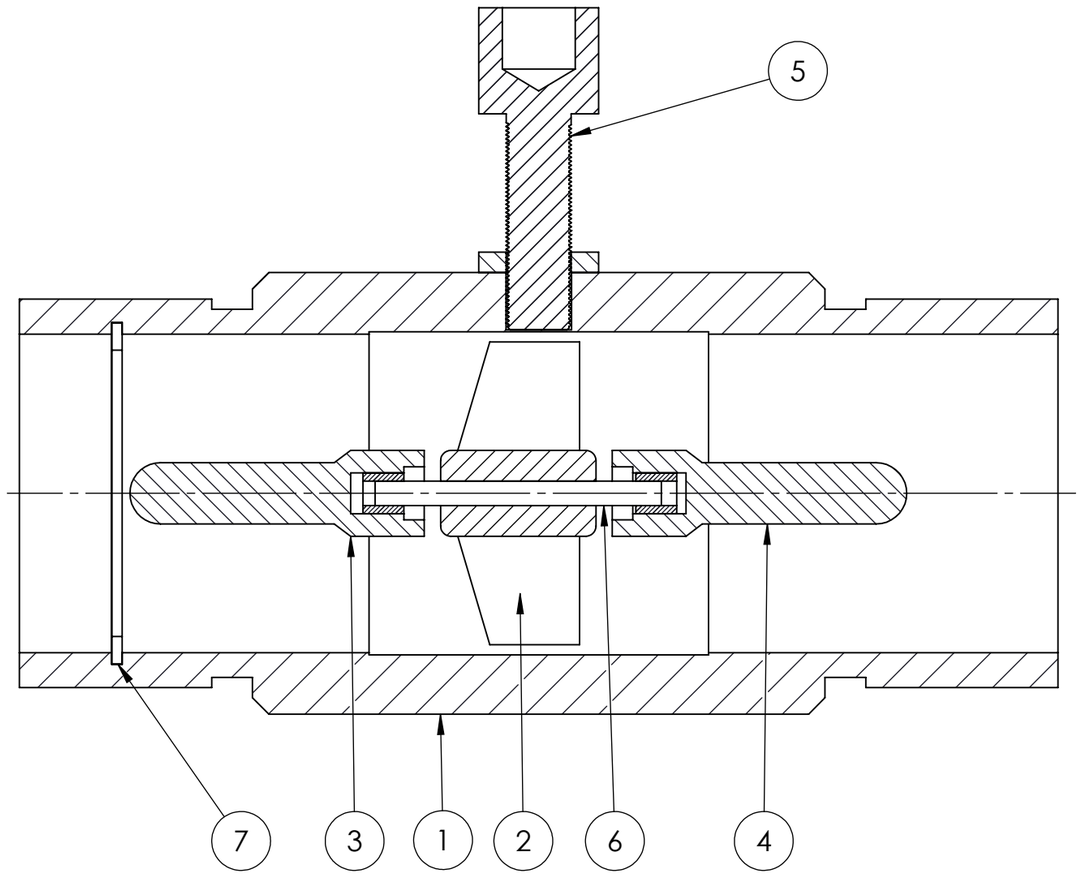
Trouble and Possible Causes	Suggested Remedy
8.2 Indication but No Flow:	
1. Spurious Signals in Readout:	
a. Signal cable shield not grounded at meter or piping multiple ground current loops.	a. Refer to inter connection instructions.
b. Signal cable in proximity of strong AC field.	b. Reroute or run cable through Conduit.
c. Strong vibrations in piping.	c. Support piping or eliminate cause of vibration.
d. Flow actually occurring.	d. Repair inter connection valve.
e. incorrect signal cable.	e. refer inter connection diagram.
f. Cal switch in 'ON" mode.	f. Change switch mode.
g. Pick off coil open.	g. Measure resistance across the two pick off terminal (without connecting to loop). It should measure 700 ohms To 1.2 kilo ohms. In case it Dose not, replace pick off Coil assembly
8.3 Lack of Repeatability of readings :	
a. Dirt in moving part or detective bearings.	a. Clear meter and/or change bearing.
b. Air entrained in fluid system.	b Make necessary change in piping.
c. Change in pipe diameter within I 0 and 5 diameter of flowmeter inlet and outlet.	c. Correct piping as described in installation section.
d. Signal cable near strong ac fields.	d. Reroute or run cable in conduit
e. Improper installation of flange gasket.	e. Replace gasket, it should Not intrude inside pipe flow.

8.4 Indicated Flow Less Than Actual Flow:	
a. Wear of moving parts	a. Clean and impact bearings, replace if seizure is observed.
b. Pickoff coil improperly seated in housing well.	b. Screw pickoff coil fully in the Well (finger tight) and tighten locknut.
c. Service temperature significantly higher than specified.	c. Reduce operating temperature Or correct 'k' factor setting for temperature.
d. Viscosity much lower than specified.	d. Correct viscosity or correct 'K' factor setting.
e. Larger change in pipe diameter within 10 diameters straight length of meter inlet.	e. Correct piping as discussed in meter installation.
8.5 Indicated Flow Greater Than Actual Flow:	
a. Pipeline not full or fluid or air Entrainment.	a. Purge system for several Minutes allowing flow Through system or make Piping changes to eliminate Air entrainment.
b. Flashing in meter i.e. change in state from liquid to gas resulting from pressure drop in the meter.	b. increase pressure to prevent flashing suggested pressure 10psi above fluid flash point.
c. Service temperature significantly higher than specified.	c. Reduce operating temperature To specified limit or correct 'k' factor.
d. Viscosity of fluid higher than originally specified.	d. Correct fluid viscosity or use new meter factor.
8.6 No Change in indicated flow;	
No change in indicated flow despite flow is present	Please refer sec. 8.2
8.6 Change in indicated flow:	
Change in indicated flow but Indication at no flow.	Please refer sec. 8.2

9. List of Drawings

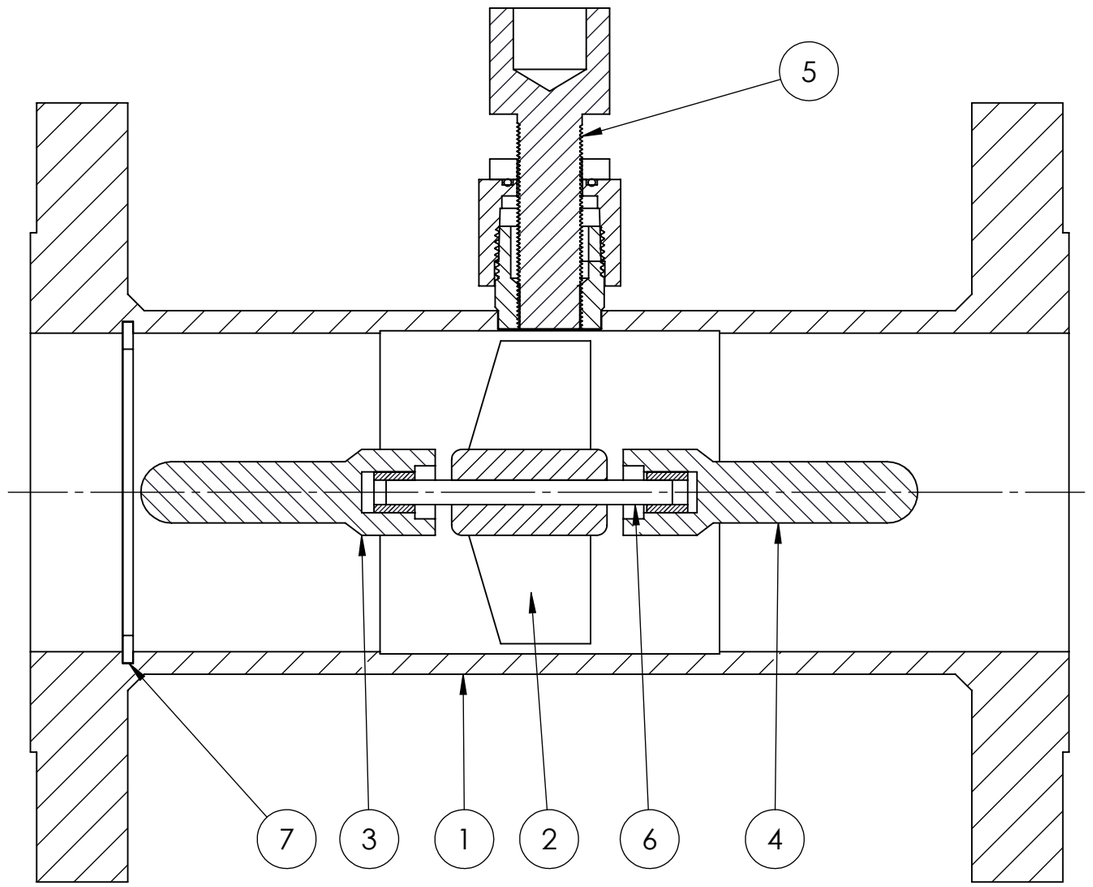
DESCRIPTION.	DRAWING NO.
1. TFM Screwed General Arrangement	BC_033.902
2. TFM Flanged General Arrangement	BC_033.901
3. TFM Flanged 100mm+ General Arrangement	BC_033.903
4. TFM+E series assembly	BC_024.102
5. Typical flowmeter installation.	BC_024.902
6. Pipe layout with Flow straighteners & Strainer	BC_024.901

Notes:



1 - METER HOUSING
2 - ROTOR
3 - FRONT BEARING SUPPORT
4 - REAR BEARING SUPPORT
5 - PICK OFF ASSEMBLY
6 - ROTOR & SHAFT ASSEMBLY
7 - CIRCLIP

TITLE: **TFM Screwed General Arrangement**			MATERIAL: **-**	DRAWN BY: **JV**	GENERAL TOLERANCES: 0.000 ±0.05; 0.00 ±0.1; 0.0 ±0.2; 0 ±0.5; ANGLE ±0.5°	**1:2**	**A3**	DO NOT SCALE DRAWING
PART/ASSY. NUMBER	REV. **1.0**	SHEET **1 OF 1**	COLOUR	DATE: **03/05/2021**			ALL DIMS. IN MM	BanksiaControls © 2015
			FINISH: **MACHINED**	DRAWING NO.: **BC_033.902**				



FLOW

1 - METER HOUSING
2 - ROTOR
3 - FRONT BEARING SUPPORT
4 - REAR BEARING SUPPORT
5 - PICK OFF ASSEMBLY
6 - ROTOR & SHAFT ASSEMBLY
7 - CIRCLIP

TITLE: **TFM Flanged General Arrangement**			MATERIAL: -	DRAWN BY: **JV**	GENERAL TOLERANCES: 0.000 ±0.05; 0.00 ±0.1; 0.0 ±0.2; 0 ±0.5; ANGLE ±0.5°	**1:2**	**A3**	DO NOT SCALE DRAWING
PART/ASSY. NUMBER	REV. **1.0**	SHEET **1 OF 1**	COLOUR	DATE: **03/05/2021**			ALL DIMS. IN MM	BanksiaControls © 2015
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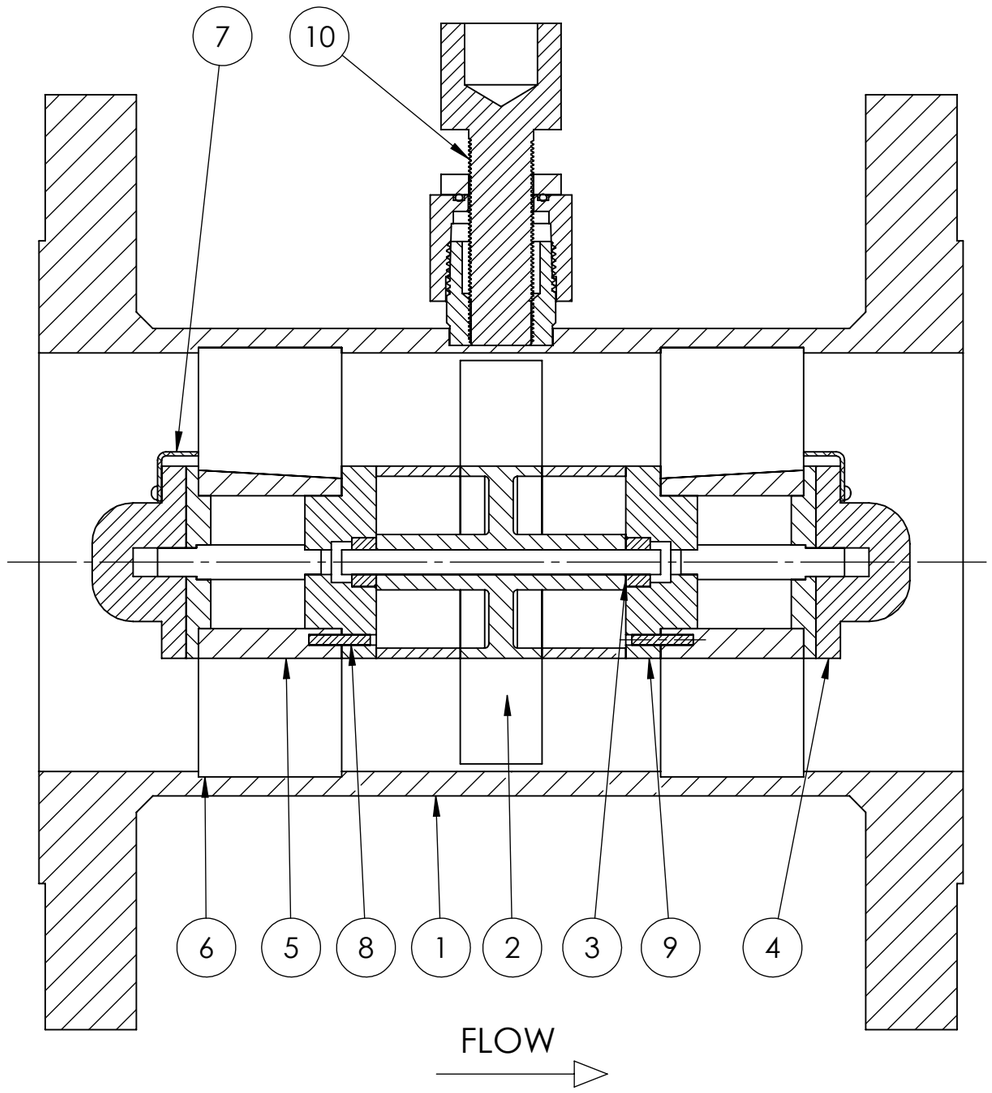

1 - BODY
2 - ROTOR SUBASSEMBLY
3 - SUPPORT NUT
4 - SUPPORT PLATE
5 - SUPPORT TUBE
6 - SUPPORT VANE
7 - LOCKING TAB
8 - LOCKING PIN
9 - BEARING HOUSING
10 - PICK-OFF ASSEMBLY

TITLE: **General Arrangement - TFM Flanged sizes TFM1100 and above**	MATERIAL: -	DRAWN BY: **JV**	GENERAL TOLERANCES: 0.000 ±0.05; 0.00 ±0.1; 0.0 ±0.2; 0 ±0.5; ANGLE ±0.5°	1:2	A3	DO NOT SCALE DRAWING	BanksiaControls © 2015
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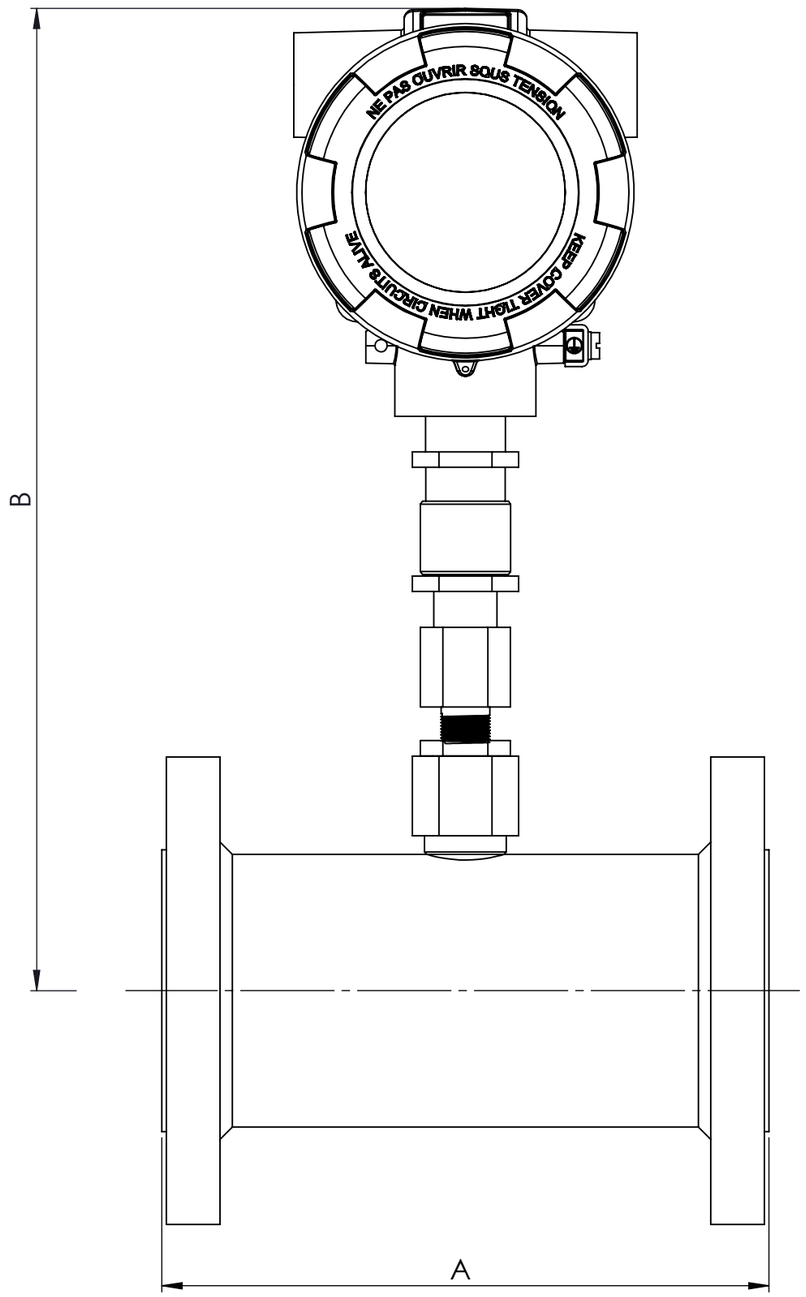


General Dimensions

Model	Pipe Diameter	ANSI Flange Size	A, mm	B, mm
TFM0010	1/2"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	127	310
TFM0012	3/4"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	127	310
TFM0015	3/4"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	127	310
TFM0020	3/4"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	140	310
TFM0025	1"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	152	310
TFM0040	1 1/2"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	178	310
TFM0050	2"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	197	310
TFM0080	3"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	254	310
TFM0100	4"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	356	410
TFM0150	6"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	368	410
TFM0200	8"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	457	410
TFM0250	10"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	457	460
TFM0300	12"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	457	510
TFM0400	16"	150RF, 300RF, 600RF, 900RF, 1500RF, 2500RF	610	610

TITLE
Turbine Flow Meter

PART/ASSY. NUMBER

REV. **1.1**

SHEET **1 OF 2**

MATERIAL
-

COLOUR

FINISH
n/a

DRAWN BY
JV

DATE
30/04/2021

DRAWING NO.
BC_024.102

GENERAL TOLERANCES
0.000 ±0.05
0.00 ±0.1
0.0 ±0.2
0 ±0.5
ANGLE ±0.5°

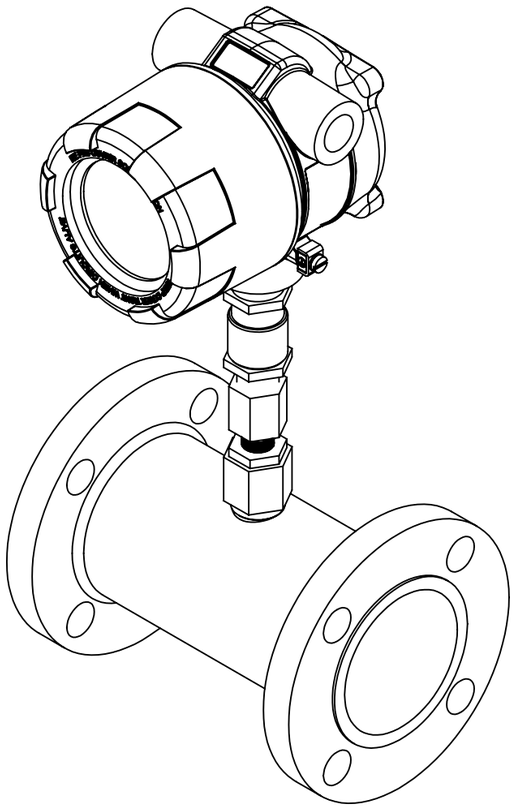
1:2

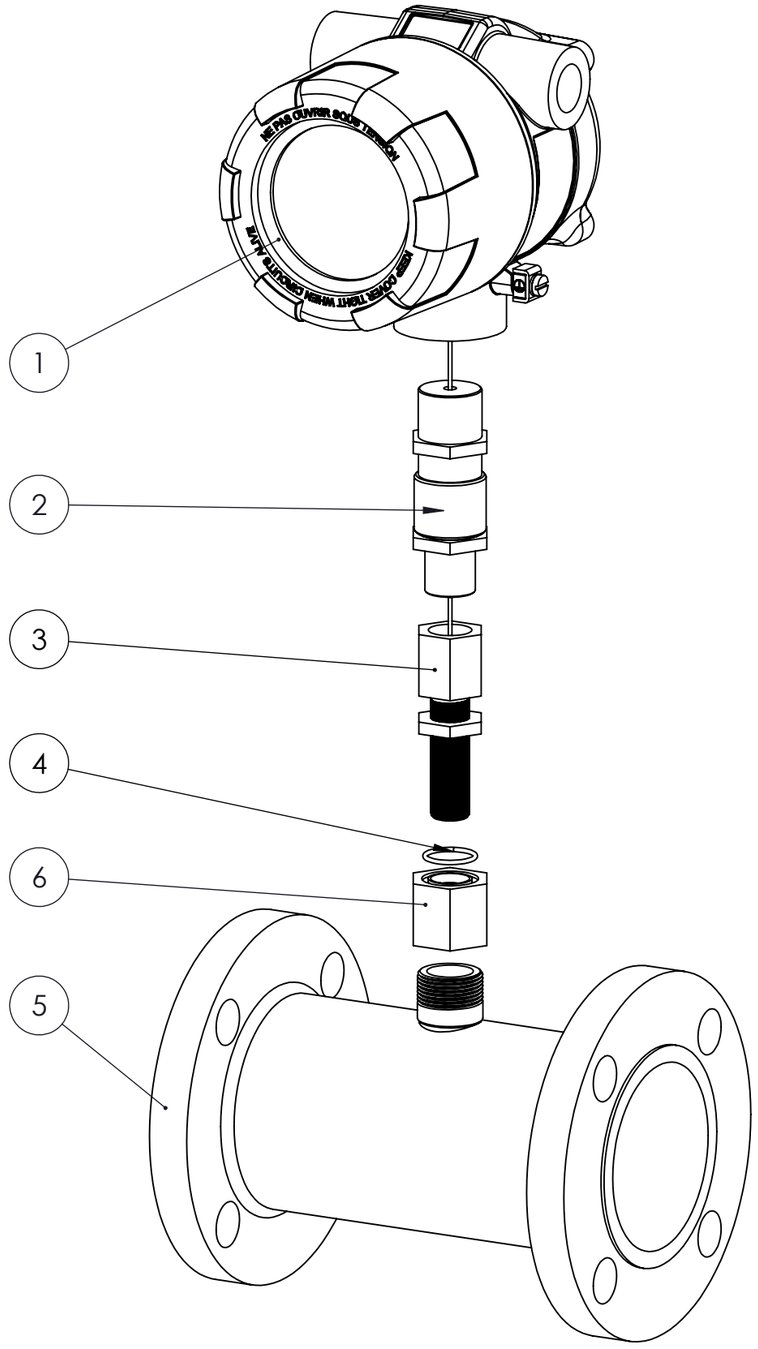
A3

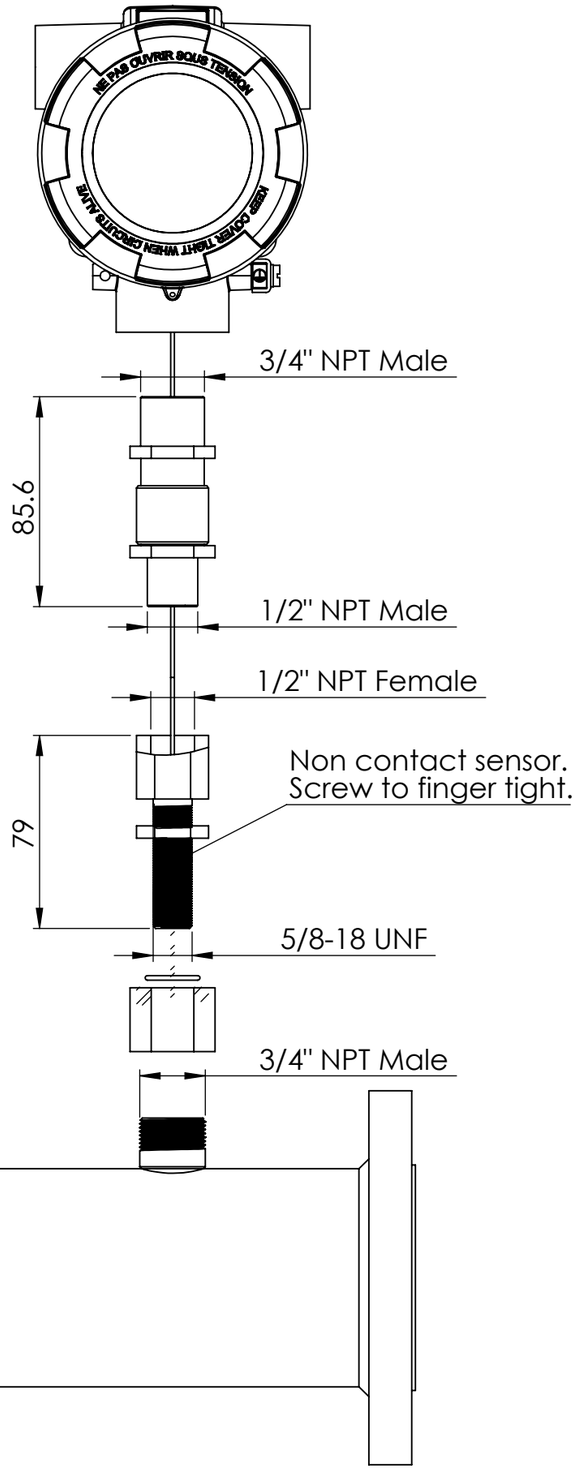
ALL DIMS. IN MM

DO NOT SCALE DRAWING

BanksiaControls



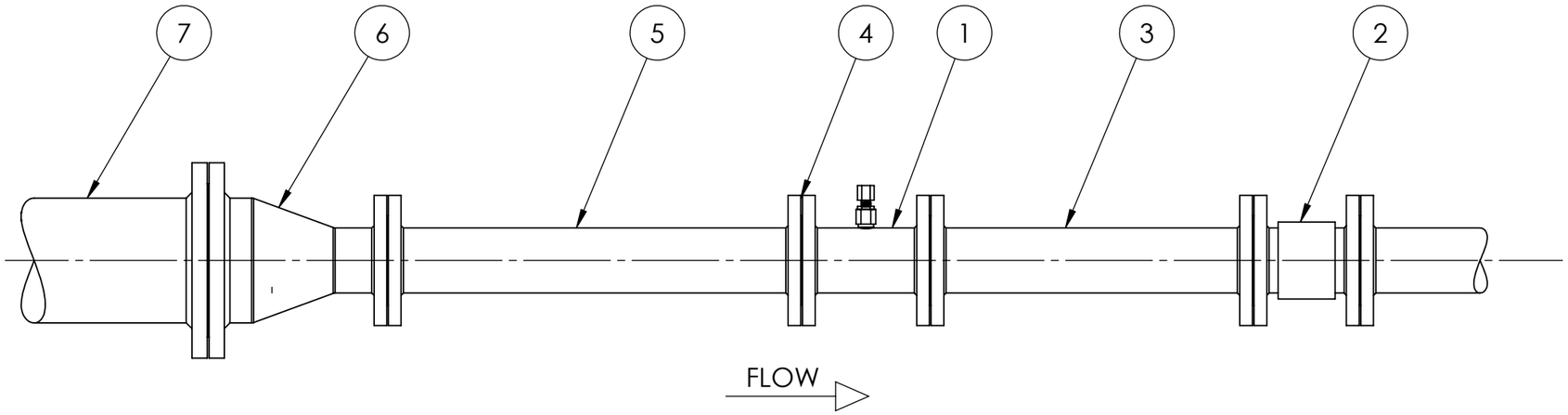




ITEM NO.	DESCRIPTION	QTY.
1	E-series with 3 thread entries	1
2	Cable gland	1
3	Pick-off	1
4	O-ring BS018	1
5	Flange spool 150RF 80mm	1
6	Cap	1

TITLE: **Turbine Flow Meter**			MATERIAL: -	DRAWN BY: **JV**	GENERAL TOLERANCES: 0.000 ±0.05; 0.00 ±0.1; 0.0 ±0.2; 0 ±0.5; ANGLE ±0.5°	**2:5**	**A3**	DO NOT SCALE DRAWING
			COLOUR	DATE: **30/04/2021**			ALL DIMS. IN MM	BanksiaControls © 2015
PART/ASSY. NUMBER	REV. **1.1**	SHEET **2 OF 2**	FINISH: **n/a**	DRAWING NO.: **BC_024.102**				

TYPICAL FLOWMETER INSTALLATION



1 - Flowmeter horizontal with pick-off at highest point.

2 - Valve should be downstream of flowmeter for maximum back pressure. Bends / elbows / restrictions, or changes in pipe diameter to at least x 5 diameter downstream of meter.

3 - 5x diameter of straight pipe, of same bore size as flowmeter.

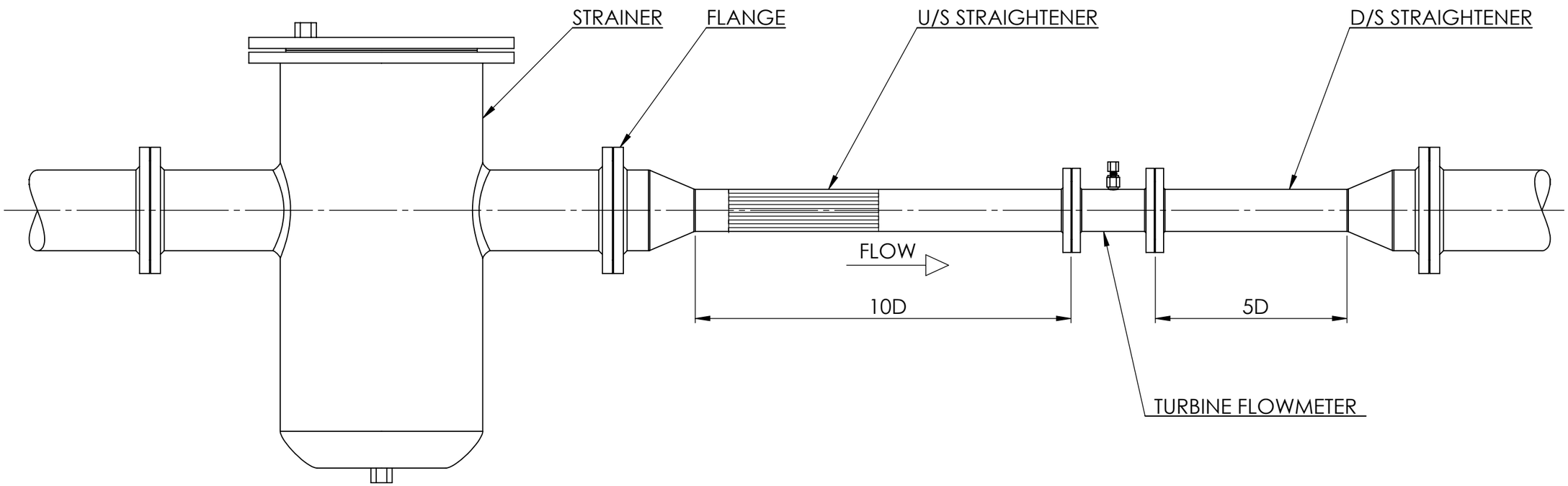
4 - Gaskets must be accurately made and must not protrude into the flow stream.

5 - Inlet pipe to be straight and at least 10x diameter.

6 - Nominal bore of reducer to match meter bore. Greater lengths and / or flow straightener may be necessary on installations with cone pipe reducers. Angle of reducer to be no greater than 30 degrees for minimum turbulence.

7 - Product pipe usually larger than nominal meter bore to reduce pressure losses in pipe.

TITLE: **TFM Typical Installation Drawing**	MATERIAL: -	DRAWN BY: **JV**	GENERAL TOLERANCES: 0.000 ±0.05; 0.00 ±0.1; 0.0 ±0.2; 0 ±0.5; ANGLE ±0.5°	**A3**	DO NOT SCALE DRAWING
PART/ASSY. NUMBER	COLOUR	DATE: **07/05/2021**		ALL DIMS. IN MM	BanksiaControls
REV. **1.0A** SHEET **1 OF 1**	FINISH: -	DRAWING NO.: **BC_024.902**			



RECOMMENDED STRAINER SIZE-LIQUID USE

METER SIZE	SLEEVE BEARING MESH SIZE	BALL BEARING MAX. PARTICLE SIZE
TFM 1010-1015	120	2/3 MICRON
TFM 1020	80	5 MICRON
TFM 1025-1075	60	10 MICRON
TFM 1100-1150	40	
TFM 1200-1250	10	

TITLE: **TFM Pipe Layout Drawing**			MATERIAL: -	DRAWN BY: **JV**	GENERAL TOLERANCES: 0.000 ±0.05; 0.00 ±0.1; 0.0 ±0.2; 0 ±0.5; ANGLE ±0.5°		A3 / DO NOT SCALE DRAWING
PART/ASSY. NUMBER	REV. **1.0**	SHEET **1 OF 1**	COLOUR	DATE: **07/05/2021**			ALL DIMS. IN MM
			FINISH: -	DRAWING NO.: **BC_024.901**			BanksiaControls © 2015