

# nixon

F L O W M E T E R S

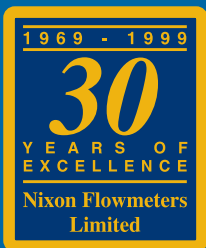


HANLEY CONTROLS

CLONMEL

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## Precision Counts



[www.nixonflowmeters.co.uk](http://www.nixonflowmeters.co.uk)





Turbine Flowmeters



Clear Tube Variable Area  
Flowmeters



Metal Tube Variable Area  
Flowmeters



Electromagnetic Flowmeters



Impact Disk Flowmeters



Gear Wheel Flowmeters



Level Indicators



Level Switches

Nixon Flowmeters was formed in 1969 and has always specialised in the field of Flow Metering. We are a family owned company based in Cheltenham, Gloucestershire and manufacture and supply most types of instruments from simple low cost Variable Area Flowmeters to high accuracy Turbine and electromagnetic types. We are fully equipped with in-house machine shop and calibration facilities. We can calibrate from 0.5 l/min to 8000 l/min water flows. The company works with many different sectors of industry such as chemical, pharmaceutical, nuclear and aerospace. We have recently gained the sole UK agency for Tecfluid, this allows us to offer an extended range of flow and level products to suit every application. Our U.K. wide team of technical representatives are complemented by home-based specialist engineers for all enquiries.

Visit our website: [www.nixonflowmeters.co.uk](http://www.nixonflowmeters.co.uk) for the latest news . . . . .



## Introduction

The Nixon range of turbine flowmeters offers high accuracy and high reliability. Over 30 years, thousands of units have been sold to all classes of industry, and the meters have an excellent reputation for durability.

Many leading flowmeter companies in the U.K. and abroad have the confidence to put their name on our range of turbine flowmeters, a sign of the high regard in which the product is held.

The range has been modified and extended over the last few years to provide a reasonably priced general purpose flow transmitter. We now produce the units entirely in-house to control quality and availability. The range is available on short deliveries, and popular sizes are held ex-stock.

Available in a wide variety of body sizes and styles, all NT flowmeters possess an electrical pulse output directly proportional to flowrate, based upon the operating principle described in this publication. Remote flowrate indication, alarms, totalising and batch control functions are available utilising our wide range of secondary electronic instruments.

The flowmeters are suitable for use on lubricating or non-lubricating liquids of low to medium viscosity and are largely insensitive to density variations, pressure or temperature fluctuations.

Contact parts are produced from 316 stainless steel, except rotors which must possess good magnetic qualities, and here 431 stainless is used or Ferralium

alloy depending upon the corrosive properties of the liquid.

Standard end connections are screwed BSP parallel thread with included 30 degree internal cones to BS5200, but Ermeto threads are also available. Flanged meters are normally to ANSI 150 or BS4504 (DIN) standards, but older type flanges to BS10 tables D-H may also be fitted.

A unique feature of the design is the use of helically milled rotors cut from solid in sizes up to 65mm. Bearing bushes are of PTFE/Carbon HY49 or similar, or tungsten carbide depending upon the nature of the metered fluid. In all cases, the spindle is of tungsten carbide with Cobalt binder, and thrust balls of tungsten carbide. Stainless steel ball races are used in the smaller sizes.

The electrical signal is a sinusoidal pulse of minimum height 50mV peak at lowest flowrate, rising to 800mV peak at max flowrate. For normal transmission distances pre-amplifiers are not essential since pulse shaping and conditioning are carried out in the appropriate electronic readout unit. In cases where heavy electrical noise is present or where transmission distances are over 500 metres, pre-amplifiers of standard or intrinsically safe design are available as head mounted weatherproof units and loop powered.

Performance and other details are listed on Technical Data tables on pages 2 & 3.

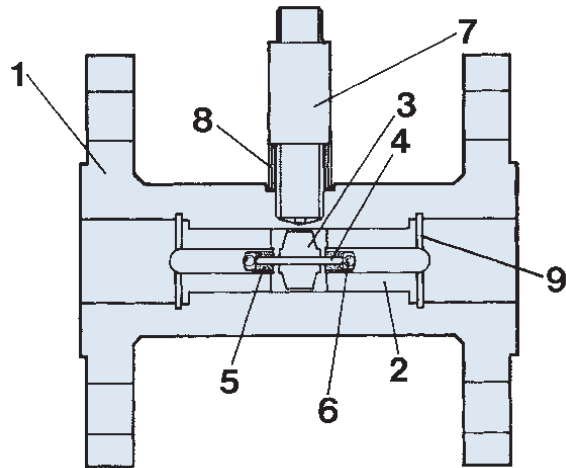




## Technical Data

- **Linear Accuracy**             $\pm 0.5\%$  over 10:1 range
- **Repeatability**                 $\pm 0.1\%$  of reading
- **Response Time**                50 milliseconds for 50% step change in flowrate
- **Output Signal**                Sinusoidal pulses  
50mV - 800mV peak  
varying with flowrate
- **Operating Pressure**        Twice the pressure drop across the meter plus vapour pressure of liquid
- **Pressure Drop**                0.2 - 0.5 bar depending on meter size
- **Flow Range**                    10:1 as standard
- **Temperature**                 Wider ranges possible  
-30°C min  
150°C max (standard coil)  
400°C special design  
120°C intrinsically safe
- **Transmission Distance**    500 metres max without pre-amplifiers for low noise environment
- **Mounting Altitude**         Horizontal or vertical (flow upwards) or inclined
- **Maximum Pressure**         Limited only by end fittings

## Parts and Material



<b>1</b>	Housing	316 Stainless Steel
<b>2</b>	Bearing Hanger	316 Stainless Steel
<b>3</b>	Rotor	431 Stainless Steel
<b>4</b>	Spindle	Tungsten Carbide
<b>5</b>	Bearing Bushes	PTFE/Carbon filled or Tungsten Carbide
<b>6</b>	Thrust Ball	Tungsten Carbide
<b>7</b>	Pick off coil	Stainless Steel body
<b>8</b>	Collar	316 Stainless Steel
<b>9</b>	Circlip	302 Stainless Steel

## Sizing table

Type Number	Flow Range (Linear)		Approx K-Factor		Linearity	Standard End Fittings		
	Ltrs/Min	I.G.P.M.	Ltr	Imp Gall		BSP Screwed	ANSI or BS10 E Flange	DIN Flange
NT3	0.5-5	.11-1.1	17000.0	771800.0	$\pm 0.5\%$	3/8"	1/2"	ND15
NT5	1.2-10	.22-2.2	5900.0	26780.0	$\pm 0.5\%$	1/2"	1/2"	ND15
NT7	2-20	.44-4.4	3000.0	13620.0	$\pm 0.5\%$	1/2"	1/2"	ND15
NT11	5-50	1.1-11	2600.0	11800.0	$\pm 0.5\%$	1/2"	1/2"	ND15
NT13	8-80	1.8-18	1950.0	8850.0	$\pm 0.5\%$	3/4"	1/2"	ND15
NT19	15-150	3.3-33	630.0	2860.0	$\pm 0.5\%$	1"	1"	ND25
NT24	25-250	5.5-55	350.0	1590.0	$\pm 0.5\%$	1"	1"	ND25
NT32	45-450	9.9-99	135.0	613.0	$\pm 0.5\%$	1 1/4"	1 1/2"	ND40
NT38	65-650	14.5-145	117.0	530.0	$\pm 0.5\%$	1 1/2"	1 1/2"	ND40
NT48	110-1100	25-250	67.0	305.0	$\pm 0.5\%$	2"	2"	ND50
NT65	200-2000	44-440	18.0	82.0	$\pm 0.5\%$	3"	2 1/2"	ND65
NT80	300-3000	66-660	14.0	64.0	$\pm 0.5\%$	-	3"	ND80
NT100	500-5000	110-1100	7.5	34.0	$\pm 0.3\%$	-	4"	ND100
NT150	1000-10000	220-2200	3.4	15.5	$\pm 0.3\%$	-	6"	ND150



## Operations Principle

A ferritic stainless steel rotor revolves within a non-magnetic housing on the outside of which is located a pick off coil containing a permanent magnet. As the rotor blades pass the tip of the permanent magnet, the reluctance of the magnetic circuit is changed, and a small a.c. voltage is generated in the coil. The frequency of the a.c. voltage is proportional to flowrate, and the total number of pulses produced represents total flow passed through the meter.

The flowmeter may be located some considerable distance from the associated secondary instrument, and remote flowrate indication, total flow, and remote batch control are thus possible.

## Installation and use

For best results the flowmeter should be installed well away from heavy current carrying cables and with control valves etc. located downstream of the meter.

A length of straight pipe of bore equal to the meter inlet should be provided, preferably 10 diameters in length, and if possible containing flow straightening vanes at the inlet end. Turbine meters are sensitive to swirl present upstream may cause a change in meter factor.

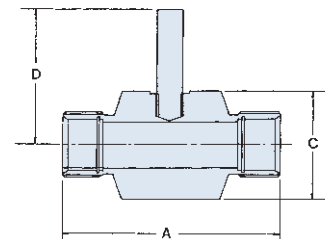
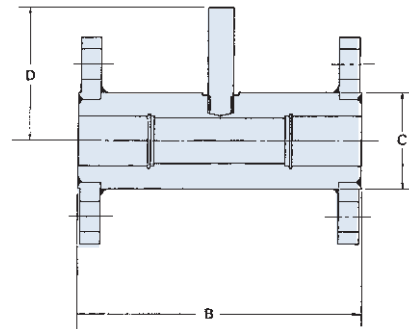
Strainers should be provided to minimise the risk of damage due to small solids in suspension. Meters may be installed in any attitude, but the flow direction and mounting attitude should be advised at the order stage if other than horizontal.

Varying densities have no appreciable effect on the accuracy of axial flow turbine meters so far as volumetric flow is concerned. If readout is required in mass flow terms, we can supply density or temperature compensation equipment to automatically correct for density variation. All turbine meters are to some extent sensitive to viscosity changes and any likely viscosity variation should be advised at the order stage.

Servicing may be carried out by our service engineers in the field, but meters should be returned to our factory wherever possible for repair. Bearing replacement can be effected on site by a skilled fitter, and instructions will be provided on request.

When requesting service visits or spares the full serial number should be stated, which immediately gives us access to the original order files for the installation.

## Dimensions



Allow an extra 50 mm height on dimension 'D' for pick off coil connector.

	A	B	C	D
NT3	51	110	25	82
NT5	64	110	25	82
NT7	64	110	25	82
NT11	85	110	38	84
NT13	85	110	38	86
NT19	114	150	51	89
NT24	114	150	51	91
NT32	135	174	64	95
NT38	150	174	64	98
NT48	180	210	76	103
NT65	-	258	100	112
NT80	-	316	100	119
NT100	-	386	167	130
NT150	-	410	167	155



**Calibration method**

Water is pumped from storage through the test meter, through a manual control valve into a collecting tank mounted upon a standard weighbridge, the vessel having a drain valve for return to storage.

At the commencement of a calibration, water is circulated through the system and allowed to drain whilst the operator regulates the control valve to set up the approximate desired flowrate. Next, a small weight, equal to about 10% of tank capacity is attached to the weighbridge arm, which when the arm is displaced is arranged by means of microswitches or an optical system, to switch on a high resolution pulse counter and a microsecond timer.

The drain valve is closed, and when the level reaches the preset value, the balance arm starts the counting procedure.

The operator now re-sets the balance arm, and attaches weights equal to the desired calibration volume whilst the collecting tank is filling.

When the second level is reached, the balance arm again deflects and closes the gating circuit of the counters.

Thus for one given flowrate, we can calculate pulses per unit of volume, and also the exact flowrate at which the calibration took place. This procedure is

then repeated at ten points over the operating range of the meter. Readings of pressure loss and output voltage are taken and the a.c. waveform is examined on an oscilloscope to detect any abnormalities in the rotor blades etc.

**NIXON FLOWMETERS LTD  
CALIBRATION CERTIFICATE**

<b>CUSTOMER</b>		<b>CERTIFICATE NO.</b> 1614801 Feb-02	
MODEL NO	NS 50063	CALIBRATION MEDIUM	WATER
SERIAL NO	1614801	DENSITY (KG/M <sup>3</sup> )	999.90
ENGINEER	C.P.	VISCOSITY (CPSE)	1
DATE	February 1, 2002	MAX FLOWRATE (L/MIN)	1.8
TEMPERATURE	14	SET VOLUME (LITRS)	1
TEST RIG	C		

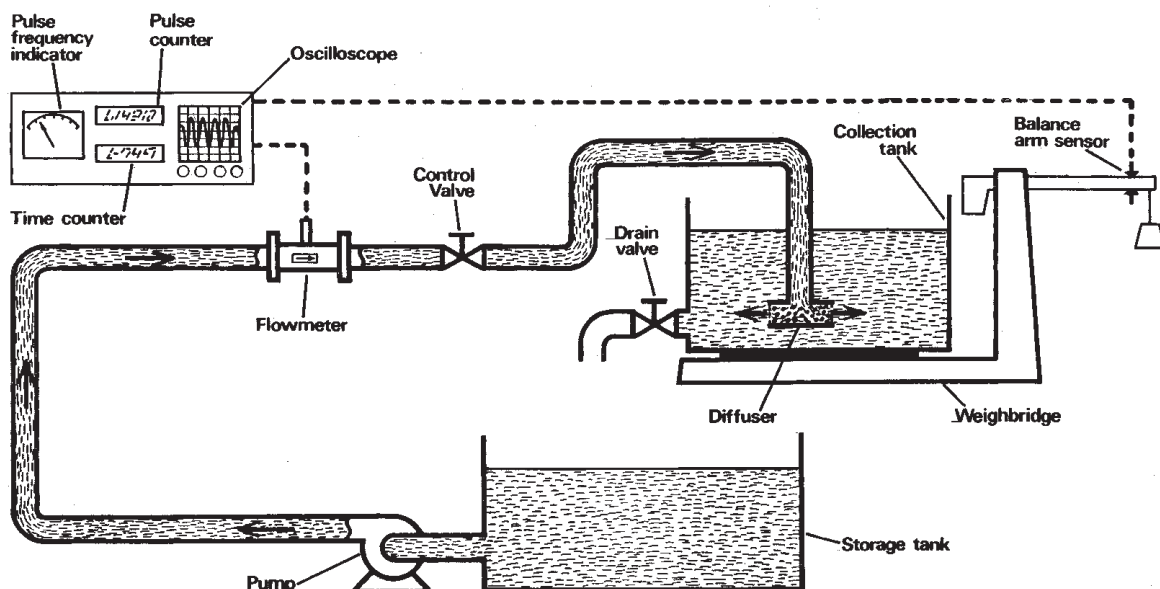
We certify that the above meter was calibrated at our works using our normal gravimetric methods traceable to national standards. The meter was found to perform to a satisfactory manner. The following results were obtained:

TOTAL PULSES	TIME (SECS)	ACTUAL VOLUME	FLOW L/MIN	PULSES PER LITRE	% OF FLOW
29536	33.31		1.60	28518.04	133.1
29564	37.78		1.59	28544.02	88.3
29588	43.47		1.36	28546.12	76.7
29322	49.6		1.20	28302.19	96.6
26357	55.43	1.001	1.01	26357.16	96.1
26118	74.62	LITRS	0.80	26098.33	44.7
26168	89.81		0.60	26148.25	33.4
26362	144.75		0.41	26362.15	23.0
26430	330.88		0.18	26410.11	10.1
26510	33.4		1.80	26450.05	99.8

AVERAGE PULSES PER LTR	(K factor) 28375.84
RECIPROCAL OF PULSES PER LTR	3.526 05
FREQUENCY AT MAX FLOWRATE	855.48 HZ
LINEARITY OVER FULL RANGE %	0.782378
MINIMUM OUTPUT (MV)	80
MAXIMUM OUTPUT (MV)	703

SCHEMED BY: ..... WITH ESSEED: .....  
Bldg: Infor Class, Leckhampton, Cheltenham, Glos ENGLAND Tel 01242 243006

A full 10 point calibration certificate is supplied with every flowmeter.





## Introduction

The BNO series flowmeters have been designed specifically for high accuracy flow measurement and batch control in the liquid food industries, and conforms to the same exacting standards as our NT industrial flowmeters so far as performance is concerned.

In the basic design, Nixon Flowmeters have been aware of the particular hygienic requirements of the brewing and dairy industries, and great care has been taken to ensure the absence of crevices where bacteria can lodge and breed.

The materials used in construction ensure that no corrosive attack occurs when in-place cleaning agents are used.

Manufactured entirely from stainless steel, except the bearing bushes which are normally of PTFE/Carbon. There are no seals or 'O' rings, nor any internal screw threads. Rotors are machined from the solid, and bearing supports (hangers) are stepped in order to reduce the contact area between hanger and meter internal bore.

## Operating principle

A ferritic stainless steel rotor revolves within a non magnetic housing on the outside of which is located a pick off coil containing a permanent magnet. As the rotor blades pass the tip of the permanent magnet, the reluctance of the magnetic circuit is changed, and a small a.c. voltage is generated in the coil. The frequency of the a.c. voltage is proportional to flowrate, and the total number of pulses produced represents total flow passed through the meter.

The flowmeter may be located some considerable distance from the associated secondary instrument, and remote flowrate indication, total flow, and most important remote batch control are thus possible.

## Advantages

- Minimum of bacteria breeding crevices
- Simple robust design
- Easy one circlip dismantling
- Strong rotor design
- Long bearing life
- Steam cleaning permissible
- Hot detergent Sterilizing permissible
- Excellent repeatability for batching
- Wide variety of end fittings available

A range of electronic readout instruments have been designed to complement our range of turbine flowmeters. Information is available on pages 13-16.





## Installation and use

For best results the flowmeter should be installed well away from heavy current carrying cables and with control valves etc. located downstream of the meter.

A length of straight pipe of bore equal to the meter inlet should be provided, preferably 10 diameters in length, and if possible containing flow straightening vanes at the inlet end. Turbine meters are sensitive to swirl and any pipe swirl present upstream may cause a change in meter factor.

Strainers should be provided to minimise the risk of damage due to small solids in suspension. Meters maybe installed in any attitude but the flow direction and mounting attitude should be advised at the order stage if other than horizontal.

All flowmeters are calibrated on water at our test facility before despatch and a calibration certificate issued.

Full instructions concerning the electrical connections and signal cables are supplied with the handbook for the particular electronic readout equipment being supplied, but it is important to remember that the signal cable screen should be earthed at one point only in the system to avoid earth loops.

Pick off coils should be screwed down to the bottom of the coil well but should not be tightened by spanner.

Operating pressures are in most cases limited by the type of end fittings, and meters have been supplied to operate up to 350 bar.

Varying densities have no appreciable affect on the accuracy of axial flow turbine meters so far as volumetric flow is concerned. If readout is required in mass flow terms we can supply density or temperature compensation equipment to automatically correct for density variation. All turbine meters are to some extent sensitive to viscosity changes and any likely viscosity variation should be advised at the order stage. High viscosity and/or low density will tend to reduce the operating flow range over which the meter will yield the stated linearity.

Care should be taken to avoid cavitation at the meter and a good general rule is to ensure that the static pressure downstream is equal to at least twice the pressure drop across the flowmeter plus the vapour pressure of the fluid.

Temperatures up to 150°C are permissible using our standard pick off coil.

Servicing may be carried out by our service engineers in the field, but meters should be returned to our factory wherever possible for repair.

Bearing replacement can be effected on site by any skilled fitter and instructions will be provided on request.

When requesting service visits or spares the full serial number should be stated, which immediately gives us access to the original order files for the installation.

## Sizing table

Type Number	Flow Range (Linear)		Approx. K Factor		Linearity	Pressure Drop (Bar) at max. flow	Overall Length	End Fittings Type		
	ltrs/min	I.G.P.M.	ltrs	Imp. Gall.				RJT	ISS	Tri-clamp
BNO250	2.0-20	.4-4	3000	13600	±0.5%	.22	127	1"	1"	1/2"
BNO500	9.0-90	2-20	1000	4550	±0.5%	.22	162	1"	1"	1"
BNO1000	18-180	4-40	330	1500	±0.5%	.22	162	1"	1"	1"
BNO1500	25-250	6-55	240	1090	±0.5%	.20	162	1 1/2"	1 1/2"	1"
BNO2000	45-450	10-100	100	454	±0.5%	.25	155	2"	2"	1 1/2"
BNO36	65-650	14-140	90	400	±0.5%	.30	155	2"	2"	1 1/2"
BNO50	90-900	19-190	33	150	±0.5%	.30	165	2"	2"	2"
BNO65	120-1200	26-260	17	78	±0.5%	.30	216	3"	3"	3"

The flow ranges given assume a liquid with viscosity 1 cps and s.g. of 1.0. Increase in viscosity increases the minimum linear flowrate such that overall linear range is reduced. For increased viscosities refer to Head Office. The pressure drop figures given assume a viscosity of 1 cps and are the maximum estimated figures for

maximum flowrate for the given meter size. For lower flowrates the pressure drop reduces as the square of the flowrate. The performance figures given above are based on previous experience and are what we would expect to achieve on calibration. No guarantee is however given unless specifically agreed at the order stage.

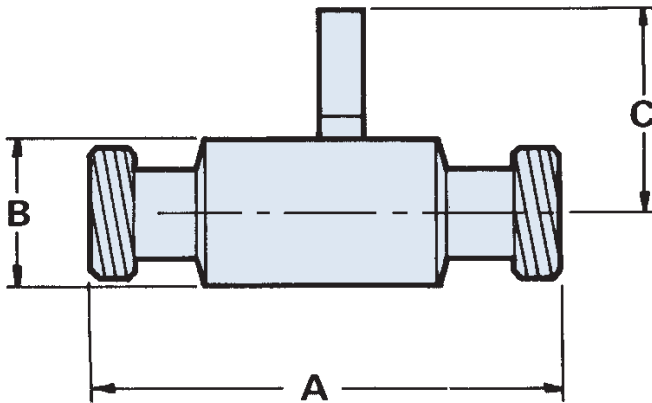




## Dimensions

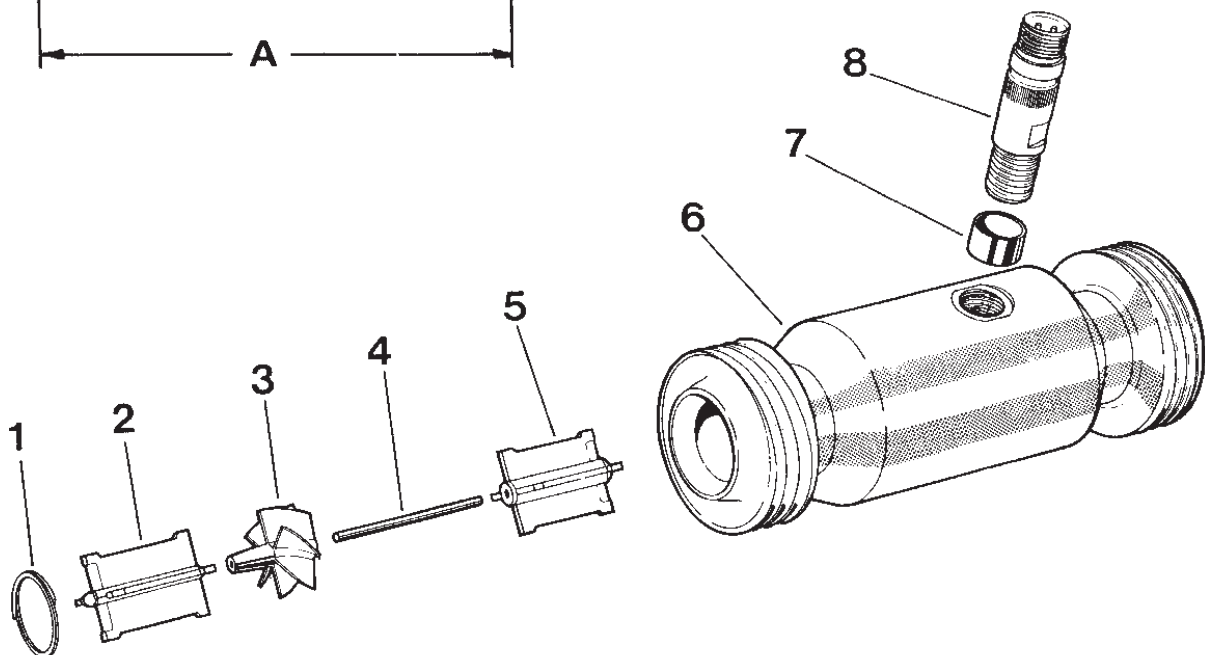
Type Number	A	B	C
BNO 250	80	50	70
BNO 500	162	50	75
BNO 1000	162	50	78
BNO 1500	162	50	80
BNO 2000	155	70	82
BNO 36	155	64	85
BNO 50	165	75	92
BNO 65	216	96	98

Allow an extra 50mm height on dimension 'C' for pick off coil connector.



## Parts and materials

1	Circlip	302 st/stl
2	Downstream Hanger	316 st/stl
3	Rotor with bush	431 st/stl PTFE/Carbon
4	Spindle	316 st/stl
5	Upstream Hanger	316 st/stl
6	Housing	316 st/stl
7	Coil collar	316 st/stl
8	Pick off coil	st/stl body





**Technical data**

**End fittings**

Measuring range	10-1
Accuracy	±0.5%
Repeatability	±0.1%
Flow ranges	min. 2-20 l/min max. 120-1200 l/min
Maximum operating temperature	150°C
Maximum operating pressure	Limited only by coupling design
Transmission length	Up to 300 mtrs. without pre-amp
Pick off coil	Reluctance type with amphenol connector for miniature screened cable. I.S. version available for hazardous locations



1" tri clamp fittings



1" CB/TS two start



1" RJT fittings

**Applications**

The BNO range of turbine meters have been particularly successful in the brewing industry where thousands of units are employed throughout Britain and abroad in keg filling operations. Several leading breweries have standardised on the BNO design to ensure high accuracy batching and long maintenance free operation. Nixon Flowmeters offer a flexible approach to design and end fittings such as RJT and tri clamp hygienic couplings can be supplied without any penalty in cost and delivery. Special designs have been considered for unusual applications e.g. wine bag filling, where a heavy duty design was employed to cope with continuous repetition of very small batches.



## Introduction

A turbine flowmeter operating on the Pelton wheel principle for low flowrate applications on low viscosity fluids.

Conventional axial flow turbine meters become increasingly difficult to manufacture in very small sizes and bearing drag becomes more significant. The Pelton wheel on the other hand still retains a manageable diameter allowing close machining tolerances whilst being capable of handling very low flowrates with reasonable accuracy.

The units may be used for additive flows, fuel consumption metering, perfumes, colourings etc and the output is compatible with our standard range of secondary readout instruments.

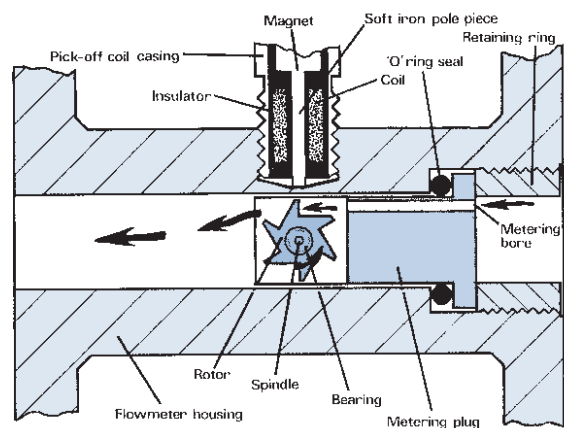
With this design a range of interchangeable metering plugs may be provided within one body size, such that flow ranges may be changed very simply.

Construction is in stainless steel as standard but other materials may be used to suit the corrosive properties of the metered fluid. Flanges to ANSI, BS4504 or BS10 may be fitted and a design is also available with Ermeto or BSP couplings for high pressure hydraulic work.



## Operating principle

In operation a star shaped paddle wheel is housed within a metering plug containing a small jet hole such that a high velocity jet is imparted tangentially on the rotor. Rotational speed and hence frequency are directly proportional to flowrate. The sharp edges of the rotor are detected by a reluctance pick off coil and an alternating voltage is thus generated.



## Sizing table

Type Number	Flow Range l/min	K factor pulse/ltr	Pressure drop (bar)
NS 500/063	0.18-1.8	20700	0.5
NS 500/093	0.45-3.2	14500	0.4
NS 500/110	1.1-5.4	12500	0.4
NS 500/125	1.3-6.5	10500	0.4

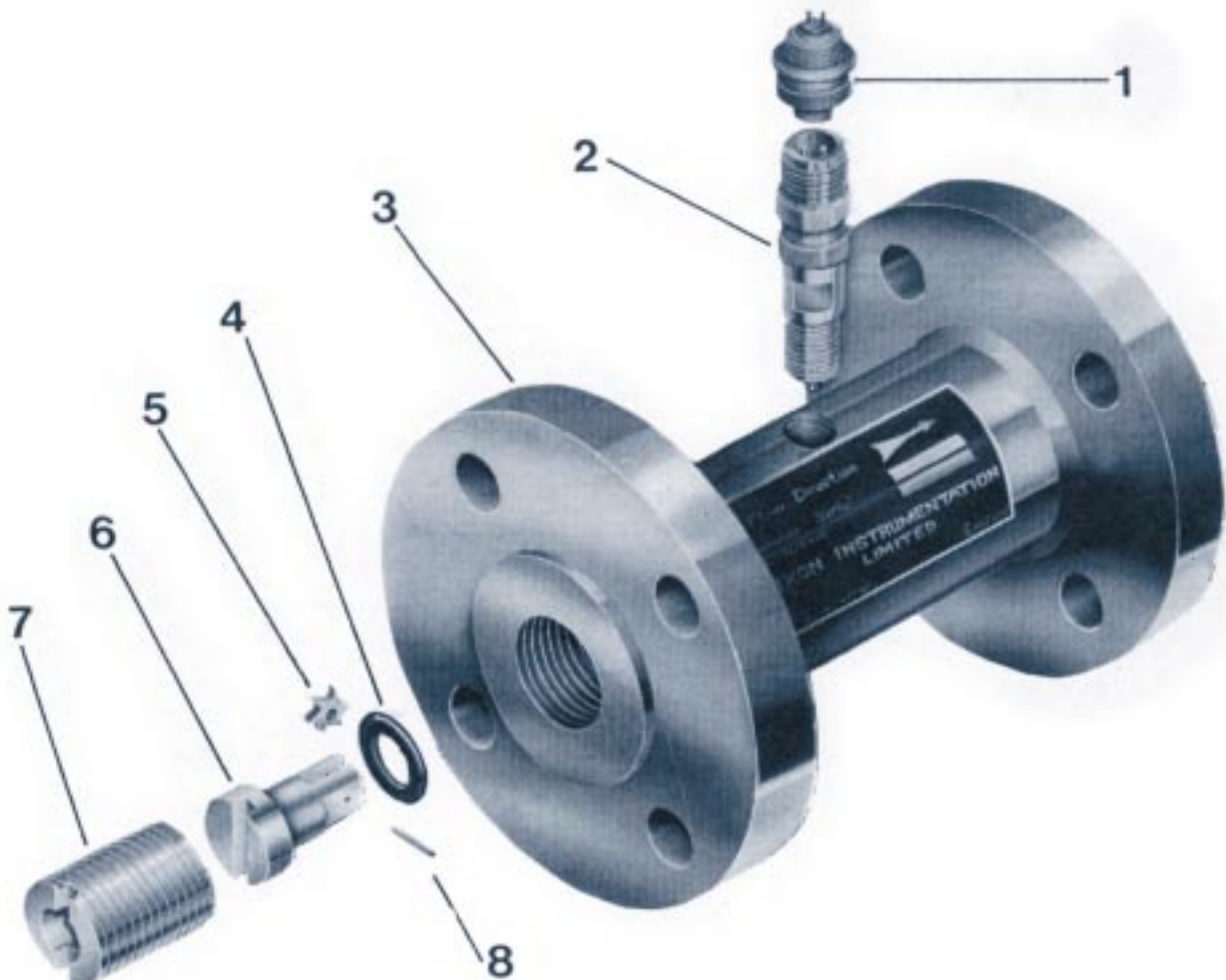


## Parts and materials

## Technical data

1	Connector	Die-cast Aluminium
2	Pick off coil	st/stl body
3	Body	316 st/stl
4	'O' Ring	Butyl rubber or PTFE
5	Rotor	431 st/stl or Ferralium Tungsten Carbide Bush
6	Metering Plug	316 st/stl
7	Retaining Screw	316 st/stl
8	Spindle	Tungsten Carbide

Measuring range	8-1
Accuracy	±1.0%
Repeatability	±0.25%
Maximum operating temperature	150°C
Maximum operating pressure	Limited only by coupling design
Transmission length	Up to 300 mtrs.
Overall length	flanged 114 mm screwed 95 mm





## OG Series Introduction

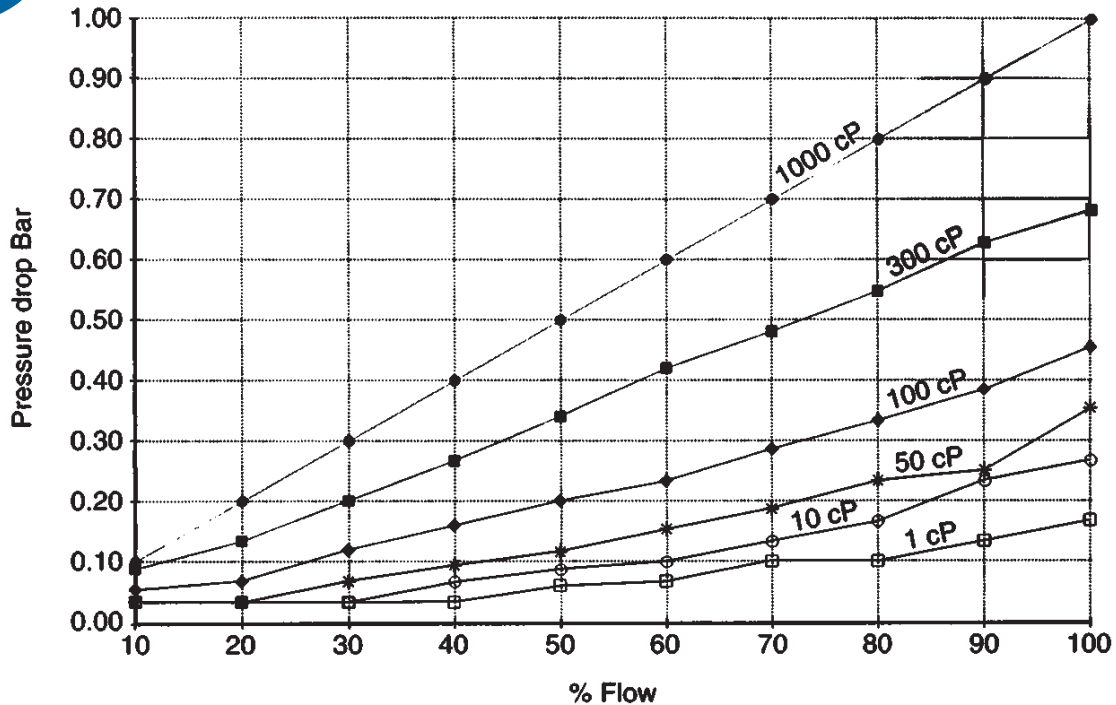
For high accuracy use or with high viscosity fluids.

- Positive displacement
- Pressures up to 670 bar
- Viscosities -1 to 10,000 cP
- Low pressure loss
- 0.1% Repeatability
- Flows from 1ml/min (150cP)
- Wide rangeability
- Inherently linear
- Hazardous area versions
- Temp to 200°C (70°C std.)
- Reed switch or Hall effect
- 0.25, 0.5 and 1% accuracies
- Excellent chemical resistance
- Compact design
- Choice of materials
- Bi-directional
- Up to 500 l/min



Model	Flow Range l/min water	Std. Fittings	Pulses/ltr	Accuracy	Std. Dimensions
OG1	0.05 - 1	1/4" BSPF	2000	1%	40L x 40W x 40H
OG2	0.2 - 4	1/4" BSPF	1000	1%	40L x 40W x 40H
OG3	0.5 - 10	3/4" BSPF	400	1%	70L x 50W x 60H
OG4	2.5 - 50	3/4" BSPF	100	0.5%	70L x 75W x 75H
OG5	5.0 - 100	1" BSPF	72	0.5%	96 Dia. x 86H
OG6	12.5 - 250	1 1/2" BSPF	30	0.5%	145 Dia. x 135H
OG7	25 - 500	2" BSPF	15	0.5%	200L x 145W x 195H

Maximum/minimum flow rates are dependant on viscosity - for more information contact our sales office. The chart above is for standard configurations; alternative end fittings and body sizes are available, we can even match your installation requirements i.e. manifold fittings or sizes to replace a redundant flowmeter.



Higher viscosities may be accommodated but the flow range must be reduced e.g. for a viscosity of 2000 cP the maximum flow would be restricted to 80% of the full flow and for 10000 - 40% of full flow.

**Oval gear meters order codes and example, OG3-6-S-2HM-V-50**

Meter Range	Body Material	Temp	Pressure	Detector	Connector	Seal	Process Connections
OG1	0=Special	<b>S=70°C</b>	<b>2=20 Bar</b>	<b>H=Hall</b>	<b>M=MIL</b>	<b>V=Viton</b>	25=1/4" BSPF
OG2	<b>6=316 St/St</b>	T=100°C	5=50 Bar	R=Read	MP=4 Pin M12	N=Nitrile	<b>50=1/2" BSPF</b>
<b>OG3</b>	7=Aluminium	U=150°C	1=100 Bar	O=Special	B=IP65 box	E=EPDM	75=3/4" BSPF
OG4	8=Brass	V=200°C	4=400 Bar		C=Contrec	K=Kalrez	10=1" BSPF
OG5	9=PEEK		7=700 Bar		Adaptor	O=Special	12=1 1/4" BSPF
OG6	PEEK gears as				O=Special		15=1 1/2" BSPF
OG7	standard						F=Flange Please specify

The above order code breakdown emphasises the flexibility of our products. The previous chart shows our standard fittings for the various size meters but any meter can have any size or type of process connection. For example, an OG1 running at 0.1 litres per minute could have 2" 600lb flanges. our standard gear material is carbon filled PEEK, which is a high-grade

engineering plastic with exceptional tribology characteristics, very good chemical resistance and excellent high temperature properties. Where the standard PEEK gear and magnet configuration is not acceptable, we offer alternative gear materials with encapsulate magnets.



## Series Introduction

The 100 series of secondary instruments have been designed as a rugged and versatile range offering the user anything from simple flowrate indication to batching, ratio metering and controlling applications. The indicator can be head, field or panel mounted and the standard aluminium case design is to IP67. A large LCD dual display shows clear text and measuring units. The units are battery powered as standard and the easily replaced lithium battery has an average life of seven years. A scaleable pulse and analogue output is available as standard. The units are very easy to program and the whole range have been designed with the same clear logical menu structure.

- 110-P Flowrate/Totaliser. Scaleable pulse output + 4-20 mA output
- 111-P Dual input flowrate/Totaliser
- 112-P Flowrate/Totaliser with linearisation. Scaleable pulse + 4-20 mA output
- 113-P Flowrate Totaliser High/Low alarms or pulse + 4-20 mA output
- 114-P Ratio indicator high/Low alarms + 4-20 mA output
- 115-P Flowrate/Totaliser with quadrature input scaleable pulse + 4-20 mA output
- 116-P Differential/sum indicator scaleable pulse + 4-20 mA output
- 120-P Flowrate controller PI (D) with 4-20 mA + pulse output
- 124-P Ratio controller PI (D) with 4-20 mA + high/low alarm output
- 126-P Flow computer with temperature and pressure compensation
- 130-P Batch controller two transistor outputs 2 stage or pulse
- 131-P Batch controller with flowrate indication 4-20 mA + 2-stage or pulse output
- 133-P Dispenser/batcher mimic with two transistor outputs

Note: STANDARD configuration for most 100-Series models: Internal Battery & 8-28V DC powered + 4-20mA Output with die-cast, powder coated aluminium field enclosure -IP67 (further options below)

### OPTIONS 100-SERIES

#### Option - communication:

- CB 2-wire RS232 Modbus protocol
- CH 2-wire RS485 Modbus protocol
- CI 4-wire RS485 Modbus protocol

#### Option - case design:

- HB aluminium panel-mount housing IP65 / Nema 4
- HD ABS wall-mount housing IP65 / Nema 4

#### Option - inputs:

- IB Remote input (reset total)
- IC Remote control of the three function keys

#### Option - power supply

- PA see PB
- PB Lithium battery (long life)
- PF 12-24V AC/DC + DC sensor supply + electro-mechanical relays
- PL input loop powered 4-20mA
- PM 80-240V AC + DC sensor supply + electro-mechanical relays
- PN 80-240V AC + sensor supply + relays + LED back-light

#### Option - hazardous area:

- XI EExia IIB T4/EEExia IIC T4 - Cenelec approved
- XD EExd IIB T5 - Explosion proof housing with one function key - 1x M20 cable entries
- XF EExd IIB T5 - Explosion proof housing + all three function keys - 3x M20 cable entries
- ZV PRTD range -200 / +800 °C





## Series Introduction

The F series range of secondary instruments has been developed with primary functionality and low cost in mind. The range comes with an ABS case to IP65 and can be head, field or panel mounted. It features the same user interface as the 100 series described on page 13 with a large LCD display showing clear text and measuring unit. In order to keep the F series competitive the base price includes a panel mounted case and is suitable for DC low voltage power supply. Lithium batteries, case backs for wall mounting and other extras are priced separately.

## Display Instrumentation

- 010-P Flowrate indicator
- 011-P Totaliser
- 012-P Flowrate/Totaliser
- 013-P Flowrate/Totaliser + one high or low alarm output
- 014-P Flowrate/Totaliser + pulse output
- 030-P Batch controller, single stage

Note: STANDARD configuration for all F-Series models:  
Supplied in ABS Panel-Mount case: 8-30V DC powered  
(further options below).

### OPTIONS F-SERIES

#### Option - case:

- HA rugged aluminium wall/field-mount housing IP65 / Nema 4x
- HD ABS wall/field-mount housing IP65 / Nema 4

#### Option - power supply

- PB Lithium battery
- PF 12-24V AC/DC + adjustable sensor supply + electro-mechanical relays
- PL input loop powered 4-20mA (models with -A designation only)
- PM 80-240V AC + adjustable sensor supply + electro-mechanical relays

#### Option - hazardous area:

- XI EEx ia IIB T4 / EEx ia IIC T4 - Cenelec IS approval
- XF EExd IIB T5 - Explosion proof housing with three keys - 3x M20 cable entries

#### Option - misc:

- ZV PRTD-extended temperature range -200 / +800 °C
- ST-ONX Stainless Steel Flow Meter Mounting Stem M20(m) x M25(f) - further threads available







## Series Introduction

The 99 Series comprises two DIN 92x92 mm panel mount instruments. The 99RT is a rate/totaliser with built-in alarms and the 99B a twin relay batcher. Both instruments have a clear twin LED display panel and all parameters are programmed from the front panel. The instruments are quick and easy to set up. The instrument design is very robust and the front panel rated to IP65.

### 99RT Rate Totaliser

The 99RT takes a pulse input from your flowmeter and simultaneously displays the flowrate and total. It also displays a non-resettable accumulated total at the touch of a button. High and low flow rate alarms can be used as part of a safety system to protect your plant. There is a scaled pulse output and an analogue 4-20mA output for transmission to other instruments or control equipment.

### 99B Batcher

To start a batch simply press the run button. One display will show you the batch count whilst the other can be set to show either the flowrate or the preset batch quantity.

You can use the 99B in two ways.

1. Single relay operation. The run button operates a relay to control a valve or pump, which is automatically shut off at the end of the batch.
- 2: Dual relay operation where two relays can be used independently to control valves and pumps for slow start and slow stop applications.

Two LEDs show you when either of the two relays are energised.

<b>Construction:</b>	Panel mounting instrument
Case	Black powder coated aluminium
Bezel	High impact phenolic plastic
Front keypad	Polyester
Protection	IP65 - bezel / face
<b>Dimensions:</b>	H 96mm x W 96mm x D 175.4mm
Panel cut-out	92mm x 92mm
Weight	1.2 kg
<b>Power input:</b>	
Mains	110 or 230V AC 45-65 Hz
DC Supply	12-24V DC 300mA typical
<b>Power output:</b>	8-24V DC 50mA
<b>Display:</b>	6 digit 14mm high LED 6 digit 10mm high LED
<b>Temperature range:</b>	0 - 45°C
<b>Connections:</b>	2 rows of through panel screw terminals
<b>Input signals:</b>	Frequency range 0 to 5kHz





**Signal Conditioner**

Wall mount ABS case version. DC 6-24V supply.  
Input from turbine flowmeter.  
Square wave output as input frequency.



**Signal Conditioner**

Head mount aluminium case version.  
DC 6-24V supply. Input from turbine flowmeter.  
Square wave output as input frequency.



**Frequency/Current converter**

DIN rail mount case. Mains or DC supply.  
Input from turbine flowmeter.  
4-20mA output. Fully scaleable.



**Frequency Divider**

DIN rail mount case. Mains or DC supply.  
Input from turbine flowmeter.  
Scaled pulse output. Easily adjusted.



**Frequency/Current converter**

Head mount or wall mount aluminium enclosure.  
DC loop powered. Input from turbine flowmeter.  
Ten point linearisation programme.





## Introduction

The BGN range of metal tube variable area flowmeters has been designed for those applications where conventional glass tube instruments may not be used on account of high pressures or liquid opacity, or for safety considerations when metering hazardous chemicals.

As opposed to the 'fixed float diameter tapered tube' principle used in conventional variable area meters, the BGN utilises a fixed sharp edged orifice and tapered profiled float, the float profile being machined to exacting standards to ensure a linear scaling.

Operating pressures are largely limited only by the flange ratings, and elevated temperature operation is possible by extending the indicator coupling to remove the indicator and associated electrical or pneumatic transmitters from the source of heat.

Large scale production and exacting machining specifications enable all parts of the flowmeter to be mechanically interchangeable within a specific range size, and range conversions and replacement of indicators can be carried out by any skilled engineer without difficulty.

Electrical transmitting system, or high and low alarm contact devices may be fitted in minutes within the indicator housing.

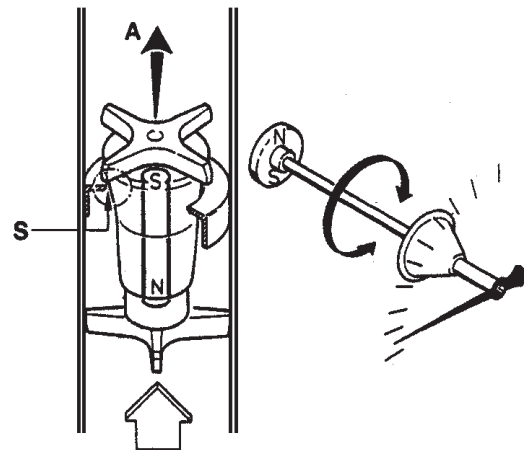


## Operating principle

The measuring system comprises a sharp edged fixed orifice ring, and a tapered float.

When the fluid flows vertically upwards, the float rises until a point of equilibrium is reached where the weight of the float is balanced by the buoyancy force 'A'. This results in an annulus 'S' the area of which is directly proportional to the flowrate.

The vertical movement of the float is transmitted to an external indicator through a magnetic coupling system such that glands and seals are avoided.



## Advantages

- Simple robust and low maintenance all metal design.
- High pressure and temperature resistance. Suitable for steam tracing.
- Linear flow indicator and output signals.
- Short length of 250 mm enables versatile application in all industries.
- Four interchangeable standard indicator systems.



**Sizing table**

	No.	Water l/hr 20°C	Air M³/hr 1.013 bar 20°C	P max mbar	Meter Availability	
					Type 120	Type 170
1/2"	1	0.5-5	0.015-0.15	40		
	2	1.0-10	0.030-0.30	40		
	3	1.6-16	0.048-0.48	40		
	4	2.5-25	0.075-0.75	40		
	5	5.0-50	0.150-1.50	40	•	
	6	7.0-70	0.210-2.10	40	•	
	7	10-100	0.3-3	60	•	
	8	16-160	0.46-4.6	60	•	
3/4"	9	25-250	0.7-7	60	•	
	10	40-400	1.1-11	70	•	
	11	60-600	1.7-17	80	•	
	12	100-1000	2.9-29	60		
	13	160-1600	4.6-46	70		
	14	250-2500	7.1-71	100		

1"	1	0.5-5	0.015-0.15	40		
	2	1.0-10	0.030-0.30	40		
	3	1.6-16	0.048-0.48	40		
	4	2.5-25	0.075-0.75	40		
	5	5.0-50	0.150-1.50	40		
	6	7.0-70	0.210-2.10	40		
	7	10-100	0.3-3	60		
	8	16-160	0.46-4.6	60		
	9	25-250	0.7-7	60	•	
	10	40-400	1.1-11	70	•	
	11	60-600	1.7-17	80	•	
	12	100-1000	2.9-29	60	•	
	13	160-1600	4.6-46	70	•	
	14	250-2500	7.1-71	100	•	
	15	400-4000	11-110	240	•	

2"	12	100-1000	2.9-29	60	•	
	13	160-1600	4.6-46	70	•	
	14	250-2500	7.1-71	110	•	
	15	400-4000	11-110	80	•	
	16	600-6000	17-170	90	•	
	17	1000-10000	29-290	110	•	
	18	1600-16000	46-460	230	•	
	19	2500-25000	71-710	500	•	

3"	15	400-4000	11-110	80	•	
	16	600-6000	17-170	90	•	
	17	1000-10000	29-290	110	•	
	18	1600-16000	46-460	70	•	
	19	2500-25000	71-710	100	•	
20	4000-40000	110-1100	350			

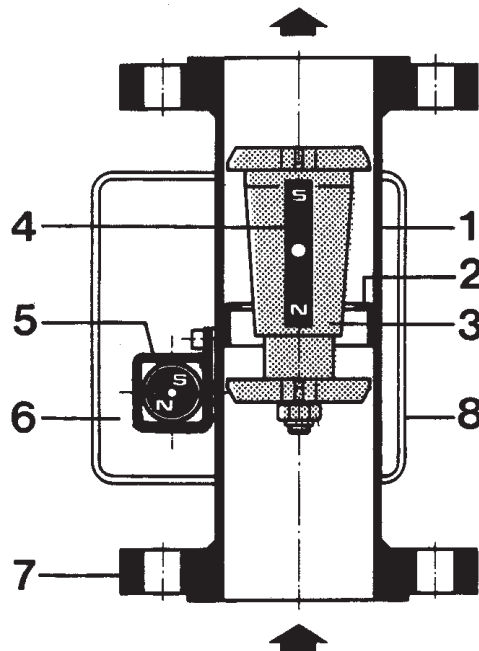
4"	18	1600-16000	46-460	70	•	
	19	2500-25000	71-710	100	•	
	20	4000-40000	110-1100	120		
	21	6000-60000	170-1700	360		

• Indicates floats are interchangeable with tubes in marked size range.  
Shaded flow range figures indicates meters are usually available ex-stock. Other sizes approx. 6-8 weeks delivery. For details refer to head office.

**Parts and materials**

BGN 120		
All contact parts in 316 st/stl		
	Part	Material
1	Body	316 st/stl
2	Measuring ring	316 st/stl
3	Float	316 st/stl
4	Magnet	"Oerstii"
5	Following magnet	"Oerstii"
6	Indicator housing	Aluminium
7	Flanges	316 st/stl
8	Cover	Aluminium

BGN 170		
All contact parts in PTFE		
	Part	Material
1	Body	316 st/stl
2	Body Lining and ring	PTFE
3	Float	PTFE
4	Magnet	"Oerstii"
5	Following magnet	"Oerstii"
6	Indicator housing	Aluminium
7	Flanges	316 st/stl
8	Cover	Ultramid





## Technical data

<b>Standard Flanges</b>	ANSI 150
<b>Ranges</b>	DIN, BS 1560
<b>Pressure Rating</b>	As flange rating
<b>Installation</b>	Vertical, with flow upwards
<b>Length</b>	250mm
<b>Measuring Span</b>	10-1
<b>Scale length</b>	100 mm
<b>Accuracy</b>	±2% of full scale ±1.5% of full scale at extra cost
<b>Temperature Rating</b>	-50°C to 200°C standard higher temp. on request
<b>Ambient</b>	-40°C to +80°C
<b>Weatherproofing</b>	To IP 65 standards
<b>Steam Jacket</b>	May be supplied to special order

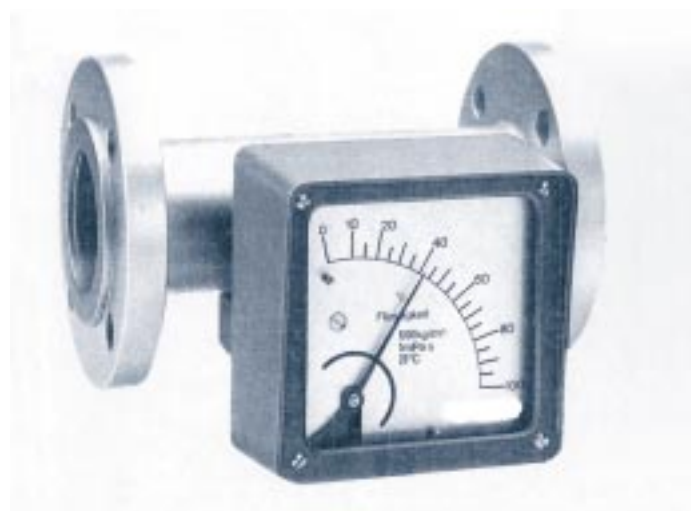
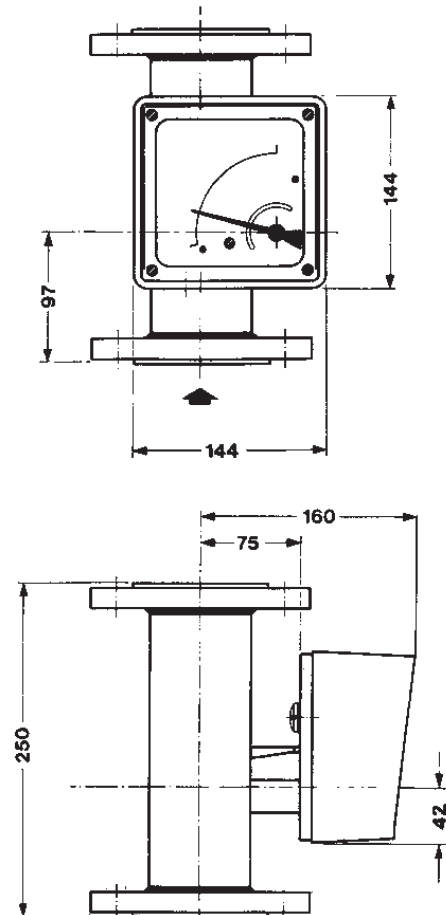
## Installation and use

The meter must be mounted vertically in the pipeline with the direction of flow from bottom to top. The rugged construction and light weight permits the unit to be supported by the surrounding pipework and under normal circumstances no additional bracketing is required.

For liquids, valves of any type may be installed up or downstream of the meter without affecting accuracy. For gas measurements however, valves should be installed downstream of the unit. When opening valves, care should be taken to open slowly since hammer of the float against the tube stop may cause damage.

Since all contact parts are in 316 stainless steel or PTFE the BGN may be used on a wide range of corrosive fluids and the sharp edged orifice enables its use on liquids containing fine particles.

## Dimensions



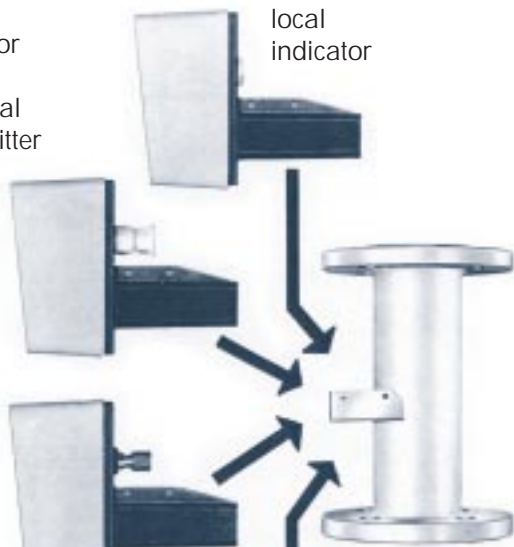
For application where the direction of flow is other than vertically upwards, spring restrained meter type BGF is available.



**Optional equipment**

Various transmitters may be fitted into the indicator housing for remote indication of flowrate or high/low alarm sensors. Electrical or pneumatic transmitters are available. Suitable for hazardous areas, these units are described in further detail in a separate leaflet.

local indicator with electrical transmitter



local indicator with pneumatic transmitter

local indicator with 1 or 2 inductive sensors. (requires relay)



Electrical or Pneumatic transmitter may be easily fitted into standard indicator housing



BGN Fitted with Electrical transmitter type "ES"



BGN Fitted with high/low flow alarm sensors type "KEI 2"



## Introduction

Over the last ten years many thousands of DFM units have been supplied to practically every industry in the UK. All units are available on quick delivery from our extensive stock.

## Advantages

- 3-50,000 litres/hour liquid in 13 ranges each with 10:1 operating span
- 6 different overall lengths from 165-350mm
- Choice of tube materials depending upon operating temperature and pressure up to 100°C and 10 Bar
- Positive pipe O-ring sealing requiring less tightening effort when installing
- Standard or magnetic floats (where alarms required) of identical mass ensure identical flow ranges when changing
- Optional bi-stable adjustable alarm on rear slide
- Optional 4-20 mA transmitter

## Materials

Tube Material: PVC, Polyamide, Polysulphon  
End Fittings: Rigid PVC socket connections for adhesive pipe coupling. BSP threads available. Special stainless steel inserts available.  
Cast iron end caps for higher temperature  
Float: Fully encapsulated PVDF. Stabilising ring fitted to larger sizes ensuring steady flow indication without wobble  
Float Stops: PVDF  
O-Rings: Standard EPDM, Special Viton, etc. available

## Technical data

Accuracy:  $\pm 2.5\%$  full scale  
Max Pressure: 10 Bar operating (at 20°C - see chart for operating pressures versus temperature)  
Temperature: PVC 60°C, PA 75°C, PSU 100°C (see chart) for operating pressures versus temperature)  
Scaling: L/hour H<sub>2</sub>O standard plus 0-100% max flow. Special product scales available  
Flow Ranges: See table on page 23 and quote model number

## Installation and use

### Pipework

Mainly for use with rigid PVC imperial pipe. Alternative screwed BSF female inserts available. See table on page 2 and note dimension 'd' (socket dia) which is also imperial pipe O.D. to be used.

### Installation

Vertical - flow upwards. For best results ensure pipework vertical to within 2/3°.

### Valves

For liquids may be installed upstream or downstream. For gases install valves downstream only.

## Optional equipment

Up to 3 in number bi-stable or mono-stable switches, comprising volt free contacts to handle 240V 5 amp max current. A 4-20mA transmitter is also available.





**Dimensions and parts list**

**Series DFM 335-350**

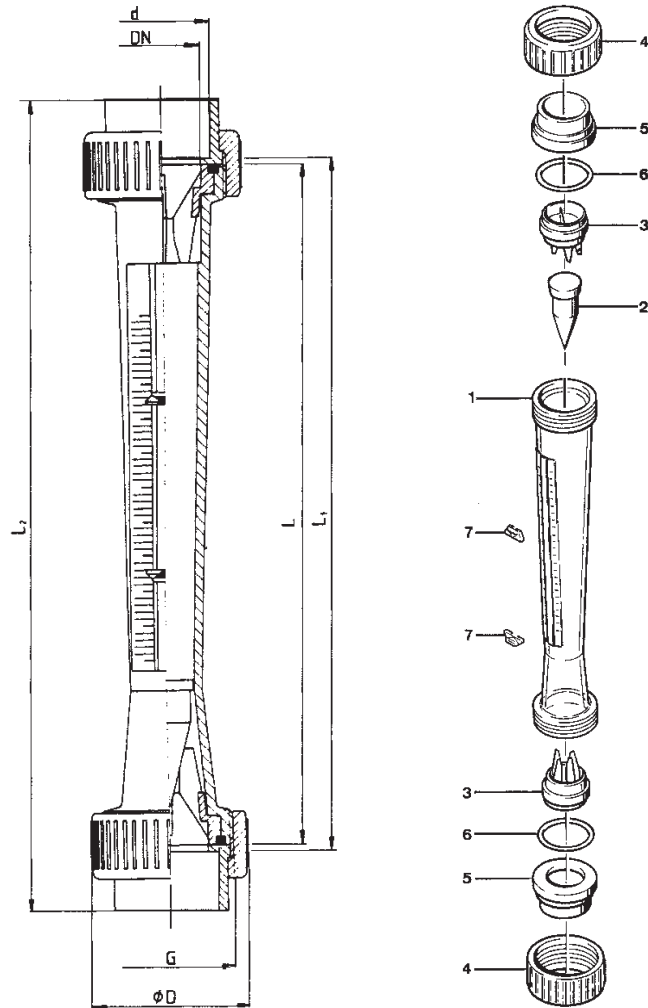
Part	No.	Description
1	1	Measuring tube
2	1	Float
3	2	Float trap
4	2	Union nut
5	2	Insert
6	2	O-rings
7	2	Set-point indicator

**Series DFM 165-170-185-200**

Part	No.	Description
1	1	Measuring tube
2	1	Float
3	1	Float trap
4	2	Union nut
5	2	Insert
6	2	O-rings
7	2	Set-point indicator

**Materials of Construction**

	Standard	Options
Tube	PVC	Polyamide, Polysulphon
Float	PVDF	
Float trap	PVDF	
Union nut	PVC	Cast Iron, St/steel
Insert	PVC	St/steel
O-Rings	EPDM	Viton Teflon



Series DFM	Dimensional mm DN	d	BSPF DN inches	G	D	L	L1	L2	p(1) m bar	Weight in grams (2)
165	10	16	3/8"	3/4"	35	165	171	199	4.6	78
170	15	20	1/2"	1"	43	170	176	208	4.5	96
185	20	25	3/4"	1 1/4"	53	185	191	229	6.1	125
200	25	32	1"	1 1/2"	60	200	206	250	8.3	250
335	25	32	1"	1 1/2"	60	335	341	385	16.2	435
335	40	50	1 1/2"	2 1/4"	83	335	341	403	16.2	1.005
335	50	63	2"	2 3/4"	103	335	341	417	27.6	1.470
335	65	75	2 1/2"	3 1/2"	122	335	341	329	40.7	1.900
350	25	32	1"	1 1/2"	60	350	356	400	16.2	475
350	32	40	1 1/4"	2"	72	350	356	408	16.2	710
350	40	50	1 1/2"	2 1/4"	83	350	356	418	16.2	1.050
350	50	63	2"	2 3/4"	103	350	356	432	27.6	1.530
350	65	75	2 1/2"	3 1/2"	122	350	356	444	40.7	2.100

(1) Pressure loss with water at 20°C

(2) PVDF version approx. +40%





## Sizing table

Nominal Size DN ins BSP	Socket Bore 'd' mm	Air Range NM3/hr 1 Bar Abs 20°C	Water Range l/hr 20°C	PVC Tube		Polyamide Tube		Polysulphon Tube	
				Std Float	Mag Float	Std Float	Mag Float	Std Float	Mag Float

### Series DFM 165

### Range

### Model Number

3/8"	17.1	0.2-1.0	3-22	47500	47683	47516	47699	47532	47715
3/8"	17.1	0.2-2.5	5-50	47501	47684	47517	47700	47533	47716
3/8"	17.1	0.6-3.6	10-90	47502	47685	47518	47701	47534	47717
3/8"	17.1	0.5-9.0	25-250	47503	47686	47519	47702	47535	47718

### Series DFM 170

1/2"	21.4	0.4-2.8	5-50	47504	47687	47520	47703	47536	47719
1/2"	21.4	0.8-6.2	15-150	47505	47688	47521	47704	47537	47720
1/2"	21.4	0.9-9.5	25-250	47506	47689	47522	47705	47538	47721
1/2"	21.4	2.0-15.0	40-400	47507	47690	47523	47706	47539	47722

### Series DFM 185

3/4"	26.5	0.5-5.0	15-150	47508	47691	47524	47707	47540	47723
3/4"	26.5	2.0-14	40-400	47509	47692	47525	47708	47541	47724
3/4"	26.5	2.5-22	60-600	47510	47693	47526	47709	47542	47725
3/4"	26.5	4-34	100-1000	47511	47694	47527	47710	47543	47726

### Series DFM 200

1"	33.6	1.0-8.0	25-250	47512	47695	47528	47711	47544	47727
1"	33.6	2.0-14	40-400	47513	47696	47529	47712	47545	47728
1"	33.6	4-34	100-1000	47514	47697	47530	47713	47546	47729
1"	33.6	5-50	150-1500	47515	47698	47531	47714	47547	47730

### Series DFM 335

1"	33.6	0.7-5.5	15-150	46271	47575	46298	47602	46325	47629
1"	33.6	2.5-20	60-600	46272	47576	46299	47603	46326	47630
1"	33.6	4-34	100-1000	46273	47577	46300	47604	46327	47631
1 1/2"	48.3	8-70	200-2000	46282	47586	46309	47613	46336	47640
1 1/2"	48.3	10-90	300-3000	46283	47587	46310	47614	46337	47641
2"	60.3	22-190	600-6000	46287	47591	46314	47618	46341	47645
2"	60.3	35-300	1000-10000	46288	47592	46315	47619	46342	47646
2 1/2"	75.2	80-720	2500-25000	46293	47597	46320	47624	46347	47651
2 1/2"	75.2	400-1500	10000-50000	46294	47598	46321	47625	46348	47652

### Series DFM 350

1"	33.6	0.7-5.5	15-150	46274	47578	46301	47605	46328	47632
1"	33.6	1.0-10.0	30-300	46275	47579	46302	47606	46329	47633
1"	33.6	2.5-20	60-600	46276	47580	46303	47607	46330	47634
1"	33.6	4-34	100-1000	46277	47581	46304	47608	46331	47635
1 1/4"	42.2	5-50	150-1500	46279	47583	46306	47610	46333	47637
1 1/4"	42.2	8.5-76	250-2500	46280	47584	46307	47611	46334	47638
1 1/2"	48.3	8-70	200-2000	46284	47588	46311	47615	46338	47642
1 1/2"	48.3	10-90	300-3000	46285	47589	46312	47616	46339	47643
2"	60.3	14-125	400-4000	46289	47593	46316	47620	46343	47647
2"	60.3	22-190	600-6000	46290	47594	46317	47621	46344	47648
2"	60.3	35-300	1000-10000	46291	47595	46318	47622	46345	47649
2 1/2"	75.2	50-500	1500-15000	46295	47599	46322	47626	46349	47653
2 1/2"	75.2	80-720	2500-25000	46296	47600	46323	47627	46350	47654
2 1/2"	75.2	400-1500	10000-50000	46297	47601	46324	47628	46351	47655

Note: For air or gas flows model number may vary and will be advised at order stage.

  Ex Stock Flowmeters

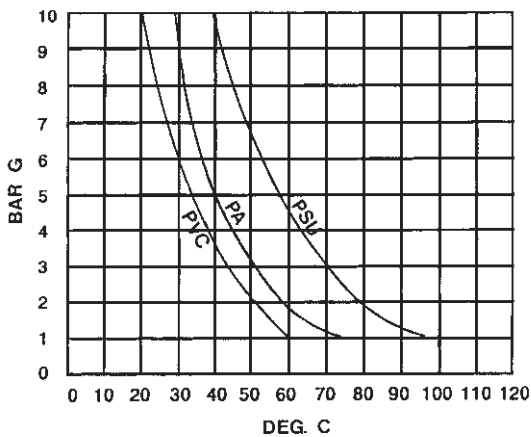


**Density / Viscosity Effects**

All DFM flowmeters are calibrated and scaled in Litre/Hour Water, density 1 Kg/litre at 20°C or Air at 1 bar A at 20°C. Variation in viscosity and density from that of water 1 mPas will affect the scaling range, but guidance on such an operation has to be obtained from our computer programme.

**Temperature vs. Pressure Rating**

Care should be taken to observe the maximum operating temperature for various tube materials, the curve illustrates the maximum operating pressure for temperatures above 20°C.



**Special Scales**

Computer calculated and plotted scales are available which incorporate all these variables and also for gas flow measurement at varying temperatures, pressures, densities and viscosities.



DFM-185 with 4-20mA transmitter and stainless steel end fittings.



Calibration facility



## Introduction

The Nixon NFX Glass tube Variable Area Flowmeter is available in a full range of lengths and is available scaled for liquid or gas measurement. Customised scales match the meter to specific conditions. There is a choice of three scale lengths for optimum readability or compact installation. Repeatability is better than 0.5% of reading to improve process control. An optional needle valve is available for precise control at reduced cost. The tubes are removable from the frame for easy cleaning/ replacement. Angled or straight connections allow for flexible pipe layout. The meters can be simply mounted to reduce installation costs. The instruments have a retained polycarbonate cover to ensure operator safety in the event of a breakage. The units are aesthetically styled to suit integration into original equipment.



## Technical data

Flow ranges - gas range 20 cc/min—115 l/min  
(air equivalent)

Liquid ranges 2.0 cc/min-4.6 l/min  
(water equivalent)

Scale length options - 140 mm / 100 mm / 30 mm

Accuracy Class - % 1.6 / 2.5 / 4 VDI/VDE

Temperature range - -15°C to +20°C

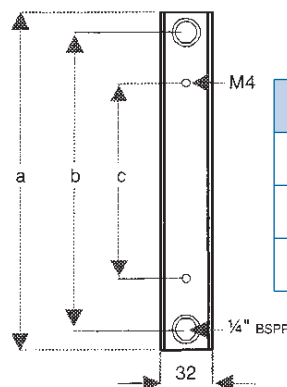
Maximum pressure - 20 Bar Non shock

Connections - Stainless Steel or Nickel plated brass  
1/4" BSP Female

Seals- Viton

Flow tube - Borosilicate glass

Float- Stainless Steel, Anodised Aluminium



mm	Compact	Standard	Long
a	133	210	250
b	108	184	226
c	65	121	121



## Operating principle

Fluid flowing vertically through a tapered tube exerts an upward force on the float such that the float takes up a point of equilibrium where the downward weight is balanced by the upward thrust of the fluid. This point then represents a specific flowrate. Increase in fluid velocity will cause the float to rise again until the next equilibrium point is reached, and this represents a higher specific flowrate. The tube may thus be scaled in terms of flowrate in an almost linear manner.

Ranging and scaling depends on three main factors -

- Shape and density of the float
- Taper of the tube
- Fluid density and viscosity

Several special versions of the NFX flowmeter are available. The long series provide maximum readability and extended flow ranges, suitable for laboratory and calibration applications. Accuracy of 1% of reading to fully traceable standards is available on request. An infrared alarm can be fitted which can be user set to provide a switched output on safety critical applications. Units can be fitted with a bench stand for laboratory applications. Anaesthetic flow tubes for use in medical equipment are available for air, oxygen and nitrous oxide.

Units	Long Series Scales		Compact Series	
	Water H <sub>2</sub> O	Air	Water H <sub>2</sub> O	Air
cc/min	2-80	-	10-80	-
cc/min	-	-	25-250	20-200
cc/min	10-350	-	100-700	40-400
l/min	-	-	0.2-1	0.2-1
l/min	0.05-1.5	0.05-1.8	-	0.5-3
l/min	0.2-4.6	0.25-4.5	-	1-6
l/min	-	1-30	-	2-12
l/min	-	4-100	-	4-24



## Sizing table

Standard Series Scales @ 20°C and 1.013 bar reference									
Units	Water H <sub>2</sub> O	Air AIR	Oxygen O <sub>2</sub>	Nitrogen N <sub>2</sub>	Carbon Dioxide CO <sub>2</sub>	Argon Ar	Hydrogen H <sub>2</sub>	Methane CH <sub>4</sub>	Propane C <sub>3</sub> H <sub>8</sub>
cc/min	2-25	-	-	-	-	-	-	-	-
cc/min	4-60	5-100	5-90	5-100	10-100	5-80	20-250	10-150	10-140
cc/min	30-280	20-250	20-220	20-250	20-250	20-200	40-600	40-360	40-300
cc/min	40-480	60-600	40-600	60-600	60-600	60-560	-	-	100-750
cc/min	50-750	50-750	50-700	50-800	50-750	40-660	100-2000	100-1100	100-850
l/min	0.1-1.2	0.1-1.2	0.1-1.1	0.1-1.2	0.1-1.1	0.1-1.0	0.2-3.4	0.1-1.7	0.1-1.2
l/min	0.3-3	0.3-3	0.4-2.8	0.3-3	0.3-2.8	0.2-2.6	-	-	-
l/min	0.4-4.4	0.6-5	0.4-4.4	0.6-5	0.6-4.4	0.4-4	1-15	1-7	0.8-4.8
l/min	-	1-13	1-12	1-13	1-11	1-8	-	-	-
l/min	-	2-26	2-25	2-28	2-20	1-22	-	-	-
l/min	-	4-50	4-50	4-50	4-40	4-44	10-180	5-70	4.40
l/min	-	10-100	10-100	10-100	10-80	10-90	40-400	-	-

Customised scales can also be supplied to suit any more specific fluids and operating conditions



## Introduction

The Streamflo series of instruments are used to measure, indicate and record very low velocities of water and other conductive fluids. Designed primarily for laboratory and specialised industrial use, the miniature head of the flow sensing probe can be inserted into small ducts and channels where it has the ability to measure velocities as low as 5.0 cm/sec. It is thus suitable for measuring accurately the velocities in hydraulic models of river estuaries, dams, harbours, etc., in addition to field measurements of clean water flows.

Using indicator model 430, a completely portable system requiring no mains supply is available. This is ideal for carrying around from one measuring point to the next.

The use of two probes allows the range of detectable flow rates to be extended up to 300 cm/sec.

All components have been chosen carefully to give long reliable life with the minimum changes in calibration within the operating temperature range stated under specification.

The sensing probe was originally designed by the British Department of Scientific and Industrial Research. Further development by Nixon Flowmeters has resulted in a compact system offering digital indication with optional recording facilities.

## Operating Principle

The sensing probe is a measuring head joined by a slim tube to the plug and socket which connects to the measuring instrument.

The measuring head comprises a five bladed PVC rotor mounted on a hard stainless steel spindle, itself terminating in fine burnished conical pivots which run in jewels mounted in a shrouded frame. Minimum frictional resistance is thus ensured. An insulated gold wire contained within the tube terminates 0.1 mm from the rotor blade tips. When the rotor is revolved by the movement of a conductive liquid, the passage of the rotor blades past the gold wire tip slightly varies the measurable impedance between the tip and the tube. This variation is used to modulate a 15 kHz carrier

signal, generated within the indicating instrument which in turn is applied to the electronic detector circuits. All components have been chosen carefully to give long reliable life with the minimum changes in calibration within the operating temperature range stated under specification.

Automatic compensation is made for changes in liquid conductivity. Following amplification and filtering out of the carrier frequency, a square wave signal is obtained. In the digital indicator the pulses are counted over a known time period to obtain a digital reading.

## Probes

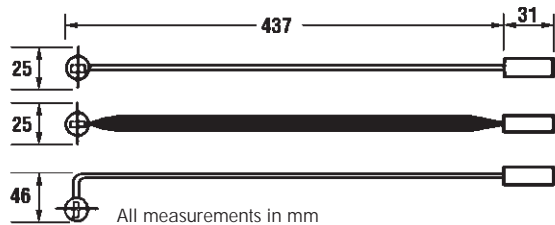
- 403** Standard low speed velocity probe for the range 5.0 to 150 cm/sec.
- 404** Standard high speed velocity probe for the range 60 to 300 cm/sec. Fitted with streamlined fairing to provide additional mechanical strength and freedom from turbulence at higher velocities. 150 cm/sec.
- 423** 90 Degree angles probe to measure vertical velocities over the range 5.0 to 150 cm/sec

With all probes, increased immersion depths can be provided to special order. The maximum length of probes is only restricted by shipping constraints. Sealed probe/cable connectors have been supplied to enable immersion of the cable and probe assembly.



## Probe Parts & Materials

Rotor	11.6 mm diameter PVC machined from solid and balanced
Spindle	Hardened stainless steel with conical ends
Bearings	Synthetic sapphire vee jewels
Cage	Heavy Chromium plated brass
Stem	Stainless steel
Input Socket	BNC
Weight	0.20 kg



## 430 Digital Indicator

The 430 digital indicator has been designed to replace all previous models of indicator, and provides all required functions in one compact unit. The power supply/charger is truly universal and incorporates a range of mains type fittings to enable the unit to be used virtually anywhere in the world at 110 or 220 V a.c. 50 or 60 Hz. The indicator is supplied with a full set of Nickel metal hydride batteries allowing over 7 days continuous operation on one charge.



The indicator can read frequency over 1 second or 10 second, can be set to count total pulses, or can be programmed to read velocity directly in cm/sec using data from the individual probes calibration certificate. A 0 to 5 V DC output is available for driving data loggers and chart recorders and this can be programmed to any frequency range.

## Indicator Specification

Indication	3 1/2 Digit LCD display
Controls	On/off and 1 second/10 second buttons
Input socket	BNC
Output socket	Miniature DIN type with plug supplied
Output	0.5 V DC
Supply	Nickel metal hydride battery or mains power
Weight	540 gms

## Technical Data

<b>Velocity Range</b>	5 to 150 & 60 to 300 cm/sec using two sensing probes
<b>Accuracy</b>	± 1.5% of true velocity
<b>Scaling</b>	digital indicators scaled in Hz or cm/sec Conversion to cm/sec by means of individual calibration curves
<b>Operating temp.</b>	0 to 50°C
<b>Operating Medium</b>	Water or other fluid having similar conductive properties.

## Accessories

<b>Line Amplifier</b>	(Model 407) Fits onto probe. Boosts signal to permit signal transmission up to 200 metres.
<b>Cable Assembly</b>	(Model 405) Standard 3 metre length supplied complete with plugs. Can be supplied with up to 200 metres cable length when line amplifier model 407 is used.

Probes are supplied in a wooden storage box with sliding lid.

## ATMOSPHERES - atm (Standard at sea-level pressure)

x101.325	= Kilopascals (kPa) absolute
x14.696	= Pounds-force per square inch absolute (psia)
x76.00	= Centimetres of mercury (cmHg) at 0°C
x29.92	= Inches of mercury (in Hg) at 0°C
x33.96	= Feet of water (ftH <sub>2</sub> O) at 68°F
x1.01325	= Bars (bar) absolute
x1.0332	= Kilograms-force per square centimetre (kg/cm <sup>2</sup> ) absolute
x1.0581	= Tons-force per square foot (tonf/ft <sup>2</sup> ) absolute
x760	= Torr (torr) (= mmHg at 0°C)

## BARRELS, PETROLEUM - bbl

x0.15899	= Cubic metres (m <sup>3</sup> )
x42	= U.S. gallons (U.S. gal) oilBARS - bar
x100	= Kilopascals (kPa)
x14.504	= Pounds-force per square inch (psi)
x33.52	= Feet of water (ftH <sub>2</sub> O) at 68°F
x29.53	= Inches of mercury (inHg) at 0°C
x1.01 97	= Kilograms-force per square centimetre (kg/cm <sup>2</sup> )
x0.98692	= Atmospheres (atm) sea-level standard
x1.0443	= Tons-force per square foot (tonf/ft <sup>2</sup> )
x750.06	= Torr (tor) (= mmHg at 0°C)

## CENTIMETRES OF MERCURY - cmHG, at 0°C

x1.3332	= Kilopascals (kPa)
x0.013332	= Bars (bar)
x0.4468	= Feet of water (ftH <sub>2</sub> O) at 68°F
x5.362	= Inches of water (inH <sub>2</sub> O) at 68°F
x0.013595	= Kilograms-force per square centimetre (kg/cm <sup>2</sup> )
x27.85	= Pounds-force per square foot (lbf/ft <sup>2</sup> )
x0.19337	= Pounds-force per square inch (psi)
x0.013158	= Atmospheres (atm) standard
x10	= Torr (torr) (= mmHg at 0°C)

## CUBIC CENTIMETRES - cm<sup>3</sup>

x3.5315 x 10 <sup>-5</sup>	= Cubic feet (ft <sup>3</sup> )
x6.1024 x 10 <sup>-2</sup>	= Cubic inches (in <sup>3</sup> )
x1.308 x 10 <sup>-6</sup>	= Cubic yards (yd <sup>3</sup> )
x2.642 x 10 <sup>-4</sup>	= US gallons (U.S. gal)
x2.200x 10 <sup>-4</sup>	= Imperial gallons(imp gal)
x1.000 x 10 <sup>-3</sup>	= Litres (l)

## CUBIC FEET PER MINUTE - cfm

x472.0	= Cubic centimetres per second (cm <sup>3</sup> /s)
x1.699	= Cubic metres per minute (m <sup>3</sup> /min)
x0.4720	= Litres per second (l/s)
x0.1247	= U.S. gallons per second (U.S. gps)
x62.30	= Pounds of water per minute (lbH <sub>2</sub> O/min) at 68°F

## CUBIC INCHES - in<sup>3</sup>

x1.6387 x 10 <sup>-5</sup>	= Cubic metres (m <sup>3</sup> )
x16.387	= Cubic centimetres(cm <sup>3</sup> )
x0.016387	= Litres (l)
x5.7877 x 10 <sup>-4</sup>	= Cubic feet (ft <sup>3</sup> )
x2.143 x 10 <sup>-5</sup>	= Cubic yards (yd <sup>3</sup> )
x4.329 x 10 <sup>-3</sup>	= U.S. gallons (U.S. gal)
x3.605 x 10 <sup>-3</sup>	= Imperial gallons (imp gal)

## CUBIC METRES - m<sup>3</sup>

x1000	= Litres (l)
x35.315	= Cubic feet (ft <sup>3</sup> )
x61.024 x 10 <sup>3</sup>	= Cubic inches (in <sup>3</sup> )
x1.3080	= Cubic yards (yd <sup>3</sup> )
x264.2	= U.S. gallons(U.S. gal)
x220.0	= Imperial gallons (imp gal)

## CUBIC METRES PER SECOND - m<sup>3</sup>/s

x3600	= Cubic metres per hour (m <sup>3</sup> /h)
x15.85 x 10 <sup>3</sup>	= U.S. gallons per minute (U.S. gpm)

## CUBIC YARDS - yd<sup>3</sup>

x0.7646	= Cubic metres (m <sup>3</sup> )
x764.6	= Litres (l)
x7.646 x 10 <sup>5</sup>	= Cubic centimetres (cm <sup>3</sup> )
x27	= Cubic feet (ft <sup>3</sup> )
x46.656	= Cubic Inches (In <sup>3</sup> )
x201.97	= U.S. gallons (U.S. gal)
x168.17	= Imperial gallons (imp gal)

## FEET - ft

x0.3048	= Metres (m)
x30.480	= Centimetres (cm)
x12	= Inches (in)
x0.3333	= Yards (yd)

## GALLONS, U.S. - U.S. gal

x3785.4	= Cubic centimetres (cm <sup>3</sup> )
x3.7854	= Litres (l)
x3.7854 x 10 <sup>-3</sup>	= Cubic metres (m <sup>3</sup> )
x231	= Cubic inches (in <sup>3</sup> )
x0.13368	= Cubic feet (ft)
x4.951 x 10 <sup>-3</sup>	= Cubic yards (yd <sup>3</sup> )

## GALLONS, U.S. - U.S. gal (continued)

x8	= Pints (pt) liquid
x4	= Quarts (qt) liquid
x0.8327	= Imperial gallons (imp gal)
x8.328	= Pounds of water at 60°F in air
x8.337	= Pounds of water 6D°F in vacuo

## GALLONS, IMPERIAL - imp gal

x4546	= Cubic centimetres (cm <sup>3</sup> )
x4.546	= Litres (l)
x4.546 x 10 <sup>-3</sup>	= Cubic metres (m <sup>3</sup> )
x0.16054	= Cubic feet (ft <sup>3</sup> )
x5.946 x 10 <sup>-3</sup>	= Cubic yards (yd <sup>3</sup> )
x1.20094	= U.S. gallons (U.S. gal)
x10.000	= Pounds of water at 62°F in air

## GRAMS PER CUBIC CENTIMETRE - g/cm<sup>3</sup>

x62.43	= Pounds per cubic foot (lb/ft <sup>3</sup> )
x0.03613	= Pounds per cubic inch (lb/in <sup>3</sup> )

## GRAMS PER LITRE - g/l

x58.42	= Grains per U.S. gallon (gr/U.S. gal)
x8.345	= Pounds per 1000 U.S. gallons
x0.06243	= Pounds per cubic foot (lb/ft <sup>3</sup> )
x1002	= Parts per million by mass (weight) in water at 60°F

## INCHES OF MERCURY - inHg at 0°C

x3.3864	= Kilopascals (kPa)
x0.03386	= Bars (bar)
x1.135	= Feet of water (ftH <sub>2</sub> O) at 68°F
x13.62	= Inches of water (inH <sub>2</sub> O) at 68°F
x0.03453	= Kilograms-force per square centimetre (kg/cm <sup>2</sup> )
x70.73	= Pounds-force per square foot (lbf/ft <sup>2</sup> )
x0.4912	= Pounds-force per square inch (psi)
x0.03342	= Standard atmospheres

## INCHES OF WATER - inH<sub>2</sub>O at 68°F

x0.2487	= Kilopascals (kPa)
x2.487 x 10 <sup>-3</sup>	= Bars (bar)
x0.07342	= Inches of mercury (inHg) at 0°C
x2.535 x 10 <sup>-3</sup>	= Kilograms-force per square centimetre (kg/cm <sup>2</sup> )
x0.5770	= Ounces-force per square inch (ozf/in <sup>2</sup> )
x5.193	= Pounds-force per square foot (lbf/ft <sup>2</sup> )
x0.03606	= Pounds-force per square inch (psi)
x2.454 x 10 <sup>-3</sup>	= Standard atmospheres

## KILOGRAMS-FORCE PER SQUARE CENTIMETRE - Kg/cm<sup>2</sup>

x98.07	= Kilopascals (kPa)
x0.9807	= Bars (bar)
x32.87	= Feet of water (ftH <sub>2</sub> O) at 68°F
x28.96	= Inches of mercury (inHG) at 0°C
x2048	= Pounds-force per square foot (lbf/ft <sup>2</sup> )
x14.223	= Pounds-force per square inch (psi)
x0.9678	= Standard atmospheres

## KILOPASCALS - kPa

x103	= Pascals (Pa) or Newtons per square metre (N/m <sup>2</sup> )
x0.1450	= Pounds-force per square inch (psi)
x0.010197	= Kilograms-force per square centimetre (Kg/cm <sup>2</sup> )
x0.2953	= Inches of mercury (inHg) at 32°F
x0.335t	= Feet of water (ftH <sub>2</sub> O) at 68°F
x4.021	= Inches of water (inH <sub>2</sub> O) at 68°F

## LITRES - l

x1000	= Cubic centimetres (cm <sup>3</sup> )
x0.035315	= Cubic feet (ft <sup>3</sup> )
x61.024	= Cubic inches (in <sup>3</sup> )
x1.308 x 10 <sup>-3</sup>	= Cubic yards (yd <sup>3</sup> )
x0.2642	= U.S. gallons (U.S. gal)
x0.2200	= Imperial gallons (imp. gal)

## LITRES PER MINUTE - l/min

x0.01667	= Litres per second (l/s)
x5.885 x 10 <sup>-4</sup>	= Cubic feet per second (cfs)
x4.403 x 10 <sup>-3</sup>	= U.S. gallons per second (U.S. gal/s)
x3.666 x 10 <sup>-3</sup>	= Imperial gallons per second (imp gal/s)

## LITRES PER SECOND - l/s

x10 <sup>-3</sup>	= Cubic metres per second (m <sup>3</sup> /s)
x3.600	= Cubic metres per hour (m <sup>3</sup> /h)
x60	= Litres per minute (l/min)
x15.85	= U.S. gallons per minute (U.S. gpm)
x13.20	= Imperial gallons per minute (imp gpm)

## MEGAPASCALS - MPa

x10 <sup>6</sup>	= Pascals (Pa) or Newtons per square metre (N/m <sup>2</sup> )
x10 <sup>3</sup>	= Kilopascals (kPa)
x145.0	= Pounds-force per square inch (psi)
x0.1020	= Kilograms-force per square millimetre (kgf/mm <sup>2</sup> )

