NT | Industrial Type Turbine Flowmeter

Introduction

The ABLE 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.

Reading Office
Cutbush Park, Danehill, Lower Earley,
Reading, Berkshire. RG6 4UT. UK.
Tel: +44 (0)118 9311188
Email: info@able.co.uk

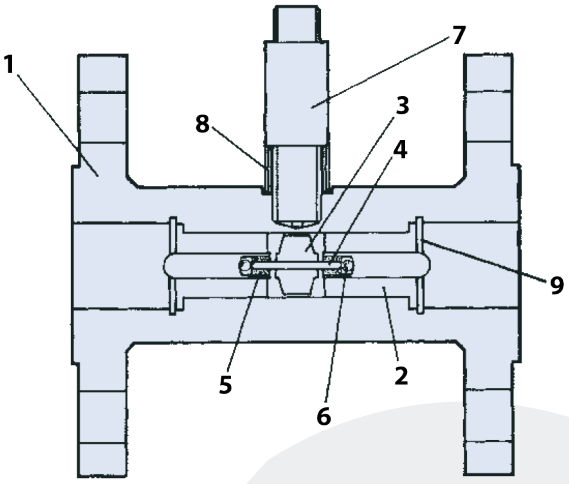
Aberdeen Office
Unit 6 Airside Business Park, Kirkhill Industrial Estate,
Dyce, Aberdeen. AB21 0GT. UK.
Tel: +44 (0)1224 725999
Email: ab@able.co.uk

Internet: www.able.co.uk
e-procurement: www.247able.com
Registered in England No: 01851002
VAT No: GB 417 2481 61

Technical Data

Linear Accuracy	±0.5% over 10:1 range
Repeatability	±0.1% of reading
Response Time	50 millisecs 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



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

Sizing table

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

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Operations Principle

A ferritic stainless steel rotor revolves within a nonmagnetic 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.

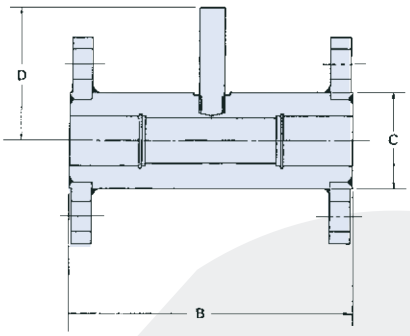
A length of straight pipe of bore equal to the meter inlet should be provided, preferably 10 diameters in length, and if possible containing flow straightening vanes at the inlet end. Turbine meters are sensitive to swirl present upstream may cause a change in meter factor.

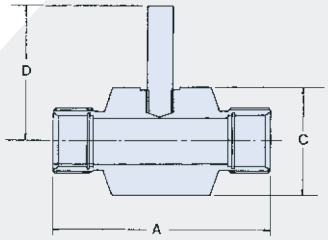
Strainers should be provided to minimise the risk of damage due to small solids in suspension. Meters may be installed in any attitude, but the flow direction and mounting attitude should be advised at the order stage if other than horizontal.

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.

Dimensions





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

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

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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.

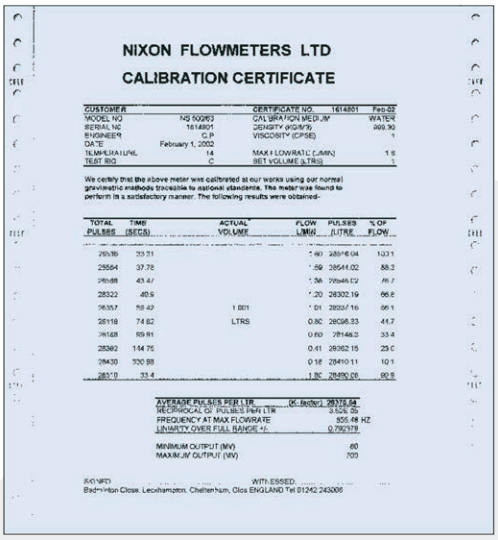
At the commencement of a calibration, water is circulated through the system and allowed to drain whilst the operator regulates the control valve to set up the approximate desired flowrate. Next, a small weight, equal to about 10% of tank capacity is attached to the weighbridge arm, which when the arm 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.



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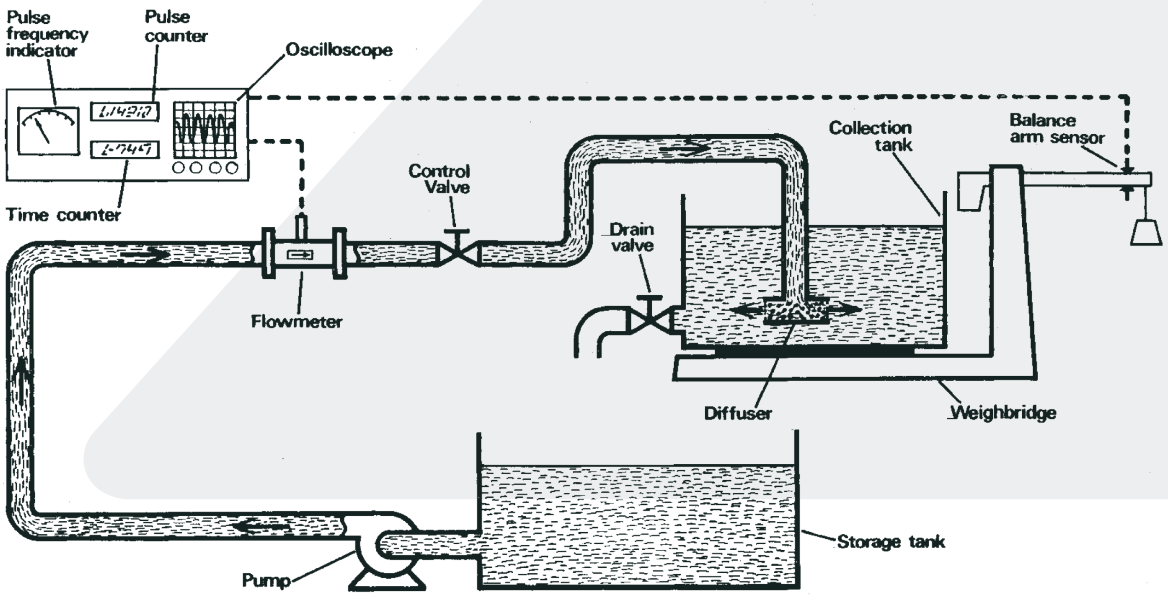
CALIBRATION CERTIFICATE

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



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BNO | Hygienic Type Turbine 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 AT industrial flowmeters so far as performance is concerned.

In the basic design, ABLE 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.

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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.

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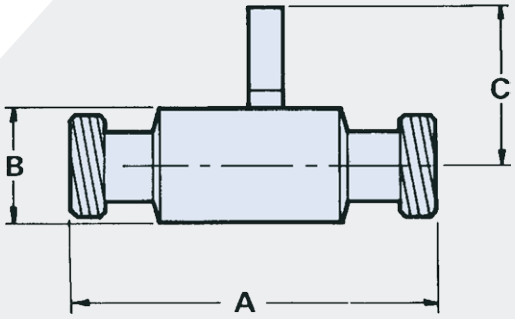
Sizing table

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.

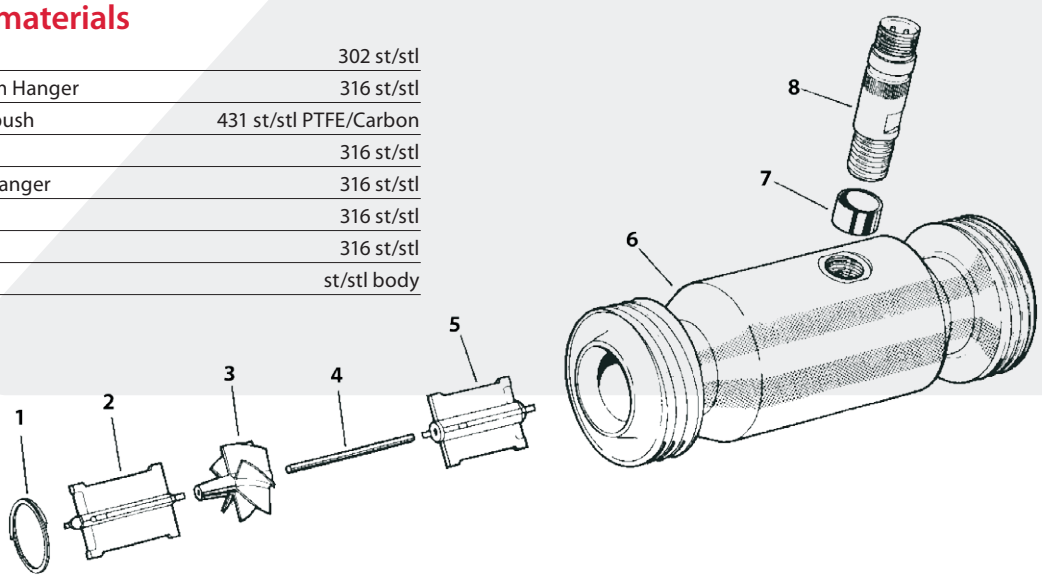
Dimensions

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



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



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Technical data

Measuring range
10-1

Accuracy
±0.5%

Repeatability
±0.1%

Flow ranges
min. 2-20 1/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

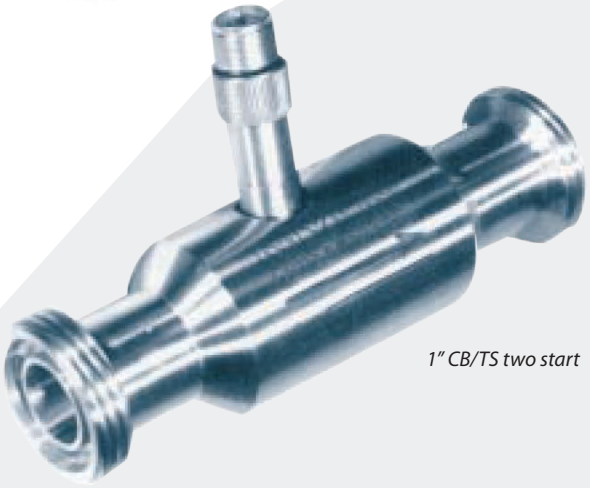
Pick off coil
Reluctance type with amphenol connector for miniature screened cable. I.S. version available for hazardous locations

Applications

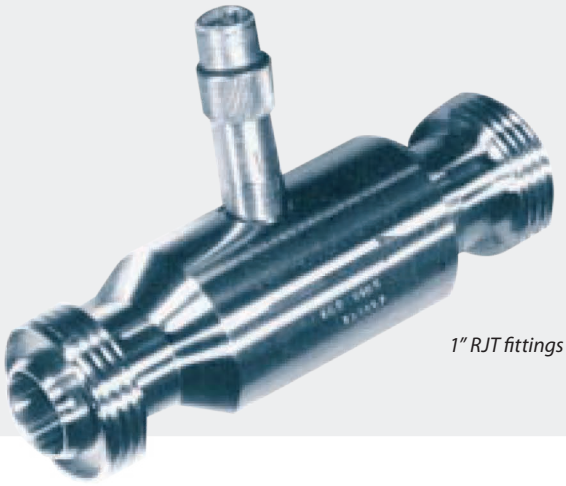
The BNO range of turbine meters have been particularly successful in the brewing industry where thousands of units are employed throughout Britain and abroad in keg filling operations. Several leading breweries have standardised on the BNO design to ensure high accuracy batching and long maintenance free operation. ABLE 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.

End fittings

1" tri clamp fittings



1" CB/TS two start



1" RJT fittings

Reading Office
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Reading, Berkshire. RG6 4UT. UK.
Tel: +44 (0)118 9311188
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