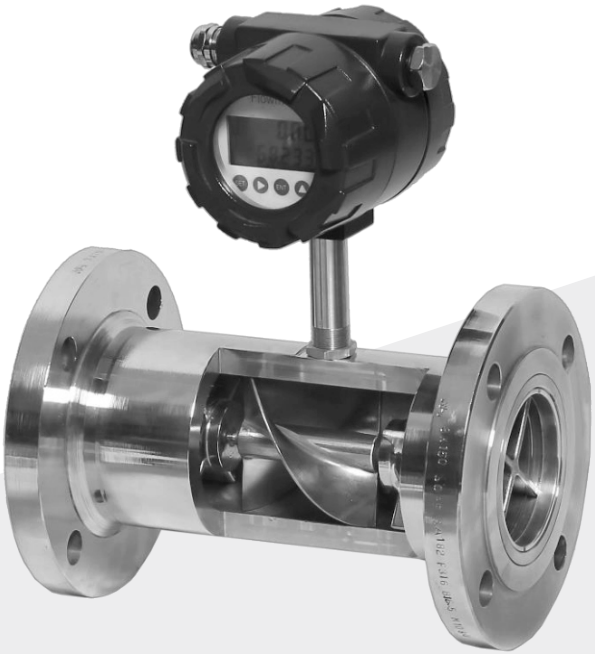
BROIL

Helical Rotor Flow Meter

User Manual



www.broiltech.com

BROIL SENSOTEK INDUSTRIES

BROIL

Table of Content

01	Introduction	03
02	Product Character	03
03	Working Principle	03
04	Main Technical Parameter	04
05	Model Range	04
06	Dimensions	05
07	Installation	08
08	Operation	10
09	Ordering Code	11
10	Maintenance and Common Faults	13
11	Transportation & Storage	14



1. Introduction

Helical Flow Meter consists of Helical Flow Sensor and display instrument. Helical rotor positive displacement Flow Sensor and Meter specially for replace Oval Gear Flow Sensor and Meter at some application where liquid is not pure and required easy and low weight flow meter with a very favorable low pressure drop behavior therefore perfectly suitable for the flow measurement of very high viscosity fluids. It is applicable for use in closed pipes to measure flow of liquid which is free of impurities such as fiber and granules. If this product is used in association with display instruments with special functions, it can be used for purpose of automatic definite quantity control and alarming in case of excessive amount.

2. Product character

The sensor is of hard alloy bearing thrust type, which may guarantee the precision and improve the wear resistance performance as well. Simple and firm structure, easy for installation and dismantling. Wide range of measuring with very low lower flow velocity limit. Small loss of pressure, fine repeatability and high precision. High resistance to electromagnetic interference and vibration.

3. Working Principle

When liquid flows through the casing of sensor, the impulse of fluid will provide the blade with a rotation moment as there is an angle between the blade of impeller and the flow direction. The blade will rotate as the friction moment and the fluid resistance are overcome and it will reach a stable speed when the moments are at balance.

Under certain conditions, the rotation speed of blade will be in direct proportion to the flow velocity. Due to the magnetic Conductivity of blade, when located in the magnetic field generated by signal detector (made of permanent magnet steel and coils), the rotating blade will cut the magnetic lines and periodically change the flux through the coil, thereby inducing electrical impulse signals at both ends of the coil. The induced signals, after amplified and rectified by amplifier, will form a continuous rectangular impulse wave with certain amplitude which may be remotely transmitted to display instrument indicating the instant flow and the cumulative flow of fluid. Within a certain range of flow, the impulse frequency f is in direct proportion to the instant flow of fluid flowing through the sensor, which is shown in the equation below:

$$Q = 3600 \times \frac{f}{k}$$

Where,

***f*-** Impulse frequency [Hz];

***k*-** Instrument factor of sensor [1/m3], which is given by checklist.

If [1/L] is used as the unit, the equation will be: $Q = 3.6 \times \frac{f}{k}$

Q- Instant flow of liquid (in operation) [m3/h];

Instrument factor of each sensor will be filled out in verification certificate by the manufacturer. The instant flow and cumulative flow will be displayed when the value of k is loaded into associated display instrument.

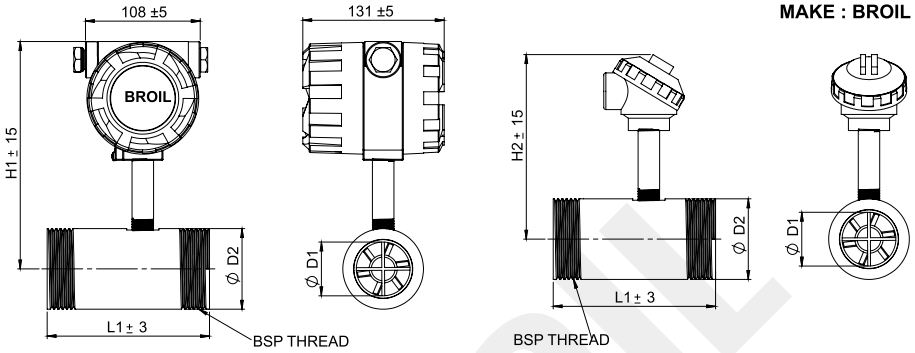
4. Main Technical Parameter

1. Diameter : （12 ~ 200） mm
2. Medium temperature : （-20 ~ 80） °C; Split type (－20 ~ 120)°C
3. Ambient temperature : （-20 ~ 55） °C
4. Precision : ±0.5% FSD , ±0.75 RS%
5. Repeatability : 0.21 % to 0.25%
6. Detector Signal transmission wiring system : three-wire voltage impulse (three-core shield wire)
7. Output voltage amplitude : high level≥8V, low level≤0.8V
8. Signal 4～20mA output : two-line
9. Local display power supply : 3.6V DC
10. Display mode : local LCD displays instant flow and cumulative flow
11. Local display with RS485 and max & min flow alarm signal. Power has 24V DC

5. Model Range

Model Number	Line Size	Flow Range (LPH)	Liter/Pulse
BT – HTFS - 012	14 mm	400 – 4000	0.001818
BT – HTFS - 020	20 mm	800 – 8000	0.005263
BT - HTFS - 025	25 mm	1000 – 10000	0.010101
BT – HTFS - 032	32 mm	1500 – 15000	0.020833
BT – HTFS - 040	40 mm	2000 – 20000	0.04166
BT – HTFS - 050	50 mm	4000 – 40000	0.08000
BT – HTFS - 080	80 mm	10000 - 100000	0.32260
BT – HTFS - 100	100 mm	20000 – 200000	0.47619
BT – HTFS - 150	150 mm	30000 – 300000	0.62500
BT – HTFS - 200	200 mm	40000 - 400000	1.0000

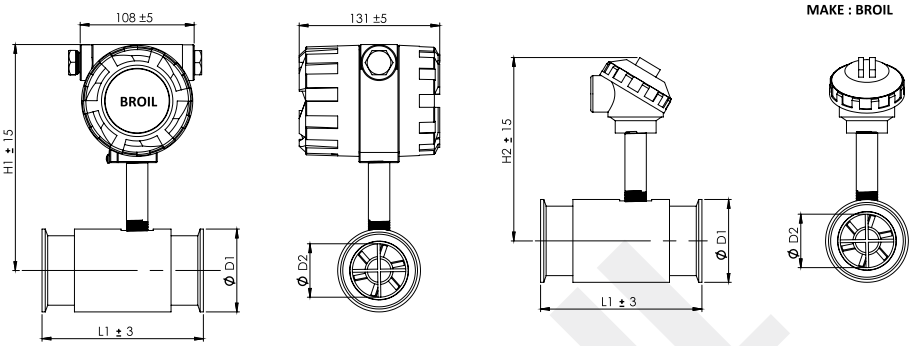
6. Dimensions



• THREAD END DIMENSION

Model Number	Thread Con.	L1	H1	H2	D1	D2
BT – HTFS - 012	¾" BSP (M)	80	187	154	14	38
BT – HTFS - 020	1" BSP (M)	101	190	157	20	38
BT - HTFS - 025	1¼" BSP (M)	130	193	160	25	46
BT – HTFS - 032	1½" BSP (M)	150	196	163	32	55
BT – HTFS - 040	2" BSP (M)	170	200	168	40	62

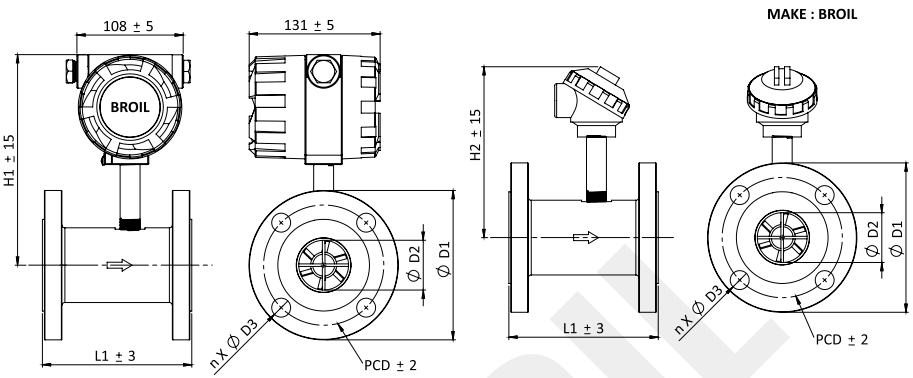
ALL DIMENSIONS ARE IN MM



• T/C END DIMENSION

Model Number	L1	D1	D2	H1	H2
BT – HTFS - 012	80	50.5	14	187	154
BT – HTFS - 020	101	50.5	20	190	157
BT - HTFS - 025	130	50.5	25	193	160
BT – HTFS - 032	150	65.0	40	196	167
BT – HTFS - 040	170	65.0	50	200	172

ALL DIMENSIONS ARE IN MM



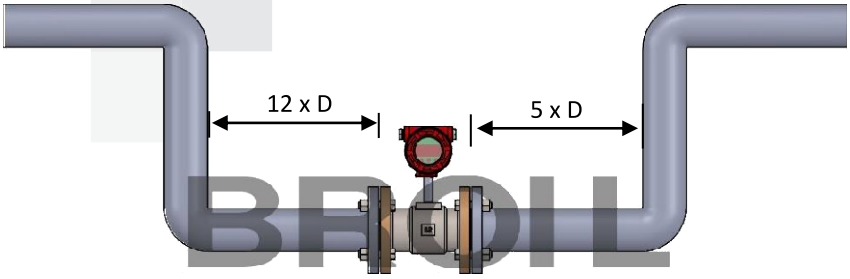
• FLANGE END DIMENSION

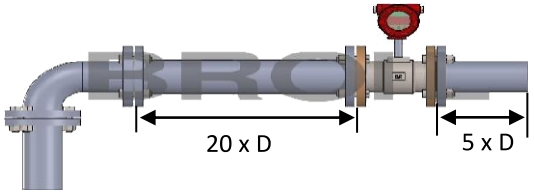
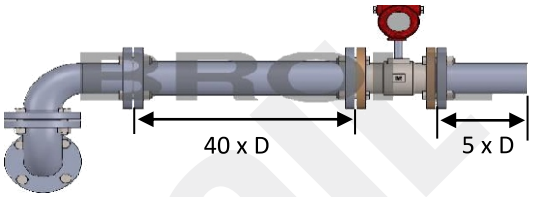
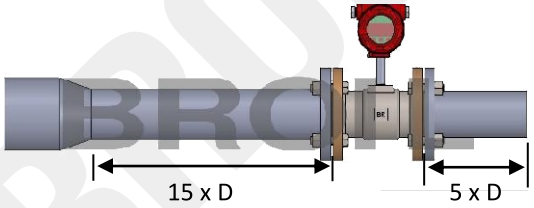
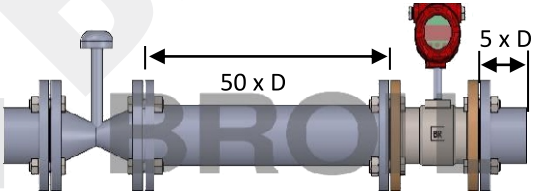
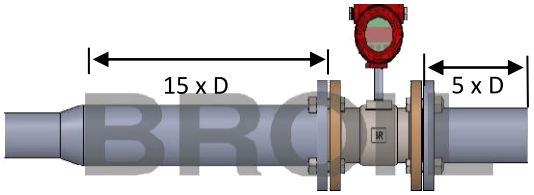
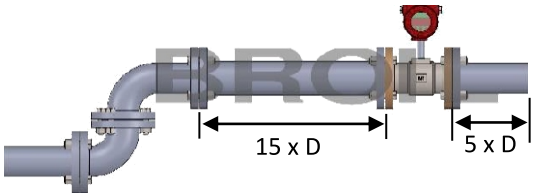
Model Number	L1	H1	H2	D2	D1	n x D3	PCD
BT – HTFS - 012	80	187	154	14	90	4X16	60.3
BT – HTFS - 020	101	190	157	20	100	4X16	69.9
BT - HTFS - 025	130	193	160	25	110	4X16	79.4
BT – HTFS - 032	150	196	163	32	115	4X16	88.9
BT – HTFS - 040	170	200	167	40	125	4X16	98.4
BT – HTFS - 050	170	205	172	50	150	4X19	120.7
BT – HTFS - 080	200	220	187	80	190	4X19	152.4
BT – HTFS - 100	220	230	197	100	230	8X19	190.5
BT – HTFS - 150	270	255	222	150	280	8X22.3	241.3

ALL DIMENSIONS ARE IN MM

7. Installation

- FLOWMETER may be installed horizontally or vertically. In the latter case the fluid shall be flowing from downward and fulfill the pipe to avoid bubbles (flow meter must be installed in U shape bend or also use NRV VALVE after flow meter); the flowing direction of liquid shall be consistent with the direction indicated by the arrow on casing of the sensor; as far as front and rear straight pipe sections are concerned (see Fig.), at upstream there shall be front straight pipe section at least 12 times of nominal drift diameter in length and at downstream no less than 5 times of nominal drift diameter in length. The internal wall of pipe sections shall be smooth and clean, free of defects such as indent, fouling and peeling. The pipe axis of the sensor shall be aligned with that of the neighboring pipe and the washers used for connection and sealing may not be embedded into depth of the pipe cavity; the sensors shall be kept away from foreign electric field and magnetic field; effective shielding measures shall be taken in case of necessity to avoid external interference.
- In order that the normal transfer of liquid will not be affected by maintenance, it is recommended that bypass pipes be installed at position of sensor.
- In case of open-air installation, water proof measures shall be taken for purpose of amplifier and plug of the sensor. The wiring between sensor and display instrument is shown in Fig. 4.
- When fluid contains impurities, filter shall be additionally installed. The number of filter screen meshes is determined in accordance with the flow and impurity, normally 20 to 60 meshes. When fluid is mixed with free gases, gas eliminator shall be additionally installed. The complete pipe system shall be well sealed. The user shall fully understand the erosion nature of the measured medium to protect the sensor from being eroded.



One 90° elbow	
Two 90° elbows for two planes	
Concentric Reducer	
Control valve half-open	
Concentric expander	
Two 90° elbows for one plane	

8. Operation

- When sensor is used, the liquid to be measured shall be clean and free of impurities such as fiber and granules.
- When sensor is used, it shall be at first slowly filled with liquid, then open the outlet valve (which should be installed behind the flow meter). It is prohibited to render the sensor under impact of high-velocity fluid when it is not filled with liquid.
- The maintenance interval for sensor is in general half a year. In case of maintenance and cleaning, attention shall be paid not to damage the parts in the measuring cavity, particularly the impeller. During assembly, watch carefully the positional relation between guide part and impeller.
- When the sensor will be out of service for a long time, the internal liquid shall be cleaned. After dried, the sensor shall be provided with protection sleeves at both ends to protect against dust and it shall be placed in dry conditions for storage.
- The associated filter shall be cleaned on regular basis and the internal liquid shall be cleaned when it is out of service for a long time. Similar to sensor, the filter shall also be provided with dust protection and stored in dry conditions.
- The transmission wire of sensor may be overhead or buried (iron bushing shall be provided in the latter case).
- Prior to installation of sensor, the connection thereof with display instrument or oscilloscope shall be finished. Then switch on the power, blow the impeller with mouth or move the impeller with hand to make it rotate quickly, see if there is any reading. Install the sensor if there is reading. In case of no reading, the related sections shall be inspected to eliminate any fault.

9. Ordering Code

BT-HTFS	1100	050	P1	OP3	B1	R1	F1	H1	C5	A1	X1	DISCRIPTION
Type	1100											Inline
	2200											Remote
	3300											Other
Line Size		XXX										DN12 ~ DN200 12, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200
Power Supply			P1									24V DC
			P2									Battery Operated
			P3									Other
Output				OP1								Pulse NPN
				OP2								Pulse PNP
				OP3								4-20 mA (2 Wire)
				OP4								4-20 mA (3 Wire) + Pulse + High and Low Alarm + RS-485
				OP5								Programmable Pulse O/P (Max. 1L = 500 Pulse)
				OP6								4-20 mA (3 Wire) + High and Low Flow Relay (NO + NC)
				OP7								4-20 mA (2 Wire) / 4-20 mA (3 Wire) + Pulse + HART
				OP8								No Output
				OP9								Other
Body & Connection Material					B1							SS316
					B2							SS304
					B3							As Per Customer Advice
Rotor Material						R1						SS410
						R2						SS410 with Teflon Coating
						R3						As Per Customer Advice
Connection Type							F1					ANSI #150 Flange End
							F2					ANSI #300 Flange End
							F3					ANSI #600 Flange End
							F4					DIN PN16 Flange End
							F5					Thread End
							F6					Tri Clover
							F7					Wafer / Sandwich Type
							F8					As Per Customer Advice
Electronic Housing material and conduit entries								H1				Aluminum Die Casting Housing with Two M20 x 1.5
												conduit entries
								H2				Other

Cable	C1			10 Meter
	C2			15 Meter
	C3			30 Meter
	C4			50 Meter
	C5			No Cable
	C6			As Per Customer Advice
Accessories		A1		Not required
		A2		Mating Flange
		A3		Mating Flange + Gasket + Nut Bolt
		A4		As Per Customer Advice
Certification (Approval)			X1	Not Required
			X2	ATEX (**Ex II 2G Ex db IIC T6 Gb / Ex II 2D Ex tb IIIC T6 Db / Ex II 1G Ex ia IIC T6 Ga)**
			X3	CIMFR (**Ex db IIC T6 Gb/Db / Ex tb/tc IIIC T6 Db/Dc**)
			X4	Legal Metrology

10. Maintenance and common faults

	Problems	Root cause	Guideline
1	Neither flow signal nor inspection signal is displayed on the panel	1. Power not switched on, incorrect voltage. 2. Panel is faulty.	1. Switch on power and provide voltage as required. 2. Repair the display panel.
2	Inspection signal is displayed but flow signal is not displayed	1. Wiring between sensor and panel is wrong or has faults such as open circuit, short circuit or poor contact 2. Amplifier is faulty or damaged 3. Converter (coil) is in open circuit or short circuit 4. Impeller is locked. No fluid is flowing in the pipe or it is clogged.	1. Refer to Fig. 4, check whether the wiring is correct and the wiring quality. 3. Repair or replace the amplifier. 4. Clean the sensor and pipe. 5. Open valve or start pump to clean the pipes.
3	Operation of display instrument is instable; measuring is incorrect.	1. The actual flow is in excess of the measuring range or instable. 2. Instrument factor K is not set correctly. 3. Impurities such as fiber are attached in the sensor. 4. There are bubbles in the liquid. 5. There is strong electromagnetic interference beside the sensor. 6. Sensor bearing and shaft are badly worn. 7. Wire shield coatings of the sensor or other grounded wires are disconnected from the grounding wire or in poor contact. 8. The display panel is faulty.	1. Align the measured flow to the measuring range of the sensor and stabilize the flow. 2. Set the factor K correctly. 3. Clean the sensor. 4. Take measures to eliminate the bubbles. 5. Try to keep away from the interference or take shielding measures. 6. Replace the guide part or the impeller shaft. 7. Refer the Fig. 4, make a good wiring. 8. Repair the display panel.

On condition that the user abides by the regulations of user manual in terms of storage and use, the manufacturer may repair the sensors which are incapable of operating due to poor fabrication free of charge within one year staring from the date of delivery.

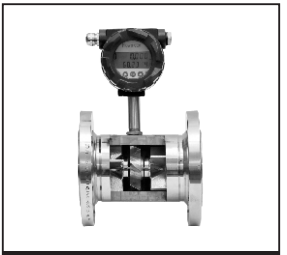
11. Transportation & Storage

- The sensor shall be packed in rigid wooden case (instruments with small specifications may be packed in cartons), which shall be fixed and handled with care.
- The place of storage shall be consistent with following conditions:
- Rain and damp proof.
- Invulnerable to mechanical shock or impact.
- With temperature range of -20℃~+55℃.
- The relative humidity shall be no more than 80%.
- The ambient shall be free of erosive gases.
- After unpacking, check if documents and accessories are complete with reference to packing list. The packing documents include: one copy of operating instruction. One product conformity certificate.
- Observe if the sensor is damaged due to transportation so as to handle properly.
- It is expected that the user preserves the verification certificate properly, otherwise the instrument factor cannot be set.

Products Portfolio



Helical Rotor Flow Meter



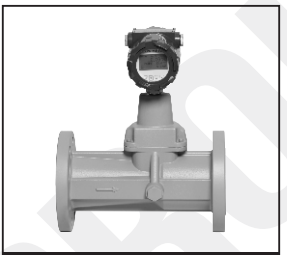
Turbine Flow Meter



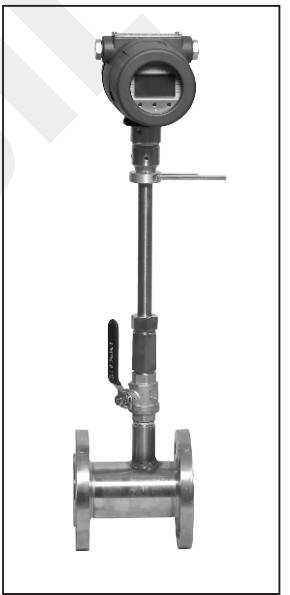
Oval Gear Flow Meter



Vortex Flow Meter



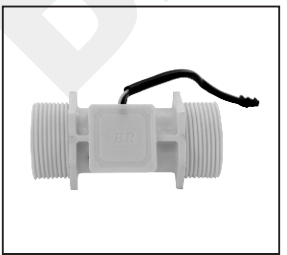
Swirl Flow Meter



Thermal Mass Flow Meter



Electromagnetic Flow Meter



Plastic Helical Flowsensor



Mechanical Oval Gear Flow Meter



Fuel Consumption Meter

BROIL



BROIL SENSOTEK INDUSTRIES
Plot No 1-4 Nilkanth Industrial Park, B/h Dediyasan Gidc
Nagalpur, Mehsana-384002, Gujarat, India
Cell : +91 94274 71371 / +91 94244 22555 / +91 97265 18181
Email Id : info@broiltech.com / URL : www.broiltech.com