

Model 5100 Model 5400

Insertion Turbine Flowmeters for Liquid and Gas

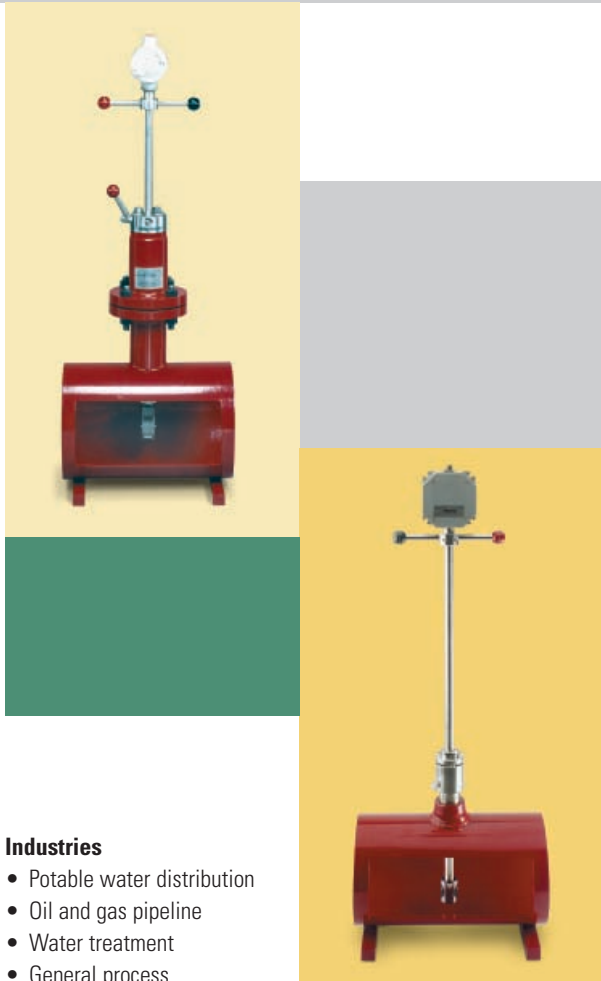
Thermo's insertion turbine flowmeters have provided highly accurate and repeatable flow measurements for large pipeline applications for over 35 years. The products are designed for easy installation using the "hot tap" method, which allows the end user to install and retract the device through an isolating valve without interrupting the process. The insertion turbine offers a dependable and economical flow metering solution with accuracy superior to that of differential pressure devices.



As the demand for water, oil and gas increases internationally, a complex network of pipelines has been developed to transport liquids and gases 24/7 over thousands of miles to waiting consumers in every corner of the globe. Most pipeline operators have a fiscal and environmental obligation to monitor the flow of product during the transportation process. Thermo Electron Corporation offers a choice of technologies for pipeline and industrial measurement to suit most customers' requirements, including ultrasonic meters and insertion turbine meters for larger pipes, and inline turbine meters for smaller sizes and custody transfer applications. Many operators have difficulty finding appropriate metering equipment for remote locations where there is no power supply.

Thermo's insertion turbine flowmeters are ideal for measuring in remote locations since the technology generates a pulse output without the need for an independent power supply. This allows the product to be used in conjunction with a battery powered totalizer or data logger. Thermo's insertion devices have been widely used for monitoring oil, gas and potable water distribution for many years, and have been marketed under several well known brand names in the past including EFM, AOT, and Flow Automation. The Thermo insertion meter provides outstanding performance at a competitive price.

The insertion turbine meter consists of a rotating impeller assembly mounted on the end of a stainless steel insertion stem. The impeller assembly is then



Industries

- Potable water distribution
- Oil and gas pipeline
- Water treatment
- General process
- Petrochemical

Features

- One size fits all pipes over 4-in diameter
- Individually calibrated turbine heads
- High levels of accuracy and repeatability
- Negligible pressure drop
- Field repairable
- Cost effective, proven technology
- Can be extracted for "pigging"

installed into a pipe through an isolating valve and held in place by a seal housing. The impeller acts much like a windmill in that the rotational speed is directly proportional to the flow rate or velocity. $Velocity \times Pipe Area = Flow Rate$. The impeller, manufactured from magnetic stainless steel, generates a pulsed output as the blades rotate through the flux field of a magnet that is contained in the pickup assembly at the end of the stem. This feature allows the instrument to function without the need for an exterior power source so that it can be installed in a remote location with a battery powered totalizer or SCADA system.

The flow measurement data can be read in the field via the local display or can be transmitted to a DCS. Alternatively, a 4-20 mA output can be provided which will feed directly into the customer's own process control system. Other signal conditioners are available. Please consult with your local representative or applications specialist.

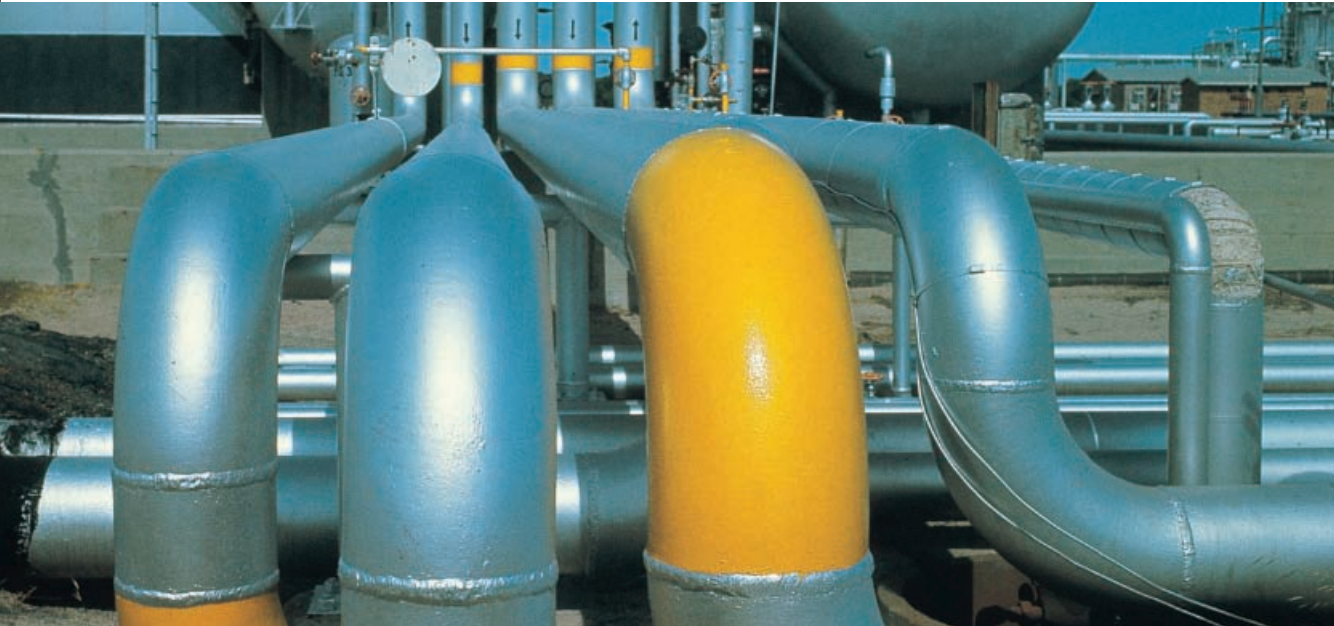
The insertion turbine can easily be installed by a qualified pipeline service technician using the "hot tap" method which involves installing a full-port ball-valve on the line without shutting off the flow or interrupting the process. The equipment can then be mounted on the top of the valve and installed or retracted for periodic service without interrupting the flow.

Model 5100 Insertion Turbine Flowmeter for Gas and Liquid

The Model 5100 turbine flowmeter is an extremely robust instrument which is intended for the accurate measurement of liquids and gases over a wide range of pipe sizes from 100 mm to 3 m (4 in to 10 ft) in diameter. The Model 5100 is generally installed on a full-port ball-valve using a 3-inch 150 lb ANSI flange. The instrument gives continuous, reliable flow measurement with achievable accuracy of better than 1% for liquid and 3% for gas. The Model 5100 offers a wide operating range with a (typical) 10 to 1 turndown. The operator can select from a range of different turbine heads in order to optimize the performance on any given application. Each instrument is factory calibrated and replacement insertion head assemblies can be installed easily without loss of accuracy. The Model 5100 flowmeter is recommended for application pressures up to 270 psi (18 bar).

Model 5400 Insertion Turbine Flowmeter for Low Flow Liquids

The Model 5400 insertion turbine flowmeter is specifically designed for low flow applications in irrigation or potable water distribution lines. It installs conveniently through a 1.5 inch female threaded full-port ball-valve. The "hot tap" method can be used to install the device in an active pipeline. The instrument is very light weight and easy to handle and features a compact impeller assembly which is designed to offer repeatable measurements down to extremely low velocities. A variety of signal amplifiers are available that ensure compatibility with the client's system requirements. The Model 5400 is suitable for use on pressures up to 225 psi (15 bar).





Interface Electronics for Turbine Flowmeters

INTERFACE ELECTRONICS

- A:** ATEX Flameproof enclosure with terminal block
- B:** ATEX Flameproof enclosure with 4-20 mA analog amplifier
- C:** ATEX Flameproof enclosure with 4-20 mA current modulated pulse
- D:** ATEX Enclosure with terminal block for I.S. service (must be used with I.S. pick-up)
- E:** ATEX Enclosure with 4-20 mA current modulated pulse amplifier for I.S. service (must be used with I.S. pick-up)
- F:** Explosion-proof enclosure with terminal block
- G:** Explosion-proof enclosure with 4-20 mA analog amplifier
- H:** Explosion-proof enclosure with 5 volt square wave amplifier
- I:** Local display with Rate/Total indicator (battery powered)
- J:** Local display with Rate/Total indicator with 4-20 mA output (loop powered)
- K:** Local display with Rate/Total indicator with relay mA output + alarm (DC powered)

NOTES:

1. Items I, J & K are certified intrinsically safe to European & U.S. standards;
Europe: ATEX EEX ia IIB T3 (Group II 2G);
U.S.A.: CSA I.S. for Class 1 Groups C & D;
2. All amplifiers require 24 VDC power source
3. Items F, G & H comply with U.S. (NEMA 7) requirements

Replacement Turbine Heads

MODEL 5100

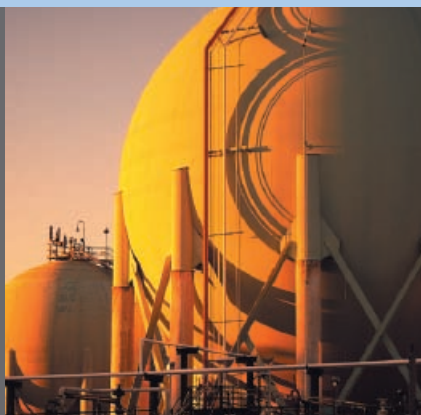
	FLOW RANGE		DESCRIPTION	PART NUMBER
	m/s	ft/s		
1	1-12	3-40	General liquid use	51L-1
2	0.6-12	2-40	Clean liquids	51L-2
3	2-30	6-100	High pressure gas	51G-3
4	4-45	13-150	High pressure gas	51G-4
5	0.3-5	1-16	General liquid use	51L-5
6	0.6-6	2-20	Low pressure gas	51G-6
7	1.2-12	4-40	Low pressure gas	51G-7
8	3-30	10-100	Low pressure gas	51G-8
9	5-50	16-170	Low pressure gas	51G-9

MODEL 5400

	FLOW RANGE		DESCRIPTION	PART NUMBER
	m/s	ft/s		
1	0.2-5	0.66-16	Low velocity liquid	54L-1

We can repair or replace turbine products manufactured by the following companies

- Electronic Flow Meters (EFM)
- Automatic Oil Tools (AOT)
- Flow Automation
- Hydril PTD
- Onix Measurement
- Tokheim Automation
- GH Flow Automation





Model 5400 Insertion Turbine Flowmeter Ordering Information

MODEL NUMBER

54: Model 5400 Insertion Liquid Turbine Flowmeter — 735-mm (29-in) stem length

A. FLUID TYPE

L: Liquid (Standard Liquid Applications)

B. FLOW RANGE

	FLOW RANGE		DESCRIPTION
	m/s	ft/s	
1:	0.2-5	0.66-16	Unidirectional

C. BODY MATERIAL

1: Stainless steel

D. TEMPERATURE RANGE

T1: -20°C to +150°C (0°F to +300°F) – I.S. & safe area
T3: -200°C to +230°C (-300°F to +450°F) – safe area only

E. PROCESS CONNECTION

S1: Male NPT (thread 1.5-in)
S2: Male BSPT (thread 1.5-in)

F. TERMINATION

01: 1-in NPT for ex-proof enclosure or local indicator
02: M25 thread for safe area or I.S.
03: M25 thread suitable for flameproof enclosure

G. HAZARDOUS AREA REQUIREMENT

S: Non-hazardous/safe area operation
I: ATEX Intrinsically safe EEx ia IIB T5 (EEx ia IIC T6 when no accessory kit fitted)*
D: ATEX Flameproof EEx d IIB T5
7: US explosion proof enclosure Class 1, Groups B,C,D

H. INTERFACE ELECTRONICS

Refer to Interface Electronics

MODEL NUMBER

54

FLUID TYPE

A

FLOW RANGE

B

BODY MATERIAL

C

TEMPERATURE RANGE

D

PROCESS CONNECTION

E

TERMINATION

F

HAZARDOUS AREA REQUIREMENT

G

INTERFACE ELECTRONICS

H

*Select hazardous area requirement (I) when specifying local display

NOTE: Consult Thermo for details of maintenance contracts and additional services including installation, commissioning, re-calibration, service, or repair.

Model 5100 Insertion Turbine Flowmeter Ordering Information

MODEL NUMBER

51: Model 5100 Insertion Turbine Flowmeter for Liquid and Gas — 500-mm (22-in) insertion length

A. FLUID TYPE

- G:** Gas
- L:** Liquid (Standard Liquid Applications)

B. FLOW RANGE

	FLOW RANGE		DESCRIPTION
	m/s	ft/s	
1:	1-12	3-40	General liquid use, no filtration required
2:	0.6-12	2-40	Clean liquids with lubricating properties
3:	2-30	6-100	High pressure gas, >10 bar (145 psi)
4:	4-45	13-150	High velocity, high pressure gas >10 bar (145 psi)
5:	0.3-5	1-16	General liquid use, low velocity ranges
6:	0.6-6	2-20	Low pressure gas, low velocity ranges
7:	1.2-12	4-40	Low pressure gas, medium velocity ranges
8:	3-30	10-100	Low pressure gas, high velocity ranges
9:	5-50	16-170	Low pressure gas, very high velocity ranges

C. BODY MATERIAL

- 1:** 316 stainless steel – housing and flange
- 2:** Carbon steel (standard) – (carbon steel flanges only can be selected)

D. TEMPERATURE RANGE

- T1:** -20°C to +150°C (0°F to +300°F) — I.S. & safe area
- T3:** -200°C to +230°C (-300°F to +450°F) — safe area use only

E. PROCESS CONNECTION

- 1:** 3-inch ANSI 150 carbon steel flange, integral with seal housing (cast assembly); oven-cured epoxy powder
- 5:** 3-inch ANSI 150 stainless steel flange, slip on flange and seal housing assembly
- X:** Special — consult Thermo applications department

F. TERMINATION

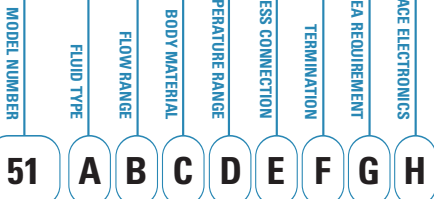
- 01:** 1-in NPT for explosion-proof enclosure or local indicator
- 02:** M25, suitable for standard enclosure connection
- 03:** M25, suitable for flameproof enclosure connection

G. HAZARDOUS AREA REQUIREMENT

- S:** Non-hazardous/safe area operation
- I:** ATEX Intrinsically safe EEx ia IIB T5 (EEx ia IIC T6 when no accessory kit fitted)*
- D:** Flameproof EEx d IIB T5
- 7:** US explosion-proof enclosure Class 1 Groups B,C,D

H. INTERFACE ELECTRONICS

Refer to Interface Electronics table



*Select hazardous area requirement (I) when specifying local display

NOTE: Consult Thermo for details of maintenance contracts and additional services including installation, commissioning, re-calibration, service, or repair.

Model 5100 — Insertion Turbine Flowmeter for Liquid and Gas

Specification	
Functional Specifications	
Accuracy	Liquids: $\pm 2.0\%$ of reading achievable (10 to 1 turndown) Gases: $\pm 2.0\%$ of reading achievable (5 to 1 turndown)
Repeatability	0.2%
Pressure Drop	Liquids: Typically 300 mbar (1 psi) at normal maximum flow rate in water Gases: Negligible at 100% flow rate dependent on gas density
Maximum Pressure	270 psig (18 bar)
Maximum Process Temperature	150°C (300°F)
Physical Specifications	
Materials	Seal housing: Carbon steel (standard) or stainless steel Flanges: Forged carbon steel or stainless steel Shaft and sleeve bearings: Tungsten carbide and durable alloy Ball bearings: Stainless steel ANSI 440C
Installation	Install in pipeline with at least 10 pipe diameters of straight length upstream and 5 diameters downstream of flowmeter.
Outputs	
Standard Pickup	100 mV pulse peak-to-peak at 1 m/s (3 ft/s)

Model 5400 — Insertion Turbine Flowmeter for Low Flow Liquids

Specification	
Functional Specifications	
Accuracy	Liquids: $\pm 2.0\%$ of reading achievable (5 to 1 turndown)
Repeatability	0.2%
Pressure Drop	Liquids: Typically 300 mbar (1 psi) at normal maximum flow rate in water Gases: Not available
Maximum Pressure	225 psig (15 bar)
Maximum Process Temperature	150°C (300°F)
Physical Specifications	
Materials	Seal housing: 316 stainless steel Shaft and sleeve bearings: Tungsten carbide and durable alloy
Installation	Install in pipeline with at least 10 pipe diameters of straight length upstream and 5 diameters downstream of flowmeter.
Outputs	
Standard Pickup	100 mV pulse peak-to-peak at 1 m/s (3 ft/s)

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