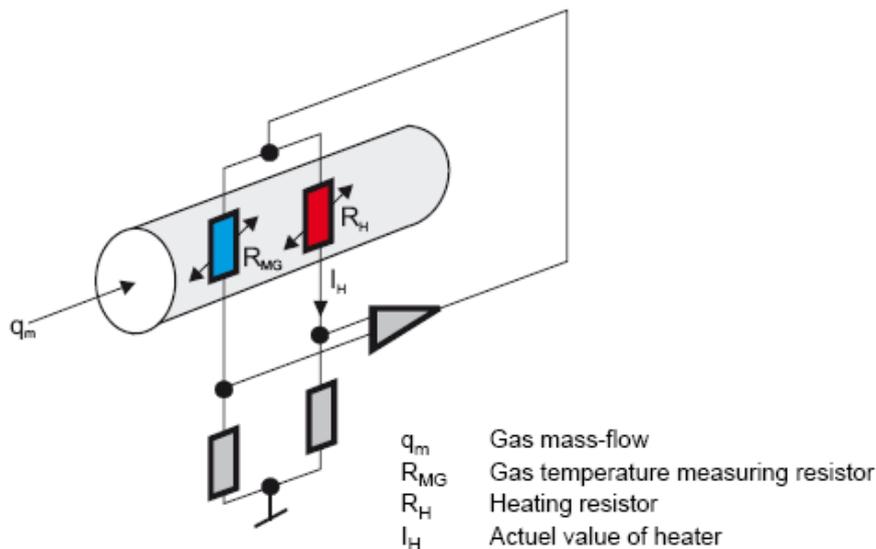


TGF600 Series Thermal Mass Flowmeter

1. Brief Introduction

TGF600 Series Thermal Mass Flowmeter is COMATE's latest thermal mass technology with more rugged design to adapt to harsh industrial applications. It implements COMATE's latest sensor filming technology and high sensitivity sensors to ensure a stable measurement at very low flow rate down to 0.3Nm/s. The standard insertion model can fit in pipe line from DN25~DN500, extended model can fit in smaller pipe down to DN25 and larger pipe up to DN 2000. The latest TPA600 circuit board and a dual-line LCD display provide user with most powerful and friendly operating interface. The TPA600 technology also ensures the product to give stable and accurate measurement and reliable output.

TGF600 Series Thermal Mass Flowmeter measures the gas mass flow base on thermal diffusion theory. It has two filmed RTDs as its sensors, one of which sense the velocity of the gas flow (RH) and the other one will detect the temperature shift of the gas flow (RMG). When the two RTD are in the gas flow ,the RH will be heated while the RMG will sense the temperature changing of the gas flow. More heat will be taken away as the velocity of the gas flow increasing, so the temperature on RH will decline.



According to King's law, the heating power P , the temperature difference ΔT ($T_{RH} - T_{RMG}$) and the mass flow rate are mathematical related. $P/\Delta T = K_1 + K_2 f(Q)K_3$, the K_1 , K_2 , K_3 are constants related to the properties of the gas. TGF Series Thermal mass flow meter is designed base on constant power measuring method, thus the RTD is heated in a consistent power and will be more durable and stable. That is why TGF flow meter has less problem of zero-off which may be caused by a function failure of RTD due to over-heated in long term.

2. Application

This application can fit in the measurement requirements of most fluids. Including air, N₂, CO₂, O₂, Argon, natural gas, biogas and many other gas.



Picture: LCD displayer of thermal mass flowmeter

3. Product features

- 1) 100:1 turn down ratio in 5 ranges: 0.3~30Nm/s, 0.6Nm/s~60 Nm/s, 0.9~90Nm/s, 1.2~120Nm/s, or 1.5~150Nm/s can also be expanded to a 200:1 turn down ratio
- 2) No pressure loss, suitable for pipe in any shape with known sectional area
- 3) For the insertion type, installation and maintenance can be finished on line
- 4) Measure the mass flow and standard flow directly.
- 5) Patent protected mathematical model for treatment of flow with impurity of water, is suitable for the special working environment of gas drainage
- 6) High accuracy data acquisition circuit to ensure outstanding repeatability and accuracy of the flow meter.
- 7) Electrical structure of total isolation to ensure a excellent EMC properties and avoid the interference from outside
- 8) High efficiency design of power supply, the total power consumption is only 60mA@24VDC
- 9) 16V~32V wide voltage range input to fit in all electricity environment
- 10) Self-protection design of Zener safety barrier inside
- 11) Metric Unit display and Metric/British unit selectable
- 12) RamTron F-RAM for permanent storage of date
- 13) Password function makes device management easier
- 14) Self-diagnose function makes trouble shooting easier
- 15) Ex-proof version optional
- 16) Bluetooth communication for reading, setting and diagnosis and COMMATE APP



4. Process connection

The TGF600 Series Thermal Flow meter has two different installation types, one is insertion and the other one is in-line type.

The insertion type can be installed and maintained on line. To install it, you have to weld and install a base with screw thread outside on the pipe and install a 1 inch ball valve on the base. Then drill a hole of 22mm diameter on the pipe with a special tool and install the flow meter on the pipe through the hole. The position and depth of how the sensor is fixed have already been set before delivery.

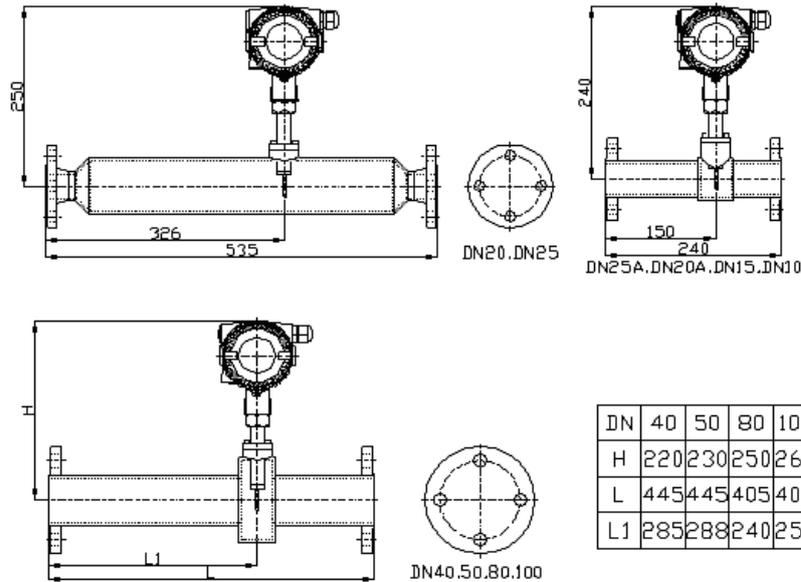
The fitting in diameter of pipe for insertion type: DN25~1200mm (Please make sure to let us know if you need it for larger diameter)

<p>Standard insertion type.</p>		<p>Insertion type with ball valve Install/remove the meter without stopping the flow.</p>	
<p>Flanged insertion type For applications with pressure higher than 1.6Mpa</p>		<p>Flanged insertion type For applications with pressure higher than 1.6Mpa. Install/remove the meter without stopping the flow.</p>	

The In-line type is delivered along with a pipe

which has a same inner diameter as the pipe in field. It should be installed through flange or screw thread. The flanges meet GB/T9119-2000 standard (or ANSI B16.5 or DIN or JIS standard). The in-line type can fit in pipe with diameter from DN25mm to DN300mm. Or customer can simply choose to use a 3-way pipe to replace the flanged body

Sensor is made in 316 stainless steel and the pipe is made in 304 or 316 stainless steel. If users need them to be made in different material, please let us know before order confirmed.



5. Special designs

To meet some special requirement on actual applications, we have made some improvement on the structures, which make it easier to be used.

1) Anti-ejection design

In some high pressure applications, there is a risk that when the pressure is too high, the nut sleeve will fail or be loosened unintentional, and the flow meter will be ejected out and cause damage or injury. On TGH insertion thermal mass flow meter, when the customer need to used it in a high pressure application, the sensor base is wider than the nut sleeve. So as long as the sleeve is still fixed on pipe with thread, the meter will not be totally ejected out. Please reference to below picture

2) Ball valve mounting

When users want to replace or re-calibration or for any reason want to remove the flow meter while do not want to stop the flow , our ball valve mounting can help. Once the meter is installed with a customized ball valve, user can remove the meter away while still keep the pipeline sealed with the ball valve.

This design should only be used when it is absolute necessary and the fluid is not explosive or hazard.



Ball valve mounting

3) Hot taping holder and hot taping driller

Some user may not want to stop the flow when installing the flow meter. With the help of our hot taping holder and hot taping driller can help do that.

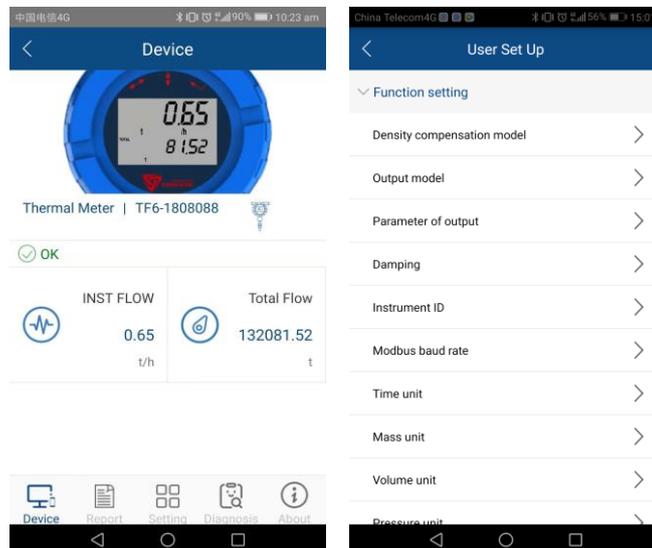
The hot taping driller can help you open a hole for inserting the flow meter without stopping the flow. It should work with a ball valve. And the in the hole process of drilling and removing the tool , the pipe will be totally sealed.



Hot taping drill

4) Bluetooth communication for reading, setting and diagnosis and COMMATE APP

All COMATE products are available to have bluetooth communication, which allows users to read, set and diagnosis the flow meter in a user-friendly interface COMATE APP. The on-line diagnosis function helps users on trouble shooting by a remotely connection between the flow meter and COMATE QA systems in which the settings can be automatically crosschecked and our engineer can analyze the internal reading and signal of the meter and provide support on trouble shooting



6. Packing

A standard package of the TGF thermal mass flow meter is in a 71.5 x 24.5 x 195mm carton (for basic version). Along with the flow meter, the package also contains the accessories for installation (Nut sleeve set) , a copy of manual and a calibration certificate.

Each and every TGF thermal mass flow meter will be calibrated on a sonic nozzle calibration system, which is the most accurate air calibration system (0.05%) in the world. The flow meter will be calibrated at 19 velocity points and verified at 8 velocity points. All meter factors are input to the meter automatically and checked by experienced engineers. We ensure you that every flow meter from COMATE have been well cared for best accuracy, repeatability and durability .



Sonic nozzle calibration system

8. Specification

	Insertion type	In-line type
Media Compatibility	Air, Nitrogen, O ₂ , CO ₂ , Argon, CH ₄ , Natural gas, biogas, and almost all dry and clean air	
Pipe diameter	DN25~2000mm	DN25~300mm
Flow velocity range	0.3~30Nm/s or 0.6~60Nm/s or 0.9~90Nm/s or 1.2~120Nm/s or 1.5~150Nm/s	
Accuracy	1.5% RD ±0.5% FS	
Temperature of medium	Standard: -40~+150°C -40~+250°C/-40~+450°C high temperature for option	
Pressure of medium	1.6MPa	6.3Mpa
Power supply	AC85~264V or DC16~32V	
Response time	1 second	
Output	Frequency and 4~20mA as standard	
Communication	RS~485+Bluetooth as standard , 4~20mA@HART as optional	
Date displayed	Mass flow, Volume flow in normal condition, Total flow	
Ingress protection grade	IP65 (GB China)	
Ex-proof	Ex d II C T3 Gb (NEPSI) (Optional)	

9. Model Selection

Model	Basic Model	TGF600-	D	N	1	T	1	1	Q	C	8	1
Process Connection	Flanged in-line		F									
	Insertion (NPT 1")		C									
	Insertion (NPT 1") (with anti-ejection design)		D									
	Insertion (with flange)		G									
Medium temp range	< 150°C			N								
	< 250°C			Q								
	< 450°C (please select remote display also)			H								
Probe Length	290mm (DN25~DN150)				1							
	440mm (DN25~DN500)				2							
	690mm(DN25~DN1000)				3							
	1000mm(DN25~DN1500)				4							
	1500mm(DN25~DN2200)				5							
Transmitter	Integral					T						
	Remote					R						
Material	OCr18Ni9(304)						1					
	316						2					
Pressure Rating	1.6 Mpa							1				
	2.5 Mpa (flanged connection only)							2				
	4.0 Mpa(flanged connection only)							3				
	6.3 Mpa(flanged connection only)							4				
Flange Standard	JIS								A			
	GB China								B			
	ANSI								C			
	Q(insertion type)								Q			
Enclosure	Comate blue enclosure									C		
Transmitte	pulse/frequency + 4~20mA@HART + Bluetooth										7	
	pulse/frequency + 4~20mA + RS485 + Bluetooth										8	
Power supply	13.5~42VDC											1
	85~265VAC 50/60Hz											2
Pipe size	please use 3 digit pipe size, such as DN50=050, DN300=300											

Remark:

- 1. Ball valve, Hop-tap insertion tool and hot-tap hole opener are as accessories, please remark if you need any of them**
- 2. Please indicate flow rate along with the model number selected**
- 3. If you have any requirement that cannot be fulfilled in this document, please check with us to see the availability**
- 4. The model selected in 1st line is the standard configuration with no accessories**

10. Other ordering information

1) Measurement range

Standard: 0.6~60 Nm/s

Option 1: 0.3~30 Nm/s

Option 2: 0.9~90 Nm/s

Option 3: 1.2~120 Nm/s

Option 3: 1..5~150 Nm/s

2) Accessories available

Anti-ejection design

Ball valve

Hot taping driller (for option)

Hot taping holder (for option)

Degreasing (for option)

Appendix I Standard Volume flow rate range in popular sizes

Pipe size (mm)	Pipe size (inch)	Option 1 (0.3~30 Nm/s)		Standard (0.6~60 Nm/s)		Option 2 (0.9~90 Nm/s)		Option 3 (1.2~120 Nm/s)	
		Min (Nm3/hr)	Max (Nm3/hr)	Min (Nm3/hr)	Max (Nm3/hr)	Min (Nm3/hr)	Max (Nm3/hr)	Min (Nm3/hr)	Max (Nm3/hr)
25 mm	1"	0.53	53	1.05	105.9	1.58	158.8	2.11	211.8
32 mm	1 1/4"	0.87	86.7	1.73	173.5	2.6	260.3	3.47	347.1
40 mm	1 1/2"	1.36	135.6	2.71	271.1	4.06	406.7	5.42	542.3
50 mm	2"	2.12	211.9	4.23	423.7	6.35	635.5	8.47	847.4
65 mm	2 1/2"	3.58	358.1	7.1	716.1	10.7	1074.1	14.3	1432.2
80 mm	3"	5.42	542.3	10.8	1084.7	16.2	1627.1	21.6	2169.4
100 mm	4"	8.47	847.5	16.9	1694.9	25.4	2542.3	33.8	3389.8
125 mm	5"	13.2	1324.2	26.4	2648.3	39.7	3972.4	52.9	5296.6
150 mm	6"	19.1	1906.8	38.1	3813.5	57.2	5720.3	76.2	7627.1
200 mm	8"	33.9	3389.8	67.7	6779.6	101.6	10169.4	135.5	13559.3
250 mm	10"	53	5296.6	105.9	10593.2	158.8	15889.8	211.8	21186.4
300 mm	12"	76.3	7627.1	152.5	15254.2	228.8	22881.3	305	30508.4