TECHNICAL GUIDANCE

CNG Fuel Gas Thermal Flowmeter

TH-1800-T Flow detector
TRX-700-CNG Converter

OUTLINE

The CNG fuel gas flowmeter is so accurate as to meet a demand of measuring the CNG directly by making the most use of our well-established mini-thermal flowmeter for the industrial use. The mini-thermal flowmeter TH-1800 series has a temperature element as standard. The converter TRX-700 series accommodated in a cubicle has additional functions as an option.
In addition of AC power supply the converter can be powered by 12 or 24 VDC supplied from batteries also. The flowmeter can measure additionally a total flow volume in a required period of time.

FEATURES

❑ Measuring mass flow rate
The flowmeter measures the mass flow rate without being influenced by the change of pressure or temperature from its measuring principle. If the change in pressure or temperature is significant, the flow rate is compensated with additional sensors. The measured value is output in the standard pressure and temperature conditions.

❑ High accuracy
±1.5% of reading in the range of 5% to 100% of full scale based on our conditions for calibration

❑ Available sizes
The total 5 sizes of 15, 20, 25, 40, 50 mm cover the flow range from minimum 0.3 m^3/h (nor) in 15 mm up to 200 m^3/h (nor) in 50 mm. The flow rate is the one converted into the city gas.

❑ Composition of CNG
By configuring 5 types of gas composition, the most suitable one can be selected with a setting by users.

❑ Durable construction
No regular replacement of parts is required thanks to no moving or wearing parts.

❑ Multi-functional converter
Powered by AC or DC it indicates or outputs such signals as flow rate, tatalized flow and alarm output in analog and also via RS485.

MEASURING PRINCIPLE

The calorific value (H) lost in unit time from an electrically heated metallic capillary placed in gas is a function of the mass flow rate of the gas (U) and the temperature difference (ΔT) between the gas and the capillary; that is,

$$H = f(U \cdot \Delta T)$$

The Joule heat value generated from the capillary is a function of voltage and current applied to the metallic capillary; that is,

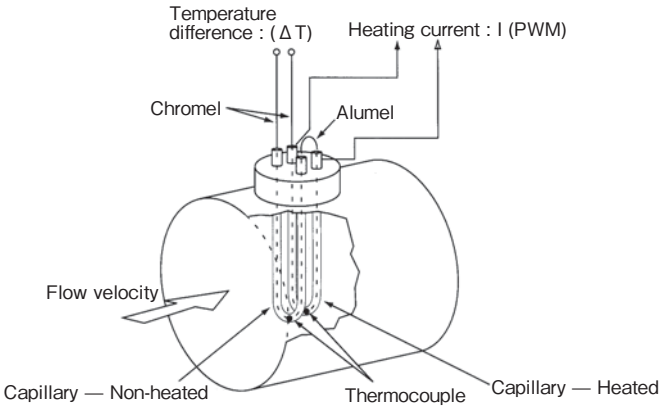
$$W = f(V \cdot I)$$

These two values are equivalent while the capillary and gas are in thermodynamically balanced condition; By controlling (ΔT) constant with an electronics circuit the mass flow rate of the gas (U) is obtained as a function of voltage (V) and current (I) applied to the capillary; that is,

$$U = f(V \cdot I)$$

Flow rate (Q) of the gas can be obtained from (U) and (A) (sectional area of the flow conduit): that is,

$$Q = U \cdot A$$



STANDARD SPECIFICATIONS

TH-1800-T flow detector

Type		Flange ended
Available size		15 mm (1/2″) to 50 mm (2″)
Max. Operating Pressure		1.0 MPa
Max. Operating Temperature segment		80°C/180°C
Measuring range	Min.	0.5 to 10 m/s (nor)
	Max.	6 to 120 m/s (nor)
Material	Sensor	316 SS
	Detector	Stainless casting SCS 14, 16, 304 SS, 316 SS, 316L SS
	Seal	FPM, Others
Protection class		IP65 equivalent
Required upstream straight runs (recommended)		Min. 5 D (D: inside diameter of pipe)

TRX-700 Converter

Connectable detectors		TH-1800-T (TH-1700-T is acceptable)
Accuracy of flow rate *1	5 to 100%	±1.5% R.D.
	0 to 5%	±1.5% F.S. in which F.S. is 5%
Accuracy of totalized flow *1	5 to 100%	±1.55% R.D. ±1 digit
	0 to 5%	±1.55% R.D. ±1 digit
Pulse output		Open collector output, Max.35 VDC and 50 mA
Contact output of alarm		SPDT relay contact, High alarm, Low alarm, Error
		250 VAC, 5 A or 24VDC, 5 A
Digital output (RS-485)		1200, 2400, 4800, 9600 bps selectable ID address : 00 to 99 Protocol : 8N1 Output : Flow rate, totalization, bargraph, temperature, pressure, error message or others
Display		Dot matrix LCD, 16 characters x 2 lines with back light
Indication	Upper section	Select one item from flow rate, totalization, temperature, pressure, heating voltage, internal temperature, SPS ripple or error message
	Lower section	Select one item from bar graph, flow rate, totalization, temperature, pressure, heating current
Maximum number of display digits	Flow rate	0.000 to 99999 in 5 digits
	Totalization	0.00 to 9999999 in 7 digits
Temperature correction function		Pt100 Ω, 3-wire resistance temperature sensor
Pressure correction function		None as standard Consult us for details
Response time		3 seconds at 63% step response
Cable length		Max. 100 m
Power supply		90 to 264 VAC 50/60 Hz
Ambient temperature		0 to 50°C
Ambient humidity		10 to 90%RH without dew condensation

*1 At our reference conditions for calibration

TRX-700-CNG Converter with additional functions

Installation		Cubicle type with TRX-700 contained
Protection class		IP20 equivalent, Indoor use
Display *1	Timer	4 digits 12 mm (Settable in 9.999s to 9999h)
	Counter	6 digits 10 mm
Analog output		4 to 20 mADC, Max. load resistance 500 Ω. 1 to 5 VDC converted from 4 to 20 mADC by a resistor of 250 Ω placed in the TRX-700 converter.
Pulse output		Optional, none as standard Consult us for details.
BNC IO *1		IO gate output • Start input, Start output • Reset input, Reset output • Time up output, Count up output
Operation on the panel *1		Measuring functions using counter and timer settings • Switching mode : Panel or remote • Switching by : Timer, counter or manual • Switching of starting or stopping measurement • Switching of reset
Optional power supply *2		12 VDC or 24 VDC
		Conversion by DC/AC converter

*1 This function is not availble for the conventional CNG converter.
*2 Specify either “12 VDC” or “24 VDC” or “not required.” No common use is allowed.

MODEL CODES

TH-1800-T flow detector

Selection	Model code							Description
TH-18	①	②	—	③	④	⑤	⑥	
① Process pipe size	1							15 mm (1/2″)
	2							20 mm (3/4″)
	3							25 mm (1″)
	4							40 mm (1-1/2″)
	5							50 mm (2″)
② Operating temperature range		1						Medium 0 to 80°C
		2						High 0 to 180°C
		7						Low -20 to 80°C
③ Sensor material				4				304 SS, Stainless casting SCS14
				5				316 SS, Stainless casting SCS14
				6				304 SS, Stainless casting SCS14
④ Process connection					1			JIS 10K flange
					2			JIS Rc 3/8
					3			JIS Rc 1/2
					4			JIS Rc 3/4
					5			JIS Rc 1
					F			Others
⑤ Tap for temperature element						T		Yes
								Not required (blank)
⑥ Special requirement								Blank when the standard terminal box is required.
							C	Connector type

• Available connection types and size

Size / Connection	15 mm	20 mm	25 mm	40 mm	50 mm
Flange	○	○	○	○	○
Rc3/8	○	×	×	×	×
Rc1/2	○	○	×	×	×
Rc3/4	×	○	○	×	×
Rc1	×	×	○	×	×

Note ○ :available, × :Not available

• Measuring range of each size

The flow rate is the one converted into 20°C and 1 atm when measuring 13A gas.

	15 mm	20 mm	25 mm	40 mm	50 mm
L/min (nor)	5 to 365	10 to 655	15 to 1050	30 to 2295	45 to 3795
m^3/h (nor)	0.3 to 21.9	0.6 to 39.3	0.9 to 63.0	1.8 to 137.7	2.7 to 227.7

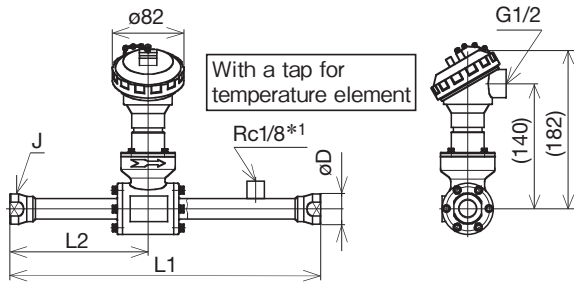
Note The minimum measurable flow rate will be increased as the operating pressure increases.

TRX-700-CNG Converter

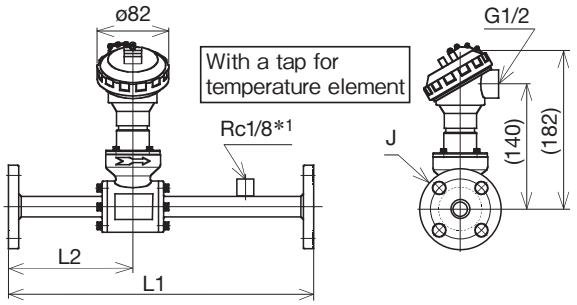
Selection	Model code								Description
TRX-7	①	②	—	③	④	⑤	⑥	-CNG	
① Temperature and pressure correction	0								Not required
	1								Temperature correction required
	4								Temperature and pressure correction required
② Cable length		1							5 m
		2							10 m
		3							15 m
		4							20 m
		5							25 m
		6							30 m
		7							35 m
		8							40 m
		9							45 m
		A							50 m
		F							50 to 100 m *Cable
③ Functional requirements conventional				1					Standard
				2					Conventional
				F					Others
④ Optional power supply					0				None
					1				12 VDC
					2				24 VDC
⑤ Analog output						1			4 to 20 mADC
						2			1 to 5 VDC
⑥ Pulse output							0		Not required
							1		Open collector (TRX-700)
							2		Others

DIMENSIONS OF FLOW DETECTOR

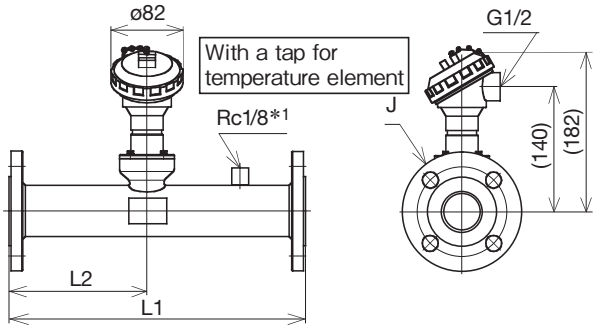
Size
15 mm to 25 mm



Size
15 mm to 25 mm



Size
40 mm to 50 mm



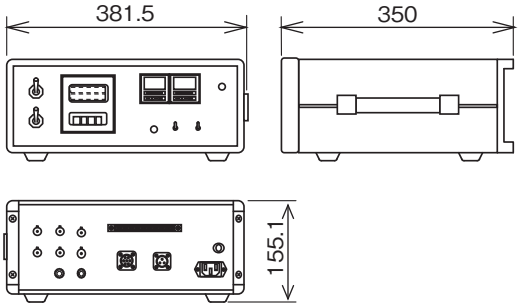
*1 The size Rc1/4 is also available.

Dimensions of flowmeter with a tap for temperature element

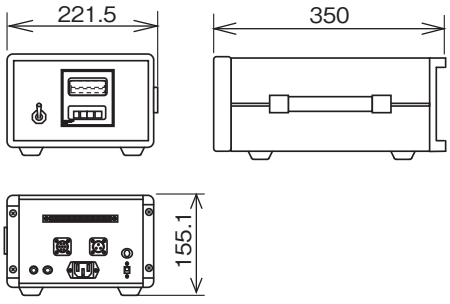
Dimension / Size	L1	L2	J	øD	W
15 mm	300	105	Rc3/8・Rc1/2	ø36	32
	270	90	15 mm JIS10K flange	—	—
20 mm	340	145	Rc1/2・Rc3/4	ø36	32
	310	130	20 mm JIS10K flange	—	—
25 mm	370	170	Rc3/4・Rc1	ø46	41
	330	150	25 mm JIS10K flange	—	—
40 mm	350	170	40 mm JIS10K flange	—	—
50 mm	390	210	50 mm JIS10K flange	—	—

DIMENSIONS OF CONVERTER

Standard type
(TRX-71□-1□□-CNG)



Conventional type
(TRX-71□-2□□-CNG)



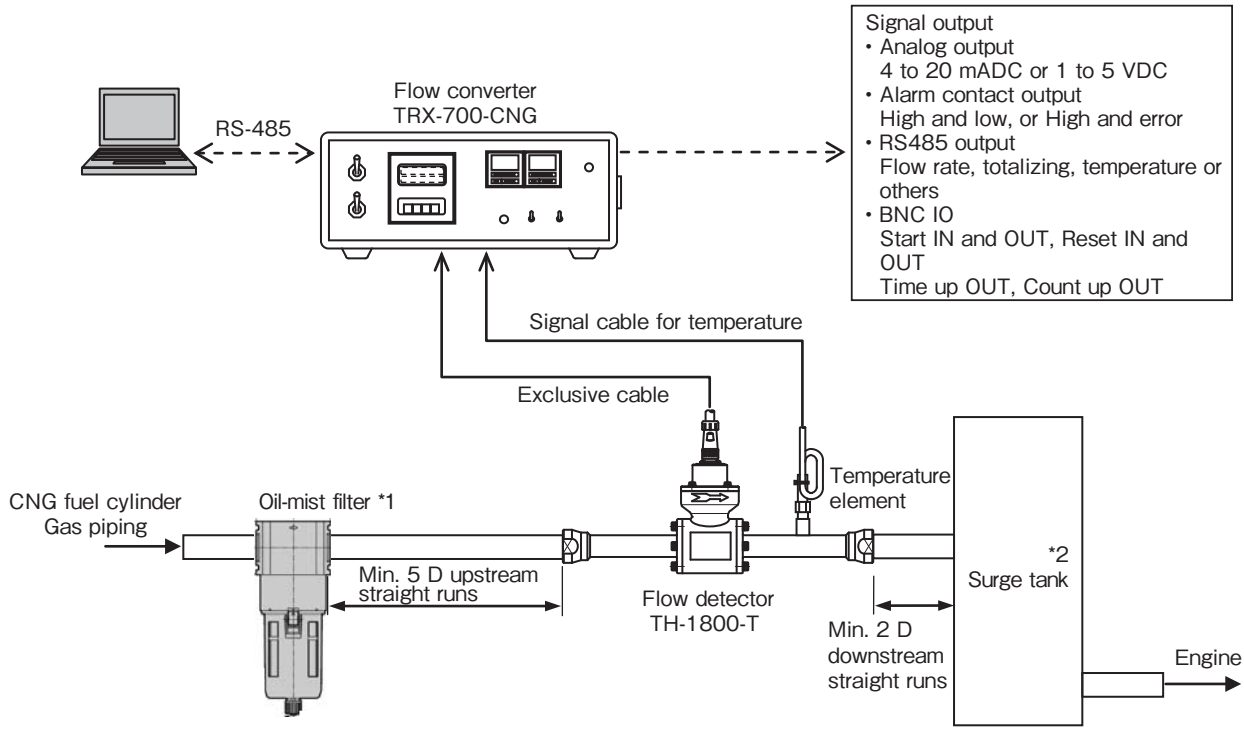
CNG FUEL GAS MEASURING SYSTEM

An example of the system is shown below.

• Provide the minimum 5 D upstream straight runs and 2 D downstream of the flow detector.

*1 Install an oil-mist filter to remove the compressor oil which may be contained in the gas from the gas cylinder. The oil mist may affect the accuracy if it adheres to the sensor. The oil-mist filter is not necessarily required when no oil is contained in the gas such as city gas.

* 2 Install a surge tank to ease the pulsation flow caused by the engine which may affect the accuracy of the flowmeter. If the pulsation flow can be reduced by installing a pressure regulator at the downstream, no surge tank is required.



* Specification is subject to change without notice.

TOKYO KEISO CO., LTD.
Head Office : Shiba Toho Building, 1-7-24 Shibakoen, Minato-ku, Tokyo 105-8558
Tel : +81-3-3431-1625 (KEY) ; Fax : +81-3-3433-4922
e-mail : overseas.sales@tokyokeiso.co.jp ; URL : http://www.tokyokeiso.co.jp