TOSHIBA

Field Intelligent Device Series

Electromagnetic Flowmeter Converter LF232

Introduction

The electromagnetic flowmeter uses Faraday's Law of electromagnetic induction to measure the process flow. The device consists of two units: a detector, through which the fluid to be measured flows and in which low-level signals proportional to flow rates are obtained; and a converter, which supplies excitation current to the detector, and amplifies the signals from the detector and then processes and converts the signals into the 4–20 mA dc current signal.
The LF232 offers various outputs such as totalization output and multi-range selection outputs. With an im-proved noise suppresser and superior signal processing capabilities the LF232 is highly resistant to noise and provides a stable output even when measuring fluids contain slurries.The LF232 can be used with a separately mounted detector such as the LF130, LF131, LF150 or LF470. The LF232 can also be used with conventional models of detectors.
The AF900 hand-held terminal can be used to communicate with the flowmeter from remote places using the HART communications protocol. See the Communications signal specification for details about HART protocol.

Figure 1. LF232 Converter

Specifications

■ Overall Specifications

Measurement range in terms of flow velocity

	Combination LF130 , LF131	Conbination LF470 , LF150
Measurement range	0-0.1m/s ～ 0-10m/s	0-0.3m/s ～ 0-10m/s

Accuracy: the accuracy is dependent on the type of detector combined with the LF232.See the following tables for accuracy when combined with specified detectors

・Detectors combined

LF130 (Meter size 15 to 200mm)
LF131 (Meter size 250 to 450mm)

Flow rate as a percent of range	Accuracy	
	0.1–1.0m/s	1.0–10m/s
0～20%	—	±0.1%FS
20～100%	—	±0.5% of rate
0～50%	±0.25%FS	—
50～100%	±0.5% of rate	—

・Detector combined

LF470 (Meter size 2.5 to 6 mm)

Flow rate as a percent of range	Accuracy	
	0.3–1.0m/s	1.0–10m/s
0～50%	±0.8%FS	±0.4%FS
50～100%	±0.8%FS	±0.8% of rate

・Detector combined

LF150 (Meter size 500 to 1000 mm)

Flow rate as a percent of range	Accuracy	
	0.3–1.0m/s	1.0–10m/s
0～100%	±0.8%FS	±0.5%FS

・Detector combined

LF150 (Meter size 1100 to 3000 mm)

Flow rate as a percent of range	Accuracy	
	0.3–1.0m/s	1.0–10m/s
0～100%	±1.2%FS	±0.8%FS

Note: Accuracy is measured when detector and converter are newly combined under the basic operating conditions in the Toshiba's calibration facility.

Fluid conductivity: 5 μ S/cm or more

Power supply :

One of the following can be selected

・100 to 240 Vac
(allowable voltage 80 to 264 Vac,50/60Hz)*1

・24 Vdc
(allowable voltage 21 to 27 Vdc)*2

*1 When the 7th digit of specification code is "B", power supply is 100 to 120Vac (allowable voltage range is 80 to 132VAC, 50/60Hz)

*2 When the 7th digit of specification code is "B", 24Vdc cannot be selected.

Power consumption:

17W(27VA) or less
(when 7th digit of specification code is "A")

35W(120VA) or less
(when 7th digit of specification code is "B")

■ Converter Specifications

Input signal — voltage signal from detector and is proportional to process flow rate.

Current output : 4 to 20 mA dc
Load resistance 0 to 1 KΩ

Digital output (DO) — 4 points (DO1 to DO4)

Digital output 1 (std.):

Output type : Transistor open collector
Number of output: 1 point
Output capacity : 30Vdc, 200mA maximum

Digital output 2 (option :added when 9th digit of specification code is "3") **:**

Out put type : Solidstate relay output (non polarity)
Number of outputs: 3 points
Output capacity : 150Vdc, 150mA maximum or 150Vac (peak to peak), 100mA maximum

DO functions:

Four digital output function, either of the following functions can be selected.

• **Totalizer pulse output**

DO1 or DO2 can be selected (Forward direction pulse and reverse direction pulse can be assigned independently)

In the case of DO1
Pulse rate 3.6 to 3,600,000 pulses/h
Pulse width
Settable within the range of 0.3 to 500ms

In the case of DO2
Pulse rate 3.6 to 360,000 pulses/h
Pulse width
Settable within the range of 4 to 500ms

• **Rage switching output**

One Digital Output (DO) is used
・Single direction, 2-range switching signal
・Forward/reverse direction switching signal

Two Digital Outputs (DO) are used
・Single direction, 4-range switching signals
・Forward/reverse 2-range switching signals

• **High/low limit alarm output**

An alarm is output when flow rate goes above or below the set-point value
Setting range : -10 to 110% of the settable maximum range
High limit 2 points, low limit 2 points can be set
At the time of alarm output, Normally Open or Normally Closed contact can be selected

• **Preset point output**

Contact ON when totalizer count exceeds the set value
Setting range : 1 to 99999999 count

• **Converter error alarm**

An alarm is output when an operation error is detected by self-diagnosis.
At the time of alarm output, Normally Open or Normally Closed contact can be selected

Digital input (DI) — 2 points (DI1 and DI2) (option : added when 9th digit of specification code is "3")

Voltage level: High level 20 to 30 V dc
Low level 2 V dc or less

Input resistance: 2.7 kΩ

DI functions:

For digital input function, either of the following functions can be selected.

• **Range switching**

One Digital Input is used : switching between large and small ranges of forward/reverse, 2-range measurement.

Two Digital Inputs are used : switching between ranges of single direction, 4-range measurement.

• **Totalizer control input**

Totalizer Start/Stop control or Reset/Start

•**Output hold input**

Fixed with set value for current output and pulse output (loop check)

• **Zero adjustment**

Starts zero adjustment (on-stream at zero flow rate) when DI voltage level goes low after remaining high for 10 to 20 seconds.

Communications signal:

A digital communications (HART protocol) signal is superimposed on 4 to 20 mA dc analog output signal.

Load resistance: 240 Ω to 1 kΩ
Load capacitance: 0.25 μF or less
Load inductance: 4mH or less

(For maximum cable length, about 2km is a guideline length when CVV-S 1.25mm^2 is used under standard installation condition.)

Note: HART (Highway Addressable Remote Trans-ducer) is a communications protocol for industrial sensors recommended by the HCF (HART Commu-nication Foundation).

Output display:

16-character×2-line dot-matrix LCD(with back light).

2 units can be selected from the flowing units : flow velocity, instantaneous flow rate, total flow (forward/reverse/difference flow), total count, %, custom unit.

Parameter settings: Parameters can be set as follows

- **IR Switches:** Various parameters can be set without opening the converter housing using 4 infrared switches (password can be set)
- **Digital communication:** The AF 900 hand-held terminal is needed to set parameters.

Damping: 0.5 to 60 s (selectable in 1s increments)

Zero adjustment:

Adjustable with infrared switches

Zero and span calibration: The converter has a built-in reference signal generation circuit and a converter check can be easily performed.

Conditions when power fails:

The output and display will stay as follows when power fails. Parameter setting values are stored in non-volatile memory and the values will be restored when the power returns to normal condition.

Current output: 0 mA
Digital output : OFF (contact open)
LCD display : No display

Mass: Approximately 8 kg
(including a mounting bracket)

Ambient temperature: -20 to 60 °C
(Storage temperature : -25 to 65 °C)

Surge protection: Surge protectors are installed in the power supply, excitation circuit, current signal output and digital I/O circuit.

Terminal block structure:21-pole, screw connection type (M4 screw)

Housing: Aluminum alloy

Coating: Acrylic resin-baked coating, pearl-gray colored

Structure: NEMA 4 (IP 67) Watertight

Cable connection ports :

A cable gland is provided for each port.
OD of cable ϕ 11 to 13 mm
Material Nylon 66
G(PF) 1/2 male screws.

Vibration resistance:

No resonance point exists when the following vibration is applied:
10 to 55Hz with amplitude of 0.07mm,
No problem occurs when vibration of 30Hz, 29.4m/s^2 is applied in each direction for 4 hours

each.

Note: If the flowmeter is intended to be used in a location where vibration is applied constantly contact Toshiba.

Installation

■ Dimensions

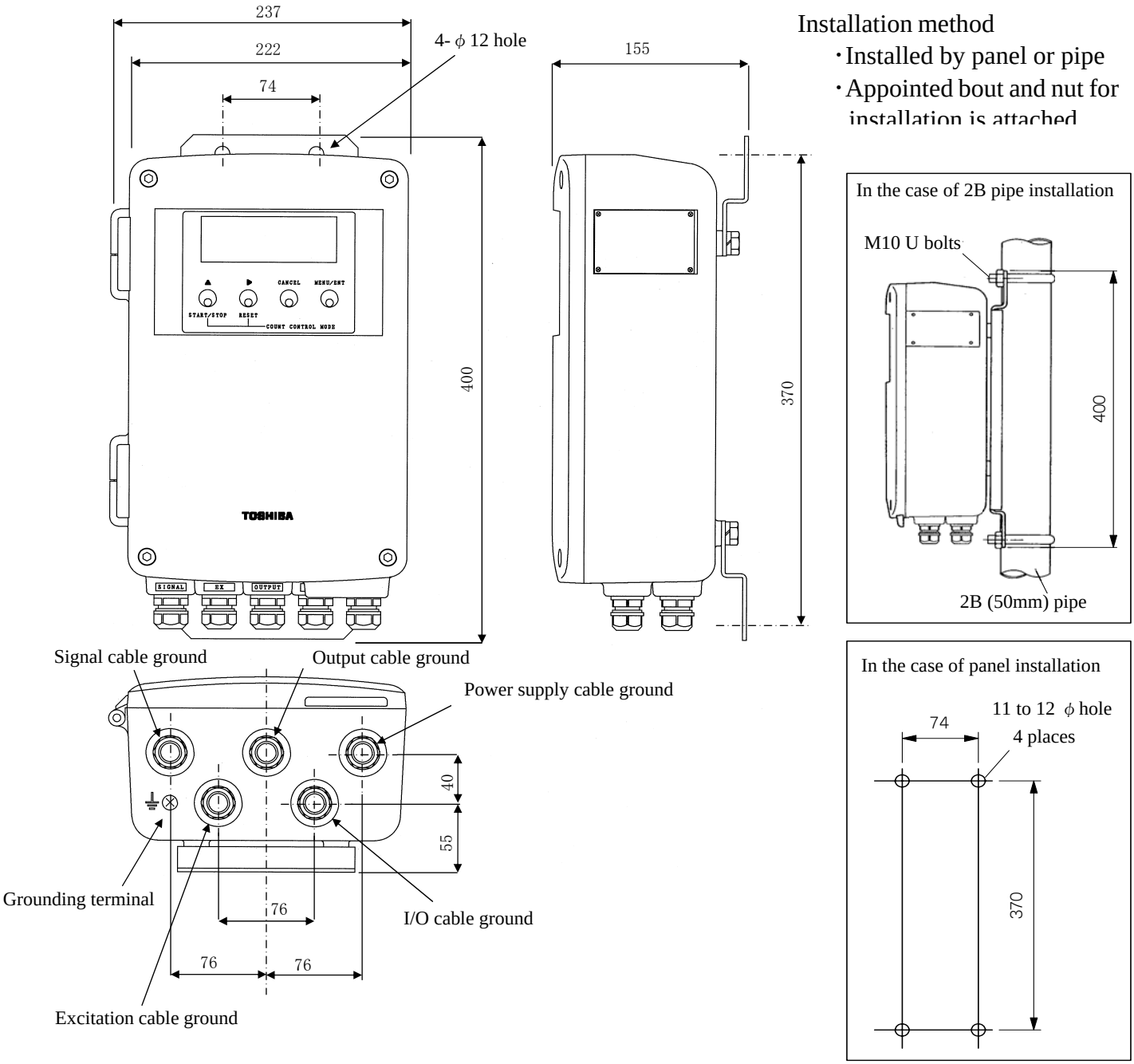


Figure 2. Dimensions

■ Dimensions (Separate type)

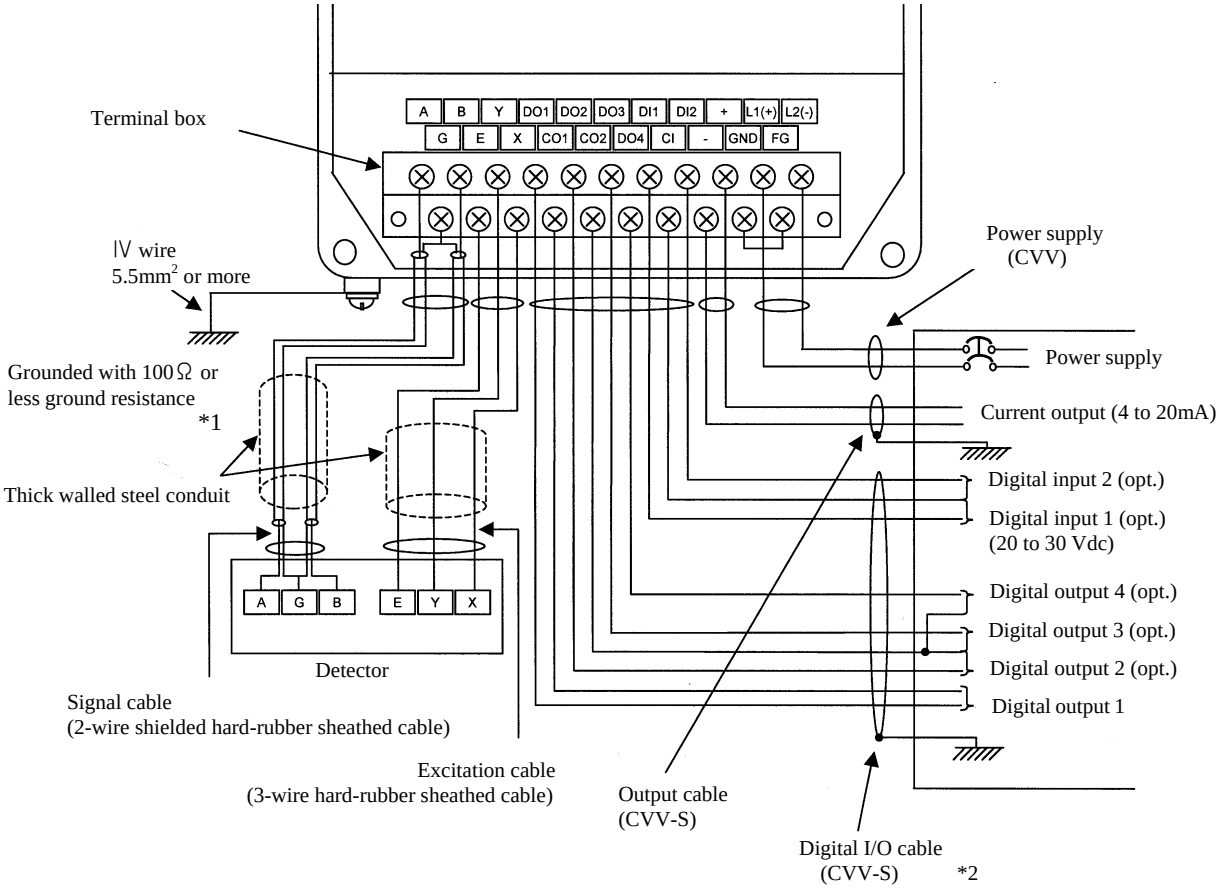


Figure 3. External Wiring Connection Diagram

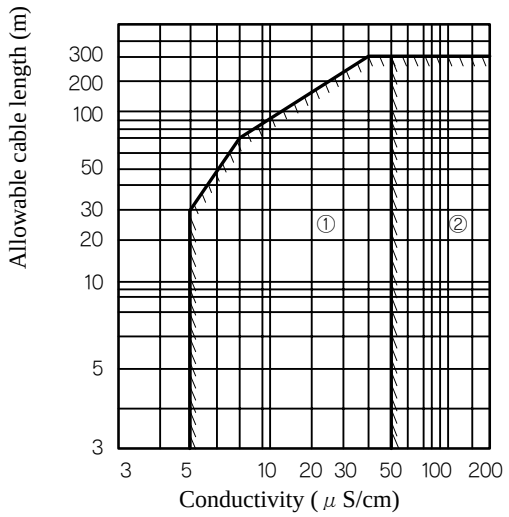
■ Wiring Precautions

(1)Be sure to use thick walled steel conduit (22mm) for signal and excitation cable wiring between the detector and converter. Use flexible conduit at the cable outlets of the detector and converter.

(2) Connect the grounding wire (IV wire 5.5mm² or more) to a good earth ground (100Ω or less ground resistance). Make the wire as short as possible. Do not use a common ground shared with other equipment where earth current may flow. An independent earth ground is recommended.

(3) The allowable cable lengths between the detector and converter for the separate type flowmeter depend on the electrical conductivity of the object fluid. See Figure 4 below.

(4) Digital output 1, digital output 2 to 4 , digital ou 1 to 2 are insulated mutually.



(1)When combined with LF130,LF131 and LF150.
(2)When combined LF470.

Figure 4. Electrical Conductivity and Cable length

■ About establishment environment

Do not store or install the flowmeter in:

- Places where there is direct sunlight.
- Places where excessive vibration or mechanical shock occurs.
- Places where high temperature or high humidity conditions obtain.
- Places where corrosive atmospheres obtain.
- Places submerged under water.
- Place where there is slop floor. To put the flowmeter temporarily on the floor, place it carefully with something, such as stopper, to support it so that the flowmeter will not topple over.

In places like the following places, there is the case that infrared switches do not function correctly. (If this is unavoidable, use an appropriate cover.

- •Places where gets very bright light onto operation panel. (direct sunlight, reflection light of sunlight by windowpanes, diffused reflection light of strength etc.)
- •Places where smoke and steam occur near.
- •Places where a snow, ice or mud that may attached.

Ordering Information

1. When ordering the LF232 converter, refer to Tables 1 (Type Specification Code).
   An entry must be made for each of the columns in each of these tables.
2. Measuring range
3. I/O function specifications.
4. Ordering scope:
   Actual flow calibration data: (required or not)
5. Specification of combined detector
6. Other scope:
   Specification other than standard items.

<u>Consult Toshiba representative before ordering when choose materials of the wetting parts such as lining, electrodes, and grounding rings.</u>

Table 1. Specification Code for converters (LF232)

Model					Specification Code								Contents
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
L	F	2	3	2										Separate type converter
					A									Purpose Standard
						A B								Compatible detectors (Note1,2,3) Medium to small-size detectors: Meter size 2.5 to 450 mm Large-size detectors: Meter size 500 to 3000 mm
							C E							Mounting nuts and bolts Panel, wall mounting (BNP material : SUS304) Pipe mounting (BNP material : SUS304)
								1 3						Digital input/output Current output + Digital output points (1 point) Current output + Digital output points (4 points) + Digital input points (2 points)
									1					Communication function HART communication
										1 2				Power supply 100Vac-240Vac, 50/60Hz (Note 2) 24Vdc (Note 3)
											A			Standard

Note 1: For applicable detector code, select one from the following table.
To combine with an existing detector, select one depending on the type of replaceable converters.
For combination with detectors not listed below, contact Toshiba.

Applicable detector code	Applicable detector	Applicable detector (discontinued model)	Replaceable converters
A	LF130, LF131, LF470 type	334, 335 type (Converters of types shown right)	372, LF200, LF220, LF420, LF230* A type
B	LF150 type	337, 335 type (Converters of types shown right)	373, 378, LF230* B type

Note 2: When the 7th digit is “B” and power supply specification code is “1”, power supply specification is 100 to 120VAC.
Note 3: 24VDC can be specified only when the 7th digit is “A”.

ISO9001 and ISO14001 are certified.

Misuse of this product can result in damages to property or human injury.
Read related manuals carefully before using this product.