

# Intelligent Functions for Greater Ease of Operation

## Multifunctional

A built-in microprocessor makes possible the numerous functions listed in the table of converter specifications. Though there are restrictions on the number of DI and DO points, the customer is free to choose from among numerous available functions.

## Communication Functions(HART Protocol)

"Smart" transmission functions employ multiplexing of analog flow rate signals (4 to 20 mA dc) and digital signals. Together with the model AF900 handheld communication terminal or the HART Communicator model 375 connected to a 4 to 20 mA line, they enable read-out of measurement data and flowmeter control from remote locations.



## Conversational Operation via LCD Display, or Enclosed Operation

Various flowmeter operations can be performed while viewing a 2-line, 16-character dot-matrix LCD display. In highly humid environments, the flowmeter can be operated via magnet switches without opening the converter cover (enclosed operation). (Standard on the LF600, LF602, LF232 & LF502)



HART protocol: Highway Addressable Remote Transducer is a Communications protocol for industrial sensors recommended by HCF(HART Communication Foundation)

## Converters

Model	LF600 (Integral type)	LF602 (Remote type)	LF232 (Remote type)	LF540 (Integral type)
Input	Digital Input: 1 (option)		Digital Input : 2	Digital Input: 1
Output	Current output: 4-20mA dc Digital output: 1 transistor open-collector 1 solidstate relay contact (option)		Current output: 4-20mA dc Digital output: 4 Solidstate relay contact	Current output: 4-20mA dc Digital output: 2 points (Transistor open-collector:1 point, Solidstate relay contact:1 point)
Comm. functions	HART protocol & PROFIBUS (option)		HART protocol	
Other functions	a) Integrated pulse output b) Multiple range-switched output c) High and/or low limit alarm d) Empty Pipe Alarm e) Preset counter (Simple batch system configurable using DI, DO) f) Low cut g) Constant-current and constant-pulse output functions h) Zero-span calibration (Note: LF600 & LF602 should be required optional DI & DO2 for function.) i) Zero adjustment function		a) Integrated pulse output b) Multiple range-switched output c) High and/or low limit alarm d) Preset counter (Simple batch system configurable using DI, DO) e) Constant-current and constant-pulse output functions f) Zero-span calibration g) Zero adjustment function	
			j) Auto-zero function (Still water zero point adjustable without stopping flow)	
Display	2-line, 16-character dot-matrix LCD display (back-light provided)		16-character, 2-row LCD (Alphanumeric, with backlight) (Standard)	16-character, 2-row LCD (Alphanumeric, with backlight)
Surge protection	Built in power supply, current signal output circuit		Built in power supply, exciting circuit, current signal output, DI, DO circuits	Built in power supply, Current signal output circuit
Power Supply	100-240Vac 24Vdc (option) 110Vdc (option)		80-132Vac, 180-264Vac 21-27Vdc or 98-121Vdc	100-240Vac
Structure	NEMA 4 (IP67) Watertight			
Explosion proof	(FM/CSA C1-D2, pending)		(FM/CSA C1-D2, pending)	



ISO9001 Certified.



ISO14001 Certified.

The works producing the flowmeter is registered as an environment management system factory specified by ISO14001.

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## Safety Instructions

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

Specifications are Aug. 2004 and subject to change without notice.

For further information, please contact your nearest Toshiba Representative or International Operations-Producer Goods.

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# TOSHIBA

# TOSHIBA'S LINE-UP OF ELECTROMAGNETIC FLOWMETERS



# TOSHIBA'S ELECTROMAGNETIC FLOWMETERS: INTELLIGENCE, HIGH QUALITY AND DURABILITY

Electromagnetic flowmeters are instruments for measuring the flow of conductive fluids, using Faraday's principle of electromagnetic induction.

Toshiba has been marketing electromagnetic flowmeters since the late 1960's. Toshiba flowmeters, the result of a wealth of experience and considerable engineering expertise, have won accolades in all areas of industry.

A full lineup of products covering diameters from 2.5 mm to 3000 mm as well as various liner materials to accommodate diverse fluids are available, making possible fluid measurements in almost any imaginable application.

## Main Applications

- **Water and Waste**
- **Foods, Beverage and Pharmaceutical**
- **Liquids Containing Solid Matter**  
Concrete slurries, Mortar, Slurries of solid matter
- **Steel, Nonferrous Metals**  
Cooling water, Metals Processing, Stack gas desulfurization
- **Fertilizers and Inorganic Chemicals**  
Fertilizers, Soda, Aqueous acid solutions, Aqueous alkaline solutions
- **Pulp and Paper**  
Papermaking processes, Pulp
- **Polymer Chemicals**  
Chemical fibers, Water-soluble applications, Water-soluble adhesives

## Toshiba Technology Meets Diverse Needs

- The divided multi-sampling system provides reliable and accurate measurement of a wide variety of fluids.
- Unique noise suppression technology reduces chemical noise.
- A high-purity alumina ceramic measurement tube eliminates potential problems in the measurement of fluids at elevated temperatures, corrosive chemicals, and fluids under other adverse conditions.
- Toshiba's functional magnetic field distribution technique and the reduced number of flowmeter components result in improved flow measurement efficiency and reliability.



## Flowmeters Ready for Use Worldwide

- LF600 and LF602 converters are provided with universal power supplies as standard equipment, enabling use anywhere in the world. They can be powered at 100 Vac to 240 Vac; 24Vdc and 110 Vdc power supplies are also available.

## Enhanced Resistance to Harsh Environments

- **Ceramic measurement tubes improve resilience**  
The LF470, LF410 and LF510 detectors (2.5 to 100 mm) employ an alumina ceramic measurement tube, for improved resistance to abrasion, pressure and temperature. The ceramic measurement tube is surrounded by metal in a construction impervious to stresses in pipe installation and stresses caused by rapid changes in temperature.
- **EPDM lining to improve ozone confinement**  
EPDM lining material provides excellent ozone resistance, so that flowmeters can be used without hesitation in high-grade water treatment and other plants where ozone resistance is important.

## Full Product Lineup

### Conventional Electromagnetic flowmeters

A complete lineup of flowmeter models with pipe diameters ranging from 2.5 mm to 3000 mm, and with various lining materials, accommodate diverse applications ranging from infinitesimal flow to largeflow measurements and from measurement of water flow to measurements of chemicals and solutions.

### Capacitance type LF510/LF540

Toshiba's advanced capacitance technology achieves to electrode-less type of electromagnetic flowmeter at the wetting part inside detector pipe.

### Electromagnetic Flowmeters for Sanitary Applications (LF490, 3A approved)

Model LF490 is used for the measurement flow under sanitary conditions. The flowmeters are designed for handling of clean in place requirements with quick connect components.

### Ready for Use in Diverse Applications

Please consult a sales representative for information on specialized applications.

## ● Detectors

Models	LF410 Wafer	LF430 Flanged	LF490 Sanitary	LF470 (334) Fractional	LF510 Capacitance	LF150 & LF450 Flanged (large)	LF502 Partially-filled
Mounting style between converter	Integral type / Remote type			Remote type	Integral type	LF450: Integral type / Remote type LF150: Remote type	Remote type
Meter size Unit : mm (inch)	15, 25, 40, 50, 80, 100, 150, 200 (1/2", 1", 1-1/2", 2", 3", 4", 6", 8")	15, 25, 32, 40, 50, 65, 80, 100, 150, 200, 250, 300, 350, 400 (1/2" to 16")	25, 40, 50, 80, 100 (1", 1-1/2", 2", 3", 4")	2.5, 4, 6 (1/10", 1/6", 1/4")	25, 40, 50, 80, 100 (1", 1-1/2", 2", 3", 4")	500, 600, 700, 800, 900, 1000, 1100, 1200, 1350, 1500, 1600, 1800, 2000, 2200-3000 (20" to 120")	150, 200, 250, 300, 350, 400, 500, 600 (6", 8", 10", 12", 14", 16", 20", 24")
Measurement Range(Flow rate equivalent)	[0-0.1]-[0-10]m/s			[0-0.3]-[0-10]m/s	[0-0.5]-[0-10]m/s	[0-0.3]-[0-10]m/s	150mm: 0-60m <sup>3</sup> /h (Std.) to 0-300m <sup>3</sup> /h 200mm: 0-110m <sup>3</sup> /h (Std.) to 0-550m <sup>3</sup> /h 250mm: 0-175m <sup>3</sup> /h (Std.) to 0-875m <sup>3</sup> /h 300mm: 0-250m <sup>3</sup> /h (Std.) to 0-1250m <sup>3</sup> /h 350mm: 0-350m <sup>3</sup> /h (Std.) to 0-1750m <sup>3</sup> /h 400mm: 0-450m <sup>3</sup> /h (Std.) to 0-2250m <sup>3</sup> /h 500mm: 0-710m <sup>3</sup> /h (Std.) to 0-3350m <sup>3</sup> /h 600mm: 0-1000m <sup>3</sup> /h (Std.) to 0-5000m <sup>3</sup> /h ±2%FS
Accuracy	Pulse output: Vs > 0.5 m/s (1.64 ft/s): +/-0.5 % of rate. Vs < 0.5 m/s (1.64 ft/s): +/-0.4 % of rate +/-1 mm/s (0.039 inch/s). Current output: plus +/- 8 uA (0.05 % of span) (Note: Span=Range in the magmeters.)			Span: 1-10m/s Flow rate 50-100%: ±0.8% of rate Flow rate 0-50%: ±0.4FS Span: 0.3-under 1m/s Flow rate 0-100%: ±0.8%FS	Span: 1.0-10m/s Flow rate 50-100%: +/-0.5% of rate Flow rate 0-50%: +/-0.25% FS Span: 0.5-under 1.0m/s Flow rate 0-100%: +/-0.5% FS	500-1000mm Span: 1.0-10m/s: ±0.5%FS Span: 0.3-under 1.0m/s: ±0.8FS 1100-3000mm Span: 1.0-10m/s: ±0.8%FS Span: 0.3-under 1.0m/s: ±1.2FS	
Mounting style	Wafer	Flange	Sanitary clamp · Sanitary screws	Threaded	Wafer	Flange	Flange
Lining material (Meter size)	Alumina ceramic (std.): 15-100mm (1/2" to 4") PFA: 15-200mm (1/2" to 8")	PFA: 15-400mm (1/2" to 16") EPDM rubber: 80-400mm (3" to 16")	PFA	Alumina ceramic		Chloroprene rubber (std.)	PFA (std.): 150-300mm (6" to 12") Chloroprene rubber: 150-600mm (6" to 24")
Electrode material	Hastelloy C equivalent (*1)(std.)	PFA lining: Hastelloy C equivalent (*1)(std.) EPDM rubber lining: 316L stainless steel (std.)	316L stainless steel (std.)	Pt-Ir	Nothing at the wetting part	316L SS (std.), others	316L stainless steel (std.)
Grounding ring material	316 stainless steel (std.)			316L stainless steel (std.)		LF150: 304 SS (std.), others LF450: None (std.), others	150-400mm (6" to 16"): 316 stainless steel (std.) 500 & 600mm (20" & 24"): 304 stainless steel (std.)
Detector body material	25-100mm (1" to 4"): Stainless steel 15, 150, 200mm: (1/2", 6", 8"): Carbon steel	Carbon steel	Stainless steel	Aluminum alloy	Stainless steel	Carbon steel	Carbon steel
Structure	NEMA 4 (IP67) Watertight	NEMA 4 (IP67) Watertight NEMA 6 (IP68) Submersible (to depth of 5m)(opt.)		NEMA 4 (IP67) Watertight		NEMA 4 (IP67) Watertight NEMA 6 (IP68) Submersible (opt.)	NEMA 4 (IP67) Watertight NEMA 6 (IP68) Submersible (to depth of 5m)(opt.)
Compatible converters	LF600, LF602 or LF232			LF602 or LF232	LF540	LF150/LF232, LF450/LF600 or LF602 (*3)	
Range of fluid levels	Fully-filled			Fully-filled			30mm to fully-filled (150-300mm) 10% of inside tube diameter to fully-filled (350-600mm)
Explosion proof	FM / CSA C1-D2			FM / CSA C1-D2		(FM / CSA C1-D2, pending)	

\*1: Hastelloy C is a registered trademark of Haynes International Inc..

\*2: The 65mm (2-1/2") size is only JIS10K flange type.

\*3: Model LF450 is combined with LF600 or LF602 converter. Its meter size is 500 & 600mm (20" & 24").