TOSHIBA

Field Intelligent Device Series

Electromagnetic Flowmeter

LF410 /LF620
LF410 /LF622
15 to 200 mm (1/2" to 8")

Introduction

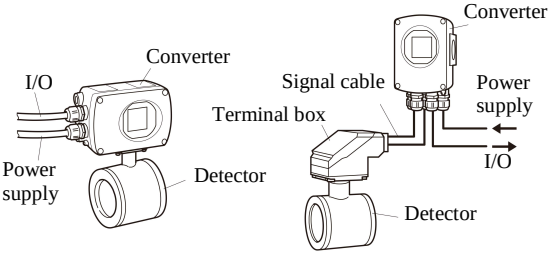
The electromagnetic flowmeter uses Faraday's Law of electromagnetic induction to measure the process flow. The device consists of two units: a detector, through which the fluid to be measured flows and in which low-level signals proportional to flow rates are obtained; and a converter, which supplies excitation current to the detector, and amplifies the signals from the detector and then processes and converts the signals into the 4–20mAdc current signal or communication signal. With the unique patented magnetic field distribution technology, the meter is highly immune for upstream flow disturbances. Combined with a multi-functional converter LF620 (combined type) or LF622 (separate type) equipped with its original noise-suppression circuit and advanced algorithms. The LF410 has high tolerance to noise, giving stable output even for slurry fluid measurement. IR (Infrared) switches enable parameter setting of the converter without removing the cover. Flow direction can be set in either way, and its 128 x 128 dot matrix LCD display allows the LCD to be rotated electronically to 90, 180 and 270 degrees without opening the cover. The terminal block in LCD side make easy to wire in case of the combined type.

The AF900 hand-held terminal (HART*[1] communicator) can be used to communicate with the flowmeter from a remote place. PROFIBUS-PA*[2] or Modbus*[3] interface is available as an option.

*1: HART protocol (Highway Addressable Remote Transducer) is a communication protocol for industrial sensors recommended by the HCF (HART Communication Foundation).

*2: PROFIBUS is the communication protocol for factory automation and process automation that the PROFIBUS Organization recommends. Instead of analog control with a conventional analog signal (4-20mA), it is one kind of the fieldbus which digitizes all signals. Flowmeters support PROFIBUS-PA.

*3: Modbus is the communication protocol that Modicon Inc. developed. Physical layer is RS485.



Combined type
LF410/LF620
LF414/LF620F

Separate type
LF410/LF622
LF414/LF622F

Figure1. Configuration

LF410/LF620
LF414/LF620F

LF410
LF414

LF622
LF622F

Figure2. LF410 series Flowmeters

FM C US APPROVED

Certification number
Z01207

Specifications

■ Overall Specifications

Measurement range in terms of flow velocity:
0 – 0.3 m/s to 0 –10 m/s (0 –1.0 ft/s to 0 – 32.8 ft/s).
0 – 0.1 m/s to 0 – 0.3 m/s (0 – 0.3 ft/s to 0 – 1.0 ft/s) range is available optionally.

Accuracy: ±0.2 % of Rate*

* This pulse output error result is established under standard operating conditions at Toshiba's admitted flow calibration facility.

* Individual meter measurement error may vary up to ±0.5% of Rate at 1.64ft/s (0.5m/s) or more and ±0.3% of rate ±0.039 inch/s (1mm/s) at 1.64 ft/s (0.5 m/s) or less.

* Current output: plus ± 8μA (0.05% of span.)

* Refer to individual calibration data for each individual meter's measurement error.

Fluid conductivity: 5μS/cm minimum

Fluid temperature:

–10 to +180°C : Ceramic type
(14 to 356 °F)

Note : 120°C (248°F) above is separate type

–10 to +120°C : tefolon PFA

(14 to 248°F)

Ambient temperature:

–20 to +60 °C (–4 to 140 °F)

Structure: IP 67 and NEMA 4X Watertight

Power consumption:

Standard:10W(14VA)

at AC100V and Excitation current:0.2A

MAX:15W (22VA)

MAX:17W(24VA) with PROFIBUS

Conformance to European Community Directives:

PED 97/23/EC (Note 1)

Note : See table 1 for detail.

Approved hazardous location certifications:

Model: LF414/LF620F and LF414/LF622F

cFMus Nonincendive for use in

hazardous (classified) locations:

Class I, II, III, Division 2, Groups A-G

Detector and converter combination:

LF410/LF620: Combined type for standard specification.

LF410/LF622: Separate type for standard specification.

LF414/LF620F: Combined type with Ex approval of Class I, Division 2 (cFMus).

LF414/LF622F: Separate type with Ex approval of Class I, Division 2 (cFMus).

■ Model LF410 and LF414 Detectors

Mounting style: Wafer type

Fluid pressure: –0.1 MPa (–15 psi or –1.0 bar) to the nominal pressure of the connection flange.

Note: The test pressure before shipping from the factory is equal to twice the nominal pressure rating of the customer specified flange connection during 15 minutes.

Connection flange standards:

ASME B16.5 class 150, ASME B16.5 class 300

EN1092-1 PN10, EN1092-1 PN16

JIS B 2220 10K, JIS B 2220 16K, JIS B 2220 20K

Principal materials:

Case —

25 to 100mm (1” to 4”): stainless steel

15, 150, and 200mm (1/2”, 6”,and 8”): carbon steel

Linings —

15 to 100mm (1/2” to 4”): Ceramic tube (std.) & Teflon PFA (opt.)

150 and 200mm (6” to 8”): Teflon PFA

Electrodes — 316L stainless steel (std.)

Grounding rings — 316 stainless steel (std.)

Note: See Table 5 for optional materials and other related information.

Measuring tube material — 304 stainless steel (in case of Teflon PFA lining)

Coating — 25 to 100mm (1” to 4”): no coating (stainless steel body).
15, 150, and 200mm (1/2”, 6”, and 8”): phthalic acid resin coating with pearl-gray colored.

Heat shock resistance : for a ceramic tube detector

Heating: $\Delta T \leq 150$ °C/0.5sec (302°F/0.5sec)

Cooling: $\Delta T \leq 100$ °C/0.5sec (212°F/0.5sec)

Note: The above means that the ceramic tube detector withstands the shock of sudden heating (temperature difference 150°C or less per 0.5seconds) and sudden cooling (temperature difference 100°C or less per 0.5seconds).

Dimensions and weights: See Figures 3 to 8.

Cable connection port: for separate type detectors.

Cable glands —

LF410: without cFMus approval
Provided as standard
R(PT) 1/2 male screws.

LF414: with cFMus approval
Not provided
3/4-14NPT male screws are required.

Applicable diameter — 11 to 13mm (0.433 to 0.512 inch)

■ Model LF620 and LF622 converters

Input signals

Analog signal — the voltage signal from detector, proportional to process flow rate (For LF622 separate type converter).

Digital input DI
Signal type: 20 to 30Vdc voltage signal
Input resistance: 2.7kΩ
Number of inputs: one point

Note: DI cannot be used with the Modbus communication.

DI function — One of the following functions can be assigned to the optional DI signal.

Range switching — Selects either the higher or lower range in the unidirectional or bidirectional 2-range setting.

Totalizer control — Starts and stops the built-in totalizer.

Fixed-value outputs — Outputs fixed-values for current and pulse outputs.

Zero adjustment — Executes zero adjustment (on-stream at zero flow rate).

Output signals

Current output:
4–20mAdc (load resistance 0 to 750Ω)

Note: The current output cannot be used with the PROFIBUS-PA communication.

Digital outputs — Two points are optionally available as follows.

Digital output DO1 :
Output type: Transistor open collector
Number of outputs: One point
Output capacity: 30Vdc, 200mA maximum

Note: DO1 cannot be used if Modbus communication connection is 3 lines.

Digital output DO2 :
Output type: Solidstate relay output (non polarity)
Number of outputs: One point
Output capacity: 150Vdc, 150mA maximum or 150 V ac (peak to peak), 100mA maximum

Note: DO2 cannot be used with the Modbus communication.

DO1 and DO2 functions — One of the following functions can be assigned to DO1 and/or DO2

- **Pulse output (available only for DO1,DO2)**
  Pulse rate: Max 10kHz (10,000pps) (DO1)
  Max 100Hz (100pps) (DO2)
  (Over 1kpps, auto-setting)
  Pulse width: 0.3 to 500ms (but less than half of the period for 100% flow rate)
  Note: The same and simultaneous pulse is not available between DO1 and DO2.)
- **Multi-range selection outputs (Note 1)**
- **High, High high, Low, and/or Low low alarm outputs (Note 2)**
- **Empty pipe alarm output (Note 2)**
- **Preset count output**
- **Converter failure alarm output(Note 2)**

Note 1: Two outputs (DO1 and DO2) are needed for 4-range switching and forward/reverse 2-range switching.

Note 2: Normal Open (default set) or Normal Close is selected for alarm outputs when programming.
When power failure occurs, unit will be fault to Normal Open.

Communications output :

- **HART(std.)**

Digital signal is superimposed on 4–20mAdc current signal as follows:

- Conforms to HART protocol
  Load resistance: 240 to 750Ω
  Load capacitance: 0.25μF maximum
  Load inductance: 4mH maximum

- **PROFIBUS (opt.)**

Protocol : PROFIBUS-PA
Baurate : 31.25kbps
Bus voltage : 9-30VDC
Consumption electric current of bus:less than 16mA
Manufacture Ident-No. : $093B_{HEX}$
Standard Ident-No. : 9740_{HEX}
Slave address : 0-126 (Default address is 126)
Profile : Profile Ver.3.01 for Process Control Devices
Function blocks : AI(Flow)×1 , Totalizer×1

- **Modbus(opt.)**

Physical layer : RS485
Protocol : Modbus
Mode : RTU
Baudrate : 4800, 9600, 19200bps
Data length : 8bit
Parity bit : None, Odd, Even
Stop bit : 1bit, 2bit
Error check : CRC-16
Max. station number : 32(with Master device)
Max. cable length : 1.2km (Note)

Note: This length is specification of 3 line

connection.

LCD display: Full dot-matrix 128×128 dot LCD display (back-light provided)
The data on the LCD inside the converter can rotate to 90, 180, and 270 degrees by a software, without rotating the indicator itself. (Combined type only)

Parameter settings — Parameters can be set as follows:
- **IR Switches**: Three key switches are provided to set configuration parameters.
- **Digital communication**: The AF900 hand-held terminal or PROFIBUS is needed to set parameters.
- **Zero adjustment:** Zero point adjustment can be started by pressing the switch in the converter.

Damping: 0.5 to 60 seconds (selectable in one second increments)

Zero and span calibration: Built-in calibration signal source allows converter unit check.

Conditions 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. The outputs and display will remain as follows when power fails.
- Current output: 0mAdc
- Digital output: OFF
- LCD display: No display
- PROFIBUS: No communication

Power supply: One of the following can be selected:
- 100 to 240Vac, 50/60Hz (std.) (allowable voltage 80 to 264Vac)
- 24Vdc (allowable voltage 18 to 36Vdc)
- 110Vdc (allowable voltage 90 to 130Vdc)

Surge protection: Arresters are installed in the power supply, and a current signal output circuit.

Case: Aluminum alloy (equivalent of IP 67)

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

Cable connection ports:
Cable glands —

LF620 and LF622 without cFMus Approval:
Provided as standard
OD of cable ϕ 11~13mm
Material Nylon 66
G (PF) 1/2 male screws.

Note: When PROFIBUS or Modbus option is specified , cable gland size is ϕ 6～8mm for signal cable, ϕ 11～13mm for power cable

LF620F and LF622F with cFMus Approval:
Not provided, 1/2-14NPT male screws are required.

Applicable diameter — 11 to 13mm (0.433 to 0.512 inch)

Vibration resistance:

No resonance to the following levels of vibration:
- 10 to 150Hz with acceleration of 9.8m/s^2
- Vibration of 30Hz with 29.4 m/s^2 in 4h in each direction will not cause any defect to unit.

Note: Avoid using the flowmeter in an environment with constant vibration.

Converter LF622 dimensions and weights:
See Figure 9 (for Separate type)

MTBF:220,000 hours at 25 deg.C (77 deg.F) based on MIL-HDBK-217F

■ PED matrix in each flange connection.

The following sizes fall under the category for PED in each flange connection when the meter ships to EU. All of them had complied with it from a notified body.

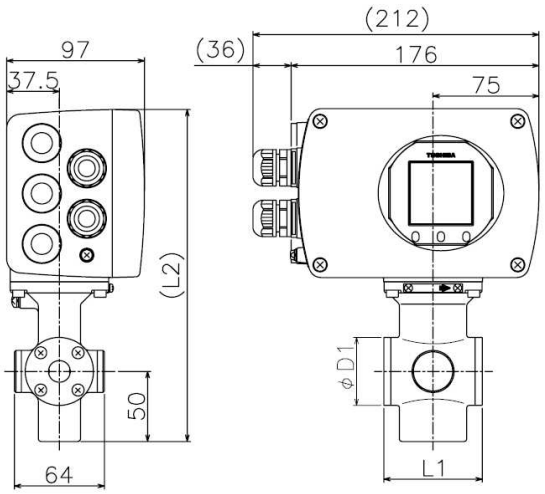
Table 1 PED matrix in each flange connection

Flange standard	Meter size
EN 1092-1 PN 16	6 to 16 inch (150 to 400mm)
EN 1092-1 PN 10	10 to 16 inch (250 to 400mm)
ASME B 16.5 class 150 and JIS B 2220 10K	6 to 16 inch (150 to 400mm)

Installation

■ Dimensions

Unit : mm



EN 1092-1 PN 16 and JIS B 2220 10K dimensions:

Meter size (mm)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
15	70	237	49	approx. 4

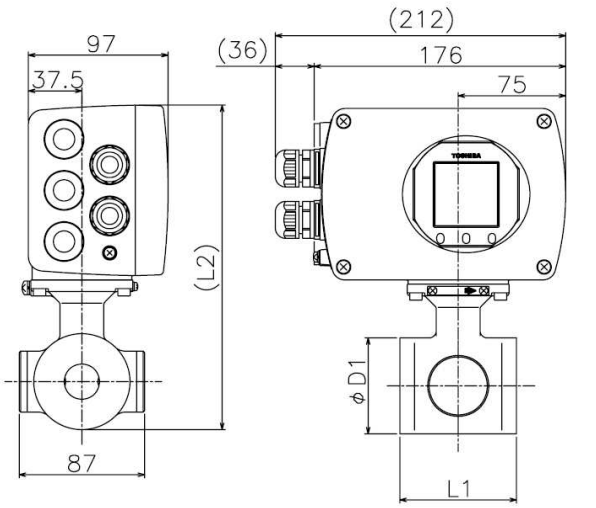
Note: 1 inch = 25.4mm

ASME B 16.5 class 150 and class 300 dimensions:

Meter size (inch)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lb)
1/2	2.76	9.33	1.93	approx. 9

Figure 3. LF410/LF620 and LF414/LF620F flowmeters Meter size 15mm (1/2")

Unit : mm



EN 1092-1 PN 16 and JIS B 2220 10K dimensions:

Meter size (mm)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
25	80	226	66	approx. 4

Note: 1 inch = 25.4mm

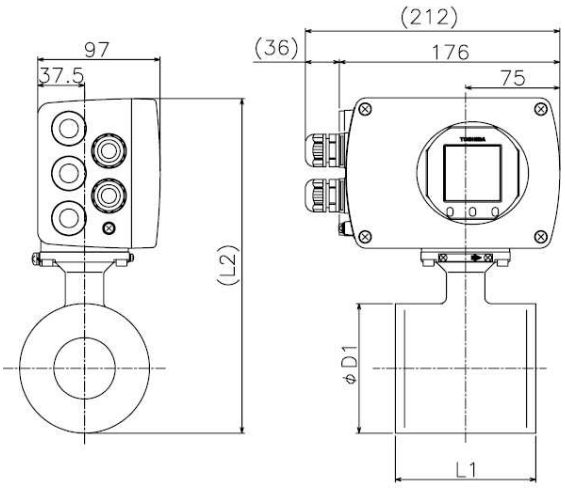
ASME B 16.5 class 150 and class 300 dimensions:

Meter size (inch)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lb)
1	3.15	8.90	2.60	approx. 9

Figure 4. LF410/LF620 and LF414/LF620F flowmeters Meter size 25mm (1")

Note1: Cable glands are not provided for LF414 of cFMus approved type.
Refer to the part of Cable connection port at detector.

Unit : mm



Note1: Eye bolts are provided at the top for flowmeters sized 200mm (8").

Note2 : Cable glands are not provided for LF414 of cFMus approved type.
Refer to the part of Cable connection port at detector.

EN 1092-1 PN 16 and JIS B 2220 10K dimensions:

Meter size (mm)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
40	100	249	85	approx. 5
50	110	265	102	approx. 6
80	110*	291	127	approx. 7
100	120*	323	159	approx. 9
150	230	392	216	approx. 21
200	300	443	267	approx. 35

ASME B 16.5 class 150 and class 300 dimensions:

Meter size (inch)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lbs)
1-1/2	3.94	9.80	3.35	approx. 11
2	4.33	10.43	4.02	approx. 14
3	4.33*	11.46	5.00	approx. 16
4	4.72*	12.72	6.26	approx. 20
6	9.06	15.43	8.50	approx. 47
8	11.81	17.44	10.51	approx. 77

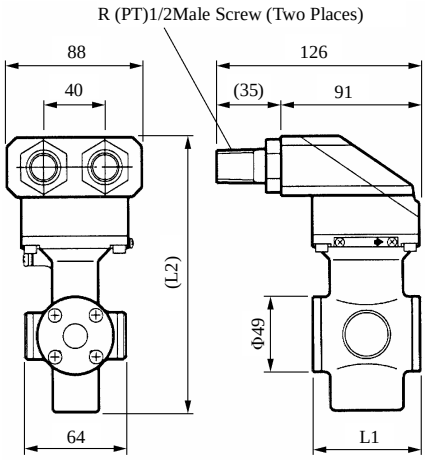
Note: 1 inch = 25.4mm

*When Teflon PFA lining is selected, L1 in the table above becomes as follows:

- L1: 115mm (4.53 inch) for meter size 80mm (3")
- L1: 126mm (4.96 inch) for meter size 100mm (4")

Figure 5. LF410/LF620 and LF414/LF620F flowmeters Meter sizes 40 (1 1/2") to 200mm (8")

Unit : mm



Note1: Cable glands are not provided for LF414 of cFMus approved type.
Refer to the part of Cable connection port at detector.

Note2: 1 inch = 25.4mm

EN 1092-1 PN 16 and JIS B 2220 10K dimensions:

Meter size (mm)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
15	70	179	49	approx. 3

ASME B 16.5 class 150 and class 300 dimensions:

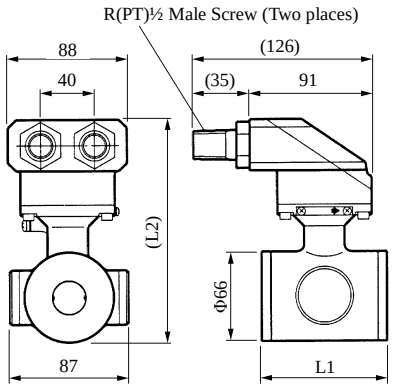
Meter size (inch)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lb)
1/2	2.76	7.05	1.93	approx. 7

Figure 6. Separate type detectors LF410 and LF414 Meter size 15mm (1/2")

The dimension of L1 is changed when the material of grounding ring is chosen Pt-Ir or Ta

Meter size	L1
15mm (1/2")	77mm (3.03 inch)
25mm (1")	95mm (3.74 inch)
40mm (1 1/2")	115mm (4.53 inch)
50mm (2")	126mm (4.96 inch)
80mm (3")	126mm (4.96 inch)
100mm (4")	136mm (5.35 inch)
150mm (6")	242mm (9.53 inch)
200mm (8")	312mm (12.28 inch)

Unit : mm



Note1: Cable glands are not provided for LF414 of cFMus approved type.
Refer to the part Cable connection port at detector.
Note2: 1 inch = 25.4mm

EN 1092-1 PN 16 and JIS B 2220 10K dimensions:

Meter size (mm)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
25	80	168	66	approx. 3

ASME B 16.5 class 150 and class 300 dimensions:

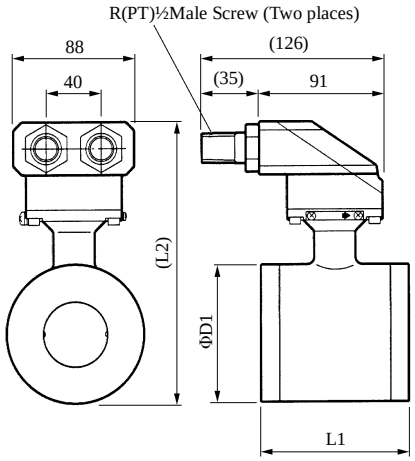
Meter size (inch)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lb)
1	3.15	6.61	2.60	approx. 7

Figure 7. Separate type detectors LF410 and LF414 Meter size 25mm (1")

The dimension of L1 is changed when the material of grounding ring is chosen Pt-Ir or Ta

Meter size	L1
15mm (1/2”)	77mm (3.03 inch)
25mm (1”)	95mm (3.74 inch)
40mm (1 1/2”)	115mm (4.53 inch)
50mm (2”)	126mm (4.96 inch)
80mm (3”)	126mm (4.96 inch)
100mm (4”)	136mm (5.35 inch)
150mm (6”)	242mm (9.53 inch)
200mm (8”)	312mm (12.28 inch)

Unit : mm



Note1: Cable glands are not provided for LF414 of cFMus approved type.
Refer to the part of Cable connection port at detector.
Note2: Eye bolts are provided at the top for flowmeters sized 200mm (8").
Note3: 1 inch = 25.4mm

EN 1092-1 PN 16 and JIS B 2220 10K dimensions:

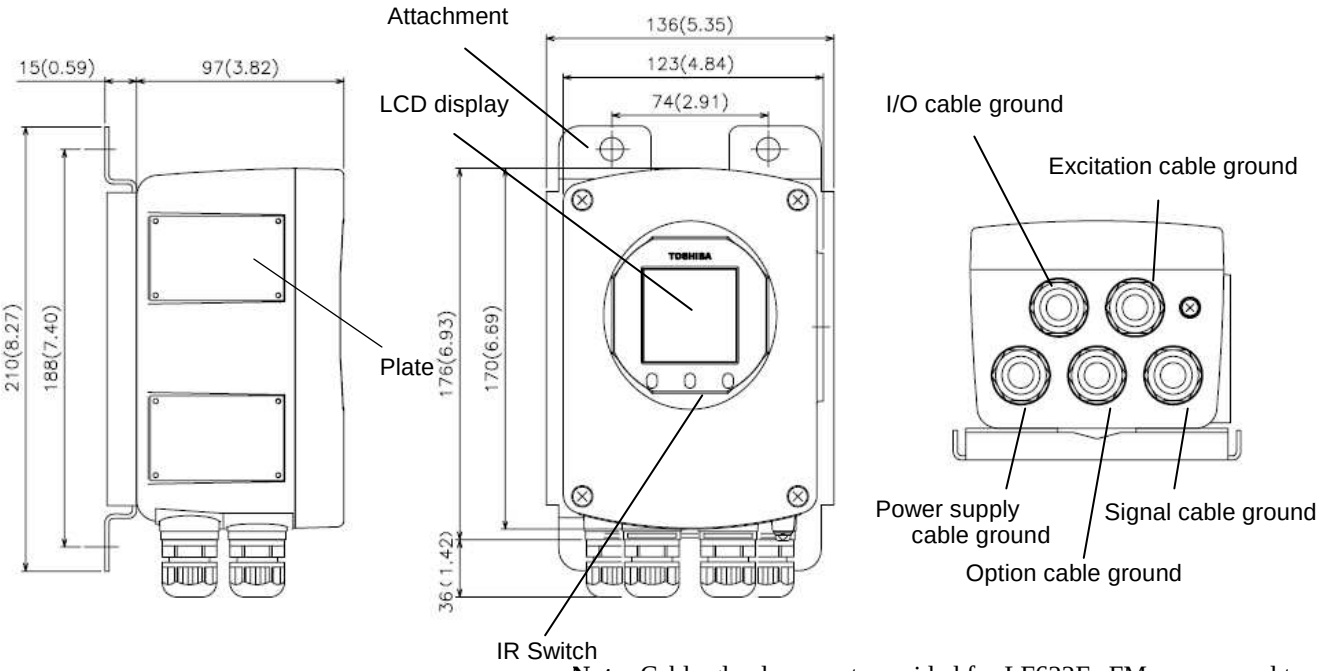
Meter size (mm)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
40	100	190	85	approx. 4
50	110	207	102	approx. 5
80	110*	232	127	approx. 6
100	120*	264	159	approx. 9
150	230	324	216	approx. 21
200	300	385	267	approx. 35

ASME B 16.5 class 150 and class 300 dimensions:

Meter size (inch)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lbs)
1-1/2	3.94	7.48	3.35	approx. 9
2	4.33	8.15	4.02	approx. 11
3	4.33*	9.13	5.00	approx. 13
4	4.72*	10.39	6.26	approx. 20
6	9.06	12.76	8.50	approx. 47
8	11.81	15.16	10.51	approx. 78

* When Teflon PFA lining is selected, L1 in the table above becomes as follows:
·L1: 115mm (4.53 inch) for meter size 80mm (3")
·L1: 126mm (4.96 inch) for meter size 100mm (4")

Figure 8. Separate type detectors LF410 and LF414 Meter size 40 (1 1/2") to 200mm (8")

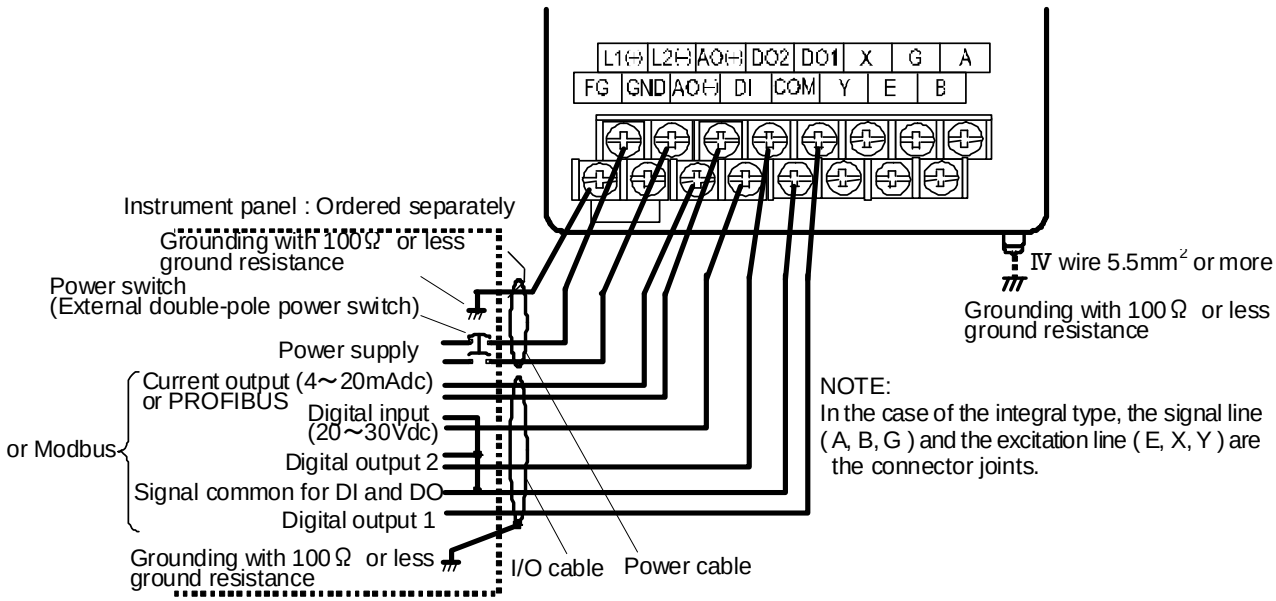


Note: Cable glands are not provided for LF622F cFMus approved type. Refer to the part Cable connection port at detector.

Figure 9. Separate type converter LF622 and LF622F

■ External Connections

- **Combined type LF410/LF620 and LF414/LF620F flowmeters**

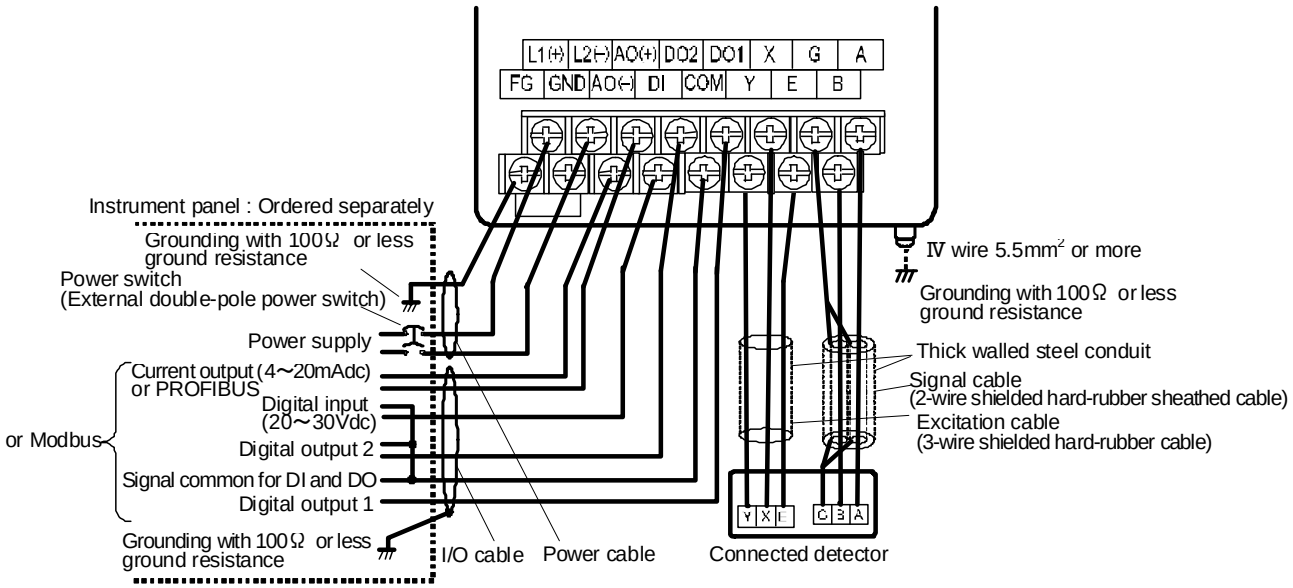


***1** Locate an external double-pole power switch on the power line near the flowmeter within easy reach of operation. Use the appropriate switch rating as shown below:

Switch rating: 250Vac, 6A or more
In rush current: 15A or more

Figure 10. Combined type LF410/LF620 and LF414/LF620F

flowmeters Wiring Diagram



Symbol	Description	Cable
L1 (+)	Power supply	Power cable
L2 (−)		
GND	Ground (for arrester)	
FG	Frame ground	
DI	Digital Input (20~30Vdc)	I/O cable
DO1	Digital Output 1	
DO2	Digital Output 2	
COM	Signal Common for DI, DO1, DO2	
+	Current Output (4~20mAdc) or PROFIBUS	
−		Shielded cable for PROFIBUS-PA
X	Excitation Output	Excitation cable (for LF622, LF622F only)
Y		
E		
A	Signal Input	Signal cable (for LF622, LF622F only)
B		
G		

Note: Symbol of the terminal is changed as follows for Modbus.

DO2 → T+, DI → T-, COM → TG

Symbol	Description	Cable
T+	Modbus(+)	Twist-pair polyethylene insulated vinyl sheath cable (JKEV,AWG24(0.2mm²))
T-	Modbus(-)	
TG	Modbus(GND)	

Figure 11. Separate type LF430/LF622 and LF434/LF622F flowmeters wiring Diagram

■ Wiring Precautions

(1) Explosion proof type flowmeters are not provided cable glands.
Refer to the part Cable connection port at 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 12 below.

(4) DO1, DO2, and DI use the same common terminal (COM). This COM can not connect to other equipments which have their own ground terminal.
(Power supply for connecting to DI or DO, etc…) Need to wire separately.

■ Wiring Precautions (PROFIBUS or Modbus)

(1) For wiring path, avoid places near electrical equipment that may cause electromagnetic induction or electrostatic induction interference (such as a motor, transformer and wireless transmitter).

(2) Use a PROFIBUS-PA cable or a RS485 twist-pair cable for signal cable. In addition, make sure to use a shielded cable to improve noise resistance. Furthermore, installation of signal cable in metal conduit is recommended.

(3) General cables are designed for indoor use where cables are not exposed to humidity, rain, etc. When you install cables, make sure to check the operating conditions such as the operating temperature range of the cable by contacting its manufacturer.

(4)When you carry out cable end treatment of cable, use a dedicated cable stripper etc. so that the core wire of the cable will not be nicked or damaged. In addition, for cables, be careful of allowable maximum bend diameter etc. (Basically, do not install cables in a way cables are twisted or bent.).

(5)Consider installing a PROFIBUS-PA arrester in the communication path of PROFBUS-PA so that the electromagnetic flowmeter will not be affected by lightning etc.

(6) The electromagnetic flowmeter is not equipped with terminating resistors.Use the terminating resistor unit for PROFIBUS-PA or junction box, if necessary.

(7) Only one PROFIBUS-PA cable goes through a cable gland of the Electromagnetic Flowmeter. Please use the junction box at system configuration.

(8) Install a terminator to flowmeter that connected to end of Modbus network.

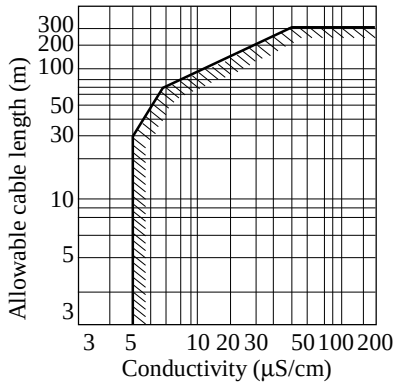


Figure 12. Electrical Conductivity and Cable Length

■ Meter Size

To select the meter size:

See Table 2 to 3 and find meter sizes within the velocity of 0.1 to 10m/s (0.3 to 32.8 ft/s) for a specified full-scale (measuring range high limit) flow. Select one that has its full-scale velocity between 1 and 3m/s (3.0 and 10 ft/s).

Note: Make sure the full-scale flow rate used for the final planning stage stays within 10m/s (32.8 ft/s) in terms of flow velocity.

Table 2. Flow rate and flow velocity (SI unit)

Unit: m^3/h

Size (mm)	Flow rate				
	0.1 m/s	0.3 m/s	1.0 m/s	3 m/s	10 m/s
15	0.0636	0.1908	0.6361	1.908	6.361
25	0.1767	0.5301	1.767	5.301	17.67
40	0.4523	1.357	4.523	13.57	45.23
50	0.7067	2.120	7.067	21.20	70.67
80	1.809	5.428	18.09	54.28	180.9
100	2.827	8.482	28.27	84.82	282.7
150	6.361	19.08	63.61	190.8	636.1
200	11.31	33.93	113.1	229.3	1,131

Table 3. Flow rate and flow velocity (U.S. unit)

Unit: gal/min

Size (inch)	Flow rate				
	0.3ft/s	0.98ft/s	3ft/s	10ft/s	32.8ft/s
1/2	0.2801	0.8403	2.561	8.532	28.01
1	0.7781	2.334	7.115	23.72	77.81
1 ½	1.992	5.975	18.21	60.71	199.2
2	3.112	9.337	28.46	94.86	311.2
3	7.967	23.90	72.85	242.8	796.7
4	12.45	37.35	113.8	379.4	1,245
6	28.01	84.03	256.1	853.8	2,801
8	49.80	149.4	455.3	1,518	4,980

■ Calibration Range

If the calibration range is not specified, the standard range as shown below will be used. If the range is specified, we will use the specified range for calibration.

Table 4. Standard Flow Range

Meter size mm (inch)	Standard flow range			
	Flow rate (m^3/h)	Flow velocity (m/s)	Flow rate (gal/min)	Flow velocity (ft/s)
15 (1/2)	2	3.144	25	29.283
25 (1)	6	3.395	75	31.625
40 (1 1/2)	15	3.316	175	28.826
50 (2)	25	3.537	300	31.625
80 (3)	60	3.316	650	26.766
100 (4)	100	3.537	1,000	26.354
150 (6)	200	3.144	2,500	29.283
200 (8)	300	2.653	4,500	29.649

Note: The unit of "gal/min" is not exchanged (converted) by "m^3/h".

■ Piping Precautions

(1) Design piping so that the flowmeter detector pipe is always filled with the fluid being measured, whether the fluid is flowing or not.

(2) The detector has no adjustable piping mechanism. Install an adjustable short pipe where needed.

(3) The required straight pipe length should comply with the requirements as follows.

(4) Be sure to ground the flowmeter according to the flow meter instruction manual.

Required straight pipe length

Upstream side	When using 90-dgree bend, tee, diffuser or fully opened valve	$L \geq 5D$
	When using other types of valves	$L \geq 10D$
Downstream side	When no valve plate protrudes into the detector pipe	$L \geq 0$

L: Required straight pipe length, D: Meter size

■ About establishment environment

Do not store or install the flowmeter :

- Where there is direct sunlight.
- Where excessive vibration or mechanical shock occurs.
- Where high temperature or high humidity conditions exist.
- Where corrosive atmospheres exist.
- Places that can be submerged under water.
- Where there is a sloped floor. To put the flowmeter temporarily on the floor, place it carefully with something, such as a block, to support it so that the flowmeter will not topple over.

In areas like the following, there may be the case that infrared switches do not function correctly. (If these are unavoidable, use an appropriate cover.)

(1) Where unit (operation panel) is exposed to direct sunlight, reflection of light onto window pane and diffused light reflection.

(2) Where smoke and steam may occur.

(3) Where exposed to direct snow, ice or mud.

Ordering Information

1. When ordering the LF410 series flowmeters, refer to Tables 5 to 7 (Type Specification Codes). An entry must be made for each of the columns in each of these tables.
2. Fluid characteristics:
   (1) Type of fluid to be measured and its characteristics
   (2) Fluid temperature
   (3) Fluid pressure
   (4) Electrical conductivity of the fluid
3. Measuring range
4. I/O function setting
5. Ordering scope:
   Flow calibration data: (required or not)
6. Other items
   Specifications other than standard items

Consult a Toshiba representative before ordering when choosing materials of the wetted parts such as lining, electrodes, and grounding rings.

Table 5. Specification Code (Wafer type detector LF410 Series)

Model					Specification Code									Description	Detector category			
															Normal type		Ex. type	
1	2	3	4	5	6	7	8	9	10	11	12	13	14		Gr.-A	Gr.-B	Gr.-C	Gr.-D
L	F	4	1	0										Normal specification type	√	√		
L	F	4	1	4										Hazardous location certification type (Note 1)			√	√
														Meter size				
					D									15mm (½")	√		√	
					E									25mm (1")	√		√	
					F									40mm (1½")	√		√	
					G									50mm (2")	√		√	
					H									80mm (3")	√		√	
					J									100mm (4")	√		√	
					K									150mm (6")		√		√
					L									200mm (8")		√		√
														Mounting Style				
						L								Detector/Converter combined type (LF410/LF620)	√	√		
						M								Detector/Converter separate type (LF410/LF622)	√	√		
						P								Detector/Converter combined type with PED (LF410/LF620) (Note 6)	√	√		
						Q								Detector/Converter separate type with PED (LF410/LF622) (Note 6)	√	√		
														cFMus Class - I Division 2 type (Note 1)				
						A								Detector/Converter combined type (LF414/LF620F)			√	√
						B								Detector/Converter separate type (LF414/LF622F)			√	√
														Connection flange standard (Note 2)				
							C							ASME B 16.5 class 150	●	●	●	●
							D							ASME B 16.5 class 300	●	●	●	●
							E							EN 1092-1 PN10	●	●	●	●
							F							EN 1092-1 PN16	●	●	●	●
							J							JIS B 2220 10K	●	●	●	●
							K							JIS B 2220 16K	●	●	●	●
							L							JIS B 2220 20K	●	●	●	●
							Z							other	○	○	–	–
														Electrode Material (Note 6)				
								B						316L stainless steel	●	●	●	●
								C						Ti (titanium)	○	○	○	○
								D						Pt-Ir (platinum/iridium)	○	○	○	○
								E						Ta (tantalum)	○	○	○	○
								F						Hastelloy C (Equivalent)	○	○	○	○
								Z						other	○	○	–	–
														Lining Material (Note 6)				
									A					Alkali-resistant ceramic (Note 3)	●	–	●	–
									B					Acid-resistant ceramic (Note 3)	●	–	●	–
									C					Teflon PFA	○	●	○	●
														Grounding Ring Material (Note 6)				
										C				316 stainless steel	●	●	●	●
										D				316L stainless steel	○	○	○	○
										E				Ti (titanium)	○	○	○	○
										F				Ta (tantalum)	–	–	–	–
										G				Pt-Ir (platinum/iridium)	–	–	–	–
										H				Hastelloy C (Equivalent)	○	○	○	○
										Z				other	○	○	–	–
														Flow and calibration velocity range				
											A			0.3 to 10 m/s (standard range calibration)	●	●	●	●
											B			0.3 to 10 m/s (specified range calibration)	○	○	○	○
											C			0.1 to 10 m/s (specified range calibration)	○	○	○	○
														Excitation and Signal Cables				
												A		not provided	●	●	●	●
												B		30m cable, provided (Note 4)	○	○	○	○
												C		other lengths, provided (Note 4)	○	○	○	○
														Coating				
													A	no coating	●	–	●	–
													B	phthalic acid resin coating pearl-gray colored (Note 5)	○	●	○	●
													C	black tar epoxy resin 0.3 mm	○	○	○	○
													D	black tar epoxy resin 0.5 mm	○	○	○	○
													E	Black tar epoxy resin 0.5 mm for submersible type (Note 7)	○	○	○	○

Size code explanation: √:Object ●: Standard ○: Option –: Not available

Note1: Cable glands are not provided. Refer to the part of "Cable connection port" at detector and converter.
Note2: Same shape of flange standard among ASME B16.5 class150/class300, EN 1092-1 PN10/PN16, JIS B2220 10K/16K/20K.
Note3: The type of material used is alumina ceramic, this is suitable for both acid and alkali liquids.
This ceramic lining and the electrodes are held with seals, there are two types, one for acids, and the other for alkalis.
Note4: Separate type detector only. Specifyng the code "C", indicate the length of cables from 1 to 300m in 1 meter increments.
Note5: Phthalic acid resin coating is standard for the flowmeter with meter size 15mm(1/2"), 150mm(6"), and 200mm(8").
Note6: Consult Toshiba before ordering when choose materials at the wetting parts.
Note7: Ceramic lining only. (Teflon PFA lining is not available.)
Note8: Check the Table 2 whether your chosen meter size meets this directive or not when the meter is shipped to EU. If yes, need to choose this code.

Table 6. Specification Code for converters

Model 1	2	3	4	Specification Code 5	6	7	8	9	10	11	12	13	14	Contents	LF620 type	LF622 type
L	F	6	2											Electromagnetic flowmeter converter		
				0										Combined (Integral) type	●	—
				2										Separate (Remote) type	—	●
														Purpose		
					A									Standard	●	●
					F									cFMus class I, Division 2 approved	○	○
														Shape		
						A								Standard type with case	●	●
														Converter mounting fitting		
							A							None	●	○
							C							Panel, Accessory for wall mounting (BNP material: SUS304)	—	●
							E							Accessory for pipe installation (BNP material: SUS304)	—	○
														Digital input/output		
								2						Digital output points 2 (DO1+DO2) +Digital input point 1 (DI)	●	●
														Current output and Communication function(Note1)		
									1					Current output + HART communication	●	●
									2					PROFIBUS communication	○	○
									3					Current output + Modbus (RS485) communication	○	○
														Power supply(Note2)		
										1				100Vac-240Vac, 50/60Hz	●	●
										2				24Vdc	○	○
										3				110Vdc	○	○
														Instruction manual		
											F			English	●	●

Code explanation: ●: Standard ○: Option —: Not available

Note 1: When Modbus communication is provided, digital output points 1(DO1) and digital output points(DO2), digital input point 1(DI), HART communication cannot be used.
When PROFIBUS communication is provided, current output(4-20mA) and HART communication cannot be used.
Check Table 7 for the details.

Note 2: Select 110Vdc for test report inspected under the condition of 110Vdc.

Table 7. Communication function and output selection table

Selection of Function		Availability of outputs			
Code (10^{th} digit)	Selected Communication	4-20mAdc	DO1	DO2	DI
1	HART	✓	✓	✓	✓
2	PROFIBUS	X	✓	✓	✓
3	Modbus	✓	✓ (Note)	X	X

Code explanation: ✓:Available X:Not Available

Note :When digital output 1 function and Modbus communication function are used at one time, TG (signal ground) of the Modbus communication function cannot be connected (2 line connection).

Table 8. Specification Code (Exciting Cable and Signal Cable for Separate type only)

Model	Specification Code					Description
1 2 3	4	5	6	7	8	
A C C						Dedicated preformed cable
	A					Nominal cross-sectional area of Exciting cable (Note 1) 1.25 mm²
	B					2 mm²
		A				Nominal cross-sectional area of Signal cable (Note 2) 0.75 mm²
						Cable length
			0	0	1	1 m
			0	0	2	2 m
			0	0	3	3 m
			0	0	4	4 m
			0	0	5	5 m
			0	0	6	6 m
			0	0	7	7 m
			0	0	8	8 m
			0	0	9	9 m
			0	1	0	10 m
			0	1	5	15 m
			0	2	0	20 m
			0	2	5	25 m
			0	3	0	30 m
			0	3	5	35 m
			0	4	0	40 m
			0	4	5	45 m
			0	5	0	50 m
			0	6	0	60 m
				⋮		⋮
			3	0	0	300 m

From 1 to 10 meters (3.3 to 32.8 feet), cable can be ordered in 1 meter increments.

From 10 to 50 meters (32.8 to 164 feet), cable can be ordered in 5 meters increments

From 50 to 300 meters (164 to 984 feet), cable can be ordered in 10 meters increments.

Notes:

1. Exciting cable is a 3-wire chloroprene sheathed cable. For a nominal cross-sectional area of 1.25 mm², the overall diameter will be 12 mm (15/32 inch): for 2 mm², 13 mm(1/2 inch).

2. Signal cable is a 2-wire shielded chloroprene sheathed cable with a nominal cross-sectional area of 0.75 mm² and an overall diameter of 12 mm (15/32 inch).

3. Relation between exciting cable length and its nominal cross-sectional area and overall diameter is as follows.

Exciting cable length	Nominal cross-sectional area	Overall diameter
1 to 200 m	1.25 mm²	12 mm
210 to 300 m	2 mm²	13 mm

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.

Specifications are subject to change without notice.
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