

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 mAdc current signal or communication signal. Combined with a multi-functional converter LF622 (separate type) equipped with its patented **Noise-Sentry** original noise- suppression circuit and advanced algorithms. The GF642 has a very high tolerance to noise, giving the unit a very 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.

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 communications protocol for factory and process automation that the PROFIBUS Organization recommends. Instead of analog control with a conventional analog signal (4-20 mA), it is fieldbus which digitizes all signals. Flowmeters support PROFIBUS-PA.
- *3: Modbus is the communication protocol that Modicon Inc. developed. Physical layer is RS485.

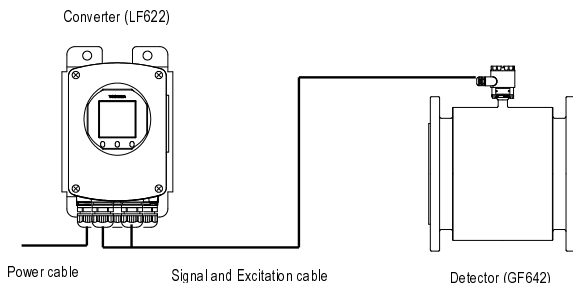


Figure1. Configuration



Certification number
Z01207



Figure2. GF642 Flowmeter

■ **General Specifications**

Measurement range: (measuring range by flow rate conversion)

Meter size	From 20" to 80" (500mm to 2000mm)
Measuring range	0-1.0ft/s to 0-32.8ft/s (0-0.3m/s to 0-10m/s)

Accuracy: (Accuracy when combined with the converter LF622)

Flow rate	Flow speed of full scale	
	1.0 ~ 3.28 ft.s (0.3 ~ 1.0m/s)	3.28ft/m ~ 32.8ft/s (1.0 ~ 10m/s)
0 ~ 100%FS	±0.8% FS	±0.5 %FS

Note: The accuracy above is measured under standard operating conditions using the weighing method at Toshiba admitted flow calibration facility.

Fluid conductivity:
5µS/cm minimum

Fluid temperature:
14 to 140 °F (-10 to +60°C)
: 20" to 36" (500mm to 900mm)
14 to 104 °F (-10 to +40°C)
: More than 40" (more than 1000mm)

Ambient temperature:

14 to 140 °F (-10 to +60°C)

Storage temperature:

5 to 149 °F (-15 to +65°C)

Storage humidity:

10 to 90%RH (no condensation)

Structure:

IP67 and NEMA 4 Watertight

*IP68 and NEMA 6P is available as option.

Power consumption:

10W (14VA) or less (at AC100V and Excitation current 0.2A)

17W (24VA) or less (with communication)

Meter size:

ANSI 150

20", 24"(500, 600m)

AWWA class D

28", 32", 36" 40", 48", 54", 66", 72", 78", 80"
(700, 800, 900, 1000, 1200, 1350, 1650, 1800,
1950mm)

EN1092-1, GB9119

500, 600, 700, 800, 900, 1000, 1200, 1400, 1600,
1800, 2000mm**Fluid pressure:**-0.1MPa to the pressure limited by the connection
flange**Connection flange standard:**

See Table 4 Type Specification Code

Principal materials:

Case	Carbon steel
Lining	Natural rubber
Electrodes	AISI 316L (std.) Titanium (opt.) Hastelloy C equivalent (opt.)
Grounding rings	None

Coating:

Polyurethane, gray colored

Terminal Box:Housing: Aluminum alloy
G(PF) 1/2 thread, Cable glands provided
(Applicable cable diameter : 0.354 to 0.551 inch(9
to 14 mm))**■ Specifications of LF622(Separate type) Converter****Input signals:****Analog signal:**The voltage signal from detector.
Proportional to process flow rate**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 outputsOutputs fixed-values for current and pulse
outputs.**Zero adjustment**Executes zero adjustment (on-stream at zero
flow rate).**Output signals:****Current output:**4-20mA_{dc} (load resistance 0 to 750Ω)**Note:** The current output cannot be used with
the PROFIBUS and Modbus
communication.**Digital outputs:**

Two points are available as follows.

Digital output DO1:

Output type: Transistor open collector

Number of outputs: One point

Output capacity: 30V_{dc}, 200mA maximum**Note:** DO1 cannot be used if Modbus
communication connection is 3
lines.**Digital output DO2:**Output type: Solid-state relay output (non
polarity)

Number of outputs: One point

Output capacity: 150V_{dc}, 150mA maximum
or 150V_{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 (Note1):****High, High-high, Low, and/or Low-low alarm outputs (Note2):****Empty pipe alarm output (Note2):****Preset count output:****Converter failure alarm output (Note2):****Note1:** Two outputs (DO1 and DO2) are needed for 4-range switching and forward/reverse 2-range switching.**Note2:** 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.**Communication signal:****HART (std.):**

Digital signal is superimposed on 4-20mA dc 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

Baud rate: 31.25kbps

Bus voltage: 9 to 30Vdc

Consumption electric current of bus: 16mA or less

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

Baud rate: 4800, 9600, 19200bps

Data length: 8bit

Parity bit: None, Odd, Even

Stop bit: 1bit or 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)

Parameter setting:

Parameters can be set as follows:

IR Switches:

Tree key switches are provided to set configuration parameters.

Digital communication:

The AF900 hand-held terminal or PROFIBUS, Modbus is needed to set parameters.

Zero adjustment:

Zero point adjustment can be started by pressing the switch in the converter.

Damping:

0.5, 1 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: 0mA dc

Digital output: OFF

LCD display: No display

Communication: No communication

Power supply:

One of the following can be selected:

• 100 to 240Vac, 50/60Hz (std.) (allowable voltage 80 to 264Vdc)

• 24Vdc (allowable voltage 18 to 36Vdc)

• 110Vdc (allowable voltage 90 to 130Vdc)

Surge protection:

Arresters are installed in the power supply, and current signal output circuit.

Case:

Aluminum alloy (equivalent of IP67)

Coating:

Acrylic resin-baked coating, pearl-gray colored

Cable connection ports:**Cable glands:** Provided as standardOuder diameter of cable ϕ 9 to 14mm

Material Nylon 66

G (PF) 1/2 male screw.

Note: When PROFIBUS or Modbus options is specified, cable gland size is ϕ 6 to 8mm for signal cable, ϕ 9 to 14mm for power cable.**Applicable diameter:**

0.354 to 0.551 inch (9 to 14mm)

Vibration resistance:

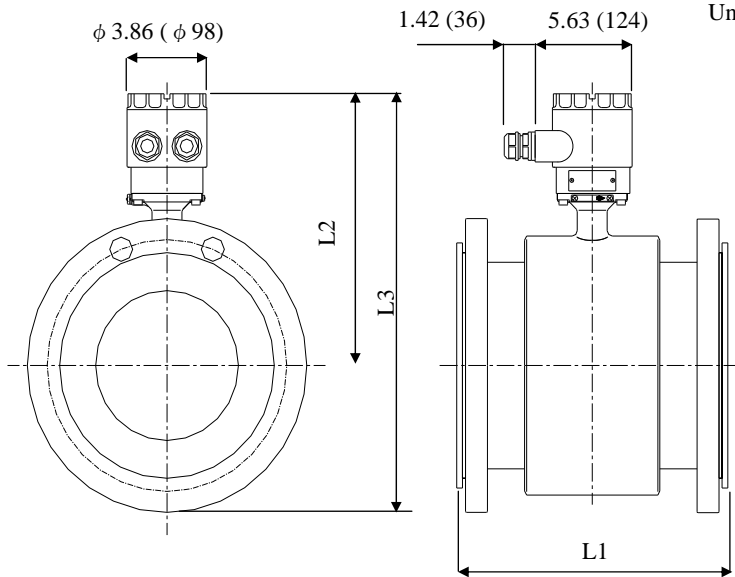
No resonance to the following levels of vibration:

- 10 to 150Hz with acceleration of 9.8m/s^2
- Vibration of 30Hz with 29.4m/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.

Installation

■ Dimensions



Unit: inch (mm)

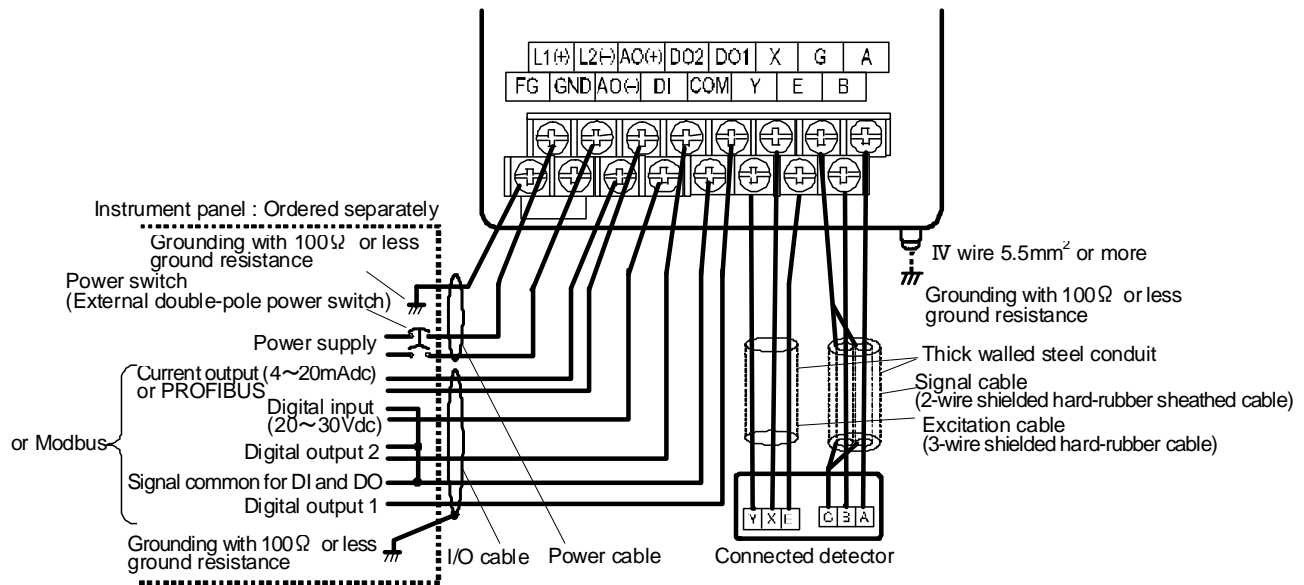
ANSI150, AWWA class D				
Size (inch)	L1	L2	L3	Weight(lbs) approx.
20	23.6	16.4	29	463
24	23.6	17.9	33	573
28	27.6	20.4	37	595
32	31.5	22.4	42	838
36	35.4	24.4	46	992
40	39.4	26.4	50	1213
48	47.2	30.3	54	1874
54	55.1	34.5	66	2646
66	63	38.5	77	3749
72	70.9	42.4	80	4851
78	78.7	46.5	87	6615

DIN PN6, GB 0.6MPa				
Size (mm)	L1	L2	L3	Weight(kg) approx.
500	/	/	/	/
600	/	/	/	/
700	700	517	947	260
800	800	569	1057	350
900	900	620	1157	400
1000	1000	670	1257	450
1200	1200	770	1473	650
1400	1400	877	1692	950
1600	1600	977	1892	1200
1800	1800	1078	2101	1700
2000	2000	1180	2313	2200

DIN PN10, GB 1.0MPa				
Size (mm)	L1	L2	L3	Weight(kg) approx.
500	600	417	752	210
600	600	455	845	260
700	700	517	965	270
800	800	569	1077	380
900	900	620	1177	450
1000	1000	670	1285	550
1200	1200	770	1498	850
1400	1400	877	1715	1200
1600	1600	977	1935	1700
1800	1800	1078	2136	2200
2000	2000	1180	2343	3000

Figure 3: GF62 Meter 20" to 80" (500mm to 2000mm)

■ External Connection



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 (4~20mA dc)	Shielded cable for PROFIBUS-PA
-	or PROFIBUS	
X	Excitation Output	Excitation cable (for LF622, LF622F only)
Y		
E		
A	Signal Input	Signal cable (for LF622, LF622F only)
B		
G		

Symbol	Description	Cable
T+	Modbus(+)	Twist-pair polyethylene insulated vinyl sheath cable (JKEV,AWG24(0.2mm ²))
T-	Modbus(-)	
TG	Modbus(GND)	

Figure 4. Separate type LF642/LF622 flowmeters wiring Diagram

■ Wiring Precautions

- (1) 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.
- (2) Digital output 1, Digital output 2 and Digital input use the same common terminal (COM). This COM can not be connected to other equipment which has their own ground terminal. (Power supply for connecting to DI or DO, etc...) Need to wire separately.

■ Wiring Precautions (PROFIBUS/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 twisted-pair cable for signal cable. Place communication cable into the metal conduit (measure of EMC*) so that electromagnetic flowmeter may not be conformed regulation of EMI.
*NIPOLEX EM-04(by NIPPON-FLEX) etc.
- (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, use a dedicated cable stripper 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. (Do not install cables in a way cables are twisted or bent.).
- (5) Consider installing a PROFIBUS-PA arrester in the communication path of PROFIBUS-PA so that the electromagnetic flowmeter will not be affected by lightning etc.
- (6) The electromagnetic flowmeter is not equipped with terminating resistors in the PROFIBUS communication. Use the terminating resistor unit for PROFIBUS-PA or junction box, if necessary.
- (7) Please install the terminator (bundling) in the electromagnetic flowmeter connected with the end in the Modbus communication.

- (8) When wiring is completed, make sure to install the terminal block protection cover.
- (9) Do not carry out withstand voltage test for the converter of electromagnetic flowmeter. In addition, perform insulation check using a voltage of 250VDC or less.
- (10) Only one communication cable goes through a cable gland of the electromagnetic flowmeter. Please use the junction box at system configuration.

■ Flow rate and Flow velocity

Table1. Flow rate

Unit : m³/h

Meter size (mm)	Flow velocity			
	0.3m/s	1m/s	3m/s	10m/s
500	212.2	706.9	2,121	7,069
600	305.4	1,018	3,054	10,179
700	415.6	1,385	4,156	13,854
800	542.9	1,810	5,429	18,096
900	687.1	2,290	6,871	22,902
1000	848.2	2,827	8,482	28,274
1200	1,221	4,072	12,215	40,715
1350	1,546	5,153	15,495	51,530
1400	1,663	5,542	16,625	55,418
1600	2,171	7,238	21,715	72,382
1650	2,309	7,698	23,093	76,977
1800	2,748	9,161	27,483	91,609
1950	3,225	10,751	32,254	107,513
2000	3,393	11,310	33,929	113,097

■ 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.

Table2. Standard flow range

Meter size (mm)	Standard Flow range	
	Flow rate (m ³ /h)	Flow velocity (m/s)
500	3,000	4.244
600	4,000	3.930
700	5,000	3.610
800	7,000	3.315
900	9,000	3.057
1000	10,000	3.537
1200	12,000	3.930
1350	16,000	3.105
1400	16,000	2.888
1600	16,000	2.211
1650	16,000	2.079
1800	16,000	1.747
1950	16,000	1.488
2000	16,000	1.415

Note: The information contained in this document is

subject to change or review without prior notice.

■ 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.

Table5. Required straight pipe length

Upstream side	When using a 90°bent ,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

■ Piping materials (to be ordered separately)

Mating flanges: The flowmeter must be mounted with its detector pipe connected between the flanges in the pipeline. If no flanges are used where the flowmeter is to be mounted, mating flanges are needed.

Adjustable short pipe: When both the upstream and downstream pipe sections cannot be adjusted laterally along the pipeline, an adjustable short pipe may be needed.

Reducers: When the flowmeter with its Meter size smaller than that of the pipeline should be installed, reducers are needed on both ends of the flowmeter detector.

Reducers with pipe extensions: Reducers with adjustable piping mechanism.

Gasket: Gaskets are needed between lining face and connection piping.

■ Type Specification Code

Table4. Type specification code of detector

Model number					Specification code					Contents	A	B				
1	2	3	4	5	6	7	8	9	1 0				1 1	1 2	1 3	1 4
G	F	6	4	2										Electromagnetic flowmeter detector	●	●
					5	0								Meter size		
					6	0								500mm	●	●
					7	0								600mm	●	●
					8	0								700mm	●	●
					9	0								800mm	●	●
					A	0								900mm	●	●
					A	2								1000mm	●	●
					A	3								1200mm	●	●
					A	4								1350mm	●	—
					A	6								1400mm	—	●
					A	7								1600mm	—	●
					A	8								1650mm	●	—
					A	9								1800mm	●	●
					A	0								1950mm	●	—
					B	0								2000mm	—	●
							A							Connection flange standard		
							F							ANSI 150, AWWA class D *1	●	—
							C							EN 1092-1 PN6 (DIN)	—	●
							G							EN 1092-1 PN10 (DIN)	—	●
							H							GB 9119 0.6MPa	—	●
														GB 9119 1.0MPa	—	●
								N						Lining		
														Natural rubber	●	●
									K					Electrode material		
									C					AISI316L	●	●
									F					Titanium	○	○
														Hastelloy C equivalent	○	○
										A				Roll prevention Base		
										B				Base not provided	●	●
														Base provided	○	○
											1			Standard	●	●

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

A : ANSI 150, AWWA class D,

B : EN1092-1PN6,10、 GB9110 0.6,1.0MPa

*1 Meter size 20”(500mm), 24”(600mm) are ANSI 150, Meter size 28”(700mm) and over is AWWA class D.

Table5. Type specification code of converter

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

Code explanation : ●:Standard ○:Option

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 6 for the details.

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

Table6. 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).

Please select the code from the following table when you want the cable.

Table7. Type specification code (Exciting cable and Signal cable)

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 1.25mm ²
			B					2mm ²
				A				Nominal cross-sectional area of Signal cable 0.75mm ²
								Cable length
					0	0	1	1m
					0	0	2	2m
					0	0	3	3m
					0	0	4	4m
					0	0	5	5m
					0	0	6	6m
					0	0	7	7m
					0	0	8	8m
					0	0	9	9m
					0	1	0	10m
					0	1	5	15m
					0	2	0	20m
					0	2	5	25m
					0	3	0	30m
					0	3	5	35m
					0	4	0	40m
					0	4	5	45m
					0	5	0	50m
					0	6	0	60m
							∞	∞
					3	0	0	300m

Notes:

- Exciting cable is a 3-wire chloroprene sheathed cable. For a nominal cross-sectional area of 1.25mm², the overall diameter will be 12mm for 2mm², 13mm.
- Signal cable is a 2-wire shielded chloroprene sheathed cable with a nominal cross-sectional area of 0.75mm² and an overall diameter of 12mm
- 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 200m	1.25mm ²	12mm
210 to 300m	2mm ²	13mm

ISO9001 and ISO14001 are certified.

Specifications are subject to change without notice.
Printed in Japan 2017-07

© Toshiba Infrastructure Systems & Solutions
Corporation 2017
All Rights Reserved.



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