TOSHIBA | FieldIntelligentDevice
ELECTROMAGNETICFLOWMETER

**GF642/LF622
(Separatetype)**
20" to 80"(500mm to 2000mm)

Introduction

The electromagnetic flowmeter uses Faraday's Law of electromagnetic induction to measure the process fl ow. The device consists of two units: a detector, throu gh which the fluid to be measured flows and in which low-level signals proportional to flow rates are obtained; and a converter, which supplies excitatio n current to the detector, and amplifies the signals from the detector and then processes and converts the si gnals 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 o utput even for slurry fluid measurement. IR (Infrared) switches enable parameter setting of the converter without removing the cover. Flow direction can be s etin 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 Tran sducer) is a communication protocol for industrial sensors recommended by the HCF (HART Communication Foundation).

*2: PROFIBUS is the communications protocol for fac tory and process automation that the PROFIBUS Organization recommends. Instead of analog control with a conven tional analog signal (4-20 mA), it is fieldbus which digit izes all signals. Flowmeters support PROFIBUS-PA.

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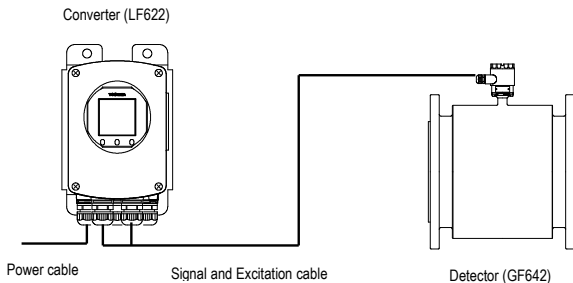

Figure1.Configuration

Certification number Z01207

Figure2.GF642Flowmeter

■ GeneralSpecifications

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 ℃)
    :20"to36"(500mm to 900mm)
14 to 104 °F (-10 to +40 ℃)
    :More than 40"(more than 1000mm)

EJL-146A

Ambienttemperature:
14to140 °**F**(-10to+60 ℃)

Storagetemperature:
5to149 °**F**(-15to+65 ℃)

Storagehumidity:
10to90%RH(nocondensation)

Structure:
IP67andNEMA4Watertight
*IP68andNEMA6Pisavailableasoption.

Powerconsumption:
10W (14VA) or less (at AC100V and Excitation current0.2A)
17W(24VA)orless(withcommunication)

Metersize:
ANSI150
20",24"(500,600m)
AWWAclassD
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

Fluidpressure:
-0.1MPatothepressurelimitedbytheconnection flange

Connectionflangestandard:
SeeTable4TypeSpecificationCode

Principalmaterials:

Case	Carbonsteel
Lining	Naturalrubber
Electrodes	AISI316L(std.)
	Titanium(opt.)
	HastelloyCequivalent(opt.)
Groundingrings	None

Coating:
Polyurethane,graycolored

TerminalBox:
Housing: Aluminumalloy
G(PF)1/2thread,Cableglandsprovided
(Applicablecablediameter:0.354to0.551inch(9 to14mm))

■ **Specifications of LF622(Separate type) Converter**

Inputsignals:
Analogsignal:
Thevoltagesignalfromdetector.
Proportionaltoprocessflowrate
DigitalinputDI:
Signaltype: 20to30Vdcvoltagesignal
Inputresistance: 2.7k Ω
Numberofinputs:onepoint
Note: DI cannot be used with the Modbus communication.
DIfunction:
One of the following functions can be assigned totheoptionalDIsignal.
Rangeswitching
Selectseitherthehigherorlowerrangeinthe unidirectionalorbidirectional 2-rangesetting.
Totalizercontrol
Startsandstopsthebuilt-intotalizer.
Fixed-valueoutputs
Outputs fixed-values for current and pulse outputs.
Zeroadjustment
Executes zero adjustment (on-stream at zero flowrate).
Outputsignals:
Currentoutput:
4-20mAdc(loadresistance0to750 Ω)
Note: The current output cannot be used with the PROFIBUS and Modbus communication.
Digitaloutputs:
Twopointsareavailableasfollows.
Digitaloutput DO1:
Outputtype:Transistoropencollector
Numberofoutputs:Onepoint
Outputcapacity:30Vdc,200mAmaximum
Note: DO1 cannot be used if Modbus communication connection is 3 lines.
Digitaloutput DO2:
Output type: Solid-state relay output (non polarity)
Numberofoutputs:Onepoint
Outputcapacity:150Vdc,150mAmaximum or 150Vac (peak to peak), 100mAmaximum
Note:DO2cannotbeusedwiththeModbus communication.
DO1andDO2functions:
One of the following functions can be assigned toDO1and/orDO2.

Pulseoutput(availableonlyforDO1,DO2):
Pulserate:
Max10kHz(10,000pps)(DO1)
Max100Hz(100pps)(DO2)
(Over1kpps,auto-setting)
Pulsewidth:
0.3to500ms(butlessthanhalfoftheperiod
for100%flowrate)
Note: The same and simultaneous pulse is
notavailablebetweenDO1andDO2.
Multi-rangeselectionoutputs(Note1):
**High,High-high,Low,and/or Low-low alarm
outputs(Note2):**
Emptypipealarmoutput(Note2):
Presetcountoutput:
Converterfailurealarmoutput(Note2):
Note1: Two outputs (DO1 and DO2) are
needed for 4-range switching and
forward/reverse2-rangeswitching.
Note2: Normal Open (default set) or
Normal Close is selected for alarm
outputs when programming. When
power failure occurs, unit will be
faulttoNormalOpen.
Communicationsignal:
HART(std.):
Digital signal is superimposed on 4-20mAdc
currentsignalasfollows:
ConformstoHARTprotocol:
Loadresistance:240to750 Ω
Loadcapacitance:0.25 µFmaximum
Loadinductance:4mHmaximum
PROFIBUS(opt.):
Protocol:PROFIBUS-PA
Baudrate:31.25kbps
Busvoltage:9to30Vdc
Consumptionelectriccurrentofbus:16mAorless
Profile: Profile Ver.3.01 for Process Control
Devices
Functionblocks:AI(Flow)×1,Totalizer×1
Modbus(opt.):
Physicallayer:RS485
Protocol:Modbus
Mode:RTU
Baudrate:4800,9600,19200bps
Datalength:8bit
Paritybit:None,Odd,Even
Stopbit:1bitor2bit
Errorcheck:CRC-16
Max.stationnumber:32(withMasterdevice)
Max.cablelength:1.2km(Note)
Note: This length is specification of 3 line
connection.

LCDdisplay:
Full dot-matrix 128×128 dot LCD display
(back-lightprovided)
Parametersetting:
Parameterscanbesetasfollows:
IRSwitches:
Tree key switches are provided to set
configurationparameters.
Digitalcommunication:
The AF900 hand-held terminal or PROFIBUS,
Modbusisneededtosetparameters.
Zeroadjustment:
Zeropointadjustment can be started by pressing
theswitchintheconverter.
Damping:
0.5, 1 to 60 seconds (selectable in one second
increments)
Zeroandspancalibration:
Built-in calibration signal source allows converter
unitcheck.
Conditionswhenpowerfails:
Parameter setting values are stored in non-volatile
memory and the values will be restored when the
powerreturnstonormalcondition.Theoutputsand
displaywillremainasfollowswhenpowerfails.
Currentoutput:0mAdc
Digitaloutput:OFF
LCDdisplay:Nodisplay
Communication:Nocommunication
Powersupply:
Oneofthefollowingcanbeselected:
・100to240Vac,50/60Hz(std.)(allowablevoltage80
to264Vdc)
・24Vdc(allowablevoltage18to36Vdc)
・110Vdc(allowablevoltage90to130Vdc)
Surgeprotection:
Arresters are installed in the power supply, and
currentsignaloutputcircuit.
Case:
Aluminumalloy(equivalentofIP67)
Coating:
Acrylicresin-bakedcoating,pearl-graycolored
Cableconnectionports:
Cableglands: Providedasstandard
Ouder diameter of cable φ9 to
14mm
MaterialNylon66
G(PF)1/2malescrew.
Note: When PROFIBUS or Modbus options is
specified,cableglandsizeis φ6to8mmfor
signalcable, φ9to14mmforpowercable.
Applicablediameter:
0.354to0.551inch(9to14mm)

Vibration resistance:

No resonance to the following levels of vibration:

・ 10 to 150 Hz with acceleration of 9.8 m/s^2

・ Vibration of 30 Hz with 29.4 m/s^2 in 4 h in each direction will not cause any defect to unit.

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

Installation

## ■ Dimensions

φ 3.86(φ 98)   1.42(36)   5.63(124)   Unit:inch(mm)

L2

L3

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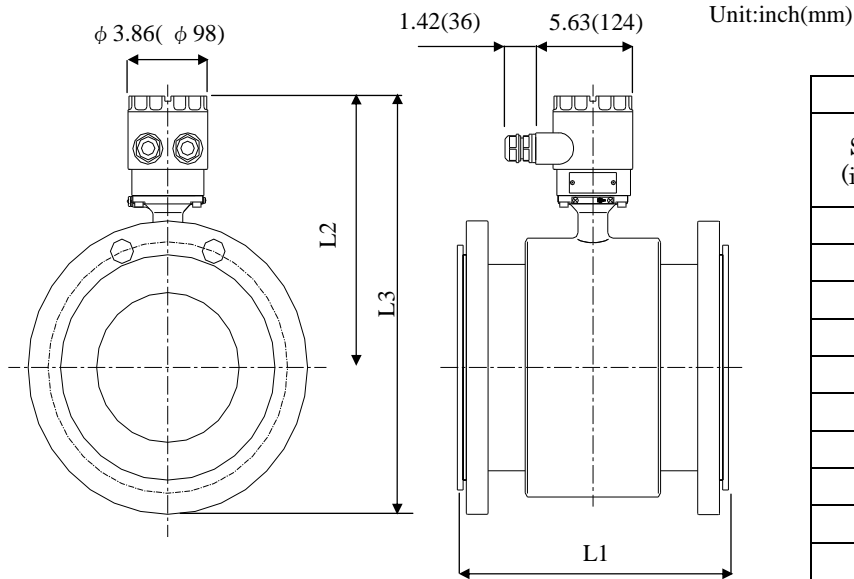
ANSI150, AWWA class D				
Size (inch)	L1	L2	L3	Weight(lbs) approx.
20	23.6	16.4	29	463
24	23.6	17.9	33	573
28	27.6	20.4	37	595
32	31.5	22.4	42	838
36	35.4	24.4	46	992
40	39.4	26.4	50	1213
48	47.2	30.3	54	1874
54	55.1	34.5	66	2646
66	63	38.5	77	3749
72	70.9	42.4	80	4851
78	78.7	46.5	87	6615

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

Figure3:GF642Meter20"to80"(500mmto2000mm)

■ ExternalConnection
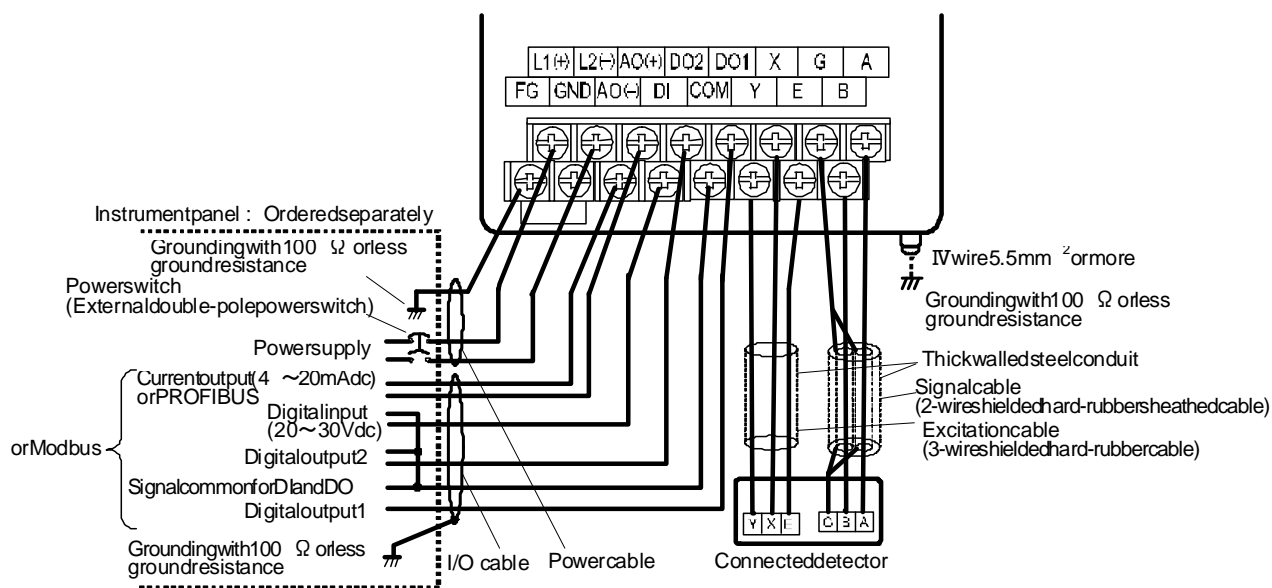
Symbol	Description	Cable
L1(＋)	Powersupply	Powercable
L2(－)		
GND	Ground(forarrester)	
FG	Frameground	
DI	DigitalInput(20 ～30Vdc)	I/Ocable
DO1	DigitalOutput1	
DO2	DigitalOutput2	
COM	SignalCommonforDI,DO1,DO2	
＋	CurrentOutput(4 ～20mAdc)	
－	orPROFIBUS	Shieldedcablefor PROFIBUS-PA
X	ExcitationOutput	Excitationcable (forLF622,LF622Fonly)
Y		
E		
A	SignalInput	Signalcable (forLF622,LF622Fonly)
B		
G		

Symbol	Description	Cable
T+	Modbus(+)	Twist-pairpolyethylene insulatedvinylsheathcable (JKEV,AWG24(0.2mm^2))
T-	Modbus(-)	
TG	Modbus(GND)	

Figure4. SeparatetypeLF642/LF622flowmeterswir   ingDiagram

■ **WiringPrecautions**

(1) Connect the grounding wire (IV wire 5.5mm² or more) to a good earth ground (100 Ω 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.

■ **WiringPrecautions(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.
*NIPOLEXEM-04(byNIPPON-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 PROFBUS-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, male 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.

■ **FlowrateandFlowvelocity**

Table1.Flowrate

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	76,9777
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

■ **CalibrationRange**

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.Standardflowrange

Meter size (mm)	Standard Flow range	
	Flow rate (m³/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.

■ PipingPrecautions

(1) Design piping so that the flowmeter detector pipe is always filled with the fluid being measured,whetherthefluidisflowingornot.

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

(3) The required straight pipe length should complywiththerequirementsasfollows.

Table5.Requiredstraightpipelength

Upstream side	When using a 90°bent ,Tee, diffuser, or fully opened valve	$L \geqq 5D$
	When using other types of valves.	$L \geqq 10D$
Downstream side	When no valve plate protrudes into the detector pipe.	$L \geqq 0$

L:Requiredstraightpipelength
D:Metersize

■ Pipingmaterials(tobeorderedseparately)

Matingflanges: The flowmeter must be mounted with its detector pipe connected between the flanges in the pipeline. If no flanges are used where the flowmeter istobemounted,matingflanges areneeded.

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 thepipelineshouldbeinstalled, reducers are needed on both endsoftheflowmeterdetector.

Reducers with pipe extensions: Reducers with adjustablepipingmechanism.

Gasket: Gaskets are needed between lining face and connectionpiping.

■ TypeSpecificationCode

Table4.Typespecificationcodeofdetector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	Contents	A	B
\multicolumn{5}{Model number}	\multicolumn{9}{Specification code}										
G	F	6	4	2										Electromagnetic flowmeter detector	●	●
					5	0								Meter size		
					5	0								500mm	●	●
					6	0								600mm	●	●
					7	0								700mm	●	●
					8	0								800mm	●	●
					9	0								900mm	●	●
					A	0								1000mm	●	●
					A	2								1200mm	●	●
					A	3								1350mm	●	─
					A	4								1400mm	─	●
					A	6								1600mm	─	●
					A	7								1650mm	●	─
					A	8								1800mm	●	●
					A	9								1950mm	●	─
					B	0								2000mm	─	●
							A							Connection flange standard		
							A							ANSI 150, AWWA class D *1	●	─
							F							EN 1092-1 PN6 (DIN)	─	●
							C							EN 1092-1 PN10 (DIN)	─	●
							G							GB 9119 0.6MPa	─	●
							H							GB 9119 1.0MPa	─	●
								N						Lining Natural rubber	●	●
									K					Electrode material		
									K					AISI316L	●	●
									C					Titanium	○	○
									F					Hastelloy C equivalent	○	○
										A				Roll prevention Base Base not provided	●	●
										B				Base provided	○	○
											1			Standard	●	●

Codeexplanation ●: Standard ○:Option ─: Notavailable

A:ANSI150,AWWAclassD,
B:EN1092-1PN6,10 、GB91100.6,1.0MPa

*1Metersize20"(500mm),24"(600mm)areANSI150,Metersize28"(700mm)andoverisAWWAclassD.

Table5.Typespecificationcodeofconverter

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 C E					Converter mounting fitting None Panel, Accessory for wall mounting (BNP material: SUS304) Accessory for pipe installation (BNP material: SUS304)	○ ● ○
								2				Digital input/output Digital output points 2(DO1+DO2)+Digital input point 1(DI)	●
									1 2 3			Current output and Communication function Current output + HART communication(Note1) PROFIBUS communication (Current output+Modbus(RS485) communication	● ○ ○
										1 2 3		Power supply(Note2) 100Vac - 240Vac, 50/60Hz 24Vdc 110Vdc	● ○ ○
											F	Instruction manual English	●

Codeexplanation ： ●:Standard ○:Option

Note1:WhenModbuscommunicationisprovided,digi taloutputpoints1(DO1)anddigitaloutpoints(DO2),digitalinputpoint 1(DI),HARTcommunicationcannotbeused.
WhenPROFIBUScommunicationisprovided,cur rentoutput(4-20mA)andHARTcommunicationcannotb eused. CheckTable6forthedetails.
Note2:Select110Vdcfortestreportinspectedund erthecondition of110Vdc.

Table6. Communicationfunctionandoutputselectio ntable

Selectionof Function		Availabilityofoutputs			
Code (10th digit)	Selected Communication	4-20mAdc	DO1	DO2	DI
1	HART	✓	✓	○	○
2	PROFIBUS	X	✓	○	○
3	Modbus	✓	✓ (Note)	X	X

Codeexplanation: ✓:Available X:NotAvailable

Note:Whendigitaloutput1functionandModbu scommunicationfunctionareusedatonetime,TG(signalground) oftheModbuscommunicationfunctioncannotbeconn ected(2lineconnection).

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

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

Model			Specification Code					Description
1	2	3	4	5	6	7	8	
A	C	C						Dedicated preformed cable
			A B					Nominal cross-sectional area of Exciting cable $1.25mm^2$ $2mm^2$
				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 — From 1 to 10 meters,
					0	0	6	6m Cable can be ordered in 1 meter increments.
					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 — From 10 to 50 meters,
					0	3	5	35m Cable can be ordered in 5 meters increments.
					0	4	0	40m
					0	4	5	45m
					0	5	0	50m
					0	6	0	60m — From 50 to 300 meters,
						⟨		⟨ Cable can be ordered in 10 meters increments.
					3	0	0	300m

Notes:

1. Exciting cable is a 3-wire chloroprene sheathed cable. For a nominal cross-sectional area of $1.25mm^2$, the overall diameter will be 12mm for $2mm^2$, 13mm.

2. Signal cable is a 2-wire shielded chloroprene sheathed cable with a nominal cross-sectional area of $0.75mm^2$ and an overall diameter of 12mm

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 200m	$1.25mm^2$	12mm
210 to 300m	$2mm^2$	13mm

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