TOSHIBA

FieldIntelligentDeviceSeries
SanitaryElectromagneticFlowmeter

LF490/LF620
LF490/LF622
25to100mm(1Sto4S)

Introduction

SanitaryelectromagneticflowmetersLF490seriesare designedforapplicationshandlingfoodandbeverages. Sanitaryflowmetersmustbestructuredinsuchaway thatoperationandhandlingissimple,easyand thoroughforthepurposeofsanitarycontrolsuchas cleaning(CIP/SIP),sterilizationanddrying.The sanitaryflowmeterhasfeaturesprovidedwithnormal electromagneticflowmetersandbyusingsanitary fittingsforpipelineconnectionsfluiddoesnotremain inanyplacealongthedetectorpipeline.Therefore,itis fitforflowratemeasurementforfoodandbeverages. TheelectromagneticflowmeterusesFaraday'sLawof electromagneticinductiontomeasuretheprocessflow. Thedeviceconsistsoftwounits:adetector,through whichthefluidtobemeasuredflowsandinwhich low-levelsignalsproportionaltoflowratesare obtained;andaconverter,whichsuppliesexcitation currenttothedetector,andamplifiesthesignalsfrom thedetectorandthenprocessesandconvertsthe signalsintothe4–20mAdccurrentsignal.Withthe uniquepatentedmagneticfielddistributiontechnology, themeterishighlyimmuneforupstreamflow disturbances.Combinedwithamulti-functional converterLF620(combinedtype)orLF622(separate type)equippedwithitsoriginalnoise-suppression circuitandadvancedalgorithms.TheLF490hashigh tolerancetonoise,givingstableoutputevenforslurry fluidmeasurement.IR(Infrared)switchesenable parametersettingoftheconverterwithoutremoving thecover.Flowdirectioncanbesetineitherway,and its128x128dotmatrixLCDdisplayallowstheLCD toberotatedelectronicallyto90,180and270degrees withoutopeningthecover.TheterminalblockinLCD sidemakeeasytowireincaseofthecombinedtype.

Combinedtype	Separatetype
LF490/LF620	LF490/LF622
LF494/LF620F	LF494/LF622F

Figure1.Configuration

LF490/LF620	LF490	LF622
LF494/LF620F	LF494	LF622F

Figure2.LF490seriesflowmeters
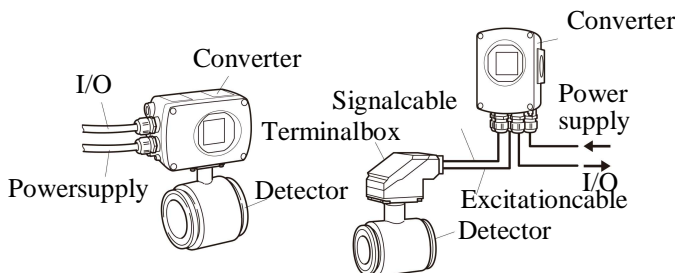

Certificationnumber
Z01207

TheAF900hand-heldterminal(HART*[1] communicator)canbeusedtocommunicatewiththe flowmeterfromaremoteplace.PROFIBUS-PA*[2] or Modbus*[3] interfaceisavailableasanoption.

*1:HARTprotocol(HighwayAddressableRemote Transducer)isacommunicationprotocolforindustrial sensorsrecommendedbytheHCF (HART Communication Foundation).

*2:PROFIBUSisthecommunicationprotocolforfactory andprocessautomationthatthePROFIBUS Organizationrecommends.Insteadofanalogcontrol withaconventionalanalogsignal(4-20mA),itisthe fieldbuswhichdigitizesallsignals.Flowmeterssupport PROFIBUS-PA.

*3:ModbusisthecommunicationprotocolthatModicon Inc.developed.PhysicallayerisRS485.

Specifications

■ OverallSpecifications

Measurementrangeintermsofflowvelocity:
0 – 0.3 m/sto0 – 10 m/s(0 – 1.0 ft/sto0 – 32.8 ft/s)
0 – 0.1 m/sto0 – 0.3 m/s(0 – 0.3 ft/sto0 – 1.0 ft/s)
rangeisavailableoptionally.

Accuracy: ±0.2%ofRate *

*Thispulseoutputerrorresultisestablishedunde rstandard
operatingconditionsatToshiba'sadmittedflowcal ibration
facility.

*Individualmetermeasurementerrorrmayvaryupto ±0.5%of
Rateat1.64ft/s(0.5m/s)ormoreand±0.3%ofrate ±0.039
inch/s(1mm/s)at1.64ft/s(0.5m/s)orless.

*Currentoutput:plus±8µA(0.05%ofspan.)

*Refertoindividualcalibrationdataforeachind ividual
meter'smeasurementerror.

Fluidconductivity: 5µS/cmminimum

Fluidtemperature:
–10to+120 °C(14to248 °F):Combinedtype

Ambienttemperature:
–20to+60 °C(–4to140 °F)

Structure: NEMAIP67andNEMA4XWatertight

Powerconsumption:

Standard:10W(14VA)

atAC100VandExcitationcurrent:0.2 A

MAX:15W(22VA)
MAX:17W(24VA)withPROFIBUS

3Astandard(LF490andLF494detectors):
Approvedfor3AstandardwithFDAapproved
TeflonPFAlining.

Approvedhazardouslocationcertifications:

Model:LF494/LF620FandLF494/LF622F

cFMusNonincendiveforusein
hazardous(classified)locations:
ClassI,II,III,Division2,GroupsA-G

Detectorandconvertercombination:
LF490/LF620:Combinedtypeforstandard
specification.
LF490/LF622:Separatetypeforstandard
specification.
LF494/LF620F:CombinedtypewithExapproval
ofClassI,Division2(cFMus).
LF494/LF622F:SeparatetypewithExapproval
ofClassI,Division2(cFMus).

■ ModelLF490andLF494Detectors

Fluidpressure:
–0.1to2.0MPa(–15to300psi,or–1.0to20bar)

Note: Thispressureistheallowablepressureforthe
detector.Theactualpressurewillberestrictedby
thetypeofconnectionmethod.Forexample,in
thecaseofsanitaryclamptype,themaximum
pressureis1.0MPa(150psior10bar).

Note: Thetestpressurebeforeshippingfromthe
factoryisequaltotwicethenominalpressure
ratingofthecustomerspecifiedflange
connectionduring15minutes.

Connectionmethod:
Sanitaryclamptype(ISO2852)
Note:
Tri-clamp®canconnectexceptmetersize100mm(4").
Tri-clamp®isaregisteredtrademarkforTri-Clove rInc.

Principalmaterials:
Case —stainlesssteel
Linings—TeflonPFA(FDAapproved)
Electrodes—316Lstainlesssteel(std.)
Sanitaryfittings —304stainlesssteel(std.)
Sealgaskets —Siliconrubber(FDAapproved)
Note: SeeTable2foroptionalmaterialsandother
relatedinformation.
Measuringtubematerial —304stainlesssteel

Coating: nocoating(std.)

Dimensionsandweights: SeeFigures3to6.

Cableconnectionport: forseparatetypedetectors.

Cableglands —
LF490: withoutcFMusapproval
Providedasstandard
R(PT)1/2malescrews.
LF494: withcFMusapproval
Notprovided
3/4-14NPTmalescrewsarerequired.
Applicablediameter —11to13mm
(0.433to0.512inch)

■ **ModelLF620andLF622converters**

Inputsignals

Analogsignal —thevoltagesignalfromdetector, proportionaltoprocessflowrate(forLF622 separatetypeconverter).

DigitalinputDI

Signaltype:20to30Vdcvoltagesignal

Inputresistance:2.7k Ω

Numberofinputs:onepoint

Note:DIcannotbeusedwiththeModbus communication.

DIfunction —Oneofthefollowingfunctions canbeassignedtotheoptionalDIsignal.

Rangeswitching —Selectseitherthehigheror lowerrangeintheunidirectionalor bidirectional2-rangesetting.

Totalizercontrol —Startsandstopsthebuilt-in totalizer.

Fixed-valueoutputs —Outputsfixed-valuesfor currentandpulseoutputs.

Zeroadjustment —Executeszeroadjustment (on-streamatzeroflowrate).

Outputsignals

Currentoutput:

4–20mAdc(loadresistance0to750 Ω)

Note: Thecurrentoutputcannotbeusedwith thePROFIBUS-PAccommunication.

Digitaloutputs —Twopointsareavailableas follows.

DigitaloutputDO1:

Outputtype:Transistoropencollector

Numberofoutputs:Onepoint

Outputcapacity:30Vdc,200mAmaximum

Note:DO1cannotbeusedifModbus communicationconnectionis3lines.

DigitaloutputDO2:

Outputtype:Solidstaterelayoutput(non polarity)

Numberofoutputs:Onepoint

Outputcapacity:150Vdc,150mAmaximum or150Vac(peaktopeak),100mAmaximum

Note: DO2cannotbeusedwiththeModbus communication.

DO1andDO2functions —Oneofthefollowing functionscanbeassignedtoDO1and/orDO2

• **Pulseoutput(availableonlyforDO1,DO2)**

Pulserate:Max10kHz(10,000pps)(DO1)

Max100Hz(100pps)(DO2)

(Over1kpps,auto-setting)

Pulsewidth:0.3to500ms(butlessthanhalfof theperiodfor100%flowrate)

Note:Thesameandsimultaneous pulseisnot availablebetweenDO1andDO2.)

• **Multi-rangeselectionoutputs(Note1)**

• **High,Highhigh,Low,and/orLowlowalarm outputs(Note2)**

• **Emptypipealarmoutput(Note2)**

• **Presetcountoutput**

• **Converterfailurealarmoutput(Note2)**

Note1: Twooutputs(DO1andDO2)areneeded for4-rangeswitchingandforward/reverse 2-rangeswitching.

Note2: NormalOpen(defaultset)orNormal Closeisselectedforalarmoutputswhen programming. Whenpowerfailureoccurs,unitwillbefaultto NormalOpen.

Communicationsoutput:

・ **HART(std.)**

Digitalsignalissuperimposedon4–20mAdc currentsignalasfollows:

•ConformstoHARTprotocol

Loadresistance:240to750 Ω

Loadcapacitance:0.25μFmaximum

Loadinductance:4mHmaximum

• **PROFIBUS(opt.)**

Protocol:PROFIBUS-PA

Baurate:31.25kbps

Busvoltage:9-30VDC

Consumptionelectriccurrentofbus:lessthan16mA

ManufactureIdent-No.:093B $_{HEX}$

StandardIdent-No.:9740 $_{HEX}$

Slaveaddress:0-126(Defaultaddressis126)

Profile:ProfileVer.3.01forProcessControl 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:1bit,2bit

Errorcheck:CRC-16

Max.stationnumber:32(withMasterdevice)

Max.cablelength:1.2km(Note)

Note: Thislengthisspecificationof3line connection.

LCDdisplay: Fulldot-matrix128×128dotLCD display(back-lightprovided) ThedataontheLCDinsidetheconvertercan rotateto90,180,and270degreesbyasoftware, withoutrotatingtheindicatoritself.(Combined typeonly)

Parametersettings —Parameterscanbesetas follows:
- **IRSwitches** :Threekeyswitchesareprovidedto setconfigurationparameters.
- **Digitalcommunication** :TheAF900hand-held terminalorPROFIBUSisneededtoset parameters.
- **Zeroadjustment:** Zeropointadjustmentcanbe startedbypressingtheswitchintheconverter.

Damping: 0.5to60seconds(selectableinone secondincrements)

Zeroandspancalibration: Built-incalibration signalsourceallowsconverterunitcheck.

Conditionswhenpowerfails:

Parametersettingvaluesarestoredinnon-volatile memoryandthevalueswillberestoredwhenthe powerreturnstonormalcondition.Theoutputs anddisplaywillremainasfollowswhenpower fails.

- Currentoutput:0mAdc
- Digitaloutput: OFF
- LCDdisplay: Nodisplay
- PROFIBUS: Nocommunication

Powersupply:
Oneofthefollowingcanbeselected:
- 100to240Vac,50/60Hz(std.)
   (allowablevoltagestd:80to264Vac
cFMus:80to250   Vac)
- 24Vdc(allowablevoltage18to36Vdc)
- 110Vdc(allowablevoltage90to130Vdc)

Surgeprotection:
Arrestersareinstalledinthepowersupply,anda currentsignaloutputcircuit.

Case: Aluminumalloy(equivalentofIP67)

Coating: Acrylicresin-bakedcoating,pearl-gray colored

Cableconnectionports:
Cableglands —

LF620andLF622withoutcFMusApproval:
        Providedasstandard
        ODofcable ϕ 11~13mm
        MaterialNylon66
        G(PF)1/2malescrews.
    Note:WhenPROFIBUSorModbusoptionis
        specified,cableglandsizeis ϕ 6～8mm
        forsignalcable, ϕ 11～13mmforpower
        cable.
LF620FandLF622FwithcFMusApproval:
        Notprovided,1/2-14NPTmalescrews
        arerequired.

Applicablediameter —11to13mm
                    (0.433to0.512inch)

Vibrationresistance:
Noresonancetothefollowinglevelsof vibration:
- 10to150Hzwithaccelerationof9.8m/s ^{2}
- Vibrationof30Hzwith29.4m/s ^{2} in4hineach directionwillnotcauseanydefecttounit.
Note: Avoidusingtheflowmeterinanenvironment withconstantvibration.

ConverterLF622dimensionsandweights:
SeeFigure8(forSeparatetype)
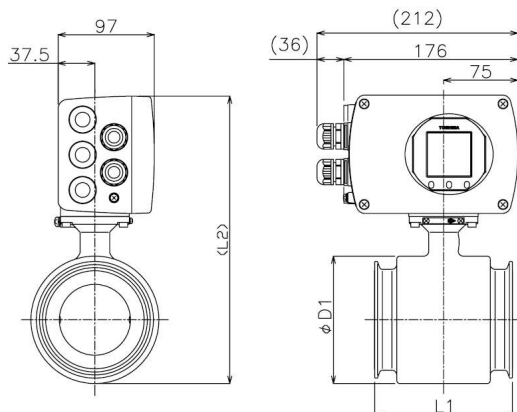
MTBF:
220,000hoursat25deg.C(77deg.F)basedon MIL-HDBK-217F.

Installation

■ Dimensions(Combinedtype)

Clampconnection   Unit:mm

Note1: Clamp(Joint)sizeisdifferentfrommetersizeof LF490andLF494.Seethefollowingtable.

Note2: CableglandsarenotprovidedforcFMus approvedtype.

ForSIunit

Metersize mm(inch)	Jointsize (ISO2852)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
25(1S)	2S	110	236.5	73	Approx.4
40(11/2S)	21/2S	125	253.5	90	Approx.5
50(2S)	3S	140	267.5	104	Approx.6
80(3S)	4S	140	293.5	130	Approx.8
100(4S)	51/2S	160	325.5	162	Approx.11

ForEnglishunit

Metersize (inch)	Jointsize (ISO2852)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lbs)
1(1S)	2S	4.33	9.31	2.87	Approx.9
1-1/2(1-1/2S)	21/2S	4.92	9.98	3.54	Approx.11
2(2S)	3S	5.51	10.53	4.09	Approx.14
3(3S)	4S	5.51	11.56	5.12	Approx.18
4(4S)	51/2S	6.30	12.82	6.38	Approx.25

Note: Tri-clamp®isavailabletousethesamejointsize insteadofISO2852clampexceptmetersize100 mm(4").

Note: 1inch=25.4mm

Figure3.LF490/LF620andLF494/LF620F Flowmeters (FerrulesandClampsnotattached)

Weldingconnection   Unit:mm

Note1: L1dimensionisforthestandard(Normallength) typeferrule.

Note2: SeeFigure7forFerruledimensions.

Note3: CableglandsarenotprovidedforcFMusapproved type.

ForSIunit

Metersize mm(inch)	Jointsize (ISO2852)	L1 (mm)	D1 (mm)	D2 (mm)	Weight (kg)
25(1S)	2S	156.4	25.4	79	Approx.6
40(11/2S)	21/2S	171.4	38.1	93	Approx.8
50(2S)	3S	186.4	50.8	106	Approx.9
80(3S)	4S	199.4	76.3	134	Approx.12
100(4S)	51/2S	219.4	101.6	173	Approx.16

ForEnglishunit

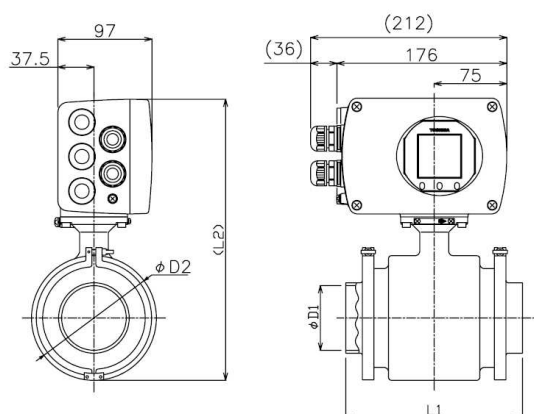| Metersize (inch)	Jointsize (ISO2852)	L1 (inch)	D1 (inch)	D2 (inch)	Weight (lbs)
1(1S)	2S	6.16	1.00	3.11	Approx.13.2
1-1/2(1-1/2S)	21/2S	6.75	1.50	3.66	Approx.17.6
2(2S)	3S	7.34	2.00	4.17	Approx.19.8
3(3S)	4S	7.85	3.00	5.28	Approx.26.5
4(4S)	51/2S	8.64	4.00	6.81	Approx.35.3

Note: Tri-clamp®isavailabletousethesamejointsize insteadofISO2852clampexceptmetersize100 mm(4").

Note: 1inch=25.4mm

Figure4.LF490/LF622andLF494/LF622F Flowmeters

(FerrulesandClampsattached)

■ Dimensions(Separatetype)

Clampconnection
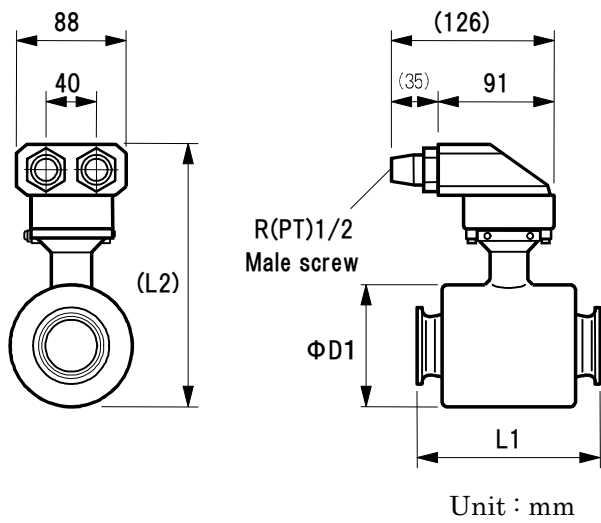
Unit：mm

Note1: Clamp(Joint)sizeisdifferentfrommetersize ofLF490.Seethefollowingtable.

Note2: CableglandsarenotprovidedforcFMus approvedtype.

ForSIunit

Metersize (mm)	Jointsize (ISO2852)	L1 (mm)	L2 (mm)	D1 (mm)	Weight (kg)
25(1S)	2S	110	179	73	approx.4
40(11/2S)	21/2S	125	196	90	approx.5
50(2S)	3S	140	210	104	approx.6
80(3S)	4S	140	236	130	approx.8
100(4S)	51/2S	160	268	162	approx.11

ForEnglishunit

Metersize (inch)	Jointsize (ISO2852)	L1 (inch)	L2 (inch)	D1 (inch)	Weight (lbs)
1(1S)	2S	4.33	7.05	2.87	approx.8.8
1-1/2(1-1/2S)	21/2S	4.92	7.72	3.54	approx.11.0
2(2S)	3S	5.51	8.27	4.09	approx.13.2
3(3S)	4S	5.51	9.29	5.12	approx.17.6
4(4S)	51/2S	6.30	10.55	6.38	approx.24.3

Note: Tri-clamp®isavailabletousethesamejointsize insteadofISO2852clampexceptmetersize100 mm(4").

Note: 1inch=25.4mm

Figure5.LF490/LF620andLF494/LF620F Flowmeters (FerrulesandClampsnotattached)

Weldingconnection
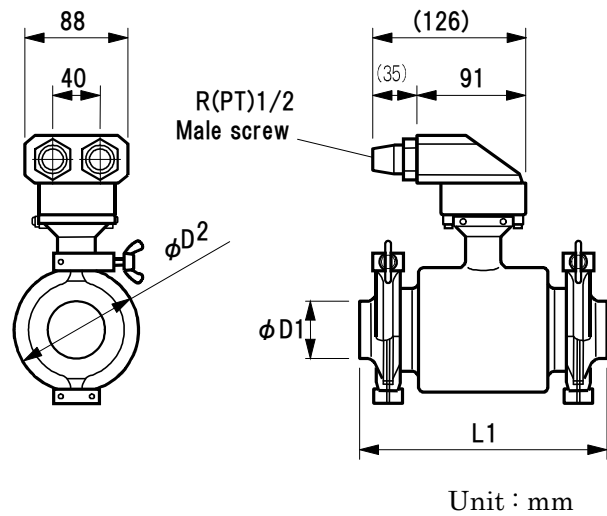
Unit：mm

Note1: L1dimensionisforthestandard(Normal length)typeferrule .

Note2: SeeFigure7forFerruledimensions.

Note3: Cable glands are not provided for cFMus approvedtype.

ForSIunit

Metersize mm(inch)	Jointsize (ISO2852)	L1 (mm)	D1 (mm)	D2 (mm)	Weight (kg)
25(1S)	2S	156.4	25.4	79	approx.5
40(11/2S)	21/2S	171.4	38.1	93	approx.7
50(2S)	3S	186.4	50.8	106	approx.8
80(3S)	4S	199.4	76.3	134	approx.11.
100(4S)	51/2S	219.4	101.6	173	approx.15

ForEnglishunit

Metersize (inch)	Jointsize (ISO2852)	L1 (inch)	D1 (inch)	D2 (inch)	Weight (lbs)
1(1S)	2S	6.16	1.00	3.11	approx.11.0
1-1/2(1-1/2S)	21/2S	6.75	1.50	3.66	approx.15.4
2(2S)	3S	7.34	2.00	4.17	approx.17.6
3(3S)	4S	7.85	3.00	5.28	approx.24.3
4(4S)	51/2S	8.64	4.00	6.81	approx.33.1

Note: Tri-clamp®isavailabletousethesamejointsize insteadofISO2852clampexceptmetersize100 mm(4").

Note: 1inch=25.4mm

Figure6.LF490/LF622andLF494/LF622F Flowmeters (FerrulesandClampsattached)

LF490, LF494 Detectors ← (φD1, φD2, φD3, Pipe (welding), 110°, L1, L2)
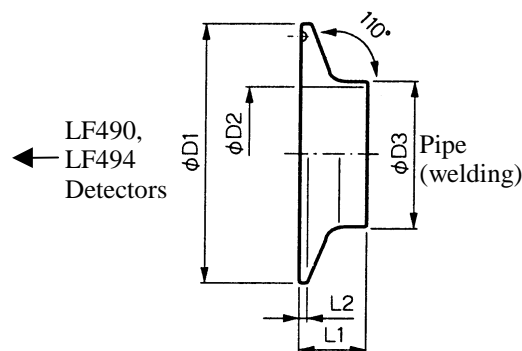
NormaltypeForSIunit

Metersize mm(inch)	Jointsize (ISO2852)	L1 (mm)	L2 (mm)	D1 (mm)	D2 (mm)	D3 (mm)	Weight (kg)
25(1S)	2S	21.5	2.85	64.0	23.0	25.4	Approx.0.2
40 (11/2S)	21/2S	21.5	2.85	77.5	35.7	38.1	Approx.0.2
50(2S)	3S	21.5	2.85	91.0	47.8	50.8	Approx.0.3
80(3S)	4S	28.0	2.85	119.0	72.3	76.3	Approx.0.5
100(4S)	51/2S	28.0	5.6	155.0	97.6	101.6	Approx.1.0

NormaltypeForEnglishunit

Metersize (inch)	Jointsize (ISO2852)	L1 (inch)	L2 (inch)	D1 (inch)	D2 (inch)	D3 (inch)	Weight (lbs)
1(1S)	2S	0.85	0.11	2.52	0.91	1.00	Approx.0.4
1-1/2 (1-1/2S)	21/2S	0.85	0.11	3.05	1.41	1.50	Approx.0.4
2(2S)	3S	0.85	0.11	3.58	1.88	2.00	Approx.0.7
3(3S)	4S	1.10	0.11	4.69	2.85	3.00	Approx.1.1
4(4S)	51/2S	1.10	0.22	6.10	3.84	4.00	Approx.2.2

LongtypeForSIunit

Metersize mm(inch)	Jointsize (ISO2852)	L1 (mm)	L2 (mm)	D1 (mm)	D2 (mm)	D3 (mm)	Weight (kg)
25(1S)	2S	76.2	2.85	64.0	23.0	25.4	Approx.0.2
40 (11/2S)	21/2S	76.2	2.85	77.5	35.7	38.1	Approx.0.3
50(2S)	3S	76.2	2.85	91.0	47.8	50.8	Approx.0.4
80(3S)	4S	101.6	2.85	119.0	72.3	76.3	Approx.0.8
100(4S)	51/2S	101.6	5.6	155.0	97.6	101.6	Approx.1.4

LongtypeForEnglishunit

Metersize (inch)	Jointsize (ISO2852)	L1 (inch)	L2 (inch)	D1 (inch)	D2 (inch)	D3 (inch)	Weight (lbs)
1(1S)	2S	3.00	0.11	2.52	0.91	1.00	Approx.0.4
1-1/2 (1-1/2S)	21/2S	3.00	0.11	3.05	1.41	1.50	Approx.0.7
2(2S)	3S	3.00	0.11	3.58	1.88	2.00	Approx.0.9
3(3S)	4S	4.00	0.11	4.69	2.85	3.00	Approx.1.8
4(4S)	51/2S	4.00	0.22	6.10	3.84	4.00	Approx.3.1

Note1: ThisspecialFerrule,whichfitsonTOSHIBALF490 andLF494,canbefastenedtoISO2852clamp. Tri-clamp®isavailabletousethesamejointsize insteadofISO2852clampexceptmetersize100mm (4").

Note2: "D1"isToshiba'soriginaldimension.

Note3: 1inch=25.4mm

Figure7.Ferruledimensions

15(0.59) 97(3.82)

Attachment

LCDdisplay

Plate

210(8.27) 188(7.40)

IRSwitch

136(5.35)
123(4.84)
74(2.91)

176(6.93) 170(6.69)

36(1.42)

I/Ocableground

Excitationcableground

Powersupply
cableground

Optioncableground

Signalcableground

Note: CableglandsarenotprovidedforcFMusapprovedty pe.
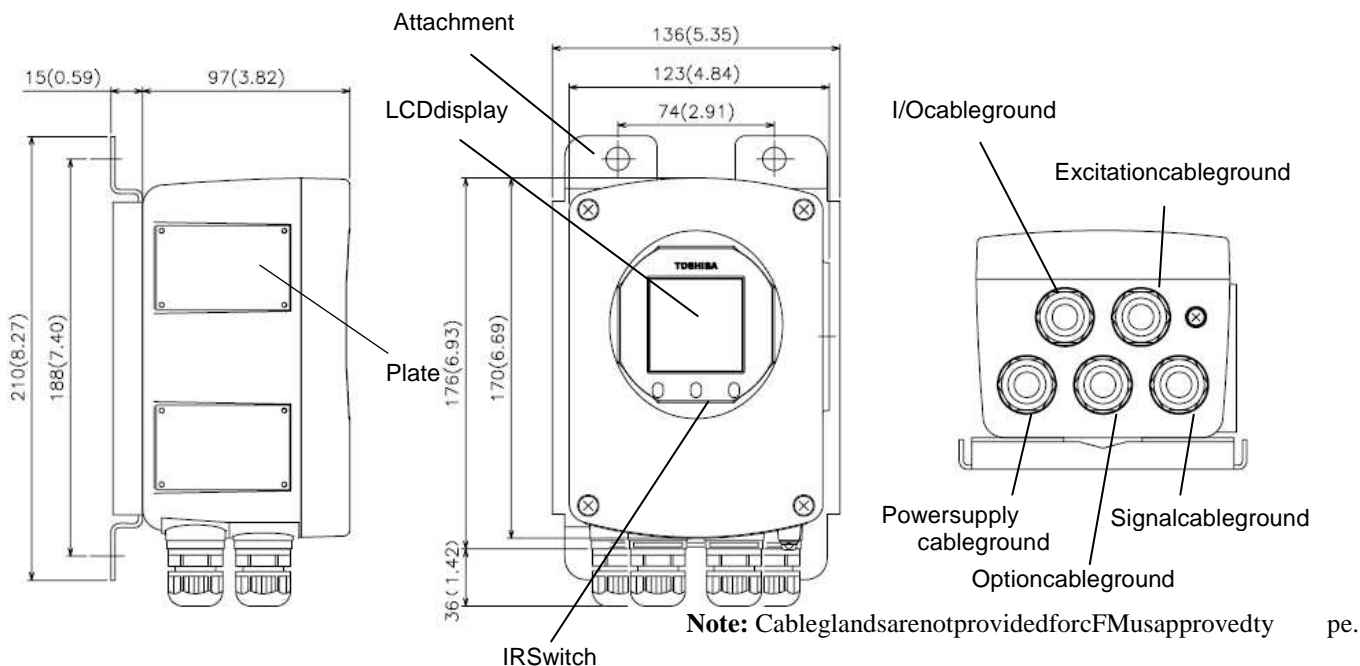
Figure8.SeparatetypeconverterLF622andLF622F

■ **ExternalConnection**
• **CombinedtypeLF490/LF620andLF494/LF620Fflowmete rs**

Instrumentpanel : Orderedseparately

Groundingwith100 Ω orless
groundresistance

Powerswitch
(Externaldouble-polepowerswitch)

Powersupply

Currentoutput(4 ～20mAdc)
orPROFIBUS

Digitalinput
(20～30Vdc)

Digitaloutput2

SignalcommonforDIandDO

Digitaloutput1

Groundingwith100 Ω orless
groundresistance

orModbus

I/Ocable   Powercable

IVwire5.5mm ²ormore

Groundingwith100 Ω orless
groundresistance

NOTE:
Inthecaseoftheintegraltype,thesignalline
(A,B,G)andtheexcitationline(E,X,Y)are
theconnectorjoints.

| L1(~) | L2(~) | AO(+) | DO2 | DO1 | X | G | A |
| FG | GND | AO(-) | DI | COM | Y | E | B |

*1 Locateanexternaldouble-polepowerswitchonthe   powerlinenearetheflowmeterwithineasyreachof   operation.
Usetheappropriateswitchratingasshownbelow:

Switchrating: 250Vac,6Aormore
Inrushcurrent:15Aormore

*Figure9.CombinedtypeLF490/LF620andLF494/LF62   0F
flowmetersWiringDiagram*

• **SeparatetypeLF490/LF622andLF494/LF622Fflowmete rs**

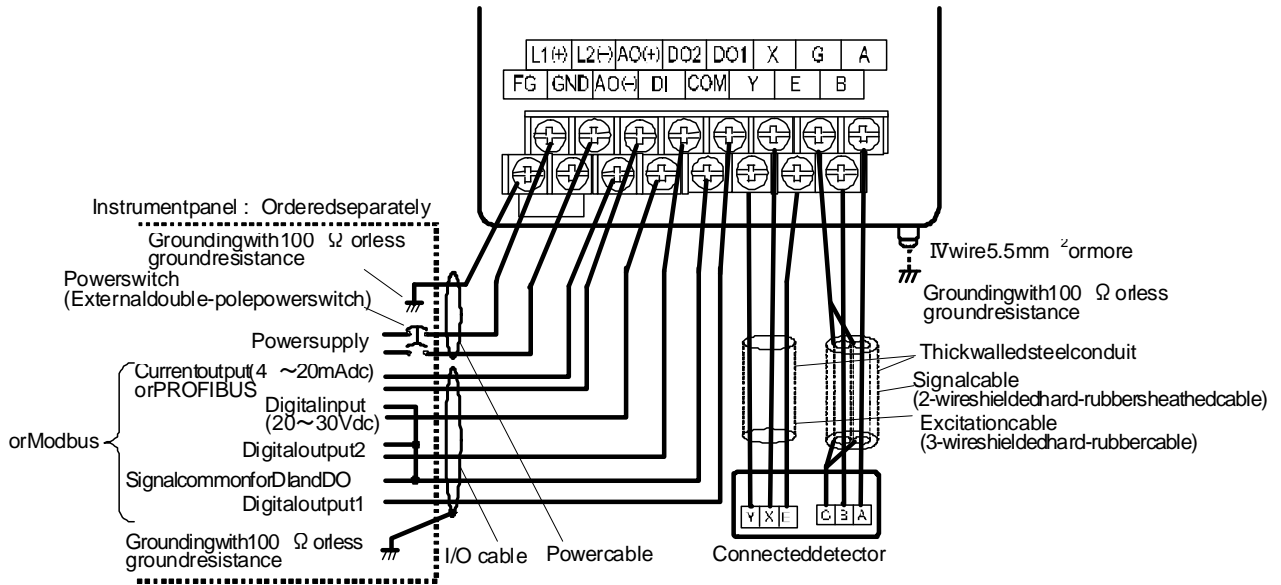| Symbol	Description	Cable
L1(+)	Powersupply	Powercable
L2(−)		
GND	Ground(forarrester)	
FG	Frameground	
DI	DigitalInput(20 ~30Vdc)	
DO1	DigitalOutput1	
DO2	DigitalOutput2	
COM	SignalCommonforDI,DO1,DO2	I/Ocable
+	CurrentOutput(4 ~20mAdc)	
−	orPROFIBUS	Shieldedcablefor PROFIBUS-PA
X	ExcitationOutput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

Note: SymboloftheterminalischangedasfollowsforMo dbus.
DO2 →T+,DI →T-,COM →T

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

Figure10.SeparatetypeLF490/LF622andLF494/LF6 22F flowmeterswiringDiagram

■ WiringPrecautions

(1) Explosionprooftypeflowmetersarenot providedcableglands. RefertothepartCableconnectionportat detectorandconverter.

(2) Connectthegroundingwire(IVwire5.5mm²or more)toagoodearthground(100 Ωorless groundresistance).Makethewireasshortas possible.Donotuseacommongroundshared withotherequipmentwhereeearthcurrentmay flow.Anindependentearthgroundis recommended.

(3) Theallowablecablelengthsbetweenthe detectorandconverterfortheseparatetype flowmeterdependontheelectricalconductivity oftheobjectfluid.SeeFigure11below.

(4) DO1,DO2,andDIusethesamecommon terminal(COM).ThisCOMcannotconnectto otherequipmentswhichhavetheirownground terminal.(PowersupplyforconnectingtoDIor DO,etc…)Needtowireseparately.

■ WiringPrecautions(PROFIBUS orModbus)

(1)Forwiringpath,avoidplacesnearelectrical equipmentthatmaycauseelectromagnetic inductionorelectrostaticinductioninterference (suchasamotor,transformerandwireless transmitter).

(2)UseaPROFIBUS-PAcableoraRS485twist-pair cableforsignalcable.Inaddition,makesureto useashieldedcabletoimprovenoiseresistance. Furthermore,installationofsignalcableinmetal conduitisrecommended.

(3)Generalcablesaredesignedforindoorusewher e cablesarenotexposedtohumidity,rain,etc. Whenyouinstallcables,makesuretocheckthe operatingconditionssuchastheoperating temperaturerangeofthecablebycontactingits manufacturer.

(4)Whenyoucarryoutcableendtreatmentofcable , useadedicatedcablestripperetc.sothatthecor e wireofthecablewillnotbenickedordamaged.In addition,forcables,becarefulofallowable maximumbenddiameteretc.(Basically,donot installcablesinawaycablesaretwistedorbent.).

(5)ConsiderinstallingaPROFIBUS-PAarresterin thecommunicationpathofPROFBUS-PAsothat theelectromagneticflowmeterwillnotbeaffected bylightningetc.

(6)Theelectromagneticflowmeterisnotequipped withterminatingresistors.Usetheterminating resistorunitforPROFIBUS-PA orjunctionbox, ifnecessary.

(7)OnlyonePROFIBUS-PAcablegoesthrougha cableglandoftheElectromagneticFlowmeter. Pleaseusethejunctionboxatsystem configuration.

(8)Installaterminatortoflowmeterthatconnecte d toendofModbusnetwork.

Figure11.ElectricalConductivityand CableLength

■ Meter Size

Toselectthemetersize:
SeeTable2to3andfind meter sizes within the velocity of 0.1 to 10m/s(0.3to32.8ft/s)fora specifiedfull-scale(measuringrangehighlimit) flow.Selectonethathasitsfull-scalevelocity between1and3m/s(3.0and10ft/s).

Note: Makesurethefull-scaleflowrateusedforthe finalplanningstagestayswithin10m/s(32.8 ft/s)intermsofflowvelocity..

Table2.FlowRateandFlowVelocity(SIunit)

Unit:m^3/h

Size (mm)	Flowrate				
	0.1m/s	0.3m/s	1.0m/s	3m/s	10m/s
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

Table3.FlowRateandFlowVelocity(USunit)

Unit:gal/min

Size (inch)	Flowrate				
	0.3ft/s	0.98ft/s	3ft/s	10ft/s	32.8ft/s
1	0.7781	2.334	7.115	23.72	77.81
1½	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

■ CalibrationRange

Ifthecalibrationrangeisnotspecified,thestan dard rangeasshownbelowwillbeused.Iftherangeis specified,wewillusethespecifiedrangefor calibration.

Table4.StandardFlowRange

Metersize	Standardflowrange			
mm(inch)	Flowrate	Flow velocity	Flowrate	Flow velocity
	(m³/h)	(m/s)	(gal/min)	(ft/s)
25(1)	6	3.395	75	31.625
40(11/2)	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

Note: Theunitof"gal/min"isnotexchanged (converted)by"m ³/h".

■ PipingPrecautions

(1)Designpipingsothattheflowmeterdetectorpi peis always filled with the fluid being measured, whetherthefluidisflowingornot.

(2) Thedetectorhasnoadjustablepipingmechanism. Installanadjustableshortpipewhereneeded.

(3) The required straight pipe length should comply withtherequirementsasfollows.

(4) Be sure to ground the flowmeter according to theflowmeterinstructionmanual.

Required straight pipe length

Upstream side	Whenusing90-dgreebend,tee, diffuserorfullyopenedvalve	L ≥5D
	When using other types of valves	L ≥10D
Downstream side	When no valve plate protrudes intothedetectorpipe	L ≥0

L:Requiredstraightpipelength,D:Metersize

■ Aboutestablishmentenvironment

Donotstoreorinstalltheflowmeter:

•Wherethereisdirectsunlight.

•Whereexcessivevibrationormechanicalshock occurs.

•Wherehightemperatureorhighhumidity conditionsexist.

•Wherecorrosiveatmospheresexist.

•Placesthatcanbesubmergedunderwater.

•Wherethereisaslopedfloor.Toputtheflowmet er temporarilyonthefloor,placeitcarefullywith something,suchasablock,tosupportitsothatt he flowmeterwillnottoppleover.

Inareaslikethefollowing,theremaybethecase that infraredswitchesdonotfunctioncorrectly.(Ifth ese areunavoidable,useanappropriatecover.)

(1)Whereunit(operationpanel)isexposedtodire ct sunlight,reflectionoflightontowindowpaneand diffusedlightreflection.

(2)Wheresmokeandsteammayoccur.

(3)Whereexposedtodirectsnow,iceormud.

OrderingInformation

1. WhenorderingtheLF490seriesflowmeters,refe r toTables5and6(TypeSpecificationCodes). Anentrymustbemadeforeachofthecolumnsin eachofthesetables.

2. Fluidcharacteristics:
(1)Typeoffluidtobemeasuredanditscharacteri stics
(2)Fluidtemperature
(3)Fluidpressure
(4)Electricalconductivityofthefluid

3. Measuringrange

4. I/Ofunctionsetting

5. Orderingscope:
Flowcalibrationdata:(requiredornot)

6. Otheritems
Specificationsotherthanstandarditems

ConsultaToshibarepresentativebeforeordering whenchoosingmaterialsofthewettedpartssuchas lining,electrodes,andgroundingrings.

Table4.SpecificationCode(Sanitarytypedetecto rLF490Series)

Model					SpecificationCode									Description	Type	
1	2	3	4	5	6	7	8	9	10	11	12	13	14		Normal	Ex.type
L	F	4	9	0										Normalspecificationtype	√	
L	F	4	9	4										Hazardouslocationcertificationtype(Note1)		√
					E									Metersize (Clampsize)		
					F									25mm(1") (2S)	√	√
					G									40mm(11/2") (21/2S)	√	√
					H									50mm(2") (3S)	√	√
					J									80mm(3") (4S)	√	√
														100mm(4") (51/2S)	√	√
						L								MountingStyle		
						M								Detector/Convertercombinedtype(LF490/LF620)	√	
						A								Detector/Converterseparatetype(LF490/LF622)	√	
						B								cFMusclassI,Division2 (Note1)		
														Detector/Convertercombinedtype(LF494/LF620F)		√
														Detector/Converterseparatetype(LF494/LF622F)		√
							A							Connectionmethod		
							Z							Sanitaryclamptype(ISO2852)(Note2)	●	●
														Other	○	—
								B						ElectrodeMaterial(Note5)		
								Z						316Lstainlesssteel	●	●
														Other	○	—
									S					LiningandSealingmaterials(gaskets)(Note5)		
														TeflonPFAandSiliconerubber	●	●
										A				Pipingconnectionparts(ferrules,clamps)(Note2, 3,5)		
										B				Noferruleandnoclamp	●	●
										C				NormaltypeofFerrules(304stainlesssteel)with noclamp	○	○
										D				NormaltypeofFerrules(304stainlesssteel)with clamp	○	○
										E				LongtypeofFerrules(304stainlesssteel)withno clamp	○	○
										Z				LongtypeofFerrules(304stainlesssteel)withcl amp	○	○
														Other	○	—
											A			Flowandcalibrationvelocityrange		
											B			0.3to10m/s(standardrangecalibration)	●	●
											C			0.3to10m/s(specifiedrangecalibration)	○	○
														0.1to10m/s(specifiedrangecalibration)	○	○
												A		ExcitationandSignalCables		
												B		notprovided	●	●
												C		30mcable,provided(Note4)	○	○
														otherlengths,provided(Note4)	○	○
													A	Coating		
													Z	nocoating	●	●
														Other	○	—

Sizecodeexplanation: √:Object ●:Standard ○:Option —:Notavailable

Note1 Cableglandsarenotprovided.Refertothepart of"Cableconnectionport"atdetectorandconvert er.

Note2:Tri-clamp®isavailabletousethesamejointsi zeinsteadofISO2852clampexceptmetersize100mm (4").

Note3:Toshiba'soriginalferruleisrequiredtousefo rLF490seriesdetectorstokeepjustfittingbetwe enthejointincase ofchoosingclamptype.

Note4 Appliestotheseparatetypeflowmeteronly.Spe cifyingthecodeC,indicatethelengthofcablefr om1to300min 1meterincrements.

Note5 ConsultToshibabeforeorderingwhenchoosemate rialsatthewettingparts.

Table5.SpecificationCodeforconverters

Model					Specification Code									Contents	LF620 type	LF622 type
1	2	3	4	5	6	7	8	9	10	11	12	13	14			
L	F	6	2											Electromagneticflowmeterconverter		
				0										Combined(Integral)type	●	—
				2										Separate(Remote)type	—	●
					A									Purpose Standard	●	●
					F									cFMusclassI,Division2approved	○	○
						A								Shape Standardtypewithcase	●	●
							A							Convertermountingfitting None	●	○
							C							Panel,Accessoryforwallmounting (BNPmaterial:SUS304)	—	●
							E							Accessoryforpipeinstallation (BNPmaterial:SUS304)	—	○
								2						Digitalinput/output Digitaloutputpoints2(DO1+DO2)+Digitalinputpo int1(DI)	●	●
									1					CurrentoutputandCommunicationfunction(Note1) Currentoutput+HARTcommunication	●	●
									2					PROFIBUScommunication(Currentoutputisnotu sable)	○	○
									3					Currentoutput+Modbus(RS485)communication (Digitaloutputs2(DO1+DO2)andDigital1(DI)inp utarenotusable)	○	○
										1				Powersupply(Note2) 100Vac-240Vac,50/60Hz	●	●
										2				24Vdc	○	○
										3				110Vdc	○	○
													F	Instructionmanual English	●	●

Codeexplanation: ●:Standard   ○:Option   —:Notavailable

Note1:WhenModbuscommunicationisprovided,digi   taloutputpoints1(DO1)anddigitaloutputpoints(DO2),digitalinputpoint
1(DI),HARTcommunicationcannotbeused.
WhenPROFIBUScommunicationisprovided   ,currentoutput(4-20mA)andHARTcommunicationcan   notbeused.
CheckTable6forthedetails.
Note2:Select110Vdcfortestreportinspectedund   ertheconditionof110Vdc.

Table6.Communicationfunctionandoutputselecti   ontable

Selection of Function		Availability of outputs			
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)of
theModbuscommunicationfunctioncannotbeconnect   ed(2lineconnection).

Table7.TypeSpecificationCodeforMaintenancePa   rts

Metersize mm(inch)	Jointsize (ISO2852)	Specificationcodeformaintenanceparts			
		Gasket	Ferrule		ISO2852Clamp
			Normaltype	Longtype	
25(1S)	2S	3L8A0355P001	3A8A7164P001	3A8A7164P006	4 A8A2957P002
40(11/2S)	21/2S	3L8A0355P002	3A8A7164P002	3A8A7164P007	4A8A2 957P003
50(2S)	3S	3L8A0355P003	3A8A7164P003	3A8A7164P008	4 A8A2957P004
80(3S)	4S	3L8A0355P004	3A8A7164P004	3A8A7164P009	4 A8A2957P006
100(4S)	51/2S	3L8A0355P005	3A8A7164P005	3A8A7164P 010	4A8A2957P008

Note1: Apairofpartsarepackedineachspecificationco   de.

Note2: Tri-clamp®isavailabletousethesamejointsize   insteadofISO2852clampexceptmetersize100mm(4   ").

Table8.SpecificationCode(ExcitingCableandSi   gnalCableforSeparatetypeonly)

Model			SpecificationCode					Description
1	2	3	4	5	6	7	8	
A	C	C						Dedicatedpreformedcable
			A					Nominalcross-sectionalareaofExcitingcable(Not e1) 1.25mm²
			B					2mm²
				A				Nominalcross-sectionalareaofSignalcable(Note 2) 0.75mm²
								Cablelength
					0	0	1	1m
					0	0	2	2m
					0	0	3	3m
					0	0	4	4m
					0	0	5	5mFrom1to10meters(3.3to32.8feet),
					0	0	6	6mcablecanbeorderedin1meterincremen ts.
					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	30mFrom10to50meters(32.8to164feet),
					0	3	5	35mcablecanbeorderedin5metersincreme nts
					0	4	0	40m
					0	4	5	45m
					0	5	0	50m
					0	6	0	60m
								From50to300meters(164to984feet), cablecanbeorderedin10metersincrements.
					3	0	0	300m

Notes:

1. Excitingcableisa3-wirechloroprenesheathedcab   le.Foranominalcross-sectionalareaof1.25mm²,   theoveralldiameterwillbe 12mm(15/32inch):for2mm²,13mm(1/2inch).

2. Signalcableisa2-wireshieldedchloroprenesheat   hedcablewithanominalcross-sectionalareaof0.   75mm²andanoveralldiameter of12mm(15/32inch).

3. Relationbetweenexcitingcablelengthandditsnom   inalcross-sectionalareaandoveralldiameterisa   sfollows.

Excitingcablelength	Nominalcross-sectionalarea	Overalldiameter
1to200m	1.25mm²	12mm
210to300m	2mm²	13mm

⚠ Misuseofthisproductcanresultindamagestopro   pertyorhumaninjury.
Readrelatedmanualscarefullybeforeusingthispr   oduct.