Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

Float Level Switch

CS1103/CS1113/CS1203/CS1213/CS1603/CS1613

Suitable for upper and lower limit storage tank alarms

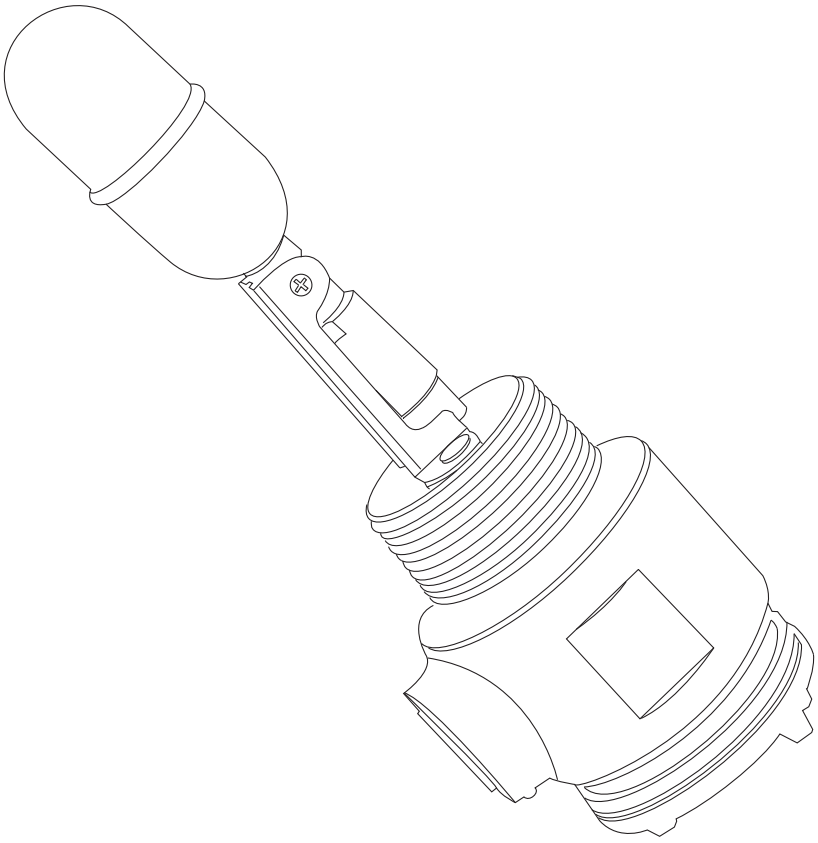

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Table of contents

1 Safety instructions

1.1 Designated use

Float Level Switch CS1103/CS1113/CS1203/CS1213/CS1603/CS1613 are a compact level switch with a stainless steel float.
It is horizontally mounted on tanks to give an alarm with a reed switch activated by change in liquid level.The system is suited to upper and lower alarm for fuel oil storage tanks.

1.2 Installation, commissioning and operation

- Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility.
- Personnel must absolutely and without fail read and understand this Operating Manual before carrying out its instructions.
- The instrument may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed without fail.
- The installer must make sure that the measuring system is correctly wired according to the wiring diagrams. The measuring system is to be grounded.

1.3 Product Requirements

Power Supply
Please check specifications of NMT such as power and frequency before turning on the power. Please use voltage suitable for NMT operating.

Power Cable
Please use the power cable specifieded by our company and make sure to ground.

Ground
Please do not remove earth terminal and earth wire when the power is on.

Connection to the peripheral equipment
It is possible to connect to the peripheral equipment explained in this installation Instrumants. Please refer to each installation Instrumants when connecting.

1.4 Safety of operation

Hazardous areas
Measuring systems for use in hazardous environments are accompanied by separate "Ex documentation", which is an integral part of this Operating Manual. Strict compliance with the installation instructions and ratings as stated in this supplementary documentation is mandatory.
- Ensure that all personnel are suitably qualified.
- Observe the specifications in the certificate as pipe as national and local regulations.

FCC approval
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Caution!

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1.5 Notes on safety conventions and symbols

In order to highlight safety-relevant or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding symbol in the margin.

Safety conventions

Symbol	Meaning
	**Warning!** A warning highlights actions or procedures which, if not performed correctly, will lead to personal injury, a safety hazard or destruction of the instrument.
	**Caution!** Caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the instruments.
	**Note!** A note highlights actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.

Explosion protection

	**Device certified for use in explosion hazardous area** If the device has this symbol embossed on its name plate it can be installed in an explosion hazardous area.
	**Explosion hazardous area** Symbol used in drawings to indicate explosion hazardous area. - Devices located in and wiring entering areas with the designation "explosion hazardous areas" must conform with the stated type of protection.
	**Safe area (non-explosion hazardous area)** Symbol used in drawings to indicate, if necessary, non-explosion hazardous areas. - Devices located in safe areas still require a certificate if their outputs run into explosion hazardous areas.

Electrical Symbols

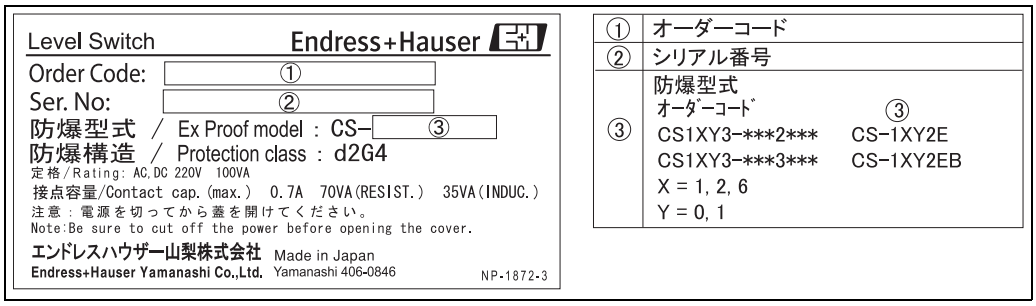
	Direct voltage A terminal to which or from which a direct current or voltage may be applied or supplied
	Alternating voltage A terminal to which or from which an alternating (sine-wave) current or voltage may be applied or supplied
	**Grounded terminal** A grounded terminal, which as far as the operator is concerned, is already grounded by means of an earth grounding system.
	**Protective grounded (earth) terminal** A terminal which must be connected to earth ground prior to making any other connection to the equipment.
	**Equipotential connection (earth bonding)** A connection made to the plant grounding system which may be of type e.g. neutral star or equipotential line according to national or company practice

2 Identification

2.1 Device designation

2.1.1 Nameplate

The following technical data are given on the instrument nameplate:



①	オーダーコード
②	シリアル番号
③	防爆型式 オーダーコード ③ CS1XY3-***2*** CS-1XY2E CS1XY3-***3*** CS-1XY2EB X = 1, 2, 6 Y = 0, 1

2.1.2 Ordering Information

CS1103

010	**Function:**								
	0	Standard function							
	1	Non standard function							
020		**Process Connection:**							
		0	Thread JIS B0203 R1-1/2						
		9	Special version, TSP-no.to be spec.						
030			**Material Process Connection ;Float:**						
			J1	SCS13 ; SUS304, cylindrical					
			J9	Special version,TSP-no.to be spec.					
040				**Protection class:**					
				2	Flame proof d2G4 E*1, IP65				
				3	Flame proof d2G4 EB*2 , IP65				
				9	Special version, TSP-no.to be spec.				
050					**External Chamber:**				
					0	Not used			
					9	Special version, TSP-no.to be spec.			
060						**Switch Position:**			
						1	High		
						2	Low		
070							**Cable entry:**		
							0	PF(G)1/2	
							1	PF (G)3/4 cable gland, TF16-11	
							2	PF (G)3/4 cable gland, TF16-12	
							3	PF (G)3/4 cable gland, TF16-9	
							4	NPT1/2	
							9	Special version,TSP-no.to be spec.	
CS1103-									Order code

*1 TIIS d2G4 (E)
*2 TIIS d2G4 + cable gland (EB)

Standard

Old	New
PT male thread	R
PT female thread	Rc
PS	Rp
PF	PF(G)

CS1113

010	**Function:**								
	0	Standard function							
	1	Non standard function							
020		**Switch Head Connection :**							
		0	Thread JIS B0203 R1-1/2						
		9	Special version, TSP-no.to be spec.						
030			**Material Process Connection;Float:**						
			J1	SCS13;SUS304, cylindrical					
			J9	Special version, TSP-no.to be spec.					
040				**Approval:**					
				2	Flame proof d2G4 E*1,IP65				
				3	Flame proof d2G4 EB*2 ,IP65				
				9	Special version, TSP-no.to be spec.				
050					**External Chamber:**				
					1	STPG370, thread JIS B0203 Rp3/4, STPG370			
					2	SUS304, thread JIS B0203 Rp3/4, SUS304			
					5	STPG370, thread ANSI NPT3/4, STPG370			
					6	SUS304, thread ANSI NPT3/4, SUS304			
					9	Special version, TSP-no.to be spec.			
060						**Switch Position:**			
						1	High		
						2	Low		
070							**Cable entry:**		
							0	PF(G)1/2	
							1	PF(G)G 3/4 cable gland, TF16-11	
							2	PF (G)3/4 cable gland, TF16-12	
							3	PF (G)3/4 cable gland, TF16-9	
							4	NPT1/2	
							9	Special version, TSP-no.to be spec.	
CS1113-									Order code

*1 TIIS d2G4 (E)
*2 TIIS d2G4 + cable gland (EB)

Standard

Old	New
PT male thread	R
PT female thread	Rc
PS	Rp
PF	PF(G)

CS1203

010	**Function:**								
	0	Standard function							
	1	Non standard function							
020		**Process Connection:**							
		1	10K 80A RF, flange JIS B2220						
		3	10K 100A RF, flange JIS B2220						
		5	3" 150lbs RF, flange ANSI B16.5						
		7	4" 150lbs RF, flange ANSI B16.5						
		9	Special version, TSP-no.to be spec.						
030			**Material Process Connection;Float:**						
			J2	SUS304 ; SUS304, cylindrical					
			J9	Special version, TSP-no.to be spec.					
040				**Approval:**					
				2	Flame proof d2G4 E[*1],IP65				
				3	Flame proof d2G4 EB[*2] ,IP65				
				9	Special version, TSP-no.to be spec.				
050					**External Chamber:**				
					0	Not used			
					9	Special version, TSP-no.to be spec.			
060						**Switch Position:**			
						1	High		
						2	Low		
070							**Cable entry:**		
							0	PF(G) 1/2	
							1	PF (G)3/4 cable gland, TF16-11	
							2	PF (G)3/4 cable gland, TF16-12	
							3	PF (G)3/4 cable gland, TF16-9	
							4	NPT1/2	
							9	Special version, TSP-no.to be spec.	
CS1203-									Order code

*1 TIIS d2G4 (E)
*2 TIIS d2G4 + Cable gland (EB)

Standard

Old	New
PT male thread	R
PT female thread	Rc
PS	Rp
PF	PF(G)

CS1213

010	**Function:**								
	0	Standard function							
	1	Non standard function							
020		**Switch Head Connection:**							
		1	Thread JIS B0203 R1-1/2						
		9	Special version, TSP-no.to be spec.						
030			**Material Process Connection;Float:**						
			J1	SCS13 ; SUS304, cylindrical					
			J9	Special agreement, TSP-no.to be spec.					
040				**Approval:**					
				2	Flame proof d2G4 E*1 , IP65				
				3	Flame proof d2G4 EB*2, IP65				
				9	Special version, TSP-no.to be spec.				
050					**External Chamber:**				
					3	STPG370, 10K 25A RF, SS400, flange JIS B2220			
					4	SUS304, 10K 25A RF, SUS304, flange JIS B2220			
					7	STPG37, 1" 150lbs RF, SS400, flange ANSI 16.5			
					8	SUS304, 1" 150lbs RF, SUS304, flange ANSI 16.5			
					9	Special version, TSP-no.to be spec.			
060						**Switch Position:**			
						1	High		
						2	Low		
070							**Cable entry:**		
							0	PF(G)1/2	
							1	PF (G)3/4 cable gland, TF16-11	
							2	PF (G)3/4 cable gland, TF16-12	
							3	PF (G)3/4 cable gland, TF16-9	
							4	NPT1/2	
							9	Special version,TSP-no.to be spec.	
CS1213-									Order code

*1 TIIS d2G4 (E)
*2 TIIS d2G4 + cable gland (EB)

Standard

Old	New
PT male thread	R
PT female thread	Rc
PS	Rp
PF	PF(G)

CS1603

010	**Function:**								
	0	Standard function							
	1	Non standard function							
020		**Process Connection:**							
		1	10K 80A RF, flange JIS B2220						
		2	20K 80A RF, flange JIS B2220						
		3	10K 100A RF, flange JIS B2220						
		4	20K 100A RF, flange JIS B2220						
		5	3" 150lbs RF, flange ANSI B16.5						
		6	3" 300lbs RF, flange ANSI B16.5						
		7	4" 150lbs RF, flange ANSI B16.5						
		8	4" 300lbs RF, flange ANSI B16.5						
		9	Special version, TSP-no.to be spec.						
030			**Material Process Connection;Float:**						
			J2	SUS304;SUS304, cylindrical					
			J3	SUS304;SUS316, spherical					
			J9	Special version, TSP-no.to be spec.					
040				**Approval:**					
				2	Flame proof d2G4 E[*1] , IP65				
				3	Flame proof d2G4 EB[*2] , IP65				
				9	Special version,TSP-no.to be spec.				
050					**External Chamber:**				
					0	Not used			
					9	Special version, TSP-no.to be spec.			
060						**Switch Position:**			
						1	High		
						2	Low		
070							**Cable entry:**		
							0	PF(G) 1/2	
							1	PF (G)3/4 cable gland, TF16-11	
							2	PF (G)3/4 cable gland, TF16-12	
							3	PF(G)3/4 cable gland, TF16-9	
							4	NPT1/2	
							9	Special version, TSP-no.to be spec.	
CS1603-								Order code	

*1 TIIS d2G4 (E)
*2 TIIS d2G4 + cable gland (EB)

Standard

Old	New
PT male thread	R
PT female thread	Rc
PS	Rp
PF	PF(G)

CS1613

010	**Function:**									
	0	Standard function								
	1	Non standard function								
020		**Switch Head Connection:**								
		1	10K 80A RF, flange JIS B2220							
		3	10K 100A RF, flange JIS B2220							
		5	3" 150lbs RF, flange ANSI B16.5							
		7	4" 150lbs RF, flange ANSI B16.5							
		9	Special version, TSP-no.to be spec.							
030			**Material Process Connection;Float:**							
			J2	SUS304; SUS304,cylindrical						
			J3	SUS304; SUS316, spherical						
			J9	Special version, TSP-no.to be spec.						
040				**Approval:**						
				2	Flame proof d2G4 E[*1], IP65					
				3	Flame proof d2G4 EB[*2], IP65					
				9	Special version, TSP-no.to be spec.					
050					**External Chamber**:					
					3	STPG370 , 10K 25A RF, SS400, flangeJIS B2220				
					4	SUS304 , 10K 25A RF, SUS304, flangeJIS B2220				
					7	STPG370 , 1"150lbs RF, SS400, flange ANSI B16.5				
					8	SUS304, 1"150lbs RF, SUS304, flange ANSI B16.5				
					9	Special version, TSP-no.to be spec.				
060						**Switch Position:**				
						1	High			
						2	Low			
070							**Cable entry:**			
							0	PF(G)1/2		
							1	PF (G)3/4 cable gland, TF16-11		
							2	PF (G)3/4 cable gland, TF16-12		
							3	PF (G)3/4 cable gland, TF16-9		
							4	NPT1/2		
							9	Special version, TSP-no.to be spec.		
CS1613-										Order code

*1 TIIS d2G4 (E)
*2 TIIS d2G4 + cable gland (EB)

Standard

Old	New
PT male thread	R
PT female thread	Rc
PS	Rp
PF	PF(G)

2.2 Scope of delivery

Caution!
It is essential to follow the instructions concerning the unpacking, transport and storage of measuring instruments given in the chapter "Incoming acceotance, transport, storage" .

The scope of delivery consists of:
- Assembled instrument

Accompanying documentation:
- Operating Instruction (this manual)

3 Installation

3.1 Incoming acceptance, transport, storage

3.1.1 Incoming acceptance

Check the packing and contents for any signs of damage.
Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

3.1.2 Transport

Caution!
Follow the safety instructions and transport conditions for instruments of more than 18 kg.

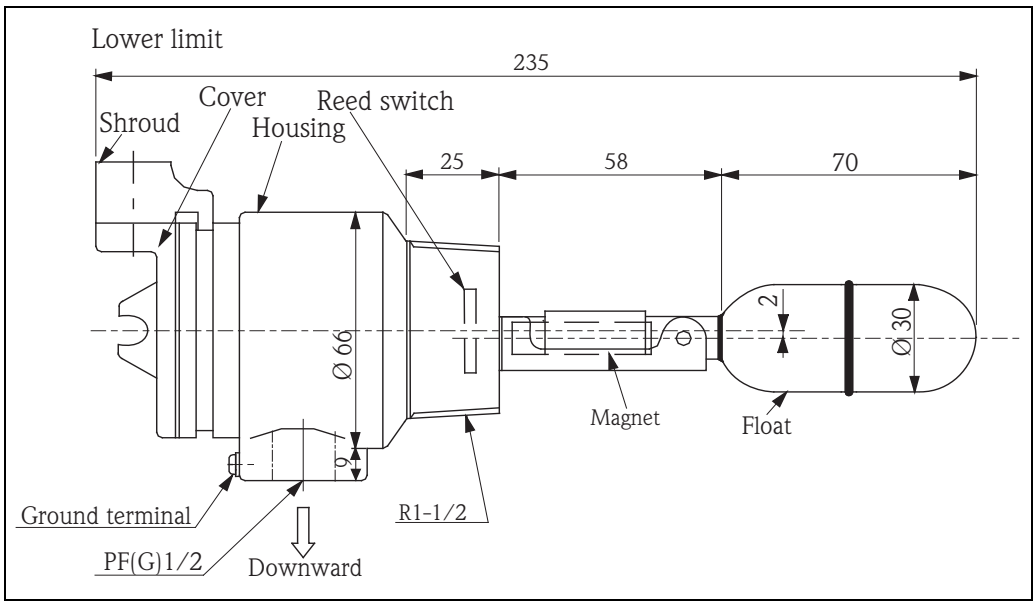
3.1.3 Storage

Pack the measuring instrument so that is protected against impacts for storage and transport. The original packing material provides the optimum protection for this.
The permissible storage temperature is -10... + 40 °C

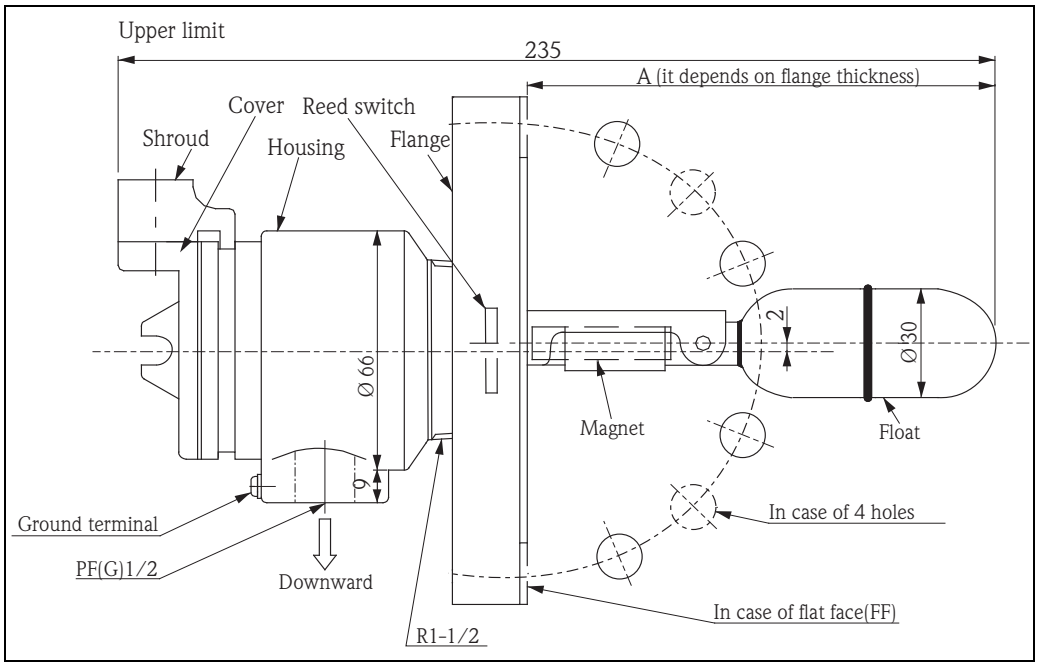
3.2 Installation conditions

3.2.1 Dimensions

CS1103 (Thread connection, Low pressure)

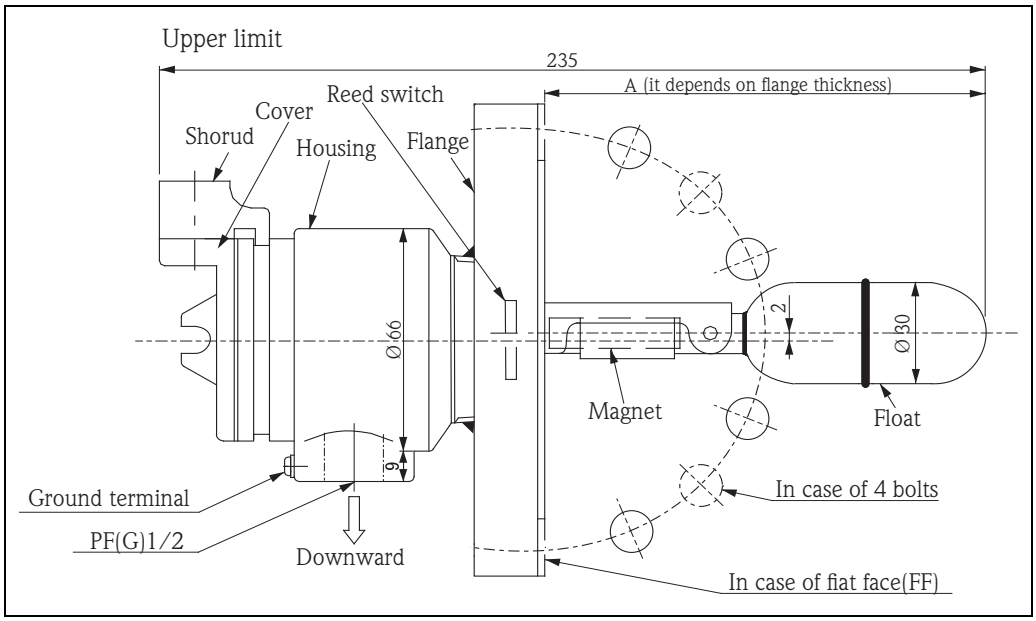


CS1203 (Flange connection, Low pressure)

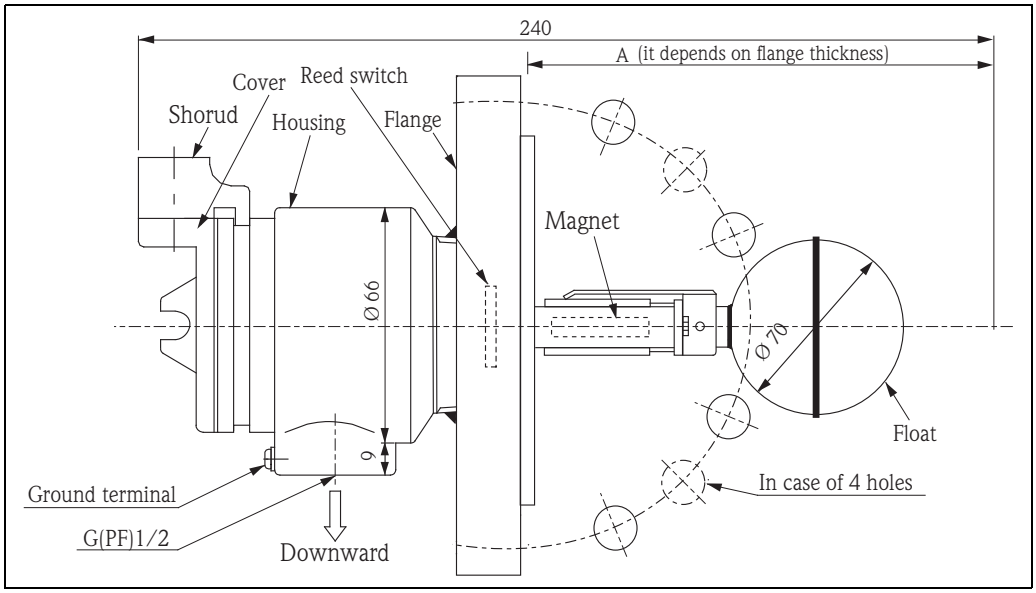


CS1603 (Flangeconnection, High pressure)

Cylindrical float

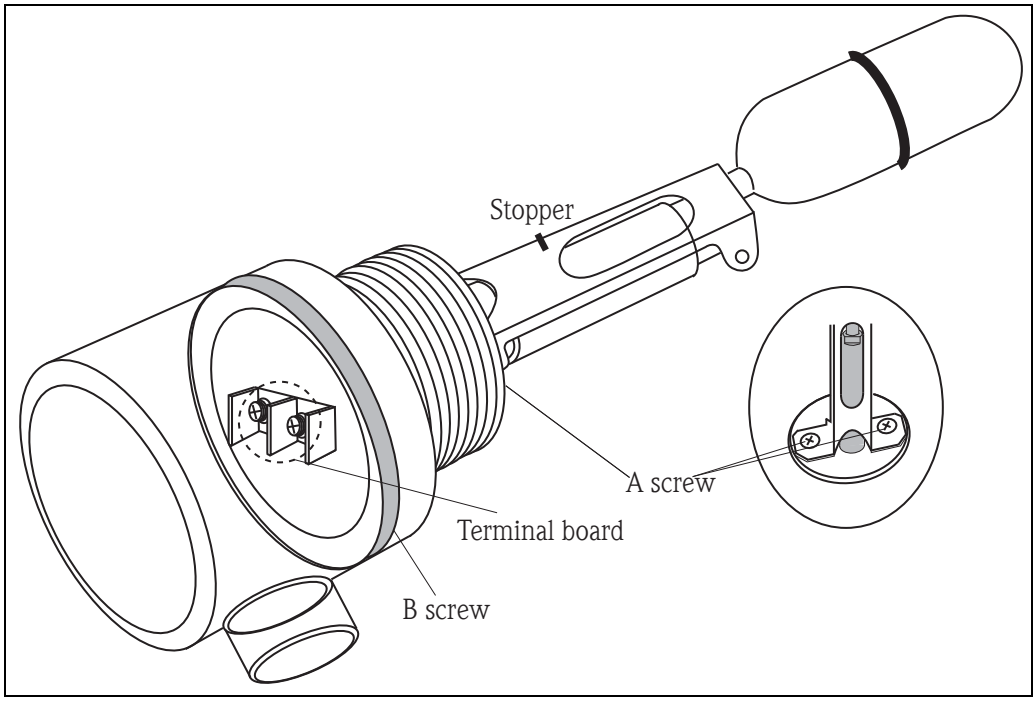


Spherica Float



3.3 Advance preparation

Place the conduit connector downside. The reed switch is turned ON at upper limit level when the level switch is designed as a upper limit switch. On the other hand, the reed switch is turned ON at lower limit level when the level switch is designed as a lower limit switch.

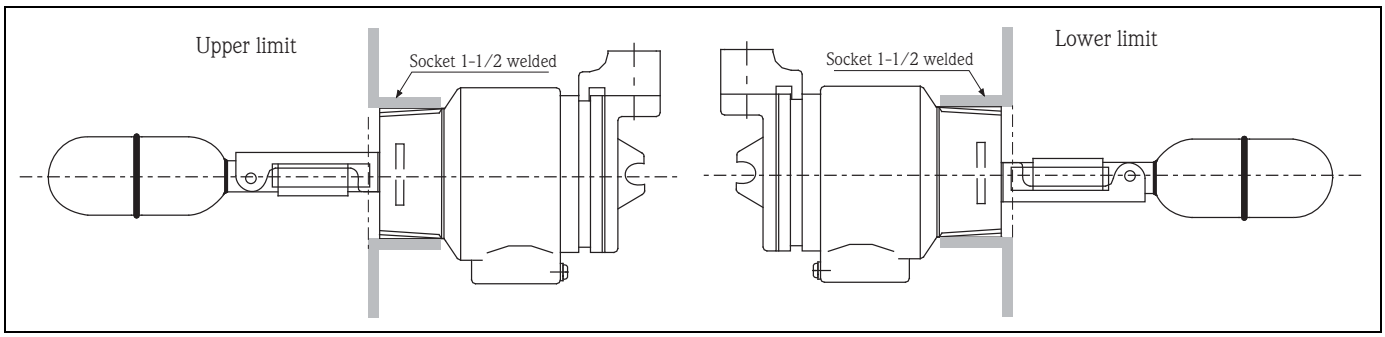


Operation check
After removing the rear cover, connect a circuit tester to the terminal board. With the conduit connector placed downside, make sure that the reed switch is normally turned ON and OFF by moving the float up and down. If the reed switch is turned ON and OFF at opposite positions, remove screw A and set the stopper in the reverse direction. Then, fix it with the screw. Further more, remove screw B and set the terminal board in the reverse direction. Fix it with the switch.

✎ Note!
The conduit connection must always be set downside.

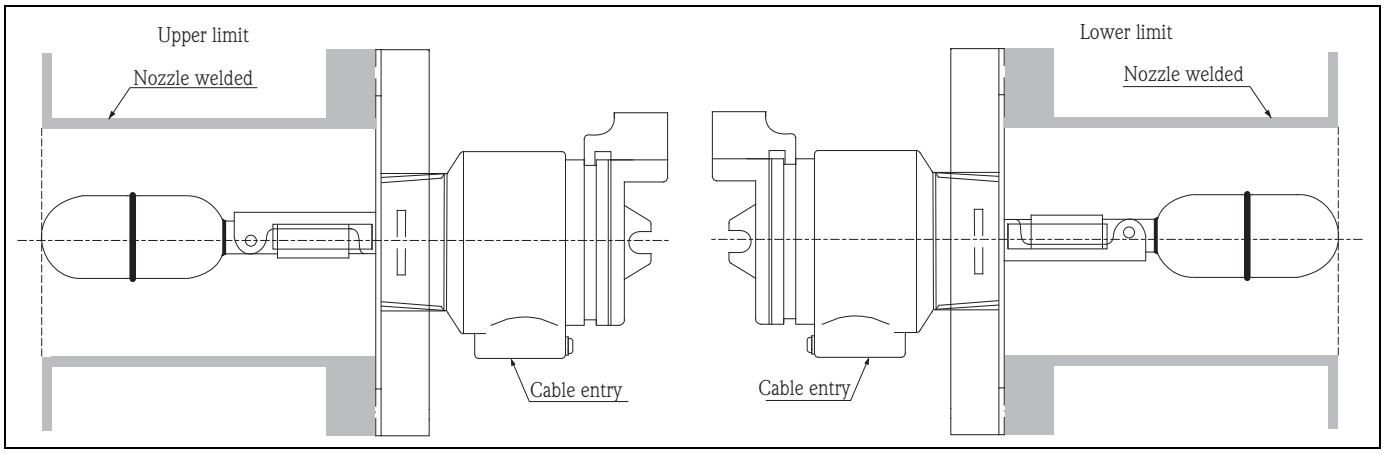
3.4 Thread connection type installation

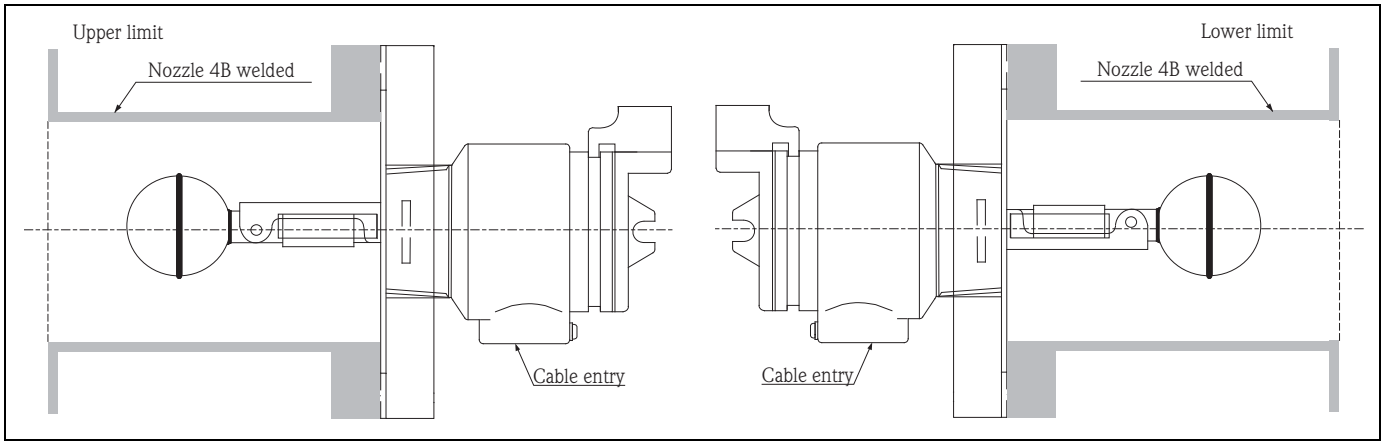
The float level switch should be mounted horizontally of a tank.The float level switch of standard type ia designed thread connection (R1-1/2) with a socket welded to side wall of a tank.The socket must have an inside diameter of at least 45mm.If the inside diameter is smaller than 45mm, it may be malfunctioning.



3.5 Flange Connection type installation

The level float switch of flange connection must prepare a nozzle of at least 3B. In case of spherical float must prepare a nozzle 4B.

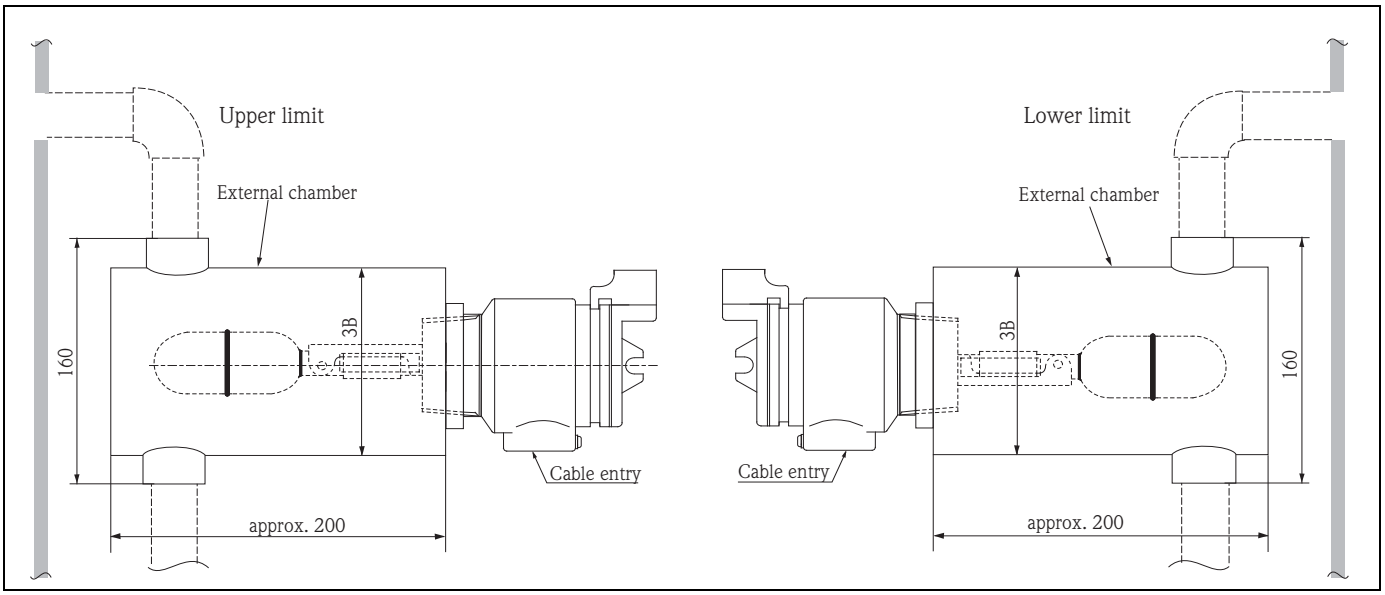




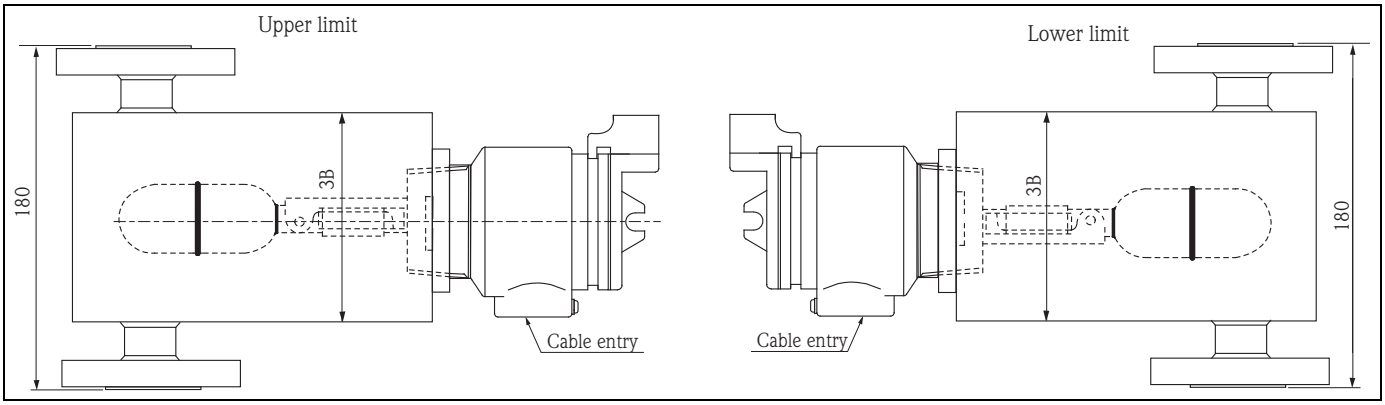
3.6 External Chamber type installation

The pipe connection for the level float switch of external chamber type has threaded connection and flange connection.

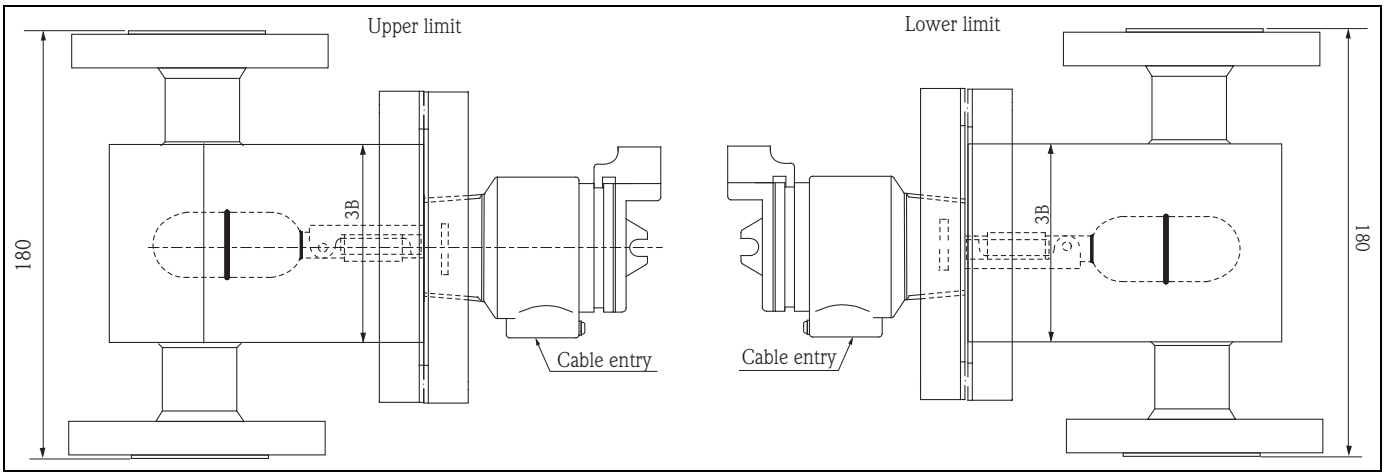
CS1113 threaded connection



CS1213 flange connection, low pressure

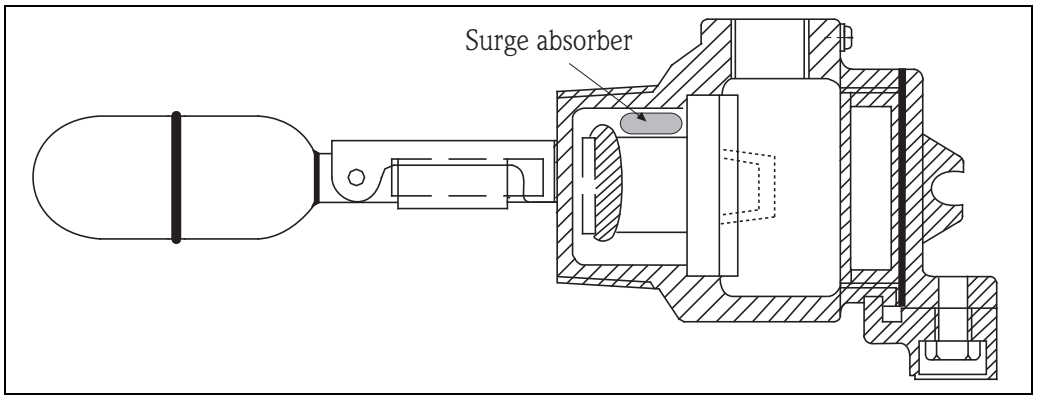


CS1613 flange connection, high pressure



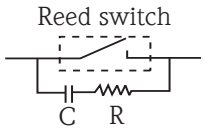
4 Contact protection circuit

When the load current is over 0.28A using D.C. supply, remove surge absorber that provided to protect the contact. Define the constant from the picture on following page and make sure to take the contact protection circuit.

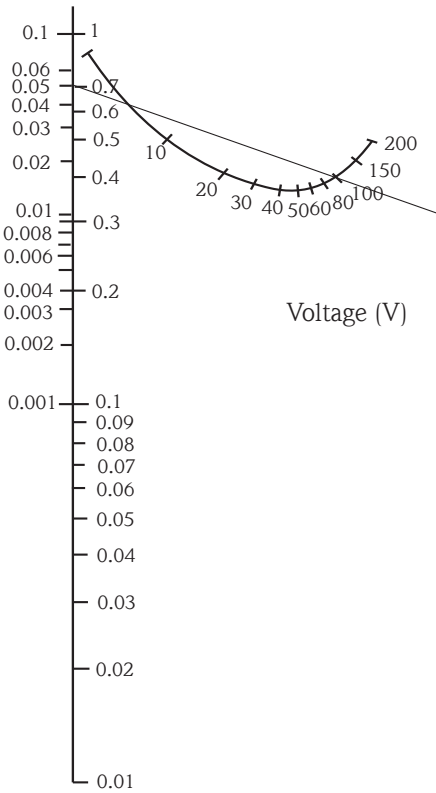


*When using D.C. supply inductive load:

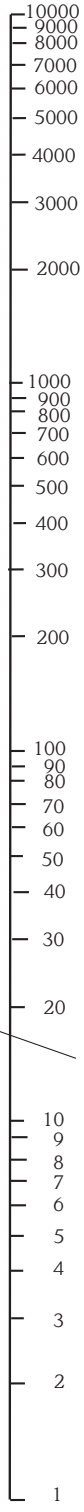
Formulae to Calculate C and R in Contact Protective Circuit



Capacitance C (uF)
Current (A)



Resistance (Ω)



Note!
When using D.C.power inductive, remove a protecting circuit (varistor) of standard equipment, install the below the protecting circuit.

Formulae to Calculate C and R in Contact Protective Circuit

$C = 1^2/10$ (uF)

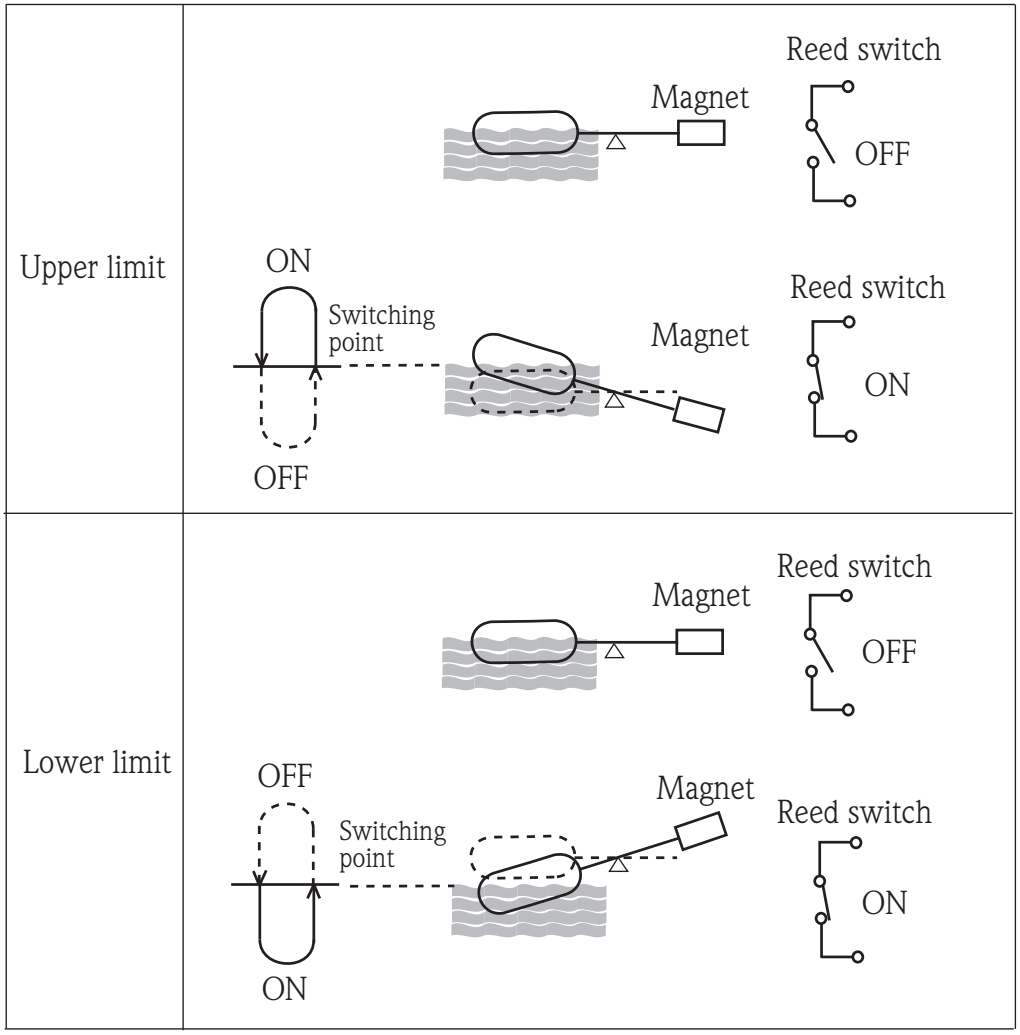
$R = 10^* I \ (1 + \frac{20}{E}) \ (\Omega)$

Applicable range of above formulae
Minimum value of R: 0.5Ω
Minimum value of C: 0.001uF
At E < 70 V:
Resistance up to 3R allowable
At 70 < E < 100 V:
Resistance within ±50% of R
At 100 < E < 150 V:
Resistance within ±10% of R
At 150 < E:
Resistance within ±5% of R
C and R can be determined by using a traced monograph based on the formulae above.

(Example)
When the level switch is operated at 100V and 0.7A, read capacitance (0.5 uF) corresponds to 0.7A on the left graph. For determining R, trace a straight line from the point of 0.7A through 100V on the middle curve to the graph on the right side. Read R (17Ω) at the intersection obtained on the graph on the right side.

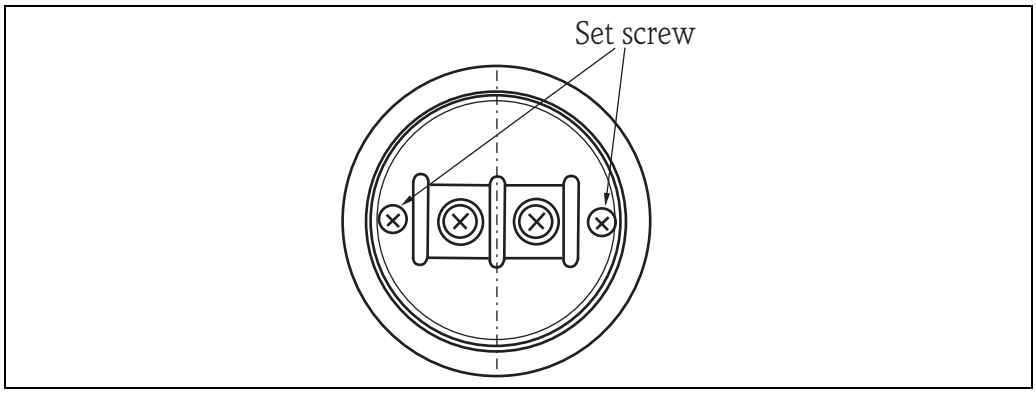
5 Operating

A float detects liquid level in a tank and a magnet attached to the rear side of the float turns ON and OFF the reed switch.The reed switch is turned OFF when the magnet is positioned near its center, and is turned ON when the magnet is located apart from its center as illustrated in the table.



6 Maintenance

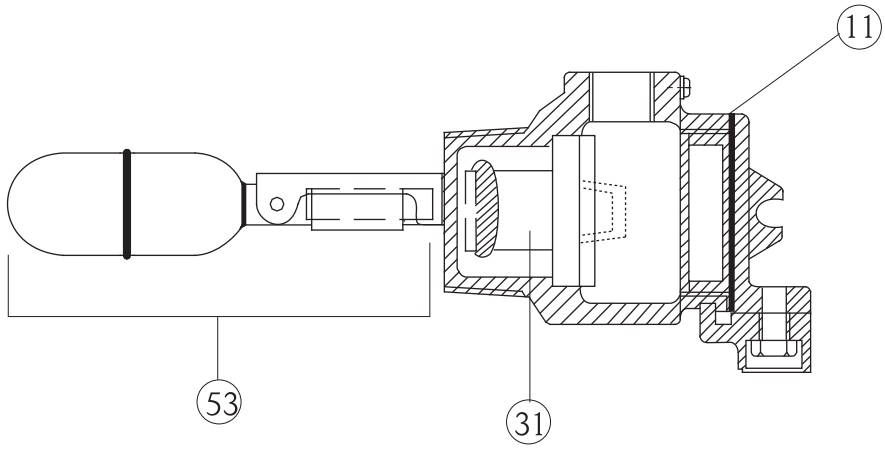
If the level switch cannot provide ON and OFF signal during its operation, open the rear cover and check electrical discontinuity with a circuit tester connected to the terminals.The reed switch should normally be turned OFF when the float is set horizontally.
If it is electrically discontinuous, remove set screws and replace the switch unit a new one.



7 Troubleshooting

7.1 Spare parts

You can order spare parts directly from your Endress+Hauser service organization by the corresponding spare parts.



Spare Parts Item	Spare Parts No.	Spare Parts Name
(11) Sealing	017875-1224	Packing
(31) Electronic module	017882-1255	Switch Assembly
(53) Float	017882-1251	Float Assembly

7.2 Troubleshooting

Error Symptom	Possible Cause	Corrective measure
Signal does not switch	■ Reed switch contact is seized (fused) ■ Surge absorber is broken ■ Internal wire is shortened or broken ■ Float is made immovable by iron powder accumlated around magnet	■ Replace switch unit ■ Replace switch unit ■ Disassemble and repair ■ Dismount and clean

7.3 Return

The following procedures must be carried out before the instruments is sent to Endress+Hauser for repair:

- Always enclose a duly completed "Declaration of Contamination" form. Only then can Endress +Hauser transport, examine and repair a returned device.
- Enclose special handling instructions if necessary, for example, safety data sheet as per EN 91/155/EEC.
- Remove all residue which may be present.Pay special attention to the gasket grooves and crevices where fluid may be present.This is especially important if the fluid is dangerous to health, e.g. corrosive, poisonous, carcinogenic, radioactive, etc.

Note!
A copy of the “Declaration of Contamination” is included at the end of this operating manual.

Caution!
No instrument should be sent back for repair without all dangerous material being completely removed first, e.g. in scratches or diffused through plastic.Incomplete cleaning of the instrument may result in waste disposal or cause harm to personnel
(burns, etc.). Any costs arising from this will be charged to the operator of the instrument.

7.4 Disposal

In case of disposal, please separate the different components according to their material consistency.

7.5 Contact addresses of Endress+Hauser

The addresses of Endress+Hauser are given on the back cover of this operating manual. If you have any questions, please do not hesitate to contact your E+H representative.

8 Technical data

Contact operation for upper limit alarm	ON when liquid level exceeds the set position
Contact operation for lower limit alarm	ON when liquid level becomes lower than the set position
Ambient temperature	-10...+40 °C (operation not possible in freezing temperature)
Measured liquid temperature	-20...+80 °C (operation not possible in freezing temperature)
Maximum allowable working pressure	1.96MPa (20kg / cm^2)
Level Accuracy (50 mm displacer)	within ±5mm (specific density=1g/cm^3)
Measured liquid specific density	0.7...2.0g/cm^3
Approval	Flame proof, TIIS d2G4
Protection class	IP65
Installation	Horizontally on the sidewall of a tank CS1103 thread connection :Thread JIS B0203 R1-1/2 CS1113 thread connection :Thread JIS B0203 R1-1/2 CS1203 flange, low pressure: 10 80A RF, flange JIS B2220 10 100A RF, flange JIS 2220 3" 150lbs RF, flange ANSI 16.5 4" 150lbs RF, flange ANSI 16.5 CS1213 Thread JIS B0203 R1-1/2 CS1603 flange, low pressur : 10 80A RF, flange JIS B2220 10 100A RF, flange JIS B2220 20 100A RF, flange JIS B2220 20 100A RF, flange JIS B2220 3" 150lbs RF, flange ANSI B 16.5 4" 150lbs RF, flange ANSI B 16.5 3" 300lbs RF, flange ANSI B 16.5 4" 300lbs RF, flange ANSI B 16.5 CS1613 flange, high pressure:10 80A RF, flange JIS B2220 10 100A RF, flange JIS B2220 20 100A RF, flange JIS B2220 20 100A RF, flange JIS B2220 3" 150lbs RF, flange ANSI B 16.5 4" 150lbs RF, flange ANSI B 16.5 Use more than *3"/80A flange, 4" 100A flange (in case of spherical float)
Material	Stainless-steel (JIS SUS304)
Cable Entry	PF(G)1/2, PF(G)3/4
Weight	CS1103: Appox. 1kg CS1113:Appox. 4.8kg CS1203: Appox. 4.4kg depend on Process Connection) CS1213: Appox. 7kg (depend on External Chamber) CS1603:Appox. 5.4g (depend on Process Connection)
Paint color	Silver

Declaration of contamination

Dear customer,
Because of legal determinations and for the safety of our employees and operating equipment, we need this "Declaration of contamination" with your signature before your order can be handled. Please, include the completely filled in declaration with the device and the shipping documents in any case. Add also safety sheets and / or specific handling instructions if necessary.

Type of device / sensor:		Serial no.:			
Medium / concentration:		Temperature:		Pressure:	
Cleaned with:		Conductivity:		Viscosity:	

Warning hints for medium used (mark the appropriate hints)

☐	☐	☐	☐	☐	☐	☐	☐
radioactive	explosive	caustic	poisonous	harmful to health	biologically hazardous	inflammable	safe

Reason for return

Company data

Company:		Contact person:	
		Department:	
Address:		Phone:	
		Fax / e-mail:	
		Your order no.:	

I hereby certify that the returned equipment has been cleaned and decontaminated acc. to good industrial practices and is in compliance with all regulations. This equipment poses no health or safety risks due to contamination.

(Place, date)

(Company stamp and legally binding signature)

More information about services and repairs:
www.services.endress.com

Endress+Hauser
People for Process Automation

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