



Level



Pressure



Flow



Temperature



Liquid  
Analysis



Registration



Systems  
Components



Services



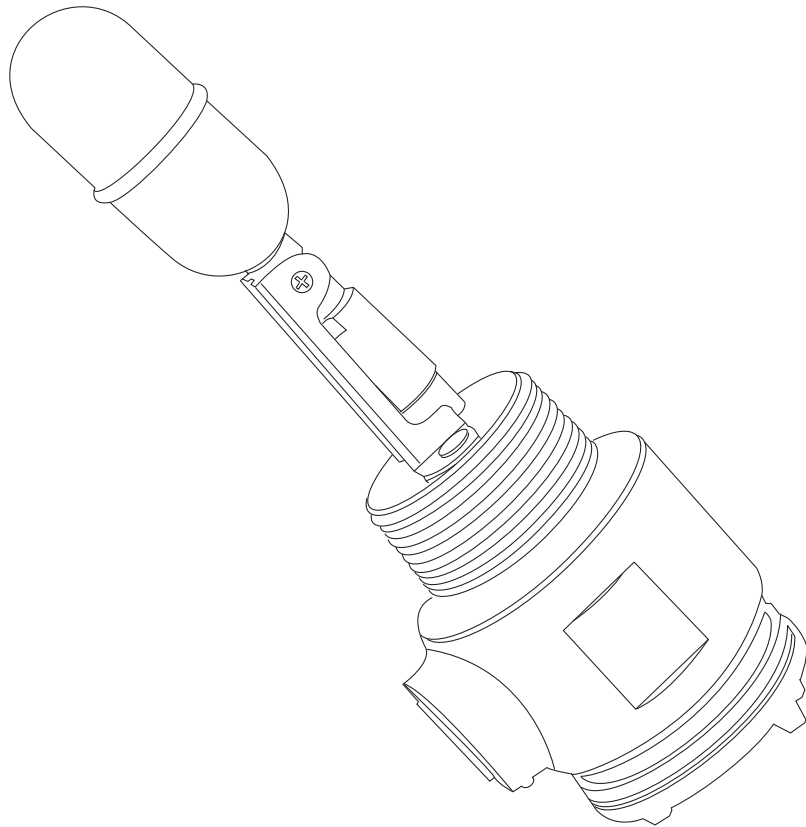
Solutions

Operation Instructions

## Float Level Switch

# CS1103/CS1203/CS1603

Upper and Lower Limit Alarms



# Declaration of Hazardous Material and De-Contamination

## Erklärung zur Kontamination und Reinigung

RA No. 

--	--	--	--	--	--	--	--

Please reference the Return Authorization Number (RA#), obtained from Endress+Hauser, on all paperwork and mark the RA# clearly on the outside of the box. If this procedure is not followed, it may result in the refusal of the package at our facility.  
Bitte geben Sie die von E+H mitgeteilte Rücklieferungsnummer (RA#) auf allen Lieferpapieren an und vermerken Sie diese auch außen auf der Verpackung. Nichtbeachtung dieser Anweisung führt zur Ablehnung ihrer Lieferung.

Because of legal regulations and for the safety of our employees and operating equipment, we need the "Declaration of Hazardous Material and De-Contamination", with your signature, before your order can be handled. Please make absolutely sure to attach it to the outside of the packaging.

Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination und Reinigung", bevor Ihr Auftrag bearbeitet werden kann. Bringen Sie diese unbedingt außen an der Verpackung an.

Type of instrument / sensor

Geräte-/Sensortyp \_\_\_\_\_

Serial number

Seriennummer \_\_\_\_\_

☐ Used as SIL device in a Safety Instrumented System / Einsatz als SIL Gerät in Schutzeinrichtungen

Process data/Prozessdaten

Temperature / Temperatur \_\_\_\_\_ [°F] \_\_\_\_\_ [°C]

Pressure / Druck \_\_\_\_\_ [psi] \_\_\_\_\_ [Pa]

Conductivity / Leitfähigkeit \_\_\_\_\_ [µS/cm]

Viscosity / Viskosität \_\_\_\_\_ [cp] \_\_\_\_\_ [mm<sup>2</sup>/s]

Medium and warnings

Warnhinweise zum Medium



	Medium / concentration Medium / Konzentration	Identification CAS No.	flammable entzündlich	toxic giftig	corrosive ätzend	harmful/ irritant gesundheitsschädlich/ reizend	other * sonstiges*	harmless unbedenklich
Process medium Medium im Prozess								
Medium for process cleaning Medium zur Prozessreinigung								
Returned part cleaned with Medium zur Endreinigung								

\* explosive; oxidising; dangerous for the environment; biological risk; radioactive

\* explosive; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv

Please tick should one of the above be applicable, include safety data sheet and, if necessary, special handling instructions.

Zutreffendes ankreuzen; trifft einer der Warnhinweise zu, Sicherheitsdatenblatt und ggf. spezielle Handhabungsvorschriften beilegen.

Description of failure / Fehlerbeschreibung \_\_\_\_\_

Company data / Angaben zum Absender

Company / Firma \_\_\_\_\_

Phone number of contact person / Telefon-Nr. Ansprechpartner: \_\_\_\_\_

Address / Adresse \_\_\_\_\_

Fax / E-Mail \_\_\_\_\_

Your order No. / Ihre Auftragsnr. \_\_\_\_\_

"We hereby certify that this declaration is filled out truthfully and completely to the best of our knowledge. We further certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free of any residues in dangerous quantities."

"Wir bestätigen, die vorliegende Erklärung nach unserem besten Wissen wahrheitsgetreu und vollständig ausgefüllt zu haben. Wir bestätigen weiter, dass die zurückgesandten Teile sorgfältig gereinigt wurden und nach unserem besten Wissen frei von Rückständen in gefahrbringender Menge sind."

(place, date / Ort, Datum)

Name, dept./Abt. (please print / bitte Druckschrift)

Signature / Unterschrift

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# 1 Safety Instructions

## 1.1 Designated Use

Float Level Switch CS1103/CS1203/CS1603 is a compact level switch, which utilizes a stainless steel float. It is horizontally mounted on tanks to activate an alarm using a reed switch when a change in liquid level is detected. This system is ideal for upper and lower limit alarms on fuel oil storage tanks.

## 1.2 Installation, Commissioning, and Operation

- Mounting, electrical installation, start-up, and maintenance of the instrument may only be performed by trained personnel authorized by the operator of the facility.
- Personnel must read and understand these installation instructions before performing the procedures.
- The instrument may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual must be observed.
- The installer must make sure that the measuring system is correctly wired according to the wiring diagrams. The measuring system must be grounded.
- Observe all law and regulations applicable and valid for your country and pertaining to the opening and repairing of electrical devices.

## 1.3 Product Requirement

### Power Source

Check the voltage of the power supply before connecting it to the product. It should be the exact voltage required for proper operation of the product.

### Connection to Other Devices

It is possible to connect to other devices explained in this instruction. Refer to each operation instruction when connecting to devices.

### Ground

Do not remove earth terminal or earth wire when the power is on.

### Power Cable

Use a power cable specified by our company. The product should be protectively grounded before it is connected to a measurement object or an external control circuit.

## 1.4 Operational Safety

### Hazardous Area

- Use the explosion proof type for measurement in areas where explosion hazards are present.
- Devices installed in areas having explosion hazards must not be opened when the power is on.
- Strict compliance with installation instructions and - ratings, as directed in this supplementary documentation, is mandatory.
- Device maintenance and repair is restricted to meet explosion proof regulations.
- Tighten the cable gland firmly.
- Devices employed in areas having explosion hazards should be installed and wired in keeping with explosion proof regulations.
- Ensure that all personnel are properly qualified.
- Observe the certification requirements as well as national and local regulations.














### 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

To highlight safety-relevant or alternative operating procedures in this manual, the following conventions have been used, each indicated by a corresponding symbol on the left.

Safety Conventions	
	<b>Warning!</b> A warning highlights actions or procedures which, if not performed correctly, will lead to personal injury, a safety hazard or destruction of the instrument
	<b>Caution!</b> Caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the instrument
	<b>Note!</b> 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	
	<b>Device certified for Use in Explosion Hazardous Area</b> If the device has this symbol embossed on its name plate it can be installed in an explosion hazardous area
	<b>Explosion Hazardous Areas</b> Symbol used in drawings to indicate explosion hazardous areas. Devices located in and wiring entering areas with the designation "explosion hazardous areas" must conform with the stated type of protection.
	<b>Safe Area (non-explosion hazardous area)</b> 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
Explosion protection	
	<b>Direct Voltage</b> A terminal to which or from which a direct current or voltage may be applied or supplied
	<b>Alternating Voltage</b> A terminal to which or from which an alternating (sine-wave) current or voltage may be applied or supplied
	<b>Grounded Terminal</b> A grounded terminal, which as far as the operator is concerned, is already grounded by means of an earth grounding system
	<b>Protective Grounding (earth) Terminal</b> A terminal which must be connected to earth ground prior to making any other connection to the equipment
	<b>Equipotential Connection (earth bonding)</b> 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:

Level Switch

Endress+Hauser 

Order code

Ser. no.

防爆型式 / Ex proof model :

防爆構造 / Protection class : d 2 G4

定格 / Rating : AC,DC 220 V 100 VA 周囲温度 / Ambient Temp.: -10 °C ~ +40 °C

接点容量 / Contact cap.(max.) 0.7 A 70 VA(RESIST.), 35 VA(INDUC.)

警告 : 通電状態では蓋を開けないでください。  
Warning: Do not open the cover when energized.

エンドレスハウザー山梨株式会社 Yamanashi 406-0846 IP65  
Endress+Hauser Yamanashi Co.,Ltd. Made in Japan NP-1872-4

①	Order Code
②	Serial Number
③	Ex Proof Model

Figure 1: CS1000-series Nameplate

## 2.2 Order Information

### 2.2.1 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	Approval:					
	2	Flame proof d2G4 E* <sup>1</sup> , IP65				
	3	Flame proof d2G4 EB* <sup>2</sup> , 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)

## 2.2.2 CS1203

<b>010</b>		<b>Function:</b>	
	0	Standard function	
	1	Non standard function	
<b>020</b>		<b>Process Connection:</b>	
	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.	
<b>030</b>		<b>Material Process Connection; Float:</b>	
	J2	SUS304; SUS304, cylindrical	
	J9	Special version, TSP-no.to be spec.	
<b>040</b>		<b>Approval:</b>	
	2	Flame proof d2G4 E <sup>*1</sup> ,IP65	
	3	Flame proof d2G4 EB <sup>*2</sup> ,IP65	
	9	Special version, TSP-no.to be spec.	
<b>050</b>		<b>External Chamber:</b>	
	0	Not used	
	9	Special version, TSP-no.to be spec.	
<b>060</b>		<b>Switch Position:</b>	
	1	High	
	2	Low	
<b>070</b>		<b>Cable Entry:</b>	
	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.	
<b>CS1203-</b>		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)



### 2.2.3 CS1603

<b>010</b>		<b>Function:</b>	
	0	Standard function	
	1	Non standard function	
<b>020</b>		<b>Process Connection:</b>	
	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.	
<b>030</b>		<b>Material Process Connection; Float:</b>	
	J2	SUS304; SUS304, cylindrical	
	J3	SUS304; SUS316, spherical	
	J9	Special version, TSP-no.to be spec.	
<b>040</b>		<b>Approval:</b>	
	2	Flame proof d2G4 E <sup>*1</sup> , IP65	
	3	Flame proof d2G4 EB <sup>*2</sup> , IP65	
	9	Special version, TSP-no.to be spec.	
<b>050</b>		<b>External Chamber:</b>	
	0	Not used	
	9	Special version, TSP-no.to be spec.	
<b>060</b>		<b>Switch Position:</b>	
	1	High	
	2	Low	
<b>070</b>		<b>Cable Entry:</b>	
	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.	
<b>CS1603-</b>		Order code	

<sup>\*1</sup> TIIS d2G4 (E)

<sup>\*2</sup> TIIS d2G4 + cable gland (EB)

#### Standard

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

## 2.3 Scope of Delivery



### Caution!

It is extremely important to follow the instructions concerning the unpacking, transportation and storage of measuring instruments provided in the chapter "3.1 Incoming Acceptance, Transportation, Storage".

The scope of delivery consists of:

- Assembled instrument

Accompanying documentation:

- Operating Instructions (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, and make sure that nothing is missing and that the items match your order.

#### **3.1.2 Transportation**

Follow the safety instructions and conditions of transportation for instruments in excess of 18kg (40 lbs.).

#### **3.1.3 Storage**

Pack the measuring instrument so that it is protected against impacts during storage and transportation.

The original packing material provides the optimum protection for this.

The allowed storage temperature is -20 to +40 °C (14° F to 104° F).

3.2 Installation Conditions

3.2.1 Dimensions

CS1103 (Thread Type)

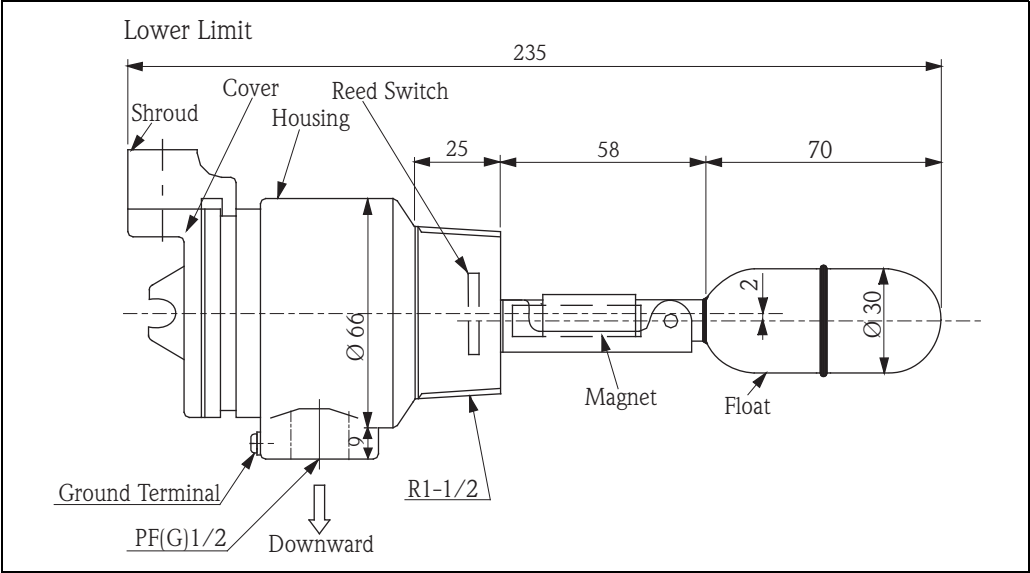


Figure 2: CS1103 Dimensions

CS1203 (Flange Type, Low Pressure)

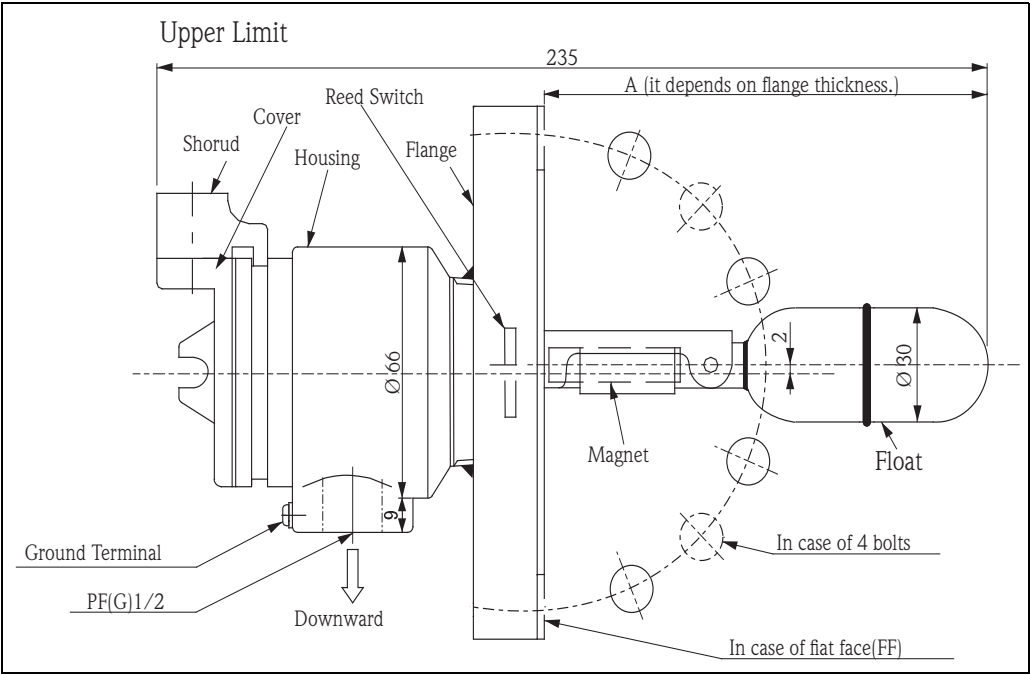


Figure 3: CS1203 Dimensions

### CS1603 (Flange Type, High Pressure)

### Cylindrical Float

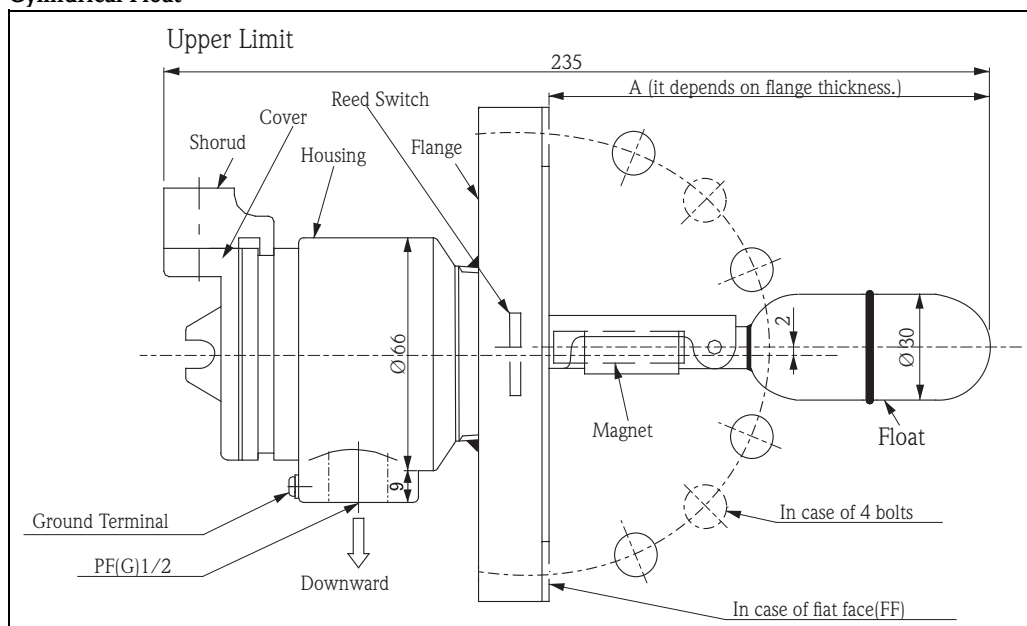


Figure 4: Dimension of Cylindrical Float

## Spherical Float

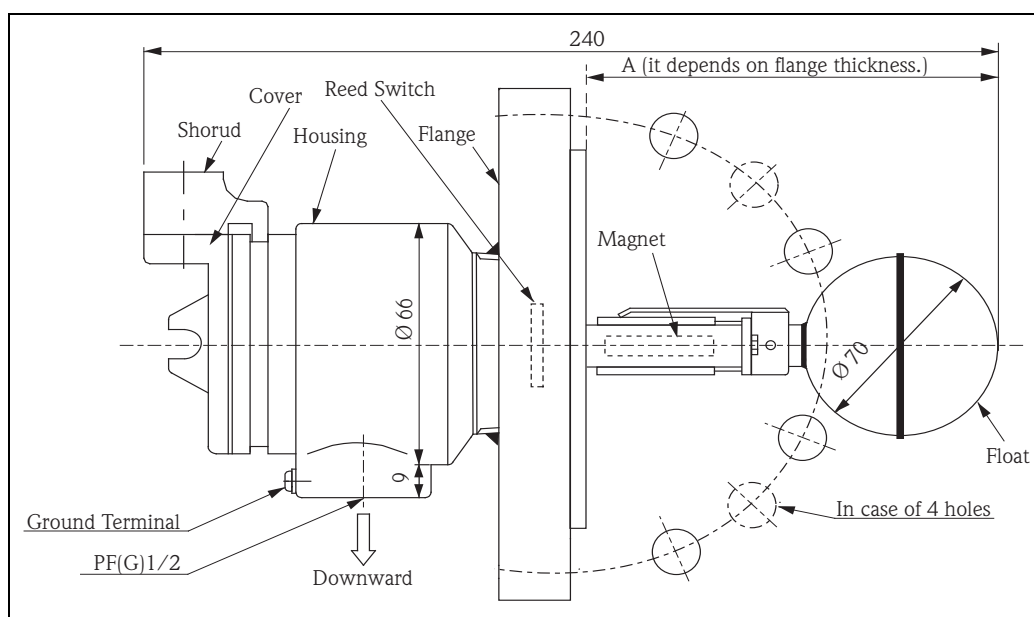


Figure 5: Dimension of Spherical Float

### 3.3 Confirmation of CS prior to Installation

When designed as an upper limit switch, the reed switch is activated when level reaches a specified upper limit. When designed as a lower limit switch, the reed switch is activated when level goes below a specified level. The conduit connection must always be set downward.

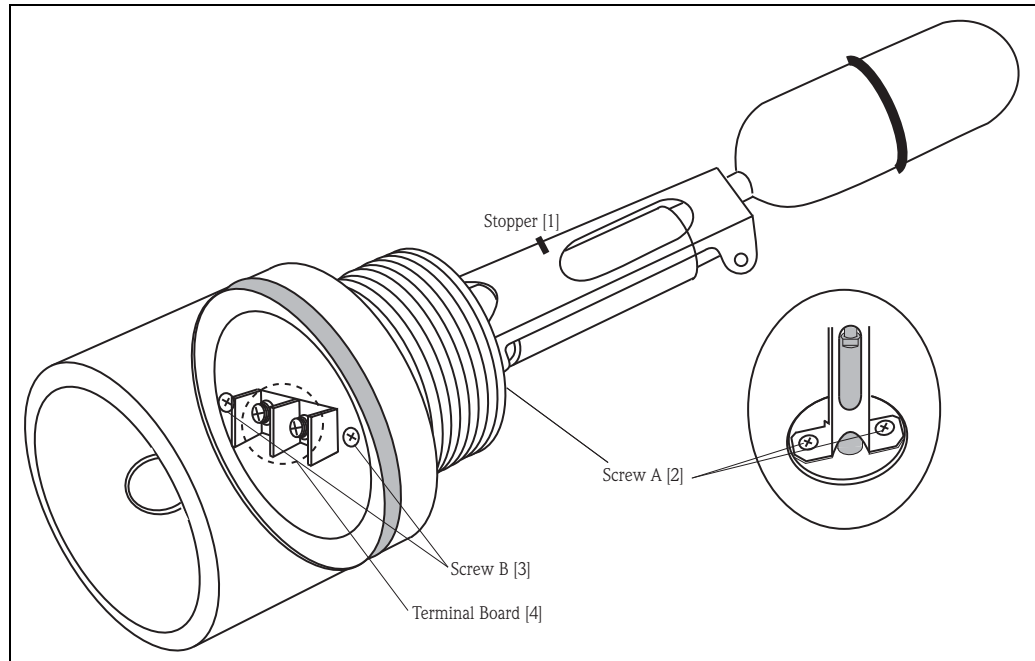


Figure 6: Reed Switch

#### Confirmation Procedure

1. Remove the cover and connect a circuit tester to the terminal board.
2. Place the conduit connector downward and confirm reed switch function by operating the float up and down.
3. If reed switch is turned on and off at opposite (incorrect) positions, remove the screw A [2], set the stopper [1] in the reverse position and replace the screw A.
4. Remove the screw B [3], and remove the terminal board [4].
5. Set the terminal board in the reverse position.
6. Replace the cover.

This completes the confirmation procedure.

### 3.4 Installation of Thread Type Connection

CS should be mounted horizontally in the tank side wall. The standard connection for CS is thread type (R1-1/2), which is installed by welding a CS socket. Inner diameter of the socket should be 45mm or more. Using a smaller diameter may result in CS malfunction.

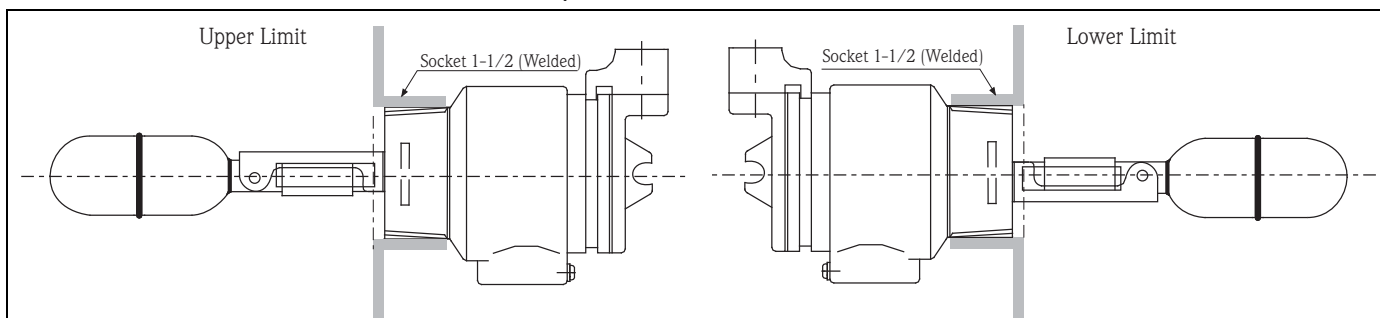


Figure 7: Thread Type Connection

### 3.5 Installation of Flange Type Connection

Prepare a size 3B or larger nozzle when using a flange type connection. Prepare a size 4B or larger nozzle when installing a spherical float.

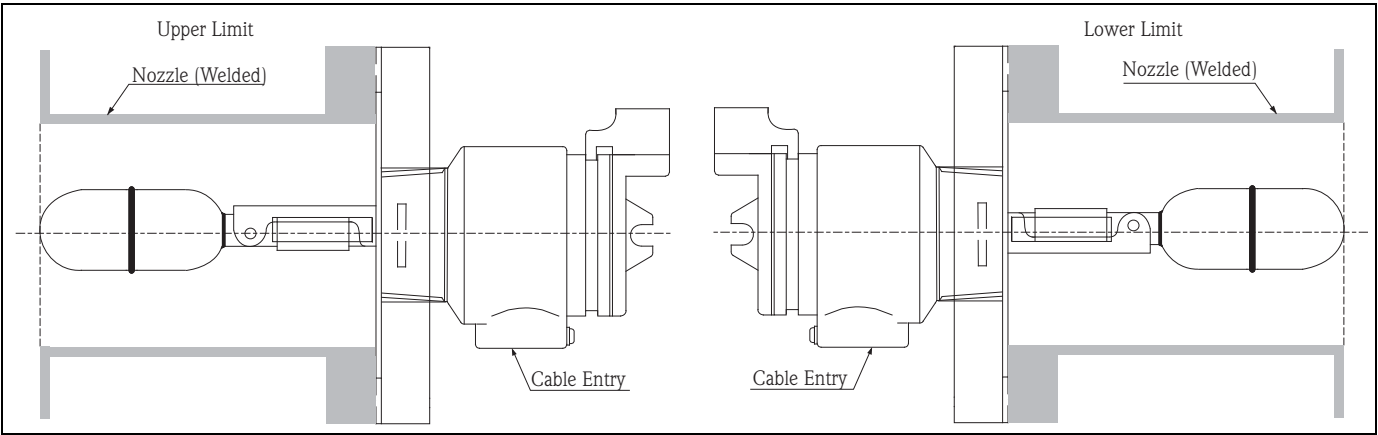


Figure 8: Cylindrical Float

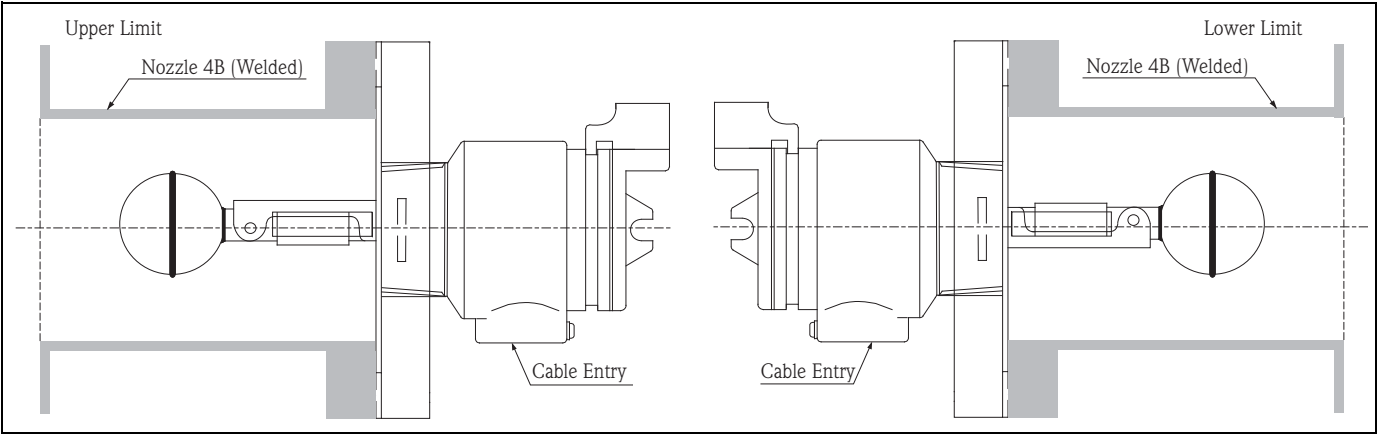


Figure 9: Spherical Float

## 4 Contact Protection Circuit

When the load current exceeds 0.28A using D.C. power supply, remove the surge absorber, provided to protect the contact. Determine a constant using Figure 11 on the following page and make certain that a contact protection circuit is in place.

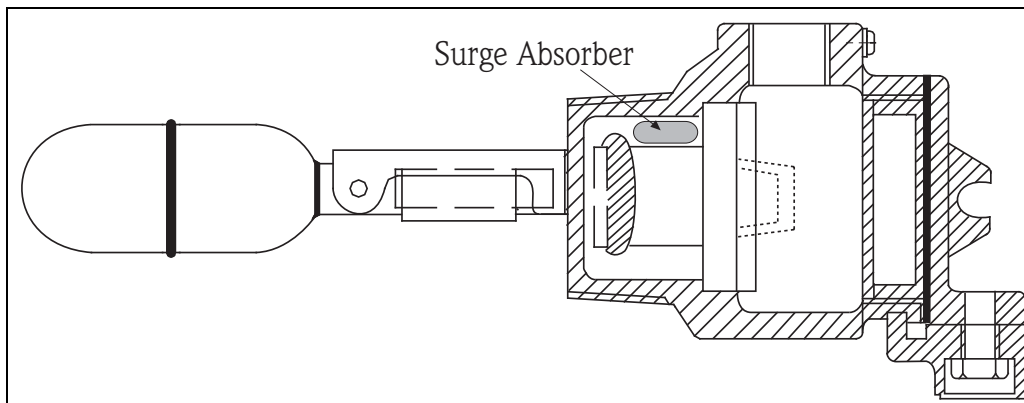


Figure 10: Surge Absorber



## Monograph for D.C Power

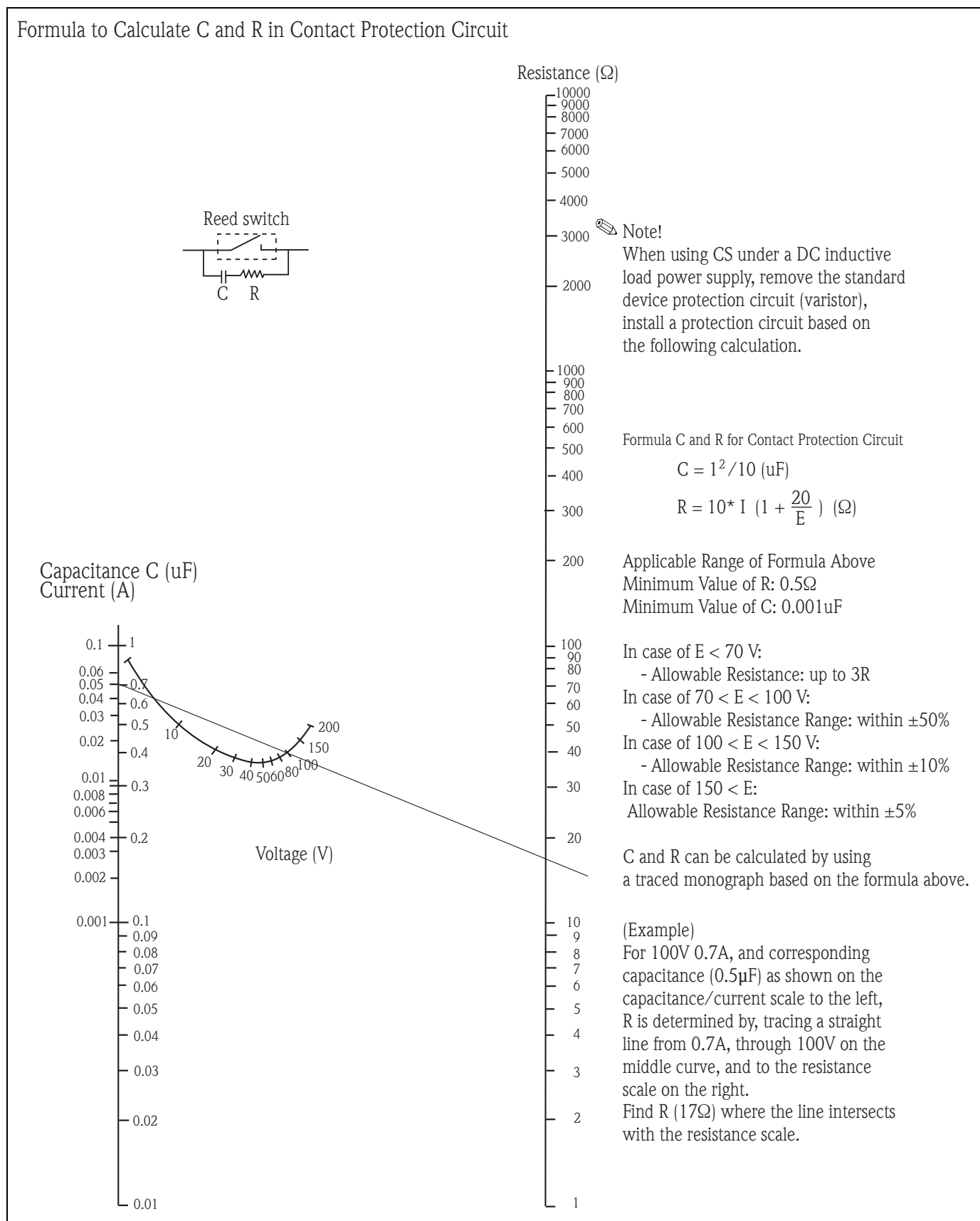


Figure 11: Monograph

# 5 Operation

The float detects liquid level inside the tank, while the reed switch is turned on or off by a magnet, installed on the rear of the float. The reed switch is turned off when magnet centers with it, and conversely turned on when magnet moves off center.

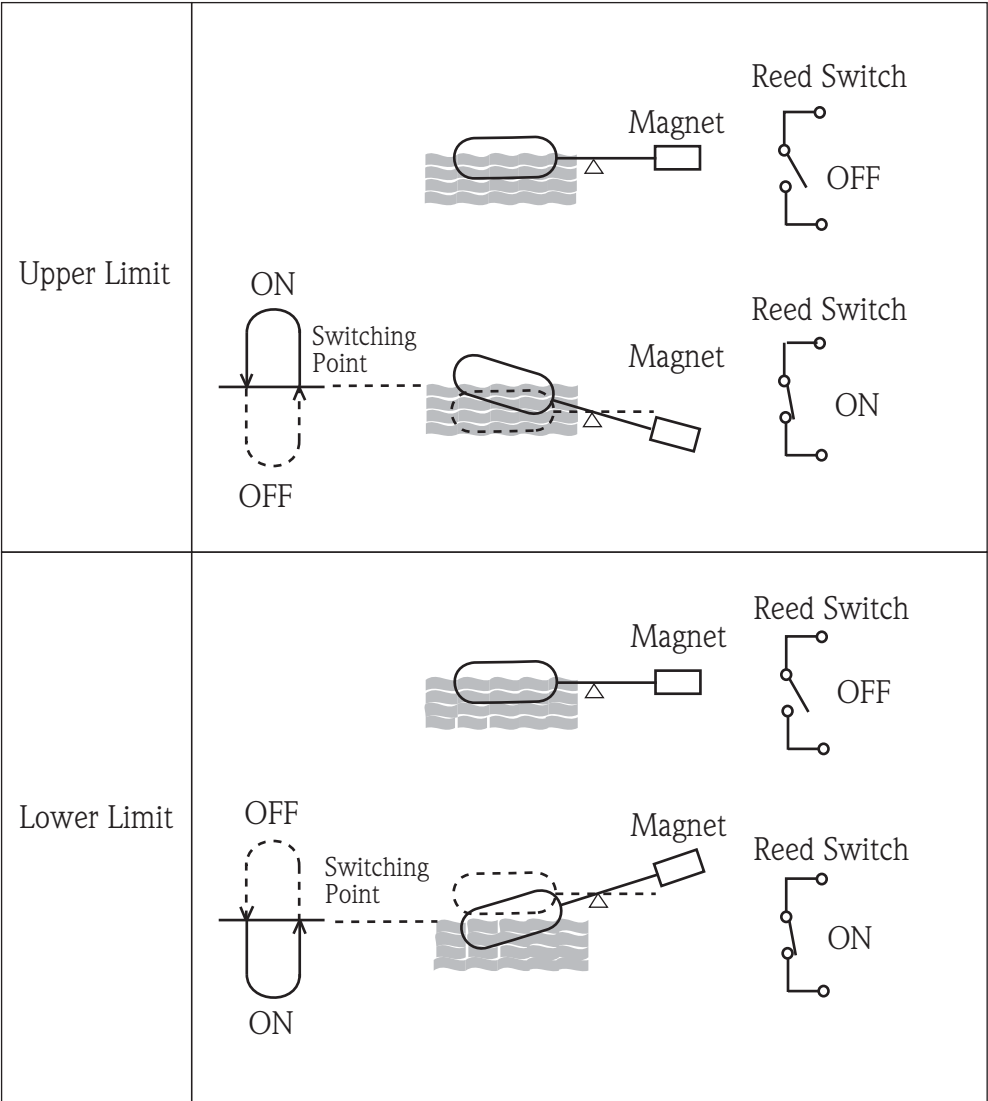


Figure 12: Operation of Reed Switch

## 6 Maintenance

If the level switch fails to produce an ON or OFF signal while in operation, open the cover and connect a circuit tester to terminals to check for conductivity. The reed switch should normally be OFF when the float is positioned horizontally.

If switch tests negative for conductivity, remove set screws and replace the switch unit.

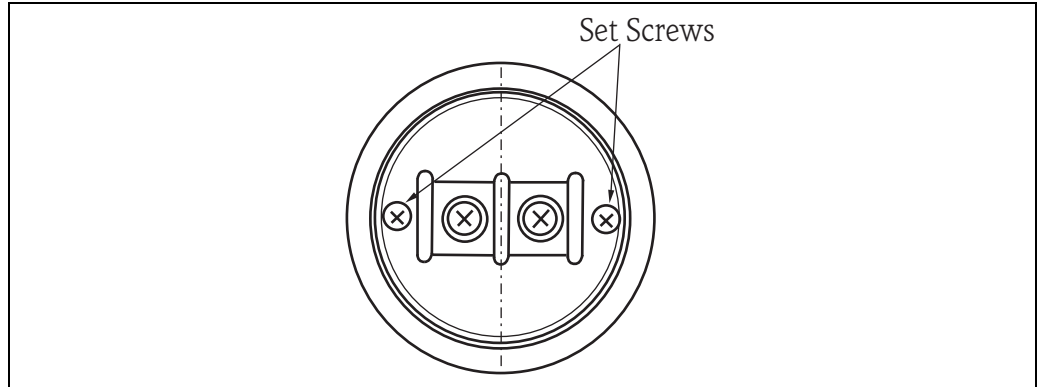


Figure 13: Level Switch Maintenance

# 7 Troubleshooting

## 7.1 Spare Parts

Spare parts are contained in kits. Spare parts for CS1000-series which can be ordered from Endress+Hauser are shown with their order numbers in the diagram below. Contact Endress+Hauser service representatives for further assistance.

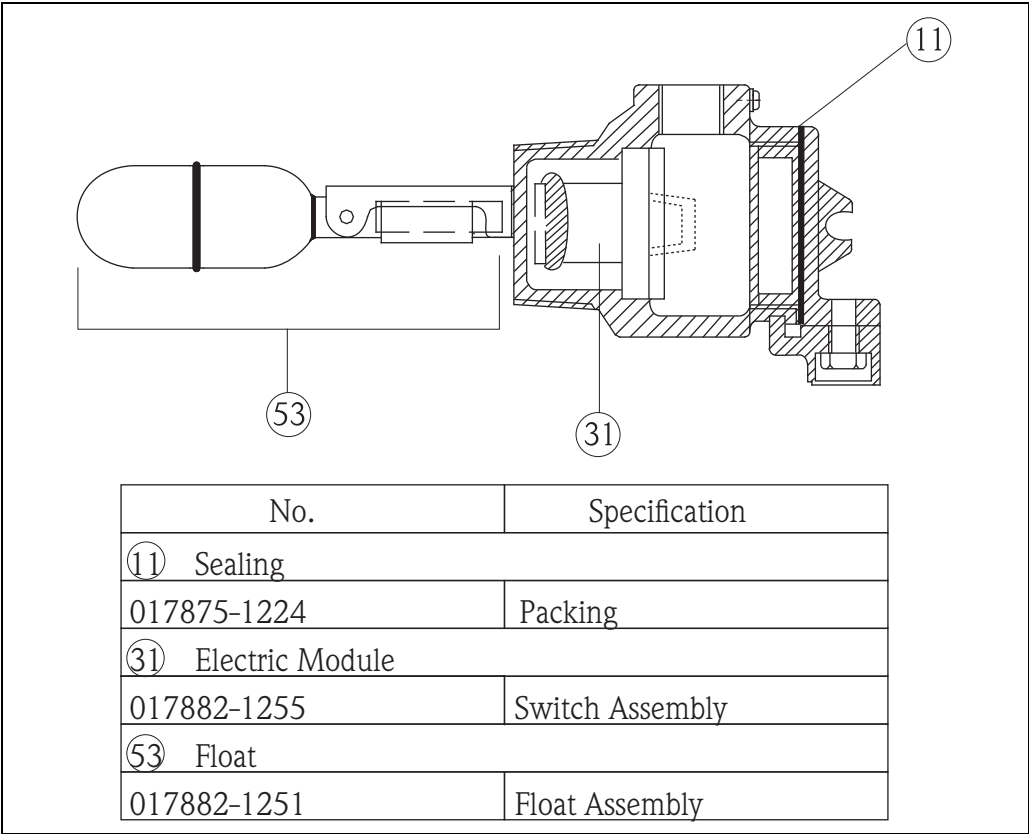


Figure 14: Spare Parts

## 7.2 Troubleshooting

Error Symptom	Possible Cause	Corrective measure
Signal does not change.	1. Reed switch contact is seized (fused). 2. Surge absorber is broken. 3. Internal wire is shortened or broken. 4. Float does not move due to accumulated iron powder around magnet.	1. Replace switch unit. 2. Replace switch unit. 3. Disassemble and repair. 4. Remove and clean switch unit.

## 7.3 Return

1. The following procedure must be performed before returning CS float level switch to Endress+Hauser e.g. for repair or calibration.
  - Remove all residue. Pay special attention to the gasket grooves and crevices where fluid may be present. This is especially important if the fluid is corrosive, poisonous, carcinogenic, radioactive, or otherwise hazardous.
  - Always enclose a duly completed "Declaration of Hazardous Material and De-contamination" form (a copy of the "Declaration of Hazardous Material and De-contamination" is included at the top of this operating manual). Only then can Endress+Hauser transport, examine, and repair a returned device.
  - Enclose special handling instructions if necessary, for example a safety data sheet as per EN 91/155/EEC.
2. Additionally specify:
  - An exact description of the application
  - The chemical and physical characteristics of the instrument
  - A short description of the error that occurred (specify the error code where possible)
  - Operating time of the device



### Note!

A copy of the "Declaration of Contamination" is included at the top of this operating manual.



### Caution!

- Hazardous materials may be attached to damaged parts of CS or its plastic material. Unless hazardous materials are completely removed from CS, no repair request is accepted.
- 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, separate the various components according to their materials.

## 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, do not hesitate to contact Endress+Hauser representative.

## 8 Technical Data

Contact Operation (Upper Limit Alarm)	ON when liquid level exceeds the set position
Contact Operation (Lower Limit Alarm)	ON when liquid level becomes lower than the set position
Ambient Temperature	-10 to +40 °C (14 ° F to 104° F) (operation not possible in freezing temperature)
Measured Liquid Temperature	-20 to +80 °C (-4 ° F to 176° F) (operation not possible in freezing temperature)
Maximum Allowable Working Pressure	1.96MPa (20kg /cm <sup>2</sup> )
Level Accuracy (50 mm Displacer)	within ±5mm (specific density=1g/cm <sup>3</sup> )
Measured Liquid Specific Density	0.7 to 2.0g/cm <sup>3</sup>
Approval	Flame proof, TIIS d2G4
Protection Class	IP65
Installation	CS should be installed horizontally on the side wall of a tank. CS1103 thread connection: Thread JIS B0203 R1-1/2 CS1203 flange, low pressure: 10K 80A RF, flange JIS B2220 10K 100A RF, flange JIS 2220 3" 150lbs RF, flange ANSI 16.5 4" 150lbs RF, flange ANSI 16.5 CS1603 flange, high pressure: 10K 80A RF, flange JIS B2220 20K 80A RF, flange JIS B2220 10K 100A RF, flange JIS B2220 20K 100A RF, flange JIS B2220 3" 150lbs RF, flange ANSI B16.5 3" 300lbs RF, flange ANSI B16.5 4" 150lbs RF, flange ANSI B16.5 4" 300lbs RF, flange ANSI B16.5
Material	Stainless-steel (JIS SUS304)
Cable Entry	PF(G)1/2, PF(G)3/4
Weight	CS1103: Appox. 1kg CS1203: Appox. 4.4kg (depends on Process Connection) CS1603: Appox. 5.4g (depends on Process Connection)
Paint Color	Silver

---

Endress+Hauser Japan Co., Ltd.  
Product Center Yamanashi  
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Fuefuki-shi Yamanashi,  
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Fax: ++81 55 266 4969

**Endress+Hauser**   
People for Process Automation