



Level



Pressure



Flow



Temperature



Liquid  
Analysis



Registration



Systems  
Components



Services

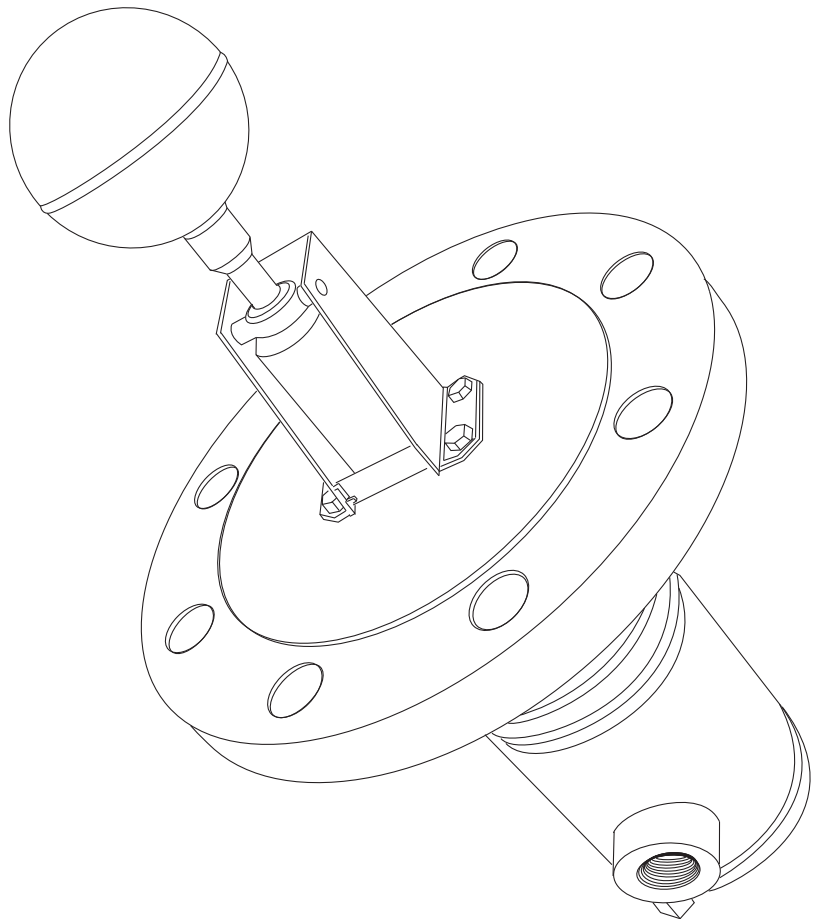


Solutions

## Operating Instructions

# Float Level Switch CS5603/CS5613

High temperature and high pressure



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# 1 Safety instructions

## 1.1 Designated use

Float Level Switch CS5603/CS5613 is a float type compact level switch with explosion-proof feature. It is made of steel and is compatible with almost all types of liquids. Float Level Switch CS5603/CS5613 is especially suited for use with high temperature (max. 350°C), the high pressure (max. 4.9MPa) and permits liquid level control in simple procedures.

## 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 diagram. The measuring system is to be grounded.

## 1.3 Product Requirements

### Power Supply

Please check specifications of this product such as power and frequency before turning on the power. Please use voltage suitable for this product operating.

### Power Cable

Please use the power cable specified 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 Instruments. Please refer to each installation Instruments 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 per 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
	<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 instruments.
	<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 area</b> 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.
	<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.

### Electrical Symbols


	<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 grounded (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:	<input type="text" value="①"/>	①	オーダーコード*
Ser. No:	<input type="text" value="②"/>	②	シリアル番号
防爆型式 / Ex Proof model : E 1 - 3 1 防爆構造 / Protection class : d 2 G 4 定格 / Rating: 接点容量 / Contact cap. : AC250V 5A DC125V 0.3A 周囲温度 / Ambient temperature : -10~+60°C 注意 : 電源を切ってから蓋を開けてください。 Note: Be sure to cut off the power before opening the cover. エンドレスハウザー山梨株式会社 Made in Japan Endress+Hauser Yamanashi Co.,Ltd. Yamanashi 406-0846 NP-1615-4			

## 2.2 Ordering Information

### 2.2.1 CS5603

<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 16.5		
	6	3" 300lbs RF, flange ANSI 16.5		
	7	4" 150lbs RF, flange ANSI 16.5		
	8	4" 300lbs RF, flange ANSI 16.5		
	9	Special version, TSP-no. to be spec.		
<b>030</b>	<b>Material Process Connection ;Float:</b>			
	4	SUS304 ; SUS316, Spherical		
	5	SUS304 ; SUS316, Cylindrical		
	6	SUS316 ; SUS316, Spherical		
	7	SUS316 ; SUS316, Cylindrical		
	9	Special version, TSP-no. to be spec.		
<b>040</b>	<b>Protection class:</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>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>070</b>	<b>Colour:</b>			
	0	Sliver		
	9	Special version, TSP-no. to be spec.		
<b>CS5603-</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)

## 2.2.2 CS5613

<b>10</b>	<b>Function:</b>			
	0	Standard function		
	1	Non standard function		
<b>20</b>	<b>Switch Head Connection:</b>			
	3	10K 100A RF, flange JIS B2220		
	4	20K 100A RF, f lange JIS B2220		
	7	4" 150lbs RF, flange ANSI 16.5		
	8	4" 300lbs RF, flange ANSI 16.5		
	9	Special version, TSP-no. to be spec.		
<b>30</b>	<b>material Switch Head Connection;Float:</b>			
	4	SUS304;SUS316, spherical		
	5	SUS304;SUS316,cylindrical		
	6	SUS316;SUS316, spherical		
	7	SUS316;SUS316,cylindrical		
	9	Special version, TSP-no. to be spec.		
<b>40</b>	<b>Protection class:</b>			
	2	Flame proof d2G4 E, IP65		
	3	Flame proof d2G4 EB, IP65		
	9	Special version, TSP-no. to be spec.		
<b>50</b>	<b>External Chambe:</b>			
	A	STPG370, 10K 25A RF, SS400,flangeJIS B2220		
	B	STPG370, 20K 25A RF, S25C,flangeJIS B2220		
	C	STPG370, 1" 150lbs RF, SS400,flangeANSI B 16.5		
	D	STPG370, 1" 300lbs RF, S25C,flangeANSI B 16.5		
	E	SUS304, 10K 25A RF,SUS304,flange JIS B2220		
	F	SUS304, 20K 25A RF,SUS304,flange JIS B2220		
	G	SUS304, 1" 150lbs RF, SUS304,flangeANSI B 16.5		
	H	SUS304, 1" 300lbs RF, SUS304,flangeANSI B 16.5		
	J	SUS316, 10K 25A RF,SUS316,flangeJIS B2220		
	K	SUS316, 20K 25A RF,SUS316,flangeJIS B2220		
	L	SUS316, 1" 150lbs RF, SUS316,flangeANSI B 16.5		
	M	SUS316, 1" 300lbs RF, SUS316,flangeANSI B 16.5		
	9	Special version, TSP-no. to be spec.		
<b>60</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>70</b>	<b>Colour:</b>			
	0	Silver		
	9	Special version, TSP-no. to be spec.		
<b>CS5613-</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)

## 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

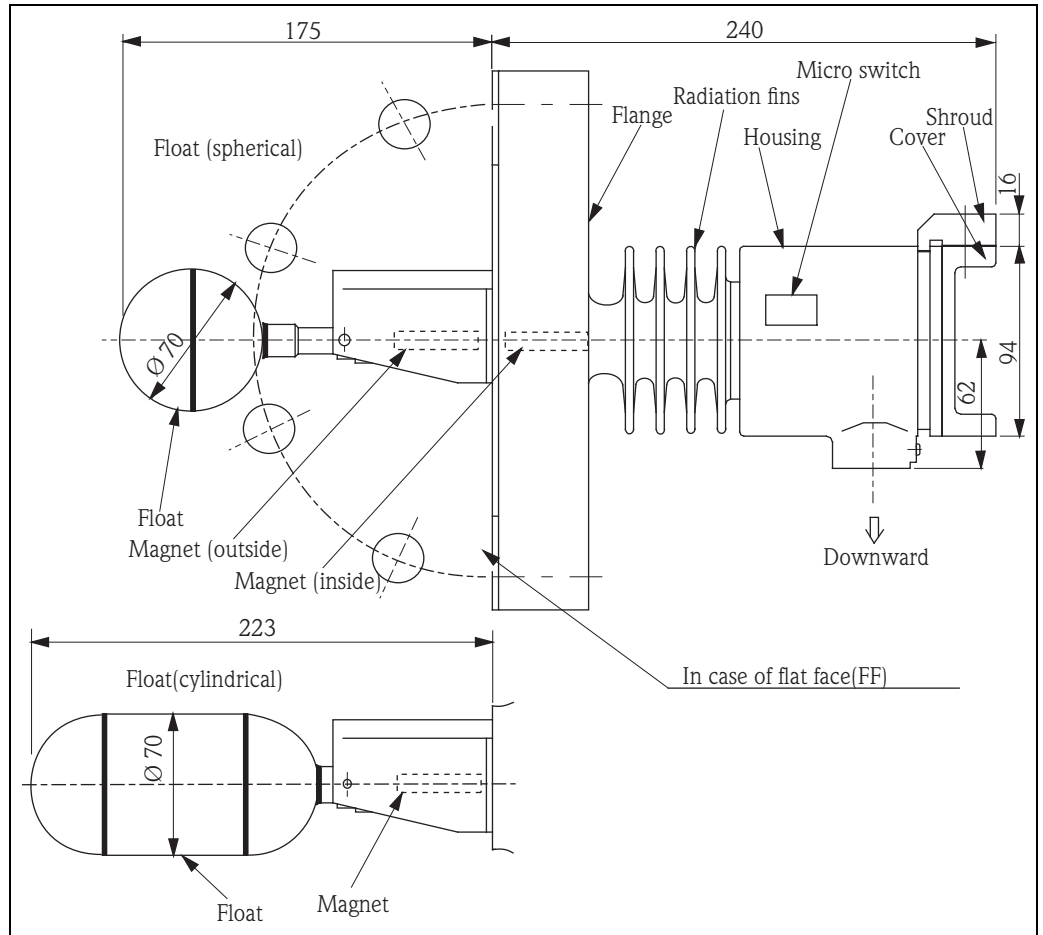
Pack the measuring instrument so that is protected against impacts for storage and transport.  
The original packing material provides the optimum protection for this. The permissible storage temperature is -10... +60 °C.



### 3.2 Installation conditions

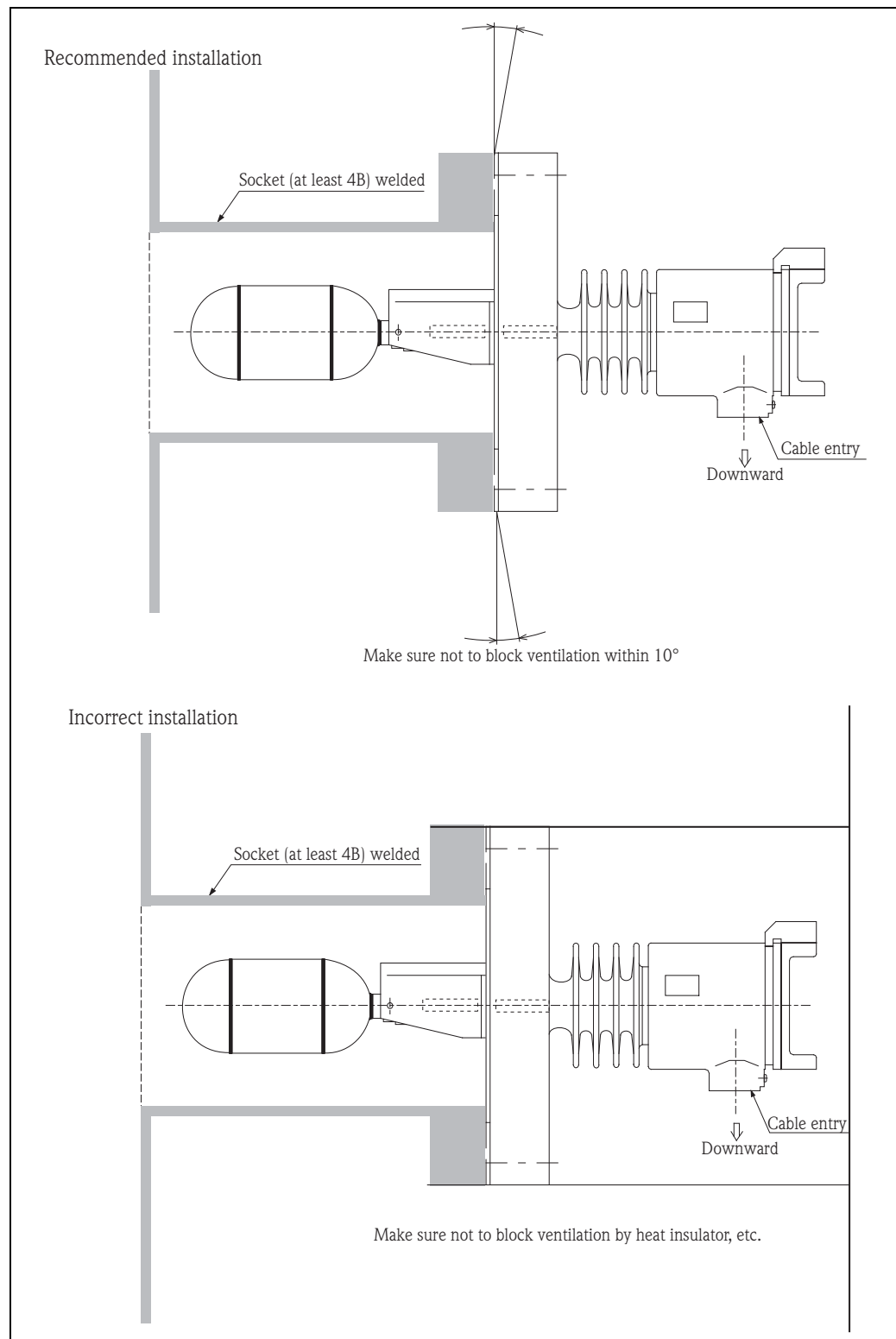
#### 3.2.1 Dimensions

##### CS5603



### 3.3 Advance preparation

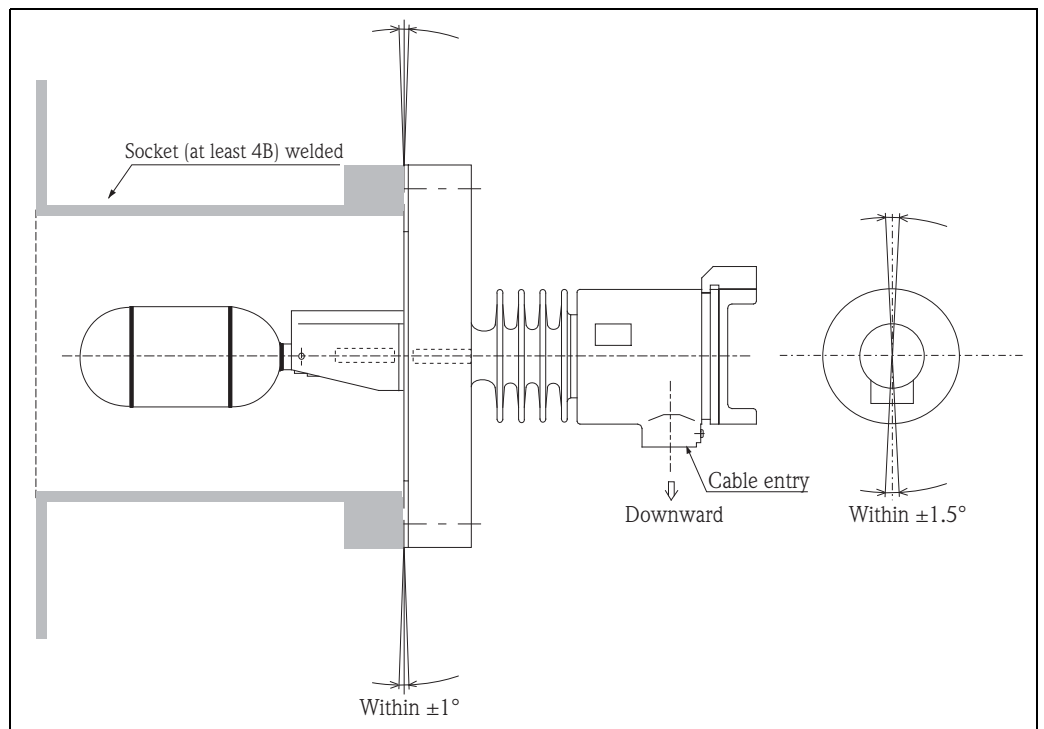
1. Mounting direction: Make sure that the conduit tube joint is set on the bottom.
2. Operating check: Remove the cover and connect a circuit tester to the terminal board with the conduit tube joint set at the bottom, hoist down the float and make sure that electrical continuity establishes between terminals No. 2 and No. 3. Lift the float by hands to see whether the electrical continuity is established between No. 1 and No. 2.
3. CS5603/5613 construction entails its radiator fins to cool the housing. Therefore, it should be mounted not to lessen the effect of the radiator fins.



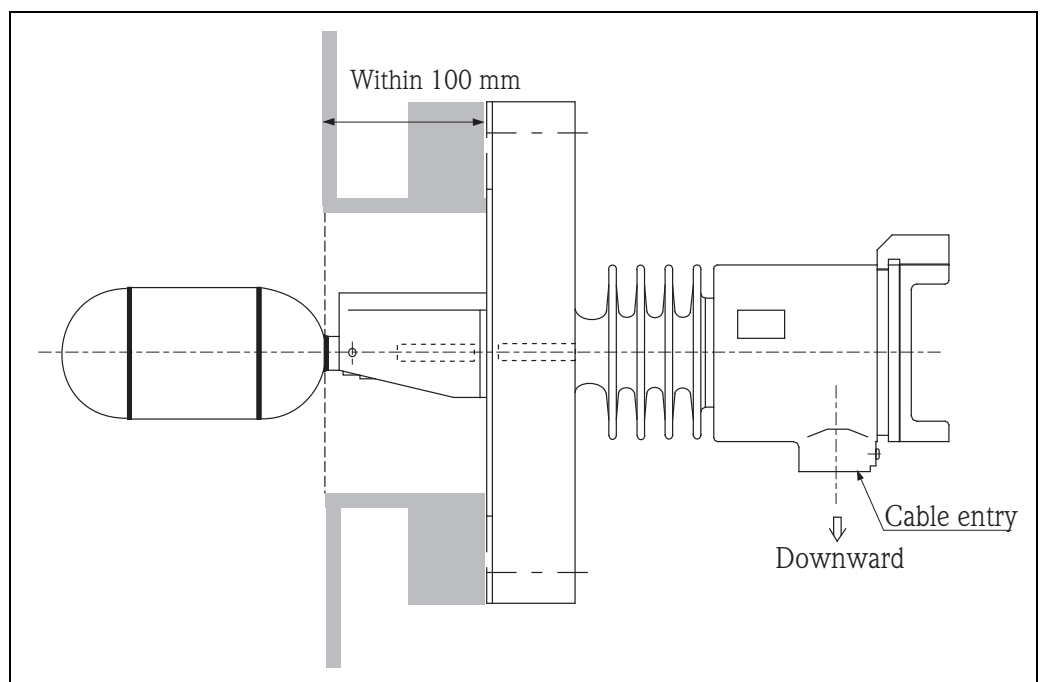
### 3.4 Installation

Mount the level switch horizontally on a tank side. Prepare a nozzle (4B) which is required to connect the level switch through a flange. (In case of 80A flange, the level switch is connected). In case of the external pipe type, pipe connection is to be made with a flange 25A.

#### 3.4.1 Allowance mounting angle

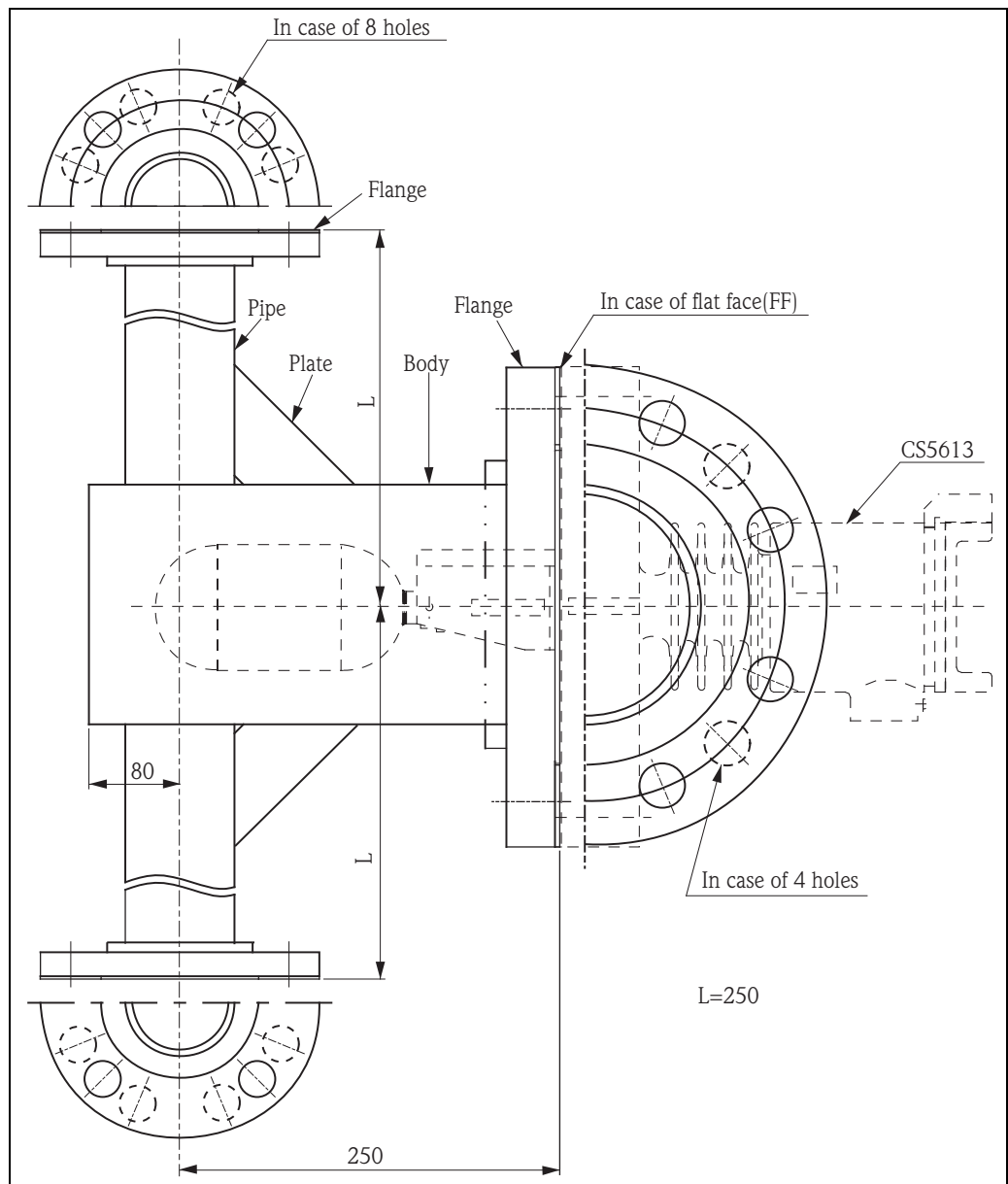


#### 3.4.2 Limitation to nozzle in case of 80A flange

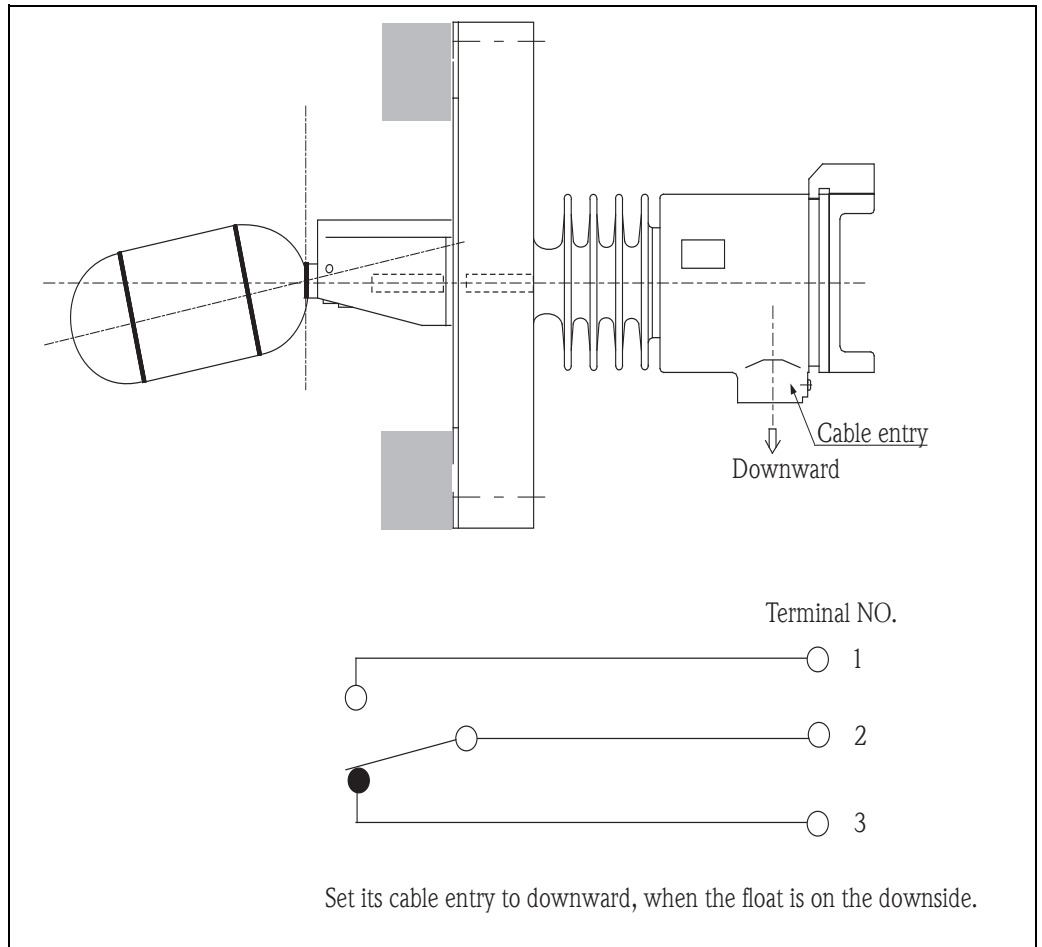


### 3.4.3 External chamber type installation

CS5613

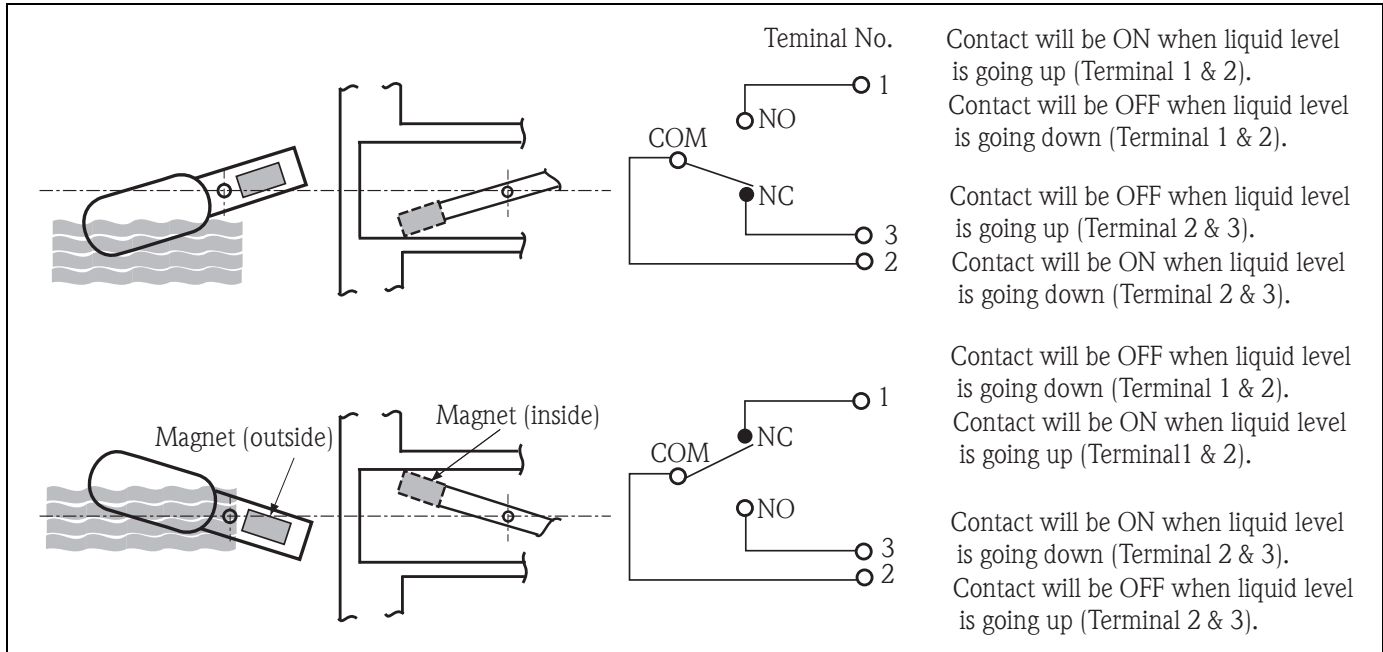


# 4 Wiring



## 5 Operating

Liquid level variation in a tank is detected with a float. Microswitch is activated with repulsive force produced between magnets attached to the float and the magnets arranged inside the housing. Operating signals are emitted as contact ON/OFF signals. Wiring is completed as shown in the diagrams below. External output wiring is made so that it forms NO or NC circuit depending on utilization mode of the signals.



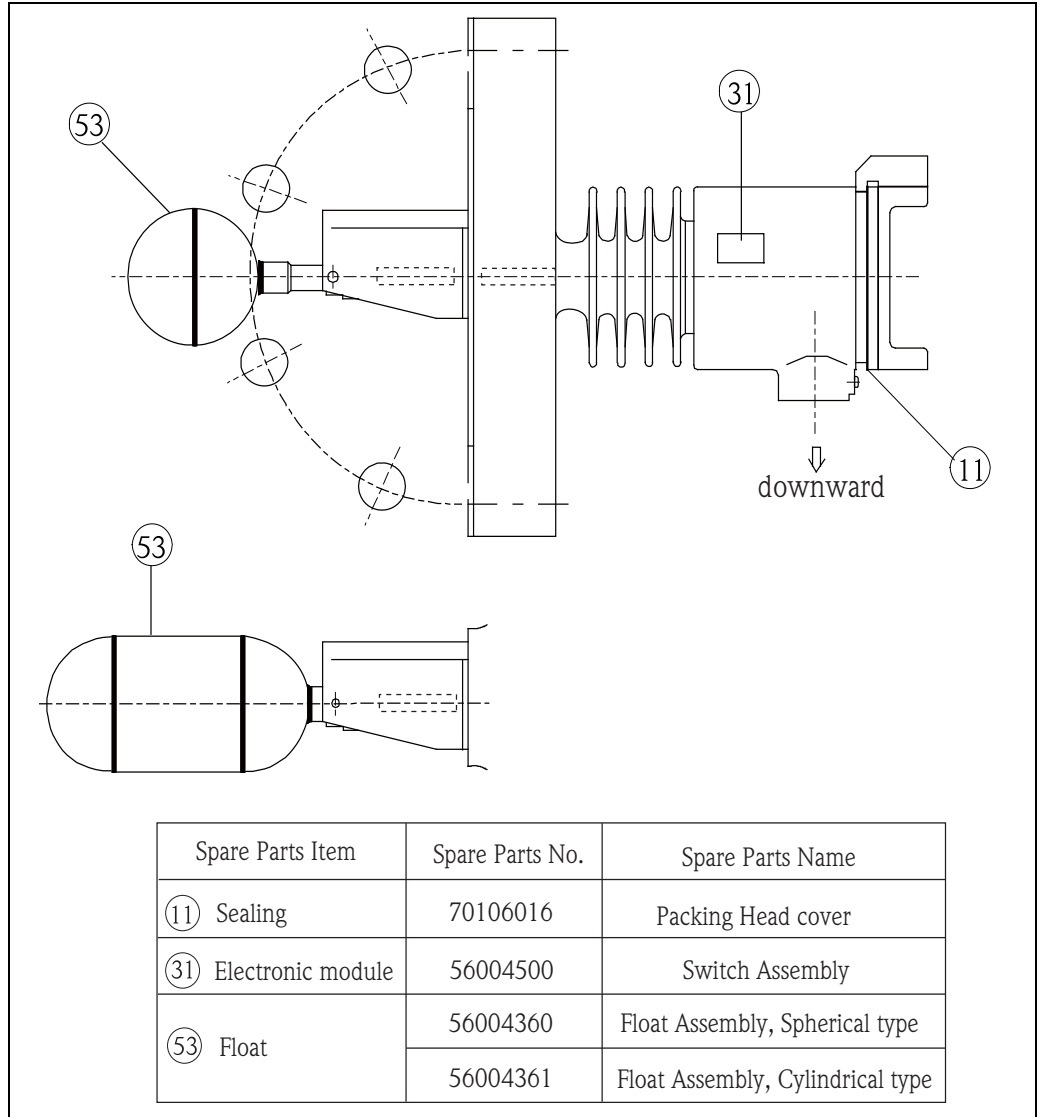
## 6 Maintenance

The level switch requires no particular operation or maintenance. However, when it is used for measuring a viscous liquid, the float should be cleaned and the inspection should be performed at the same time.

## 7 Troubleshooting

### 7.1 Spare Parts

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



## 7.2 Troubleshooting

Symptom	Possible cause	Corrective measure
Signal does not switch	<ul style="list-style-type: none"> <li>■ Microswitch is defective</li> </ul>	<ul style="list-style-type: none"> <li>■ Disassemble and replace micro-switch</li> </ul>
	<ul style="list-style-type: none"> <li>■ Float is submerged</li> </ul>	<ul style="list-style-type: none"> <li>■ Replace the float</li> </ul>
	<ul style="list-style-type: none"> <li>■ Float shaft is seized</li> </ul>	<ul style="list-style-type: none"> <li>■ Disassemble and remove the adhering iron powder</li> </ul>
	<ul style="list-style-type: none"> <li>■ Float is immovable due to iron powder accumulated around the magnet</li> </ul>	<ul style="list-style-type: none"> <li>■ Disassemble and remove the adhering iron powder</li> <li>■</li> </ul>
	<ul style="list-style-type: none"> <li>■ Internal wire is shortened or broken</li> </ul>	<ul style="list-style-type: none"> <li>■ Require complete overhaul</li> </ul>

## 7.3 Return

The following procedures must be carried out before the instrument 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

Ambient temperature	-10...+60°C (in case of liquid freezing, it is unmeasurable)		
Measured liquid temperature	-20...+350°C (in case of liquid freezing, it is unmeasurable)		
Float shape		Spherical	Cylindrical
		±5mm ( $\rho = 1\text{g/cm}^3$ )	±8mm ( $\rho = 0.8\text{g/cm}^3$ )
	Hysteresis	10mm ( $\rho = 1\text{g/cm}^3$ )	16mm ( $\rho = 0.8\text{g/cm}^3$ )
	Measured liquid specific density	$\geq 0.65\text{g/cm}^3$	$\geq 0.45\text{g/cm}^3$
	Maximum allowable working pressure	4.90 MPa (at 200°C max.)	2.35 MPa (at 100°C max.)
	Containment temperature	-20...350°C (at 4.41MPa max.)	-20...350°C (at 1.96MPa max.)
	Measured liquid specific density	0.45... 2.0g/cm <sup>3</sup>	
Protection class	Flame proof TIIIS, d2G4		
Protection class	IP65		
Installation	10K 80A RF, flange JIS B2220 10K 100A RF, flange JIS B2220 20K 80A RF, flange JIS B2220 20K 100A RF, flange JIS B2220 3" 150lbs RF, flangeANSI B16.5 4" 150lbs RF, flangeANSI B16.5 3" 300lbs RF, flangeANSI B16.5 4" 300lbs RF, flangeANSI B16.5		
material	Float (cylindrical, spherical):SUS316 flange: SUS304, SUS316 Housing: SCS13, AC4CT6 Cover: AC4A		
Contact capacity	AC250V, 5A (resistance load) DC125V, 0.3A (resistance load)		
Contact arrangement	SPDT (microswitch)		
Cable entry	PF(G)1/2		
Weight	Approx. 7.5kg (CS5603 : 10K 80A RF, flange JIS B2220)		
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)

							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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)

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Endress + Hauser Japan Co., Ltd.  
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**Endress+Hauser**   
People for Process Automation