



Cert. No. LRQ 0963008

ISO 9001

# spirax sarco

TI-P324-02  
CH Issue 1

## Colima TOR Series Magnetic Level Switches

### Description

Magnetic-activated level switches for controlling liquid levels in most industrial applications.  
Instruments with rigid rod for vertical installation.  
Used for full automation of control management, including pressurised tanks, tubs, boilers and for the control of pumps, valves and alarm systems.


### Regulations and certifications


Instruments compliant with the European Directive ATEX 94/9/EC. RINA, Lloyd Register and M.M.I. approved.


### Available types







Type **TOR A** made entirely of stainless steel, with weatherproof housing and thread connection.

<b>TOR</b>		<b>A</b>
	<p>Type <b>A</b> is recommended for most industrial applications. All wetted parts are made totally of stainless steel.</p> <p>Type <b>A</b> is equipped with reed switches, which allows control of up to six switching points with a single instrument.</p> <p>Type <b>A</b> is equipped with a potentiometer transmitter allowing continuous reading of liquid level.</p>	

<b>TOR</b>		<b>B</b>
	<p>Type <b>B</b> is recommended for liquids with low specific weight such as hydrocarbons and mineral oils. Floats are made of BUNA N, the other wetted parts are made entirely of stainless steel.</p> <p>Type <b>B</b> is equipped with reed switch contacts, which allows the control of up to six switching points with a single instrument.</p> <p>Type <b>B</b> is equipped with a potentiometer transmitter allowing the continuous reading of the liquid level.</p>	

<b>TOR</b>		<b>PC</b>
	<p>Type <b>PC</b> is recommended for corrosive liquids, such as acids and brines, where the use of stainless steel is not recommended.</p> <p>All wetted parts are made entirely of PVC-Polyvinylchloride.</p> <p>Type <b>PC</b> is equipped with reed switch contacts, which allows the control of up to six switching points with a single instrument.</p> <p>Type <b>PC</b> is equipped with a potentiometer transmitter allowing the continuous reading of the liquid level.</p>	

<p><b>TOR</b></p>  <p>Type <b>PP</b> is recommended for corrosive liquids, such as acids and brines, where the use of stainless steel is not recommended. All wetted parts are made entirely of PP-Polypropylene. Type <b>PP</b> is equipped with reed switches, which allow control of up to six switching points with a single instrument. Type <b>PP</b> is equipped with a potentiometer transmitter allowing continuous reading of liquid level.</p>	<b>PP</b>	<p><b>Mounting</b></p> <p>The TOR series level switches are installed vertically on the top of the tank or externally in a chamber connected to the tank.</p> <p><b>Manufacturing characteristics</b></p> <p>Materials and sizing are defined in relation to the characteristics of the liquid and the project conditions.</p> <p><b>Housings</b></p> <p>Protection degree IP67 and IP68 on request. For general applications in weatherproof execution. For hazardous areas in explosion-proof execution ATEX  II 1/2 G EEx d IIC T6, T5 resp. T4 certified. Only for TOR CD DIN IP64 connector.</p> <p><b>Electrical equipment</b></p> <p>SPST SPDT DPDT (two simultaneous SPDT contacts)</p>				
<p><b>TOR</b></p>  <p>Type <b>PF</b> is recommended for corrosive liquids, such as acids and brines, where the use of stainless steel is not recommended. All wetted parts are made entirely of PVDF-Polyvinylidene fluoride. The <b>PF</b> is equipped with reed switch contacts, which allows control of up to six switching points with a single instrument. The <b>PF</b> is equipped with a potentiometer transmitter allowing continuous reading of liquid level.</p>	<b>PF</b>	<p><b>Potentiometer transmitter</b></p> <p>Reed switch chain transmitter with divisions reading every 5, 10, 20 mm. Converter for output signal 4÷20 mA, Available for safe areas or ATEX EEx-i certified approved for plants. Also available with Hart® protocol. Can only be used with types A - B - PC - PP - PF.</p> <p><b>Operating principle</b></p> <p>One or more magnetic contacts (reed switches) or a reed switch 'chain' potentiometer transmitter are placed inside a sealed vertical tube, joined to the locking system.</p> <p><b>Contacts</b></p> <p>One or more floats, free to slide along the guide tube depending on the liquid level inside the tank, acting magnetically on contacts placed at the operation point, switching their status from normally open (NO) to normally closed (NC) position or vice versa. Switching points are always field adjustable.</p>				
<p><b>TOR</b></p>  <p>The compact type <b>CD</b> is recommended for applications in hydraulic control units. It can also be used with liquids with low specific weight such as hydrocarbons and mineral oils. The floats are made of stainless steel or BUNA N, the other wetted parts are made of stainless steel. The compact type <b>CD</b> can be equipped with reed switch contacts, allowing control of up to two switching points with a single instrument. In place of the housing, a three-pin DIN connector with flying plug is used.</p>	<b>CD</b>	<p><b>Transmitter</b></p> <p>A float, free to slide along the guide tube depending on the liquid level inside the tank, acts magnetically on the transmitter. The level is continuously transmitted.</p> <p><b>Length of rod</b></p> <table data-bbox="821 1512 1220 1579"> <tbody> <tr> <td>Minimum length</td> <td>100 mm</td> </tr> <tr> <td>Maximum length</td> <td>5000 mm</td> </tr> </tbody> </table>	Minimum length	100 mm	Maximum length	5000 mm
Minimum length	100 mm					
Maximum length	5000 mm					

### Wetted parts

	Flanged or threaded						Float							
Steel	A105	1	304LSS	2	316LSS	3	316LSS	A	Titanium	B	Monel	C	Hastelloy	D
Plastic	PVC	4	PP	5	PVDF	6	PVC	E	PP	F	PVDF	G	Buna N	H

### Float diameters to be used with flanged type

Steel	Ø44	44	Flanges ≥ DN50 - 2" ASME (ANSI)	Ø55	55	Flanges ≥ DN65 - 2½" ASME (ANSI)
				Ø72	72	Flanges ≥ DN80 - 3" ASME (ANSI)
Buna N	Ø44	44	Flanges ≥ DN50 - 2" ASME (ANSI)	Ø58	58	Flanges ≥ DN65 - 2½" ASME (ANSI)
Plastic	Ø70	70	Flanges ≥ DN80 - 3" ASME (ANSI)			

### Float diameters to be used with threaded type

Steel	Ø44	44	Thread ≥ G 1½" M (NPT not applicable)	Ø55	55	Thread ≥ G 2" M (NPT non applicable)
				Ø72	72	Thread ≥ G 3" M
Buna N	Ø30	30	Thread ≥ G 1" M	Ø58	58	Thread ≥ G 2½" M
	Ø44	44	Thread ≥ G 1½" M			
Plastic	Ø70	70	Thread ≥ G 2½" M			

**Note:** the size of the float is subject to fluid specific gravity; the sizes shown are for standard floats. Other sizes can be made on request.

### Process connections

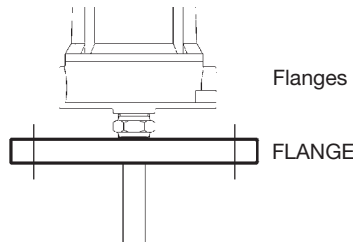
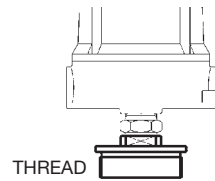
UNI and ASME (ANSI) flanges **FL**

UNI	PN6	PN10/PN16		PN40	PN64
DN50	UA	UB		UC	UD
DN65	UE	UF		UG	UH
DN80	UI	UL	UM	UN	UO
DN100	UP	UQ		UR	US
DN125	UT	UU		UV	UZ

ASME	150	300	600
2"	AA	AB	AC
2½"	AD	AE	AF
3"	AG	AJ	AH
4"	AI	AL	AM
5"	AN	AO	AP

Threads **FI**

G M	
1½"	FA
2"	FB
2½"	FC
3"	FD
4"	FE

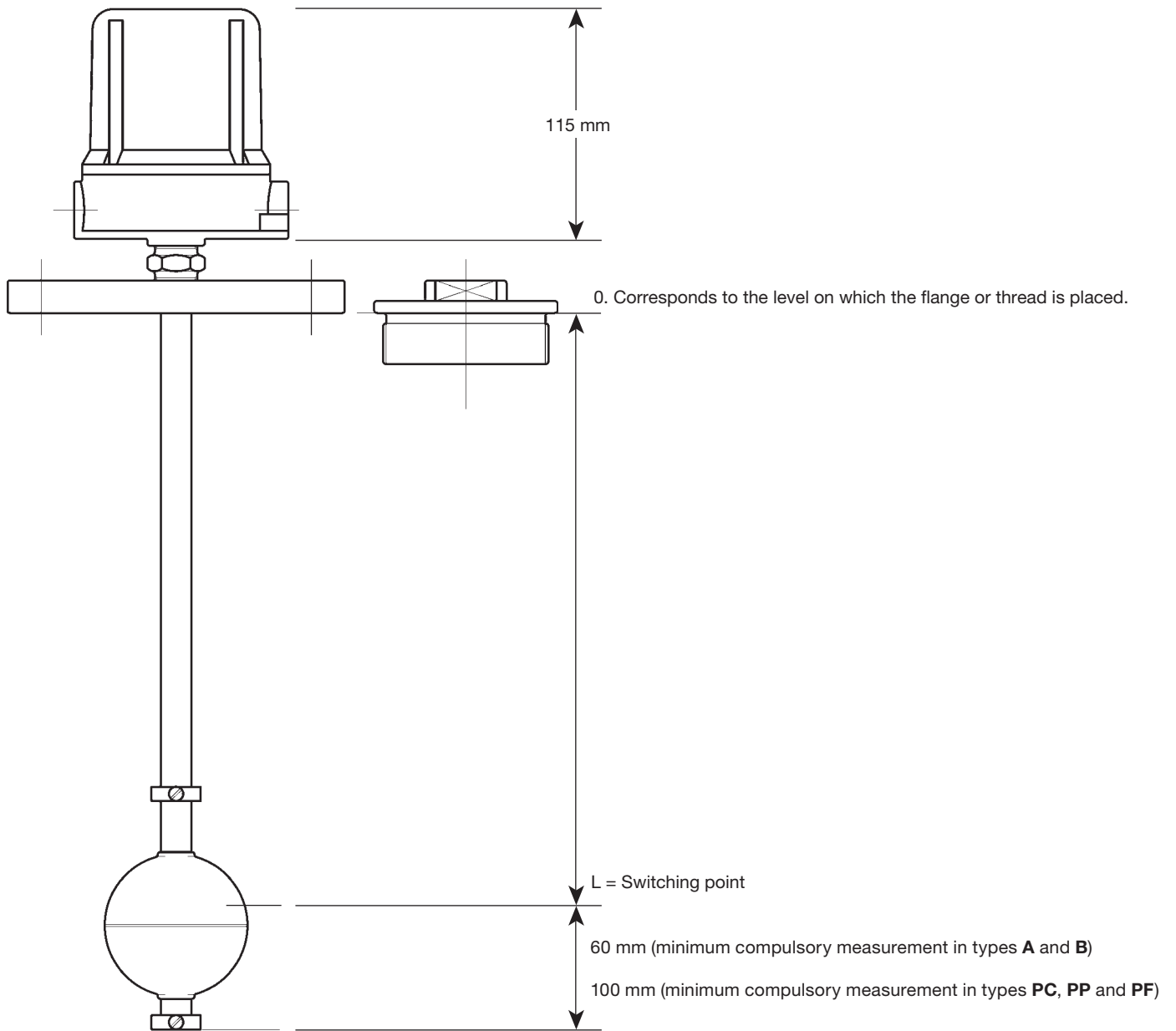


Flanges and threads are available in other sizes on request.

### Design conditions

TMA - Maximum allowable temperature	Steel	-110 to +200°C	
	Buna N	-20 to +80°C	
	Plastic	PVC	-20 to +70°C
		PP	-20 to +105°C
PMA - Maximum allowable pressure	PVDF	-20 to +130°C	
	Steel	< 100 bar g	
	Buna N	< 16 bar g	
Fluid specific gravity	Plastic	< 16 bar g	
	Steel and plastic	> 0.8 kg/l	
Differential	Buna N/Titanium	> 0.5 kg/l	
		fixed 8 mm	

Type **TOR A** with weatherproof housing, steel float and a reed switch contact



# Colima electrical equipment and housings for Colima TOR series magnetic level switches

## Description

The electrical equipment in TOR series magnetic level switches comprises one or more reed switch contacts, fitted inside a sealed stainless steel tube.

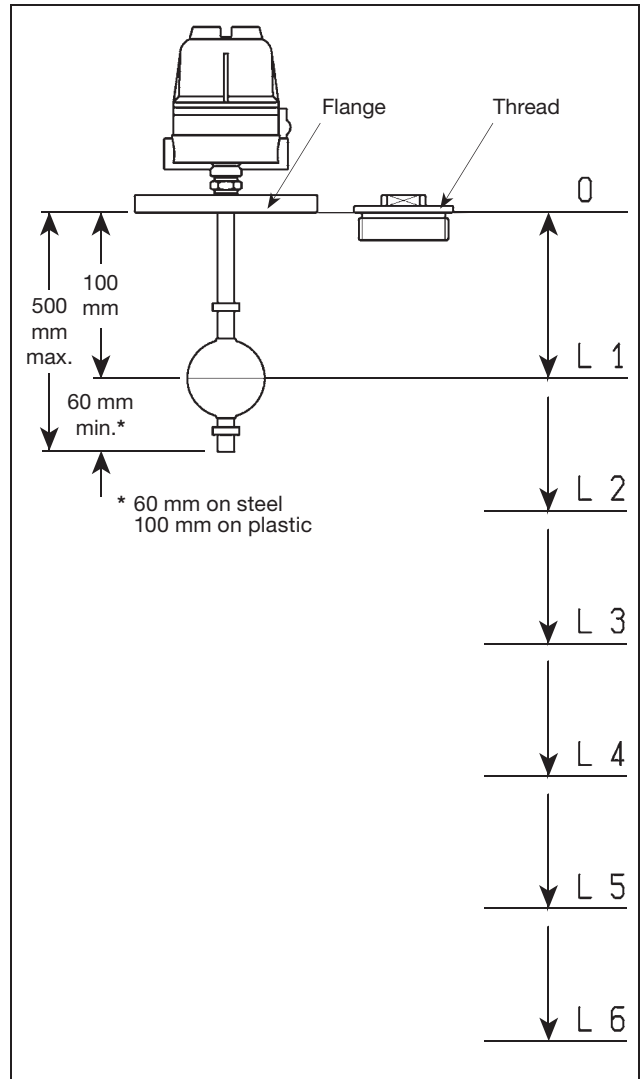
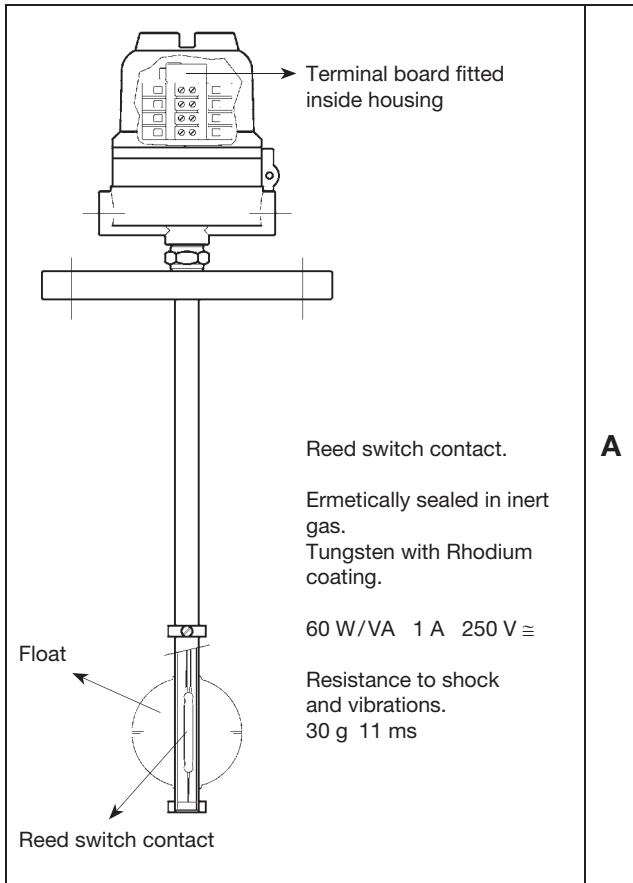
Wires are welded to the contacts connected to the terminal board inside the housing.

Contacts are activated by floats that slide along the tube. The floats contain a magnetic system that, when the level of liquid rises or falls, switch the state of each contact quickly and reliably.

The position of the contacts at the required switching points are set in the factory but is always field adjustable.



## Reed switch contact characteristics



SPDT execution	1
DPDT execution (two simultaneous SPDT contacts)	2

## Wiring diagram

### Maximum number of contacts per instrument

The terminal board inside the housing can connect a maximum number of 18 cables.

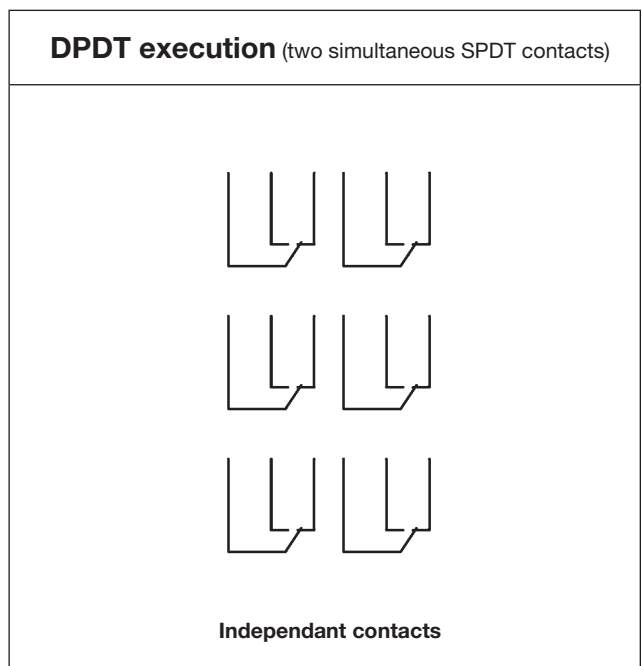
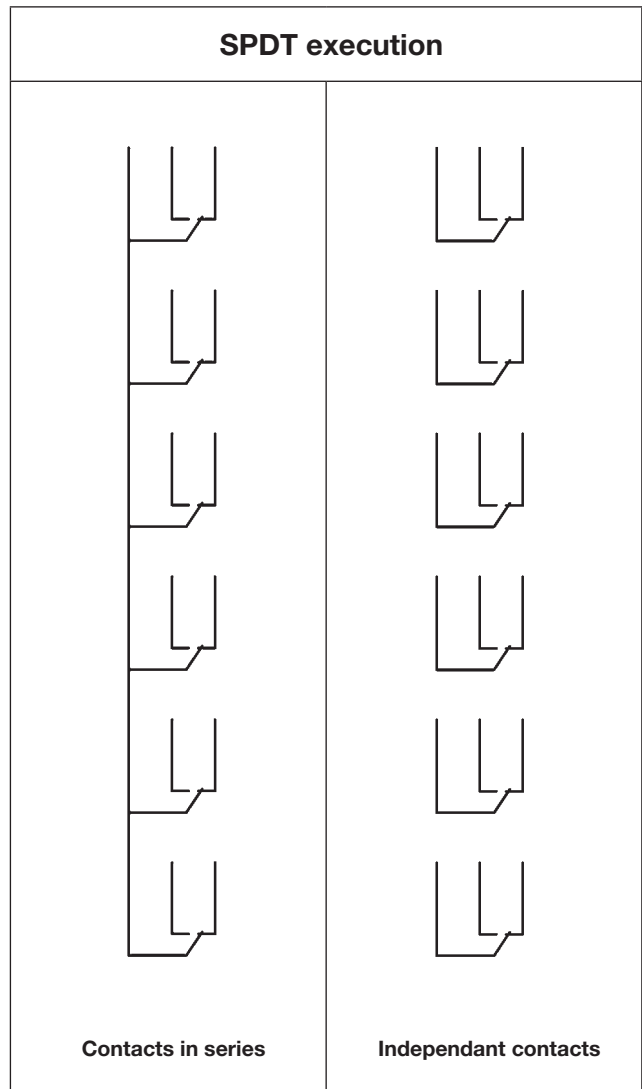
Each contact has the following number of wires:

- 3 wires in **SPDT** contacts
- 6 wires in **DPDT** contacts

The various possible combinations of contacts must be taken into account:

(Example of how many contacts can be installed in one instrument:

- 6 SPDT or
- 2 SPDT + 2 DPDT or
- 5 SPDT or
- 4 SPDT + 1 DPDT etc.).



### Potentiometer transmitter characteristics

A potentiometer, a device comprising a printed circuit board on which a reed/resistance chain is welded, is placed inside the float's vertical guide tube.

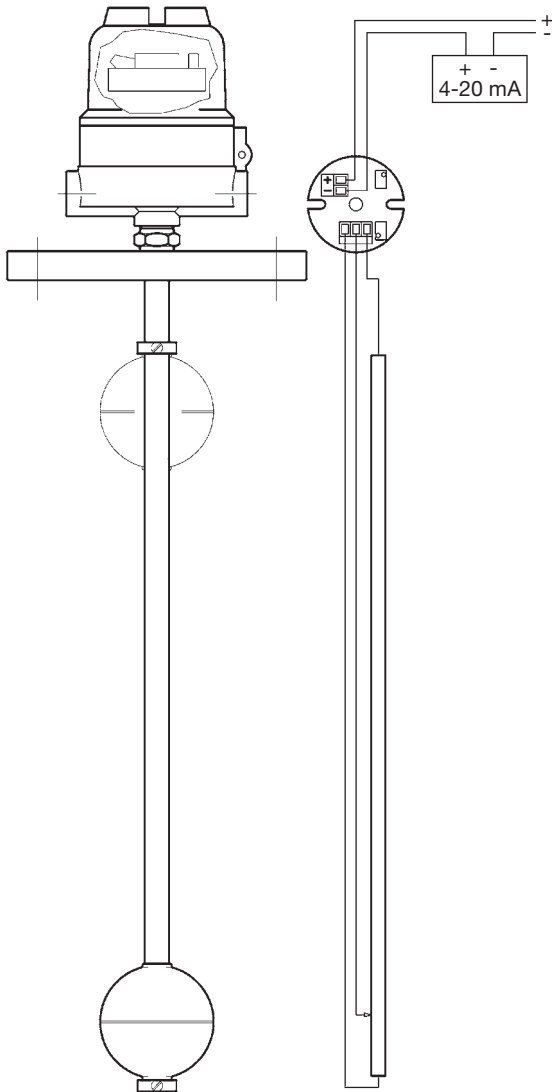
The total resistance of a known value is measured at the ends of this potentiometer.

The float, following the liquid level trend, activates the potentiometer's reed contact chain through its own magnetic field, locally closing the signal.

The total value of the resistance, is measured 100% at its maximum level and 0% at its minimum level.

The end poles of the potentiometer are connected to a converter that transforms the input value into Ohm and the output into mA.

Reading resolution available: 5, 10, 20 mm  
Resistance input  $1\text{ k} \div 100\text{ k Ohm}$ .



T

### Converter characteristics

The Ohm-mA signal converters are inside the housing.

Three types of converter are available:

- Converter for safe zone
- Converter for inbuilt safety zone, ATEX certified.
- Converter suitable for HART® protocol

Resistance input  $1\text{ k} \div 100\text{ k Ohm}$

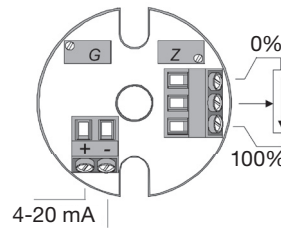
Current output  $4 \div 20\text{ mA}$

Type 1 and 2 converters can be field set using two trimmers [for the Z (zero) gauging and G (Gain) gauging], without resorting to interconnecting systems.

The type 3 converter must be regulated with an interconnection cable.

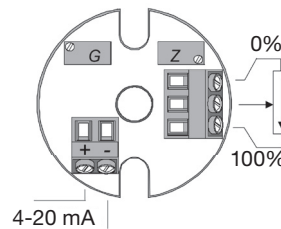
C

#### Converter for safe zone



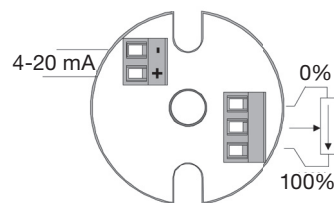
1

#### Converter for inbuilt safety zone




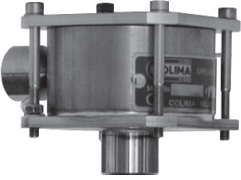

2

#### Converter for HART® protocol



3

The TOR series magnetic level switch housings are available in various forms to meet all possible application needs and are suited to most environmental and safety conditions. They are available in the normal version for general use and the explosion-proof version for use in hazardous areas.

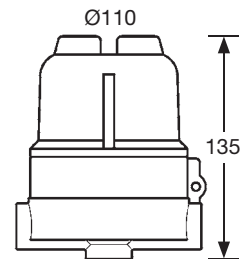
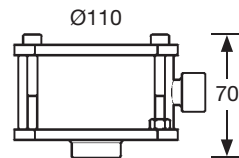
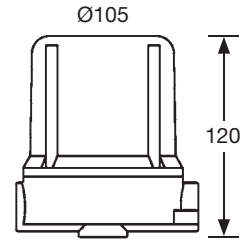
<p><b>Weatherproof housing</b></p>  <p>Type 1 is designed for use on general purpose industrial applications. Manufactured using pressure die-cast aluminium and protected with polyamide paint. Protection degree IP67. Up to two cable entrances.</p>	<b>1</b>
<p><b>Weatherproof housing</b></p>  <p>The type 2 has been designed for lower temperature applications, installation in high concentration saline environments and for use in the food industry. Manufactured entirely in stainless steel. Protection degree IP67. On request IP68. Up to two cable entrances.</p>	<b>2</b>
<p><b>Explosion-proof housing</b></p>  <p>The type 3 has an explosion-proof housing - ATEX certified <math>\text{II 1/2 G EEx d IIC T6, T5}</math> resp. T4 for use in hazardous areas. Manufactured using pressure die-cast aluminium with a polyamide paint. Protection degree IP67. Up to two cable entrances.</p>	<b>3</b>

**Electrical connections**

The housings allow for two cable entry points which are available as follows:

Standard	G 1/2" F	<b>A</b>
Explosion-proof	Gk 1/2" F	<b>B</b>
On request	1/2" NPT F	<b>C</b>
	M20 x 1.5	<b>D</b>
	PG 13.5	<b>E</b>

**Dimensions (approximate) in mm**





## Product selection and order placement

Each unit is identified by a unique alphanumeric code that defines the manufacturing characteristics that best suites the application.

Range	Colima		Colima
<b>Model</b>	<b>T</b>	TOR	<b>T</b>
<b>Type</b>	<b>A</b>	Wetted parts stainless steel	<b>A</b>
	<b>B</b>	Wetted parts stainless steel, float BUNA N	
	<b>PC</b>	Wetted parts PVC	
	<b>PP</b>	Wetted parts PP	
	<b>PF</b>	Wetted parts PVDF	
	<b>CD</b>	Miniature type without housing, DIN connector with plug	
<b>Housing</b>	<b>1</b>	IP67 General purpose	<b>1</b>
	<b>2</b>	IP67 Stainless steel	
	<b>3</b>	ATEX certified	
<b>Electrical connections</b>	<b>1</b>	G 1/2" F	<b>1</b>
	<b>2</b>	Gk 1/2" F	
	<b>3</b>	1/2" NPT F	
	<b>4</b>	M20 x 1.5	
	<b>5</b>	PG 13.5	
<b>Connections</b>	<b>F</b>	Flanged connection	<b>F</b>
	<b>T</b>	Thread connection	
<b>Flange or thread material</b>	<b>1</b>	A 105 stainless steel	<b>2</b>
	<b>2</b>	304 stainless steel	
	<b>3</b>	316L stainless steel	
	<b>4</b>	PVC	
	<b>5</b>	PP	
	<b>6</b>	PVDF	
<b>Flange or thread rating</b>	Refer to page 3		<b>UA</b>
<b>Float material</b>	<b>A</b>	316 stainless steel	<b>B</b>
	<b>B</b>	Titanium	
	<b>C</b>	Monel	
	<b>D</b>	Hastelloy	
	<b>E</b>	PVC	
	<b>F</b>	PP	
	<b>G</b>	PVDF	
	<b>H</b>	BUNA N	
<b>Float diameter</b>	<b>44</b>	Ø 44 steel (>DN50 - 2" ASME)	<b>72</b>
	<b>55</b>	Ø 55 steel (>DN65 - 2 1/2" ASME)	
	<b>72</b>	Ø 72 steel (>DN80 - 3" ASME)	
	<b>44</b>	Ø 44 Buna N (>DN50 - 2" ASME)	
	<b>58</b>	Ø 58 Buna N (>DN65 - 2 1/2" ASME)	
	<b>55</b>	Ø 55 plastic (>DN65 - 2 1/2" ASME)	
	<b>70</b>	Ø 70 plastic (>DN80 - 3" ASME)	
<b>Float number</b>	from 1 up to 6		<b>2</b>
<b>Electrical equipment switches</b>	<b>1</b>	SPDT	<b>2</b>
	<b>2</b>	DPDT	
<b>SPDT contact number</b>	from 1 up to 6		
<b>DPDT contact number</b>	from 1 up to 3		
<b>Electrical equipment transmitter</b>	<b>T5</b>	5 mm	<b>T10-C3</b>
	<b>T10</b>	10 mm	
	<b>T20</b>	20 mm	
	<b>C3</b>	Converter for safe area	
	<b>C4</b>	Converter for in built safe area	
	<b>C5</b>	Converter Hart® protocol	

**How to order example:** 1 off Spirax Sarco Colima T-A-1-1-F-2-UA-B-72-2-2-T10-C3