

INSTRUCTION MANUAL

Magnetostrictive Level Transmitter

CZ80 Series



SILVER AUTOMATION INSTRUMENTS

Important Notes

Read this manual carefully before using the product. The supplier does not provide free repair for damage caused by operation contrary to this manual or by improper use.

Before ordering or installation, check the site conditions and read this manual. Make sure the ambient temperature, shock, vibration, pressure and installation dimensions at site are within the permitted range of the level transmitter. The purchaser or user is responsible for the application, corrosion protection and function selection. The ordered product must match the operating conditions.

CAUTION

1. Do not bend the probe. The transmitter head and the probe end must not be exposed to strong impact or vibration.
2. Do not use the transmitter directly in applications with chemical reactions, or with flammable, explosive or corrosive media, steam or liquids that may damage it. Provide protective measures where necessary.
3. Do not replace components or modify the structure of explosion-proof certified products.
4. Do not disassemble the instrument.
5. Protect the transmitter head. Use a protective cover for outdoor installation.
6. Route the shielded cable away from high-power supplies, RF signal sources and other noisy transmission lines.
7. Before wiring, check the power supply of the ordered instrument and wire carefully. Do not reverse the polarity.

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1 Overview

The magnetostrictive level transmitter provides continuous measurement of liquid level, interface level and multi-point temperature.

Typical applications include level measurement and control in tanks for:

- Petroleum and chemical raw material storage
- Industrial processes
- Biochemical, pharmaceutical, food and beverage industries
- Tank farm management and underground fuel storage at filling stations
- Dam and reservoir water level monitoring
- Wastewater treatment

2 Features

- **High accuracy and resolution:** 32-bit microprocessor.
- **Multi-parameter measurement:** level, interface and 1 to 5 point temperature.
- **Local display:** industrial LCD with backlight.
- **Safety:** flameproof design.
- **Long service life:** stainless steel probe with good pressure and corrosion resistance.
- **High reliability:** sealed construction, non-contact sensing, no mechanical wear.
- **Easy installation and maintenance:** sliding flange connection, adjustable insertion length, maintenance-free.
- **Automation ready:** digital and analog outputs.

3 Operating Principle

The sensing part consists of a stainless steel rigid rod or flexible probe, a magnetostrictive wire (waveguide) and a movable float with industrial-grade permanent magnets inside. See Figure 1.

In operation, the electronics send a current pulse along the waveguide. This pulse generates a magnetic field around the waveguide. The float moves up and down along the probe with the liquid level and contains a set of permanent magnet rings.

Where the pulse field meets the float magnet field, the combined field produces a torsional strain pulse in the magnetostrictive waveguide at the float position. This pulse travels back along the waveguide at a fixed speed and is detected by the electronics.

The time between the current pulse and the returning torsional pulse gives the exact float position, which is the liquid level.

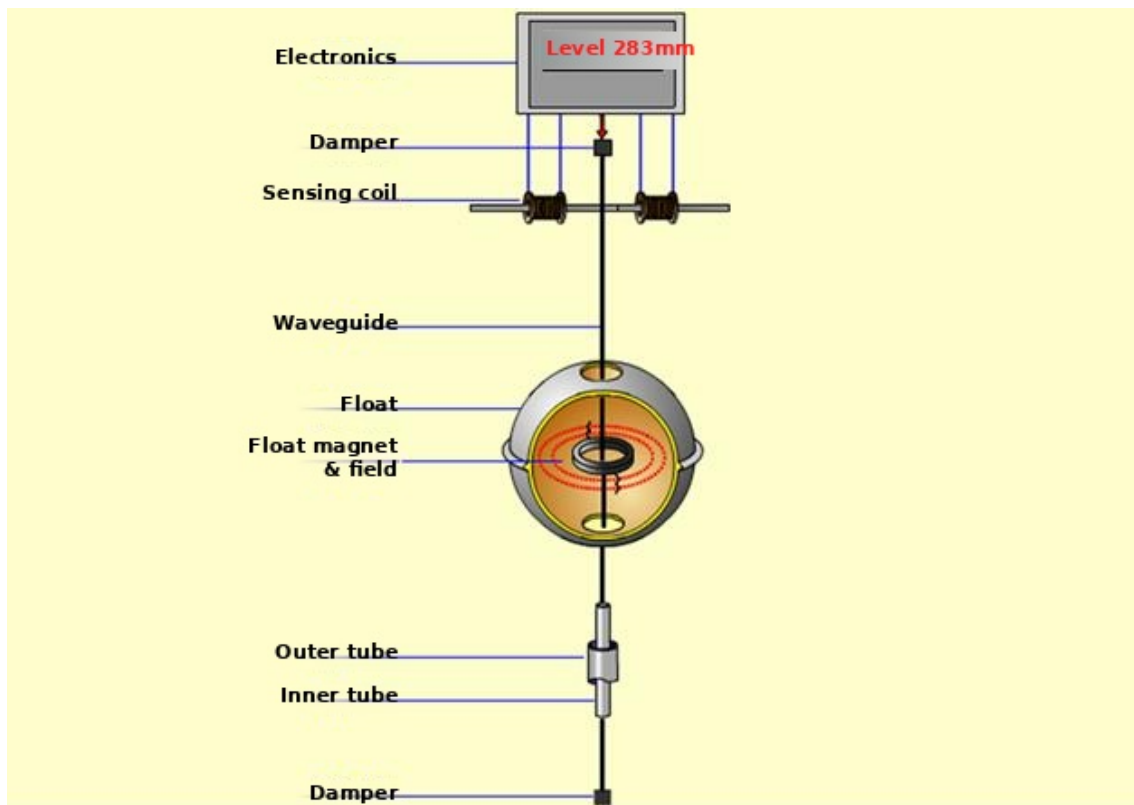


Figure 1. Structure of the magnetostrictive level transmitter

4 Product Models

The CZ80 series includes six models for different measuring tasks and process conditions. Each model is described on the following pages.

Model	Type	Measured variable
CZ-81	Single Parameter	Single level (or interface)
CZ-82	Multi-Parameter	Level, interface and 1 to 5 point temperature
CZ-83	High Pressure Type	Level, interface and 1 to 5 point temperature
CZ-84	High Temperature Type	Level, interface and 1 to 5 point temperature
CZ-85	Flexible Cable Type	Digital output (RS-485): level, interface, multi-point temperature; Analog output (4-20 mA): level or interface
CZ-86	Strap-on Type	Single level (or interface)

4.1 CZ-81 Single Parameter



Measured variable	Single level (or interface)
Application	Small and medium tanks, pools and water tanks
Wetted material	Stainless steel, PTFE, titanium alloy
Range	0 to 4000 mm rigid rod
Accuracy	±0.5 mm
Resolution	0.1 mm
Ambient temperature	-25 °C to 70 °C
Process temperature	-20 °C to 135 °C
Process pressure	-0.1 MPa to 2.5 MPa
Electrical connection	3/4" NPT, 1/2" NPT
Power supply	24 VDC / 220 VAC
Output	RS-485 digital (standard Modbus RTU) 4-20 mA analog (3-wire; 4-wire with two level current outputs) 4-20 mA + HART (2-wire)
Process connection	M24×1.5 thread; flange DN50 and above
Ex marking	Ex d IIC T4 Gb

4.2 CZ-82 Multi-Parameter



Measured variable	Level, interface and 1 to 5 point temperature
Application	Small and medium tanks and pools
Wetted material	Stainless steel, PTFE, titanium alloy
Range	0 to 4000 mm rigid rod
Accuracy	±0.5 mm
Resolution	0.1 mm
Ambient temperature	-25 °C to 70 °C
Process temperature	-20 °C to 135 °C
Process pressure	-0.1 MPa to 2.5 MPa
Electrical connection	3/4" NPT, 1/2" NPT
Power supply	18 to 36 VDC
Output	RS-485 digital (standard Modbus RTU): level, interface, 1 to 5 point temperature and average temperature 4-20 mA analog (3-wire: level output; 4-wire: level and interface outputs)
Process connection	M24×1.5 thread; flange DN50 and above
Ex marking	Ex d IIC T4 Gb

4.3 CZ-83 High Pressure Type



Measured variable	Level, interface and 1 to 5 point temperature
Application	High-pressure and ultra-high-pressure vessels
Wetted material	Titanium alloy
Range	0 to 4000 mm rigid rod (custom float)
Accuracy	±0.5 mm
Resolution	0.1 mm
Ambient temperature	-25 °C to 70 °C
Process temperature	-20 °C to 135 °C
Process pressure	-0.1 MPa to 10 MPa
Electrical connection	3/4" NPT, 1/2" NPT
Power supply	18 to 36 VDC
Output	RS-485 digital (standard Modbus RTU): level, interface, 1 to 5 point temperature and average temperature 4-20 mA analog (3-wire: level output; 4-wire: level and interface outputs)
Process connection	M24×1.5 thread; flange DN50 and above
Ex marking	Ex d IIC T4 Gb

4.4 CZ-84 High Temperature Type



Measured variable	Level, interface and 1 to 5 point temperature
Application	Small and medium tanks and pools
Wetted material	Stainless steel
Range	0 to 4000 mm rigid rod (custom float)
Accuracy	±0.5 mm
Resolution	0.1 mm
Ambient temperature	-25 °C to 70 °C
Process temperature	-20 °C to 135 °C
Process pressure	-0.1 MPa to 10 MPa
Electrical connection	3/4" NPT, 1/2" NPT
Power supply	18 to 36 VDC
Output	RS-485 digital (standard Modbus RTU): level, interface, 1 to 5 point temperature and average temperature 4-20 mA analog (3-wire: level output; 4-wire: level and interface outputs)
Process connection	M24×1.5 thread; flange DN50 and above
Ex marking	Ex d IIC T4 Gb

4.5 CZ-85 Flexible Cable Type



Measured variable	Digital output (RS-485): level, interface, multi-point temperature Analog output (4-20 mA): level or interface
Wetted material	Stainless steel
Range	0 to 20000 mm flexible cable Temperature measurement: -55 °C to +135 °C
Accuracy	Level: $\pm(0.01\% \text{ FS} + 1) \text{ mm}$ Temperature: $\leq \pm 0.5 \text{ }^{\circ}\text{C}$
Resolution	0.1 mm
Ambient temperature	-25 °C to 70 °C
Process temperature	-20 °C to 135 °C
Process pressure	-0.1 MPa to 2.5 MPa
Electrical connection	3/4" NPT, 1/2" NPT
Power supply	24 VDC / 220 VAC
Output	RS-485 digital (standard Modbus RTU) 4-20 mA analog (3-wire; 4-wire with two level current outputs) 4-20 mA + HART (2-wire)
Process connection	M24×1.5 thread; flange DN50 and above
Ex marking	Ex d IIC T4 Gb

4.6 CZ-86 Strap-on Type



Measured variable	Single level (or interface)
Application	Small and medium tanks, pools and water tanks
Wetted material	Stainless steel, PTFE, titanium alloy
Range	0 to 4000 mm rigid rod
Accuracy	±0.5 mm
Resolution	0.1 mm
Ambient temperature	-25 °C to 70 °C
Process temperature	-20 °C to 135 °C
Process pressure	-0.1 MPa to 2.5 MPa
Electrical connection	3/4" NPT, 1/2" NPT
Power supply	24 VDC / 220 VAC
Output	RS-485 digital (standard Modbus RTU) 4-20 mA analog (3-wire; 4-wire with two level current outputs) 4-20 mA + HART (2-wire)
Process connection	M24×1.5 thread; flange DN50 and above
Ex marking	Ex d IIC T4 Gb
Ex certificate No.	CE18.1636X

5 Installation

5.1 Rigid Rod Probe

- Install the probe vertically. The inclination must not exceed 5°.
- There are dead zones at both ends of the probe.
- When fixing the locking ring, its lower end must be flush with the bottom end of the rod.
- This method suits most liquid tanks. Use the flange supplied by the manufacturer or a user-specified flange, and screw the transmitter thread directly into the flange.

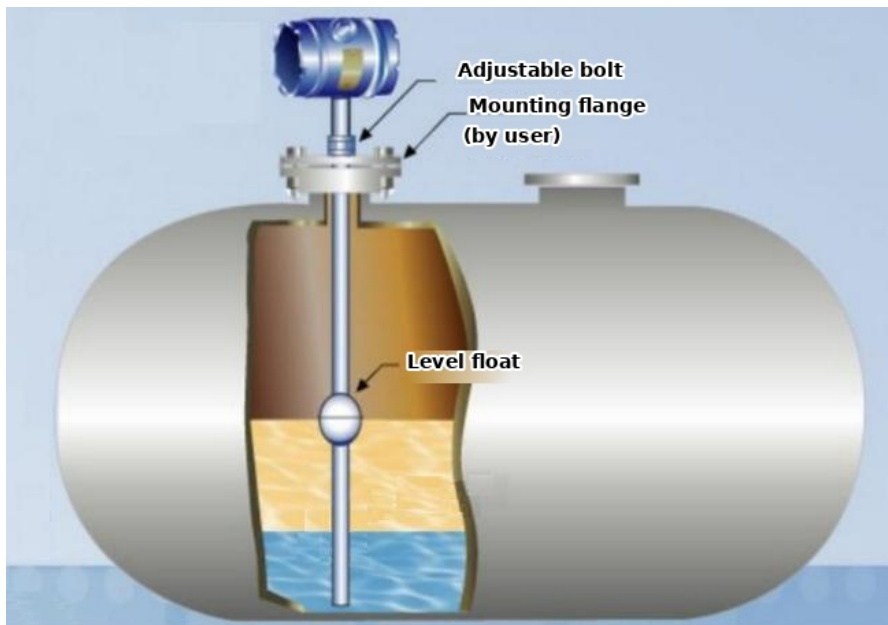


Figure 2. CZ81 installation

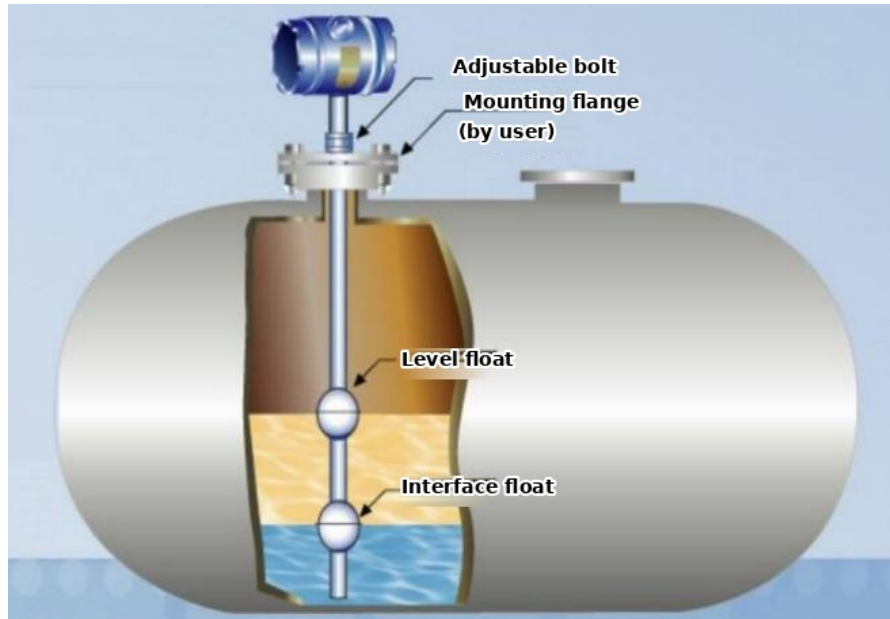


Figure 3. CZ82 installation

5.2 Flexible Probe

- The flexible probe is mounted by thread or flange.
- Install the probe vertically. The inclination must not exceed 5°.
- There are dead zones at both ends of the probe. A weight is fitted at the probe end.

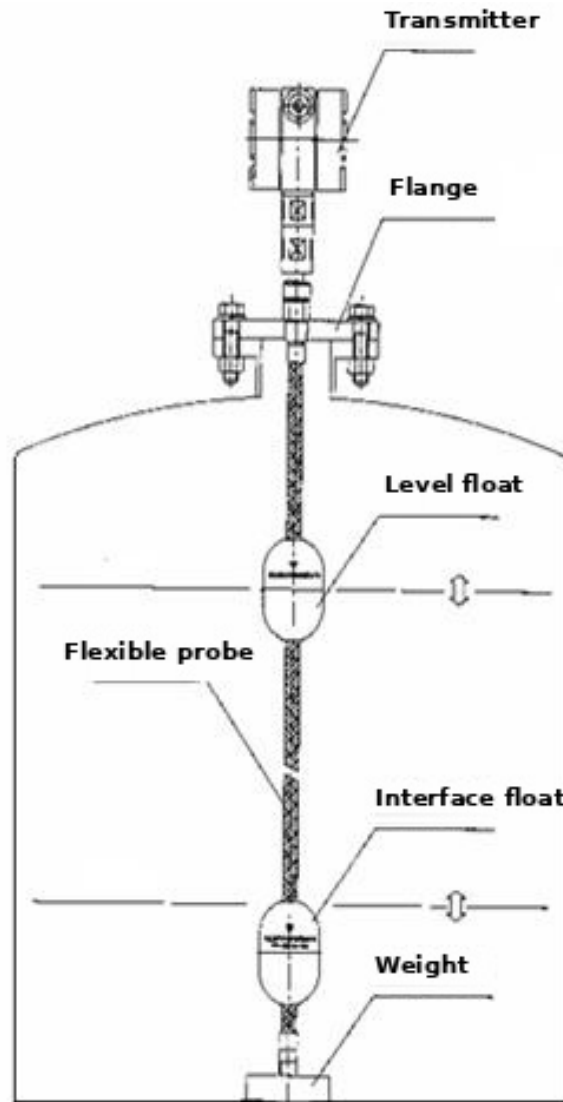


Figure 4. CZ85 installation

6 Technical Specifications

6.1 General

Power supply	18 to 36 VDC
Ambient temperature	-40 °C to +80 °C

6.2 Performance

Measuring range	CZ81/82/83/84/86: 150 mm to 6000 mm CZ85: up to 20000 mm
Output	RS-485 digital (standard Modbus RTU) 4-20 mA analog (3-wire; 4-wire with two level current outputs) 4-20 mA + HART (2-wire)
Linearity	Better than $\pm 0.05\%$ FS
Repeatability	Better than $\pm 0.002\%$ FS
Output temperature drift	50 ppm/°C
Current consumption	≤ 50 mA
Output ripple	≤ 20 mV
Dead zone	CZ81/82/83/84: top min. 18 mm, bottom min. 18 mm CZ85/86: top 100 mm, bottom 300 mm (for Ø51 mm float)
Load capacity	4-20 mA output: $\leq 500 \Omega$

6.3 Other Specifications

Probe material	SS304, SS316L, PTFE, or custom
Housing material	Stainless steel, die-cast aluminum
Cable connection	Shielded cable, default length 1 m (other lengths on request) Terminal block
Float material	SS304, SS316L, PTFE, titanium
Mounting	Flange, M24×1.5 thread, connector, positioning ring, or custom
Explosion protection	Flameproof, Ex d IIC T4 Gb
Ingress protection	IP67

7 Model Selection

The CZ80 series magnetostrictive level transmitter is selected as follows:

CZ8X - (A) - (B) - (C) - (D) - (E) - (F)

Code	Description
A	Process connection G = M24×1.5 thread; DN = flange
B	Measured variable Y = level; J = interface; C = temperature
C	Medium density, g/cm ³
D	Tank pressure, MPa
E	Maximum medium temperature, °C
F	Output 485 = RS-485 digital; mA = analog
G	Installation height, from the mounting flange to the tank bottom, m (accurate to mm)