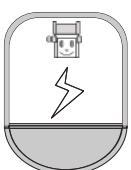


EchoBeam

LR RADAR LEVEL INSTRUMENT



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1. Principle of Measurement



● Principle

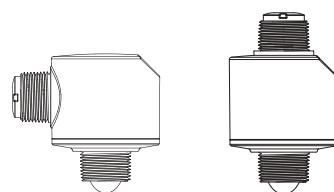
Frequency modulated continuous wave (FMCW) is adopted for radar level instrument (80G). The antenna transmits the high frequency and frequency modulated radar signal. The frequency of the radar signal linearly increases. The transmitted radar signal is reflected by dielectric to be measured and received by antenna. At the same time, the difference between the frequency of transmitted signal and that of the received signal is proportional to the measured distance. Therefore, the distance is calculated by the spectrum derived from the analog-to-digital conversion frequency difference and the fast Fourier transform (FFT).

● Features

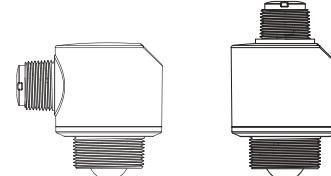
1. High frequency, small beam angle, and smaller unmeasurable zone which can help to measure the tanks with small diameter and can adapt to the connecting pipe on the tank;
2. Centralized energy and stronger anti-jamming capability which have significantly improved the measurement accuracy and reliability;
3. Small antenna size which facilitates the installation.

2. Brief description of instrument

LR80

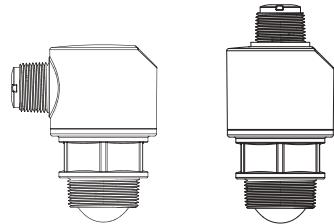


LR81

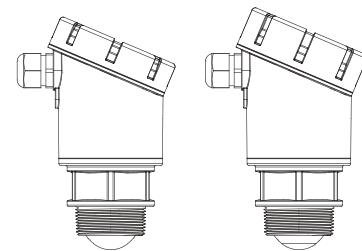


Application:	Liquid/Solid	
Measurement range:	0~10m (Liquid) 0~5m (Solid)	0~15m (Liquid) 0~8m (Solid)
Measurement accuracy:	±2mm	±2mm
Process temperature:	(-40~80) °C	(-40~80) °C
Process pressure:	(-0.1~0.3) MPa	(-0.1~0.3) MPa
Frequency:	80GHz	80GHz
Signal output:	(4~20) mA/HART RS485/MODBUS Protocol SDI Protocol	(4~20) mA/HART RS485/MODBUS Protocol SDI Protocol
Bluetooth	Yes	Yes
Power Supply:	See page 22	See page 22
Display/programming:	None	None
Housing material:	PVDF	PVDF
Antenna material:	PVDF	PVDF
Installation form:	Thread	Thread
Size:	G1" (up) 1"NPT (up) G1" (down) 1"NPT (down)	G1" (up) 1"NPT (up) G1½" (down) 1½"NPT (down)
Protection Level:	IP68	IP68

LR82

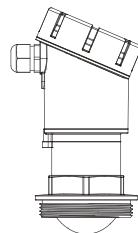


LR83

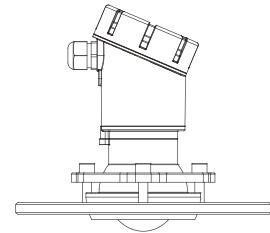


Application:	Liquid/Solid	
Measurement range:	0~30m (Liquid) 0~15m (Solid)	0~30m (Liquid) 0~15m (Solid)
Measurement accuracy:	±2mm	±2mm
Process temperature:	(-40~100) °C	(-40~100) °C
Process pressure:	(-0.1~0.3) MPa	(-0.1~0.3) MPa
Frequency:	80GHz	80GHz
Signal output:	(4~20) mA/HART RS485/MODBUS Protocol SDI Protocol	(4~20) mA/HART RS485/MODBUS Protocol SDI Protocol
Bluetooth	Yes	Yes
Power Supply:	See page 22	See page 22
Display/programming:	None	Yes
Housing material:	PVDF	PBT
Antenna material:	PVDF	PVDF
Installation form:	Thread	Thread
Size:	G1" (up) 1"NPT (up)	G1½" (down) 1½"NPT (down)
Protection Level:	IP68	IP67

LR84



LR85



Application:	Liquid/Solid	
Measurement range:	0~120m (Liquid) 0~60m (Solid)	0~120m (Liquid) 0~60m (Solid)
Measurement accuracy:	±5mm	±5mm
Process temperature:	(-40~120) °C	(-40~120) °C
Process pressure:	(-0.1~0.3) MPa	Atmospheric
Frequency:	80GHz	80GHz
Signal output:	(4~20) mA/HART RS485/MODBUS Protocol SDI Protocol	(4~20) mA/HART RS485/MODBUS Protocol SDI Protocol
Bluetooth	Yes	Yes
Power Supply:	See page 22	See page 22
Display/programming:	Yes	Yes
Housing material:	PBT	PBT
Antenna material:	PFA	PFA
Installation form:	Thread	Flange
Size:	M80X3 (down)	DN80/DN100/DN125/DN150 DN200/DN250
Protection Level:	IP67	IP67

LR86



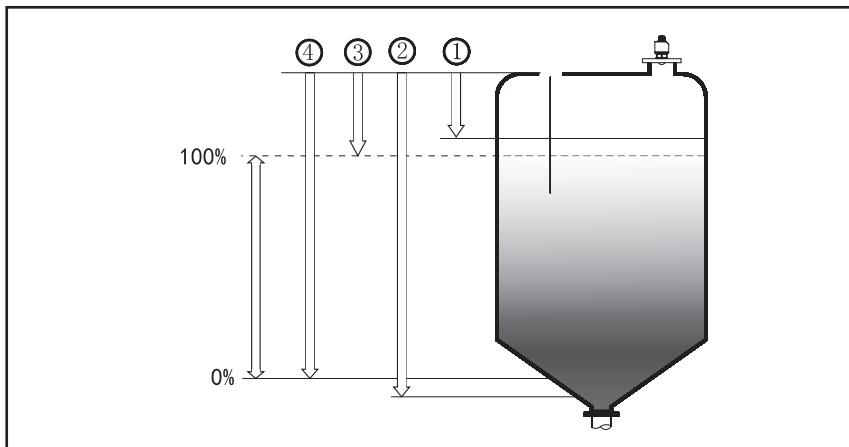
Application:	Liquid/Solid
Measurement range:	0~120m (Liquid) 0~60m (Solid)
Measurement accuracy:	±5mm
Process temperature:	(-40~80) °C
Process pressure:	Atmospheric
Frequency:	80GHz
Signal output:	(4~20) mA/HART RS485/MODBUS Protocol SDI Protocol
Bluetooth	None
Power Supply:	See page 22
Display/programming:	None
Housing material:	PVDF
Antenna material:	PFA
Installation form:	Thread
Size:	G1" (up)
Protection Level:	IP68

3 Requirement of installation

● Basic requirements

When the antenna transmits the microwave pulse, it has a certain transmitting angle. There shall be no obstacles in the area radiated by the transmitted microwave beam from the lower edge of the antenna to the dielectric surface to be measured. Therefore, it is necessary to avoid the facilities in the tank during installation, for example: human ladder, limit switch, heating equipment, supports, etc. If necessary, "Virtual Echo Learning" should be implemented. In addition, please note that the microwave beam should not intersect the charging material flow. During the installation of instrument, please also note that: the highest material level shall not enter the unmeasurable zone; the instrument shall be kept at a certain distance from the wall of tank; the installation of instrument should enable the transmitting direction of antenna to be perpendicular to the dielectric surface to be measured as much as possible.

● Graphic illustration

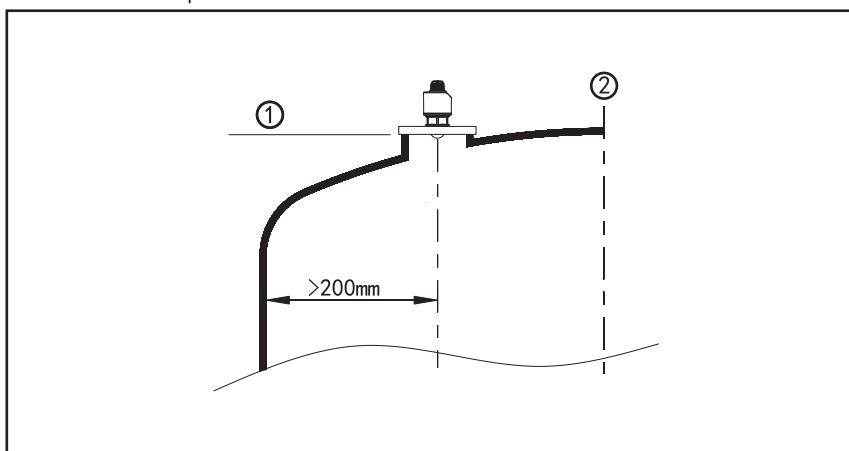


The reference plane for measurement is the sealing surface of threads or flanges.

- 1 Scope of unmeasurable zone
- 2 Setting of measurement range
- 3 Adjustment at high level
- 4 Adjustment at low level

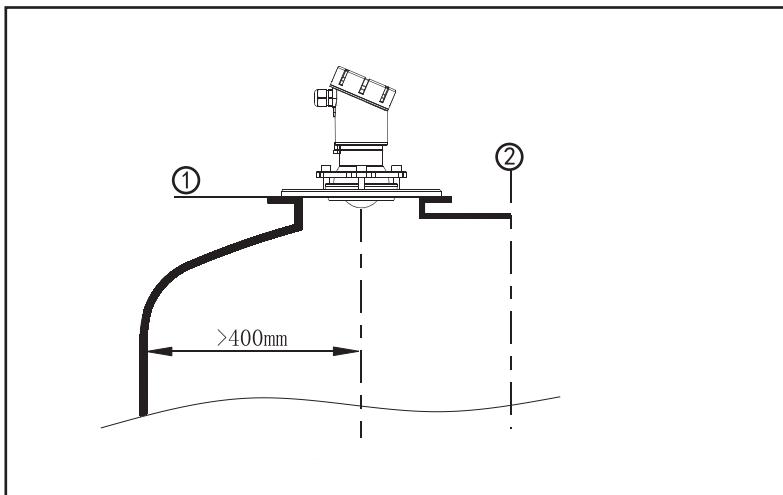
Note: when the radar level instrument is used, please make sure that the highest material level does not enter the unmeasurable zone (No.1 area shown in the figure).

● Installation position

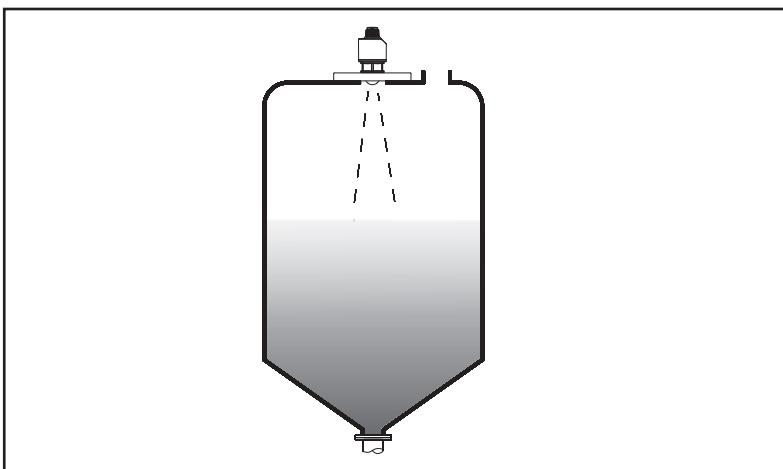


During the installation, please note the the instrument should be kept at a distance of 200mm at least from the vessel wall.

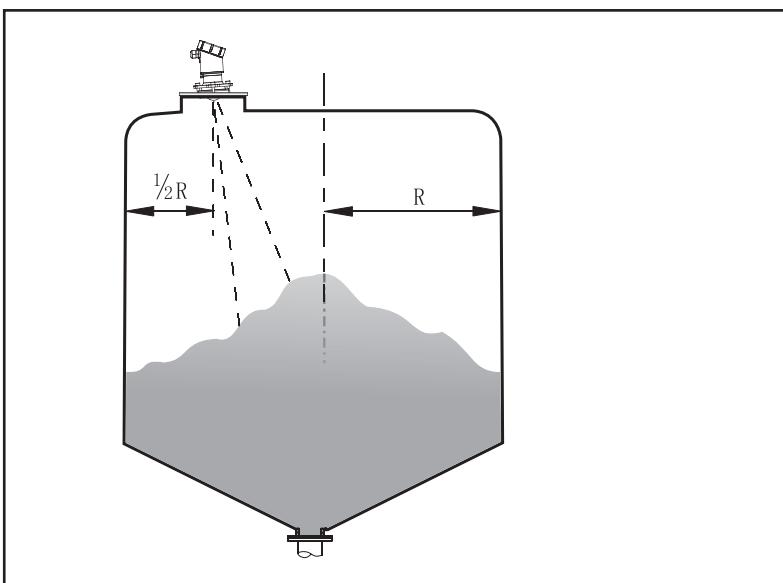
- 1 Reference plane
- 2 Center of the vessel or symmetry axis.



1 Reference plane
2 Center of the vessel or symmetry axis

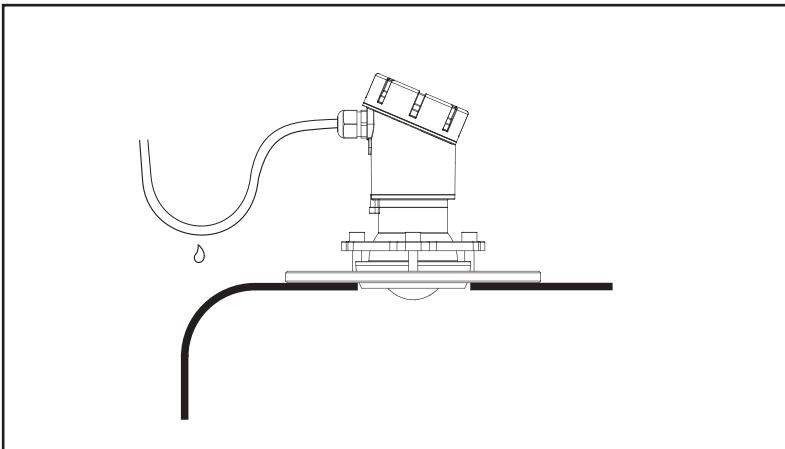


As for the conical vessel with flat tank top, the best installation position of instrument is the top center of the vessel, which ensures that the bottom of the container is measured.



Installation with gimbal installation

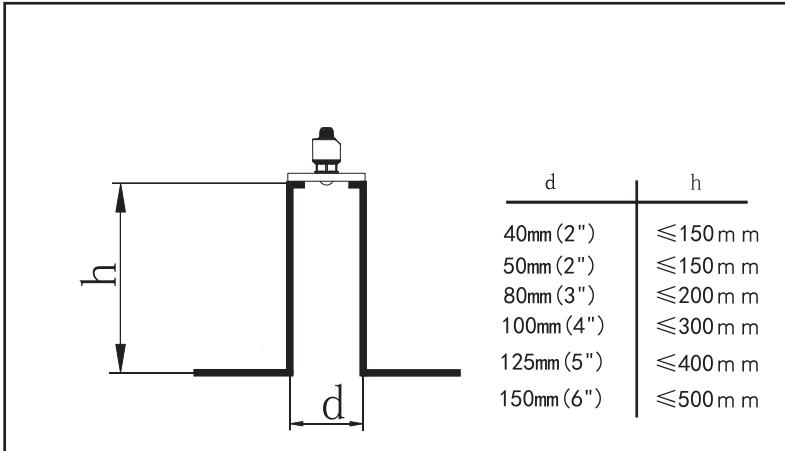
- Moisture-proof



As for the instrument installed in outside or wet indoor environment and cooling or heating tanks, the cable gland should be tightened and the cable at the cable entry should be bend downward for preventing moisture. As shown in the figure:

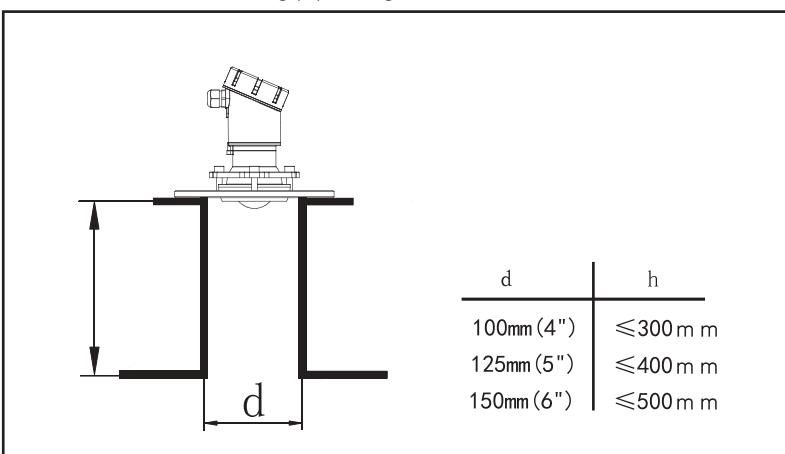
- Antenna extension

LR80～LR83 Connecting pipe diagram

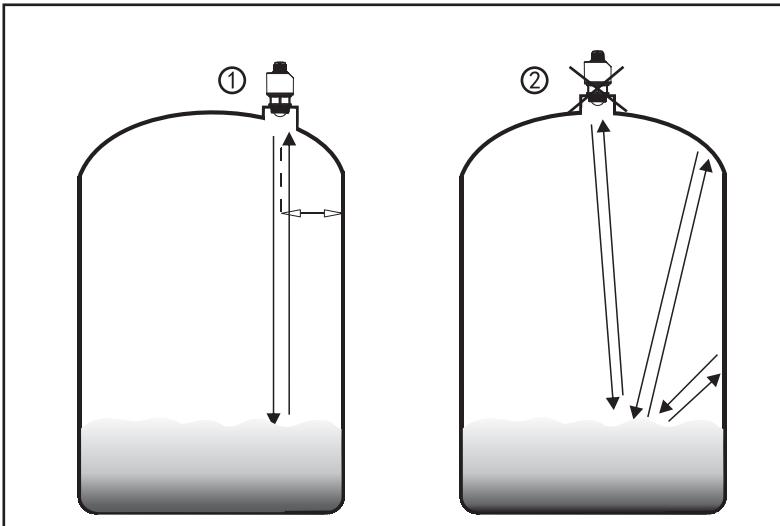


If the reflection property of the dielectric to be measured is good, the antenna extension can also be longer than the length of antenna. See the following table for the standard length in such case. The standard length in such case. The ends must be ground without the bulges, for example, burrs. If necessary, "Virtual echo learning" function should be used. Eliminating the reflection on the ends of smaller connecting pipe also can achieve better measurement results.

LR84～LR86 Connecting pipe diagram

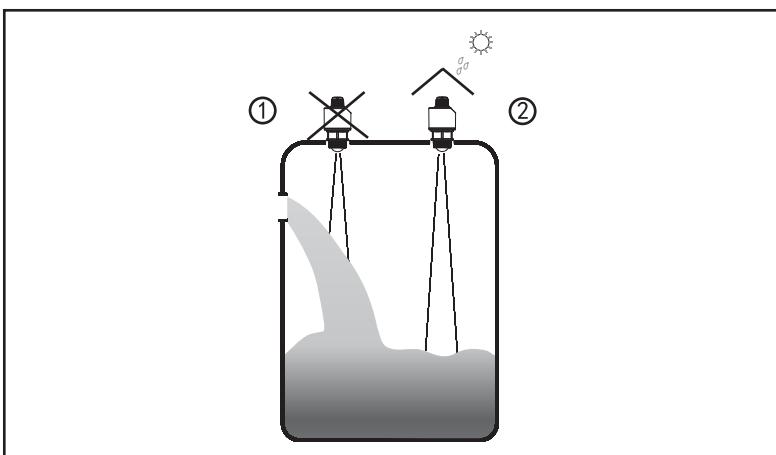


- Rights and wrongs of installation position



1 Correct

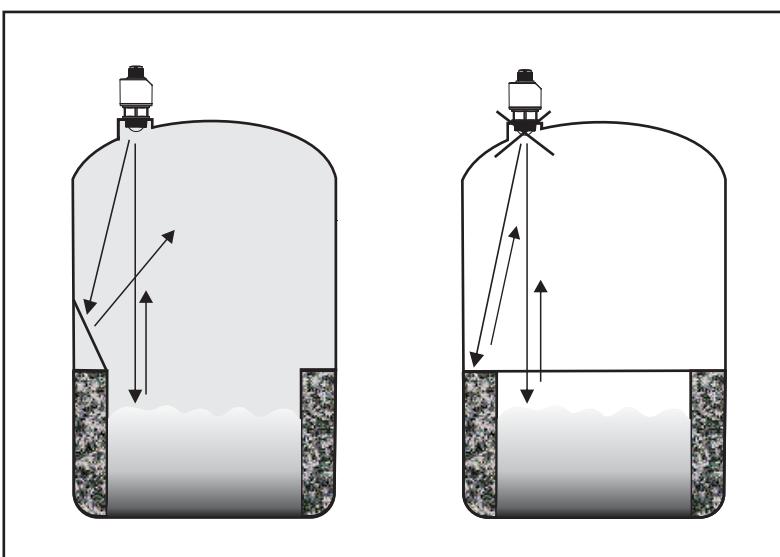
2 Error: Instruments are installed in the arched or round top of tank, which will result in multiple echoes. So it should be avoided as much as possible during the installation.



1 Error: Instruments should not be installed above the charging material flow, in order to ensure that the dielectric surface is to be measured, rather than the charging material flow.

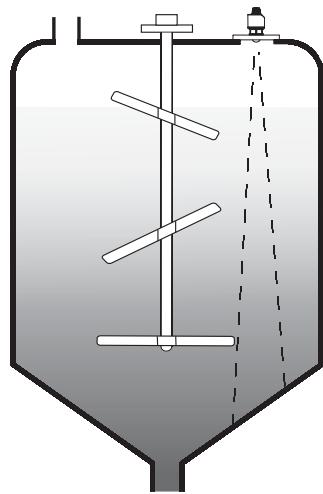
2 Correct Note: Sun-shading and rain-proof measures. should be adopted for the outdoor installation.

- Installation of reflecting plate



If there are barriers in the tank, the reflecting plate can be installed to reflect the reflected wave of barriers out. If necessary, "virtual echo learning" can be implemented.

- Agitation



If there are agitation in the tank, the instruments should be installed as far away from agitators as possible. Once the installation is completed, the "virtual echo learning" should be carried out while agitators are running, to eliminate the influence of fraud echo generated by mixing blades. If foam or wave is generated due to the agitation, the waveguide installation method should be adopted.

4 Electrical connection

● Supply voltage

(4-20)mA/HART(2-Wire)

Power supply and the output current signal are carried by the same two-core cables.

See the technical data on page 22 for the detailed range of supply voltage.

A safety barrier should be placed between the power supply and instrument for the intrinsically safe version.

RS485/MODBUS protocol output

See the technical data on page 22 for the detailed range of supply voltage.

● Installation of connecting cables

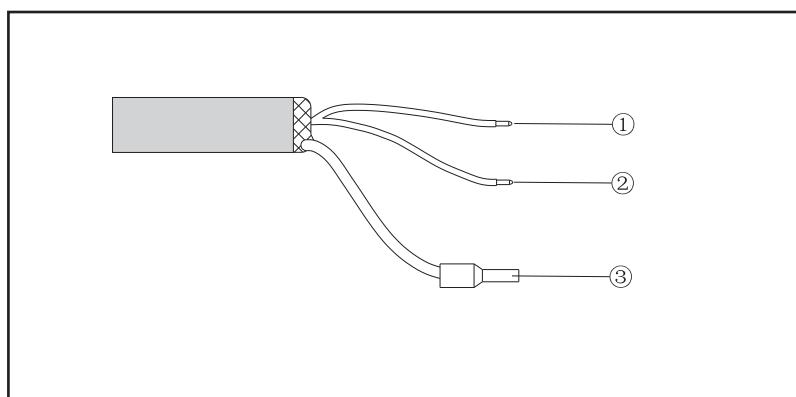
LR80～LR82 and LR86 have been assembled in the factory. If needs to be extended, two core cables on the market can be selected. In case of electromagnetic interference, it is recommended to use the shielded cable.

The outside diameter of LR82-LR85 power supply cables should be (5-9)mm to ensure the sealing of cable entry. In case of electromagnetic interference, it is recommended to use the shielded cable.

● Shielding and wiring of cables

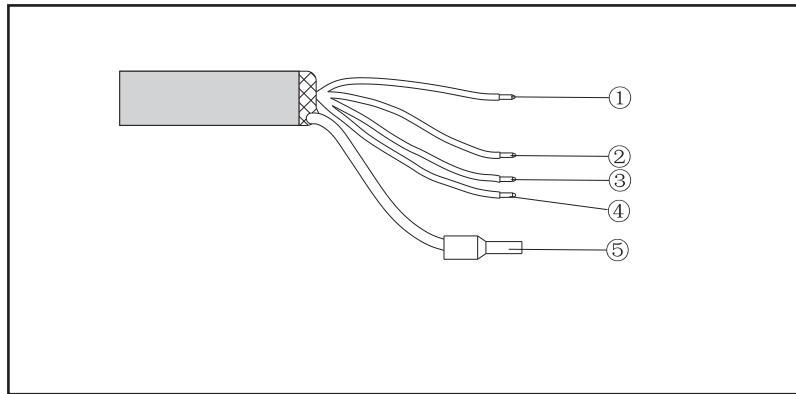
To shield the cable, it is recommended that the cable shield be grounded at one end of the power supply side.

● LR80～LR82 and LR86 Wiring mode



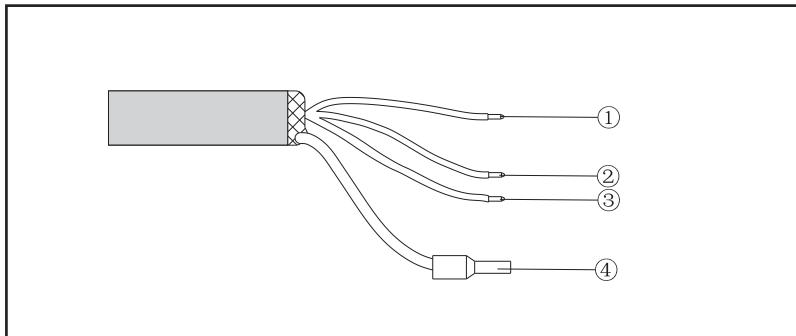
(4-20)mA output / HART 2-Wire
(electronic unit B)

	Color	Explain
1	Brown	Power supply +, output signal
2	White	Power supply -, output signal
3	Black	Shield



RS485/MODBUS protocol
(electronic unit R)

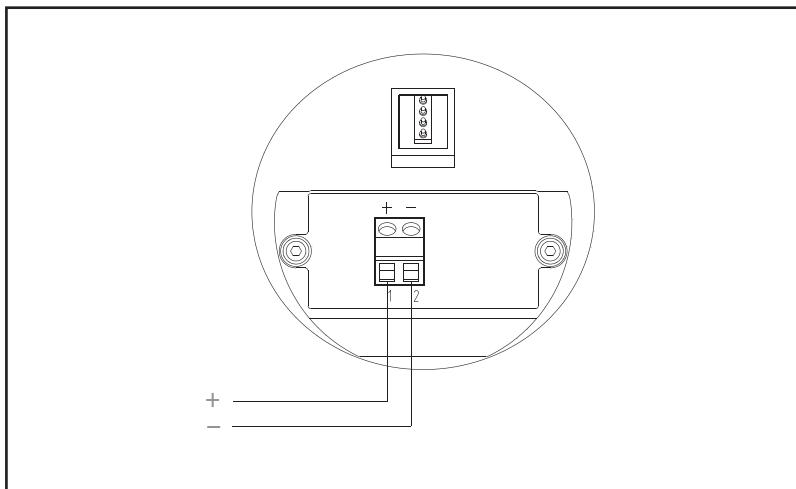
	Color	Explain
1	Brown	Power supply +
2	White	Power supply -
3	Green	Signal A
4	Yellow	Signal B
5	Black	Shield



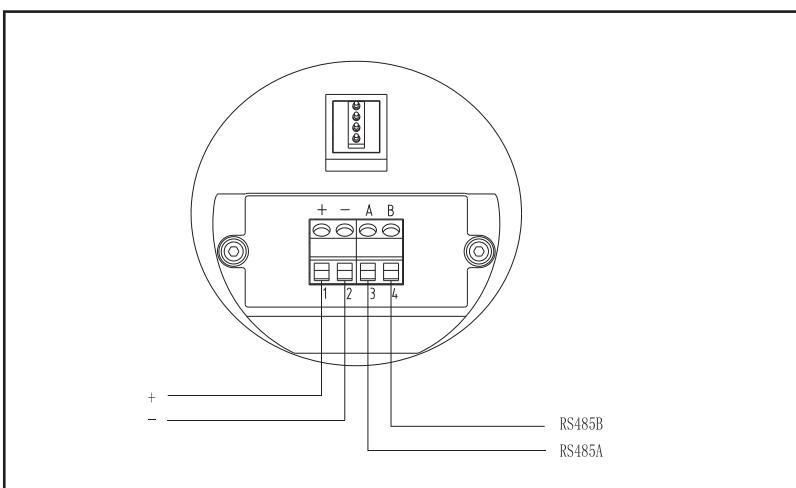
SDI protocol
(electronic unit S)

	Color	Explain
1	Brown	Power supply +
2	White	Power supply-
3	Green	SDI
4	Black	Shield

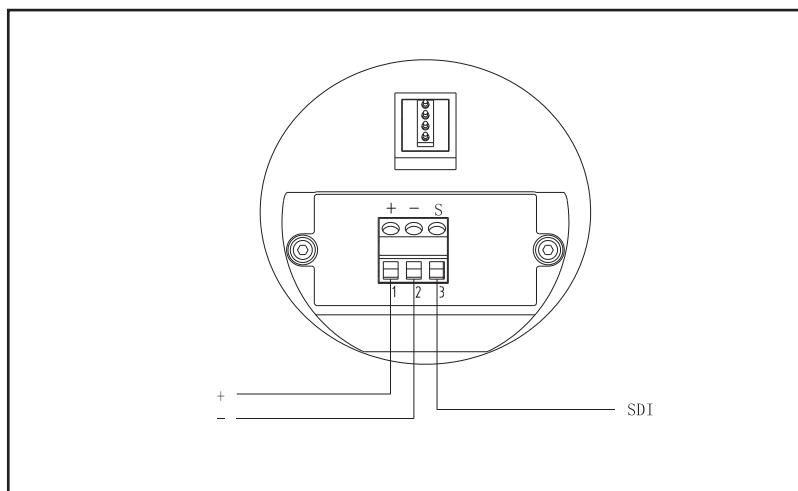
● LR83~LR85 Wiring mode



(4-20) mA output / HART 2-Wire
(electronic unit B)



RS485/MODBUS protocol
(electronic unit R)



SDI protocol
(electronic unit S)

● Wiring

The protection of the product is the intrinsic safety.

Ex marking: Ex ia II C T6~T4 Ga;Ex ia IIIC T85°C~120°C Da. PVDF or PBT housing material is adopted for the intrinsically safe level instrument. The glue sealing structure is adopted for the electronic parts to ensure the sparks generated by the circuit fault will not be discharged. The product is applicable to the continuous level measurement for the media of inflammable gas of Ex ia II C T6~T4 Ga. The product is applicable to the continuous level measurement for the media of dust of Ex ia IIIC T85°C~120°C Da.

When the intrinsic safety instrument is used, safety barrier should be applied for its power supply. FBS-2 safety barrier is an associated equipment of this product, and its protection type is intrinsically safe. Ex marking: [Ex ia] II C, with supply voltage of 24V DC±5%, short-circuit current of 130.5mA and working current of (4-20)mA. The shielded cable should be adopted for all cables. The max length from the instrument to safety barrier is 500m. Distributed capacity $\leq 0.1 \mu F/Km$, distributed inductance $\leq 1mH/Km$. During installation, instrument should be grounded.

Ta of mainframe(°C)	Process temperature at The antenna(°C)	T class of whole equipment	Ex marking
-40~50	-40~50	T6/ 85 °C	Ex ia II C T6 Ga;Ex ia IIIC T85°C Da
-40~60	-40~95	T5/ 100°C	Ex ia II C T5 Ga;Ex ia IIIC T100°C Da
-40~70	-40~120	T4/ 120°C	Ex ia II C T4 Ga;Ex ia IIIC T120°C Da
Protection Level		IP67	IP68
LR Radar Level Instrument		LR83~LR85	LR80~LR82, LR86

The safety barrier parameters

The Safety barrier	FBS-2 (4-20)mA, (2-Wire)
Port Properties	Between 4 and 6 terminals
Uo	25.2V
Io	130.5mA
Po	0.82W
Co	100nF
Lo	0.3mH
Um	250VDC/AC
Device Maximum Input	Between 1 and 2 terminals
Ui	30.6V
li	131mA
Pi	1.0W
Ci	0 μF
Li	102 μH