

# 柯普乐® 磁翻柱式液位计 (旁路型)

KSR KUEBLER® MAGNETIC LEVEL GAUGES  
(BNA)

## 安装和操作说明书 Mounting and operating instructions

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**工作原理**

BNA 旁路磁翻柱式液位计采用连通器原理使液体等高引入主体内，主体内飘浮一带永久磁性的浮子，由浮子带动的磁性能无阻隔地传出主体，并始终定位在液体的表面。液位计现场测量的液面位置指示利用了附靠在主体外同样带磁性体的两半不同色的翻柱来实现，当液面上升时，翻柱被主体内液面处的磁场推动 180°，由白色变为红色或蓝色；当液面下降时，翻柱又被主体内液面处的磁场推回 180°，由红色或蓝色又变为白色，这样就达到了液面检测的目的。

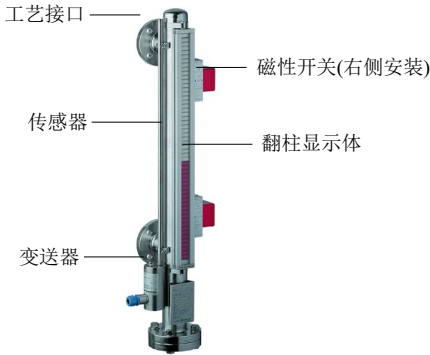


图 1 结构图

**适用范围**

耐腐蚀性强，适用于各种工业场所，广泛应用于化工、石油化学、天然气、制药业、海上勘探、造船业、发电厂、动力装置、机器制造业、纯净水净化装置、饮料和食品工业等。

**结构安装**

安装时先打开底部法兰盖或螺盖，将浮子装入主体（有标识或重端向上），然后安装法兰盖或螺盖；液位计的工艺接口（法兰、螺纹、焊接端等）与罐体的工艺接口（法兰、螺纹、焊接端等）对应密封连接；安装后应检查液位计指示部分，无液位时其翻柱应均为白色，否则用备用磁钢将其纠正；传感器的安装位置出厂前已做零位校正，用户无需调整。

**警告！**当设备内的液体是有压、有毒、易燃的危险性液体时，安装前应放空设备内的液体，必要时应进行冲洗，待内部干净后再进行安装。

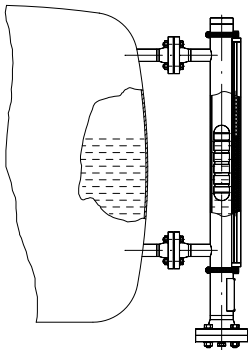


图 2 安装示意图

技术参数

测量范围：L（按实际尺寸）/M：（0~300mm 至 20000mm）  
示值最大允许误差：±10mm  
输出值最大允许误差：±0.50%FS

电气接线

电气接线在磁翻柱式液位计安装好后进行，接线时先打开接线盒盒盖，连接电缆穿过电缆接口进入到接线盒内，接线按不同变送器及接线盒的形式来进行。  
**注意：**电缆敷设和电气连接必须按照设备适用的规则进行，并由具有资格的人员完成；用于本安区域时，必须配有安全栅或本安控制电路。  
**警告！**远传信号或脉冲信号可能因使用较长的电缆或线路与动力线路一并敷设而引发故障，所以必须使用屏蔽电缆并一端接地。

液位变送

液位变送器必须根据电气接线图进行连接，并串联接线至电子测定装置。

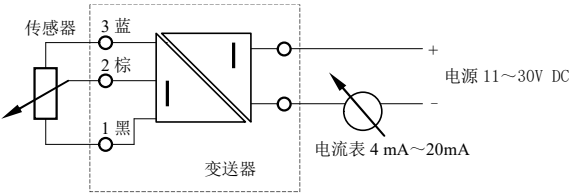


图 3 电气接线图（普通变送器）

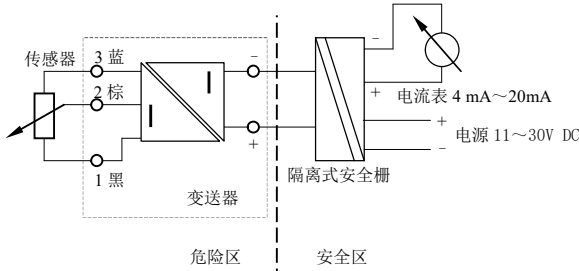
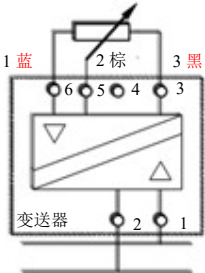


图 4 电气接线图（本安变送器）



PROFIBUS-PA 或 FOUNDATION FIELDBUS 总线

图 5 电气接线图（总线）

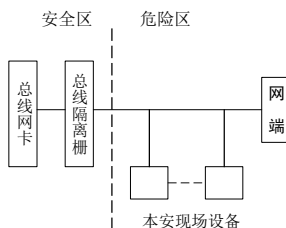


图6 隔离栅应用图 (FISCO)

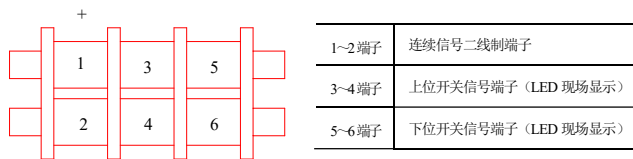


图7 接线端子图 (隔爆及现场显示接线盒)

## 信号调试

**注意：**当变送器工作在危险区域时请将变送器移至安全的场所进行调试。

### 1. 模拟信号输出变送器调试

调试时先让液位计的浮子工作在0%处，此时调试电流表的值应为4mA。如果电流值有误差，则可调节变送器的4mA调校电位器直至调试电流表的值为4mA为止；然后让液位计的浮子工作在100%处，此时调试电流表的值应为20mA。如果电流值有误差，则可调节变送器的20mA调校电位器直至调试电流表的值为20mA为止。重复上述的过程直到调试电流表的值正确不需要再调整为止。

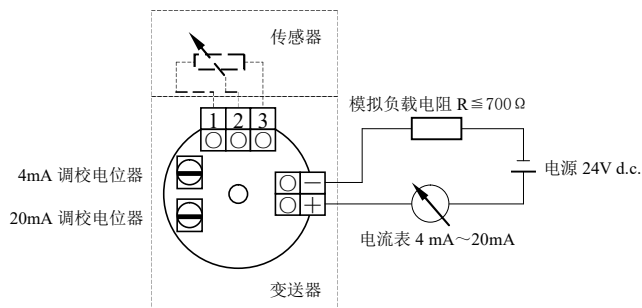


图8 信号调试图 (模拟信号输出)

## 2. HART<sup>®</sup>及总线协议数字信号输出变送器调试

调试时先让液位计的浮子工作在 0%处或按实际需要的起步状态，此时通讯设备上变送器输出的值应为变送器起步处的设定下限值。如果此下限值有误差，则可通过总线程序进行调整直至正确的下限值为止；然后让液位计的浮子工作在 100%处或按实际需要的满量程状态，此时通讯设备上变送器输出的值应为变送器满量程处的设定上限值。如果此上限值有误差，则可通过总线程序进行调整直至正确的上限值为止。重复上述的过程直到通讯设备上测得的变送器起步和满量程时所设定的相应下限值和上限值正确不需要再调整为止。

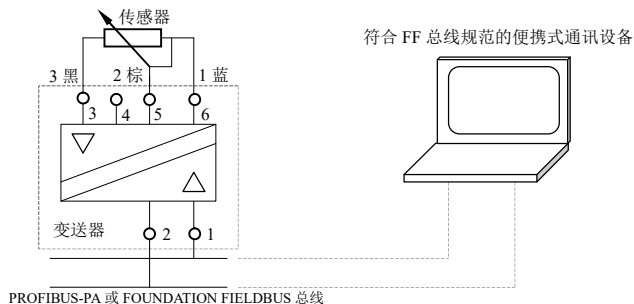


图 9 信号调试图（数字信号输出）

**注意：**一些带 HART<sup>®</sup>通信协议或其它可编程的变送器在使用时可阅读附带的变送器说明书或在提供的网页上查阅。

### 磁性开关

磁性开关必须根据图电气接线图进行连接，如图 10 所示。在翻柱显示体定位槽中移动磁性开关，就能任意设定磁性开关的切换点位置。放松紧固螺钉，将开关移动到期望的位置，再次紧固螺钉即可。

**注意：**磁性开关标准安装位置在显示体右侧（见图 1），对于 MA、MHT 型，改变安装侧可能导致常开、常闭线反向，请在调试后使用，或咨询厂方、也可在订货时注明开关点位置。主管为 45mm 的液位计，两磁性开关的开关点位置间隔应不小于 60mm，小于该距离时请向厂方咨询。

**注意：**当磁性开关工作在危险区域时请将磁性开关移至安全的场所进行调试，开关的切换点位于开关外壳的中央。信号调试前应先让浮子在水管内上下走一个来回使开关复位。

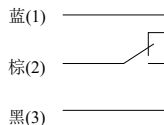


图 10 磁性开关接线图

### 触点保护

#### 1. 电感负载 AC

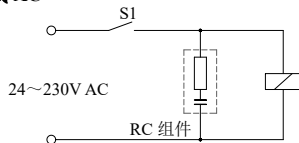


图 11 触点保护电路图（电感负载 AC）

## 2. 电感负载 DC

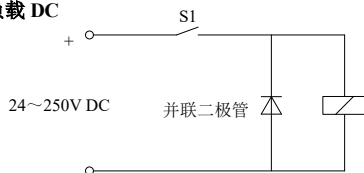


图 12 触点保护电路图（电感负载 DC）

## 3. 电容性负载

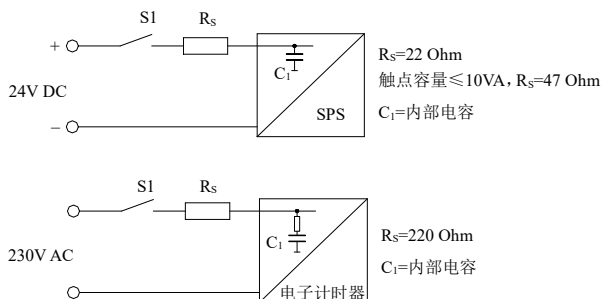


图 13 触点保护电路图（电容性负载）

**警告！** 使用带感性负载或容性负载的磁性开关可能导致干簧开关损坏，这可能引起控制线路故障，并对人员或货品造成损伤。感性交流负载时，开关必须与一个 RC 保护电路连接，如图 11 所示。感性直流负载时，开关必须与一个二极管保护电路连接，如图 12 所示。容性负载时，当连接电缆长于 50m 或与带容性输入电路的 PLC 连接时，则需要串联连接一个  $22\Omega$  的电阻，触点容量为 10VA 时，开关必须串联一个  $47\Omega$ ，如图 13 所示，以限制峰值电流的产生。当连接一个电子计时器时，应接入一个  $220\Omega$  的电阻器。

## 4. 示波器测量

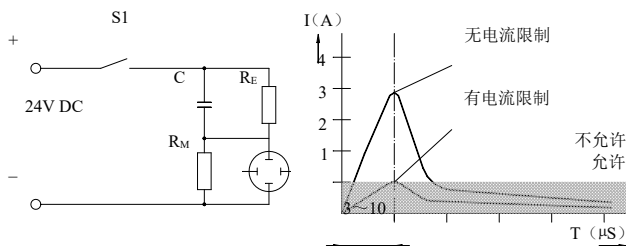


图 14 触点保护电路图（示波器测量）

**警告！** 磁性开关过载可能导致干簧开关损坏，这可能引起控制电路误动作，并对人员或货物造成伤害。

**危险！** 连接电缆无接地保护的磁性开关在故障工况下，可能带电，触及外壳对人员造成伤害，甚至致人死亡。磁性开关必须在具有保护低电压的情况下使用，例如安装漏电保护器或接线盒外壳可靠接地。

防爆说明

1. 隔爆产品的使用应严格遵循下列内容：  
隔爆产品经国家级仪器仪表防爆安全监督检验站（NEPSI）检验，符合标准 GB/T 3836.1-2021、GB/T 3836.2-2021 的有关要求，其防爆标志为 Ex d IIC T3~T6 Gb。
- 产品使用环境温度：-40℃~+60℃；
  - 现场使用应遵守“严禁带电开盖”的原则；
  - 引入电缆护套外径应为  $\varnothing 8\pm 1\text{mm}$ ，用户应保证夹紧电缆护套；
  - 产品使用时外壳应可靠接地；
  - 温度组别与被测介质最高温度的关系如下：

温度组别	T3	T4	T5	T6
被测介质最高温度（℃）	190	130	95	80

- 安装现场应不存在对铝合金有腐蚀作用的有害气体；
  - 维修必须在安全场所进行；当现场确认无可燃性气体存在时方可维修
  - 产品的安装、使用、维护、检查应同时遵守产品说明书、GB/T 3836.15-2017“爆炸性气体环境用电气设备 第 15 部分：危险场所电气安装（煤矿除外）”、GB50257-1996 “电气装置安装工程爆炸和火灾危险环境电力装置施工及验收规范”、GB/T 3836.13-2021 “爆炸性气体环境用电气设备 第 13 部分：爆炸性气体环境用电气设备的检修”和 GB/T 3836.16-2017 “爆炸性气体环境用电气设备 第 16 部分：电气装置的检查和维修（煤矿除外）”的规定；
  - 传感器外壳、接口、浮球材质均不选用塑料材质。
2. 本安产品的使用应严格遵循下列内容：  
本安产品经国家级仪器仪表防爆安全监督检验站（NEPSI）检验，符合标准 GB/T 3836.1-2021、GB/T 3836.4-2021 的有关要求，其防爆标志为 Ex ia IIC T3~T6，产品必须与安全栅配套组成本安防爆系统。
- 产品使用环境温度：-40℃~+60℃；
  - 温度组别与被测介质最高温度的关系如下：

温度组别	T1	T2	T3	T4	T5	T6
被测介质最高温度	440	290	190	130	95	80

- 磁性开关的本安参数为：U<sub>i</sub>=30V,I<sub>i</sub>=120mA,P<sub>i</sub>=1.2W,C<sub>i</sub>=0uF,L<sub>i</sub>=0mH；液位变送器的本安参数为：U<sub>i</sub>=30V,I<sub>i</sub>=120mA,P<sub>i</sub>=1.2W,C<sub>i</sub>=0uF,L<sub>i</sub>=0mH；
- 安装现场不存在对产品外壳有腐蚀性作用的气体；
- 该产品与安全栅本安端之间的连接电缆为本安电缆（必须有绝缘护套），每根线芯截面积>0.5mm<sup>2</sup>，其接地线在安全场所接地。电缆布线应尽可能排除电磁干扰的影响；
- 用户不得自行更换该产品的零部件，应会同产品制造商共同解决运行中出现的故障，以杜绝损坏现象的发生；
- 产品的安装、使用和维护应同时遵守产品说明书、GB/T 3836.13-2021 “爆炸性气体环境用电气设备 第 13 部分：爆炸性气体环境用电气设备的检修”、GB/T 3836.15-2017 “爆炸性气体环境用电气设备 第 15 部分：危险场所电气安装（煤矿除外）”、GB/T 3836.16-2017 “爆炸性气体环境用电气设备 第 16 部分：电气装置的检查和维修（煤矿除外）”和 GB50257-1996 “电气装置安装工程爆炸和火灾危险环境 电气装置施工及验收规范”的有关规定。

防护说明

为了满足电气防护等级，按照产品上电缆锁口的线径范围、防爆等级选择合适的电缆线，接线完成后，使用开口扳手拧紧电缆锁口；接线盒盒盖的密封件放置平整，接线盒盒盖安装均匀受力，用工具拧紧；冗余电气接口需要用螺塞封堵，并拧紧。

使用

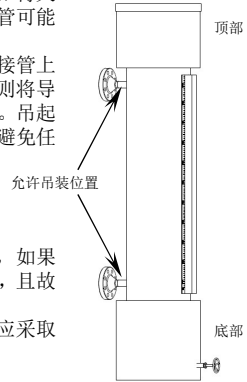
1. 液位计使用时如果设备内有碎屑或铁粉类杂质，则液位计浮子移动的通道有可能被堵塞，这样液位计的使用就会受到影响；
2. 液位计工作时，其内部所受的压力极限在每台液位计的技术指标中都已规定，如果使用设备中的压力超过了所规定的指标，液位计就有可能被损坏；
3. 液位计使用时设备内的液面变化应平稳过渡，出现有突变时，液位计的输出可能会出现反常现象，此时只要待液面重新稳定后信号即会立刻恢复正常；
4. 变送器工作时的电气供电应该稳定，信号传输应考虑电气的屏蔽；
5. 磁性开关安装牢固，接地线可靠接地。
6. 液位计使用前需先安装浮子，安装时请将两头中较重的一头朝上。
7. 液位计使用前开启连接阀时，请先缓慢开启上连接的气相阀门，再缓慢开启下连接的液相阀门。

8. 蒸汽夹套型液位计开始注入蒸汽时应缓慢进入，待夹套内蒸汽温度稳定后再全部开启，否则液位计主管可能因蒸汽水锤现象导致而损坏。

9. 安装低温包覆型液位计时，仅允许在过程连接接管上进行吊装，如图。严禁吊装在任何其他位置，否则将导致液位计表面保护层或内部保温材料、阀门损坏。吊起后液位计的中心尽可能保持竖直。吊装过程中应避免任何撞击、磕碰，以免损坏液位计的表面保护层。

#### 注意：

- 液位计工作时应避免强烈的振动；
- 液位计不能在强磁场的环境工作；
- 隔爆接线盒在开盖检查故障前切记关闭电源，如果必须带电检查应将隔爆接线盒放到安全场所进行，且故障排除后应仍确保其隔爆性能；
- 液位计的电气结构应避免直接雨淋和日晒，应采取防护措施。



### 日常维护

1. 液位计工作时一般不用进行特别的维护，只是当工作介质的流动性和洁净度不够理想时，液位计旁路管要经常排污；
2. 如果液位计一经工作后又需经长期的停用，此时应将液位计旁路管内工作介质冲洗干净；
3. 长期不用的液位计其浮子最好能与磁性开关适当分开，以避免浮子的磁性长期作用于磁性开关，造成长期静态工作而影响磁性开关的使用性能。
4. 低密度型液位计采用内芯可拆卸设计，便于日常维护（图 15）。

### 故障检查

1. 液位计翻柱显示体不能正常显示，按如下步骤进行检查：
  - 用备用磁钢沿显示体视窗从上往下引一遍；低温包覆产品需采用专用工具引导，引导工具及放置方向见（图 16）；
  - 浮子是否损坏或被卡死；
2. 液位计磁性开关不能正常工作，按如下步骤进行检查：
  - 是否按本说明书连接触点保护电路；
  - 检查磁性开关的接线是否松动，电缆线是否老化而引起短路；
  - 用备用磁钢引磁性开关，用万用表电阻档检查开关切换是否正常；
3. 液位传感器/变送器不能正常工作，按如下步骤进行检查：
  - 检查变送器的接线是否松动，电缆线是否老化而引起短路；
  - 万用表直流电压档检查供电电源是否正确无误；
  - 万用表的直流毫安档串入变送器，用备用磁钢带动浮子，从零位到满位引一遍，同时观察电流是否线性变化；

**注意：**液位计经以上检查修理后仍不能正常工作，请与制造厂联系。

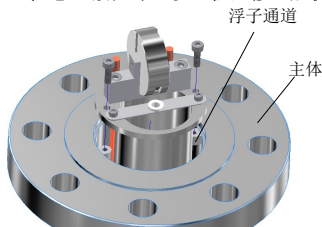


图 15 结构

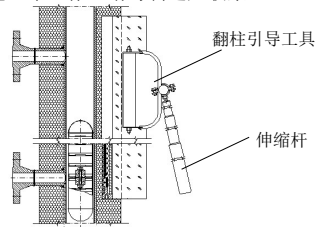


图 16 低温包覆产品专用翻柱引导工具

### 质量保证

在用户按文件规定使用的前提下，从发货日起 12 个月的保证期内，产品因质量问题而不能正常工作或不符合文件的技术条件时将给予无偿修理或更换。

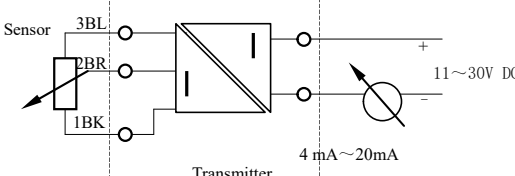
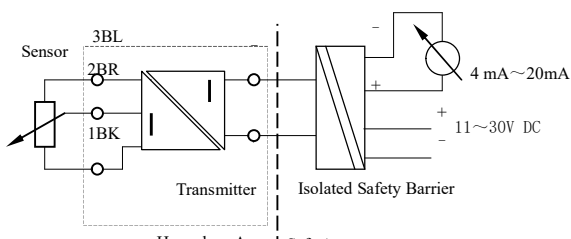
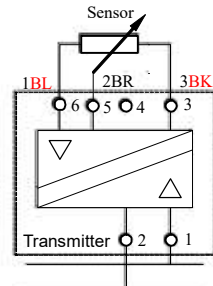
### 产品附件

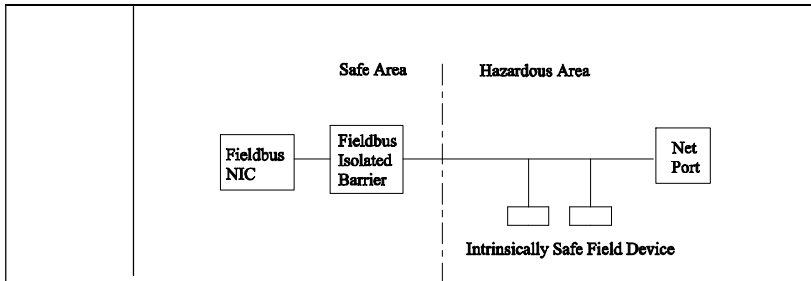
装箱单；产品说明书；产品合格证；用户附加定购的配件或附件。

**特别声明：**本手册以中文版本为标准，英文版本仅供参考

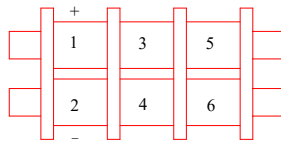


<b>Operating Principle</b>	<p>A communicating bypass chamber is connected to the vessel, and as the liquid level in the tank rises or falls, a float with a built-in magnetic system inside the chamber rises or falls with it. There is magnetic roller display, a column of magnetic rollers which are white on one side and red on the other. As the float moves up or down the bunched field of the permanent magnet mounted in its top section pulls the rollers through a rotation of 180°, thus changing their color. As the float rises the rollers are turned from white to red, and as the float falls, they are changed back to white again. This means that at any given time the amount of liquid in the tank is constantly represented by a red column.</p> <div data-bbox="420 316 882 667" data-label="Image"> </div> <p style="text-align: center;"><b>Fig.1 Structure</b></p>
<b>Application</b>	<p>Available for applications in all areas of industry through use of highly corrosion resistant materials, such as: chemical, petrochemical, natural gas, pharmaceutical industry, marine exploration, shipbuilding, power plants, machinery manufacturing, water purification devices, food and beverage etc.</p>
<b>Structure and installation</b>	<p>Before installation, move off the bottom flange or thread cover, assembly the float into the chamber body (be careful about the direction) and tight flange or thread cover back. Mount the bypass chamber on the tank to be monitored using flange thread or welded-end provided. Align the magnetic roller display by magnet provided; level transmitter has been calibrated before leaving factory.</p> <p>Warning! In the event that liquid in container is pressurized, toxic, flammable and dangerous, it shall be emptied before the installation and flushed if necessary; and installation shall not be performed until the inside of the container is cleaned.</p> <div data-bbox="517 1018 763 1369" data-label="Image"> </div> <p style="text-align: center;"><b>Fig. 2 Installation schematic diagram</b></p>

<b>Technical parameter</b>	Measuring range: L (according to actual dimension)/M: 0 ~ 300mm to 20000mm Max. indicator error: $\pm 10\text{mm}$ Max. output error: $\pm 0.50\%FS$
<b>Electrical Connection</b>	<p>Electric wiring can be carried out after installation of magnetic level gauges is completed. During wiring, the cover of terminal box is opened at first, and then introducing the cable into the terminal box via the cable port; the cables are wired depending on type of transmitter and terminal box.</p> <p><b>Note:</b> The cable laying and electrical connection shall be performed by qualified persons according applicable regulations of equipment. In the event that they are used in intrinsic safety zones, they must be equipped with safety barrier or IS control circuit.</p> <p><b>Warning!</b> The current pulse signal may be failure due to longer cables or the signal line is laid together with power line, so the shielded cable with grounding at one end must be used.</p>
<b>Level Transmitter</b>	 <p style="text-align: center;"><b>Fig. 3 Electrical wiring diagram (common transmitter)</b></p>
	 <p style="text-align: center;"><b>Fig. 4 Electrical wiring diagram (IS transmitter)</b></p>
	 <p style="text-align: center;"><b>Fig. 5 Electrical wiring diagram (FIELD BUS)</b></p>



**Fig. 6 Application diagram of isolated barrier (FISCO)**



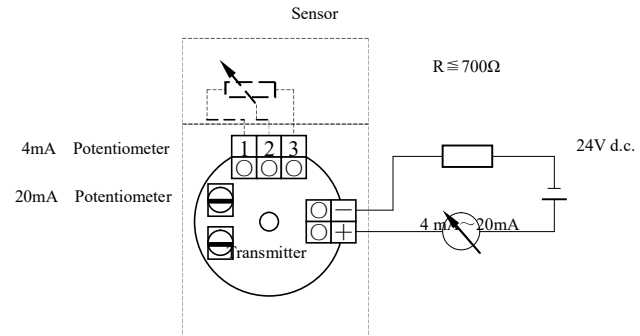
Terminal 1-2	Continuous signal 2-wire system terminal
Terminal 3-4	Upper switch signal terminal (LED local display)
Terminal 5-6	Lower switch signal terminal (LED local display)

**Signal Commissioning**

**Note:** in the event that the transmitters are operating in dangerous zones, they shall be moved to safe place for commissioning.

**1.Commissioning of transmitter for analog signal output**

During commissioning, making the float of transmitter operated at 0%, the value indicated on the test ammeter shall be 4 mA. If the current has error, you can adjust 4mA potentiometer of the transmitter until the value of ammeter is 4mA; and then make the float operate at 100%, at this time the value indicated on the ammeter shall be 20mA. If the value has error, you can adjust the 20mA potentiometer of the transmitter until the value is 20mA. Repeat the above-mentioned steps until the value indicated on ammeter is correct and no adjustment is made any more.



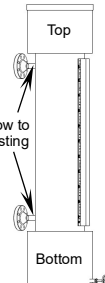
**Fig. 8 Signal commissioning diagram (analog signal output)**

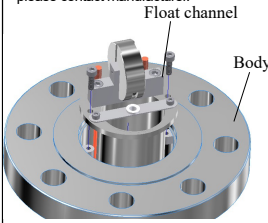
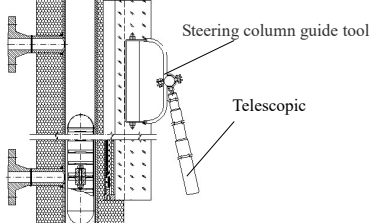
**2. Commissioning of HART® and Bus protocol digital signal output for transmitter**

During commissioning, make the float of transmitter operated at 0% or any startup condition as necessary, and then the output value of the transmitter on communication device shall be lower limit value preset at startup condition of the transmitter. If the lower limit value has error, you can adjust device shall be upper limit value preset on the condition of full range. If the upper limit value has error, you can adjust with bus program until the upper limit value is reached. Repeat the above-mentioned steps until the measured lower limit value and upper limit value of the transmitter corresponding to startup and full range respectively are correct and do not require any adjustment any more.

	<div data-bbox="351 108 941 395" data-label="Diagram"> </div> <p>PROFIBUS-PA or FOUNDATION FIELDBUS</p> <p><b>Fig. 9 Signal commissioning diagram (digital signal output)</b></p> <p><b>Note:</b> for operation of transmitter with HART® communication protocol or other programmable transmitter, you can read the attached instructions of transmitter or refer to available website.</p>
<b>Magnetic switch</b>	<p>Functioning point for on/off signal of switch has been preset before ex-works, and its position is fixed according to liquid level control point. Wiring can be carried out after installation of switch; during wiring, the cover of terminal box is opened at first, and then introducing the cable into the terminal box via the cable port; the cables are wired according to arrangement diagram of terminals, see Fig. 10.</p> <p><b>Note:</b> Magnetic switch is right side mounted of magnetic indicator as default (see Fig. 1), for MA &amp; MHT, change mount side may cause the NC &amp; NO wire opposite, please test signal before use, or contact manufacture, or specify the switch position in the order. When chamber OD is 45mm, the distance of two magnetic switch point should bigger than 60mm, if not, please contact manufacture.</p> <p><b>Note:</b> cable routing and electric connection shall be carried out by qualified persons according applicable regulations of equipment. Before test, move float in the chamber for a cycle so that the switch status will be reset.</p> <p><b>Warning!</b> The current pulse signal may be failure due to longer cables or the signal line is laid together with power line, so the shielded cable with grounding at one end must be used.</p> <div data-bbox="535 850 700 970" data-label="Diagram"> </div> <p><b>Fig. 10 Wiring indicator of magnetic switch</b></p>
<b>Circuit Protection</b>	<p><b>1. Inductive load AC</b></p> <div data-bbox="400 1034 750 1193" data-label="Diagram"> </div> <p><b>Fig. 11 Contact protection circuit diagram (inductive load AC)</b></p> <p><b>2. Inductive load DC</b></p> <div data-bbox="434 1257 767 1409" data-label="Diagram"> </div> <p><b>Fig. 12 Contact protection circuit diagram (inductive load DC)</b></p>

	<div>3. Capacitive load</div> 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Information on Explosion-proof	<ul style="list-style-type: none"><li>● Dangerous corrosive gas to aluminum alloy shall not exist on the installation site;</li><li>● Repairing shall be carried out on safe site; repairing can be carried out only after making sure there is no inflammable gas exists on site.</li><li>● Installation, use, maintenance and inspection shall be carried out according to stipulations in Product instructions, GB/T 3836.15-2017- Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines), GB50257-1996-Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering, GB/T 3836.13-2021- Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres and GB/T 3836.16-2017- Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines).</li><li>● Plastic material shall not be used for housing, connection of sensor and float.</li></ul> <p>2. Application of IS product shall be strictly in accordance with the following: The IS product has been inspected by National Supervision and Inspection Center for Explosion Protection and Safety of Instrumentation (NEPSI) and conforms to relative requirements in standard GB/T 3836.1-2021, GB/T 3836.4-2021, and its explosion-proof mark is Ex ia IIC T3 to T6. The product and safety barrier will comprise the IS explosion protection system.</p> <ul style="list-style-type: none"><li>● Ambient temperature: -40℃ to +60℃;</li><li>● The relationship between temperature group and max. temperature of the medium to be measured is as following:</li></ul> <table><tr><th>Temperature group</th><th>T1</th><th>T2</th><th>T3</th><th>T4</th><th>T5</th><th>T6</th></tr><tr><td>Max. temperature of the medium to be measured (℃)</td><td>440</td><td>290</td><td>190</td><td>130</td><td>95</td><td>80</td></tr></table> <ul style="list-style-type: none"><li>● IS parameters of magnetic switch are: <math>U_i=30V, I_i=120mA, P_i=1.2W, C_i=0uF, L_i=0mH</math>; IS parameters of Level Transmitter are: <math>U_i=30V, I_i=120mA, P_i=1.2W, C_i=0uF, L_i=0mH</math>;</li><li>● Dangerous corrosive gas to housing of product shall not exist at the installation site;</li><li>● The connection cable between the product and safety barrier is IS cable (must have insulated shield), cross-sectional area of each core shall be more than 0.5 mm<sup>2</sup> and its earthing will earth at safe site. Routing of cable shall be prevented from electromagnetic interference as far as possible;</li><li>● No customer is allowed to change parts of the product. In case of any failure during the operation of the product, the customer shall work together with manufacturer to solve the product and eliminate the damage to product.</li></ul> <p>Installation, use, maintenance and inspection shall be carried out according to stipulations in Product instructions, GB/T 3836.13-2021- Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres, GB/T 3836.15-2017- Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines), GB/T 3836.16-2017- Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines) and GB50257-1996-Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering.</p>	Temperature group	T1	T2	T3	T4	T5	T6	Max. temperature of the medium to be measured (℃)	440	290	190	130	95	80
Temperature group	T1	T2	T3	T4	T5	T6									
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Ingressive protection	In order to meet the ingress protection, select the appropriate cable according to the wire diameter and explosion-proof grade of the cable gland. After wiring, tighten the cable gland with an open wrench. The sealing parts of junction box cover shall be placed in a flat way, and junction box cover shall be tightened with tools in uniform strength. The redundant electrical interface shall be sealed with a screw plug and tightened.														
Application	<ol style="list-style-type: none"><li>1. If there is any foreign substance such as scrap or iron powder inside the container when the magnetic level gauges are operating, the channel for movement of float may be clogged, then the use of the magnetic level gauges will be influenced;</li><li>2. When the magnetic level gauges operates, the allowable pressure limit of the magnetic level gauges is stipulated in technical specification; if the pressure is above the specified limit, the magnetic level gauges may be damaged;</li><li>3. The change of liquid level in container shall be stable when the magnetic level gauges operates, if sudden change happens, the output of magnetic level gauges may be abnormal, at this time, the signal can get right immediately after the level has settled down again.</li><li>4. The surrounding environment shall have no obvious magnetic field when the magnetic level gauges operates, so as to avoid affecting the magnetic field of the switch.</li><li>5. The power supply shall be stable when operation of magnetic level gauges, and electric shield shall be taken into consideration for signal transmission.</li><li>6. It is the prerequisite of normal operation of the magnetic level gauges that the installation is firm and wiring is reliable.</li><li>7. Install float into the chamber before operating of the level gauge, and put the heavier side upwards.</li><li>8. Before operating of the level gauge, open upper connection valve which in gaseous phase slowly, then open lower connection valve which in liquid phase slowly.</li><li>9. For heating jacket type level gauge, the vapor shall enter slowly at beginning, after the temperature in jacket stable, turn on the entry completely, otherwise the chamber may damage because of steam water hammer.</li><li>10. For low temperature insulate level gauge, the only allowable hoisting position is process connection tube, see the figure. Any other position is forbidden to hoisting strictly, otherwise the protect case or inner insulate, valve would be damaged. The center of the level gauge shall be maintained as vertical as possible. Avoid any impact or bump during the hoisting to prevent protect case of level gauge damaged.</li></ol> <p><b>Note:</b></p> <ul style="list-style-type: none"><li>● Strong vibration at the time of operation of magnetic level gauges shall be avoided;</li><li>● The magnetic level gauges must not be operated at and nearby strong magnetic</li></ul> 														

	<ul style="list-style-type: none"> <li>The protective measures shall be also taken for electric system of magnetic level gauges against rain and sunshine.</li> </ul>
Maintenance	<p>1. In general, no special maintenance is necessary for magnetic level gauges when operation. In the event that fluidity and cleanliness of working medium is not good, regular cleaning shall be carried out for magnetic level gauges;</p> <p>2. In the case of lengthy stoppages of the magnetic level gauges after running, be sure to clean the working medium on the surface of the magnetic level gauges;</p> <p>3. If the magnetic level gauges is shut down for a longer period of time, the float has to be separated properly from the magnetic switch, in order to prevent electric attraction of magnetism of float and cause long-term static working of magnetic switch and affect its performance.</p> <p>4. Low density level gauge designed to renewable inner parts for the convenience of maintenance. (fig.15).</p>
Troubleshooting	<p>1. If the magnetic level gauges cannot operate normally, the check shall be carried out according to the following steps:</p> <ul style="list-style-type: none"> <li>Check seals at the connect of magnetic level gauges; Low-temperature coating products shall be guided by special tools, and the guiding tools and placement are shown in (fig.16).</li> <li>Check float of magnetic level gauges for damage or spalling;</li> <li>Check connection of signal transmission of magnetic level gauges for breaking and damage;</li> </ul> <p>2. Check wearing parts of magnetic level gauges: (including: float, reed switch)</p> <ul style="list-style-type: none"> <li>If the liquid level changes at the rating point in tank while output of magnetic switch has no response, check float for damage; if the float is in a good condition, then make the simulated liquid level of float move upwards and downwards manually, at this time, observe whether the output signal has change, if no, it means the reed sensor of the magnetic switch has been damaged;</li> <li>When the liquid in container varies and move smoothly, and position with output of magnetic switch is not in the preset point, check the retainer on switch sensor for loosens or falls off, if has, make it reset and then the magnetic switch operate again.</li> </ul> <p>3. If the transmitter cannot operate normally, the check shall be carried out according to the following steps:</p> <ul style="list-style-type: none"> <li>Check float for damage or spalling;</li> <li>Check connection of signal transmission of transmitter for breaking and damage;</li> <li>Check wearing parts of transmitter for damage (including: float, reed resistance induction circuit, transmitter module).</li> <li>If the tank contains liquid while the output signal of the transmitter is the initial value all the time, check the float for damage; if the float is in good condition, move the float manually for simulation of the level upwards and downwards, and observe the output, if the output has no change, then check whether output resistance value changes in the leads of sensor of the transmitter, if it has change, then it means the transmitter has been damaged or the connection between the sensor and transmitter is incorrect; if not, then it means the sensor has been damaged or wiring inside the sensor is incorrect;</li> </ul> <p><b>Note:</b> if the magnetic level gauges cannot operate normally after above-mentioned inspection and repairing, please contact manufacturer.</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p><b>Fig. 15 Structure</b></p> </div> <div style="text-align: center;">  <p><b>Fig. 16 Cryogenic bag to cover the products for the guide tool</b></p> </div> </div>
Warranty	<p>Under the prerequisite that users operate the product according to stipulations in relative documents, within the guarantee period of 12 months from shipping date, if the products cannot operate normally due to quality issues or be not in accordance with technical conditions stipulated in documents, they can be repaired or replaced free of charge.</p>
Accessories	<p>Packing list; product instructions; product certificate; additional fittings or accessories to be ordered by customer.</p>

**Special Statement:** This manual is subject to Chinese, English is only for reference.



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