INDUCTIVE SENSOR

PRODUCT INTRODUCTION

INDUCTIVE SENSOR

When the metal conductive objects close to the magnetic field and reach the induction area , high-frequency alternating magnetic field generated by a LC oscillation circuit , which is composed of a coil wounf on a ferrite , through the eddy crrent effect generated by internal of metal objects to achieve non-contact detection.

STANDARDS

All ELCO's inductive proximity sensor conform to IEC 60947-5-2.

HOUSING MATERIAL

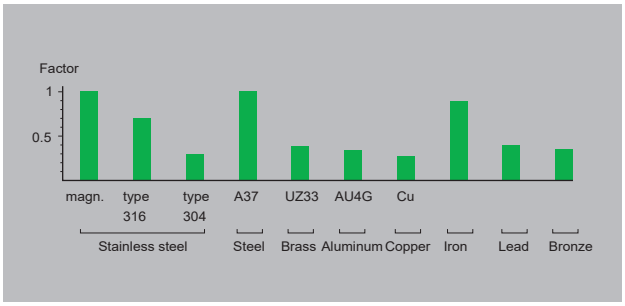
The housing material of sensor including nickel plated copper , also stainless steel and plastic with resistance of compression and temperature rapid change . Most of square sensor is plastic housing . Plastic can also be used to produce square sensor with adjustable sensing surface or compact (small square)sensors . Such sensors can be used in the occasions of limited installation space or required large detection range.

APPLICATION

Inductive proximity switch is a low cost method for non-contact setection of metal objects , which is widely in the following sector , such as:
- Automotive industry
- Metallrgicl sector
- Machine tool sector
- Robot induustry
- Conveyor system
- Paper and printing industry
- Mechanical engineering

ATTENUATION COEFFICIENT

When detect different materials with inductive sensors , there will be different detection distance even using the same product , please refer to following figure.



SPECIAL INDUCTIVE SENSOR

ELCO can provide special sensor for special environment to adapt to the field environment , avoid malfunction occurred and extend the service life.

GENERAL PARAMETERS

Shock resistance 30G, 11 ms
Anti - vibration 55Hz , 1mm
Voltage drop
- 2-wire non-polarity DC transistor output proximity switch＜ 5V
- 2-wire polarity DC transistor output proximity switch＜ 5V
- 2-wire AC / DC proximity switch＜ 6V
- 3-wire DC transistor output proximity switch＜ 1.8V
- 4-wire DC transistor output proximity switch＜ 1.8V

电感式传感器

产品信息

电感式传感器

利用缠绕在铁氧体磁芯上的线圈而构成的LC振荡电路产生的一个高频交变的磁场在金属性导电物体接近磁场并到达感应区时，通过金属物体内部产生的涡流效应来达到非接触式检测。

符合标准

所有ELCO的电感式接近传感器复合IEC 60947-5-2标准。

外壳材料

除了标准的铜镀镍外科外，还提供抗压力及耐温度突变的不锈钢及塑料等外壳材料的传感器。方型传感器则多为塑料外壳。这些材料也可用来制作感应面可调的方形产品或紧凑型（小方形）产品。此类产品可以用在某些安装控件有限或者需要大检测距离的场合。

应用

电感式接近开关是用于非接触检测金属物体的一种低成本方法。他们广泛应用于金属部件关键的领域。
如:
-汽车工业
-冶金行业
-机床行业
-机器人工业
-输送机系统
-造纸和印刷工业
-机械工程

衰减系数

对于电感式传感器在检测不同材质的被测物时，即使使用同一款产品，也会出现检测距离不相同的情况，这是使用下图作为参考。

特殊应用型电感式传感器

针对特殊环境的需要，ELCO能够提供特殊应用型的传感器，以更好适应现场情况避免发生误动作，延长使用寿命。

一般参数

抗冲击性 30G, 11 ms
抗振性 55Hz , 1mm
电压降
- 2线无极性直流晶体管输出接近开关＜ 5V
- 2线有极性直流晶体管输出接近开关＜ 5V
- 2线交/直流制接近开关＜ 6V
- 3线直流晶体管输出接近开关＜ 1.8V
- 4线直流晶体管输出接近开关＜ 1.8V

INDUCTIVE SENSOR

FASTENING TORQUE

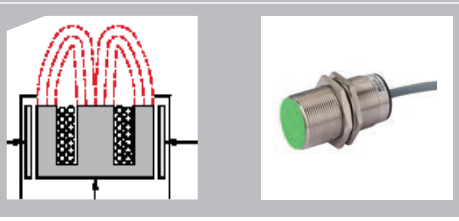
Fastening nut	M8	M12	M18	M30
Fastening torque Nm	Brass:2 N·m	Brass:10 N·m	Brass:20N·m	Brass:40 N·m
		Plsatic:1 N·m	Plsatic:3N·m	Plsatic:5 N·m
	Stainless steel:5 Nm	Stainless steel:25 N·m	Stainless steel:50 N·m	Stainless steel:100 N·m

MOUNTING

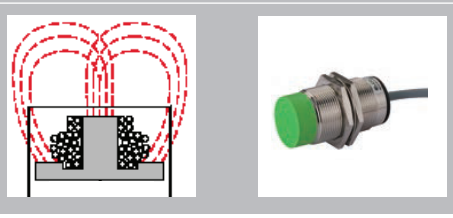
FLUSH MOUNTING AND NON-FLUSH MOUNTING

Flush mounting :the sensing surface and the base surface are flushed to protect the detection surface of sensor.Non-flush mounting:the sensing surface is higher than the base surface . Generally , the non-flushing sensor has larger detection range.

Flush mounting



Non-flush mounting

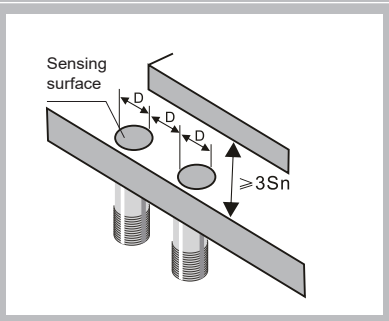


INSTALLATION SPACE REQUIREMENTS

To avoid the interference of the surrounding metal objects or other sensors during installation , there shall have the minimum installation space.

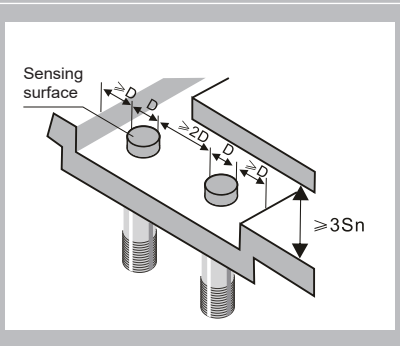
Flush

The sensing surface is flushed with the metal surface during installation. The distance from the sensing surface to detected metal object should be ≥3Sn. The distance between two adjacent switches must be ≥D.



Non-flush

Since there is no metal housing in the sensing surface, the mounting type can be identified through the sensor head. The distance from sensing surface to the metal mounting medium must be ≥2Sn. The distance from the sensing surface to detected metal object must be ≥3Sn. The distance between the two adjacent proximity switches must be ≥ 2D.



电感式传感器

紧固扭矩

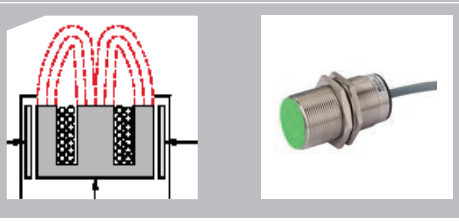
紧固螺母	M8	M12	M18	M30
设计材料紧固扭矩Nm	黄铜:2 N·m	黄铜:10 N·m	黄铜:20 N·m	黄铜:40 N·m
		塑料:1 N·m	塑料:3 N·m	塑料:5 N·m
	不锈钢:5 N·m	不锈钢:25 N·m	不锈钢:50 N·m	不锈钢:100 N·m

安装

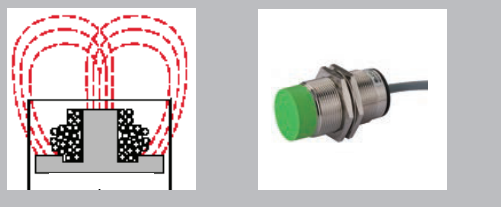
齐平安装和非齐平安装

传感器齐平安装时埋入金属基座中，感应面与基座面齐平；可以对传感器检测面进行机械保护。
传感器非齐平安装时埋入金属基座中，感应面漏出基座面；一般来说，非齐平安装的传感器有更大的检测距离。

齐平安装



非齐平安装

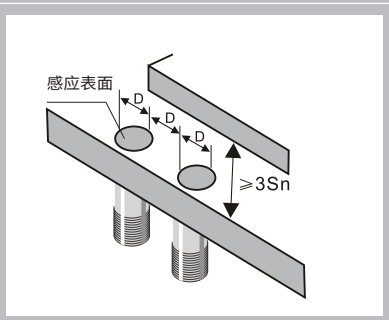


安装空间要求

电感式传感器安装时应避免周围金属物体或其他传感器对其干扰，故存在最小安装空间。

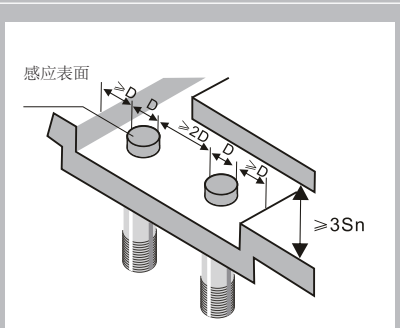
齐平

传感器安装时感应面可以和金属表面齐平。开关表面到其对面的金属物体的距离要≥3Sn，
邻近的两个开关间的距离必须≥D。



非齐平

传感器安装时可以根据他们的头部来识别，非齐平式的感应表面的区域没有金属壳。感应表面到金属安装介质的距离必须≥2Sn。
感应表面到对面的金属物体的距离必须≥3Sn，另外两个邻近的接近开关的距离必须大于等于号2D



INDUCTIVE SENSOR

TECHNICAL DESCRIPTION

RESISTANCE TO ELECTROMAGNETIC INTERFERENCE

When the inductive load is disconnected , the output voltage rises to a very high value (without a protective element), at which point the output transistor will be destroyed . there , the proximity seitch is equipped with a Zener diode at the output , which can limit the disconnect voltage to a safe value (2-wire proximity seitch). When connecting inductive loads with current ＞100 mA and switching voltage ＞10Hz,it is recommended to connect a continuous current diode directly between the loads (due ti power loss in the built-in Zener diode).

RF INTERFERENCE PROTECTION

The high frequency sensitivity is sufficiently reduced to comply with IEC 61000-4-3 level 3 (test level 10 V/m)

ANTISTATIC DISCHARGE

The structure of the divice is such that electrostatic discharge according to IEC 61000-4-3 level 3(8kV) can damage the device.

APPLICATION ELECTROMAGNETIC COMPATIBILITY(EMC)

All inductive proximity switches comply with EMC guidslines protection requirements of NO.89/334/ECC.This can be confirmed by EN 60947-5-2 standard.
Individual test apply the following EMC standards:
- EN 61000-6-2
- EN61000-6-4
- EN61000-3-2
- EN61000-3-3

PROTECTION LEVEL

Sensor housing protection against solids and liquids , IP(INTERNATIONAL PROTECTION) , The IP class standard iec 60529 is compiled by the IEC(INTERNATIONALELE CTR-Technical COMMISSION)in order to classify electrical appliances and other equipment according to their dustproof and waterproff characteristics . IP protection level is composed of two numbers , he first mark number intrusion , the second mark number indicates the degree if anti-electrical moisture and water intrusion . The greater the number indicates the higher the level of protection .(The foreign objects referred to here include tools , human fingers ,etc.,should not touch the live part of the electrical appliance to avoid electric shock.

IP65 Full contact protection under upright part pressure .
Anti-dust and drench.
IP67 Full contact protection under pressure in the upright part.
IP68 Includes IP67 content
- 24 hours at +70℃
-24 hours at -25℃
-7 days under 1 meter of water ,no seepage
-+70℃to -25℃,every 10℃for 1 hour

REVERSE POLARITY PROTECTION

Short-circuit protection is applied to the sensor when the polarity reversal results in a short circuit (only relative to the sensor without reverse polarity protection).

SHORT CIRCUIT PROTECTION

Built-in standard short-circuit protection circuit to protect the temporary access current greater than the rated load current.

POWER-ON DELAY

All have power-on delay function , so that the sensor can be switched on the instant circuit protection.

STANDARD TEST SUBSTANCE

Material:37 steel
Thickness:1mm
Dimensions:3 times the rated working distance , and the diameter of the sensing surface , take the bigger value.

电感式传感器

技术术语

抗电磁干扰性

当将感应负载断开时，输出电压会上升到很高的值（不带保护元件），此时输出晶体管将遭到破坏。因此，接近开关在输出处配备了一个齐纳二极管，它可以将断开电压限制到一个安全的数值（3线制接近开关）。
在电流＞100mA同时开关电压＞10Hz下连接感应负载时，建议在负载之间连接一个续流二极管（由于在内置的齐纳二极管中具有功率损耗）。

射频干扰保护

高频敏感性被充分降低以复合IEC 61000-4-3的Level 3(测试电平10 V/m）。

防止静电放电

器件的结构使得根据IEC 61000-4-3 Level 3(8KV）的静电放电会损坏器件。

电磁兼容性（EMC）

所有电感性接近开关都符合EMC指南No.89/334/ECC的保护要求。此可根据EN 60947-5-2标准应用确认。
- EN 61000-6-2
- EN61000-6-4
- EN61000-3-2
- EN61000-3-3

防护级别

传感器外壳对固体和液体的防护,IP (INTERNATIONAL PROTECTION)防护等级标准 IEC 60529 是由IEC (INTERNATIONALELE CTRO-TECHNICAL COMMISSION)所起草,目的是为了将电器等设备依其防尘防水之特性加以分级。IP防护等级是由两个数字所组成,第一个标记数字表示电器防尘、防止外物侵入的等级,第二个标记数字表示电器防湿气、防水侵入的密闭程度,数字越大表示其防护等级越高。(这里所指的外物含工具、人的手指等,均不可接触到电器内之带电部分,以免触电)。

IP65	直立部分压力下的完全接触保护。 防尘和淋水。
IP67	直立部分压力下的完全接触保护。 水下1米,30分钟不渗水。
IP68	包括IP67的内容 ·24小时置于+70°C ·24小时置于-25°C

反极性保护

当极性接反导致短路时对传感器进行短路保(只是相对于无反极性保护的传感器)。

短路保护

内置标准的短路保护电路,对暂时接入电流大于额定负载电流进行保护。

通电延时

均有通电延时功能,由此可以对传感器进行接通瞬间的电路保护。

标准检测物

材料:37号钢

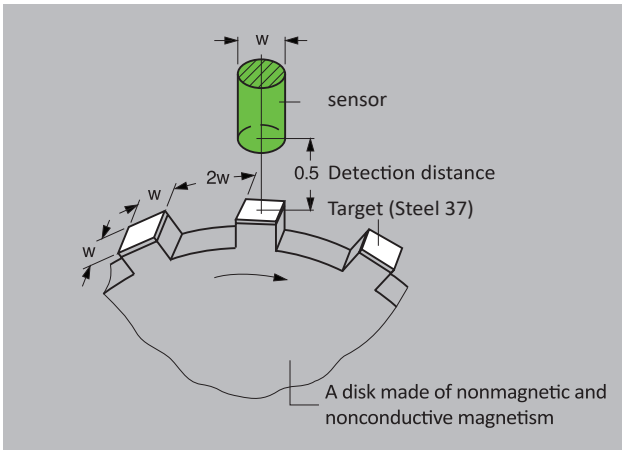
厚度:1mm

外形尺寸:3倍额定工作距离,与感应面直径,取最大值。

INDUCTIVE SENSOR

SWITCHING FREQUENCY

The maximum number of switch changes per second measured by a standard dial.



OPERATING VOLTAGE

The operating voltage specification shall include 10% ripple voltage.

RATED WORKING DISTANCE Sn

The rated working distance is a general variable used to define the working distance . Scattering of the object under test and changes caused byexternal influences such as voltage or temperature (IEC)are not taken into account . The working distance is applicable when a standard target is used and measured according to IEC 60947-5-2.If the size of the material and/or target is different from the standard target , the reduction factor must be taken into account.

ACTUAL WORKING DISTANCE Sr

The operating distance of a proximity switch at a given temperature , voltage ,and installation condition . This is the working distance of the proximity switch measured according to IEC60947-5-2.
Manufacturing tolerance is 10%:
0.9 Sn < Sr < 1.1 Sn

USABLE WORKING DISTANCE Su

The working distance (IEC) of a proximity seitch measured under certain conditions. This includes additional expected deviations due to variations in temperature and operating voltage within specified ranges. The usable working distance is between 90% and 110%of the actual working distance . For a reliable design proximity switch :0.81 Sn < Su < 1.21 Sn

ASSURED WORKING DISTANCE (EXECUTION DISTANCE) Sa

The distance (IEC) from an effective surface to which proximity to the switch execution action is guaranteed under certain conditions. Ensure that the working distance is between zero and the lowest value of the available working distance :0 < Sa < 0.81 Sn

RATED OPERATING CURRENT Ie(output surrent)

Proximity switches are designed to have a specific maximum output current . If this current is exceeded(even for a short time),the built-inoverload protection function is activated . Bulb capactiors and other strong capactive loads (such sa long wires) have a similar effect to overload.

HYSTERESIS H

The hystersis H is the distance between the standard metal target approaching the start point of the sensor and leaving the end point of the sensor.

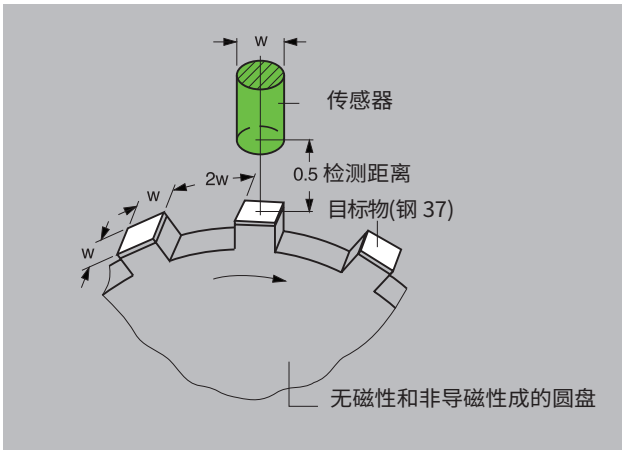
REPETITION ACCRACY R

Repetition accuracy refers to the change in the tuurue working distance Sr(IEC) under certain sonditions . The repetition accracy was measred within 8 hours at 23℃(±5℃) , within a specified range relative humidity and at a determined supply voltage ,The difference between any two measured values should not exceed 10% of the actal working distance .Sr repetition accuracy is usually much better in cases where merasurements are made one after the other.

电感式传感器

开关频率

用标准检测盘测出的每秒开关变化的最大次数。



工作电压

工作电压的规定要包括10%纹波电压。

额定工作距离Sn

额定工作距离是用于定义工作距离的一个常规变量。不考虑被测物体的散射以及由电压或温度等外部影响所引起的变化(IEC)。工作距离在使用标准目标并根据IEC 60947-5-2进行测量时 适用。如果材料或目标的尺寸与标准目标不同,则必须要考虑折减系数。

实际工作距离Sr

在确定的温度、电压和安装条件下某个接近接近开关的工作距离。这是根据IEC60947-5-2测量得到的接近开关的工作距离。
制造容差为10%:
0.9 Sn < Sr < 1.1 Sn

可用工作距离Su

在确定条件下测量得到的某个接近开关的工作距离(IEC)。这包括在规定范围内温度和工作电压变化所引起的附加预期偏差。可用工作距离在实际工 作距离的90%和110%之间。对于一个可靠设计接近开关:0.81 Sn < Su < 1.21 Sn

保证工作距离（执行距离）Sa

与在确定条件下可保证接近开关执行动作的有效表面的距离(IEC)。保证工作距离在零和可用工作距离的低值之间:0 < Sa < 0.81 Sn

额定工作电流Ie（输出电流）

接近开关在设计上有一个特定的最大输出电流。如果超过此电流(即使是短时超过),就会激活内置的过载保护功能。白炽灯、电容器和其它强电容性负载(如长导线)具有与过载类似的作用。

回查H

回差H是标准金属目标接近传感器开始点到离开传感器结束点之间的距离。

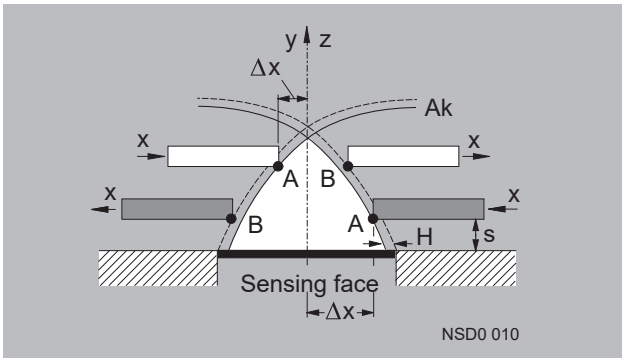
重复精度R

重复精度是指在确定条件下真实工作距离Sr上的变化(IEC)。重复精度是在23°C(±5°C)、在规定范围相对湿度内和确定电源电压下在8小时内测量得到的。任意两个测量值之间的差值不能超过实际工作距离的10%。Sr在测量一个紧接一个进行的情况下, 重复精度通常要好得多。

INDUCTIVE SENSOR

RESPONSE CURVE

Curves for all response points A.The curve is determined using standard targets . The correlation characteristics of proximity switch can be obtained from this curve . The Z-axis of the switch is coincided with to the Y-axis.



AK	Response characteristic	X	Direction of motion
A	Response point	△x	Trigger distance
B	Release point	Y	Distance from proximity switch
H	Differential travel	Z	Reference axis
s	Working distance		

NO-LOAD CURRENT

Refers to the current required by the sensor itself ,this is ,when there is no load.

OPERATING CURRENT(CONTINUOUS CURRENT)

Refers to the maximum load current in continuous operation.

INSTANTANEOUS CURRENT

It refers to the current that is allowed for a short period of time when the switch is closed without damaging the sensor.

RESIDUAL CURRENT

Refers to the current flowing through the load when the sensor is disconnected.

VOLTAGE DROP U

It refers to the voltage measured at the two ends of the sensor or the output end when the sensor is switched on .

RIPPLE VOLTAGE

Refers to the AC voltage superimposed on operating voltage (peak-peak) is usually expressed sa a percentage of the arithmetic mean .

SWITCHING FREQUENCY

The maximum number of transformations from a attenuation state to an non-attenuation state , measured in Hertz(Hz).

PERMISSIVE INTERFERENCE VOLTAGE

A voltage spike acting on a power supply for a short period of time that can damage an unprotected sensor.Turn-on delay refers to the required when the power supply voltage of the proximity switch is connected until the peoximity switch starts working.

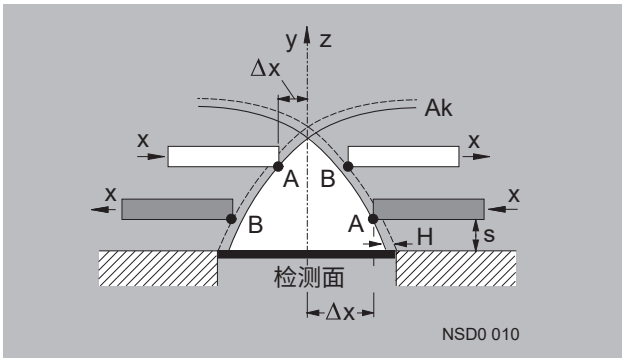
FALSE PULSE SUPPRESSION

When the operating voltage is added ,the output of the error signal can be suppressed in the time stsge of TV.

电感式传感器

响应曲线

可以找到接近开关的所有响应点A的曲线。该曲线使用标准目标进行确定。从该曲线可以得到接近开关相关特性。接近开关的z轴与y轴重合。



Ak	响应特性	x	运动方向
A	响应点	△x	触发距离
B	释放点	y	离接近开关的距离
H	差动行程	Z	参考轴
s	工作距离		

空载电流

是指传感器自身所需要的电流,即在没有负载时测量。

工作电流（持续电流）

是指连续工作时的最大负载电流。

瞬时电流

是指在开关闭合时不会损坏传感器的短时间内允许出现的电流。

剩余电流

是指传感器断开时,流过负载的电流。

电压降U

是指传感器接通时在传感器二端或者输出端 测量得到的电压。

纹波电压

是指叠加在工作电压之上的交流电压(峰-峰值)常用算术平均值的百分比来表示。

开关频率

是指从衰减状态转变到没有衰减的状态的变换的最大次数,用赫兹(Hz)来度量。

允许干扰电压

是指作用在电源上的短时间的电压尖峰,可能会损坏无保护的传感器。
接通延时是指在接近开关的电源电压接上,到该接近开关开始工作,所需要的时间。

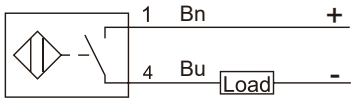
对误脉冲限制

当工作电压加上的时候,能在TV这个时间阶段里,抑制错误信号的输出。

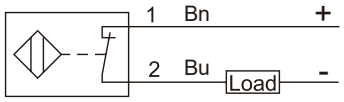
INDUCTIVE SENSOR

WIRING DIAGRAMS (Note: 1 / 2 / 3 / 4 connector and terminals pin number Bn / Bu / Wh / Bk cable color)

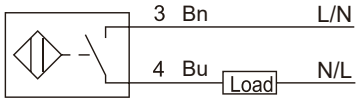
WD1 DC 2-wire NO



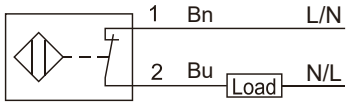
WD2 DC 2-wire NC



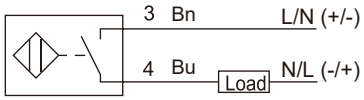
WD3 AC 2-wire NO



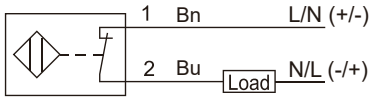
WD4 AC 2-wire NC



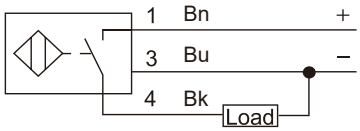
WD5 AC / DC 2-wire NO



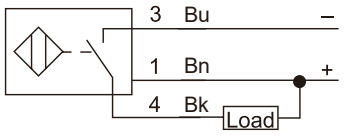
WD6 AC / DC 2-wire NC



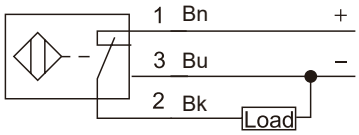
WD7 DC 3-wire PNP NO



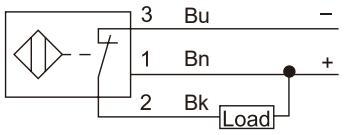
WD8 DC 3-wire NPN NO



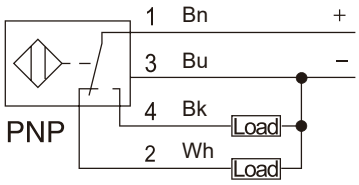
WD9 DC 3-wire PNP NC



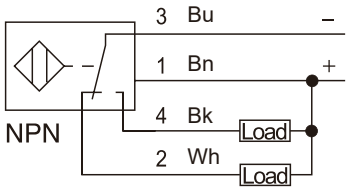
WD10 DC 3-wire NPN NC



WD11 DC 4-wire PNP NO + NC



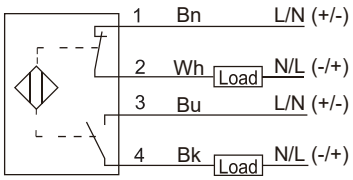
WD12 DC 4-wire NPN NO + NC



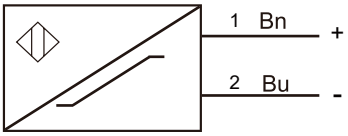
INDUCTIVE SENSOR

WIRING DIAGRAMS (Note: 1 / 2 / 3 / 4 connector and terminals pin number Bn / Bu / Wh / Bk cable color)

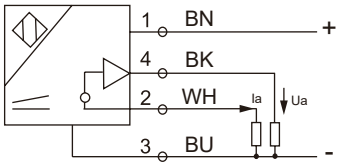
WD13 AC/DC 4-wire NO+NC



WD14 NAMUR 2-wire NC



WD15 DC 4-wire 0-10V+0-20mA



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