

## Inductive Proximity Sensors E2Q2/E2Q3/E2Q4

### Square Proximity Sensors

- Limit switch styled housing models easy to install
- Standard CENELEC models and miniature types
- Terminal housing, M12 Plug-in connection and cable types
- Special weld-field immune models



### Square Proximity Sensor

- Terminal housing
- Active face changeable to one of every five
- Easy to install and same mounting dimensions as a standard style electromechanical limit switch
- Integrated short circuit and reverse polarity protection
- Robust body with stainless steel screws



## Ordering Information

### DC type

Sensing distance	Connection	Active face	Output		
				NO	NO + NC
20 mm shielded	Terminals/ Connector	Changeable	NPN	E2Q2-N20E1-G	E2Q2-N20E3-□
			PNP	E2Q2-N20F1-G	E2Q2-N20F3-□
30 mm non shielded	Terminals/ Connector	Changeable	NPN		E2Q2-N30ME3-□
			PNP		E2Q2-N30MF3-□

- = G: terminal conduit PG 13,5  
 U: terminal conduit 1/2" NPT  
 50: BHMS4 connector, North American style

### AC type

Sensing distance	Connection	Active face	Output		
				NO	NO or NC
15 mm shielded	Terminals/ Connector	Changeable	AC		E2Q2-N15Y4-□
30 mm non shielded	Terminals/ Connector	Changeable	AC		E2Q2-N30MY4-□

- = G: terminal conduit PG 13,5  
 U: terminal conduit 1/2" NPT  
 50: BHMS3 connector, North American style



### Weld-Field Immune DC type (100mT)

Sensing distance	Connection	Active face	Output		
				NO	NO + NC
15 mm shielded	Terminal conduit 1/2" NPT	Changeable	PNP	E2Q2-N15F1-51	
15 mm shielded	BHMS4-Connector	Changeable	PNP	E2Q2-N15F1-52	



### Weld-Field Immune AC type (100mT)

Sensing distance	Connection	Active face	Output		
				NO	NO or NC
15 mm shielded	Terminal conduit 1/2" NPT	Changeable	AC		E2Q2-N15Y4-51
15 mm shielded	BHMS3-Connector	Changeable	AC		E2Q2-N15Y4-52

## Specifications for DC type

Operating voltage	10 to 60 VDC/10 to 30 VDC weld-field immune types
Current consumption	max. 20 mA / max 10 mA E2Q2-N30... types
Sensing object	Ferrous metals
Sensing distance Sn E2Q2-N15.. (Standard target size, L x W x H, Fe 37) E2Q2-N20.. (Standard target size, L x W x H, Fe 37) E2Q2-N30.. (Standard target size, L x W x H, Fe 37)	15 mm $\pm$ 10%, shielded (45 x 45 x 1 mm) 20 mm $\pm$ 10%, shielded (60 x 60 x 1 mm) 30 mm $\pm$ 10%, non shielded (90 x 90 x 1 mm)
Setting distance E2Q2-N15.. E2Q2-N20.. E2Q2-N30..	0 to 12,15 mm 0 to 16,2 mm 0 to 24,3 mm
Differential travel	15% max. of sensing distance Sn
Switching frequency	...N20...: 150 Hz / ...N30...: 100 Hz / ...N15...: 10Hz weld-field immune types
Control output	Type E2Q2-N □ □ □ E1- □ □ : NPN-NO E2Q2-N □ □ □ E3- □ □ : NPN-NO+NC E2Q2-N □ □ □ F1- □ □ : PNP-NO E2Q2-N □ □ □ F3- □ □ : PNP-NO+NC
	Max-Load 200 mA
	Max on-state voltage drop 3 VDC (at 200 mA load current)
Circuit protection	Reverse polarity, output short circuit
Alternating magnetic field	100 mT
Indicator	Operating indicator (yellow LED)
Ambient temperature	Operating: -25° to 70°C
Humidity	35 to 95% RH
Influence of temperature	$\pm$ 10% max. of Sn at 23°C in temperature range of -25° to 70°C
Dielectric strength	1.500 VAC, 50/60 Hz for 1 min. between current carry parts and case
Electromagnetic compatibility EMC	EN 60947-5-2
Vibration resistance	10 to 55 Hz, 1 mm amplitude according to IEC 60068-2-6
Shock resistance	approx. 30 G for 11 ms according to IEC 60068-2-27
Protection degree	IP 67 (IEC 529)
Connection	Terminals Up to 2,5 mm <sup>2</sup>
Material	Case Terminal base Sensing face PBT Al / .. - G Type: PBT PBT
Approvals	 CERTIFIED  LISTED

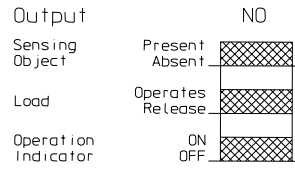
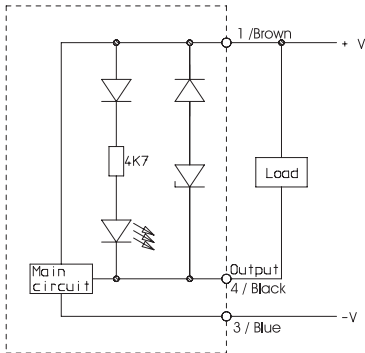
## Specifications for AC type

Operating voltage		20 to 253 VAC
Off-state current		max. 1,9 mA / max 2,5 mA weld-field immune types
Sensing object		Ferrous metals
Sensing distance Sn		
	E2Q2-N15..	15 mm $\pm$ 10%, shielded (45 x 45 x 1 mm)
(Standard target size, L x W x H, Fe 37)		
	E2Q2-N30..	30 mm $\pm$ 10%, non shielded (90 x 90 x 1 mm)
(Standard target size, L x W x H, Fe 37)		
Setting distance		
	E2Q2-N15..	0 to 12,15 mm
	E2Q2-N30..	0 to 24,3 mm
Differential travel		15% max. of sensing distance Sn
Switching frequency		20 Hz
Control output		
Type		E2Q2-N □ □ □ Y4- □ □ : AC - NO or NC
Max-Load		500 mA
Min-Load		8 mA / 10 mA weld-field immune types
Max on-state voltage drop		12 VAC (at 500 mA load current)
Circuit protection		none
Alternating magnetic field		100 mT
Indicator		Operating indicator (yellow LED)
Ambient temperature		Operating: -25° to 70°C
Humidity		35 to 95% RH
Influence of temperature		$\pm$ 10% max. of Sn at 23°C in temperature range of -25° to 70°C
Dielectric strength		1.500 VAC/ 2500 VAC E2Q2-...-G between current carry parts and case
Electromagnetic compatibility EMC		EN 60947-5-2
Vibration resistance		10 to 55 Hz, 1 mm amplitude according to IEC 60068-2-6
Shock resistance		approx. 30 G for 11 ms according to IEC 60068-2-27
Protection degree		IP 67 (IEC 529)
Connection	Terminals	Up to 2,5 mm <sup>2</sup>
Material	Case	PBT
	Terminal base	Al / .. - G Type: PBT
	Sensing face	PBT
Approvals		 CERTIFIED  LISTED

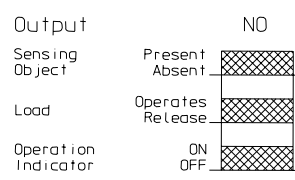
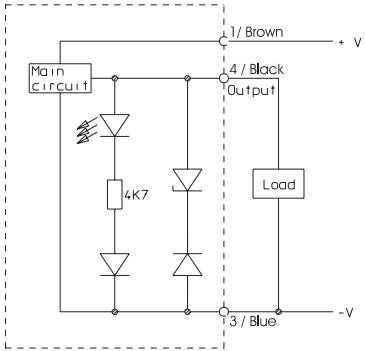
# Operation

## Output Circuit Diagram and Timing Chart

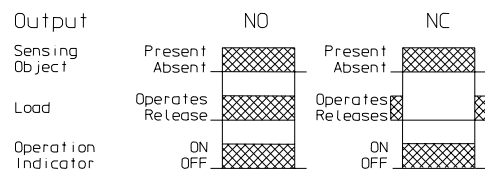
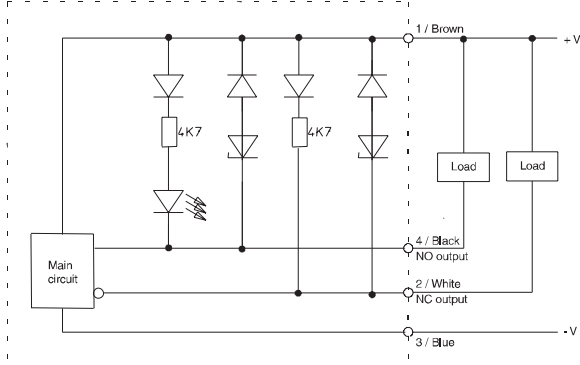
NPN NO output



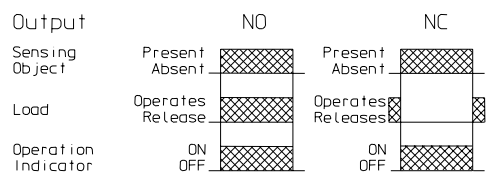
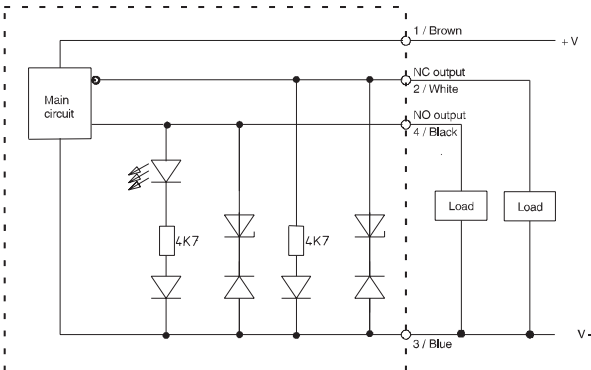
PNP NO output



NPN NO + NC output

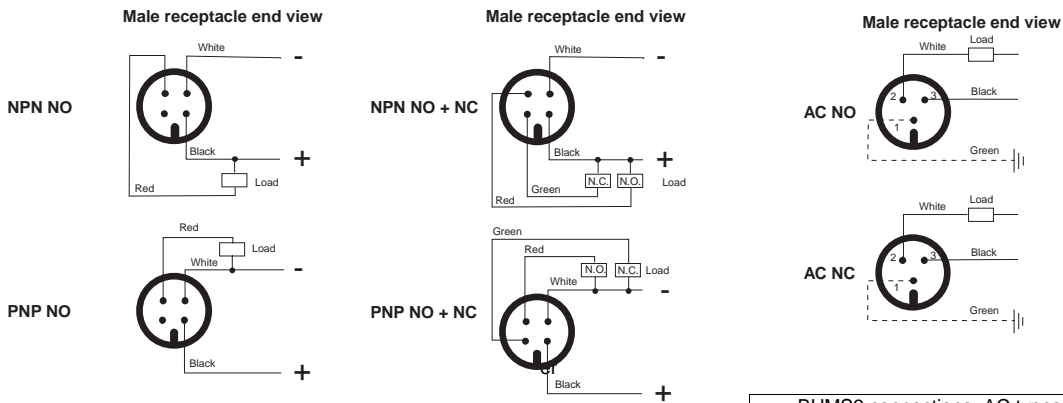
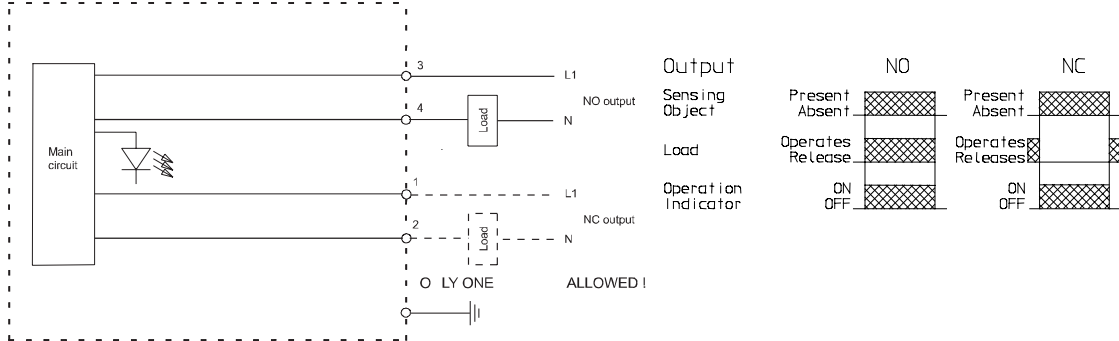


PNP NO + NC output



■ BHMS Wiring

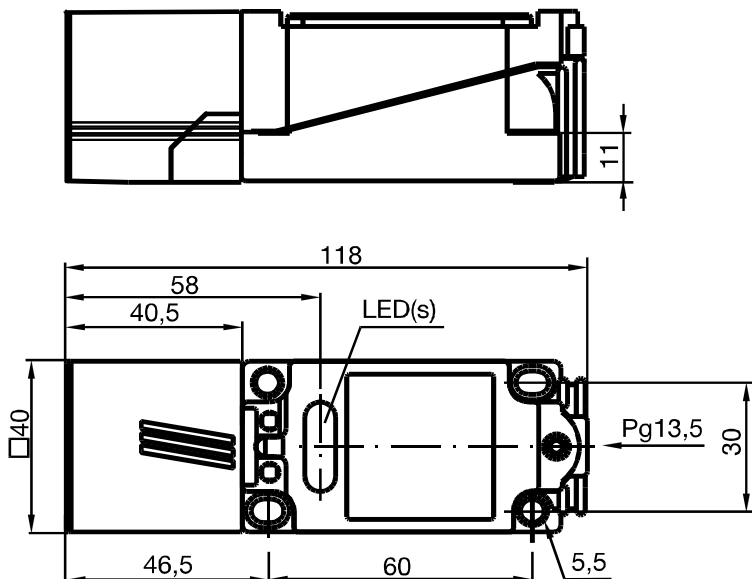
AC NO or NC output



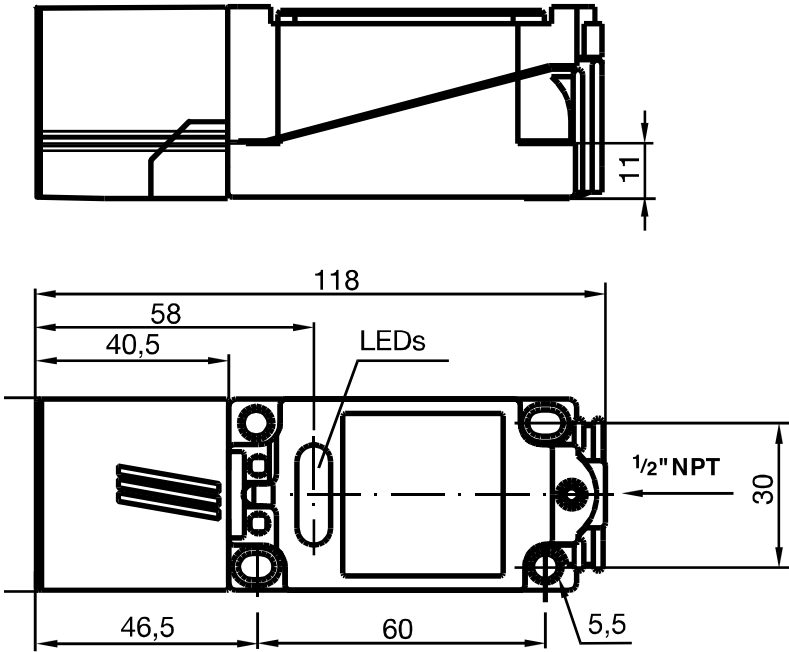
BHMS3 connections, AC types			
Function	State	BHMS Connector	Intern terminals
NO	At factory	2	3
		3	4
NC	Change by us	2	1
		3	2

Dimensions

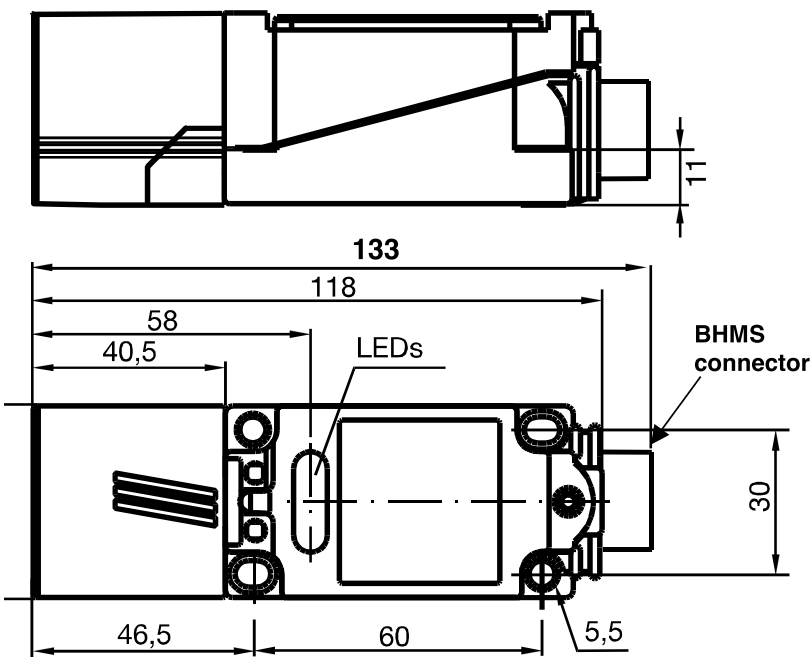
■ E2Q2-...-G type



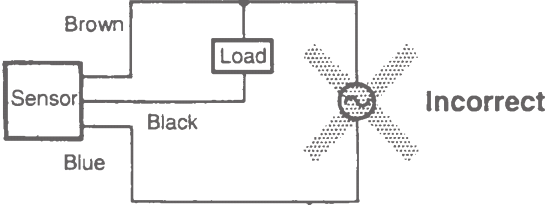
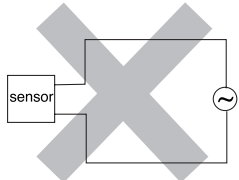
■ E2Q2-...-U and -51 type



■ E2Q2-...-50 and -52 type



## Precautions

Item	Examples
<p><b>Power Supply</b></p> <p>Do not impose an excessive voltage on the E2Q2, otherwise it may explode or burn. Do not impose AC voltage on any E2Q2 DC model, otherwise it may explode or burn.</p>	
<p>Do not connect the AC types without load to the power supply. The sensor will be damaged.</p>	

## Correct Use

### ■ Installation

#### Power Reset Time

The Proximity Sensor is ready to operate within 300 ms after power is supplied. If power supplies are connected to the Proximity Sensor and load respectively, be sure to supply power to the Proximity Sensor before supplying power to the load.

#### Power OFF

The Proximity Sensor may output a pulse signal when it is turned off. Therefore, it is recommended to turn off the load before turning off the Proximity Sensor.

#### Power Supply Transformer

When using a DC power supply, make sure that the DC power supply has an insulated transformer. Do not use a DC power supply with an auto-transformer.

#### Sensing Object

##### Metal Coating:

The sensing distance of the Proximity Sensor vary with the metal coating on sensing objects.

### ■ Wiring

#### High-tension Cables

##### Wiring through Metal Conduit

If there is a power or high-tension cable near the cable of the Proximity Sensor, wire the sensor cable through an independent metal conduit to prevent against Proximity Sensor damage or malfunctioning.



## ■ Mounting

The Proximity Sensor must not be subjected to excessive shock with a hammer when it is installed, otherwise the Proximity Sensor may be damaged or lose the water-resistivity.

## ■ Environment

### Water-resistivity

Do not use the Proximity Sensor underwater, outdoors or in the rain.

### Operating Environment

Be sure to use the Proximity Sensor within operating ambient temperature range and do not use the Proximity Sensor outdoors so that its reliability and life expectancy can be maintained. Although the Proximity Sensor is water resistive, a cover to protect the Proximity Sensor from water or soluble machining oil is recommended so that its reliability and life expectancy can be maintained. Do not use the Proximity Sensor in an environment with chemical gas (e. g., strong alkaline or acid gases including nitric, chromic, and concentrated sulfuric acid gases).

## DC Type

Connection type	Method	Description
<b>AND</b> (serial connection)	<p style="text-align: center;"><b>Correct</b></p>	<p>The Sensors connected together must satisfy the following conditions:</p> $i_L + (N-1) \times i \leq \text{Upper-limit of control output of each Sensor}$ $V_s - N \times V_R \geq \text{Load operating voltage}$ <p> <math>N</math> = No. of Sensors  <math>V_R</math> = Residual voltage of each Sensor  <math>V_s</math> = Supply voltage  <math>i</math> = Current consumption of the Sensor  <math>i_L</math> = Load current         </p> <p>If the MY Relay, which operate at 24 VDC, is used as a load for example, a maximum of two Proximity Sensors can be connected to the load.</p>
<b>OR</b> (parallel connection)	<p style="text-align: center;"><b>Correct</b></p>	<p>A minimum of three Sensors with current outputs can be connected in parallel. The number of Sensors connected in parallel varies with the Proximity Sensor model.</p>

AC Type

Connection type	Method	Description
<p><b>AND</b> (serial connection)</p>		<p>If 100 or 200 VAC is imposed on the Proximity Sensors, <math>V_L</math> (i.e., the voltage imposed on the load) will be obtained from the following.  <math>V_L = V_S - (\text{residual voltage} \times \text{no. of Proximity Sensors}) (V)</math>                      Therefore, if <math>V_L</math> is lower than the load operating voltage, the load will not operate.                      A maximum of three Proximity Sensors can be connected in series provided that the supply voltage is 100 V minimum.</p>
<p><b>OR</b> (parallel connection)</p>		<p>In principle, more than two Proximity Sensors cannot be connected in parallel.                      Provided that Proximity Sensor A does not operate with Proximity Sensor B simultaneously and there is no need to keep the load operating continuously, the Proximity Sensors can be connected in parallel. In this case, however, due to the total leakage current of the Proximity Sensors, the load may not reset properly.</p> <p>It is not possible to keep the load operating continuously with Proximity Sensors A and B in simultaneous operation to sense sensing objects due to the following reason.                      When Proximity Sensor A is ON, the voltage imposed on Proximity Sensor A will drop to approximately 10 V and the load current flows into Proximity Sensor A, and when one of the sensing objects is close to Proximity Sensor B, Proximity Sensor B will not operate because the voltage imposed on Proximity Sensor B is 10 V, which is too low.                      When Proximity Sensor A is OFF, the voltage imposed on Proximity Sensor B will reach the supply voltage and Proximity Sensor B will be ON. Then, Proximity Sensor A as well as Proximity Sensor B will be OFF for approximately 10 ms, which resets the load for an instant. To prevent the instantaneous resetting of the load, use a relay as shown on the left.</p>

### Square Proximity Sensor



- Miniature terminal housing
- Integrated short circuit and reverse polarity protection
- Output function programmable by wiring
- Active face positioning: Y-axis 15°, X-axis 90° increments



### Ordering Information

Sensing distance	Connection	Active face	Output	
				NO or NC
15 mm non shielded	Terminals	Changeable	NPN	E2Q3-N15ME4-G
			PNP	E2Q3-N15MF4-G

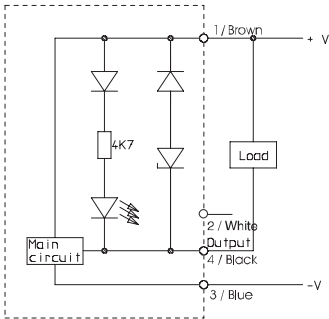
# Specifications

Operating voltage	10 to 60 VDC	
Current consumption	max. 14 mA	
Sensing object	Ferrous metals	
Sensing distance $S_n$ (Standard target size, L x W x H , Fe 37)	15 mm $\pm$ 10%, non shielded (45 x 45 x 1 mm)	
Setting distance	0 to 12,15 mm	
Differential travel	15 % max. of sensing distance $S_n$	
Switching frequency	150 Hz	
Control output	Type	E2Q3-N15ME4-G: NPN-NO / NC E2Q3-N15MF4-G: PNP-NO / NC
	Max-Load	200 mA
	Max on-state voltage drop	3 VDC (at 200 mA load current )
Circuit protection	Reverse polarity, output short circuit	
Indicator	Operating indicator (yellow LED)	
Ambient temperature	Operating: -25° to 70°C	
Humidity	35 to 95% RH	
Influence of temperature	$\pm$ 10% max. of $S_n$ at 23°C in temperature range of -25° to 70°C	
Dielectric strength	1.500 VAC, 50/60 Hz for 1 min. between current carry parts and case	
Electromagnetic compatibility EMC	EN 60947-5-2	
Vibration resistance	10 to 55 Hz, 1 mm amplitude according to IEC 60068-2-6	
Shock resistance	approx. 30 G for 11 ms according to IEC 60068-2-27	
Protection degree	IP 67 (IEC 529)	
Connection	Terminals	Up to 2,5 mm <sup>2</sup>
Material	Case	PBT
	Sensing face	PBT
Approvals	 CERTIFIED  LISTED	

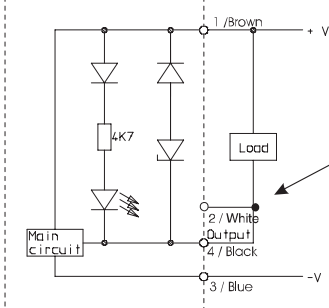
# Operation

## ■ Output Circuit Diagram and Timing Chart

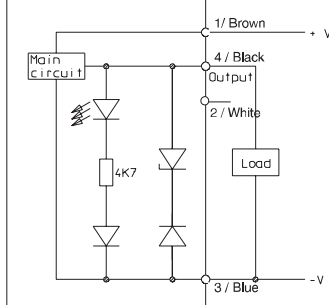
NPN NO Output



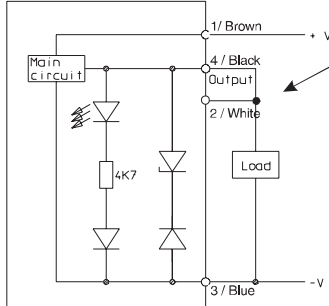
NPN NC Output



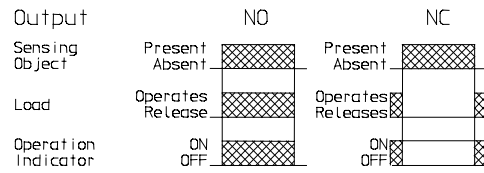
PNP NO Output



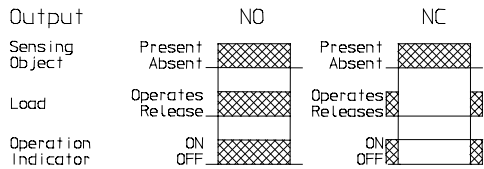
PNP NC Output



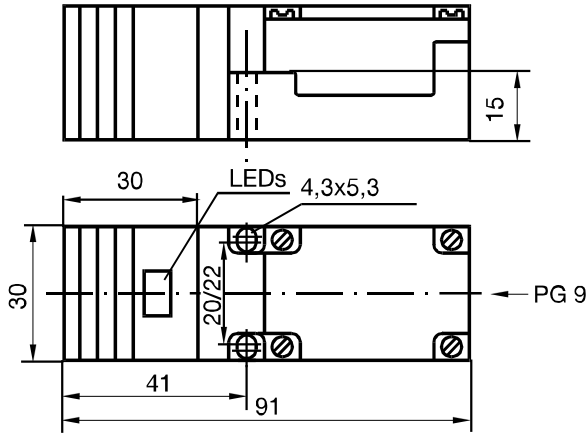
Output



Output



Dimensions



Precautions

Item	Examples
<p><b>Power Supply</b></p> <p>Do not impose an excessive voltage on the E2Q3, otherwise it may explode or burn. Do not impose AC voltage on any E2Q3 model, otherwise it may explode or burn.</p>	<p>The diagram shows a sensor with three wires: Brown, Black, and Blue. The Brown wire is connected to one terminal of a load. The Black wire is connected to the other terminal of the load. The Blue wire is connected to the same terminal as the Black wire. This configuration is marked as 'Incorrect' with a large 'X' over the load symbol.</p>

## Correct Use

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### ■ Installation

#### Power Reset Time

The Proximity Sensor is ready to operate within 300 ms after power is supplied. If power supplies are connected to the Proximity Sensor and load respectively, be sure to supply power to the Proximity Sensor before supplying power to the load.

#### Power OFF

The Proximity Sensor may output a pulse signal when it is turned off. Therefore, it is recommended to turn off the load before turning off the Proximity Sensor.

#### Power Supply Transformer

When using a DC power supply, make sure that the DC power supply has an insulated transformer. Do not use a DC power supply with an auto-transformer.

#### Sensing Object

##### Metal Coating:

The sensing distance of the Proximity Sensor vary with the metal coating on sensing objects.

### ■ Wiring

#### High-tension Cables

##### Wiring through Metal Conduit

If there is a power or high-tension cable near the cable of the Proximity Sensor, wire the sensor cable through an independent metal conduit to prevent against Proximity Sensor damage or malfunctioning.

### ■ Mounting

The Proximity Sensor must not be subjected to excessive shock with a hammer when it is installed, otherwise the Proximity Sensor may be damaged or lose the water-resistivity.

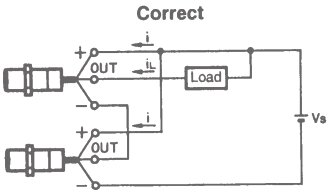
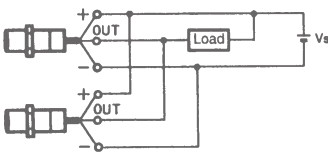
### ■ Environment

#### Water-resistivity

Do not use the Proximity Sensor underwater, outdoors or in the rain.

#### Operating Environment

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Connection type	Method	Description
<p><b>AND</b> (serial connection)</p>	<p style="text-align: center;"><b>Correct</b></p> 	<p>The Sensors connected together must satisfy the following conditions:</p> <p><math>i_L + (N-1) \times i \leq</math> Upper-limit of control output of each Sensor</p> <p><math>V_s - N \times V_r \geq</math> Load operating voltage</p> <p>N = No. of Sensors</p> <p><math>V_r</math> = Residual voltage of each Sensor</p> <p><math>V_s</math> = Supply voltage</p> <p>i = Current consumption of the Sensor</p> <p><math>i_L</math> = Load current</p> <p>If the MY Relay, which operate at 24 VDC, is used as a load for example, a maximum of two Proximity Sensors can be connected to the load.</p>
<p><b>OR</b> (parallel connection)</p>	<p style="text-align: center;"><b>Correct</b></p> 	<p>A minimum of three Sensors with current outputs can be connected in parallel. The number of Sensors connected in parallel varies with the Proximity Sensor model.</p>



### Square Proximity Sensor



- Slim, compact size
- M12 Plug-in connection and cable models
- Integrated short circuit and reverse polarity protection
- Active face positioning: Y-axis 15°, X-axis 90° increments



### Ordering Information

Sensing distance	Connection	Active face	Output		
				NO	NO + NC
20 mm shielded	Pre-wired	Changeable	NPN	E2Q4-N20E1	E2Q4-N20E3
			PNP	E2Q4-N20F1	E2Q4-N20F3
	Plug-in connector	Changeable	NPN	E2Q4-N20E1-M1	E2Q4-N20E3-M1
			PNP	E2Q4-N20F1-M1	E2Q4-N20F3-M1
30 mm non shielded	Pre-wired	Changeable	NPN	E2Q4-N30ME1	E2Q4-N30ME3
			PNP	E2Q4-N30MF1	E2Q4-N30MF3
	Plug-in connector	Changeable	NPN	E2Q4-N30ME1-M1	E2Q4-N30ME3-M1
			PNP	E2Q4-N30MF1-M1	E2Q4-N30MF3-M1

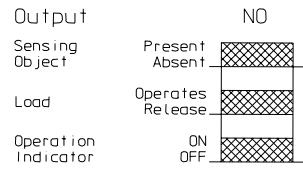
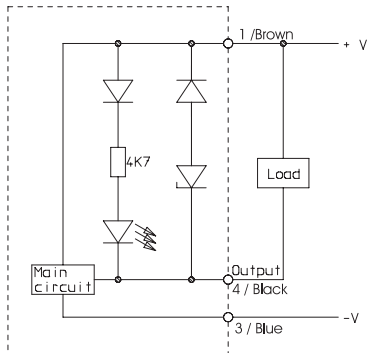
## Specifications

Operating voltage		10 to 30 VDC
Current consumption		max. 20 mA
Sensing object		Ferrous metals
Sensing distance Sn (Standard target size, L x W x H, Fe 37)	E2Q4-N20.. E2Q4-N30M.. E2Q4-N20.. E2Q4-N30M..	20 mm ±10%, shielded 30 mm ±10%, non shielded (60 x 60 x 1 mm) (90 x 90 x 1 mm)
Setting distance	E2Q4-N20.. E2Q4-N30M..	0 to 16,2 mm 0 to 24,3 mm
Differential travel		15 % max. of sensing distance Sn
Switching frequency		150 Hz
Control output	Type	E2Q4-N□□□ E1-□□ : NPN-NO E2Q4-N□□□ E3-□□ : NPN-NO+NC E2Q4-N□□□ F1-□□ : PNP-NO E2Q4-N□□□ F3-□□ : PNP-NO+NC
	Max-Load	200 mA
	Max on-state voltage drop	3 VDC (at 200 mA load current )
Circuit protection		Reverse polarity, output short circuit
Indicator		Operating indicator (yellow LED)
Ambient temperature		Operating: -25° to 70°C
Humidity		35 to 95% RH
Influence of temperature		± 10% max. of Sn at 23°C in temperature range of -25° to 70°C
Dielectric strength		1.500 VAC, 50/60 Hz for 1 min. between current carry parts and case
Electromagnetic compatibility EMC		EN 60947-5-2
Vibration resistance		10 to 55 Hz, 1 mm amplitude according to IEC 60068-2-6
Shock resistance		approx. 30 G for 11 ms according to IEC 60068-2-27
Protection degree		IP 67 (IEC 529)
Connection	Pre-wired	2 m PVC-cable, 3x0,34mm <sup>2</sup> / 4x0,34mm <sup>2</sup>
	Connector	M12 plug, 3 / 4 pins
Material	Case	PBT
	Sensing face	PBT
Approvals		 CERTIFIED  LISTED

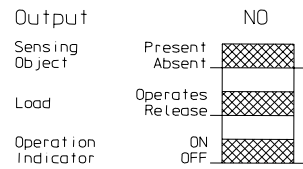
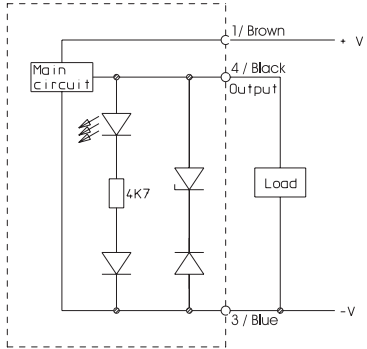
# Operation

## ■ Output Circuit Diagram and Timing Chart

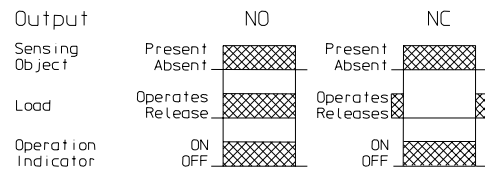
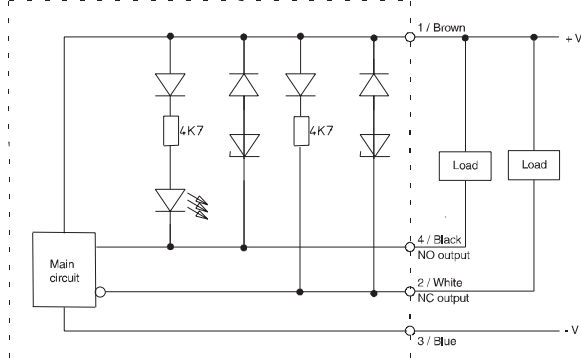
NPN NO output



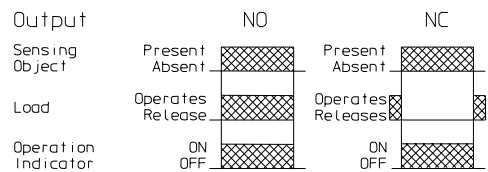
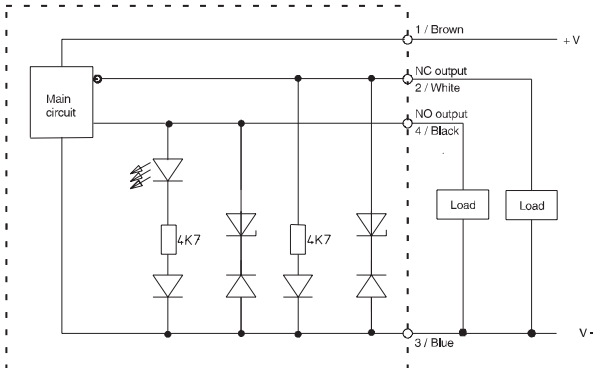
PNP NO output



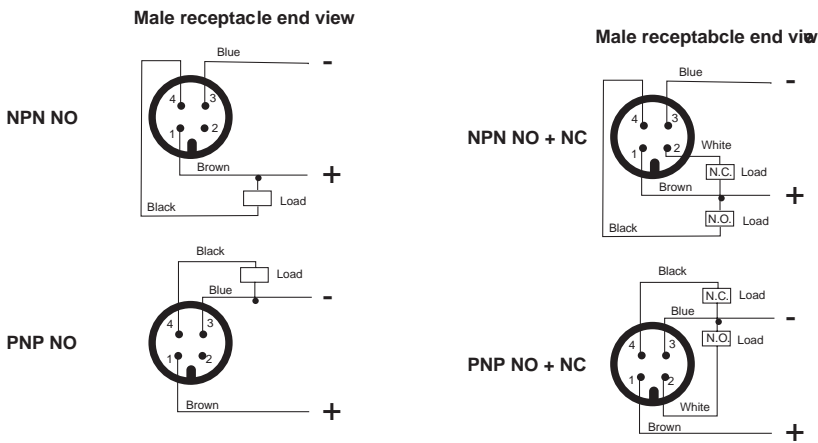
NPN NO + NC output



PNP NO + NC output



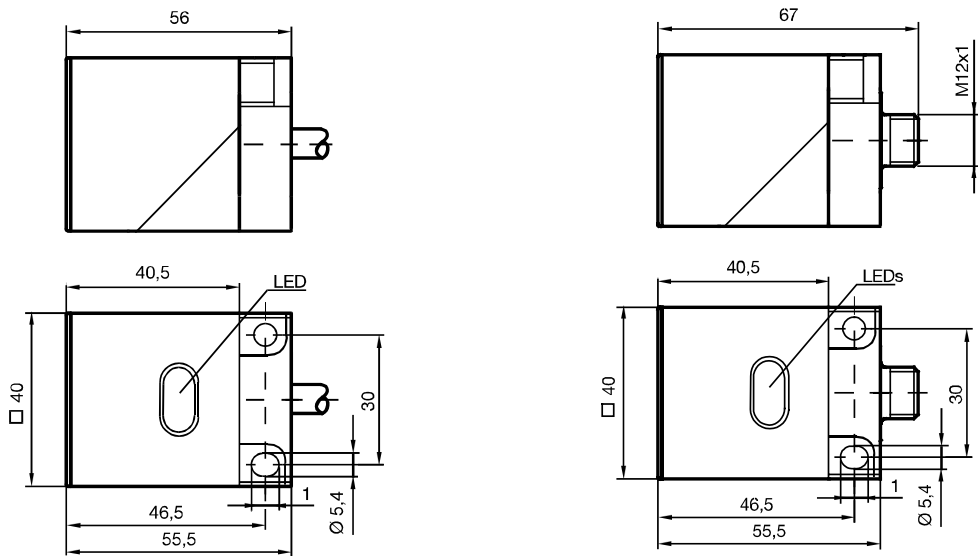
■ Wiring



Dimensions

E2Q4-N...

E2Q4-N....-M1



Precautions

Item	Examples
<p><b>Power Supply</b></p> <p>Do not impose an excessive voltage on the E2Q4, otherwise it may explode or burn. Do not impose AC voltage on any E2Q4 DC model, otherwise it may explode or burn.</p>	<p><b>Incorrect</b></p> <p>The diagram shows a sensor with three wires: Brown, Black, and Blue. The Brown wire is connected to the positive terminal of a load, and the Blue wire is connected to the negative terminal. The Black wire is also connected to the positive terminal. This configuration is marked as incorrect with a large 'X' over the load.</p>

## Correct Use

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### ■ Installation

#### Power Reset Time

The Proximity Sensor is ready to operate within 300 ms after power is supplied. If power supplies are connected to the Proximity Sensor and load respectively, be sure to supply power to the Proximity Sensor before supplying power to the load.

#### Power OFF

The Proximity Sensor may output a pulse signal when it is turned off. Therefore, it is recommended to turn off the load before turning off the Proximity Sensor.

#### Power Supply Transformer

When using a DC power supply, make sure that the DC power supply has an insulated transformer. Do not use a DC power supply with an auto-transformer.

#### Sensing Object

Metal Coating:

The sensing distance of the Proximity Sensor vary with the metal coating on sensing objects.

### ■ Wiring

#### High-tension Cables

Wiring through Metal Conduit

If there is a power or high-tension cable near the cable of the Proximity Sensor, wire the sensor cable through an independent metal conduit to prevent against Proximity Sensor damage or malfunctioning.

### ■ Mounting

The Proximity Sensor must not be subjected to excessive shock with a hammer when it is installed, otherwise the Proximity Sensor may be damaged or lose the water-resistivity.

### ■ Environment

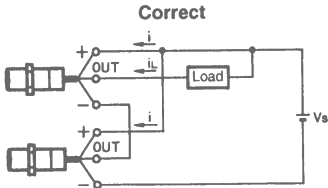
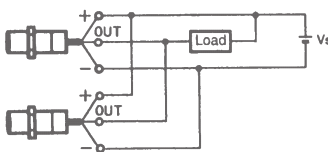
#### Water-resistivity

Do not use the Proximity Sensor underwater, outdoors or in the rain.

#### Operating Environment

Be sure to use the Proximity Sensor within operating ambient temperature range and do not use the Proximity Sensor outdoors so that its reliability and life expectancy can be maintained. Although the Proximity Sensor is water resistive, a cover to protect the Proximity Sensor from water or soluble machining oil is recommended so that its reliability and life expectancy can be maintained. Do not use the Proximity Sensor in an environment with chemical gas (e. g., strong alkaline or acid gases including nitric, chromic, and concentrated sulfuric acid gases).

## DCType

Connection type	Method	Description
<b>AND</b> (serial connection)	 <p style="text-align: center;"><b>Correct</b></p>	<p>The Sensors connected together must satisfy the following conditions:</p> <p><math>i_L + (N-1) \times i \leq</math> Upper-limit of control output of each Sensor</p> <p><math>V_s - N \times V_R \geq</math> Load operating voltage</p> <p>N = No. of Sensors</p> <p><math>V_R</math> = Residual voltage of each Sensor</p> <p><math>V_s</math> = Supply voltage</p> <p>i = Current consumption of the Sensor</p> <p><math>i_L</math> = Load current</p> <p>If the MY Relay, which operate at 24 VDC, is used as a load for example, a maximum of two Proximity Sensors can be connected to the load.</p>
<b>OR</b> (parallel connection)	 <p style="text-align: center;"><b>Correct</b></p>	<p>A minimum of three Sensors with current outputs can be connected in parallel. The number of Sensors connected in parallel varies with the Proximity Sensor model.</p>

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS

To convert millimeters into inches multiply by 0.03937. To convert grams into ounces multiply by 0.03527.

Cat. No. D200-E2-01

In the interest of product improvement, specifications are subject to change without notice.

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