



ULTRASONIC CATALOG



INDEX

ULTRASONIC SENSORS

List of the functions	2
Technical and functional description	2
M18 models	5
M30 models	9

DIMENSIONS AND WIRING

M18 and M30 models	13
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ELECTRICAL DIAGRAMS OF THE CONNECTIONS

M18 and M30 models	14
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ULTRASONIC SENSORS

List of the functions



M18 ultrasonic sensors U9 series; M30 U3 series and cubic transmitter & receiver U2 series.
 Models with power voltage or current digital and analogical output.
 High resolution and precision.
 Maximum operating distance adjustment on all digital models, both with direct or retro-reflective.
 Direct reflection, retro-reflective and transmitter receiver models.
 IP67 Protection degree.
 Harsh Duty Plastic housing.
 Total protection against any type of electric damages.
 Mark CE UL approvals (U9 & U3)



Technical and functional description

ULTRASONIC FUNCTIONAL PRINCIPLES

The functional principle of an ultrasonic sensor is based on sound waves. By means of the emission of a sound impulse and the measurement of the time which elapses from the point of emission to the point of reception, one can measure the echo signal reflected by the object of detection and the dimensional measurements.

Since the means of transmission are through the medium of the air, any kind of significant disturbance which influences the air column may cause problems with measurements.

Pneumatic valves, outlets, high temperature objects or anything which can produce whirling air motions could alter the base measurement.

The ultrasonic beam can be reflected by almost all materials (metal, wood, plastic, glass, liquid, etc.), whether they are colored, transparent or luminescent.

A loss of performance is possible only in the case of sound-absorbent materials (that which absorbs the

ultrasonic beam), or objects that have reclined surfaces with respect to the sensor axis (which can deflect the ultrasonic beam far from the receiver).

In direct or retro reflective models (reflex) the same ultrasonic capacity is used both to emit and receive the ultrasonic beam.

During the beam emission, the reception is disabled. It is during that short time, necessary for the commutation of the emission to the reception function, that the echo signal cannot be received. As a result, there is an area nearby the reflection sensor in which object detection is not possible.

In retro-reflective models, any kind surface that is flat and orthogonal to the sensor axis can be used as a reflector (you can use also a fixed part of the device). Therefore, any object passing between sensor and reflector can be detected. No reflector is needed; such as ones used in reflex photo electric or laser devices.

In the direct reflection models (diffuse), detection occurs when the object is located in front of the sensor and it will therefore be necessary to check that backgrounds are not detected. If this is the case it will be necessary to adjust the sensors sensitivity through the trimmer or a teach-in key (for the models where such a function is included).

In the transmitter / receiver models there exist two separate housings: The emitter contains the cap which emits the ultrasonic beam with integrated electrical circuits and the receiver contains the cap receiving the ultrasonic beam.

Through the proper alignment of the transmitter and receiver (one in front of the other), at a distance equal to or higher than the specified one, it is possible to detect any object able to interrupt the ultrasonic beam.

The ultrasonic sensors U9 (M18), U3 (M30) and U2 (cubic transmitter / receiver) are the ideal solution to detect objects in all applications where the use of a normal photocells does not allow one to reach the required performances: levels measurement (tanks containing solid or liquid), diameter or loop detection (for materials such as paper, sheet iron, etc.) and transparent objects detection (plastic or glass bottles, plastic filters, etc.).

Additionally, the plastic housings have an IP67 protection degree.

Wide-ranging functions:

Direct reflection M18 models: 60...300mm, 100...600mm, 200...1500mm, with power voltage or current, PNP digital or analog output.

Retro-reflective M18 models: 400...1500mm with PNP digital output.

Direct reflection M30 models, 300...2500mm, with power voltage or current, PNP digital or analog output.

Direct reflection M30 models, 250...2000mm, 350...3500, with two PNP digital outputs and one analog output (power voltage or current) with programmable minimum and maximum points through teach-in key.

Emitter / receiver cubic 30x20x12 mm models, 300mm with NO or NC, PNP or NPN digital output.





The ultrasonic sensors with digital output(s) are equipped with a PNP NO output; and as a result, support the connection between the output and the power supply negative pole. The output is active when the sensor detects the object. The maximum sensing distance is adjustable through the trimmer.

The reflection sensors with analog output can have power voltage 0 to 10V output or current 4 to 20 Ma output.

The analog output reaches the whole sensor reading field.

The direct and retro reflective sensors are equipped with a synchronization input in order to avoid problems of mutual interference: to enable this function, it is necessary to connect one to the other pin 2 / pink wire. If this function is not required, it is necessary to insulate the wires.

The models with adjustment through a teach-in key, are equipped with two digital PNP outputs with the possibility of a NO / NC configuration, and one power voltage 0 to 10V or current 4 to 20 Ma analog output.

Through the teach-in key, it is possible to adjust both the intervention points of the two digital outputs, and the proportional band and direction of the analogical output.

For these models, the synchronization input is not available.

The emitter / receiver models are not equipped with either sensitivity adjustment or any synchronization input.

The ultrasonic sensors with direct proximity scanning are less influenced by the characteristics of the surface of the object to be detected than standard photoelectric sensors, but require that the ultrasonic beam strikes more or less perpendicular to the surface of the object of detection.

If the object inclination is higher than $\pm a/2$ (ultrasonic beam angle), the reflected beam is diverted far from the sensor and this could cause detection problems.





Code structure

M18 models

U 9 15K D T 4 P 1 G M1

Ultrasonic Sensor Series	U	K5	M12 connector with pigtail extension
M18 mm diameter body	9	K2	M12 connector
200--1500mm direct proximity scanning	15K	M1	standard axial cable exit 2 meters
60--300mm direct proximity scanning	300	G	180 Hz
100--600mm direct proximity scanning	600	H	300 Hz
100-1500mm reflex	15KF	1	NO digital output on (P) only
diffuse mode - direct proximity scanning	D	P	PNP digital output
PBTP housing	T	X	4--20mA analog current output
4 wire device*	4	Z	0--10V analog voltage output

Available models

U915KDT4P1GK5	U9300DT4ZHM1	U2300RT3P1M1
U915KDT4XGK2	U9600DT4P1HK5	U2300RT3P2M1
U915KDT4ZGK2	U9600DT4XHK2	U2300RT3N1M1
U915KDT4P1GK5	U9600DT4XHM1	U2300RT3N2M1
U9300DT4P1HK5	U9600DT4ZHK2	U915KFT4P1GK5
U9300DT4XHM1	U9600DT4ZHM1	

U 2 300 R T 3 P 1 M1

Ultrasonic Sensor Series	U	M1	standard integrated axial cable
30x30x12 Cubic Housing	2	1	NO normally open
300mm range	300	2	NC normally closed
Transmitter/Receiver Set	RT	P	PNP
Transmitter	T	N	NPN
Receiver	R		
3 Wire Device	3		





U9 M18 SENSORS & U2 TRANSMITTER/RECEIVER WITH DIGITAL OUTPUT

Models	U9300-P1	U9600-P1	U915K-P1	U915K-P1	U2300
maximum sensing distance	300mm	600mm	1500mm	1500mm*	300 mm **
Minimum sensing distance	60mm	100mm	200mm	400mm*	0
Dimensions	M18				30x20x12 mm
Differential travel	2%				---
Repeat accuracy	0,2%				---
Beam angle	8°				15°
Operating voltage					18...30Vdc
Ripple					<10%
No load supply current					<40 mA
Load current					<500mA
Leakage current					<10µA
Output voltage drop					<2,5V
Output type	PNP - NO				PNP or NPN NO or NC
Switching frequency	25Hz	8Hz			150 Hz
Time delay before availability					<200ms
Supply electrical protections	Overvoltage Pulses, Polarity reversal				
Protection electrical output	Short circuit (autoreset)				
Sensitivity adjustment	Trimmer				---
Operative Temperature range	-15...+70°C				
Storage temperature	-25...+75°C				
Temperature range					<15%
Synchronization input					---
Protection degree	Yes				---
LED indicators	IP67				
	Yellow (output energized)				
Housing material	PBTP				
Active head material	Ceramic				
Tightening torque	3Nm				---

*distance between sensor and reflector.
**distance between emitter and receiver.





ANALOGICAL OUTPUT MODELS SPECIFICATIONS

Models	U9300-Z	U9300-X	U9600-Z	U9600-X	U915K-Z	U915K-X
Maximum sensing distance	300mm		600mm		1500mm	
Minimum sensing distance	60mm		100mm		200mm	
Max. response time	50ms				150ms	
Linearity error					<0,3%	
Repeat accuracy	0,2%		+/- 2mm		0,2%	
Beam angle	8°					
Operating voltage	18...30Vdc					
Ripple	<10%					
No load supply current	<35mA					
Load current	5mA	4...20mA	5mA	4...20mA	5mA	4...20mA
Leakage current	<10µA					
Output type	0...10V	4...20mA	0...10V	4...20mA	0...10V	4...20mA
Sensitivity	42mV/mm	67µA/mm	20mV/mm	32µA/mm	5,5mV/mm	8,8µA/mm
Time delay before availability	<500ms					
Supply electrical protections	Overvoltage Pulses, Polarity reversal					
Protection electrical output	Short circuit (autoreset)					
Sensitivity adjustment	No					
Operative Temperature range	-15...+70°C					
Storage temperature	-25...+75°C					
Temperature range	<10%					
Synchronization input	Yes					
Protection degree	IP67					
Housing material	PBTP					
Active head material	Ceramic					

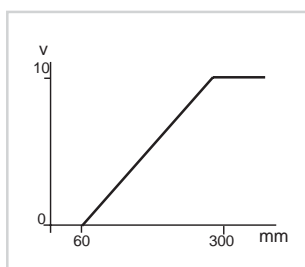
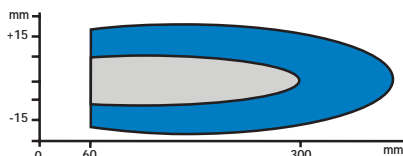


M18 MODELS CHARACTERISTICS CURVE

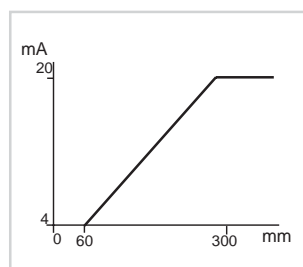
Guaranteed detection of a target of 100x100mm

Possible detection of large object

Models U9300



Power voltage analogical output

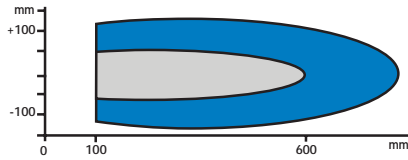


Current analogical output



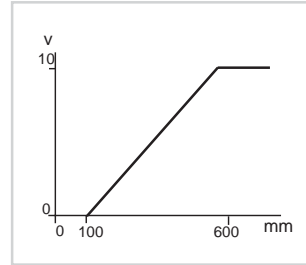


Models U9600

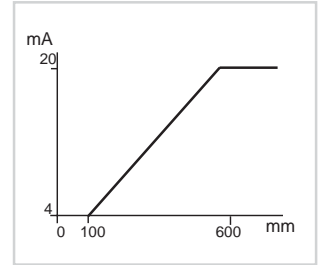


Guaranteed detection of a target of 100x100mm

Possible detection of large object

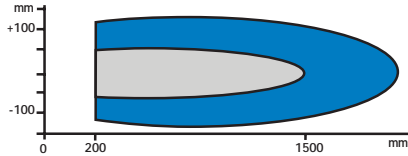


Power voltage analogical output



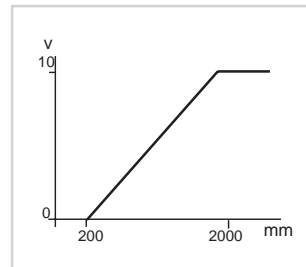
Current analogical output

Models U915K

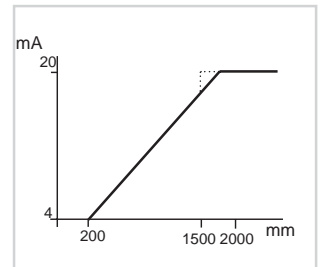


Guaranteed detection of a target of 100x100mm

Possible detection of large object

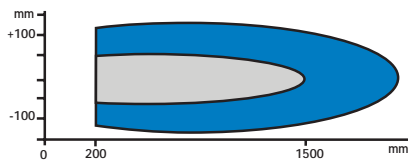


Power voltage analogical output



Power voltage analogical output

Models U915KF



Guaranteed detection of a target of 100x100mm

Possible detection of large object





Code structure

M30 models

U 3 20K D T 5 Z * F M1

Ultrasonic Sensor Series	U		
M30 mm diameter body	3	B1	M12 5 pin connector
300--2000mm direct proximity scanning	20K		
250--2500mm direct proximity scanning	25K	F	130 Hz
350--3500mm direct proximity scanning	35K		
		P1	PNP NO digital output
		X	4-20mA analog power current output
diffuse mode - direct proximity scanning	D	Z	0-10V analog power voltage output
PBTP housing	T	H	2 PNP NO/NC digital outputs and +1 4--20mA analog power current output
5 wire device*	5	G	2 PNP NO/NC digital outputs and +1 0--10V analog power voltage output



Available models

U320KDT5G3FB1	U325KDT5P1FB1	U335KDT5G3FB1
U320KDT5H3FB1	U325KDT5X3FB1	U335KDT5H3FB1
	U325KDT5Z3FB1	





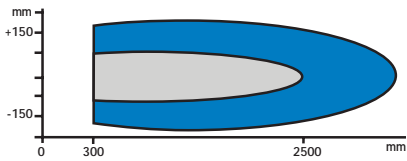
M30 MODELS SPECIFICATIONS

Models	U325K-P	U325K-X	U325K-Z	U320K-G	U320K-H	U335K-G	U335K-H
Maximum sensing distance	2500mm			2000mm		3500 mm	
Minimum sensing distance	300mm			250mm		350 mm	
Switching frequency	1Hz	---		1Hz		0,8 Hz	
Hysteresis	2%	---		1% / 2mm			
Max. response time	---	90ms		60ms (target speed <1m/s) 300ms (step response)		120 ms (target speed <1m/s) 500 ms (step response)	
Linearity error	---	<0,3%		0,5% / 3mm			
Repeat accuracy	---	+/- 2mm		0,4% / 2 mm			
Beam angle	8°						
Operating voltage	18...30Vdc			19...30Vdc			
Ripple	<10%						
No load supply current	<35mA			<25mA			
Load current	<500mA	---		<100mA (digital output)			
Leakage current	<10µA						
Output type	PNP - NO	0...10V	4...20mA	2 digital PNP – NO/NC + 1 analog output 0...10V 4...20mA 0...10V 4...20mA			
Sensitivity	---	37mv/mm	5,9µA/mm	depending on switching points			
Time delay before availability	<200ms			<1s			
Supply electrical protections	Overvoltage Pulses, Polarity reversal						
Protection electrical output	Short circuit (autoreset)						
Sensitivity adjustment	trimmer	No		Teach-in			
Operative Temperature range				-15...+70°C			
Storage temperature				-25...+75°C			
Temperature range	<10%						
Synchronization input	Yes			No			
LED indicators	Yellow output energized	No		Yellow (output energized – teach-in)			
Protection degree				IP67			
Housing material				PBTP			
Active head material				Ceramic			



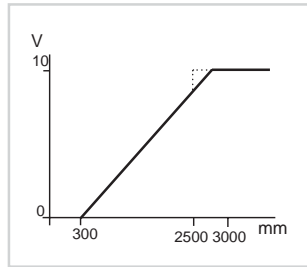
M30 MODELS CHARACTERISTICS CURVE

Models U325K

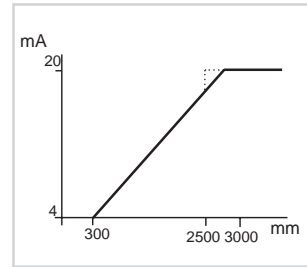


Guaranteed detection of a target of 100x100mm

Possible detection of large object

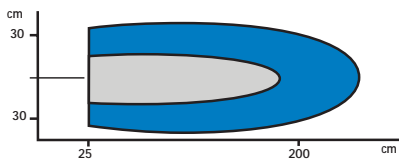


Power voltage analogical output



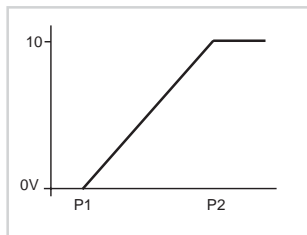
Current analogical output

Models U320K-G

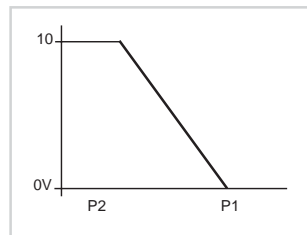


Guaranteed detection of a target of 100x100mm

Possible detection of large object



Power voltage analogical output



Power voltage analog output, P1 and P2 are the switching points set through the teach-in key.

The digital output are on pin 4 (P1) and pin 2 (P2) while the analog output, linear between P1 and P2, is on pin 5.

By suitably setting P1 and P2, it is possible to select a positive or negative ramp and the status NO or NC of the output.

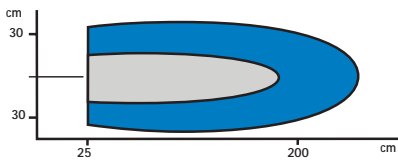


INPROX sensors



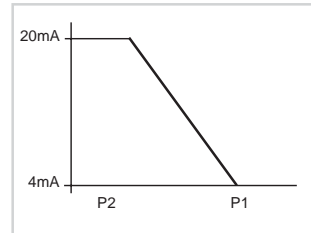
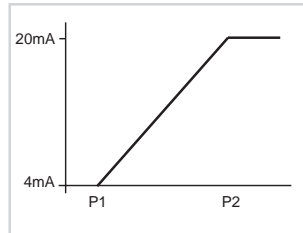


Models U320K-H



Guaranteed detection of a target of 100x100mm

Possible detection of large object



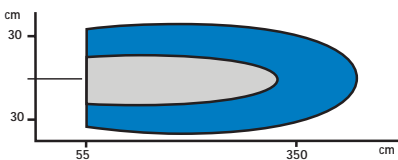
Current analogical output

Current analog output, P1 and P2 are the switching points set through the teach-in key.

The digital output are on pin 4 (P1) and pin 2 (P2) while the analog output, linear between P1 and P2, is on pin 5.

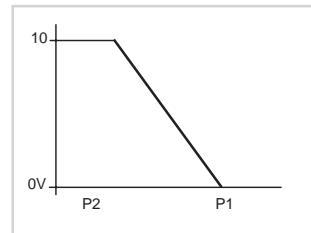
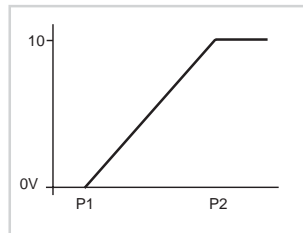
By suitably setting P1 and P2, it is possible to select a positive or negative ramp and the NC or NO status of the output.

Models U335K-G



Guaranteed detection of a target of 100x100mm

Possible detection of large object



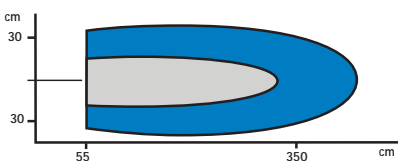
Power voltage analogical output

Power voltage analogic output, P1 and P2 are the switching points that can be set through the teach-in key.

The digital output are on pin 4 (P1) and pin 2 (P2) while the analogical output, linear between P1 and P2, is on pin 5.

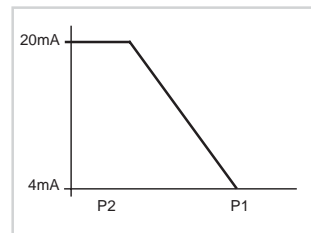
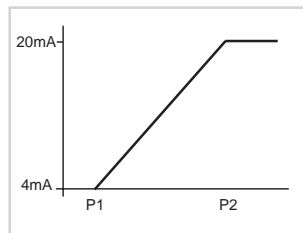
By suitably setting P1 and P2 it is possible to select a positive or negative ramp and NO or NC output status.

Models U335K-H



Guaranteed detection of a target of 100x100mm

Possible detection of large object



Current analogical output

Current analogical output, P1 and P2 are the switching points that can be set through the teach-in key.

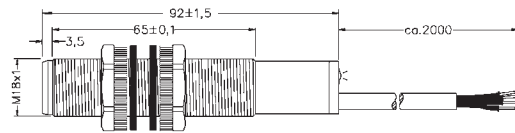
The digital output are on pin 4 (P1) and pin 2 (P2) while the analogical output, linear between P1 and P2, is on pin 5.

By suitably setting P1 and P2 it is possible to select a positive or negative ramp and NO or NC output status.

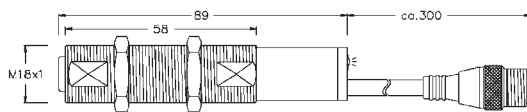


DIMENSIONS AND WIRING

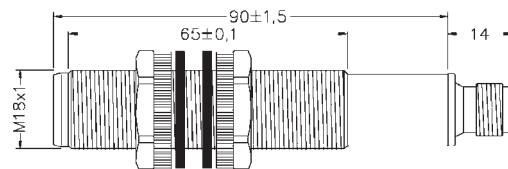
M18 U9 Models with cable



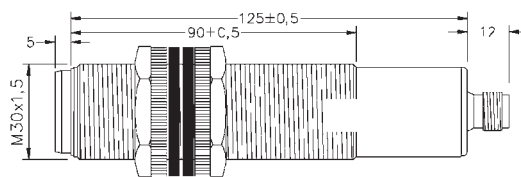
M18 U9 Models with extended connector



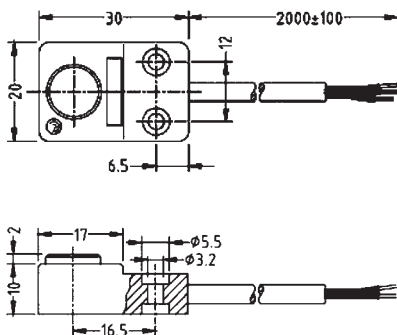
M18 U9 with connector



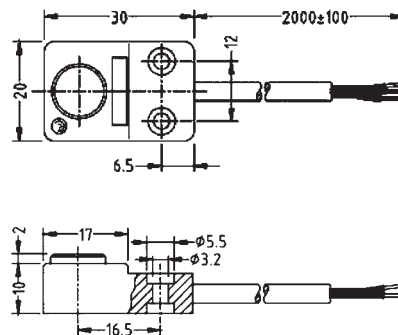
M30 U3 Models with axial connector



Transmitter

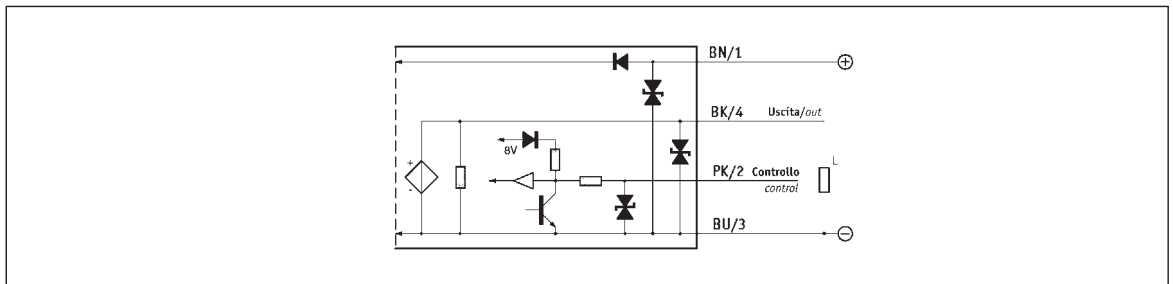


Receiver

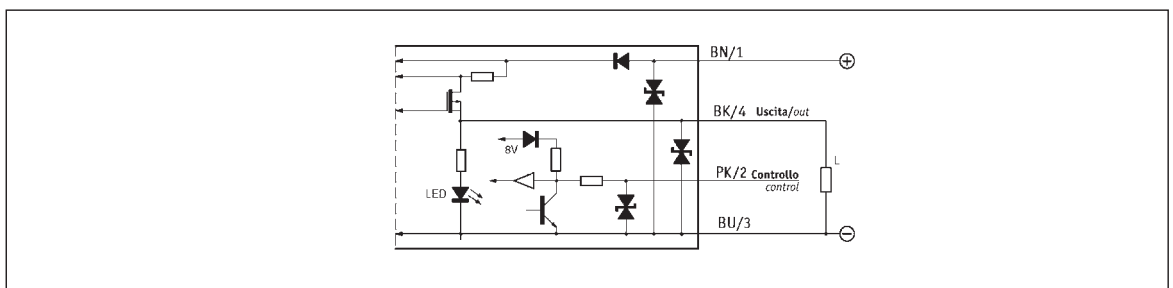


ELECTRICAL DIAGRAMS OF THE CONNECTIONS

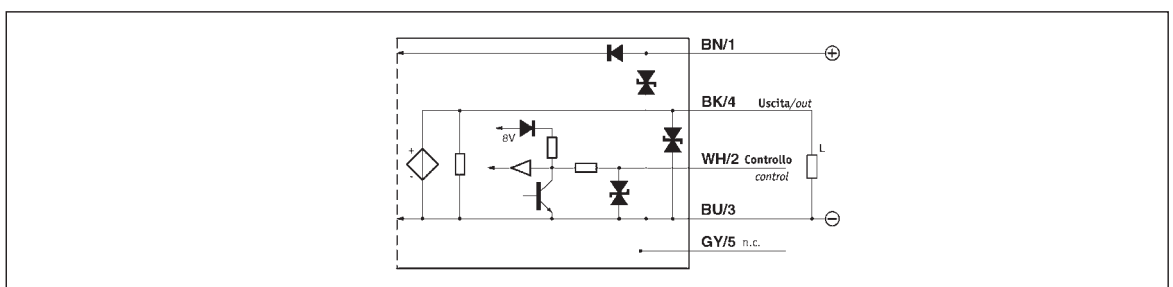
M18 models with analog output



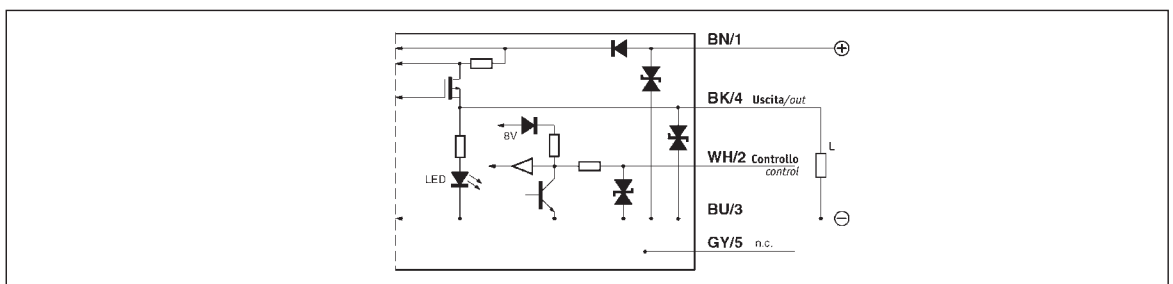
M18 models with digital output



M30 models with analogical output

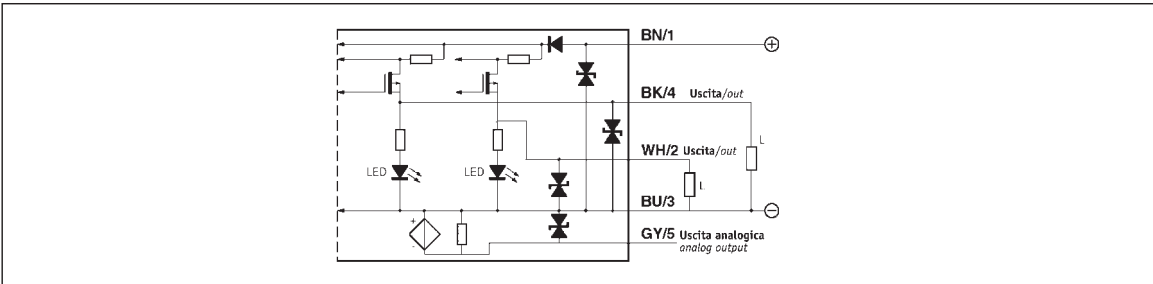


M30 models with digital output

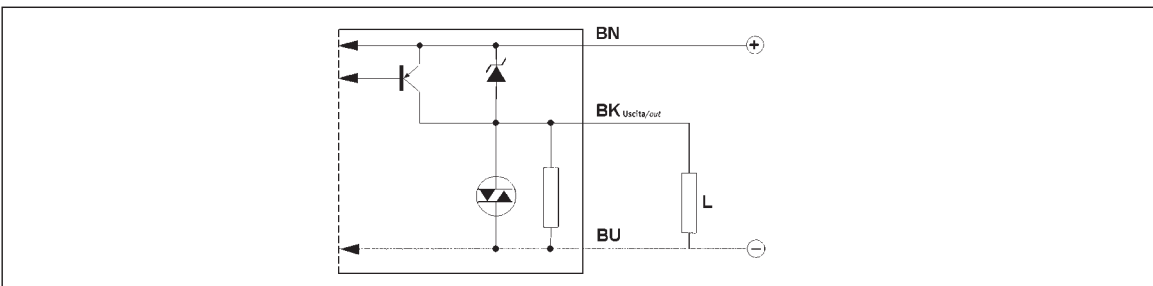




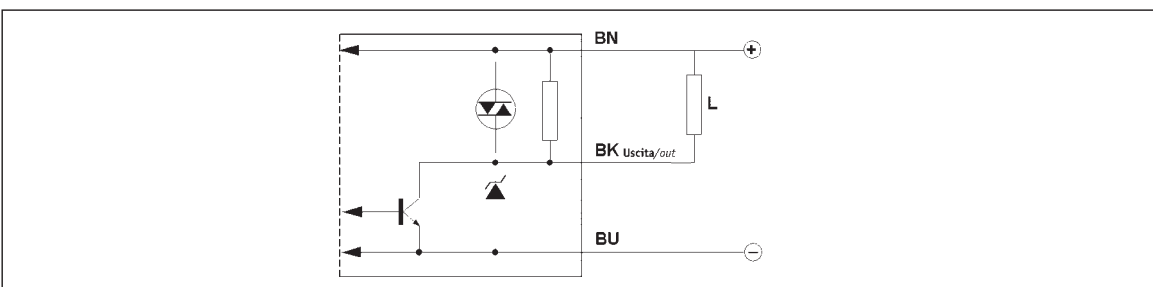
M30 U3 Models with Teach IN



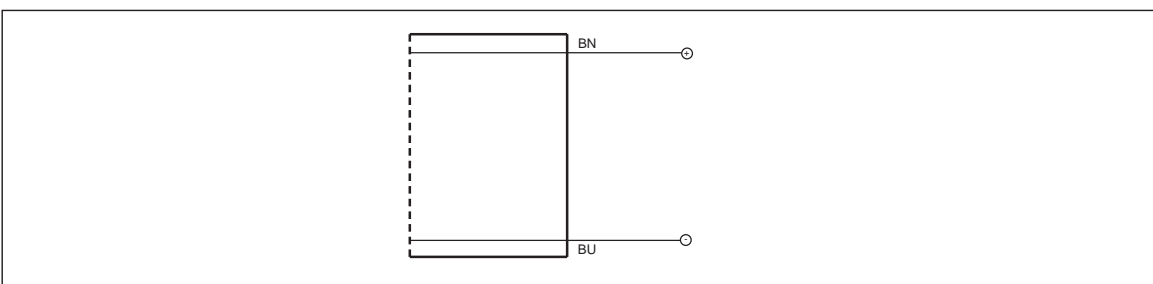
PNP Receiver Model



NPN Receiver Model



Transmitter Model



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