

UK1A M18 CILINDRYCAL ULTRASONIC SENSOR

Installation manual - CAT8BUK1365401 - ENG - Created: 20/03/2014

SUPPLIED MATERIAL

- Installation manual
- 2 plastic nuts SW22, h 8.3 mm (for plastic housing)
- 2 flexible washer (only for plastic version)
- 2 metallic nuts SW24, h 4 mm (for metallic housing)

SUPPLIED MATERIAL FOR ATEX CERTIFIED PRODUCTS

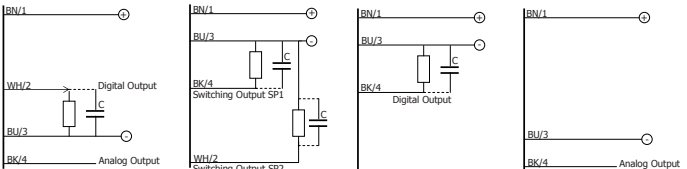
- Installation manual
- Safety instructions for dangerous areas
- Declaration of CE conformity
- Label ATEX marked
- 2 plastic nuts SW22, h 8.3 mm (for plastic housing)
- 2 flexible washer (only for plastic version)
- 2 metallic nuts SW24, h 4 mm (for metallic housing)

GENERAL DESCRIPTION

- M18 ultrasonic sensors with output plug (M12) or cable (2m)
- Models with single output:
 - Current analogue output (4 – 20 mA)
 - Voltage analogue output (0 -10 V)
 - Digital output (NPN and PNP, NO/NC selectable)
- Models with double outputs:
 - Current analogue output (4 – 20 mA) and digital output (NPN and PNP, NO/NC selectable)
 - Voltage analogue output (0 -10 V) and digital output (NPN and PNP, NO/NC selectable)
 - Digital output (PNP and NPN with window and hysteresis function)
- Operating distance adjustment (Windows Teach-in option and On object Teach-in option)
- Complete protection against electrical damages
- Multifunction LED indicator: output state, Teach-in function and NO/NC configuration
- Plastic or stainless steel AISI 316L (DIN 1.4404) housing

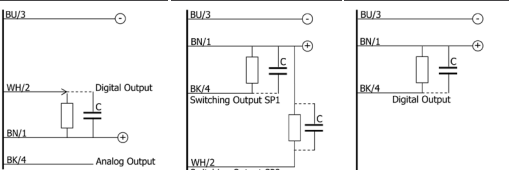
ELECTRICAL DIAGRAMS OF THE CONNECTIONS

PNP NO/NC + analogue output models	PNP models with double output	PNP NO/NC models with single digital output	Models with single analogue output
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In case of combined load, resistive and capacitive, the maximum admissible capacity (C) is 0,1 µF for maximum output voltage and current.

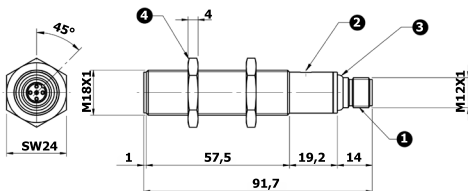
NPN NO/NC + analogue output models	NPN models with double output	NPN NO/NC models with single digital output
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KEY: BN = brown; BK = black; BU = blue; WH = white

DIMENSIONS

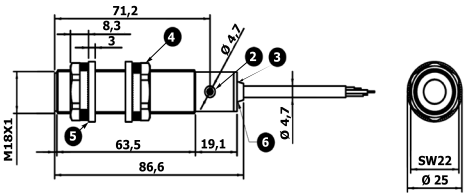
Metallic connector version (plastic version available)



KEY

- 1 M12 plug cable exit
- 2 Teach-in button
- 3 LED
- 4 Plastic or metallic tightening nut
- 5 Flexible washer
- 6 Cable exit

Plastic cable version (metallic version available)



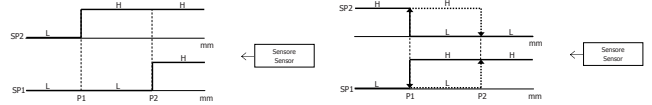
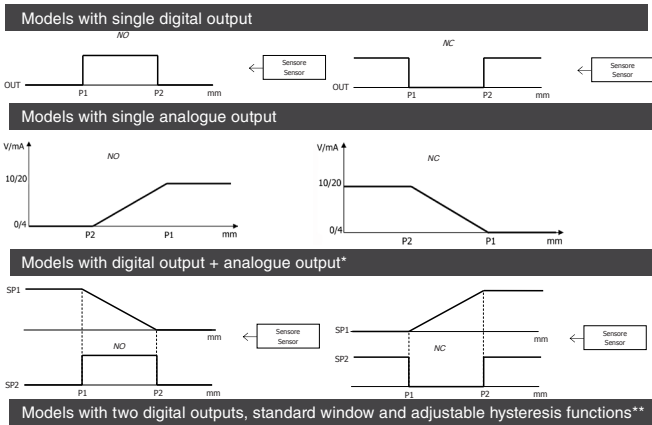
CODE STRUCTURE

UK	1	A	/	E	1	-	0	E	UL	AN
UK	M18 ultrasonic sensor									
1	Standard body lenght									
A	50 - 400 mm direct diffuse									
/										
E	Adjustment by Teach-in button									
1	0 ... 10 V single voltage analogue output									
2	4 ... 20 mA single current analogue output									
4	NPN - NO/NC digital output + 4 ... 20 mA current analogue output									
6	PNP - NO/NC digital output + 4 ... 20 mA current analogue output									
7	PNP - NO/NC digital output + 0 ... 10 V voltage analogue output									
9	NPN - NO/NC digital output + 0 ... 10 V voltage analogue output									
N	NPN - NO/NC single digital output									
P	PNP - NO/NC single digital output									
W	PNP - two digital outputs with standard window and adjustable hysteresis functions (**)									
M	NPN - two digital outputs with standard window and adjustable hysteresis functions (**)									
0	Plastic housing									
1	Stainless steel AISI 316L (DIN 1.4404) housing									
E	M12 plug cable exit									
A	Axial cable exit									
UL	With cULus certification									
AN	ATEX certified, Cat. 3 Zone 2,22 (*)									

(**) The transition between the two functions takes place by pressing the "teach-in" button for more than 8 seconds, until the status LED will flash quickly. Release the button and the LED will flash slowly. When the LED stops flashing, the function is changed. In the standard window function the state selection was done by wires reversing on the plc controller (NO / NC). See the "Output curve" section.
(*) Only for the PNP plug version.

OUTPUT CURVES

The following graphics are referred to the PNP state output, while the NPN state output have the of the inverted functions.



* It can be used as a single model output.

ERROR CONDITIONS

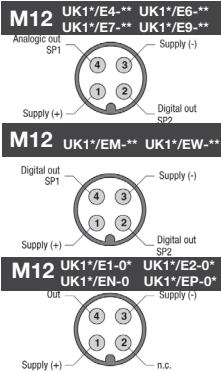
Error condition	Sensor state	Corrective action
Teach P1 = P2		
Teach P2 (closest point) after the P1 (farthest point)	Exit OFF until a new and correct teach operation	Repeat correctly the Teach operation
Teach P1 (farthest point) within the range and P2 at infinite		

Models	UK1A/E/-**UL**
Maximum sensing distance	400 mm ⁽¹⁾
Minimum sensing distance (blind zone)	50 mm
Sensing range (Sd)	100-400 mm
Beam angle	± 10°
Switching frequency (digital output)	10 Hz
Response time (digital output)	≤ 50 ms
Response time (analog output)	500 ms
Repeat accuracy	0,5%
Linearity error	1%
Temperature range	-20°...+60 °C
Temperature compensation	Yes
Operating voltage	15 ... 30 Vdc
Thermal drift (analog output)	≤ 7%
Thermal drift (digital output)	≤ 7%
Ripple	5%
Leakage current	≤ 10 µA @ 30 Vdc
Output voltage drop	2.2 V max. @ (I=100 mA)
No-Load current	≤ 50 mA
Output current	100 mA
Minimum load resistance (Analog voltage output)	3 k Ω
Adjustment set point	Teach-in button
Time delay before avaiability (digital output)	≤ 500 ms (1 digital output); ≤ 900 ms (2 digital output)
Time delay before avaiability (analog output)	≤ 900 ms
Recovery time	400 ms
Supply electrical protections	Polarity reversal, transient
Digital output electrical protections	Short circuit (auto reset), overvoltage pulses
Analog output electrical protections	Overvoltage pulses
EMC	Conforming to the EC Directive 2004/108/EC requirements according to EN 60947-5-2
Protection degree	IP67 (EN60529) ⁽²⁾
Housing material	PBT / AISI 316L stainless steel
Front end material	Epoxy-Glass resin
Weight	Plastic housing: 26 g (connector exit), 88 g (cable exit) Metallic housing: 55 g (connector exit), 125 g (cable exit)
Tightening torque	1 Nm plastic housing / 50 Nm metallic housing
Storage temperature	-35 °C...+70 °C without freezing

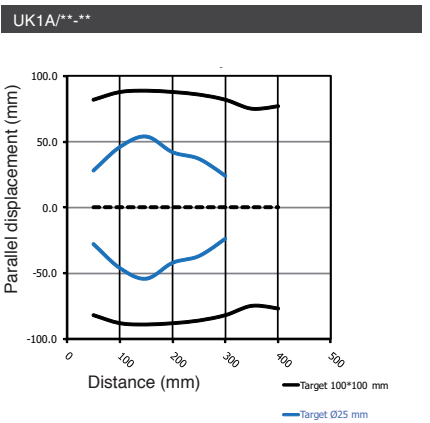
(1) Metallic target 100x100 mm

(2) Protection guarantee only with plug cable well mounted

PLUGS



CHARACTERISTIC CURVES



ADJUSTMENT

P1 AND P2

P1 coincides with the maximum working distance requested; during regulation phase P1 must be the first point to be set up. P2 coincides with the minimum working distance requested; during regulation phase P2 must be the second point to be set up.

ANALOGUE OUTPUT

Positive slope: P1 = 10 V or 20 mA, P2 = 0 V or 4 mA
Negative slope: P1 = 0 V or 4 mA, P2 = 10 V or 20 mA

NORMAL FUNCTION

The LED is ON when the echo is received and the target is between P1 and P2 (Windows Teach-in option) or the target is detected into sensing area (On object Teach-in option), in NO state (Normally Open).

BUTTON TEACH-IN ADJUSTMENT OPTIONS

Two Teach-in adjustment options are available :1) Windows Teach-in option 2) On object Teach-in option

1) WINDOWS TEACH-IN OPTION (adjustment of two points: P1 and P2)

TEACH-IN OF P1 POSITION

Place the target at the right distance P1, then press the teach-in button for 1 second. The LED turns ON after maximum 2 seconds, from OFF state, and the sensor will acquire the position P1. Only at this point it is possible to remove the target. The LED will stay in ON state waiting for the regulation of P2 point.

TEACH-IN OF P2 POSITION

Place the target at the right distance P2, then press the Teach-in button. The LED turns OFF, from ON state, then blinks 5 times, and in this phase the sensor acquires the position of P2 point. The LED returns in ON state and only at this point it is possible to remove the target. At this time P1 and P2 are programmed and the sensor works in Normal Function state with the values stored in the memory: the LED is in ON state when target is between P1 and P2, if the sensor is NO State (Normally Opened).

2) ON OBJECT TEACH-IN OPTION (adjustment of only one point: P1)

TEACH-IN OF P1 POSITION

Place the target at the right distance P1, then press the teach-in button for 1 second. The LED turns ON after maximum 2 seconds, from OFF state, and the sensor will acquire the position P1. Only at this point it is possible to remove the target.

TEACH-IN OF P2 POSITION

Place the target (or another object able to cover the active face) in front of the sensor to delete any possible echo; press the teach-in button for 1 second to acquired P2 distance. P2 will coincide with the minimum sensing distance (50 mm). The LED will turn OFF, from ON state, then will blink 5 times and during this phase the sensor acquires the position of P2 point. The LED return in ON state and only at this point it is possible to remove the target. At this time P1 and P2 are programmed and the sensor works in Normal Function state with the values stored in the memory: the LED is in ON state when target is between P1 and the minimum sensing distance, if the sensor is NO State (Normally Opened).

NOTE 1: If the sensor is taught for a time more longer than 1 second and then left, without target in front of the sensor or with the target out from the maximum sensing distance (400 mm), it will acquire as distance P1 a distance more longer than the maximum sensing distance indicated in the table of Technical Specifications, and this distance is not uniquely definite and repeatable and as distance P2 the minimum sensing distance (50 mm). Don't use this regulation with analogue output. To optimize the resolution it is necessary to adjust the working range using Teach-in on object option or Windows Teach-in option.

NOTE 2: When the analogical output is used, it must be used the Windows Teach-in option mode in order to reach the maximum resolution.

CONFIGURATION OF NO AND NC STATES

Sensors are delivered from factory in NO state. It is possible to change the logical digital output state of the sensor (except the models UK1*/EW-0* e UK1*/EM-0*) by pushing the Teach in button for more than 8 seconds until the LED starts to blink fast. Release the button and the LED will blink slowly. When the LED will stop to blink the digital output state is changed. If the output is in NO state the slope of the analogical output is positive moving from P2 towards P1, otherwise if the sensor is in NC state the slope of the analogical output is negative moving from P1 towards P2. This option is possible any time and it is separated from the Teach-in option.

MODELS WITH ADJUSTABLE HYSTERESIS

UK1*/EW-0* e UK1*/EM-0* models are delivered from production site of M.D. Micro Detectors with hysteresis function set. It is possible to change the function pressing the Teach-in button for more than 8 seconds, until orange LED will start to blink quickly. Release the button, LED will blink slowly ; when the LED stops to blink the function is changed. The output function is shown in the "Output curves". In these models with the standard window and adjustable hysteresis functions if the target is removed from the field of view of the sensor, the output state switches. In these models isn't provided the NO/NC function, which can be obtained through a logic reverse by the control system (e.g. PLC). A typical application is the liquid level control, the output sensor switches to the achievement of the P1 point (farthest from the sensor) when the container is empty and the nearest to P2 point in the liquid filling.

INSTALLATION CONDITION

The installation of the sensor has to be done using plastic nuts and flexible washers supplied with ultrasonic sensor (see Supplied Material) (standard condition). In the case of non-standard installation conditions, as for example, sensor fixed directly into metal block through threaded or not- threaded hole or using metallic nuts, both metallic block and nuts have to be connected to ground. Moreover, both nut and metallic block have to be minimum 5 mm from the edge of the active face and it is necessary that the first 5 mm of threaded housing are not screwed.

ATTENTION

Make sure that the supply voltage is correctly set with a ripple corresponding to the values indicated on the catalogue. In case the noise produced by the power lines exceeds the values foreseen by the CE norm (interference immunity), separate the sensor cables from both the power and high tension lines and insert it in a grounding metal raceway. Moreover it is advisable to connect the sensor directly to the supply source and not to other devices. To extend the supply and output cables, it is necessary to use a cable having conductors with a minimum size of 1 mm². The maximum length of extension is 100 m (this value is referred to a minimum tension and power supply at the load of 100 mA). In industrial environments, we recommend to use shielded cables in order to prevent possible disturbances on the devices caused by electromagnetic fields induced. Do not expose sensor head to hot water > 50 °C, water steam, acids or solvents. Clean the active face of the sensor with a wet cloth and then dry it. If the sensor is measuring across a temperature gradient, the compensation will be less effective. The temperature warm up drift upon power-up influence the measurement of the sensing distance. After 20 minutes, the sensing distance will be stable.



Micro Detectors
Italian Sensors Technology



II 3G Ex nA IIC T5
II 3D Ex tD A22 IP67 T 90°C
Number of certificate: 1112021X



WARNING These products are NOT safety sensors and are NOT suitable for use in personnel safety application

Declaration of conformity

M.D. Micro Detectors S.p.A. con Unico Socio declare under our sole responsibility that these products are in conformity with the following EEC directive: 2004/108/EC and subsequent amendments

Micro Detectors
Italian Sensors Technology
a company of



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