DATALOGIC

US30 SERIES

The range of measurement and inspection devices is enriched thanks to the introduction of tubular standard M30x1 sensors of the US30 series. Models with operating distances reaching 200 cm are available either with bipolar digital output (NPN/PNP NO/NC) or with 4-20 mA or 0-10 V analogue output. The sensors can be easily configured using the Teach-in function, while the operating status is visibly signalled by 3 LEDs. The temperature compensation function corrects the sound speed changes due to temperature variations, so the sensor precision remains unchanged in all situations and guarantees a resolution reaching 0.5 mm. The electrical connection is accomplished through standard M12 4-pole connectors. The US30 ultrasonic sensors detect all objects independent from the non sound-absorbent material, reflectivity, transparency and colour, thus perfectly suiting applications in the automotive, packaging, machine tool fields and material transformation processes.

HIGHLIGHTS

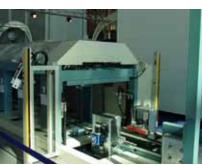
- High precision and switching frequency
- Colour independence and transparent object detection
- Easy Teach-in setting and 3 signalling LEDs
- Models with digital NPN PNP and 0 10 V or 4- 20 mA analogue outputs





APPLICATIONS

Ceramics



Beverage & Bottling



Packaging lines

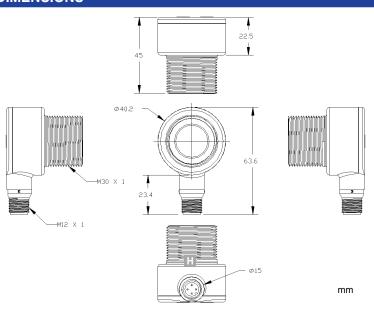
Transportation lines



DIMENSIONS

Models with discrete output are excellent foreground and/or background suppressors. The Teach-in procedure allows to fix a switching window with 10 mm width or to detect minimum and maximum values.

The models with analogue output are conceived as distance sensors: the analogue output can be scaled on windows of any width inside the operating range, or positioned at the centre of a detection window with a fixed width of 100 mm.



INDICATORS AND PUSH-BUTTONS



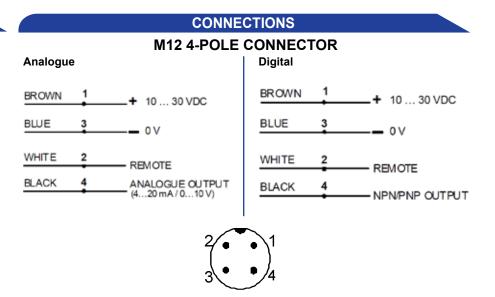


- A Output status LED
- POWER ON LED
- **C** SIGNAL LED
- MODE push-button
- E TEACH push-button

ACCESSORIES

For **dedicated accessories** refer to the **ACCESSORIES** section of this catalogue.

Refer also to **Connectors** of the **General Catalogue**.

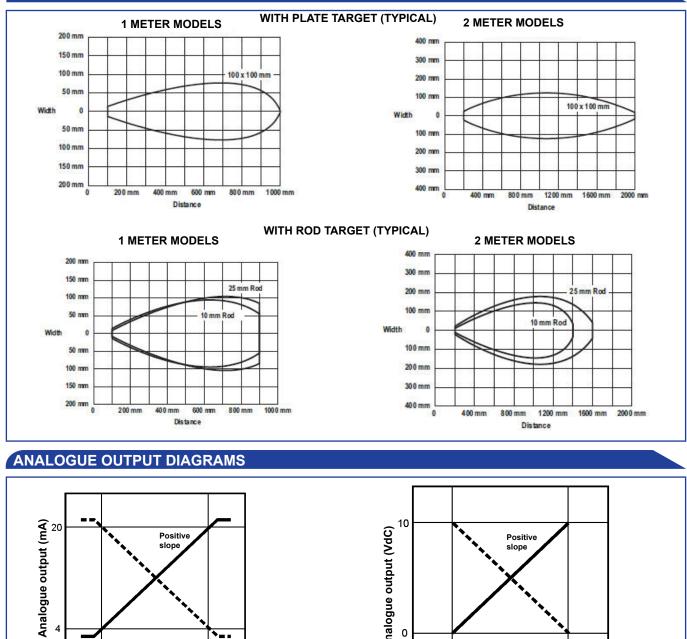


Versions and options: refer to MODEL SELECTION TABLE

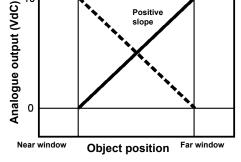
DATALOGIC

		T	Т	ŕ	£	F	2
		13-11	23-II	13-V	23-V	13-0	
		-2-N	2-2	-2-N	2-S	-2-N	
		L L L L L L L L L L L L L L L L L L L	ΡŔ	ЧЧ	ЧЧ	ЧЧ	
		US30-PR-5-N13-IH	US30-PR-5-N23-IH	US30-PR-5-N13-VH	US30-PR-5-N23-VH	US30-PR-5-N13-OH	000
Operating distance:	100 1000 mm	•		•		•	ŀ
- p	200 2000 mm		•		•		\mid
Power supply:	10 30 Vdc (limit values),	•	•	•	•	•	T
	polarity inversion protection	•	•	•	•	•	
Ripple:	≤ 2 Vpp	•	•	•	•	•	ſ
Consumption:	40 mA max. (output current excluded)	•	•	•	•	•	T
Output type:	bipolar digital NPN and PNP					•	T
	analogue 010 Vdc			•	•		ſ
	analogue 420 mA	•	•				ſ
Output current:	100 mA max., short-circuit protection					•	T
Saturation voltage:	PNP < 3 V @ 100 mA; NPN < 1.6 V @ 100 mA					•	T
Load resistance:	voltage output: 2,5 kΩmin.			•	•		ſ
	current output: 1 kΩ @ 24 V	•	•				ſ
Response time:	45 92 ms selectable					•	t
	45 105 ms selectable	•		•			ſ
	92 222 ms selectable		•		•		Γ
Switching frequency:	11 5.4 Hz			•	•		Γ
	11 4.7 Hz	•		•			Γ
	5.4 2.2 Hz		•		•		Γ
Delay at powering:	500 ms	•	•	•	•	•	ſ
Indicators:	yellow OUT LED	•	•	•	•	•	ſ
	green POWER ON LED	•	•	•	•	•	Γ
	red SIGNAL LED	•	•	•	•	•	Γ
Setting:	DISCRETE push-button					•	ſ
	ANALOG push-button	•	•	•	•		Γ
	MODE push-button	•	•	•	•	•	ſ
Ultrasonic emission frequency:	174 kHz		•		•		ſ
	224 kHz	•		•		•	Γ
Temperature drift:	< 0.02 % reading distance/°C	•	•	•	•	•	
Repeatability:	0.1% reading distance					•	
Resolution:	0.1% reading distance	•	•	•	•		Γ
Linearity:	0.25% reading distance	•	•	•	•		Γ
Minimum detection window:	10 mm					•	
	100 mm	•	•	•	•		
Hysteresis:	2 mm					•	
	3 mm						
Operating temperature:	-40 70 °C	•	•	•	•	•	Γ
Storage temperature:	-40 70 °C	•	•	•	•	•	
Housing material:	PBT	•	•	•	•	•	
Mechanical protection:	IP67	•	•	•	•	•	
Connections:	M12 4-pole connector	•	•	•	•	•	
Weight:	68 g	•	•	•	•	•	
Standard reference:	EN 60947-5-2	•	•	•	•	•	T

READING DIAGRAMS



۰... Near window Far window **Object position**



MODEL SELECTION AND ORDER INFORMATION

MODEL	OPERATING DISTANCE	OUTPUT	ORDER N°
US30-PR-5-N13-IH	100 1000 mm	4-20 mA analogue	95B040060
US30-PR-5-N13-OH	100 1000 mm	NPN e PNP	95B040100
US30-PR-5-N13-VH	100 1000 mm	0-10 V analogue	95B040070
US30-PR-5-N23-IH	200 2000 mm	4-20 mA analogue	95B040080
US30-PR-5-N23-OH	200 2000 mm	NPN e PNP	95B040110
US30-PR-5-N23-VH	200 2000 mm	0-10 V analogue	95B040090

The company endeavours to continuously improve and renew its products; for this reason the technical data and contents of this catalogue may undergo variations without prior notice. For correct installation and use, the company can guarantee only the data indicated in the instruction manual supplied with the products.

COLOUATACO

US30 SERIES

- analogue output ultrasonic sensors

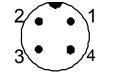
INSTRUCTION MANUAL

CONTROLS

Programming push-button (ANALOG) This push-button allows to program the reading points of the sensor

Response time selection push-button (MODE) This push-button allows to select the response time (Fast or Slow).

POWER LED indicator	Indication				
OFF	Power is OFF.				
ON Red	Target is weak or outside sensing range.				
ON Green	Sensor is operating in normal conditions.				
OUT LED indicator	Indication				
OFF	Target is outside operating field (NO operating mode)				
ON Yellow	Target is inside operating field (NO operating mode)				
SIGNAL LED indicator	Indication				
OFF	Target is outside operating field				
Blinking Red	Target is inside operating field				
MODE LED indicator	Indication				
ON Amber	Indicates response time selected (Fast or Slow)				
	CONNECTIONS				
BROWN	1 10 30 VDC				
BLUE	3 0 ∨				
WHITE	2 ■ REMOTE				
BLACK	4 ANALOGUE OUTPUT (420 mA / 010 V)				
4-POLE M12 CONNECTOR					



PRINCIPLES OF OPERATION

Ultrasonic sensors emit a series of ultrasonic energy pulses, which travel through the air at the speed of sound. A portion of this energy is reflected by the target and travels back to the sensor. The sensor measures the total time required for the energy to reach the target and return to the sensor. The distance to the object is then calculated using the following formula:

D = <u>ct</u> 2

D = Distance from the sensor to the target Speed of sound in the air T = Transit time for the signal

To improve accuracy, an ultrasonic sensor elaborates the average results of several pulses before activating the output.

Temperature effects

The speed of sound depends on the composition, pressure and temperature of the gas in which it is travelling. For most ultrasonic applications, the composition and pressure of the gas are relatively fixed, while the temperature may vary. In air, the speed of sound varies according to the following approximate formulas:

$$C_{m/s} = 20 \sqrt{273 + T_C}$$

Cm/s = Speed of sound in meters per second Tc = Temperature in °C

Temperature Compensation

Changes in air temperature affect the speed of sound, which in turn affects the distance reading measured by the sensor. An increase in air temperature shifts both sensing window limits closer to the sensor. Viceversa, a decrease in air temperature shifts both limits farther away from the sensor This shift is approximately 3.5% of the limit distance for a 20° C change in temperature The US30 ultrasonic sensors are temperature compensated. This reduces the error due to temperature by about 90%. The sensor will maintain its window limits to within 2.2% over the -40° to +70°C range.

Notes

- Exposure to direct sunlight can affect the sensor's ability to accurately compensate for changes in If the sensor is measuring across a temperature gradient, the compensation will be less effective.

	US30-XX- N13-IH	US30-XX- N13-VH	US30-XX- N23-IH	US30-XX- N23-VH	
Power supply:	10 30 VDC (Class 2 UL508) reverse polarity protection				
Ripple:	≤ 2 Vpp				
Consumption (load current excluded):		40mA max.			
Analogue output configuration:	Voltage output: 420 mA	Voltage output 010 V	Voltage output: 420 mA	Voltage output 010 V	
Outputs:	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$			dc	
Response time:	Selec	table:	Selec	table:	
		105 ms (slow)	. ,.	s (fast), 222 ms (slow	
Switching frequency: Indicators:	11 Hz (fast), 4.7 Hz (slow) 5.4 Hz (fast), 2.2 Hz (slow) Power On LED (GREEN), Out LED (YELLOW), Signal LED (RED), Time Response Mode LEDs (YELLOW)				
Setting:	ANALOG push-button, remote command input (remote teach). Minimum and maximum detection limits can be programmed using the ANALOG push-button or remote input.				
Remote input levels:	Active: V _{LOW} ≤ 2 V @ 1mA		ourront)		
Delay at Power On:	Disabled: V _{HIGH} ≥ 5V @ 50uA (leakage current) 500 ms		currenty		
Temperature effect:			istance /°C		
Temperature drift:		< 1 % of rea	ding distance		
Linearity:		0.25% of	distance		
Resolution:		ance (0.5 mm n.)		tance (1 mm n.)	
Minimum reading window size:		10	mm		
Ultrasonic emission frequency:	224	KHz	174	KHz	
Operating temperature:		-40	70 °C		
Storage temperature:			70 °C		
Maximum relative humidity:		,	out condensatio	,	
Operating distance (typical values):		000 mm		000 mm	
Vibrations:	0.5 mm amplitude, 1055 Hz frequency, for every at (EN60068-2-6)		or every axis		
Shock resistance:	11 ms (30 G) shock for every axis (EN60068-2-27)		068-2-27)		
Reference standard:	EN60947-5-2				
Housing material:	PBT polyester				
Push-button material:	Polyester				
Mechanical protection:	IP67				
Connections:	M12 4-pol connector				
Weight:	68 g				

DIMENSIONS

1

Ø40 2

M30×1.5

23.4

22.5

636

TECHNICAL DATA

SENSOR PROGRAMMING

and the voltage

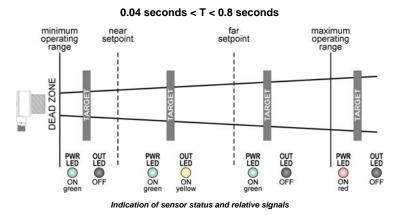
Two TEACH methods may be used to program the sensor Detect minimum and maximum limits, or

 Use Auto-Window feature to centre a sensing window around the taught position

The sensor may be programmed either via ANALOG push-button, or via a remote command (remote teach). Remote programming may be used to disable the push-button, preventing unauthorized personnel from adjusting the programming settings. To access this feature, connect the Remote Teach wire of the sensor to 0 Vdc, with a remote configuration switch between the sensor



Programming is accomplished by following the sequence of input pulses. The duration of each pulse (corresponding to a push-button "click"), and the period between multiple pulses, are defined as "T":

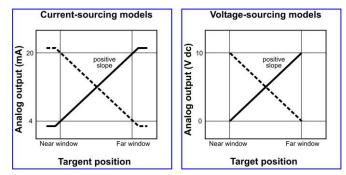


Positive or negative output slope programming

The sensor may be programmed for either a positive or a negative output slope, based on which limit is taught first (see pictures).If the Minimum limit is taught first, the slope will be positive.

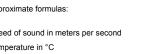
· If the Maximum limit is taught first, the slope will be negative

The analogue output signal, is automatically distributed over the width of programmed sensing window In the event of signal loss for more than 2 sec., the analogue output goes to 3.6mA or 0Vdc, which may be used to trigger an alarm.



	ANALOG push-button		REMOTE Line		
	Procedure	LED indicators	Procedure	LED indicators	
TEACH Mode	Push and hold ANALOG push- button for >2sec.	LED OUT: ON LED PWR: OFF	No action required. Sensor is ready for 1st limit teach	None.	
	Position the target for the first limit	LED SIGNAL: must be on or blinking	Position target for the first limit	LED SIGNAL: must be on or blinking	
TEACH First Limit	Press ANALOG push-button for the first limit	Teach accepted: <u>LED PWR</u> : OFF <u>LED OUT</u> : Blinking Teach not accepted: <u>LED OUT</u> : ON	Single-pulse the remote line (0.04 s < T < 0.8 s).	Teach accepted <u>LED PWR</u> : OFF <u>LED OUT</u> : Blinking Teach not accepted: <u>LED PWR</u> : ON	
	Position the target for the second limit	LED SIGNAL: must be on or blinking	Position target for the second limit	LED SIGNAL: must be on or blinking	
TEACH Second Limit	Press ANALOG push-button for the second limit	Teach accepted: LED PWR: ON LED OUT: ON Teach not accepted: LED PWR: OFF LED OUT: Blinking.	Single-pulse the remote line (0.04 s < T < 0.8 s).	Teach accepted LED PWR: ON LED OUT: ON Teach not accepted: LED PWR: OFF LED OUT: Blinking.	

<u>NOTE</u>: the duration of each pulse (remote teach) and the period between multiple pulses are defined as "T" and must be included between 0.04 s and 0.8 s (0.04 s < T < 0.8 s).



Teaching limits using the Auto-Window feature

Teaching the same limit twice for the same output automatically centres a 100mm window on the taught position (\pm 50 mm).

	DISCRETE	oush-button	REMOTE Line			
	Procedure	LED indicators	Procedure	LED indicators		
TEACH Mode	Push and hold ANALOG push- button for >2sec	LED OUT: ON LED PWR: OFF	No action required. Sensor is ready for 1st limit teach	None		
	Position the target for the first limit	LED SIGNAL: must be on or blinking	Position target for the first limit	LED SIGNAL: must be on or blinking		
TEACH First Limit	Press ANALOG push-button	Teach accepted: <u>LED PWR</u> : OFF <u>LED OUT</u> : Blinking Teach not accepted: <u>LED OUT</u> : ON	Single-pulse the remote line_(0.04 s < T < 0.8 s).	Teach accepted: <u>LED PWR</u> : OFF <u>LED OUT</u> : Blinking Teach not accepted: <u>LED PWR</u> : ON		
Re-TEACH Limit	Press ANALOG push-button again without moving target	Teach accepted: LED PWR: ON LED OUT: ON Teach not accepted: LED PWR: OFF LED OUT: Blinking	Pulse again the remote line without moving the target (0.04 s < T < 0.8 s).	Teach accepted: <u>LED PWR</u> : ON <u>LED OUT</u> : ON Teach not accepted: <u>LED PWR</u> : OFF <u>LED OUT</u> : Blinking		

<u>General Notes on Programming</u> The sensor will return to RUN mode if the first TEACH condition is not registered within 120 seconds. After the first limit is taught, the sensor will remain in PROGRAM mode until the TEACH sequence is finished.

To exit PROGRAM mode without saving any changes, press and hold the programming push button > 2 seconds (before teaching the second limit). The sensor will revert to the last saved program.

Response time selection (Fast or Slow)

Two different response times can be selected using the MODE push-button or remote line.

	MODE		REMOTE Line			
	MODE push-button					
	Procedure	LED indicators	Procedure	LED indicators		
TEACH Mode	Push and hold MODE push- button for >2sec	LED PWR: OFF LED MODE: Blinking amber LED shows previously selected mode	Double-pulse the remote line	LED PWR: OFF LED MODE: Blinking amber LED shows previously selected mode		
Output selection	Press MODE to choose between FAST or SLOW	LED PWR: OFF LED MODE: Blinking amber LED shows currently selected mode.	Single pulse: SLOW Double pulse: FAST	LED PWR: ON LED MODE: Blinking amber LED shows currently selected mode.		
Save and activate new mode	Push and hold MODE push- button for >2sec	LED PWR: ON LED MODE: Blinking amber LED shows currently selected mode.	None. Sensor exits programming procedure.	None.		

Please refer to the document "Sensor Configuration" for advanced functions.

The sensors are NOT safety devices, and so MUST NOT be used in the safety control of the machines where installed.

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Helpful links at www.datalogic.com: Contact Us, Terms and Conditions, Support

The warranty period for this product is 36 months. See General Terms and Conditions of Sales for further details.

Under current Italian and European laws, Datalogic is not obliged to take care of product disposal at the end of its life. Datalogic recommends disposing of the product in compliance with local laws or contacting authorised waste collection centres.

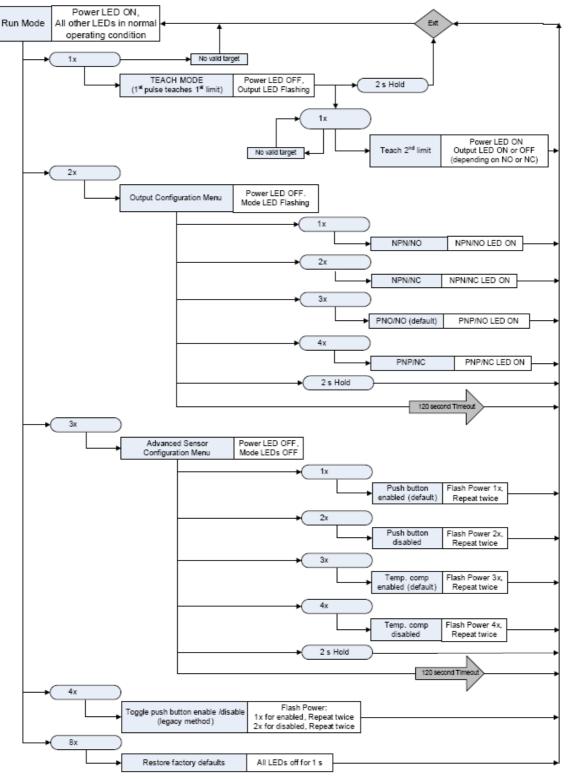
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US30 DIGITAL OUTPUT "SENSOR CONFIGURATION"

Remote Line TEACH

- Run mode is the sensor's normal operating condition.
- The duration of each pulse is defined as "T" : 0.04 s < T < 0.8 s.
- A Hold will exit TEACH mode and return to Run mode with previously saved changes. The duration of Hold is: **T>2 s**.
- A Timeout will occur if a condition is not registered within 120 seconds, causing the sensor to return to Run mode (during sensor configuration only).
- Sensor configuration user feedback shown on green LED. See flow-chart.
- The red signal LED will be ON whenever the target is in view.



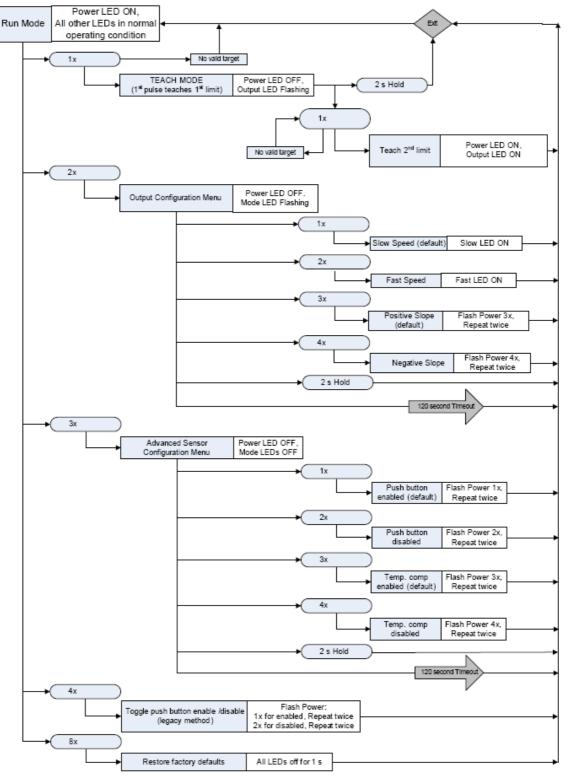
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US30 ANALOGUE OUTPUT "SENSOR CONFIGURATION"

Remote Line TEACH

- Run mode is the sensor's normal operating condition.
- The duration of each pulse is defined as "T" : 0.04 s < T < 0.8 s.
- A Hold will exit TEACH mode and return to Run mode with previously saved changes. The duration of Hold is: **T>2 s**.
- A Timeout will occur if a condition is not registered within 120 seconds, causing the sensor to return to Run mode (during sensor configuration only).
- Sensor configuration user feedback shown on green LED. See flow-chart.
- The red signal LED will be ON whenever the target is in view.



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