

Model VM1 Series

VIRTU™

Ultrasonic Proximity Sensors

- Sensing range of 50.8 mm (2") up to 508 mm (20")
- Dual-mount 18 mm and flat-profile body style
- Sinking (NPN) or a sourcing (PNP) output available
- Rugged duty design for harsh environments
- Simple remote pushbutton accessory available for teaching of sensing limits
- NEMA 4X, IP67 and CE certified



The next generation compact ultrasonic proximity sensor outperforming many other sensor types in both application and cost.

The new Virtu™ ultrasonic sensor developed by Hyde Park features sensing ranges from 50.8 mm (2") up to 508 mm (20"). This versatile, powerful proximity sensor sells for under \$100, a price breakthrough for superior ultrasonic technology.

With an M18 x 1 threaded snout 0.89" long and a 1.49" rectangular body for a total length of only 2.38", the Virtu's small size and tough VALOX® housing make it not only ideal for many OEM applications but also an unfailing performer for an array of packaging applications, including food and beverage. Available in cable or connector style, Virtu is the first sonic compact sensor to offer a dual mounting feature. In addition, it operates on 12 to 24 VDC and provides either a sinking (NPN) or a sourcing (PNP) output. Virtu also has teach-in window capability, and no downtime is required for sensor recalibration when colors, materials, or shapes change.

With protection ratings of NEMA 4X and IP67, this CE certified sensor is resistant to dust, 100% humidity, most acids and bases, and high pressure washdowns that often leave water buildup on

the sensing face. This sleek sensor is virtually impervious to the effects of splashing food, caustic cleaning solutions, and changing light conditions or colors. Shielding and filtering make the fully encapsulated sensor resistant to radiated or conducted energy.

Operation

The Virtu Model VM1 series is a self-contained, pulse-echo, proximity sensing device that both transmits and receives sonic energy within a 508 mm (20") maximum sensing range. Operating on 12 to 24 VDC, and employing the latest piezoelectric and microprocessor technology, Virtu sensors detect only those designated objects within a set "window" and ignore all surrounding sonic interference.

Prior to operation, a simple and easy "teach" function is used to set the sensing window limits through either a remote or an inline cable pushbutton. A near and far limit for a desired sensing window can be set anywhere within the sensing range and may be set to either encompass the full sensing range or be as small as 6 mm (0.25").

The sensor is equipped with a two-color status LED to show the state of the output. When the output is active, the LED is amber, regardless of whether the output is normally open or closed. When the output is not active, the LED is green. The LED also serves to show the

sensing status of the sensor. With a normally open output and an object in the sensing window, the LED will be amber and switch to green when the object leaves the sensing window, switching off the output. With a normally closed output and an object in the sensing window, the LED will be green and switch to amber when the object leaves the sensing window, switching on the output.

Setting the Window Limits

Before operating the sensor, you should teach the sensor the sensing window. The sensing window is the distance between the near and far limits. To teach the limits, press and hold the pushbutton. The LED fast flashes amber and then after holding the pushbutton for 3 seconds, the LED slowly flashes green indicating the sensor is in teach mode. Release the pushbutton, and the LED continues slowly flashing green indicating the sensor is waiting for the first limit. Place a target at either limit, and press and release the pushbutton. While the pushbutton is pressed with a target present, the LED turns amber indicating a valid echo is being detected. After teaching the sensor the first limit successfully, the LED slowly flashes amber indicating the sensor is waiting for the second limit. Place a target at the second limit, and press and release the pushbutton. While the pushbutton is pressed with a target present, the LED turns amber indicating a valid echo is being detected. After teaching the sensor the second limit, the two limits are saved in non-volatile memory and then the LED fast flashes green for 3 seconds to indicate the limits were successfully saved. The limits can be set in either order.

To teach the default window of 25.4 mm (1.0"), while the sensor is in teach mode requesting the first limit (LED slowly flashing green), place a target parallel to the sensor face at the center of the desired window. Press and release the pushbutton twice in succession within one second.

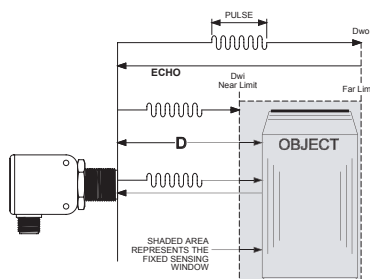
The LED fast flashes green indicating the limits were successfully saved. This sets the limits 12.7 mm (0.5 in.) in front of and behind the front surface of the target.

If not using an optional pushbutton, the process is similar. The white teach wire (pin 2) can be grounded to the blue DC return wire (pin 3) to simulate the pushing of the button. All LED indications and the teach sequence is identical to the previously detailed process.

While setting either limit, if no echo is detected, the LED fast flashes green and amber indicating no object is detected. After 5 seconds, the sensor resumes operation with the old limits. If either limit is not set in 30 seconds, a limit timeout occurs, the LED flashes green and amber for 3 seconds indicating the error, and then the sensor resumes operating with the old limits.

How Does It Work?

During teach and operation, the Virtu sensor continually and accurately measures the elapsed time from the first pulse echo received after each pulse transmission. The transmitted pulse begins a time clock to register the elapsed time of the first received pulse echo. Given the elapsed time, the sensor software calculates the distance traveled out to the object or surface and back to the sensor, using the formula, $D = TV_s/2$, where: D = Distance from the sensor to the object; T = Elapsed time between the pulse transmission and its first received echo; V_s = the Velocity of sound, approximately 335 meters (1100 feet) per second.



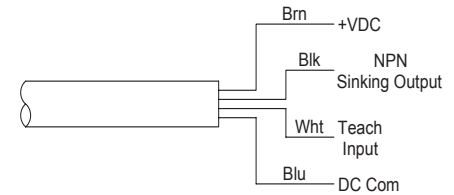
During operation, the calculated distance (D) between the

sensor and the object is compared to the distances associated with the window limits. These limits are shown in the illustration as Dwi and Dwo. If D is within these limits, an output is activated or deactivated, depending whether normally open or normally closed. The output remains in such state until the echo does not return or it returns from outside the window limits.

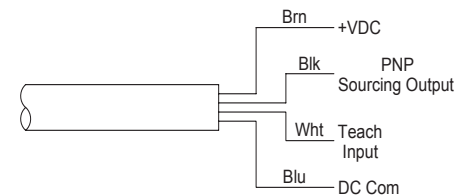
Electrical Wiring

The sensor cable must be run in conduit, free of any AC power or control wires.

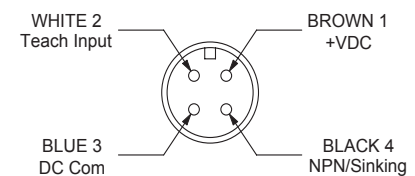
NPN Cable Style Wire



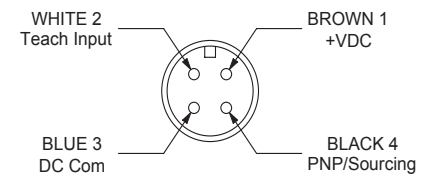
PNP Cable Style Wire



NPN Micro Connector Style

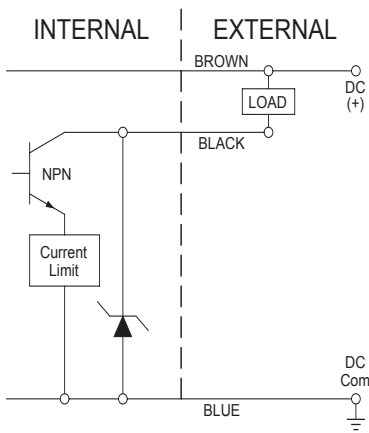


PNP Micro Connector Style

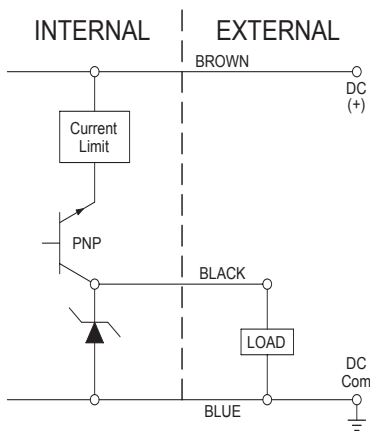


Output Style

NPN Output

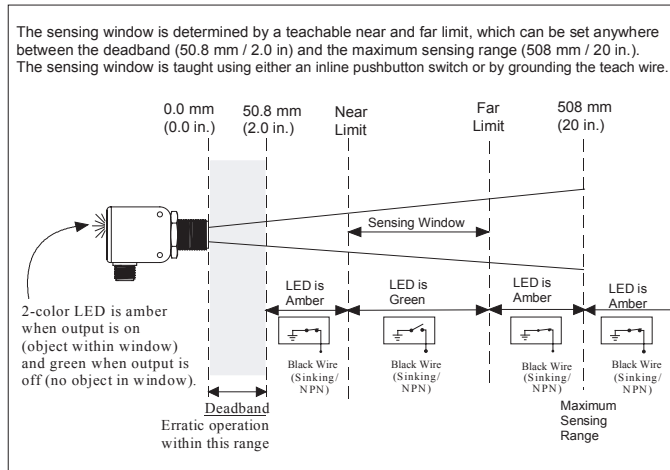


PNP Output

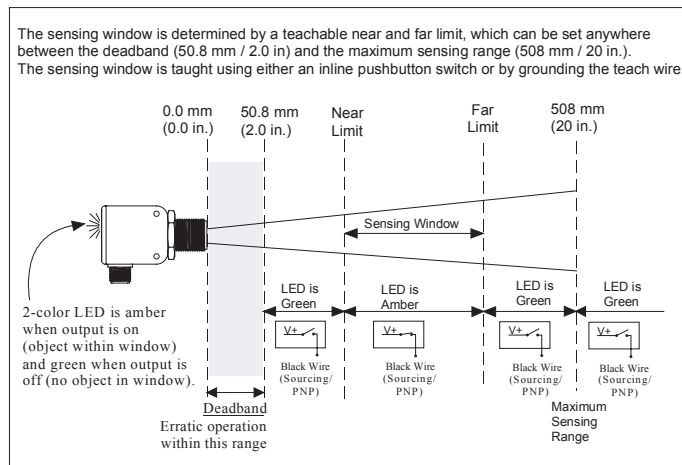


Output Type

NPN - Normally Closed Output



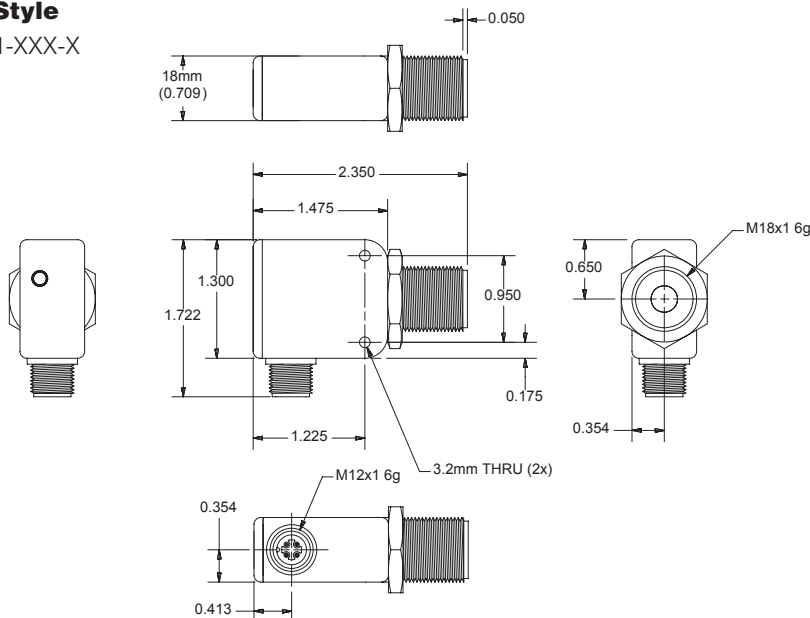
PNP - Normally Open Output



Dimensions

Quick Disconnect Style

(VALOX® Plastic) VM1-XXX-X



Model Reference Guide - VM1 Series

Use the guide below to ensure the correct model number is specified for the application. Please note that not all sensor model combinations are available.

EXAMPLE MODEL:

VM1 - P NO - Q

Ultrasonic Miniature Proximity Series

Output Type

N...NPN Sinking Output

P...PNP Sourcing Output

Output Style

NO...Normally Open

NC...Normally Closed

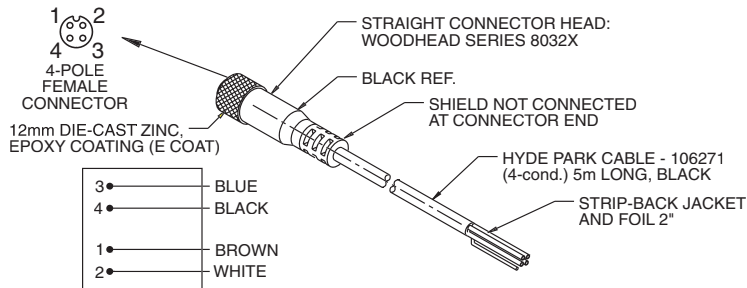
Connection Types

...No designator indicates 3M (10') cable style connection

Q...Quick Disconnect – 4 pin "Micro" connector

Accessories

AC130 Straight, 4-conductor, connector/cable assembly,
5 m (16') (for barrel and flat-profile micro sensors)



General Specifications

Sensing [T_A = 20° C (68° F)]

Sensing Range:

50 mm (2") to 508 mm (20")
(large flat objects)

Sonic Frequency: 300 kHz

Minimum-size Detection:

2.5 mm (0.098") diameter rod or 38 mm (1.5") wide flat bar at a distance of 200 mm (8")

Note: Smaller object may not be detected at closer distances

Maximum Angular Deviation:

± 5° on a 100 mm x 100 mm (4" x 4") flat target at a distance of 508 mm (20")

Sonic Cone Profile:

see beam plot on page 3-2

Limit Position Accuracy:

± 1.6 mm (0.062") max.

Repeatability:

± 0.7mm (0.027") or better

Power Requirements

Supply Voltage:

12VDC to 24VDC ± 10%, regulated supply

Current Consumption:

40 mA max. (excluding load)

Power Consumption:

1.0W max. (excluding load)

Output

Sinking Output (NPN Model VM1-NXX):

Maximum on-state voltage: 0.75 V @ 100 mA

Maximum load current: 100 mA

Maximum applied voltage: 30 VDC

Sourcing Output (PNP Model VM1-PXX):

Maximum on-state voltage drop: 1.10 V @ 100mA

Maximum load current: 100mA

Output voltage: V_{Supply} - 1.10 V @ 100mA

Input-Teach Setup

Contact Closure(pushbutton) to common. Internal 115KΩ pull-up to 5V

Input Voltage Range

Setup Input Active 0V to 1V

Setup Input Inactive 2.5V to 5V

Max Voltage without Damage -30V to 30V

Response Time

15.0 ms On/ 15.0 ms Off max

Indicators

Green LED: Illuminated if output is off

Amber LED: Illuminated if output is on

Note: Green and Amber LEDs are never illuminated simultaneously

Connections

Cable Style Models:

24 AWG, foil shield, lead-free, PVC jacket

4-conductor, 3M (10') long

Connector Style Models:

8 mm, circular 4-pole, male micro connector

Protection

Power Supply: Current-limited over-voltage, ESD, reverse polarity

Output: Current-limited over-voltage, ESD, reverse polarity

Input: Current-limited over-voltage, ESD, reverse polarity

Environmental

Operating Temperature Range:

-30° to 70° C (-22° to 152° F)

Storage Temperature Range:

-40° to 85° C (-40° to 185° F)

Operating Humidity: 100% non-condensing

Protection Ratings: NEMA 4X, IP67

Chemical Resistance: Resists most acids and bases including most food products.

Agency Approvals

CE Mark: CE conformity is declared to:
EN60947:1998 (proximity sensors)
EN61010-1 (general safety)

EMC:

FCC 47 CFR Part 15 Class A (USA)

EN5022:1994 / A2:1997 Class A ITE (EU)

VCCI Class A ITE (Japan)

AS/NZS 3548:1995 / CISPR 22 Class A ITE (Australia)

Declaration of Conformity available upon request.

Construction

Dimensions:

Barrel(snout): 18 mm (0.709") x 1 mm-6g thread x 22.23 mm (0.875") long

Flat-profile: 43.74 mm (1.722") x

18 mm (0.709") x

59.69 mm (2.354")

Overall length: 59.69 mm (2.354")

Housing:

Shock and vibration resistant

Case: VALOX® plastic (FDA Approved)

Transducer Face: Epoxy

Sensor Cable: PVC jacketed, black

LED: Polycarbonate

* VALOX® is a registered trademark of The General Electric Co.

Accessories

Model PB100, Inline pushbutton switch (for teaching window)

Model AC130, Straight, 4-conductor, connector/cable assembly, 5 m (16'), for micro-connector sensors

Model AC132, Right-angle, 4-conductor, connector/cable assembly, 5 m (16'), for micro connector sensors

Model AC228, Right-Angle Bracket

Selection Chart

VM1 Series Proximity

Model No.	Power Version 12/24 VDC		Conn. Style	Sensing		Materials		Outputs			Notes
	Cable	Quick Disconnect		Range	Window	Epoxy	VALOX	Type			
			PNP Sourcing					Normally Open	Normally Closed		
VM1-NNO	■	■		508 mm (20")	Teachable	■	■	■	■	■	
VM1-NNC	■	■		508 mm (20")	Teachable	■	■	■		■	
VM1-NNO-Q	■	■	■	508 mm (20")	Teachable	■	■	■	■	■	
VM1-NNC-Q	■	■	■	508 mm (20")	Teachable	■	■	■		■	
VM1-PNO	■	■		508 mm (20")	Teachable	■	■		■	■	
VM1-PNC	■	■		508 mm (20")	Teachable	■	■		■	■	
VM1-PNO-Q	■	■	■	508 mm (20")	Teachable	■	■		■	■	
VM1-PNC-Q	■	■	■	508 mm (20")	Teachable	■	■		■	■	