

# Cellocator Concrete Mixer Sensor Overview



Cellocator Division  
Pointer Telocation Ltd.

Proprietary and Confidential

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**POINTER**



# Cellocator Concrete Mixer Sensor Overview



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# Cellocator Concrete Mixer Sensor Overview



## 1 Introduction

### 1.1 Scope and Purpose

The purpose of this document is to describe the features and capabilities of the Cellocator Concrete Mixer Sensor. It includes a description and technical specifications of the sensor, magnetic bolt and brackets which comprise the Concrete Mixer Sensor Kit, as well as installation instructions for the sensor.

This document also describes the integration of the Cellocator unit with the sensor, in order to provide the back-end Telematics application with the information generated by the sensor.

The document is intended for TSP or IT integrators who want to use the information provided by the sensor within their Telematics applications. It is intended to provide all the required information for customers, customer support, and sales personnel.

### 1.2 Abbreviations

Abbreviation	Description
TSP	Telematics Service Provider
IT	Information Technology

### 1.3 References

All the reference documents listed in the following table can be downloaded from the support section of the Pointer website ([www.pointer.com](http://www.pointer.com)).

#	Reference	Description
1.	<a href="#">CelloFamily Hardware Installation Guide</a>	
2.	<a href="#">Harness Selection Wizard</a>	

### 1.4 Revision History

Version	Date	Description
1.0	16/04/2015	Initial version
1.1	17/09/2016	Add flat alignment instructions (section 3)



# Cellocator Concrete Mixer Sensor Overview



## 2 General Description

### 2.1 Overview

The Cellocator Concrete Mixer Sensor provides a low-cost, smart solution for the construction vertical market.

Consisting of a magnetic field count and direction sensor, two magnetic bolts, and a bracket, the Concrete Mixer Sensor monitors (in conjunction with other features, such as Geo-fence) the complete concrete supply cycle, including the following stages:

- ◆ Engine on
- ◆ Arrival at the concrete plant
- ◆ Loading (mixing) the concrete
- ◆ Agitating the concrete while traveling
- ◆ Arrival at the construction site
- ◆ Unloading the concrete
- ◆ Washing the mixer
- ◆ Exiting the construction site

The Concrete Mixer Sensor can also help issue alerts when unloading outside the construction site, for timing issues, or when there is a failure to comply with expected procedures.

### 2.2 Solution Description and Narrative

The Cellocator Concrete Mixer Sensor solution is composed of magnetic bolts mounted on the mixer's drum, and a Hall Effect based sensor which detects the direction of the rotation and generates a pulse per bolt detection.

The bolts are mounted on the mixer's drum, replacing the original ones. Two are sufficient.

The sensor should be installed on the truck facing the rotating bolts and close enough to detect the magnetic field of the bolts.

The sensor direction digital output provides high or low signals according to the rotation direction and should be connected to the Cellocator unit's discrete input. The unit reports on any change of direction to the back-end application.




The sensor speed output generates a pulse per magnet detection and should be connected to the Cellocator unit pulse counter input. The unit reports on counted pulses periodically. The pulse counter can be read and reset by the back-end application.

The back-end application determines the mixer mode of operation (mixing, agitating, unloading, washing or no rotation) based on the rotation speed and direction, in addition to other information such as movement and geo-fence.

## 2.3 Product Description

### 2.3.1 Concrete Mixer Sensor Kit Description

The Cellocator Concrete Mixer Sensor kit (PN 712-20033) includes a count and direction sensor, two magnetic bolts and a bracket. The items are listed in the table below.

Name/Part Number	Description	Picture
<b>Count and Direction Sensor</b> PN: AR0292	Sensor, which provides 2 digital outputs; <i>speed</i> and <i>direction</i> , activated when the magnetic bolts installed in the mixer drum pass by the sensor.	
<b>Potted Magnet Bolt</b> PN: AR0293	The magnetic bolt triggers the speed and direction digital outputs of the Concrete Mixer Sensor.	
<b>Mounting Bracket</b> PN: AR0294	The mounting bracket is used to attach the Concrete Mixer Sensor in the relevant location on the truck.	

*Table 1: Cellocator Concrete Mixer Sensor Components*

### 2.3.2 Count and Direction Sensor Description

The Count and Direction Sensor uses Hall Effect technology and provides 2 digital open collector outputs, which are activated when the magnetic bolts installed in the mixer drum pass by the sensor.

The *speed* output provides one pulse each time the south pole of the magnetic bolt passes the sensor, while the *direction* output goes low when the magnet is spinning clockwise, and high when it is spinning counterclockwise.

The sensor supports 4 wires, which are weather protected by Heat shrink, are described in the following table.



## Cellocator Concrete Mixer Sensor Overview



Wire Color	Description
Red	Vcc
Black	Ground
White	Speed
Green	Direction

*Table 2: Concrete Mixer Sensor Wires*

The sensor uses internal hysteresis for accurate magnetic poles detection, packed in a solid state housing made of stainless steel which is temperature stable.

### **2.3.3 Magnetic Bolt Description**

The magnets are actually potted magnets customized for rotating drum detection on cement/concrete trucks. The entire magnet is covered with potting to protect from harsh environments and chemical wash-down.

The magnetic bolts are mounted on the mixer drum, replacing the mixer's original bolts. The south pole of each magnet (located in the head of each bolt) triggers the sensor to activate its outputs.

### **2.3.4 Bracket Description**

The Right Angle Bracket is a zinc-plated cold-rolled steel bracket used as part of the Concrete Mixer Sensor solution; the bracket attaches the sensor to the relevant point alongside the mixer drum.



## 3 Installation Instructions

**CAUTION:** To avoid possible bodily injury, or damage to the vehicle, the installer must be a certified technician who has been qualified to install the system.

The following instructions detail how to install the Concrete Mixer Sensor, including the magnetic bolts and RAB.

➤ **To install the Concrete Mixer Sensor:**

1. Replace at least one of the drum mixer bolts with the magnetic bolts, as shown below. For proper operation the bolts should be spread evenly along the drum perimeter. Do not screw a bolt next to another bolt.

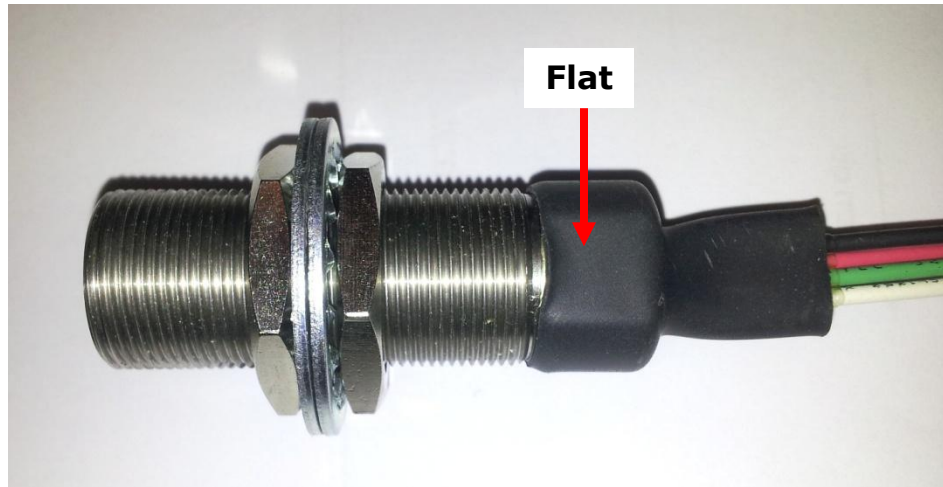


*Figure 1: Installing the Concrete Mixer Sensor Bolts*

2. Attach the Count and Direction Sensor to the truck using the bracket, as shown below. The sensor needs to be mounted in a location where its face will be pointing directly at the magnets as the drum rotates.

Ensure the alignment of the flat is parallel to the rotation drum. The flat should also face outwards from the drum (opposite to the center of the drum), in order for the direction output to be low when the drum is spinning clockwise. For example, In the installation picture shown below and shown below the flat face should pointing towards the camera.

When the magnet passes by the sensor the distance between the surface of the magnet and the face of the sensor should be far enough apart to ensure they never contact, and can be up to 22 mm apart.



*Figure 2: Attaching the Concrete Mixer Sensor*

3. Connect the sensor wires according to the connection table below:

Wire Color	Description	Connected to
Red	Vcc	Vehicle Battery or Ignition
Black	Ground	Vehicle Ground



## Cellocator Concrete Mixer Sensor Overview



Wire Color	Description	Connected to
White	Speed	Cellocator unit digital input which can be programmed as pulse counter; Doors or Shock
Green	Direction	Any Cellocator unit digital input

*Table 3: Connecting Sensor Wires*

4. Verify that when the mixer drum is turning, the two digital outputs are properly activated. Especially make sure that the *direction* output goes low when the drum is spinning clockwise

Please review the [CelloFamily Hardware Installation Guide](#) for instructions regarding connecting the sensors to the Cello Harness.

Please review the [Harness Selection Wizard](#) to select the best harnesses for your specific application.

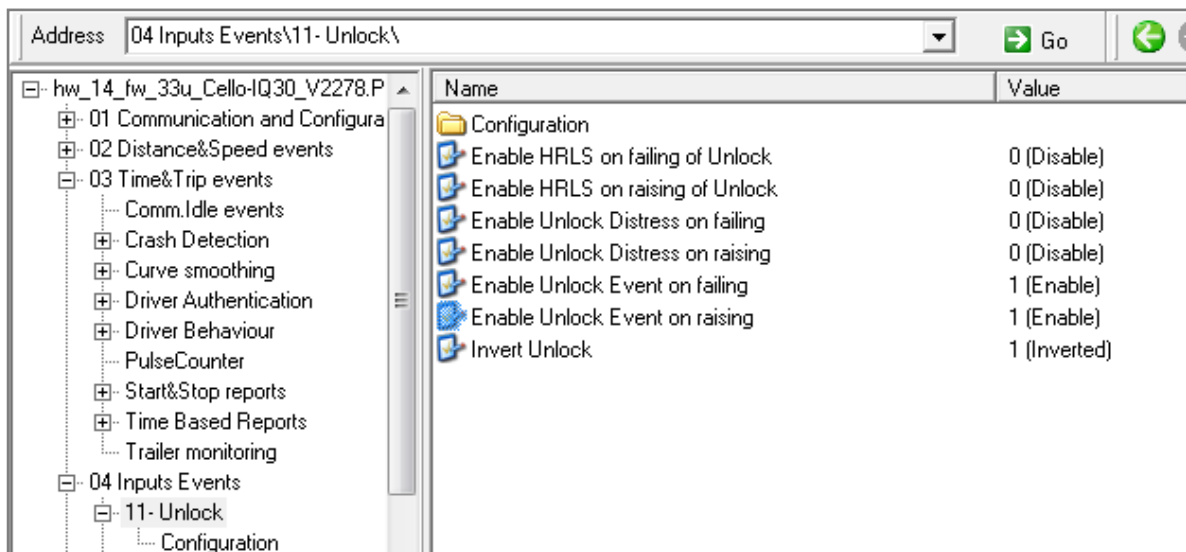
## 4 Integration Description

### 4.1 Cellocator Unit Programming

#### 4.1.1 Programming the Input Connected to the Direction Output of the Sensor

Any Cellocator unit input can be used for connecting to the Direction output of the sensor. The Unlock input is used as an example; please program the input as shown in the Programmer screenshots below.

- ◆ Send regular events on any change of direction
- ◆ No need to change the input configuration



*Figure 3: Programming Input Connected to Direction Output*

#### 4.1.2 Programming the Input Connected to the Speed Output of the Sensor

The input connected to the Speed output of the sensor should support the pulse counter capability; therefore only the Doors (Cello unit pin 14) and Shock (Cello unit pin 15) inputs are relevant. The Doors input is used as an example. Please program the input as shown in the Programmer screenshots below.

- ◆ All input events should be disabled
- ◆ The assigned function should be 'use as GP input'
- ◆ The Input Type should be set to pulse counter
- ◆ The input pulse counter scaling factor should be set to 1
- ◆ The pulse counter periodic time transmission should be set according to the specific application. It is recommended to set it from 30 up to 60 seconds (value = 2 - 4)
- ◆ The pulse counter periodic transmission resolution should be set to 15 seconds

Please review the [Cellocator Cello Programming Manual](#) for further information.



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Note that you should contact Customer Support in order to verify which product and FW versions support the pulse counter periodic transmission resolution of 15 seconds.

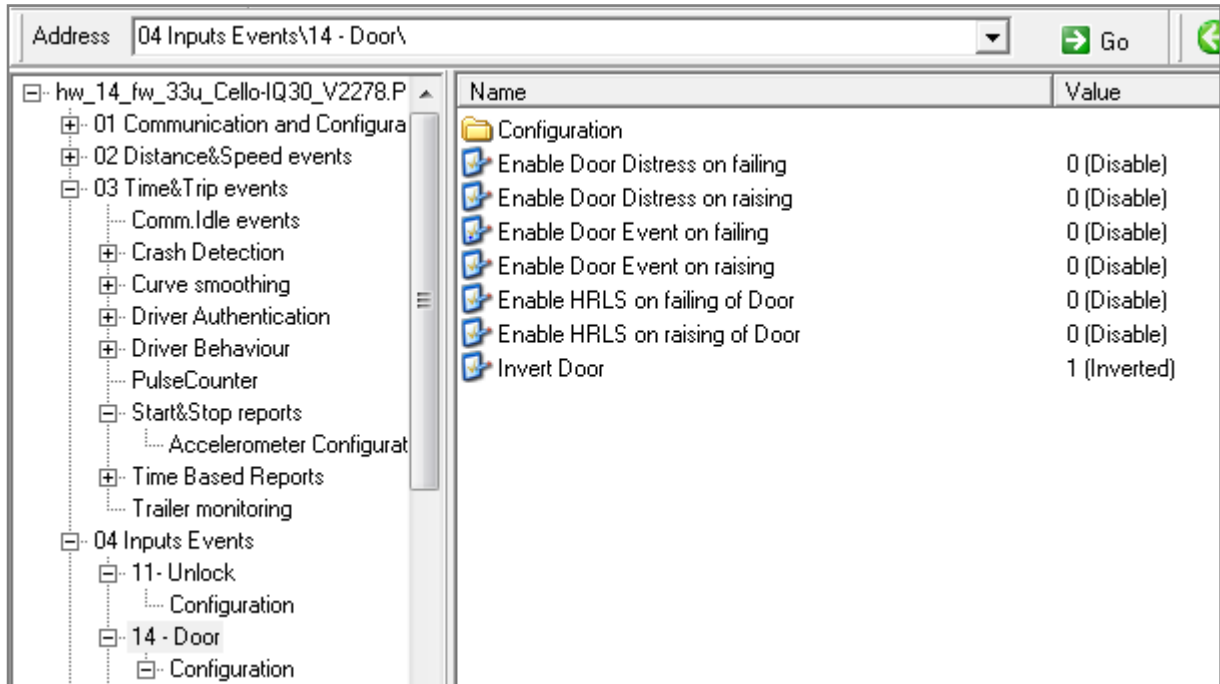


Figure 4: Programming Input Connected to Speed Output

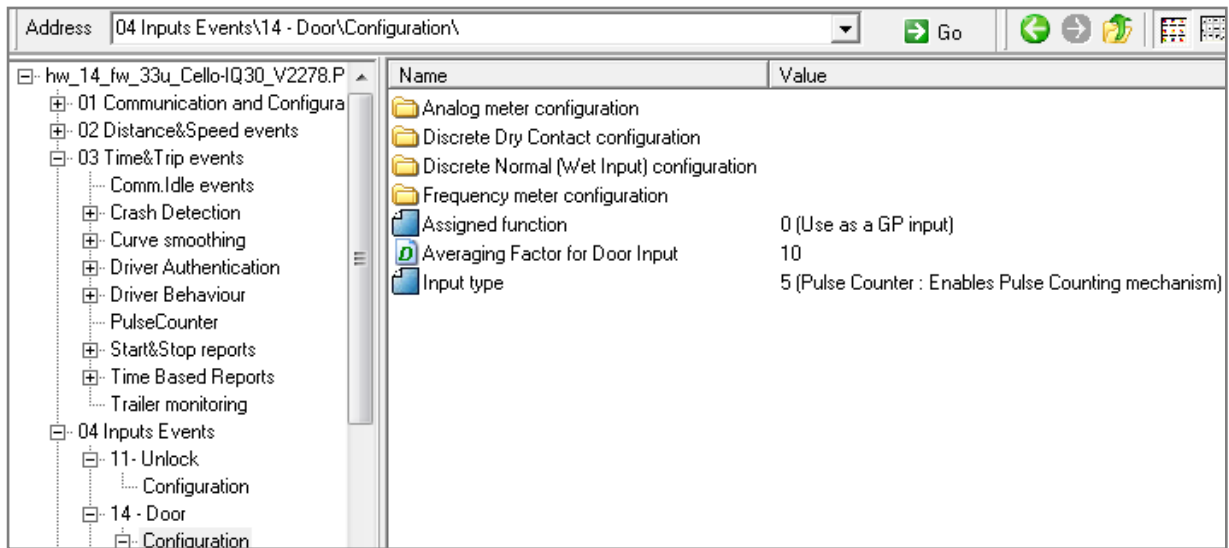
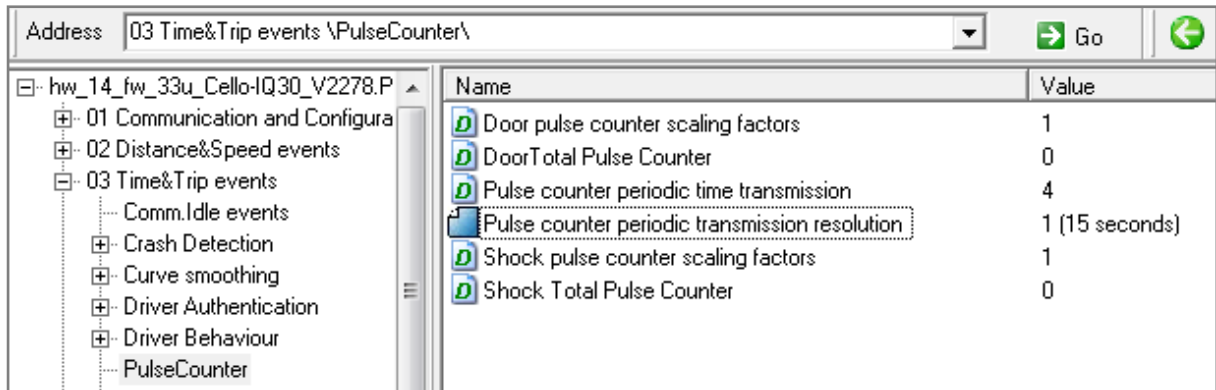


Figure 5: Programming Configuration of Input Connected to Speed Output



Name	Value
Door pulse counter scaling factors	1
DoorTotal Pulse Counter	0
Pulse counter periodic time transmission	4
Pulse counter periodic transmission resolution	1 (15 seconds)
Shock pulse counter scaling factors	1
Shock Total Pulse Counter	0

*Figure 6: Programming the Pulse Counter*

## 4.2 Cellocator Unit Messages

The Cellocator unit provides the following messages regarding the sensor Speed and Direction output.

- ◆ Message 0 with appropriate transmission reason is sent on each direction change detection.
- ◆ Type 9, Sub-data type 14 Pulse Counter Measurement request can be used by the application for requesting the current value of the pulse counter.
- ◆ Type 9, Sub-data type 14 Pulse Counter Measurement Response is sent by the Cellocator unit and reports the current value of the pulse counter as response to the Pulse Counter Measurement request or periodically per the programmable periodic time transmission parameter.
- ◆ The user can read and set the accumulated pulse count via PL accesses (OTA and serial). The value in the PL is the raw pulse count.

The messages description and format can be found in [Cellocator Wireless Communication Protocol](#).



## Cellocator Concrete Mixer Sensor Overview



### 5 SW Integration Guide

The back-end application determines the mixer mode of operation (mixing, agitating, unloading, washing or no rotation) based on the rotation speed and direction, in addition to other information such as movement and geo-fence. The table below can be used as a guide for defining the mode of operation.

Please note that the mixer rotation speed for each mode might vary for each mixer type and should be defined according to actual monitoring and experience.

Mode of Operation	Truck Movement	Location	Direction (CW or CCW)	Rotation Speed
Mixing (loading, adding water)	No	Plant site	CCW	Varied
Agitating (traveling to construction site)	Yes	On planned route	CCW	Varied
Traveling (empty)	Yes	On planned route		No rotation
Unloading	No	Construction site	CW	Varied
Washing – loading water	No	Planned washing site	CW	Varied
Washing – unloading water	No	Planned washing site	CCW	Varied

*Table 4: Mode of Operation*

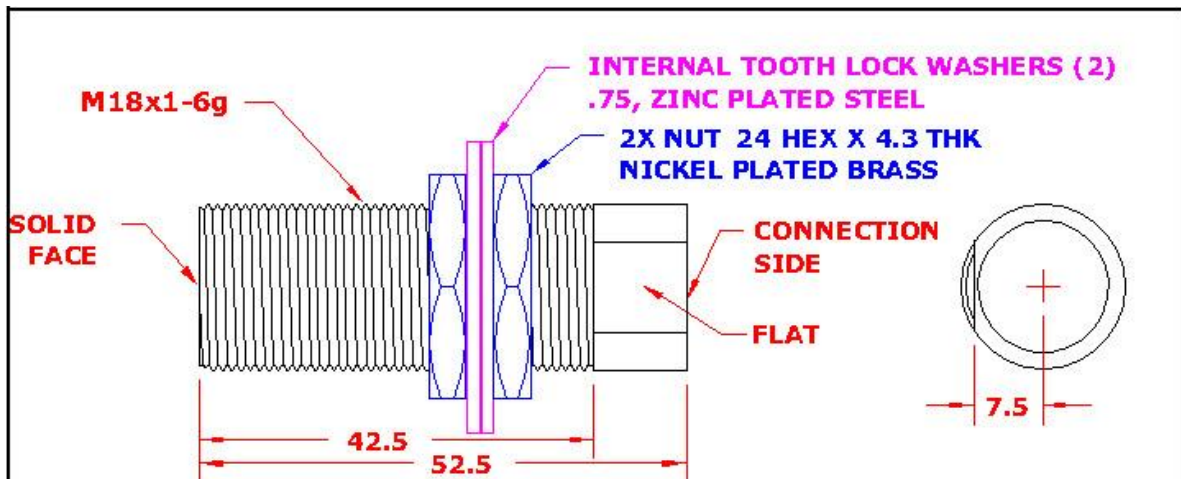
## 6 Technical Specifications

### 6.1 Count and Direction Specifications

Parameter	Value
Supply voltage	8 to 30 Volts DC
Supply current	10 to 40 mA
Frequency range	0-10 kHz
Enclosure standard	IP67
Environmental standards	Rust proof, vibration proof, and mechanical shock proof
Operating temperature range	-40 to 125 °C
Dimensions	Ø18mm x 53mm
Housing material	303 stainless steel

*Table 5: Count and Direction Sensor Specifications*

The sensor drawing is shown below.



*Figure 7: Concrete Mixer Sensor Drawing (Dimensions in mm)*



The sensor wires drawing is shown below.

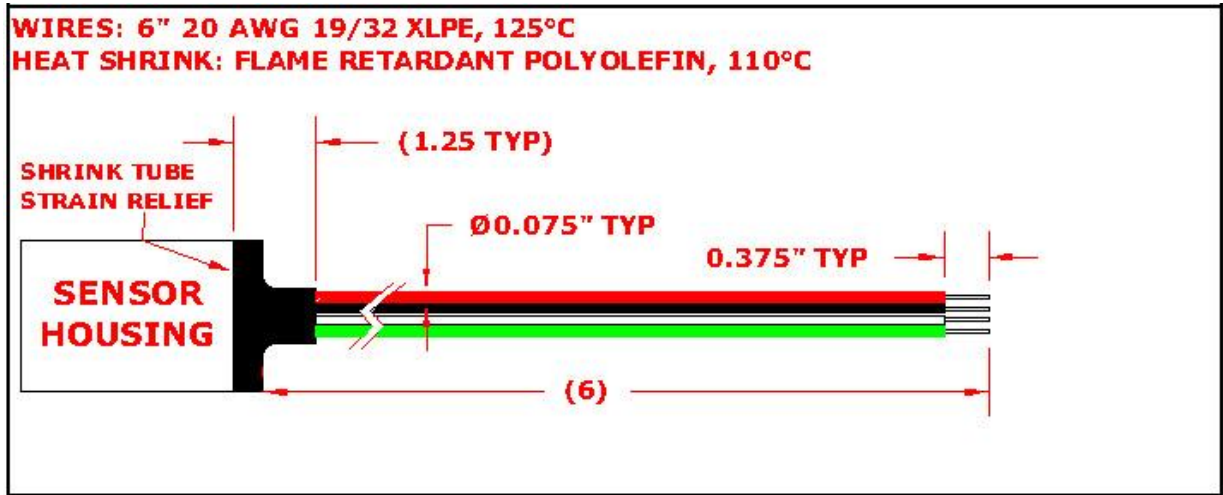


Figure 8: Sensor Wires Drawing (Dimensions in inches)

## 6.2 Magnetic Bolts Specifications

Parameter	Value
Enclosure standard	IP67
Environmental standards	Rust proof, vibration proof, and mechanical shock proof
Maximum operating temperature	90 °C
Dimensions	See drawing below
Thread	5/8-11 15/16 Hex
Housing material	Nylon

Table 6: Magnetic Bolts Specifications

The magnetic bolt drawing is shown below.

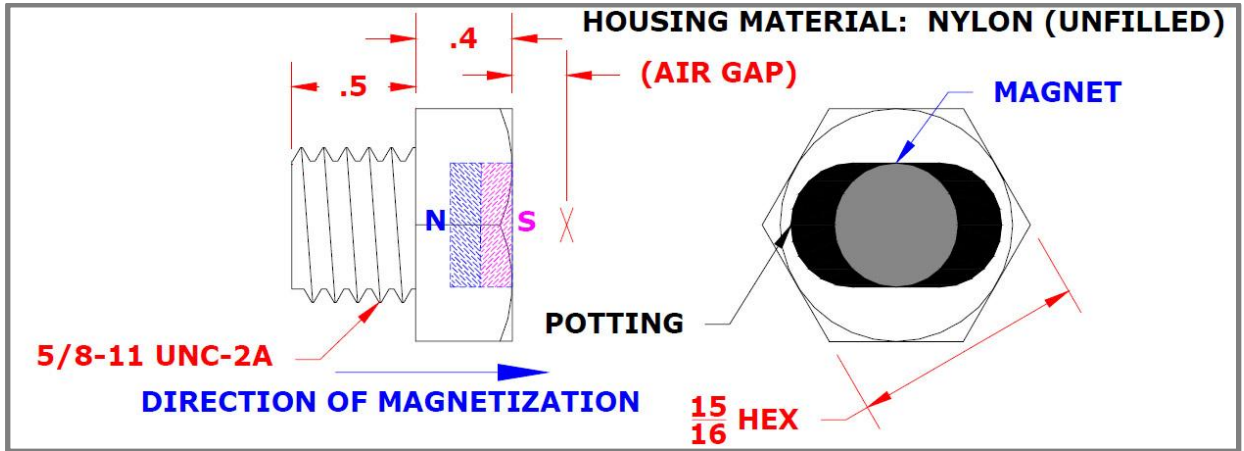


Figure 9: Magnetic Bolt Drawing (Dimensions in inches)

The following two graphs illustrate the field strength of the magnet in relation to the air gap between it and the Concrete Mixer Sensor.

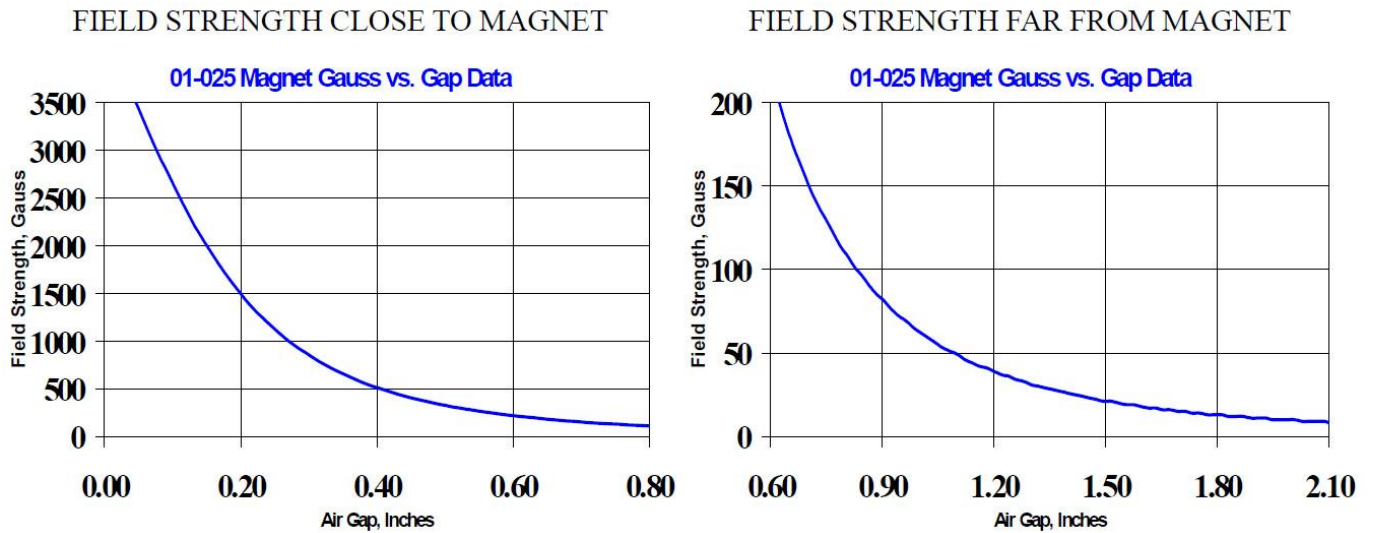
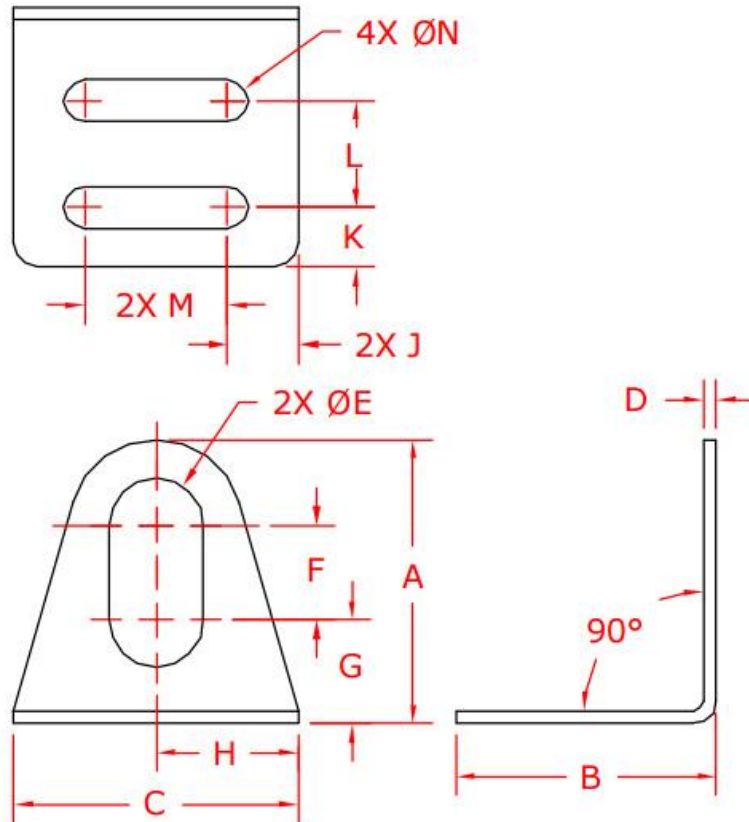


Figure 10: Magnetic Field Strength

## 6.3 Bracket Specifications

Below is an illustration of the bracket, with the relevant dimensions for each part of it.



A	B	C	D	E	F	G	H	J	K	L	M	N
50.8	34.8	44.5	1.78	18.1	15.9	19.1	22.2	9.5	7.92	14.3	25.4	5.54

Figure 11: Bracket Dimensions (in mm)