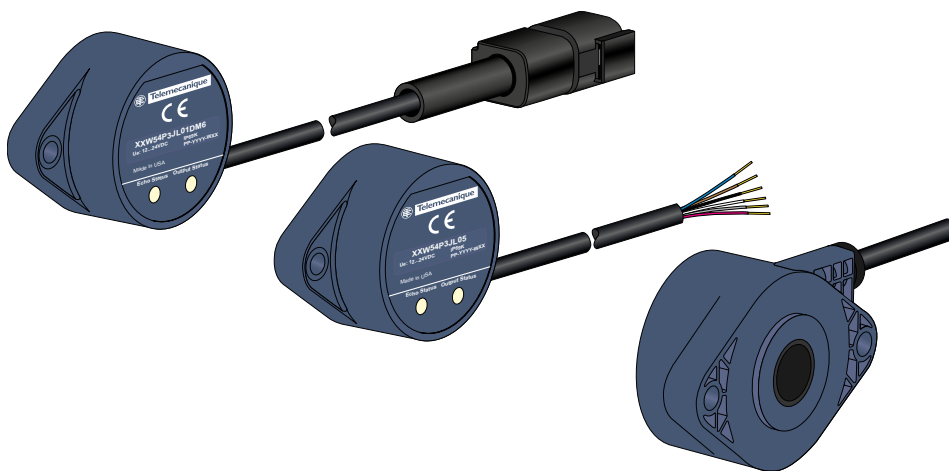


Wide Beam Ultrasonic Sensors

User Guide

Original instructions



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Safety Information

Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Please Note

Our product should be installed, operated and maintained only by qualified personnel. Neither TMSS France nor any of its subsidiaries or other affiliated companies shall be responsible or liable for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book

Document Scope

This manual describes the features, installation, wiring, and usage of the XXW54P wide beam ultrasonic sensors.

Validity Note

The technical characteristics of the devices described in this manual also appear online.

To access this information online:

Step	Action
1	Go to www.telemecaniquesensors.com .
2	In the Search box, type the model number of a product or the name of a product range. Do not include blank spaces in the model number/product range.
3	If more than one model number appears in the Products search results, click on the model number that interests you.
4	To save or print a data sheet as a .pdf file, click Download product data-sheet .

The characteristics that are described in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

QR Code

A QR code including the Telemecanique Sensors web address is present on the XXW54P wide beam ultrasonic sensors label. Technical documents are available in various languages in this website.



Related Documents

Title of Documentation	Reference Number
XXW54P3APL0... Wide Beam Ultrasonic Sensor 4...20mA, Instruction Sheet	JYT27830_EN
XXW54P3HPL0... Wide Beam Ultrasonic Sensor 0,5...4,5V, Instruction Sheet	GDE78658_EN
XXW54P3JL0... Wide Beam CAN J1939 Ultrasonic Sensor, Instruction Sheet	JYT27831_EN
Catalogue Ultrasonic sensors XX range English 11/2021	TESEBRO000046EN
Wide angle ultrasonic sensor detection for mobile equipment	9006HO2001
Sensor Solutions for Mobile Lift Applications	TESEBRO000078EN

You can download these technical publications and other technical information from our website at www.telemecaniquesensors.com

User Comments

We welcome your comments about this document. You can reach us through the customer support page on your local TMSS website.

Cybersecurity

Machines, controllers, and related equipment are usually integrated into networks. Unauthorized persons and malware may gain access to the machine as well as to other devices on the network/fieldbus of the machine and connected networks via insufficiently secure access to software and networks.

 WARNING
UNAUTHORIZED ACCESS TO THE MACHINE VIA SOFTWARE AND NETWORKS • In your hazard and risk analysis, consider all hazards that result from access to and operation on the network/fieldbus and develop an appropriate cybersecurity concept. • Verify that the hardware infrastructure and the software infrastructure into which the machine is integrated as well as all organizational measures and rules covering access to this infrastructure consider the results of the hazard and risk analysis and are implemented according to best practices and standards covering IT security and cybersecurity (such as ISO/IEC 27000 series, ISO/ IEC 15408, IEC 62351, ISA/IEC 62443, Common Criteria for Information Technology Security Evaluation, NIST Cybersecurity Framework, Information Security Forum - Standard of Good Practice for Information Security). • Verify the effectiveness of your IT security and cyber security systems using appropriate, proven methods. Failure to follow these instructions can result in death, serious injury, or equipment damage.

Consult the [TMSS Cybersecurity Best Practices](https://telemecaniquesensors.com/sites/default/files/2025-10/Cybersecurity_Best_Practices.pdf) (https://telemecaniquesensors.com/sites/default/files/2025-10/Cybersecurity_Best_Practices.pdf) for additional information.

General Information

Ultrasonic Sensors Presentation

Ultrasonic sensors enable non-contact detection of objects in many kinds of industrial environment, irrespective of:

- Material (metal, plastic, wood, cardboard, and so on),
- Nature (solid, liquid, powder, paste, and so on),
- Colour,
- Degree of transparency.

XX Wide Beam ultrasonic sensors meet the specific needs of mobile equipment such as:

- Lift trucks,
- Cherry pickers,
- Mobile elevating work platforms,
- Self-propelled ride-on handling trucks,
- Ground support equipment,
- Aircraft access platforms.

These sensors are designed to detect the following kinds of obstacles when mobile equipment is lifting or rotating: ceilings, beams, cables, scaffolding, other platforms or buckets, and so on.

They are compact, flush mountable in metal.

They can be wired with:

- A remote Deutsch DTM04 connector on a 0.5 m (19.68 in) cable,
- A M12 5-pins connector on a 0.15 m (5.9 in) cable,
- A 0.5 m (19.68 in) cable.

The XX configuration software allows the programming of these sensors. The synchronization function is used to reduce interference between sensors, even when installed close to each other, thus contributing to the detection of objects over a wide area.

DANGER

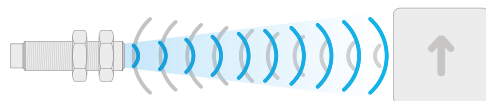
LACK OF FUNCTIONAL SAFETY CAPABILITY

Do not use this device if you need a Performance Level or Safety Integrity Level or any other type of capability with regard to functional safety.

Failure to follow these instructions will result in death or serious injury.

Detection mode

XX Wide Beam ultrasonic sensors use the diffuse detection mode: an object reflects the ultrasonic wave back to the sensor which, in turn, changes the output state.



This operating mode is well suited for detecting objects with flat surfaces that are positioned perpendicularly to the direction of the ultrasonic beam.

Range Presentation

The Wide Beam ultrasonic sensors range offers the following models:

Nominal sensing distance	Output mode	Main use	Connector	Cable length	Reference
3 m (9.84 ft)	Analog 0.5...4.5 V	Standard ratio-metric output for controllers	Deutsch 6-pins	0.15 m (5.90 in)	XXW54P3HPL01DM6
			–	0.50 m (19.68 in)	XXW54P3HPL05
			M12 5-pins	0.15 m (5.90 in)	XXW54P3HPL01M12
	Analog 4...20 mA	Standard current-loop output for industrial automation	Deutsch 6-pins	0.15 m (5.90 in)	XXW54P3APL01DM6
			–	0.50 m (19.68 in)	XXW54P3APL05
			M12 5-pins	0.15 m (5.90 in)	XXW54P3APL01M12
	CAN J1939	Standard output for communication with utility vehicles	Deutsch 6-pins	0.15 m (5.90 in)	XXW54P3JL01DM6
			–	0.50 m (19.68 in)	XXW54P3JL05
			M12 5-pins	0.15 m (5.90 in)	XXW54P3APL01M12

Device Descriptions



1	LEDs, page 37
2	Mounting holes, page 20
3	Active zone, page 20
4	Connector/wires, page 22
5	Silicone washer and stainless steel insert, page 20

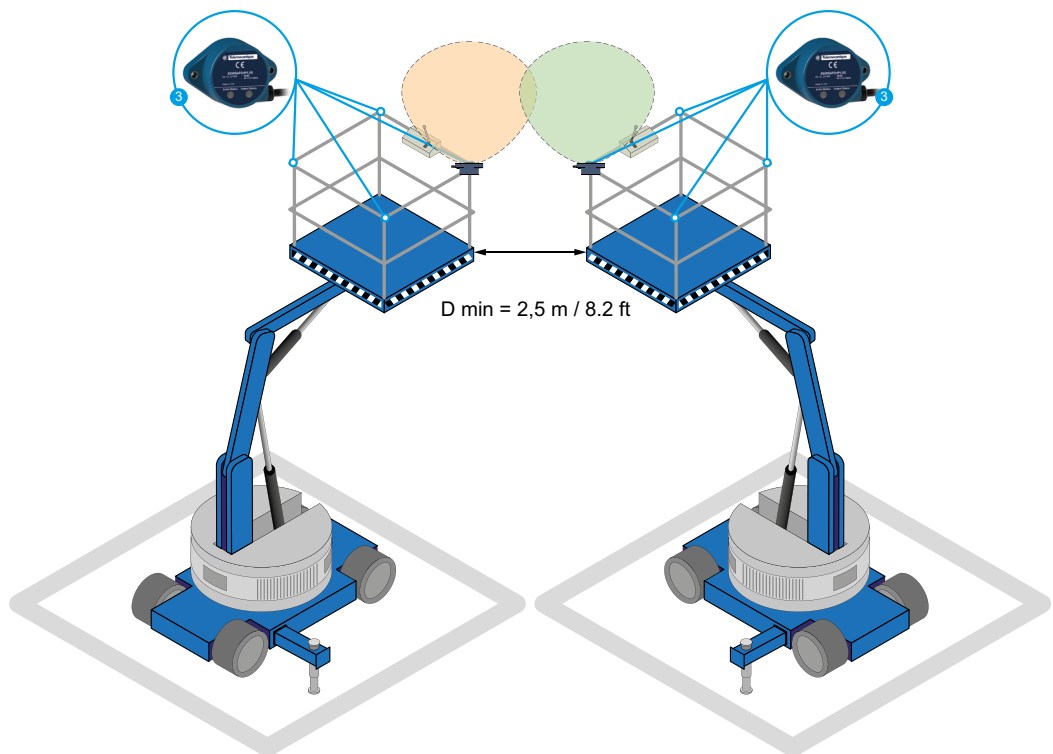
Applications

Common Use Cases

XX Wide Beam ultrasonic sensors can be used for a wide variety of cases. Below are some of the most common cases where ultrasonic sensors can be used.

Anti-collision for Mobile Equipment

The sensors can be used to avoid the collision between two nacelles:



Depending on the size of the basket, it is recommended to use 1 to 4 sensors per side.

As a general rule, sensors in the same mobile equipment must be synchronized. But between two mobile equipments, the sensors can not be synchronized.

⚠ WARNING

RISK OF COLLISION

For the side by side use, consider the prescriptions of the machine manufacturer without ever going below the 2.5 m (8.2 ft).

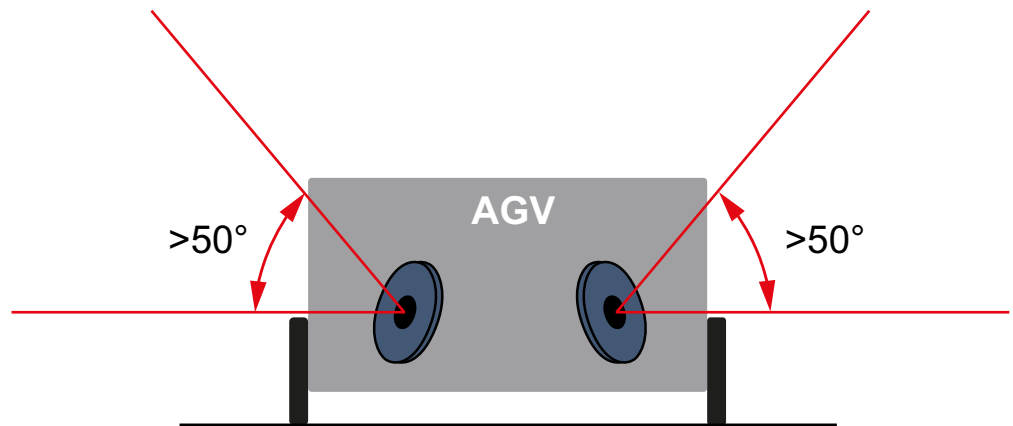
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Anti-collision for Automated Guided Vehicle

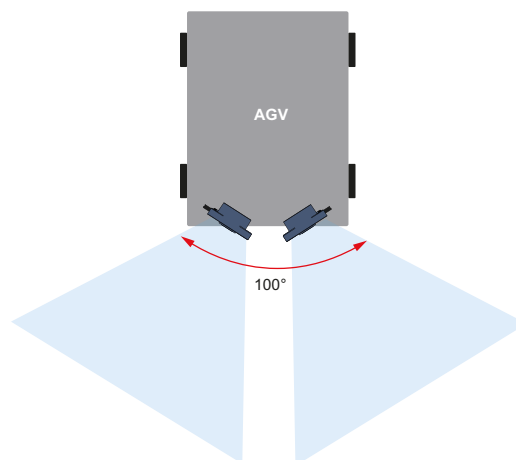
The majority of AGV (Automated Guided Vehicle) manufacturers use 3D scanners as an anti-collision system.

This system can be replaced by ultrasonic sensors which have the advantage of being more robust and less expensive.

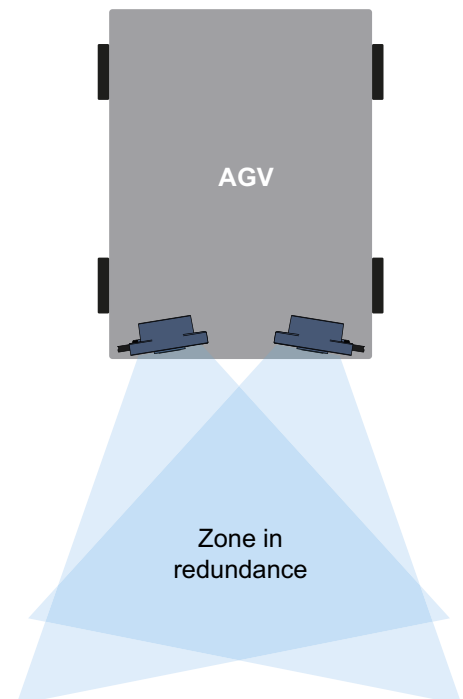
In the following example, two ultrasonic sensors are installed in front of an AGV:



Analog outputs can create different detection zones



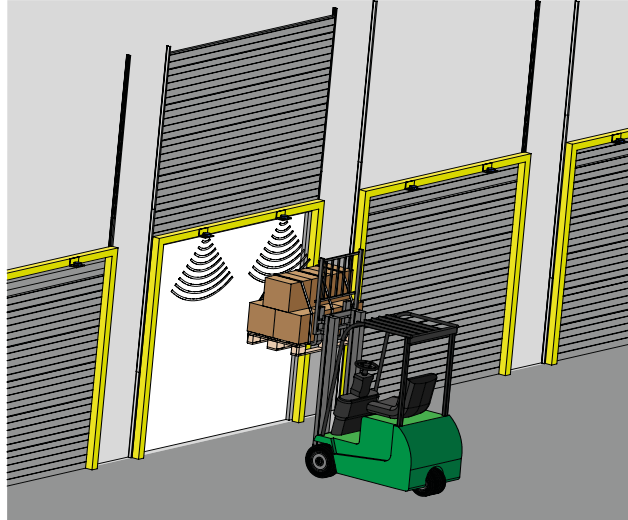
PNP outputs with safety module can create redundancy for safety needs



Anti-collision for Loading Bay

Ultrasonic sensors can be installed on the lintel of an opening to signal to a forklift the presence of an obstacle. The driver stops raising the forks after seeing or hearing the alarm triggered by the PNP outputs.

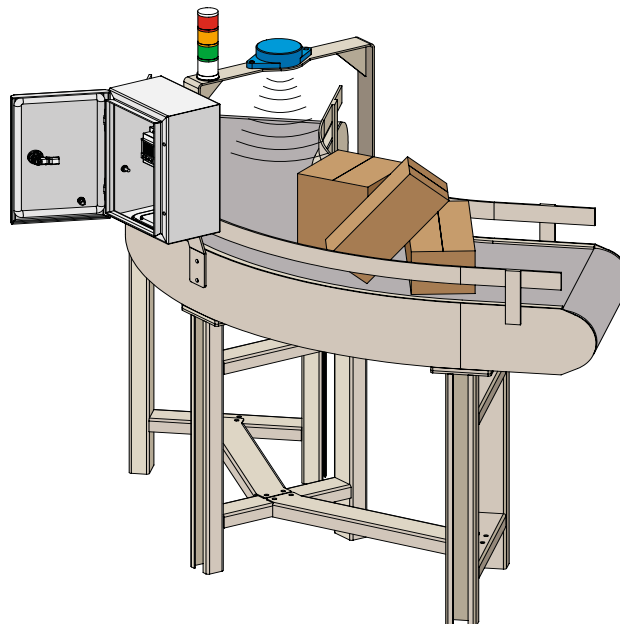
In the following example, two synchronized ultrasonic sensors are installed on the lintel to prevent the forklift goods from colliding with it:



Anti-jamming for Mobile Conveyor

Ultrasonic sensors can be installed on conveyors to detect parcel jams.

In the following example, an ultrasonic sensor coupled to a Zelio timer relay detects if the packages remain on the conveyor for more than a few seconds (if so, the light tower reminds the nearest operator to clear the traffic jam):



An XX Wide Beam ultrasonic sensor will cover a greater detection area than a photoelectric sensor while being easier to mount and less expensive.

CAN J1939 Protocol

CAN (Controller Area Network)

CAN (Controller Area Network) is an international standard defined in the ISO 11898. It provides the basis for communication. Several higher-layer protocols use CAN (such as CAN J1939).

The CAN data bus is a serial system bus widely used in many industries, especially automotive. This system enables each node or ECU (Electronic Control Units) to communicate with all other ECUs.

CAN is based on a broadcast communication mechanism. This broadcast communication is achieved by using a message oriented transmission protocol.

The priority at which a message is transmitted compared to another less urgent message is specified by the identifier of each message.

CAN frames defined in ISO 11898-1:

- CAN base frame (CAN 2.0 A) is a message that contains up to 8 byte and is identified by 11 bits.
- CAN extended frame (CAN 2.0 B) is a message that contains up to 8 byte and is identified by 29 bits.

NOTE: The sensors only use the CAN 2.0 B frame format for messages.

CAN J1939

The SAE J1939 communications network, also called CAN J1939, is developed for use in heavy-duty environments and it is suitable for horizontally integrated vehicle industries. The SAE J1939 communications network is applicable for light-duty, medium-duty, and heavy-duty vehicles used on-road or offroad, and for appropriate stationary applications which use vehicle derived components (for example generator sets). Vehicles of interest include, but are not limited to, on-highway and off-highway trucks and their trailers, construction equipment, and agricultural equipment and implements.

SAE J1939 is a set of standards that define how ECUs communicate via the CAN bus in heavy duty vehicles. However, CAN bus only provides a "basis" for communication (like a telephone), not a "language" for conversation. It means that SAE J1939 provides a higher layer protocol (HLP) based on CAN as the "physical layer".

Principle of communication

Overview

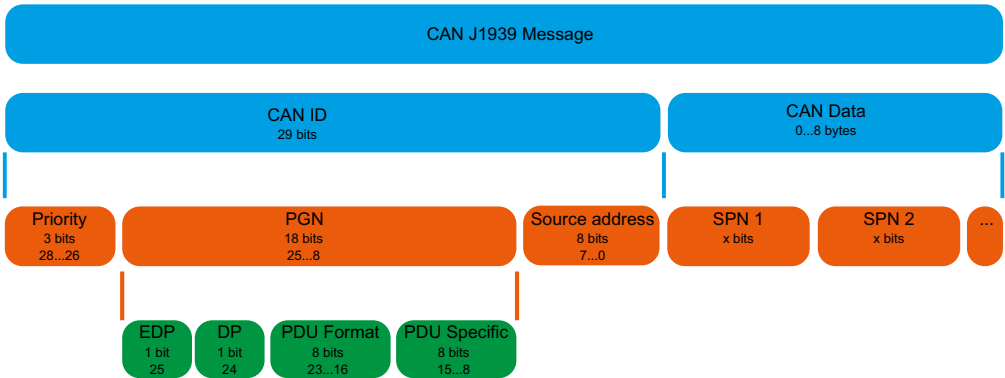
CAN J1939 bus communication is based on the information broadcasting through a network where each ECU (Electronic Control Units) connected to this network listens to the frames transmitted by the ECUs which emit messages. Then, each node of the network decides how to process the received messages.

These ECUs can transmit messages on the network. Although access to the bus is therefore random, the messages are organized by the order of priority defined in the CAN ID.

CAN Messages Structure

The CAN network allows the communication of several ECU by sending messages through the network.

CAN messages are composed by a CAN identifier and CAN data:



Data: contains the [SPN, page 15](#).

Priority: the 3 bits are used to optimize the transmission of a message on the bus.

PGN: refer to [PGN, page 14](#).

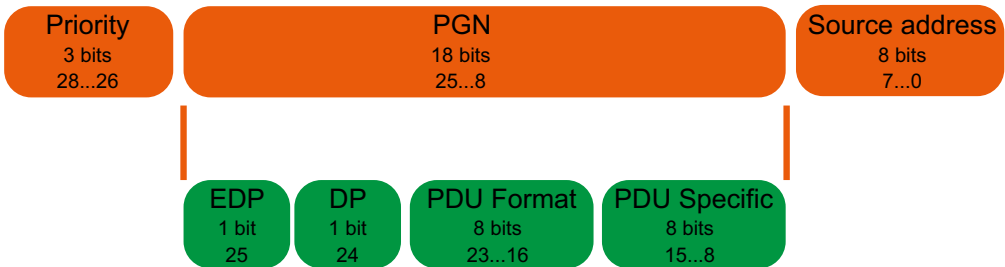
Source address: CAN network address of the message transmitter.

PGN

A parameter group (PG) is a set of parameters belonging to the same topic. For more information about available PGNs, refer to [PGNs Supported, page 31](#).

There are two types of PGN:

- **Broadcast:** the message is sent to all the ECUs communicating on the network.
- **Point-to-point:** the message is intended for a specific ECU.



EDP (Extended Data Page): used with DP to identify different message definitions.

DP (Data Page): used with EDP to identify different message definitions.

PDU Format: used to define the parameter group the message belongs in. Distinguishes what type of data is being sent.

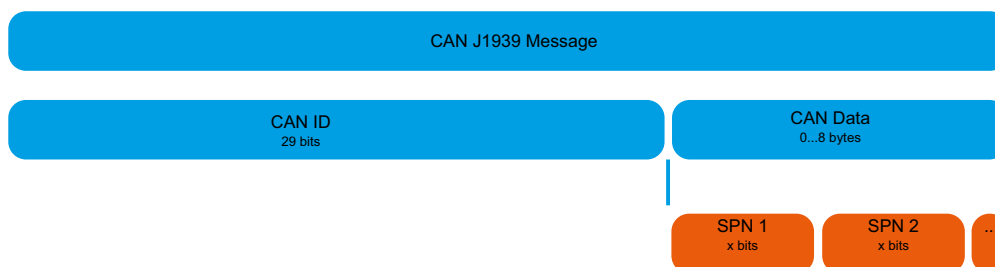
PDU Specific: used to define the recipient of the message.

PDU Format		PDU Specific	Description
PDU Format 1	00h - EFh 23...16	Target address (DA) 15...8	PDU specific contains the address of receiver Message used for point-to-point communication
PDU Format 2	F0h - FFh 23...16	Group extension (GE) 15...8	Message used for Broadcast communication

SPN

SPNs (Suspect Parameter Number) are the parameters included in PGNs. SPNs are listed in the data portion of the CAN message. Their sequence is standardized.

The details of the SPNs constituting the PGNs supported by the sensors are indicated in the tables of the [PGN, page 31](#) part.



CAN ID Construction Example 1

The controller wants to send a name management request to an ECU:

- The ECU receiver address is 22 (dec) = 16 (hex),
- The controller address is 128 (dec) = 80 (hex),
- The PGN NAME Management is 37632 (dec) = 9300 (hex).

CAN ID						CAN Data
Priority	PGN				Source address	SPNs
	EDP	DP	PDU format	PDU Specific		
3 bits	1 bit	1 bit	1 byte	1 byte	1 byte	0...8 bytes
3	0	0	93 (hex)	16 (hex)	80 (hex)	(1)
011	0	0	0101 0011	0001 0110	1000 0000	0...8 bytes
C			93	16	80	(1)

In the request from controller to ECU, the CAN ID is C931680 (hex).

In the answer from ECU to controller, the CAN ID is C938016 (hex).

(1): For more details about CAN data (SPN), refer to [PGN 37632 — NAME Management \(NM\)](#), page 32.

CAN ID Construction Example 2

The controller wants to change the CAN bus speed of the ECU to 250 kbits/s:

- The ECU receiver address is 22 (dec) = 16 (hex),
- The controller address is 128 (dec) = 80 (hex),
- The PGN CAN Bus Speed is 61184 (dec) = EF00 (hex),
- The CAN bus speed is 250 kbits/s (dec) = FA (hex).

CAN ID						CAN Data
Priority	PGN				Source address	SPNs
	EDP	DP	PDU format	PDU Specific		
3 bits	1 bit	1 bit	1 byte	1 byte	1 byte	0...8 bytes
3	0	0	EF (hex)	16 (hex)	80 (hex)	FA (hex)
011	0	0	1110 1111	0001 0110	1000 0000	0...8 bytes
C			EF	16	80	FA

In the request from controller to ECU, the CAN ID is CEF1680 (hex).

In the answer from ECU to controller, the CAN ID is CEF8016 (hex).

For more details about CAN data (SPN), refer to [PGN 61184 — CAN Bus Speed](#), page 34.

Characteristics

Characteristics of Ultrasonic Sensors

The following table presents the technical specifications of the XX Wide Beam ultrasonic sensors:

Description	0.5 - 4.5 V + PNP NO/ NC ⁽¹⁾	4 - 20 mA + PNP NO/ NC ⁽²⁾	CAN J1939 w/o PNP ⁽³⁾
General characteristics			
Net weight	115 g (4.06 oz)		
Conformity to standards	EN/IEC 60947-5-2, UL 508, and CSA C22.2 n°14		
Compliance with regulations	CE (based on EMC directive 2014/30/EU)		
Product certifications	cULus, E2, and UKCA		
Nominal sensing distance	Configured to 3 m (9.84 ft) Available to 4 m (13.12 ft) when detecting object ≥ 100 x 100mm (≥ 3.94 x 3.94in)		
Blind zone	0.425 m (1.39 ft)		
Detection window	Adjustable using the XX configuration software		
Transmission frequency	48 kHz		
Differential travel	≤ 20 mm (0.79 in)		
Repeat accuracy (repeatability)	0.10 %		
Accuracy at 20 °C	2 %		
Internal temperature compensation	Yes		
Minimum window size	20 mm (0.79 in)		
Resolution	1 mm (0.04 in) 0.025 % of Sn, 12 bits		
Minimum size of object to be detected	Cylinder Ø 10 mm (0.4 in) up to sensing distance of 3 m (9.84 in)		
Tilt angle with 500 x 500 mm (19.68 x 19.68 in) target	± 6° at 4 m (13.12 ft) ± 10° at 3 m (9.84 ft) ± 45° at 1.5 m (3.3 ft)		
Case materials	PBT, UV resistant		
Sensing face materials	PEI surrounded by PUR, UV resistant		
Electrical connection	0.5 m (1.64 ft) TPU cable 5 wires 0.34mm2 (22 AWG) 0.15 m (0.49 ft) TPU cable with 6-pin Deutsch Male (5 pins are used) For M12 connector version, 0.15 m (0.49ft) PVC cable with 5-pin M12 connector		0.5 m (1.64 ft) TPU cable 6 wires 0.34mm2 (22 AWG) 0.15 m (0.49 ft) TPU cable with 6-pin Deutsch Male (6 pins are used)
Supply characteristics			
Supply protection	Reverse polarity		
Rated supply voltage (UE)	12...24 VDC		
Voltage limits	9...32 VDC		
Current consumption, no-load (I _g)	< 30 mA		
Output characteristics			
LED indicator output state	1 yellow LED		
LED indicator echo state/power supply	1 bi-color LED: • White: power supply • Green: echo state		

Description	0.5 - 4.5 V + PNP NO/ NC ⁽¹⁾	4 - 20 mA + PNP NO/ NC ⁽²⁾	CAN J1939 w/o PNP ⁽³⁾
Switching capacity	< 100 mA		–
Output protection	Overload, short-circuit		
Resistive load impedance	≥ 2 KΩ	At 12VDC load ≤ 250Ω At 24VDC load ≤ 850Ω	–
Voltage drop closed state	< 2 V		–
Current leakage	< 1 μA		–
Maximum switching frequency	1.6 Hz		–
First-up delay	400 ms		–
Response delay (tON)	300 ms		–
Recovery delay (tOFF)	300 ms		–
Environment characteristics			
IP protection	IP65, IP67, IP69K (except M12 cable and connector) Conforming to IEC 60529 and EN/IEC 60947-5-2		
Operating temperature	-40...+70 °C (-40...+158 °F)		
Storage temperature	-40...+85 °C (-40...+185 °F)		
Relative humidity	< 95 %, without condensation		
Vibration resistance	± 1 mm (0.039 in) amplitude (10...55 Hz) Conforming to IEC 60068-2-6		
Shock resistance	30 gn, duration 11 ms, in all 3 axes Conforming to IEC 60068-2-27		
Electromagnetic compatibility EMC			
Electrostatic discharges	Immunity, conform to IEC 61000-4-2 4 kV in contact, 8 kV in air discharge		
Radiated electromagnetic fields	Immunity, conform to IEC 61000-4-3 10 V/m		
Fast transients	Immunity, conform to IEC 61000-4-4 +/- 2 kV		
Conducted disturbances induced by radio frequency fields	Immunity, conform to IEC 61000-4-6 Frequency: 0.15 to 80 MHz; Voltage: 10 V		
Electrical shocks	Immunity 1 kV; 0.5 J; 500 Ω		
Radiated voltage	Per CISPR 11, Group 1, class A (30 MHz to 1 GHz)		
Mounting			
Attachment method	Two ears extend on opposing sides of housing.Each ear has bolt holes.		
Bolt holes	Hole diameter: 4.8 mm (0.19 in). Metal insert accepts 4 mm bolt or SAE grade 8 bolt. Distance between bolt holes is 67 mm (2.64 in).		
Mounting torque (typical recommended)	≤ 3 Nm (26 in-lbs)		
Mounting torque (maximum recommended)	3 Nm (26 in-lbs)		
Panel mounting, face protrusion	Diameter of face is 31.5 mm (1.24 in). Rise from body mounting plane to face plane is 2 mm (0.079 in).		

Characteristics of CAN J1939 Sensors

The following table presents the specific technical specifications of the CANJ 1939 sensors:

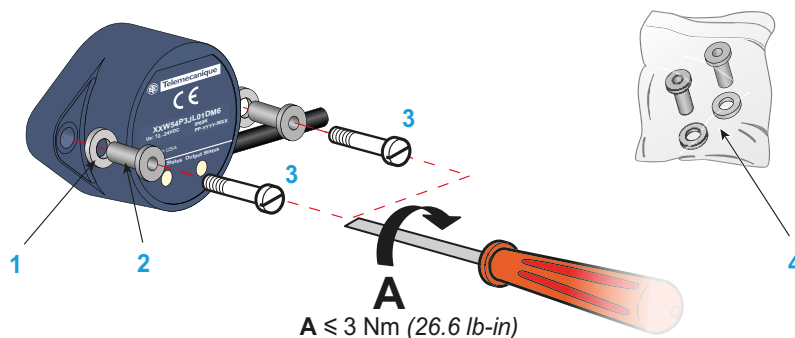
Description	Value
CAN standard	SAE J1939
CAN interface	2-wire (pin-5, pin-6) ESD and transient protected
Internal terminating resistor	Not provided, 120 Ω
CAN bus type	CAN 2.0B - High speed
CAN bus speed	250 to 500 kbits/s
J1939 frame emission rate	50 ms
J1939 addressing mode	Fixed / Auto-claiming
J1939 Source node addressing configuring	User configurable with XXBOX01 Box (default 0x80)
J1939 destination node addressing configuring	Default 0xFF for broadcasting mode or reply to the source address of the request
J1939 ECU NAME configuring	User configurable with XX Box, 3 bits as standard
CAN identifier length	29 bits
Max network length	40 m
Maximum number of sensors	30 sensors
J1939 emitted frame PGN	0xFE8C (65164); AAI: Auxiliary Analog Information
Data Payload PGN 2048	0x0800 (2048): AUXIO5 Auxiliary Input/Output Status 5
PGN_2048 frame emission duration	~ 0.5 ms (note that each emitted frame shall be acknowledged)
Data transmitted type	Little-endian

Installation

Mechanical Installation

Sensor Installation

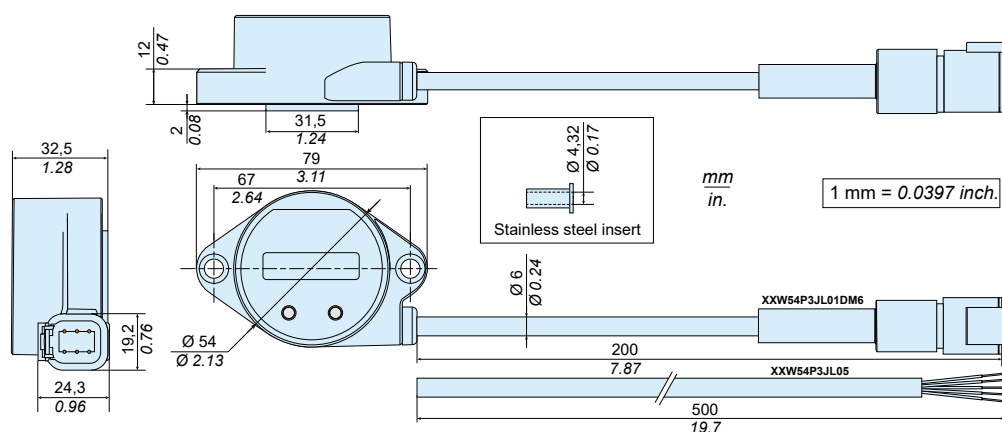
Fix the sensor using two M4 screws with a tightening torque less than or equal to 3 Nm (26.6 lb-in) as shown below:



1. Silicone washer
2. Stainless steel insert
3. 2 screws M4 (not provided)
4. Silicone washer (1) and stainless steel insert (2) (provided with the sensor)

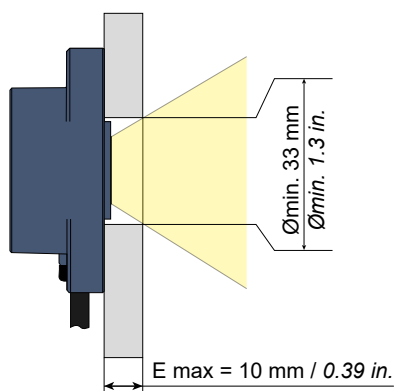
Dimensions

The dimensions of the sensor to be taken into account are as follows:



Flush mounting limit

It is important to respect the flush mounting limit:



CAUTION

RISK OF MATERIAL DAMAGE

The stainless steel insert and the silicone washer are mandatory in all mounting cases.

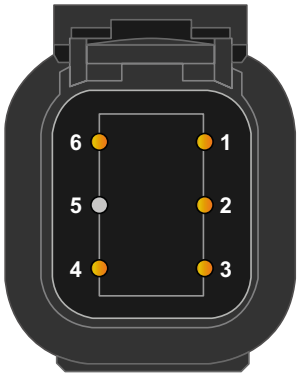
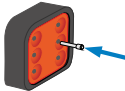
Failure to follow these instructions can result in injury or equipment damage.

Wiring

Wiring for Analog Sensors

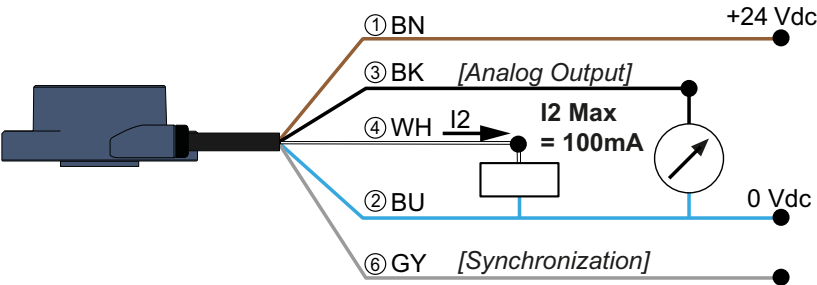
Analog Sensors with DTM04-6P Connector

The following table describes the XX Wide Beam ultrasonic sensors connections for the analog models with a deutsch male connector (DTM04 with 6 pin):

DTM04-6P Connector	Pin number	Wire color	Description
 XXW54P3•PL01DM6	1	BN: Brown	+12...24 Vdc
	2	BU: Blue	0 Vdc
	3	BK: Black	Analog Output
	4	WH: White	PNP Digital Output
	5	–	Not Connected ⁽²⁾
	6	GY: Grey	Synchronization ⁽¹⁾
(1) refer to Synchronization Wiring, page 25 (2)Deutsch connector Pin 5 = Sealing plug 			

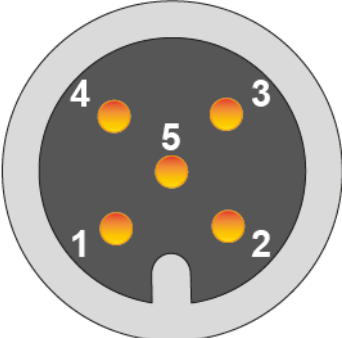
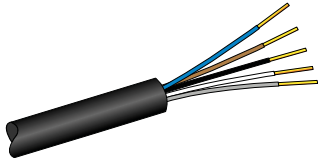
Reference	Analog Output	Analog output load	Exceeded output value
XXW54P3HPL01DM6	0.5...4.5 V	2 kΩ...∞	5 V
XXW54P3APL01DM6	4...20 mA	• For 12 Vdc, Load ≤ 250 Ω • For 24 Vdc, Load ≤ 850 Ω	2 mA

In case of excessive noise, the sensor delivers an exceeded output value. This exceeded output value means that the sensor cannot work properly in this environment.



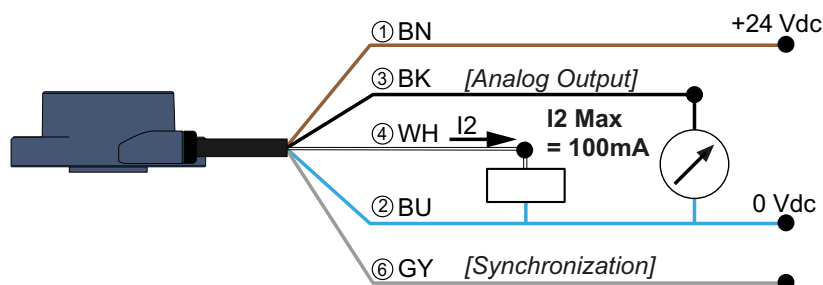
Analog Sensors with M12-5P Connector or without Connector

The following table describes the XX Wide Beam ultrasonic sensors connections for the analog models with a M12 male connector (5 pin) or without connector:

M12-5P Connector or Cable	Pin number	Wire color	Description
 XXW54P3•PL01M12  XXW54P3•PL05 Cable of 5 wires (0.34 mm² / 22 AWG)	1	BN: Brown	+12...24 Vdc
	2	WH: White	PNP Digital Output
	3	BU: Blue	0 Vdc
	4	BK: Black	Analog Output
	5	GY: Grey	Synchronization (1)
(1) refer to Synchronization Wiring, page 25			

Reference	Analog Output	Analog output load	Exceeded output value
XXW54P3HPL01M12, XXW54P3HPL05	0.5...4.5 V	2 k Ω ... ∞	5 V
XXW54P3APL01M12, XXW54P3APL05	4...20 mA	- For 12 Vdc, Load $\leq$ 250 Ω - For 24 Vdc, Load $\leq$ 850 Ω	2 mA

In case of excessive noise, the sensor delivers an exceeded output value. This exceeded output value means that the sensor cannot work properly in this environment.



Power Supply

Rated supply voltage:

- 12 or 24 Vdc
- Min: 9 Vdc
- Max: 32 Vdc with reverse polarity protection



WARNING

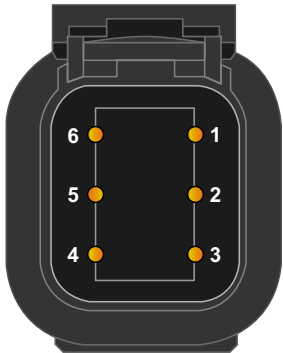
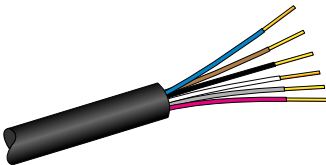
IMPROPER CONNECTION

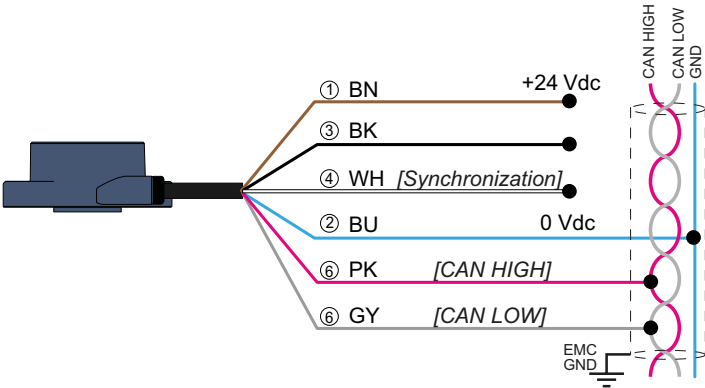
- The sensor must be powered by a dedicated safety extra low voltage (SELV) or a protected extra low voltage (PELV).
- The sensor operate directly from a 24 Vdc power supply. The power supply must meet the requirements of IEC 60204-1.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Wiring of CAN J1939

CAN J1939 Sensor Models with DM Connector or without ConnectorThis table describes the pin-wire connections:

DTM04-6P Connector	Pin number	Wire color	Description
 XXW54P3JL01DM6  XXW54P3JL05 Cable of 6 wires (0.34 mm² / 22 AWG)	1	BN: Brown	+12...24 Vdc
	2	BU: Blue	0 Vdc
	3	BK: Black	XXZBOX Communication
	4	WH: White	Synchronization (1)
	5	PK: Pink	CAN HIGH (2)
	6	GY: Grey	CAN LOW (2)
(1) refer to Synchronization Wiring, page 25 (2) For details on information delivered to the CAN bus, see the sections “Noise Detection” and “Sensor setting” below.			



CAN J1939 Sensor Models with Connector M12

Synchronization Wiring

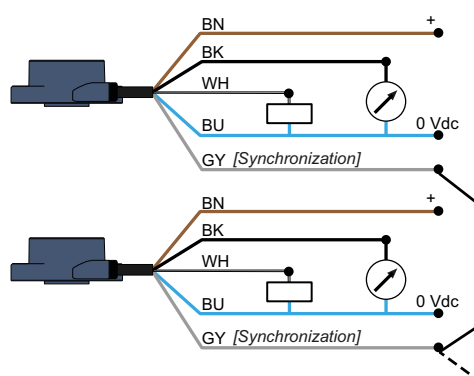
Synchronization Wiring for Side by Side Application

In the case of a side by side application as presented in the [Anti-collision for Mobile Equipment, page 10](#) section, it is recommended to synchronize the sensors used in the same direction in order to avoid any interference between them which can be caused by the width of their beams.

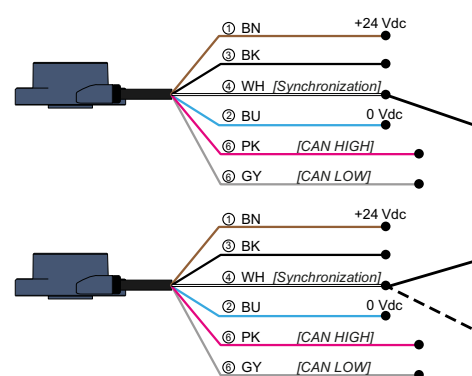
Up to 8 sensors can be synchronized to operate side by side by electrically connecting all pin:

- Number 6 (grey) wires together for analog models.
- Number 4 (white) wires together for CAN J1939 models.

Analog models:



CAN J1939 models:



⚠ WARNING

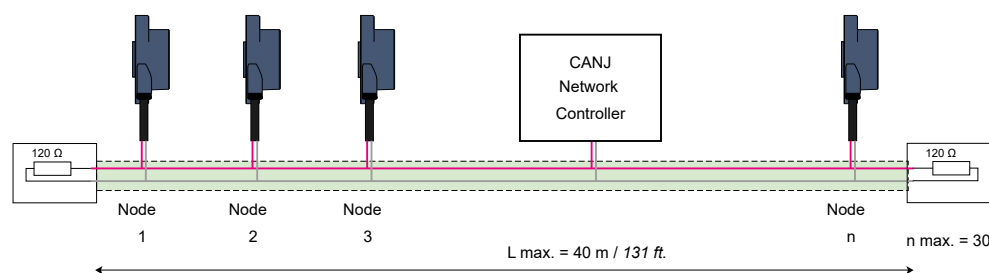
RISK OF INTERFERENCE BETWEEN SENSORS

All sensors must be the same model and have the same cycle time setting.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

CANJ Network Architecture

Up to 30 wide beam CAN J1939 sensors on a CAN network:



⚠ WARNING

RISK OF TRANSMISSION REFLECTIONS IN THE BUS

In the case of CAN J1939 network topologies, each segment must have a terminating resistor of 120 ohms at the beginning and at the end.

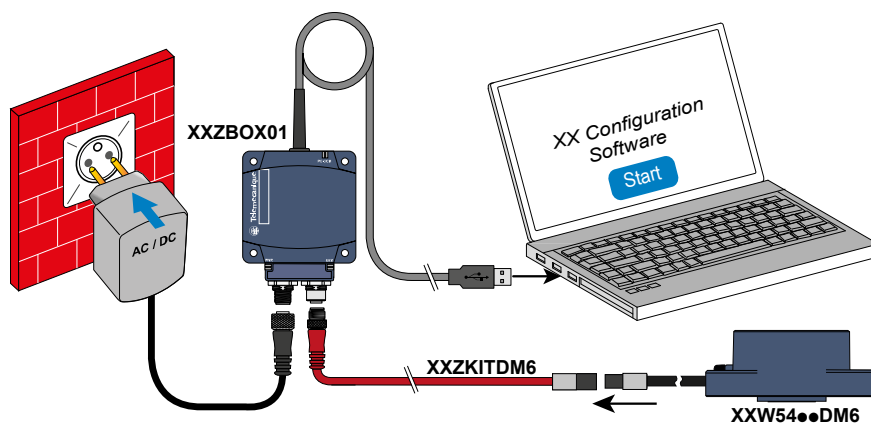
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Wiring for Configuration

To configure the sensor parameters, you have to connect the sensor to the configuration interface XXZBOX01. For CAN J1939 sensor version, you can modify the communication parameter directly on the CANJ network.

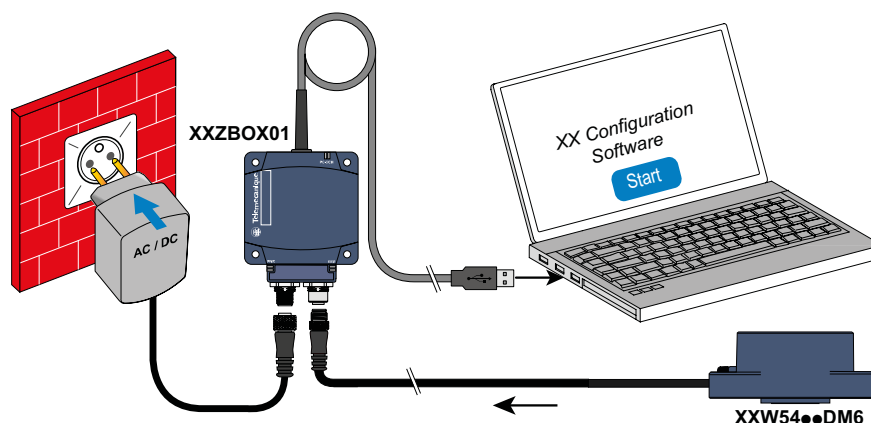
Wiring DM4 Connector Sensors

For sensors with DM4 connector, use the dedicated cable **XXZKITDM6** to connect the sensor to the configuration interface **XXZBOX01**:



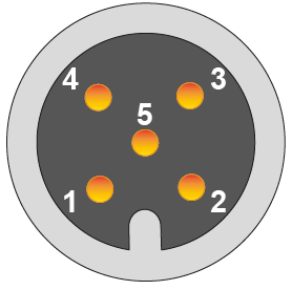
Wiring M12 Connector Sensors

For sensor with M12 connector, connect directly the sensor to the configuration interface **XXZBOX01**.



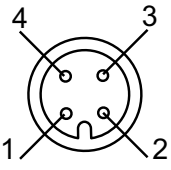
Wiring Sensors without Connector

For analog sensors, you have to install a M12 connector (not included):

XXZKITDM6 - M12 connector	Pin number	Wire color	Description
	1	BN: Brown	Power out to sensor
	2	WH: White	Software communication
	3	BU: Blue	0 Vdc
	4	BK: Black	Software communication
	5	GY: Grey	Not Used

Once the M12 connector is installed, connect directly the sensor to the configuration interface **XXZBOX01**

For digital sensor, you have to install a M12 connector (not included).

M12 connector (4 pins)	Pin number	Wire color	Description
 XZCC12MDM40B	1	BN: Brown	+12...24 Vdc
	2	WH: White	Software communication
	3	BU: Blue	0 Vdc
	4	BK: Black	Software communication
	5	PK: Pink	Not Used
	6	GY: Grey	Not Used

Once the M12 connector is installed, connect directly the sensor to the configuration interface **XXZBOX01**.

XXKITDM6 connection cable



Precautions

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the equipment.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

WARNING

UNINTENDED EQUIPMENT OPERATION

Install and operate this equipment according to the environmental conditions described in the operating limits.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Configuration

To configure analog sensors, you must connect them to the XXZBOX01 configuration interface and use the XX Configuration software.

For CANJ 1939 models, you can also modify the communication parameters by sending requests on the network.

Network Management

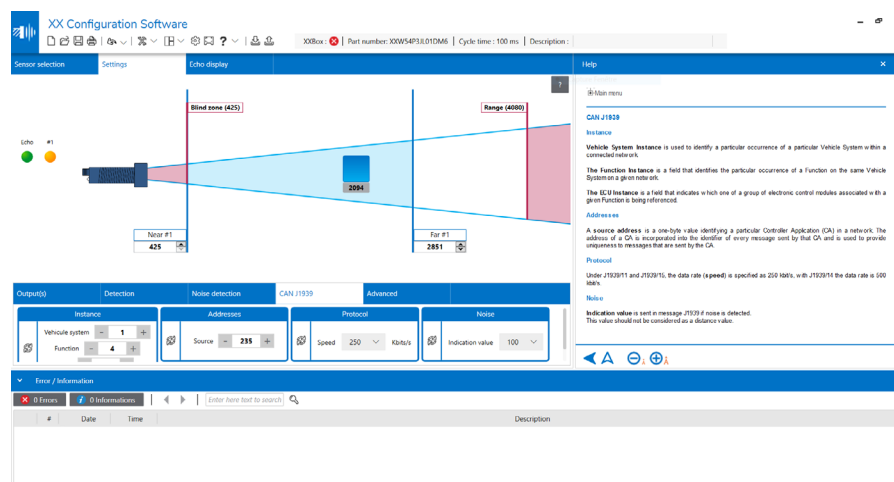
Network configuration of sensors is accomplished by sending read or write messages to one or more specific destination addresses.

CAN J1939 protocol messages are identified by Parameter Group Numbers (PGNs) which are the unique frame identifiers used to refer to the value of the Reserve bit, Data Page, PDU Format, and PDU Specific fields combined into a single 18-bit value. Specific parameters within a PGN are identified by Suspect Parameter Numbers (SPNs). For more information about PGNs and SPNs, refer to [CAN J1939 Dictionary, page 31](#).

Software Management

Main Window

Ultrasonic XX Software is a computer software dedicated to the detection parameters configuration of the ultrasonic sensors of the XX range:



Many functions are at your disposal (such as the output configurations, the detection parameters, or the noise detection threshold) to configure your sensor according to your needs.

To understand the software interface and the different settings, a help is incorporated into the software. It is visible on the right of the main window and its content adapts depending on the active tab.

For more information about linking the ultrasonic sensor to the PC, software configuration and software registration procedure, refer to the XXZBOX01 / XXZKIT01 Instruction Sheet.

CANJ 1939 Models

Ultrasonic sensors equipped with a CAN J1939 bus have an additional tab in the software interface. The **CAN J1939** tab allows you to:

Instance: Assign a name to the sensor. The name is composed as follows:

- **Vehicle System Instance:** 4-bit field used to identify a particular occurrence of a particular Vehicle System within a connected network.
- **Function Instance:** 5-bit field that identifies the particular occurrence of a Function on the same Vehicle System on a given network.
- **ECU Instance:** 3-bit field that indicates which one of a group of electronic control modules associated with a given Function is being referenced.

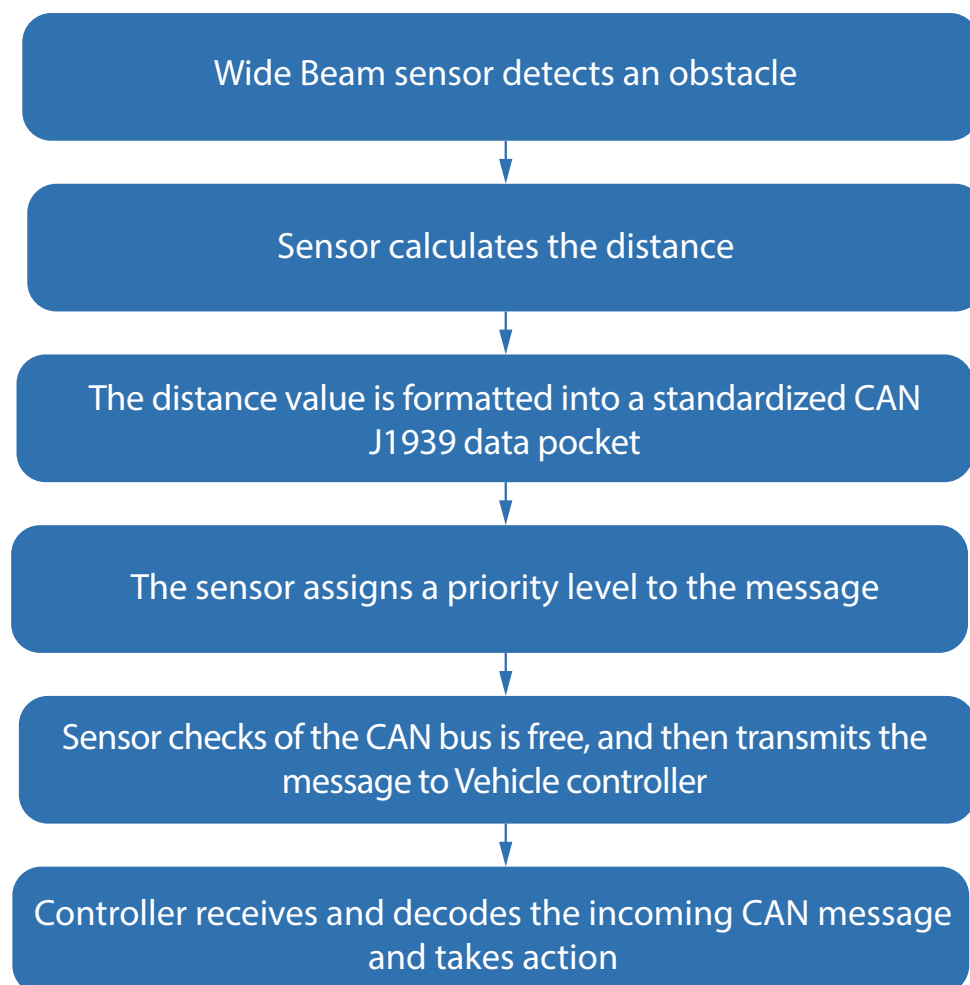
Addresses: Choose the byte value of the source address in order to assign a unique identifier to the sensor in the network.

Protocol: Select the data transfer speed.

Noise: Select the value from which you are alert that the environmental noise is likely too excessive for the sensor to sense object distances properly.

How It Works

Here is the chart showing the process flow of Wide Beam sensor on detection of an obstacle.



CAN J1939 Dictionnary

PGNs Supported

The PGN (Parameter Group Number) identifies the PG (Parameter Group) transmitted in the message.

The CAN J1939 sensors can be configured for the transmission of one of the PGNs listed in the following table:

PGN (dec)	PGN (hex)	PG Label	PG Acronym	PDU Format	Product Specific	Multi-packet	TX Rate	PG Data Length	Default Priority
37632	9300	NAME Management	NM	147	DA	No	–	–	–
59904	EA00	Request	RQST	234	DA	No	–	–	–
60928	EE00	Address Claimed	AC	238	DA	No	–	–	–
61184	EF00	Proprietary A	PropA	239	DA	Yes	–	–	–
65164	FE8C	Auxiliary Analog Information	AAI	254	140	No	50 ms	8	7
65240	FED8	Commanded Address	CA	254	216	Yes	–	–	–
65242	FEDA	Software Identification	SOFT	254	218	Yes	On request	Variable	6

PGN 37632 — NAME Management (NM)

This PGN is used to modify the Name of an ECU.

SPN	Label	Description	Data position	Length
5657	NAME Checksum / Error Code	Not implemented. All bits shall be set to 1.	1	8 bits
5658	Manufacturer Code Qualifier Flag	Not implemented. All bits shall be set to 1.	2.1	1 bit
5659	ECU Instance Qualifier Flag	- For Set Pending Name Mode: Shall be set to 0 if ECU Instance has to be changed. - For Adopt Pending Name Mode: Shall be set to 1.	2.2	1 bit
5660	Function Instance Qualifier Flag	- For Set Pending Name Mode: Shall be set to 0 if Function Instance has to be changed. - For Adopt Pending Name Mode: Shall be set to 1.	2.3	1 bit
5661	Function Qualifier Flag	Not implemented. All bits shall be set to 1.	2.4	1 bit
5662	Vehicle System Qualifier Flag	Not implemented. All bits shall be set to 1.	2.5	1 bit
5663	Vehicle System Instance Qualifier Flag	- For Set Pending Name Mode: Shall be set to 0 if Vehicle System Instance has to be changed. - For Adopt Pending Name Mode: Shall be set to 1.	2.6	1 bit
5664	Industry Group Qualifier Flag	Not implemented. All bits shall be set to 1.	2.7	1 bit
5665	Arbitrary Address Capable Qualifier Flag	Not implemented. All bits shall be set to 1.	2.8	1 bit
5666	NM Control Mode Indicator	The two following modes are supported: - Set Pending Name (0x0): Shall be used to change the pending Name of the ECU. - Adopt Pending Name (0x7): Shall be used to force the ECU to adopt his pending Name.	3.1	4 bits
–	–	Reserved. All bits shall be set to 1.	3.5	1 bit
5667	Commanded Manufacturer Code	Not implemented. All bits shall be set to 1.	3.6 – 4	11 bits
5668	Commanded ECU Instance	- For Set Pending Name Mode: Shall be set to the desired value (between 0 and 7). - For Adopt Pending Name Mode: All bits shall be set to 1.	5.1	3 bits
5669	Commanded Function Instance	- For Set Pending Name Mode: Shall be set to the desired value (between 0 and 31). - For Adopt Pending Name Mode: All bits shall be set to 1.	5.4	5 bits
5670	Commanded Function	Not implemented. All bits shall be set to 1.	6	8 bits
–	–	Reserved. All bits shall be set to 1.	7.1	1 bit
5671	Commanded Vehicle System	Not implemented. All bits shall be set to 1.	7.2	7 bits
5672	Commanded Vehicle System Instance	- For Set Pending Name Mode: Shall be set to the desired value (between 0 and 15). - For Adopt Pending Name Mode: All bits shall be set to 1.	8.1	4 bits
5673	Commanded Industry Group	Not implemented. All bits shall be set to 1.	8.5	3bits
5674	Commanded Arbitrary Address Capable	Not implemented. All bits shall be set to 1.	8.8	1 bit

How to use it

To change the Name of an ECU, you have to send 2 PGN 37653 messages.

The first PGN 37653 message is used to define in the ECU a Pending Name:

- SPN 5666 = 0
- SPN 5659...5662 : Flags must be set to 0 to inform the ECU that the corresponding SPN 5668...5672 contains new data for the pending name.
- SPN 5668...5672: if corresponding SPN Flags are set to 0, SPN contains new data for the pending name.

The second PGN 37653 message is used to force the ECU to adopt the pending name:

- SPN 5666 = 7
- All bits of other SPN are set to 1.

PGN 59904 — Request

This PGN is used to send a read request of the PGNs 65242 and 60928.

SPN	Label	Description	Length
2540	Parameter Group Number to be read (RQST)	LSB of PGN being requested (most significant at bit 8)	1 byte
		Second byte of PGN being requested (most significant at bit 8)	1 byte
		MSB of PGN being requested (most significant at bit 8)	1 byte

PGN 60928 — Address Claimed

This PGN is used to read the Name of an ECU.

SPN	Label	Description	Range	Type	Length
2848	NAME of Controller Application (for address claimed)	Returns the complete name of the ECU.	0...2e ¹⁶ -1	Measured	8 bytes

In order to request (read) the PGN 60928, you must use the [PGN 59904 — Request, page 34](#).

The ECU Name is composed of the following fields:

Fields	Description	Length
Identifier Number	Unique Serial Number.	21 bytes
Manufacturer code	Schneider-Electric, 807 (0x327).	11 bytes
ECU Instance	Default value is 1 (0x01), this value is configurable.	3 bytes
Function Instance	Default value is 1 (0x01), this value is configurable.	5 bytes
Function	Sonic Sensor, 143 (0x8F).	8 bytes
Reserved	Reserved	1 byte
Vehicle System	Non-specific system, 0 (0x00).	7 bytes
Vehicle System Instance	Default value is 1 (0x01), this value is configurable.	4 bytes
Industry Group	Construction equipment, 3 (0x03).	3 bytes
Arbitrary Address Capable	Yes, 1 (0x01).	1 byte

PGN 61184 — CAN Bus Speed

This PGN is used to define the CAN Bus Speed to adopt.

SPN	Label	Description	Length	Unit
2550	Manufacturer Specific Information (PropA_PDU1)	Define the CAN Bus Speed to adopt. Two values are possible: 0xFA for 250kbits/s 0x1F4 for 500kbits/s According to the standard, this parameter is 64bits length and data are in LSB first order.	8 bytes	kbits/s

As soon as the CAN Bus Speed is set through PGN 61184, the device reboots and adopt the new speed configured.

PGN 65164 — Auxiliary Analog Information

This PGN is used by the device to send Analog informations.

Every 50ms, the WideBeam CAN J1939 device broadcasts the PGN 65164 - Auxiliary Analog Information. Within this PGN, information about the target distance in mm can be found.

SPN	Label	Description	Range	Unit	Data position	Length
441	Auxiliary Temperature #1	Estimation of the device temperature in degree Celsius with an offset of 40°C. This value is approximative and provided just for information. It shall not be used in place of a formal Temperature Sensor.	-40...210	°C	1	1 byte
442	Auxiliary Temperature #2	Not implemented. All bits shall be set to 1.8.2 <i>ft</i>	-40...210	°C	2	1 byte
1387	Auxiliary Pressure #1	Not implemented. All bits shall be set to 1.	0...4000	kPa	3	1 byte
1388	Auxiliary Pressure #2	Not implemented. All bits shall be set to 1.	0...4000	kPa	4	1 byte
3087	Auxiliary Level	Level measured by a sensor. Distance of the target within near and far limit. Values are encoded on 16 bits with steps of 1 bit for 0.1mm. Noise value is also displayed here.	0...6 425.5	mm	5...6	2 bytes
354	Relative Humidity	Not implemented. All bits shall be set to 1.	0...100	%	7	1 byte

PGN 65240 — Commanded Address

This PGN is used to modify the source address of a device.

SPN	Label	Description	Range	Length
2849	NAME of Commanded Address Target	Value of the ECU Name of device that must change its source address.	0...2e16-1	8 bytes
2847	Address Assignment (new source address)	New value of the source address that should be adopted by the sensor from 0 to 254. The product preferred source address is 235 (0xEB). If no address has been assigned by the Customer, the product will try to adopt any addresses between 235 (0xEB) and 240 (0xF0) during the claiming process. In case the desired address is not available, the product can't join the J1939 bus and remain silent.	0...253	1 byte

A **source address** is a one-byte value identifying a particular Controller Application (CA) in a network. The address of a CA is incorporated into the identifier of every message sent by that CA and is used to provide uniqueness to messages that are sent by the CA.

As soon as the source address is set through PGN 65240, the device reboots and adopt the new speed configured.

PGN 65242 — Software Identification

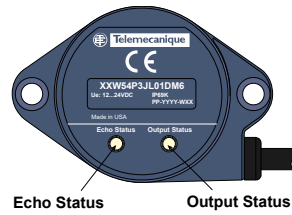
This PGN is used to modify the source address of a device.

SPN	Label	Description	Range	Unit	Data position	Length
965	Number of Software Identification Fields	Always equal to 1.	0...250	step	1	1 byte
234	Software Identification	Returns the Software versions of the sensor. For example, this parameter can be represented with ASCII characters MMDDYYaa where MM is the month, DD is the day, YY is the year, and aa is the revision number.	0...255 per byte	—	2...N	Variable - up to 200 bytes followed by an "*" delimiter

In order to request (read) the PGN 65242, you shall use the [PGN 59904 — Request, page 34](#).

Diagnostic

LED/Error Messages



LEDs	Description
Echo Status	The White LED is ON when the green is OFF (to indicate that the product is powered). Green = object detected between the blind zone and the max sensing distance (from 0,425 m to 4 m / 1.39 to 13.1 ft.).
Output Status	Yellow = object detected between the near and the far limits (from 0,425 m to 3 m / 1.39 to 9.8 ft)

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TMSS France SAS

Share capital: 366 931 214 €
Tour Eqho, 2 avenue Gambetta
92400 Courbevoie – France
908 125 255 RCS Nanterre

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