

Installation Manual 2021

# Ultrasonic Sensor Module

The compact ultrasonic sensor module (USSM) detects objects using ultrasonic waves, which are transmitted and received with only one piezoelectric disc.

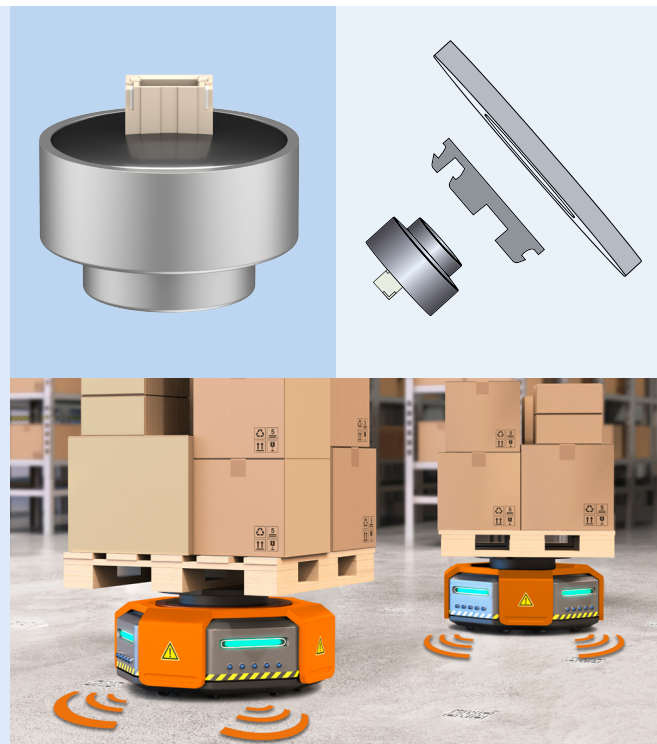
An integrated driver and signal processor is used for signal generation and processing.

The very compact design transforms the ultrasonic sensor module into a highly robust and versatile component with excellent EMC characteristics, which thanks to the solid aluminum housing, is also protected against dust and splash water. As such, it is ideally suitable for numerous industrial applications and applications in harsh environments.

This installation manual provides information on how to mount the USSM to avoid misleading influences such as vibrations and false echo detection to occur.

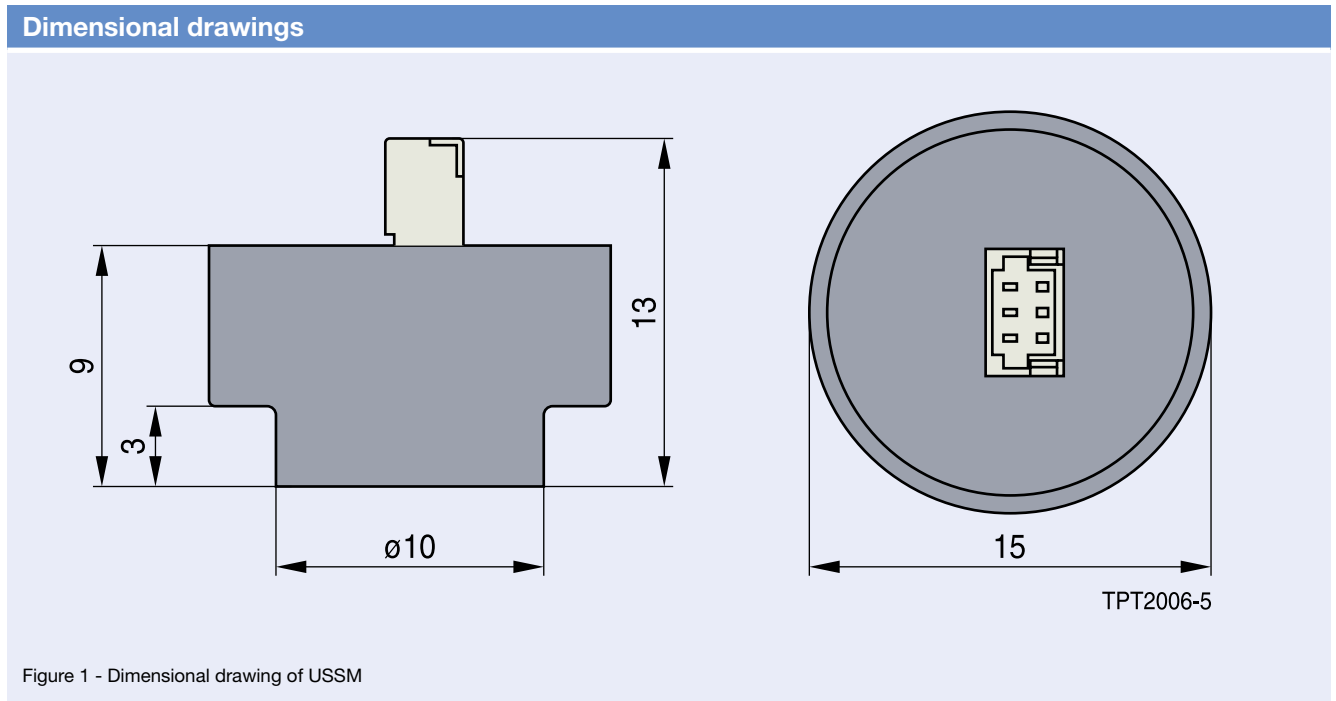
A CAD file in standard STP format for mounting recommendation is available on TDK's Website to allow a customized prototyping suitable for customer's needs.

Recommendations are included for gluing instructions, acoustic decoupling and basic information for installation of the module.



# Ultrasonic Sensor Module Installation Manual

## 1. Dimensional specifications



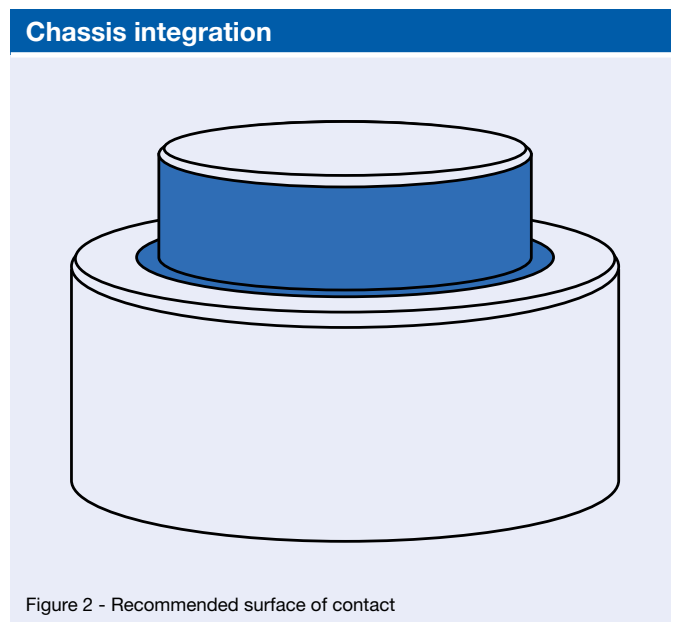
Parameter	Typical	Unit
Front diameter	10	mm
Total diameter	15	mm
Total length	13	mm
Pot length	9	mm
Length of front cylinder	3	mm

## 2. Module integration into the chassis

The housing of the USSM consists of one single aluminum pot. A thin metal membrane on the top is designed to send and receive ultrasonic waves, the more robust corpus can be used as the mounting area (recommended surface of contact, see figure 2).

This mounting area is designed to have minimum vibration and is therefore the only point of contact recommended by TDK as otherwise, the sound emission and reception of the device may be significantly reduced or false echo detection may occur.

The sensor should also not be touched on its backside. Best practice is to use flexible cables for connection.



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## Mechanical decoupling of the module from the chassis

Vibrations in general can be coupled over from the USSM into the chassis and can be reflected back to the sensor where they will be received.

To ensure a good decoupling of the Module from the chassis, TDK suggests to use a 2-step decoupling approach (Figure 3) using an elastic mounting supplement (see paragraph 4) which is mounted in the chassis. The USSM is fixed by pressure and/or glue to the mounting supplement. Apart from the decoupling aspect, the supplement gives more flexibility to adjust the sensor in the best possible way to the application, e.g. in the optimum direction, or to adjust for the chassis thickness.

## 3. Optimized Field of View

The chassis surface near the membrane has a significant impact on the FoV. To achieve a directivity similar to the sensors specification of  $60^\circ$ , the surface near the membrane should be flat, closed and free of structures like steps or holes.

Such surface artefacts can generate reflections, which interfere with the direct emission, and thus result in a different beam shape. Again, using a mounting supplement can help to assure a flat area around the sensor membrane.

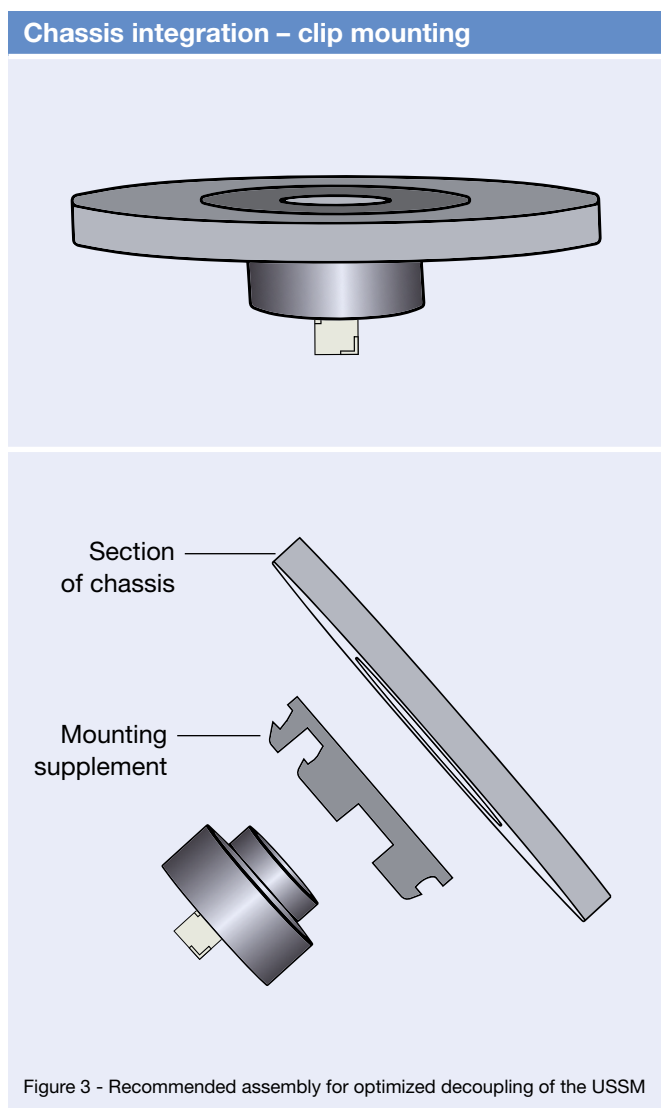


Figure 3 - Recommended assembly for optimized decoupling of the USSM

## Chassis integration

### Correct object detection

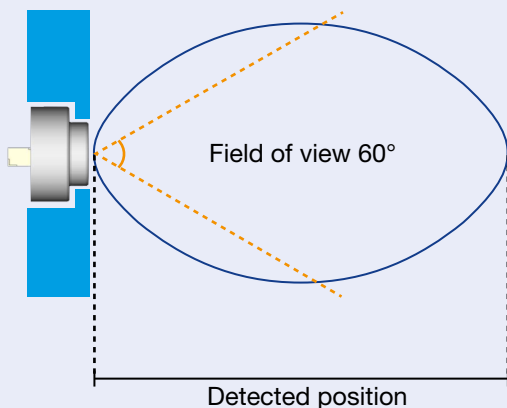


Figure 4 - Recommended surface area around the USSM – no disturbance by obstacles on the surface

### Incorrect object detection

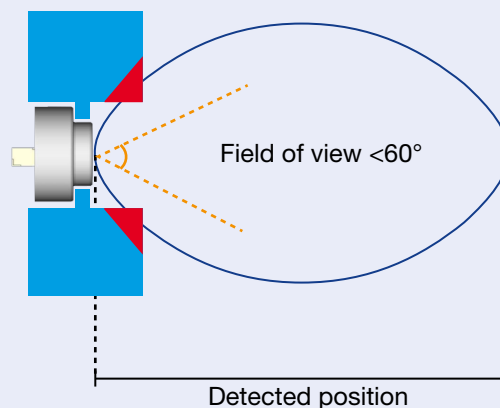


Figure 5 - Obstacles near the mounting position of the USSM can cause false detections

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## 4. Mounting accessories with 3D Printing

The mounting supplements can be produced using a 3D printing method together with the standard STP file provided on the TDK website.

TDK recommends to use Markforged its “Onyx” (nylon, reinforced with carbon fibers) material for 3D printing of the mounting supplement (<https://www.mark3d.com/en/>) or equivalent 3D printer.

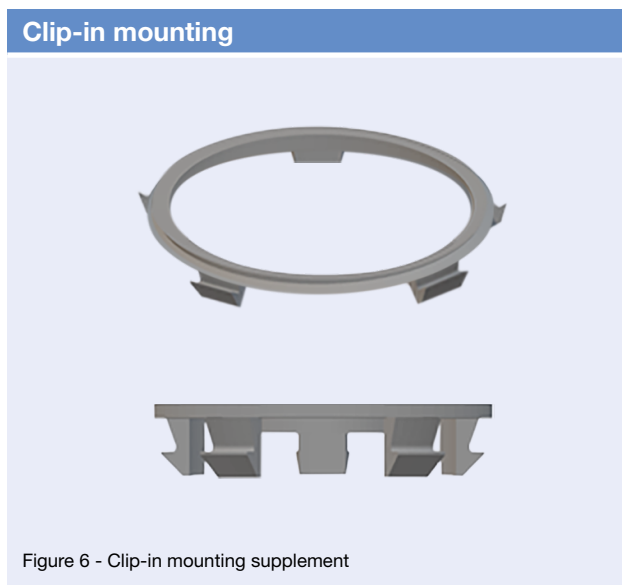


Figure 6 - Clip-in mounting supplement

### Clip-in mounting

- Assembly: The Click-in part is pressed on the foreseen surface of the Ultrasonic Sensor Module. Additionally, it may be fixed with epoxy-based glue.
- The Click-in part can then be mounted in the chassis of the application.

Alternatively, the mounting can be combined with a bayonet or screw-in mount instead of the clip-in fixture.

### Screw-in mounting

- Alternative mount uses a thread M12 x 1, pressed on the foreseen surface (10 mm diameter) on the device.
- Fabrication: The thread is cut after printing a pole, then a hole with 10 mm diameter is drilled, and the part is cut at 3 mm height.
- The device can then be mounted into a chassis by screwing it in.

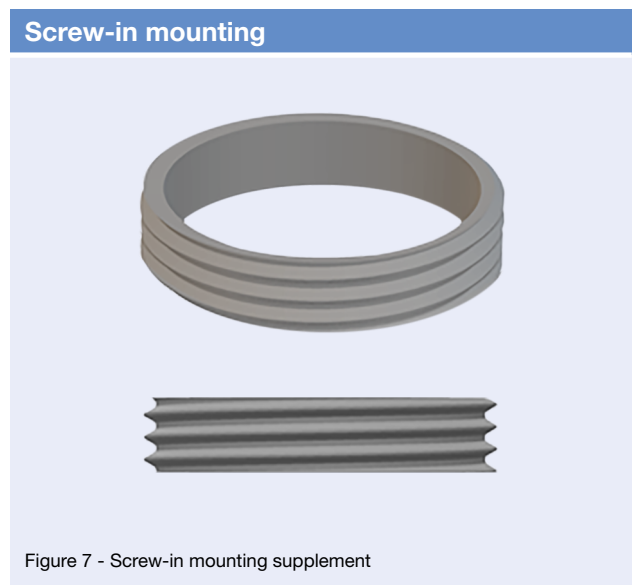


Figure 7 - Screw-in mounting supplement

## 5. Gluing instructions

TDK recommends an epoxy-based glue which combines elastic properties and is well adhesive on metal and plastic.

### Epoxy-based glue

**Supplier:** Henkel TEROSON

**Material:** MS 9220 Power Adhesive

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