ECS75 OEM Standalone Eddy Current Sensor
PRODUCT AND WARRANTY INFORMATION

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CAUTION: READ BEFORE OPENING

For safety purposes these instructions must be read before use of this product.

This Eddy Current Sensor is dedicated to monitor the position of a conductive target without contact.

Only qualified personnel should work on or around this equipment and only after becoming thoroughly familiar with all warnings, safety notices, and procedures contained herein.

The successful and safe operation of this equipment is dependent on proper handling, installation and operation.

A "qualified person" is one who is familiar with the installation, construction and operation of the equipment and the hazards involved. In addition, he/she has the following qualifications :

- **is trained and authorized to energize, de-energize, clean, and ground equipment in accordance with established practices,**
- **is trained in the proper care and use of protective equipment in accordance with established safety practices.**
- **is trained in the soldering process of microelectronic systems.**

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1. INTRODUCTION

The ECS75 OEM is a standalone Eddy Current Sensor (ECS) conditioner. It can have up to 2 sensor channels in single or dual (push-pull) configuration. This conditioner is the standalone version of the ECS75, which means that it is integrated in a specific package and supplied directly through a standard AC/DC converter. The AC/DC converter is not delivered with the conditioner, so it is the customer's duty to buy a compatible AC/DC converter. The requirements for the AC/DC converter are given in the next section.

The conditioner should be used in combination with an ECS probe that should be placed faced to the conductive target whose position the user wants to monitor. The details of probe installations are given in the next sections. C-TEC produces two types of probes, the PC75-500 which has a 500µm detection range, and the PC75-2000 which has a 2000µm detection range.

2. ELECTRICAL CONNECTIONS

The ECS75 OEM features electrical interfaces on both the front and rear panels, as shown on the Figure 2-1. The rear panel consist in the power supply interface, there is a Jack connector (2.1mm diameter central pin) to plug the AC/DC adapter, and the On/Off switch to turn on or turn off the electronics. The AC/DC adapter should be chosen to be compatible with the ECS75 OEM characteristics:

- ➔ The AC/DC adapter should have a connector compatible with the Jack connector which has a 2.1mm diameter central pin.
- ➔ The AC/DC adapter should supply a DC voltage to the ECS75 OEM in the range of +12Vdc up to +24Vdc.
- ➔ With the two channels version, the AC/DC adapter should have a minimum output power of 12W, i.e. 1A @+12Vdc or 0.5A @+24Vdc.
- ➔ With the single version, AC/DC adapter should have a minimum output power of 7.4W, i.e. 0.7A @+12Vdc or 0.35A @+24Vdc.

Warning: The supply voltage should never exceed +28Vdc. Exceeding +28Vdc will lead to permanent damage of the ECS75 OEM.

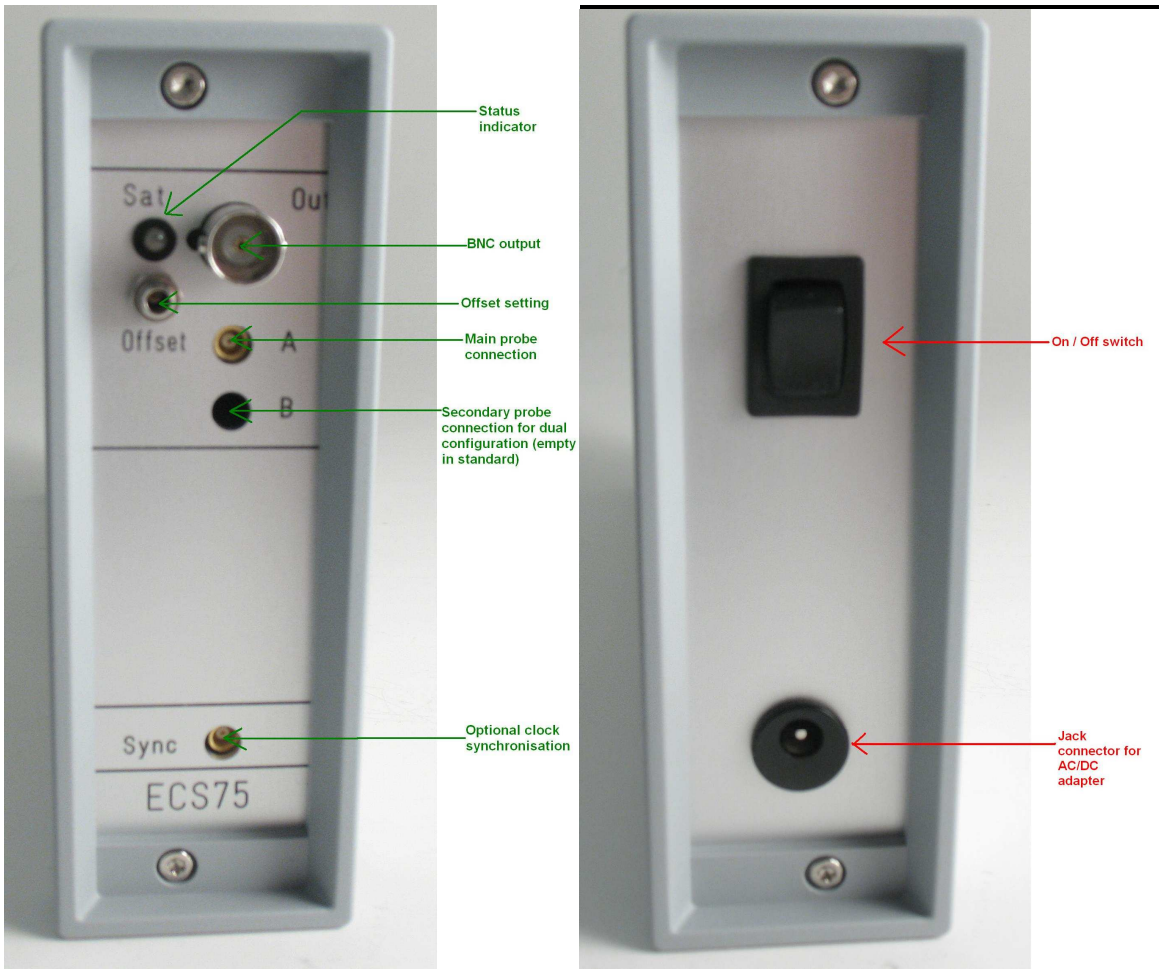

Figure 2-1: Electrical connections of the ECS75 OEM on the rear and front panels.

The front panel features the signal connections. A BNC connector is used for the measurement output. Next to the BNC output is a status LED which can be either red or green to indicate that the sensor is working in its calibration range. A potentiometer is used in order to adjust the offset of the output measurement if needed. The MCX coaxial connector "A" is used to connect the probe on the front panel in the single configuration. The "B" is used to connect the secondary probe in a differential configuration. The "B" slot is empty in the case of the single configuration.

Another MCX connector "Sync" can be used to synchronise several ECS75 together in order to avoid low frequency inter-modulation noise. The connector can be programmed as an output (for the master) or an input (for the slaves) at the factory. The default configuration is the master mode (output), in this configuration the internal clock of the board is repeated on this connector. The internal clock is a 8MHz square signal with 0-5V amplitude. If several ECS75 OEM are used simultaneously and the probes targeting the same system, Cedrat Technologies recommends to synchronise the board in order to maintain a good precision. In such case, the synchronisation option should be asked specifically to Cedrat Technologies. In a multi board configuration, only one ECS75 OEM can be configured as master, and the others should be configured as slaves.

Warnings:

- ➔ **Only the ESC75 OEM configured as master can function autonomously. Any ECS75 OEM configured as slave requires to be connected to a master ECS75 OEM to work properly.**
- ➔ **The "Sync" signal should not be used for any other purposes than synchronising several ECS75 OEM.**

3. USING THE ECS75 OEM

3.1. Power up

Prior to powering up the ECS75 OEM, the electrical connections should be made. In the single configuration, the probe should be connected to the "A" MCX connector as shown on the Figure 3-1. In the differential configuration, the probe's connector "A" should be connected to the "A" terminal, and the probe's connector "B" should be connected to the "B" terminal. Each ECS75 OEM channel is calibrated with one probe, thus it is mandatory to connect the probe to the channel on which it was calibrated. If several electronics and probes are used, please refer to the factory verification sheet to know the association between ECS75 OEM channels and probes.

Warnings:

1) **Always use the ECS75 OEM with probes manufactured by Cedrat Technologies PC75-500 and PC75-2000. The use of other probes will lead to invalid measurement and potential damaging of the ECS75 OEM.**
2) **Always connect the probe on the channel on which it was calibrated. Failure to do so will lead to invalid measurement and possible damages to the board.**

Figure 3-1: Probe connection on the front panel.

If several ECS75 should be synchronised, Cedrat Technolgogies provides an additional coaxial cable with as many connectors as ECS75. The coaxial cable provided with the electronics should be connected on the "Sync" terminals of all the boards.

Finally, the AC/DC adapter can be plugged on the Jack connector of the rear panel, as shown on the Figure 3-2:

Figure 3-2: AC/DC adapter connection on the rear panel.

Warning: When connecting an AC/DC adapter to the board, always make sure that it does not deliver a voltage higher than +28Vdc.

The On / Off switch can then be activated to power up the board. The status LED on the front panel should light to indicate that the board is supplied.

3.2. Probe Installation

The ECS75 OEM together with a PC75 probe form a high precision contactless position sensor. However, the functionality can only be guaranteed if proper probe installation is implemented. This section describes the rules to install the probe.

The probe consists in a 1m coaxial cable with a MCX connector, a steel holder to attach the probe, an isolating support (white) on which the Eddy Current probe is installed. The steel support has a diameter of 7mm, and it should always be used to attach the probe.

Warnings:

- ➔ **The standard cable length has a 1m length. The user should not attempt to make its own cables as this would invalidate the calibration. If more length is required for the application, please send a specific request to Cedrat Technologies.**
- ➔ **The probe should always be attached on the steel support. Attaching the probe in another area might result in permanent damages to the probe.**

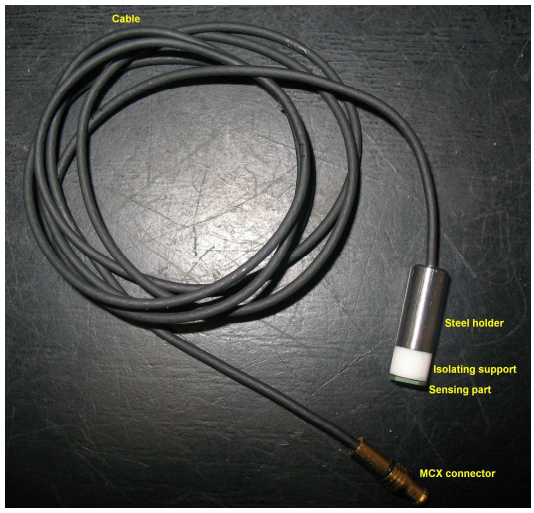

Figure 3-3: PC75 probe.

The target has a strong impact on the performance of the sensor, since it is this surface that is detected by the probe. In standard the target material is aluminium, however, the user can request Cedrat Technologies to perform the calibration on other standard materials, such as steel. In any case, the target material should be electrically conductive. The target material used for the calibration is specified in the factory verification sheet. The user should always use the same target material as the one used for the calibration.

Concerning the dimensions of the target, it should have a minimum thickness of 0.5mm and be flat. The target surface in front of the probe should be centred and of at least three times the diameter of the probe:

- ➔ For the PC75-500 (500µm range), it is recommended to use a target diameter of at least 9mm.
- ➔ For the PC75-2000 (2000µm range), it is recommended to use a target diameter of at least 15mm.

The positioning of the probe with reference to the target also has a strong impact on the performance of the sensor. There are two rules for positioning the probe (see Figure 3-4):

1) The surface of the probe should be parallel to the surface of the target. This means that there should not be angle between the two surfaces. If the two surfaces are not parallel, this will add some error in the measurement. The user should always try to minimize the installation angle.

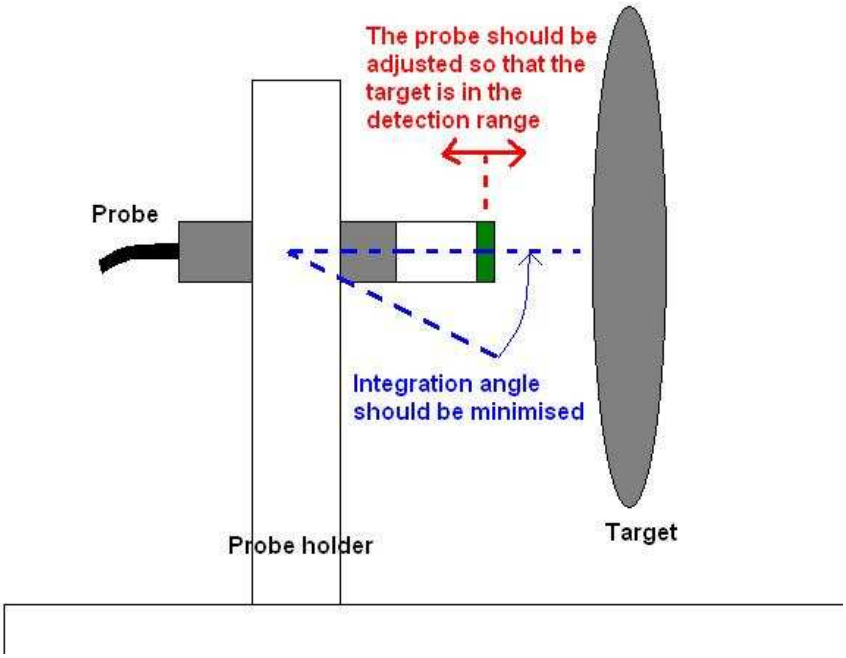

Figure 3-4: Rules for the probe installation.

2) The target should always be in the detection range of the probe. This means [50 ; 550µm] for the PC75-500, and [200 ; 2200µm] for the PC75-2000. This can easily be checked using the status LED on the front panel. When the LED is red (Figure 3-5) it means that the sensor is out of its range, when the LED is green (Figure 3-6) it means that the sensor is in its detection range. During the installation of the probe, the system to monitor can be activated, and the position of the probe should be adjusted so that the LED is always green on the whole stroke of the system monitored. The LED indicator should always be green during normal operation.

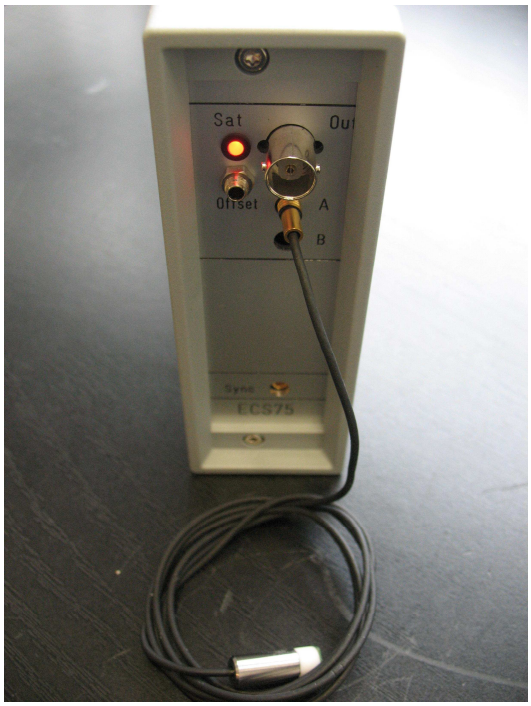

Figure 3-5: Red indicator, sensor is out of range.

Figure 3-6: Green indicator, sensor is in the range.

Warning: If the installation of the sensor does not fulfil the rules given above, the gain and possibly the linearity of the sensor will be jeopardised.

3.3. Position measurement

The position of the sensor is given by the output voltage on the BNC connector. The measurement system should be plugged to the BNC connector as shown on the Figure

3-7. The impedance of the measurement system (scope, controller, …) should be at least 10kΩ.

Figure 3-7: BNC connection on the front panel.

The BNC output provides a voltage proportionate to the distance between the probe and the target. The gain (µm/V) and linearity (% of Full Scale) of the sensor are given in the Factory Verification Sheet for the target material chosen by the customer (aluminium or steel target). Based on the voltage measured on this BNC output, the position of the target with reference to the probe is found following this formula:

$$\text{Position } (\mu m) = \text{Gain } (\mu m/V) \times V_{ECS75}$$

The position output is refreshed at a rate of 10kHz. It should be noted that the performance of the sensor is given for an operation at ambient around 20°C.

For practical reasons, the user might want to adjust the offset of the output signal. The offset adjustment can be performed through the potentiometer on the front panel with a flathead screwdriver, as shown on the Figure 3-8. The offset can be adjusted in the range of [-10V ; +10V]. The offset adjustment does not impact the gain nor the linearity of the sensor.

Figure 3-8: Setting the offset of the BNC output.

4. TECHNICAL CHRACTERISTICS OF THE ECS75 OEM

The technical characteristics of the ECS75 OEM are given on the Figure 4-1:

	Unit	ECS75OEM-x
Notes	-	x : number of channel Preliminary data
Function	-	Eddy current sensor conditioner with linear output
Max. number of channels	-	2
Main voltage	VDC	9 - 24
Max current	A	1.2 - 0.6
Output voltage	V	-10 ... 10
Min output voltage	V	-10
Max output voltage	V	10
Resolution	% of FS	0.005
Bandwidth	kHz kS/s	10
Accuracy - Linearity	+/- % of FS	1
Accuracy - Thermal Offset drift	% FS /°C	TBD
Accuracy - Thermal gain drift	% FS /°C	0.1
DC offset setting	-	10 turn potentiometer
Min DC offset	V	-12
Max DC offset	V	12
External Sensor output connector	-	SMC 50Ohms
External output connector	-	BNC
Main voltage connector	-	2 ways RCA
Back panel interface	-	-
Weight	kg	1.2
Dimensions	W, L, H mm x mm x mm	12F, 3H, 260mm 12F rack 89x260x129
Option	-	Differential measurements Synchronization of sensors

Figure 4-1: Technical characteristics of the ECS75 OEM.

5. INSPECTION UPON RECEIPT

This product has been inspected and shown to operate correctly at the time of shipment, as verified by the Factory Verification Form that accompanies the power supply.

Immediately upon receipt of the product, it should be inspected carefully for any signs of damage that may have occurred during shipment. If any damage is found, a claim should be filed with the carrier.

The package should also be inspected for completeness according to the enclosed packing list. If an order is incorrect or incomplete, contact your distributor.