

TILT & TIP-TILT STAGES - PRODUCT AND WARRANTY INFORMATION

Version : 3.3

Date 02/07/15



CAUTION: READ BEFORE OPENING

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

Piezoelectric products are not warranted against mechanical damage resulting from improper use, wherein excessive forces or voltages that are outside specified ranges are applied.

High voltage is present in this product.

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.

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1 PRESENTATION

The piezoelectric mechanisms, Tilt (TT60SM) and Tip-Tilt (DTT35XS) stages from CEDRAT TECHNOLOGIES SA are using multilayer actuators. Each axis includes a pair of piezo actuators that are driven in push pull configuration thanks to a push pull option integrated in each amplifier channel per axis. The standard driving electronic connector is a Lemo 3 points.

Piezoelectric Actuators must be handled carefully. Lifetime of Piezoelectric Multilayer actuators is not limited by wear. They can perform millions of cycles without loss of performance provided they are operated under suitable conditions.

The lifetime of a Piezoelectric Multilayer Actuators is a function of many combined parameters; the most influencing being the applied voltage, the temperature and the humidity. For maximum lifetime, operating voltage should be minimized, especially when they are used in static conditions.

Tests have shown that the lifetime is reduced significantly, if the actuator is maintained continuously at the maximal operating voltage. For instance, a Piezoelectric Multilayer Actuator can be definitively damaged, if submitted to the maximal operating voltage (e.g.: high electrical field up to 1.5 kV/mm) during more than one hour.

A high self heating of the piezo ceramic may occur during a long use in dynamic (high frequency) operation. This can lead to depolarization or electrical breakdown of the piezo ceramic. **It is recommended to monitor the temperature of the piezo device when using it in dynamic operation.**

The mechanical installation or the induced moments under operation by the mechanism are the main sources of failure.

2 MOUNTING PROCEDURE

2.1 Mechanical mounting

The mirror payload is not supplied by default along with the stage. The mirror payload can be either glued and/or fixed with holding screws on the top platform. For benefiting from a larger gluing surface on the top platform, the holding screws can be easily removed by the operator.

Piezo mechanisms require a proper installation procedure:

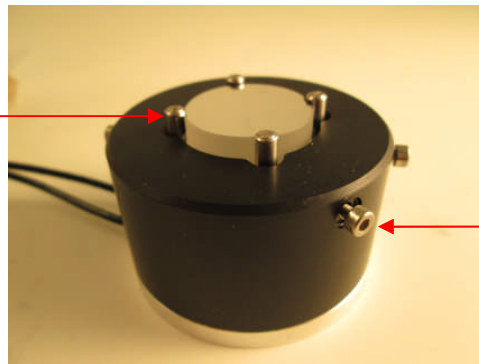
- when mounting the mirror payload onto the moving part of the piezo mechanism (see ANNEX 3 & 4),
- when attaching the piezo mechanism to the base plate,

In any case, please take care during the mounting procedure, to avoid excessive moments in the moving frame, when tightening the screws.



To protect the mechanism, install the 4 fixing screws before each physical intervention. Remove the 4 fixing screws on the sides before operating or applying a voltage on the mechanism. See figure here below.

Top platform
screws to fix
the mirror



Side screws to
remove before
operation

2.2 Electrical connections

Electrical connectors are used for the Tilt & Tip Tilt stages driving, and in option position sensors.

During the mounting operation, electrical charges can be produced by the piezo stage, through any applied force and the direct piezoelectric effect.

Before the electrical connection, please refer to the electrical connection scheme to avoid exchanging the driving and the sensing connectors.

The stages can be delivered with a full bridge of strain gauges (SG option) or with Eddy current proximity sensor per axis for monitoring and controlling the angular position. For these actuators, purchased without the sensing electronic, the connection between the strain gauges or the proximity sensor and the electronic must be performed by the customer. The electrical interface is described below.

The Strain Gauges used by CEDRAT TECHNOLOGIES display an Ohmic resistance of 350Ω for all the actuators and mechanisms.

For the strain gauges 350Ω the driving voltage ($V_{cc}-GND$) should not be higher than 10V.

The reduction of the driving voltage reduces the dissipated power and the related thermal effect, but also reduces the sensitivity of the bridge.

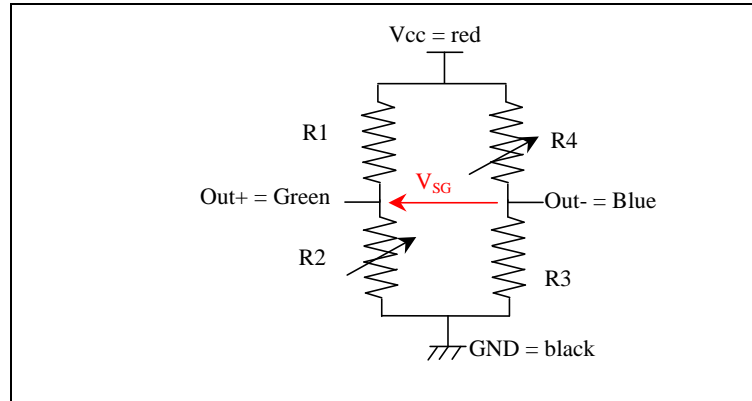


Figure 1 : Schematic of the Strain Gauges bridge

3 WARRANTY CONDITIONS AND EXCEPTIONS

The equipment is warranted for one year, including parts and labor, and only under standard technical conditions as outlined above and expressly mentioned in the technical data sheet. Repairs will be carried out at Cedrat Technologies or through your vendor.

Interventions or attempts to service or repair the Actuators by any unauthorized persons will invalidate this warranty.

In addition, this warranty will not apply if the stages is subjected to any of the following:

- improper handling, including, but not limited to, shocks and abrasions
- improper installation, including, but not limited to, excessive mechanical forces and moments, failure to use the standard electrical and mechanical interfaces
- excessive voltage, including, but not limited to, peak values outside the recommended operating range, DC values applied for excessive time periods
- inappropriate environmental conditions, including, but not limited to, high temperatures or high humidity
- attempt to modify the standard electrical connection of the mechanism (soldering out of electrical wires, plugs change,...) or the standard mechanical interfaces

4 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 actuator.

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.

If a device requires service, please contact Cedrat Technologies or your local vendor. Please include the device model and serial number in all correspondence with Cedrat Technologies or your vendor.

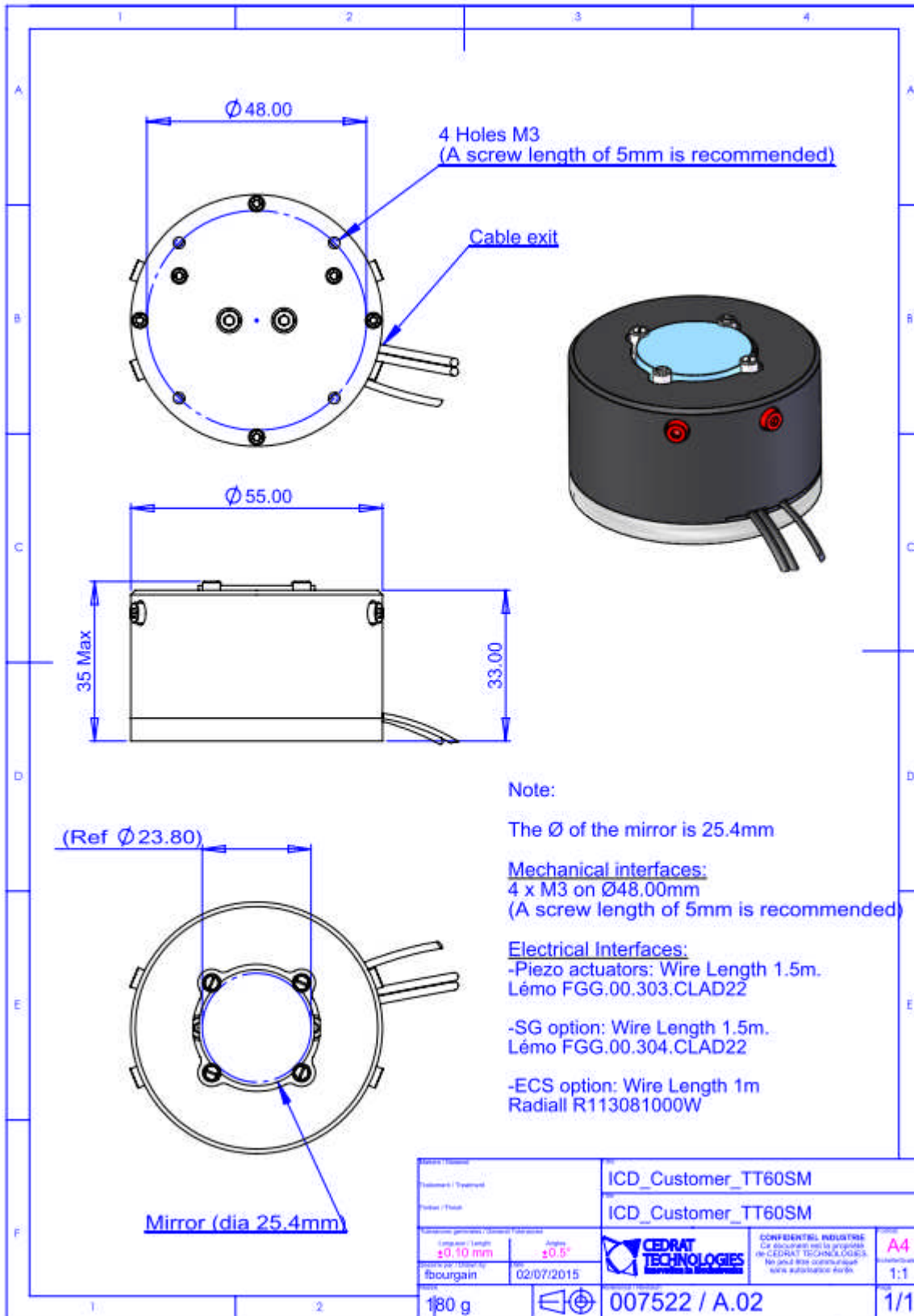
ANNEX 1: TT60SM TECHNICAL CHARACTERISTICS

Properties TT60SM	Standard technical conditions	Unit	Nominal values	Min. values	Max. values
Notes		-	<i>Preliminary data</i>	-	-
Sensor options	SG, ECS	-	-	-	-
Mastered motions	TZ, RX	-	-	-	-
TZ max. no load displacement	Quasistatic excitation, blocked-free	μm	50	45	58
RX Angular displacement		<i>mrad (+/-)</i>	11.30	10.17	11.70
Blocked force	Quasistatic excitation, blocked-free	N	110	88	132
Stiffness	Quasistatic excitation, blocked-free	$\text{N}/\mu\text{m}$	2.00	1.60	2.20
Unloaded resonance frequency (in the actuation's direction)	Harmonic excitation, blocked-free, on the admittance curve	Hz	400	340	440
Response time	Quasistatic excitation, blocked-free	ms	1.25	1.13	1.44
Capacitance (per electrical port)	Quasistatic excitation, free-free, on the admittance curve	μF	1.55	1.40	2.02
Angular resolution		μrad	0.11	-	-
Vertical resolution		nm	0.50	-	-
Height (Z axis)		mm	35.00	-	-
Diameter		mm	$\varnothing 55\text{mm}$	-	-
Mass		g	180.0	-	-
Standard mechanical interface (payload)	<i>Flat surface $\varnothing 25.4\text{mm}$ (1°)</i>	-	-	-	-
Standard mechanical interface (frame)	<i>4 M3 threaded holes on $\varnothing 48\text{mm}$</i>	-	-	-	-
Standard electrical interface	Actuators connection: 1.5m wire with Lemo FGG.00.303.CLAD22 connector -SG option: 1.5m wire with Lemo FGG.00.304.CLAD22 connector -Ecs option: 1m wire with Radiall R113081000W connector	-	-	-	-

ANNEX 2: DTT35XS TECHNICAL CHARACTERISTICS

Properties DTT35XS	Standard technical conditions	Unit	Nominal values	Min. values	Max. values
Notes		-	<i>Preliminary data</i>	-	-
Sensor options	SG, ECS	-	-	-	-
Mastered motions	RX, RY, TZ	-	-	-	-
TZ max. no load displacement	<i>Quasistatic excitation, blocked-free</i>	μm	35	32	40
RX, RY max. Angular displacement		<i>mrad (+/-)</i>	2.80	2.52	2.90
Blocked force	<i>Quasistatic excitation, blocked-free</i>	N	19	15	23
Stiffness	<i>Quasistatic excitation, blocked-free</i>	N/ μm	2.00	1.60	2.20
Unloaded resonance frequency (in the actuation's direction)	<i>Harmonic excitation, blocked-free, on the admittance curve</i>	Hz	2800	2380	3080
Response time	<i>Quasistatic excitation, blocked-free</i>	ms	0.2	0.16	0.21
Capacitance (per electrical port)	<i>Quasistatic excitation, free-free, on the admittance curve</i>	μF	0.50	0.45	0.65
Angular resolution		μrad	0.03	-	-
Vertical resolution		nm	0.35	-	-
Height (Z axis)		mm	24.00	-	-
Diameter		mm	$\varnothing 45\text{mm}$	-	-
Mass		g	105.0	-	-
Standard mechanical interface (payload)	<i>Flat surface $\varnothing 12.7\text{mm}$ (1/2")</i>	-	-	-	-
Standard mechanical interface (frame)	<i>Cylinder $\varnothing 43\text{mm}$ or 4 M3 threaded holes on $\varnothing 30$</i>	-	-	-	-
Standard electrical interface	<p align="center"><i>Actuators connection: 1.5m wire with Lemo FGG.00.303.CLAD22 connector</i></p> <p align="center"><i>-SG option: 1.5m wire with Lemo FGG.00.304.CLAD22 connector</i></p> <p align="center"><i>-Ecs option: 1m wire with Radiall R113081000W connector</i></p>	-	-	-	-

ANNEX 3: TT60SM MECHANICAL INTERFACES



ANNEX 4: DTT35XS MECHANICAL INTERFACES

