

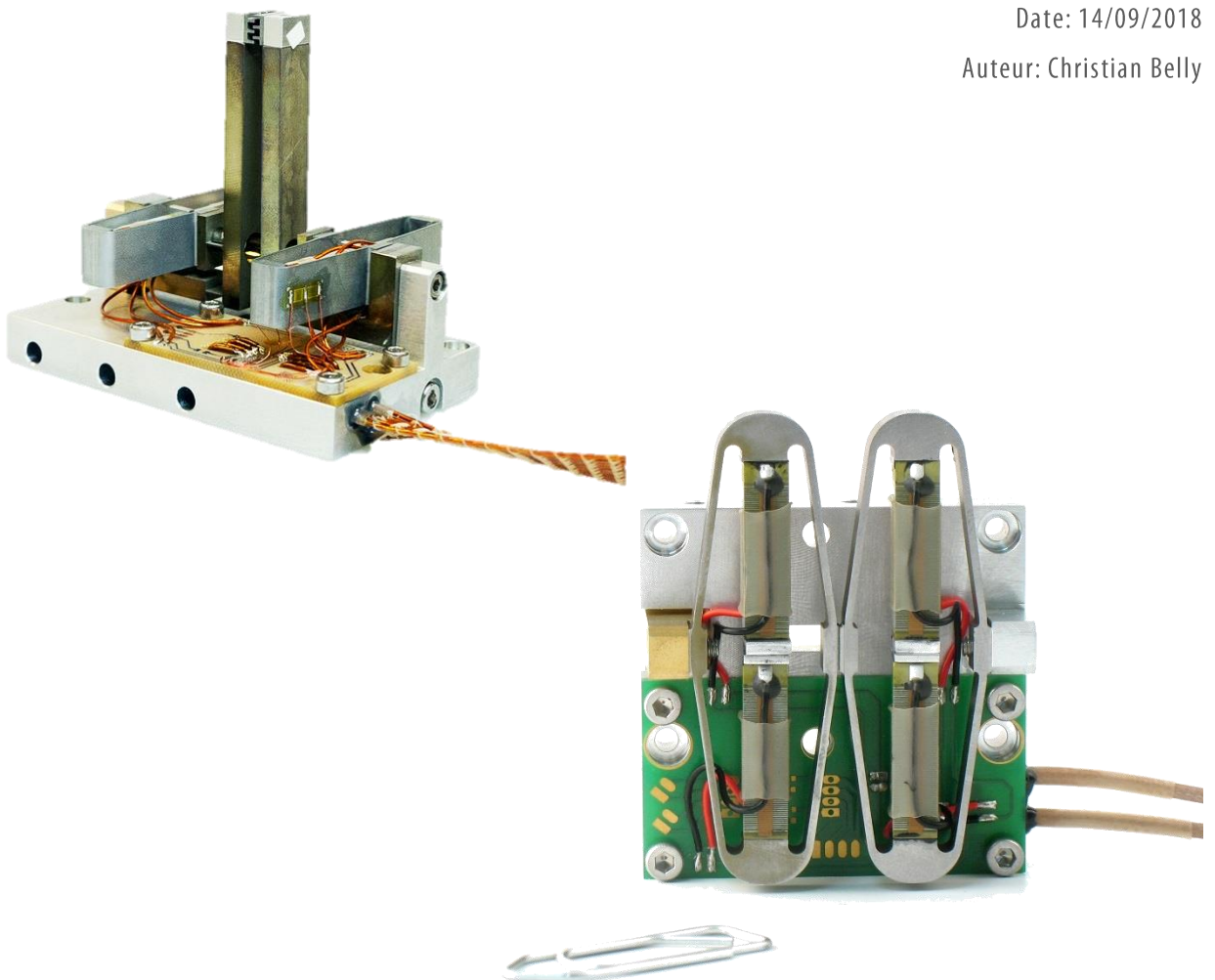
FAST PIEZO SHUTTERS USER MANUAL

PRODUCT AND WARRANTY INFORMATION

Version: 2.0

Date: 14/09/2018

Auteur: Christian Belly



I. CAUTION: READ BEFORE OPENING

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

This driver board is dedicated to multilayers piezoelectric actuators.

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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II. CONDITIONS OF USE & WARRANTY

II.1. TEMPERATURE

Performances in technical datasheet of Cedrat Technologies actuators are given for a temperature between 15°C and 25°C.

Typical operational temperature range is from -40°C to 80°C.

Actuator height is varying because of thermal expansion. The actuator height is given in laboratory conditions of temperature (20°C).

II.2. SELF-HEATING

An important 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.

If you have some doubts on your operating conditions please contact actuator@cedrat-tec.com for more information before starting the device.

II.3. HUMIDITY

Performances in technical datasheet of Cedrat Technologies actuators are given for a humidity rate of max 60% with non-condensed water.

Driving ceramic with a DC voltage above 60% of relative humidity is technically possible but it leads to a reduced life time. Standard actuator can perform more than 1000h supplied at their maximum DC voltage in a 60% humidity level.

The piezo component fails under humidity mainly if it is driven with a DC voltage (ie a constant electric field). Some water is absorbed by the ceramic and generates a migration of metallic ions from the internal electrodes. This migration leads to a progressive loss of isolation between these electrodes. The power consumption increases up to electric breakdown.

Please do not supply the ceramic with a DC voltage above 60% of relative humidity without Cedrat Technologies agreement.

In this particular case the data monitoring is very important to activate the warranty especially on the following data:

- Hygrometry
- Voltage

If needed an analysis should be performed by Cedrat Technologies on a specific design. Most common solution is encapsulation. Then please contact actuator@cedrat-tec.com.

II.4. ENVIRONMENTS (SHOCKS, VIBRATIONS...)

Shocks and Vibrations are very dependent of the operating conditions (loading and boundary conditions).

If the mechanism must withstand shocks or vibrations an analysis has to be performed by Cedrat technologies.

If needed, please contact actuator@cedrat-tec.com before doing the tests.

II.5. ELECTRICAL CONNECTIONS

Since piezoelectric actuators behave also as pyroelectric materials, voltage can appear, even without any power supply, due to temperature changes.

CAUTION: It is recalled that the actuator must be excited between -20 V and 150 V. A higher voltage will damage the mechanism.

CTEC's electronics limit the output voltage at 150V, preventing any damage to the actuators.

MECHANISM WITHOUT VACUUM BOX

The following cables will be supplied by CTEC along with the mechanism.

- Cable from the FAPS mechanism to a sub-D 9 connector male (as shown in Figure 1)



Figure 1 View of output wire of the mechanism with a Male Sub-D 9 connector (High Vacuum compatible).

- A sub-D 9 to Lemo for Piezo voltage and SG, cable length 1.5m
 - o Piezo: 2 x Lemo# FFA.00.250.CTAC22,
 - o For SG in option: Lemo# FGG.00.304.CLAD22.

The following scheme (Figure 2) summarizes the connections between the mechanism (FAPS400M as an example) and its electronics. CTEC's delivery is indicated in dotted line.

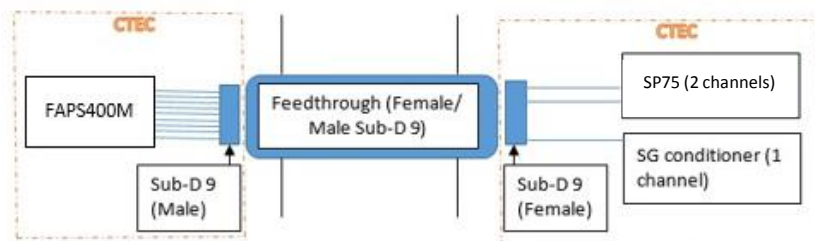


Figure 2 Scheme of CTEC's providing's within vacuum box

MECHANISM WITHIN VACUUM BOX

When ordered with vacuum box option, CTEC delivery includes all the parts and connectors from vacuum box to driver. (see Figure 3)

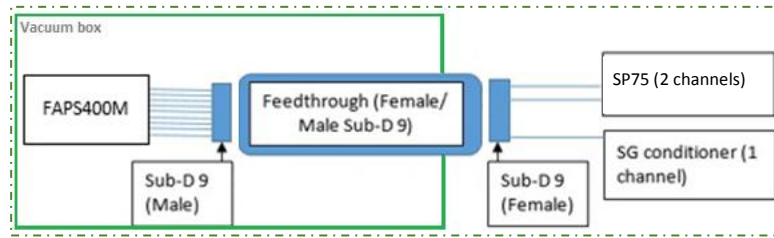


Figure 3 Scheme of CTEC providing's with vacuum box

CONNECTION TO SWITCHING AMPLIFIER FOR PIEZO ACTUATORS SP75

The connection to the SP75 driver is described in Figure 4. Please refer to SP75 user manual in order to obtain information about commands, voltages, RS422 option, etc.

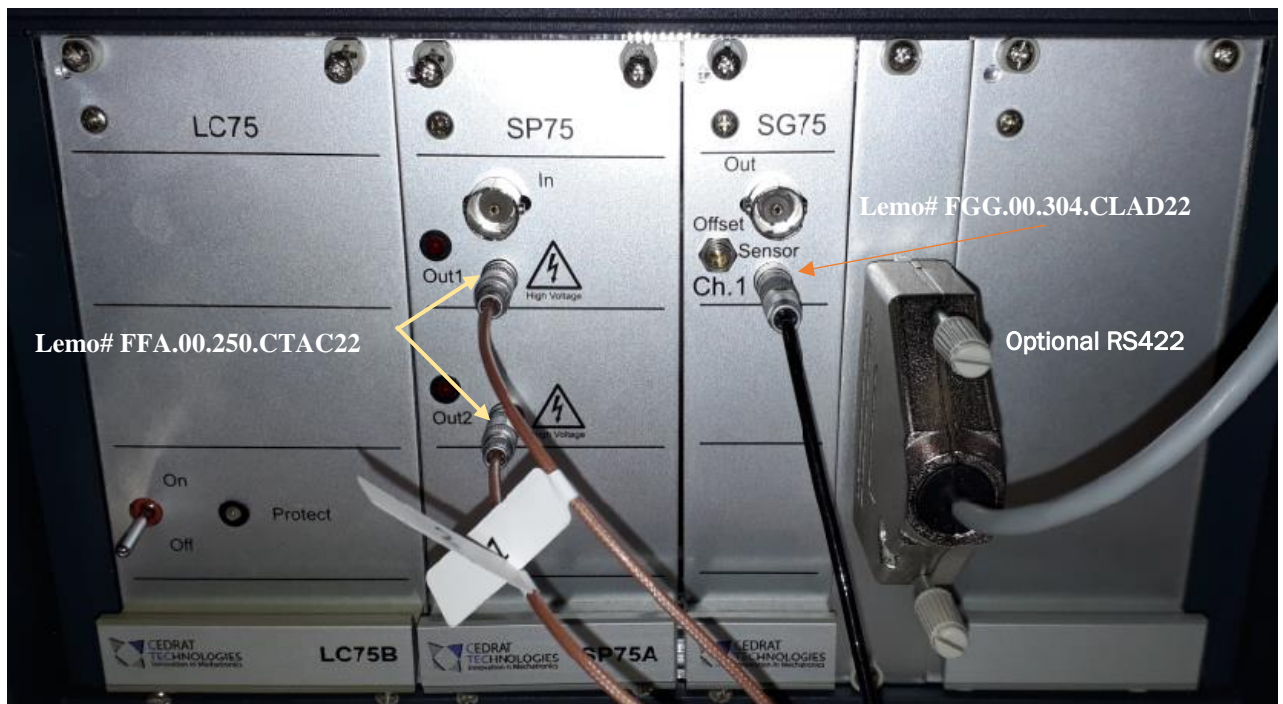


Figure 4 Connection on the front panel of the SP75

II.6. MECHANICAL INSTALLATION

The mechanical ICD of the FPS and FAPS mechanism is given in ANNEX 2: Interface Control Documents.

II.7. BEAM DIAMETER AND SLIT DIMENSIONS

FPS and FAPS mechanisms are designed to block different diameter of beams. Slits width depend on the selected mechanism.

For every mechanism an SIW (Silicon-Tungsten) option is available: the slit material is changed to Tungsten allowing higher X-Ray stop (no change in the interface nor utilization of the mechanism with this option). For FAPS, Tungsten slit material is standard.

	FPS200M	FPS400M	FPS900M	FAPS400M
Maximum beam diameter	0.3 mm	0.7 mm	1.1 mm	3.0 mm
Slit width	4 x 0.6mm	8 x 0.6mm	8 x 0.6mm	6 x 0.5mm

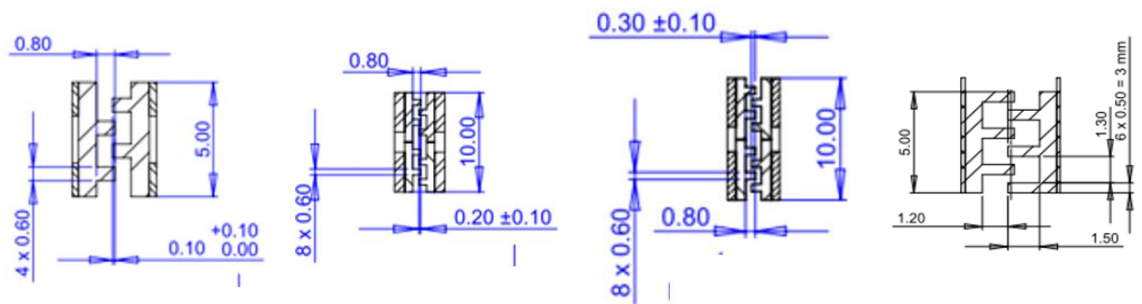


Figure 5 Shutter slit dimensions

II.8. ULTRA HIGH VACUUM OPTION

An UHV option is possible for the FAPS mechanism. The mechanical and electrical interfaces remain the same (only internal material component are changed within the mechanism).

Please contact actuator@cedrat-tec.com if you have any questions.

II.9. VACUUM BOX OPTION

All FPS and FAPS products can be proposed within a vacuum box to be easily integrated on a beam line. Mechanical and electrical interfaces are compatible with all FPS products from CTEC. Shutters performances are kept unchanged.

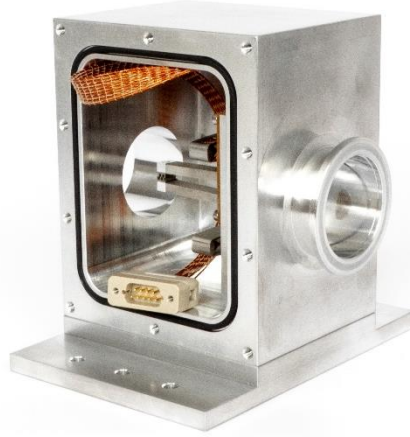


Figure 6 FAPS400M in Vacuum box (open door)

PERFORMANCES AND INTERFACES

Vacuum box is based on Viton O-ring and KF clamping technologies. It is typically designed for 10^{-6} mbar vacuum level. Qualified leakage rate is below 10^{-10} mbar.L/s. Interface document is presented in ANNEX 3: Vacuum box ICD.

TRANSPORT CLAMP

Upon reception, user is possibly invited to remove transport clamping system. You need a long (>10cm) flat screwdriver and a manual clamp.

1. Remove left side (when looking at the connector) feedthrough blank flange.



Figure 7 Vacuum chamber for shutter

2. Position the chamber with tube axis vertical. Keep accessible the open tube. You can see the mechanism inside.
3. Make one turn counter-clockwise on the two top screws (notes "1" & "2" on next figure). Once it is made on the two screws, make another turn counter-clockwise on both.

4. Unscrew the third screw (Approx 3 turns are needed). When the metallic part is capable to move, remove it carefully using a clamp. The part shall be removed by the KF40 nipple.

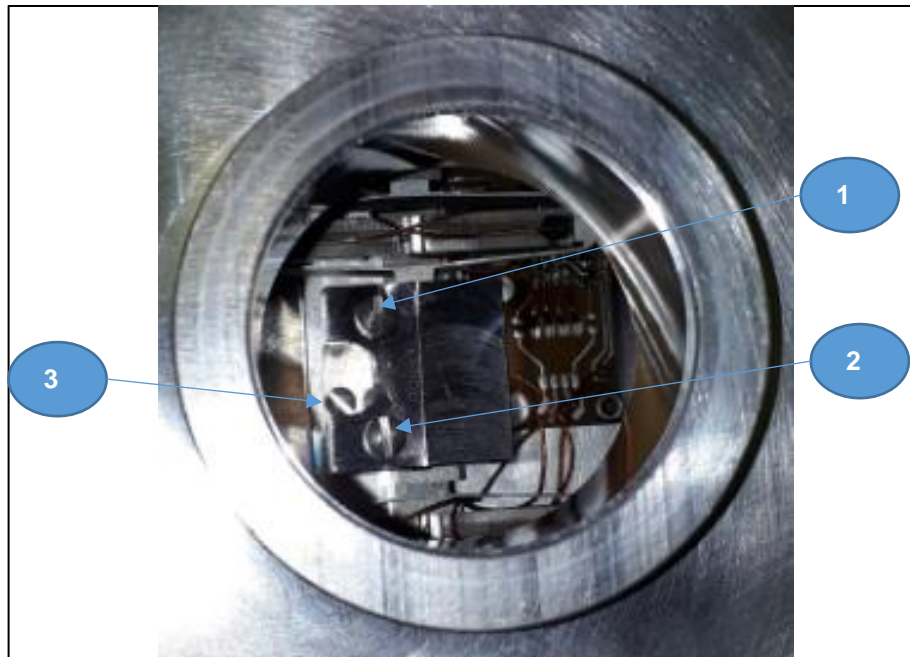


Figure 8 View from open nipple

5. Store the transport clamp in safe position for any further maintenance.

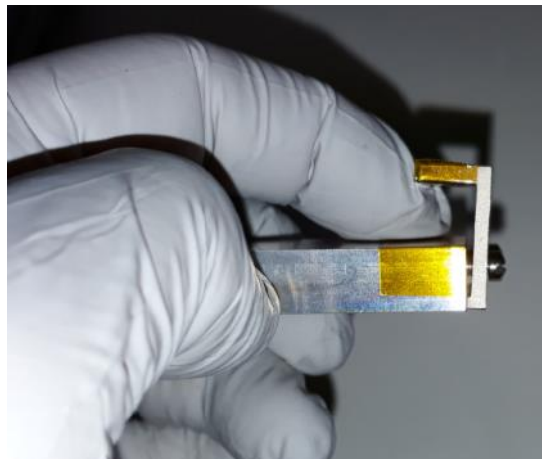


Figure 9 Transport clamp

6. To replace the transport clamp, realize the exact inverse actions. Be sure screws 1, 2 and 3 are free to move within their housing.

MAINTENANCE

Additionally, maintenance may be done (replacement/improvement of shutter product) following next instructions. During any work on the inner and sealing surfaces of the vacuum box and when handling the component, wearing of clean, lint-free gloves is required to prevent contamination of the vacuum-facing surfaces. Feel free to contact CTEC if you face any doubt.

1. Shut down power and remove external connector.
2. It is good practice to replace the transport clamp system to avoid major risk for mechanism during handling.
3. Remove the 8 front screws. Keep them carefully.
4. Remove extremely carefully the front panel as a connector is inside the box. Cables may bend the shutter and damage it. Therefore take extreme care and remove connector from the inside part.
5. Remove the 2 holding M3 screws of the bracket (see Figure 10).

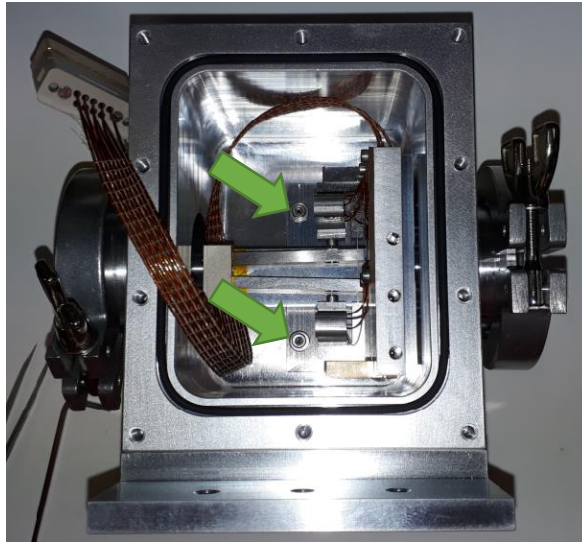


Figure 10 Position of bracket screws within the vacuum box

6. Remove the bracket taking care not to touch the box with the long shutter arms.
7. Remove the shutter from the bracket unscrewing the 4 screws.
8. To remount the assembly, redo the operations in inverse order.

III. WARRANTY CONDITIONS AND EXCEPTIONS

The equipment is warranted for a period of one year from date of shipment, 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. During the warranty period, Cedrat Technologies will, at its option, either repair or replace products which prove to be defective.

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 actuator 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 APA (soldering out of electrical wires, plugs change,...) or the standard mechanical interfaces

This warranty will not apply if the proper use is not at least partially justified by the following data acquisition:

- Number of cycles (frequency, shape and duration)
- Temperature
- Hygrometry

Depending on your application some additional data has to be recorded. Please refer to previous paragraphs to see which data is relevant to monitor to activate the warranty.

No other warranty is expressed or implied. Cedrat Technologies specifically disclaims the implied warranties of merchantability and fitness for a particular purpose

IV. 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 which is delivered with the actuator.

Immediately upon receipt, the product 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.

V. AFTER-SALE SERVICE

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.

VI. DISPOSAL

In accordance with the applicable EU law, electrical and electronic equipment may not be disposed of with unsorted municipal wastes in the member states of the EU.

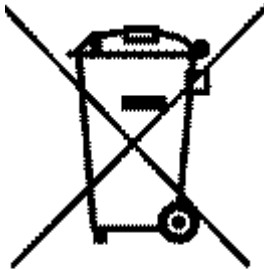
When disposing of your old equipment, observe the international, national and local rules and regulations.

To meet the manufacturer's product responsibility with regard to this product, Cedrat Technologies (CTEC) SA ensures environmentally correct disposal of old CTEC equipment that was first put into circulation after 13 August 2005, free of charge.

If you have old CTEC equipment, you can send it to the following address (please contact CTEC prior expedition):

CEDRAT TECHNOLOGIES S.A.

59 Chemin du Vieux Chêne - Inovalée - 38246 MEYLAN cedex - FRANCE



VII. ANNEX 1: TROUBLE SHOOTING FORM

In case of trouble or breakdown with the electronic device, this form must be completed by the customer in order to:

- allow Cedrat Technologies to authorise the product return back to the factory,
- help Cedrat Technologies in repairing it.

Product: Please give mention here the references and delivery date,

History: Please summarise here every action which has been performed with the device since the delivery,

Problem description: Please describe here the problems faced with the electronics and which are not described in the paragraph 3,

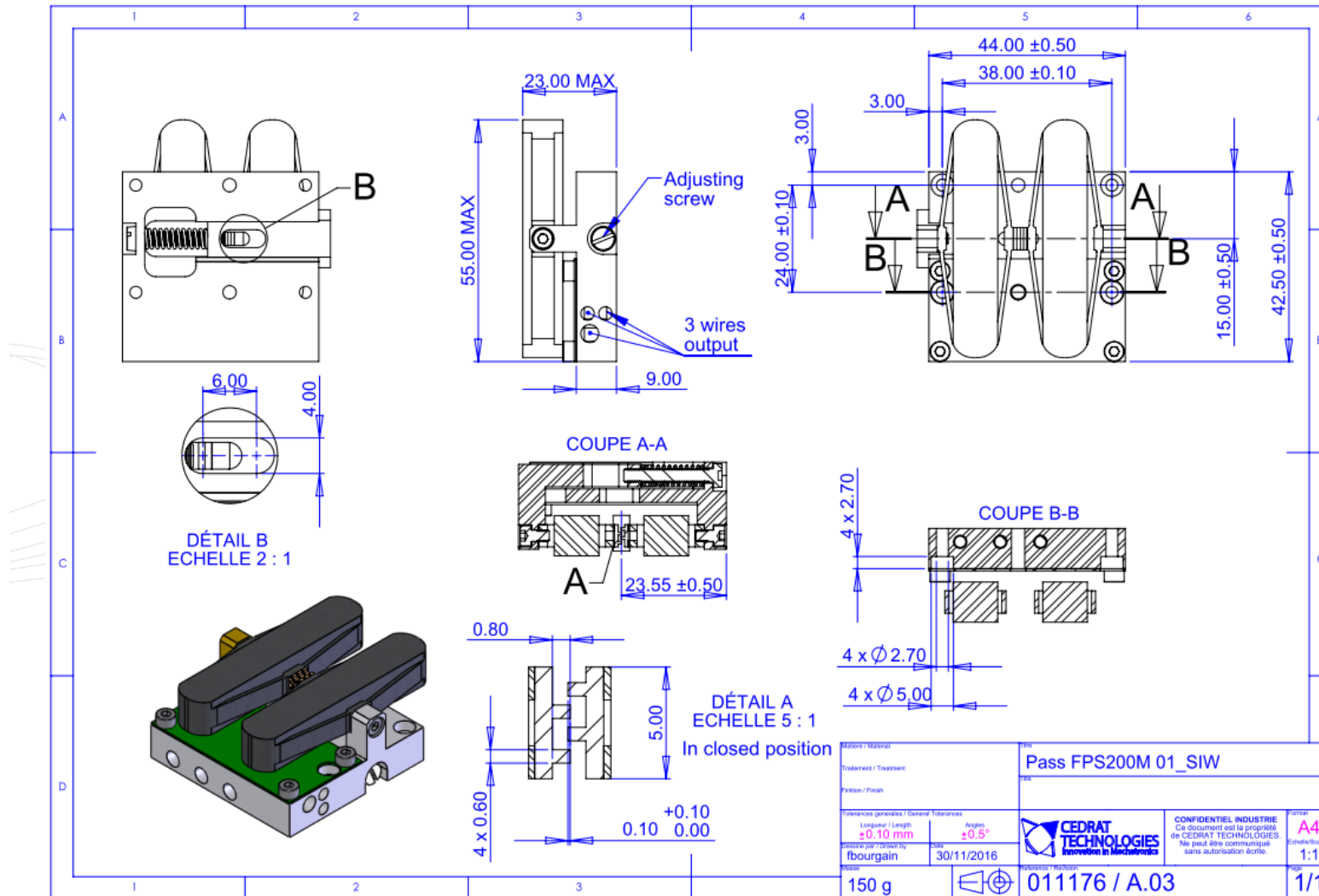
Notations: Please define here the short term used for external devices plugged in the electronics in order to make the writing of "problem identification" easier,

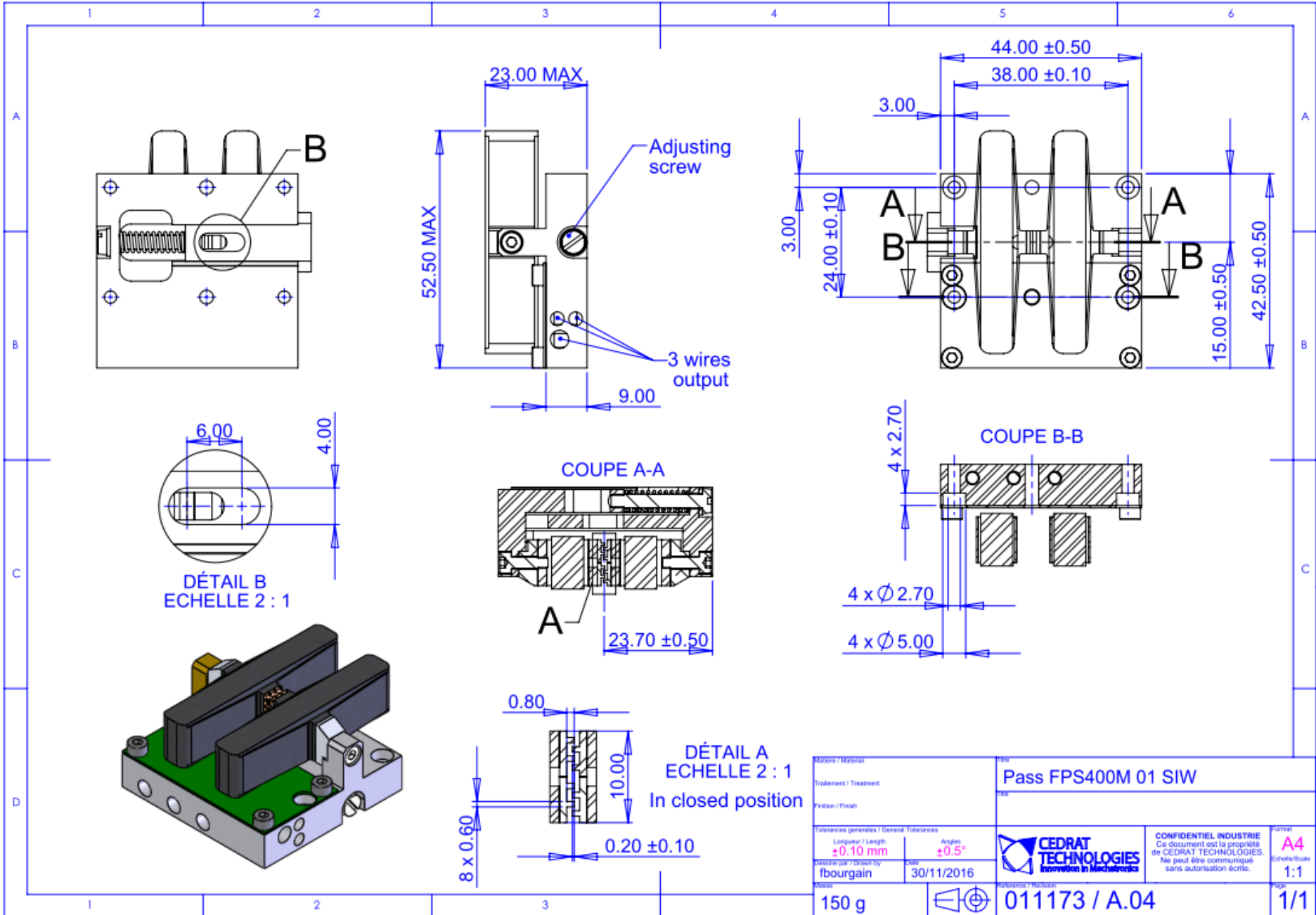
Problem identification: Please summarise and describe here, using the "notations", the operation that could lead to problem identification,

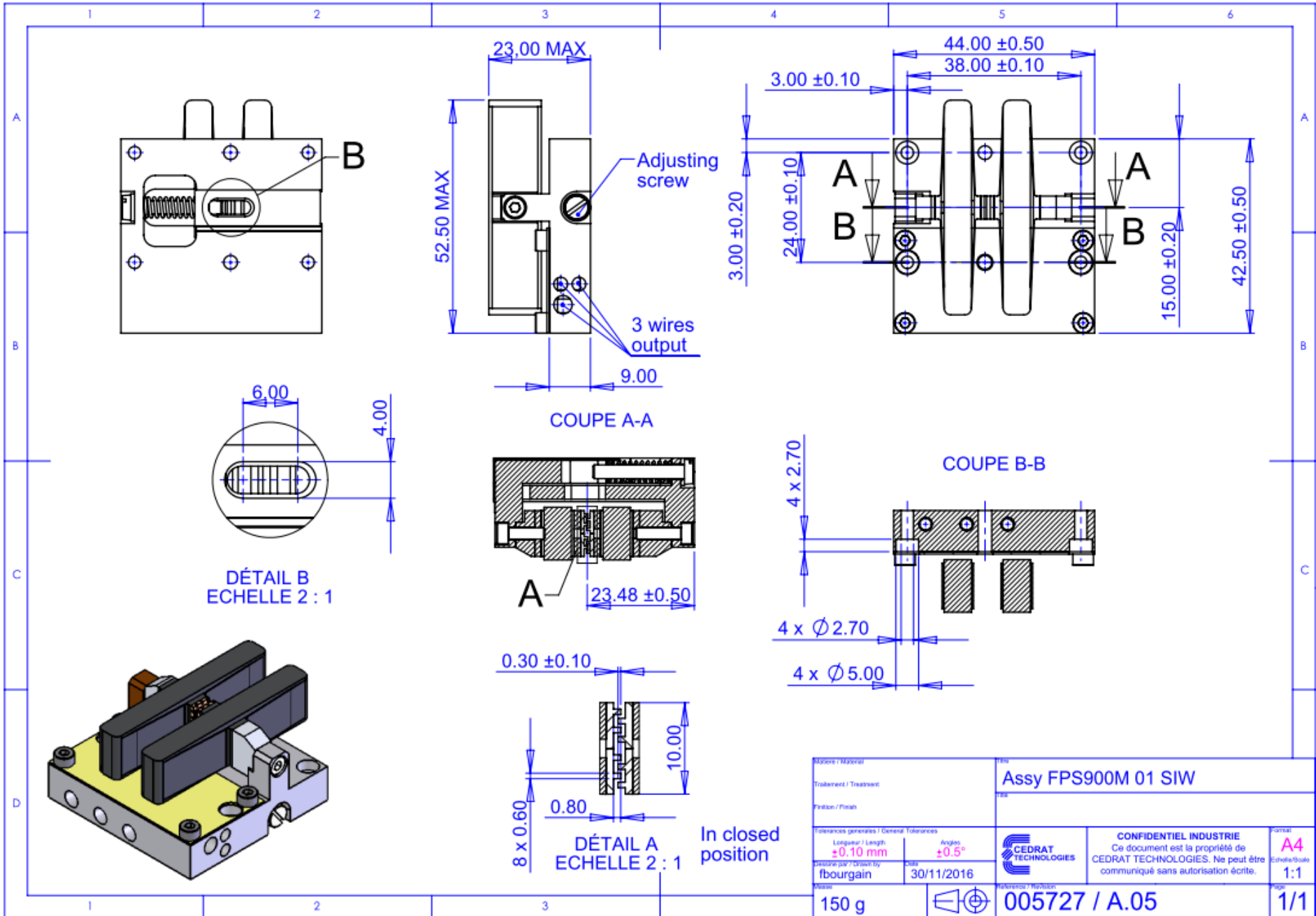
Action: Please mention and update here every action undertaken by yourself, by Cedrat Technologies or by your local vendor,

Please note that you need to get the authorisation from CEDRAT TECHNOLOGIES before sending back the hardware.

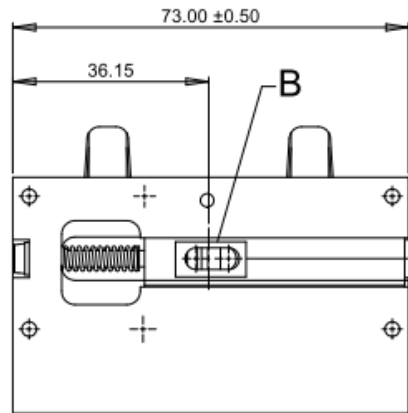
VIII. ANNEX 2: INTERFACE CONTROL DOCUMENTS



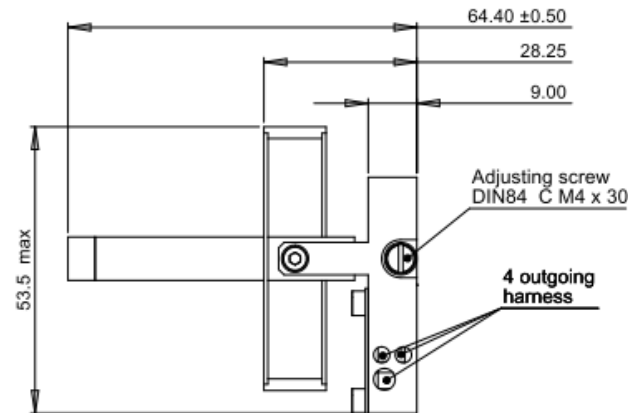
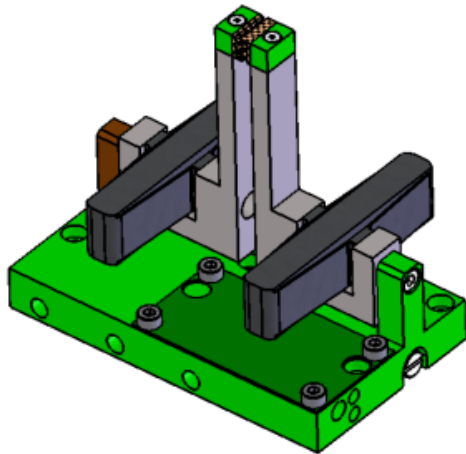
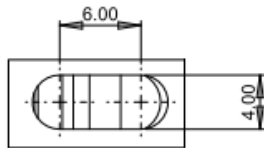




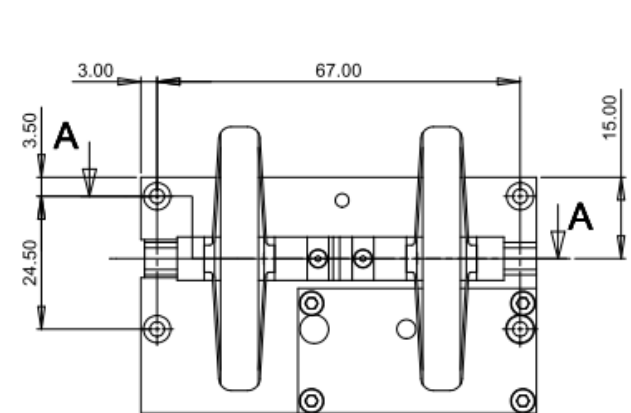
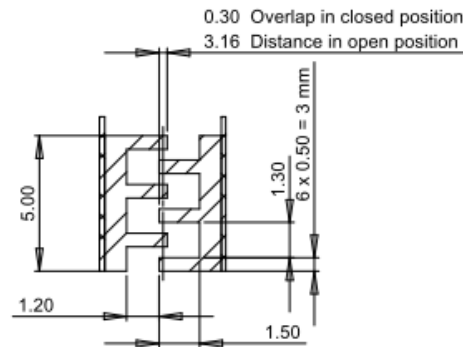
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Dessiné par / Drawn by fbourgain		Date 30/11/2016	
Masse 150 g		Référence / Revision 005727 / A.05	
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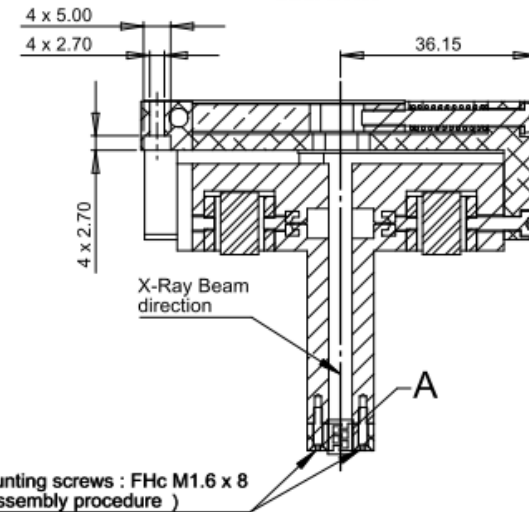
DÉTAIL B
ECHELLE 3 : 1



DÉTAIL A
ECHELLE 6 : 1
In closed position



COUPE A-A



Shutter dismounting screws : Fhc M1.6 x 8
(According assembly procedure)

Electrical interface :

APA

2 harness Twisted pairs AWG26 Polyimide tape / Length 15
Connector LEMO FAA.00.250.CTAC22

Strain gauge

2 harness Twisted quads AWG32 PFA / Lenth 15 m
Connector LEMO FGG.00.304.CLAD22

Drawn par / Dessiné by nbencheikh	Model / Modèle Treatment / Traitement	ICD_FAPS_400M	
Verifed par / Vérifié by AJ Pages	Finishing / Finis	ICD_FAPS_400M	
Valid par / Approuvé by F Bourgain	Fabrication process / Usinage / Fabrication Length / Longueur ± 0.10 mm Angle / Angle $\pm 0.5^\circ$		CONFIDENTIEL INDUSTRIE Ce document est la propriété de CEDRAT TECHNOLOGIES No peut être communiqué sans autorisation écrite.
	R&D 25/01/2016		A3 12:1
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