



FAME-UHD experimental station

5 crystals Crystal Analyser Spectrometer

Volume IV - Documents concerning other products incorporated into the equipment



Date	Version	Reason	Writer	Technical approval	Safety approval
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Table of contents

1	Introduction	4
	1.1 Contents of the CE declaration	4
	1.2 Details of the different volume	4
2	JJ X-ray slits	5
3	Silicon Drift Detector - Vortex®-60EX X-ray Detector	10
	3.1 General Description.....	10
	3.2 Specifications.....	10
4	Hybrid photon counting pixels detector - XPAD-S70	13
	4.1 General Description.....	13
	4.2 Specifications.....	13
5	Experimental Table Symétrie : CE certification	14
6	Large active area Si photodiode - Hamamatsu S3590-09.....	15
	6.1 General Description.....	15
	6.2 Mounting of unsealed products	16
7	Beryllium windows foil specification.....	20
	7.1 Beryllium foil specification	20
	7.2 Beryllium window flange.....	21
8	Newport Sample-Holder	22
	8.1 Generalities	22
	8.2 TRA25 PPD miniature motorized actuator, 25mm Travel.....	24
	8.2.1 Dimensions	24
	8.2.2 Technical Specifications.....	24
	8.3 Double-Row Ball Bearing Linear Stage, M-UMR8.25.....	27
	8.3.1 Dimensions	27
	8.3.2 Technical Specifications.....	27
	8.4 Precision Ball Bearing Vertical Linear Stage, M-MVN80	28
	8.4.1 Dimensions	28
	8.4.2 Technical Specifications.....	28
	8.5 Compact Rotation Stage, 360°, SR50PP	29
	8.5.1 Dimensions	29
	8.5.2 Technical Specifications.....	29
9	Hexapode installation	32
	9.1 Sikadur 53.....	32
	9.2 Hexapode table	40
	9.3 Hexapode table attachement.....	41
	9.4 Hexapode power supply.....	42

1 Introduction

1.1 Contents of the CE declaration

Designation of the equipment:

Type: 14 crystals Crystal Analyzer Spectrometer for High Energy Resolution X-ray Fluorescence detection

The equipment manufacturer is:

CNRS - Institut Néel

No. SIRET: 180 089 013 00387

25 Avenue des Martyrs

38042 Grenoble, France

Authorised representative:

Etienne Bustarret – Head of the French CRG Exploitation Structure for the CNRS - Neel Institute Director

Institut NEEL CNRS/UGA UPR2940

25 rue des Martyrs

38042 GRENOBLE Cedex 9 - FRANCE

The equipment is in conformity with:

2006/42/EC Machinery

2006/95/EC Low voltage

2004/108/EC Electromagnetic compatibility

1.2 Details of the different volume

The technical documentation for the CE Certification is:

Volume I: User instruction (User manual + Maintenance)

Volume II: Risk assessment

Volume III: Drawings, calculation notes, tests results, graph

Volume IV: Documents concerning other products incorporated into the equipment

This document has been compiled by:

Olivier PROUX

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2 JJ X-ray slits

Generalities

The JJ X-Ray AT-C30-HV slit was developed for applications where relatively large apertures (up to 30 mm x 30 mm), and/or highly accurate slit-scans are required. The AT-C30 is therefore an optimum solution for customers with a need for blade motions similar to those of the standard AT-F7-HV slit, who have found the 7 mm opening too small.

The slit system holds four motors that set the position and the opening of the aperture. For each dimension, one motor defines the aperture opening and another determines the position of the aperture. Due to the fact that only one motor is moved during a one-dimensional scan, the AT-C30-HV is the optimum choice for high precision scans with a fixed and relatively large aperture.

The blades can be installed in two configurations, either providing a curved surface of radius 16 mm or providing a knife-edge sloping at 0.5 degrees. Standard blades are polished to obtain a roughness better than 25 nm RMS.

In its basic configuration, the AT-C30-HV slit is delivered with a flange-opening and tightening bolts to allow connection with KF-40 flanges.

Key Facts of AT-C30-HV	
Aperture size	Maximum: 30 mm x 30 mm Minimum: Full Overlap
Resolution	1 micron per full step
Repeatability	< 2 micron
Accuracy	± 2 micron (over 3 mm)
Vacuum	O-ring sealed, high vacuum 10 ⁻⁵ mbar, low outgassing materials
Mechanical dimension	249 mm x 249 mm x 68 mm 184 mm x 184 mm x 64 mm (housing only)
Standard blades	2 mm thick tungsten carbide blades, can be mounted either with 0.5 degree knife-edge or R16 radius edge
Mechanical connections	M5-threaded holes on the sides as shown on the drawing. KF-40 flange connections are provided on the body of both sides of the slit
Limit switches (end-of-travel)	Included as standard on all motions
Weight	≈ 6.1 kg
Outer surface	Anodized aluminum in color nature
Guiding	High precision internal rails and carriages
Electrical connections	Microswitches coupled to 2 motor connectors (SUB-D 15 pins male)
Motors	2 phase stepping motors
Outer surface	Anodized aluminum in color nature
Guiding	High precision internal rails and carriages
Electrical connections	Microswitches coupled to 2 motor connectors (SUB-D 15 pins male)
Motors	2 phase stepping motors

Table 1. JJ X-ray AT-C30-HV slits main characteristics

Cabling

Pin		Color*
1	M1 Ph 1+	Black
2	M1 Ph 1 -	Green
3	M1 Ph 2+	Red
4	M1 Ph 2 -	Blue
5	M2 Ph 1+	Black
6	M2 Ph 1 -	Green
7	M2 Ph 2+	Red
8	M2 Ph 2 -	Blue
9	Not connected	
10	Not connected	
11	+Limit M1 (far from motor)	Red
12	- Limit M1 (near motor)	Black
13	+Limit M2 (far from motor)	Blue
14	- Limit M2 (near motor)	Orange
15	Limit GND	White

Table 2. Connector table for AT-C30-HV (SUB-D 15 pin male). M1 and M2 are specifying the motors on each slit house (one slit system consist of two identical houses). Some users will provide their own cables, whose exact configuration will depend on the exact specification of the drivers. Please contact us if you need additional cabling diagrams.

*Wiring for teflon cables: Pin 11: White/red; Pin 12: Red/white; Pin 13: White/black; Pin 14: Black/white; Pin 15: Black/blue

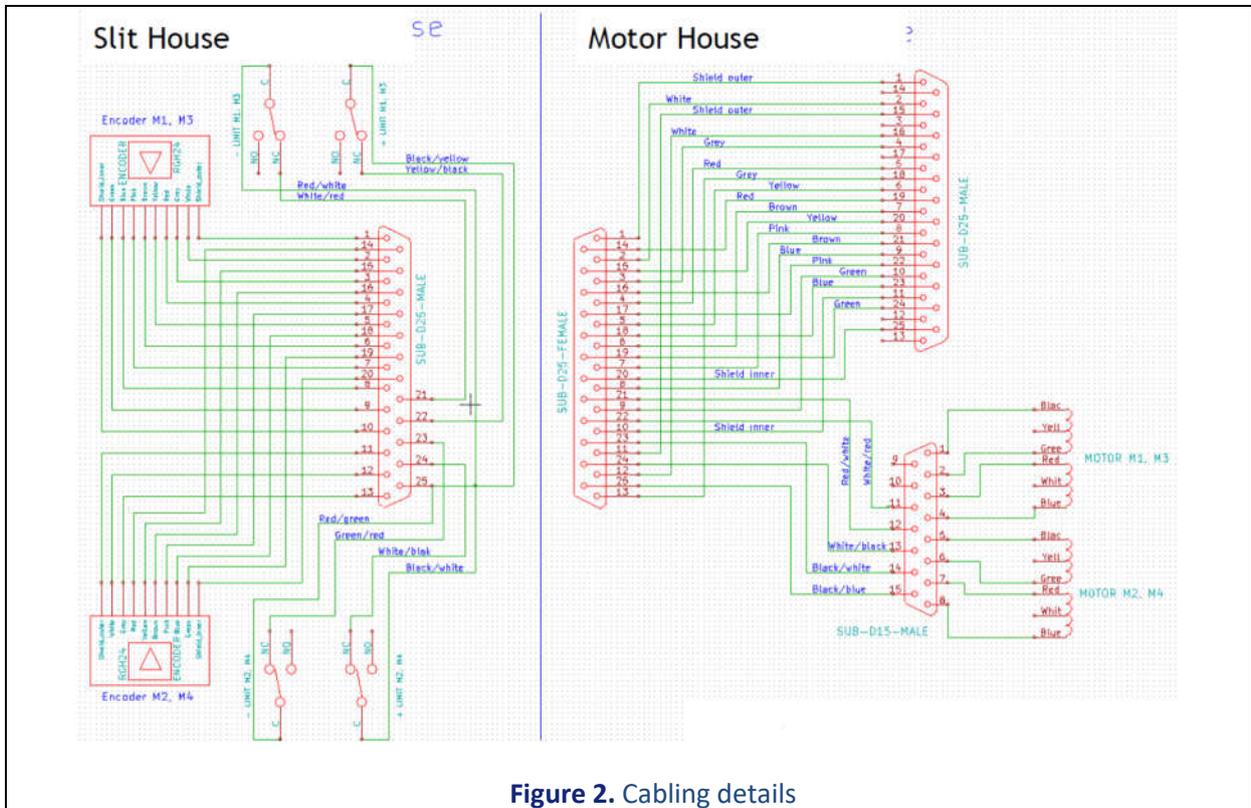


Figure 2. Cabling details

Motor Specifications

Motor Specifications	
Number of motors	4
Motor type	2-phase stepping motor
Manufacturer	Oriental Motors
Motor make	PK245M-01B
Step angle	0.9°
Connection type	Bipolar (Serial)
Current per phase	0.85 A/phase
Resistance	6.6 Ω/phase
Inductance	15.6 mH/phase
Limit switches	'+' and '-' end of travel

Motion Mechanism	
Type of motion	Translation
Guidance	In vacuum rails and carriages
Motor step angle	0.9°/step
Motor gear	None
Lead screw pitch	0.4 mm/rev
Scale factor	1000 steps/mm
Mechanical resolution	1 μm/step
Translation calibration	1 μm/step
Inductance	15.6 mH/phase
Limit switches	'+' and '-' end of travel

Recommended Driver Settings	
The motors should be run at 1.2 A per phase. The motors have been tested at:	
Running speeds	1000 steps/second
Starting speeds	300 steps/second
Ramp times	0.1 second

Table 3. JJ X-ray AT-C30-HV slit motor specifications. Always use “backlash correction” if available (i.e. the motor always approaches the final position from the same side). A useful backlash parameter could be 0.1 mm.

Warning:

If you are using systems/detectors that can be damaged by overexposure, where the slits are used to remove a lot of the intensity, be careful when changing aperture size since the backlash correction may result in the slit being opened significantly more than you anticipated during adjustment.

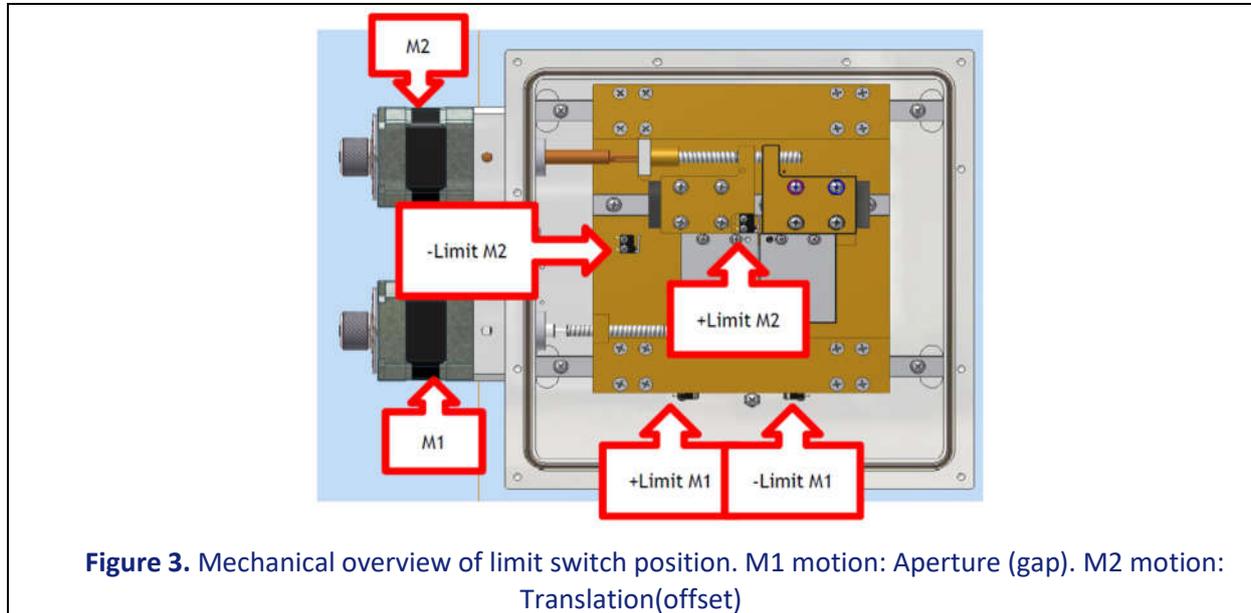
Manual control

If for some reason, you need to move the slit blades manually, it is possible to use the scale wheel attached to the back shaft of the motor. It is probably easiest, if this operation is done with an open cover so you can see what is going on.

The manual control is not possible in slit-versions with back shaft encoders or slit versions mounted with IMS motors.

Limit Switches

The limit switches should be wired up, if at all possible. There is always some ambiguity in the definition of the travel direction. The first time you test the slits and cables you should therefore open up the slit and test the actual functioning of the limit switches. Below we show an image that may help you in determining the appropriate limit switch setup.



Trouble Shooting

The most common issues and their resolutions are: The motor does not move when it should (it can be silent, be jittering or be making a noise).

- The motor is not receiving enough current. Try setting the current a bit higher (for example 10%). If problems persist check with an amp-meter to see that your driver is working properly.
- The wiring is bad. Check cabling.
- One of the motors' phases is burnt. Check that the resistance on all phases is the same. If not, contact us to have the slit sent for repair.
- The motor is stuck against a limit switch. Un-stick it, using the scale wheel or, if an AT-slit, open the slit (see manual control), and fix the limit switch issue. Restart the controller and the controller program. The blade system shows irreproducibility during operation.
- The rail system may have become loose. Open the slit. Check if the rail-system is tight. Tighten screws if you need to.

Common options

- Blade: 4, 5 or 10 mm, other blade materials.
- Motors: Custom high resolution stepping motors, including IMS motors.
- Encoders: Back-axle rotary encoders.
- Connectors: Adaptors to other KF (NW) flanges or CF flanges can be provided.
- Special preparation for enabling vacuum <10⁻⁶ mbar.

3 Silicon Drift Detector - Vortex®-60EX X-ray Detector

3.1 General Description

Name & type	Silicon Drift X-Ray Detector Spectrometer from Hitachi High-Technologies Science America Inc. Vortex®-60EX
Overview	Vortex®-60EX silicon drift X-ray detectors feature active areas between 50 mm ² and 100 mm ² . Vortex®-EX detectors are produced from high purity Si using state-of-the-art CMOS production technology. They feature excellent energy resolution (<133 eV FWHM at Mn K α is typical) and a high count rate capability (input rate >1 Mcps). At a very short peaking time of 0.25 μ s, an output count rate of 600 kcps is achieved. A unique feature of these detectors is their ability to process high count rates with virtually zero loss in energy resolution and no peak shift with count rate. The Vortex®-EX is operated at near room temperature and cooled by a thermoelectric cooler (TEC) and can be cycled as frequently as needed without any degradation in detector performance. Cool down times are typically less than 3 minutes. The Vortex®-60EX X-ray spectroscopy system includes a detector unit and control box, which includes power supplies for the detector and TEC, a digital pulse processor with PI-SPEC Software. The complete detector also contains a charge-sensitive preamplifier and temperature stabilization system, which eliminates concerns of varying ambient temperature.
Features	60 mm Probe Available in 50, 65, & 100mm ² Available in thickness of 0.5 and 1mm Superb energy resolution Detector temperature stabilization Additional sizes are available under special contracts Small and compact package for minimum vibration Digital pulse processor (DPP) with PI-SPEC Software
US Patent Number	6,455,858 7,129,501 B2

Table 4. Silicon Drift Detector general description

3.2 Specifications

Detector	Material–Silicon Active Area–50mm ² -Thickness–350 μ m-450 μ m
Window	Material–Beryllium Thickness–12.5 and 25 μ m (alternatives available)
Energy Resolution (FWHM) @ 5.9 keV	@ 12 μ s Peaking Time - <130 eV Typical, 140 eV Maximum @ 4 μ s Peaking Time - <145 eV Typical, 150 eV Maximum @ 1 μ s Peaking Time - <165 eV Typical, 178 eV Maximum @ 0.25 μ s Peaking Time - <230 eV Typical, 250 eV Maximum
Preamplifier	Type – Charge sensitive, 1.6 mV/keV Signal polarity – Positive Reset – Electrical, <1 μ s duration Rise time – <100 ns
Cooling	Thermoelectric
Power Consumption	Nominal voltage – 110/230 V (switchable) Power supply and detector – 40 W Max.
Physical Specifications	Detector package weight – 900g Length – 227 mm (60 mm probe) Height×Width – 62mm×62mm Cable Standard Length – 3m
Digital Pulse Processor (DPP)	PI-SPEC Software
Digital Controls	Gain–16-Bit DAC Peaking Time – 0.25–64 μ s Preset Time – Up to 1717s
Data Output	Spectrum Size – 1024, 2048, 4096 or 8192 channels Channel Size – 10, 20 or 40 eV
Integr. Non-linearity	0.1% of full-scale output
Deadtime Correction	Better than \pm 0.5% accuracy from 0 to 120,000 cps at 4 μ s peaking time

Table 5. Silicon Drift Detector specifications

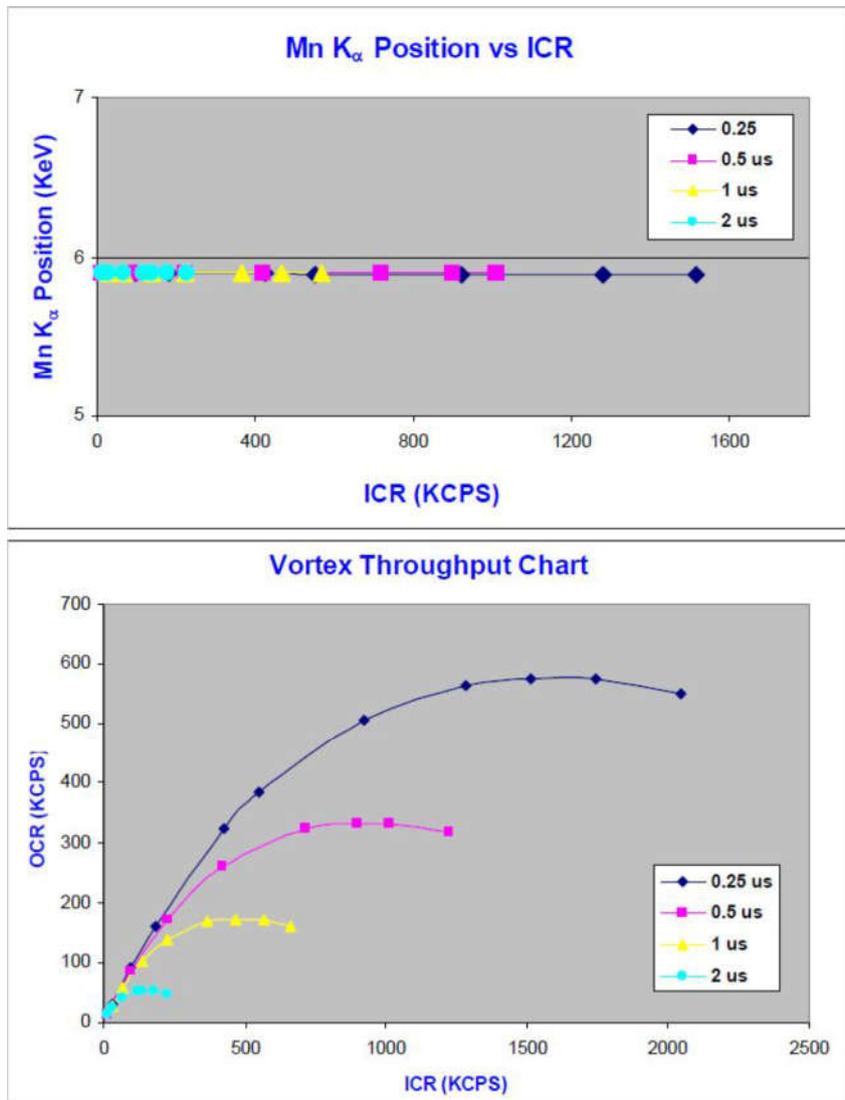
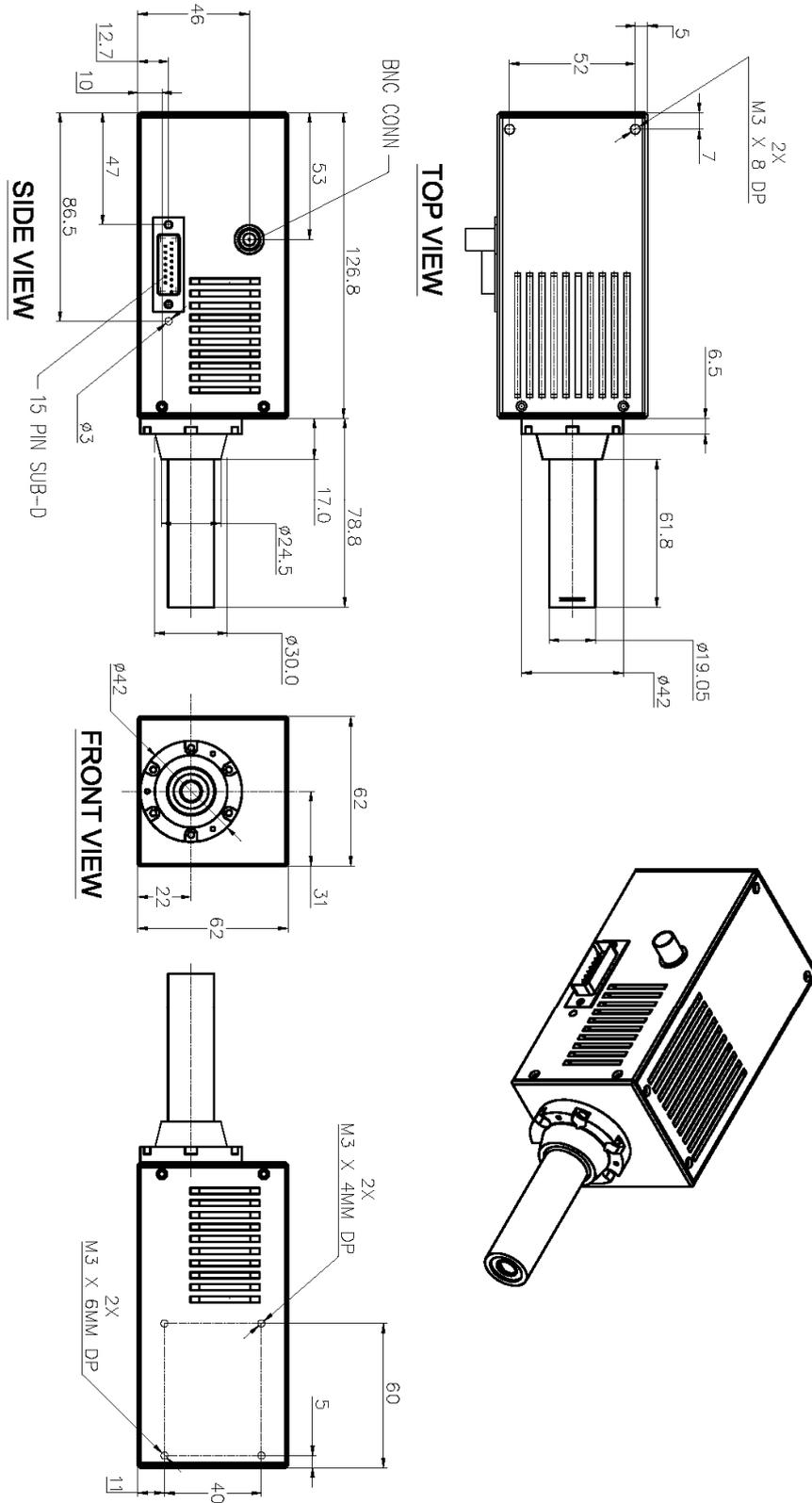


Figure 4. Silicon Drift Detector counting measurements



NOTES:
MODEL NO. 739-VTX-60EX

VORTEX 60EX

Figure 5. Silicon Drift Detector external design

4 Hybrid photon counting pixels detector - XPAD-S70

4.1 General Description

Name & type	hybrid photon counting pixels detector from ImXpad company XPAD-S70
Overview	Xpad detectors are based on the photon counting technology providing a quasi noiseless imaging as well as a very high dynamic range (32 bits) and fast frame rates (up to 700 images/s). Energy discrimination, only possible with photon counting detectors, opens the possibility to color imaging. Current detector materials used in our detectors are Si and CdTe.
Features	No noise Very high dynamic range High image rate (> 500 images/sec) Short gate (electronic shutter ~ 100 ns) Stacking (adding image sequences) Time resolved experiments



Table 6. Hybrid photon counting pixels detector general description

4.2 Specifications

Dynamic range	32 bits
Counting rate	7×10^5 ph/sec/pix
Energy range	7 - 35 keV
Quantum efficiency	99%@9 keV, 70%@15 keV (measured)
Threshold range	5 -30 keV
Frame rate	100 Hz / option 700 Hz 700 Hz by bunches of 900 images
Point-spread function	1 pixel
Cooling	Air-cooled
Power consumption	8 W
Pixel size	$130 \times 130 \mu\text{m}^2$
Pixels number	67 200 (560 x 120)
Active area	$7,5 \times 1,5 \text{ cm}^2$
Sensor thickness	500 μm
Number of modules	1
Overall dimensions(WHD)	120 x190x 45 mm ³
Weight	1 kg

Table 7. Hybrid photon counting pixels detector specifications

5 Experimental Table Symétrie : CE certification

ANNEXE 1 EC DECLARATION OF CONFORMITY

The designer and manufacturer designated below:

SYMETRIE
10, Allee Charles BABBAGE
30035 Nimes – Cedex 1
FRANCE



Declare that the electrical equipment, for measurement, control and laboratory use, designated below:

Type:	Positioning hexapod
Manufacturer:	SYMETRIE
Model:	JORAN
Serial Number:	14315
Manufacturing Year:	2015

Identified with "CE" mark, complies with requirements of following Directives:

- ✓ 2006/42/CE Machine Safety
- ✓ 2006/95/CE Low voltage applied to electrical equipment

And the technical requirements of Appendix I of the Labor Legislation (amended by Decree 96-725).

Written in Nimes, 24 February 2016

Thierry ROUX
 Technical Director



Figure 6. Experimental Table Symétrie : CE certification declaration of conformity

6 Large active area Si photodiode - Hamamatsu S3590-09¹

6.1 General Description

Specifications	
Photosensitive area	10 × 10 mm
Window material	Unsealed
Package	Ceramic
Reverse voltage (max.)	100 V
Spectral response range	340 to 1100 nm
Peak sensitivity wavelength (typ.)	960 nm
Photosensitivity (typ.)	0.66 A/W
Dark current (max.)	6000 pA
Cutoff frequency (typ.)	40 MHz
Terminal capacitance (typ.)	40 pF
Measurement condition	T _a =25 °C, Typ., unless otherwise noted, Photosensitivity: λ=λ _p , Dark current: V _R =70 V, Cutoff frequency: V _R =70 V, Terminal capacitance: V _R =70 V, f=1 MHz

Table 8. Hamamatsu S3590-09 main specifications

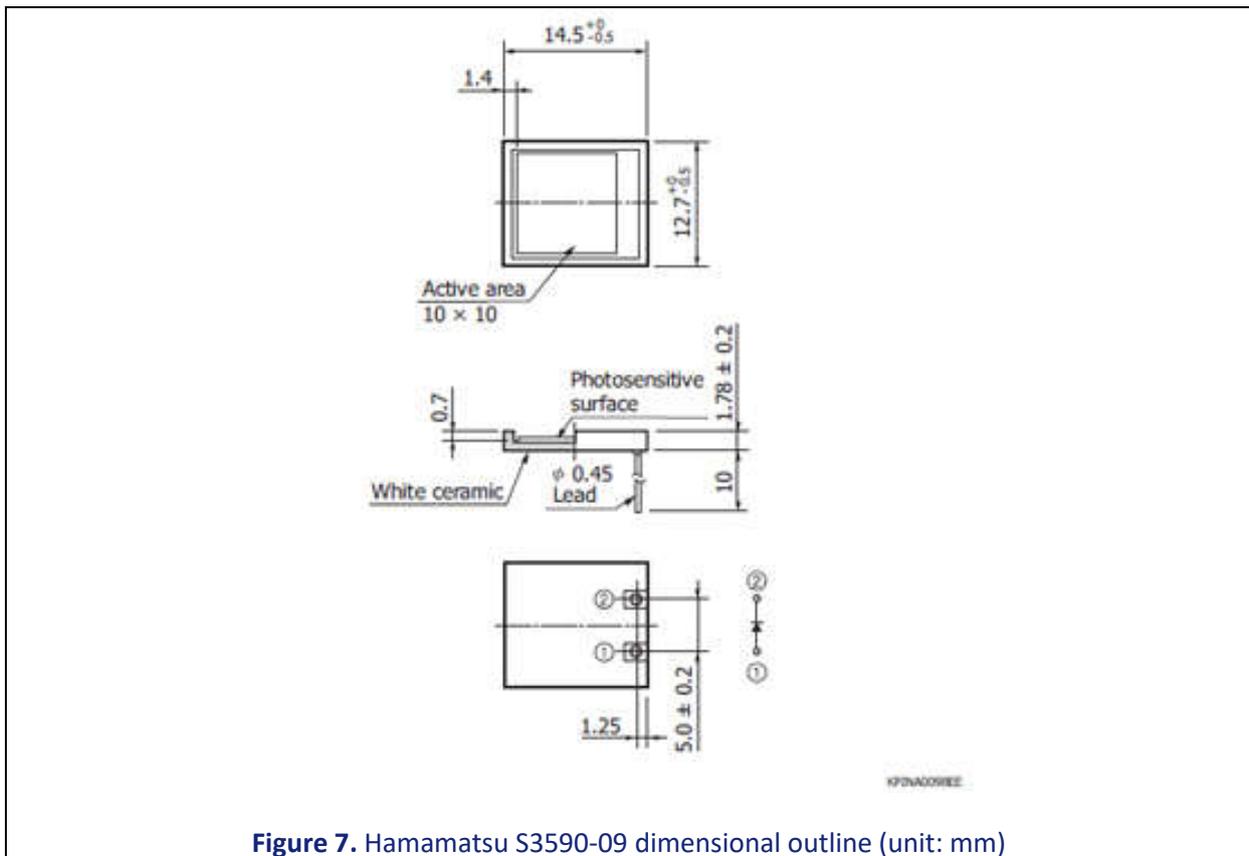


Figure 7. Hamamatsu S3590-09 dimensional outline (unit: mm)

¹ Information obtained on Hamamatsu website :
<http://www.hamamatsu.com/us/en/product/category/3100/4001/4103/S3590-09/index.html>

6.2 Mounting of unsealed products

Unsealed products are opto-semiconductors whose chip is exposed. Parts such as electrodes on the chip are not protected by an external enclosure and so require especially strict care during handling compared to ordinary products.

What is an unsealed product?

An unsealed product is an unprotected item having no window material or similar enclosure and where the chip forming the photosensitive area or light emitting area is exposed to air. Unsealed products also include products with a temporarily attached window (including protective tape) during shipping, which is removed prior to use. Unlike ordinary packaged products, the chips on these unsealed products are not protected by an external enclosure and so require special care to prevent physical breakage or contamination. Bare chip products (wafers or diced chips) do not fall under unsealed products.

Handling

(1) Usage environments

- Open the moisture-proof packing and mount in a clean room environment (within class 10000)
- Use the unsealed product (hereafter called “the product”) in an environment between 15 to 35°C, and within 45 to 75% humidity. Avoid using the product under any other conditions.
- Condensation may form on the chip surface in environments subject to sharp or sudden fluctuations in temperature, so avoid use in such locations. After the thermoelectrically cooled type is used by cooling, to prevent condensation on the chip surface, make sure that the product returns completely to room temperature before exposing it to air. Condensation on the chip surface can cause wiring corrosion or poor device characteristics or reliability due to ionization of substances adhering to the chip. In environments where the finished product is used, take measures to prevent condensation from forming on the chip.

(2) General handling precautions

- Wear a mask and gloves, and handle the product with tweezers in a clean bench or a clean room and be careful not to contaminate the chip. If substances containing ions (such as sweat, fingerprints, saliva, etc.) adhere to the chip surface, then device reliability will deteriorate in the form of fluctuations in device electrical characteristics or poor photosensitivity.
- Take the product out of the moisture-proof package or desiccated atmosphere and mount it within 5 days.
- If the product comes shipped with a temporarily attached window (including protective tape), then after removing static electricity, detach the window just before using the product. This temporarily attached window cannot be reused.
- Applying excessive force to the product using a printed circuit board may cause the board to warp. This warping may damage the chip, wires, or bump connections so use caution.
- Do not let anything come in contact with the chip surface. Though the chip is hard, it is also brittle and easily notched. Sharp or hard items that come in contact with the

chip may cause cracks or scratches, which can lead to fluctuations in electrical characteristics or poor device reliability. Treat any products that were dropped as defect parts and dispose of them.

(3) Wire sections

- The photosensitive areas or light emitting areas are connected to their terminals using gold or aluminum wires only tens of microns in diameter. Never touch these wires. Even just gently touching these wires may cause problems such as shorts or wiring breaks due to warping.
- Even on the product where the wiring is protected, this protection is at best only for the purpose of relieving stress from wire warping when lightly touched. So never let anything come in contact with protected wire sections

(4) Removing contamination

- Use air-blow to remove contamination such as dust particles. When using air-blow, set the air pressure to a level as low as possible by taking effects on wire sections into consideration. Be sure to perform the air-blow work in a clean environment, such as clean room or clean bench. If the air-blow work is performed in a contaminated environment, dust particles may be entangled in an air flow and strike the device surface, causing damage to the device.
- If directly wiping the chip surface is unavoidable, then use a cotton-tipped swab moistened with ethyl alcohol and wipe gently while taking care not to touch the wire sections. Strongly rubbing the same section or wiping it over and over will cause poor electrical characteristics or a loss of device reliability.
- Never attempt wet washing.

(5) Sealing, etc.

Please observe the following precautions when sealing the product or bonding components such as scintillators to the chip section.

- If using resin sealers or adhesives, then use high purity material specifically for semiconductor in order to prevent contamination.
- If the chip surface is exposed during use, then be sure not to let condensation form on the chip surface.

Soldering

The correct soldering time and temperature differs depending on the type of package. Follow the soldering conditions established for each particular product.

(1) Points requiring special caution

- Take adequate care to make sure that the soldering iron tip temperature and the solder time are correct. Do not attempt soldering at high temperatures or long periods.
- Take measures to prevent solder or flux from flying outward and sticking to the chip surface, contaminating it.

(2) Flux

Use non-cleaning solder and rosin type flux. Using flux with relatively strong acid or alkali levels or inorganic flux will cause corrosion on the wire leads.

(3) When using a soldering iron

- To prevent effects from electrostatic charges, use a grounded soldering iron whose insulation resistance is 10 M Ω or more.
- Set the soldering iron tip temperature by referring to the recommended soldering temperature and soldering time conditions. If you cannot provide these conditions, then grip the root of the solder lead you are soldering with tweezers or a similar tool to prevent heat from conducting to the product package.
- Do not let the soldering iron directly contact the package section of the product. Direct contact with the soldering iron may cause mechanical or optical damage.
- Do the soldering so that no stress is applied to the package section of the product. Soldering in a state where stress is applied will cause residual stress after the soldering that tends to cause deterioration.

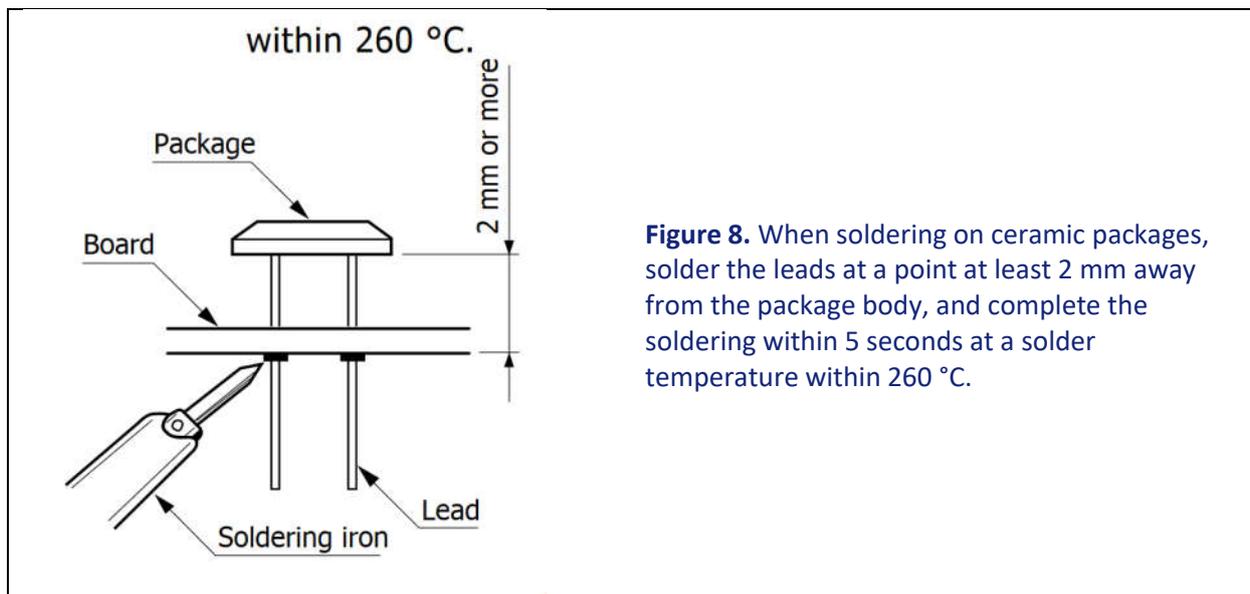


Figure 8. When soldering on ceramic packages, solder the leads at a point at least 2 mm away from the package body, and complete the soldering within 5 seconds at a solder temperature within 260 °C.

(4) Soldering of bump connection products

- Use a solder paste suitable for components with fine pitch leads or terminals.
- Before making bump connections, design a process that takes into account factors such as the solder paste, underfill resin, temperature conditions, and warping of the board due to heating.
- If the packing was opened and the product left in that state for a long period of time, then oxidation will develop on the solder-ball surfaces, causing solder not to melt. So mount the device as quickly as possible after opening the packing.

Electrostatic sensitive devices

Electrostatic sensitive products come with an electrostatic warning label on the product packing. Handling of these products requires taking precautions on the following points to avoid damage and product deterioration due to static electricity.

(1) Workplace and facilities, etc.

- Lay a conductive mat (750 k Ω to 1 G Ω) on the surface of the workbench and ground it.

- Use conductive flooring material or lay a conductive mat on the workplace floor or and ground it.
- Ground all manufacturing equipment and inspection devices.
- Use a grounded soldering iron having an insulation resistance of 10 M Ω
- or higher.
- Keep moisture at approximately 50%. Low humidity tends to cause static electricity and high humidity is prone to moisture absorption.

(2) Handling

- Using an ionizer or similar item to eliminate electrical charges is recommended when handling the unsealed product.
- Wear anti-static clothing and conductive shoes (750 k Ω to 1 G Ω).
- Attach a wrist strap (having protective resistance of 750 k Ω to 5 M Ω) directly to the skin, and ground the strap. Also wear conductive finger sacks or gloves.
- Tools such as tweezers or soldering irons used to handle the product may sometimes become electrically charged. Connect a ground line as needed.
- If the product is induction-charged and contacts with a metal, excessive current may flow due to electrostatic discharge causing damage to the product. To prevent induction charging, keep objects (insulators such as plastic and vinyl, PC display monitors and keyboards, etc. that may possibly be electrically charged) away from the product. The product may be induction-charged even by just bringing such objects close to the product. If keeping such objects near the product is unavoidable, then use an ionizer or similar equipment to remove electrostatic charges from the objects that are apt to be electrostatically charged.
- Friction on the product causes electrostatic charges. If such friction is unavoidable, then remove the electrostatic charges using an ionizer or similar equipment.
- Peripheral devices must be properly grounded so that no surges are applied to the product by a leakage voltage. Do not allow a voltage exceeding the absolute maximum rating to be applied to the product from the measurement instrument, etc. (This tends to occur during ON/OFF switching of power sources, so use caution.) If there is the possibility of a surge voltage, insert a filter (made up of a resistor and capacitor) to protect the unsealed product. During operation do not attach or detach any connector, etc. that are connected to the power supply line or output line.

(3) Carrying, storage and packing

- Use a conductive carrying case and storage shelf.
- When storing the product, avoid placing it near equipment that may generate high voltage or high electromagnetic fields.
- When packing the product, short the electrodes to set them at the same potential and pack with a conductive material.

Note: It is not always necessary to provide all the anti-electrostatic and surge measures stated above. Implement these measures according to the extent of deterioration or damage that may occur

7 Beryllium windows foil specification

7.1 Beryllium foil specification



Ultra-High Purity Beryllium Foil Specification IF-1



Revision C, Issued 1 July 2004

SCOPE

This specification defines the requirements for beryllium foil and x-ray windows produced by machining, extruding, slicing, and/or hot rolling Be ingots cast from vacuum melted electrolytically refined flake and is designated IF-1.

COMPOSITION

The vacuum cast ingot to make foil or x-ray windows to this specification shall meet the following chemical limits:

Be Assay	99.8%	<u>Minimum</u>	
----------	-------	----------------	--

	<u>Maximum</u>		<u>Maximum</u>
Be Oxide	0.06%	Lead	0.0005%
Iron	0.03%	Manganese	0.003%
Aluminum	0.01%	Molybdenum	0.001%
Magnesium	0.006%	Nickel	0.02%
Silicon	0.01%	Calcium	0.02%
Carbon	0.03%	Zinc	0.01%
Chromium	0.0035%	Silver	0.0005%
Cobalt	0.0005%	Titanium	0.001%
Copper	0.005%		

Other metallic impurities as determined by normal spectrographic techniques. Beryllium may be determined by difference (i.e. 100% - other elements).

Detailed analytical procedures used by BW-Electrofusion Products are available upon request.

AVAILABILITY

Foil to this specification is available as flat stock in standard thickness range 0.0001" (2.5 micrometers) to 0.020" (508 micrometers). Foil is supplied cut to shapes such as rectangles, circular discs and other configurations. Foil is supplied either vacuum tight, optically dense or as-rolled in the following thickness ranges.

<u>Classification</u>	<u>Foil Thickness, inch (micrometers)</u>
Vacuum tight	0.0003 (7.6) to under 0.020 (508)
Optically dense	0.0002 (5.1) to under 0.020 (508)
As-rolled	0.0001 (2.5) and over

Please contact Brush Wellman - Electrofusion Products for available sizes and tolerances.

MATERIAL QUALITY

- **Foil Integrity:** Foil is available in three classifications of integrity, as defined below:
Vacuum Tight: There shall be no detectable leakage through the foil when tested with a helium mass spectrometer leak detector with a sensitivity of 1×10^{-9} atm-cc/sec.

Optically Dense: The foil shall not be penetrated by light when tested by illuminating one side of the foil over a restricted area with a high intensity light source and viewing from the opposite side in a darkened room.

As-Rolled: Supplied in as-produced condition, being neither inspected for nor guaranteed to be vacuum tight or optically dense.

- **Surface Quality:** Material shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.
- **Surface Finish:** The surface finish of standard foils shall be 40 microinches R_a or better. Various thicknesses may be available in different surface finishes. Please consult BW-Electrofusion for availability.

TOLERANCES

Thickness	to 0.0009" 0.001"	+0.0002"/-0 +0.0002/ -0.0001"
	0.002" to 0.020"	±10%
Diameter	0.5" to 4.0"	±0.005"
Length & Width	to 3.0" over 3.0"	±0.015" ±0.030"

Special tolerances on disc and straight-cut foils are available on request. Please consult Brush Wellman - Electrofusion Products for price and availability.

PACKAGING

Material will be appropriately identified, packaged, and labeled to comply with applicable government regulations and/or standard procedures of Brush Wellman - Electrofusion Products.

HEALTH AND SAFETY

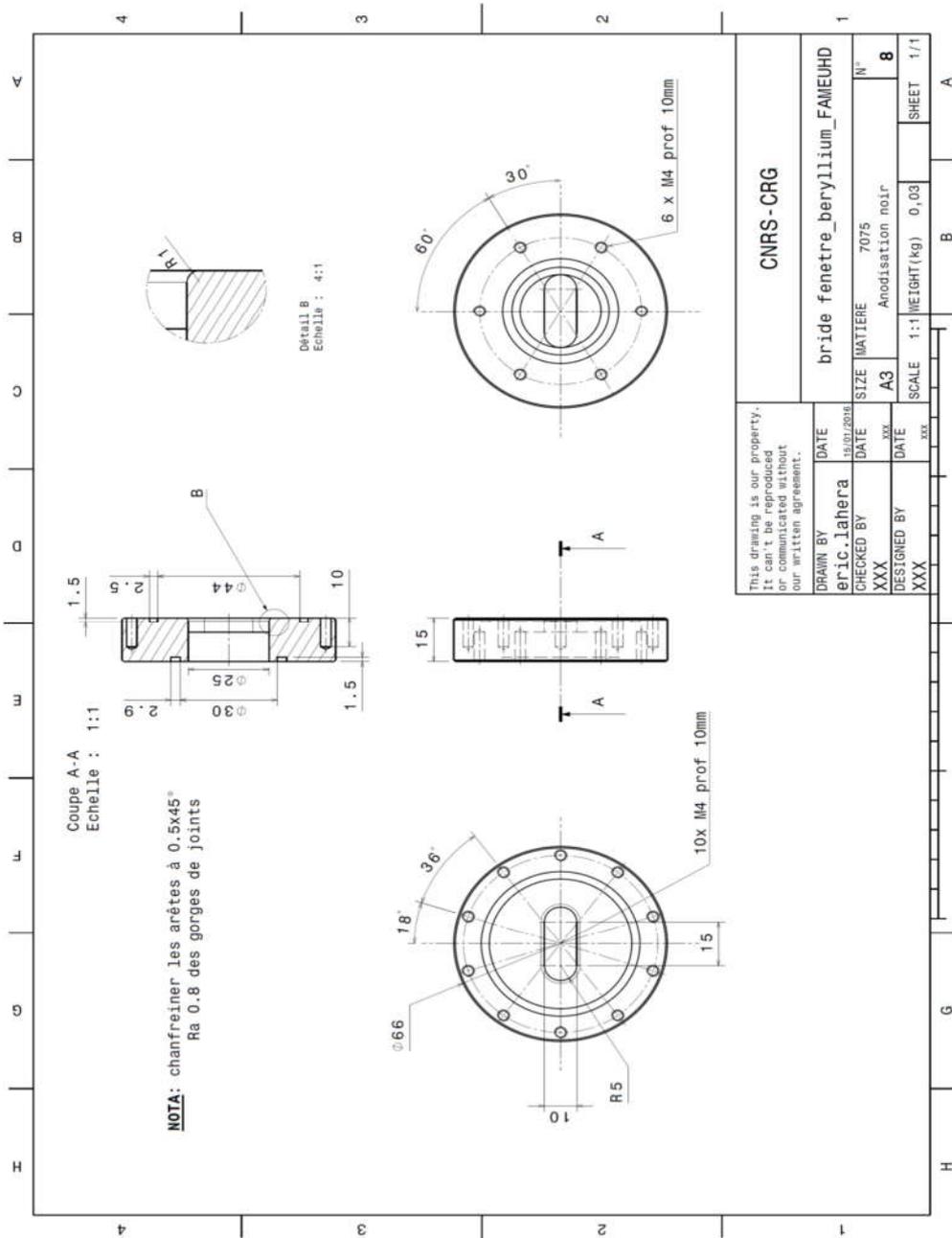
Handling beryllium in solid form poses no special health risk. Like many industrial materials, beryllium-containing materials may pose a health risk if recommended safe handling practices are not followed. Inhalation of airborne beryllium may cause a serious lung disorder in susceptible individuals. The Occupational Safety and Health Administration (OSHA) has set mandatory limits on occupational respiratory exposures. Read and follow the guidance in the Material Safety Data Sheet (MSDS) before working with this material. For additional information on safe handling practices or technical data on beryllium, contact Brush Wellman Inc. - Electrofusion Products.

Brush Wellman Inc.
Electrofusion Products
 44036 South Grimmer Blvd. • Fremont, CA 94538
 800-4Be-FOIL • 510-623-1500 • FAX 510-623-7600
www.ElectrofusionProducts.com

BRUSHWELLMAN
CHALUR METALS MATERIALS
Electrofusion Products

20 | Page

7.2 Beryllium window flange



8 Newport Sample-Holder

8.1 Generalities

The Newport multi-axis sample-holder is composed of

- 4 linear "x" stages, with their corresponding actuator
- 1 linear "z" stage, with their corresponding actuator
- 1 rotation stage
- 3 interface

Motion	Name	Range	Characteristic speed
linear "x" stage	TRech / Y'	25 mm	0.4 mm/s
linear "x" stage	TLech / X'	25 mm	0.4 mm/s
rotation stage	Rech / THETA	360°	4 °/s
linear "z" stage	Zech / Z	12.7 mm	0.2 mm/s
linear "x" stage	Yech / Y	25 mm	0.4 mm/s
linear "x" stage	Xech / X	25 mm	0.4 mm/s

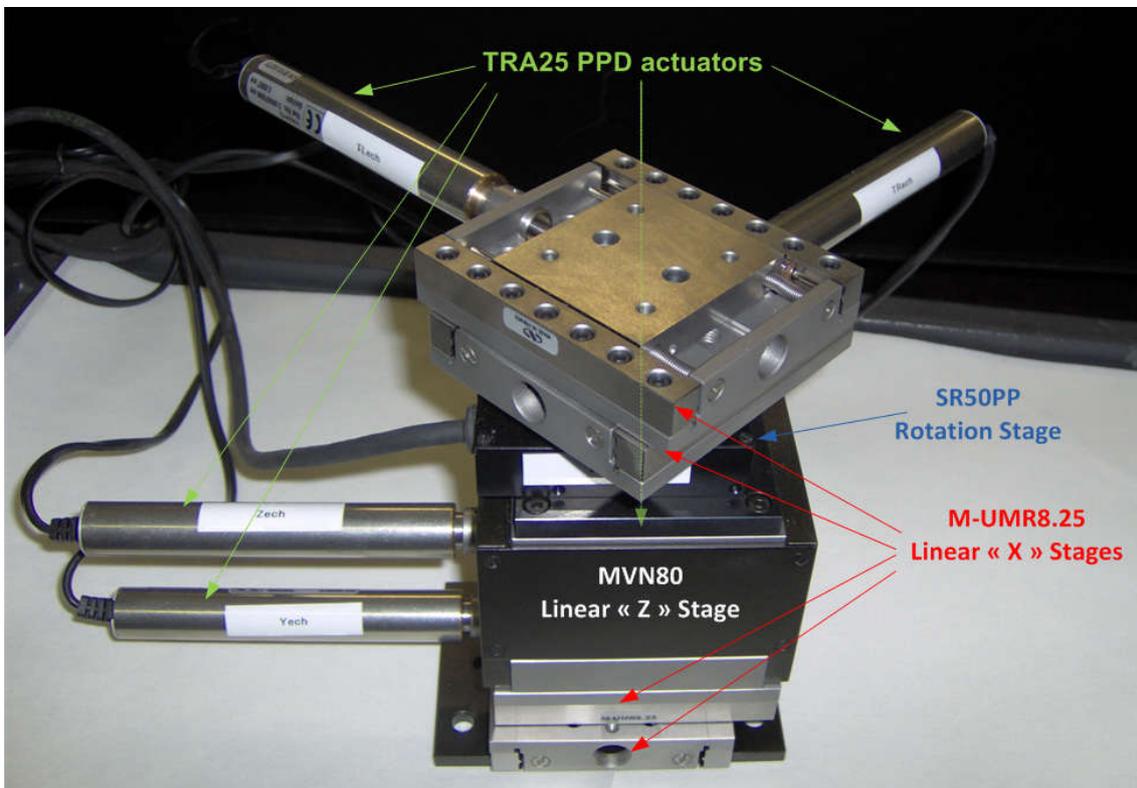


Figure 9. Newport Sample-holder in the final configuration XYZ Theta X'Y'

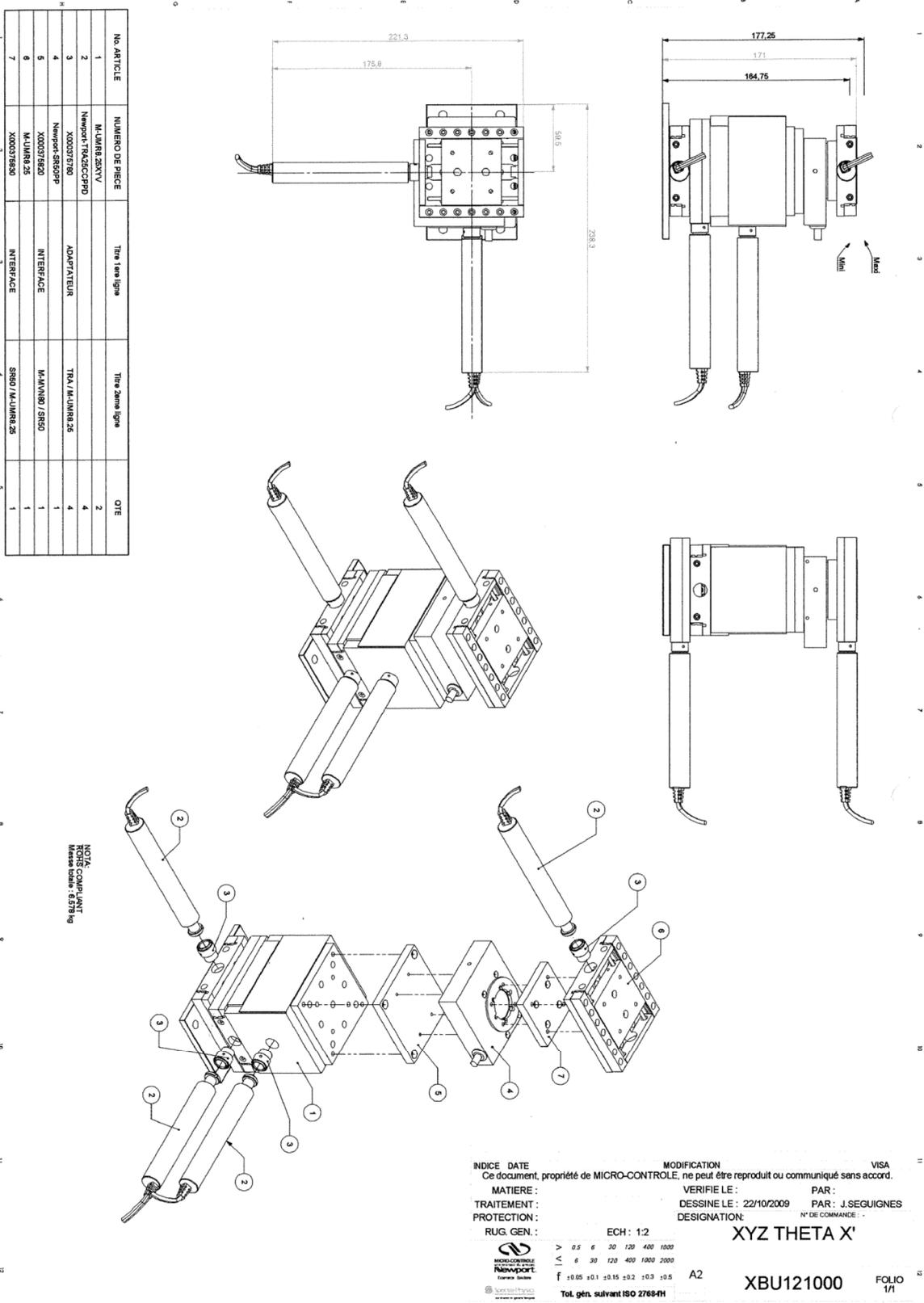
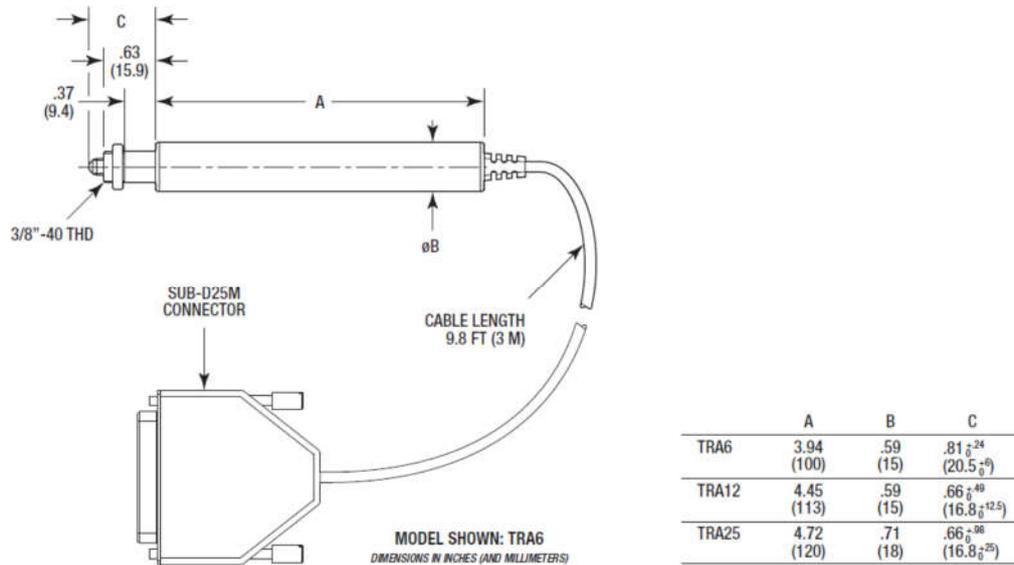


Figure 10. Newport Sample-holder study in the configuration XYZ Theta X'

8.2 TRA25 PPD miniature motorized actuator, 25mm Travel

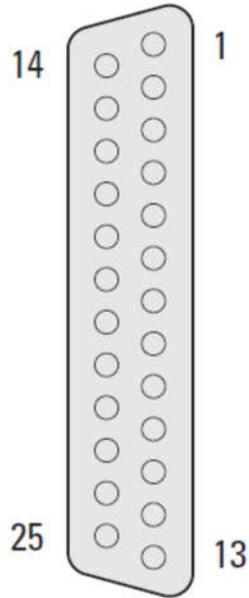
8.2.1 Dimensions



8.2.2 Technical Specifications

Technical specifications : https://www.newport.com/p/TRA25PPD			
Travel Range	25 mm		
Origin	Uses minimum travel limit for homing, typically 4 μm repeatability	Origin Repeatability	±2 μm
Axial Load Capacity (+Cx)	-60, +0 N	Axial Load Capacity	60 N
Minimum Incremental Motion	0.10 μm	Accuracy Typical (Guaranteed)	±2.5 (±5.0) μm
Maximum Speed	0.4 mm/s	Backlash	10 μm
Bi-directional Repeatability, Guaranteed	± 1.5 μm	Bi-directional Repeatability with Compensation Typical (Guaranteed)	±0.18 (±1.25) μm
Uni-directional Repeatability, Guaranteed	1 μm	Uni-directional Repeatability Typical (Guaranteed)	±0.15 (±0.5) μm
Feedback	Open loop	MTBF	10,000 h
Reduction Gear	1:256	Drive Mechanism	Rolled lead screw
Base Material	Stainless Steel	Drive Screw Pitch	0.5 mm
Weight	0.1 kg	Limit Switches	optical switches, both ends
Connector Type	25-pin D-Sub	Cable Length	3 m
Drive Type	2 Phase Stepper	Power Consumption	5 W
Motor	20 steps/rev (18°/step) 0.22A RMS current per phase 12V nominal voltage		

SUB-D25 connection for the SR50 rotation stages



1	+ Phase 1
2	+ Phase 1
3	- Phase 1
4	- Phase 1
5	+ Phase 2
6	+ Phase 2
7	- Phase 2
8	- Phase 2
9	N.C.
10	N.C.
11	N.C.
12	N.C.
13	Reserved (1)
14	Ground
15	N.C.
16	N.C.
17	+ End-of-Run
18	- End-of-Run
19	N.C.
20	N.C.
21	+5 V
22	0 V
23	N.C.
24	N.C.
25	N.C.

(1) Pin #13 of SUB-D25M is reserved for internal logic for Newport controller.

EC Declaration of Conformity

<p>TRA Series</p> <p><u>EC Declaration of Conformity</u> following Annex II-1A of Directive 2006/42/EC on machinery</p> <p>The manufacturer: MICRO-CONTROLE Spectra-Physics, 9 rue du Bois Sauvage F-91055 Evry FRANCE</p> <p>Hereby declares that the machinery:</p> <ul style="list-style-type: none"> • Description: " TRA " • Function: Compact Motorized Actuators • Models: TRA6/12/25/-CC/-PPD/-PPV6 <p>– the technical file of which was compiled by: Mr Dominique DEVIDAL, Quality Director, MICRO-CONTROLE Spectra-Physics, Zone Industrielle - B.P.29 F-45340 Beauce La Rolande France</p> <p>– complies with all the relevant provisions of the Directive 2006/42/EC on machinery. – complies with all the relevant provisions of the Directive 2014/30/EU relating to electro-magnetic compatibility.</p> <p>– was designed and built in accordance with the following harmonised standards:</p> <ul style="list-style-type: none"> • NF EN 61326-1:2013 « Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements » • NF EN 55011:2010/A1:2011 Class A <p>– was designed and built in accordance with the following other standards:</p> <ul style="list-style-type: none"> • NF EN 61000-4-2 • NF EN 61000-4-3 • NF EN 61000-4-4 • NF EN 61000-4-5 • NF EN 61000-4-6 	 Newport [®] Experience Solutions
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ORIGINAL DECLARATION

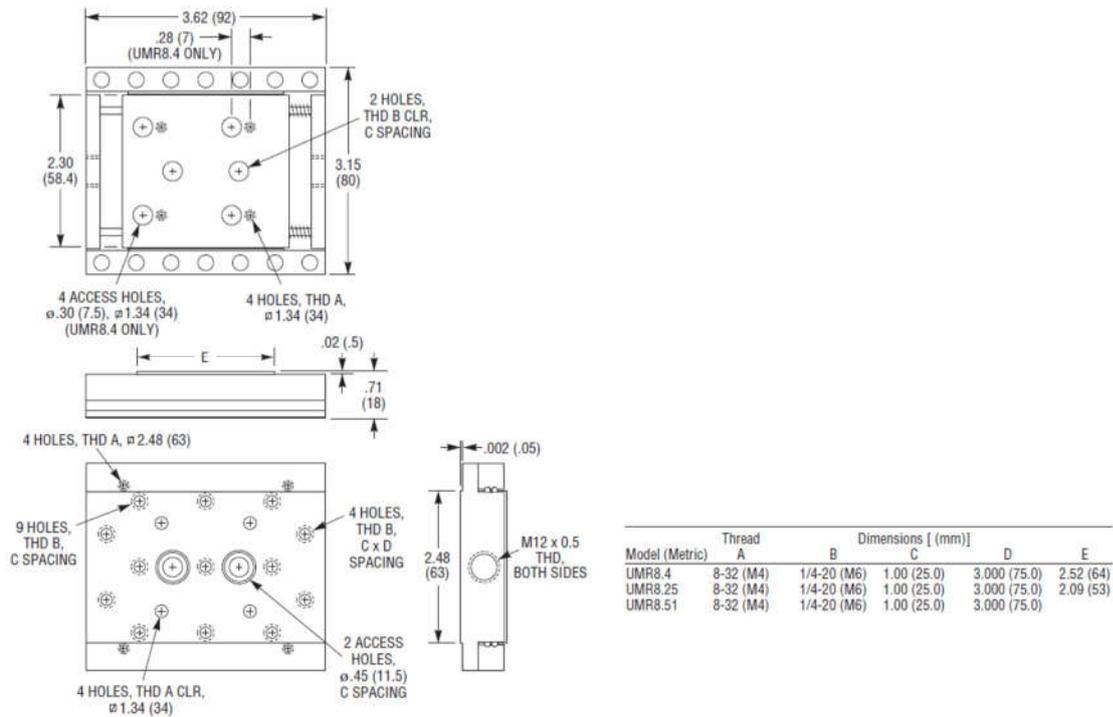
Done in Beauce La Rolande on 26 June 2015
Dominique DEVIDAL
Quality Director



DC1-EN rev.A

8.3 Double-Row Ball Bearing Linear Stage, M-UMR8.25

8.3.1 Dimensions



8.3.2 Technical Specifications

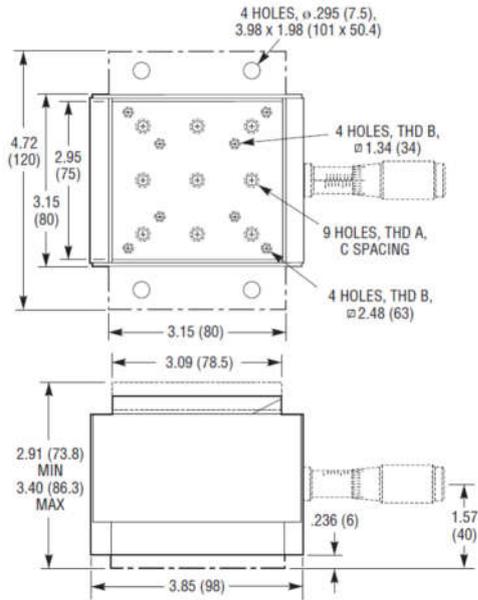
Technical specifications (from <https://www.newport.com/p/M-UMR8.25>)

Axes of Travel	X	Bearing Constant	40 mm
Maximum Stage Travel	25 mm	Drive Location	Center drive
Thread Type	M6	Drive Torque	0.07 Nm
Recommended Actuators	LTA-HL or BM15.25*	Centered Load Capacity with BM Micrometer	100 N
Load Capacity	900 N	Vertical Load Capacity	100 N
Angular Deviation	<200 μ rad	Compliance in Roll	0.05 mrad/Nm
Inverse Axial Load Capacity	1.3 kg	Compliance in Pitch	0.05 mrad/Nm
Material	Steel	Compliance in Yaw	0.05 mrad/Nm
Bearings	Double-Row Ball Bearings	<p>Single Row V Profile Gothic Profile Double Row Gothic Profile</p> <p>● Contact Points --- Ball Rotation Axis</p>	

* a motorized actuator adapter ADAPT-BM-375 is used to adapt the chosen actuator, following Newport preconizations.

8.4 Precision Ball Bearing Vertical Linear Stage, M-MVN80

8.4.1 Dimensions



Model	A	B	C
M-MVN80	M6	M4	25 mm
MVN80	1/4-20	8-32	1.0 in.

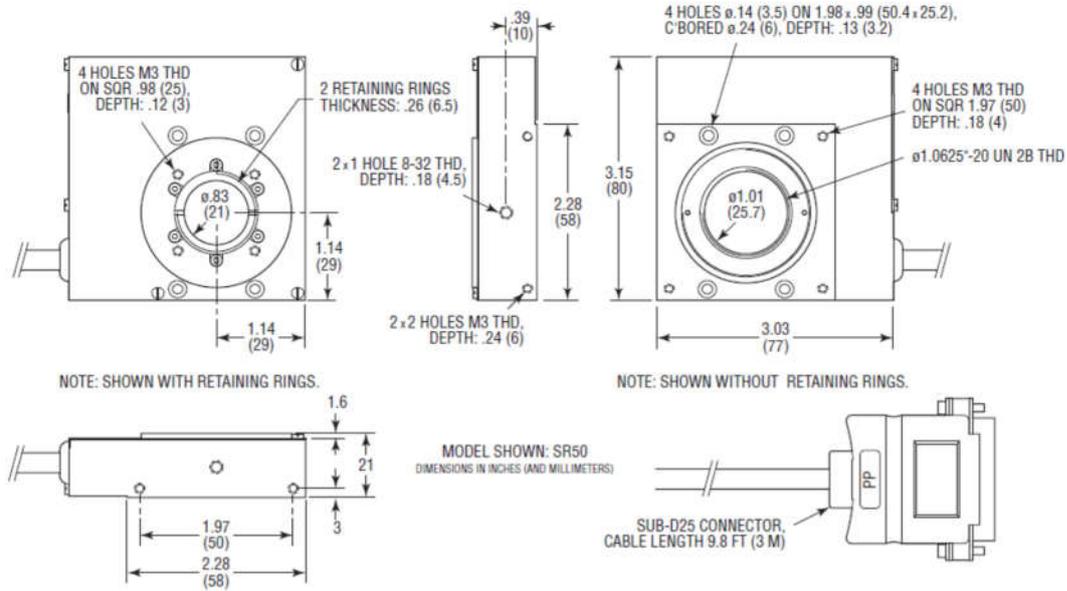
Note: The height dimension includes the 6-mm thickness of the M-PBN8 base plate which is sold separately."

8.4.2 Technical Specifications

Technical specifications (from https://www.newport.com/p/M-MVN80)			
Axes of Travel	Z		
Travel Range	12.7 mm	Material	Alloy Steel
Load Capacity	111 N	Bearings	Ball Bearing
Thread Type	M4 and M6	Drive Location	Center drive
Minimum Height	73.9 mm	Weight	3.2 kg
Maximum Height	86.6 mm	Platform Size	80 x 80 mm

8.5 Compact Rotation Stage, 360°, SR50PP

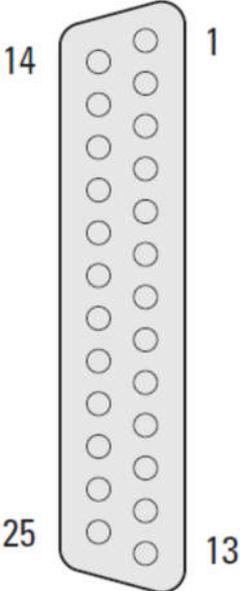
8.5.1 Dimensions



8.5.2 Technical Specifications

SR50PP technical specifications (from https://www.newport.com/p/SR50PP)			
Accuracy Typ. (Guar.)	± 20 (± 30) mdeg	Centered load capacity	30 N
Uni-directional repeatability Typ. (Guar.)	± 3.5 (± 5.0) mdeg	Optic Diameter	25.4 mm
Bi-directional Repeatability with Compensation Typ. (Guar.)	± 16 (± 25) mdeg	Drive Type	Micro Step Drive Stepper
Wobble Typ. (Guar.)	± 20 (± 50) μ rad	Drive Mechanism	Ground worm gear
Origin Repeatability	± 25 mdeg	Material	Aluminum
Travel Range	360°	Bearings	Ball bearings
Maximum Speed	4 °/s	Cable Length	3 m
Resolution	0.001 °	Feedback	Open-loop, no encoder
Minimum Incremental Motion	4.0 mdeg	Inertia	0.015 kg.m ²
Bi-directional Repeatability, Guar.	0.05 °	Maximum Torque	0.5 Nm
Uni-directional Repeatability, Guar.	0.01 °	Motor	UE16PPSC
Reversal Value (Hysteresis)	0.02 °	Reduction Gear	107.143:1
Transverse Stiffness	160 μ rad/Nm	Weight	0.3 kg

UE16PPSC Motor Characteristics					
Motor	Angle by Step (°)	RMS Current per phase (A)	Resistance	Inductance (mH)	Newport Utilization
UE16PPSC	15	0.25 (1) 0.18 (2)	12.5	5.5	Half-Step 1 phase at once

SUB-D25 connection for the SR50 rotation stages		
	1	Phase 1a
	2	N.C.
	3	Phase 1b
	4	N.C.
	5	Phase 2a
	6	N.C.
	7	Phase 2b
	8	N.C.
	9	N.C.
	10	N.C.
	11	N.C.
	12	N.C.
	13	Mechanical Zero
	14	Shield Ground
	15	Connected to +5 V
	16	0 V logic
	17	Do not connect
	18	Do not connect
	19	N.C.
	20	N.C.
	21	N.C.
	22	N.C.
	23	N.C.
	24	N.C.
	25	Connected to 0 V

EC Declaration of Conformity

<p style="font-size: 1.2em; font-weight: bold; margin-bottom: 10px;">SR50 Series</p> <p style="font-weight: bold; margin-bottom: 5px;"><u>EC Declaration of Conformity</u></p> <p style="font-size: 0.8em; margin-bottom: 10px;">following Annex II-IA of Directive 2006/42/EC on machinery</p> <p>The manufacturer: MICRO-CONTROLE Spectra-Physics, 9 rue du Bois Sauvage F-91055 Evry FRANCE</p> <p>Hereby declares that the machinery:</p> <ul style="list-style-type: none"> • Description: " SR50 " • Function: Compact High-Resolution Rotation Stages • Models: SR50CC/PP <p>– the technical file of which was compiled by: Mr Dominique DEVIDAL, Quality Director, MICRO-CONTROLE Spectra-Physics, Zone Industrielle - B.P.29 F-45340 Beauce La Rolande France</p> <p>– complies with all the relevant provisions of the Directive 2006/42/EC on machinery. – complies with all the relevant provisions of the Directive 2014/30/EU relating to electro-magnetic compatibility.</p> <p>– was designed and built in accordance with the following harmonised standards:</p> <ul style="list-style-type: none"> • NF EN 61326-1:2013 « Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements » • NF EN 55011:2010/A1:2011 Class A <p>– was designed and built in accordance with the following other standards:</p> <ul style="list-style-type: none"> • NF EN 61000-4-2 • NF EN 61000-4-3 • NF EN 61000-4-4 • NF EN 61000-4-5 • NF EN 61000-4-6 	 <p style="font-weight: bold; font-size: 1.1em;">Newport.</p> <p style="font-size: 0.8em;">Experience Solutions</p>
<p>ORIGINAL DECLARATION</p> <p>Done in Beauce La Rolande on 26 June 2015 Dominique DEVIDAL Quality Director</p> <div style="text-align: right; margin-top: 10px;">  </div> <p style="text-align: right; font-size: 0.7em; margin-top: 10px;">DC1-EN rev.A</p>	

9 Hexapode installation

9.1 Sikadur 53



SAFETY DATA SHEET

Sikadur 53 Part A

Date of issue - 26/04/2002.

SKD53A

PRODUCT AND COMPANY IDENTIFICATION

<i>Product Code</i>	SKD53A
<i>Product Name</i>	Sikadur 53 Part A
<i>Product Description</i>	2-component, solvent free, epoxy resin for underwater injection systems.
<i>Manufacturer/Supplier</i>	Sika Limited Watchmead Welwyn Garden City Hertfordshire. AL7 1BQ tel. 01707 394444 Fax. 01707 329129

COMPOSITION/INFORMATION ON THE COMPONENTS

Preparation - Hazardous ingredients (Europe)

Component		Concentration	Classification	Risk Phrases
1) Epoxy resin (No.Av. mol.wt. < 700)	25068-38-6	10.00% - 25.00%	Xi, N	R36/38, R43, R51/53
2) Aliphatic glycidyl ether	68609-97-2	2.50% - 10.00%	Xi, N	R38, R43, R51/53
3) Nonyl Phenol	25154-52-3	1.00% - 2.50%	C, N	R22, R34, R50/53

HAZARD IDENTIFICATION

<i>Main Hazards</i>	Irritating to eyes and skin. May cause sensitisation by skin contact. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
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FIRST AID MEASURES

<i>Eye Contact</i>	Immediately flood the eye with plenty of water for at least 15 minutes, holding the eye open. Obtain medical attention urgently.
<i>Skin Contact</i>	Wipe off as much as possible with a clean dry cloth. Wash skin thoroughly with soap and water. Solvents should not be used to clean skin because they may increase the penetration of the material.
<i>Ingestion</i>	Wash out mouth with water. Obtain medical attention.
<i>Inhalation</i>	Remove from exposure. In cases of possible respiratory irritation or if feeling unwell in cases of prolonged exposure, obtain medical attention.

FIRE FIGHTING MEASURES

<i>Extinguishing Media</i>	Not readily combustible. Use foam, dry chemical or carbon dioxide.
<i>Extinguishing Media - Not suitable</i>	Do not use water jet.
<i>Special Hazards of Product</i>	Combustion will produce smoke, carbon dioxide and carbon monoxide.
<i>Protective Equipment for Fire-Fighting</i>	Wear full protective clothing and self-contained breathing apparatus.


SAFETY DATA SHEET
Sikadur 53 Part A

Date of issue - 26/04/2002.

SKD53A

ACCIDENTAL RELEASE MEASURES

<i>Personal Precautions</i>	Wear appropriate protective clothing.
<i>Environmental Precautions and Clean-up Methods</i>	Try to prevent the material from entering drains or water courses.
<i>Spillages</i>	Contain and absorb using earth, sand or other inert material. Transfer into suitable containers for recovery or disposal.

HANDLING AND STORAGE

<i>Handling</i>	Use in well ventilated area. Avoid contact with eyes, skin and clothing.
<i>Storage</i>	Storage area should be: cool, dry. Storage temperature should be controlled to between 5 and 25 °C. Store in the original container securely closed. Keep away from foodstuffs

EXPOSURE CONTROLS/PERSONAL PROTECTION

<i>Engineering Control Measures</i>	Use of the basic principles of Industrial Hygiene will enable this material to be used safely.
<i>Respiratory Protection</i>	Respiratory protection not normally required.
<i>Hand Protection</i>	Wear suitable impervious gloves. (butyl / nitrile type) The insides of gloves must be kept scrupulously clean.
<i>Eye Protection</i>	Chemical goggles.

PHYSICAL AND CHEMICAL PROPERTIES

<i>Physical State</i>	Viscous liquid.
<i>Color</i>	Green.
<i>Odor</i>	Faint. Characteristic.
<i>pH</i>	Not applicable.
<i>Flash Point °C</i>	Exceeds 100.
<i>Solubility - Water</i>	Insoluble.
<i>Density (kg/m³)</i>	Approx. 2250 at 20 °C.
<i>Autoignition Temperature °C</i>	Above 250.
<i>Viscosity (at 20°C)</i>	Viscous liquid at ambient temperatures.

STABILITY AND REACTIVITY

<i>Stability</i>	Stable under normal conditions.
<i>Hazardous Decomposition Products</i>	Heating may produce: oxides of carbon, acrid smoke and irritating fumes.

TOXICOLOGICAL INFORMATION

<i>Acute toxicity</i>	Low order of acute toxicity.
<i>Eye irritation</i>	Irritating to the eyes.
<i>Skin irritation</i>	Frequent or prolonged skin contact may cause some local short term skin irritation.
<i>Sensitization - Skin</i>	The low molecular weight epoxy resin is a potential skin sensitizer.



SAFETY DATA SHEET

Sikadur 53 Part A

Date of issue - 26/04/2002.

SKD53A

ECOLOGICAL INFORMATION

<i>Mobility</i>	The product is insoluble in water.
<i>Persistence/degradability</i>	The product is expected to be not readily biodegradable.
<i>Ecotoxicity</i>	This material is harmful to aquatic organisms.

DISPOSAL

<i>Product Disposal</i>	Dispose of as Special Waste. Arrange for disposal via a licensed waste contractor.
<i>Container Disposal</i>	Dispose of containers with care. Empty containers may contain hazardous residues. Empty packaging should be removed by a licensed waste contractor.

TRANSPORT INFORMATION

<i>UN : UN number</i>	3082
<i>UN : Proper shipping name</i>	Environmentally hazardous substances, liquid, n.o.s.
<i>UN : Class</i>	9
<i>UN : Packing Group</i>	3
<i>ADR/RID Substance Identification Number</i>	3082
<i>ADR/RID Proper shipping name</i>	Environmentally hazardous substance, liquid, n.o.s. contains Epoxy Resin
<i>ADR/RID Class</i>	9
<i>ADR/RID Item Number</i>	11 (c)
<i>ADR/RID Hazard Identification Number</i>	90
<i>IMDG : Proper shipping name</i>	Environmentally hazardous substance, liquid, N.O.S. contains Epoxy Resin
<i>IMDG : Packing Group</i>	3
<i>IMDG : Class</i>	9
<i>IATA : Proper shipping name</i>	Not Classified for Air Transport

REGULATORY INFORMATION

<i>Label Requirements</i>	Irritant, Dangerous for the environment 
<i>Risk Phrases</i>	Irritating to eyes and skin. May cause sensitisation by skin contact. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
<i>Safety Phrases</i>	Avoid contact with skin. Wear suitable gloves. Contains epoxy constituents. See information supplied by the manufacturer.

**SAFETY DATA SHEET****Sikadur 53 Part A**

Date of issue - 26/04/2002.

SKD53A

OTHER INFORMATION

<i>First Issue Date</i>	04.05.1995
<i>Revisions Highlighted</i>	Hazards Identification Regulatory Information
<i>Uses and Restrictions</i>	Customers are urged to ensure that the product is entirely suitable for their own purpose. It is the customer's responsibility to ensure that a suitable and sufficient assessment of the risks created by the use of the product is undertaken.
<i>UK Legislation</i>	Health and Safety at Work etc Act, 1974, and relevant Statutory Provisions. Chemicals (Hazard Information and Packaging) Regulations, 2002. SI 1999/437: The Control of Substances Hazardous to Health Regulations SI No. 972/1996: The Special Waste Regulations 1996 SI No 2839 1991 Environmental Protection (Duty of Care) Regulations.
<i>UK Guidance Publications</i>	Approved Code of Practice - Management of Health and Safety at Work, HSE. General Approved Code of Practice to COSHH Regulations, HSE.
<i>Footnote</i>	The information contained in this SDS corresponds to our level of knowledge at the time of publication. All warranties are excluded. Our most current General Sales Conditions shall apply. Please consult the Technical Data Sheet prior to use.

**SAFETY DATA SHEET****Sikadur 53 Part B**

Date of issue - 26/04/2002.

SKD53B

PRODUCT AND COMPANY IDENTIFICATION

Product Code	SKD53B
Product Name	Sikadur 53 Part B
Product Description	2-component, solvent free, epoxy resin for underwater injection systems.
Manufacturer/Supplier	Sika Limited Watchmead Welwyn Garden City Hertfordshire. AL7 1BQ tel. 01707 394444 Fax. 01707 329129

COMPOSITION/INFORMATION ON THE COMPONENTS**Preparation - Hazardous ingredients (Europe)**

Component		Concentration	Classification	Risk Phrases
1) Benzyl Alcohol	100-51-6	25.00% - 50.00%	Xn	R20/22
2) Isophoronediamine	2855-13-2	10.00% - 25.00%	C	R21/22, R34, R43, R52/53
3) Triethylenetetramine	112-24-3	10.00% - 25.00%	C	R21, R34, R43, R52/53
4) Solvent Naptha (petroleum) heavy aromatic.	64742-94-5	10.00% - 25.00%	Xn, N	R51/53, R65, R66
5) 2,4,6-Tri(dimethylaminomethyl) phenol	90-72-2	2.50% - 10.00%	Xn	R22, R36/38
6) Polyaminoimidazoline		2.50% - 10.00%	Xi	R41

HAZARD IDENTIFICATION

Main Hazards	Causes burns. May cause sensitisation by skin contact. Harmful by inhalation, in contact with skin and if swallowed. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
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FIRST AID MEASURES

Eye Contact	Immediately flood the eye with plenty of water for at least 15 minutes, holding the eye open. Eyelids should be held away from the eyeball to ensure thorough rinsing. Obtain medical attention urgently.
Skin Contact	Wipe off as much as possible with a clean dry cloth. If material proves difficult to remove, use suitable skin cleanser (not solvent). Solvents should not be used to clean skin because they may increase the penetration of the material. Contaminated clothing should be washed or dry-cleaned before re-use.
Ingestion	Do not induce vomiting. Obtain medical attention.
Inhalation	Remove from exposure. In cases of possible respiratory irritation or if feeling unwell in cases of prolonged exposure, obtain medical attention.

**SAFETY DATA SHEET****Sikadur 53 Part B**

Date of issue - 26/04/2002.

SKD53B

FIRE FIGHTING MEASURES

<i>Extinguishing Media</i>	Not readily combustible. Use foam, dry chemical or carbon dioxide.
<i>Extinguishing Media - Not suitable</i>	Do not use water jet.
<i>Special Hazards of Product</i>	Thermal decomposition or burning may release oxides of carbon, nitrogen and other toxic gases and vapours.
<i>Protective Equipment for Fire-Fighting</i>	Wear full protective clothing and self-contained breathing apparatus.

ACCIDENTAL RELEASE MEASURES

<i>Personal Precautions</i>	Wear appropriate protective clothing.
<i>Environmental Precautions and Clean-up Methods</i>	Try to prevent the material from entering drains or water courses.
<i>Spillages</i>	Contain and absorb using earth, sand or other inert material. Transfer into suitable containers for recovery or disposal.

HANDLING AND STORAGE

<i>Handling</i>	Mix in a well ventilated area. Avoid contact with eyes, skin and clothing.
<i>Storage</i>	Storage area should be: cool, dry. Storage temperature should be controlled to between 5 and 25 °C. Store in the original container securely closed. Keep away from foodstuffs

EXPOSURE CONTROLS/PERSONAL PROTECTION

<i>Engineering Control Measures</i>	Use of the basic principles of Industrial Hygiene will enable this material to be used safely.
<i>Respiratory Protection</i>	Respiratory protection not normally required.
<i>Hand Protection</i>	Wear suitable impervious gloves. (butyl / nitrile type) The insides of gloves must be kept scrupulously clean.
<i>Eye Protection</i>	Chemical goggles.

PHYSICAL AND CHEMICAL PROPERTIES

<i>Physical State</i>	Liquid.
<i>Color</i>	Amber.
<i>Odor</i>	Ammoniacal.
<i>pH</i>	Approx. 12 in water.
<i>Boiling Point °C</i>	Boils above 200.
<i>Flash Point °C</i>	94
<i>Explosion Limits (%)</i>	Lower limit 1.0 Upper limit 6.0.
<i>Solubility - Water</i>	Partially soluble.
<i>Vapor Pressure (kPa)</i>	Negligible vapour pressure at ambient conditions.
<i>Density (kg/m3)</i>	Approx. 1000 at 20 °C.
<i>Autoignition Temperature °C</i>	300
<i>Viscosity (at 20°C)</i>	Mobile liquid at ambient temperatures.



SAFETY DATA SHEET

Sikadur 53 Part B

Date of issue - 26/04/2002.

SKD53B

STABILITY AND REACTIVITY

<i>Stability</i>	Stable under normal conditions.
<i>Hazardous Decomposition Products</i>	Heating may produce: ammonia, oxides of carbon, oxides of nitrogen, acid smoke and irritating fumes.

TOXICOLOGICAL INFORMATION

<i>Acute toxicity</i>	Low order of acute toxicity.
<i>Eye irritation</i>	This material is corrosive to the eye.
<i>Skin irritation</i>	This material is corrosive to the skin.
<i>Sensitization - Skin</i>	The possibility of allergic sensitisation should be considered

ECOLOGICAL INFORMATION

<i>Mobility</i>	The product is sparingly soluble in water.
<i>Persistence/degradability</i>	The product is expected to be not readily biodegradable.
<i>Ecotoxicity</i>	This material is harmful to aquatic organisms.

DISPOSAL

<i>Product Disposal</i>	Dispose of as Special Waste.
<i>Container Disposal</i>	Arrange for disposal via a licensed waste contractor. Empty containers may contain hazardous residues. Dispose of containers with care. Empty packaging should be removed by a licensed waste contractor.

TRANSPORT INFORMATION

<i>UN : UN number</i>	1760
<i>UN : Proper shipping name</i>	Corrosive liquid, n.o.s.
<i>UN : Class</i>	8
<i>UN : Packing Group</i>	3
<i>ADR/RID Substance Identification Number</i>	1760
<i>ADR/RID Proper shipping name</i>	Corrosive liquid, n.o.s. contains Triethylenetetramine
<i>ADR/RID Class</i>	8
<i>ADR/RID Item Number</i>	66(c)
<i>ADR/RID Hazard Identification Number</i>	80
<i>IMDG : Proper shipping name</i>	Corrosive liquid, N.O.S. contains Triethylenetetramine
<i>IMDG : Packing Group</i>	3
<i>IMDG : Class</i>	8
<i>IMDG : Ems Number</i>	8-15
<i>IATA : Proper shipping name</i>	Corrosive liquid, N.O.S. contains Triethylenetetramine
<i>IATA : Packing Group</i>	3
<i>IATA : Class</i>	8

**SAFETY DATA SHEET****Sikadur 53 Part B**

Date of issue - 26/04/2002.

SKD53B

REGULATORY INFORMATION*Label Requirements*

Corrosive

*Risk Phrases*

Causes burns.
 May cause sensitisation by skin contact.
 Harmful by inhalation, in contact with skin and if swallowed.
 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases

Avoid contact with skin.
 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
 Wear suitable protective clothing, gloves and eye/face protection.

OTHER INFORMATION*First Issue Date*

04.05.1995

Revisions Highlighted

Hazards Identification
 Regulatory Information

Uses and Restrictions

Customers are urged to ensure that the product is entirely suitable for their own purpose. It is the customer's responsibility to ensure that a suitable and sufficient assessment of the risks created by the use of the product is undertaken.

UK Legislation

Health and Safety at Work etc. Act, 1974, and relevant Statutory Provisions.
 Chemicals (Hazard Information and Packaging) Regulations, 2002.
 SI 1999/437: The Control of Substances Hazardous to Health Regulations
 SI No. 972/1996: The Special Waste Regulations 1996
 SI No 2839 - 1991 Environmental Protection (Duty of Care) Regulations.

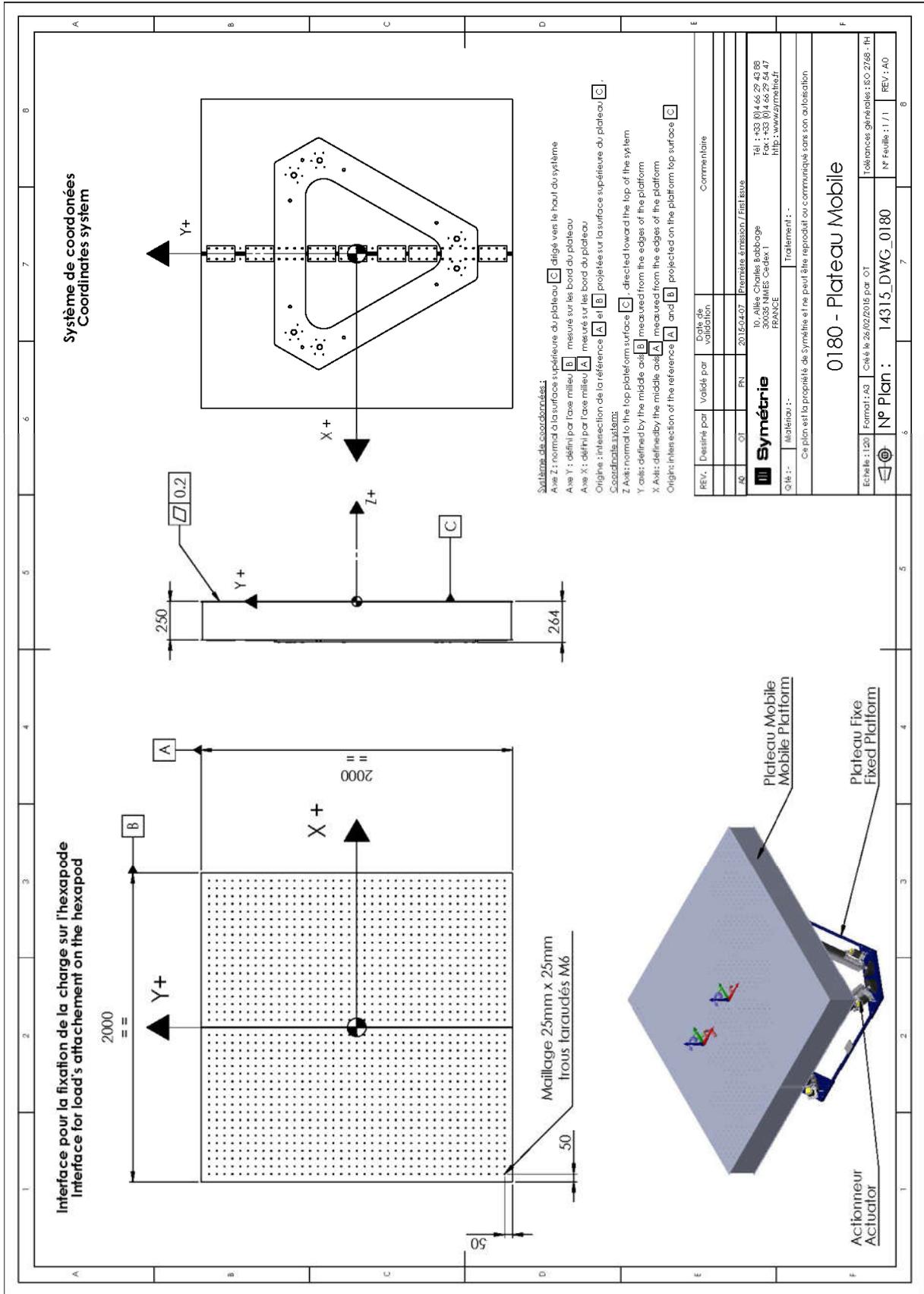
UK Guidance Publications

Approved Code of Practice - Management of Health and Safety at Work, HSE.
 General Approved Code of Practice to COSHH Regulations, HSE.

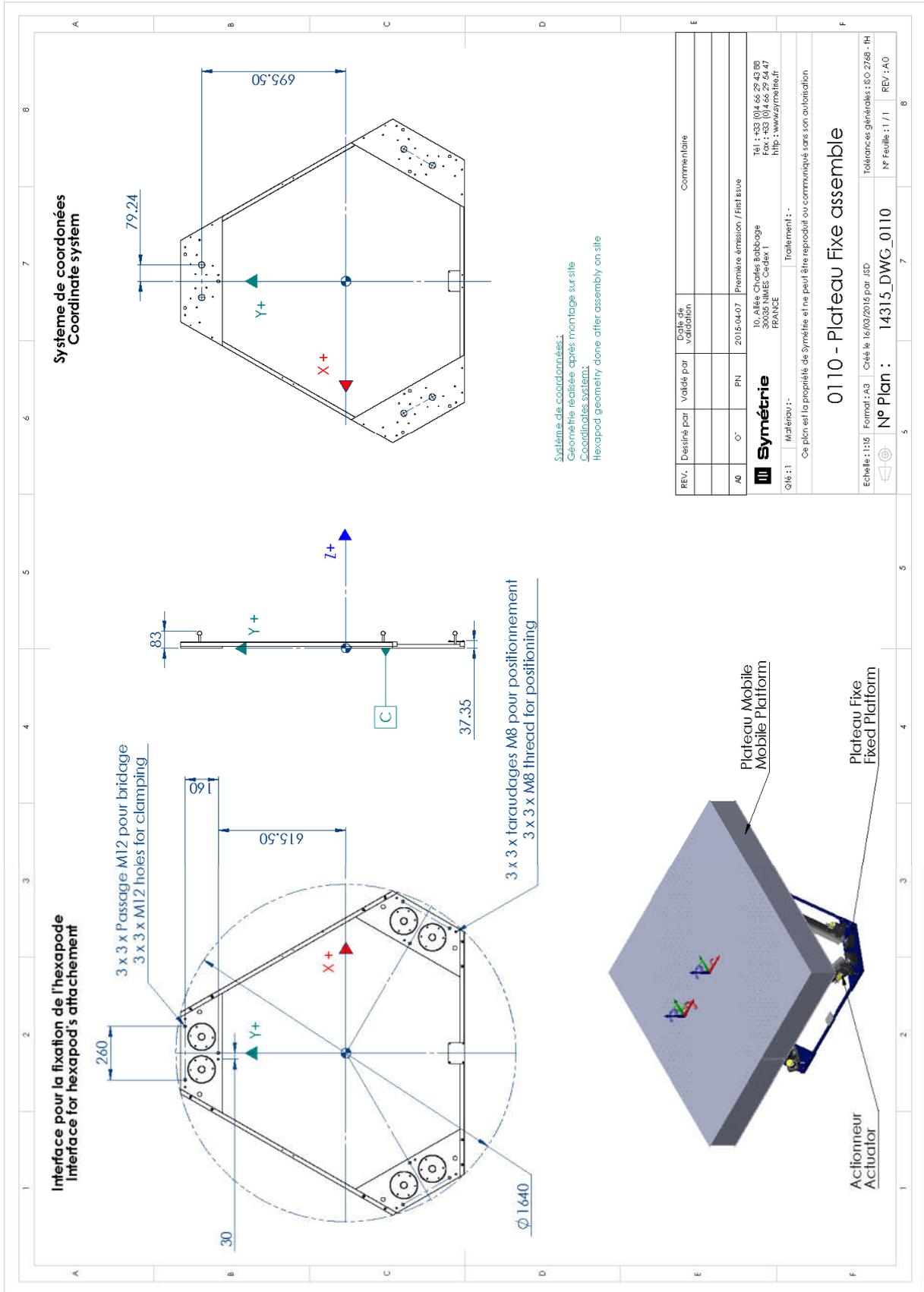
Footnote

The information contained in this SDS corresponds to our level of knowledge at the time of publication. All warranties are excluded. Our most current General Sales Conditions shall apply. Please consult the Technical Data Sheet prior to use.

9.2 Hexapode table



9.3 Hexapode table attachment



9.4 Hexapode power supply



Final Design Review

Table Fame UHD

Référence : 14315_003_TRE
Version : B

6.1.2 Front panel

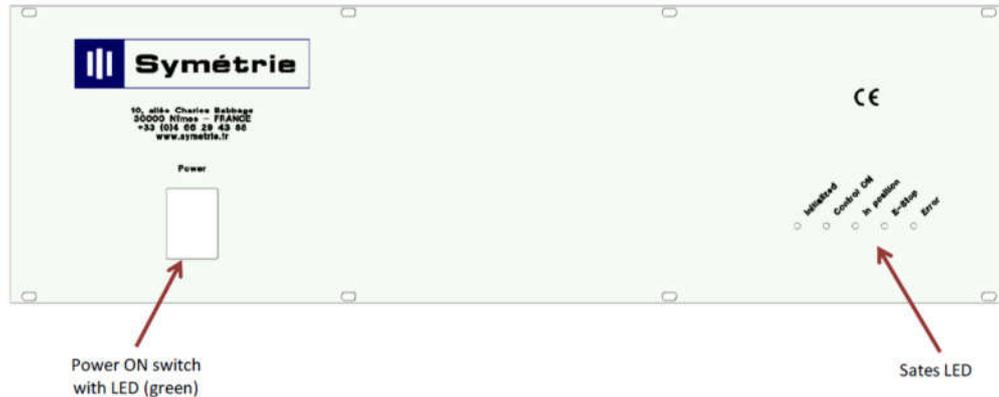


Figure 12: Control enclosure – front panel

Starting of the equipment is done using the ON/OFF switch on the front panel of the control enclosure. The switch light is green when the rack is powered on. If you do not plan to use the system for a long time, make sure to cut off the power of the control enclosure.

On the right side of the control enclosure, some indicators give the general system states. LEDs are green for normal operation states and red for abnormal states:

- “Initialized” LED (green): indicates when controller is ready to operate, for use.
- “Control On” LED (green): indicates when at least one motor is powered.
- “In position” LED (green): indicates when all the actuators are in position, complementary to “In movement” state.
- “E-stop” LED (red): indicates when Emergency stop button is pressed.
- “Error” LED (red): indicates when system is in error state. Refer to software manual for further information about the associated error codes.

SYMÉTRIE’s contact information are printed on the front panel.

6.1.3 Rear panel

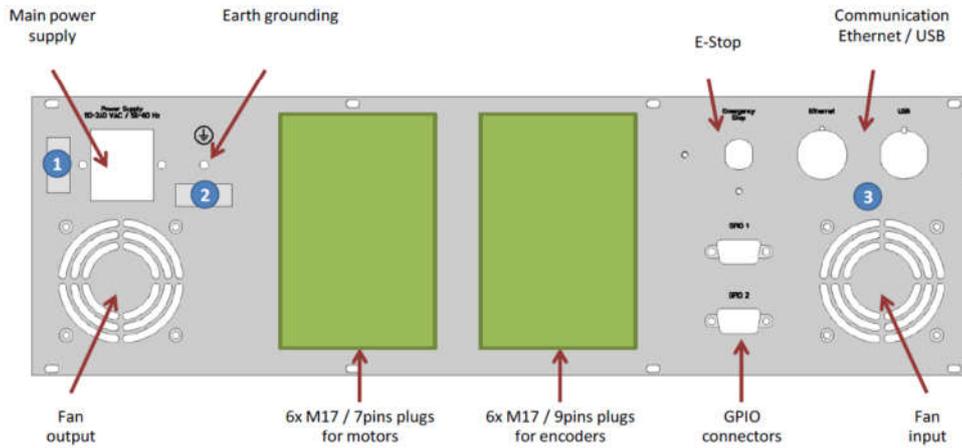


Figure 13: Control enclosure – Rear panel

The table below lists all the available connections on the back of the enclosure rack.

Signal	Connector Type	Gender	Protocol / Type
Power Supply	IEC6320-C13	Male	
Ground	Metric screw M4		
E-stop	LEMO Ref.: PKG.M0.4GL.LR Ref.: PAG.M0.4GL.AC52R (plug)	Female	2x Switch NC (24Vdc)
Communication Ethernet	RJ-45 standard		Ethernet TCP-IP
Communication USB	USB type B		
Motors	M17 / 7 pins	Female	
Encoders	M17 / 9 pins	Female	
GPIO 1	D-Sub 9	Female	
GPIO 2	D-Sub 15 high density	Female	Manual control unit