TECNICAL RELATION

TVC_Relation.doc
date: 20th December 2005
Prot.:

Laboratorio per lo Studio degli Effetti delle Radiazioni sui Materiali per lo Spazio
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riferimento	Contenuti
Thermo-Vacuum Chamber (TVC)	Description of the camera, flanges and feedthrough

signature

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change record

date	change description	revision
20/12/05	First emission	A01
18/01/06	Description of connectors-vacuum side	A02

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INTRODUCTION

Aim of this relation is to give some technical information about the thermo vacuum chamber of SERMS laboratory site in Terni, its flanges and feedthrough available at the moment. The chamber has been certified by the supplier (Angelantoni Industrie SpA) and is ready to be used.

The information included in this document can be used to design and schedule thermo-vacuum tests and the related data acquisition or sending using PT100 sensors, strain gauges, heaters, etc.

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DESCRIPTION OF THE THERMO-VACUUM CHAMBER

Dimension of the TV Chamber and technical data

- Diameter of the inner cylinder (shroud): 2.100 mm;
- Length of the cylinder: 2.100 mm;
- Minimum pressure: $5x10^{-5}$ mbar (nominal value); registered value during commissioning (chamber without any test item inside): $3x10^{-7}$ mbar;
- Sliding door with three plates (cold plates) fixed on the inner side furnished of M5 holes to fix the test item;
- Dimension of the cold plates:
  - Lower cold plate mm 500 x 1820
  - Middle cold plate mm 500 x 1970
  - Upper cold plate mm 500 x 1550
- Temperature range for the shroud: -70 ÷ +125 °C;
- Temperature range for the cold plates: -70 ÷ +125 °C;
- Medium temperature gradient 1°C/min (in the range -20 ÷ +50 °C for the cold plates and in all the range for the shroud).

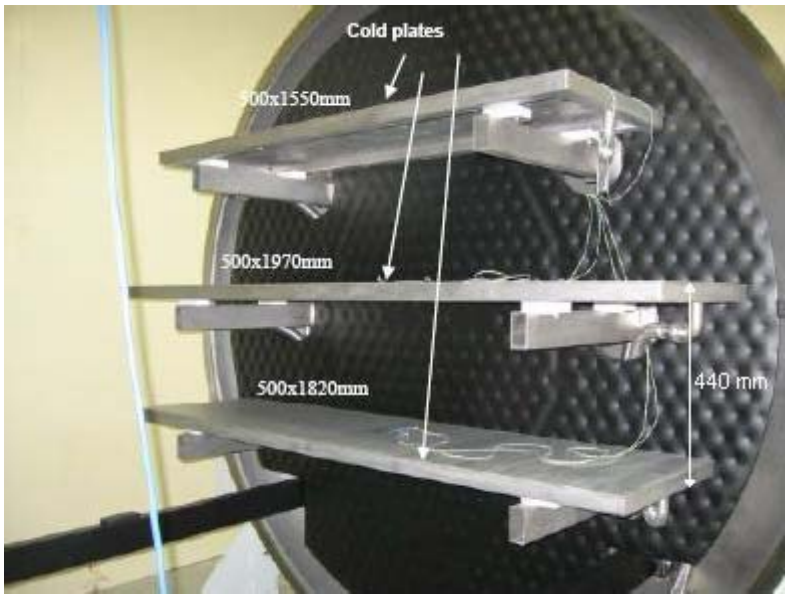


Figure 1 – Dimensions of cold plates

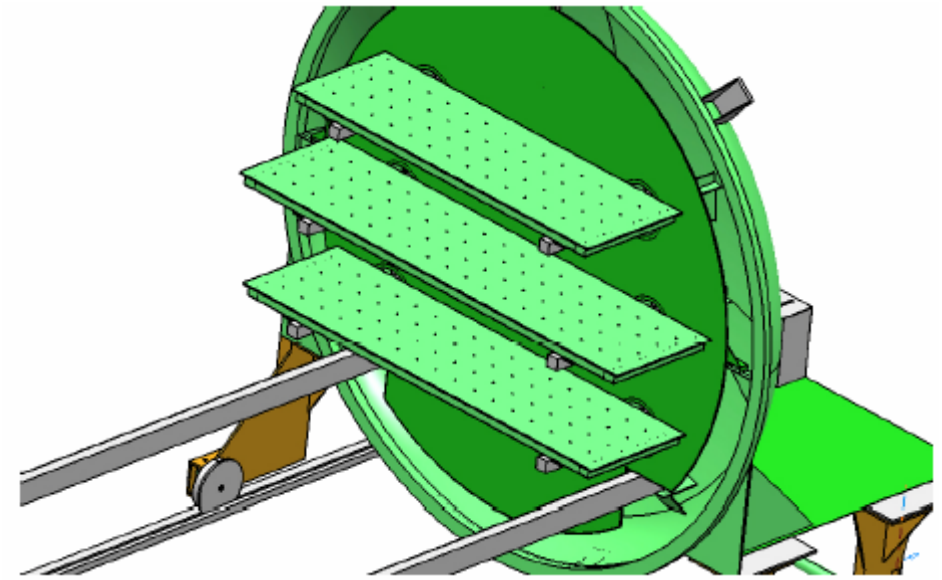


Figure 2 – M5 holes on cold plates

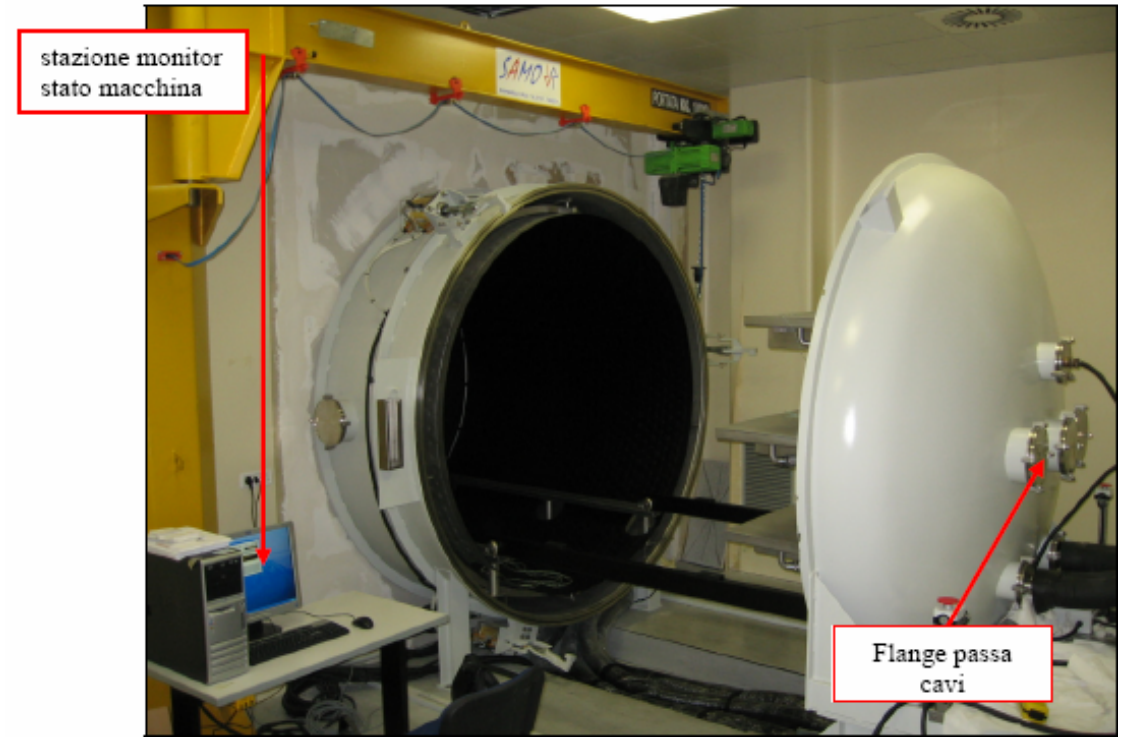


Figure 3 – Thermo-Vacuum Chamber

DESCRIPTION OF THE DATA CHAMBER

The software used to monitor the chamber is able to acquire up to 22 parameters as it is specified in the figure below. Through these signals the set of the chamber can be evaluated and monitored. The temperature sensors of the camera acquire signal every 5 seconds.

During a test additional test temperature sensors can be used to control and monitor the temperature variation of the test item.

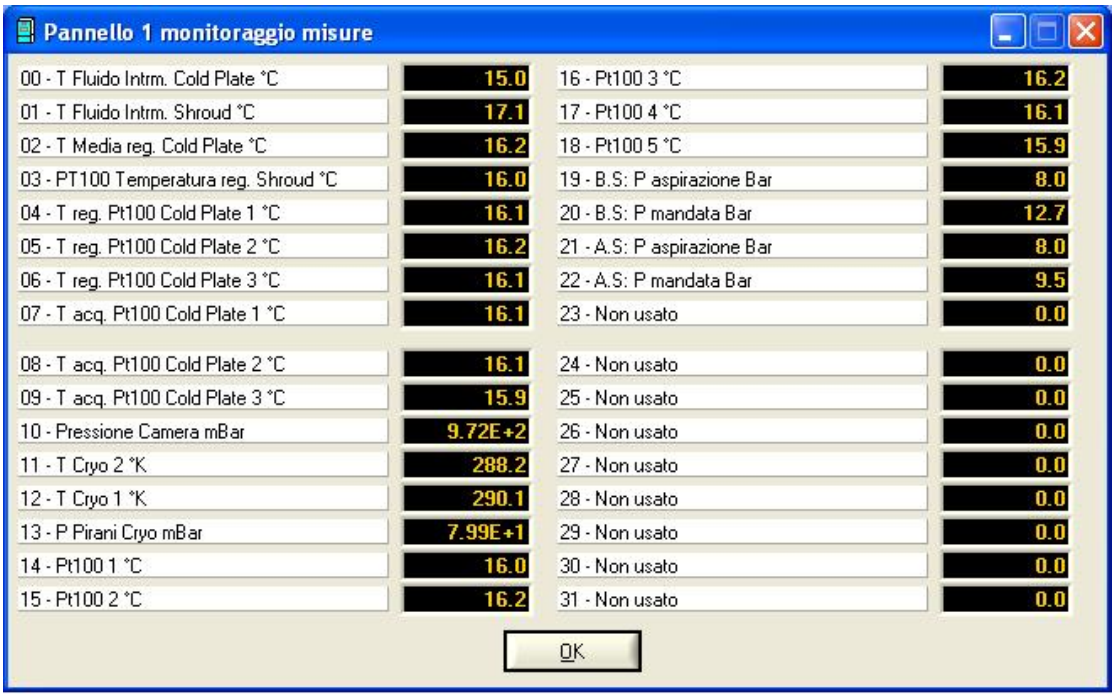


Figure 4 – Parameters used to monitor the chamber

The acquired data can be reported in a graph as a function of the time.

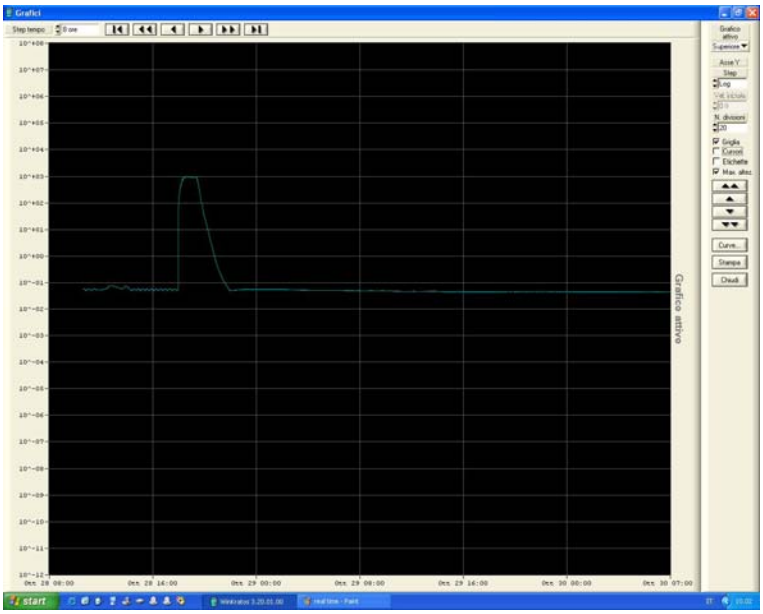


Figure 5 – Pressure of the chamber vs time.

Using cursor on the graph, the temperature and pressure gradient can be evaluated:

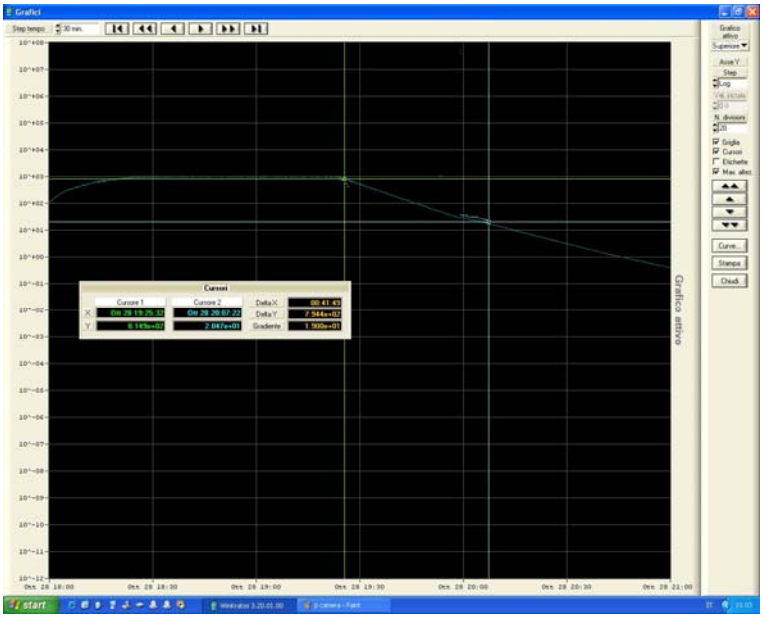
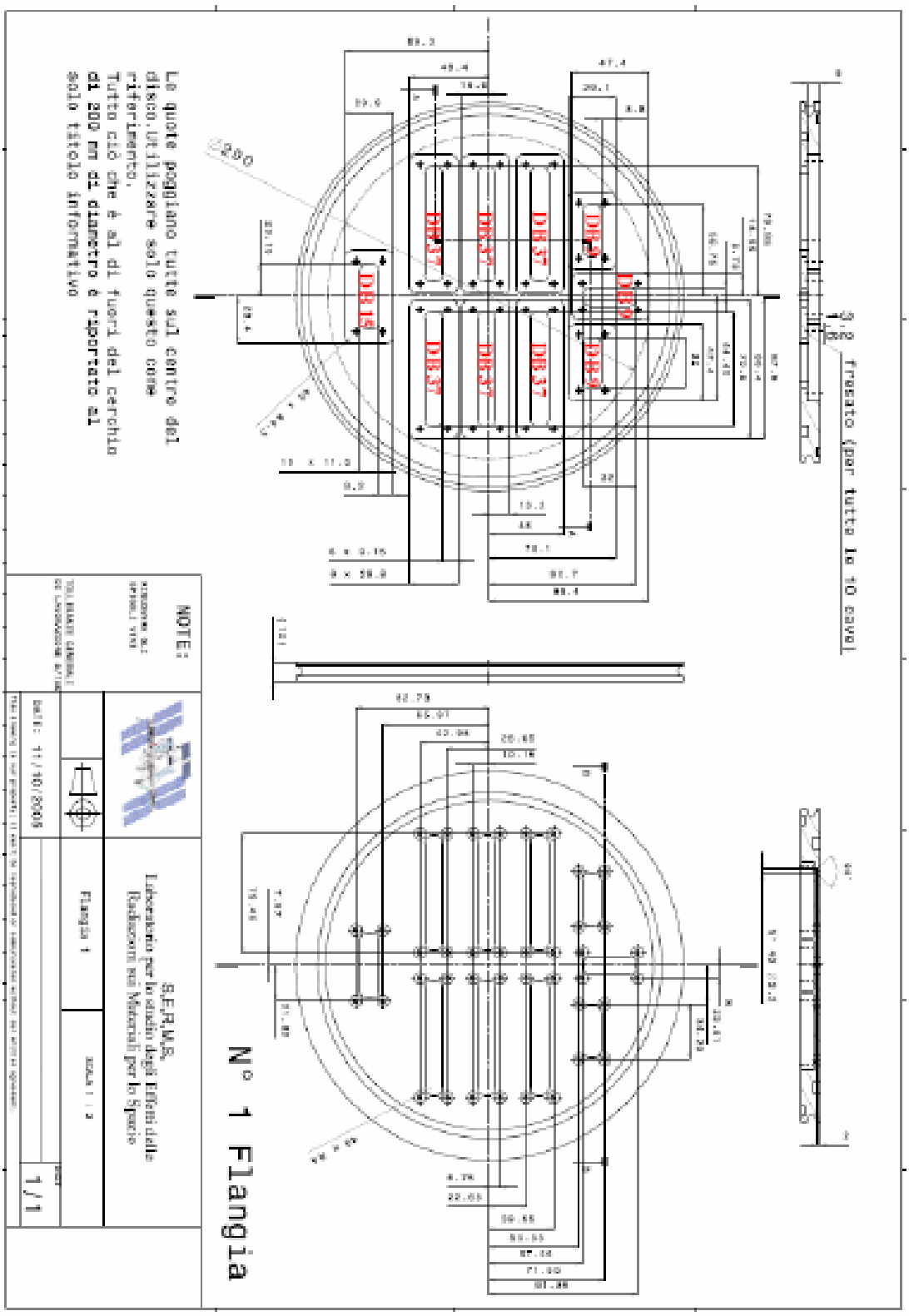


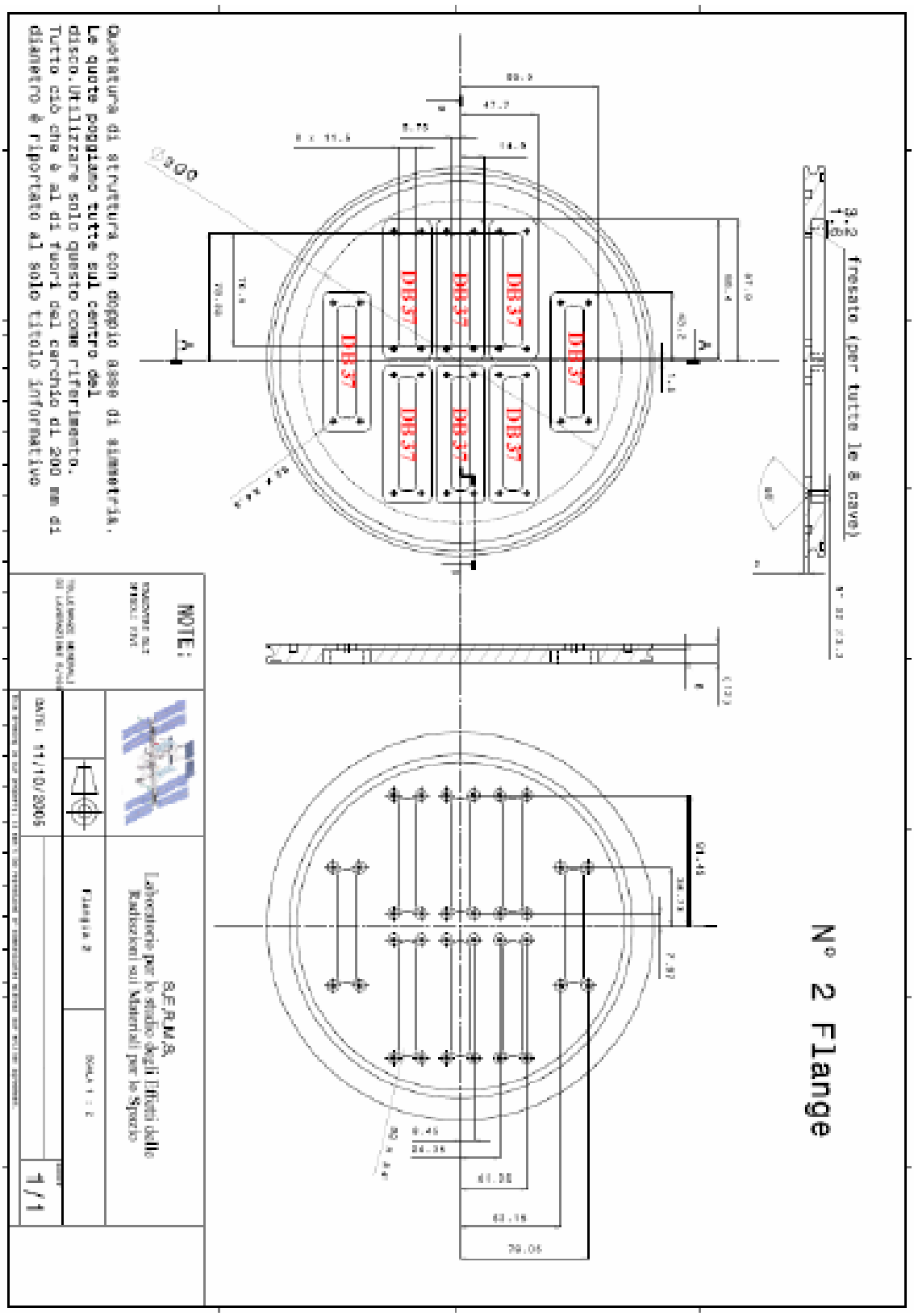
Figure 6 – Cursor to evaluate temperature and pressure gradient.

All the registered data can be converted in ASCII format.

DESCRIPTION OF THE AVAILABLE FLANGES

At the SERMS laboratory there are three **ISOK** flanges available at the moment; all the flanges are made of stainless steel (AISI 304) having a nominal diameter of 200mm and 12mm thickness. Holes have been realized on these flanges to mount SUB-D feedthrough (MIL-C-24308) as it is illustrated in the next figures.


Le quote poggiano tutte sul centro del disco.Utilizzare solo questo come riferimento.
Tutto ciò che è al di fuori del cerchio di 200 mm di diametro è riportato al solo titolo informativo
Foro passante per tutta la lunghezza
NOTE:
N° 1 Flangia
S.E.R.M.S.
Laboratorio per lo studio degli Effetti delle Radiazioni sui Materiali per lo Spazio
Flangia 1
1/1


Costruire di struttura con doppio asse di simmetria.
Le quote poggiano tutte sul centro del
disco.Utilizzare solo questo come riferimento.
Tutto ciò che è al di fuori del cerchio di 200 mm di
diametro è riportato al solo titolo informativo
DB37
fresato (per tutta la sua cava)
NOTE:
S.E.R.M.S.
Laboratorio per lo studio degli Effetti delle Radiazioni sui Materiali per lo Spazio
Flangia 2
DATE: 11/10/2005
1/1
N° 2 Flange

The technical characteristics, number and dimension of the feedthroughs mounted on the different flanges are reported in the following tables and figures:

Type	# of pins	I/F type	Type of contacs	Total # of feedthrought
DB 9	9	M/F (male vacuum side)	Normal Density	3
DB 15	15	M/F (male vacuum side)	Normal Density	1
DB 37	37	M/F (male vacuum side)	Normal Density	22
			Total # of pins	856

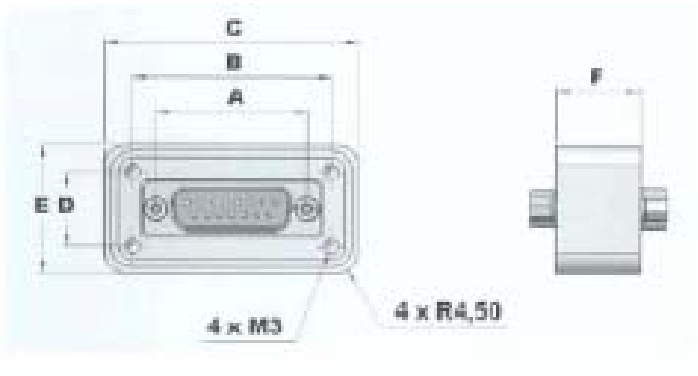


Figure 7 – Dimensions of the feedthrough.

	A	B	C	D	E	F
DB 9	24.99	34.29	46.37	16.00	28.08	18
DB 15	33.32	43.64	55.79	16.76	28.92	18
DB 37	63.50	73.46	85.38	16.90	28.82	18

N.B.: all the dimensions are in mm

Mounting scheme and dimensions of the hole are reported in the next table and figure.

Figure 8 – Dimensions of the hole and mounting description.

	A	B	C	D	E	F
DB 9	32	47.4	34.29	11.50	29.10	16
DB 15	40.3	56.8	43.64	11.50	29.9	16.76
DB 37	70.50	86.40	73.46	11.50	29.80	16.90

N.B.: all the dimensions are in mm

MATERIALS AND FINISHES

Insulator:	Glass-filled DAP (ASTM-D-5948)
Contacts:	Precision machined high tensile copper alloy with stainless steel shrouds
Contact plating:	0.000050 inch (1.25 micron) gold over copper plate
Housing:	Alluminum alloy
O-ring:	Viton

ELECTRICAL CHARACTERISTICS

Contact Current Rating:	7.5 A (nominal value)
Initial contact resistance:	0.008 ohms maximum
Working Voltage:	1000 V.r.m.s.

DESCRIPTION OF THE AVAILABLE CONNECTORS

D-Sub connectors vacuum-side (realized according to MIL-C-24308) are available:

- n° 22 D-Sub connectors with 37 pins
- n°1 D-Sub connectors with 15 pin
- n° 3 D-Sub connectors with 9 pin

These connectors have the following characteristics:

Material:	Glass fiber reinforced polyetherimide UL94V0 with removable crimp contacts;
Current rating:	5A
Test current between contacts:	1200 V / 1 min
Insulation resistance between contacts:	> 5000 MOhm
Maximum cable size:	2.2 mm
Mating cycles:	> 500
Heat deflection limit according to DIN HDT/A:	197°C
Relative temperature index according UL 746 B:	130°C
Sub temperature limit:	- 55 °C

All the contacts pin are crimp contact. To crimp the cable the following tool are available at SERMS laboratory:

- Crimping tool M22520/2-01
- Positioner M22520/2-08
- Extraction tool M81969/1-02

To choose an adequate cable length, in the following figures the distances between the cold plates and their position respect to the flanges with the feedthrough are showed.

Minimum cable length suggested:

- 4 mt for test item placed on the lower cold plate
- 5 mt for test item placed on the middle cold plate
- 6 mt for test item placed on the upper cold plate

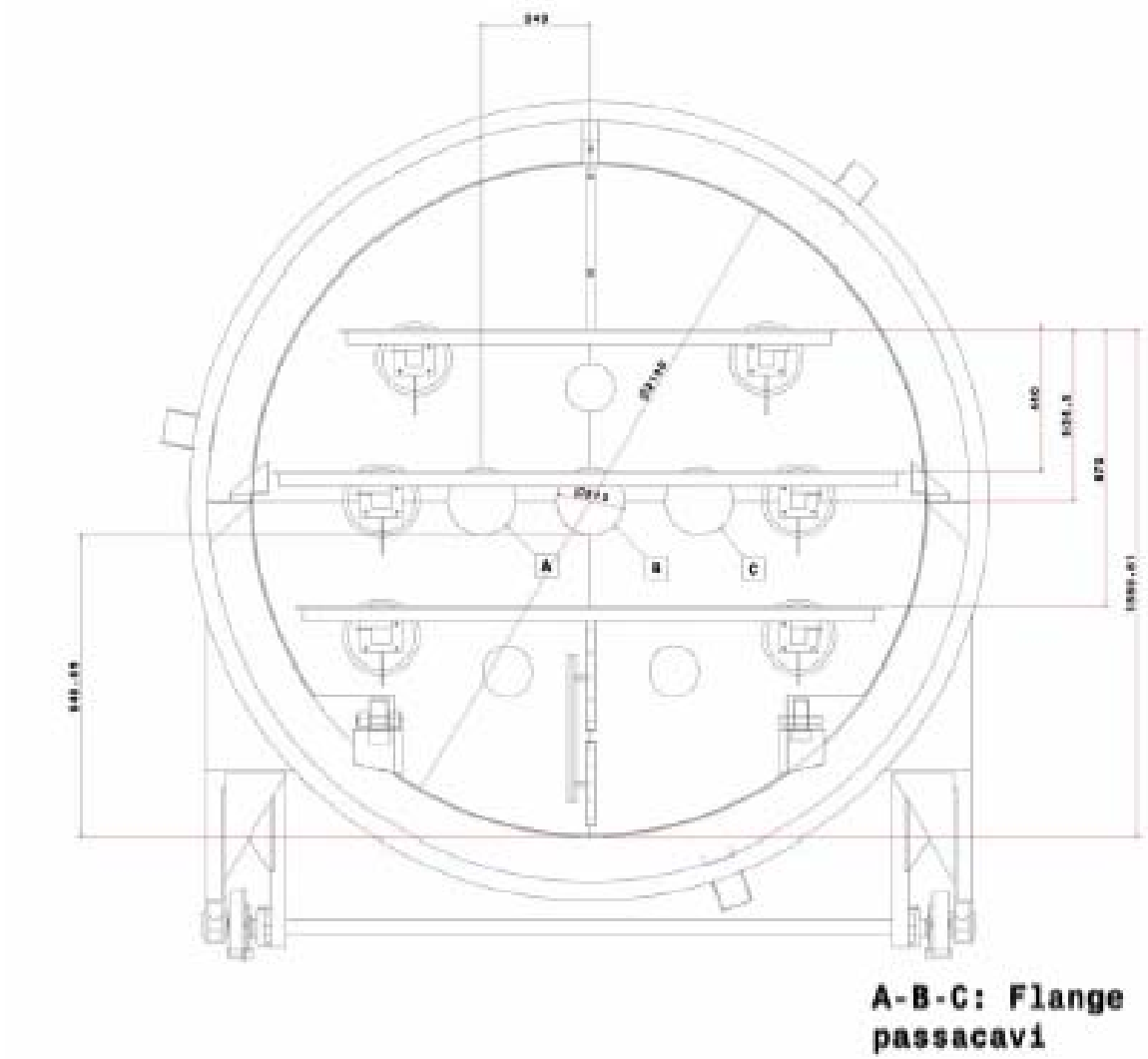


Figure 9 – Position of the cold plates respect to the flanges with the feedthrough.

DESCRIPTION OF THE AVAILABLE EQUIPMENT

At the SERMS laboratory both heaters, strain gauges and PT100 sensors are available. In the following section a brief description of these sensors is reported.

Heaters

Two types of heaters are available; they differs for the electrical resistance and thus for the power that are able to dissipate.

They are all Kapton Heaters from MINCO supplier, suitable for vacuum environment (NASA-RP-1061). All the materials are NASA approved for space application (S-311-P-079).

Figure 10 – Type configuration for the heaters.

In the following table the main characteristic and the number of heater available are reported.

Part #	# available	Size (mm) X	Size (mm) Y	Resistance In ohms	Typical power	Effective area (in^2)	Lead AWG
HK5167R264L12A	2	25.4	254	264	50 W at 115 V	8.96	30
HK5165R52.3L12A	4	25.4	76.2	52.3	15 W at 28 V	2.70	30

Strain Gauges

A total amount of 20 bidirectional (0°-90° T rosette) strain gauges (from HBM supplier-part # 1-XY31-6/120) are available. They have the following characteristics:

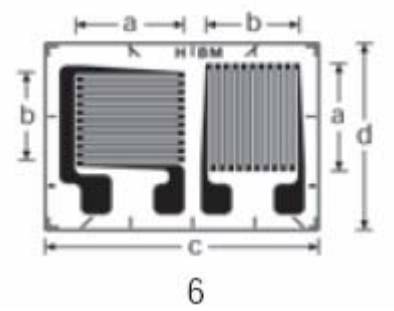


Figure 11 – Size of the strani gauges.

- **Dimensions (mm) (see figure above)**

  Measuring grid

  a = 6

  b = 5.8

  Measuring grid carrier

  c = 17.5

  d = 12

- **Strain Gauges construction:**

  Measuring grid
  Material Constantan foil
  Carrier
  Material polyimide
  Thickness 45 ±10 µm
  Cover
  Material polyimide
  Thickness 25 ± 5 µm

- **Nominal resistance** 120 Ohms
- **Gage factor** approx. 2
- **Gage factor tolerance** ± 1 %
- **Temperature response matched to steel** $10.8 \cdot 10^{-6}$ / K
- **Max. perm. Effective bridge excitation voltage** 11 V
- **Operating temperature range**

  For absolute, i.e. zero point related measurements -70 ÷ 200 °C

  For relative, i.e. not zero point related measurements -200 ÷ 200 °C

Temperature sensors (PT100)

A total amount of 50 PT100 test temperature sensors (from MINCO supplier – part # S249PD12) are available. All PT100s have 100±0.12% ohm platinum element; here there are the main characteristics of these sensors:

- Material	Ceramic/glass body, silver leads
- Dimensions	0.08" × 0.09" (2.0 × 2.3 mm)
- Temperature range	-70 to 400°C
- Sampling frequency	0.008 Hz with 64 sensors (1 acquisition every 128 sec)
	0.01 Hz with 50 sensors (1 acquisition every 100 sec)

Temperature controller

One temperature controller is available (Watlow supplier – part # PDD1-CCCC-1AAA) to control the heaters temperature variation during the test. This controller has a dual channnel input (PT100 sensors) and four output channel for the heaters. The guarantee temperature stability is ± 0.1 °C/°C, while the update rates are 10 Hz for both input and output.. Together with this controlled, four SSR can be used (supplier Watlow – n° 2 part # SSR-240-10A-DC1 – n° 2 part # SSR-100-20A-DC1).
Two of them are able to control a maximum current value of 10A, with an output tension of 120/240 vdc/vac, the other a maximum current of 20A with an output voltage from 0 to 100 vdc.

Cho-Term - Thermally conductive elastomer insulator

A rool 74,2mm x 122 mt without adhesive of Cho-Term 1674 (from Chomerics) is available (part # 64-40-0300-1674). It is a aluminum oxide-filled silicone elastomer designed for applications which require good heat transfer performance and moderate electrical isolation characteristics. It is reinforced with fiberglass cloth to provide
maximum resistance to tear, cut-through and punctures due to burrs and other mating surface irregularities. Using this insulator both a good heat flow from the device to the metal heat sink and electrical isolation of the device from the metal heat sink can be achieved. This insolator has a thickness of 0.25 mm (0,01 inch), a thermal impedance of 2.6 °C – cm^2/W, a thermal conductivity of 1.0 W/m K and an operating temperature range from -60°C to 200°C.