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<p>DATE</p>	<p>DATE</p>	<p>DATE</p>	<p>DATE</p>

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**Technical Specification for the Supply of Segments and Accessories for the Arc Heater of the 2 MW Plasma Wind Tunnel facility at CIRA**

**ABSTRACT:**

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# **Technical Specification for the Supply of Segments and Accessories for the Arc Heater of the 2 MW Plasma Wind Tunnel facility at CIRA**

## **0. INTRODUCTION**

During a series of last test executions, into the 2MW Plasma Wind Tunnel facility GHIBLI, different operating problems occurred, that have produced damage of some arc heater components that have to be replaced, but spare parts in warehouse are not available at moment. .

Mainly copper segments and their accessories are necessary and they are the arc heater most numerous components. These segments are cooled by means of demineralized water circulation and they form the column of the arc heater where the plasma passes through.

So, in order to go on with the Ghibli facility testing activities, the procurement of a high number of spare segments and accessories is necessary.

## **1. PURPOSE**

The purpose of this document is to define the supply of segments and related accessories required for the operation of the Arc Heater 2 MW of the C.I.R.A S.c.p.a Ghibli facility, whose provision is necessary.

## **2. APPLICABILITY**

This technical document applies to the supply process to CIRA, for copper segments and accessories (components of the Arc Heater 2 MW).

## **3. DEFINITIONS & ACRONYMS**

CIRA Aerospace Research Center  
PWT Plasma Wind Tunnel

## **4. GENERAL DESCRIPTION OF EQUIPMENT**

The Ghibli arc heater consists of a series of segments, side by side, for an extension of about one meter to form a tube with the inner diameter of 1 cm, into which an electric discharge is generated, which in turn produces the air plasma that realizes the hypersonic flow.

Material of Ghibli segments: Copper.

Circular shape.

Inner Diameter: 0.5 INC or 12.7 mm

External diameter: 3.010 INC or 76 mm

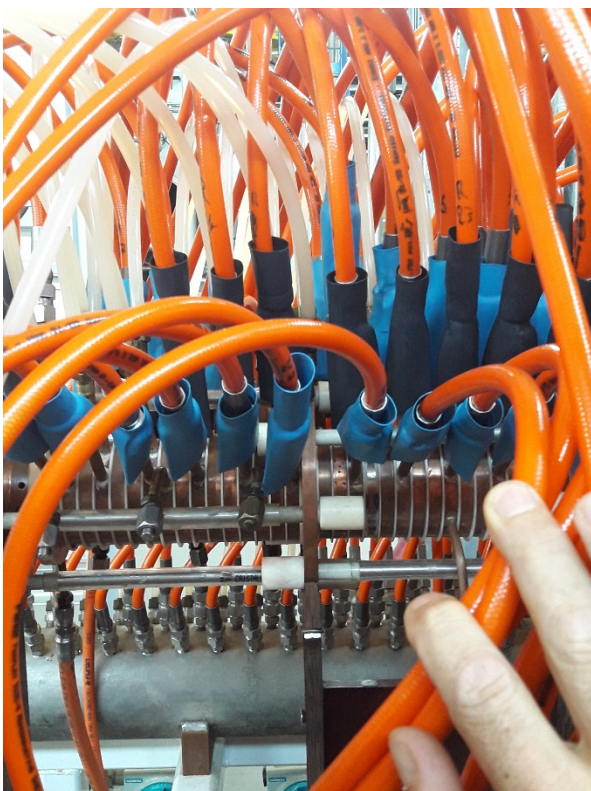
Thickness: 0.381 INC, or 9.7

These segments are of three types, each of which has precise functions and features. A segment set can be assembled to form the "Segment Pack Assembly" and each "Segment Pack Assembly" is in turn composed as follows:

QTY	Segment type	DESCRIPTION
11	Type 1	375" Basic Segment 1.00 Bore
2	Type 2	375" End Segment 1.00 Bore
20	Type 3	375" Gas Injection Segment 1.00 Bore

The entire Ghibli Arc Heater consists in No. 4 "Segment Pack Assembly". These are arranged continually, one after the other, along the arch (Fig. 3). These segments are connected according to specific functions, presenting a different number of external ducts for the inlet and expulsion of cooling water (Fig. 1) and other water for cooling and process air (Fig. 2).

The following pictures (Fig.3-Fig.4) show the 2Mw Ghibli Arc Heater images.



**Fig.3** Arc Heater's Segments**Fig.4** Arc Heater's Segments

The completion of a "Segment Pack Assembly" of the electric arc of the 2MW Ghibli facility is composed not only by the above described segments, but also by other accessories, as shown in the following table:

DESCRIPTION	DRAWING N°.
375" Starter Segment 1.00 Bore	6204-006-03
Outer Insulator Segment	6204-024-01
Inner Insulator Segment	6204-023-01
O – Ring Silicone Rubber S70	2-032
O – Ring Silicone Rubber S70	2-033
O – Ring Silicone Rubber S70	2-034
O – Ring Silicone Rubber S70	2-038
Screw, Flat Head, Cross Recess 82"	6-32NC-2Bx1/2"
Flange 6" DIAx.375 thk	6204-018-01
Primary Gas Injection Segment	6204-128
Retaining Stud	6204-026-01

## 5. SUPPLY REQUIREMENTS

### 5.1 Object

The supply exactly consists of the following number of segments and related accessories s. component list required to the supplier, with total quantity and drawing codes indication:

Quantity	DESCRIPTION	DRAWING N°.
60	375" Basic Segment 1.00 Bore	6204-006-01
3	375" Starter Segment 1.00 Bore	6204-006-03
6	375" Gas Injection Segment 1.00 Bore	6204-031-02
9	375" End Segment 1.00 Bore	6204-006-02
0	Outer Insulator Segment	6204-024-01
80	Inner Insulator Segment	6204-023-01
0	O – Ring Silicone Rubber S70	2-032
0	O – Ring Silicone Rubber S70	2-033
0	O – Ring Silicone Rubber S70	2-034
0	O – Ring Silicone Rubber S70	2-038
0	Screw, Flat Head, Cross Recess 82"	6-32NC-2Bx1/2"
4	Flange 6" DIAx.375 thk	6204-018-01
1	Primary Gas Injection Segment	6204-128
0	Retaining Stud	6204-026-01
0	Anode	
163	Numero Complessivo Componenti nell'ordine	

The following pictures (Fig.5-Fig.6-Fig.7-Fig.8) show the images of the components with the relevant technical drawings on the order:



375 BASIC SEGMENT 1.00 BORE 6204-006-01



FLANGE 6" DIAx thk 6204-018-01



OUTER INSULATOR SEGMENT  
PIN. 6204-024-01

OUTER INSULATOR SEGMENT  
6204-024-01



375 END SEGMENT 1.00 BORE  
6204-006-02

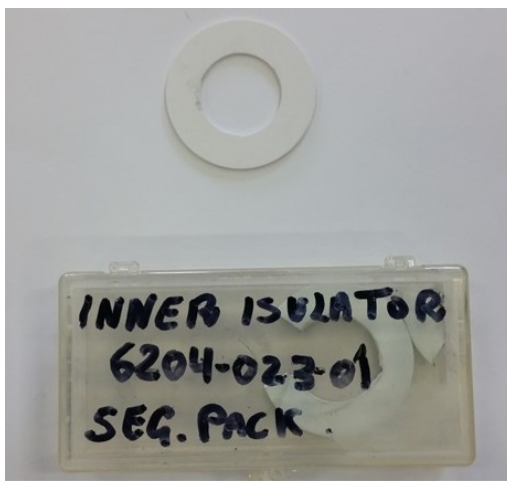


375 GAS INJECTION SEGMENT  
1.00 BORE

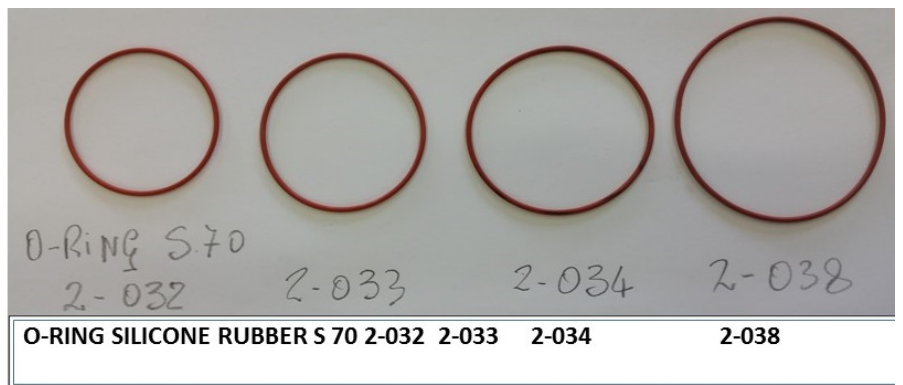


375 STARTER SEGMENT 1.00  
BORE 6204-006-03

**Fig.5** Photo Components Segment

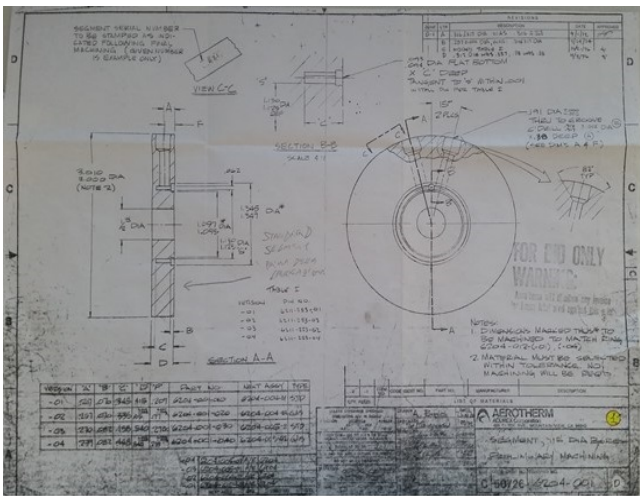


INNER INSULATOR SEGMENT 6204-023-01

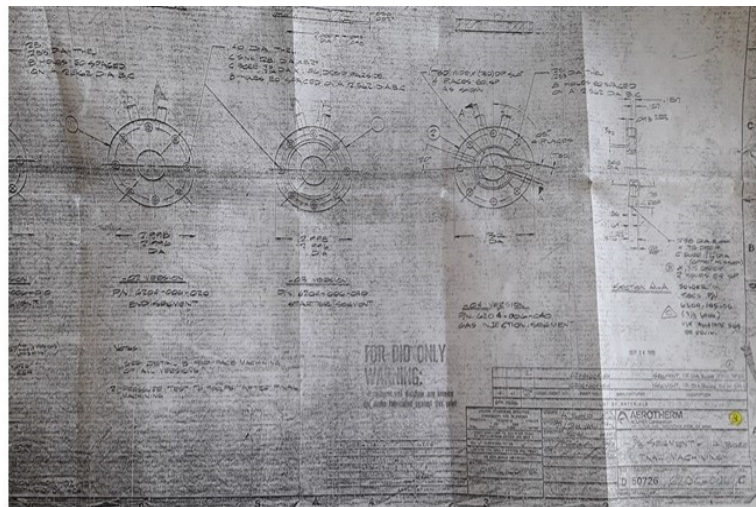


O-RING SILICONE RUBBER S 70 2-032 2-033 2-034 2-038

**Fig.6** Photo Components Segment

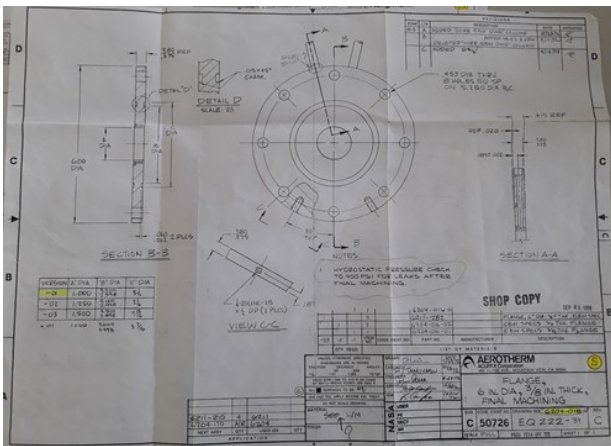


Disegno : 375 BASIC SEGMENT 1.00 BORE 6204-006-01

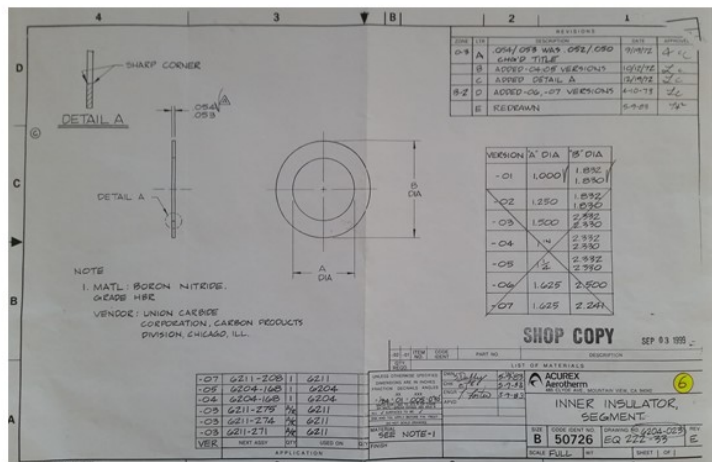


Disegno : 375 END SEGMENT 1.00 BORE 6204-006-02  
375 STARTER SEGMENT 1.00 BORE 6204-006-03  
375 GAS INJECTION SEGMENT 1.00 BORE 6204-031-02

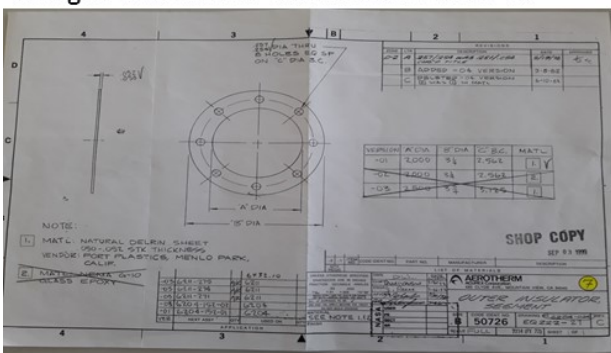
Fig.7 Technical Drawings Segment Components



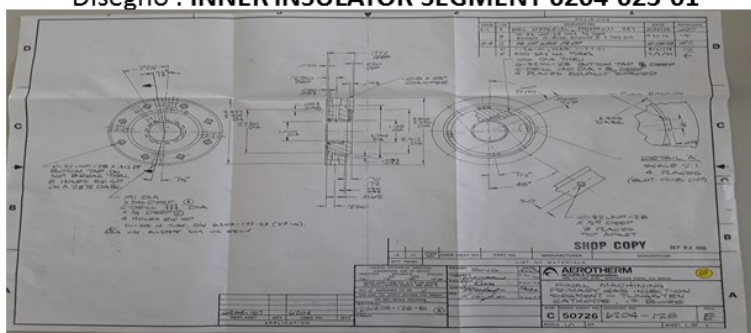
Disegno : FLANGE 6" DIAx thk 6204-018-01



Disegno : INNER INSULATOR SEGMENT 6204-023-01



Disegno : OUTER INSULATOR SEGMENT 6204-024-01



Disegno : PRIMARY GAS INJECTION SEGMENT

Fig.8 Technical Drawings Segment Components

The original drawings will be available to the supplier, if requested.



## **5.2 Limits of Supply**

Within the scope of supply are included only the components in paragraph 5.1, including their shipment from the supplier's location in the United States to CIRA.

## **5.3 Exclusions of supply**

Component assembly activity is excluded from the supply, it will be carried out by expert personnel of the company that manages the Global facility and infrastructure maintenance service at CIRA.

Customs fees are excluded from the delivery.

# **6. TIMELINES AND MODES OF EXECUTION OF THE SUPPLY**

The delivery will take place at the C.I.R.A S.c.p.a. headquarters. Packaging and transport will be responsibility of the supplier, as well as the insurance of the transported material.

Delivery is required within a time limit of 75 days from the date of issue.

# **7. CRITERIA AND ACCEPTANCE MODELS**

Upon joining C.I.R.A, the parts in question will be checked for compliance with specifications and the absence of transport damage.

# **8. TESTING**

The supplier will perform the following tests:

- Hydrostatic pressure test 25 BAR \* 1,5
- Dimensional and pressure controls for fluid transfers

# **9. GUARANTEE**

The Supplier is the only CIRA guarantor against all defects in material and construction as well as, regardless of the tests performed, for full compliance with the technical specification of CIRA itself. The warranty covers any repair or replacement free of charge, including transport, for a standard time (1 year).

## **10.ATTACHMENTS**

Not applicable.