IberEspacio
Tecnología Aeroespacial

Project:	**CG020**
Client:	**Massachusetts Institute of Technology**

Title:

Acceptance Data Package

Document No: **CG020-ADP-0001**	Issue: **1**
Issued for: **INFORMATION**	Date: **16/05/07**

Prepared: **JOK**

Reviewed: **AGU**

Approved: **AGU**

QUALITY RECORD

Retention Period: 5 years

Formato IT-3301-F1-1 Ed. 1

MODIFICATION RECORD

Issue	Modification and Reasons for the Modification

PENDING OR PRELIMINARY INFORMATION

Concept	State

DISTRIBUTION LIST

External	Internal	Quantity / File's Type
J D BURGER		1
M MOLINA		1
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	JOK	1
	AGU	1
	AGI	1(Original)

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1. PACKING LIST

This document refers to the documents included in the next table

Qty	Description	Marking	Length (mm)
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA001/07	2475
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA002/07	2475
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA003/07	2410
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA004/07	2410
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA005/07	2345
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA006/07	2345
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA007/07	2285
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA008/07	2285
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA009/07	2220
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA010/07	2220
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA011/07	2155
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA012/07	2155
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA013/07	2095
1	Axial Grooved Heat Pipe, straight, with 40mm flange	IEA014/07	2095
1	Wooden Container with foam		

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2. DESIGN DRAWINGS

The Design Drawings of the Heat Pipes are included in Annexe I.

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3. DIMMENSIONAL INSPECTION CERTIFICATES

The Dimmensional Certificates of the Heat Pipes are included in Annexe II.

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4. BURST PRESSURE/TEST RECORDS

The Burst Pressure of the lot of material is *at least 204 bar*.

The Test Records of the Heat Pipes are included in Annexe III.

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5. CERTIFICATE OF CONFORMANCE

The Certificates of Conformance are included in Annexe IV.

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6. MATERIAL CERTIFICATES

The Certificates of different Materials used in The Heat Pipes are included in Annexe V.

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7. SAFETY/HANDLING

7.1 AGHP PACKING

AGHP are packed into polyethylene bags. These bags shall to be packed into containers as specified in work instructions documents. AGHP shall be fastened so as to avoid displacement, which may damage them during storage or transportation.

Empty space has to be filled with light material. Bag with silica gel shall be put inside the container.

Quality of AGHP packing shall be examined by quality representative and by project leading designer.

Packing list shall be filled at least in 2 copies for each container with goods.

- 1st copy: Inside the container.
- 2nd copy: kept by the manufacturer' quality department.

7.1.1 AGHP container completeness

Completeness of each container is to be verify when delivering or receiving material.

Each AGHP delivery set shall include following items:

- AGHP
- ADP (Acceptance Data Package),

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7.2 AXIAL GROOVED HEAT PIPES TRANSPORT REQUIREMENTS

AGHP packed in accordance with requirements in a transport container or as a part of dust and moisture proof product can be transported by the following types of transportation:

- by air in hermetic and no hermetic cabin without speed and altitude limits;
- by railway without speed and altitude limits;
- by motor transport without speed and altitude limits.
- by air in hermetic and no hermetic cabin without speed and altitude limits;
- by sea without speed and altitude limits;

7.2.1 Environmental Requirements during Transport

Environment conditions during AGHP(s) transportation shall be as follows:

- pressure: from 20 kPa to 108 kPa (150...810 mm of Mercury column);
- temperature: -50 ... +50°C;
- humidity up to 80% (Humidity up to 98% at the temperature of +20o is permitted for no more than 72 hours totally).

The container with the AGHP shall be fastened to avoid its motion during transportation.

During Lift-on/lift-off, transportation and storage follow the warning signs and symbols indicated on the container.

7.3 STORAGE REQUIREMENTS

It is permitted to store AGHP(s) packed in accordance with the present Specification requirements and in the suitable environmental conditions:

Formato IT-3301-F4-I Ed. 1

a) in ambient conditions at the environment temperature from -50°C to +50°C and relative humidity up to 85%;

b) in non-heated facilities with relative humidity up to 95% for 6 months;

Presence of acid, alkaline and other chemically active substances is forbidden in the storage.

The total storage shelf life is no more than 6 years from manufacturing date (date of AGHP filled with ammonia).

7.4 HANDLING INSTRUCTIONS.

Unpack AGHP in the following order:

1. Check the compliance of the package to the requirements.
2. Open the container and check the correctness of the packing;
3. Open the polyethylene bag and take the Heat Pipe out;
4. Check the completeness of the AGHP;
5. Perform incoming inspection of the linear and connecting dimensions of AGHP in accordance with the requirements of overall dimensions drawing.
6. AGHP(s) documentation shall be kept for the whole warranty period of operation stated in each contract.

Just before mounting the device, make sure that I/F surfaces of AGHP are cleaned using a wet cloth (wipe tissue with Ethyl Alcohol) and blown the surface with air.

Install AGHP on the equipment in accordance with requirements of corresponding mounting drawings.

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It is forbidden to:

- bend AGHP (s)
- use impact instruments or other mechanical impacts during installation works with AGHP

If the requirements mentioned above are observed AGHP (s) is not a dangerous product for storage and installation works.

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8. SAFETY MEASURES FOR OPERATIONS WITH AGHP.

Safety measures during AGHP manufacturing and testing are specified in Manufacturing Instructions

As a unit filled with Ammonia AGHP shall be handled with special care.

In case of d*epressurisation* and ammonia leakage consider the following information and actions:

- Stop all working activities in the area and leave the room until gas is removed or remove AGHP into deserted place with exhaust ventilation.

In case of *ammonia poisoning*:

- Take the victim outdoors immediately;
- call ambulance,

When *falling into the eyes* or onto the mucous membranes, rinse them with water.

Ammonia Data Sheet is included in Annexe VI.

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A1 DESIGN DRAWINGS

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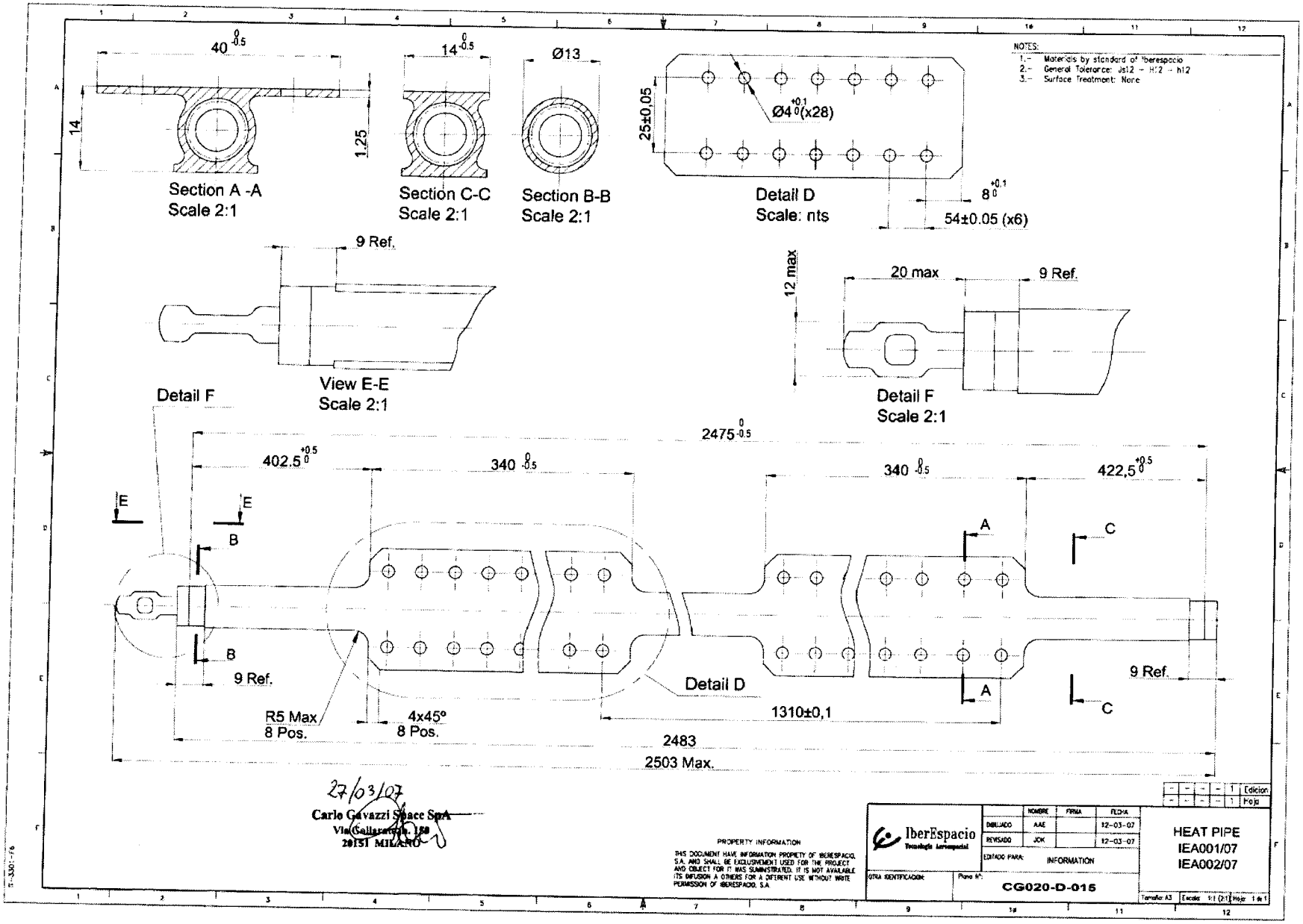
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1.- Materials by standard of Iberespacio
2.- General Tolerance: Js12 → H12 → h12
3.- Surface Treatment: None
Section A -A
Scale 2:1
Section C-C
Scale 2:1
Section B-B
Scale 2:1
Detail D
Scale: nts
Ø4 +0.1 0 (x28)
25±0.05
54±0.05 (x6)
Ø13
View E-E
Scale 2:1
Detail F
Scale 2:1
Detail F
Detail D
2475 0 -0.5
402.5 +0.5 0
340 0 -0.5
422,5 +0.5 0
R5 Max
8 Pos.
4x45°
8 Pos.
1310±0,1
2483
2503 Max.
9 Ref.
12 max
20 max
27/03/07
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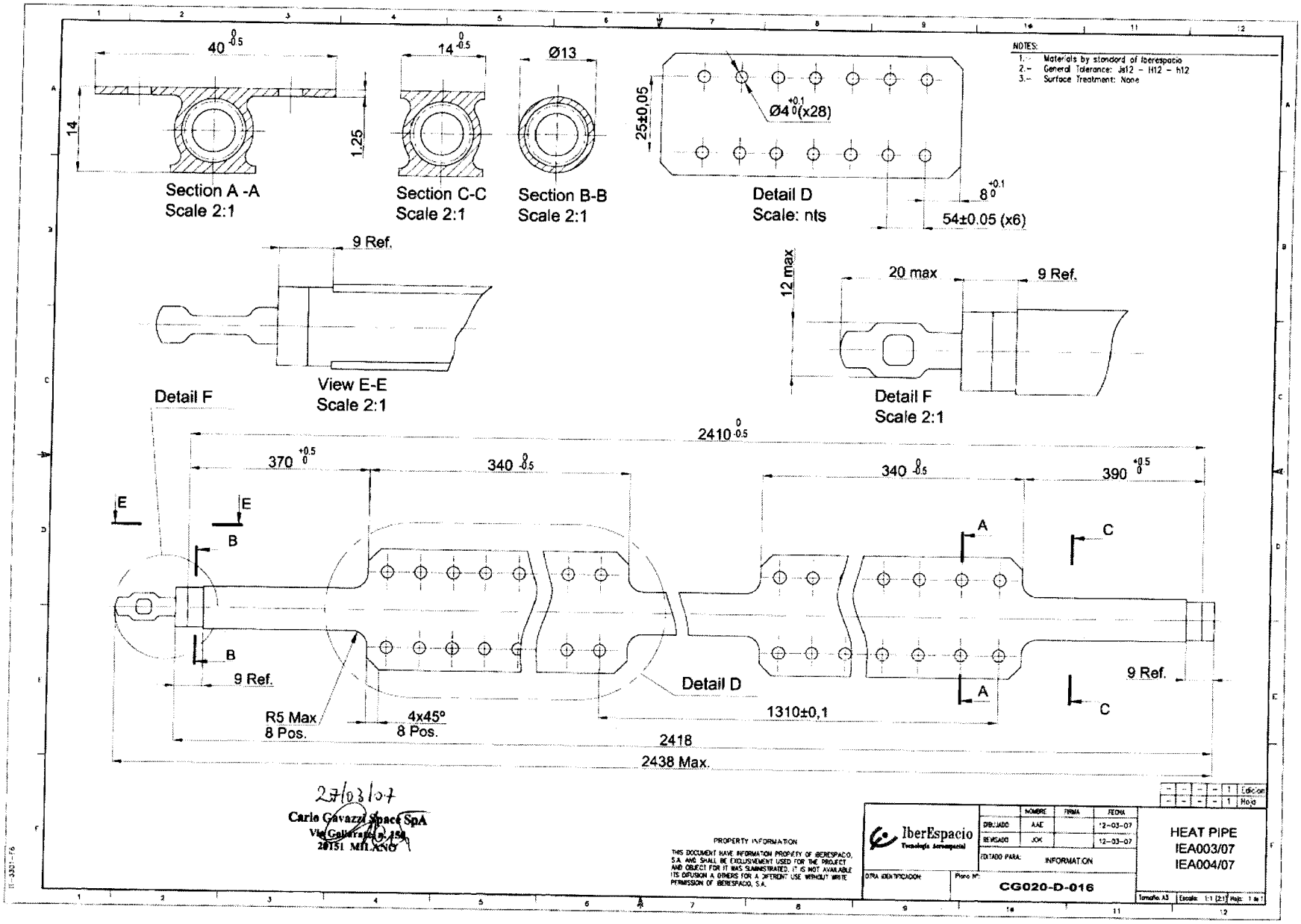
NOMBRE
FIRMA
FECHA
DIBUJADO AAE 12-03-07
REVISADO JOK 12-03-07
EDITADO PARA: INFORMATION
CLAVE IDENTIFICACION
Plano Nº: CG020-D-015
HEAT PIPE
IEA001/07
IEA002/07
Edicion 1
Hoja 1
Tamaño A3
Escala 1:1 (2:1)
Hoja 1 de 1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Section C-C
Scale 2:1
Section B-B
Scale 2:1
Detail D
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Ø4 +0.1 0 (x28)
25±0.05
54±0.05 (x6)
Detail F
View E-E
Scale 2:1
Detail F
Scale 2:1
12 max
20 max
9 Ref.
2410 0 -0.5
370 +0.5 0
340 0 -0.5
390 +0.5 0
R5 Max
8 Pos.
4x45°
8 Pos.
1310±0,1
2418
2438 Max.
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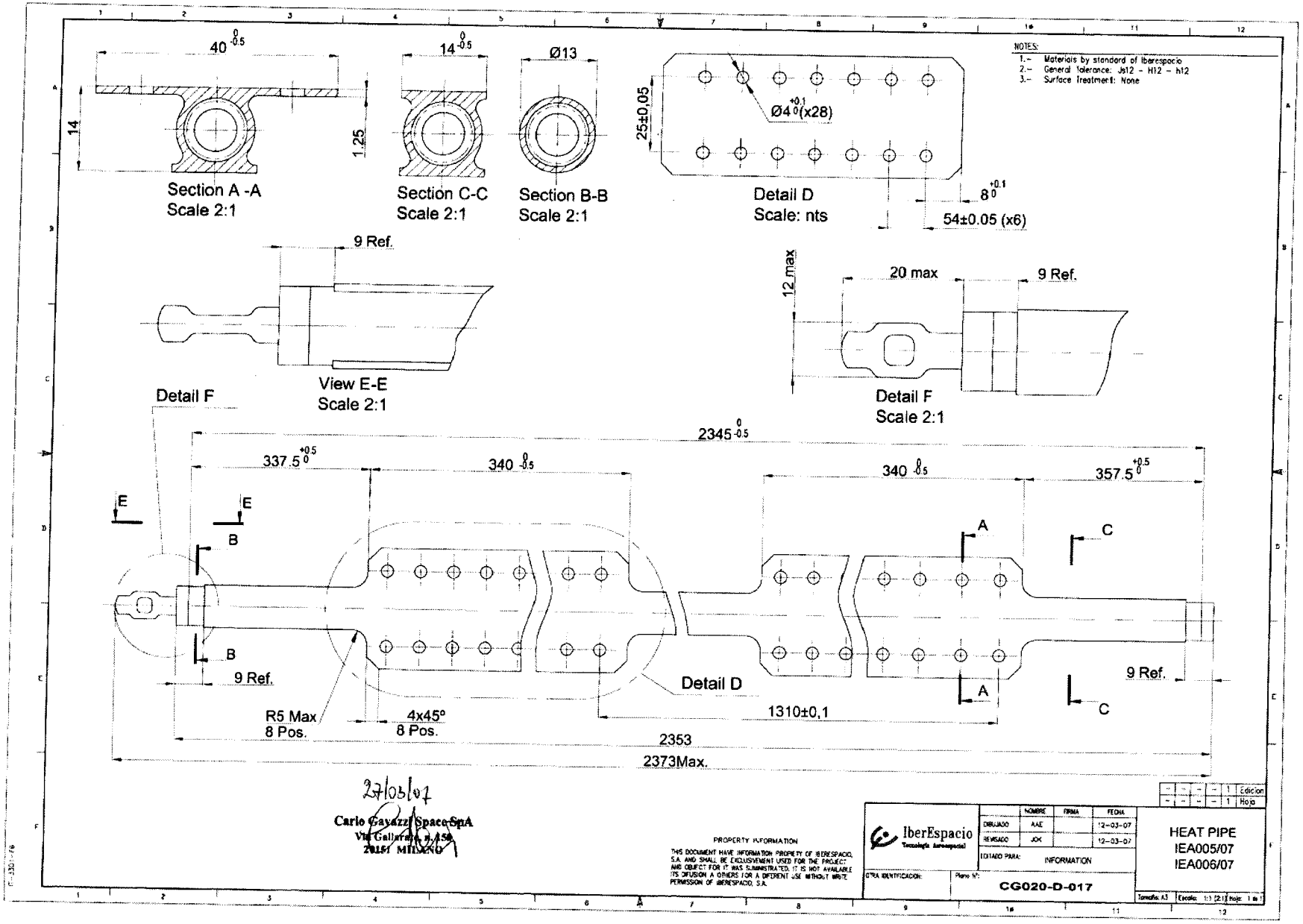
REVISADO JOK 12-03-07
EDITADO PARA: INFORMATION
OTRA IDENTIFICACION
Plano Nº CG020-D-016
HEAT PIPE
IEA003/07
IEA004/07
Tamaño A3
Escala 1:1 (2:1)
Hoja 1 de 1
Edicion 1
Hoja 1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Scale 2:1
Section C-C
Scale 2:1
Section B-B
Scale 2:1
Detail D
Scale: nts
Ø4 +0.1 0 (x28)
25±0,05
8 +0.1 0
54±0.05 (x6)
Detail F
View E-E
Scale 2:1
Detail F
Scale 2:1
12 max
20 max
9 Ref.
2345 0 -0.5
337.5 +0.5 0
340 0 -0.5
340 0 -0.5
357.5 +0.5 0
R5 Max
8 Pos.
4x45°
8 Pos.
1310±0,1
2353
2373Max.
Detail D
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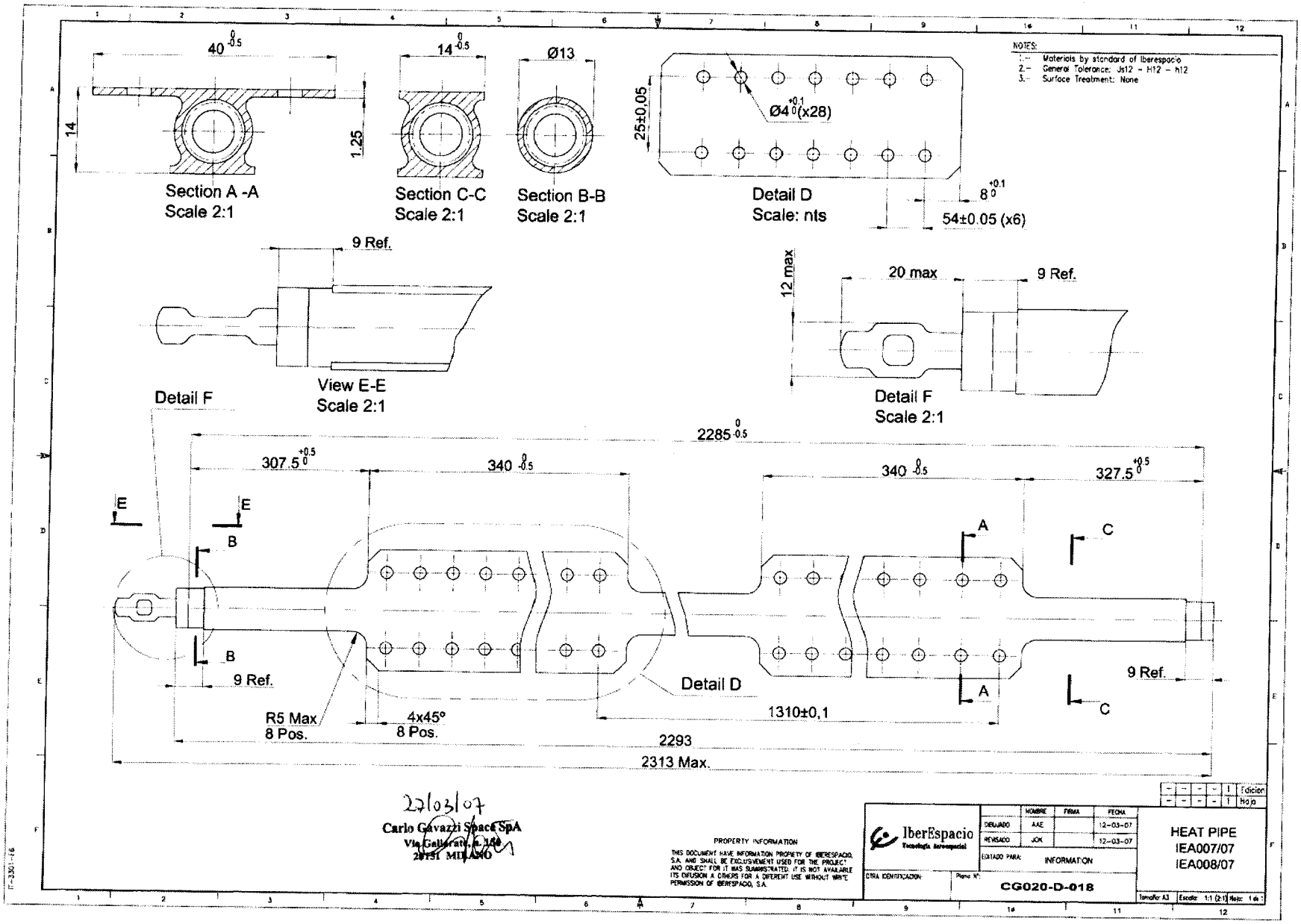
EDITADO PARA: INFORMATION
OTRA IDENTIFICACION:
Plano Nº: CG020-D-017
HEAT PIPE
IEA005/07
IEA006/07
Edicion 1
Hoja 1
Tamaño A3
Escala 1:1 (2:1)
Hoja 1 de 1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Scale 2:1
Section C-C
Scale 2:1
Section B-B
Scale 2:1
Detail D
Scale: nts
54±0.05 (x6)
Detail F
View E-E
Scale 2:1
Detail F
Scale 2:1
9 Ref.
20 max
12 max
2285
307.5
340
340
327.5
R5 Max
8 Pos.
4x45°
8 Pos.
1310±0,1
2293
2313 Max.
Detail D
9 Ref.
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REVISADO JCK 12-03-07
EDITADO PARA: INFORMATION
OTRA IDENTIFICACION:
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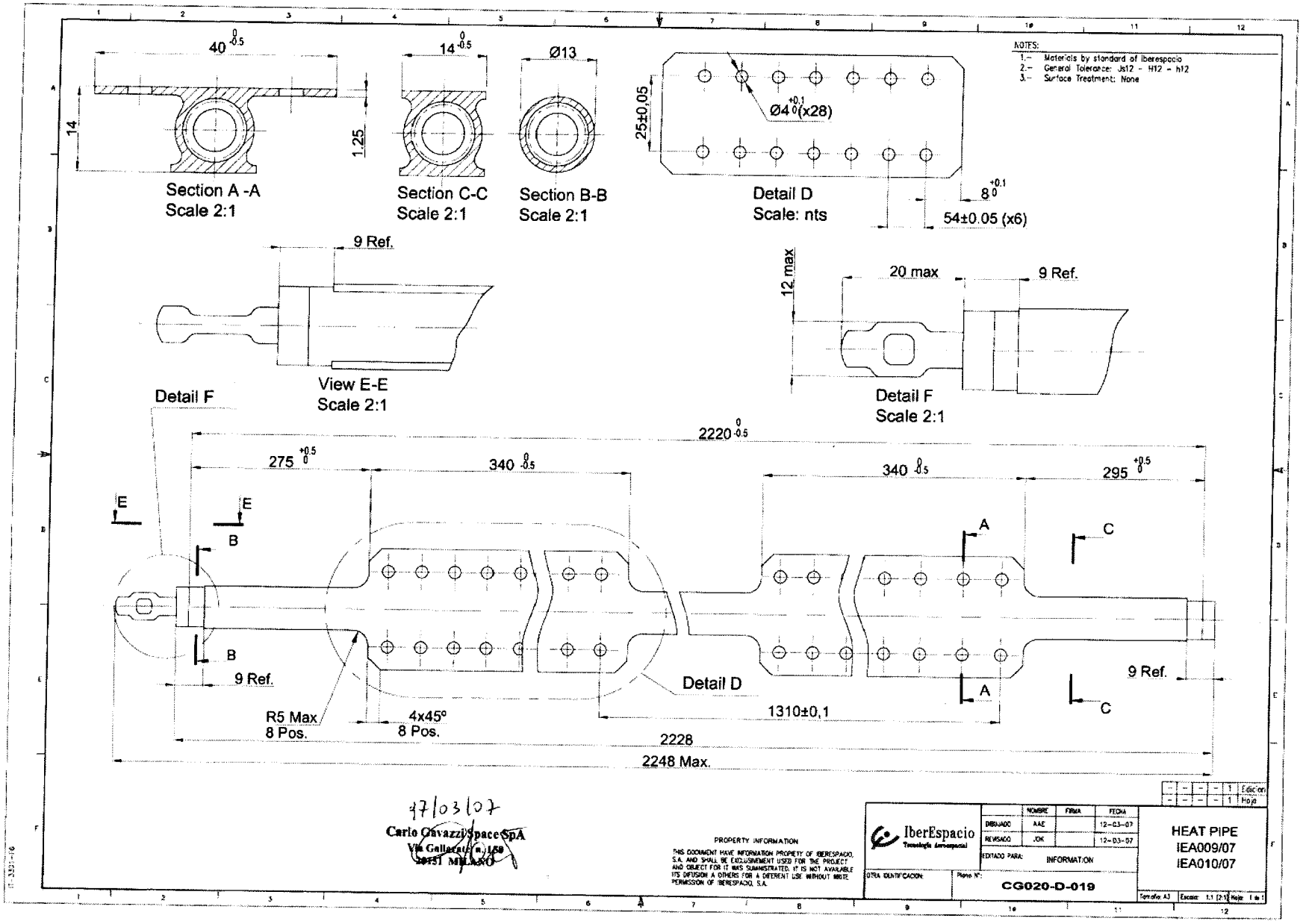
HEAT PIPE
IEA007/07
IEA008/07
Tamaño: A3
Escala: 1:1 (2:1)
Edicion
Hoja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3.- Surface Treatment: None
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Scale 2:1
14 0 -0.5
Section C-C
Scale 2:1
Ø13
Section B-B
Scale 2:1
25±0,05
Ø4 +0.1 0 (x28)
8 +0.1 0
54±0.05 (x6)
Detail D
Scale: nts
9 Ref.
View E-E
Scale 2:1
Detail F
12 max
20 max
9 Ref.
Detail F
Scale 2:1
2220 0 -0.5
275 +0.5 0
340 0 -0.5
340 0 -0.5
295 +0.5 0
E
E
B
B
A
A
C
C
9 Ref.
9 Ref.
Detail D
R5 Max
8 Pos.
4x45°
8 Pos.
1310±0,1
2228
2248 Max.
Edicion
Hoja
IberEspacio
Tecnologia Aeroespacial
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FIRMA
FECHA
DIBUJADO
AAE
12-03-07
REVISADO
JOK
12-03-07
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INFORMATION
OTRA IDENTIFICACION:
Plano Nº:
CG020-D-019
HEAT PIPE
IEA009/07
IEA010/07
Tamaño A3
Escala: 1:1 [2:1]
Hoja 1 de 1
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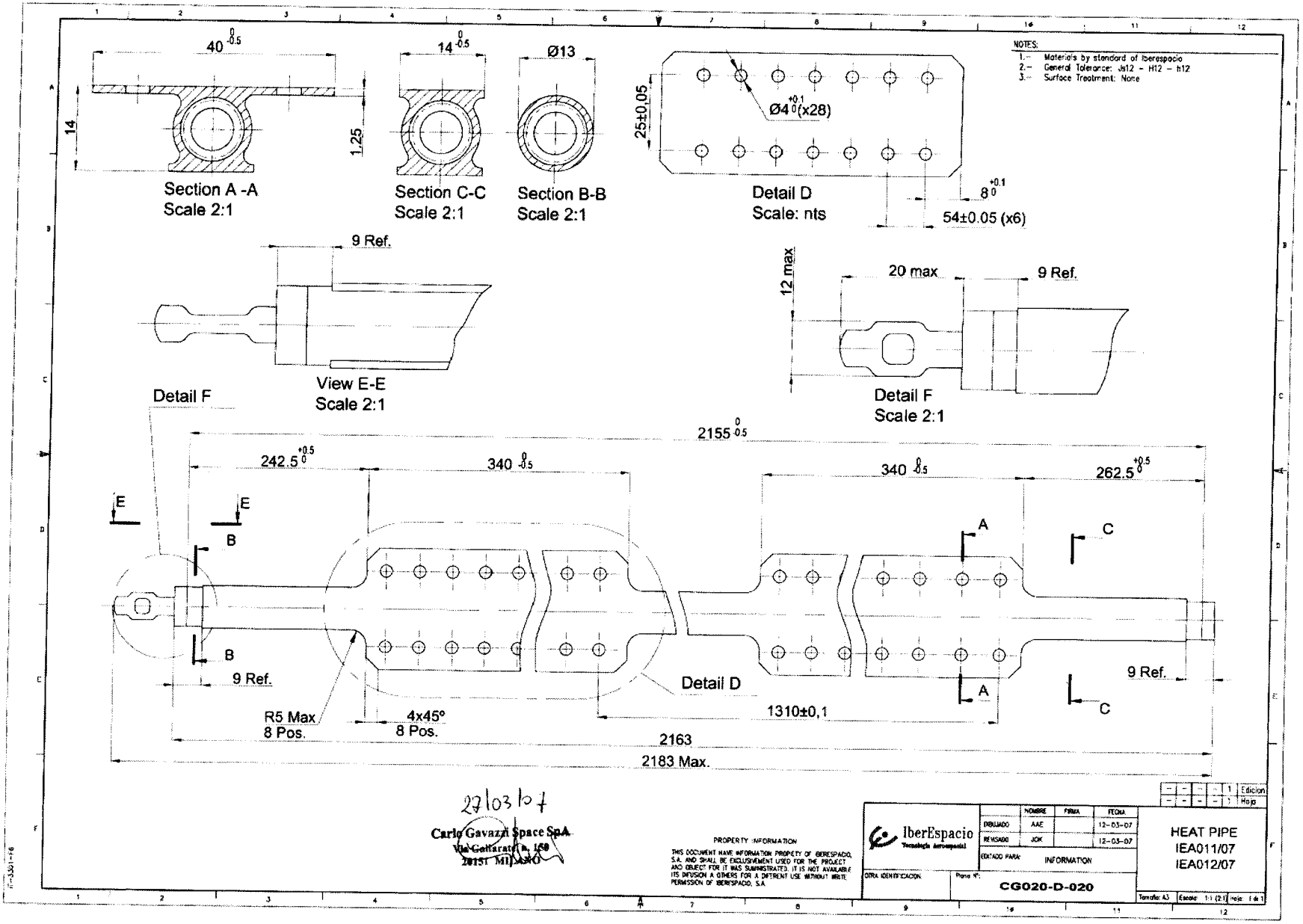
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1.25
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14 0 -0.5
Section C-C
Scale 2:1
Ø13
Section B-B
Scale 2:1
25±0.05
Ø4 +0.1 0 (x28)
Detail D
Scale: nts
8 +0.1 0
54±0.05 (x6)
9 Ref.
View E-E
Scale 2:1
12 max
20 max
9 Ref.
Detail F
Scale 2:1
Detail F
2155 0 -0.5
242.5 +0.5 0
340 0 -0.5
340 0 -0.5
262.5 +0.5 0
E
E
B
B
A
A
C
C
9 Ref.
9 Ref.
Detail D
R5 Max
8 Pos.
4x45°
8 Pos.
1310±0,1
2163
2183 Max.
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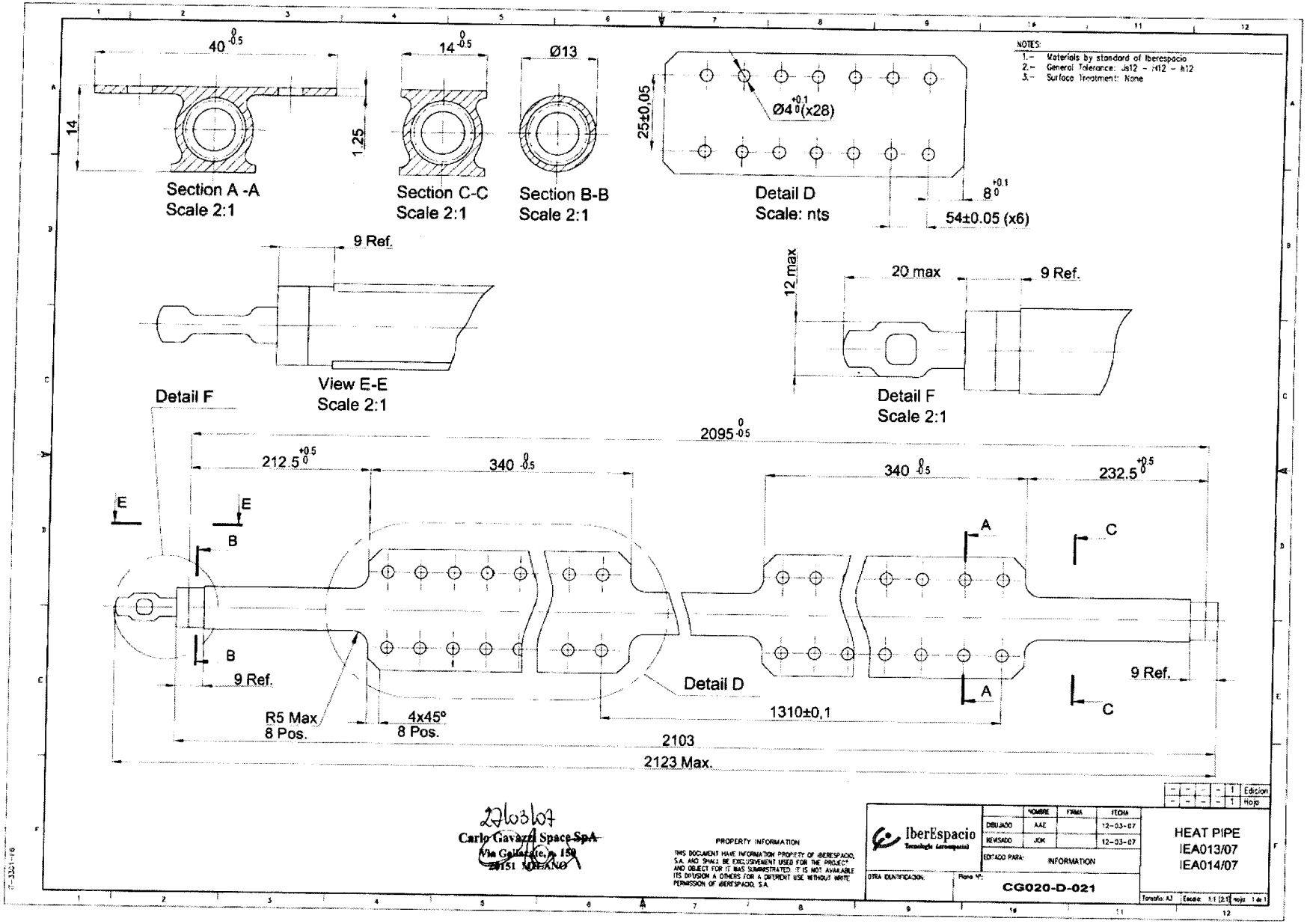
12-03-07
REVISADO
JOK
12-03-07
EDITADO PARA:
INFORMATION
OTRA IDENTIFICACION
Plano Nº:
CG020-D-020
HEAT PIPE
IEA011/07
IEA012/07
Edicion
Hoja
Tamaño: A3
Escala: 1:1 (2:1)
Hoja: 1 de 1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2.- General Tolerance: Js12 - H12 - h12
3.- Surface Treatment: None
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14
1.25
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Scale 2:1
14 0 -0.5
Section C-C
Scale 2:1
Ø13
Section B-B
Scale 2:1
25±0.05
Ø4 +0.1 0 (x28)
Detail D
Scale: nts
8 +0.1 0
54±0.05 (x6)
9 Ref.
View E-E
Scale 2:1
Detail F
12 max
20 max
9 Ref.
Detail F
Scale 2:1
2095 0 -0.5
212.5 +0.5 0
340 0 -0.5
340 0 -0.5
232.5 +0.5 0
E
E
B
B
A
A
C
C
9 Ref.
9 Ref.
R5 Max
8 Pos.
4x45°
8 Pos.
Detail D
1310±0,1
2103
2123 Max.
Edicion
Hoja
HEAT PIPE
IEA013/07
IEA014/07
IberEspacio
Tecnologia Aeroespacial
NOMBRE
FIRMA
FECHA
DIBUJADO
AAE
12-03-07
REVISADO
JOK
12-03-07
EDITADO PARA:
INFORMATION
OTRA IDENTIFICACION:
Plano Nº:
CG020-D-021
Tamaño: A3
Escala: 1:1 (2:1)
Hoja 1 de 1
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I.N.T.A. AREA DE DISEÑO MECANICO Y TALLERES Orden de trabajo nº 07-20-006 HR0	CERTIFICADO DE CONTROL Nº VE/RPI/7030/026/INTA/07 FECHA 10-05-07
DESTINATARIO Garantía de Calidad	PETICIONARIO IBERESPACIO Nº DE LOTE

DESIGNACION	CANTIDAD	PLANOS	EDICION
HEAT PIPE IEA009/07 IEA010/07	2	CG020-P-005	
Certifico que las piezas arriba detalladas han sido inspeccionadas dimensionalmente y de conformidad con los planos excepto en los puntos señalados en observaciones			FIRMA FUNCION Jefe de Verificación

OBSERVACIONES

IEA009/07
Planitud: 0,12
Planitud: 0,22
Cota de 1,2 tiene 1,10-1,50

IEA010/07
Planitud: 0,20
Planitud: 0,15
Cota de 1,2 tiene 1,25-1,40
Cota de 1310 tiene 1310,14

Instrumentos utilizados.
Medidora por coordenadas nº de serie. 016
Incertidumbre de Medida = ± 0,007 mm

Cotas en mm

I.N.T.A. AREA DE DISEÑO MECANICO Y TALLERES Orden de trabajo nº 07-20-006 HR0	CERTIFICADO DE CONTROL Nº VE/RPI/7030/027/INTA/07 FECHA 10-05-07
DESTINATARIO Garantía de Calidad	PETICIONARIO IBERESPACIO Nº DE LOTE

DESIGNACION	CANTIDAD	PLANOS	EDICION
HEAT PIPE IEA011/07 IEA012/07	2	CG020-P-006	
Certifico que las piezas arriba detalladas han sido inspeccionadas dimensionalmente y de conformidad con los planos excepto en los puntos señalados en observaciones			FIRMA FUNCION Jefe de Verificacion

OBSERVACIONES

IEA011/07
Planitud: 0,20
Planitud: 0,14
Cota de 1,2 tiene 1,20-1,40

IEA012/07
Planitud: 0,35
Planitud: 0,24
Cota de 1,2 tiene 1,00-1,30

Instrumentos utilizados.
Medidora por coordenadas nº de serie. 016
Incertidumbre de Medida = ± 0,007 mm

Cotas en mm

I.N.T.A. AREA DE DISEÑO MECANICO Y TALLERES Orden de trabajo nº 07-20-006 HR0	CERTIFICADO DE CONTROL Nº VE/RPI/7030/028/INTA/07 FECHA 10-05-07
DESTINATARIO Garantía de Calidad	PETICIONARIO IBERESPACIO Nº DE LOTE

DESIGNACION	CANTIDAD	PLANOS	EDICION
HEAT PIPE IEA013/07 IEA014/07	2	CG020-P-007	

Certifico que las piezas arriba detalladas han sido inspeccionadas dimensionalmente y de conformidad con los planos excepto en los puntos señalados en observaciones

FIRMA:

FUNCION: Jefe de Verificación

OBSERVACIONES

IEA013/07
Planitud: 0,08
Planitud: 0,10
Cota de 1,2 tiene 1,24-1,30
Cota de 1310 tiene 1310,13

IEA014/07
Planitud: 0,18
Planitud: 0,18
Cota de 1,2 tiene 1,20-1,50

Instrumentos utilizados.
Medidora por coordenadas nº de serie. 016
Incertidumbre de Medida = ± 0,007 mm

Cotas en mm

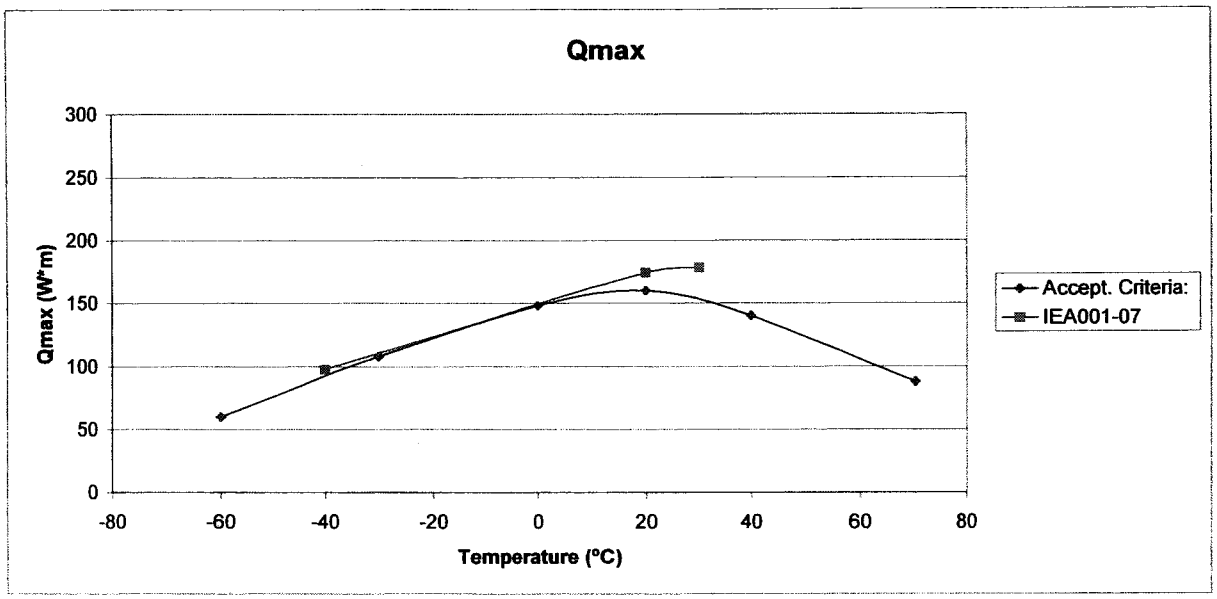
A3 TEST RECORDS

Formato IT-3301-F4-1 Ed. 1

IberEspacio Tecnología Aeroespacial	TEST RESULTS RECORD	Date: 27/04/2007 Sheet: 1 Document. CG020-TR-001
SN: IEA001-07		

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



Tilt Test:

Q = 50% Qmax (W*m)	87.125
Tilt Result (mm)	9.0
Accept. Criteria.	≥ 5.0 mm

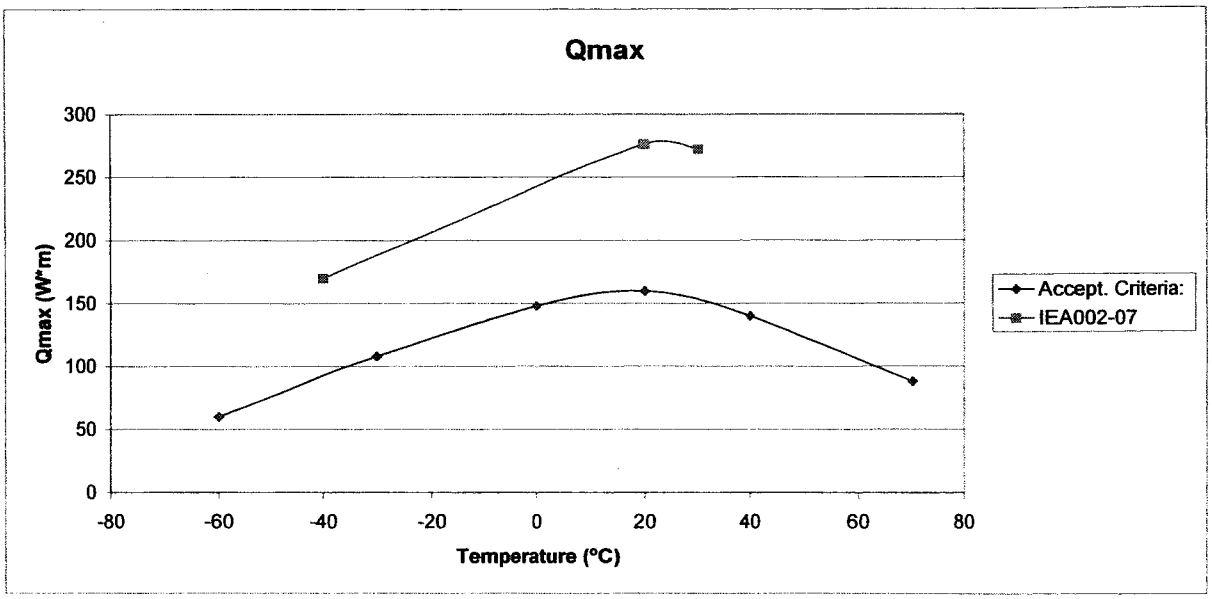
NCG Test:

NCG Length (mm)	0.0
Accept. Criteria. (mm)	49.3

IberEspacio Tecnologia Aeroespacial	TEST RESULTS RECORD	Date: 20/04/2007 Sheet: 1 Document. CG020-TR-002
SN: IEA002-07		

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



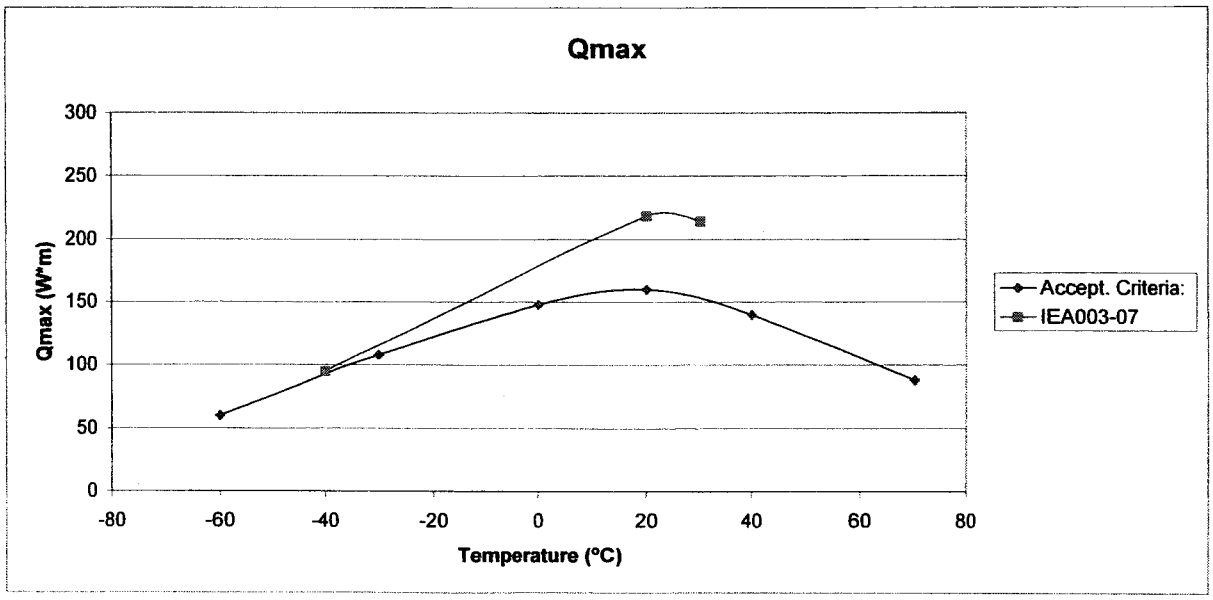
Tilt Test:

Q = 50% Qmax (W*m)	138.125
Tilt Result (mm)	10.0
Accept. Criteria.	≥ 5.0 mm

IberEspacio Tecnologia Aeroespacial	TEST RESULTS RECORD	Date: 07/05/2007 Sheet: 1 Document. CG020-TR-003
SN: IEA003-07		

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



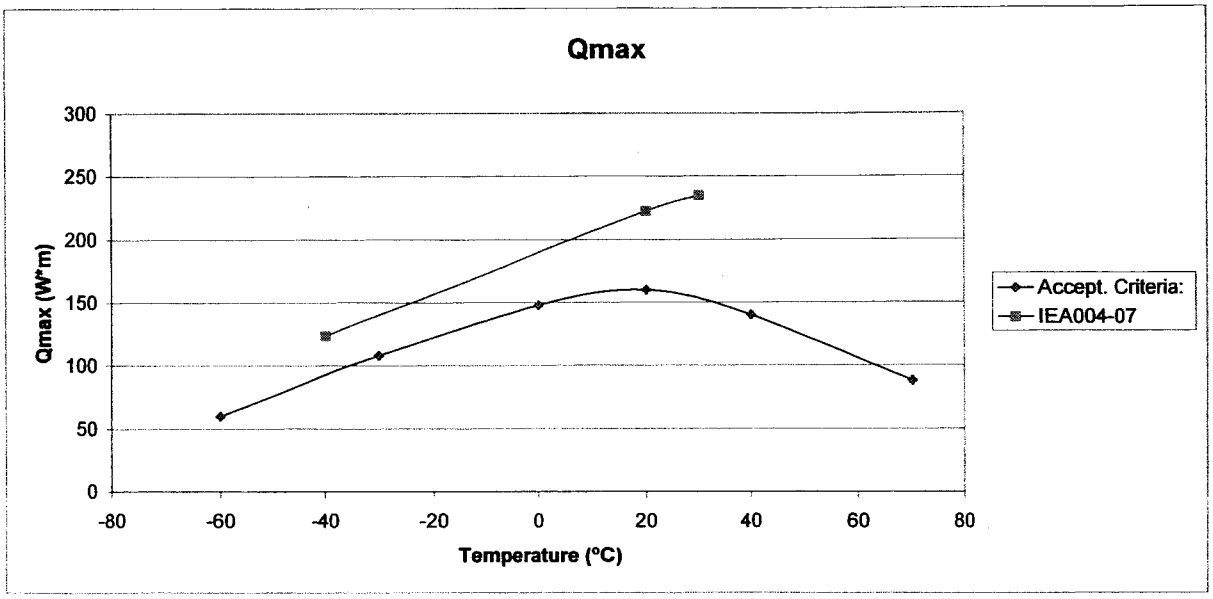
Tilt Test:

Q = 50% Qmax (W*m)	109.18
Tilt Result (mm)	8.0
Accept. Criteria.	≥ 5.0 mm

IberEspacio Tecnologia Aeroespacial	TEST RESULTS RECORD	Date: 20/04/2007 Sheet: 1 Document. CG020-TR-004
SN: IEA004-07		

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



Tilt Test:

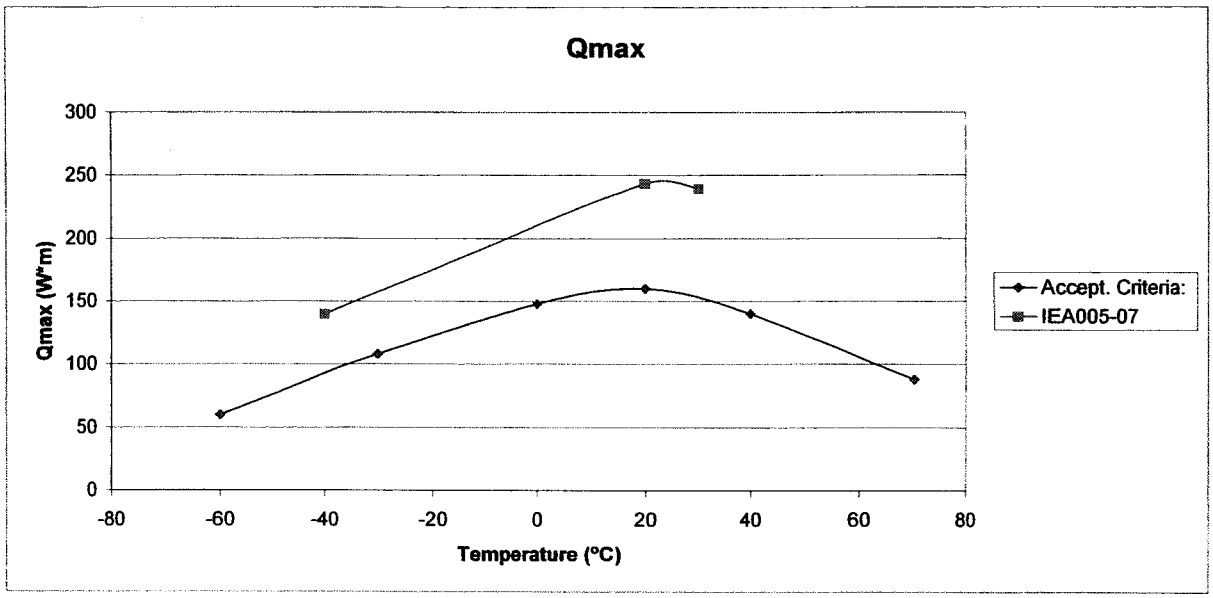
Q = 50% Qmax (W*m)	111.24
Tilt Result (mm)	8.0
Accept. Criteria.	≥ 5.0 mm

IberEspacio Tecnologia Aeroespacial	TEST RESULTS RECORD	Date: 07/05/2007 Sheet: 1 Document. CG020-TR-005

SN: IEA005-07

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



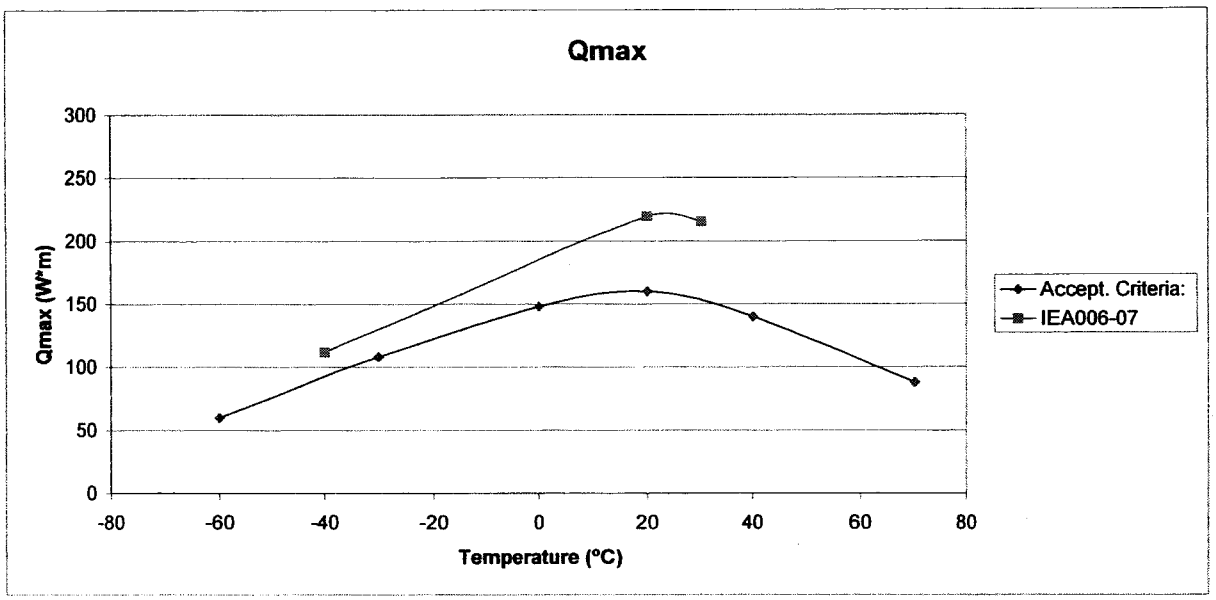
Tilt Test:

Q = 50% Qmax (W*m)	121.695
Tilt Result (mm)	12.0
Accept. Criteria.	≥ 5.0 mm

IberEspacio Tecnología Aeroespacial	TEST RESULTS RECORD	Date: 07/05/2007 Sheet: 1 Document. CG020-TR-006
SN: IEA006-07		

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



Tilt Test:

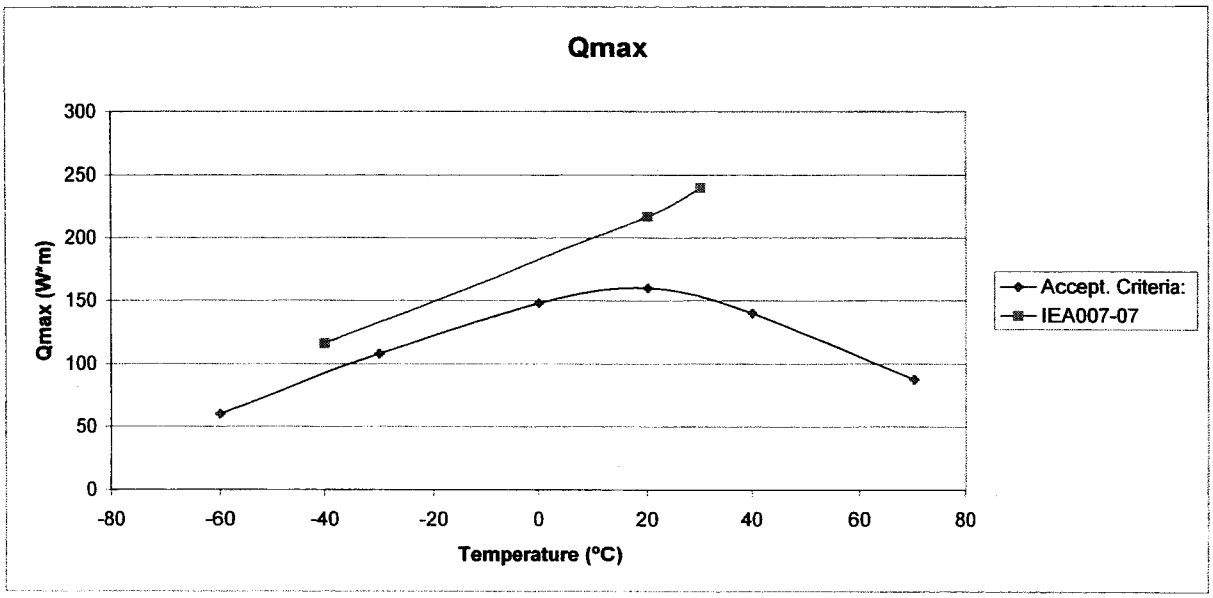
Q = 50% Qmax (W*m)	109.725
Tilt Result (mm)	8.0
Accept. Criteria.	≥ 5.0 mm

IberEspacio Tecnologia Aeroespacial	TEST RESULTS RECORD	Date: 13/04/2007 Sheet: 1 Document. CG020-TR-007

SN: IEA007-07

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



Tilt Test:

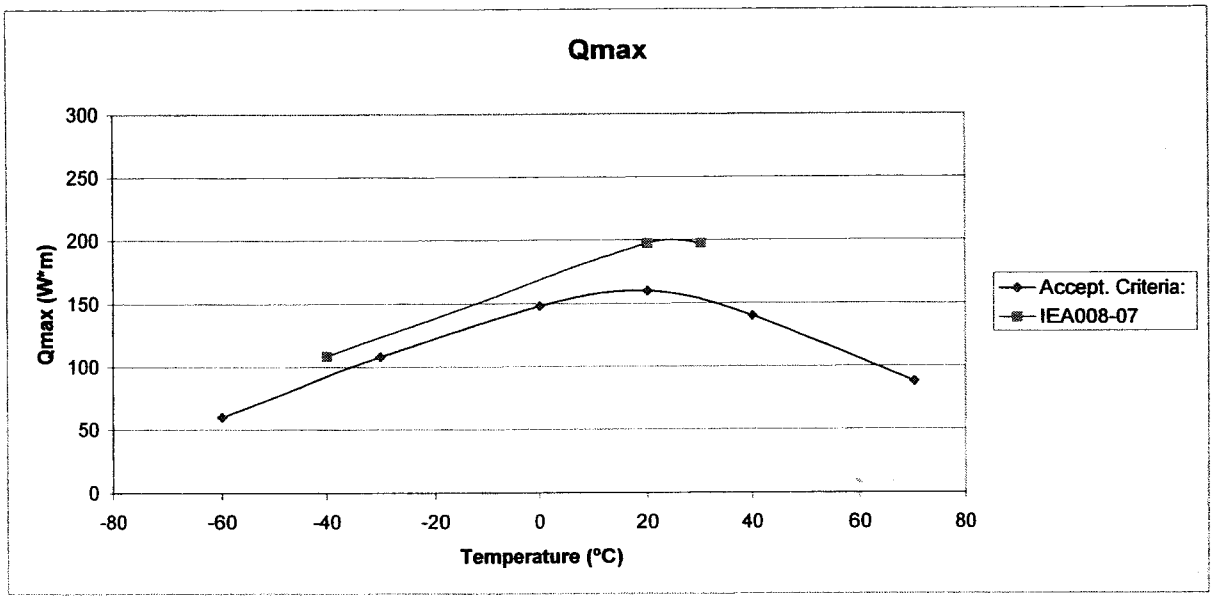
Q = 50% Qmax (W*m)	108.36
Tilt Result (mm)	10.0
Accept. Criteria.	≥ 5.0 mm

IberEspacio Tecnologia Aeroespacial	TEST RESULTS RECORD	Date: 20/04/2007 Sheet: 1 Document. CG020-TR-008

SN: IEA008-07

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



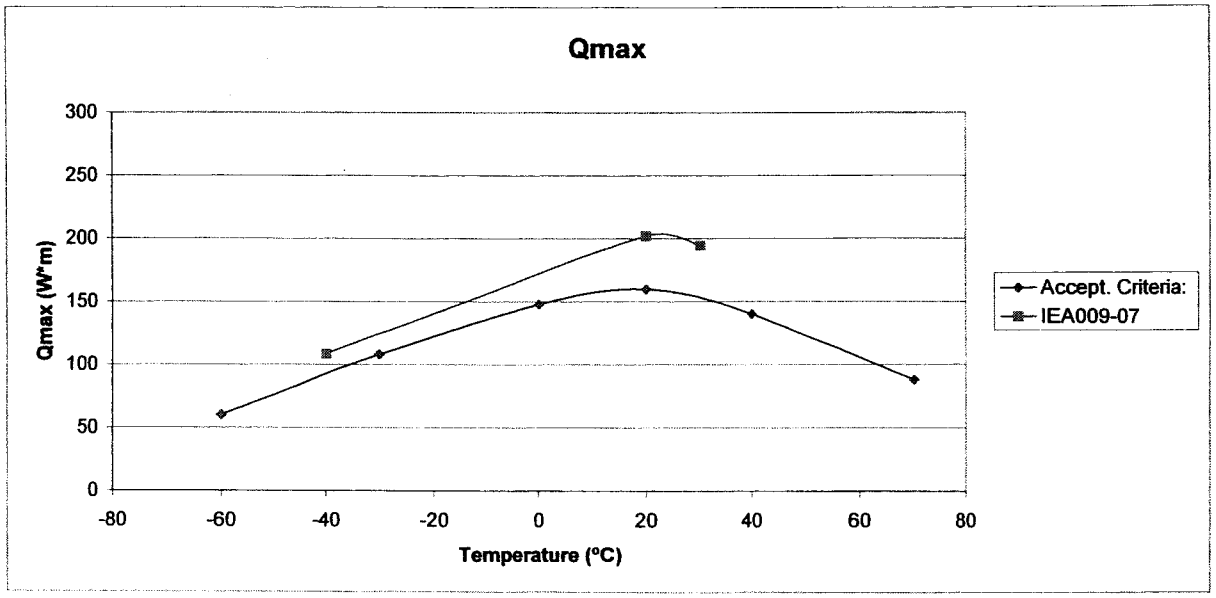
Tilt Test:

Q = 50% Qmax (W*m)	98.685
Tilt Result (mm)	8.0
Accept. Criteria.	≥ 5.0 mm

IberEspacio Tecnología Aeroespacial	TEST RESULTS RECORD	Date: 13/04/2007 Sheet: 1 Document. CG020-TR-009
SN: IEA009-07		

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



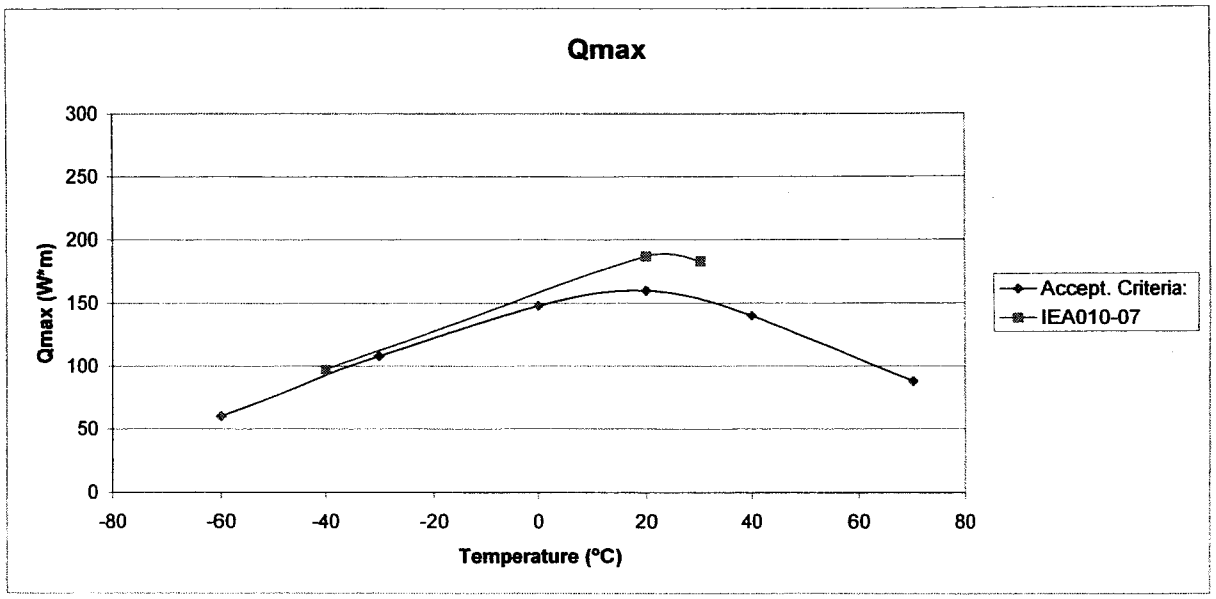
Tilt Test:

Q = 50% Qmax (W*m)	100.98
Tilt Result (mm)	8.5
Accept. Criteria.	≥ 5.0 mm

IberEspacio Tecnología Aeroespacial	TEST RESULTS RECORD	Date: 20/04/2007 Sheet: 1 Document. CG020-TR-010
SN: IEA010-07		

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



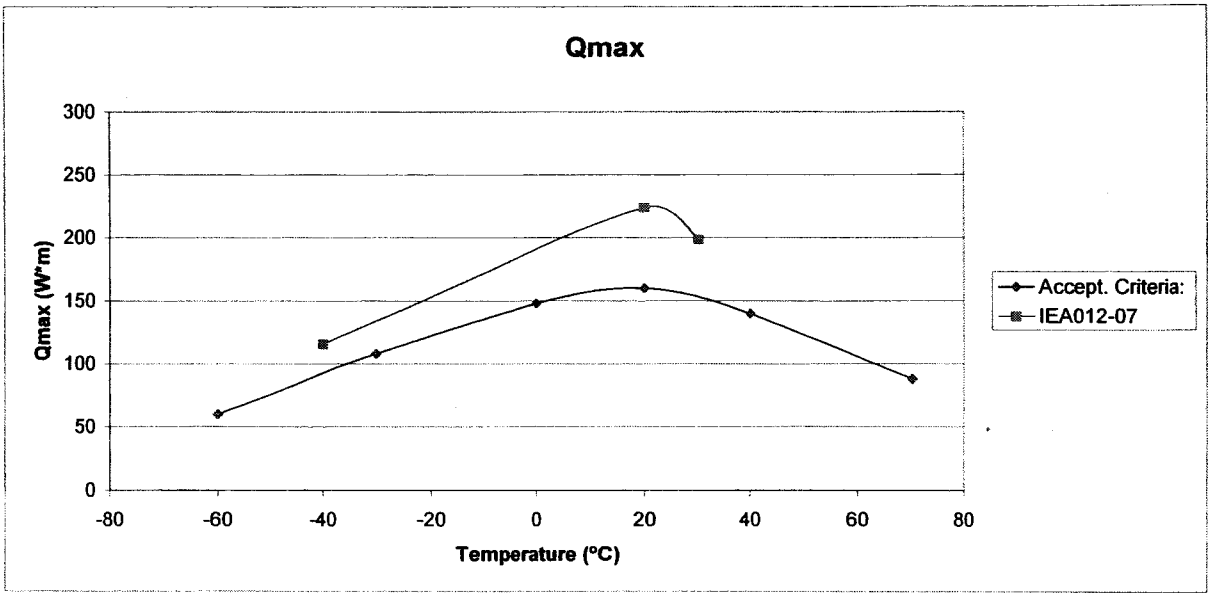
Tilt Test:

Q = 50% Qmax (W*m)	93.5
Tilt Result (mm)	8.0
Accept. Criteria.	≥ 5.0 mm

IberEspacio Tecnología Aeroespacial	TEST RESULTS RECORD	Date: 13/04/2007 Sheet: 1 Document. CG020-TR-0012
SN: IEA012-07		

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



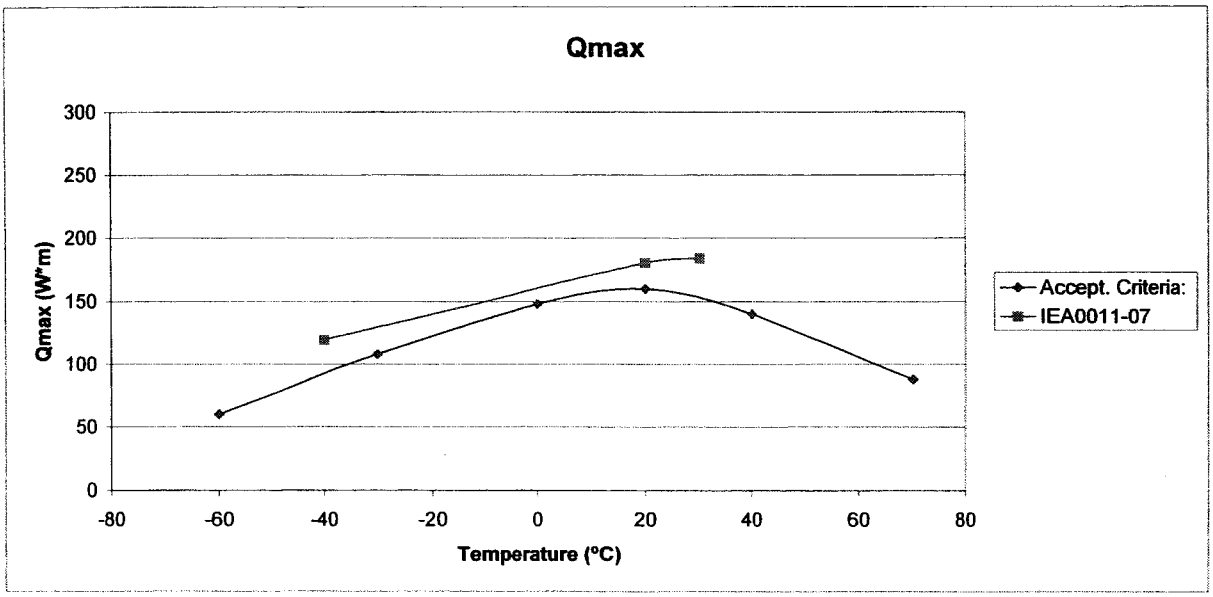
Tilt Test:

Q = 50% Qmax (W*m)	111.91
Tilt Result (mm)	10.0
Accept. Criteria.	≥ 5.0 mm

IberEspacio Tecnología Aeroespacial	TEST RESULTS RECORD	Date: 15/05/2007 Sheet: 1 Document. CG020-TR-001
SN: IEA0011-07		

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



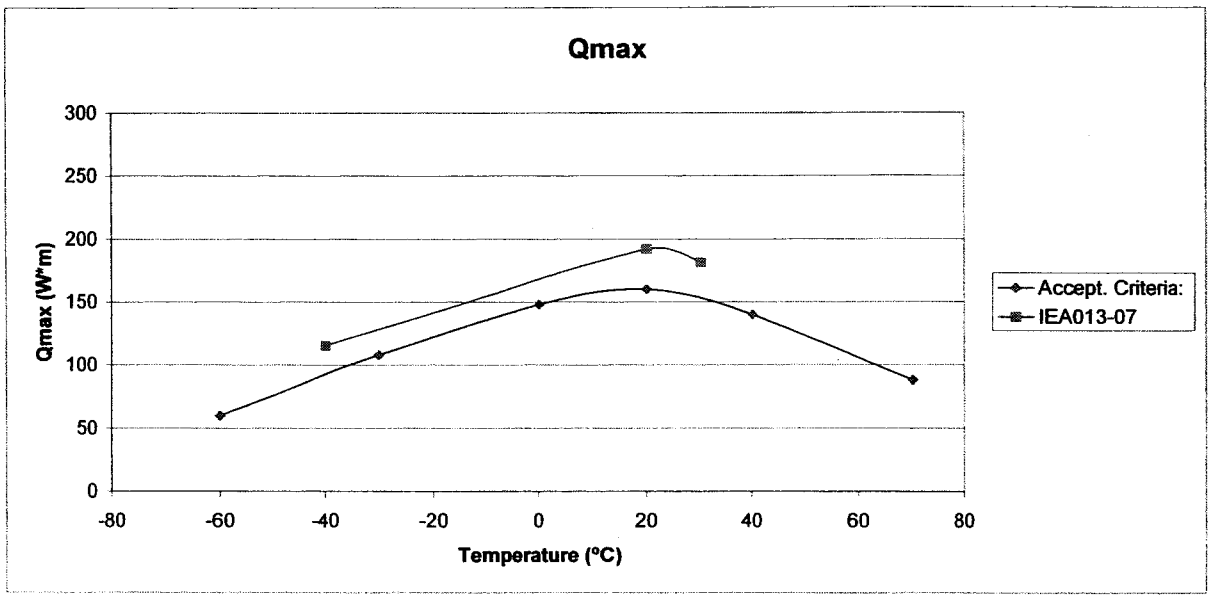
Tilt Test:

Q = 50% Qmax (W*m)	90.25
Tilt Result (mm)	10.0
Accept. Criteria.	≥ 5.0 mm

IberEspacio Tecnologia Aeroespacial	TEST RESULTS RECORD	Date: 07/05/2007 Sheet: 1 Document. CG020-TR-013
SN: IEA013-07		

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



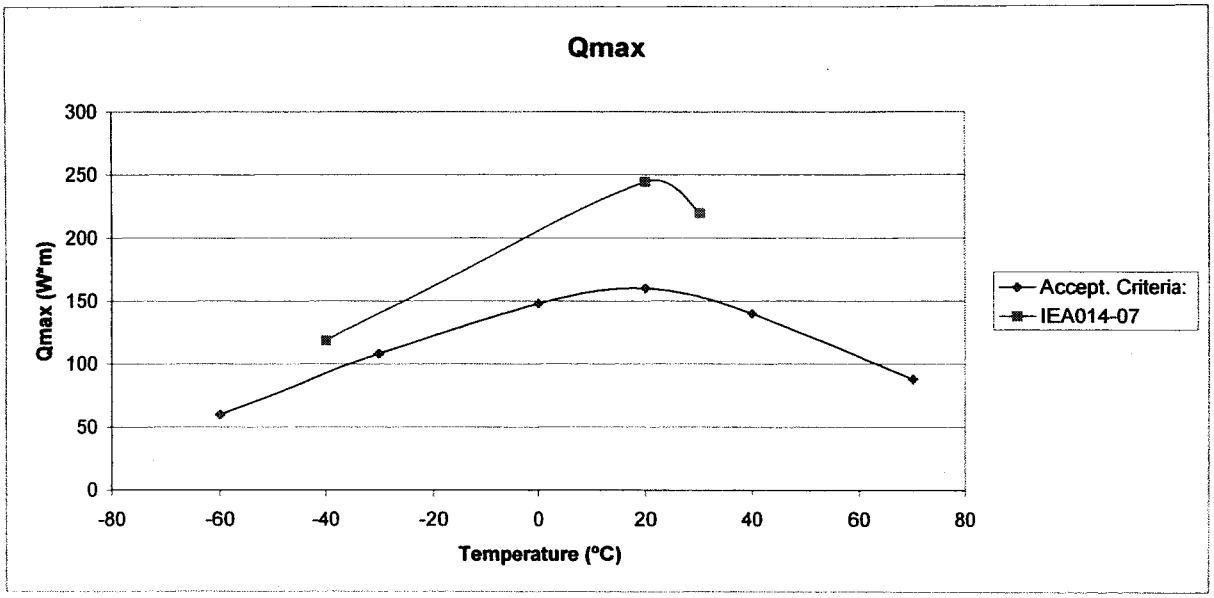
Tilt Test:

Q = 50% Qmax (W*m)	95.975
Tilt Result (mm)	8.5
Accept. Criteria.	≥ 5.0 mm

IberEspacio Tecnología Aeroespacial	TEST RESULTS RECORD	Date: 13/04/2007 Sheet: 1 Document. CG020-TR-014
SN: IEA014-07		

Performance Test:

Ev. Length (mm)	340.0
Cond. Length (mm)	340.0



Tilt Test:

Q = 50% Qmax (W*m)	122.15
Tilt Result (mm)	9.0
Accept. Criteria.	≥ 5.0 mm

A4 CERTIFICATE OF CONFORMANCE OF THE HEAT PIPES

Formato IT-3301-F4-1 Ed. 1

IberEspacio Tecnología Aeroespacial	**CERTIFICATE OF CONFORMANCE**	**NUMBER: CG020-CC-0001** **ISSUE: 1** **DATE: 16/05/2007**

Product: Axial Grooved Heat Pipe

Identification: IEA001/07

In compliance with Drawing: CG020-D-015, Issue 1

Test records: CG020-TR-001

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.028

Measured Operating power at 20°C (W): 82

Mass (g): 835.2

Working fluid mass (g): 28.5

Proof pressure (bar): 153

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s) at 102bar: $< 4 \times 10^{-10}$

Ammonia leakage at 90°C (ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 13/04/2007

Production Manager	**QA & PA**

IberEspacio Tecnología Aeroespacial	**CERTIFICATE OF CONFORMANCE**	**NUMBER: CG020-CC-0002** **ISSUE: 1** **DATE: 16/05/2007**

Product: Axial Grooved Heat Pipe

Identification: IEA002/07

In compliance with Drawing: CG020-D-015, Issue 1

Test records: CG020-TR-002

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.030

Measured Operating power at 20°C (W): 130

Mass (g): 835.5

Working fluid mass (g): 28.5

Proof pressure (bar): 153

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s)at 102bar: $< 5 \times 10^{-10}$

Ammonia leakage at 90°C(ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 13/04/2007

Production Manager	**QA & PA**

IberEspacio Tecnología Aeroespacial	**CERTIFICATE OF CONFORMANCE**	**NUMBER: CG020-CC-0003** **ISSUE: 1** **DATE: 16/05/2007**

Product: Axial Grooved Heat Pipe

Identification: IEA003/07

In compliance with Drawing: CG020-D-016, Issue 1

Test records: CG020-TR-003

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.024

Measured Operating power at 20°C (W): 106

Mass (g): 816.4

Working fluid mass (g): 27.8

Proof pressure (bar): 153

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s) at 102bar: $< 1 \times 10^{-10}$

Ammonia leakage at 90°C (ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 23/04/2007

Production Manager	**QA & PA**
	QUALITY & PRODUCT ASSURANCE IberEspacio Tecnología Aeroespacial

IberEspacio Tecnología Aeroespacial	**CERTIFICATE OF CONFORMANCE**	**NUMBER: CG020-CC-0004** **ISSUE: 1** **DATE: 16/05/2007**

Product: Axial Grooved Heat Pipe

Identification: IEA004/07

In compliance with Drawing: CG020-D-016, Issue 1

Test records: CG020-TR-004

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.032

Measured Operating power at 20°C (W): 108

Mass (g): 814.3

Working fluid mass (g): 27.8

Proof pressure (bar): 153

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s) at 102bar: $< 8 \times 10^{-10}$

Ammonia leakage at 90°C (ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 23/04/2007

Production Manager	**QA & PA**
	QUALITY & PRODUCT ASSURANCE IberEspacio Tecnología Aeroespacial

IberEspacio Tecnología Aeroespacial	**CERTIFICATE OF CONFORMANCE**	**NUMBER: CG020-CC-0005** **ISSUE: 1** **DATE: 16/05/2007**

Product: Axial Grooved Heat Pipe

Identification: IEA005/07

In compliance with Drawing: CG020-D-017, Issue 1

Test records: CG020-TR-005

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.025

Measured Operating power at 20°C (W): 122

Mass (g): 797.4

Working fluid mass (g): 27.0

Proof pressure (bar): 153

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s) at 102bar: $< 1 \times 10^{-10}$

Ammonia leakage at 90°C (ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 20/04/2007

Production Manager	**QA & PA**
	QUALITY & PRODUCT ASSURANCE IberEspacio Tecnología Aeroespacial

IberEspacio Tecnología Aeroespacial	**CERTIFICATE OF CONFORMANCE**	**NUMBER: CG020-CC-0006** **ISSUE: 1** **DATE: 16/05/2007**

Product: Axial Grooved Heat Pipe

Identification: IEA006/07

In compliance with Drawing: CG020-D-017, Issue 1

Test records: CG020-TR-006

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.028

Measured Operating power at 20°C (W): 110

Mass (g): 797.3

Working fluid mass (g): 27.0

Proof pressure (bar): 153

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s) at 102bar: $< 1 \times 10^{-10}$

Ammonia leakage at 90°C (ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 23/04/2007

Production Manager	**QA & PA**
	QUALITY & PRODUCT ASSURANCE IberEspacio Tecnología Aeroespacial

IberEspacio Tecnología Aeroespacial	**CERTIFICATE OF CONFORMANCE**	**NUMBER: CG020-CC-0007** **ISSUE: 1** **DATE: 16/05/2007**

Product: Axial Grooved Heat Pipe

Identification: IEA007/07

In compliance with Drawing: CG020-D-018, Issue 1

Test records: CG020-TR-007

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.016

Measured Operating power at 20°C (W): 112

Mass (g): 780.2

Working fluid mass (g): 26.3

Proof pressure (bar): 153

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s) at 102bar: $< 6 \times 10^{-10}$

Ammonia leakage (ppm) at 90°C: Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 04/04/2007

Production Manager	**QA & PA**
	QUALITY & PRODUCT ASSURANCE IberEspacio Tecnología Aeroespacial

IberEspacio Tecnología Aeroespacial	**CERTIFICATE OF CONFORMANCE**	**NUMBER: CG020-CC-0008** **ISSUE: 1** **DATE: 16/05/2007**

Product: Axial Grooved Heat Pipe

Identification: IEA008/07

In compliance with Drawing: CG020-D-018, Issue 1

Test records: CG020-TR-008

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.023

Measured Operating power at 20°C (W): 102

Mass (g): 777.9

Working fluid mass (g): 26.3

Proof pressure (bar): 153

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s) at 102bar: $< 1 \times 10^{-10}$

Ammonia leakage at 90°C (ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 14/04/2007

Production Manager	**QA & PA**
	QUALITY & PRODUCT ASSURANCE IberEspacio Tecnología Aeroespacial

IberEspacio Tecnología Aeroespacial	**CERTIFICATE OF CONFORMANCE**	**NUMBER: CG020-CC-0009** **ISSUE: 1** **DATE: 16/05/2007**

Product: Axial Grooved Heat Pipe

Identification: IEA009/07

In compliance with Drawing: CG020-D-019, Issue 1

Test records: CG020-TR-009

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.031

Measured Operating power at 20°C (W): 108

Mass (g): 756.9

Working fluid mass (g): 25.6

Proof pressure (bar): 153

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s) at 102bar: $< 1 \times 10^{-10}$

Ammonia leakage at 90°C(ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 04/04/2007

Production Manager	**QA & PA**
	QUALITY & PRODUCT ASSURANCE IberEspacio Tecnología Aeroespacial

IberEspacio Tecnología Aeroespacial	**CERTIFICATE OF CONFORMANCE**	**NUMBER: CG020-CC-010** **ISSUE: 1** **DATE: 16/05/2007**

Product: Axial Grooved Heat Pipe

Identification: IEA010/07

In compliance with Drawing: CG020-D-019, Issue 1

Test records: CG020-TR-010

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.024

Measured Operating power at 20°C (W): 100

Mass (g): 756.8

Working fluid mass (g): 25.6

Proof pressure (bar): 153

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s) at 102bar: $< 1 \times 10^{-10}$

Ammonia leakage at 90°C(ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 10/04/2007

Production Manager	**QA & PA**
	QUALITY & PRODUCT ASSURANCE IberEspacio Tecnología Aeroespacial

IberEspacio Tecnología Aeroespacial	**CERTIFICATE OF CONFORMANCE**	**NUMBER: CG020-CC-011** **ISSUE: 1** **DATE: 16/05/2007**

Product: Axial Grooved Heat Pipe

Identification: IEA011/07

In compliance with Drawing: CG020-D-020, Issue 1

Test records: CG020-TR-011

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.027

Measured Operating power at 20°C (W): 100

Mass (g): 733.9

Working fluid mass (g): 24.8

Proof pressure (bar): 153

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s) at 102bar: $< 3.5 \times 10^{-10}$

Ammonia leakage at 90°C (ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 10/05/2007

Production Manager	**QA & PA**
	QUALITY & PRODUCT IberE Tecnolo

IberEspacio Tecnología Aeroespacial	**CERTIFICATE OF CONFORMANCE**	**NUMBER: CG020-CC-012** **ISSUE: 1** **DATE: 16/05/2007**

Product: Axial Grooved Heat Pipe

Identification: IEA012/07

In compliance with Drawing: CG020-D-020, Issue 1

Test records: CG020-TR-012

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.018

Measured Operating power at 20°C (W): 124

Mass (g): 733.3

Working fluid mass (g): 24.8

Proof pressure (bar): 153.

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s) at 102bar: $< 1 \times 10^{-10}$

Ammonia leakage at 90°C (ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 04/04/2007

Production Manager	**QA & PA**
	QUALITY & PROC... IberEspacio Tecnología...

IberEspacio Tecnología Aeroespacial	CERTIFICATE OF CONFORMANCE	NUMBER: CG020-CC-013 ISSUE: 1 DATE: 16/05/2007

Product: Axial Grooved Heat Pipe

Identification: IEA013/07

In compliance with Drawing: CG020-D-021, Issue 1

Test records: CG020-TR-013

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.024

Measured Operating power at 20°C (W): 110

Mass (g): 717.6

Working fluid mass (g): 24.2

Proof pressure (bar): 153

Proof temperature (°C): 125

Helium leakage rate (mbar.l/s) at 102bar: $< 1 \times 10^{-10}$

Ammonia leakage at 90°C (ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 27/04/2007

Production Manager	QA & PA
	QUALITY & PRODUCT... IberEspacio Tecnología Aeroespacial

IberEspacio Tecnología Aeroespacial	CERTIFICATE OF CONFORMANCE	NUMBER: CG020-CC-014 ISSUE: 1 DATE: 16/05/2007

Product: Axial Grooved Heat Pipe

Identification: IEA014/07

In compliance with Drawing: CG020-D-021, Issue 1

Test records: CG020-TR-014

Technical parameters

Operation temperature range: -40 °C to +30 °C

Measured thermal resistance at 20 °C (K/W): 0.016

Measured Operating power at 20°C (W): 140

Mass (g): 718.7

Working fluid mass (g): 24.2

Proof pressure (bar): 153

Proof temperature (°C): 125.

Helium leakage rate (mbar.l/s) at 102bar: $< 1 \times 10^{-10}$

Ammonia leakage at 90°C(ppm): Less than 1 ppm (Less than 1×10^{-7} scc/s)

Warranty lifetime: 18 years including

- Flight operation: 12 years
- Storage and ground operation: 6 years

Date of charging: 04/04/2007

Production Manager	QA & PA
	QUALITY & PRODUCT IberEspacio Tecnología Aeroespacial

A5 CERTIFICATE OF MATERIALS

Formato IT-3301-F4-1 Ed. 1

THERMAL SYSTEMS

DESIGN AND MANUFACTURING

QUALITY CERTIFICATE

L-01

IDENTIFICACION
Quality Certificates
HP Bodies JEF001-D-2400
CM001-DS/P-0010-0005

Seller: 21/1, Engelsa str., Khimki,
Moscow region, 141400
"TAIS" Ltd., RUSSIA

Customer: IBERESPACIO, Spain
P.O. No. CM001-P-0010 of 18.11.05

Items: pressed extrusions made from aluminum alloys

Code of extrusion: 200095

Pressed extrusions made from aluminum alloy AD31 were delivered in T5 condition with the following strength parameters:

- tensile strength σ_B=213 МПа,
- yield strength $\sigma_{0.2}$ = 187 МПа,
- extension ratio δ_5 =14%

Chemical composition of alloy meets the requirement of GOST 4784-97

Chemical composition, %					
Si	Fe	Cu	Mn	Mg	Cr
0.46	0.19	0.0009	0.007	0.57	0.01

Geometrical dimensions and shapes of extrusions from aluminum alloys meet the requirements of GOST 22233-2001 and Agreement.

Deputy Head of Manufacturing Department V. Staroverov

Quality inspector V. Toisov
31.08.05

REGISTRO DE CALIDAD
Periodo Retención 5 AÑOS

JDY
JDR
JBG

EN 10204 **DIN 50049**

Transcripción de Cert. Original Nº:
Fecha: **Albarán Nº:** M501N601
T.Certif.: **Página:** 1

Su pedido /Votre order/Your order

CORTES LEVANTE, S.L. /
C/LA POVEDA-CAMPO REAL,KM 3.1
ARGANDA DEL REY
28500 MADRID

Pos. Item	PRODUCTO /PRODUIT/PRODUCT	CARACTERISTICAS MECANICAS S/NORMAS EN				
		Rm Mpa	Rp 0,2 Mpa	A%	HB	
1	BARRA REDONDA 16 MM. EXTRUIDA SIMAGAL 63 IDENTIFICACION CM001-DS/P-0041-0006	120 -	60 -	16 -	-	

CARACTERISTICAS MECANICAS /CARACTÈRISQUES MÉCANIQUES/MECHANICAL PROPERTIES

Valores especificados EN Valeurs requises Specified values			Rm Mpa	Rp 0,2 Mpa	A%	HB	
Pos. Item	Neto Kg.	Dimensiones mm Dimensions					
1	6,600	x 6.050	120 -	60 -	16 -	-	

COMPOSICIÓN QUIMICA % COMPOSITION CHEMIQUE% CHEMMICAL COMPOSITION%

Pos. Item	Lote Lot Colada	Si	Fe	Cu	Mn	Mg	Zn	Ti	Pb	Cr	Otros	Ni
1		0,300	0,100			0,350						

Comentarios /Remarques/Remarks

Este informe es copia exacta del Certificado del Fabricante, estando a su disposición en nuestras instalaciones / Copie conforme à l'original (à votre disposition, si necessaire, dans nos bureaux) / Accurate report to the original at your disposal in our company

Departamento de inspección
Département d'inspection
Inspection Departament

F 05

REGISTRO DE CALIDAD

Periodo Retención: 5 AÑOS

REGISTRO DE CALIDAD

Periodo Retención: 5 AÑOS

IDENTIFICACION

CN001-DS/P-0050-0003

Absender

Linde AG, Linde Gas Division
Produktion Spezialgase · Elektronikgase (Werk 93)
Carl-von-Linde-Str. 25, D-85716 Unterschleißheim
Tel.: ++49-89-31001-391, Fax.: ++49-89-31001-370

Kontrollzertifikat

Nebenbestandteile:		Grenzwert:
Wasser (H2O)	≤	0.2 ppm
Sauerstoff (O2)	≤	0.1 ppm
Stickstoff (N2)	≤	0.5 ppm
Kohlenstoffmonoxid (CO)	≤	0.1 ppm
Kohlenstoffdioxid (CO2)	≤	0.2 ppm
Kohlenwasserstoffe (CnHm)	≤	0.1 ppm
Eisen (Fe)	≤	0.1 ppmw

Angabe in Stoffmengenanteilen,
Massenanteilen w

Hinweis(e)

o Ventil im Betrieb bitte vollständig (bis Anschlag) öffnen.

Endprüfung

durchgeführt am: 21.02.2006 von: A.Sticksel

Empfänger

Abello Linde S.A.
Kunden-Nr.: 3773175

52-6

Behälter-Nr.: 3 599 359
Barcode-Nr.: 276311-13962834
Auftrags-Nr.: 103000017853/0001

Transport

UN-Nr.: 1005 Klassifizierungscode: 2TC
Benennung: AMMONIAK, wasserfrei
Bruttogewicht: 20.5 kg

Füllung

Gasart: Ammoniak
Reinheit: 6.0
Spezifikation: LINDE 8232/5, 12/99
Füllmenge: 5.10 kg
Chargen-Nr.: 1825
IBA-Nr.: F6883

Behälter

Volumen: 10 l
Werkstoff: Leichtstahl
Tara-Gewicht: 14.3 kg
nächster TÜV: 02.2008

Ventil

Anschluß: DIN 477, Nr. 6
Werkstoff: Edelstahl

A6 SAFETY DATA SHEET OF AMMONIA

Formato IT-3301-F4-I Ed. 1

SAFETY DATA SHEET

Ammonia

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1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY

Product name
Ammonia, liquified.
Chemical formula: NH3
Company identification
Linde AG, Werksgruppe Technische Gase
Seitnerstraße 70, D-82049 Höllriegelskreuth
Emergency phone number: 089-7446-0

2 COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Preparation: Substance.
Components/Impurities
Contains no other components or impurities which will influence the classification of the product.
CAS Nr: 07664-41-7
EEC Nr (from EINECS): 231-635-3

3 HAZARDS IDENTIFICATION

Hazards identification
Liquefied gas.
Corrosive to eyes, respiratory system and skin.
Toxic by inhalation.

4 FIRST AID MEASURES

Inhalation
Toxic by inhalation. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
Skin/eye contact
May cause chemical burns to skin and cornea (with temporary disturbance to vision) Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contaminated clothing. Drench affected area with water for at least 15 minutes Obtain medical assistance
Ingestion
Ingestion is not considered a potential route of exposure.

5 FIRE FIGHTING MEASURES

Specific hazards
Non flammable. Exposure to fire may cause containers to rupture/explode.
Hazardous combustion products
If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition:
Nitric oxide/nitrogen dioxide
Suitable extinguishing media
All known extinguishants can be used.
Specific methods
If possible, stop flow of product. Move container away or cool with water from a protected position.
Special protective equipment for fire fighters
Use self-contained breathing apparatus and chemically protective clothing.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions
Evacuate area. Use self-contained breathing apparatus and chemically protective clothing. Ensure adequate air ventilation.
Environmental precautions
Try to stop release. Reduce vapour with fog or fine water spray.
Clean up methods
Ventilate area. Hose down area with water. Wash contaminated equipment or sites of leaks with copious quantities of water. Keep area evacuated and free from ignition sources until any spilled liquid has evaporated. (Ground free from frost).

7 HANDLING AND STORAGE

Handling and storage
Keep container below 50°C in a well ventilated place. Refer to supplier's container handling instructions. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt. Do not allow backfeed into the container. Suck back of water into the container must be prevented. Segregate from oxidant gases and other oxidants in store. Keep away from ignition sources (including static discharges). Purge air from system before introducing gas.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit value TLV(ACGIH)
25 ppm (2000 edition)
Exposure limit value
France: VLE: 50 ppm; VME: 25 ppm
Germany: MAK: 50 ppm (TRGS 900 3/2002)
Great Britain: LTEL: 25 ppm; STEL: 35 ppm (EH 40/95)
Personal protection
Keep suitable chemically resistant protective clothing readily available for emergency use. Keep self contained breathing apparatus readily available for emergency use. Do not smoke while handling product. Ensure adequate ventilation. Protect eyes, face and skin from liquid splashes.

9 PHYSICAL AND CHEMICAL PROPERTIES

Molecular weight: 17
Melting point: -77.7 °C
Boiling point: -33 °C
Critical temperature: 132 °C
Relative density, gas: 0.6 (air=1)
Relative density, liquid: 0.7 (water=1)
Vapour pressure 20°C: 8.6 bar
Solubility mg/l water: Hydrolyses.
Appearance/Colour: Colourless gas
Odour: Ammoniacal
Autoignition temperature: 630 °C
Flammability range: 15-30 vol% in air.
Other data
Although this substance has flammability data, it is difficult to ignite in air and is classified as non-flammable.

10 STABILITY AND REACTIVITY

Stability and reactivity
May react violently with oxidants. May react violently with acids. Reacts with water to form corrosive alkalis. Can form explosive mixture with air.

11 TOXICOLOGICAL INFORMATION

SAFETY DATA SHEET

Ammonia

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General
May cause inflammation of the respiratory system and skin. Inhalation of large amounts leads to bronchospasm, laryngeal edema and pseudomembrane formation.
LC50/1h (ppm): 7338 ppm

12 ECOLOGICAL INFORMATION

General
May cause pH changes in aqueous ecological systems.

13 DISPOSAL CONSIDERATIONS

General
Do not discharge into any place where its accumulation could be dangerous. Avoid discharge to atmosphere. Contact supplier if guidance is required. Gas may be scrubbed in sulphuric acid solution. Gas may be scrubbed in water.

14 TRANSPORT INFORMATION

Proper shipping name:
Ammonia, anhydrous
UN Nr.: 1005
Class/Division: 2.3
Subsidiary risk: 8
ADR/RID Item Nr.: 2, 2 TC
Labelling ADR
Label 2.3: toxic substance.
Label 8: corrosive substance.
ADR/RID Hazard Nr.: 268
CEFIC Tremcard Nr.: 1
CEFIC Groupcard Nr.: 20g09
Other transport information
Only transport on vehicles where the load space is separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers ensure that they are firmly secured and:
- cylinder valve is closed and not leaking
- valve outlet cap nut or plug (where provided) is correctly fitted
- valve protection device (where provided) is correctly fitted
- there is adequate ventilation.
- compliance with applicable regulations.

15 REGULATORY INFORMATION

Number in Annex I of Dir 67/548
007-001-00-5.
EC Classification: R10|T;R23|C;R34|N;R50
Labelling of cylinders
-Symbols
T: Toxic
N: Dangerous for the environment
-Risk phrases
R10 Flammable
R23 Toxic by inhalation.
R34 Cause burns (to eyes, respiratory system and skin).
R50 Very toxic to aquatic organisms.
-Safety phrases
S9 Keep container in a well-ventilated place
S16 Keep away from sources of ignition - No smoking
S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S36/37/39 Wear suitable protective clothing, gloves and eye/face protection
S45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S33 Take precautionary measures against static discharges.
S61 Avoid release to the environment. Refer to special instructions/ Safety data sheets.

16 OTHER INFORMATION
Ensure all national/local regulations are observed. Ensure operators understand the toxicity hazard. Users of breathing apparatus must be trained. Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out. Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

End of document