



ENGINEERING DIVISION

<i>ALBA Project Document No.</i>	<i>EDMS Document No.</i>	<i>Created:</i> 21/07/06	<i>Page:</i> 1/16
END-SRID-CI-0001		<i>Modified:</i> 09/11/06	<i>Rev. No.:</i> 1.0

Mechanical and drafting requirements for ALBA Project.

Abstract

This document contains CELLS mechanical standards, mechanical drafting standards, wiring and mechanical installations standards and its drawings standards and the legislation that must be fulfilled.

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Distribution list:

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<i>Record of Changes</i>			
<i>Rev. No.</i>	<i>Date</i>	<i>Pages</i>	<i>Description of changes</i>
0.0	21.07.06	***	Initial release
1.0	09.11.06	8-11	ISO standars list ampliaded

References

- [1] R. de la Calle. Equipment naming conventions. END-PM-QA-0005. EDMS document number: 94. 2005. UAB (Bellaterra) Barcelona, Spain
- [2] R. de la Calle. Documents types and naming conventions. END-PM-QA-0003. EDMS document number 92. 2005. UAB (Bellaterra) Barcelona, Spain.
- [3] X. Permanyer. ALBA Drawing convention. END-PM-QA-022. EDMS document number 382. 2006. UAB (Bellaterra) Barcelona, Spain.

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1. Drawings

In order to maintain a good organisation in the CELLS data base, all the technical documentation has to fulfil the CELLS quality standards. This rule includes the documentation generated internally as well the generated from out sources. If it not possible it must be agreed.

1.1. Formats

Each drawing has to be delivered in electronic format and a hard copy. The size paper must be at minimum DIN A4, vertical as well horizontal, to DIN A0 as maximum. Formats DIN A3, DIN A2, DINA1, DINA0 must be horizontal. If the draft needs the paper vertical it has to be oriented with the bottom at the right size and the box orientation must continue horizontal. See next figure.

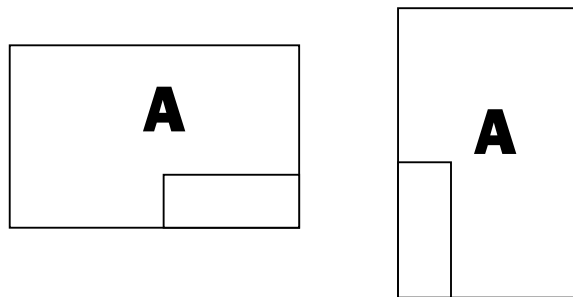


Figure 1: Drawing Formats

1.2. Line Weights

Next table shows the line weight that the drawings must be plotted:




<i>NAME</i>	<i>Line Weight [mm.]</i>	<i>USE</i>	
<i>Thin</i>	<i>0.1</i>	<i>Axis, annotations, crosshatch</i>	
<i>Medium</i>	<i>0.3</i>	<i>Contour lines</i>	
<i>Thick</i>	<i>0.5</i>		

Table: Line Weights

1.3. Drawing elements

1.3.1. Frame and box

The drawings must be delivered with ALBA standard boxes. Next figure shows the ALBA box. CELLS will deliver in electronic format and a hard copy the frames and boxes for each format. If the drawing has boom list it must be expanded on the top of the drawing box, where the titles for this purpose are placed. See next figure.


ITEM	PLÀNOL N°/ DRAWING N°	CANT QTY	DESCRIPCIÓ/DESCRIPTION	OBSERVACIONS/ COMMENTS
CELLS www.cells.es		 ISO Estàndard TOL. GRAL LINEAL GEN. LINEAR TOLERANCE TOL. GRAL ANGULAR GEN. ANGULAR TOLERANCE		TÍTOL/TITLE TITOLLINIA1 TITOLLINIA2
APROVACIÓ APPROVAL	DATA DATE			CICLE DE VIDA/LIFE CYCLE
DIBUIXAT/ DRAWN NOM	DATA	ACABAT SUPERFIC. SURFACE FINISH	ENSAMBLATGE/ASSEMBLY	MATERIAL
REVISAT/ CHECKED CHECKED	DATAche	ACABAT LINEAL ANGULAR	PLÀNOL N°/ DRAWING N°	NUMEROPLANOL
ACCEPTAT/ RELEASED RELEASED	DATArel	ESCALA/SCALE	A4	
APROVAT/ APPROVED APPROVED	DATAappr	ESCALA/SCALE	A4	

Figure 2: CELLS Drawing Box

CELLS will deliver the drawings frames and box in electronic format for the design. If the electronic formats are not compatibles CELLS will deliver drawings defining the dimensions of the drawing frames and boxes.

1.3.2. BOM list

The boom list must be a continuation of the drawing box indicating the part number, corresponding to a balloon in the draw, code, quantity, name or description and some observations if it needed. Next figure shows an example of boom list on the drawing box.


13	SR-P-ID-ECMS-0001-01	1	Elevating Clamp Mounting Screw	
12	SR-P-ID-THAN-0001-01	1	Triple Holder Attaching Nut	Silver Coating
11	SR-P-ID-SMHC-0001-01	1	Shimming Magnet Holder Cap	
10	SR-P-ID-SHAN-0001-01	1	Single Holder Attaching Nut	Silver Coating
9	SR-ID-ISP	1	In Vacuum Shimming Permanent Magnet	
8	SR-P-ID-IPPM-0001/2/3-01	1	In Vacuum Pure Permanent Magnet	
7	SR-P-ID-SCTH-0001-01	1	Central Section Triple Holder	
6	SR-P-ID-CSSH-0001-01	1	Central Section Single Holder	
5		13	DIN 915 M4x5 Stainless Steel	
4		2	DIN 912 M5x30 Stainless Steel	
3		2	DIN 912 M3x30 Stainless Steel	
2		8	DIN 912 M3x20 Stainless Steel	
1		2	DIN 7991 M3x5 Stainless Steel	Silver Coating
ITEM	PLÀNOL N°/ DRAWING N°	CANT QTY	DESCRIPCIÓ/DESCRIPTION	OBSERVACIONS/ COMMENTS
CELLS www.cells.es		 ISO Estàndard TOL. GRAL LINEAL GEN. LINEAR TOLERANCE TOL. GRAL ANGULAR GEN. ANGULAR TOLERANCE		TÍTOL/TITLE Central Section Holders Prototype
APROVACIÓ APPROVAL	DATA DATE			CICLE DE VIDA/LIFE CYCLE TO MOUNT
DIBUIXAT/ DRAWN CCoIldelram	16/03/06	ACABAT SUPERFIC. SURFACE FINISH	ENSAMBLATGE/ASSEMBLY	
REVISAT/ CHECKED CCoIldelram	16/03/06	ACABAT LINEAL ANGULAR	PLÀNOL N°/ DRAWING N°	SR-A-ID-SCHP-0001-01
ACCEPTAT/ RELEASED CCoIldelram	16/03/06	ESCALA/SCALE	A3	
APROVAT/ APPROVED D.Bertwistle	16/03/06	ESCALA/SCALE	A3	

Figure 3: CELLS Drawing Box

1.3.3. Revision Note

If some parts have been already produced need any change or modification, the drawing must be corrected and updated with the revision note box, See next figure. If the part is as well useful to the new devices as well the old versions of the device the drawing and the naming have to be the same. In the other hand if a modification changes the functionality of the part and can not be used in the old version of the device, then a new drawing with a new name is needed.

RevNo	DATA DATE	AUTOR/AUTHOR	TAULA DE REVISIONS/REVISION NOTE
1	DD/MM/AA	Autor3	Comentari3

Figure 4: Revision Note.

1.3.4. Legal note

The drawings include a legal note advertising about the possible not allowed utilisations of the drawing. See next figure.

AQUEST PLÀNOL NO POT SER REPRODUÏT O UTILITZAT PER UNA ALTRA FINALITAT QUE L'ESPECIFICADA NOT TO BE REPRODUCED NOR EMPLOYED FOR ANY PURPOSE OTHER THAN SPECIFIED

Figure 5: Legal Note.

1.3.5. Elements positioning example

Next figure shows the position of the drawing elements in vertical DINA4 case and the largest one's. The example is a horizontal DIN A3.

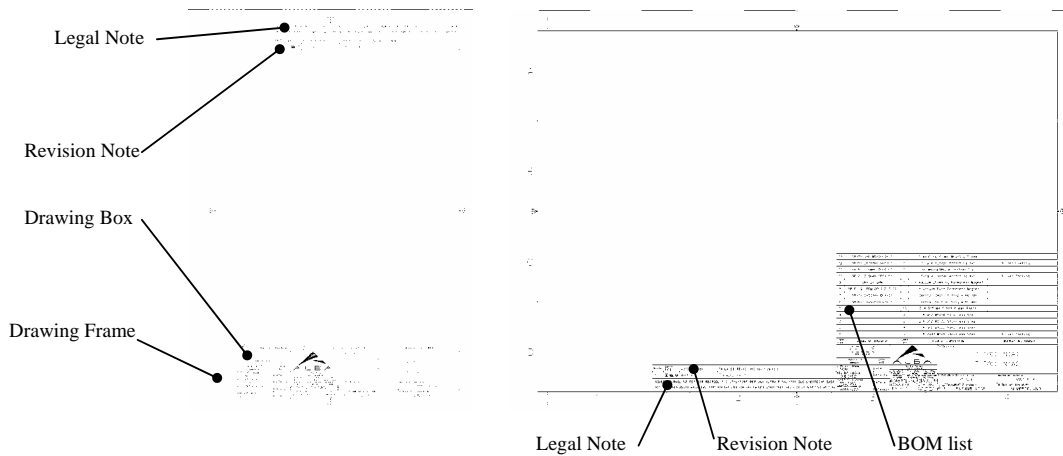


Figure 6: Drawing Examples.

1.3.6. Annotation

The drawings must be done fulfilling the ISO standard about annotation. All the annotations like dimensions, tolerances, geometrical tolerancing, surface texture, material requirement and any other annotations must be written as is indicated in the following ISO standards or any other ISO standard which could be applied.

1.3.7. ISO standards list

Document identifier	ISO 129-1
Publication date	2004-09-00
Title (English)	Technical drawings - Indication of dimensions and tolerances - Part 1: General principles
Document identifier	ISO 1101
Publication date	2004-12-00
Title (English)	Geometrical Product Specifications (GPS) - Geometrical tolerancing - Tolerances of form, orientation, location and run-out
Document identifier	ISO 1302
Publication date	2002-02-00
Title (English)	Geometrical Product Specifications (GPS) - Indication of surface texture in technical product documentation
Document identifier	ISO 1660
Publication date	1987-11-00
Title (English)	Technical drawings; Dimensioning and tolerancing of profiles
Document identifier	ISO 1829
Publication date	1975-06-00
Title (English)	Selection of tolerance zones for general purposes
Document identifier	ISO 2538
Publication date	1998-09-00
Title (English)	Geometrical Product Specifications (GPS) - Series of angles and slopes on prisms
Document identifier	ISO 2692
Publication date	1988-12-00
Title (English)	Technical drawings; geometrical tolerancing; maximum material principle
Document identifier	ISO 2692 AMD 1
Publication date	1992-10-00
Title (English)	Technical drawings; geometrical tolerancing; maximum material principle; amendment 1: least material requirement
Document identifier	ISO 2768-1
Publication date	1989-11-00
Title (English)	General tolerances; part 1: tolerances for linear and angular dimensions without individual tolerance indications
Document identifier	ISO 2768-2
Publication date	1989-11-00
Title (English)	General tolerances; part 2: geometrical tolerances for features without individual tolerance indications

Document identifier	ISO 3040
Publication date	1990-12-00
Title (English)	Technical drawings; dimensioning and tolerancing; cones
Document identifier	ISO 3274
Publication date	1996-12-00
Title (English)	Geometrical Product Specifications (GPS) - Surface texture: Profile method - Nominal characteristics of contact (stylus) instruments
Document identifier	ISO 3274 Technical Corrigendum 1
Publication date	1998-06-00
Title (English)	Geometrical Product Specifications (GPS) - Surface texture: Profile method - Nominal characteristics of contact (stylus) instruments; Technical Corrigendum 1
Document identifier	ISO 3650
Publication date	1998-12-00
Title (English)	Geometrical Product Specifications (GPS) - Length standards - Gauge blocks
Document identifier	ISO 5458
Publication date	1998-12-00
Title (English)	Geometrical Product Specifications (GPS) - Geometrical tolerancing - Positional tolerancing
Document identifier	ISO 5459
Publication date	1981-11-00
Title (English)	Technical drawings; Geometrical tolerancing; Datums and datum-systems for geometrical tolerances / Note: To be replaced by ISO/DIS 5459 (2004-04).
Document identifier	ISO/DIS 5459
Publication date	2004-04-00
Title (English)	Geometrical product specifications - Geometrical tolerancing - Datums and datum-systems / Note: Intended as replacement for ISO 5459 (1981-11).
Document identifier	ISO/TR 5460
Publication date	1985-05-00
Title (English)	Technical drawings; Geometrical tolerancing; Tolerancing of form, orientation, location and run-out; Verification principles and methods; Guidelines
Document identifier	ISO 7083
Publication date	1983-06-00
Title (English)	Technical drawings; Symbols for geometrical tolerancing; Proportions and dimensions
Document identifier	ISO 8015
Publication date	1985-12-00
Title (English)	Technical drawings; Fundamental tolerancing principle

Document identifier	ISO/DIS 8062-3
Publication date	2004-10-00
Title (English)	Geometrical Product Specifications (GPS) - Dimensional and geometrical tolerances for moulded parts - Part 3: General dimensional and geometrical tolerances and machining allowances for castings / Note: Intended as replacement for ISO 8062 (1994-04).
Document identifier	ISO/DIS 10135
Publication date	2004-06-00
Title (English)	Technical product documentation (TPD) - Drawing indications for moulded parts / Note: Intended as replacement for ISO 10135 (1994-10).
Document identifier	ISO 10578
Publication date	1992-07-00
Title (English)	Technical drawings; tolerancing of orientation and location; projected tolerance zone
Document identifier	ISO 10579
Publication date	1993-02-00
Title (English)	Technical drawings; dimensioning and tolerancing; non-rigid parts
Document identifier	ISO 11562
Publication date	1996-12-00
Title (English)	Geometrical Product Specifications (GPS) - Surface texture: Profile method - Metrological characteristics of phase correct filters
Document identifier	ISO 11562 Technical Corrigendum 1
Publication date	1998-06-00
Title (English)	Geometrical Product Specifications (GPS) - Surface texture: Profile method - Metrological characteristics of phase correct filters; Technical corrigendum 1
Document identifier	ISO/TS 12180-1
Publication date	2003-12-00
Title (English)	Geometrical Product Specifications (GPS) - Cylindricity - Part 1: Vocabulary and parameters of cylindrical form
Document identifier	ISO/TS 12180-2
Publication date	2003-12-00
Title (English)	Geometrical Product Specifications (GPS) - Cylindricity - Part 2: Specification operators
Document identifier	ISO/TS 12181-1
Publication date	2003-12-00
Title (English)	Geometrical Product Specifications (GPS) - Roundness - Part 1: Vocabulary and parameters of roundness
Document identifier	ISO/TS 12181-2
Publication date	2003-12-00
Title (English)	Geometrical Product Specifications (GPS) - Roundness - Part 2: Specification operators
Document identifier	ISO/TS 12780-1
Publication date	2003-12-00

Title (English)	Geometrical Product Specifications (GPS) - Straightness - Part 1: Vocabulary and parameters of straightness
Document identifier	ISO/TS 12780-2
Publication date	2003-12-00
Title (English)	Geometrical Product Specifications (GPS) - Straightness - Part 2: Specification operators
Document identifier	ISO/TS 12781-1
Publication date	2003-12-00
Title (English)	Geometrical Product Specifications (GPS) - Flatness - Part 1: Vocabulary and parameters of flatness
Document identifier	ISO/TS 12781-2
Publication date	2003-12-00
Title (English)	Geometrical Product Specifications (GPS) - Flatness - Part 2: Specification operators
Document identifier	ISO 15785
Publication date	2002-07-00
Title (English)	Technical drawings - Symbolic presentation and indication of adhesive, fold and pressed joints
Document identifier	ISO/TR 16570
Publication date	2004-10-00
Title (English)	Geometrical Product Specifications (GPS) - Linear and angular dimensioning and tolerancing: \pm limit specifications - Step dimensions, distances, angular sizes and radii

1.3.8. Annotation sizes

The annotation sizes of the drawings also must fulfil CELLS standards. If the design will be done with I-Deas software CELLS will deliver the master files for the standard default annotation. The document END-PM-QA-022 [3], ALBA drawing conventions, defines the annotation parameters. Next is shown the main points.

Length/ arrows:

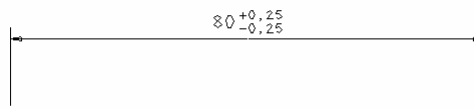


Figure 7: Length dimensions.

- Arrow Size: 2 mm
- Arrow Width ratio: 3
- Leader length: 2 mm
- Text Gap: 1 mm
- Reference lines gap: 1 mm
- Reference line extension: 2 mm
- Outside length from ref. lines: 3 mm
- Text Size: 2 mm
- Text Width and height ratio: 1
- Text Angle: 0°

Tolerances:

- Main text / tolerance ratio 0.75
- Text gap 1.5 mm

Angular dimension: As length dimensions.

Cuts and sections: Under ISO

- Arrow size: 2 mm
- Long length: 10 mm
- Short length 5 mm
- Text Gap: 2 mm


<p>CUT A-A E X:X</p>	<p>TEXT HEIGHT H=3</p>
	<p>TEXT HEIGHT H=4</p>

Figure 8: Cut lines.

Detail Views:

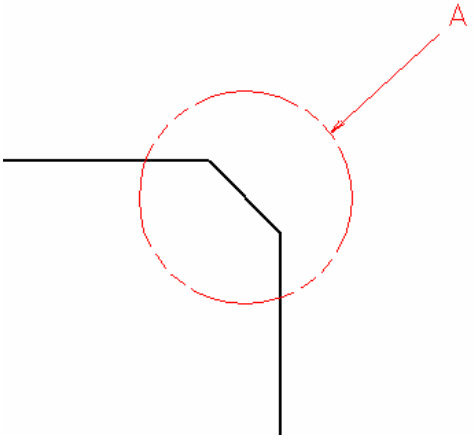
	<p>TEXT HEIGHT H=4</p> <p>CIRCLE FONT TYPE: PHANTOM</p> <p>The arrow should point to the center of the circle</p>
---	---

Figure 8: Detail views.

Naming, boom list:

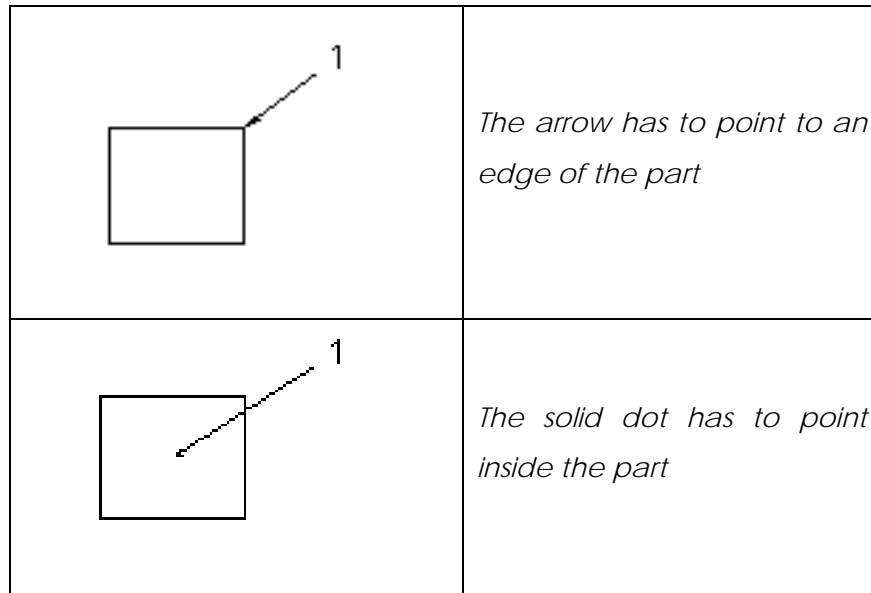


Figure 9: Naming.

Datum:

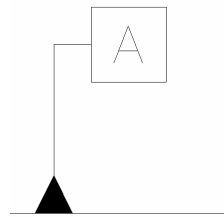


Figure 10: Datum.

- Leader length 2 mm.
- Arrow size 2 mm.
- Text height 2 mm.
- Text width/height ratio 1 mm
- Angle 0°.

Geometrical tolerances:

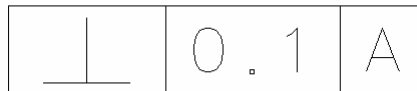


Figure 11: Geometrical tolerances.

- Leader length 2 mm.
- Arrow size 2 mm.
- Text height 2 mm.
- Text width/height ratio 1 mm
- Angle 0°.

1.4. CELLS Equipment naming conventions

All the drawing, assembly, subassembly or part drawing must be named under CELLS Equipment naming conventions described in the document END-PM-QA-0505 [1]. During the design phase CELLS will create the list of names for each general assembly, subassembly and part and their correspondent drawing name.

If the supplier needs his own naming each name must be written on TITOLLINIA2 (Tittle), see figure 2, and never on NUMEROPLANOL (Drawing N°) where must be CELLS name. In addition the supplier must deliver the list of correspondences between supplier names and CELLS names.

If the design is developed in 3D CAD system, the name of the part is not the same of its drawing but they are related. In this case CELLS will create the part names, drawing names and the list of both and the relation between them.

2. Materials

The material naming must be written following the numerical designation. There is the gap in the drawing box for this purpose, see chapter 1.3.1. For welded parts which their raw materials are the same it must be written in the drawing box. Welded parts drawings which have different materials it must be listed and written in the bom list, (see point 1.3.2). If a welded part has extra drawings for each raw material then the material must be written in the drawing box of each raw material drawing.

3. Treatment naming

The part which needs any treatment must be indicated clearly on the drawing with all the information needed to produce the part like for example the thickness of a surface treatment, the deep, surface finish, final hardness, the face where the treatment have to be done and any other information that the treatment requires.

The part which has to be painted must be indicated on the drawing also with RAL designation. The drawing must indicate also the faces to paint.

4. BOM Lists

The supplier has to deliver the lists with the codes of the general assemblies, subassemblies and parts and the codes of the drawings of these. Moreover it has to include the lay-out drawings, mounting instructions drawings, wiring drawings, mechanical installations and any other drawing needed to produce and install the device.

5. Electronic format

CELLS CAD system is I-Deas. It would be preferred the design in I-Deas to be directly introduced in CELLS database. If it is not possible must be agreed with CELLS; in this case a set of drawings must be delivered in DXF or DWG in this order of preference. Anyway a copy of each drawing in PDF format must be delivered.

If the design will be developed in 3D CAD system but not I-Deas a copy of each model assemblies, subassemblies and parts must be delivered in IGES or STEP format preferable.

In any case before take a decision about the format, CELLS will do a test to check what is it the proper one.

The files must be delivered in windows operating system. If the supplier works with UNIX or LINUX the files must be translated before sending them and CELLS will do a test to check that the translation is OK.

6. Set of drawings

6.1. Lay-out

The supplier must develop and deliver the lay-outs positioning in the storage ring needed to place the device to ALBA. CELLS will deliver with the electronic agreed form the lay-out of the straight section where it will be placed the device. The lay-outs must contain all the relevant information for the installations in ALBA; this doesn't exempt the supplier to write an installation manual.

6.2. General Assemblies

The supplier must deliver the general assemblies drawings needed to produce the device. These general assembly drawings have to contain all the relevant information of the device: the overall dimensions, weight, volume needed to store it, identify the different groups or subassemblies with the BOM list and any other relevant information. Minimum one of these has to identify all the subassemblies, show the position and define the nominal position of the adjustable subassemblies.

6.3. Subassemblies

The supplier must deliver all the subassembly drawings needed to produce the device. Minimum a drawing for each group or subassembly. The drawings have to contain all the relevant information of the subassembly like overall dimensions, weight and identify all the special parts and standard parts with a BOM list and any other relevant information. They have to contain also the exact position of each part in each subassembly and define de nominal position for the adjustable parts.

6.4. Parts

The supplier must deliver the drawing of each single part and the drawing of the standard part which need some operation.

Welded parts are considered as a single part. For this reason these parts must be delivered with a single drawing. If it needed to dimension the raw material it must be done on the same drawing if they could be fit in. If it is not possible the different drawings, parts, must have the same family name, see chapter 1.5, and the welded part drawing have to contain the BOM list of the raw materials with drawing code.

Part drawings must to contain all the information to produce the final part to be assembled to the device. The supplier must deliver the check certification for the critical parts which needs final verification. The requirement for verification must be written on the drawing or and independent list for these parts. The supplier must deliver also the verification drawings if exist. If some critical part require material certification it must written on the drawing or on an independent list and these certification must be also delivered jointly with the set of drawings.

6.5. Installations Drawings

The supplier must deliver the wiring drawings and mechanical installations drawings fulfilling the UNE standards norms for this purpose.

6.6. Delivers

The supplier must deliver two sets of drawings, in hard and electronic format, before the start of the production, and two sets of drawings after the installation with all the corrections from the incidences and the control production documentation generated.

7. Technical documentation format

All the technical documentation must be written with CELLS standard format as it is written in this document. CELLS will create the documents codes fulfilling CELLS Document types and naming conventions, END-PM-QA-0003 [2]. If it is not possible must be agreed.

8. Legislation

8.1. CE certification

All the components that circulate inside the European region must fulfil the European directives. The device must be CE certificated. If it has, at minimum, one mobile part the machinery directive must be applied. In any case the electromagnetic compatibility, pressure vessels, low voltage equipment and any other European law that its scope covers the device.

8.2. Spanish legislation

The device has also to fulfil all the Spanish legislation applicable which is in force at the moment of the production. At minimum work equipment law, Spanish low voltage equipment (REBT), Pressure vessels, cryogenics, electromagnetic compatibility, mechanical installations (RITE) and any other which its scope cover the device.

8.3. Installation

CELLS, as well as he supplier, must fulfil the Spanish safety and work risk legislation for all the technicians, physics, engineers, and any other person involved in the installation, commissioning, starting and useful life of the device and any other task developed in Spain for the foreign people as well as for the Spanish people; with special attention in handling and elevation tasks and cryogenics installations manipulations.

9. Spare part

The supplier must indicate the critical shortest life parts if exist and deliver a lot of spare part for at minimum the first cycle life. These part have to be identified in the correspondent assembly or subassembly drawings and a manual of maintenance must be created and delivered.