



# ENGINEERING DIVISION

<i>ALBA Project Document No.</i>	<i>EDMS Document No.</i>	<i>Created:</i> 12.05..2006	<i>Page:</i> 1/15
<b>END-BLEL-CC-0001</b>		<i>Modified:</i>	<i>Rev. No.:</i> 1.1

Title

## **Technical Terms of Delivery and Acceptance for the Electrical Installations of the ALBA Beamline**

Abstract

This document contains the electrical characteristics that Beamlines will have.

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*Distribution list:*

<i>Record of Changes</i>			
<i>Rev. No.</i>	<i>Date</i>	<i>Pages</i>	<i>Description of changes</i>

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## 1. Introduction

The present Technical Terms of Delivery and Acceptance (hereafter referred as TTDA's) shall supplement the Technical Specifications of the Beamline as well as the General Purchasing Conditions of the customer.

Upon request, the customer shall be informed about the current state of the work. He shall be given access to all workshops where parts of the order are executed or inspected. This shall apply to both the contractor/supplier and his sub-contractors. The contractor/supplier shall make available to his sub-contractors all documents required (TTDA's etc.).

Beamlines will be fed of two types of power: unprotected and critical power:

- There will be 10 kW of unprotected power per Beamline, this kind of power is called Non Preferential and is taken directly from the external power network. In this case the loads will be directly connected to the transformer.
- There will be 20 kW of critical power per Beamline, this kind of power guarantees a clean supply and no interruptions because it is connected to a Static-UPS supplied by the network and also there is a Diesel Motor in case of networks failures.

## 2. Regulations

The electrical installations shall be designed in accordance with the valid rules of technology and the current state of the art. Interfaces with other components, in particular measuring and control devices, shall be agreed upon with the customer.

CE approval of all components included in the scope of supply is considered as a basic requirement.

The commonly applied standards and guidelines are:

Reglamento Electrotécnico para Baja Tensión –

Real Decreto 842/2002, 2 Agosto de 2002

DIN 18283 Electrical cables and circuits in buildings

DIN VDE 0100 Installation of high-voltage systems with nominal voltages up to 1 kV

DIN VDE 0101 Installation of high-voltage systems with nominal voltages of more than 1 kV

DIN VDE 660 Current control switches, switch combinations

VBG4 Electrical installations and materials

Reference: instrument safety regulations

### **3.Planning**

Planning shall be completed before the installation starts.

Planning of the electrical installations shall be deemed completed when the following documents have been submitted by the contractor/supplier:

- complete circuit diagrams
- wiring diagrams
- list of devices
- cabling diagrams
- list of cables
- wall breach point plans
- terminal diagrams
- assembly plans

The interfaces, layout and locations of installations shall be determined by the contractor/supplier in cooperation with the customer.

The contractor/supplier shall be responsible for providing, completing, and revising the documents and checking them together with the customer in due time before ordering the components or starting the assembly.

If external advisors are needed for the execution of projects, the required preliminary inspection shall be arranged by the contractor/supplier.

### **4.Manufacturing**

#### **4.1. Identification**

For the identification of cables and circuits, the following color code shall be selected (clockwise setup):

- L1 grey lead
- L2 brown lead
- L3 black lead
- N blue lead
- PE green/yellow lead

Electrical installations, lamps and any other devices, circuits and cables shall be marked with permanent, durable tags, in particular, radiation hard. The cables and circuits shall be marked at both ends as well as on both sides of fire barriers in a clearly visible manner. Inscription of the tags shall be agreed upon with the customer.

Approximate dimensions of tags:

Electrical installations:

length x width    60 mm x 15 mm

height of inscription 6 mm

Distribution boards, large components:

length x width 150 mm x 35 mm

height of inscription 15 mm

Colors:

inscription black

background white

#### **4.2. Optical and Acoustic Signals, Signaling Devices**

The pertinent standards and guidelines and in particular

DIN 19235 Signalling of states of operation

VDI/VDE 2180, sheet 2 Design, operation and testing of PLT protective devices

shall be complied with.

If binary signals are required for display or documentation in the central control system, the closed-circuit principle, 24 V DC, shall be ensured. The respective plan of terminals for control-room signals shall be provided by the contractor/supplier.

Current output signals of analog measurements shall be provided as current signals of 420 mA, unless otherwise specified.

#### **4.3. Cables and Circuits**

Power cables and circuits must be separated from measuring and pulse transmission lines and arranged in lines of their own (cable trays, channels), wherever possible. Parallel layout should be avoided. Connection points on housings, switch cabinets etc. shall be fitted such that the terminal ends are not subjected to tension or torsion. The cables shall be sealed at the cable entries.

#### **4.4. Grounding**

The necessary grounding or potential compensation shall be agreed upon with the customer during the planning.

#### **4.5. Interference Protection**

Interference protection shall be agreed upon with the customer during planning. Shielded lines shall be used for signal transmission and stepper motors.

#### **4.6. Components**

The components shall be agreed upon with the customer.

Equipment housings shall be made of sheet steel and provided with both an undercoating and a cover coating. The color shall be agreed upon with the customer.

For the future installation of devices into cabinets and distributors as well as for cable entries, an additional space of at least, 30%, shall be provided.

The cabinets and distributors shall comply at least with the IP 31 requirements according to DIN VDE 0470-1. In case of low operation and protection voltage, IP 11 requirements shall be sufficient.

The location of the PE terminals and N isolation terminals shall be clearly associated with the phase terminals of the respective circuits. Without exception, separate terminals shall be used. Terminals where lines have to be separated for regular inspections, shall be designed as disconnecting terminals with two sockets.

As a general rule, fuse elements shall be fitted with a status display.

#### **5. Functional Tests**

During assembly and prior to commissioning the electrical installations, in part or as a whole, shall be subjected to functional tests which are performed by the contractor/supplier in the presence of the customer. The scope and the details regarding the functional tests shall be arranged in mutual agreement with the customer.

The devices needed for the test shall be provided by the contractor/supplier. Nevertheless the customer reserves the right to supply his own test equipment. In this case, the test shall be carried out with the devices supplied by the customer. The contractor/supplier shall draw up a record on the functional tests.

Normally, the following tests shall be carried out:

- test of the protection systems according to DIN VDE 0100 Part 600
- phase sequence of three phase power lines and connections
- functions of circuits, signalling and interlock systems
- identification of the components
- visual inspection of the installation.

#### **6. Commissioning and Acceptance**

Upon the successful completion of assembly and functional tests, the contractor/supplier shall instruct the customers operating personnel as far as the operation of the installations is concerned. The installations shall be commissioned by the contractor/supplier in the presence of the customer.

Acceptance by the customer shall take place upon commissioning and submission of the required as-built documents. These should include

- complete circuit diagrams
- wiring diagrams
- lists of devices
- terminal diagrams
- assembly and cabling diagrams
- lists of cables
- parts lists
- data sheets
- certificates (as required: material certificates, calibration certificates, Physikalisch-Technische Bundesanstalt (PTB) test certificates, design approval certificates)
- records on functional tests
- records on commissioning tests

Acceptance shall be documented in test records to be drawn up by the contractor/supplier.

If the installations are found to be defective, they must be subjected to new acceptance tests once the defects have been corrected.

## **7.Documentation**

Documentation shall include the documents to be available during commissioning as well as the records on the commissioning and acceptance tests.

Documentation shall be submitted in English in triplicate. A digital copy on a CD-ROM is to be included as well.