



Elettra Sincrotrone Trieste

TECHNICAL SPECIFICATION **ELECTRICAL SYSTEM OF A BEAMLINE**

Project E.2.0

Revision	Data	Reason for issue	Drafted	Controlled	Approved
1.1	04/12/2025	English translation	Prince K. / Skala T./	Martinolli A. / Prince K.	
1	18/05/2023	For approval	Gregoratti S. / Filippi D. / Martinolli A.	Martinolli A.	
0	22/02/2023	Emission	Gregoratti S. / Filippi D. / Martinolli A.	Martinolli A.	

Elettra - Sincrotrone Trieste S.C.p.A.

S.S. 14 Km 163,5 in Area Science Park
34149 Basovizza, Trieste, Italy
T. +39 040 37581
F. +39 040 938 0903

PIVA e C.F. IT00697920320
Cap. Soc. € 49.969.980,45 i.v.
PEC: sincrotrone.trieste.elettra@legalmail.it
www.elettra.eu

Iscritta al Registro delle Imprese di Trieste
Società di interesse nazionale
ai sensi dell'art. 10, comma 4,
L. 19 ottobre 1999 n. 370





Elettra Sincrotrone Trieste

INDICE

Table of Contents

INDICE	2
OBJECT	3
PURPOSE	3
LAWS AND STANDARDS	3
GENERAL DESCRIPTION OF ST ELECTRICAL SYSTEM	3
ST ELECTRICAL SYSTEM DATA	4
CONNECTION POINTS FOR THE PLANTS AND AVAILABLE POWER	4
SUPPLY LIMITS	4
ELECTRICAL DESIGN	5
ELETTRA TECHNICAL SPECIFICATIONS & STANDARDS	5
GENERAL REQUIREMENTS	5
BEAMLINE ELECTRICAL PANEL	6
DISTRIBUTION CABLE ROUTES	7
CPR CERTIFIED POWER SUPPLY LINES	7
SOCKET GROUPS DEDICATED TO THE REQUIRED UTILITIES	8
GENERAL AND EMERGENCY LIGHTING	8
RADIATION PROTECTION HUTCH	8
CONTROL HUTCH (UNSEALED/SHIELDED)	9
FIRE DETECTION SYSTEM	9
UNDER-OXYGENATION PLANT	9
BAKE-OUT SYSTEM	9
EARTHING AND EQUIPOTENTIAL BONDING SYSTEM	9
DEGREES OF PROTECTION	10
EQUIPMENT NOMENCLATURE	10
GENERAL REQUIREMENTS FOR SITE MANAGEMENT AND WORK	10
TYPES AND CHARACTERISTICS OF MATERIALS AND COMPONENTS	10
VERIFICATION AND TESTING OF SYSTEMS	10
VISUAL EXAMINATION	11
TESTS	12
FINAL PLANT DOCUMENTATION	12
PREVENTION AND SAFETY MEASURES TO BE TAKEN	13
ATTACHMENTS	14

Elettra - Sincrotrone Trieste S.C.p.A.

S.S. 14 Km 163,5 in Area Science Park
34149 Basovizza, Trieste, Italy
T. +39 040 37581
F. +39 040 938 0903

P.IVA e C.F. IT00697920320
Cap. Soc. € 49.969.980,45 i.v.
PEC: sincrotrone.trieste.elettra@legalmail.it
www.elettra.eu

Iscritta al Registro delle Imprese di Trieste
Società di interesse nazionale
ai sensi dell'art. 10, comma 4,
L. 19 ottobre 1999 n. 370





Elettra Sincrotrone Trieste

OBJECT

The document was prepared by the Electrical Systems Activity of the Infrastructure Group of Elettra – Sincrotrone Trieste S.C.p.A., hereinafter EST. Its object is the design, construction, verification and testing of extraordinary maintenance, transformation, expansion or new construction of electrical systems, hereinafter systems, dedicated to beamlines within building S of EST, as part of the project called E.2.0.

PURPOSE

The purpose of the document is to provide designers and electrical technicians in charge with EST's interface elements, regulatory framework and technical standards for a coordinated design and construction of beamline systems at EST.

LAWS AND STANDARDS

For the purposes of the design, construction, verification and testing of the systems in EST, the technical standards and laws of the Italian State and the European Community set out in Annex 1 (Annex 1) apply.

GENERAL DESCRIPTION OF ST ELECTRICAL SYSTEM

The electrical system of the Elettra Laboratory – Sincrotrone Trieste S.C.p.A. is powered by the Italian National Medium Voltage grid (20,000 V, 50 Hz) and by means of two electrical transformer substations and two generation plants supplies all the low voltage electricity (400 V, 230 V, 50Hz) to the users of the ST laboratory. The electricity supplied by the external grid is defined as "normal" while that produced by the plants is "privileged".

The system originates at the Electrical Substation in the Fermi Technological Building, at the distributors' electricity supply points and ends at the poles of the individual socket points and at the connection terminals of the fixed (excluded) low-voltage users.

The above electrical system therefore includes all the electrical components suitable for the operation, transformation and distribution of medium and low voltage electricity from the point of supply to the final point of use. For a graphic planimetric description of the laboratory area and the actual state of the systems in building S, please refer to the graphic attachments.

Elettra - Sincrotrone Trieste S.C.p.A.

S.S. 14 Km 163,5 in Area Science Park
34149 Basovizza, Trieste, Italy
T. +39 040 37581
F. +39 040 938 0903

P.IVA e C.F. IT00697920320
Cap. Soc. € 49.969.980,45 i.v.
PEC: sincrotrone.trieste.elettra@legalmail.it
www.elettra.eu

Iscritta al Registro delle Imprese di Trieste
Società di interesse nazionale
ai sensi dell'art. 10, comma 4,
L. 19 ottobre 1999 n. 370



Elettra Sincrotrone Trieste

ST ELECTRICAL SYSTEM DATA	
E.E. Normal	
Rated voltages and (var.%)	$U_0=230\text{ V}$, $U_N= 400\text{ V}$ ($\pm 10\%$)
Nominal frequency and (var.%)	$f_N=50\text{ Hz}$ ($\pm 1\%$ for 95% of the year, $+4\%$ / -6% for 100% of the year)
E.E. Privileged	
Rated voltages and (var.%)	$U_0= 230\text{ V}$, $U_N= 400\text{ V}$ ($\pm 1\%$)
Nominal frequency and (var.%)	$f_N =50\text{ Hz}$ ($\pm 1\%$)

CONNECTION POINTS FOR THE PLANTS AND AVAILABLE POWER

The electrical systems of each beamline will be powered, in the final state, by the general switchboards of the experimental room in building S, the diagram of which is shown in the annexes.

The electrical system of each beamline consists of:

1. a **single electrical** distribution panel dedicated to the beamline with a "normal" and a "privileged" section that will power all the expected users.
2. Distribution cable routes;
3. CPR certified cable power supply lines;
4. Socket groups dedicated to the required users;
5. General and emergency lighting for closed rooms ("Hutch" for radiation protection and control (not leaded/shielded);
6. Fire Detection System;
7. Bake-out system;
8. Connections to the earthing system and equipotentiality;

The electrical system will therefore be supplied by the EST general switchboards mentioned above by means of a maximum of two cable lines, one in normal and one in privileged with an adequate cross-section and in any case included among the following for the correct certification: from 5G16 to 5G50 (cross-sections allowed for the switch/terminal blocks/switchboard bars);

SUPPLY LIMITS

EST's supply limit is determined by the output terminals of the circuit breakers of the Experimental Room's distribution board.

Elettra - Sincrotrone Trieste S.C.p.A.

S.S. 14 Km 163,5 in Area Science Park
34149 Basovizza, Trieste, Italy
T. +39 040 37581
F. +39 040 938 0903

PIVA e C.F. IT00697920320
Cap. Soc. € 49.969.980,45 i.v.
PEC: sincrotrone.trieste.elettra@legalmail.it
www.elettra.eu

Iscritta al Registro delle Imprese di Trieste
Società di interesse nazionale
ai sensi dell'art. 10, comma 4,
L. 19 ottobre 1999 n. 370





Elettra Sincrotrone Trieste

ELECTRICAL DESIGN

In general, the electrical design must be carried out in accordance with the standards of the Italian Electrotechnical Committee, the UNI standards where required and laws and decrees of the Italian state as per the annexes.

Pursuant to Ministerial Decree 37/2008, art. 6, systems built in compliance with current legislation and the standards of UNI, CEI or other standardization bodies belonging to the Member States of the European Union or which are contracting parties to the Agreement on the European Economic Area, are considered to have been carried out according to the state of the art.

The works must therefore comply with the technical standards of the Italian Electrotechnical Committee (C.E.I.) and the Italian Standardization Body (U.N.I.).

The works of the electrical system must comply with the technical documentation, projects and reference regulations, they must also be carried out by a Qualified Company, duly registered with the Chamber of Commerce, in possession of the technical-professional requirements, also in order to be able to issue to the Customer, at the end of extraordinary maintenance works, after carrying out the checks required by the relevant regulations in force, the declaration of compliance with the state of the art for the works carried out (art. 7 of Ministerial Decree no. 37 of 22 January 2008), its annexes and the final documentation ("As Built").

ELETTRA TECHNICAL SPECIFICATIONS & STANDARDS

The ST standards for the electrical systems of the E.2.0 Beamlines are listed below.

General requirements

In the design of new electrical and special systems, in addition to the requirements for the power supply, type and arrangement of the equipment, the following must be taken into account:

1. building development of structures, useful spaces, encumbrances and escape routes;
2. presence of different types of plants serving research equipment (e.g. technical liquids and gases, scientific and mechanical-fluid systems, etc.);
3. protection of leaded screens;
4. speed in maintenance interventions (also related to other systems);
5. preferable prefabrication of plant parts, in order to minimize installation times;
6. cancellation of impactful interventions in the experimental hall to protect scientific material present there (such as milling, welding, dust-generating processes, etc.);
7. coexistence of existing systems;
8. reduction of consumption of "privileged" expensive energy;

The following must be considered when choosing installation materials and how to build systems:

9. the optimization of electricity consumption (energy saving);
10. the reduction of wiring for control and operation;
11. the increase in safety levels during construction and subsequent maintenance;
12. the reduction of maintenance times and costs;

5

Elettra - Sincrotrone Trieste S.C.p.A.

S.S. 14 Km 163,5 in Area Science Park
34149 Basovizza, Trieste, Italy
T. +39 040 37581
F. +39 040 938 0903

PIVA e C.F. IT00697920320
Cap. Soc. € 49.969.980,45 i.v.
PEC: sincrotrone.trieste.elettra@legalmail.it
www.elettra.eu

Iscritta al Registro delle Imprese di Trieste
Società di interesse nazionale
ai sensi dell'art. 10, comma 4,
L. 19 ottobre 1999 n. 370





Elettra Sincrotrone Trieste

13. the optimization of the plants in consideration of future implementations and updates of the system;
14. the influence of radiation on the materials and supply equipment within the lead shielded hutches;
15. ease of use-maintenance for operators and maintenance technicians;
16. optimisation with respect to the Directives on recycling and the reuse of materials at the end of their life.

For the installation of systems, where possible, those solutions that limit the use of ladders should be considered preferable, preferring other elevation systems (scaffolding, trestle bridges, mobile elevating work platforms).

Beamline electrical panel

The beamline electrical panel must consist of 2 (two) columns designed for power supply from different sources (normal and privileged), of the metal cabinet type with transparent glass doors, with handles and key lock of the fingerprint type with side compartment for cable ascent and terminal block for electrical connections. In general, it must comply with the legal requirements and comply with CEI standards. It must also be equipped with an adequate number of eyebolts to allow it to be easily lifted and moved.

All equipment (switches, terminals, busbars, etc.) must have live parts protected against direct contact: when the door is open and/or panels are disassembled, the degree of protection must not be less than IP20. On the front panels must be shown the plates, all the writings necessary to clearly identify the various control, manoeuvring, signalling devices, etc.

The beamline electrical panel is powered by a main low voltage distribution panel (400V/230V 50 Hz) positioned along the walkway of the Elettra experimental hall, called EC013 (plus a progressive) for the Normal in-line circuits and EC015 (plus a progressive) for the Privileged in-line circuits.

This user supplies 2 power lines for each beamline, one in Normal and one in Privileged, of adequate cross-section and protected by a moulded case circuit breaker with an adjustable LS/I electronic relay 10... 160 A and rated short-circuit limit breaking capacity Icu equal to 36 kA.

Each section of the beamline distribution panel must be equipped with a multifunction instrument for low voltage networks, for three-phase line 80...500 V (phase-to-phase) and single-phase line 50...290 V, insertion on dedicated CTs, programmable CT and external TV ratio, active energy cl. 0.5, phase sequence correction, RS485 communication system, diagnostics with various parameters that can be displayed (active energy, reactive energy, voltage, current, power factor, current/voltage harmonic distortion), equipped with suitably sized TA 400/5 A transformers and voltmeters.

For each section, overvoltage protection must be provided by means of extractable varistor energy arresters with front tripping indication for TT and TN-S network systems (3+1 circuit), type 2 / Class II.

The disconnection of the electrical panel must be guaranteed by a suitable main disconnect switch, for each section. The distribution circuits must be protected by thermal/residual current circuit breakers sized as indicated by the reference legislation in force.

Protection against direct and indirect contact must be guaranteed according to the indications of the CEI 64-8 standards. Where there is only automatic magnetothermic protection, it must be coordinated with the minimum short-circuit currents presumed and calculated according to the

Elettra - Sincrotrone Trieste S.C.p.A.

S.S. 14 Km 163,5 in Area Science Park
34149 Basovizza, Trieste, Italy
T. +39 040 37581
F. +39 040 938 0903

PIVA e C.F. IT00697920320
Cap. Soc. € 49.969.980,45 i.v.
PEC: sincrotrone.trieste.elettra@legalmail.it
www.elettra.eu

Iscritta al Registro delle Imprese di Trieste
Società di interesse nazionale
ai sensi dell'art. 10, comma 4,
L. 19 ottobre 1999 n. 370



Elettra Sincrotrone Trieste

project. For calculation data, refer to the Electrical Systems Activity of the Elettra Infrastructure Group.

Distribution cable routes

For the laying of cables, generally and in particular for the backbones, there must be 3 (three) separate cable trays (Power-230V/400V AC, Signal, H.V. - 500-7000V DC) of the Sendzimir galvanized steel type, not drilled with partitions.

The ducting system must guarantee electrical continuity and those solutions that minimize the use of tools for connection are preferable, in order to ensure a reduction in installation times.

The ducts must be complete with suitable signs for easy identification from a distance of the nature of the systems contained (molded/screen-printed plastic plates).

The colour code and the type of marking must follow the provisions of the Elettra offices as part of the update of the Elettra 2.0 systems.

The overhead ducts are generally placed at a height of about 2.70 meters up to the machine after which the paths are on the floor after the installation, where necessary, of mechanical protection from trampling.

In correspondence with passages through drilling sections with sharp edges, suitable and appropriate edges in plastic material (e.g. PVC) must be positioned in order to avoid abrasion of the cable sheaths (electrical and signal) during the laying of the same and future system updates.

The cable routes are generally supported by metal posts made of hot-dip galvanized steel, with a "U" profile open with unequal sides, dimensions 100x50 mm, thickness 5 mm, length 3 m, with support base of dimensions 250x250 mm and thickness 4 mm, equipped with holes for fixing to the ground by means of dowels, with a reinforcement gusset of dimensions 120x400 mm. The elements are welded continuously and free of irregularities; the edges are rounded and burr-free. The painting is carried out with a double coat of enamel after preparation of the base, RAL shade equal to the existing posts, with application on the external sides of the profile of adhesive tape with PVC support covered in modified resin rubber and high thickness, for fixed yellow-black obstacle signalling, application of the signal up to a height of 2 meters from the walking surface.

CPR certified power supply lines

Power lines must be made with single/multicore cables and comply with the CEI UNI and CPR regulations in force.

In general, cables laid inside metal conduits must be of the FG18M16 0.6/1 kV type insulated with high modulus ethylene propylene rubber of G18 quality, with an outer sheath in LS0H compound of M16 quality. In the case of distribution by means of plastic conduits, the cables must be of the single-core type FS17 450/750 V insulated in PVC.

All cables must be identified, as indicated in the project documents, by means of indelible signs/tags.

Elettra - Sincrotrone Trieste S.C.p.A.

S.S. 14 Km 163,5 in Area Science Park
34149 Basovizza, Trieste, Italy
T. +39 040 37581
F. +39 040 938 0903

P.IVA e C.F. IT00697920320
Cap. Soc. € 49.969.980,45 i.v.
PEC: sincrotrone.trieste.elettra@legalmail.it
www.elettra.eu

Iscritta al Registro delle Imprese di Trieste
Società di interesse nazionale
ai sensi dell'art. 10, comma 4,
L. 19 ottobre 1999 n. 370



Elettra Sincrotrone Trieste

Socket groups dedicated to the required utilities

Groups of sockets must be provided in such a number as to ensure the direct use of motive power, avoiding the systematic use of flying extensions.

The points of use will consist of interlocked socket groups for the insertion of CEE type industrial plugs, generally of the type 2P+E 16 A 250 V~, 3P+N+E 16A 250 V~ and 2P+E 16 A 250 V~ sockets of the Italian standard universal type P40. 32 A receptacle assemblies are generally used only for connecting the bake-out systems required for the beamline. Any special needs, and/or with significant loads in terms of installed power, must be agreed with the competent offices of Elettra.

The socket assemblies positioned along the beamline must be installed on support structures and/or on metal posts made with the same characteristics as those indicated in the paragraph on distribution cable routes.

Electrical sockets powered by the Italian standard universal P40 line must be red, while those in the normal line must be white. As for the other types of sockets in the privileged line, they must be identified by clear labelling on the sockets themselves.

The power supply of Instrumentation Racks, bake-out systems and non-"fixed" users in general must be achieved by installing interlocked sockets for the insertion of CEE-type industrial plugs.

General and emergency lighting

The general and emergency lighting system of the EST Experimental Hall is designed to ensure adequate average illuminance of the beamline. Any localized needs must be designed accordingly and verified with the competent offices of Elettra.

Inside the Hutch, the lighting fixtures must guarantee uniform illumination of the room with the minimum values required by current legislation (UNI EN 12464-1). Devices must also be provided to guarantee lighting in the event of an emergency and escape routes of the self-powered type with a self-diagnosis system. All lighting fixtures must be of the light emitting diode type (LED) and electronic power supply systems, preferably in waterproof execution.

It is also required to prepare for the supervision system (currently under construction) of Elettra (to be verified with the competent offices of Elettra).

Ignition systems must guarantee effective energy savings, i.e. systems with local presence detection (e.g. infrared sensors and/or radar technology) are preferable.

The connections of the lighting equipment must preferably be with waterproof connectors of the quick type and/or quick coupling in order to allow the removal of the same without the use of hand tools.

Radiation protection hutch

The distribution of the electrical system must be carried out in such a way as to guarantee the continuity of the protective screen. During the design phase of the Hutch, the points and types of anchoring of the electrical system to be built both inside and outside the Hutch itself must be defined. The system, as far as possible, must be divided into areas and refer to a dedicated electrical subpanel.



Elettra Sincrotrone Trieste

Control Hutch (Unsealed/Shielded)

In the control Hutch, the electrical system should refer to a dedicated sub-panel. Self-extinguishing PVC cable holders and multi-compartment quick-insert appliance holders (usually 3) must be provided. The branches must be made inside suitable boxes made of waterproof insulating material and equipped with suitable labelling to identify the nature of the system contained.

Fire Detection System

An automatic smoke detection and manual fire alarm system must be provided inside the Hutch. For this purpose, devices of the address type must be used and compatible with the centralized supervision system existing at Elettra (Notifier WIN-FIRE-CLIP32 by Honeywell). The engineering and updating of the graphic maps of the centralized supervision system remains the responsibility of Elettra.

Under-oxygenation plant

In rooms where the risk assessment for the presence of gas (e.g. nitrogen) requires it, the fire detection system must be integrated with an under-oxygenation system connected to the Elettra supervision system.

The engineering and updating of the graphic maps of the centralized supervision system remains the responsibility of Elettra.

Bake-out system

For beamlines that require a "bake-out" system (electrical vacuum pipe heating systems) it is considered appropriate to provide adequate interlocked CEE sockets dedicated to this use and powered exclusively by the Normal line.

Earthing and equipotential bonding system

The EST area has a unique earthing system.

The ground impedance of the system is approximately 1 ohm ($R = 0.992$ ohms, data taken from the verification report of the systems by ASUITs on 09/04/2018 and in the records in the archive of the Elettra Infrastructure Group). The way of grounding the neutral in the laboratory is of the TN-S type. No other systems are allowed.

The beamline electrical distribution panel must be equipped with an earth collector from which the necessary equipotential collectors to be prepared along the entire beamline are derived.

Any earths, including the earthing sockets of plug-in sockets and extraneous earths (metal parts not forming part of the electrical system) entering the premises, must be individually earthed by means of a conductor of suitable cross-section.



Elettra Sincrotrone Trieste

Degrees of protection

The degrees of mechanical protection of the systems (IP and IK degrees) must take into account the environmental context, in some cases related to the type of experiments envisaged (e.g. presence of technical gases, chemicals, ionizing radiation, etc.).

Equipment nomenclature

For the nomenclature of everything concerning the electrical system of a beamline, from its design to installation, the interface document prepared by the competent offices of Elettra must be followed.

General requirements for site management and work

The work to be carried out at ST must minimise the emission of dust, chips and the like into the environment as they could damage the scientific equipment present. If they are still necessary, the use of vacuum cleaners and/or other suitable devices must be provided to avoid the above.

The design of the electrical intervention must include actions to minimize interference and risks between concomitant processes. It must also contain actions to reduce the accumulation of materials at the Elettra site, as well as a waste management plan in order to maximize the recovery of waste materials and their inclusion in the recovery cycles (environmental management plans).

TYPES AND CHARACTERISTICS OF MATERIALS AND COMPONENTS

The materials, equipment, machinery, electrical and electronic supplies must comply with the product standards of the Italian Electrotechnical Committee, suitable for installation and installed in a workmanlike manner and according to the manuals of the manufacturers and manufacturers.

The technical standards of reference for supply and installation are the standards of the Italian Electrotechnical Committee (CEI), as well as the Italian and EU laws on electrical systems and in particular on low voltage electrical safety.

All the materials to be used, in addition to meeting the provisions of the laws and regulations of the C.E.I. and U.N.I., must be new, of the best quality and commercial choice; they must be IMQ and CE marked where applicable, be suitable for the place of installation and meet the requirements in relation to the works for which they will be used.

For anything not reported in this chapter, the CEI and UNI technical standards in force will always refer to the technical standard of the CEI and UNI in force for the purposes of material acceptance.

VERIFICATION AND TESTING OF SYSTEMS

The authorized installation company will carry out during and at the end of the work, the appropriate

10

Elettra - Sincrotrone Trieste S.C.p.A.

S.S. 14 Km 163,5 in Area Science Park
34149 Basovizza, Trieste, Italy
T. +39 040 37581
F. +39 040 938 0903

P.IVA e C.F. IT00697920320
Cap. Soc. € 49.969.980,45 i.v.
PEC: sincrotrone.trieste.elettra@legalmail.it
www.elettra.eu

Iscritta al Registro delle Imprese di Trieste
Società di interesse nazionale
ai sensi dell'art. 10, comma 4,
L. 19 ottobre 1999 n. 370





Elettra Sincrotrone Trieste

visual and instrumental checks required by the CEI and UNI regulations and by the manufacturer of the equipment.

The checks must be duly documented by means of verification reports and test bulletins (on site or in the factory, when required).

The work is considered to include assistance activities by the Company to technical testing (execution of instrumental and/or operational tests) in the presence of the Customer's technical personnel.

The technical test must be duly recorded.

The technical testing verifications are those of the CEI 64-8 part 6 standard.

Please note that the tests are divided into "Visual exams" and "Tests". Therefore, the testing checks are referred to below. The methods of execution are referred to the technical standard.

Visual examination

The visual examination must precede the test and must be carried out, as a rule, with the entire system "without voltage".

The visual examination must ascertain that the electrical components that are part of the fixed system are:

1. comply with the safety requirements of the relevant standards (examination of markings, certifications or manufacturer's information);
2. correctly chosen and installed in accordance with the requirements of the standards and with the manufacturer's instructions;
3. not visibly damaged in such a way as to compromise safety;

The visual examination must cover the following conditions, as applicable:

1. methods of protection against direct and indirect contact;
2. presence of flame barriers or other precautions against the spread of fire and methods of protection against thermal effects;
3. choice of conductors with regard to their capacity and voltage drop;
4. selection and calibration of protection and signalling devices;
5. presence and correct installation of disconnecting or control devices;
6. selection of suitable electrical components and protective measures with reference to external influences;
7. correct identification of neutral and protective conductors (PE);
8. single-pole control devices connected to phase conductors;
9. presence of diagrams, monitoring signs and similar information;
10. identification of circuits, fuses, switches, terminals, etc.;
11. suitability of conductor connections;
12. presence and adequacy of protective conductors, including conductors for the main and supplementary equipotential bonding;
13. easy accessibility of the system for operational and maintenance interventions;
14. The visual examination must include all the requirements for the particular environments and applications referred to in the reference standards.



Elettra Sincrotrone Trieste

Tests

Measuring instruments and control equipment must comply with the CEI EN 61557 series standards. If other measuring instruments or other testing equipment are used, they must not have lower characteristics and degree of protection.

The following tests shall be carried out, as far as applicable, and preferably in the order indicated:

- a) continuity of tenants;
- b) insulation resistance of the electrical system;
- c) protection by SELV and PELV systems or by electrical separation (if present);
- d) resistance of floors and walls;
- e) protection by automatic power stoppage;
- f) additional protection;
- g) polarity test;
- h) proof of the order of the phases;
- i) functional tests;
- j) voltage drop;
- k) functional tests.

In the event that any test indicates the presence of a defect, that test and any other previous test that may have been affected by the reported defect must be repeated after the defect has been rectified.

FINAL PLANT DOCUMENTATION

Pursuant to art. 7 of Ministerial Decree 37/2008, at the end of the works, after carrying out the checks required by current legislation, including those of the functionality of the system, the installation company must issue the Customer with the declaration of conformity of the systems built in compliance with the reference standards. This declaration, made on the basis of the model referred to in Ministerial Decree 37/2008 as amended, includes an integral part of the report containing the type of materials used, as well as the construction or AS Built.

The final documentation is therefore understood to be the following:

1. Declaration of conformity pursuant to Ministerial Decree 37/2008;
2. Report with the type of materials used pursuant to Ministerial Decree 37/2008;
3. Scheme of the system created pursuant to Ministerial Decree 37/2008 (**digital and 1 copy on paper**)*;
4. As Built single-line wiring diagram of the switchboards (**digital and 1 copy on paper**)*;
5. Wiring diagram of the supply electrical panels (**digital and 1 copy on paper**)*;
6. Arrangement of the supply equipment in a listed plan (AS BUILT) (**digital and 1 copy on paper**)*;
7. Copy of the certificate of recognition of technical and professional requirements;
8. Material/equipment sheets approved by the Customer before assembly;
9. Use and maintenance manuals for all supply equipment;
10. Verification reports during construction, in contradictory with the Client;



Elettra Sincrotrone Trieste

11. Factory or on-site testing bulletins of supply equipment;

The AS Built Documentation must be signed and stamped by the executing company.

PLEASE NOTE: "*" the documents delivered in digital format must be in Portable Document Format PDF (*portable document format*) digitally signed, and editable (AutoCAD).®

PREVENTION AND SAFETY MEASURES TO BE TAKEN

The works must be carried out in full compliance with current legislation on safety and hygiene in the workplace and in strict compliance with the provisions of a specific D.U.V.R.I (Single Document Assessment of Interference Risks), any further indications and prescriptions of Elettra.

All regulations on energy saving, environmental impact and waste disposal must also be complied with. All equipment used must be approved according to specific regulations, including the use of PPE.

Unless otherwise provided for by Elettra, the systems must be taken out of service exclusively by Elettra's authorised internal personnel (Electrical Systems Activities of the Infrastructure Group), who will carry out, subject to adequate notice, the necessary manoeuvres on the main switchboards, issuing and requesting the system delivery and redelivery form, in compliance with the CEI 11-27 standard, from the Company's supervisor.

The annexes to this technical specification contain the EST standard modules that will be used for the safety of the systems (Work Plan and plant delivery and redelivery modules, compliant with the CEI 11-27 standard).

Particular attention must also be paid to the equipment installed near the operating areas and all activities must be carried out paying attention not to cause damage and/or contamination to the structures and/or equipment installed in the various laboratories and technological environments.

The resulting material must be delivered to the authorized landfill in full compliance with the specific regulations in force. The customer will provide the required safety documents (DUVRI, Emergency Plan, etc.) in order to ensure the most complete collaboration and integration between the Employers.

Elettra - Sincrotrone Trieste S.C.p.A.

S.S. 14 Km 163,5 in Area Science Park
34149 Basovizza, Trieste, Italy
T. +39 040 37581
F. +39 040 938 0903

P.IVA e C.F. IT00697920320
Cap. Soc. € 49.969.980,45 i.v.
PEC: sincrotrone.trieste.elettra@legalmail.it
www.elettra.eu

Iscritta al Registro delle Imprese di Trieste
Società di interesse nazionale
ai sensi dell'art. 10, comma 4,
L. 19 ottobre 1999 n. 370





Elettra Sincrotrone Trieste

ATTACHMENTS

Annex	STATUS	SITUATED IN	TITLE / TABLE	DOCUMENT
1	----	----	List of Standards and Laws	
STATO DI FATTO				
2	SDF	General	Framing plan	
3	SDF	General	Fire Detection Block Diagram	
4	SDF	General	Ground dispersion and atmospheric discharge capture system	
5	SDF	Building S Sala Sperimentale	Block diagram Electrical system	
6	SDF	Building S Sala Sperimentale	Single-line diagram of the electrical system – e.e. normal	
7	SDF	Building S Sala Sperimentale	Single-line diagram of the electrical system – e.e. privileged	
8	SDF	Building S Galleria Servizi e Sala Sperimentale	Identification of electrical panels	
9	SDF	Building E Piano primo	Identification of the fire detection control panel	
PROJECT STATUS				
10	SDP	Building S Galleria Servizi e Sala Sperimentale	Identification of electrical panels	
11	SDP	Building S Sala Sperimentale	Typical beamline electrical distribution reference floor plan type	
12	SDP	Building S Sala Sperimentale	Typical beamline electrical distribution type	
13	SDP	Building S Sala Sperimentale	Typical wiring diagram beamline distribution panel type	
14	SDP	Building S Sala Sperimentale	Diagram of the main distribution panel (ref. E2--1301C-F00R00)	
15	SDP	General	Typical Tests	
MANAGEMENT OF ELECTRICAL WORKS				
16	---	---	ST standard modules compliant with CEI 11-27	

Elettra - Sincrotrone Trieste S.C.p.A.

S.S. 14 Km 163,5 in Area Science Park
34149 Basovizza, Trieste, Italy
T. +39 040 37581
F. +39 040 938 0903

PIVA e C.F. IT00697920320
Cap. Soc. € 49.969.980,45 i.v.
PEC: sincrotrone.trieste.elettra@legalmail.it
www.elettra.eu

Iscritta al Registro delle Imprese di Trieste
Società di interesse nazionale
ai sensi dell'art. 10, comma 4,
L. 19 ottobre 1999 n. 370

