NATO Defense College
Collège de Défense de l'OTAN
Rome - Italy

Rome, 11 August 2026 NDC/0054

SUBJECT: Invitation for the Electrical Lines and ICT UPSes revision at the NATO Defense College (NDC), Rome - Italy.

Madam/Sir,

The subject of this bid concerns the revision of the Electrical Lines and ICT UPSes at the NDC located in Rome, via G. Pelosi 1 Rome (Cecchignola).

This project aims to standardize and rationalize the electrical lines in place to feed the ICT equipment installed in the CIS concentration rooms Located on each floor's end of the building hosting the NDC as per the description provided in the Standard Bidding and Contract Specifications at Annex A to this letter and in the Statement of Work (SoW) and *Modification project of the existing electrical system* at Annex B.

The *Modification project of the existing electrical system* shows details of the existing and the final electrical layout.

In case of discrepancies, the SoW (Annex B) will prevail on the "NDC Standard Bidding and Contract Specifications" (Annex A) or other bidding documentation.

According to the SoW and *Modification project of the existing electrical system* at Annex B, this project has at least three single provisions:

1) The creation and installation of power lines from the main building to the CIS Warehouse and the vertical power lines for the ICT racks.
2) The provision of 3 UPSes[1] and additional equipment.
3) Additional electrical work that includes:
   - Power line conditioner installation[2].
   - Line controllers and monitors provision[3].

[1] Please note that NDC will not accept UPS vendors different from **RIELLO** because a software management framework already exists and it would not be efficient introducing an additional one.

[2] Frutech, t.racks and APC are preferred brands, therefore it will be highly appreciated whether the provision of **No. 2 FRUTECH DAYTONA 303** in CIS Computer area and DR and **No. 10 t.raks Power Conditioner 12** could be accommodated.

[3] Please note that NDC will not accept Power strips different from **No. 14 x EATON EMAH28 power strip, model EPDU MA 1U (C20 16A 1P) 8xC13**.

- The provision of a new electrical Line for the Disaster Recovery (DR) system included old wirings reclamation and new system certification and mapping.

The project's 1 and 2 parts are strongly connected while part number 3 is a work that could be deferred but if executed in parallel with 1 and 2, could facilitate the overall provision being the technicians already on site. It is also worth mentioning that the College reserves the right to decide whether the work at #3 can be postponed depending on available funds and after the evaluation of the technical offers.

All the needed electrical part should be provided by the contractor. Please note that **the earthing of the power line should be done at the origin and without using any existing connection**.
Particular attention should be paid to not interfere with the building power lines.
At the end of the installation of the new power lines, **all unnecessary cabling will be removed and disposed of if not used anymore**. Moreover, any wiring inconsistencies, error and missing parts should be fixed.
All the industrial certifications should be produced in accordance with the local rules and regulations in terms of safety and processes before the final work commissioning.
The new electrical system should be provided along with certification and both printed and electronic formats. For the electronic documents, DXF (Autocad) format is preferred.

The work timeframe, including the contract awarding and its implementation, should not take more than two months.
The installation of new ICT power Lines will be under the supervision of the ICT department. **The final work will be subject to acceptance**.

A mandatory site survey is necessary to participate in the bid.
The survey access will be granted during the business time from 18 to 31 August 2026. To arrange an appointment, please send an email to tommaso.cerullo@ndc.nato.int**.**
During the site survey, firms will have the opportunity to assess the status of the current power lines, the dimensioning of the power line conditioners units in terms of power capability and the dimensioning of the 2+1 UPSes in terms of power capacity.

Firms not participating in the survey will be automatically discarded.

Please, submit quotes as instructed in Annex C of this document.

The Bid closing date shall be **04 September 2026, 15:30 Local Time**.

The bid opening is not public.

This invitation to bid is in no way binding on the NDC which reserves the right not to award the contract, to award it partially, or to reject any offer which does not comply with the conditions of this invitation to bid, or with any other relevant element as assessed by the NDC, with no legal liability of any sort for the NDC. Its decision will not be open to appeal, and the bidder will not be entitled to any claim or reimbursement. The NDC also reserves the possibility of further negotiating the terms and conditions of the initial offer received with the bidders.

The Contract will be awarded, subject to availability of sufficient funds, to the firm offering the lowest priced technically compliant quote.

The possible resulting contract will be governed by the applicable NATO Defense College Purchase Order Standard General Provisions.

Any question related to the bidding procedure must be referred to the Purchasing and Contracting Officer:

Name: LTC Tommaso CERULLO and MCPO Luca STAZI

Telephone: +39 (06) 50525 408/7

Email address: tommaso.cerullo@ndc.nato.int and contracting@ndc.nato.int.

Read carefully the instructions as stated in this document and related enclosures. Failure to comply with them may cause your offer to be rejected.

Your participation in bidding is greatly appreciated.

Sincerely,

Tommaso Cerullo
Lieutenant Colonel (OF-4), ITA A com
Purchasing and Contracting Officer

ANNEX A

STANDARD BIDDING AND CONTRACT SPECIFICATIONS

1. GENERAL ASPECTS

The NATO Defense College is a NATO subsidiary body to which provisions of the Ottawa Agreement on the "Status of the North Atlantic Treaty Organization, National Representatives and International Staff" apply (for domestic suppliers Ottawa Agreement is ratified under Italian Law n. 1226 (10 Nov 1954).
The Purchasing and Contracting Officer of the NATO Defense College is responsible for applying the Bidding procedure to meet the requirements of the College, in accordance with NATO Financial Regulations and Implementing Instructions.
Implementation of this procedure does not entail any obligation to award, totally or partially, the Contract; the competent Authority may either decide not to award the contract at all or set the procedure in motion again, when necessary, in a different form.
When the Contract covers several lots, the competent Authority reserves the right to allocate some of them only and it may even decide that the other lots will be covered by one or more contracts, when necessary, under a different procedure.
Goods and services will be purchased from governmental or commercial entities that are (1) chartered / incorporated within NATO member Nations and (2) that maintain a professionally active facility (office, factory, laboratory etc.) within NATO-member Nations. The NDC invitations to bid are not opened to any consortium of firms / companies or any type of temporary groupings of companies.
Sub-contracting is allowed only if specifically authorized. In case of sub-contracting, the contractor remains the sole party responsible to the NATO Defense College for all obligations assumed. Sub-contracting shall be limited to firms and persons of NATO member nations. Sub-contractors shall procure all permits and licenses necessary for the execution of the contract at no additional cost for the NATO Defense College.

2. SOLICITATION

A vendor may request a deadline extension for translation purposes. In such cases and irrespective of the number of requests, the procurement authority must grant a one-time extension for translation purposes of up to 15 calendar days, if the request comes no later than 14 calendar days prior to the initial deadline set for the submission of bids/proposals. Any other requests for extensions are at the procurement authority's discretion.
The solicitation documentation must include a summary of the procurement's purpose and background. The solicitation method shall be clearly specified, be it an Invitation for Bids (IFB), Request for Proposals (RFP), or other approach. A well-defined problem statement, Performance Work Statement (PWS), Statement of Work (SOW) or technical specifications must be included, providing a clear description of the goods, works, or services required. The procurement authority shall outline eligibility requirements for vendors, including any minimum qualifications or restrictions.
The solicitation documentation must clearly detail all aspects of the procurement process, including submission requirements, deadlines, communication protocols and timeframes for clarifications, amendment procedures, dialogue, down-selection, alteration of bids, post-award

debriefing mechanisms, and the applicable dispute procedure. It must also specify the criteria to be used for bid/proposal evaluation and contract award, and whether the evaluation will occur in successive stages.
The bid shall be submitted in accordance with the Invitation letter. It will normally be subdivided into two separate parts: the price proposal and the technical proposal:

- The technical proposal (two copies) will include:
  a. All documentation/ information required in the Invitation letter;
  b. All documentation / Information Required in the Bidding Technical Specifications;
  c. Any catalogues, brochures, photos, samples etc. deemed necessary.
- The price proposal will be the total cost in Euro where applicable, quoted separately for each Lot.

If referred to in the Contract Technical Specifications, models or samples must be enclosed with the bid, if necessary under separate cover, provided that no price is stated or referred to.

3. LANGUAGES / PREVAILING VERSION

Notifications of procurement opportunities shall be published by the procurement authority in at least one of the NATO official languages. Additional languages may be used when deemed beneficial for increasing competition.
When the procurement authority is a NATO Body, the solicitation documentation shall be published in at least one of the NATO official languages. When the procurement authority is a Territorial Host Nation/User Nation, the solicitation documentation may be published in the official language(s) of the nation, although the use of one of the NATO official languages is encouraged. The bids/proposals must be either in the official language(s) of the procurement authority or in one of the NATO official languages, unless the choice of language between these was specifically determined by the procurement authority and stated in the solicitation documentation.
In case of documents issued in more than one language (call for bids, annexes, orders, etc.), the English version prevails in case of dispute.
In case of different provisions between the General Contract Specifications and the Technical Contract Specifications in the call for bids, the latter will prevail.

4. ENGAGEMENT WITH VENDORS

Any engagement by the procurement authority with a vendor before and after the deadline for the receipt of bids/proposals must uphold the principles of open and fair competition, ensuring the nondiscrimination and equal treatment of eligible vendors.
A vendor may submit written requests for clarification regarding the solicitation documentation within the specified timeframe. The procurement authority shall respond in writing, ensuring that all responses are shared appropriately, in order to maintain equal access to information. Selective or private responses are prohibited. If a pre-bid conference is held, all relevant questions and responses must be documented and made available to all vendors to ensure transparency. Clarifications must be issued through the same channel(s) where the solicitation was originally published.
If clarifications require changes to the solicitation documentation before the deadline for the receipt of bids/proposals, the procurement authority must issue an official amendment or addendum. Any such modifications must be communicated in writing to all vendors. The procurement authority may extend the deadline for the receipt of bids/proposals to allow vendors reasonable time for the adjustment of bids/proposals.
If the solicitation allows for dialogue, such as in the case of competitive dialogue, phased evaluations, or other agile procurement approaches, vendors may be invited to participate in structured discussions. These discussions aim to refine solutions, clarify requirements, and explore innovative approaches. Any dialogue must be non-discriminatory, well-documented, and

conducted in a transparent manner that does not give any vendor an unfair advantage. Similarly, when the solicitation allows for negotiations, this shall be done according to the process set out in the solicitation documentation. During exchanges, the procurement authority shall ensure that any relevant information is shared in a non-discriminatory manner, in order to not give some bidders an unfair advantage over others.

The procurement authority may request clarifications from a bidder regarding ambiguous information in their bid/proposal. Such requests must be made in writing and must not permit the introduction of new or materially altered information. The same opportunity must be extended to all bidders where applicable.

Upon request, the procurement authority shall provide post-award debriefs to unsuccessful bidders, ensuring transparency into the evaluation process while safeguarding the confidentiality of proprietary or competitive information. In the context of agile procurement, where iterative approaches and continuous improvement are vital, debriefs are especially encouraged. The procurement authority must conduct debriefs in a fair, objective, and consistent manner.

5. EVALUATION OF BIDS

The procurement authority must develop and adhere to formalized procedures for the evaluation of bids/proposals to ensure complete objectivity and non-discrimination. The procurement authority shall specify the methodology and criteria used for evaluating proposals/bids in the solicitation documentation. Changes to the evaluation methodology and criteria may take place exceptionally after the publication of the solicitation documentation but before the deadline for the receipt of bids/proposals, when they are needed for valid reasons, including, but not limited to, correction of errors. In such circumstances the procurement authority should inform bidders and allow sufficient time to bidders to make the necessary adjustments to their bids/proposals, should that be required. The procurement authority shall ensure the consistent and uniform application of the evaluation criteria across all bids/proposals.

6. ALTERATION OF BIDS

Where information or documentation submitted by a vendor is or appears to be incomplete or erroneous or where specific documents are missing, the procurement authority may request the vendor concerned to complete or correct the relevant information or documentation within a specified timeframe, provided that such requests are made in full compliance with the principles of open and fair competition, non-discrimination and transparency.

A bidder may correct minor clerical or administrative errors in its submission after the deadline for the receipt of bids/proposals, provided such corrections do not change the substance of the bid or proposal or affect pricing or competitive positioning. All corrections must be properly documented.

After the final deadline for the receipt of bids/proposals, a bidder shall not be permitted to alter or supplement its bid or proposal in any way that would affect pricing, technical specifications, or other substantive elements. In procurements using an agile approach that involve multiple phases of dialogue, negotiation, or iterative submissions, adjustments—including those affecting pricing—may be permitted during the relevant phases, but before the final deadline for the receipt of bids/proposals, provided that the conditions for such adjustments are clearly specified in the solicitation documentation. Bidders may be invited to refine their solutions, adjust proposals based on discussions, or participate in phased evaluations. Such engagements must be conducted transparently, documented rigorously, and applied consistently across all bidders. Any negotiation or refinement must not distort fair competition or give one bidder an unfair advantage over others.

7. AWARD CRITERIA AND CONTRACT TYPE

The procurement authority shall award contracts based on predetermined and clearly defined criteria. The chosen criteria must align with the objectives of the procurement. and must ensure a transparent and fair assessment of all proposals. The procurement authority may choose between the following award criteria: lowest price technically compliant, lowest lifecycle cost, best price-quality ratio or best value. In the case of the best price-quality ratio or best value, the procurement authority must clearly communicate the weight and significance of each criterion/sub-criterion in the solicitation documentation.

The use of other award criteria shall be subject to prior governance approval.

When applicable, the Contracts Award Board (CAB) or Committee (CAC) awards the contract in accordance with NATO procedures. The CAB/CAC sessions are held in closed sessions limited to NATO personnel. 3.2. The CAC may accept or reject bids in whole or in part.

The CAB/CAC selects the bid which it considers the most advantageous, considering the quotation, connected costs, the technical and functional specifications, the reliability of suppliers, the professional and financial trustworthiness of each bidder, the time schedule, and any other relevant considerations, together with any suggestion made in the bid, provided it is not in contrast with the formal instructions for presentation of the offers. Whenever the award is not based solely on price, the value/score assigned to the technical proposal and to the economic offer will be specified in the bidding documentation.

During the entire bid evaluation process the NATO Defense College reserves the right to discuss any bid with the bidders in order to clarify what is being offered and/or to obtain more detailed information. The NATO Defense College will, in any case, not be responsible for finding information which is not readily identifiable and available in the bid.

In case no communication is received within 90 days from the deadline for the offer presentation, the same will be considered as not accepted. No reasons will be given on the call for bids results.

The invitation to bid is not opened to any consortium of firms / companies or any type of temporary groupings of companies.

The procurement authority shall determine the most suitable type of contract. These may include but are not limited to: fixed-price contracts, cost-reimbursement contracts, incentive contracts, indefinite delivery contracts, or any hybrid structure, with or without provisions for price variation. The contract must be appropriately structured to manage risk, ensure accountability, and achieve the procurement objectives.

When deemed suitable by the procurement authority, framework agreements should be sought to maximize benefits to NATO. Framework agreements may be the result of an open competitive bidding procedure or an accelerated procurement vehicle allowing for competition among a select pool of vendors, such as the NATO Communications and Information Agency (NCIA)'s Basic Ordering Agreement (BOA) and Not-For-Profit Framework (NFPF). Although not requisite, framework agreements may sometimes involve a binding financial commitment, as may be the case in certain Indefinite Delivery/Indefinite Quantity (IDIQ) contracts.

The NATO Defense College reserves the right to negotiate other contracts for additional specialized or special works with other parties, even if falling in the same professional area as the present call for bids / contract.

8. ACCEPTANCE OF CONDITIONS

The supplier is required to return the specific Annex to the Invitation letter, duly dated and signed for acceptance by the contractor's legal representative.

9. AWARD DECISION AND CONTRACT SIGNATURE

The procurement authority must immediately notify all bidders of the award decision. Before contract signature, the procurement authority must ensure the respect of the standstill period as set out below.
For procurements with an estimated value exceeding EFL Level E, a contract may not be signed for at least a period equal to the number of calendar days set as the time period to allow for complaints to be lodged (in line with the deadline set in sub-paragraphs 11.2 of Appendix 1). For procurements with an estimated value up to and including EFL Level E, the establishment of a standstill period shall be mandatory and at the discretion of the procurement authority. Standstill periods do not apply in the following cases:

- If, by the nature of the procurement method (e.g. sole source) or due to limited interest in the bid, there is only one bidder and no other interested bidders;
- For urgent and compelling reasons (e.g. when a delay in contract signature endangers life, property, or mission) to be duly justified by the procurement authority. When a standstill period is waived on these grounds for a procurement with an estimated value exceeding EFL Level E, such cases shall be reported for information to the relevant Committee.

10. PRICES

Unless differently specified in the contract / order, the prices given shall be firm and not subject to revision, even if the project / works are executed in more than one year. The price offer will separately quote the safety-related costs as part of the overall offer if specifically required.
When applicable, the terms of the contract may be extended from year to year, up to a total of five years, provided that the bidder agrees to maintain his prices.
Prices are to be quoted in Euro.
For domestic suppliers: under article 72 D.P.R. Number 633 para III.2 dated 26.10.1972 and further modifications: Services supplied and goods delivered to the NATO DEFENSE COLLEGE for its official use, shall be exempted from Value Added Tax (V.A.T.).
Similarly, for international suppliers of NATO countries, the NATO Defense College is exempted from all Customs duties and quantitative restrictions on imports and exports in respect of articles imported or exported by the College for its official use, regardless of the amount. Under this provision, goods imported by the College for its official use are also exempt from VAT.

11. BANK / INSURANCE GUARANTEE

No initial deposit is requested to participate to the bidding procedure, unless otherwise stated in the invitation letter.
If requested by the P&C, the Contractor must provide to NDC at the time of the signature of the contract, to ensure the adequate performance of the works/services, a bank or insurance guarantee for a value not less than 20% of the contract amount including a waiver clause regarding preliminary prosecution of the main debtor.
The guarantee must be enforceable at the first request from the NDC within a maximum period of ays and must include cover for a period of three months beyond the period of validity of the contract. The guarantee must include cover for a period of three months beyond the period of validity of the contract.

12. ORDERS – DELIVERY – ACCEPTANCE OF GOODS

All orders placed by the College will invariably be on numbered ordered forms or contracts signed by the Purchasing and Contracting Officer and, when required by NATO rules, by the Financial Controller Delegated, completed with the College's official stamp.
Unless otherwise stipulated by the College, goods shall be delivered F.O.B. to the following address between 0900 to 1200 hours, and 1400 to 1600 hours, Monday to Friday: NATO Defense

College, Via Giorgio Pelosi 1 – I-00143 Rome, Italy, ATTN: Property & Accounting Officer (tel. 0039-6-50525338) or other agent as indicated in the contract / order.
Delivery date: deadline for delivery / works completion will be the one stated in the bidding Technical Specifications or otherwise the one stated in the contract / order. In the absence of a deadline specified in the call for bids, the bidders will indicate in their offer the proposed delivery / works completion date.
Goods must be delivered to the College address, brought to the rooms where they are to be installed/used and assembled/mounted at the supplier's care with no additional costs for the College. The firm will dismantle, remove and dispose of the replaced material wholly at its own expense, and in full compliance with applicable safety and environmental protection rules and regulations.
Goods shall be delivered, packed in accordance with the normal standards applicable to each category of supplies. The supplier shall be entirely liable for damage due to inadequate packing.
Any damage, partial or total loss of goods in transit shall be the contractor's liability only.
Activities / works will be carried out with the schedules and modes to be agreed with the NATO Defense College, in order not to interfere with its academic activities. The NATO Defense College reserves the right, in accordance with its planned activities, to request one or more suspension of works not exceeding a total of 5 (five) working days, giving at least 5 (five) calendar days' notice to the contractor prior to each requested suspension. Those suspension days will not be counted towards the delays and consequent penalties mentioned at para 5.7. No claims for costs arising from those suspensions will be considered.
Goods / services will be accepted only if they meet the contract specifications mentioned in the contract / order, and are delivered undamaged and are subject to quantity and quality checks. The equipment, goods, spare parts and their components will be new. Reconditioned, recycled or repaired goods will not be accepted. The NDC reserves the right to make the appropriate checks with the manufacturer or with other sources.

13. GUARANTEE

Goods will be guaranteed against any material or functional defects. Unless differently established in the call for bids and subsequent contract / order, where differently assessed by the law, the guarantee will be valid for at least two years from the date of acceptance by the College.
Based on Paragraph 11, by virtue of the bank/insurance guarantee all repairs and replacements will be promptly executed by the contractor. In this respect, all expenses incurred will be borne by the latter. Any replaced equipment, or part of it, will be guaranteed as from the date of replacement. Services will be rendered in line with professional standards, subject to acceptance by responsible agents or internal Board properly appointed.
Deliveries found to be defective, damaged or not up to the specifications will be returned to the suppliers for replacement.
Unless otherwise specified in the Contract Technical Specifications, the Contractor will maintain and furnish a source of an adequate supply of components, spare parts, sub-assemblies and related services to properly maintain the equipment for a minimum of five (5) years from the warranty expiry.

14. TESTS AND ACCEPTANCE

It is the Contractor's responsibility to obtain, at no additional cost to NATO, the required official certificates for all parts, equipment and installations. The certificates, together with the validated test reports, shall be made available prior to the start of the acceptance testing by NATO. All new electrical and mechanical installations or modifications must be inspected and accepted by a certified inspection agency when required by Host Nation or International regulations.

Acceptance shall be conclusive, except for latent defects, fraud, gross mistakes amounting to fraud, or otherwise stated in the Contract. It is the action by which NATO acknowledges that the Contractor has fully demonstrated that the deliveries are complete and operational.
Acceptance will be accomplished when the following requirements are met:

- Availability at final destination of all deliverables.
- Successful completion of technical testing.
- Verification of the inventories.
- Satisfactory completion of all training or other required services, if any.

15. INVOICES AND PAYMENT

The invoices should show the reference and the date of the order/contract, the delivery note, and give a detailed description of the goods/services together with their reference and the bank name, bank account number (IBAN & BIC codes) and any other payment references for a prompt payment of the items ordered.
Invoices shall be exempt from VAT in accordance with DPR 633/72 art. 72 - 1.b and subsequent amendments. Each Invoice shall be supported by a Certificate of Inspection and Acceptance duly signed by the Operational Responsible Person. Payment will be processed in Euro via Bank Transfer to the account provided by the Contractor within 30 calendar days from the receipt of the invoices, unless specified otherwise in the bidding documentation.
Transfer of credit is strictly forbidden under the terms of this contract, even in the form of instructions for payment to third parties included in the invoice payment instructions.
Partial payments are taken into consideration when costs of labor and equipment acquisition are high. Partial payments will be subject to achievement of agreed targets / benchmarks, and to their acceptance by the responsible technical / functional agents. Proposed schedule for partial payments is reported in the bidding documentation, or may be proposed in the offer. Request for partial payment may be part of the offer technical evaluation, with higher score assigned to lower or nil partial payment request(s).
Any partial payment will be subject to equipment delivery and entails the transfer of legal ownership of such equipment to the NATO Defense College.

16. PENALTIES

In the event of partial or total non-compliance and/or any delay in performing the agreed works by the Contractor, whatever the reason other than force majeure or due to NDC request, the NDC will apply the following penalties: 1% of the total value of the contract may be imposed for each working day delay, up to 20% of the contract value, when this creates disruption for the NDC which alone will decide when any disruption has been caused.
Should the delay go beyond 30 calendar days or in case of material/serious/fundamental breach, the NDC reserves the right to cancel the order and to procure the whole or part of the order from another supplier. This penalty will not be imposed in the event of circumstances entirely beyond the control of the supplier, duly justified.
However, the NDC, according to the specific contract requirements, has the right to include different penalties than the above-mentioned. The decision on the actual amounts of penalties will be taken following a proposal from the Operational Responsible People, with specific responsibility for such matters. After duly informing the firm's representative of the issue concerned and receiving any justifications offered, Operational Responsible People will submit its proposal to the Purchasing and Contracting Officer to assess the case and notify the firm of the application of the penalty in writing.
The firm is to be notified of the penalties as an administrative procedure, excluding any formal legal default notice and any judicial act or procedure.
The amounts of the penalties are normally deducted from credits due to the firm pursuant to the contract and will be subtracted from the first invoice to be paid without prejudice in respect of

reimbursement of any additional expenses that the NDC might incur to compensate for failures or defaults attributable to the firm. Alternatively, the NDC will avail itself of the cautionary deposit. In this case the firm is obliged to replenish the deposit up to the originally established sum.
The right of the NDC to be compensated for any further damage is in any case unquestioned.

17. SECURITY AND CIVIL LIABILITY

The contractors' personnel list will be notified to the NATO Defense College before the execution starts. The contractor accepts to replace immediately any employee whose presence is deemed undesirable by the NATO Defense College, without any need to state the reason. Furthermore, in no case may NATO be held responsible for the consequences of such decision.
The College cannot be held responsible for damages suffered by the contractor's personnel or contractor's equipment while they are on the College's premises. The contractor must insure his personnel against all risks, damages, losses or injuries that the said personnel could be liable for, including damages against third parties. The insurance will be submitted to the Contracting Officer for verification of adequacy upon request.
The contractor shall repair at his expense any damage resulting from his work and inflicted to NATO buildings, equipment, services, utilities, roads and grassed areas, where such work is not included in the scope of work. Any material belonging to the contractor in use at the NATO Defense College will be the contractor's own liability.
The contractor (as well as sub-contractors) must comply with all Host Nation and European standards and regulations for health, security and safety (in particular with D. Lgs 81/2008 under the domestic legislation), and with all the applicable labour, social security and tax regulations. At any time the NATO Safety Officer and Host Nation labour inspection authorities will be entitled to inspect any contractor's activity. The contractor and sub-contractors may be asked to supply a copy of the work contracts for their employees present at the NATO Defense College.
In case of contract award the contractor will present the safety plan ("piano di sicurezza") i.a.w. Italian law. The issue of the Contract / Order is subject to acceptance of the "Documento Unico di Valutazione dei Rischi da Interferenze" (DUVRI) i.a.w. Italian Law, when applicable.
The contractor certifies that neither he nor his agents or representatives have offered or given any gratuity whatsoever to any NATO personnel, with a view of securing a contract or favorable treatment with regard to the award, modification or execution of this contract.
No news or information whatsoever (including photographs, films etc.) will be released by the contractor pertaining to this contract or any activity, programme, personnel or any other relevant information on the NATO Defense College. The contractor (and sub-contractors) shall in no circumstance use the name, emblem or official seal of NATO or of any NATO command in connection with its business or otherwise, if not duly authorized.
To safeguard order and security, the areas inside and outside the NATO Defense College premises are under video surveillance. Files of the resulting footage are accessible only to those responsible for security, and under no circumstances to any unauthorized persons. The contractor will be responsible for informing his employees that they and/or their vehicles may have to undergo a check/search upon entering and/or exiting the NATO Defense College.
Intellectual Property Rights (IPRs): Unless the Supplier has advised NATO before the acceptance of the purchase order on existing third parties or Supplier's rights arising otherwise than by virtue of this contract, and with due regard to national security regulations, all rights in the results of work undertaken by, or on behalf of, the NATO for the purposes of this contract, including any technical data specifications, report, drawings, computer software data, computer programmes, computer databases, computer software, documentation including software documentation, design data, specifications, instructions, test procedures, training material produced or acquired in the course of such work and, in particular, all rights, including copyright therein, will vest in and be the sole and exclusive property of NATO.

Except as otherwise provided in the contract, the Contractor agrees to assume all liability for the infringement, if any, of patents in force in the countries where the items will be manufactured, and in other countries where the patents are in force: and will be responsible for obtaining any patent licenses necessary for the performance of the present contract / order and for making any other arrangements required to protect NATO Defense College from any liability for patent infringement in said countries.
The NATO Defense College is a non-profit international organization which will use the goods and services purchased under the present contract for its own use and not for rent or resale. For this reason, the contractor will accept the NATO Defense College being treated as a 'consumer', thus benefitting from consumer protection laws. The contractor expressly accepts extending the same guarantees and consumer protection regulations to the NATO Defense College.
For domestic suppliers, the NATO Defense College is not part of the Italian Public Administration, and the related Host Nation / EU rules and regulations are not applicable. The NDC acts as a private entity, within the autonomous set of rules established by NATO organization.

18. CAPPED LIABILITY

The Contractor's aggregate liability to NATO arising out of or in connection with the Contract, whether in contract, tort, or otherwise, shall not exceed two times the value of the relevant PO. Neither Party shall be liable to the other for any indirect, consequential, or incidental damages, including loss of profits, loss of revenue, loss of goodwill, or loss of anticipated savings, arising out of or in connection with the Contract.
The above limitation shall not apply to:

- Liability arising from gross negligence or wilful misconduct;
- Liability arising from breach of confidentiality obligations;
- Liability arising from breach of personal data protection obligations;
- Liability arising from infringement of Intellectual Property rights;

NATO shall not be liable to the Contractor for any loss, damage, cost, expense, claim, or liability of any kind whatsoever, except to the extent of payments expressly due under the Contract for Deliverables accepted by NATO.

19. APPLICABLE LAW

The United Nations Convention on Contracts for the International Sale of Goods will not apply to this contract. The Supplier confirms that it has been notified by the NATO Defense College prior to the Supplier's acceptance of the purchase order to the effect that NATO, including its personnel, assets, and facilities, enjoys immunity from jurisdiction and execution in all member states of the Alliance.

20. DISPUTE RESOLUTION

NDC shall apply the Dispute Resolution Procedure as underlined in the annexed document according to the following principles:

1. Dispute settlement shall be transparent, non-discriminatory, timely and effective, and aim to reduce recourses to Committees.
2. The procurement authority shall provide reasons for its decision relative to a dispute, in writing, to the other parties to the dispute.
3. Each party shall undertake best efforts to resolve the matter amicably, even beyond any specific periods explicitly mandated for this purpose.

ANNEX F: DISPUTE RESOLUTION PROCEDURE

GENERAL PROVISIONS

Scope

1. This Appendix shall apply to disputes arising prior to, and including, the signature of a contract. Unless otherwise decided by governance, NATO Bodies shall apply this procedure in connection to any common funded procurements, while a Territorial Host Nation/User Nation shall apply this procedure when choosing to use NATO Competitive Procurement in connection to a NATO Security Investment Programme (NSIP) project it is responsible for implementing.
2. This dispute resolution procedure foresees three possible resolution stages: at procurement authority level, at Committee level and at Arbitration level. At any stage before the final decision of the Board of Arbitration is released, an amicable settlement is possible, allowed and advisable.
3. Where the procurement authority is part of a body established under the Paris Protocol, the party lodging the complaint will be informed in writing by the procurement authority whether it intends to proceed with the procurement action, including contract award, and that it is the interested party's prerogative to pursue the issue in accordance with the relevant dispute resolution procedure described in the solicitation documentation.

Settlement Principles

4. Dispute settlement shall be transparent, non-discriminatory, timely and effective, and aim to reduce recourses to Committees.
5. The procurement authority shall provide reasons for its decisions relative to a dispute, in writing, to the other parties to the dispute.
6. Each party shall undertake best efforts to resolve the matter amicably, even beyond any specific periods explicitly mandated for this purpose.

Lodging a Complaint

7. With the exceptions set out in paragraph 10 below, any interested party must be able to lodge a complaint if it considers that a decision by a procurement authority has violated applicable procurement rules and principles in a way that prejudiced a bidder or an interested bidder.
8. The grounds for any complaint must be described in clear and concise manner in writing and addressed to the procurement authority. Failure to lodge a coherent and substantiated complaint may be grounds for dismissal by the procurement authority. When a complaint is received, the procurement authority shall initiate informal discussions with the party lodging the complaint in order to understand and resolve the matter as soon as possible. A complaint may or may not result in a disagreement, but once it does, the matter automatically becomes a dispute that needs to be resolved.
9. The party lodging the complaint has the burden of demonstrating that the action of the procurement authority was clearly unreasonable and prejudiced their interests following a material violation of applicable procurement rules and principles. The party lodging the complaint must further be able to demonstrate that, but for the procurement authority's violation of the applicable rules and procedures, there would have been a substantial chance of being awarded the contract.
10. The following shall not be grounds for a dispute:
    - 10.1. The deadline set for the receipt of bids/proposals, or potential extensions by the procurement authority, including for translation purposes;
    - 10.2. Non-compliance by a bidder (or an interested bidder) with the deadlines set by the procurement authorities.

Deadline to Lodge a Complaint

11. The deadline to lodge a complaint shall be clearly specified in the solicitation documentation and shall, in any case, align as much as possible with the principles of this procedure and those of the policy at reference.

    11.1. For procurements with an estimated value up to and including EFL Level E, the deadline to lodge a complaint shall be mandatory and at the discretion of the procurement authority.

    11.2. For procurements with an estimated value exceeding EFL Level E, complaints shall be lodged by an interested party within 15 calendar days from the date when the interested party first knew, or ought to have known, about the circumstances giving rise to the grounds for the potential dispute, whichever is earlier. For complaints relating to the contract award decision, the deadline is 15 calendar days from the day following the date on which the contract award decision is communicated to the bidders. The procurement authority may choose to increase the time period allowed for the lodging of a complaint.

    11.3. For all procurements, the procurement authority may also exceptionally provide for shorter time periods for urgent and compelling reasons (e.g. when a delay in contract signature endangers life, property, or mission), to be duly justified by the procurement authority.

    11.4. To ensure clarity in communication, the procurement authority and the party lodging the complaint are encouraged to verify the delivery and/or receipt of the information they share with each other with regard to complaints lodged.

12. The procurement authority, for good cause shown, or where it determines that a complaint raises significant issues to the procurement authority's procurement objectives or processes, may voluntarily consider the merits of any complaint which is not timely lodged.

Suspension of the Award

13. The procurement authority shall not award a contract if a complaint is lodged before the award is made, and results in a dispute. The suspension of the award shall remain in effect until the final resolution of the dispute (including up to Board of Arbitration stage, if the case), or until the party lodging the complaint confirms in writing to the procurement authority that it shall not pursue the matter further.

14. The procurement authority may exceptionally override the suspension, if it is justified for urgent and compelling reasons (e.g. when a delay in contract signature endangers life, property, or mission), to be duly justified by the procurement authority.

15. The decision to override the suspension of the award must be documented and approved by the same body or person responsible for making the award decision on behalf of the procurement authority. Such an override decision for procurements with an estimated value exceeding EFL Level E shall be reported for information to the relevant Committee.

16. A suspension of an award must be communicated in writing to all bidders. When needed, the procurement authority should attempt to obtain an extension of their bid/proposal validity period from the bidders.

PROCUREMENT AUTHORITY LEVEL

17. The procurement authority shall establish internal procedures allowing for the expeditious treatment and resolution of complaints and disputes, without the involvement of the Committees. The procurement authority shall prioritize inexpensive, informal, procedurally simple, and effective resolution of complaints and disputes. The use of various dispute resolution techniques by the procurement authority, including third party neutrals, are acceptable methods.

18. The procurement authority's procedures should be consistent with the principles and rules set out in the policy at reference, building confidence in the NATO procurement system and reducing disputes before the Committees or judicial protest fora. The procurement authority shall undertake best efforts to resolve any dispute at its level within 14 calendar days after the complaint is duly lodged. The

procurement authority shall notify in writing the party lodging the complaint of the conclusion of the dispute resolution procedure at this stage. Disputes related to procurements with an estimated value up to and including EFL Level E shall be resolved at the procurement authority level.

19. For procurements with an estimated value exceeding EFL Level E, when a Territorial Host Nation/ User Nation applies this procedure in connection to a NATO Competitive Procurement for an NSIP project it is responsible for implementing, it may choose to forego a resolution of the dispute at its level beyond amicable settlement, and refer any formal matters directly to the Committee level.

COMMITTEE LEVEL

20. For all procurements with an estimated value exceeding EFL Level E, the interested party may raise the resolution of the dispute to the relevant Committee, through its delegation, if it considers that it has not obtained appropriate remedy at the procurement authority level either through the procurement authority's dispute resolution procedure or through amicable settlement. The relevant Committee will be the Budget Committee or the Investment Committee.

21. At Committee level, the bidder or the interested bidder shall be represented by the delegation of its nation of origin.

22. The resolution of a dispute shall be raised at Committee level by official letter to the Chair of the relevant Committee, sent by the delegation of the interested party's nation of origin. The letter must be submitted within 20 calendar days from the date on which the party lodging the complaint has been notified by the procurement authority of the conclusion of its dispute resolution procedure, as set out in paragraph 18 above. Upon receipt of the letter, the Chair shall forward it to the Committee to inform that a dispute has been raised at its level. The procurement authority shall also inform the Committee, in writing, of the suspension of the award[2], or of any override decisions.

23. A period of 10 calendar days from the date of receipt of the official letter referring the dispute to the Committee shall be allocated for the purposes of further exchanges between the parties to the dispute, ideally leading to an amicable settlement of the dispute. At this stage, if relevant, the International Staff may be invited to present their views.

24. The procurement authority shall immediately inform the Committee of the resolution of the dispute via amicable settlement or that the resolution was not possible. If an amicable settlement was not achieved, the relevant Committee shall hold a discussion on the points in dispute, based on oral or written statements by the parties. The issue may be discussed at not more than one meeting of the relevant Committee.

ARBITRATION LEVEL

25. If at the conclusion of the discussion in Committee, the parties to the dispute are unable to arrive at a mutually-agreed resolution, the Committee shall submit the dispute to a Board of Arbitration ("Board") for resolution.

26. The Board shall be appointed by the Committee and formed of three individuals selected from a Standing List of Board of Arbitration Members ("Standing List"), in no way concerned[3] with the dispute. The establishment of the Standing List and the nomination of the Board members shall be done in accordance with the section below on Composition, Conduct and Terms of Reference for a Board of Arbitration. The Board may request that a designated member of the International Staff support the discussions. The members of the Board and the International Staff shall act impartially according to their individual good judgement.

27. The Board members have the obligation not to disclose, except as provided in paragraph 29 below, the views held by any of the arbitrators or the nature of their deliberations and discussions.

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2 Or suspension of the performance of the contract, in cases where a contract had been exceptionally signed and a decision to suspend it is considered the appropriate way forward at this stage.

3 Amongst other measures to ensure impartiality, the Board of Arbitration shall exclude members that have the same nationality as the nation(s) of origin of the contractors or sub-contractors that may have an interest in the dispute.

28. The Board shall meet as soon as possible and, in any case, not later than 7 calendar days after the date when the Board was appointed. It shall establish its activity in accordance with the terms of reference below which, inter alia, will provide for:

    28.1. An exchange of memoranda in which each party shall state its position;

    28.2. The possibility for each party to comment upon the memoranda submitted by the other party;

    28.3. The possibility for each party to present oral submissions at a hearing.

29. The Board shall aim to inform the Committee of its decision, in writing, within 14 calendar days after the Board's first meeting but not later than 28 calendar days after the Board's first meeting. The decision of the Board shall be final, binding, and no appeal shall be allowed. In case the procurement in question relates to Council approved Alliance Operations and Missions (AOM), the Board shall inform the Committee of its decision, in writing, not later than 14 calendar days after the Board's first meeting.

30. The parties shall, with due speed, take the necessary steps to implement the Board's decision.

COMPOSITION, CONDUCT AND TERMS OF REFERENCE FOR A BOARD OF ARBITRATION

Composition

31. The Investment Committee[4] will select on an annual basis a minimum of eight national representatives to the Standing List. Each year at least 25% of the Standing List members should change to allow for an equitable sharing of the responsibility.

32. The three members of the Board shall be appointed by the relevant Committee from the Standing List, concurrent with the Committee's decision to proceed to the arbitration stage.

33. In the Board selection process, the Committee shall also consider:

    33.1. Availability and previous service on the Board amongst the selection criteria. Should the Committee not be able to make its appointment of the Board based on the members of the Standing List, the Committee may consider appointing another national representative, not part of the Standing List, or a member of the International Staff to the Board;

    33.2. Backgrounds, which shall be such that the Board as a whole has experience of the relevant aspects of the subject under dispute and shall comprise members who are in no way concerned with the dispute.

34. Should the Committee not be able to finalise the appointment of the Board within 14 calendar days from its decision to submit the dispute to arbitration by the Board, the Chair will escalate the matter of the Board selection and appointment to the NATO Secretary General.

Conduct of the Board Members

35. The members of the Board shall:

    35.1. Be, and reasonably appear to be, independent and impartial;

    35.2. Avoid impropriety as well as any appearance of impropriety;

    35.3. Avoid actual, potential and apparent conflicts of interests;

    35.4. Respect the confidentiality of the arbitral proceedings;

    35.5. Observe high standards of conduct that preserve in all respects the integrity of the arbitral proceedings; and

    35.6. Act diligently, fairly, and in a timely manner.

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4 The Standing List selected by the Investment Committee shall also be used by the Budget Committee, if required. The Budget Committee may consider selecting a separate (annual) list, should it be needed.

Terms of Reference

36. The Board shall conduct its activity in line with the provisions of this procedure.

37. The Board shall have access to all documentation relevant to the disputes, including but not limited to, the solicitation documentation, the bids/proposals, and other relevant records. If applicable, the Board may request that a member of the NATO International Staff provide technical clarifications. As required, the Board can also request that a party not involved in the dispute (e.g. from another NATO Body) provide an expert to assist the Board.

38. Memoranda from the parties, fully reflecting the views of each, shall be produced and be made available to the Board and each of the other parties.

39. The Board shall conduct at least one hearing of the party submitting the dispute in the presence of the procurement authority and of the procurement authority in the presence of the party submitting the dispute. If so required, to take account of commercial sensitivities or for other valid reasons, the Board may exceptionally also hold private hearings of each party without the presence of the other; in such cases, the Board shall ensure equal and non-discriminatory treatment of the parties.

40. The Board shall, if so requested, allow parties to provide further technical clarification during the hearings. Such clarifications shall not result in a change of the technical proposals or the bid price.

41. The decision of the Board shall be based on the principles of this procedure and of the policy at reference, as well as any other applicable rules and procedures, and on the evidence produced. The decision shall be made by majority and with no dissenting or separate opinions.

Electrical Lines and ICT UPSes Revision

Statement Of Work

AT THE

NATO DEFENSE COLLEGE

Authors:	CIS
Date:	21-05-2026
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Status:	Final

TABLE OF CONTENTS

1. Project overview

This project aims to standardize and rationalize the electrical lines in place to feed the ICT equipment installed in the CIS concentration rooms located on each floor's end of the building hosting the NATO Defense College. Please note that the main electrical works are described in the Annexed technical specifications which show details of involved areas along with the necessary data concerning the materials, installation and required features also for the final compliance and legal responsibilities. This document summarizes the main project and also provides information about aside work connected with the main one as well as the provision of additional equipment needed to improve the overall results.

2. Current scenario

The existing ICT power lines are the result of years of best effort and urgent issue resolutions. The constant growth in services demand and equipment technology, requiring specific cabling and consequent environment conditions (to guarantee the expected performances output) have furthermore worsened the situation. At the moment of writing this document, the status is hybrid: the impulse to the standardization and optimization has already begun but a structured approach is necessary to reach the final goal. Power lines were updated and modified so many times that area survey has shown also the need to traceback, tidy up and remove unused cabling.

3. Execution

3.1 Standardization and documentation

The project will document the cable passages (with labels) and will clearly report all the implemented solution as to put the College in the position of awarding the maintenance of this system without resorting to the installer. Each part of the new wirings should then be standard and installed following replicable industrial standards and procedures.

3.2 Old cabling removal

At the end of the installation of the new power lines, all unnecessary cabling will be removed and disposed of. Moreover, any wiring inconsistencies, error and missing parts should be fixed. Particular attention should be paid to not interfere with the building power lines, therefore no direct connection should exist from the building's switchboards to the ICT racks after this project completion. Besides, new lines should be installed from the low-power electrical room in full compliance with the local regulations.

3.3 UPSes devices

As detailed in the annexed technical specifications, the main work also includes the provision of 2+1 UPSes. The devices are to be connected to the ICT room on 3A and 1C floors. One additional unit should be installed in the Telephone Switchboard area located in the technical spaces of the College (more details to be provided during the site survey). Dimensioning the units is up to the firm. Please note that NDC will not accept UPS vendors different from RIELLO because a software management framework already exists and it would not be efficient introducing an additional one. Firms are therefore invited to consider this brand in their offers.

3.4 Responsabilities

The installation of new ICT power lines will be under the supervision of the ICT department. Should any intervention be necessary on the building's electrical system, the firm should inform the ICT department representative so that it will be possible to coordinate further steps with the technicians/maintenance section of the College.

3.5 Certifications

The final work will be subject to acceptance. All the industrial certifications should be produced in accordance with the local rules and regulations in terms of safety and processes before the final work commissioning.

3.6 Mandatory survey

A mandatory site survey is necessary to participate in the bid. During the site survey, firms will have the opportunity to assess the status of the current power lines and correctly prepare their best offer. Firms not participating in the survey will be automatically discarded.

4. Additional electrical work

The annexed document shows details of the existing and the final electrical layout. In addition to the required electrical parts such as cabling, switches, enclosures, safety systems, etc., UPSes should be provided so it will be possible to power and shied the ICT equipment during power shortages or grid anomalies.
Moreover, this SOW also indicates the procurement of additional equipment and the revision and installation of a new power line for the Disaster Recovery system (DR) located at the CIS Warehouse. UPSes are from Riello and NDC intends to remain on that brand for standardization reasons as well as commercial agreements already in place.

NOTE:
The dimensioning of the UPSes in terms of power capacity should be assessed beforehand during the site survey.

4.1 Power line conditioner

Power line conditioners should be installed in the CIS Computer Room and in the Disaster Recovery Areas. If the unit supports dual line operations, one unit per area will be sufficient. Conversely, a separate device should be installed for each power line.

The following are only few examples of devices:

- ISOTEK EVO3 Nova
- FURUTECH DAYTONA 303 LINE CONDITIONER
- MF BPC10
- AudioQuest Niagara 3000EU
- APC H10BLK
- t.racks Power Conditioner 12

For the quality and reliability of the products offered, Frutech, t.racks and APC are preferred brands, therefore it will be highly appreciated whether the following provision could be accommodated:

- No. 2 FRUTECH DAYTONA 303 (CIS Computer area and DR)
- No. 10 t.raks Power Conditioner 12

Alternative brands are accepted provided that the same level of protection, quality, support and reliability is offered.

NOTE:
The dimensioning of the units in terms of power capability should be assessed beforehand during the site survey.

4.2 Line controllers and monitors

Remote management and monitoring should be possible at each CIS closet. The provision of *Managed Power Strips* for each rack (for each line) are therefore required. The following products should be procured, configured and installed in every rack involved by this project. Power Strip units' procurement is as follows:

- No. 14 x EATON EMAH28 power strip, model EPDU MA 1U (C20 16A 1P) 8xC13

Please note that EATON exact product should be procured to ensure compliance with the existing management framework.

4.3 Disaster Recovery area

The Disaster Recovery (DR) is an IT system meant to guarantee the continuity of service in case of major interruptions. The DR equipment structure is already installed and being refined by specific projects. However, current power lines could not be sufficient to sustain the future requirements introduced by the service's growth plan, therefore the provision of new power or the revision of the existing lines is part of this project. The firm should also consider dual power lines to replicate the structure of the electrical wirings of the racks in the main building.

4.3.1 Old wirings reclamation

Old electrical cables should be removed if not used anymore. This includes reclamation as required by local regulations. Proof of reclamation should be provided to CIS for reference. The reclamation also includes electrical switchboards, cable ducts and any annexed part that were used with the old set up.

4.3.2 New system certification and mapping

The new electrical system should be provided along with certification and both printed and electronic formats. For the electronic documents, DXF (Autocad) format is preferred.

5. Risk assessment

This project addresses the electrical lines issue that proved to be a factual killing factor in the event of power grid anomalies such as electrical spikes, abnormal voltage levels and sub-signal noise/resonance. Moreover, the maintenance section plans to balance and distribute the building's load over its electrical phases: the current procurement will factually facilitate said task by separating lines that are now connected to the building's electrical switchboards, installed in the past without coordination, lack of professional awareness and following an *on demand* services approach.

Awarding the project is subjected to the technical skills verification of participants along with their score with the submitted offers. However, the risk of not meeting the deadlines or the delivery of a non-compliant or incomplete service, will result in a refusal of the deliverable. In the event of unsuccessful testing or negative product assessment, the delay and service degradation deriving from missing this milestone will add to the service handover time with subsequent corrective actions from the College.

5.1 Implementation timeframes

The work timeframe, including the contract awarding and its implementation, should not take more than two months. This time limit is calculated taking into account:

- the CIS workload and resources
- other concurrent activities that may require coordination not to interfere with each other and also to minimize the chances of similar service interruption (as lately experienced).

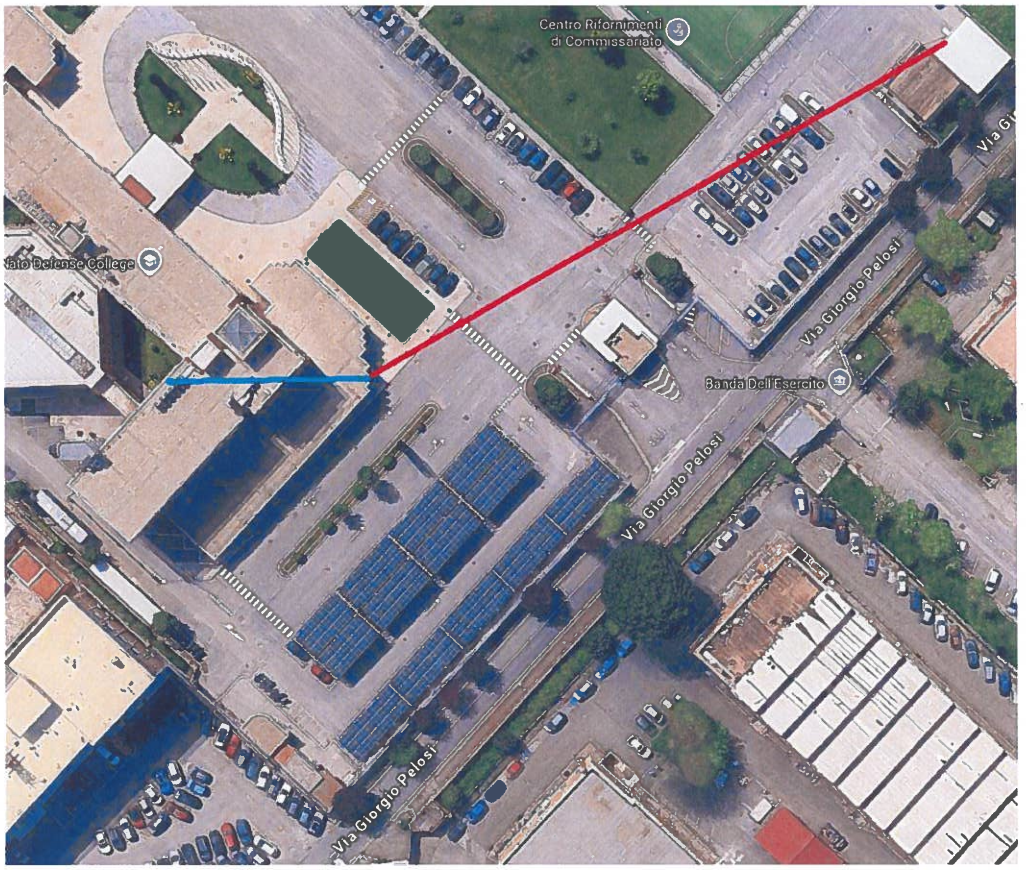
The execution of the project by delivering a state of the art and cutting edge product is paramount to support the College mission. Any delay, unexpected situation encountered during the implementation phase should be timely remediated as they have a direct impact over the operations. Therefore the firms *fit-for-purpose* skill will be essential for this work execution and should be assessed solely by the CIS branch.

5.2 Litigations and technical discrepancies

Should the final product(s) found not meeting the expected service level or not working as it should, the CIS Branch will inform the NATO Defense College Purchasing and Contracting section (acceptance report) to initiate the necessary verifications as well as starting to collect all the relevant documentation to eventually resolve or open a litigation with the firm.

6. ANNEX A – Power lines to the CIS Warehouse

As early explained, power lines from the main building to the CIS Warehouse, should be provided so to permit the installation of further IT systems. A new power line is requested: an informal assessment indicated the provision of a new 15kW, 400V three-phases plus earth, 50Hz. All the needed electrical part should be provided by the contractor. Connection should start from the low-power booth with a dedicated drawer-switch and reach the CIS Warehouse. Please note that the earthing of the line should be done at the origin and without using any existing connection.



The above picture shows the possible path of the line. The approximate length of the wirings is 180mt. (blue: internal route, red: external cable ducts).

7. Annex B – Technical Specification

The annexed documents are the technical specifications to be considered valid for the provision of the new electrical lines along with the two UPSes. As described earlier in this document, a third UPS will be requested as "additional unit" to be placed into the switch board area to serve the ICT rack in that area.

Files:

1) "Modification project of the existing electrical system"
2) "Electrical map"

8. Conclusions

This project has at least three single provisions:

1) The creation and installation of the vertical power lines for the ICT racks
2) The provision of 3 UPSes and additional equipment
3) The provision of a new electrical line for the DR system

The project's 1 and 2 parts are strongly connected (see attached technical specifications as reported in Annex B) while part number 3 is a work that could be deferred but if executed in parallel with 1 and 2, could facilitate the overall provision being the technicians already on site. It is also worth mentioning that the College reserves the right to decide whether the work at #3 can be postponed depending on available funds and after the evaluation of the technical offers.

SUBJECT:

Modification project of the existing electrical system

NDC – UPS SECTION

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CLIENT

NATO DEFENSE COLLEGE

DATE

18 NOVEMBER 2025

EXECUTING COMPANY

-

REVISION

1.0

engineering report

Indice generale

Introduction

This report is the document that summarizes the scope of the works to be carried out and coordinates all the project documentation. Its purpose is to identify and provide the information and methodologies used for drafting the project, as well as all general guidelines for the construction of the electrical installations.

This report has been prepared in accordance with the following provisions:

- Decreto 22/01/08 n. 37 e s.m.i., "Regolamento concernente l'attuazione dell'articolo 11-quaterdecies, comma 13, lettera a) della legge n. 248 del 2 dicembre 2005, recante riordino delle disposizioni in materia di attività di installazione degli impianti all'interno degli edifici".
- Guida CEI 0-2, "Guida per la definizione della documentazione di progetto degli impianti elettrici"
- Norma CEI 64-8, "Impianti elettrici utilizzatori a tensione nominale non superiore a 1000 V in corrente alternata e a 1500 V in corrente continua".

Any modification made to the project during installation invalidates the design.

Scope of the Intervention

The installations described in this document pertain to the primary power supply line for the data racks of NATO Defense College at via Giorgio Pelosi no. 1, Rome.

The building subject to the works consists of a three-story structure, in addition to the ground floor.

On the ground floor, there is a MV/LV substation (transformer room.

The current intervention involves the upgrading of the electrical switchboards and the redundant backbone lines running from the MV/LV transformer room to the rooms housing the UPS units.

The UPS units will be installed on the **third floor on side A** of the building and on the **first floor on side C**. From there, the standard and priority lines will be distributed to the utility rooms on the other floors.

By explicit request of the client and given the nature of the premises, the installation is subject to the regulations for locations with increased fire risk.

Technical Standards and Legislation

Electrical installations must be carried out in compliance with current laws and regulations, including any amendments, supplements, or integrations thereto.

The characteristics of the installations and their components must, in particular, comply with:

- CEI standards (Italian Electrotechnical Committee);
- Requirements of local authorities, particularly the Fire Department;
- Requirements and guidelines of the electricity distributor;
- Requirements and guidelines of the telephone service provider;
- Occupational health and safety regulations;
- Standards and recommendations of the Labor Inspectorate and ISPESL;
- Client's requirements.

The following table lists the main laws and regulations applicable to electrical installations.

- D.M. n. 37 del 22/01/08	"Regolamento concernente l'attuazione dell'articolo 11-quaterdecies, comma 13, lettera a) della legge n. 248 del 2 dicembre 2005, recante riordino delle disposizioni in materia di attività di installazione degli impianti all'interno degli edifici"
- Legge n. 186 del 01/03/68	"Costruzione e realizzazione di materiali ed impianti elettrici a regola d'arte"
- D.L. del 9/4/08 n. 81 e s.m.i.	"Testo Unico sulla Salute e Sicurezza sul Lavoro"

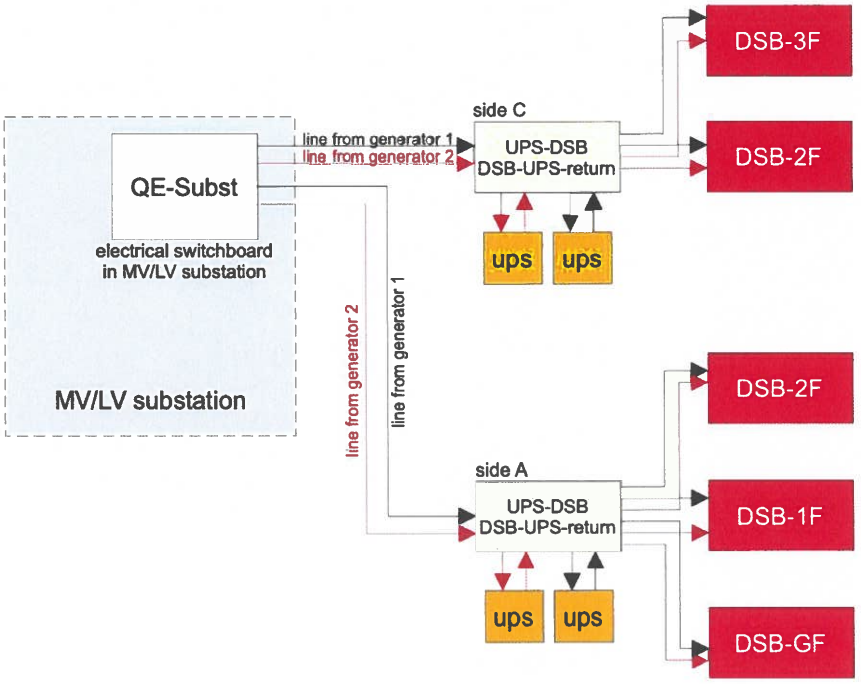
Consideration has also been given to CEI standards and guides, which govern the installation of the system and its components, in particular CEI Standard 64-8.

Electrical System Structure

Energy Supply and Distribution Point

The standard power supply is of type 3P+N with a nominal voltage V_n = 400V; the earthing system is pre-existing. The supply is at medium voltage, with a MV/LV transformer room located on the ground floor of the building.

Below is the diagram of the distribution system for the intervention:



The design of the switchboards must take into account:

- Heat dissipation of the equipment (adequate internal volume);
- Convenient and safe access to the equipment (for inspection and maintenance);
- Future expansions, providing 30% free space and a minimum of 2 spare modules.

The terminal blocks must display the necessary markings to identify the circuit and service to which each conductor belongs.

The switchboards must be equipped with a permanent, non-removable nameplate identifying the data required by CEI EN 61439 standards, accompanied by the manufacturer's declaration of conformity and test certificate.

The function of the switching and protection devices must be indicated by permanent, non-removable labels, with inscriptions corresponding to the single-line electrical diagrams provided in the annex.

Where multiple power supplies are present in the same switchboard, a warning sign must be displayed for maintenance personnel.

Fire Safety Measures

For "MaRCI" environments, which present a higher fire risk compared to ordinary areas, the standards provide specific additional requirements to minimize the probability that the electrical installation may cause ignition or propagation of fires.

In particular:

- Electrical components must be limited to those necessary for the use of the environment itself, with the exception of cables, which may also pass through.
- Cables passing through these areas, but not intended to supply power within them, must not have splices along the route inside these areas unless the splices are housed in fire-resistant enclosures.
- In MaRCI areas accessible to the public, switching and protection devices must be installed in a lockable cabinet or in a room inaccessible to the public.
- Measures[1] against series faults (a poor contact capable of causing fire due to high temperatures, sparks, or electrical arcs) must be adopted. A planned inspection and maintenance schedule should be implemented, particularly for the inspection of connections (especially in switchboards), including the use of thermal imaging cameras.
- At wall or floor penetrations that delimit a fire compartment, suitable firestop barriers must be installed to seal openings in case of fire.
- Electrical cables passing through emergency exit routes must not obstruct the flow of people and should preferably be out of reach.
- AC circuit conductors must be arranged to avoid dangerous heating of adjacent metal parts due to inductive effects, particularly when single-core cables are used.

1 The use of an AFDD (Arc Fault Detection Device), for detecting arc faults and disconnecting the affected circuit, is optional and serves only as a supplementary measure for series fault protection.

- Electrical cables must be installed so as not to cause ignition and/or fire propagation.
- Installation components and electric motors, limited to the terminal blocks and any collectors, must have a protection rating of at least IP4x.
- Overcurrent protection devices must be installed at the origin of the circuits.
- For flexible cables (extensions), heavy-duty cables are recommended (e.g., H07RN-F).
- In vehicle circulation areas, to prevent components (sockets, switches, exposed cables, etc.) from being crushed, they must be installed at a minimum height of 1.15 m above the floor.
- Electrical components containing flammable fluids must not be installed in the emergency exit system.
- Lighting fixtures must be kept at a safe distance from combustible objects. Unless otherwise specified by the manufacturer, for spotlights and small projectors, the minimum distance must be:
  - 0,50m: up to 100W;
  - 0,80m: 100–300W;
  - 1,00m: 300–500W.
- Lighting fixtures subject to mechanical stress (e.g., below 2,50m in transit areas) should have impact-protected lamps.
- For lighting fixtures installed in MaRCI type C areas, a protection rating of at least IP4x is required (protection against access to live parts, not lamps).

Wiring system

The electrical wiring must be installed so as not to cause ignition and/or fire propagation. Junction boxes are considered part of the wiring and must therefore have the same IP protection rating.

For cables installed in concealed conduits, no special requirements apply.

For other types of installation, the requirements for cables depending on the type of conduit used are as follows:

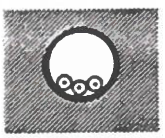
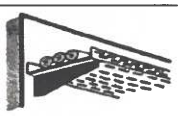
cables in rigid conduit or in exposed trunking			
metal		insulating	
≥ IP4x	< IP4x	≥ IP4x	< IP4x (multipolari con PE)
E_{ca}	C_{ca}-s3d1a3	C_{ca}-s3d1a3	C_{ca}-s3d1a3
	E_{ca} se d ≥ 25cm	E_{ca} se d ≥ 25cm	E_{ca} se d ≥ 25cm

cables on cable tray (< IP4x)		exposed cables (multipolari con PE)
metallica (cavi con guaina)	isolante (multipolari con PE)	C_{ca}-s3d1a3
		E_{ca} se d ≥ 25cm
C_{ca}-s3d1a3	C_{ca}-s3d1a3	
E_{ca} se d ≥ 25cm	E_{ca} se d ≥ 25cm	

The distribution (for the new lines) will be carried out using CPR-rated cables:

- Single-core cables of type **FS17 - 450/750 V Cca-s3,d1,a3**
- Multi-core cables of type **FG16OM16 - 0.6/1 kV Cca-s1b,d1,a1**

Installed according to the following method (CEI 64-8, Table 52C):

3	Single-core cables in circular protective conduits mounted on the wall	
5	Single-core cables in protective conduits embedded in masonry	
13	Multi-core cables on perforated or mesh cable trays, horizontally or vertically routed	

The cable cross-sections have been sized based on the load current I_B, applying appropriate correction factors to the nominal current-carrying capacities I_z indicated by CEI-UNEL 35024/1, considering the simultaneity and use of loads, grouping within the same conduit, and the maximum voltage drop (4%). The reference ambient temperature considered is 30°C.

Protective conduits and cable trays must have a fill ratio that facilitates the insertion and possible removal of conductors. Protective conduits must be installed to allow straight horizontal runs (with minimal slope to facilitate drainage of any condensation) or vertical runs. Bends must be made using appropriate fittings or junction boxes.

All conduits must be standardized, equipped with junction boxes in sufficient quantity to allow easy conductor insertion and removal.

Junction boxes must be made of self-extinguishing PVC with a protection rating of at least IP4x. The cover must be secured with screws and openable only with a tool. Snap-on covers are not permitted.

All branch connections must be made inside the junction boxes using insulated terminals, preventing conductor damage during tightening. If this is not possible, conductors must be provided with crimped ferrules. Connections or splices made by simple twisting and taping or with screw clamps ("mammut" terminals) are not allowed.

For all wall-mounted and outdoor junction boxes, the box-to-conduit or box-to-sheath interconnection must always be made with a press-fit insulating fitting made of self-extinguishing material.

Within each junction box, conductors must be identified with wire markers indicating the line to which they belong, as specified in the schematics. In cable trays, this marking must be applied near intersections. Terminal blocks in junction boxes and switchboards must be appropriately labeled.

Earthing System

The earthing system of the installation in question is of TN-S type, meaning that the neutral is directly connected to earth but is separate from the protective conductor.

The earthing system is pre-existing; the characteristics of the new materials used for the earthing system must ensure that:

- The efficiency of the system is maintained over time in accordance with the applicable standards;
- The materials have adequate mechanical strength or protection, taking into account external influences.

Cable Protection and Check of Let-Through Energy

In the verification of line protection, a short-circuit current of **15kA** has been assumed[2] at the point of installation of the switchboard in the MV/LV transformer room (QE-Sudst).

The planned thermal-magnetic circuit breakers are capable of interrupting the supply in case of currents caused either by short-circuit or overload.

The project provides, depending on the specific case, for the use of thermal-magnetic circuit breakers with **C-curve** and **B-curve** tripping characteristics (see the attached single-line diagrams).

Overload current refers to an overcurrent that occurs in a normally operating circuit and persists for a certain period of time.

Overload protection must satisfy the relationships imposed by CEI 64-8:

$$I_b \leq I_n \leq I_z \quad \text{e} \quad I_f \leq 1{,}45\, I_z$$

If the conductor presents sections with different current-carrying capacities along its route (e.g., due to different installation conditions), the lower-rated capacity must be considered.

2 As no specific information is available, and since the low-voltage side of the existing MV/LV transformer room contains wall-mounted switchboards with several modular circuit breakers rated at 6kA and 10kA breaking capacity, as a precautionary measure for safety, it was decided to install modular circuit breakers with a breaking capacity of 15kA at this location.

Short-circuit current refers to an overcurrent occurring due to a negligible impedance fault between two points at which voltage is present under normal operating conditions.

End-of-line short-circuit:

If the conductor is already protected against overload, no verification is required for the minimum short-circuit current at the end of the line.

Start-of-line short-circuit:

In this case, the protection device must satisfy the following two conditions:

- It must have a breaking capacity not lower than the assumed short-circuit current at the point of installation;
- It must be able to interrupt the short-circuit current occurring at any point of the circuit within a time not exceeding that which would raise the conductors to their maximum allowable temperature. For short-circuits of duration not exceeding 5s (adiabatic heating), the following condition must be satisfied:

$$I^2 t \leq K^2 S^2$$

The selection of conductor protection devices (thermal-magnetic circuit breakers) was made taking into account both the assumed short-circuit currents and the rated capacity of each cable according to the CEI-UNEL tables.

The sizing of the supply line sections and their respective thermal-magnetic protections was carried out based on the design load assumptions, and therefore on the operating current (I_B), while also considering a maximum voltage drop of 4%.

In defining the load power, a power factor $\cos\varphi=0,9$ was assumed, considering that the loads are already power factor corrected.

Protection coordination

Particular attention has been paid to ensure the best selectivity of protection devices, both for overcurrents (thermal-magnetic selectivity) and for earth fault protections (differential selectivity), so that a fault on a terminal circuit or a distribution line cannot put large areas of the facility out of service.

The installation has also been divided into multiple circuits (horizontal selectivity) to prevent the simultaneous use of numerous devices connected to the same circuit from causing the differential circuit breaker to trip (for example, due to the capacitive leakage currents of the devices). This arrangement also prevents a single earth fault from causing widespread service interruption.

Overcurrent protection will be provided by modular thermal-magnetic circuit breakers with inverse-time characteristics and non-adjustable magnetic releases. Therefore, "total" selectivity cannot be achieved in the event of a short-circuit; selective coordination can only be obtained for moderate overcurrents, with an indicative value of 0,6–0,7 kA.

Direct Contact Protection

Protection against direct contact is intended to protect people from the consequences of contact with live parts, which are energized during normal operation.

If specific protection ratings are not required, live parts must be enclosed within housings or behind barriers providing at least IPXXB protection (the test finger cannot touch live parts), except for horizontal top surfaces, for which at least IPXXD protection is required (a 1mm diameter test wire cannot touch live parts). For operational and safety reasons, opening the enclosures must require the use of a tool or key, if it is a single unit, and should be entrusted only to trained personnel.

The insulation of live parts can only be removed destructively and must have adequate resistance to mechanical, chemical, thermal, electrical, and atmospheric agents; generally, paints, varnishes, enamels, and similar products are not suitable as insulation.

Residual current devices (RCDs) with rated residual current $I_d \leq 0,03A$ should be considered only as an "additional" protection against direct contact and must be used in conjunction with one of the other total or partial protection measures previously mentioned.

Indirect Contact Protection

Protection against indirect contact is intended to protect people from the consequences of contact with exposed conductive parts, which are normally not live but may become energized in the event of equipment fault.

Protection against indirect contact is provided using the following types of devices, coordinated with the earth resistance value:

- Terminal circuits (industrial sockets, etc.):

  protection by Type A residual current device (RCD) with rated residual current I_{dn} = 30mA

- UPS supply circuits:

  Protection by Type B residual current device (RCD) with rated residual current I_{dn} = 300mA

Lightning and Surge Protection

The lightning risk assessment for the building, not having been commissioned, is not part of this project.
In any case, a simplified verification has been carried out in accordance with the instructions of section 443 of CEI 64-8:

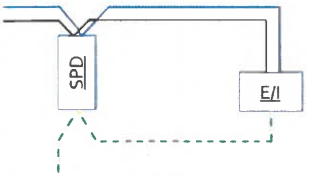
Lp	=	2	*(lunghezza equivalente delle linee MT e AT non nota)*
Ng	=	2,45	
Fenv	=	850	
CRL	=	**173,47**	< 1000

Consequently, in order to protect the installation from overvoltages originating from the network, it has been decided to install SPDs (Surge Protective Devices) in the switchboards with the following characteristics:

class: **II**
type: **combined**
protection level $U_p \leq$ **1500V**
effective protection level $U_{p/f}$: **1500V**
nominal discharge current I_n: **5kA**
maximum discharge current I_{max}: **20kA**

If the installed SPDs do not have built-in protection, the protection of the SPDs against overcurrents must comply with the manufacturer's instructions (for example, by using appropriately rated fuses).

To achieve optimal protection against overvoltages, the SPD connection conductors must be kept as short as possible (preferably 0,50m between input and output, and in any case not exceeding 1,00m). In this regard, it is recommended to use a "V" wiring configuration or "loop-in/loop-out" cabling.



If particularly sensitive electronic equipment is installed, it may be necessary to install additional Class III SPDs directly at the terminals of such equipment, either inside the equipment or in its immediate vicinity.

The minimum cross-section of SPD connection conductors shall be:

- Class I: 6 mm^2
- Class II: 4 mm^2
- Class III: 1,5 mm^2

Power Sockets

The rooms contain plug-type sockets of the following type:

- Interlocked industrial sockets 2P+T, protected by fuses.

Lighting System

The lighting system is already installed using various types of luminaires, some mounted on walls and others on the ceiling.

The lighting installation (both ordinary and emergency lighting) is not included in the scope of this project.

Testing and Documentation

Before the handover and commissioning of the electrical installations, or any part thereof, the installing Company, in compliance with D.M. 37/08, must carry out a series of tests and inspections to verify the proper execution of the works.

These verifications, in accordance with CEI 64-8/6, section 6.4, must include:

- **Visual inspection** of the installation;
- **Continuity** test of conductors;
- **Insulation resistance** measurement;
- **Polarity** test;
- Tests and measurements to verify the effectiveness of **automatic supply disconnection protection**;
- **Earth resistance** measurement;
- Tests and/or measurements to verify the effectiveness of **additional protections**;
- **Phase sequence** test;
- **Functional** tests;
- **Voltage drop** measurement.

The **CEI 64-14 Guide** provides recommendations for carrying out electrical installation verifications.

At the end of the works, the Installing Company must issue the **Declaration of Conformity** in accordance with D.M. 37/08, certifying that the entire installation complies with the current regulations, including the compliance of the switchboards with CEI EN 61439 standards.

The Company must also certify that the works have been carried out in accordance with the specifications of this project, applying all necessary measures during installation to ensure that the works are executed in accordance with good practice and all applicable regulations.

Maintenance Plan

Carrying out regular maintenance inspections on electrical systems is a statutory obligation established by Ministerial Decree D.M. 37/08 and, in workplaces, by Legislative Decree D.Lgs. 81/08.

Statistically, the useful life cycle of the most commonly used equipment is as follows:

Equipment	Useful life cycle
Incandescent and halogen lamps	2000 h
Fluorescent lamps	5000-7000 h
LED lamps	50000-100000 h
Light switches	50000 cycles
Socket outlets	10-20 years
Electrical switchboards/panels	10-20 years
Electrical cables	20-30 years
Galvanized steel cable trays/conduits	20 years
Earthing (grounding) system	20-30 years
Lightning protection systems (LPS)	20-30 years
VVVF drives (inverters)	10 years
Lithium batteries	5-15 years
Electrical and electromechanical equipment	15 years
Power factor correction systems	15 years

The **maintenance plan** is the document that defines, plans, and schedules maintenance activities in order to ensure system safety, maximize the service life of components by limiting and slowing the effects of wear, anticipate potential failures, and progressively reduce extraordinary maintenance costs associated with the replacement and/or repair of critical system components.

The list of activities provided below is not to be considered exhaustive, as, in addition to the operations described, all further actions necessary to ensure the proper preservation and full functionality of the systems shall be carried out, as well as any activities that may arise from detailed knowledge of the equipment actually installed.

Electrical System Maintenance Plan	
activity	**Minimum frequency**
Visual inspection • verification of documentation, collection of any new documents, and updating of maintenance inspection records; • inspection of the condition of rooms housing electrical components; • inspection of the state of preservation of electrical components (switchboards, socket outlets, junction boxes, cables); • inspection of cable routing.	*quarterly*
Residual current device (RCD) testing • functional check of the device using the "test" button.	*semi-annual*
Emergency lighting testing *(standard UNI CEI 11222):*	
• Functional test (verify that the lights turn on)	*semi-annual*
• Operational test (verify that the lights remain on for the required duration)	*annual*
Cleaning activities • of components and technical rooms (or compartments)	*annual*
System functional tests • ordinary lighting of stairwells, outdoor areas, parking garages, technical rooms, elevator landings, etc.; • operation of controls (switching tests, door opening, etc.); • doors with electric locks; • intercoms, call systems, etc.; • gates and turnstiles; • video surveillance systems;	*annual*
Detailed inspection an inspection that includes instrumental tests performed by qualified personnel: • measurement of earth (ground) resistance; • instrumental testing of residual current devices (RCDs); • continuity tests of protective conductors (PE), exposed conductive parts, and extraneous conductive parts; • tightening of terminals;	*biennial*
Other activities • depending on the installed components...	*According to the instructions contained in the component's operation and maintenance manual.*

Attachments

LIST OF ATTACHMENTS: THE FOLLOWING DOCUMENTS FORM AN INTEGRAL PART OF THE PROJECT AND MUST BE CONSULTED FOR THE PROPER EXECUTION OF THE ELECTRICAL SYSTEM INSTALLATION WORKS.

Description	code	document type
• Single-line diagrams of the electrical system (from **generator set 1** to **building side A**):		
◦ "electrical switchboard in MV/LV substation"	QE-Subst	diagrams
◦ "UPS electrical switchboard"	UPS-DSB	diagrams
◦ "UPS return distribution panel"	DSB-UPS-return	diagrams
◦ "ground-floor distribution switchboard"	DSB-GF	diagrams
◦ "first-floor distribution switchboard"	DSB-1F	diagrams
◦ "second-floor distribution switchboard"	DSB-2F	diagrams
• Single-line diagrams of the electrical system (from **generator set 2** to **building side A**):		
◦ "electrical switchboard in MV/LV substation"	QE-Subst	diagrams
◦ "UPS electrical switchboard"	UPS-DSB	diagrams
◦ "UPS return distribution panel"	DSB-UPS-return	diagrams
◦ "ground-floor distribution switchboard"	DSB-GF	diagrams
◦ "first-floor distribution switchboard"	DSB-1F	diagrams
◦ "second-floor distribution switchboard"	DSB-2F	diagrams

Description	code	document type
• Single-line diagrams of the electrical system (from **generator set 1** to **building side C**):		
◦ "electrical switchboard in MV/LV substation"	QE-Subst	diagrams
◦ "UPS electrical switchboard"	UPS-DSB	diagrams
◦ "UPS return distribution panel"	DSB-UPS-return	diagrams
◦ "second-floor distribution switchboard"	DSB-2F	diagrams
◦ "third-floor distribution switchboard"	DSB-3F	diagrams
• Single-line diagrams of the electrical system (from **generator set 2** to **building side C**):		
◦ "electrical switchboard in MV/LV substation"	QE-Subst	diagrams
◦ "UPS electrical switchboard"	UPS-DSB	diagrams
◦ "UPS return distribution panel"	DSB-UPS-return	diagrams
◦ "second-floor distribution switchboard"	DSB-2F	diagrams
◦ "third-floor distribution switchboard"	DSB-3F	diagrams
• Design Calculations and Checks	-	tables
• Floor plan indicating the location of the components	-	technical drawing

Note 1: The four switchboards to be installed in the MV/LV transformer substation (from generator sets 1 and 2 to building sides A and C) may also be combined into a single switchboard, provided that a *warning notice* is displayed indicating the presence of multiple incoming power sources to the switchboard.

Note 2: Switchboards *UPS-DSB* and *UPS-DSB-return* may also be combined into a single switchboard, provided that a *warning notice* is displayed indicating the presence of multiple incoming power sources to the switchboard.

REF. SWITCHBOARD	[QE-Subst]	1	2	3	4	5	6	7	8	9

SYMBOLS

 CIRUIT BREAKER	 DISCONNECTOR	 SWITCH-DISCONNECTOR	 THERMAL PROTECTION	 MAGNETIC PROTECTION	 RESIDUAL CURRENT PROTECTION	 OVERLOAD CUT OUT	 FUSE	 TOROID	 MANUAL CONTROL
 AUTOMATIC CONTROL	 TRIP FREE	 ROTARY HANDLE	INTERLOCK	REMOVABLE/WITHDRAWAL EQUIPMENT	KEYLOCK OFF POSITION	KEYLOCK ON POSITION	 AUXILIARY CONTAC	 UNDERVOLTAGE RELEASE	 SHUNT RELEASE
 CHANGE OVER SWITCH (FOR MEASUREMENT)	 AMMETER	 VOLTMETER	 FREQUENCY METER	 METER	 NO CONTACTS CONTACTOR	 MANUAL CONTROL CONTACTOR	 NC CONTACTS CONTACTOR	 IMPULSE RELAY	 CLOCK
 TWILIGHT SWITCH	 ASTRONOMIC CLOCK	 UNINTERRUPTED POWER SYSTEM (UPS)	 SOCKET	 INTERLOCKED SOCKET WITH FUSES	 SOFT STARTER	 VARIABLE SPEED DRIVE	 STAR DELTA STARTER	 TRANSFORMER	SURGE PROTECTIVE DEVICE

CUSTOMER Nato Defense College	PROJECT -	FILE ndc-a1-schemi [Q00] [QE-Subst].dwg	
	ARCHIVE -	DATE 18/11/2025	REVISION 1.0
	DESIGNER -	PAGE 2	NEXT
PLANT UPS section of the NDC from gen. 1 to side A		TABLE	

REF. SWITCHBOARD	[QE-Subst]	1	2	3	4	5	6	7	8	9

PURCHASER

Nato Defense College

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ORDER

UPS section of the NDC from generator set 1 to side A

SWITCHBOARD

electrical switchboard in MV/LV substation

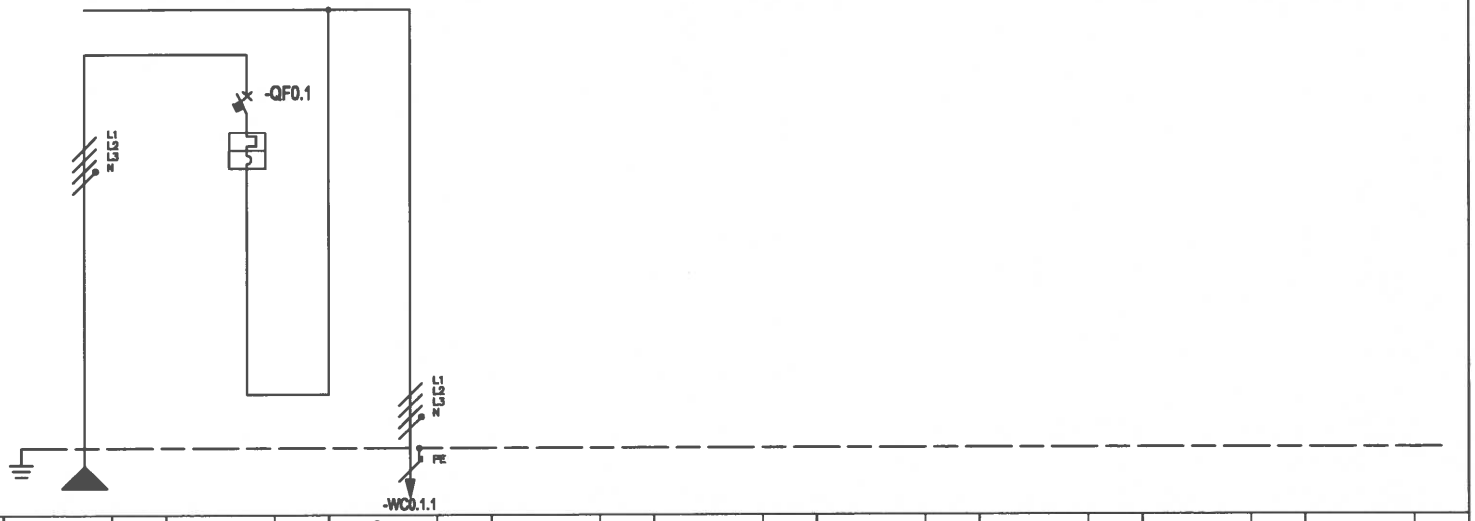
SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			14,1
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER	Nato Defense College	PROJECT	-	FILE	ndc-a1-schemi [Q00] [QE-Subst].dwg
		ARCHIVE	-	DATE 18/11/2025	REVISION 1.0
		DESIGNER	-	PAGE 1	NEXT
PLANT	UPS section of the NDC from gen. 1 to side A			TABLE	

REF. SWITCHBOARD	[QE-Subst]	1	2	3	4	5	6	7	8	9



TERMINALS NUMBERING										
CIRCUIT NUMBERING	DISTRIBUTION	L1L2L3N/PE	1	2 L1L2L3N/PE						
CIRCUIT DESCRIPTION		from generator 1	main switch A1	to UPS-DSB third floor side A						
EQUIPMENT			IC60 L							
CIRCUIT BREAKER	Icu [kA] / Icn [A]		15000							
	N. POLES / In [A]		4P 40							
	COURBE/TRIPPING UNIT		C							
	Ir [A] / tr [s]		40							
	Isd [A] / tsd [s]		400							
	I [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS									
	Idn [A] / tdn [ms]									
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD	EPR 13		EPR 61						
	CROSS SECTION PHASE-N-PE/PEN [mmq]	1x10 1x10 1x10		1x10 1x10 1x10						
	Ib [A] / Iz [A]	38,9 66		38,9 46,8						
	Un [V] / Pn [kW]	400 26,3	26,3	400 26,3						
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]	9,68 14,1		0,47 2,1						
	LENGHT [m] / dV TOTAL [%]	1 0		60 2,3						
NOTES		FG16OM16-0,6/1 kV Cca-s1b,d1,a1		FG16OM16-0,6/1 kV Cca-s1b,d1,a1						

CUSTOMERS Nato Defense College	PROJECT -	FILE	ndc-a1-schemi [Q00]_[QE-Subst].dwg
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PLANT UPS section of the NDC from gen. 1 to side A		TABLE	

REF. SWITCHBOARD	[UPS-DSB]	1	2	3	4	5	6	7	8	9

PURCHASER

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ORDER

UPS section of the NDC from generator set 1 to side A

SWITCHBOARD

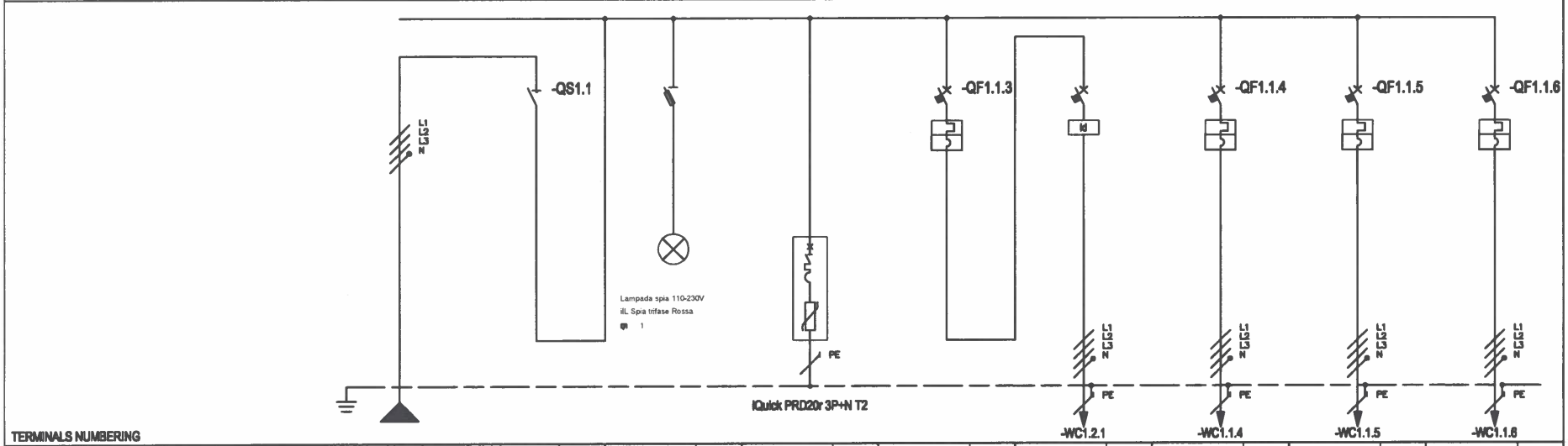
UPS switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [QE-Subst]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			2,1
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER Nato Defense College	PROJECT -	FILE ndc-a1-schemi_[Q01]_[UPS-DSB].dwg		
	ARCHIVE -	DATE 18/11/2025	REVISION 1.0	
	DESIGNER -	PAGE 1	NEXT	
PLANT UPS section of the NDC from gen. 1 to side A		TABLE		



REF. SWITCHBOARD	[UPS-DSB]		1		2		3		4		5		6		7		8		9	
TERMINALS NUMBERING				L1,L2,L3,N,PE	1	L1,L2,L3,N	2	L1,L2,L3,N,PE	3	L1,L2,L3,N,PE	4	L1,L2,L3,N	5	L1,L2,L3,N	6	L1,L2,L3,N,PE	7	L1,L2,L3,N,PE	8	L1,L2,L3,N,PE
CIRCUIT NUMBERING	DISTRIBUTION																			
CIRCUIT DESCRIPTION			from DSB-Subst		panel main switch		mains presence indicator		Type-2 SPD with protections		to the UPS 1		B-type RCD		to GF Standard Power existing switchboard		to 1F Standard Power existing switchboard		to 2F Standard Power existing switchboard	
EQUIPMENT					ISW		STI 3P+N Fus NFC (10,3x38)				IC60 N		iID Tipo B-SI (4P)		IC60 N		IC60 N		IC60 N	
CIRCUIT BREAKER	Icu [kA] / Icn [A]										6000				6000		6000		6000	
	N. POLES	In [A]			40						4P	32		40	4P	25	4P	25	4P	25
	COURBE/TRIPPING UNIT										C				C		C		C	
	Ir [A]	tr [s]									32				25		25		25	
	Isd [A]	tsd [s]									320				250		250		250	
	Ii [A]																			
	Ig [A]	tg [s]																		
RESIDUAL CURRENT DEVICE	TYPE	CLASS											iID Tipo B-SI (4P)	B						
	Idn [A]	tdn [ms]											0,3	istantaneo						
CONTACTOR	TYPE	CLASSE																		
IMPULSE RELAY	COIL	N. POLES / In [A]																		
THERMAL RELAY	TYPE	Irth [A]																		
FUSE	N. POLES	In [A]																		
OTHER	TYPE	MODEL																		
CONDUCTORS	INSULATION	INST.METHOD	EPR	61			EPR						PVC	03	EPR	13	EPR	13	EPR	13
	CROSS SECTION PHASE-N-PE/PEN [mmq]		1x10	1x10 1x10									1x10	1x10 1x10	1x6	1x6 1x6	1x6	1x6 1x6	1x6	1x6 1x6
	Ib [A]	Iz [A]	39,9	46,8			0						28,7	40	3,5	47,5	3,5	47,5	3,5	47,5
	Un [V]	Pn [kW]	400	26,3		26,3	400	0				19,7	400	19,7	400	2,2	400	2,2	400	2,2
BOTTOM OF THE LINE	Icc min [kA]	Icc max [kA]	0,47	2,1									0,46	2	0,41	1,8	0,41	1,8	0,37	1,7
	LENGHT [m]	dV TOTAL [%]	60	2,3									1	2,3	5	2,3	5	2,3	10	2,3
NOTES			FG16OM16-0,6/1 kV Cca-s1b,d1,a1										FS17-450/750 V Cca-s3,d1,a3		FG16OM16-0,6/1 kV Cca-s1b,d1,a1		FG16OM16-0,6/1 kV Cca-s1b,d1,a1		FG16OM16-0,6/1 kV Cca-s1b,d1,a1	

CUSTOMERS	Nato Defense College	PROJECT	-
		ARCHIVE	-
		DESIGNER	-
PLANT	UPS section of the NDC from gen. 1 to side A	FILE	ndc-a1-schemi [Q01] [UPS-DSB].dwg
		DATE	18/11/2025
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		PAGE	3
		NEXT	
		TABLE	

REF. SWITCHBOARD	[DSB-UPS return]	1	2	3	4	5	6	7	8	9

PURCHASER

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ORDER

UPS section of the NDC from generator set 1 to side A

SWITCHBOARD

UPS return distribution panel

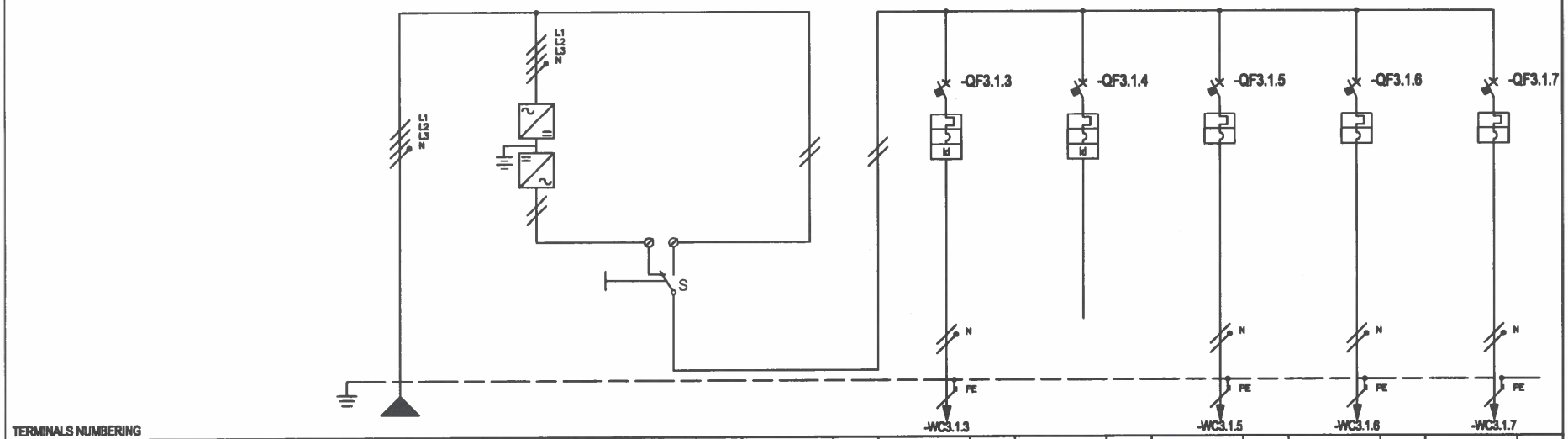
SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [UPS]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			2
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER	Nato Defense College	PROJECT	-	FILE	ndc-a1-schemi [Q03] [DSB-UPS return].dwg
		ARCHIVE	-	DATE 18/11/2025	REVISION 1.0
		DESIGNER	-	PAGE 1	NEXT
PLANT	UPS section of the NDC from gen. 1 to side A			TABLE	

REF. SWITCHBOARD	[DSB-UPS return]	1	2	3	4	5	6	7	8	9



TERMINALS NUMBERING										
CIRCUIT NUMBERING	DISTRIBUTION				3 L1N PE	4 L1N PE	5 L1N PE	6 L1N PE	7 L1N PE	8 L1N PE
CIRCUIT DESCRIPTION		from WC1.2.1	from UPS	manual bypass	from mains	interlocked industrial socket UPS power line 1	reserve UPS power line 1	to DSB-GF UPS power line 1	to DSB-1F UPS power line 1	to DSB-2F UPS power line 1
EQUIPMENT						IC60 N	IC60 N	IC60 N	IC60 N	IC60 N
CIRCUIT BREAKER	Icu [kA] / Icn [A]					6000	6000	6000	6000	6000
	N. POLES / In [A]					2P 16	2P 16	2P 25	2P 25	2P 25
	COURSE/TRIPPING UNIT					B	B	B	B	B
	Ir [A] / tr [s]					16	16	25	25	25
	Isd [A] / tsd [s]					77	77	120	120	120
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS					Vigi A	Vigi A			
	Idn [A] / tdn [ms]					0,03 Istantaneo	0,03 Istantaneo			
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD					PVC 03		EPR 13	EPR 13	EPR 13
	CROSS SECTION PHASE-N-PE/PEN [mmq]					1x4 1x4 1x4		1x6 1x6 1x6	1x6 1x6 1x6	1x6 1x6 1x6
	Ib [A] / Iz [A]					14,4 32		0 55,4	14,4 55,4	14,4 55,4
	Un [V] / Pn [kW]					230 3		230	230 3	230 3
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]					0,44 1		0,33 0,7	0,36 0,8	0,4 0,9
	LENGHT [m] / dV TOTAL [%]					1 2,5		15 2,4	10 2,9	5 2,7
NOTES						FS17-450/750 V Cca-s3,d1,a3		FG16OM16-0,6/1 kV Cca-s1b,d1,a1	FG16OM16-0,6/1 kV Cca-s1b,d1,a1	FG16OM16-0,6/1 kV Cca-s1b,d1,a1

CUSTOMERS Nato Defense College	PROJECT -	FILE	ndc-a1-schemi [Q03] [DSB-UPS return].dwg
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PLANT UPS section of the NDC from gen. 1 to side A		TABLE	

REF. SWITCHBOARD	[DSB-GF]	1	2	3	4	5	6	7	8	9

PURCHASER

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ORDER

UPS section of the NDC from generator set 1 to side A

SWITCHBOARD

ground-floor distribution switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [DSB-UPS return]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,5
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER	Nato Defense College	PROJECT	-	FILE	ndc-a1-schemi [Q04] [DSB-GF].dwg
		ARCHIVE	-	DATE	18/11/2025 REVISION 1.0
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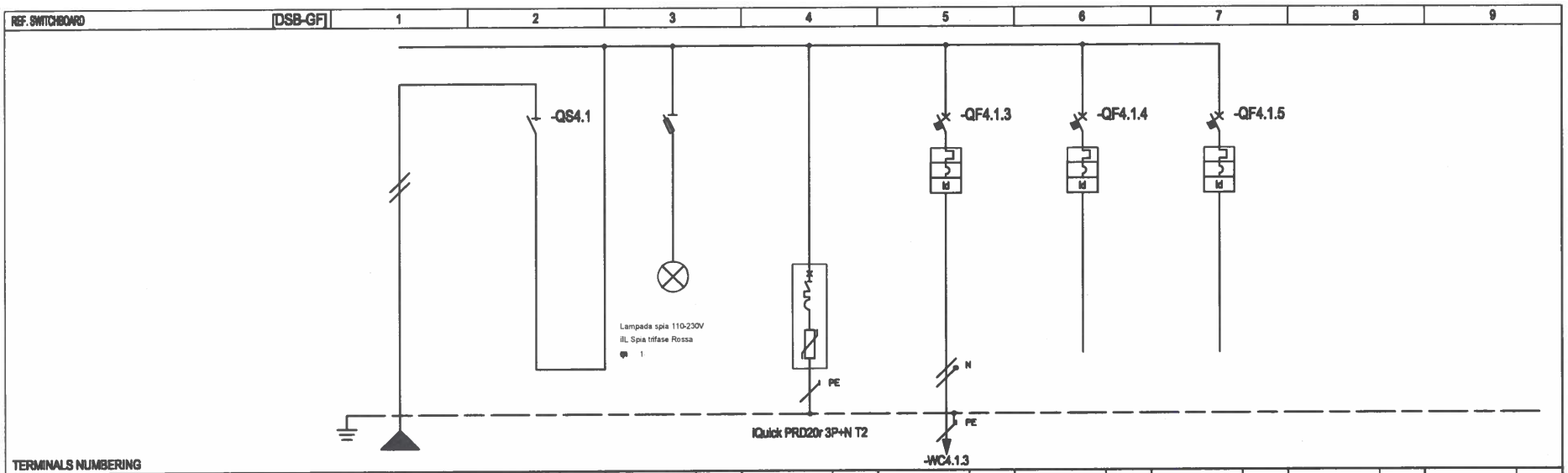
PLANT	UPS section of the NDC from gen. 1 to side A			TABLE	



REF. SWITCHBOARD	[DSB-GF]	1	2	3	4	5	6	7	8	9
TERMINALS NUMBERING										
CIRCUIT NUMBERING	DISTRIBUTION	L1NPE	1 L1N	2 L1NPE	3 L1NPE	4 L1NPE	5 L1NPE	6 L1NPE		
CIRCUIT DESCRIPTION		from UPS UPS power line 1	panel main switch UPS power line 1	mains presence indicator	Type-2 SPD with protections	interlocked industrial socket UPS power line 1	reserve UPS power line 1	reserve UPS power line 1		
EQUIPMENT			ISW	STI 3P+N Fus NFC (10,3x38)		IC60 N	IC60 N	IC60 N		
CIRCUIT BREAKER	Icu [kA] / Icn [A]					6000	6000	6000		
	N. POLES / In [A]		32			2P 16	2P 10	2P 16		
	COURBE/TRIPPING UNIT					B	B	B		
	Ir [A] / tr [s]					16	10	16		
	Isd [A] / tsd [s]					77	48	77		
	I [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS					Vigi A	Vigi A	Vigi A		
	Idn [A] / tdn [ms]					0,03 Istantaneo	0,03 Istantaneo	0,03 Istantaneo		
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD	EPR 13		EPR		PVC 03				
	CROSS SECTION PHASE-N-PE/PEN [mmq]	1x6 1x6 1x6				1x4 1x4 1x4				
	Ib [A] / Iz [A]	0 55,4		0		0 32				
	Un [V] / Pn [kW]	230		230 0		230				
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]	0,33 0,7				0,31 0,7				
	LENGHT [m] / dV TOTAL [%]	15 2,4				2 2,4				
NOTES		FG16OM16-0,6/1 kV Cca-e1b,d1,a1				FS17-450/750 V Cca-e3,d1,a3				

CUSTOMERS	Nato Defense College	PROJECT -	FILE ndc-a1-schem [Q04] [DSB-GF].dwg
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PLANT	UPS section of the NDC from gen. 1 to side A		TABLE

REF. SWITCHBOARD	[DSB-1F]	1	2	3	4	5	6	7	8	9

PURCHASER

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ORDER

UPS section of the NDC from generator set 1 to side A

SWITCHBOARD

first-floor distribution switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [DSB-UPS return]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,6
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER Nato Defense College	PROJECT -	FILE ndc-a1-schemi [Q05] [DSB-1F].dwg		
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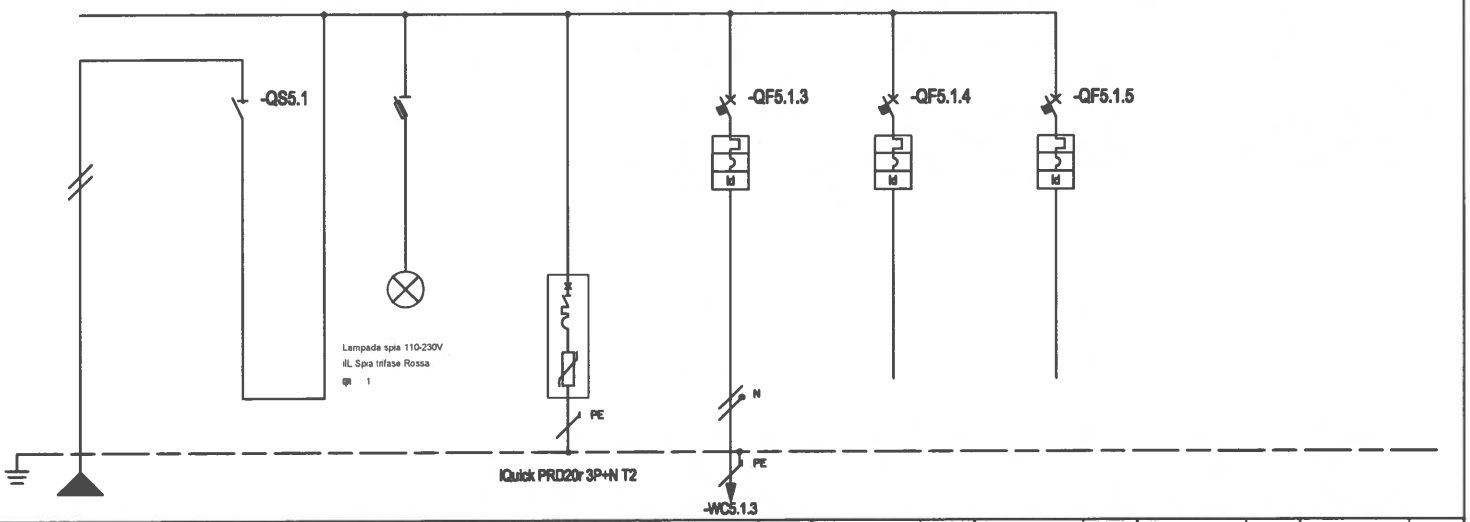
PLANT UPS section of the NDC from gen. 1 to side A		TABLE		



TERMINALS NUMBERING

REF. SWITCHBOARD [DSB-1F]			1	2	3	4	5	6	7	8	9
CIRCUIT NUMBERING		DISTRIBUTION	L1NPE	1 L1N	2 L1NPE	3 L1NPE	4 L1NPE	5 L1NPE	6 L1NPE		
CIRCUIT DESCRIPTION			from UPS UPS power line 1	panel main switch UPS power line 1	mains presence indicator	Type-2 SPD with protections	interlocked industrial socket UPS power line 1	reserve UPS power line 1	reserve UPS power line 1		
EQUIPMENT				ISW	STI 3P+N Fus NFC (10,3x38)		iC60 N	iC60 N	iC60 N		
CIRCUIT BREAKER	Icu [kA] / Icn [A]						6000	6000	6000		
	N. POLES	In [A]		32			2P 16	2P 10	2P 16		
	COURBE/TRIPPING UNIT						B	B	B		
	Ir [A]	tr [s]					16	10	16		
	Isd [A]	tsd [s]					77	48	77		
	Ii [A]										
	Ig [A]	tg [s]									
RESIDUAL CURRENT DEVICE	TYPE	CLASS					Vigi A	Vigi A	Vigi A		
	Idn [A]	tdn [ms]					0,03 Istantaneo	0,03 Istantaneo	0,03 Istantaneo		
CONTACTOR	TYPE	CLASSE									
IMPULSE RELAY	COIL N. POLES	In [A]									
THERMAL RELAY	TYPE	Irth [A]									
FUSE	N. POLES	In [A]									
OTHER	TYPE	MODEL									
CONDUCTORS	INSULATION	INST.METHOD	EPR 13		EPR		PVC 03				
	CROSS SECTION PHASE-N-PE/PEN [mmq]		1x6 1x6 1x6		0		1x4 1x4 1x4				
	Ib [A]	Iz [A]	14,4 55,4				14,4 32				
	Un [V]	Pn [kW]	230	3	230 0		230 3				
BOTTOM OF THE LINE	Icc min [kA]	Icc max [kA]	0,36 0,8				0,34 0,8				
	LENGHT [m]	dV TOTAL [%]	10 2,9				2 3				
NOTES			FG16OM16-0,6/1 kV Cca-s1b,d1,a1				FS17-450/750 V Cca-s3,d1,a3				

CUSTOMERS	Nato Defense College	PROJECT	-	FILE ndc-a1-schemi [Q05] [DSB-1F].dwg
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PLANT	UPS section of the NDC from gen. 1 to side A	TABLE		

REF. SWITCHBOARD	[DSB-2F]	1	2	3	4	5	6	7	8	9

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ORDER

UPS section of the NDC from generator set 1 to side A

SWITCHBOARD

second-floor distribution switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [DSB-UPS return]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,8
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD	
MOULDED CASE CIRCUIT BREAKERS	[X] — CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ] — CEI EN 60947-2
	[ ] — CEI EN 60898
STRUCTURE	[X] — CEI EN 60439-1
	[ ] — CEI 23-48
	CEI 23-49
	CEI 23-51

CUSTOMER	Nato Defense College	PROJECT	-	FILE ndc-a1-schemi_[Q06]_[DSB-2F].dwg
		ARCHIVE	-	DATE 18/11/2025 REVISION 1.0
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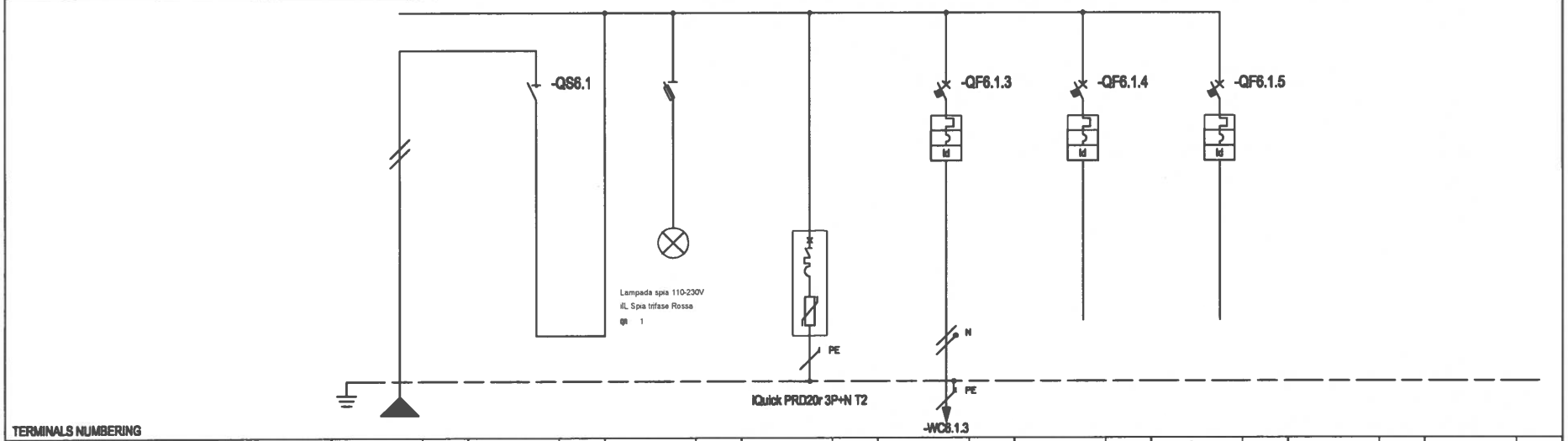
PLANT	UPS section of the NDC from gen. 1 to side A			TABLE



REF. SWITCHBOARD	[DSB-2F]	1	2	3	4	5	6	7	8	9
TERMINALS NUMBERING										
CIRCUIT NUMBERING	DISTRIBUTION	L1NPE	1 L1N	2 L1NPE	3 L1NPE	4 L1NPE	5 L1NPE	6 L1NPE		
CIRCUIT DESCRIPTION		from UPS UPS power line 1	panel main switch UPS power line 1	mains presence indicator	Type-2 SPD with protections	interlocked industrial socket UPS power line 1	reserve UPS power line 1	reserve UPS power line 1		
EQUIPMENT			ISW	STI 3P+N Fus NFC (10,3x38)		IC60 N	IC60 N	IC60 N		
CIRCUIT BREAKER	Icu [kA] / Icn [A]					6000	6000	6000		
	N. POLES / In [A]		32			2P / 16	2P / 10	2P / 16		
	COURBE/TRIPPING UNIT					B	B	B		
	Ir [A] / tr [s]					16	10	16		
	Isd [A] / tsd [s]					77	48	77		
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS					Vigi / A	Vigi / A	Vigi / A		
	Idn [A] / tdn [ms]					0,03 / Istantaneo	0,03 / Istantaneo	0,03 / Istantaneo		
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD	EPR / 13		EPR		PVC / 03				
	CROSS SECTION PHASE-N-PE/PEN [mmq]	1x6 / 1x6 / 1x6				1x4 / 1x4 / 1x4				
	Ib [A] / Iz [A]	14,4 / 55,4		0		14,4 / 32				
	Un [V] / Pn [kW]	230	3	230 / 0		230 / 3				
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]	0,4 / 0,9				0,38 / 0,9				
	LENGHT [m] / dV TOTAL [%]	5 / 2,7				2 / 2,8				
NOTES		FG16OM16-0,6/1 kV Cca-s1b,d1,a1				FS17-450/750 V Cca-s3,d1,a3				

CUSTOMERS	Nato Defense College	PROJECT -	FILE ndc-s1-schemi [Q06] [DSB-2F].dwg
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PLANT	UPS section of the NDC from gen. 1 to side A		TABLE

REF. SWITCHBOARD	[QE-Subst]	1	2	3	4	5	6	7	8	9

PURCHASER

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ORDER

UPS section of the NDC from generator set 2 to side A

SWITCHBOARD

electrical switchboard in MV/LV substation

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			14,1
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER Nato Defense College	PROJECT -	FILE ndc-a2-schemi [Q00] [QE-Subst].dwg		
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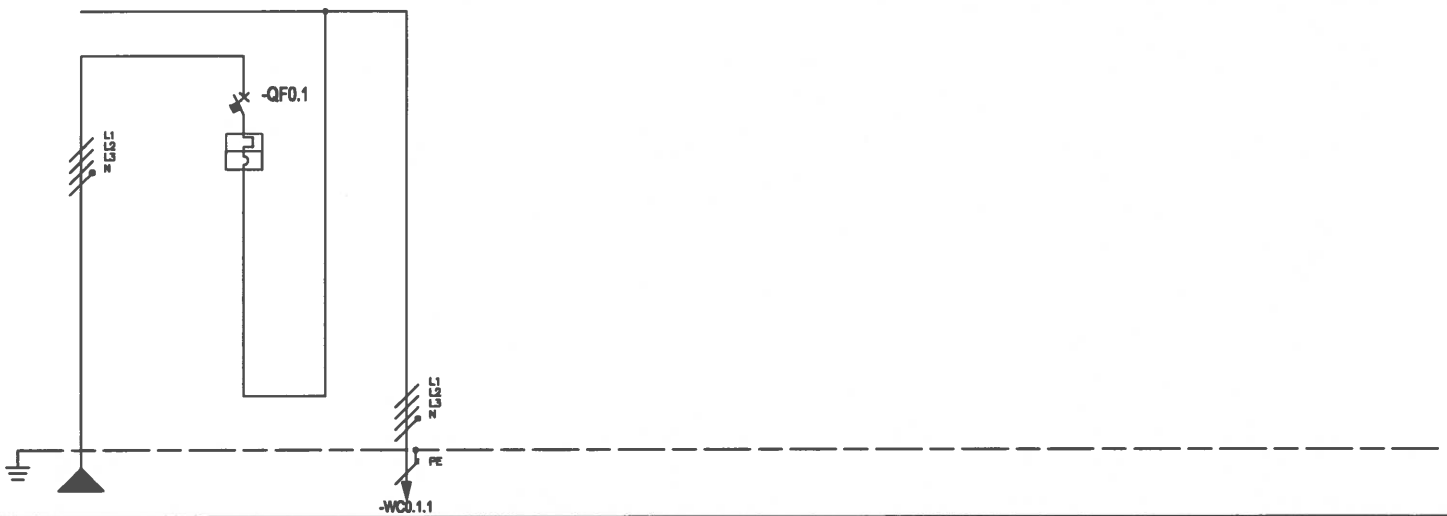
PLANT UPS section of the NDC from gen. 2 to side A		TABLE		

REF. SWITCHBOARD	[QE-Subst]	1	2	3	4	5	6	7	8	9



TERMINALS NUMBERING										
CIRCUIT NUMBERING	DISTRIBUTION	L1L2L3NPE	1	2 L1L2L3NPE						
CIRCUIT DESCRIPTION		from generator 2	main switch A2	to UPS-DSB third floor side A						
EQUIPMENT			IC60 L							
CIRCUIT BREAKER	Icu [kA] / Icn [A]		15000							
	N. POLES / In [A]		4P / 40							
	COURBE/TRIPPING UNIT		C							
	Ir [A] / tr [s]		40							
	Isd [A] / tsd [s]		400							
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS									
	Idn [A] / tdn [ms]									
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD	EPR 13		EPR 61						
	CROSS SECTION PHASE-N-PE/PEN [mmq]	1x10 1x10 1x10		1x10 1x10 1x10						
	Ib [A] / Iz [A]	38,9 66		38,9 46,8						
	Un [V] / Pn [kW]	400 26,3	26,3	400 26,3						
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]	9,66 14,1		0,47 2,1						
	LENGHT [m] / dV TOTAL [%]	1 0		60 2,3						
NOTES		FG16OM16-0,6/1 kV Cca-s1b,d1,a1		FG16OM16-0,6/1 kV Cca-s1b,d1,a1						

CUSTOMERS Nato Defense College	PROJECT -	FILE	ndc-a2-schemi [Q00] [QE-Subst].dwg
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PLANT UPS section of the NDC from gen. 2 to side A		TABLE	

REF. SWITCHBOARD	[UPS-DSB]	1	2	3	4	5	6	7	8	9

PURCHASER

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ORDER

UPS section of the NDC from generator set 2 to side A

SWITCHBOARD

UPS switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [QE-Subst]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			2,1
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER	Nato Defense College	PROJECT	-	FILE	ndc-a2-schemi [Q01] [UPS-DSB].dwg
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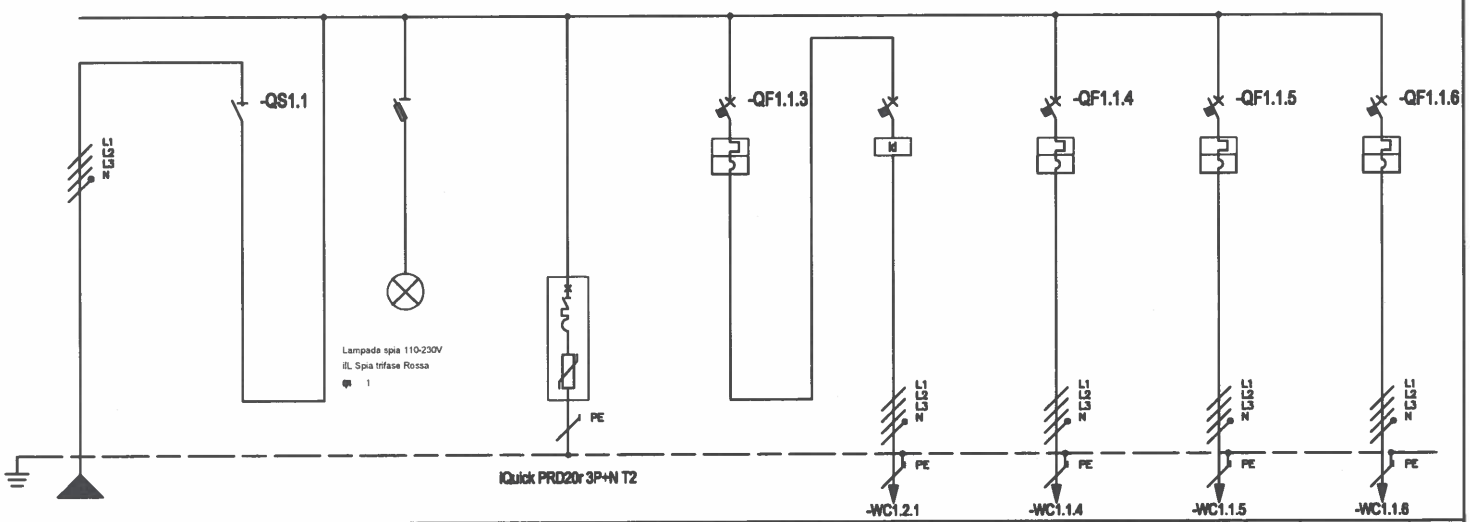
PLANT	UPS section of the NDC from gen. 2 to side A			TABLE	



REF. SWITCHBOARD [UPS-DSB]			1	2	3	4	5	6	7	8	9
TERMINALS NUMBERING											
CIRCUIT NUMBERING		DISTRIBUTION	L1L2L3NPE	1 L1L2L3N	2 L1L2L3NPE	3 L1L2L3NPE	4 L1L2L3NPE	5 L1L2L3N	6 L1L2L3NPE	7 L1L2L3NPE	8 L1L2L3NPE
CIRCUIT DESCRIPTION			from DSB-Subst	panel main switch	mains presence indicator	Type-2 SPD with protections	to the UPS 2	B-type RCD	to GF Standard Power existing switchboard	to 1F Standard Power existing switchboard	to 2F Standard Power existing switchboard
EQUIPMENT				ISW	STI 3P+N Fus NFC (10,3x38)		IC60 N	IID Tipo B-SI (4P)	IC60 N	IC60 N	IC60 N
CIRCUIT BREAKER	Icu [kA] / Icn [A]						6000		6000	6000	6000
	N. POLES	In [A]		40			4P 32	40	4P 25	4P 25	4P 25
	COURBE/TRIPPING UNIT						C		C	C	C
	Ir [A]	tr [s]					32		25	25	25
	Isd [A]	tsd [s]					320		250	250	250
	Ii [A]										
	Ig [A]	tg [s]									
RESIDUAL CURRENT DEVICE	TYPE	CLASS						IID Tipo B-SI (4P) B			
	Idn [A]	tdn [ms]						0,3 Istantaneo			
CONTACTOR	TYPE	CLASSE									
IMPULSE RELAY	COIL N. POLES	In [A]									
THERMAL RELAY	TYPE	Irth [A]									
FUSE	N. POLES	In [A]									
OTHER	TYPE	MODEL									
CONDUCTORS	INSULATION	INST.METHOD	EPR 61		EPR			PVC 03	EPR 13	EPR 13	EPR 13
	CROSS SECTION PHASE-N-PE/PEN [mmq]		1x10 1x10 1x10					1x10 1x10 1x10	1x6 1x6 1x6	1x6 1x6 1x6	1x6 1x6 1x6
	Ib [A]	Iz [A]	38,9 46,8		0			28,7 40	3,5 47,5	3,5 47,5	3,5 47,5
	Un [V]	Pn [kW]	400 28,3	28,3	400 0		19,7	400 19,7	400 2,2	400 2,2	400 2,2
BOTTOM OF THE LINE	Icc min [kA]	Icc max [kA]	0,47 2,1					0,46 2	0,41 1,8	0,41 1,8	0,37 1,7
	LENGHT [m]	dV TOTAL [%]	60 2,3					1 2,3	5 2,3	5 2,3	10 2,3
NOTES			FG16OM16-0,6/1 kV Cca-s1b,d1,a1					FS17-450/750 V Cca-s3,d1,a3	FG16OM16-0,6/1 kV Cca-s1b,d1,a1	FG16OM16-0,6/1 kV Cca-s1b,d1,a1	FG16OM16-0,6/1 kV Cca-s1b,d1,a1

CUSTOMERS Nato Defense College	PROJECT -	FILE	ndc-a2-schemi [Q01] [UPS-DSB].dwg
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PLANT UPS section of the NDC from gen. 2 to side A		TABLE	

REF. SWITCHBOARD	[DSB-UPS return]	1	2	3	4	5	6	7	8	9

PURCHASER

Nato Defense College

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ORDER

UPS section of the NDC from generator set 2 to side A

SWITCHBOARD

UPS return distribution panel

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [UPS]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			2
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER Nato Defense College	PROJECT -	FILE	ndc-a2-schemi_[Q03]_[DSB-UPS return].dwg	
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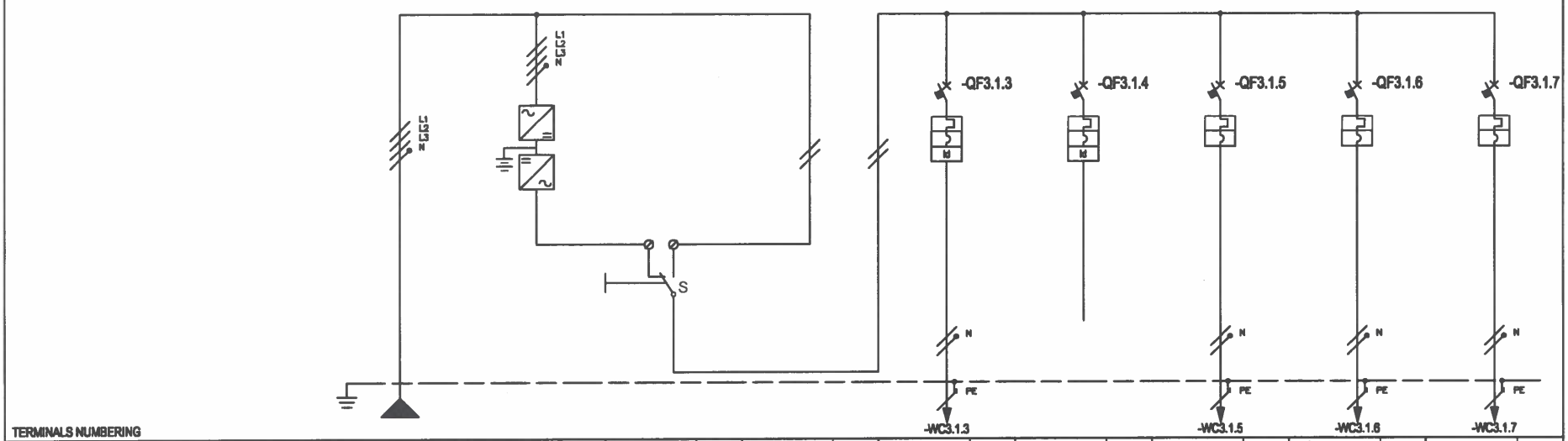
PLANT UPS section of the NDC from gen. 2 to side A		TABLE		

REF. SWITCHBOARD	[DSB-UPS return]	1	2	3	4	5	6	7	8	9



TERMINALS NUMBERING										
CIRCUIT NUMBERING	DISTRIBUTION				3 L1NPE	4 L1NPE	5 L1NPE	6 L1NPE	7 L1NPE	8 L1NPE
CIRCUIT DESCRIPTION		from WC1.2.1	from UPS	manual bypass	from mains	interlocked industrial socket UPS power line 2	reserve UPS power line 2	to DSB-GF UPS power line 2	to DSB-1F UPS power line 2	to DSB-2F UPS power line 2
EQUIPMENT						IC60 N	IC60 N	IC60 N	IC60 N	IC60 N
CIRCUIT BREAKER	Icu [kA] / Icn [A]					6000	6000	6000	6000	6000
	N. POLES / In [A]					2P 16	2P 16	2P 25	2P 25	2P 25
	COURBE/TRIPPING UNIT					B	B	B	B	B
	Ir [A] / tr [s]					16	16	25	25	25
	Isd [A] / tsd [s]					77	77	120	120	120
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS					Vigi A	Vigi A			
	Idn [A] / tdn [ms]					0,03 Istantaneo	0,03 Istantaneo			
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD					PVC 03		EPR 13	EPR 13	EPR 13
	CROSS SECTION PHASE-N-PE/PEN [mmq]					1x4 1x4 1x4		1x6 1x6 1x6	1x6 1x6 1x6	1x6 1x6 1x6
	Ib [A] / Iz [A]					14,4 32		0 55,4	14,4 55,4	14,4 55,4
	Un [V] / Pn [kW]					230 3		230	230 3	230 3
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]					0,44 1		0,33 0,7	0,36 0,8	0,4 0,9
	LENGHT [m] / dV TOTAL [%]					1 2,5		15 2,4	10 2,9	5 2,7
NOTES						FS17-450/750 V Cca-s3,d1,a3		FG16OM16-0,6/1 kV Cca-s1b,d1,a1	FG16OM16-0,6/1 kV Cca-s1b,d1,a1	FG16OM16-0,6/1 kV Cca-s1b,d1,a1

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PLANT UPS section of the NDC from gen. 2 to side A		TABLE	

REF. SWITCHBOARD	[DSB-GF]	1	2	3	4	5	6	7	8	9

PURCHASER

Nato Defense College

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ORDER

UPS section of the NDC
from generator set 2 to side A

SWITCHBOARD

ground-floor distribution switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [DSB-UPS return]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,5
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER	Nato Defense College	PROJECT	-	FILE	ndc-a2-schemi [Q04]_[DSB-GF].dwg
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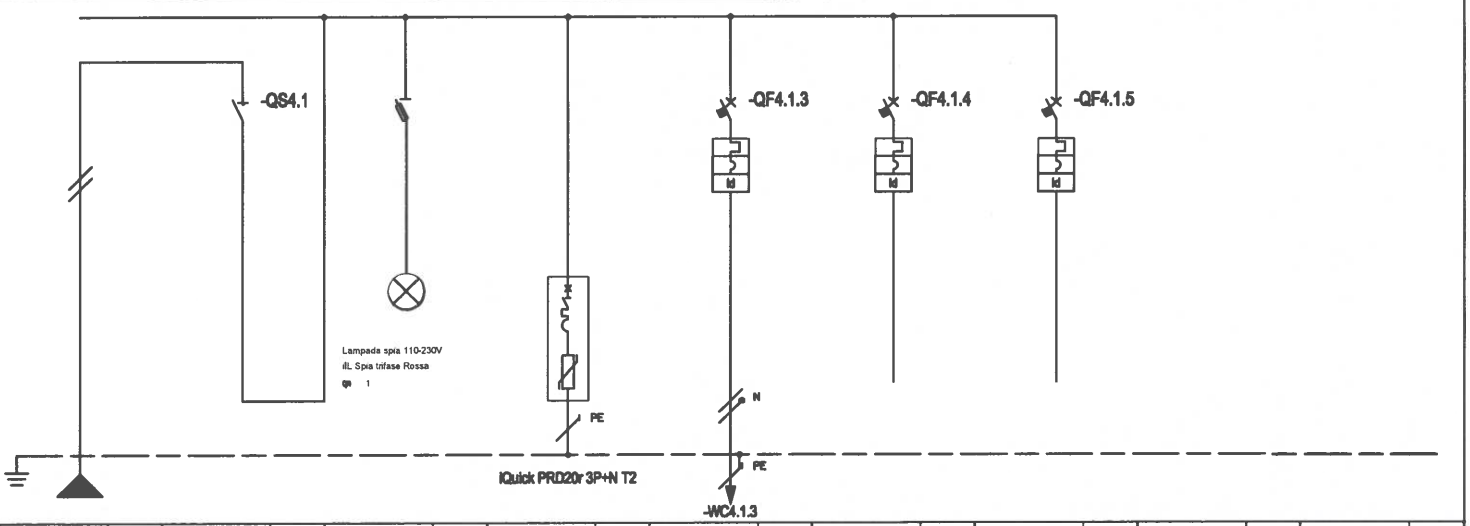
PLANT	UPS section of the NDC from gen. 2 to side A			TABLE	



REF. SWITCHBOARD	[DSB-GF]	1	2	3	4	5	6	7	8	9
TERMINALS NUMBERING										
CIRCUIT NUMBERING	DISTRIBUTION	L1NPE	1 L1N	2 L1NPE	3 L1NPE	4 L1NPE	5 L1NPE	6 L1NPE		
CIRCUIT DESCRIPTION		from UPS UPS power line 2	panel main switch UPS power line 2	mains presence indicator	Type-2 SPD with protections	interlocked industrial socket UPS power line 2	reserve UPS power line 2	reserve UPS power line 2		
EQUIPMENT			ISW	STI 3P+N Fus NFC (10,3x38)		IC60 N	IC60 N	IC60 N		
CIRCUIT BREAKER	Icu [kA] / Icn [A]					6000	6000	6000		
	N. POLES / In [A]		32			2P 16	2P 10	2P 16		
	COURBE/TRIPPING UNIT					B	B	B		
	Ir [A] / tr [s]					16	10	16		
	Isd [A] / tsd [s]					77	48	77		
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS					Vigi A	Vigi A	Vigi A		
	Idn [A] / tdn [ms]					0,03 Istantaneo	0,03 Istantaneo	0,03 Istantaneo		
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD	EPR 13		EPR		PVC 03				
	CROSS SECTION PHASE-N-PE/PEN [mmq]	1x6 1x6 1x6				1x4 1x4 1x4				
	Ib [A] / Iz [A]	0 55,4		0		0 32				
	Un [V] / Pn [kW]	230		230 0		230				
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]	0,33 0,7				0,31 0,7				
	LENGHT [m] / dV TOTAL [%]	15 2,4				2 2,4				
NOTES		FG16OM16-0,6/1 kV Cca-s1b,d1,a1				FS17-450/750 V Cca-s3,d1,a3				

CUSTOMERS Nato Defense College	PROJECT -	FILE	ndc-a2-schemi [Q04] [DSB-GF].dwg
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PLANT UPS section of the NDC from gen. 2 to side A		TABLE	

REF. SWITCHBOARD	[DSB-1F]	1	2	3	4	5	6	7	8	9

PURCHASER

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ORDER

UPS section of the NDC from generator set 2 to side A

SWITCHBOARD

first-floor distribution switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [DSB-UPS return]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,6
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

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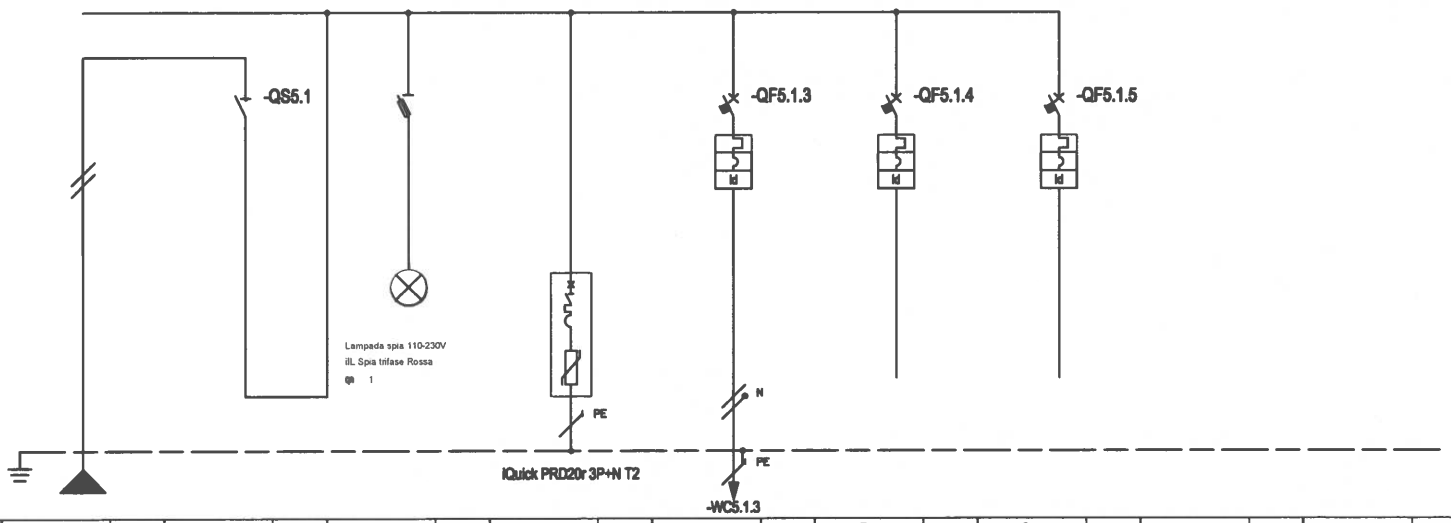
PLANT UPS section of the NDC from gen. 2 to side A		TABLE		



REF. SWITCHBOARD	[DSB-1F]	1	2	3	4	5	6	7	8	9
TERMINALS NUMBERING										
CIRCUIT NUMBERING	DISTRIBUTION	L1NPE	1 L1N	2 L1NPE	3 L1NPE	4 L1NPE	5 L1NPE	6 L1NPE		
CIRCUIT DESCRIPTION		from UPS UPS power line 2	panel main switch UPS power line 2	mains presence indicator	Type-2 SPD with protections	interlocked industrial socket UPS power line 2	reserve UPS power line 2	reserve UPS power line 2		
EQUIPMENT			ISW	STI 3P+N Fus NFC (10,3x38)		IC60 N	IC60 N	IC60 N		
CIRCUIT BREAKER	Icu [kA] / Icn [A]					6000	6000	6000		
	N. POLES / In [A]		2P 32			2P 16	2P 10	2P 16		
	COURBE/TRIPPING UNIT					B	B	B		
	Ir [A] / tr [s]					16	10	16		
	Isd [A] / tsd [s]					77	48	77		
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS					Vigi A	Vigi A	Vigi A		
	Idn [A] / tdn [ms]					0,03 Istantaneo	0,03 Istantaneo	0,03 Istantaneo		
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD	EPR 13		EPR		PVC 03				
	CROSS SECTION PHASE-N-PE/PEN [mmq]	1x6 1x6 1x6				1x4 1x4 1x4				
	Ib [A] / Iz [A]	14,4 55,4		0		14,4 32				
	Un [V] / Pn [kW]	230	3	230 0		230 3				
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]	0,36 0,8				0,34 0,8				
	LENGHT [m] / dV TOTAL [%]	10 2,9				2 3				
NOTES		FG16OM16-0,6/1 kV Cca-s1b,d1,a1				FS17-450/750 V Cca-s3,d1,a3				

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PLANT UPS section of the NDC from gen. 2 to side A		TABLE	

REF. SWITCHBOARD	[DSB-2F]	1	2	3	4	5	6	7	8	9

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ORDER

UPS section of the NDC from generator set 2 to side A

SWITCHBOARD

second-floor distribution switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [DSB-UPS return]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,8
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD

MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER Nato Defense College	PROJECT -	FILE ndc-a2-schemi [Q06] [DSB-2F].dwg	
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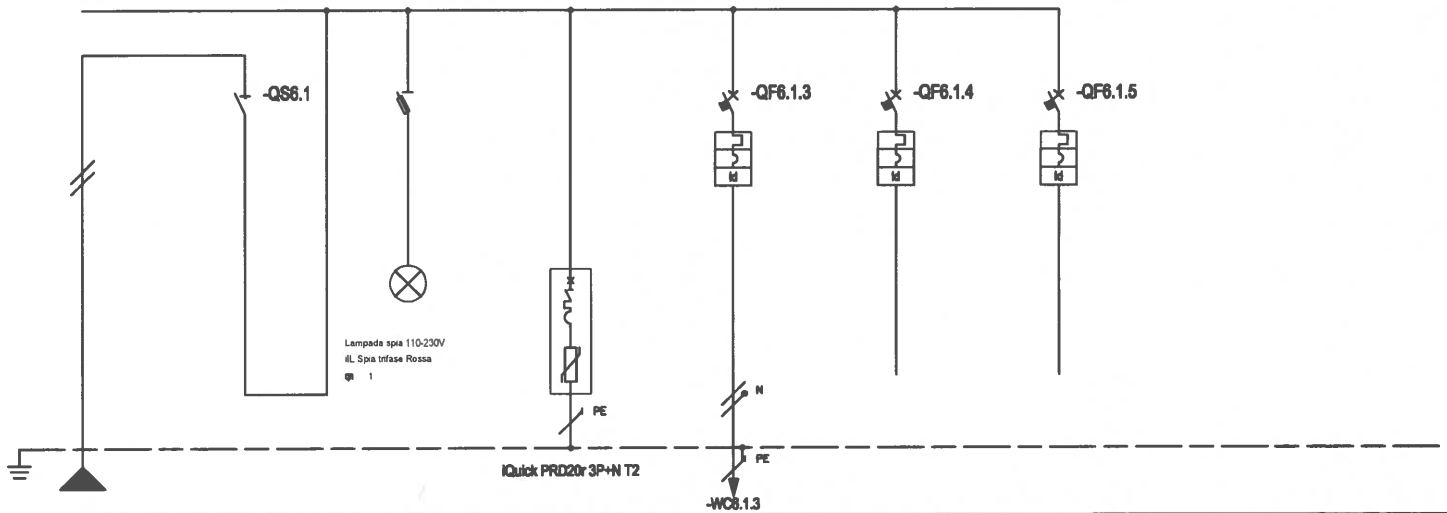
PLANT UPS section of the NDC from gen. 2 to side A		TABLE	

REF. SWITCHBOARD	[DSB-2F]	1	2	3	4	5	6	7	8	9



TERMINALS NUMBERING																					
CIRCUIT NUMBERING		DISTRIBUTION		L1NPE	1	L1N	2	L1NPE	3	L1NPE	4	L1NPE	5	L1NPE	6	L1NPE					
CIRCUIT DESCRIPTION			from UPS UPS power line 2		panel main switch UPS power line 2		mains presence indicator		Type-2 SPD with protections		interlocked industrial socket UPS power line 2		reserve UPS power line 2		reserve UPS power line 2						
EQUIPMENT					ISW		STI 3P+N Fus NFC (10,3x38)				IC60 N		IC60 N		IC60 N						
CIRCUIT BREAKER	Icu [kA] / Icn [A]										6000		6000		6000						
	N. POLES	In [A]			32						2P	16	2P	10	2P	16					
	COURBE/TRIPPING UNIT										B		B		B						
	Ir [A]	tr [s]									16		10		16						
	Isd [A]	tsd [s]									77		48		77						
	II [A]																				
	Ig [A]	tg [s]																			
RESIDUAL CURRENT DEVICE	TYPE	CLASS									Vigi	A	Vigi	A	Vigi	A					
	Idn [A]	tdn [ms]									0,03	Istantaneo	0,03	Istantaneo	0,03	Istantaneo					
CONTACTOR	TYPE	CLASSE																			
IMPULSE RELAY	COIL	N. POLES / In [A]																			
THERMAL RELAY	TYPE	Irth [A]																			
FUSE	N. POLES	In [A]																			
OTHER	TYPE	MODEL																			
CONDUCTORS	INSULATION	INST.METHOD	EPR	13			EPR				PVC	03									
	CROSS SECTION PHASE-N-PE/PEN [mmq]		1x6	1x6 1x6							1x4	1x4 1x4									
	Ib [A]	Iz [A]	14,4	55,4			0				14,4	32									
	Un [V]	Pn [kW]	230			3	230	0			230	3									
BOTTOM OF THE LINE	Icc min [kA]	Icc max [kA]	0,4	0,9							0,38	0,9									
	LENGHT [m]	dV TOTAL [%]	5	2,7							2	2,8									
NOTES			FG16OM16-0,6/1 kV Cca-s1b,d1,a1								FS17-450/750 V Cca-s3,d1,a3										

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PLANT UPS section of the NDC from gen. 2 to side A		TABLE	

REF. SWITCHBOARD	[QE-Subst]	1	2	3	4	5	6	7	8	9

PURCHASER

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ORDER

UPS section of the NDC
from generator set 1 to side C

SWITCHBOARD

electrical switchboard in MV/LV substation

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			14,4
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER	Nato Defense College	PROJECT	-	FILE	ndc-c1-schemi_[Q00]_[QE-Subst].dwg
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PLANT	UPS section of the NDC from gen. 1 to side C			TABLE	

REF. SWITCHBOARD	[QE-Subst]	1	2	3	4	5	6	7	8	9

TERMINALS NUMBERING										
CIRCUIT NUMBERING	DISTRIBUTION	L1L2L3NPE	1	2 L1L2L3NPE						
CIRCUIT DESCRIPTION		from generator 1	main switch C1	to UPS-DSB first floor side C						
EQUIPMENT			IC60 L							
CIRCUIT BREAKER	Icu [kA] / Icn [A]		15000							
	N. POLES / In [A]		4P / 40							
	COURBE/TRIPPING UNIT		C							
	Ir [A] / tr [s]		40							
	Isd [A] / tsd [s]		400							
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS									
	Idn [A] / tdn [ms]									
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD	EPR / 13		EPR / 61						
	CROSS SECTION PHASE-N-PE/PEN [mmq]	1x16 / 1x16 / 1x16		1x16 / 1x16 / 1x16						
	Ib [A] / Iz [A]	38 / 88		38 / 61,2						
	Un [V] / Pn [kW]	400 / 25,7	25,7	400 / 25,7						
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]	10,57 / 14,4		0,38 / 1,7						
	LENGHT [m] / dV TOTAL [%]	1 / 0		120 / 2,8						
NOTES		FG16OM16-0,6/1 kV Cca-s1b,d1,a1		FG16OM16-0,6/1 kV Cca-s1b,d1,a1						

CUSTOMERS Nato Defense College	PROJECT -	FILE	ndc-c1-schemi_[Q00]_[QE-Subst].dwg
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PLANT UPS section of the NDC from gen. 1 to side C		TABLE	FLB ENGINEERING

REF. SWITCHBOARD	[UPS-DSB]	1	2	3	4	5	6	7	8	9

PURCHASER

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ORDER

UPS section of the NDC from generator set 1 to side C

SWITCHBOARD

UPS switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [QE-Subst]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,7
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48 — CEI 23-49 — CEI 23-51

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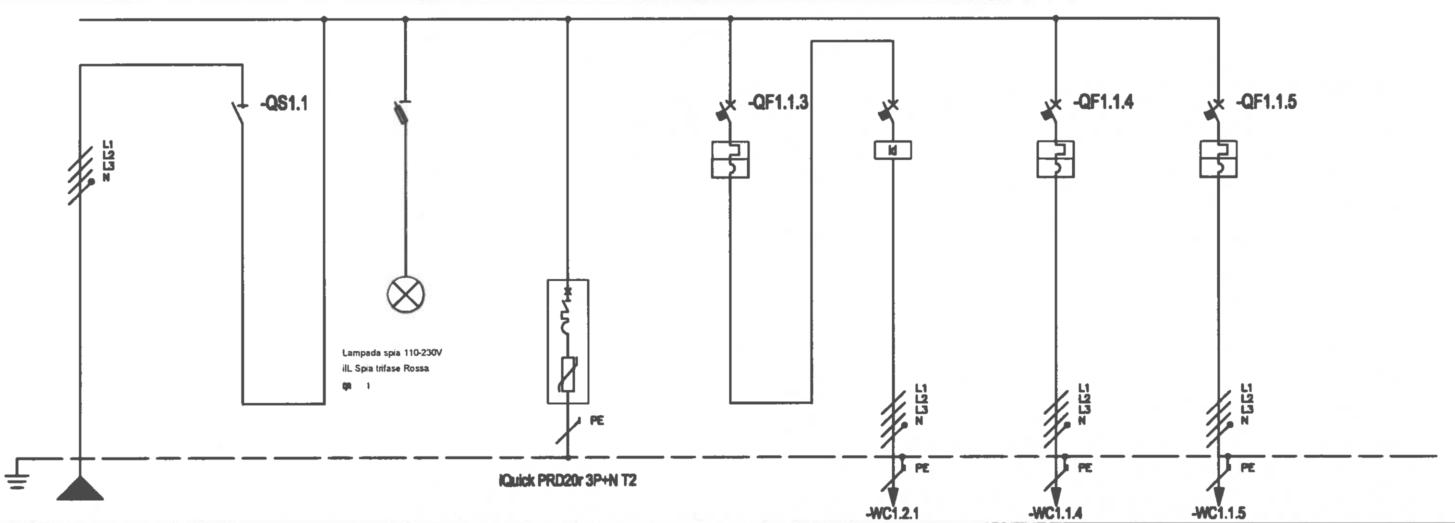
PLANT	UPS section of the NDC from gen. 1 to side C			TABLE	

REF. SWITCHBOARD	[UPS-DSB]	1	2	3	4	5	6	7	8	9



TERMINALS NUMBERING										
CIRCUIT NUMBERING		DISTRIBUTION	L1L2L3NPE	1 L1L2L3N	2 L1L2L3NPE	3 L1L2L3NPE	4 L1L2L3NPE	5 L1L2L3N	6 L1L2L3NPE	7 L1L2L3NPE
CIRCUIT DESCRIPTION			from DSB-Subst	panel main switch	mains presence indicator	Type-2 SPD with protections	to the UPS 1	B-type RCD	to 2F Standard Power existing switchboard	to 3F Standard Power existing switchboard
EQUIPMENT				ISW	STI 3P+N Fus NFC (10,3x38)		iC60 N	iID Tipo B-SI (4P)	iC60 N	iC60 N
CIRCUIT BREAKER	Icu [kA] / Icn [A]						6000		6000	6000
	N. POLES	In [A]		40			4P 32	40	4P 25	4P 25
	COURBE/TRIPPING UNIT						C		C	C
	Ir [A]	tr [s]					32		25	25
	Isd [A]	tsd [s]					320		250	250
	Ii [A]									
	Ig [A]	tg [s]								
RESIDUAL CURRENT DEVICE	TYPE	CLASS						iID Tipo B-SI (4P) B		
	Idn [A]	tdn [ms]						0,3 istantaneo		
CONTACTOR	TYPE	CLASSE								
IMPULSE RELAY	COIL	N. POLES / In [A]								
THERMAL RELAY	TYPE	Irth [A]								
FUSE	N. POLES	In [A]								
OTHER	TYPE	MODEL								
CONDUCTORS	INSULATION	INST.METHOD	EPR 61		EPR			PVC 03	EPR 13	EPR 13
	CROSS SECTION PHASE-N-PE/PEN [mmq]		1x16 1x16 1x16					1x10 1x10 1x10	1x6 1x6 1x6	1x6 1x6 1x6
	Ib [A]	Iz [A]	38 61,2		0			28,7 40	4,8 47,5	4,8 47,5
	Un [V]	Pn [kW]	400 25,7	25,7	400 0		19,7	400 19,7	400 3	400 3
BOTTOM OF THE LINE	Icc min [kA]	Icc max [kA]	0,38 1,7					0,38 1,7	0,34 1,5	0,31 1,4
	LENGHT [m]	dV TOTAL [%]	120 2,8					1 2,8	5 2,9	10 2,9
NOTES			FG16OM16-0,6/1 kV Cca-s1b,d1,a1					FS17-450/750 V Cca-s3,d1,a3	FG16OM16-0,6/1 kV Cca-s1b,d1,a1	FG16OM16-0,6/1 kV Cca-s1b,d1,a1

CUSTOMERS	Nato Defense College	PROJECT -	FILE ndc-c1-schemi [Q01] [UPS-DSB].dwg
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PLANT	UPS section of the NDC from gen. 1 to side C		TABLE

FLB ENGINEERING

REF. SWITCHBOARD	[DSB-UPS return]	1	2	3	4	5	6	7	8	9

PURCHASER

Nato Defense College

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ORDER

UPS section of the NDC from generator set 1 to side C

SWITCHBOARD

UPS return distribution panel

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [UPS]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,6
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD	
MOULDED CASE CIRCUIT BREAKERS	[X] — CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ] — CEI EN 60947-2
	[ ] — CEI EN 60898
STRUCTURE	[X] — CEI EN 60439-1
	[ ] — CEI 23-48
	CEI 23-49
	CEI 23-51

CUSTOMER	Nato Defense College	PROJECT	-	FILE ndc-c1-schemi_[Q03]_[DSB-UPS return].dwg
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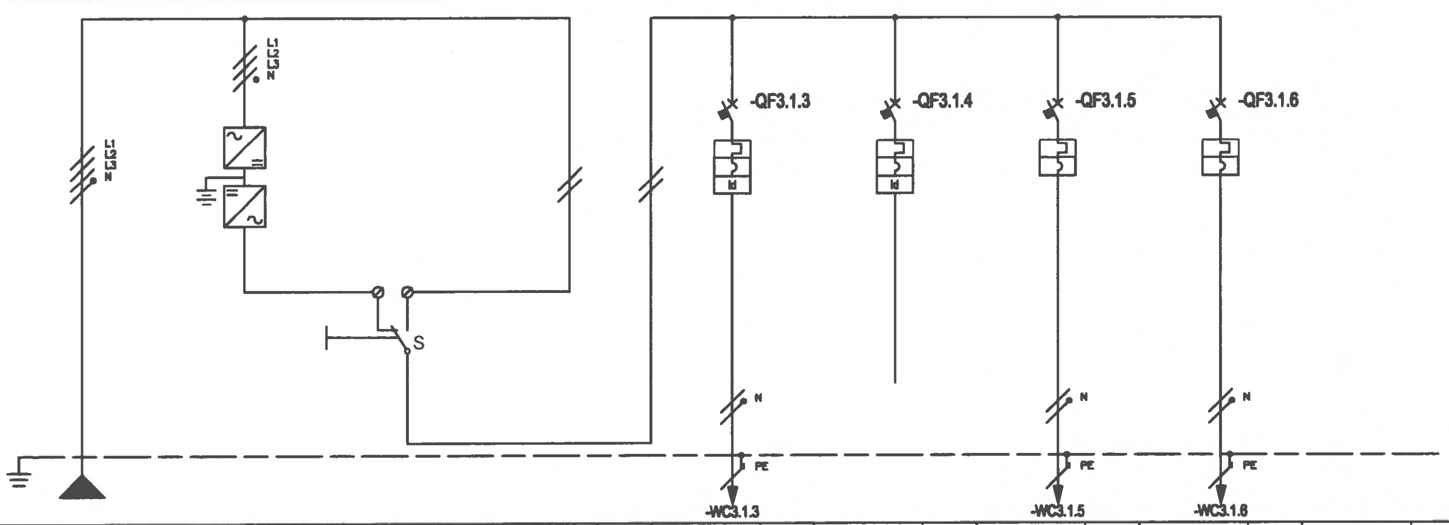
PLANT	UPS section of the NDC from gen. 1 to side C			TABLE



REF. SWITCHBOARD	[DSB-UPS return]	1	2	3	4	5	6	7	8	9
TERMINALS NUMBERING						-WC3.1.3		-WC3.1.5	-WC3.1.6	
CIRCUIT NUMBERING	DISTRIBUTION				3 L1NPE	4 L1NPE	5 L1NPE	6 L1NPE	7 L1NPE	
CIRCUIT DESCRIPTION		from WC1.2.1	from UPS	manual bypass	from mains	interlocked industrial socket UPS power line 1	reserve UPS power line 1	to DSB-2F UPS power line 1	to DSB-3F UPS power line 1	
EQUIPMENT						IC60 N	IC60 N	IC60 N	IC60 N	
CIRCUIT BREAKER	Icu [kA] / Icn [A]					6000	6000	6000	6000	
	N. POLES / In [A]					2P / 16	2P / 16	2P / 25	2P / 25	
	COURBE/TRIPPING UNIT					B	B	B	B	
	Ir [A] / tr [s]					16	16	25	25	
	Isd [A] / tsd [s]					77	77	120	120	
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS					Vigi / A	Vigi / A			
	Idn [A] / tdn [ms]					0,03 / istantaneo	0,03 / istantaneo			
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD					PVC / 03		EPR / 13	EPR / 13	
	CROSS SECTION PHASE-N-PE/PEN [mmq]					1x4 / 1x4 / 1x4		1x6 / 1x6 / 1x6	1x6 / 1x6 / 1x6	
	Ib [A] / Iz [A]					14,4 / 32		14,4 / 55,4	14,4 / 55,4	
	Un [V] / Pn [kW]		9			230 / 3		230 / 3	230 / 3	
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]					0,36 / 0,8		0,33 / 0,8	0,3 / 0,7	
	LENGHT [m] / dV TOTAL [%]					1 / 3		5 / 3,2	10 / 3,4	
NOTES						FS17-450/750 V Cca-s3,d1,a3		FG16OM16-0,6/1 kV Cca-s1b,d1,a1	FG16OM16-0,6/1 kV Cca-s1b,d1,a1	

CUSTOMERS	Nato Defense College	PROJECT -	FILE ndc-c1-schemi_[Q03]_[DSB-UPS return].dwg
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PLANT	UPS section of the NDC from gen. 1 to side C		TABLE

REF. SWITCHBOARD	[DSB-2F]	1	2	3	4	5	6	7	8	9

PURCHASER

Nato Defense College

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ORDER

UPS section of the NDC from generator set 1 to side C

SWITCHBOARD

second-floor distribution switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [DSB-UPS return]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,5
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

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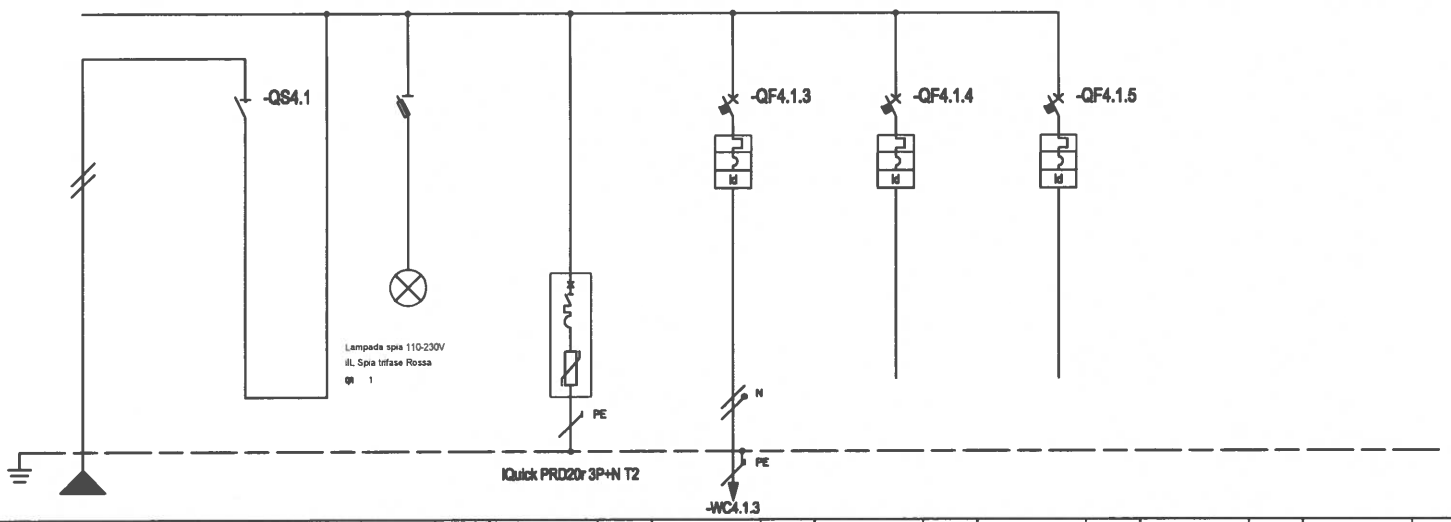
PLANT UPS section of the NDC from gen. 1 to side C		TABLE		

REF. SWITCHBOARD	[DSB-2F]	1	2	3	4	5	6	7	8	9



TERMINALS NUMBERING																							
CIRCUIT NUMBERING		DISTRIBUTION		L1N/PE	1	L1N	2	L1N/PE	3	L1N/PE	4	L1N/PE	5	L1N/PE	6	L1N/PE							
CIRCUIT DESCRIPTION			from UPS UPS power line 1		panel main switch UPS power line 1		mains presence indicator		Type-2 SPD with protections		interlocked industrial socket UPS power line 1		reserve UPS power line 1		reserve UPS power line 1								
EQUIPMENT					ISW		STI 3P+N Fus NFC (10,3x38)				IC60 N		IC60 N		IC60 N								
CIRCUIT BREAKER	Icu [kA] / Icn [A]										6000		6000		6000								
	N. POLES	In [A]				32					2P	16	2P	10	2P	16							
	COURBE/TRIPPING UNIT										B		B		B								
	Ir [A]	tr [s]									16		10		16								
	Isd [A]	tsd [s]									77		48		77								
	Ii [A]																						
	Ig [A]	tg [s]																					
RESIDUAL CURRENT DEVICE	TYPE	CLASS									Vigi	A	Vigi	A	Vigi	A							
	Idn [A]	tdn [ms]									0,03	Istantaneo	0,03	Istantaneo	0,03	Istantaneo							
CONTACTOR	TYPE	CLASSE																					
IMPULSE RELAY	COIL	N. POLES In [A]																					
THERMAL RELAY	TYPE	Irth [A]																					
FUSE	N. POLES	In [A]																					
OTHER	TYPE	MODEL																					
CONDUCTORS	INSULATION	INST.METHOD	EPR	13			EPR				PVC	03											
	CROSS SECTION PHASE-N-PE/PEN [mmq]		1x6	1x6 1x6							1x4	1x4 1x4											
	Ib [A]	Iz [A]	14,4	55,4			0				14,4	32											
	Un [V]	Pn [kW]	230			3	230	0			230	3											
BOTTOM OF THE LINE	Icc min [kA]	Icc max [kA]	0,33	0,8							0,32	0,7											
	LENGHT [m]	dV TOTAL [%]	5	3,2							2	3,3											
NOTES			FG16OM16-0,6/1 kV Cca-s1b,d1,a1								FS17-450/750 V Cca-s3,d1,a3												

CUSTOMERS	Nato Defense College	PROJECT	-	FILE	ndc-c1-schemi_[Q04]_[DSB-2F].dwg
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PLANT	UPS section of the NDC from gen. 1 to side C			TABLE	

REF. SWITCHBOARD	[DSB-3F]	1	2	3	4	5	6	7	8	9

PURCHASER

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ORDER

UPS section of the NDC from generator set 1 to side C

SWITCHBOARD

third-floor distribution switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [DSB-UPS return]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,4
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

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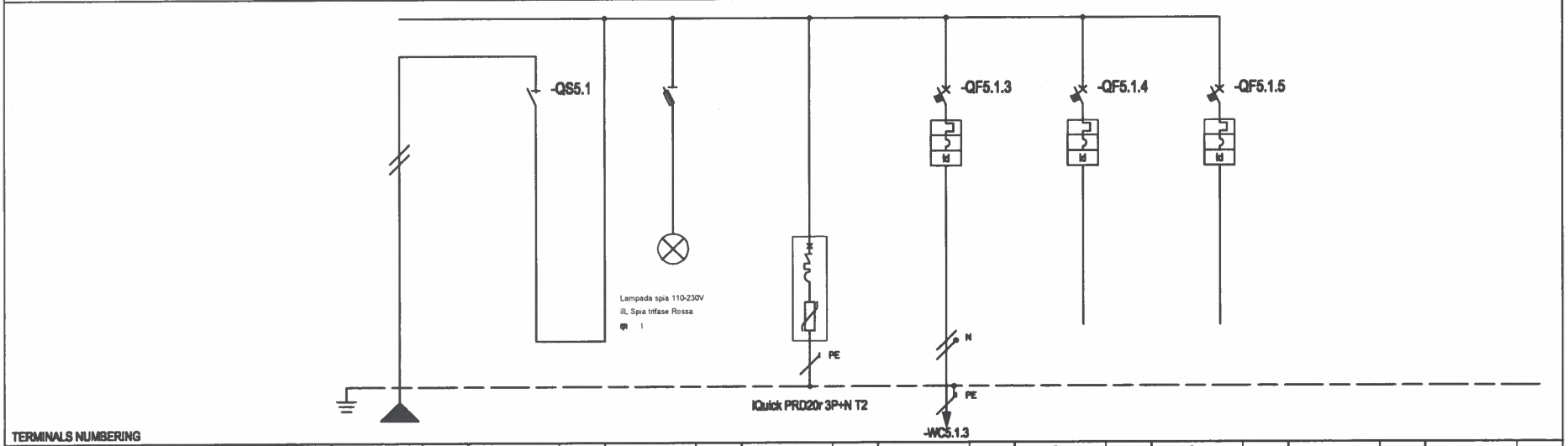
PLANT UPS section of the NDC from gen. 1 to side C		TABLE		



REF. SWITCHBOARD	[DSB-3F]	1	2	3	4	5	6	7	8	9
TERMINALS NUMBERING										
CIRCUIT NUMBERING	DISTRIBUTION	L1NPE	1 L1N	2 L1NPE	3 L1NPE	4 L1NPE	5 L1NPE	6 L1NPE		
CIRCUIT DESCRIPTION		from UPS UPS power line 1	panel main switch UPS power line 1	mains presence indicator	Type-2 SPD with protections	interlocked industrial socket UPS power line 1	reserve UPS power line 1	reserve UPS power line 1		
EQUIPMENT			ISW	STI 3P+N Fus NFC (10,3x38)		IC60 N	IC60 N	IC60 N		
CIRCUIT BREAKER	Icu [kA] / Icn [A]					6000	6000	6000		
	N. POLES / In [A]		32			2P 16	2P 10	2P 16		
	COURBE/TRIPPING UNIT					B	B	B		
	Ir [A] / tr [s]					16	10	16		
	Isd [A] / tsd [s]					77	48	77		
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS					Vigi A	Vigi A	Vigi A		
	Idn [A] / tdn [ms]					0,03 Istantaneo	0,03 Istantaneo	0,03 Istantaneo		
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD	EPR 13		EPR		PVC 03				
	CROSS SECTION PHASE-N-PE/PEN [mmq]	1x6 1x6 1x6				1x4 1x4 1x4				
	Ib [A] / Iz [A]	14,4 55,4		0		14,4 32				
	Un [V] / Pn [kW]	230	3	230 0		230 3				
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]	0,3 0,7				0,29 0,7				
	LENGHT [m] / dV TOTAL [%]	10 3,4				2 3,5				
NOTES		FG16OM16-0,6/1 kV Cca-s1b,d1,a1				FS17-450/750 V Cca-s3,d1,a3				

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PLANT UPS section of the NDC from gen. 1 to side C		TABLE	

REF. SWITCHBOARD	[QE-Subst]	1	2	3	4	5	6	7	8	9

PURCHASER

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ORDER

UPS section of the NDC from generator set 2 to side C

SWITCHBOARD

electrical switchboard in MV/LV substation

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			14,4
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

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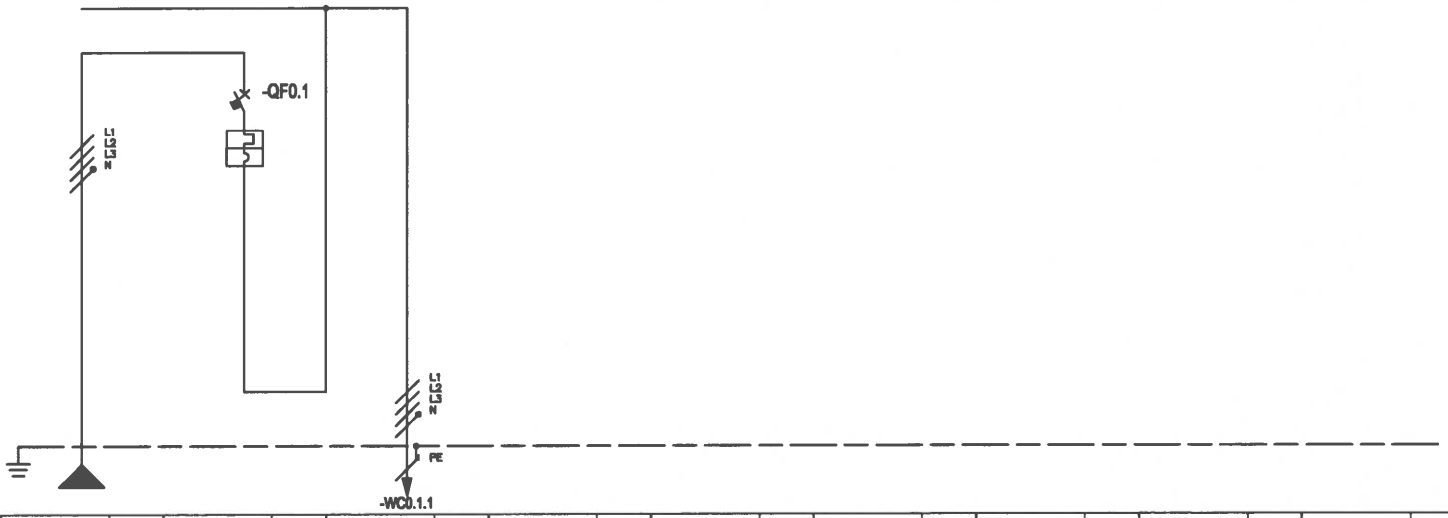
PLANT	UPS section of the NDC from gen. 2 to side C			TABLE	

REF. SWITCHBOARD	[QE-Subst]	1	2	3	4	5	6	7	8	9



TERMINALS NUMBERING										
CIRCUIT NUMBERING	DISTRIBUTION		1 L1L2L3NPE	2 L1L2L3NPE						
CIRCUIT DESCRIPTION		from generator 2	main switch C2	to UPS-DSB first floor side C						
EQUIPMENT			IC60 L							
CIRCUIT BREAKER	Icu [kA] / Icn [A]		15000							
	N. POLES / In [A]		4P 40							
	COURBE/TRIPPING UNIT		C							
	Ir [A] / tr [s]		40							
	Isd [A] / tsd [s]		400							
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS									
	Idn [A] / tdn [ms]									
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD	EPR 13		EPR 61						
	CROSS SECTION PHASE-N-PE/PEN [mmq]	1x16 1x16 1x16		1x16 1x16 1x16						
	Ib [A] / Iz [A]	38 88		38 61,2						
	Un [V] / Pn [kW]	400 25,7	25,7	400 25,7						
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]	10,57 14,4		0,38 1,7						
	LENGHT [m] / dV TOTAL [%]	1 0		120 2,8						
NOTES		FG16OM16-0,6/1 kV Cca-s1b,d1,a1		FG16OM16-0,6/1 kV Cca-s1b,d1,a1						

CUSTOMERS Nato Defense College	PROJECT -	FILE	ndc-c2-schemi [Q00] [QE-Subst].dwg
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PLANT UPS section of the NDC from gen. 2 to side C		TABLE	

REF. SWITCHBOARD	[UPS-DSB]	1	2	3	4	5	6	7	8	9

PURCHASER

Nato Defense College

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ORDER

UPS section of the NDC from generator set 2 to side C

SWITCHBOARD

UPS switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [QE-Subst]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,7
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

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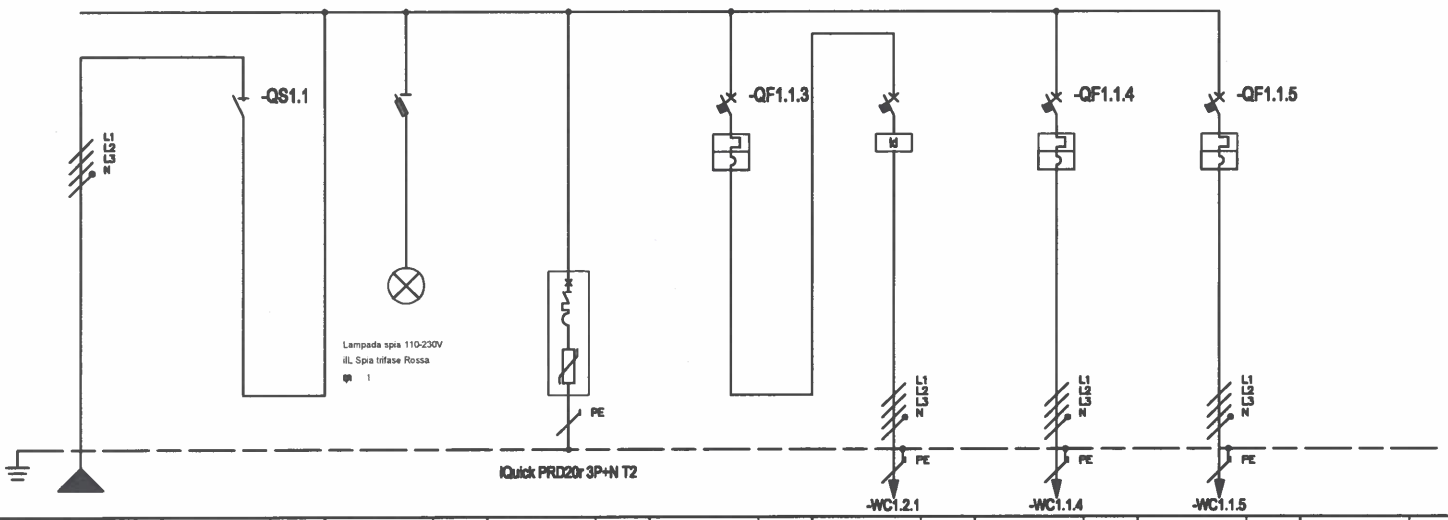
PLANT UPS section of the NDC from gen. 2 to side C		TABLE	



REF. SWITCHBOARD	[UPS-DSB]	1	2	3	4	5	6	7	8	9
TERMINALS NUMBERING										
CIRCUIT NUMBERING	DISTRIBUTION	L1L2L3NPE	1 L1L2L3N	2 L1L2L3NPE	3 L1L2L3NPE	4 L1L2L3NPE	5 L1L2L3N	6 L1L2L3NPE	7 L1L2L3NPE	
CIRCUIT DESCRIPTION		from DSB-Subst	panel main switch	mains presence indicator	Type-2 SPD with protections	to the UPS 2	B-type RCD	to 2F Standard Power existing switchboard	to 3F Standard Power existing switchboard	
EQUIPMENT			ISW	STI 3P+N Fus NFC (10,3x38)		IC60 N	IID Tipo B-SI (4P)	IC60 N	IC60 N	
CIRCUIT BREAKER	Icu [kA] / Icn [A]					6000		6000	6000	
	N. POLES / In [A]		40			4P 32	40	4P 25	4P 25	
	COURBE/TRIPPING UNIT					C		C	C	
	Ir [A] / tr [s]					32		25	25	
	Isd [A] / tsd [s]					320		250	250	
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS						IID Tipo B-SI (4P) B			
	Idn [A] / tdn [ms]						0,3 Istantaneo			
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD	EPR 61		EPR			PVC 03	EPR 13	EPR 13	
	CROSS SECTION PHASE-N-PE/PEN [mmq]	1x16 1x16 1x16					1x10 1x10 1x10	1x6 1x6 1x6	1x6 1x6 1x6	
	Ib [A] / Iz [A]	38 61,2		0			28,7 40	4,8 47,5	4,8 47,5	
	Un [V] / Pn [kW]	400 25,7	25,7	400 0		19,7	400 19,7	400 3	400 3	
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]	0,38 1,7					0,38 1,7	0,34 1,5	0,31 1,4	
	LENGHT [m] / dV TOTAL [%]	120 2,8					1 2,8	5 2,9	10 2,9	
NOTES		FG16OM16-0,6/1 kV Cca-s1b,d1,a1					FS17-450/750 V Cca-s3,d1,a3	FG16OM16-0,6/1 kV Cca-s1b,d1,a1	FG16OM16-0,6/1 kV Cca-s1b,d1,a1	

CUSTOMERS Nato Defense College	PROJECT -	FILE	ndc-c2-schemi [Q01] [UPS-DSB].dwg
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PLANT UPS section of the NDC from gen. 2 to side C		TABLE	

REF. SWITCHBOARD	[DSB-UPS return]	1	2	3	4	5	6	7	8	9

PURCHASER

Nato Defense College

v. Giorgio Pelosi, 1 - Roma

ORDER

UPS section of the NDC from generator set 2 to side C

SWITCHBOARD

UPS return distribution panel

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [UPS]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,6
NEUTRAL SYSTEM			TNS
BUSBAR SIZE In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER	Nato Defense College	PROJECT	-	FILE	ndc-c2-schemi_[Q03]_[DSB-UPS return].dwg
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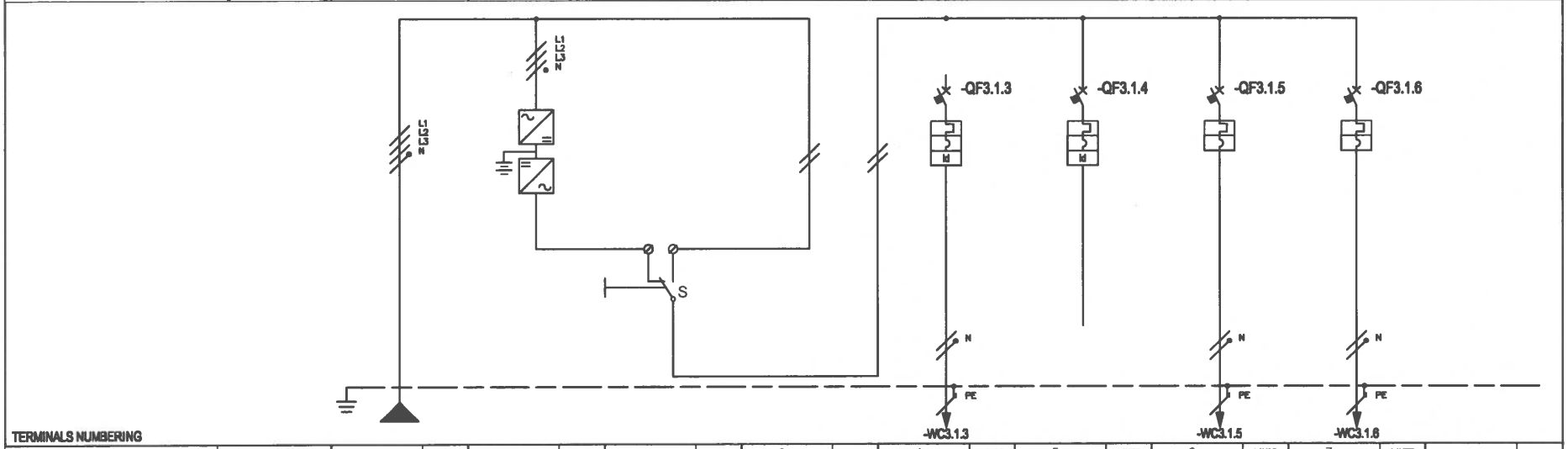
PLANT	UPS section of the NDC from gen. 2 to side C			TABLE	



REF. SWITCHBOARD	[DSB-UPS return]	1	2	3	4	5	6	7	8	9
TERMINALS NUMBERING					3 L1NPE	4 L1NPE	5 L1NPE	6 L1NPE	7 L1NPE	
CIRCUIT DESCRIPTION		from WC1.2.1	from UPS	manual bypass	from mains	interlocked industrial socket UPS power line 2	reserve UPS power line 2	to DSB-2F UPS power line 2	to DSB-3F UPS power line 2	
EQUIPMENT						IC60 N	IC60 N	IC60 N	IC60 N	
CIRCUIT BREAKER	Icu [kA] / Icn [A]					6000	6000	6000	6000	
	N. POLES / In [A]					2P / 16	2P / 16	2P / 25	2P / 25	
	COURBE/TRIPPING UNIT					B	B	B	B	
	Ir [A] / tr [s]					16	16	25	25	
	Isd [A] / tsd [s]					77	77	120	120	
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS					Vigi / A	Vigi / A			
	Idn [A] / tdn [ms]					0,03 / Istantaneo	0,03 / Istantaneo			
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD					PVC / 03		EPR / 13	EPR / 13	
	CROSS SECTION PHASE-N-PE/PEN [mmq]					1x4 / 1x4 / 1x4		1x6 / 1x6 / 1x6	1x6 / 1x6 / 1x6	
	Ib [A] / Iz [A]					14,4 / 32		14,4 / 55,4	14,4 / 55,4	
	Un [V] / Pn [kW]		9			230 / 3		230 / 3	230 / 3	
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]					0,36 / 0,8		0,33 / 0,8	0,3 / 0,7	
	LENGHT [m] / dV TOTAL [%]					1 / 3		5 / 3,2	10 / 3,4	
NOTES						FS17-450/750 V Cca-s3,d1,a3		FG16OM16-0,6/1 kV Cca-s1b,d1,a1	FG16OM16-0,6/1 kV Cca-s1b,d1,a1	

CUSTOMERS Nato Defense College	PROJECT -	FILE	ndc-c2-schemi_[Q03]_[DSB-UPS return].dwg
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PLANT UPS section of the NDC from gen. 2 to side C		TABLE	

REF. SWITCHBOARD	[DSB-2F]	1	2	3	4	5	6	7	8	9

PURCHASER

Nato Defense College

v. Giorgio Pelosi, 1 - Roma

ORDER

UPS section of the NDC from generator set 2 to side C

SWITCHBOARD

second-floor distribution switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [DSB-UPS return]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,5
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD		
MOULDED CASE CIRCUIT BREAKERS	[X]	— CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ]	— CEI EN 60947-2
	[ ]	— CEI EN 60898
STRUCTURE	[X]	— CEI EN 60439-1
	[ ]	— CEI 23-48
		— CEI 23-49
		— CEI 23-51

CUSTOMER Nato Defense College	PROJECT -	FILE ndc-c2-schemi [Q04] [DSB-2F].dwg	
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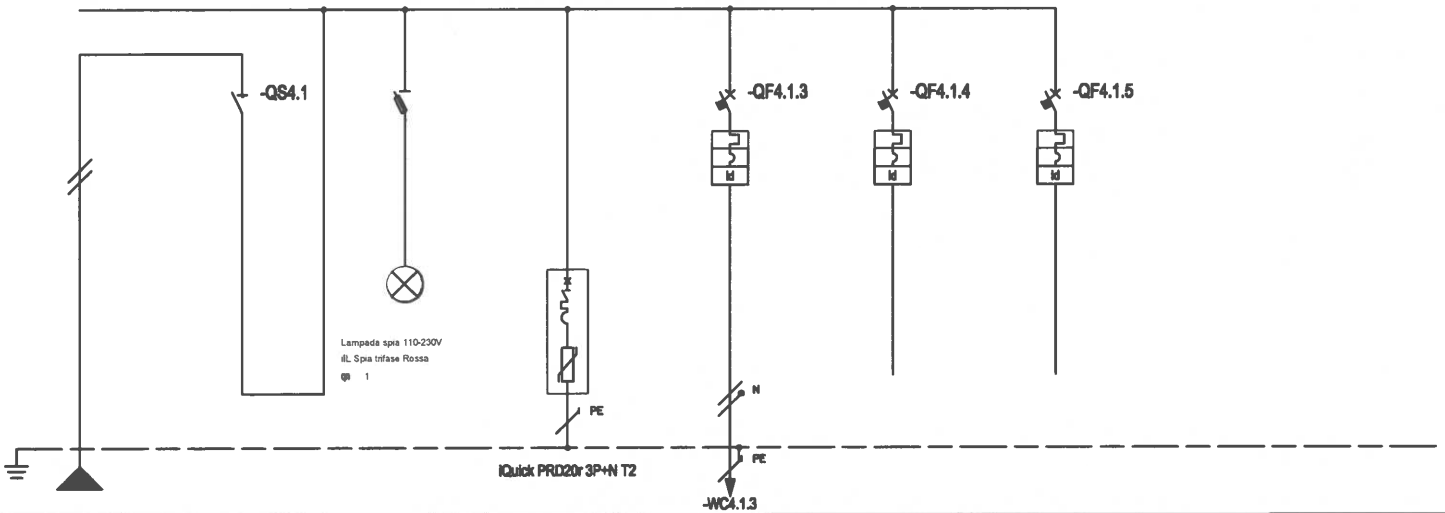
PLANT UPS section of the NDC from gen. 2 to side C		TABLE	



REF. SWITCHBOARD		[DSB-2F]	1	2	3	4	5	6	7	8	9
TERMINALS NUMBERING											
CIRCUIT NUMBERING		DISTRIBUTION	L1N/PE	1 L1N	2 L1N/PE	3 L1N/PE	4 L1N/PE	5 L1N/PE	6 L1N/PE		
CIRCUIT DESCRIPTION			from UPS UPS power line 2	panel main switch UPS power line 2	mains presence indicator	Type-2 SPD with protections	interlocked industrial socket UPS power line 2	reserve UPS power line 2	reserve UPS power line 2		
EQUIPMENT				ISW	STI 3P+N Fus NFC (10,3x38)		iC60 N	iC60 N	iC60 N		
CIRCUIT BREAKER	Icu [kA] / Icn [A]						6000	6000	6000		
	N. POLES	In [A]		32			2P 16	2P 10	2P 16		
	COURBE/TRIPPING UNIT						B	B	B		
	Ir [A]	tr [s]					16	10	16		
	Isd [A]	tsd [s]					77	48	77		
	Ii [A]										
	Ig [A]	tg [s]									
RESIDUAL CURRENT DEVICE	TYPE	CLASS					Vigi A	Vigi A	Vigi A		
	Idn [A]	tdn [ms]					0,03 Istantaneo	0,03 Istantaneo	0,03 Istantaneo		
CONTACTOR	TYPE	CLASSE									
IMPULSE RELAY	COIL N. POLES	In [A]									
THERMAL RELAY	TYPE	Irth [A]									
FUSE	N. POLES	In [A]									
OTHER	TYPE	MODEL									
CONDUCTORS	INSULATION	INST.METHOD	EPR 13		EPR		PVC 03				
	CROSS SECTION PHASE-N-PE/PEN [mmq]		1x6 1x6 1x6				1x4 1x4 1x4				
	Ib [A]	Iz [A]	14,4 55,4		0		14,4 32				
	Un [V]	Pn [kW]	230	3	230 0		230 3				
BOTTOM OF THE LINE	Icc min [kA]	Icc max [kA]	0,33 0,8				0,32 0,7				
	LENGHT [m]	dV TOTAL [%]	5 3,2				2 3,3				
NOTES			FG16OM16-0,6/1 kV Cca-s1b,d1,a1				FS17-450/750 V Cca-s3,d1,a3				

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PLANT UPS section of the NDC from gen. 2 to side C		TABLE	

REF. SWITCHBOARD	[DSB-3F]	1	2	3	4	5	6	7	8	9

PURCHASER

Nato Defense College

v. Giorgio Pelosi, 1 - Roma

ORDER

UPS section of the NDC from generator set 2 to side C

SWITCHBOARD

third-floor distribution switchboard

SWITCHBOARD CHARACTERISICS

UPSTREAM PLANT [DSB-UPS return]			
VOLTAGE [V]	400	FREQ. [Hz]	50
SWITCHBOARD RATED CURRENT [A]			
SWITCHBOARD PERSPECTIVE CURRENT [kA]			1,4
NEUTRAL SYSTEM			TNS
BUSBAR SIZE			
In [A]		Icc [kA]	
STRUCTURE			thermoplastic
INSULATION CLASS			IP

REFERENCE STANDARD	
MOULDED CASE CIRCUIT BREAKERS	[X] — CEI EN 60947-2
MINIATURE CIRCUIT BREAKERS	[ ] — CEI EN 60947-2
	[ ] — CEI EN 60898
STRUCTURE	[X] — CEI EN 60439-1
	[ ] — CEI 23-48
	CEI 23-49
	CEI 23-51

CUSTOMER	Nato Defense College	PROJECT -	FILE	ndc-c2-schemi_[Q05]_[DSB-3F].dwg
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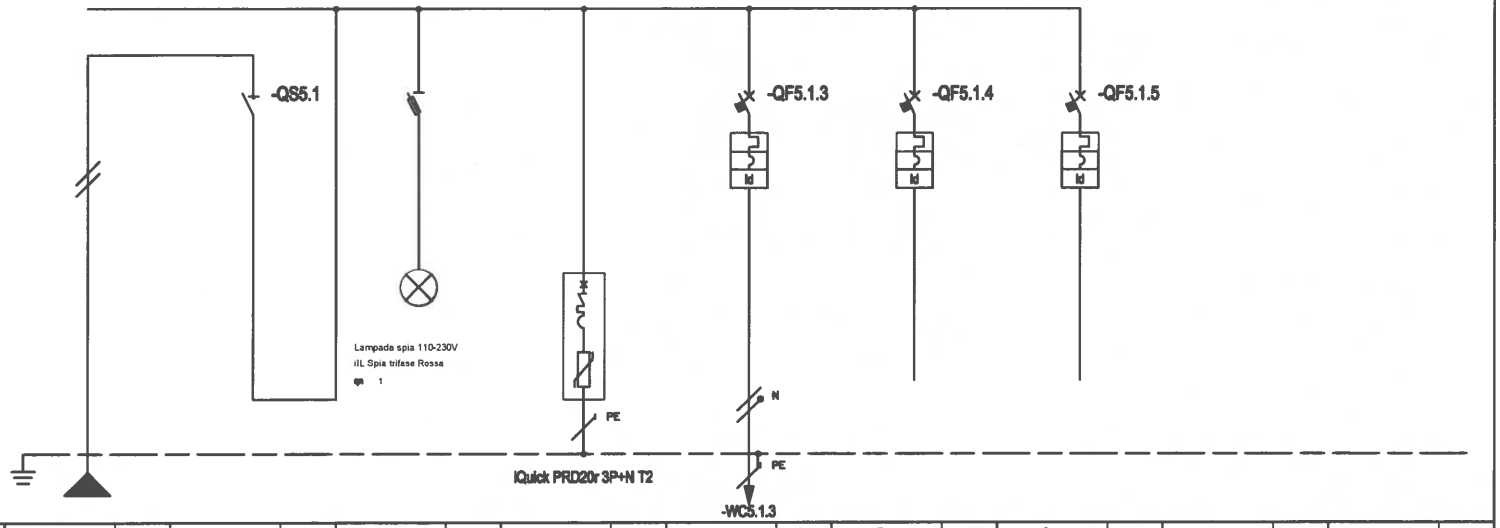
PLANT	UPS section of the NDC from gen. 2 to side C		TABLE	



TERMINALS NUMBERING

REF. SWITCHBOARD	[DSB-3F]	1	2	3	4	5	6	7	8	9
CIRCUIT NUMBERING	DISTRIBUTION	L1NPE	1 L1N	2 L1NPE	3 L1NPE	4 L1NPE	5 L1NPE	6 L1NPE		
CIRCUIT DESCRIPTION		from UPS UPS power line 2	panel main switch UPS power line 2	mains presence indicator	Type-2 SPD with protections	interlocked industrial socket UPS power line 2	reserve UPS power line 2	reserve UPS power line 2		
EQUIPMENT			ISW	STI 3P+N Fus NFC (10,3x38)		IC60 N	IC60 N	IC60 N		
CIRCUIT BREAKER	Icu [kA] / Icn [A]					6000	6000	6000		
	N. POLES / In [A]		32			2P 16	2P 10	2P 16		
	COURBE/TRIPPING UNIT					B	B	B		
	Ir [A] / tr [s]					16	10	16		
	Isd [A] / tsd [s]					77	48	77		
	Ii [A]									
	Ig [A] / tg [s]									
RESIDUAL CURRENT DEVICE	TYPE / CLASS					Vigi A	Vigi A	Vigi A		
	Idn [A] / tdn [ms]					0,03 Istantaneo	0,03 Istantaneo	0,03 Istantaneo		
CONTACTOR	TYPE / CLASSE									
IMPULSE RELAY	COIL / N. POLES / In [A]									
THERMAL RELAY	TYPE / Irth [A]									
FUSE	N. POLES / In [A]									
OTHER	TYPE / MODEL									
CONDUCTORS	INSULATION / INST.METHOD	EPR 13		EPR		PVC 03				
	CROSS SECTION PHASE-N-PE/PEN [mmq]	1x6 1x6 1x6				1x4 1x4 1x4				
	Ib [A] / Iz [A]	14,4 55,4		0		14,4 32				
	Un [V] / Pn [kW]	230	3	230 0		230 3				
BOTTOM OF THE LINE	Icc min [kA] / Icc max [kA]	0,3 0,7				0,29 0,7				
	LENGHT [m] / dV TOTAL [%]	10 3,4				2 3,5				
NOTES		FG16OM16-0,6/1 kV Cca-s1b,d1,a1				FS17-450/750 V Cca-s3,d1,a3				

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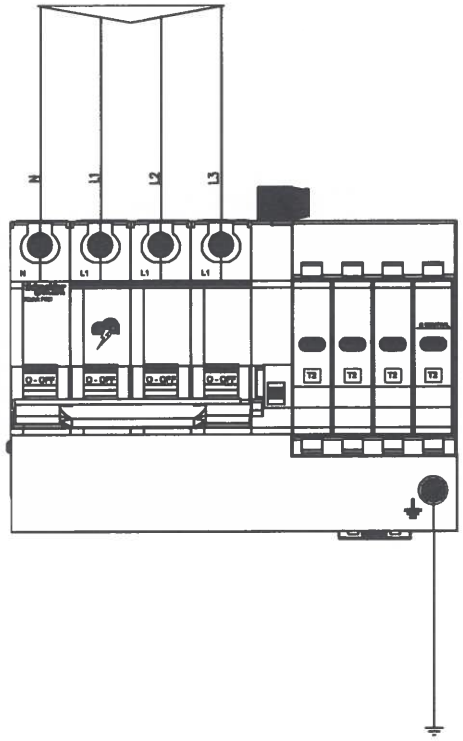
PLANT UPS section of the NDC from gen. 2 to side C		TABLE	

REF. SWITCHBOARD [DSB-2F]

L



N

	CUSTOMER Nato Defense College	PROJECT -	FILE ndc-a1-schemi_[Q06]_[DSB-2F].dwg		
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	PLANT UPS section of the NDC from gen. 1 to side A		TABLE		

FROM GENERATOR 1 TO BUILDING SIDE A

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [QE-SUBST] ELECTRICAL SWITCHBOARD IN MV/LV SUBSTATION

LINE: FROM GENERATOR 1 MAIN SWITCH A1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_B [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
26,29	38,93	38,93	38,93	38,93	0,97		1	

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1	3F+N+PE	multi	1	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 10	1x 10	1x 10	1,85	0,09	10,32	14,75	0,03	0,03	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
38,93	66	15	14,1	9,66	9,66

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{set} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta n}$ [A]	$T_{\Delta n}$ [ms]
from generator 1 main switch A1	iC60 L	4	C	40	40	-	0,4	0,4
Q1	4	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	-	-	-

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [QE-SUBST] ELECTRICAL SWITCHBOARD IN MV/LV SUBSTATION

LINE: TO UPS-DSB THIRD FLOOR SIDE A

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_B [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
26,29	38,93	38,93	38,93	38,93	0,97			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L0.1.1	3F+N+PE	multi	60	61			1,0	0,8	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 10	1x 10	1x 10	111,12	5,17	121,44	19,92	2,25	2,29	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
38,93	46,75	14,1	2,06	0,46	0,46

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: PANEL MAIN SWITCH

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
26,29	38,93	38,93	38,93	38,93	0,97		1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	40	6	N.D.	1,50	25

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO THE UPS 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
19,69	28,71	28,71	28,71	28,71	0,99		1	

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_q [xI_n - A]	T_p [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
to the UPS 1	iC60 N	4	C	32	32	-	0,32	0,32
Q1.1.3	4	-	-	-				

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: B-TYPE RCD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
19,69	28,71	28,71	28,71	28,71	0,99			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.2.1	3F+N+PE	uni	1	03	30			-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 10	1x 10	1x 10	1,85	0,12	123,29	20,04	0,02	2,32	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
28,71	40	2,06	2,03	0,46	0,46

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{isp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
	iID Tipo B-SI (4P)	40	6	1,50	N.D.	

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO GF STANDARD POWER EXISTING SWITCHBOARD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
2,2	3,52	3,52	3,52	3,52	0,9			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.1.4	3F+N+PE	multi	5	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	15,43	0,48	136,87	20,4	0,02	2,32	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
3,52	47,52	2,06	1,83	0,41	0,41

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_{cu} [kA]	I_{cs} [kA]
Initialling/ Description	T_{rd} [s]	I_i [kA]	I_g [$x I_n$ - A]	T_g [s]	Residual current device	Class	I_{dn} [A]	T_{dn} [ms]
to GF Standard Power existing switchboard	iC60 N	4	C	25	25	-	0,25	0,25
Q1.1.4	4	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO 1F STANDARD POWER EXISTING SWITCHBOARD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
2,2	3,52	3,52	3,52	3,52	0,9			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.1.5	3F+N+PE	multi	5	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	15,43	0,48	136,87	20,4	0,02	2,32	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
3,52	47,52	2,06	1,83	0,41	0,41

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_n [kA]	I_{ss} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
to 1F Standard Power existing switchboard	iC60 N	4	C	25	25	-	0,25	0,25
Q1.1.5	4	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO 2F STANDARD POWER EXISTING SWITCHBOARD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
2,2	3,52	3,52	3,52	3,52	0,9			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.1.6	3F+N+PE	multi	10	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	30,87	0,96	152,31	20,87	0,05	2,34	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
3,52	47,52	2,06	1,65	0,37	0,37

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_n [kA]	I_{ss} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
to 2F Standard Power existing switchboard	iC60 N	4	C	25	25	-	0,25	0,25
Q1.1.6	4	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{imp} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,9	1		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.3	F+N+PE	uni	1	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (distr)}$ [%]
1x 4	1x 4	1x 4	4,63	0,14	131,63 (1219,21)	20,42 (908,54)	0,06	2,49 (0,17)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	32	1,02 (0,16)	0,99 (0,16)	0,43 (0,13)	0,43 (0,13)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
interlocked industrial socket UPS power line 1	iC60 N	2	B	16	16	-	0,08	0,08
Q3.1.3	2	-	-	-	Vigi	A	0,03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: RESERVE UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{imp} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 1	iC60 N	2	B	16	16	-	0,08	0,08
Q3.1.4	2	-	-	-	Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: TO DSB-GF UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp} [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.5	F+N+PE	multi	15	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	46,3	1,43	173,3 (1260,88)	21,71 (909,83)	0	2,43 (0,11)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
0	55,44	1,02 (0,16)	0,74 (0,15)	0,32 (0,12)	0,32 (0,12)

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{rel} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
to DSB-GF UPS power line 1	iC60 N	2	B	25	25	-	0,12	0,12
Q3.1.5	2	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: TO DSB-1F UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp} [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.6	F+N+PE	multi	10	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	30,87	0,96	157,86 (1245,44)	21,23 (909,35)	0,43	2,86 (0,54)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	55,44	1,02 (0,16)	0,82 (0,16)	0,35 (0,12)	0,35 (0,12)

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{rel} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
to DSB-1F UPS power line 1	iC60 N	2	B	25	25	-	0,12	0,12
Q3.1.6	2	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: TO DSB-2F UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.7	F+N+PE	multi	5	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (lim/t)}$ [%]
1x 6	1x 6	1x 6	15,43	0,48	142,43 (1230,01)	20,75 (908,87)	0,21	2,65 (0,32)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	55,44	1,02 (0,16)	0,91 (0,16)	0,4 (0,13)	0,4 (0,13)

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta n}$ [A]	$T_{\Delta n}$ [ms]
to DSB-2F UPS power line 1	iC60 N	2	B	25	25	-	0,12	0,12
Q3.1.7	2	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CUSTOMER: NATO DEFENSE COLLEGE
Plant: UPS section of the NDC Reference: Date: 18/11/2025

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-GF] GROUND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: PANEL MAIN SWITCH UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0			1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	32	4	N.D.	N.D.	5,5

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-GF] GROUND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0		0,3		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp} [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L4.1.3	F+N+PE	uni	2	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	9,26	0,29	182,56 (1270,14)	21,99 (910,11)	0	2,43 (0,11)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
0	32	0,74 (0,15)	0,7 (0,15)	0,31 (0,12)	0,31 (0,12)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{cu} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	I_{on} [A]	T_a/n [ms]
interlocked industrial socket UPS power line 1	iC60 N	2	B	16	16	-	0,08	0,08
Q4.1.3	2	-	-	-	Vigi	A	0,03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-GF] GROUND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{cu} [s]	I_i [kA]	I_3 [xI_n - A]	T_3 [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 1	iC60 N	2	B	10	10	-	0,05	0,05
Q4.1.4	2	-	-	-	Vigi	A	0,03	inst.

CUSTOMER: NATO DEFENSE COLLEGE
Plant: UPS section of the NDC Reference: Date: 18/11/2025

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-GF] GROUND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{cu} [s]	I_i [kA]	I_3 [xI_n - A]	T_3 [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 1	iC60 N	2	B	16	16	-	0.08	0,08
Q4.1.5	2	-	-	-	Vigi	A	0.03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-1F] FIRST-FLOOR DISTRIBUTION SWITCHBOARD
LINE: PANEL MAIN SWITCH UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89		1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	32	4	N.D.	N.D.	5,5

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-1F] FIRST-FLOOR DISTRIBUTION SWITCHBOARD
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,9	1		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L5.1.3	F+N+PE	uni	2	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	9,26	0,29	167,12 (1254,7)	21,52 (909,63)	0,12	2,99 (0,67)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	32	0,82 (0,16)	0,77 (0,16)	0,34 (0,12)	0,34 (0,12)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cs} [kA]
Initialling/ Description	T_{ac} [s]	I_i [kA]	I_p [$x I_n$ - A]	T_p [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
interlocked industrial socket UPS power line 1	iC60 N	2	B	16	16	-	0,08	0,08
Q5.1.3	2	-	-	-	Vigi	A	0,03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-1F] FIRST-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 1	iC60 N	2	B	10	10	-	0,05	0,05
Q5.1.4	2	-	-	-	Vigi	A	0,03	inst.

CUSTOMER: NATO DEFENSE COLLEGE
Plant: UPS section of the NDC Reference: Date: 18/11/2025

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-1F] FIRST-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 1	iC60 N	2	B	16	16	-	0,08	0,08
Q5.1.5	2	-	-	-	Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: PANEL MAIN SWITCH UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89		1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	32	4	N.D.	N.D.	5,5

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,9	1		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L6.1.3	F+N+PE	uni	2	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	9,26	0,29	151,69 (1239,27)	21,04 (909,16)	0,12	2,77 (0,45)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	32	0,91 (0,16)	0,85 (0,16)	0,37 (0,13)	0,37 (0,13)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cs} [kA]
Initialling/ Description	T_{cd} [s]	I_i [kA]	I_a [xI_n - A]	T_a [s]	Residual current device	Class	I_{dn} [A]	T_{An} [ms]
interlocked industrial socket UPS power line 1	iC60 N	2	B	16	16	-	0,08	0,08
Q6.1.3	2	-	-	-	Vigi	A	0,03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_t [kA]	I_a [xI_n - A]	T_a [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 1	iC60 N	2	B	10	10	-	0,05	0,05
Q6.1.4	2	-	-	-	Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_t [kA]	I_a [xI_n - A]	T_a [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 1	iC60 N	2	B	16	16	-	0,08	0,08
Q6.1.5	2	-	-	-	Vigi	A	0,03	inst.

FROM GENERATOR 2 TO BUILDING SIDE A

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [QE-SUBST] ELECTRICAL SWITCHBOARD IN MV/LV SUBSTATION

LINE: FROM GENERATOR 2 MAIN SWITCH A2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_n [A]	I_b [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
26,29	38,93	38,93	38,93	38,93	0,97		1	

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1	3F+N+PE	multi	1	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 10	1x 10	1x 10	1,85	0,09	10,32	14,75	0,03	0,03	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
38,93	66	15	14,1	9,66	9,66

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_p [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
from generator 2 main switch A2	iC60 L	4	C	40	40	-	0,4	0,4
Q1	4	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	-	-	-

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [QE-SUBST] ELECTRICAL SWITCHBOARD IN MV/LV SUBSTATION

LINE: TO UPS-DSB THIRD FLOOR SIDE A

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_n [A]	I_b [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
26,29	38,93	38,93	38,93	38,93	0,97			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L0.1.1	3F+N+PE	multi	60	61			1,0	0,8	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 10	1x 10	1x 10	111,12	5,17	121,44	19,92	2,25	2,29	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
38,93	46,75	14,1	2,06	0,46	0,46

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: PANEL MAIN SWITCH

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity,}$	η
26,29	38,93	38,93	38,93	38,93	0,97		1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	40	6	N.D.	1,50	25

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO THE UPS 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity,}$	η
19,69	28,71	28,71	28,71	28,71	0,99		1	

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_s [A]	I_r [A]	T_r [s]	I_{cs} [kA]	I_{cw} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_a [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
to the UPS 2	iC60 N	4	C	32	32	-	0,32	0,32
Q1.1.3	4	-	-	-				

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: B-TYPE RCD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_s [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
19,69	28,71	28,71	28,71	28,71	0,99			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.2.1	3F+N+PE	uni	1	03	30			-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 10	1x 10	1x 10	1,85	0,12	123,29	20,04	0,02	2,32	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
28,71	40	2,06	2,03	0,46	0,46

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
	iID Tipo B-SI (4P)	40	6	1,50	N.D.	

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO GF STANDARD POWER EXISTING SWITCHBOARD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_s [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
2,2	3,52	3,52	3,52	3,52	0,9			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.1.4	3F+N+PE	multi	5	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	15,43	0,48	136,87	20,4	0,02	2,32	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
3,52	47,52	2,06	1,83	0,41	0,41

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_r [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{set} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
to GF Standard Power existing switchboard	iC60 N	4	C	25	25	-	0,25	0,25
Q1.1.4	4	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO 1F STANDARD POWER EXISTING SWITCHBOARD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
2,2	3,52	3,52	3,52	3,52	0,9			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.1.5	3F+N+PE	multi	5	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	15,43	0,48	136,87	20,4	0,02	2,32	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
3,52	47,52	2,06	1,83	0,41	0,41

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics		I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]	
to 1F Standard Power existing switchboard	iC60 N	4	C	25	25	-	0,25	0,25	
Q1.1.5	4	-	-	-					

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO 2F STANDARD POWER EXISTING SWITCHBOARD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
2,2	3,52	3,52	3,52	3,52	0,9			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.1.6	3F+N+PE	multi	10	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	30,87	0,96	152,31	20,87	0,05	2,34	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
3,52	47,52	2,06	1,65	0,37	0,37

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics		I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]	
to 2F Standard Power existing switchboard	iC60 N	4	C	25	25	-	0,25	0,25	
Q1.1.6	4	-	-	-					

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mn} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,9	1		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.3	F+N+PE	uni	1	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	4,63	0,14	131,63 (1219,21)	20,42 (908,54)	0,06	2,49 (0,17)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	32	1,02 (0,16)	0,99 (0,16)	0,43 (0,13)	0,43 (0,13)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics		I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cs} [kA]
Initialling/ Description	T_{cd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]	
interlocked industrial socket UPS power line 2	iC60 N	2	B	16	16	-	0,08	0,08	
Q3.1.3	2	-	-	-	Vigi	A	0,03	inst.	

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: RESERVE UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mn} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics		I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cs} [kA]
Initialling/ Description	T_{cd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]	
reserve UPS power line 2	iC60 N	2	B	16	16	-	0,08	0,08	
Q3.1.4	2	-	-	-	Vigi	A	0,03	inst.	

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: TO DSB-GF UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{fm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp}. [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.5	F+N+PE	multi	15	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	46,3	1,43	173,3 (1260,88)	21,71 (909,83)	0	2,43 (0,11)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
0	55,44	1,02 (0,16)	0,74 (0,15)	0,32 (0,12)	0,32 (0,12)

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{ed} [s]	I_r [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
to DSB-GF UPS power line 2	iC60 N	2	B	25	25	-	0,12	0,12
Q3.1.5	2	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: TO DSB-1F UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{fm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp}. [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.6	F+N+PE	multi	10	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	30,87	0,96	157,86 (1245,44)	21,23 (909,35)	0,43	2,86 (0,54)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	55,44	1,02 (0,16)	0,82 (0,16)	0,35 (0,12)	0,35 (0,12)

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{ed} [s]	I_r [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
to DSB-1F UPS power line 2	iC60 N	2	B	25	25	-	0,12	0,12
Q3.1.6	2	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: TO DSB-2F UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.7	F+N+PE	multi	5	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	15,43	0,48	142,43 (1230,01)	20,75 (908,87)	0,21	2,65 (0,32)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	55,44	1,02 (0,16)	0,91 (0,16)	0,4 (0,13)	0,4 (0,13)

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta n}$ [A]	$T_{\Delta n}$ [ms]
to DSB-2F UPS power line 2	iC60 N	2	B	25	25	-	0,12	0,12
Q3.1.7	2	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CUSTOMER: NATO DEFENSE COLLEGE
Plant: UPS section of the NDC Reference: Date: 18/11/2025

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-GF] GROUND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: PANEL MAIN SWITCH UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0			1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	ISW	32	4	N.D.	N.D.	5,5

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-GF] GROUND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0		0,3		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp} [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L4.1.3	F+N+PE	uni	2	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	9,26	0,29	182,56 (1270,14)	21,99 (910,11)	0	2,43 (0,11)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
0	32	0,74 (0,15)	0,7 (0,15)	0,31 (0,12)	0,31 (0,12)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_{cu} [kA]	I_{cw} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_d [$x I_n$ - A]	T_d [s]	Residual current device	Class	I_{dn} [A]	T_{dn} [ms]
Interlocked industrial socket UPS power line 2	iC60 N	2	B	16	16	-	0,08	0,08
Q4.1.3	2	-	-	-	Vigi	A	0,03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-GF] GROUND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_n [A]	I_z [A]	I_T [A]	cos φ b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics		I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{cu} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]	
reserve UPS power line 2	iC60 N	2	B	10	10	-	0,05	0,05	
Q4.1.4	2	-	-	-	Vigi	A	0,03	inst.	

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-GF] GROUND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_n [A]	I_z [A]	I_T [A]	cos φ b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics		I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{cu} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]	
reserve UPS power line 2	iC60 N	2	B	16	16	-	0.08	0,08	
Q4.1.5	2	-	-	-	Vigi	A	0.03	inst.	

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-1F] FIRST-FLOOR DISTRIBUTION SWITCHBOARD
LINE: PANEL MAIN SWITCH UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{res} [A]	I_n [A]	I_g [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89		1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	32	4	N.D.	N.D.	5,5

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-1F] FIRST-FLOOR DISTRIBUTION SWITCHBOARD
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{res} [A]	I_n [A]	I_g [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,9	1		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp} [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L5.1.3	F+N+PE	uni	2	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	9,26	0,29	167,12 (1254,7)	21,52 (909,63)	0,12	2,99 (0,67)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	32	0,82 (0,16)	0,77 (0,16)	0,34 (0,12)	0,34 (0,12)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_{cu} [kA]	I_{cs} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [$x I_n$ - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
interlocked industrial socket UPS power line 2	iC60 N	2	B	16	16	-	0,08	0,08
Q5.1.3	2	-	-	-	Vigi	A	0,03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-1F] FIRST-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{ed} [kA]
Initialling/ Description	T_{ed} [s]	I_i [kA]	I_a [xI_n - A]	T_a [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 2	iC60 N	2	B	10	10	-	0,05	0,05
Q5.1.4	2	-	-	-	Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-1F] FIRST-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{ed} [kA]
Initialling/ Description	T_{ed} [s]	I_i [kA]	I_a [xI_n - A]	T_a [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 2	iC60 N	2	B	16	16	-	0,08	0,08
Q5.1.5	2	-	-	-	Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: PANEL MAIN SWITCH UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89		1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	32	4	N.D.	N.D.	5,5

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,9	1		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp} [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L6.1.3	F+N+PE	uni	2	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	9,26	0,29	151,69 (1239,27)	21,04 (909,16)	0,12	2,77 (0,45)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	32	0,91 (0,16)	0,85 (0,16)	0,37 (0,13)	0,37 (0,13)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
interlocked industrial socket UPS power line 2	iC60 N	2	B	16	16	-	0,08	0,08
Q6.1.3	2	-	-	-	Vigi	A	0,03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{cu} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 2	iC60 N	2	B	10	10	-	0,05	0,05
Q6.1.4	2	-	-	-	Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{cu} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 2	iC60 N	2	B	16	16	-	0,08	0,08
Q6.1.5	2	-	-	-	Vigi	A	0,03	inst.

FROM GENERATOR 1 TO BUILDING SIDE C

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [QE-SUBST] ELECTRICAL SWITCHBOARD IN MV/LV SUBSTATION

LINE: FROM GENERATOR 1 MAIN SWITCH C1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_n [A]	I_s [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
25,69	37,99	37,99	37,99	37,99	0,97		1	

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp}. [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1	3F+N+PE	multi	1	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 16	1x 16	1x 16	1,16	0,08	9,63	14,75	0,02	0,02	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
37,99	88	15	14,42	10,56	10,56

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{ret} [s]	I_i [kA]	I_a [$x I_n$ - A]	T_a [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
from generator 1 main switch C1	iC60 L	4	C	40	40	-	0,4	0,4
Q1	4	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	-	-	-

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [QE-SUBST] ELECTRICAL SWITCHBOARD IN MV/LV SUBSTATION

LINE: TO UPS-DSB FIRST FLOOR SIDE C

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_n [A]	I_s [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
25,69	37,99	37,99	37,99	37,99	0,97			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp}. [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L0.1.1	3F+N+PE	multi	120	61			1,0	0,8	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 16	1x 16	1x 16	138,9	9,8	148,53	24,55	2,79	2,81	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
37,99	61,2	14,42	1,68	0,37	0,37

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	NO

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: PANEL MAIN SWITCH

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_n [A]	I_s [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
25,69	37,99	37,99	37,99	37,99	0,97		1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	40	6	N.D.	1,50	25

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO THE UPS 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_n [A]	I_s [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
19,69	28,71	28,71	28,71	28,71	0,99		1	

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cs} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	I_{dn} [A]	T_dn [ms]
to the UPS 1	iC60 N	4	C	32	32	-	0,32	0,32
Q1.1.3	4	-	-	-				

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: B-TYPE RCD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_n [A]	I_s [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
19,69	28,71	28,71	28,71	28,71	0,99			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp} [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.2.1	3F+N+PE	uni	1	03	30			-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 10	1x 10	1x 10	1,85	0,12	150,38	24,67	0,02	2,84	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
28,71	40	1,68	1,66	0,37	0,37

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
	iID Tipo B-SI (4P)	40	6	1,50	N.D.	

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO 2F STANDARD POWER EXISTING SWITCHBOARD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{ma} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	4,81	4,81	4,81	4,81	0,89			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.1.4	3F+N+PE	multi	5	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	15,43	0,48	163,96	25,03	0,03	2,85	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
4,81	47,52	1,68	1,53	0,34	0,34

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	I_{dn} [A]	T_{dn} [ms]
to 2F Standard Power existing switchboard	iC60 N	4	C	25	25	-	0,25	0,25
Q1.1.4	4	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO 3F STANDARD POWER EXISTING SWITCHBOARD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{ma} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	4,81	4,81	4,81	4,81	0,89			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.1.5	3F+N+PE	multi	10	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	30,87	0,96	179,39	25,51	0,07	2,88	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
4,81	47,52	1,68	1,4	0,31	0,31

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	I_{dn} [A]	T_{dn} [ms]
to 3F Standard Power existing switchboard	iC60 N	4	C	25	25	-	0,25	0,25
Q1.1.5	4	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,9	1		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp}. [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.3	F+N+PE	uni	1	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	4,63	0,14	158,71 (1219,21)	25,05 (908,54)	0,06	3,01 (0,17)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	32	0,84 (0,16)	0,81 (0,16)	0,35 (0,13)	0,35 (0,13)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
interlocked industrial socket UPS power line 1	iC60 N	2	B	16	16	-	0,08	0,08
Q3.1.3	2	-	-	-	Vigi	A	0,03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: RESERVE UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 1	iC60 N	2	B	16	16	-	0,08	0,08
Q3.1.4	2	-	-	-	Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: TO DSB-2F UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.5	F+N+PE	multi	5	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	15,43	0,48	169,51 (1230,01)	25,39 (908,87)	0,21	3,16 (0,32)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	55,44	0,84 (0,16)	0,76 (0,16)	0,33 (0,13)	0,33 (0,13)

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
to DSB-2F UPS power line 1	iC60 N	2	B	25	25	-	0,12	0,12
Q3.1.5	2	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: TO DSB-3F UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.6	F+N+PE	multi	10	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	30,87	0,96	184,95 (1245,44)	25,86 (909,35)	0,43	3,38 (0,54)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	55,44	0,84 (0,16)	0,69 (0,16)	0,3 (0,12)	0,3 (0,12)

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
to DSB-3F UPS power line 1	iC60 N	2	B	25	25	-	0,12	0,12
Q3.1.6	2	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: PANEL MAIN SWITCH UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mn} [A]	I_n [A]	I_s [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89		1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	32	4	N.D.	N.D.	5,5

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mn} [A]	I_n [A]	I_s [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,9	1		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp} [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L4.1.3	F+N+PE	uni	2	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	9,26	0,29	178,77 (1239,27)	25,67 (909,16)	0,12	3,29 (0,45)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	32	0,76 (0,16)	0,72 (0,16)	0,31 (0,13)	0,31 (0,13)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_a [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cs} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [xI$_n$ - A]	T_g [s]	Residual current device	Class	I_{dn} [A]	T_d/n [ms]
interlocked industrial socket UPS power line 1	iC60 N	2	B	16	16	-	0,08	0,08
Q4.1.3	2	-	-	-	Vigi	A	0,03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 1	iC60 N	2	B	10	10	-	0,05	0,05
Q4.1.4	2	-	-	-	Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 1	iC60 N	2	B	16	16	-	0.08	0,08
Q4.1.5	2	-	-	-	Vigi	A	0.03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-3F] THIRD-FLOOR DISTRIBUTION SWITCHBOARD
LINE: PANEL MAIN SWITCH UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mn} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89		1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	32	4	N.D.	N.D.	5,5

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-3F] THIRD-FLOOR DISTRIBUTION SWITCHBOARD
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mn} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,9	1		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L5.1.3	F+N+PE	uni	2	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	9,26	0,29	194,21 (1254,7)	26,15 (909,63)	0,12	3,51 (0,67)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	32	0,69 (0,16)	0,66 (0,16)	0,29 (0,12)	0,29 (0,12)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{ac} [kA]
Initialling/ Description	T_{ad} [s]	I_i [kA]	I_g [xI$_n$ - A]	T_g [s]	Residual current device	Class	I_{dn} [A]	T_{dn} [ms]
interlocked industrial socket UPS power line 1	iC60 N	2	B	16	16	-	0,08	0,08
Q5.1.3	2	-	-	-	Vigi	A	0,03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-3F] THIRD-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{im} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 1	iC60 N	2	B	10	10	-	0,05	0,05
Q5.1.4	2	-	-	-	Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-3F] THIRD-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 1

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{im} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 1	iC60 N	2	B	16	16	-	0.08	0,08
Q5.1.5	2	-	-	-	Vigi	A	0,03	inst.

FROM GENERATOR 2 TO BUILDING SIDE C

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [QE-SUBST] ELECTRICAL SWITCHBOARD IN MV/LV SUBSTATION

LINE: FROM GENERATOR 2 MAIN SWITCH C2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
25,69	37,99	37,99	37,99	37,99	0,97		1	

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp}. [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1	3F+N+PE	multi	1	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 16	1x 16	1x 16	1,16	0,08	9,63	14,75	0,02	0,02	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
37,99	88	15	14,42	10,56	10,56

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cs} [kA]
Initialling/ Description	T_{ed} [s]	I_t [kA]	I_s [xI_n - A]	T_s [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
from generator 2 main switch C2	iC60 L	4	C	40	40	-	0,4	0,4
Q1	4	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	-	-	-

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [QE-SUBST] ELECTRICAL SWITCHBOARD IN MV/LV SUBSTATION

LINE: TO UPS-DSB FIRST FLOOR SIDE C

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
25,69	37,99	37,99	37,99	37,99	0,97			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp}. [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L0.1.1	3F+N+PE	multi	120	61			1,0	0,8	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 16	1x 16	1x 16	138,9	9,8	148,53	24,55	2,79	2,81	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
37,99	61,2	14,42	1,68	0,37	0,37

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	NO

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: PANEL MAIN SWITCH

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
25,69	37,99	37,99	37,99	37,99	0,97		1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	40	6	N.D.	1,50	25

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO THE UPS 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
19,69	28,71	28,71	28,71	28,71	0,99		1	

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cs} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [$x I_n$ - A]	T_g [s]	Residual current device	Class	I_{dn} [A]	T_d n [ms]
to the UPS 2	iC60 N	4	C	32	32	-	0,32	0,32
Q1.1.3	4	-	-	-				

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: B-TYPE RCD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
19,69	28,71	28,71	28,71	28,71	0,99			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp} [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.2.1	3F+N+PE	uni	1	03	30			-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 10	1x 10	1x 10	1,85	0,12	150,38	24,67	0,02	2,84	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
28,71	40	1,68	1,66	0,37	0,37

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
	iID Tipo B-SI (4P)	40	6	1,50	N.D.	

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO 2F STANDARD POWER EXISTING SWITCHBOARD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	4,81	4,81	4,81	4,81	0,89			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.1.4	3F+N+PE	multi	5	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	15,43	0,48	163,96	25,03	0,03	2,85	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
4,81	47,52	1,68	1,53	0,34	0,34

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{rd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	I_{dn} [A]	T_{dn} [ms]
to 2F Standard Power existing switchboard	iC60 N	4	C	25	25	-	0,25	0,25
Q1.1.4	4	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [UPS-DSB] UPS SWITCHBOARD
LINE: TO 3F STANDARD POWER EXISTING SWITCHBOARD

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	4,81	4,81	4,81	4,81	0,89			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L1.1.5	3F+N+PE	multi	10	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	30,87	0,96	179,39	25,51	0,07	2,88	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
4,81	47,52	1,68	1,4	0,31	0,31

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{rd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	I_{dn} [A]	T_{dn} [ms]
to 3F Standard Power existing switchboard	iC60 N	4	C	25	25	-	0,25	0,25
Q1.1.5	4	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_n [A]	I_s [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,9	1		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp} [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.3	F+N+PE	uni	1	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	4,63	0,14	158,71 (1219,21)	25,05 (908,54)	0,06	3,01 (0,17)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	32	0,84 (0,16)	0,81 (0,16)	0,35 (0,13)	0,35 (0,13)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics		I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]		Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
interlocked industrial socket UPS power line 2	iC60 N	2	B	16		16	-	0,08	0,08
Q3.1.3	2	-	-	-		Vigi	A	0,03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: RESERVE UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_n [A]	I_s [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics		I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cc} [kA]
Initialling/ Description	T_{cc} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]		Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 2	iC60 N	2	B	16		16	-	0,08	0,08
Q3.1.4	2	-	-	-		Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: TO DSB-2F UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.5	F+N+PE	multi	5	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	15,43	0,48	169,51 (1230,01)	25,39 (908,87)	0,21	3,16 (0,32)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	55,44	0,84 (0,16)	0,76 (0,16)	0,33 (0,13)	0,33 (0,13)

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{sd} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	I_{dn} [A]	T_{dn} [ms]
to DSB-2F UPS power line 2	iC60 N	2	B	25	25	-	0,12	0,12
Q3.1.5	2	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-UPS RETURN] UPS RETURN DISTRIBUTION PANEL
LINE: TO DSB-3F UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{nm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89			

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L3.1.6	F+N+PE	multi	10	13	30	1		-	side by side	1	1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 6	1x 6	1x 6	30,87	0,96	184,95 (1245,44)	25,86 (909,35)	0,43	3,38 (0,54)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	55,44	0,84 (0,16)	0,69 (0,16)	0,3 (0,12)	0,3 (0,12)

Designation
FG16OM16-0,6/1 kV - Cca-s1b,d1,a1/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{sd} [kA]
Initialling/ Description	T_{sd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	I_{dn} [A]	T_{dn} [ms]
to DSB-3F UPS power line 2	iC60 N	2	B	25	25	-	0,12	0,12
Q3.1.6	2	-	-	-				

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: PANEL MAIN SWITCH UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89		1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	32	4	N.D.	N.D.	5,5

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,9	1		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	T_{amp} [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L4.1.3	F+N+PE	uni	2	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	9,26	0,29	178,77 (1239,27)	25,67 (909,16)	0,12	3,29 (0,45)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	32	0,76 (0,16)	0,72 (0,16)	0,31 (0,13)	0,31 (0,13)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_a [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{rd} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	I_{gn} [A]	$T_g\eta$ [ms]
interlocked industrial socket UPS power line 2	iC60 N	2	B	16	16	-	0,08	0,08
Q4.1.3	2	-	-	-	Vigi	A	0,03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{cu} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 2	iC60 N	2	B	10	10	-	0,05	0,05
Q4.1.4	2	-	-	-	Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-2F] SECOND-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ $_b$	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{cu} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 2	iC60 N	2	B	16	16	-	0,08	0,08
Q4.1.5	2	-	-	-	Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-3F] THIRD-FLOOR DISTRIBUTION SWITCHBOARD
LINE: PANEL MAIN SWITCH UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_n [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,89		1	

SWITCH-DISCONNECTOR

Initialling/ Description	Type	I_n [A]	U_{imp} [kV]	I_{cm} [kA peak]	I_{cw} [kA rms]	Upstream circuit-breaker protection [kA]
S1	iSW	32	4	N.D.	N.D.	5,5

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-3F] THIRD-FLOOR DISTRIBUTION SWITCHBOARD
LINE: INTERLOCKED INDUSTRIAL SOCKET UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{rm} [A]	I_n [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
3	14,43	14,43	0	0	0,9	1		

CABLE

Initialling	Ph/N/PE Distribution	Cable type	Lenght [m]	Inst. method	$T_{amp.}$ [°C]	Nr. supp.	Resis.ty [°K m/W]	Installation depht [m]	Prox. circuit	Other circuits	K
L5.1.3	F+N+PE	uni	2	03	30			-	side by side		1

Conductors cross-section [mm²] phase	neutral	PE	R_{cable} [mΩ]	X_{cable} [mΩ]	R_{tot} [mΩ]	X_{tot} [mΩ]	ΔV_{cable} [%]	ΔV_{tot} [%]	$\Delta V_{max\ (limit)}$ [%]
1x 4	1x 4	1x 4	9,26	0,29	194,21 (1254,7)	26,15 (909,63)	0,12	3,51 (0,67)	4

I_b [A]	I_z [A]	$I_{cc\ max\ (start\ of\ line)}$ [kA]	$I_{cc\ max\ (end\ of\ line)}$ [kA]	$I_{cc\ min\ (end\ of\ line)}$ [kA]	$I_{cc\ (ground\ fault)}$ [kA]
14,43	32	0,69 (0,16)	0,66 (0,16)	0,29 (0,12)	0,29 (0,12)

Designation
FS17-450/750 V - Cca-s3,d1,a3/Cu

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_{cn} [kA]	I_{cu} [kA]
Initialling/ Description	T_{rel} [s]	I_i [kA]	I_g [xI_n - A]	T_g [s]	Residual current device	Class	I_{dn} [A]	T_{dn} [ms]
interlocked industrial socket UPS power line 2	iC60 N	2	B	16	16	-	0.08	0,08
Q5.1.3	2	-	-	-	Vigi	A	0.03	inst.

PROTECTIONS VERIFICATIONS

Overload	Maximum short-circuit	Minimum short-circuit	Indirect contact
SI	SI	SI	SI

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-3F] THIRD-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mb} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{cu} [s]	I_i [kA]	I_a [xI_n - A]	T_a [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 2	iC60 N	2	B	10	10	-	0,05	0,05
Q5.1.4	2	-	-	-	Vigi	A	0,03	inst.

CALCULATIONS AND VERIFICATIONS

DISTRIBUTION BOARD: [DSB-3F] THIRD-FLOOR DISTRIBUTION SWITCHBOARD
LINE: RESERVE UPS POWER LINE 2

GENERAL FEATURES OF THE LINE

P [kW]	I_b [A]/I_{mb} [A]	I_R [A]	I_S [A]	I_T [A]	cos φ_b	$K_{utilization}$	$K_{diversity}$	η
0	0	0	0	0				

CIRCUIT-BREAKER

User	Circuit-breaker	Poles	Tripping characteristics	I_n [A]	I_r [A]	T_r [s]	I_m [kA]	I_{cu} [kA]
Initialling/ Description	T_{cu} [s]	I_i [kA]	I_a [xI_n - A]	T_a [s]	Residual current device	Class	$I_{\Delta}n$ [A]	$T_{\Delta}n$ [ms]
reserve UPS power line 2	iC60 N	2	B	16	16	-	0.08	0,08
Q5.1.5	2	-	-	-	Vigi	A	0.03	inst.

CITY OF ROME

NATO Defense College
via Giorgio Pelosi, 1 - ROMA

Committente:

NATO Defense College

TAV. N.

1

backup power backbone lines general layout

SCALE

-

DATE: 18/11/2025

legenda simboli - symbol legend

Quadro di distribuzione
Distribution panel (switchboard)

Cavo multipolare – linea del secondo gruppo elettrogeno
Multicore cable from Generator 2

Cavo multipolare – linea del primogruppo elettrogeno
Multicore cable from Generator 1

Linea passante al piano interrato
Electrical line passing through basement

Descending electrical line

Rising electrical line

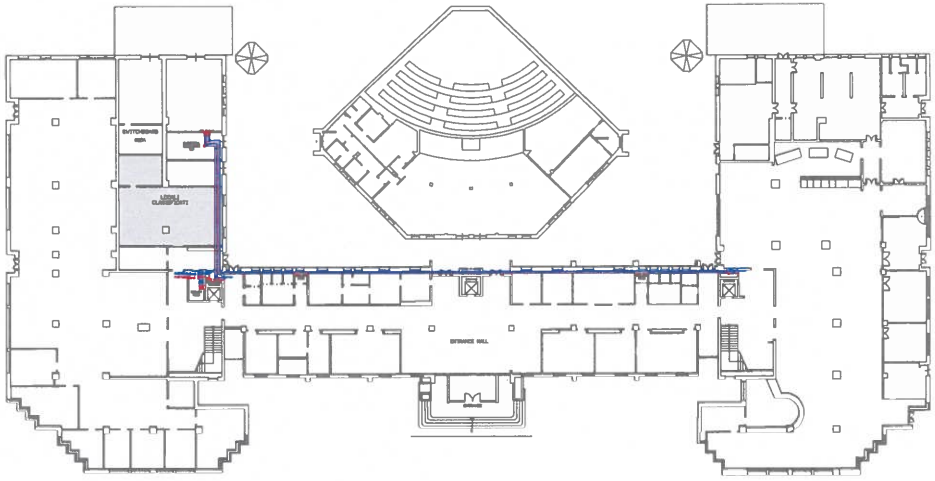
Presa industriale interbloccata protetta con fusibili
Fuse-protected interlocked industrial socket

UPS = Uninterruptible Power Supply

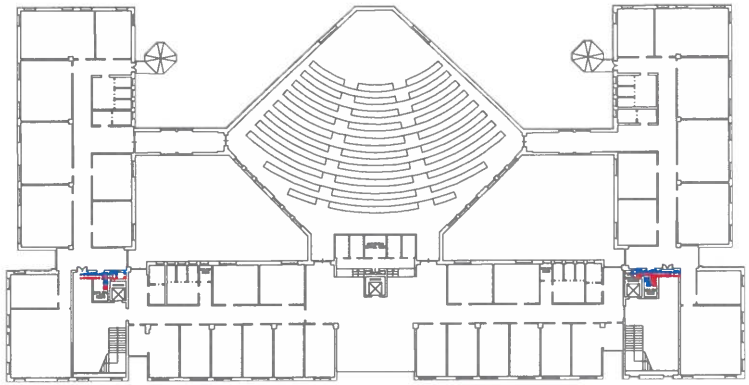
Distribution switchboard nomenclature:

Ing. Fulfaro Bianchi Luciano
ENGINEERING

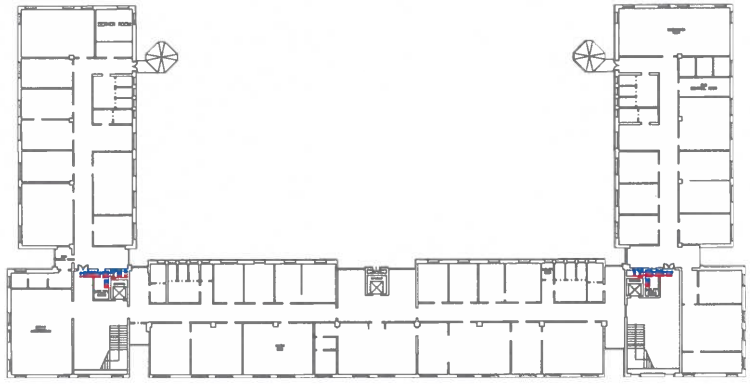
PIANTA PIANO TERRA - GROUND FLOOR PLAN



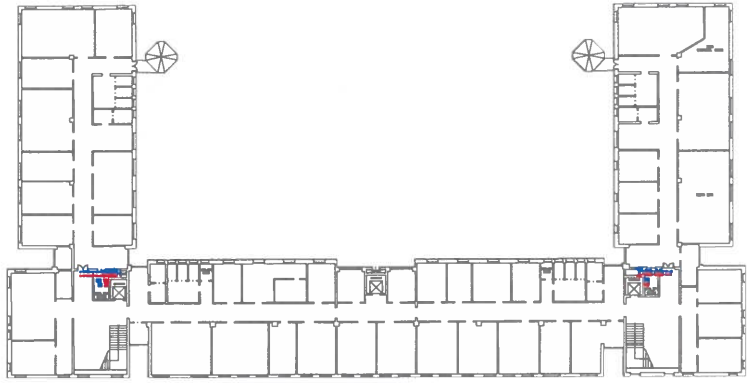
PIANTA PRIMO PIANO - FIRST FLOOR PLAN



PIANTA SECONDO PIANO - SECOND FLOOR PLAN



PIANTA TERZO PIANO - THIRD FLOOR PLAN



N.B.: la presente planimetria ha valore puramente descrittivo dell'ubicazione dei componenti dell'impianto elettrico: non è in scala e non ha alcuna valenza urbanistica.
Please note: this floor plan is intended solely to illustrate the location of the electrical system components. It is not to scale and holds no legal or urban planning validity.

ANNEX C

BID INSTRUCTIONS FOR SUBMITTING OFFERS

The bidders must comply with the following **formal conditions**:

1. The offers must be submitted in English only.
2. Offers must be sent by two different emails addressed to competitive.bidding@ndc.nato.int:
   a. **One email containing** the SELF DECLARATION AND ACCEPTANCE OF CONDITIONS (Annex E) and relevant documentation to be provided in support.
   b. **One email containing** the ECONOMICAL OFFER FORM (Annex D). Prices quoted shall be in Euros using two decimal numbers. The price offer **shall be valid until 31st January 2027**. Please be advised that the NATO Defense College is exempt from all duties and taxes (including VAT) on expenditures, in accordance with DPR 633/72 art. 72 - 1.b and its subsequent amendments.
   c. The inner emails **shall clearly indicate whether it is the Technical or Economical proposals** and should also indicate the reference code of the Tender procedure.
   d. Each document shall be submitted in **PDF format**. No other file formats shall be accepted. The SELF DECLARATION AND ACCEPTANCE OF CONDITIONS (Annex E) and the ECONOMICAL OFFER FORM (Annex D) **shall be also digitally signed**.
   e. All technical and administrative documents shall be included **in a single password-protected ZIP archive**. No other archive formats shall be accepted, including RAR, 7z or equivalent formats.
   f. The e-mail containing the ZIP archives **shall not contain the password**.
3. Both emails must be submitted no later than Friday **04 September 2026, 15:30 Local Time**. The password for the technical archive shall be sent separately, the day after the submission deadline, that is on **05 September 2026, by 12:00 PM local time**. The password for the economical offer shall be sent separately **under request by the NDC, after the first meeting of the Contract Award Board**. Passwords received before the bid submission deadline may lead to rejection of the offer.

4. A bidder may correct **minor clerical or administrative errors** in its submission after the deadline for the receipt of bids/proposals, provided such corrections do not change the substance of the bid or proposal or affect pricing or competitive positioning. After the final deadline for the receipt of bids/proposals, a bidder **shall not be permitted to alter or supplement its bid or proposal in any way that would affect pricing, technical specifications, or other substantive elements**. All corrections shall be properly documented.
5. The technical and administrative documentation shall be opened first. The financial proposal **shall remain encrypted and shall only be opened after completion of the technical and administrative evaluation**.
6. Where information or documentation submitted by a vendor is or appears to be incomplete or erroneous or where specific documents are missing, the procurement authority may request the vendor concerned to complete or correct the relevant information or documentation within a specified timeframe, provided that such requests are made in full compliance with the principles of open and fair competition, non-discrimination and transparency.

FAILURE TO COMPLY WITH ONE OR MORE OF THE ABOVE INSTRUCTIONS MAY DEEM THE OFFER NON-COMPLIANT AND THE QUOTATION NOT ELIGIBLE FOR CONTRACT AWARD.

ANNEX D

ECONOMICAL OFFER FORM

DESCRIPTION	CURRENCY	OFFER (*)
Electrical Lines and ICT UPSes revision:		
1. Creation and installation of power lines from the main building to the CIS Warehouse and the vertical power lines for the ICT racks	**EURO**	**€**
2. Provision of 3 UPSes and additional equipment	**EURO**	**€**
3. Additional electrical work (Power line conditioner installation, Line controllers and monitors provision and the provision of a new electrical Line for the DR system)	**EURO**	**€**
GRAN TOTAL (1+2+3)	**EURO**	**€**

Place and date _____

Signature of the Legal Representative _____

The ECONOMICAL OFFER FORM (Annex D) **shall be also digitally signed**.

BID AWARD APPROACH
The bid will be award by "Best Price Approach" to the best **GRAN TOTAL** offer.

A copy, not authenticated, of the valid identity document of the subscriber is attached to this declaration

(*) ITALIAN SUPPLIERS: Prices are net of VAT because the NATO Defense College is exempt pursuant to art. 72-paragraph 1, letter b) of the D.P.R. 633 of 10/26/1972 and subsequent amendments.

INTERNATIONAL SUPPLIERS FROM NATO COUNTRIES: NATO Defense College is exempted from all Customs duties and quantitative restrictions on imports and exports in respect of articles imported or exported by the College for its official use, regardless of the amount. Under this provision, goods imported by the College for its official use are also exempt from VAT.

NATO Defense College
Collège de Défense de l'OTAN
Rome - Italy

ANNEX E

SELF DECLARATION

AND ACCEPTANCE OF CONDITIONS

(This document shall form an integral part of the

Purchase Order issued to the awarded supplier)

I undersigned, _____(name, title or position)

being duly authorized by: _____

Name of firm: _____

Address (Street and Nr.): _____

Town and Country: _____

1. Hereby certify that I have read and accepted all documents and conditions governing the invitation for bid, and specifically, the Standard Bidding and Contract Specifications as outlined in Annex A and **the Statement of Work (SoW) and *Modification project of the existing electrical system* as outlined in Annex B**.
2. **Specifically, hereby certify that the works will be carried out in accordance with the specifications of this project, applying all necessary measures during provision/installation/configuration to ensure that the works are carried out in accordance with good practice and all applicable regulations.**
3. Declare that the turnover achieved by _____ (Name of Firm) in Italy and in total over the years 2023, 2024 and 2025 as shown in the table below, is accurate and complete:

In €	2023	2024	2025
Turnover Italy			
Turnover other countries			
Total Turnover			

4. With reference to the subject of the present bid, declare that _____ (Name of Firm) has worked, with positive assessment, for the following customers/organizations during the last three years, as shown in the table below:

Year	Name of the Authority/Organization	Subject of the contract	Amount of the contract

5. Declare that that _____ (Name of Firm) has no outstanding debts, defaults, or overdue payments with the financial institutions, and that the following prime bank and/or financial company shall in case report on the quality of the relationships in place, such as the correctness and punctuality in fulfilling the commitments undertaken:

   Name of the Bank (or Financial Company): _____

   Full Address _____

   Email address _____

   Telephone Number _____

   Point of contact _____

6. I am aware that:
   - The Authority, without any warning and at any time, will be able to control all the self-declared information and the certificates provisioned, according to the referred legal operating framework.
   - The company I represent cannot – at any time and by any means – share, distribute or communicate on the information related to this Call for Tenders (and all technical documentation in support) with other entities unless authorized by NDC.
   - The Authority, through its own Security Officer, will be able to ask for the Security Clearance or other security documents according to the security legal framework.
   - **During the site survey, the company I represent has the opportunity to assess the status of the current power lines, the dimensioning of the power line conditioners units in terms of power capability and the dimensioning of the 2+1 UPSes in terms of power capacity.**
   - **The company I represent must provide NDC at the time of the signature of the contract, to ensure adequate performance of the work/service, a bank or insurance guarantee for a value not less than 20% of the contract amount including a waiver clause regarding preliminary prosecution of the main**

debtor. The guarantee must be enforceable at the first request from the NDC within a maximum period of 15 days and must include cover for a period of three months beyond the period of validity of the contract. The guarantee must include cover for a period of three months beyond the period of validity of the contract.

- **The work timeframe, including the contract awarding and its implementation, should not take more than two months.**
- **Before the handover and commissioning of the electrical installations or any part thereof, the company I represent must carry out a series of tests and inspections to verify the proper execution of the works. Additionally, at the end of the work, it must issue the Declaration of Conformity in accordance with D.M. 37/08, certifying that the entire installation complies with the current regulations, including the compliance of the switchboards with CEI EN 61439 standards.**
- **The risk of not meeting the deadlines or the delivery of a non-compliant or incomplete service, will result in a refusal of the deliverable and that, in the event of unsuccessful testing or negative product assessment, the delay and service degradation deriving from missing this milestone will add to the service handover time with subsequent corrective actions from the College.**

7. I agree that, in the event the company I represent will award a contract for supplying whole or part of the goods and/or services covered by this invitation for bid, the aforementioned conditions will be binding.
8. I communicate that the dedicated Point of Contact (POC) for the NDC, with full and reactive availability via phone and email and, where appropriate or needed, for meetings in VTC or in person, is _____.

A copy, not authenticated, of the following documents is attached to this declaration:

a) **A technical proposal** in accordance with the general guidelines listed in the SoW at Annex B detailing the plan for the 3 provisions of the project defined to ensure the project competition in two months along with the list of equipment when not already identified in NDC's guidelines. For the materials listed in the technical specifications, model and dimension in terms of power capacity of the requested

RIELLO UPSes and brand, model and power capability of the proposed power line conditioners units should be indicated. Any offer that includes equipment or technologies different from those expressly requested as Managed Power Strips will not be considered.

b) **Attestation of the survey access execution (Annex F).**

c) Because the firms *fit-for-purpose* skill is essential for this work **SOA OS30 or OG11 Attestation** is requested. However, declaration as for the art. 90 of the D.P.R. 207/2010 could be assessed by the CIS branch.

d) Certificate (or self-declaration) from **Social Security Authorities** to the effect that the bidder is up to date with the payment of social security contributions (*for Italian companies only: "Documento Unico Regolarita' Contributiva – DURC*").

e) Certificate (or self-declaration) from **Tax Authorities** to the effect that the bidder has met all his tax obligations in accordance with the legal provisions of the country in which he is registered (for Italian companies only: "Certificato unico debiti tributari").

f) Certificate from **the relevant Chamber of Commerce, Industry, Craft and Agriculture** or equivalent, dated not more than 6 months prior to the signing of the contract, giving the name, surname, place and date of birth of the persons authorized to enter into commitments, collect payments and issue receipts in the name of and on behalf of the company, and certifying that the company is free of any legal limitations on its rights, that is to say that it is not in receivership, or subject to deed of management or bankrupt proceedings, and that such situations have not occurred in the previous five years (or since the date of the company's establishment, if less than five years before).

g) Anti-mafia self-declaration (for Italian companies only).

h) If owned, Certificate/statement of conformity to the Quality Assurance System as per Directive UNI EN ISO 9001:2008 or subsequent upgrades, issued by an accredited certification body, for the specific sector concerned.

Place and date _____

Signature of the Legal Representative _____

The SELF DECLARATION AND ACCEPTANCE OF CONDITIONS (Annex E) **shall be also digitally signed**.

ANNEX F

CERTIFICATE OF ATTENDANCE

Mr/Mrs _____ born in _____

on _____ in his/her function as representative for the Company

_____ on _____ took part in

the mandatory survey access for the bid "**NR. 0054 FOR THE ELECTRICAL LINES AND ICT UPSES REVISION AT THE NATO DEFENSE COLLEGE (NDC), ROME - ITALY**"

as for invitation letter prot. NDC/0054 dated 11/08/2026.

Rome, _____

FOR THE NDC

_____

(signature)