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Name of building

ASU No.9 -USS Košice/SK

**Realization project**  
**Electricparts**

Documentation:

**PART H – CURRENT-LIMITING REACTORS**

Index:

**A5**

Annex No.

**02**Designed:  
Ing.KuchtaApproved:  
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**TECHNICAL REPORT**

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## 1. Subject and scope of project

### 1.1. Subject of Project

Subject of project is equipment of site reactors 6 kV in site area T80.

### 1.2. Scope of project

Scope of project is stepping of two reactors in the area of T80. Earthing wiring on the surface from reactors and steel structures is included.

### 1.3. Project doesn't deal with

Project doesn't deal with terminals 6k V and cables, which connect reactors and power distribution - they belong to part „K“.

## 2. List of used Abbreviation

L1	Reactor 6kV
T80	Building - substation 6 kV
T81	Substation 6 kV
MIS	Management information system
STN	Slovak Technical Norm

## 3. Regulations and Standards

The project documentation is processed according to regulations and STN standards in force at the time of this realization project elaboration.

There are particularly the following standards.

STN 33 3210	Distribution equipment
STN 33 2004-4-41	Electric system of buildings Section 4: Safety assurance Chapter 41: Protection against electric shock inquiry
STN 33 0300	Environment for electrical equipment.
STN 33 2000-5-54	Electric system of building Section 5: Selection and erection of electric equipment Chapter 54: Grounding system and protective conductors
STN 33 2000-3	Electric system of building Section 3: Assignment of basic features

## 4. Basic operating date

### 4.1. Description of electric equipment according to health hazard margin

The electric devices are designed according to reg. No. 718/2002 coll. MPSVaR SR, technical electric equipment group A, section b) technical equipment for transformation electric energy with input power over 250 kVA.

In terms of this reg. parag. 11, this equipment is a subject of a first official testing.

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3~ 50Hz 6 300V/IT

### 4.3. Protection against electric shock injury

4.3.1 During regular operation (active parts): it is specified by the constructional execution and set-up of active parts of electrical equipment.

According to STN 33 2000-4-41 standard, following protective measures solve the protection:

- positioning out of hand - national annex NC 2.3.- cables terminals, bus bar of reactor
- isolation of active parts art. 412.1,- cables 6kV

4.3.2 Protection in case of failure:/inactive parts/

- automatic disconnection of power supply in network IT according to art. 413.1,413.1.2,413.1.5 and national annex NC 3.3.

### 4.4. Signification grade of electrical energy supply

Signification grade of electrical energy supply is No. 1.

### 4.5. Methods of electric energy supply

Reactors L1 are connected with cable wiring from switchgear 6kV marked T80 from cabinet No. 6 and No. 13. These terminals are important for connection of switchgear T81. Switchgear T80 is solved in section „B“ of project ASU No. 9 and switchgear T81 is solved in section „C“ of project. Connection cabling is solved in section „K“ of project.

### 4.6. Short-circuit data

#### Switchgear T80 before the reactor

$I_{ks} = 32,4 \text{ kA}$  initial impulse short-circuit current

$I_{km} = 55 \text{ kA}$ .

parameters of reactor L1

Induction of reactor : 0,175 mH

impedance of reactor:  $X_L = \omega \cdot L = 2 \cdot \pi \cdot f \cdot L = 2 \cdot 3,14 \cdot 50 \cdot 0,175 \cdot 10^{-3} = 0,055 \Omega$

#### Short-circuit current beyond the reactor

short-circuit impedance of network 6,3 kV  $Z_S = (c \cdot U_n / \sqrt{3} \cdot I_{ks}) = (1,05 \cdot 6,3 \cdot 10^3 / \sqrt{3} \cdot 32,4 \cdot 10^3)$

$Z_S = 0,118 \Omega$

consequential short-circuit impedance  $Z_V = Z_S + X_L = 0,118 + 0,055$

$Z_V = 0,243 \Omega$

Initial Signification grade of electrical energy supply  $I_{ks} = c \cdot U_n / \sqrt{3} \cdot Z_V =$

$1,05 \cdot 6300 / \sqrt{3} \cdot 0,243$

$I_{ks} = 15,72 \text{ kA}$

### 4.7. Grounding

Grounding of reactors, bearing cable construction a cable terminals are connected to the grounding system, which are conducting to outdoor grounding system using bleeders.

The switchgear is in continuous service and network is regularly checked, there must not be contact voltage and step voltage more than 125V, resp.  $125/\sqrt{t} \text{ V}$  ( $t$  = cut off time).

#### Specification of cross-section on grounding system

$S = I_{ke} \cdot \omega \cdot \sqrt{t_k} / k$

$I_{ke}$  equivalent heated short-circuit current

$S = 33 \text{ 000} \cdot 0,7 \cdot \sqrt{0,2} / 58,5$

$\omega$  expectation coefficient 0,7

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$$S = 177 \text{ mm}^2$$

$t_k$  short-circuit time (protection time + cut-off time) 0,2  
 $k$  coefficient for Fe and final temperature  $200^\circ\text{C}$  je 58,5

Protective conductor used in site of reactor FeZn 2x30x4mm, is coated green/yellow.

#### 4.8. Specification of types of surroundings

Site of reactors is in separate room of object T80 according to standards STN 33 0300 year 1989

čl.3.1.1. –main- site of reactors L1

čl.3.1.2. - normal- cable premises

#### 4.9. Protection against overloading and shor-circuit

6,3 kv terminal to reactors L1 are protected overcurrent protections 7SJ61 fy Siemens, which are situated in switchgear T80 in cabinet No. 6 and No. 13.

#### 4.10. Metrological analyses

During testing and putting into operation it is necessary to use the measuring devices of category 2,5% at least.

#### 4.11. Safety and protection of health at work

##### *Requirements on qualification of personnel operating electric equipment*

Personnel operating electric devices must be acquainted with regulations relating to their work, eventually to be trained for the respective type of work.

About safety regulations during operation and work with electric equipment deal the following standards: STN 34 3100, STN 34 3101 and the set of standards STN 33 2000 (mod IEC 60364). The designed electric equipment can operate personnel who have, at least, specialized qualification and who were instructed in accordance with §20 of reg. No.718/2002 Coll. Personnel acquaintance, training, first aid, warning and examination of their knowledge must be verified by a memorandum that must sign the worker in charge and also the instructed personnel.

Personnel that will operate electric equipment must be informed about operation and function of equipment.

Operating personnel can only touch those parts that are designated for servicing. There must always be a free approach to the servicing parts. In case of the electric equipment damage or failure that could jeopardize safety or health of personnel, the person who such status identifies must make measures and provide prevention or reduction of risk of injury, fire or other risks.

##### *Requirements on qualification of personnel working with electric equipment*

Personnel working with electric devices must be acquainted with respective regulations. Working with electric equipments can only personnel with specialized skills in terms of §21 reg. No.718/2002 Coll. and with experience in terms of reg. No.718/2002 Coll., appendix No.11, art. d). The personnel must have finished specialized education and after

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their training they must take an exam in frame of the defined regulations. The company must provide examination of personnel at least once in tree years.

During inspection and work with EHV equipment as well as ELV equipment, equipment must be switched off, grounded and locked against a re-activation.

### *General requirements on safety and protection of health at work*

The general operating regulations in force must be extended with local operating instructions of equipment, to which they are supposed to serve. During operating and work with electric equipment must be provided following measurements:

- safety schemes,
- safety and auxiliary tools,
- technically-organizing measures: works on directive B, securing workplace,
- protection against accidents.

Electrical equipment must be kept in a state that complies with manufacturer of equipment regulations and with electro-technical standards.

Operation and maintenance of equipment must be aimed towards error-free operation and protection of health at work, and consists of following actions:

- regular examination and inspection of physical state of equipment,
- regular inspection of functionality of equipment,
- regular maintenance.

Content of documentation accompanying technical equipment must be in terms of reg. No.: 718/2000 Coll., appendix No.:3

## **5. Technical description**

It is necessary to catch on the strip supply of reactors the bus bar made of strip Ecu 80/10 mm for connecting of cables-see drasing V02-1240/2005/9738/H/06. Reactors serve for modification of short circuit in the case of fault of switchgear T81. One three pole set is made of three single phase reactors, which are put on themselves on the isolator. For the terminal from the cubicle No. 6 switchgear T80 are reactor situated in the room No. 07, for the terminal from the cubicle No. 13 switchgear T80 are reactors in the room No. 08. Reactors will be anchored to the floor by means of screws to metalic fasteners HILTI.

Reactors will be connected by single core cable cross section 400 mm<sup>2</sup>, there are four cables for each phase. Cables are solved in section „K“ of project Air Separation Unit No. 9.

The holes in the floor have to be done for the running of cables into the room No. 07 and 08, according to drawing V02-1240/2005/9738/H/05. Cables will be caught on the wall by means of terminals UKZ1/40-46.

In Trnava:

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