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Title

Instruction Manual

Turbogenerator
Commissioning Manual

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Turbogenerator Vilnius Biomass | EG000367

Commissioning Manual

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Commissioning Manual

Project name **Vilnius Biomass**

Generator type SGen5-100A-2P

Two-Pole Turbogenerator
with Directly Air-Cooled Rotor
and Indirectly Air-Cooled Stator Winding

Order no. 3000018595

Machine no. EG000367

Project ID FERT00574216

Siemens document no. DPSDES-00002589 en

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Original manual

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Safety Instructions

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1 General

This section contains the relevant information necessary for safe operation of a generator.

Although the generator is designed to state-of-the-art technology and complies with the applicable safety standards, hazards which could result in personal injury to the user or third parties and damage to the generator or other property cannot be ruled out completely.

Please read this section carefully and make sure that you comply with the instructions in order to safeguard against personal injury and damage to the generator.

Please note that the safety information in this section is general and applies to different types of generators. In the individual chapters of this document, you will find safety notes that must be obeyed absolutely, for your own safety, to protect other people and to avoid damage to property.

Apart from the safety instructions in this section observe all indications on safety in the supplier documentations included in this manual.

2 Warnings

The operating instructions use a range of key words and symbols to identify information which is of particular importance. The key words **Danger**, **Warning**, **Caution** and **Notice** give you a better idea of the significance of the warning notices:

⚠ DANGER — ... indicates an imminently hazardous situation which, if not avoided, **will** result in death or serious injury.

⚠ WARNING — ... indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.

⚠ CAUTION — ... indicates a potentially hazardous situation which, if not avoided, **may** result in minor or moderate injury.

NOTICE — ... indicates a potentially hazardous situation which, if not avoided, **may** result in property damage.

HINWEIS — Additionally, the signal word NOTE is used to identify any information relevant to ensure maximum generator efficiency.



Such kind of information can be complemented by the pictograph Information.

In order to emphasize the above mentioned warning notices, these are used together with pictographs. In this manual you will find the following hazard warning signs, mandatory signs and prohibition signs, which in each case are followed by an explanatory remark.

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Warning signs

A black graphical symbol inside a yellow triangle with a black triangular band defines a safety sign that indicates a hazard. For example:


General warning sign


Warning: Electricity

Prohibition signs

A black graphical symbol inside a red circular band with a red diagonal bar defines a safety sign that indicates that an action shall not be taken or shall be stopped.
For example:


General prohibition sign


No access

Mandatory signs

A white graphical symbol inside a blue circle defines a safety sign that indicates that an action shall be taken to avoid a hazard. For example:


General mandatory sign


Ear protection required

3 Proper Usage of the Generator

The function of a generator is to convert rotating mechanical energy to electrical energy. Alternatively generators are used as synchronous condensers.

To ensure normal and trouble-free operation of the generator, it is necessary to comply with the operating instructions as well as the inspection and maintenance intervals specified for the generator.

Siemens AG do not accept any liability for any damage which may occur as a result of use of the generator for any other purpose or noncompliance with the aforementioned operating instructions or inspection and maintenance intervals.

4 General Organization

The following instructions must be followed to ensure safe and reliable operation:

- Based on this technical documentation shift procedures must be prepared with additional information regarding responsibilities, work organization and workflows.

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- Any personnel working on the generator and its auxiliary systems must be familiarized with the operating instructions and shift procedures and in particular with the safety instructions and regulations before starting work. This particularly applies to personnel such as maintenance personnel who do not work on the generator on a regular basis.
- In addition to the operating instructions, the general legal provisions and other regulations for employment protection, the prevention of accidents and fire as well as the protection of the environment must be observed. The operator is responsible for the implantation and the correct adherence of the staff. Protective apparel and equipment must be used.
- Note safety data sheet when using hazardous material.
- Place signs at the entrance to the operating room of the generator according to the local legal and employment protection requirements. Every person who enters the operating room must wear personal protective equipment according to these local requirements and the requirements stated in this documentation.
- In case that equipment, protection systems or instrumentation and control components are damaged or defect, the generator must be handled as specified (shut down if necessary) and the supervisor must be informed. In some cases local authorities must be informed as well. The local authorities can conduct extraordinary examinations in an event of damage in some individual cases.
- It must be ensured that work on oil carrying systems and piping must be conducted after emptying. Switch off procedures must be strictly adhered. Special procedures for environmental and employment protection must also be considered.
- If work is done on several systems at the same time, it must be coordinated in a way to avoid mutual endangering.
- During start-up and synchronization of the generator only authorized staff with defined task is allowed to stay within the machine room.
- Only use suitable and faultless climbing equipment (e.g. ladders) for work in larger heights. Scaffolding can be necessary and further safeguards like anti-fall guard. Do not step on armatures, thermometers and the bearing.
- The use of pipes, cables, terminal boxes and fittings as a kick or hold is inadmissible. Parts get visible or invisible damages which may lead to a failure beside the danger of injury.
- The operating instructions must always be kept on hand.



NOTE

We recommend engaging the support and services of your local Siemens service center for all planning, installation, commissioning and maintenance work.

5 Personnel

With regard to personnel working on the generator, compliance must be ensured with the following:

- Work on the generator and its auxiliary systems is to be performed by authorized personnel only. Activities and associated responsibilities are to be clearly defined for the personnel.

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- Staff must be trained on the basis of the manufacturer technical documentation. They must be physically and mentally suitable for the tasks and must have the required expertise. Staff must be able to carry out maintenance measures independently and to take decisions in the case of disturbances or deviations from the stated operation condition independently. Depending on local regulations it can be required that these people have a certification from special trainings.
- Personnel requiring or undergoing training must only be allowed to perform work on the generator or its auxiliary systems under the constant supervision of an appropriately qualified member of staff.
- Work on the electrical systems of the generator may only be performed by electrical engineers or by suitably qualified personnel under the supervision of an electrical engineer in compliance with the relevant electrical engineering standards.
- The staff has to avoid dangers or reduce them as far as possible. This also contains the self-control of completed work. In addition, it has to be checked before work execution whether all necessary safety measures are taken.
- The operator's position during operation of the generator is the control room. Abidance near the generator is only permitted for inspection and attendance purposes which are required for the operation.

6 Lifting and Working Posture

When working on the generator make sure to comply with the local rules regarding lifting and working posture. All work shall be planned in order to be executed in a safe and healthy manor.

Lifting that can be a risk to health and safety shall be avoided. The usage of lifting equipment should be preferred for all lifting workings at the generator. This applies to all generator equipment such as filters, manhole covers etc. Observe the local requirements regarding the recommended lifting weight and carrying distance.

7 Modifications to Generator

Do not carry out any modifications to the generator or perform any other work on the generator which might impair safety. Any changes must be approved by Siemens AG prior to their implementation.

8 Spare Parts and Special Tools

Spare parts and special tools must comply with the technical standards set forth by Siemens and other suppliers. Compliance with the aforementioned standards is only ensured if original parts and tools are used. Special tools should only be used as intended by Siemens or the supplier.

Spare parts and special tools must be stored in a way to ensure quality and functionality. Further requirements from the supplier documentations must be fulfilled including the guarantee conditions. The spare parts and special tools should be checked at regular intervals.

Do not remove any blocks, braces, anchors and/or cushions used during shipment until just before erection or installation of spare parts.

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9 Environment Protection and Waste Disposal

Waste products of any kind (e.g. lubricants) must be disposed of in compliance with the applicable waste disposal regulations. An environmentally friendly disposal (recycling e.g.) has to be striven.

For the de-installation and professional disposal of the generator experts of Siemens AG have to be contacted.

10 Safety Instructions Regarding Special Operating Phases

10.1 Shipment, Transport and Storage

The following safety instructions apply during generator shipment, transport and storage:



⚠ WARNING

Suspended load

Falling loads may cause injury to persons.

- Keep safe distance. Place barriers if necessary.
- Only use specified load attachment points. Only use suitable lifting equipment. The lifting equipment must be in good condition and have a sufficient load carrying capacity.

- Refer to the shipping documents for information about the dimensions and weights of generator components.
- For transportation of heavy machine parts in buildings a sufficient load-capacity of the building has to be guaranteed along the complete transport route as well as at the operation or stock location.
- Prevent generator rotor from rope-induced damage by using suitable cushions at load attachment points. Hitch ropes to fully extracted bollards only. Insert and lock bollards during transport.
- Carefully check components for evidence of damage, moisture and corrosion on arrival. Notify manufacturer in written and photo documentation of any damage.
- If transport locks must be removed for the purpose of control of the components, these guards must be reattached and removed just before installation of the components.
- Adhere to all measures for protection during transport described in this manual.
- Take appropriate measures to protect and preserve the generator at standstill. Observe the storage instructions in this manual.
- Fill in the generator packing checklist for long time storage, if necessary. Storage goods must be checked monthly.

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10.2 Erection

The following safety instructions apply during generator erection:



⚠ CAUTION

Crushing hazard

These may cause injury to persons.

- Installation, raising, transporting of heavy objects only with the help of hoists.

- Before erection remove protective coating and any other protective material from components using a suitable cleaning agent. Observe environmental regulations.
- Check the generator for foreign objects. Even minimal-size metallic particles left inside after work on the generator can lead to large-scale damage during generator operation.
- If it is necessary to open parts of the system the openings must be covered. The used covers must be sufficiently exact and stable to prevent a contamination with foreign material.
- Use only suitable lubrication and seal material for the respective purpose. They must comply with the later operation conditions.

10.3 Start-up

The following safety instructions apply during generator start-up:



⚠ WARNING

Rotating components

These may cause injury to persons.

- Before commencing with generator start-up ensure that personnel are not exposed to any hazards. The start-up sequence must be adhered.

- All mechanical and hydraulic components as well as the generator protection system must be checked with regard to function and settings.
- Before start-up/ re-commissioning all components must be checked for safety and for recognizable defects. Defective parts and systems must be repaired before start-up.
- Obligatory documentation requirement: Prepare start-up record. Record all operating data after allowing sufficient time for steady-state conditions to be established.

10.4 Operation

The following safety instructions apply during generator operation:



⚠ CAUTION

Hot surface.

Parts of the generator can be very hot and may cause serious burns.

- Do not touch.

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⚠ CAUTION

Operating noise of generator may damage hearing.

- Wear ear plugs when staying next to the operating generator.

- Any irregular events which occur during operation must be reported directly, and the generator shut down if necessary.
- In the event of loss of control voltage the generator must be shut down immediately.
- Only qualified staff with a specified work order should stay near the running generator.
- Obligatory documentation requirement: Record requisite checks during generator operation.

10.5 Maintenance in Operation

The following safety instructions apply during generator maintenance in operation:



⚠ WARNING

Rotating components

These may cause injury to persons.

- Ensure compliance with the scope of work set forth in the maintenance instructions.
- Do not remove any safeguard during operation.

- Operating personnel must be notified before starting any maintenance work. Appoint a suitably qualified supervisor.
- Empty pockets before starting maintenance work. Deposit jewelry and other metal objects. Record all tools used in a list and check that tools have been completely removed from generator when finishing work.

10.6 Maintenance at Standstill

The following safety instructions apply during generator maintenance at standstill:



⚠ WARNING

Danger of serious injuries and substantial material damage.

- The machine must be electrically disconnected.
- Identify all additional dangerous sources of energy e.g. compressed air, hydraulic systems, water.
- The machine must be secured against being switched on accidentally.
- A notice must be attached in the control room that work is in progress.

- Parts which are undergoing inspection or repair activities must be de-energized. Disconnected parts must be checked for voltage, grounded and short-circuiting. Neighboring energized parts must be isolated and covered.
- It must be ensured that the generator cannot be switched on if somebody is working on it. It has to be made sure that no one stays in an area where it could come to injuries during start-up process.

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- The removal of safeguards must be avoided. It is only allowed when it is required for the work and does not endanger the staff. Removed safeguards must be re installed and checked just after the work task.
- Switch pressurized systems off before starting to work on it. Take care of ram pressures. Solving screw connections carefully.
- Disconnect cable connections to electrical devices and ground terminals before lifting any cover. Remove electrical devices before dismantling components.
- Check the generator for foreign objects. Even minimal-size metallic particles left inside after work on the generator can lead to large-scale damage during generator operation.

10.7 Shutdown

The following safety instructions apply during generator shutdown:



⚠ WARNING

Rotating components

These may cause severe injury to persons.

- Ensure that rotor has coasted down.
- Do not remove any guards until generator has come to a full standstill.

- Obligatory documentation requirement: Record requisite checks during and following generator shutdown.

11 Special Hazards

11.1 Electric Current

Ensure compliance with the following instructions:



⚠ DANGER

Electrical hazard

Touching electrical equipment during operation can result in damage to property, serious injury and even death.

- Do not remove any safeguards or open cabinets during operation.

- Work on the electrical systems of the generator may only be performed by electrical engineers or by suitably qualified personnel under the supervision of an electrical engineer in compliance with the relevant electrical engineering standards.
- Local requirements regarding work on electrical installations must be strictly adhered to.
- For all work on electrical installations observe the five safety rules:

  1 Disconnect from the mains

  2 Secure against reconnection

  3 Verify that the system is dead

  4 Carry out earthing and short circuiting

  5 Provide protection from adjacent live parts.

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- During operation very high voltages occur, which can remain in existence for long periods of time even after switching off due to remanence or discharge of capacitors. As long as the generator is still rotating it carries a dangerous voltage. Do not touch the equipment before all 5 rules are fulfilled.
- Regularly check the electrical equipment, grounding system and isolation levels. Immediately repair any defects.

11.2 Electromagnetic Fields



⚠ WARNING

Electromagnetic fields are generated during the operation of the generator.

Electromagnetic fields can interfere with electronic devices. This could lead to malfunction of such devices.

- Therefore persons with active medical implants must not enter these areas.

- The system operator must put appropriate measures, markings and warnings into effect so that the personnel working there are sufficiently protected against possible injury. Also observe the local requirements.

11.3 Heat



⚠ WARNING

Hot surface

Parts of the generator can be very hot and may cause serious burns.

- Do not touch.

- The surface of oil lines, covers etc. become hot during operation.
- The surface of anti-condensation heaters switched on automatically during standstill becomes hot.

11.4 Noise



⚠ CAUTION

Operating noise of generator may damage hearing.

- Wear ear plugs when staying next to the operating generator.

- The generator may produce noise levels of approx. 90 dB(A) depending on model and type. In the long term such noise levels may result in damage to hearing.

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2.0. General System Check

2.1. Purpose

The purpose of this engineering procedure is to provide a compilation of information and suggestions regarding system checks performed in the course of commissioning fossil-fuel power plants.

2.2. Scope of Applicabaility

This engineering procedure is valid as of the most recent date of signature for release upon distribution, and applies:

- to fossil-fuel power plant projects executed in Germany and abroad
- for all organizational units of the Energy Sector Group of Siemens AG concerned with project commissioning as well as subcontractors and consortim partners.

2.3. Actions, Procedures

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A system check comprises inspection of the of the system for completeness and correct positioning of installed components in accordance with the system flow diagram. It serves to verify that functionality of the individual components is ensured within the given system arrangement.

The folling listing of parameters which must be considered in system checks does not constitute a complete list of all relevant factors. The scope of respective system checks depends on the given requirements of the system under check.

2.4. Pipework

- Nominal diameter
- Correct slope
- Correct arrangement and sufficient number of drains, vents and air intakes
- Completeness and correct adjustment of supports, hangers and anchor points
- Free thermal expansion. Are the anchor points arranged at the correct locations ? Can the pipe move into the correct direction?
- Checks of flange connections (align,ent, bolt connections)

2.5. Tanks, heat exchangers

- Checks of nameplate, comparison with design data
- Anchoring ans support of pressure vessel, heat exchanger
- Free expansion given temperature fluctuations
- Drains, vents and air intakes
- Arrangement of measuring points
- Cleanliness and completeness of internals and mountad parts

- Internal cleanliness of heat exchangers
- Check of flow directions (correct installation of inlet and outlet piping)
- Check of vessel/tank protective systems to ensure sufficient degree of protection

2.6. Valves

- Identification Label
- Flow direction and mounting position
- Safety device against unauthorized operation for hand operated valves
- Operability, accessibility
- Possibility of dismantling internals for repairs / maintenance

2.7. Pumps

- Arrangement and anchoring of component on the foundation
- Check the alignment
- Tension-free connection of suction and discharge lines
- Installation complete
- Inspection of electrical connections

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2.8. Measuring Points (as per Instrument List in Wiring Diagram , Chapter 8.0)

- Completeness of installation of all transmitters, including electrical connections
- Correctness of installed measuring instruments
- Location and position of measuring points in accordance to wiring diagram
- Accessibility of measuring points

2.9. Information

The performance of system checks is verified for the correponding commissioning step by the responsible commissioning engineer by initialling the system in question.

Nonconformances detected in the course of system checks will be registered in the computer-generated LoP, compiled in printouts according to areas of competence and forwarded to the appropriate department responsible clarification (erection, engineering dept.). Status of clarification of such items must be continuously tracked. Points which have been clarified are marked as such by entering the date of final clarification in the Lop.

3.0. Commissioning generator

3.1. Conditions for commencing start up activities

The generator and the auxiliary plant units should be installed according to the assembly guide and almost completed. All the essential setting and testing work within the scope of the assembly is completed and fully documented. This documentation is to be submitted to the installation personnel for checking. Nonconformances with standards or the assembly guidelines supplied by the manufacturer are to be indicated to the installation personnel. Continuous performance of the installation work without lengthy interruptions is the basis of the installation guidelines detailed below. Should lengthy interruptions be unavoidable, then, after the interruptions are over, a check must be made to see whether the individual measures already performed still correspond to the conditions required for starting the generator. Examples of this are the measurements of the insulating resistance, checking the oil circulation etc.

3.2. Electrical measurements, visual Inspections and functional tests before start up

- Visual check of generator and cabinet positions, regarding completion, screwed connections, cover plates, and the installation of all grounding/earthing strips, etc.
- Measurement of insulation resistance values at the generator's stator and rotor windings.
- Adjusting the distance of the shaft-vibration sensors at both generator bearings

3.3. Stator winding

3.3.1 Insulation resistance tests

The resistance of the winding insulation of each conductor is measured against ground, and against the other conductors of the stator winding, preferably with 5.000 V DC.
The measuring instrument is attached between a conductor and a ground point on the stator.
The other two winding conductors and the fitted winding temperature sensors are connected to a ground point on the stator. Readings are taken after 30 and 60 seconds.
All three conductors are measured in this way and the insulating strengths are logged in the report. The insulation resistances of the conductors are then measured among each other, and also logged in the report. With this measuring arrangement, readings are taken in each case after 60 seconds.
After assembling all current leads and the neutral point, we recommend repeating the measurements on the entire winding and the bus bars up to the circuit isolator or circuit breaker against a suitable ground point. These measurements are to be agreed with the start-up engineer or the operating personnel of the switching station. The switching station is to be regarded as live for these measurements and it must be secured appropriately.

Note:
The winding must be discharged after the relevant measurements have been completed.

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Turbogenerators
Prüfprotokoll
Turbogenerators
Test Record

Generator stator insulation resistance test

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:5.0-1001-0001** Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Insulation Resistance Measurement on Stator Winding

Slot temperature _____ °C/F Aplied Voltage _____ kV

Testing Time	Total Winding	Phase U	Phase V	Phase W	U - V	U - W	V - W
	Insulation Resistance MΩ	Insulation Resistance MΩ	Insulation Resistance MΩ	Insulation Resistance MΩ	Insulation Resistance MΩ (60 sec)	Insulation Resistance MΩ (60 sec)	Insulation Resistance MΩ (60 sec)
30 sec							
1 min							
10 min							
PI							

Measuring Instrument

Measurement of Total Winding

corrected to 40 °C/104 F: $R_{1\ ,40}$ = MΩ
corrected to 40 °C/104 F: $R_{10,40}$ = MΩ

Measerument Phase U

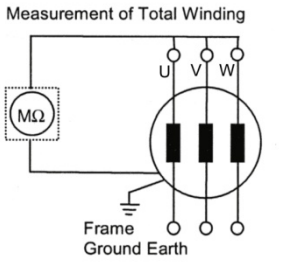
corrected to 40 °C/104 F: $R_{1\ ,40}$ = MΩ
corrected to 40 °C/104 F: $R_{10,40}$ = MΩ

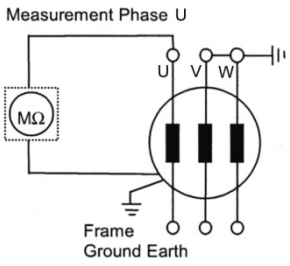
Measurement Phase V

corrected to 40 °C/104 F: $R_{1\ ,40}$ = MΩ
corrected to 40 °C/104 F: $R_{10,40}$ = MΩ

Measurement Phase W

corrected to 40 °C/104 F: $R_{1\ ,40}$ = MΩ
corrected to 40 °C/104 F: $R_{10,40}$ = MΩ





Comments

Time of Test:
Date of Test:

Tested by:
Witnessed by:

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During manufacture and transport the insulation of the stator winding may have been exposed to moisture which would reduce the insulation resistance of the windings. The insulation resistance should therefore be measured prior to initial startup, after prolonged shutdowns and after work on the windings. If required, the generator should be dried until a sufficient insulation resistance is obtained.

Required Insulation Resistance of Stator Winding

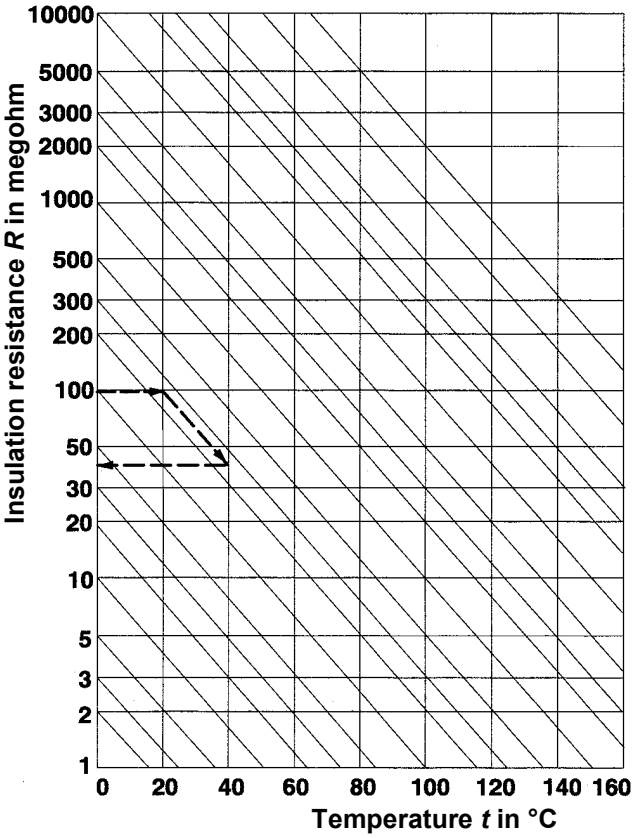


Fig. 1 Diagram for Correction of Insulation Resistance Measured to a Temperature of 40 °C

The insulation resistance measured is dependent on the temperature. To permit a proper assessment, a correction to an agreed reference temperature (formerly 75 °C,167 °F) must be made.

An insulation resistance of 1 megohm per each kilovolt of rated voltage at 75 °C (167 °F) is normally attainable without any difficulties.

New international standards specify an insulation resistance of not less than 1 megohm per each kilovolt of rated generator voltage at 40 °C (104 °F).

A correction of the insulation resistance measured at the winding temperature prevailing during the measurement to the above reference temperature can be made using the diagram in Fig. 1.

If the insulation resistance measured is lower than the specified minimum value, the neutral connections must be separated and the insulation resistances of the individual winding phases measured. During the test, the other two phases which are not involved should be grounded. If the insulation resistances of the individual phases are likewise lower than the required limit value, drying of the windings will be indispensable. Great differences in the insulation resistance values are indicative of local contaminations, e.g. insulators in bus duct or terminal-bushings. If practicable, additional connections should be separated.

If this measure does not result in an improvement, it is recommended to obtain the services of a specialist from the manufacturer's works.

Measurement of Insulation Resistance

Prior to each measurement, the generator must be de-excited and any static charges removed by grounding the windings. The windings should also be grounded after each measurement for the duration of the recharging period.

The insulation resistance of the stator is measured between the winding copper and the stator core.

The measurement should be made with a megger giving a scale reading of not less than 1000 megohm. The megger voltage should be not less than 1000 V, but may amount to up to 5000 V.

The insulation resistance should be reached after one minute.

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3.4. Rotor winding

3.4.1. Insulation resistance tests

The insulation resistance of the rotor winding is measured with 250 V DC.

Note: The winding must be discharged after the measurements have been completed.

Turbogeneratoren
Prüfprotokoll
Turbogenerators
Test Record

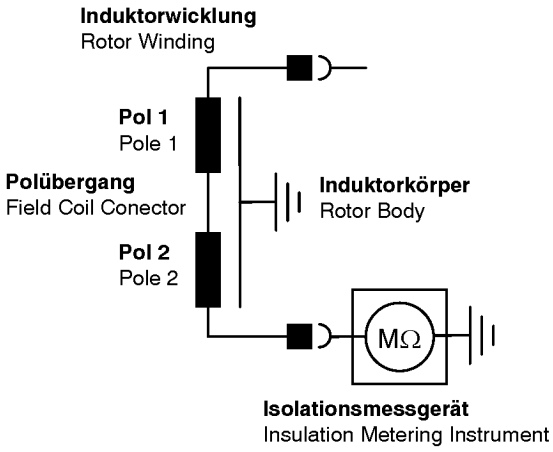
Generator rotor insulation resistance test

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:** 5.0-1010-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Insulation Resistance Measurement on Rotor Winding

Messaufbau
Measuring Setup



Rotor temperature _____ [°C/F]

Applied voltage _____ [V]

Metering instrument _____

Comments:

Insulation resistance 2 min: _____ MΩ

corrected to 40 °C/104 F : _____ MΩ

Prior to / after each measurement any static charges should be removed by grounding the windings

Time of Test : Tested by :

Date of Test : Witnessed by :

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During manufacture and transport, the insulation of the rotor winding may have been exposed to moisture which would reduce the insulation resistance of the winding. The insulation resistance should therefore be measured prior to initial startup, after prolonged shutdowns and after work on the winding. If required, the generator should be dried until a sufficient insulation resistance is obtained.

Required Insulation Resistance of Rotor Winding

The insulation resistance should amount to ≥1 megohm at 40 °C (104 °F).

At winding temperatures other than 40 °C, a correction can be made using the curve shown in Fig. 1.

Measurement of Insulation Resistance

Prior to each measurement, the generator must be deexcited and any static charges removed by grounding the winding.

The insulation resistance should be measured between one slipring being in contact to the rotor winding and the slipring being in contact to the generator shaft, using a megger with a maximum voltage of 250 V. This voltage will present no danger to any of the devices in the excitation circuit. The duration of the test should be at least two minutes.

The measuring brush for ground monitoring should not be in contact with the slipring when measuring.

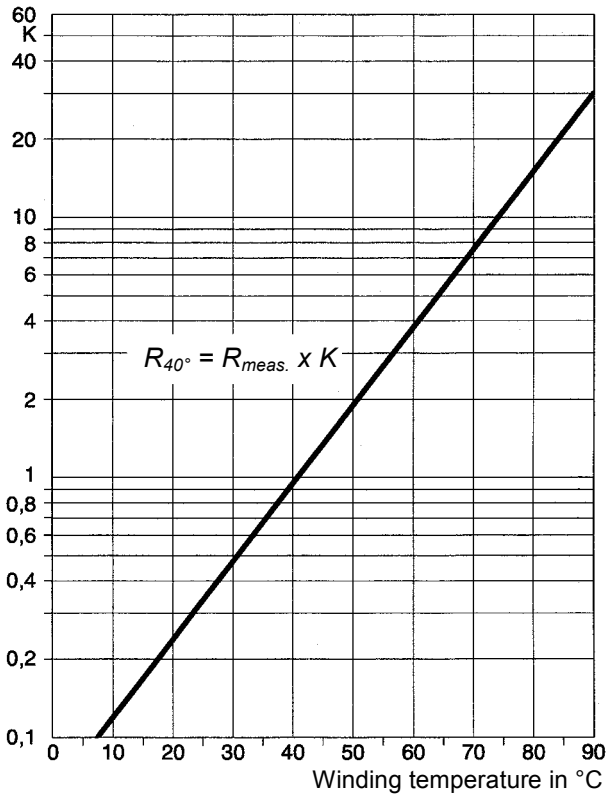


Fig. 1 Correction Curve for Insulation Resistance Measured (R_{meas}) to a Temperature of 40 °C

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3.5. Electrical accessories

The electrical accessories of the generator include the winding thermometers, cold and hot air thermometers, stand-by heaters and other accessories.
In order to obtain error-free measurements, disconnect the individual objects which are to be measured from the supply system by unclipping their connecting cables.
The measuring voltage for the individual objects which are to be measured is to be taken from the following table.

Note:
The objects which are to be measured must be discharged after the relevant measurements have been completed.

3.5.1. Evaluation of the measurements

Objects to be measured	Measuring voltages
Stator windings	1000 - 5000 V DC
Rotor winding	250 V DC
Exciter Stator	250 - 500 V DC
Bearing thermometers	250 - 500 V DC
Hot air thermometer	250 - 500 V DC
Cold air thermometer	250 - 500 V DC
Stand-by heaters	250 - 500 V DC

Objects to be checked	
Leakage water sensors	Functional check

Polarization index PI		
R60 Sec/R30 Sec.	**R10 min/R1 min**	**Assessment**
> 1.25	> 2	Good condition
< 1.25	< 2	Diagnosis required

3.5.2.. Measuring instruments

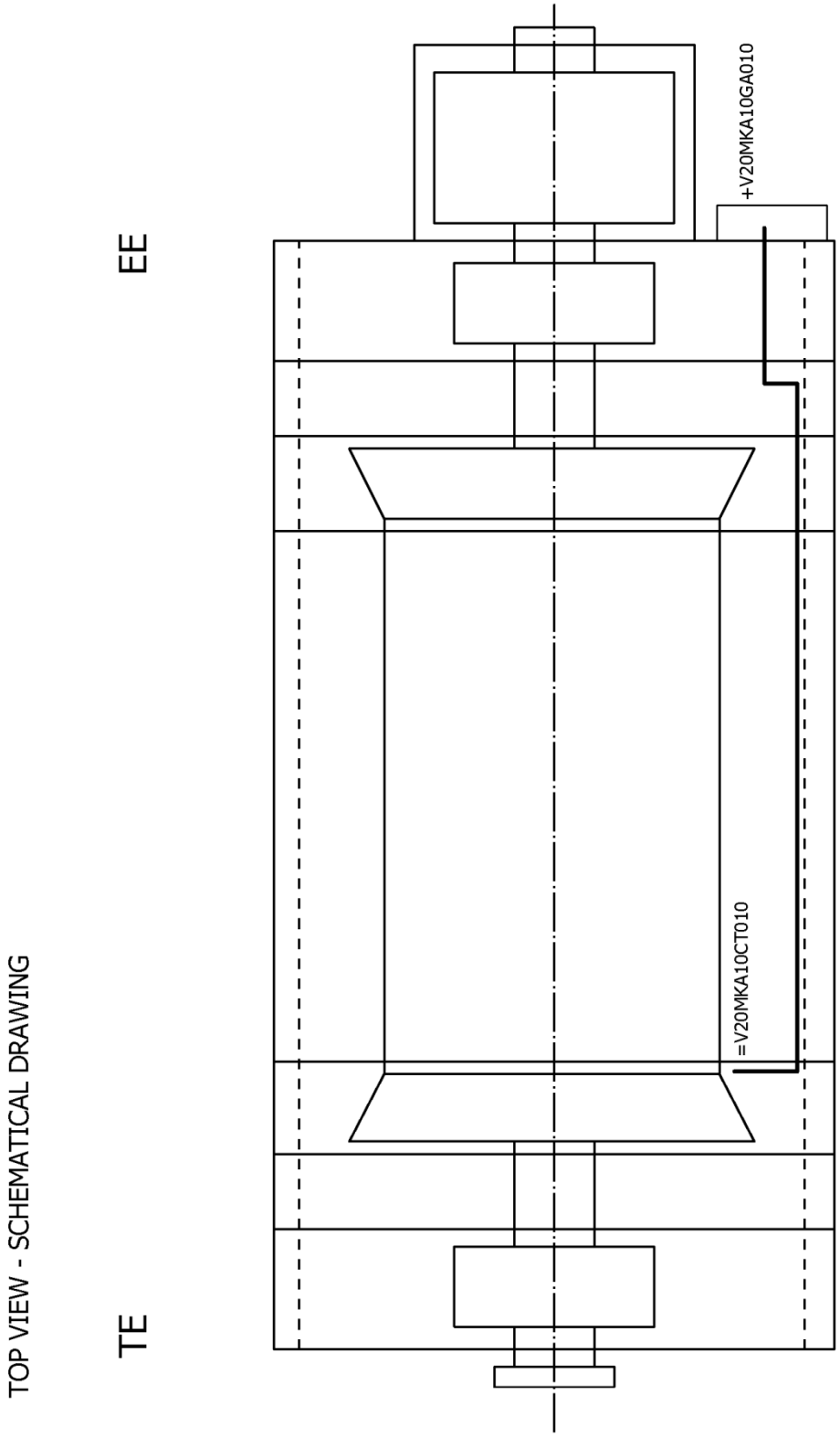
Commercially available, calibrated insulation meters with stable DC sources and settable measuring voltages are required to measure the insulating resistances with different measuring voltages. The winding resistances are preferably measured with measuring bridges.
Suitable bridges should use the Thomson and Wheatstone methods as measurement circuits. The Thomson measurement circuit is used for the stator and rotor windings. All other resistances can be measured with the Wheatstone measurement circuit.

3.5.3. General safety instructions

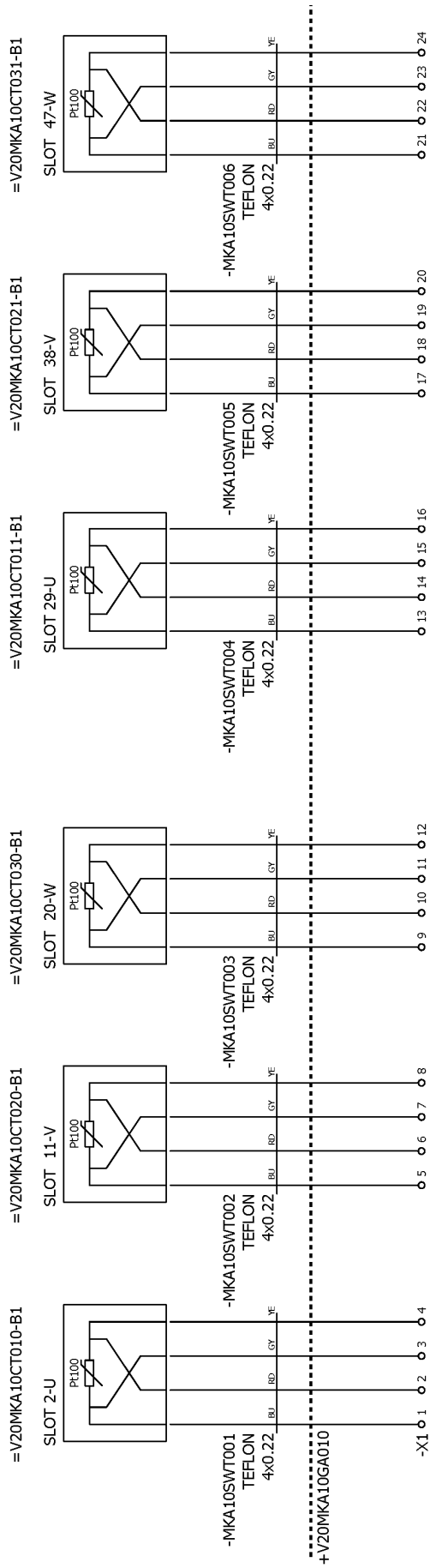
All inspection and measurement work on the generator must be performed by trained, skilled personnel. While staying in the area of the generator, it must be ensured that no foreign objects are left in the spaces opened for measuring purposes. Suitable notices must be put up and danger areas must be fenced off to prevent untrained people from touching parts of the windings before starting measurements with voltages over 24 V. If it is necessary to take measurements at current leads or parts of windings in inaccessible places, at least a second trained person must be employed to look out and supervise. When using ladders, scaffolding or similar aids, their instructions for use must be followed.

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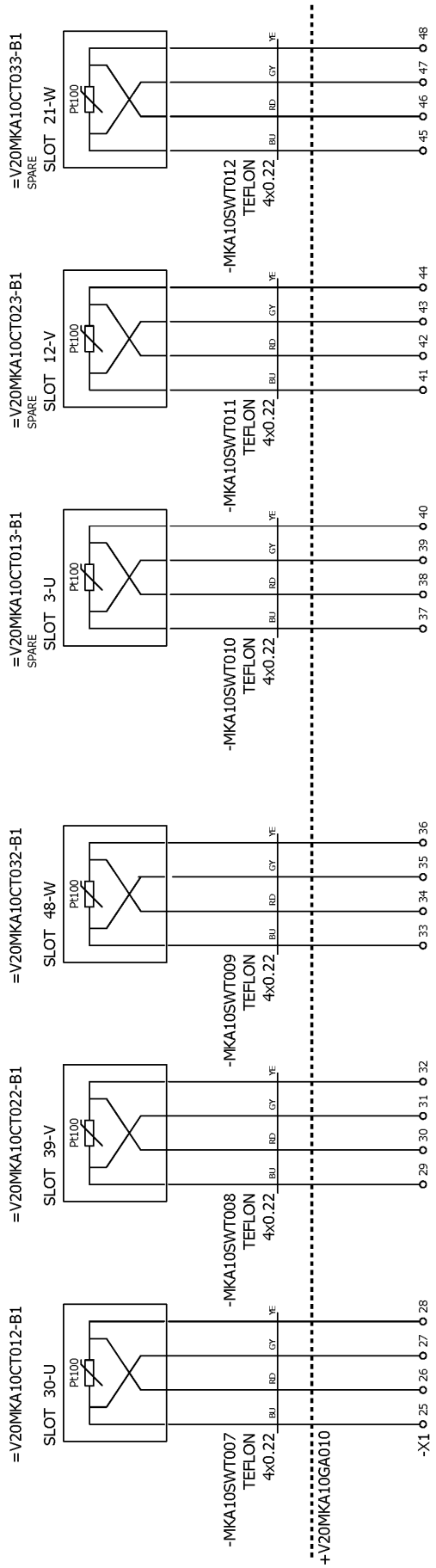
3.5.4. Generator Slot Winding Temperature Detector



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Terminal diagram

Terminal strip
=+V20MKA10GA010-X1

item designation					destination A	terminal	link	terminal number		destination B	terminal	type cable	no. cable	Lev.	MKA10SWT001	MKA10SWT002	MKA10SWT003	MKA10SWT004	MKA10SWT005	MKA10SWT006	MKA10SWT007	MKA10SWT008
												TEFLON										
SLOT 2-U							⊛	1		=V20MKA10CT010-B1					BU							
=							⊛	2		=V20MKA10CT010-B1					RD							
=							⊛	3		=V20MKA10CT010-B1					GY							
=							⊛	4		=V20MKA10CT010-B1					YE							
SLOT 11-V							⊛	5		=V20MKA10CT020-B1						BU						
=							⊛	6		=V20MKA10CT020-B1						RD						
=							⊛	7		=V20MKA10CT020-B1						GY						
=							⊛	8		=V20MKA10CT020-B1						YE						
SLOT 20-W							⊛	9		=V20MKA10CT030-B1							BU					
=							⊛	10		=V20MKA10CT030-B1							RD					
=							⊛	11		=V20MKA10CT030-B1							GY					
=							⊛	12		=V20MKA10CT030-B1							YE					
SLOT 29-U							⊛	13		=V20MKA10CT011-B1								BU				
=							⊛	14		=V20MKA10CT011-B1								RD				
=							⊛	15		=V20MKA10CT011-B1								GY				
=							⊛	16		=V20MKA10CT011-B1								YE				
SLOT 38-V							⊛	17		=V20MKA10CT021-B1									BU			
=							⊛	18		=V20MKA10CT021-B1									RD			
=							⊛	19		=V20MKA10CT021-B1									GY			
=							⊛	20		=V20MKA10CT021-B1									YE			
SLOT 47-W							⊛	21		=V20MKA10CT031-B1										BU		
=							⊛	22		=V20MKA10CT031-B1										RD		
=							⊛	23		=V20MKA10CT031-B1										GY		
=							⊛	24		=V20MKA10CT031-B1										YE		
SLOT 30-U							⊛	25		=V20MKA10CT012-B1											BU	
=							⊛	26		=V20MKA10CT012-B1											RD	
=							⊛	27		=V20MKA10CT012-B1											GY	
=							⊛	28		=V20MKA10CT012-B1											YE	
SLOT 39-V							⊛	29		=V20MKA10CT022-B1												BU
=							⊛	30		=V20MKA10CT022-B1												RD
=							⊛	31		=V20MKA10CT022-B1												GY
=							⊛	32		=V20MKA10CT022-B1												YE

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Terminal diagram

Terminal strip
=+V20MKA10GA010-X1

item designation	destination A	terminal	link	terminal number	destination B	terminal	MKA10SWT009 TEFLON	MKA10SWT010 TEFLON	MKA10SWT011 TEFLON	MKA10SWT012 TEFLON
SLOT 48-W			⊙	33	=V20MKA10CT032-B1					
=			⊙	34	=V20MKA10CT032-B1		RD			
=			⊙	35	=V20MKA10CT032-B1		GY			
=			⊙	36	=V20MKA10CT032-B1		YE			
SLOT 3-U			⊙	37	=V20MKA10CT013-B1			BU		
=			⊙	38	=V20MKA10CT013-B1			RD		
=			⊙	39	=V20MKA10CT013-B1			GY		
=			⊙	40	=V20MKA10CT013-B1			YE		
SLOT 12-V			⊙	41	=V20MKA10CT023-B1				BU	
=			⊙	42	=V20MKA10CT023-B1				RD	
=			⊙	43	=V20MKA10CT023-B1				GY	
=			⊙	44	=V20MKA10CT023-B1				YE	
SLOT 21-W			⊙	45	=V20MKA10CT033-B1					BU
=			⊙	46	=V20MKA10CT033-B1					RD
=			⊙	47	=V20MKA10CT033-B1					GY
=			⊙	48	=V20MKA10CT033-B1					YE
			○							
			○							
			○							
			○							
			○							
			○							
			○							
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			○							

Turbogeneratoren
Prüfprotokoll
Turbogenerator
Test Record

Resistance Measurement on Slot Winding Temperature

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:** EG000367 Order-No.:	**Prot.-Nr.:** 5.0-1020-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

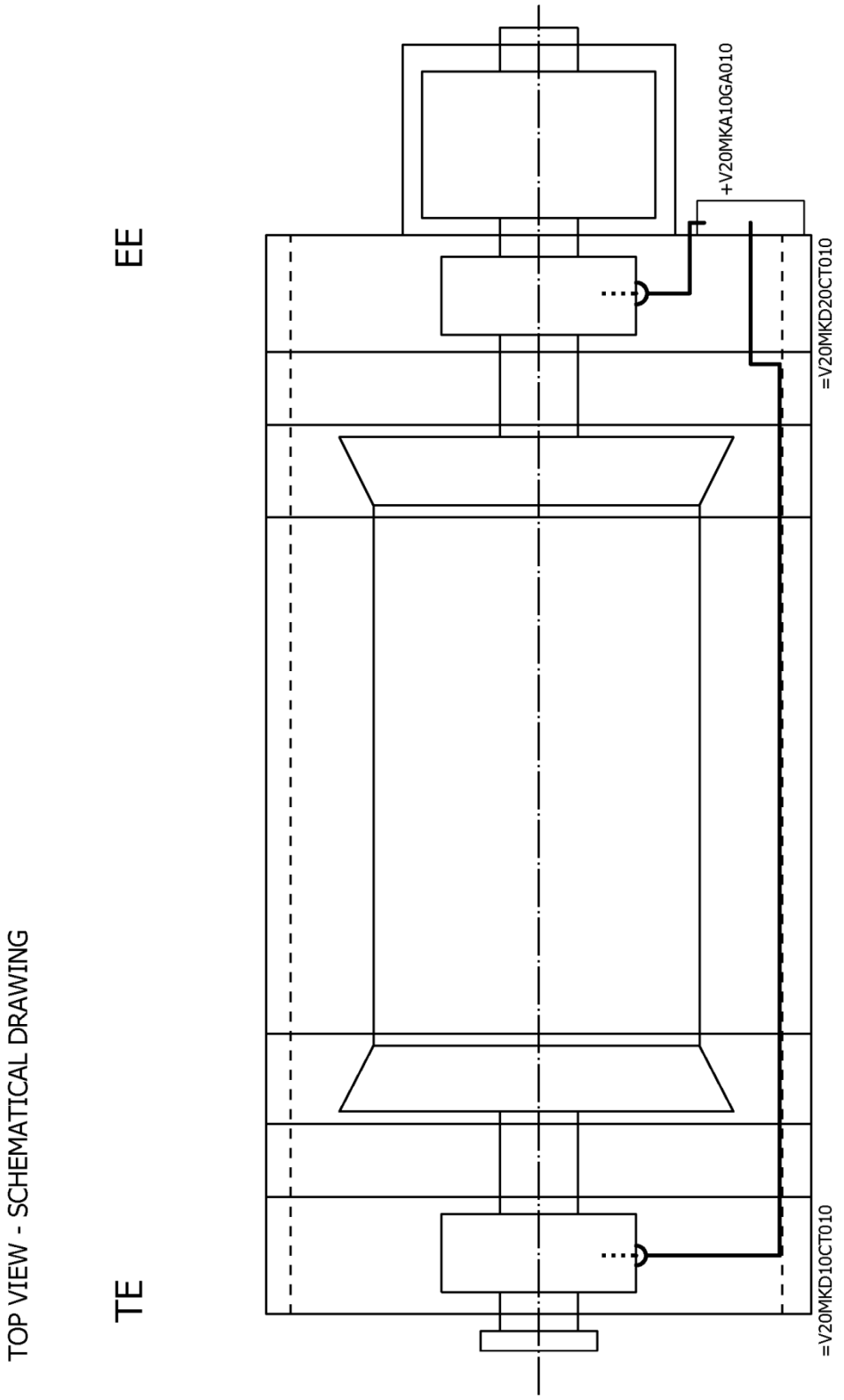
Abteilung:	**Prüfdatum:**	**Prüfer:**	**Gegenzeichnung:**
Department:	Date of Insp.:	Inspector:	Countersignature:

Slot-Nr Phase	KKS	Terminal Number	R / Ω	Slot-Nr Phase	KKS	Terminal Number	R / Ω
2	=V20MKA10CT010	X1 3-2		**30**	=V20MKA10CT012	X1 27-26	
U				**U**			
		X1 1-4				X1 25-28	
11	=V20MKA10CT020	X1 7-6		**39**	=V20MKA10CT022	X1 31-30	
V				**V**			
		X1 5-8				X1 29-32	
20	=V20MKA10CT030	X1 11-10		**48**	=V20MKA10CT032	X1 35-34	
W				**W**			
		X1 9-12				X1 33-36	
29	=V20MKA10CT011	X1 15-14		**3**	=V20MKA10CT013	X1 38-39	
U				**U**			
		X1 13-16		spare		X1 37-40	
38	=V20MKA10CT021	X1 19-18		**12**	=V20MKA10CT023	X1 42-43	
V				**V**			
		X1 17-20		spare		X1 41-44	
47	=V20MKA10CT031	X1 23-22		**21**	=V20MKA10CT033	X1 46-47	
W				**W**			
		X1 21-24		spare		X1 45-48	

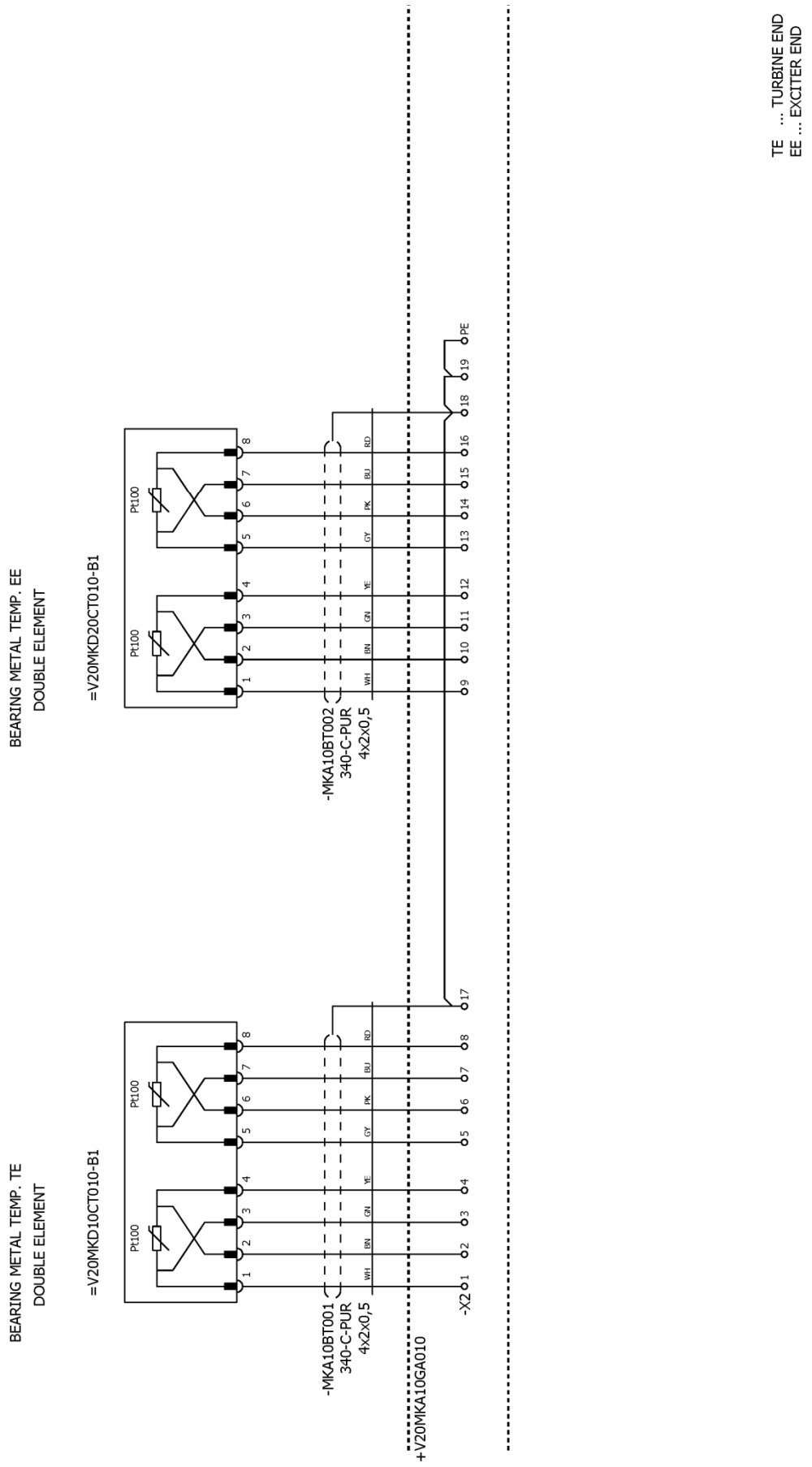
Comments:

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3.5.5. Bearing Metal Thermometer



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Terminal diagram

Terminal strip
= +V20MKA10GA010-X2

item designation	destination A	terminal	link	terminal number		destination B	terminal	type cable	340-C-PUR MKA10BT001	340-C-PUR MKA10BT002
BEARING METAL TEMP. TE			⊙	1		=V20MKD10CT010-B1	1		WH	
=			⊙	2		=V20MKD10CT010-B1	2		BN	
=			⊙	3		=V20MKD10CT010-B1	3		GN	
=			⊙	4		=V20MKD10CT010-B1	4		YE	
=			⊙	5		=V20MKD10CT010-B1	5		GY	
=			⊙	6		=V20MKD10CT010-B1	6		PK	
=			⊙	7		=V20MKD10CT010-B1	7		BU	
=			⊙	8		=V20MKD10CT010-B1	8		RD	
BEARING METAL TEMP. EE			⊙	9		=V20MKD20CT010-B1	1		WH	
=			⊙	10		=V20MKD20CT010-B1	2		BN	
=			⊙	11		=V20MKD20CT010-B1	3		GN	
=			⊙	12		=V20MKD20CT010-B1	4		YE	
=			⊙	13		=V20MKD20CT010-B1	5		GY	
=			⊙	14		=V20MKD20CT010-B1	6		PK	
=			⊙	15		=V20MKD20CT010-B1	7		BU	
=			⊙	16		=V20MKD20CT010-B1	8		RD	
BEARING METAL TEMP. TE			⊙	17						
BEARING METAL TEMP. EE			⊙	18						
=			⊙	19						
=			⊙	PE						
			○							
			○							
			○							
			○							
			○							
			○							
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			○							
			○							
			○							

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Turbogeneratoren
Prüfprotokoll
Turbogenerators
Test Record

Insulation Resistance Test and Resistance Measurement on Bearing Metal Temperature Detector

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:** 5.0-1030-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

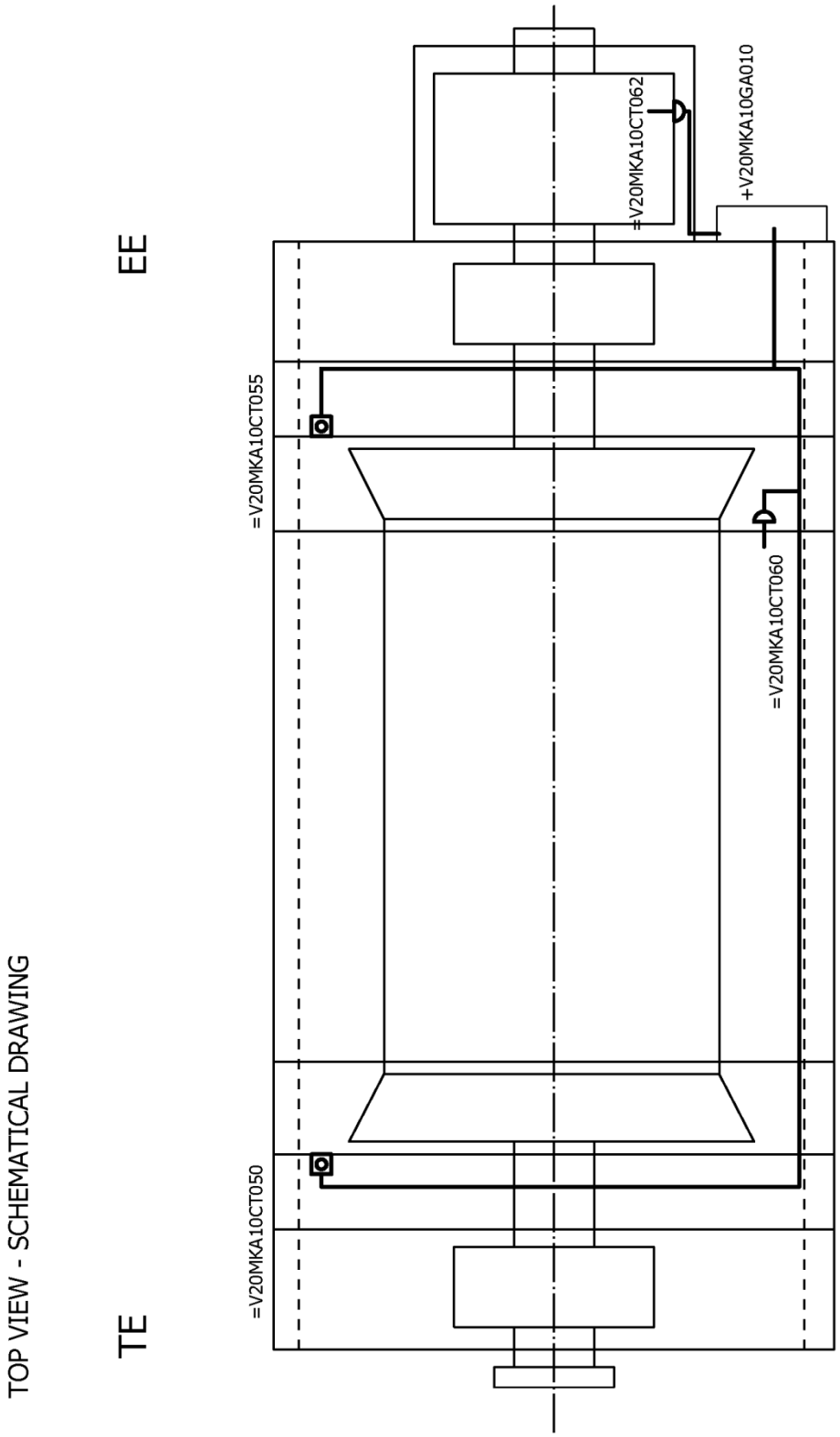
Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Prüfspannung / Applied Voltage : _____ V

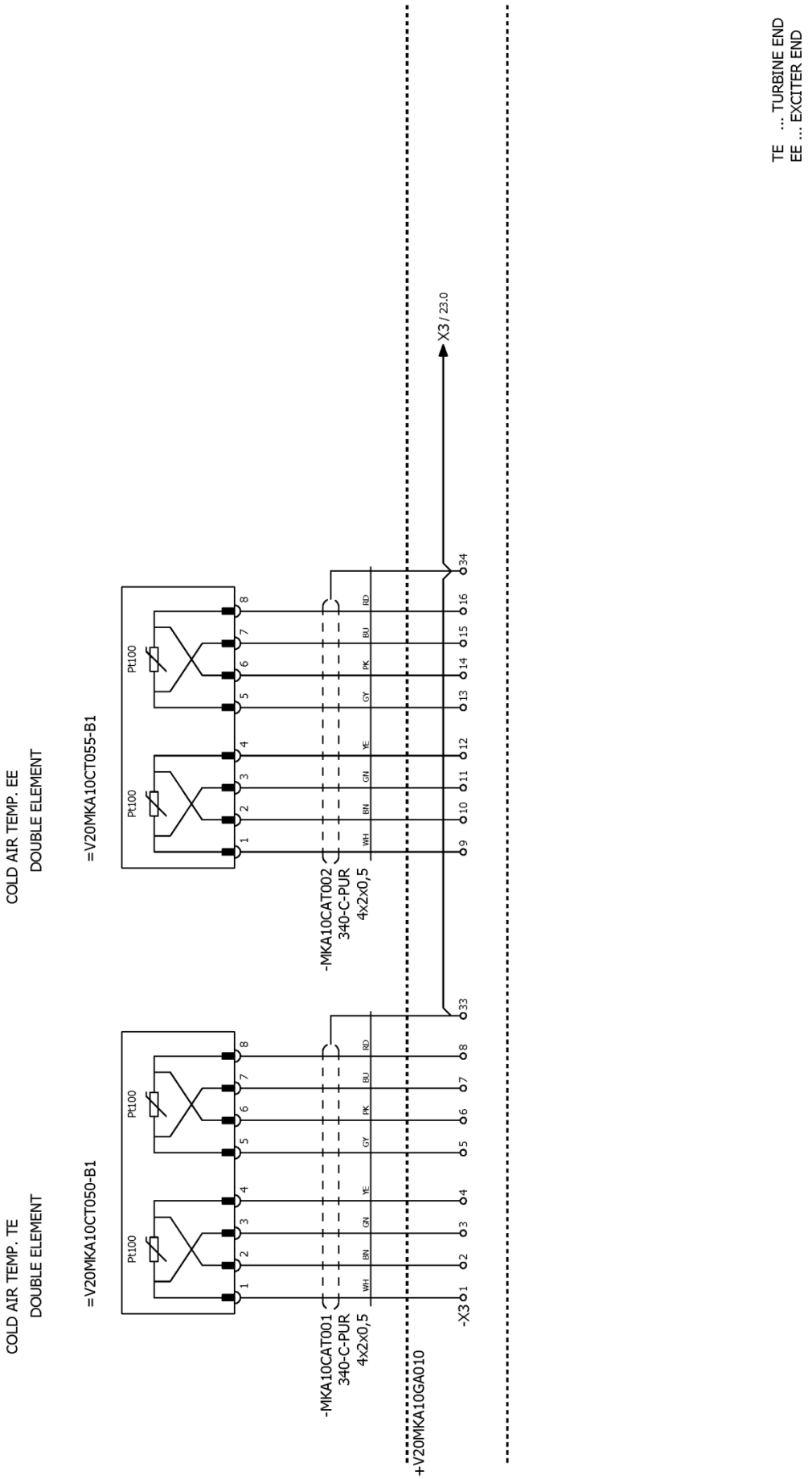
Bearing	Terminal Number	R / Ω	R_{iso} / MΩ
TE	X2 2-3		
=V20MKD10CT010			
	X2 1-4		
	X2 6-7		
	X2 5-8		
EE	X2 10-11		
=V20MKD20CT010			
	X2 9-12		
	X2 14-15		
	X2 13-16		

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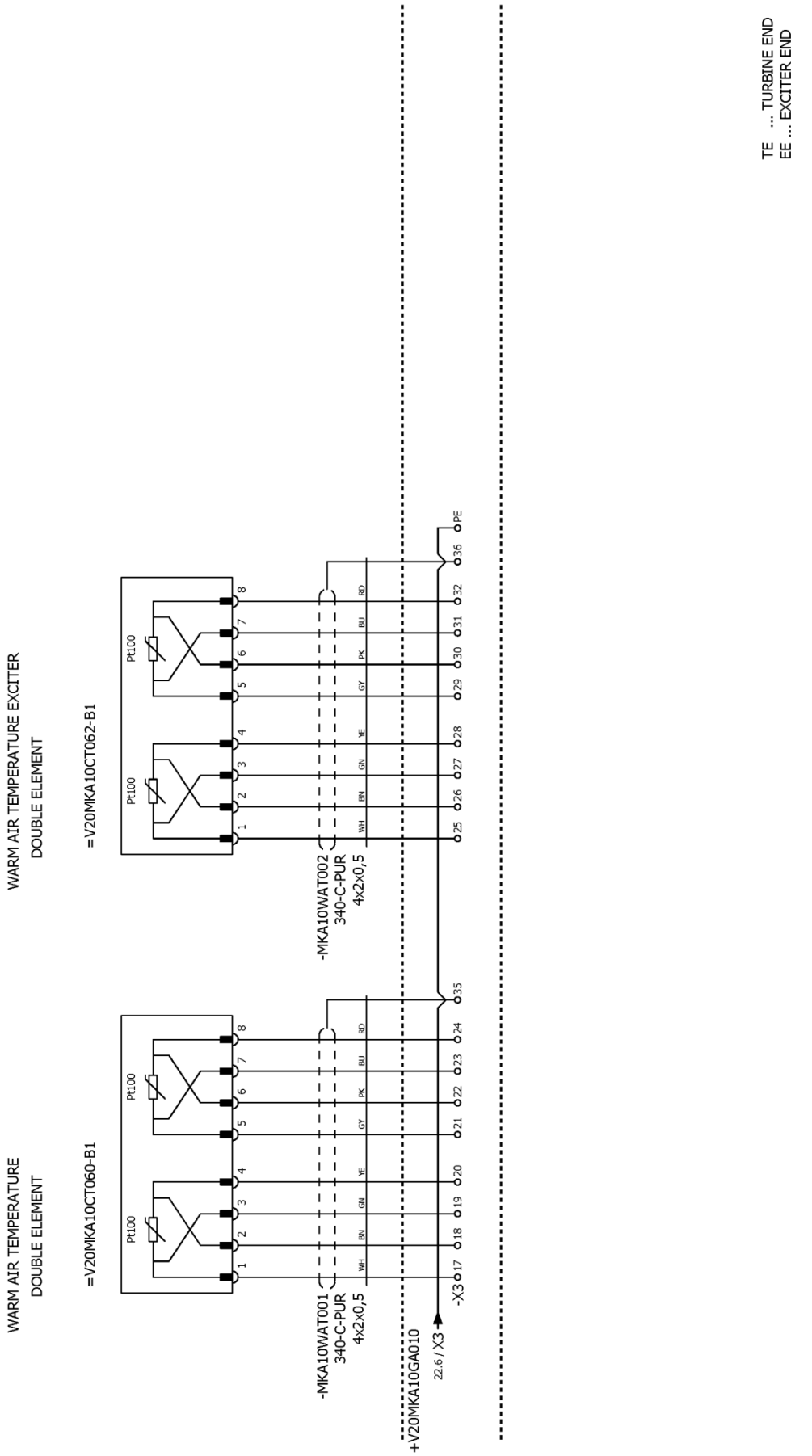
3.5.6. Air Thermometer



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Terminal diagram

item designation					Lev.	Terminal strip =+V20MKA10GA010-X3							Lev.						
					no. cable								no. cable	MKA10CAT001	MKA10CAT002	MKA10WAT001	MKA10WAT002		
					type cable	destination A	terminal	link	terminal number		destination B	terminal	type cable	340-C-PUR	340-C-PUR	340-C-PUR	340-C-PUR		
COLD AIR TEMP. TE									1		=V20MKA10CT050-B1	1		WH					
=									2		=V20MKA10CT050-B1	2		BN					
=									3		=V20MKA10CT050-B1	3		GN					
=									4		=V20MKA10CT050-B1	4		YE					
=									5		=V20MKA10CT050-B1	5		GY					
=									6		=V20MKA10CT050-B1	6		PK					
=									7		=V20MKA10CT050-B1	7		BU					
=									8		=V20MKA10CT050-B1	8		RD					
COLD AIR TEMP. EE									9		=V20MKA10CT055-B1	1			WH				
=									10		=V20MKA10CT055-B1	2			BN				
=									11		=V20MKA10CT055-B1	3			GN				
=									12		=V20MKA10CT055-B1	4			YE				
=									13		=V20MKA10CT055-B1	5			GY				
=									14		=V20MKA10CT055-B1	6			PK				
=									15		=V20MKA10CT055-B1	7			BU				
=									16		=V20MKA10CT055-B1	8			RD				
WARM AIR TEMPERATURE									17		=V20MKA10CT060-B1	1				WH			
=									18		=V20MKA10CT060-B1	2				BN			
=									19		=V20MKA10CT060-B1	3				GN			
=									20		=V20MKA10CT060-B1	4				YE			
=									21		=V20MKA10CT060-B1	5				GY			
=									22		=V20MKA10CT060-B1	6				PK			
=									23		=V20MKA10CT060-B1	7				BU			
=									24		=V20MKA10CT060-B1	8				RD			
WARM AIR TEMPERATURE EXCITER									25		=V20MKA10CT062-B1	1					WH		
=									26		=V20MKA10CT062-B1	2					BN		
=									27		=V20MKA10CT062-B1	3					GN		
=									28		=V20MKA10CT062-B1	4					YE		
=									29		=V20MKA10CT062-B1	5					GY		
=									30		=V20MKA10CT062-B1	6					PK		
=									31		=V20MKA10CT062-B1	7					BU		
=									32		=V20MKA10CT062-B1	8					RD		

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Terminal diagram

Terminal strip
=+V20MKA10GA010-X3

item designation					type cable	destination A	terminal	link	terminal number		destination B	terminal	type cable	MKA10CAT001 / 340-C-PUR	MKA10CAT002 / 340-C-PUR	MKA10WAT001 / 340-C-PUR	MKA10WAT002 / 340-C-PUR
COLD AIR TEMP. TE									33								
COLD AIR TEMP. EE									34								
WARM AIR TEMPERATURE									35								
WARM AIR TEMPERATURE EXCITER									36								
=									PE								

Turbogeneratoren Prüfprotokoll
Turbogenerators Test Record

Insulation Resistance Test and Resistance Measurement on Cold Air Temperature Detector

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:**5.0-1040-0001 Record-No.:	**Blatt-Nr.:**1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Prüfspannung / Applied Voltage : _____ V

Temperatur Detector	Terminal Number	R / Ω	R_{iso} / MΩ
Cold Air TE	X3 / 1-4		
=V20MKA10CT050			
	X3 / 2-3		
	X3 / 6-7		
	X3 / 5-8		
Cold Air EE	X3 / 10-11		
=V20MKA10CT055			
	X3 / 9-12		
	X3 / 14-15		
	X3 / 13-16		

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Turbogeneratoren Prüfprotokoll
Turbogenerators Test Record

Insulation Resistance Test and Resistance Measurement on Warm Air Temperature Detector

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:**5.0-1040-0001 Record-No.:	**Blatt-Nr.:**3 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

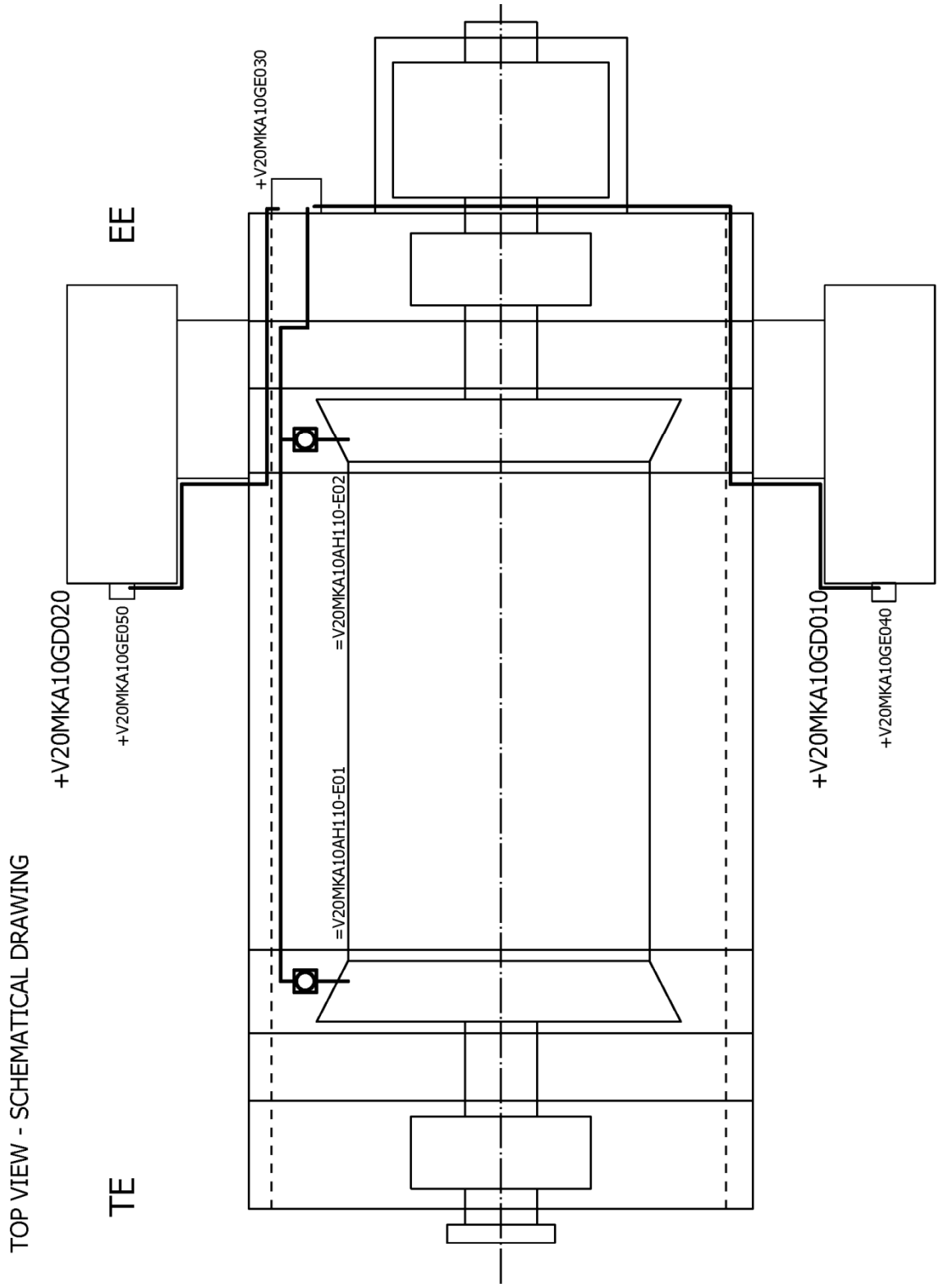
Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Prüfspannung / Applied Voltage : _____ V

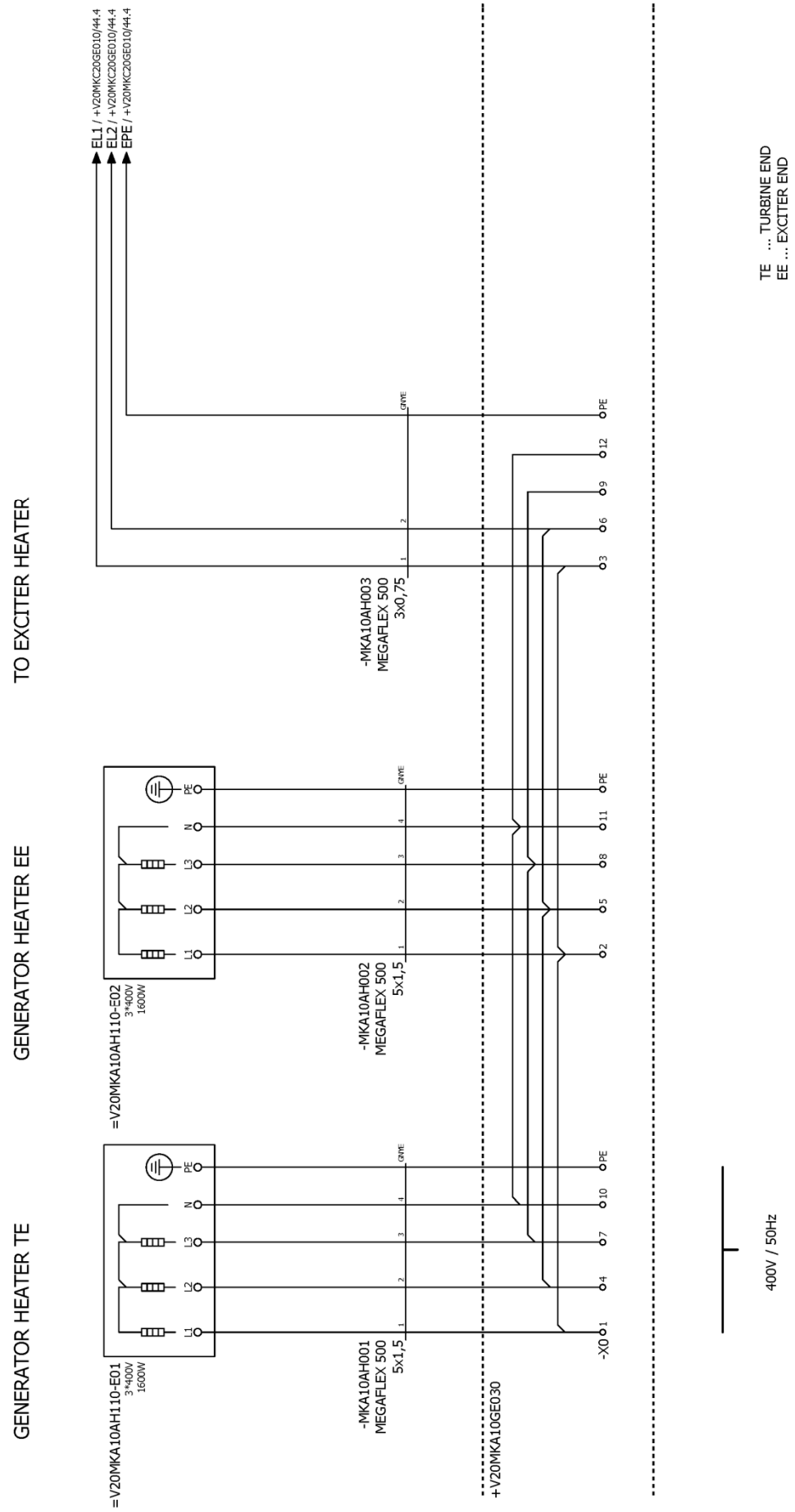
Temperatur Detector	Terminal Number	R / Ω	R_{iso} / MΩ
Warm Air	X3 / 18-19		
=V20MKA10CT060			
	X3 / 17-20		
	X3 / 22-23		
	X3 / 21-24		
Warm Air Exciter	X3 / 26-27		
=V20MKA10CT062			
	X3 / 25-28		
	X3 / 30-31		
	X3 / 29-32		

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3.5.7. Anticondensation Heater

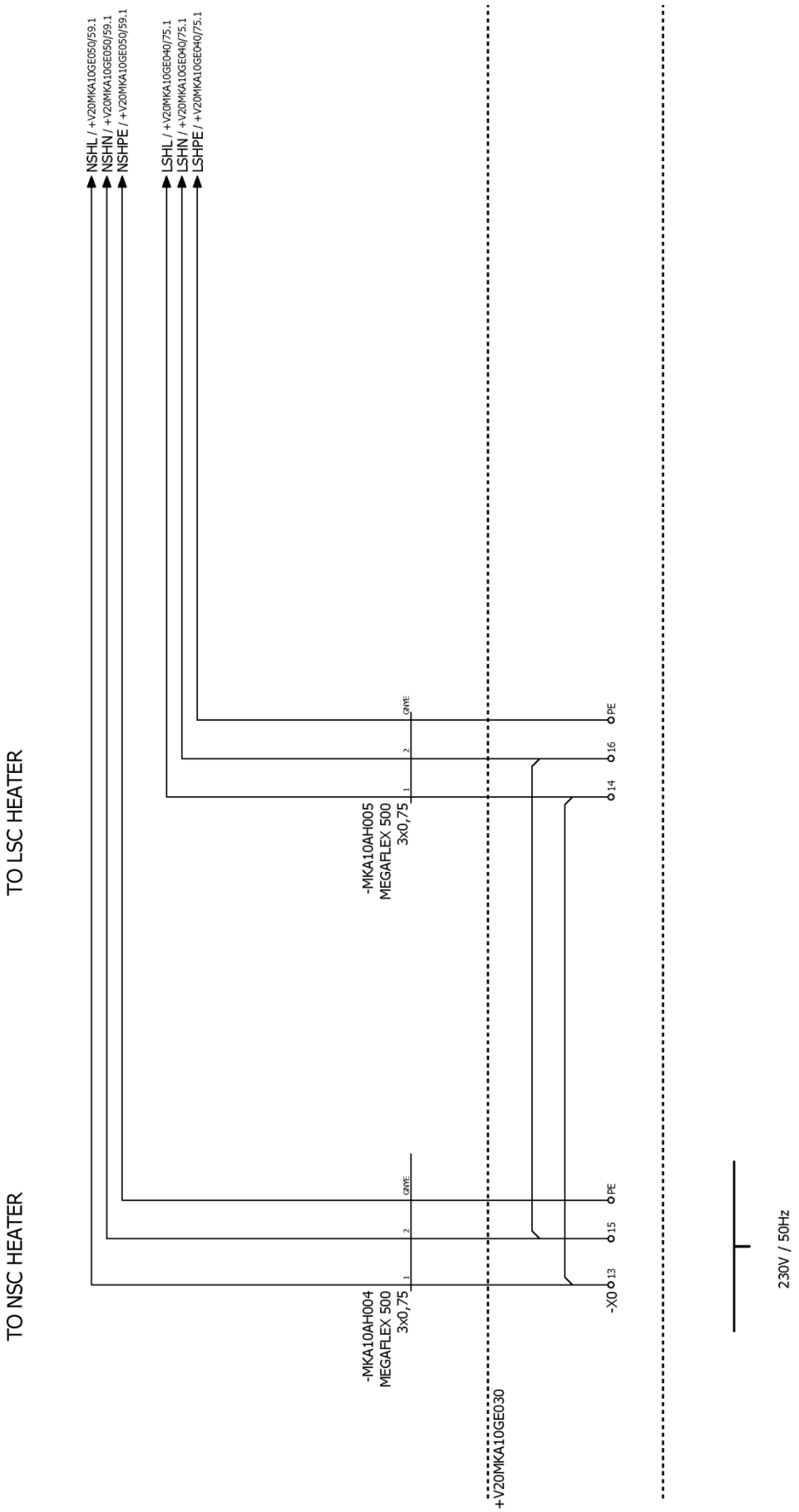


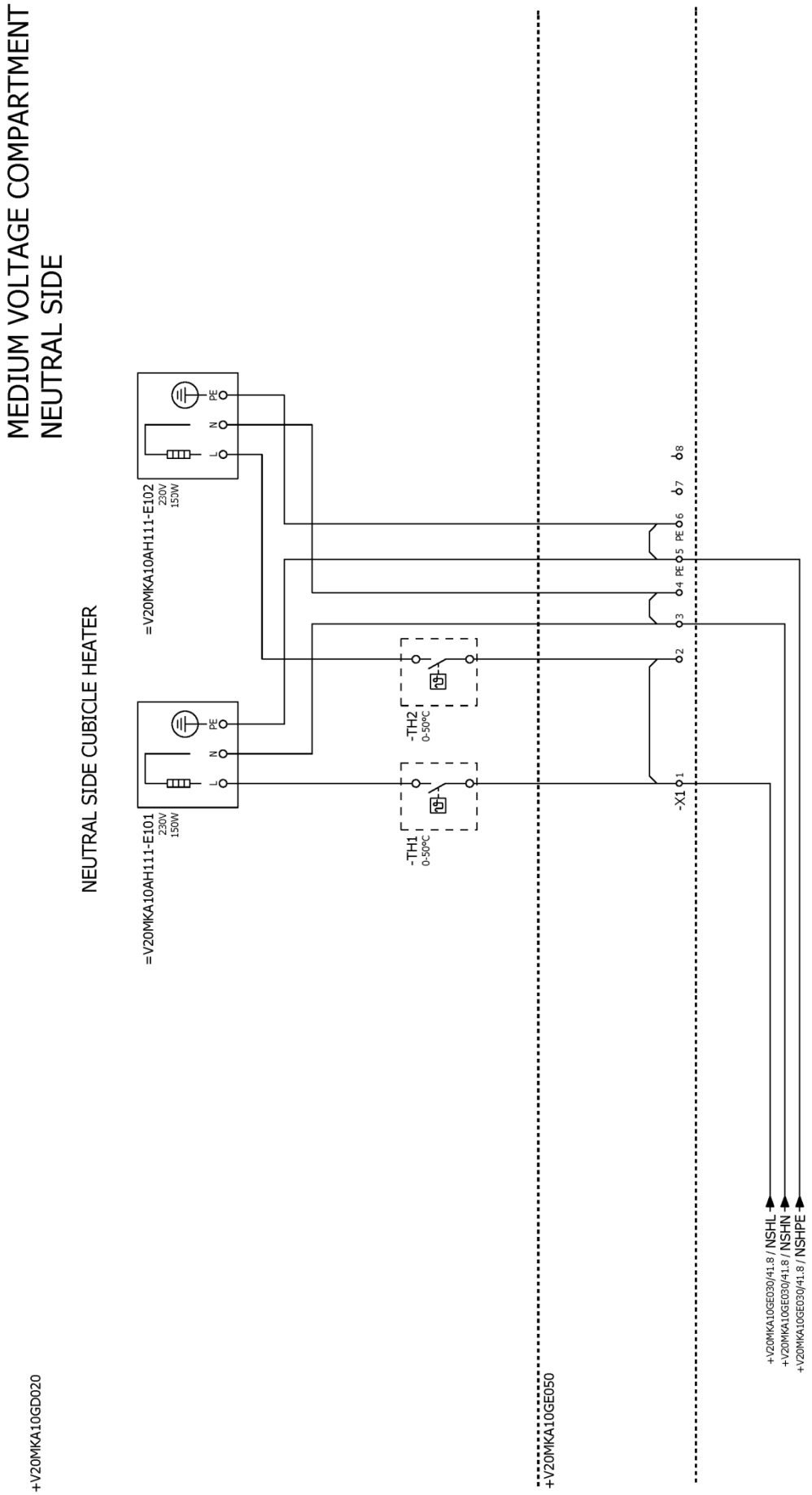
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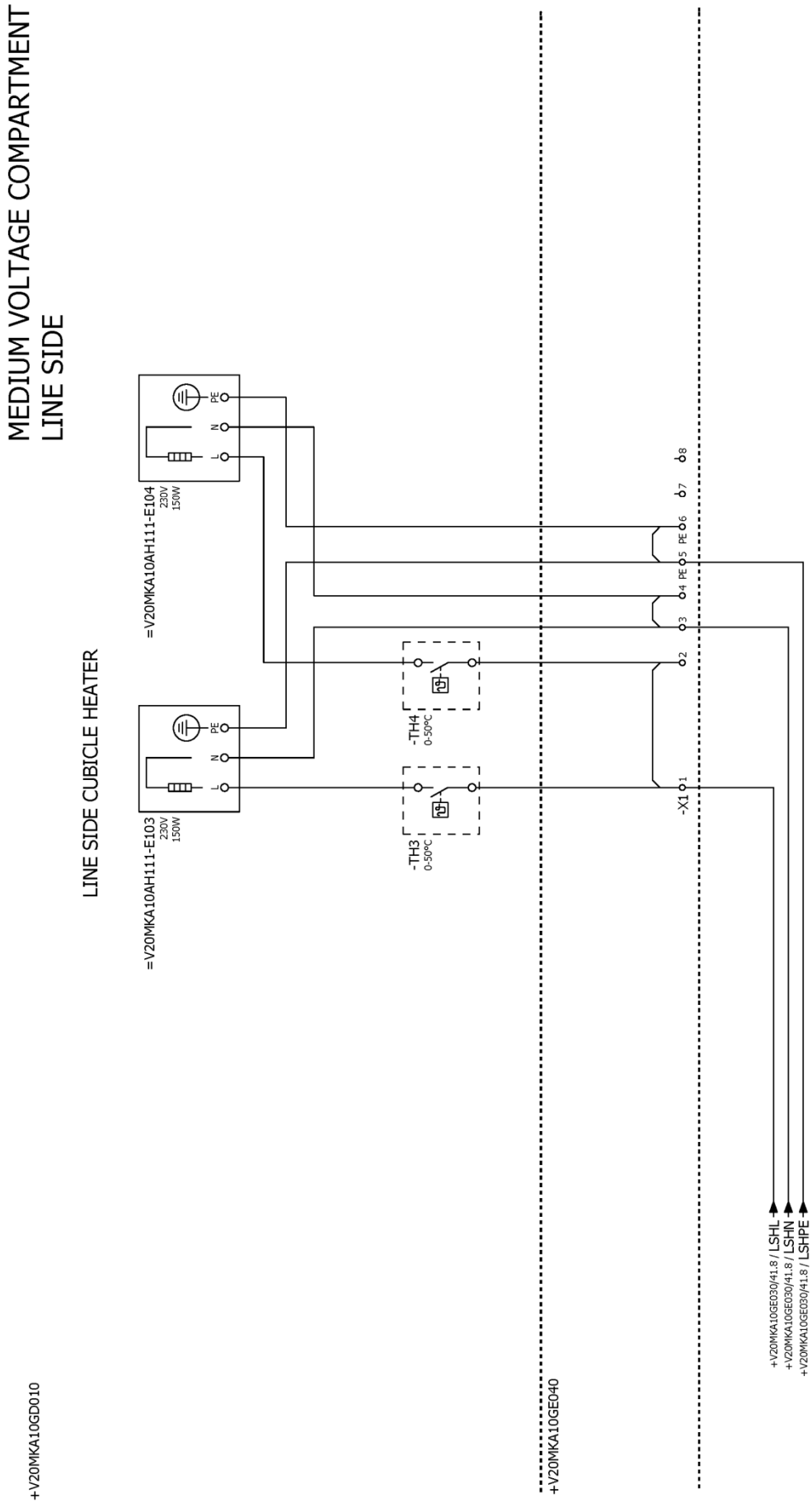
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Terminal diagram

item designation					Lev. / no. cable / type cable	destination A	terminal	link	terminal number		destination B	terminal	Lev. / no. cable / type cable	MKA10AH001 / MEGAFLEX 500	MKA10AH002 / MEGAFLEX 500	MKA10AH003 / MEGAFLEX 500	MKA10AH004 / MEGAFLEX 500	MKA10AH005 / MEGAFLEX 500	
						Terminal strip =+V20MKA10GE030-X0														
GENERATOR HEATER TE									1		=V20MKA10AH110-E01	L1		1					
GENERATOR HEATER EE									2		=V20MKA10AH110-E02	L1			1				
TO EXCITER HEATER									3		+V20MKC20GE010-X41	1				1			
GENERATOR HEATER TE									4		=V20MKA10AH110-E01	L2		2					
GENERATOR HEATER EE									5		=V20MKA10AH110-E02	L2			2				
TO EXCITER HEATER									6		+V20MKC20GE010-X41	3				2			
GENERATOR HEATER TE									7		=V20MKA10AH110-E01	L3		3					
GENERATOR HEATER EE									8		=V20MKA10AH110-E02	L3			3				
TO EXCITER HEATER									9										
GENERATOR HEATER TE									10		=V20MKA10AH110-E01	N							
GENERATOR HEATER EE									11		=V20MKA10AH110-E02	N							
TO EXCITER HEATER									12										
TO NSC HEATER									13		+V20MKA10GE050-X1	1					1		
TO LSC HEATER									14		+V20MKA10GE040-X1	1						1	
TO NSC HEATER									15		+V20MKA10GE050-X1	3					2		
TO LSC HEATER									16		+V20MKA10GE040-X1	3						2	
GENERATOR HEATER TE									PE		=V20MKA10AH110-E01	PE		GNYE					
GENERATOR HEATER EE									PE		=V20MKA10AH110-E02	PE			GNYE				
TO EXCITER HEATER									PE		+V20MKC20GE010-X41	4				GNYE			
TO NSC HEATER									PE		+V20MKA10GE050-X1	5					GNYE		
TO LSC HEATER									PE		+V20MKA10GE040-X1	5						GNYE	

Turbogeneratoren Prüfprotokoll
Turbogenerators Test Record

Insulation Resistance Test and Resistance Measurement on Anticondensation Heater

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:**5.0-1050-0001 Record-No.:	**Blatt-Nr.:**1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

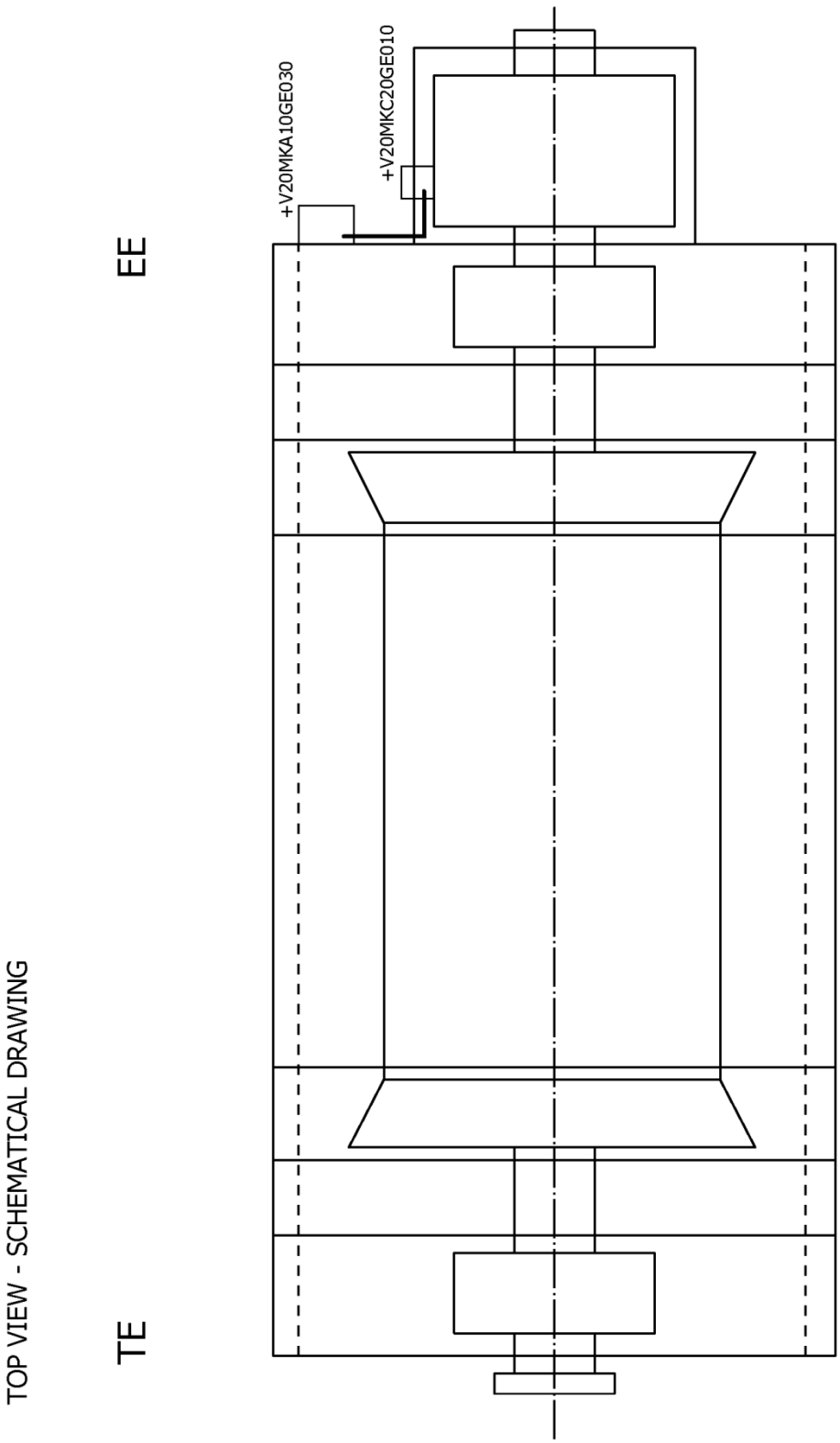
Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:
Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Prüfspannung / Applied Voltage : _____ V

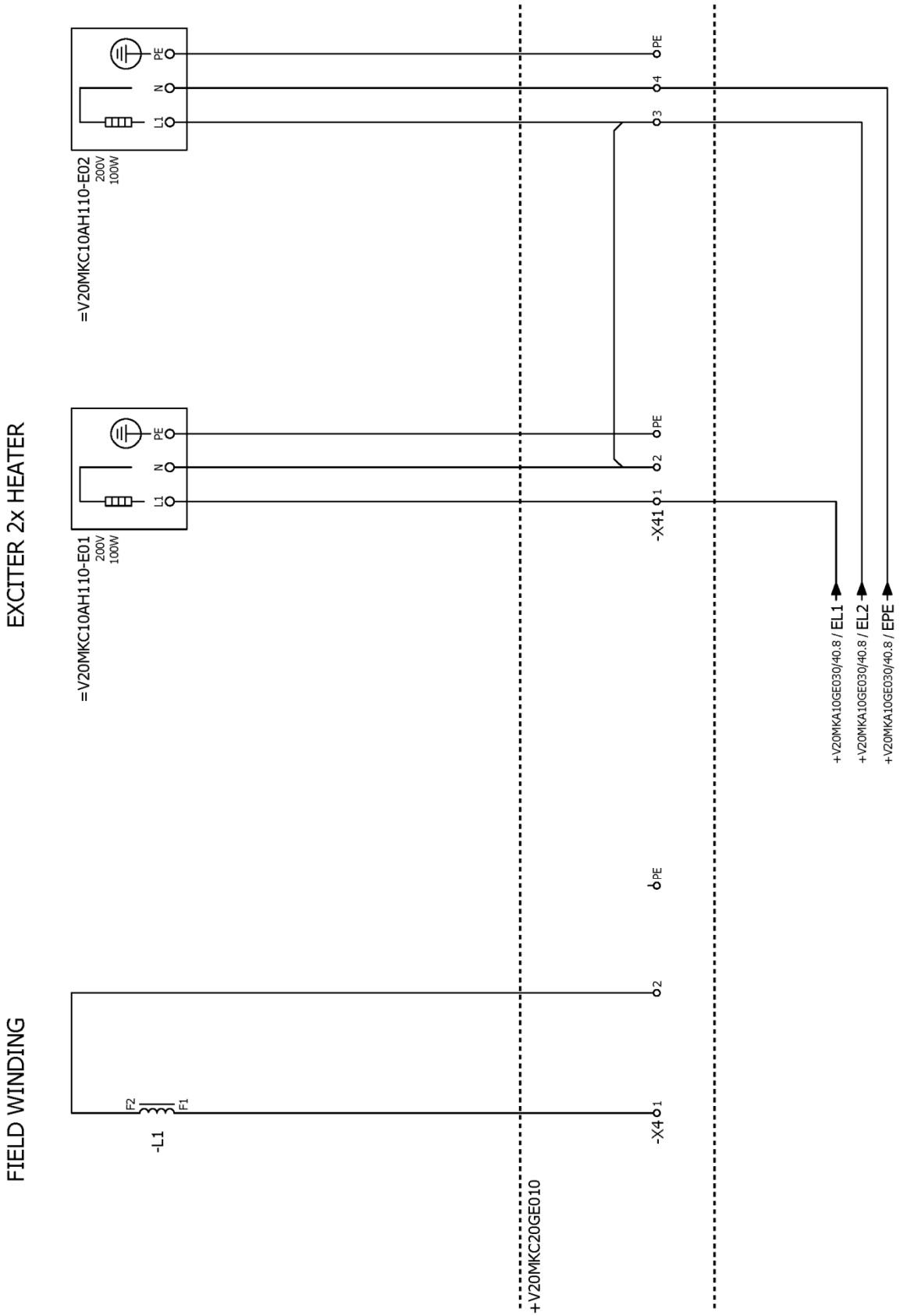
Heater	**Terminal Number**	**R / Ω**	**R_{iso} / MΩ**
Generator TE			
=V20MKA10AH110-E01	X0 1-4		
	X0 1-7		
Generator EE			
=V20MKA10AH110-E02	X0 2-5		
	X0 2-8		
NSC Heater			
=V20MKA10AH111-E101/102	X1 1-3		
LSC Heater			
=V20MKA10AH111-E101/102	X1 1-3		

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3.5.8. Exciter



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Terminal diagram

Terminal strip =+V20MKC20GE010-X41

item designation		destination A	terminal	link	terminal number		destination B	terminal	type cable	no. cable	Lev.
EXCITER 2x HEATER		+V20MKA10GE030-X0	3		1		=V20MKC10AH110-E01	L1			
=					2		=V20MKC10AH110-E01	N			
=		+V20MKA10GE030-X0	6		3		=V20MKC10AH110-E02	L1			
=		+V20MKA10GE030-X0	PE		4		=V20MKC10AH110-E02	N			
=					PE		=V20MKC10AH110-E01	PE			
=					PE		=V20MKC10AH110-E02	PE			
	1	MEGAFLEX 500								MKA10AH003	
	2										
	GNYE										

Terminal strip =+V20MKC20GE010-X4

item designation		destination A	terminal	link	terminal number		destination B	terminal	type cable	no. cable	Lev.
FIELD WINDING					1		-L1	F1			
=					2		-L1	F2			
=					PE						

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Insulation Resistance Test and Resistance Measurement on Exciter Stator

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:** EG000367 Order-No.:	**Prot.-Nr.:**5.0-1055-0001 Record-No.:	**Blatt-Nr.:**1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

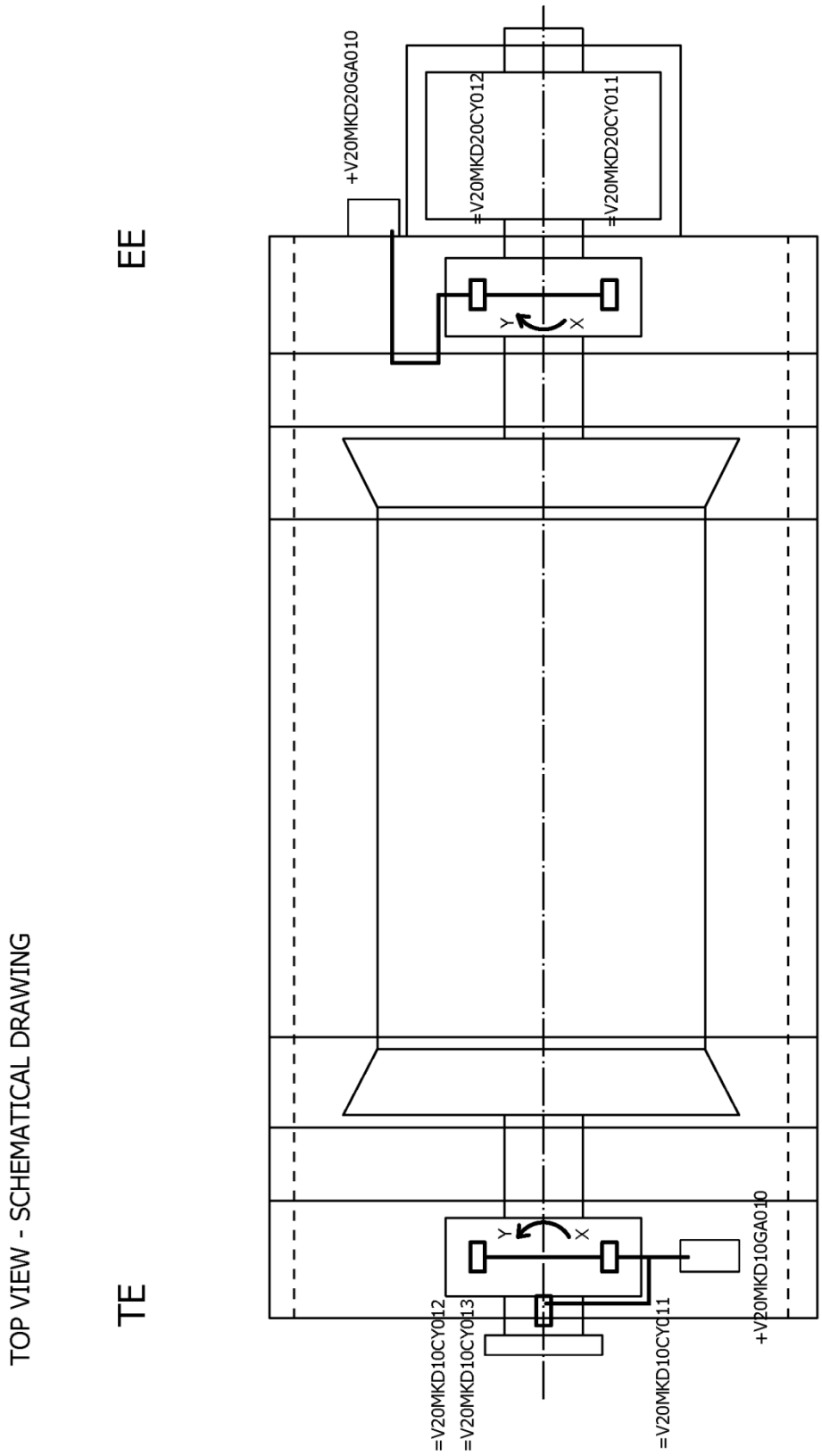
Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:
Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Prüfspannung / Applied Voltage : _____ V

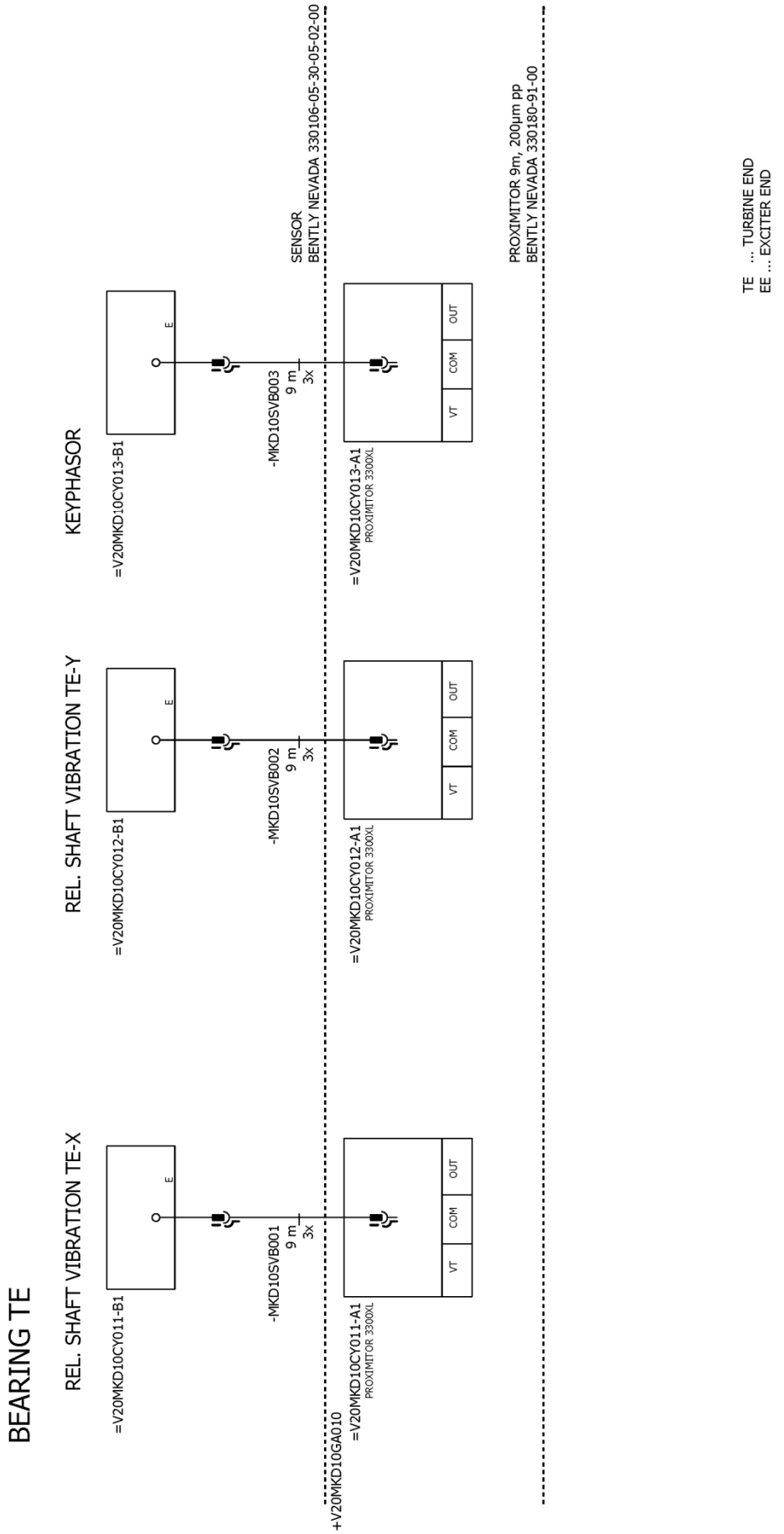
Exciter	**Terminal Number**	**R / Ω**	**R_{iso} / MΩ**
Field Winding	X4 1-2		
Exciter Heater			
=V20MKC10AH110-E01	X41 1-2		
=V20MKC10AH110-E02	X41 3-4		

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3.5.9. Adjustment of vibration sensors to the shaft



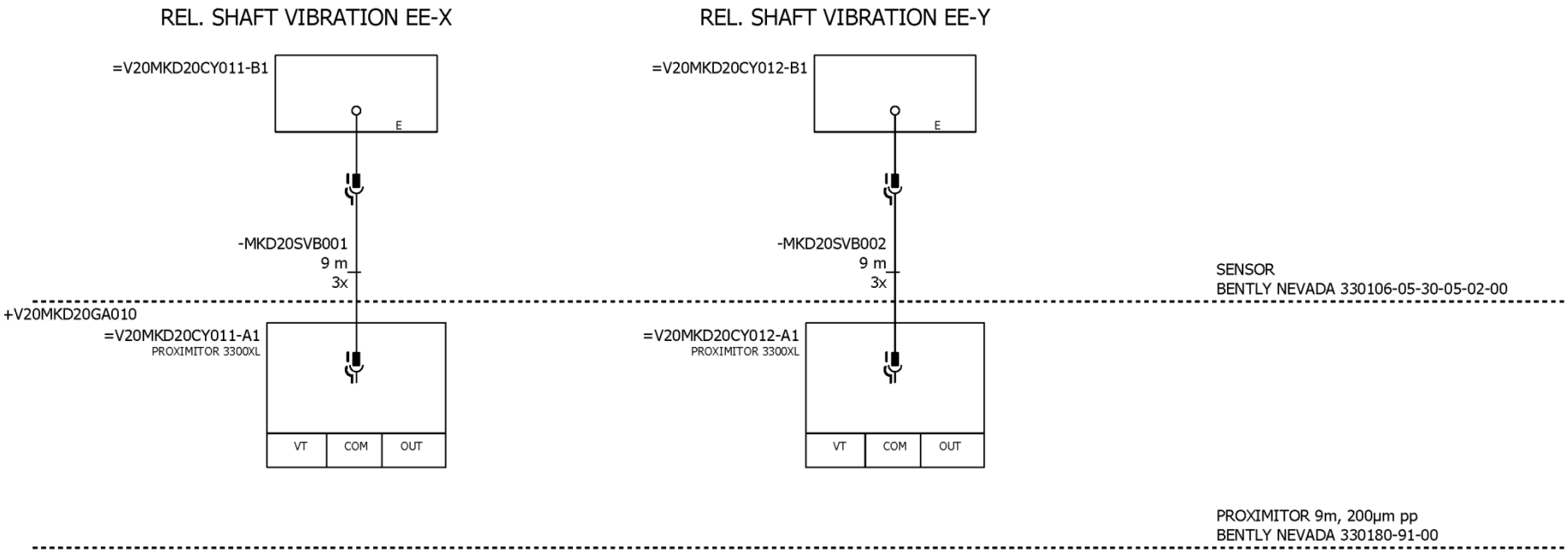
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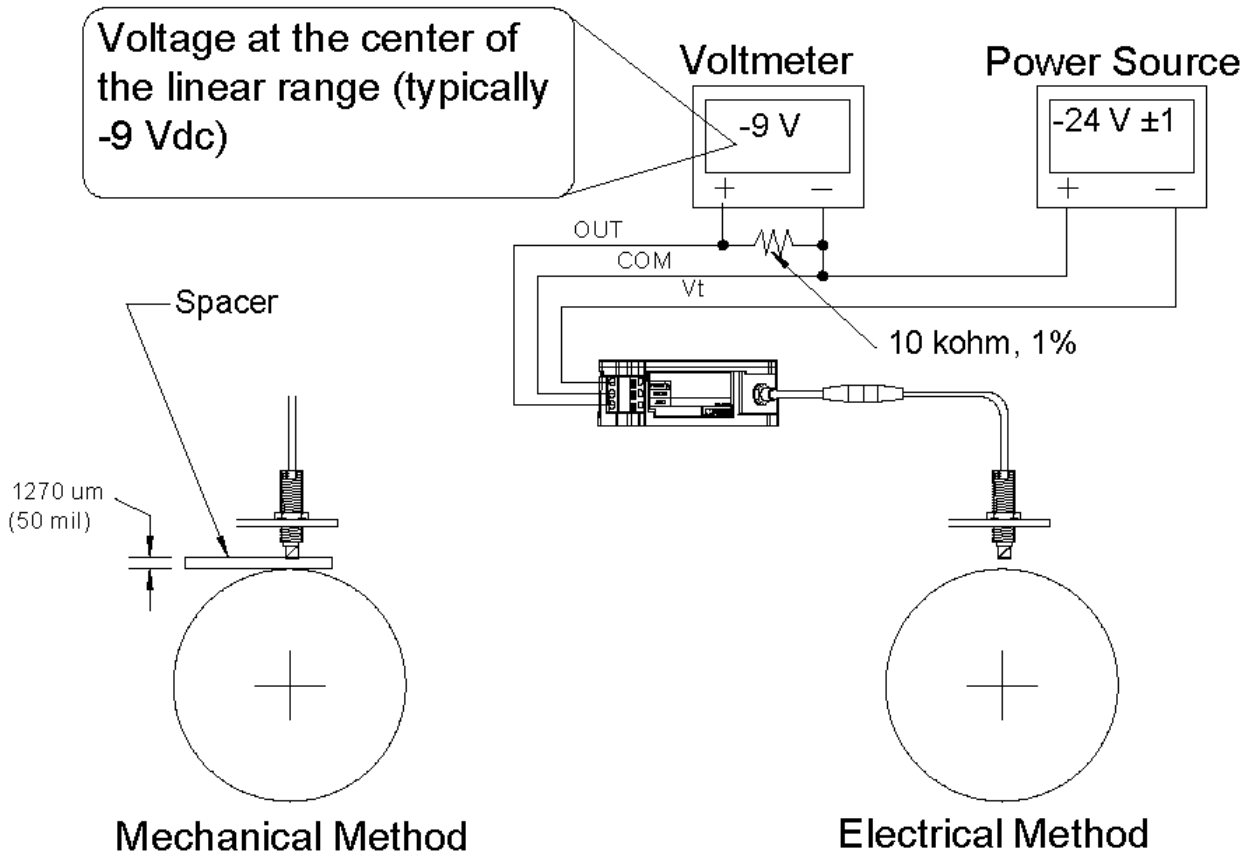
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BEARING EE



TE ... TURBINE END
EE ... EXCITER END

Adjust the distance between the probe tip and the shaft using one of the methods shown in the following figure. The electrical method for setting the probe gap is preferred.



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Adjustment of vibration sensors to the shaft

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:** EG000367 Order-No.:	**Prot.-Nr.:** 5.0-1060-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung:	**Prüfdatum:**	**Prüfer:**	**Gegenzeichnung:**
Department:	Date of Insp.:	Inspector:	Countersignature:

Shaft vibration pick-up	**Proximitor**	**GAP-voltage (V)**	
Bearing TE		measured	correct
TE-X = V20MKD10CY011-B1	= V20MKD10CY011-A1		
TE-Y = V20MKD10CY012-B1	= V20MKD10CY012-A1		
Bearing EE			
EE-X = V20MKD20CY011-B1	= V20MKD20CY011-A1		
EE-Y = V20MKD20CY012-B1	= V20MKD20CY012-A1		
Keyphasor			
= V20MKD10CY013-B1	= V20MKD10CY013-A1		

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3.6. Visual control

3.6.1. General reference

Suitable skilled personnel must make visual inspections after the assembly work has been finished and before the initial start up. All areas within the sphere of the generator must be inspected for dirt, foreign objects, damage and nonconformances to the manufacturer's design. The visual inspection is the last examination of all components, connections between components, their securing devices and completeness, and it should therefore be carried out with appropriate care.
Suitable notes about the tours of inspection and checks of the following individual modules are to be written in a report.

3.6.2. Generator stator

Before closing the access points and apertures on the stator, all accessible areas of the end winding, the current lead ducts and apertures, the current lead connections, the laminated core, the cover and the housing are to be examined within the scope of the visual inspection with suitable lighting and also with a mirror if necessary. All dirt and foreign objects found are to be removed.

3.6.3. Rotor

The visual inspections of the rotor should include the accessible areas under the end bells, the slip rings, brushes, brush yoke and the coupling. The direction of rotation of the fans and the resulting direction of the cold air flow must also be checked.

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3.6.4. Electrical accessories

The electrical accessories are to checked to see that the components are properly attached, the cables are laid correctly, and that the labeling corresponds to the manufacturer's specifications.

3.6.5. Cooling system

The examination of the cooling circuit includes checking that all the associated components such as seals, flanges, guiding equipment, shut-off and deflection equipment are securely attached, complete and fault-free.

3.6.6. Oil supply unit

The oil circuit should be visually inspected after being flushed with oil and brought back to a system which is ready for operation. The pipelines, their supports, screw connections, sealing elements, inspection glasses, shut-off and setting devices, their connections and securing and safety devices must be checked.

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Visual Controls

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:5.0-1070-0001** Record-No.:	**Blatt-Nr.:**1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Visual Controls

Design Group	Remark
Generator stator	
Rotor	
Electrical accessories	
Cooling system	
Oil supply unit	

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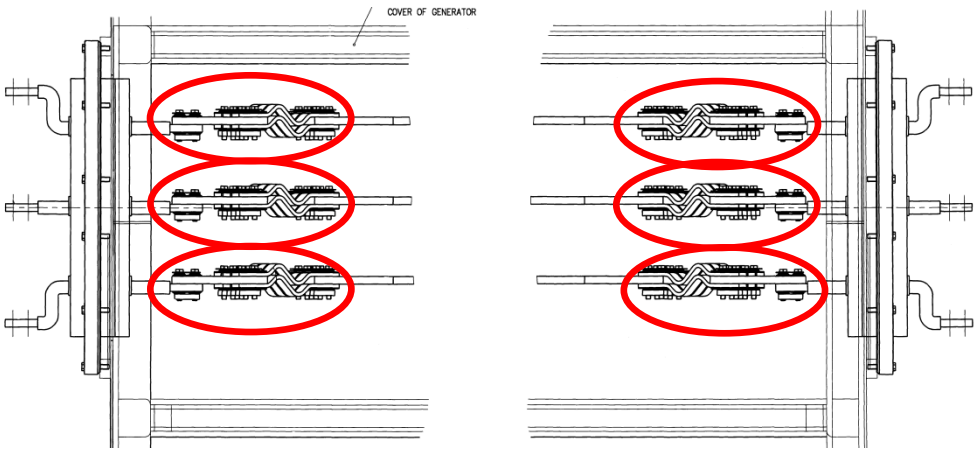
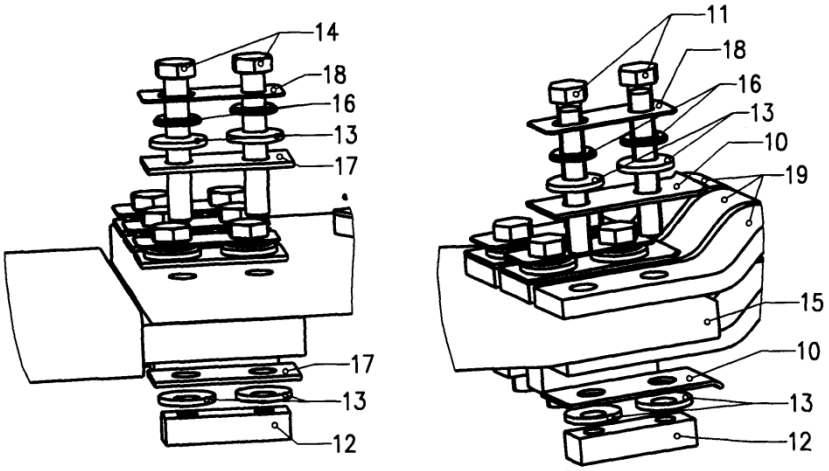
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Bushings Assembly Visual Controls

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:**5.0-1071-0001 Record-No.:	**Blatt-Nr.:**1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Bushings Assembly Visual Controls

Design Group	Remark
	Tighten all flex links mounted stress-free and their screwed connections according the specified torques. The lock washers are locked (bended)
 IT.11 and 14 locked with IT.18	Screw connections on flex links and copper bars and bushings are assembled according the drawing.

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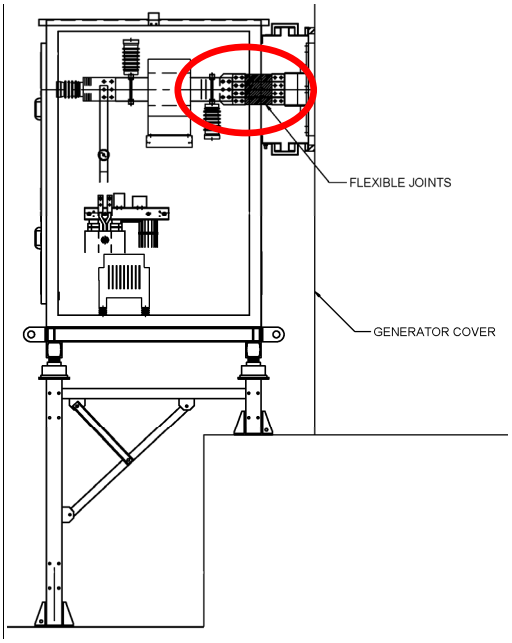
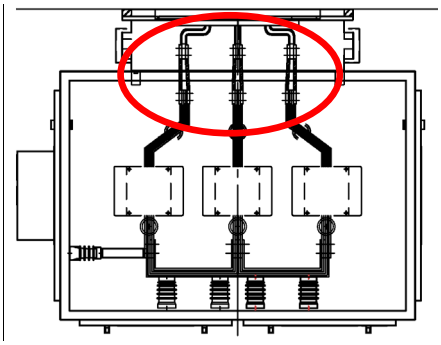
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Bushings Assembly Visual Controls

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:5.0-1071-0001** Record-No.:	**Blatt-Nr.:**2 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

NS Cubicle Bushings Assembly Visual Controls (Example)

Design Group	Remark
	Tighten all flex links mounted stress-free and their screwed connections according the specified torques. The lock washers are locked (bended)
	All neutral point connections plates mounted stress free and there screw connections tighten, according the specified torques. The lock washers are locked (bended), just before starting the commissioning.

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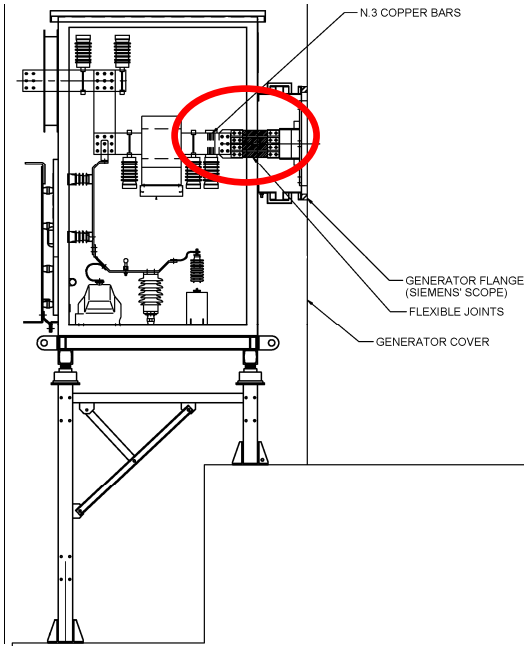
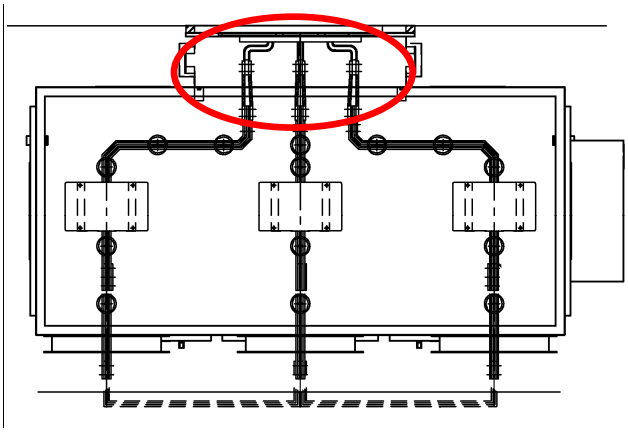
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Bushings Assembly Visual Controls

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:5.0-1071-0001** Record-No.:	**Blatt-Nr.:**3 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

LS Cubicle Bushings Assembly Visual Controls (Example)

Design Group	Remark
	Tighten all flex links mounted stress-free and their screwed connections according the specified torques. The lock washers are locked (bended)
	Tighten all flex links mounted stress-free and their screwed connections according the specified torques. The lock washers are locked (bended)

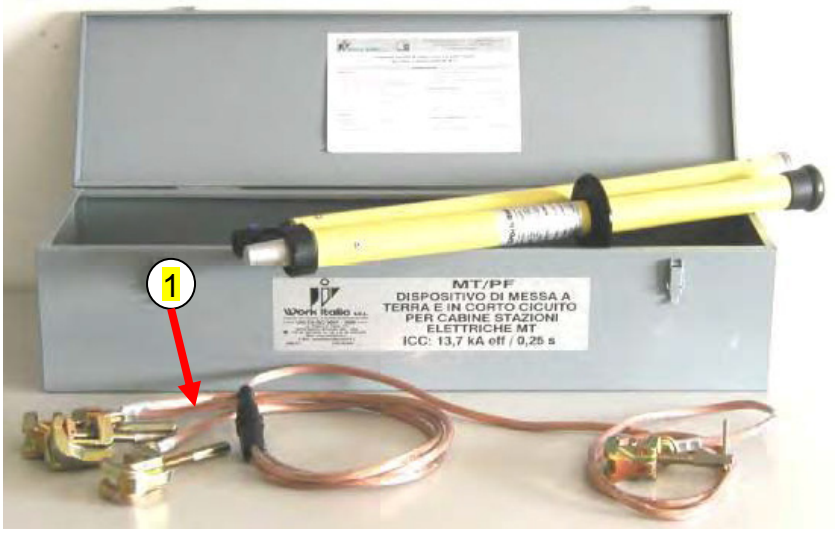
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3.7. Functional tests

3.7.1. Electrical accessories

The functional tests of the electrical accessories are made on the control devices of the control and measuring rooms jointly with the operator's trained personnel. After the plant has been released, the individual electrical devices are to be switched on by the control personnel, and the functions of the displays, data storage, registration devices, control and message displays are to be checked.
The serviceability of each individual device is to be logged.

- Step-by-step switching-in and start-up of power supplies and auxiliary supplies for anti-condensation heater, protection system and excitation system
- Loop checks of all analog and binary signal connections between generator, current transformers and voltage transformers, exciter system and protective system, and of the central instrumentation and control or of the turbine controller
- If the installation of a 3-phase short circuit is necessary, a rated current-resistant version must be used. The grounding cables (1) are NOT suitable for that purpose!!



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3.7.2. Oil circulation

The oil circulation is to be switched on by the operator's personnel and the system feedback of the functions is to be checked. The following generator functions are to be checked:
- oil-tightness of the entire system
- functional performance of the oil circulation
- check all inspection glasses in the return line
- check the oil pressures in the pressure oil system
- check the rates of flow

3.7.3. Spinning the rotor

The rotor should be spun with the rotor spinning device or other aids intended for that purpose, with the pressure oil pumps switched on. The noise is to be checked over the entire shaft train. The causes must be found if the shaft does not turn freely or there are unusual noises.

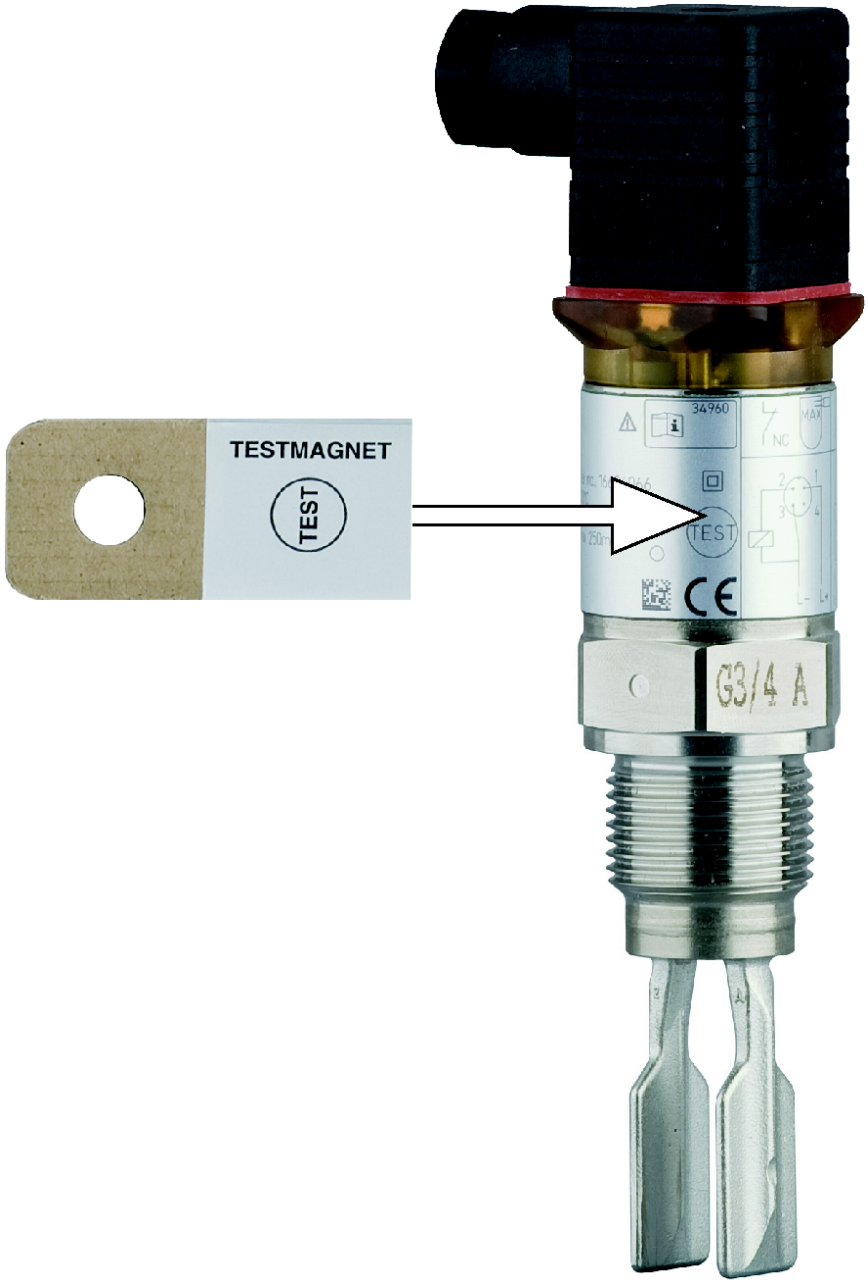
Note:
The rotor must not be turned by the fan blades or with rods on the rotor body. The use of hoisting equipment to turn the rotor is also forbidden.

3.7.4. Recording the actual conditions directly before the start

The machine temperatures, oil pressures and secondary conditions are to be entered as reference data in the installation and start-up documentation.

3.7.5. Leakage Water Sensor Check

The sensor has an integrated test switch which can be activated magnetically.
Proceed as follows to test the instrument:
Hold the test magnet (accessory) to the magnet symbol on the instrument housing.



The test magnet changes the current switching condition of the instrument. You can check the change on the signal lamp. Please note that the connected instruments are activated during the test.

If Sensor does not switch over after several tests with the test magnet, you have to check the plug connection and the connection cable and test the instrument again.

⚠ CAUTION
It is absolutely necessary that you remove the test magnet after the test from the instrument housing.

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Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:**5.0-1080-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Functional Tests

		TE	**EE**	nominal
Lifting pressure	barg			118
Holding pressure	barg			77
Oil flow per Bearing	l/min			3,0 l/min (max.49°C)
Shaft Lift	mm			min. 0,07mm
min.Oil pressure at inlet	bar			min. 1,3 max. 2,0
Required Oil Volume for both Bearings at least	l/min			120 l/min (max. 49°C)

	Remark
oil-tightness of the entire system	
functional performance of the oil circulation	
check all inspection glasses in the return line	
spinning the rotor	

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Test Record

Functional Tests

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:** EG000367 Order-No.:	**Prot.-Nr.:**5.0-1090-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Leakage Water Sensor Check / Magnet or Water Check

Leakage Water Sensor	**Magnet Check / Signal Lamp**		
TE	**Switch open / GREEN**	**Switch closed / RED**	**Failure / flashes red**
=V20MKA10CL111			
= V20MKA10CL110			
EE			
= V20MKA10CL121			
= V20MKA10CL120			
Leakage Water Sensor	**Water Check / Signal Lamp**		
TE	**no Water / GREEN**	**Water / RED**	**Failure / flashes red**
=V20MKA10CL111			
= V20MKA10CL110			
EE			
= V20MKA10CL121			
= V20MKA10CL120			

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4.0. Measurements and checks after the start (rated speed no-load operation)

The generator should be operated on the turning gear and run up in accordance with the turbine startup diagrams. Prior to running the generator on turning gear, the shaft lift oil pump (if existing) and the bearing oil system must be placed into operation. The oil flow to the bearings should be checked prior to turning gear operation to ensure an adequate flow. In addition, drains should be inspected for proper operation.

During runup to rated speed, the bearing oil inlet temperature should be in accordance with the turbine manual.
During runup the critical speed ranges should be passed through quickly and at an uniform rate.
Smooth running depends on several factors. Even minor temperature differences of 1 to 2 K between opposite sides of the rotor may result in rotor distortion which could lead to inadmissible vibrations due to unbalance.
During runup the bearing and oil temperatures should be read and logged at short intervals.
To prevent these thermal unbalances during runup the turbine-generator should be run on turning gear. If the generator is run up following prolonged turning gear operation, no restriction regarding the rate of runup need be observed other than those required for the turbine.

4.1. Measurements and checks during the run up

- Check the direction of rotation

The direction of rotation of the rotor is to be compared with the existing, supply-side electrical rotating field in terms of the synchronous conditions.

- Check for unusual noises

Should the generator make unusual noises during the run up, it must be brought to a standstill immediately and the causes eliminated.

- Check the oil circulation in accordance with section 3.7.2.

Should leaks occur during the run up that bring further damage free operation of the plant into question, it must be brought to a standstill immediately and the causes eliminated.

- Check all seals in the cooling circuit

The cooling circuit must be examined for leaks of the cooling media.
Should leaks be detected during the run up that bring further damage free operation of the generator into question, it must be brought to a standstill immediately and the causes eliminated.

- Ongoing check of all bearing temperatures

The bearing temperatures are to be continually checked during the start phase and are to be logged until an equilibrium temperature is reached.
If the temperatures reach the alarm level set in the protection program during the run up, then the machine set must be brought to a standstill immediately and the causes eliminated.

- Ongoing check of all measured vibration values

The measured vibration values are to be continually checked during the start phase and logged at each speed stage until the rated speed is reached.
If the vibrations reach the alarm level set in the protection program during the run up, then the machine set must be brought to a standstill after the initial start up and the causes diagnosed. Should the measured vibration levels exceed the alarm levels, the generator must be brought to a standstill immediately.

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4.2. Accident and damage prevention measures

The initial start up is to be supervised by a qualified coordinator.
All inspection and measurement work on the generator must be performed by trained, skilled personnel, and agreed in advance with the person in charge of the initial start up. Only those trained people who have been directly appointed to carry out the start up activities may remain in the area around the generator.
The generally applicable protective working clothes and equipment are to be worn while making checks and measurements on the generator, and the accident prevention regulations relevant to the plant must be observed.
When using ladders, scaffolding or similar aids, their instructions for use must be followed.

Note:
Special conditions and states may occur within the scope of the initial start up which are not usual in normal operation. (e.g. rotating parts, such as slip rings, coupling etc. are exposed, whereas they are covered during normal operation)
For such states, appropriate warning notices and fencing must be erected, and the personnel must be instructed.
Failure to observe these instructions may put untrained people in danger.

4.3. Inspections at nominal speed during no-load operation

- Excite the generator in the ECR mode to approx. 10% of the stator nominal voltage, and check the phase voltages for balance and direction of rotating field.
- Measurement of induced shaft voltage, and functional verification of the bearing insulation at generator nominal voltage.
- Inspection of the synchronizing unit and of the different synchronizing positions.
- Check the bearing and winding temperatures.
- Measure the bearing and shaft vibrations of the entire turbine-generator with and without excitation.

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Turbogeneratoren
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Turbogenerators
Test Record

Bearing Metal Temperature / Oil flow

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:** EG000367 Order-No.:	**Prot.-Nr.:** 5.0-1100-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Bearing Temperature (°C)

	Standstill	5 min	10 min	15 min	30 min	60 min	120 min	180 min
TE								
TE								
EE								
EE								

		TE	**EE**	nominal
Lifting pressure	barg			118
Holding pressure	barg			77
Oil flow per Bearing	l/min			3,0 l/min (max.49°C)
Min.Oil pressure at inlet	bar			min. 1,3 max. 2,0
Required Oil Volume for both Bearings at least	l/min			120 l/min (max. 49°C)

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Stator Slot Temperature

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:** 5.0-1110-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Stator Slot Temperatur (°C)

Phase	Slot								
		Standstill	5 min	10 min	15 min	30 min	60 min	120 min	180 min
U	2								
V	11								
W	20								
U	29								
V	38								
W	47								
U	30								
V	39								
W	48								

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Air Temperature

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:** 5.0-1120-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Air Temperatur (°C)

		Standstill	5 min	10 min	15 min	30 min	60 min	120 min	180 min
Cold Air TE									
Cold Air EE									
Warm Air									
Warm Air Exciter									

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Turbogeneratoren
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Shaft Vibration

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:** 5.0-1130-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Shaft Vibration (S_{PP} according to ISO 7919-2)

Time	TE (µm)	EE (µm)	U [kV]	I [A]	P [MW]	u_f [V]	i_f [A]

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Bearing Vibration

Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:** 5.0-1140-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Bearing Vibration (V_{eff} according to ISO 10816-2)

Time	TE (mm/s)	EE (mm/s)	U [kV]	I [A]	P [MW]	u_f [V]	i_f [A]

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4.4. Electrical checks of the bearing insulation

The electrical check of the exciter end bearing insulation can only be performed with the excitation switched on at the contact provided on the bearing pedestal. The resistance between the contact made on the spherical bearing seat and the bearing pedestal housing is to be measured.

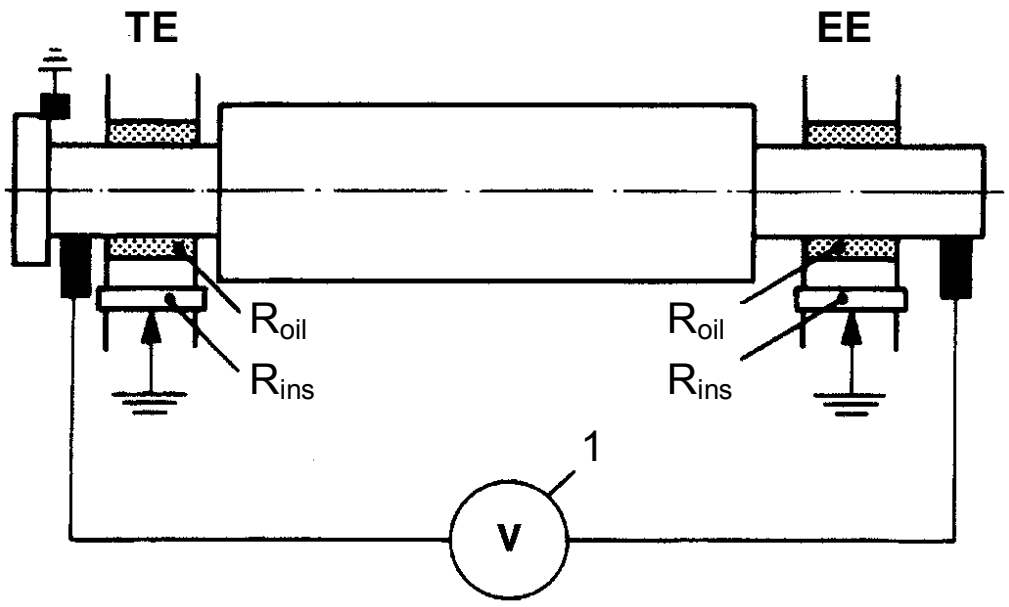
Due to the rotor grounding arrangement at the turbine end, the shaft voltage should be measured at the exciter end. Since the result depends, however, on the function of the rotor grounding system (carbon brush sliding on shaft), the shaft voltage should first be measured according to Fig. 1 with the generator running and excited. Normally, this will be an AC voltage of a few volts on which a small DC component is superimposed. Measurement should be performed by means of a voltmeter in the ac range. The voltage should be picked off the shaft through a sliding contact with an insulated handle, which is connected to the meter by a cable.

The shaft voltage measured in this way should then be compared with the voltage measured according to Fig. 2. If the two readings are not identical, the rotor grounding system should be rectified first before taking any further readings to check the insulation for shaft currents.

If the shaft voltage can be accurately measured according to Fig. 2, the measuring brush on the shaft should first be connected to the potential measuring terminal on the insulated bearing at the exciter end by means of a cable. The oil film is thus bridged, and the component assumes the shaft potential. With satisfactory insulation, the instrument will continue to indicate a shaft voltage of the original magnitude. Insufficient insulation resistance will result in a current flow through the insulation that can be read on the ammeter. The bridging of the oil film results in a reduction of the original shaft voltage or in its complete collapse.

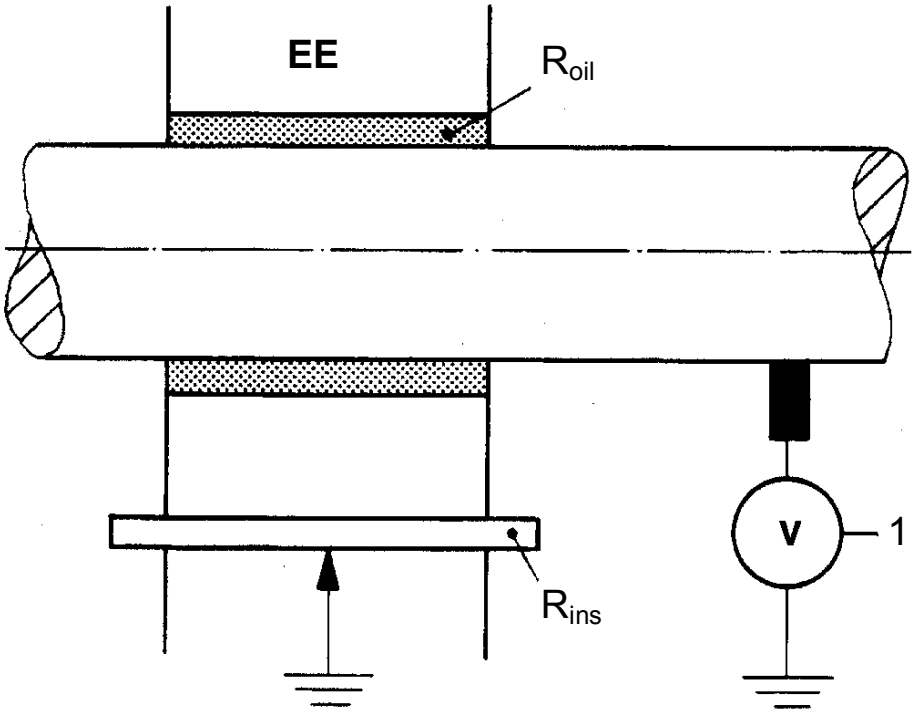
The resulting current can be measured for a brief moment by means of an ammeter connected into the circuit between the measuring brush and the potential measuring terminal (Fig. 3).

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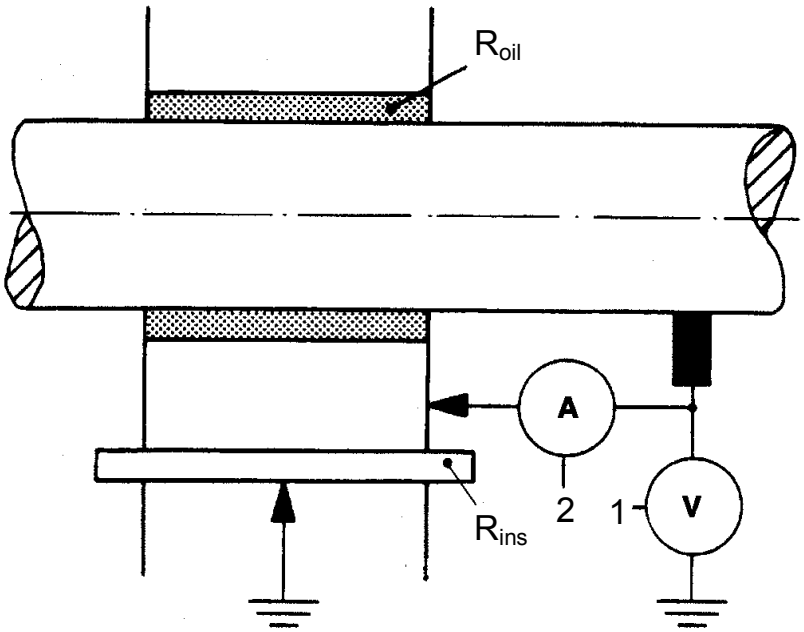
1 Voltmeter (AC range)

Fig. 1 Measurement of Shaft Voltage With the Generator in Excited Condition



1 Voltmeter (AC range)

Fig. 2 Measurement of Shaft Voltage at Exciter End With the Generator in Excited Condition



1 Voltmeter (AC range)
2 Ammeter

Fig. 3 Measurement of Shaft Current With the Generator in Excited Condition

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Turbogeneratoren Prüfprotokoll
Turbogenerators Test Record

Checking of Insulation for Protection from Shaft Currents

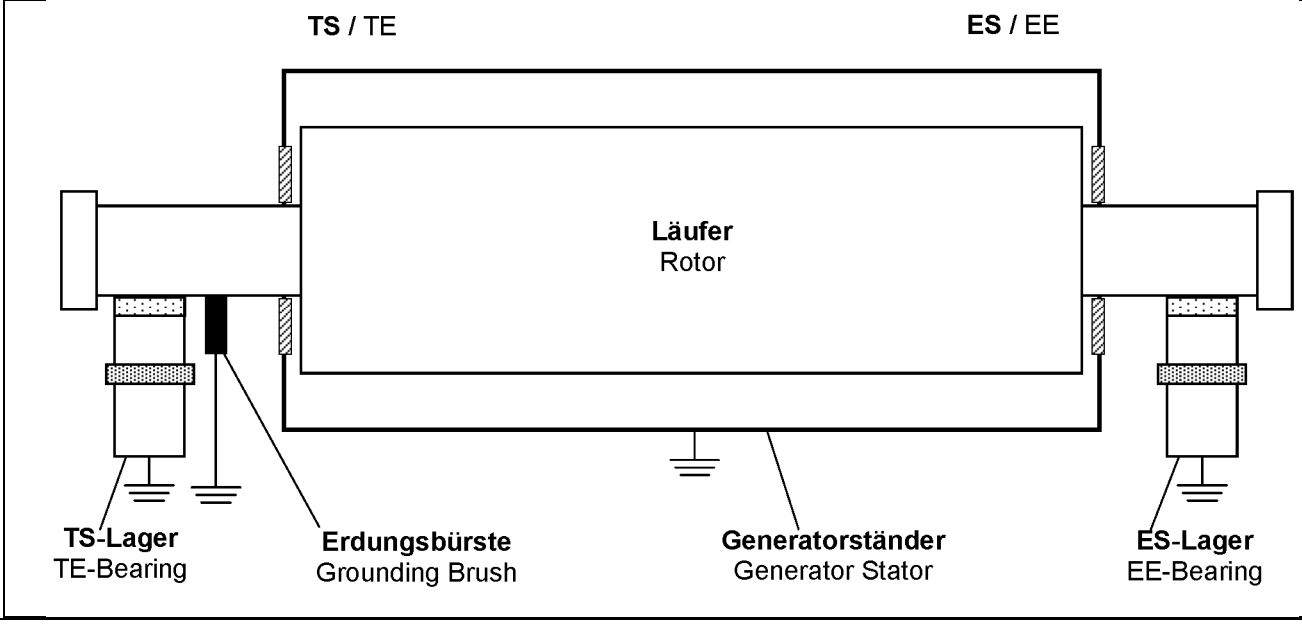
Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:**EG000367 Order-No.:	**Prot.-Nr.:** 5.0-1170-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Checking of Insulation for Protection from Shaft Currents

	Unit	Date		
Generator Load Conditions				
Active Power	MW			
Reactive Power	MVAr			
Terminal Voltage	kV			
Stator Current	kA			
Generator Field Current	A			
Measurement of Shaft Voltage / Current				
across the shaft TE - EE	V			
Shaft EE – Ground	V			
Pot. Bearing EE – Shaft EE	mA			
	V			

Instruments	
V-meter:	Meas. Range:
A-meter:	Meas. Range:



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5.0. Prerequisites for switching into the power supply network

The generator cannot be switched into the power supply network until all the necessary protective devices have been shown to be checked. The plant monitoring system must be in full working order. All operating data stores of the plant are to be switched on.
After setting the rated voltage of the generator, maintenance of the four synchronous conditions must be verified with certainty. Suitable control measures are to be used to eliminate plant faults which only simulate synchronism. This control work can only be performed by experienced, skilled personnel.

Note:
Multiple faults in the area of the plant can cancel out each others effects.
Asynchronous switching into the network may heavily stress the generator and plant components or cause substantial damage to parts of it.

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5.1. Inspections during turbine-generator load operation

Measure bearing temperatures, air temperatures and winding temperatures if possible at the generator's rated load after the thermal balance has been reached.

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Turbogenerators
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Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:** EG000367 Order-No.:	**Prot.-Nr.:** 5.0-1220-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Stator Slot Temperatur (°C)								
Phase	Slot	KKS	**(°C)**	U [kV]	I [A]	P [MW]	u_f [V]	i_f [A]
U	2	V20MKA10CT010						
V	11	V20MKA10CT020						
W	20	V20MKA10CT030						
U	29	V20MKA10CT011						
V	38	V20MKA10CT021						
W	47	V20MKA10CT031						
U	30	V20MKA10CT012						
V	39	V20MKA10CT022						
W	48	V20MKA10CT032						
Air Temp. (°C)								
Cold Air TE		V20MKA10CT050						
Cold Air EE		V20MKA10CT055						
Warm Air		V20MKA10CT060						
Warm Air Exciter		V20MKA10CT062						
Bearing Metal Temp. (°C)								
Bearing TE		V20MKD10CT010						
Bearing EE		V20MKD20CT010						

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Measure bearing and shaft vibrations of the entire turbine-generator at rated load.

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Kennwort: Vilnius Biomass Code word:	**Auftr.-Nr.:** EG000367 Order-No.:	**Prot.-Nr.:** 5.0-1230-0001 Record-No.:	**Blatt-Nr.:** 1 Sheet-No.:
Material-Nr.: * Material-No.:	**Baugr.-Nr.:** * Group-No.:	**Id.-Nr.:** Id.-No.:	
Zeichn.-Nr.: * Drawing-No.:	**Index:** * Index:	**Position:** * Position:	**Typ:** SGen5-100A-2P Type:

Abteilung: Department:	**Prüfdatum:** Date of Insp.:	**Prüfer:** Inspector:	**Gegenzeichnung:** Countersignature:

Bearing Vibration (v_{eff} according to ISO 10816-2)

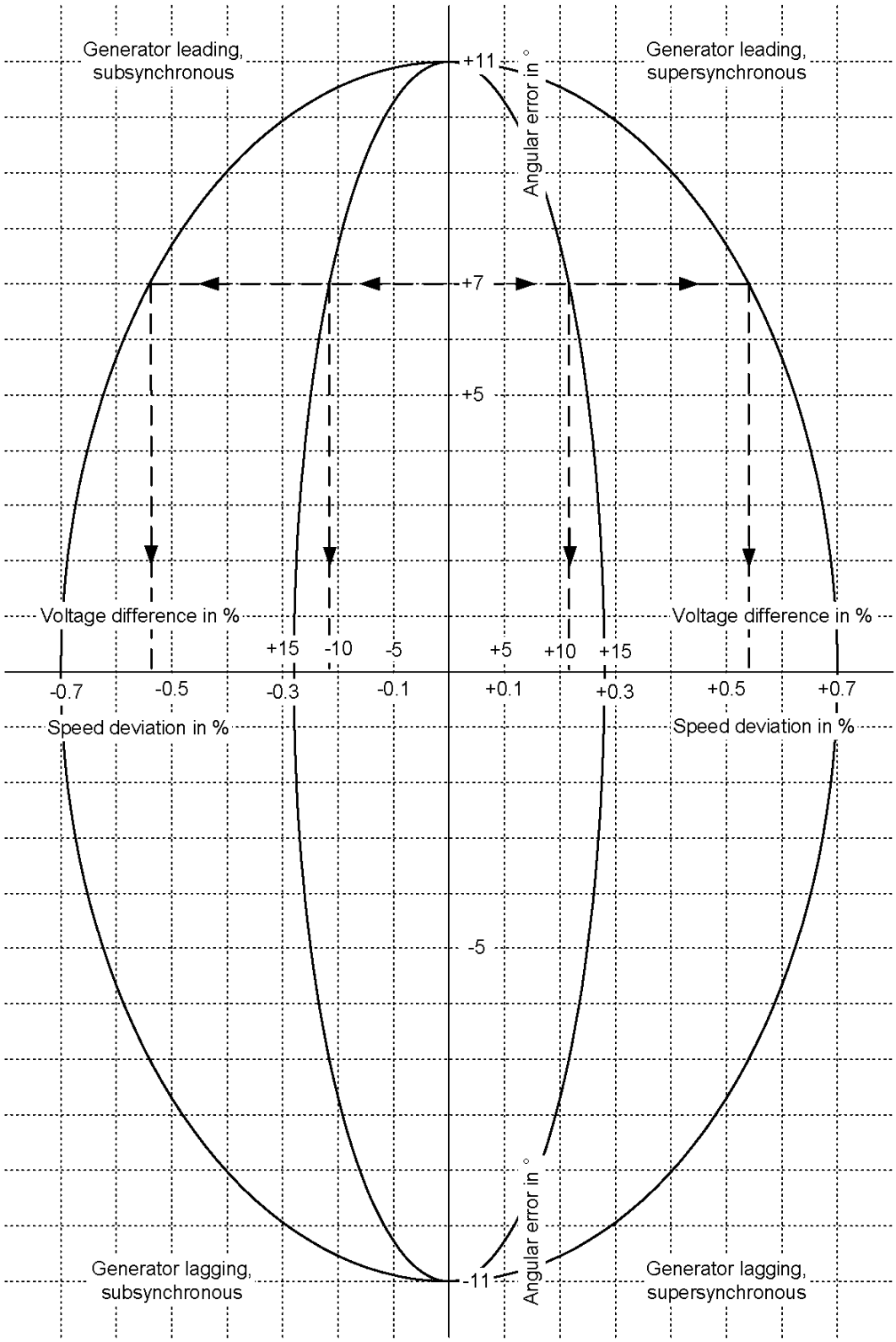
Bearing		mm/s			U [kV]	I [A]	P [MW]	u_f [V]	i_f [A]
Turbine 1	hor.								
	vert.								
	axial								
Turbine 2	hor.								
	vert.								
	axial								
Geno TE	hor.								
	vert.								
	axial								
Geno EE	hor.								
	vert.								
	axial								

Shaft Vibration (s_{p-p} according to ISO 7919-2)

Bearing		µm			U [kV]	I [A]	P [MW]	u_f [V]	i_f [A]
Turbine 1	X								
	Y								
Turbine 2	X								
	Y								
Geno TE	X								
	Y								
Geno EE	X								
	Y								

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5.2. Permissible Synchronizing Criteria



Example: Angular error +7° { Permissible speed deviation ± 0.54% max. Permissible voltage difference ± 10,7% max.

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5.3. Load input on the generator

After switching into the network and load input, the protective devices required for that should be tested.
The generator may then be run according to the rating plate data.
All temperature measuring devices are to be continually read and documented until the equilibrium temperatures in the windings have been attained.
The following checks are required within the scope of the load input:

Check for unusual noises

Should the generator make unusual noises during the load input, it must be unloaded again and the causes found.

- Ongoing check of all bearing temperatures

The bearing temperatures are to be continually checked during the load input.
Should the temperatures during the load input reach the alarm level set in the protection program, the generator must be unloaded again or brought to a standstill. The causes of dependencies must be found and eliminated.

- Ongoing check of all measured vibration values

The measured vibration values are to be continually checked during the load input and logged at each load stage until the rated load is reached.
If, during the load input, the vibrations reach the alarm level set in the protection program, then the machine set must be appropriately unloaded and the causes diagnosed.

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5.4. Load Limits

The generator can be excited, synchronized and connected to the system after rated speed has been reached. To do this, the excitation system must be taken into operation. For details, see separate description.

After the generator has been connected to the system, the active power should be set by means of the turbine speed changer and the reactive power through the excitation system.
For the permissible loading, always refer to the capability curve. The following conditions are assumed to exist:

- Generator is operated at rated frequency
- Generator is operated at rated voltage
- Generator phase sequence corresponds to phase sequence of system

This diagram shows different limiting curves for air operation which indicate the active and reactive power at a given power factor. The design point, representing the rated data of the generator, has been specially marked in this diagram. Any desired load setting is possible within the limits indicated as long as the load is not increased beyond the limit specified for the respective cold air temperature.

5.5. Rate of Loading

During operation, any desired load variation is permissible within the region of the capability curve. The permissible rate of loading depends on the condition of the winding insulation.

Generators provided with a *Micalastic*® stator winding insulation and a rotor winding of silver-alloyed copper with glass laminate insulation can be suddenly loaded and unloaded. The actual rate of loading should, however, be matched to the limits permissible for the turbine.

5.6. Unbalanced Load

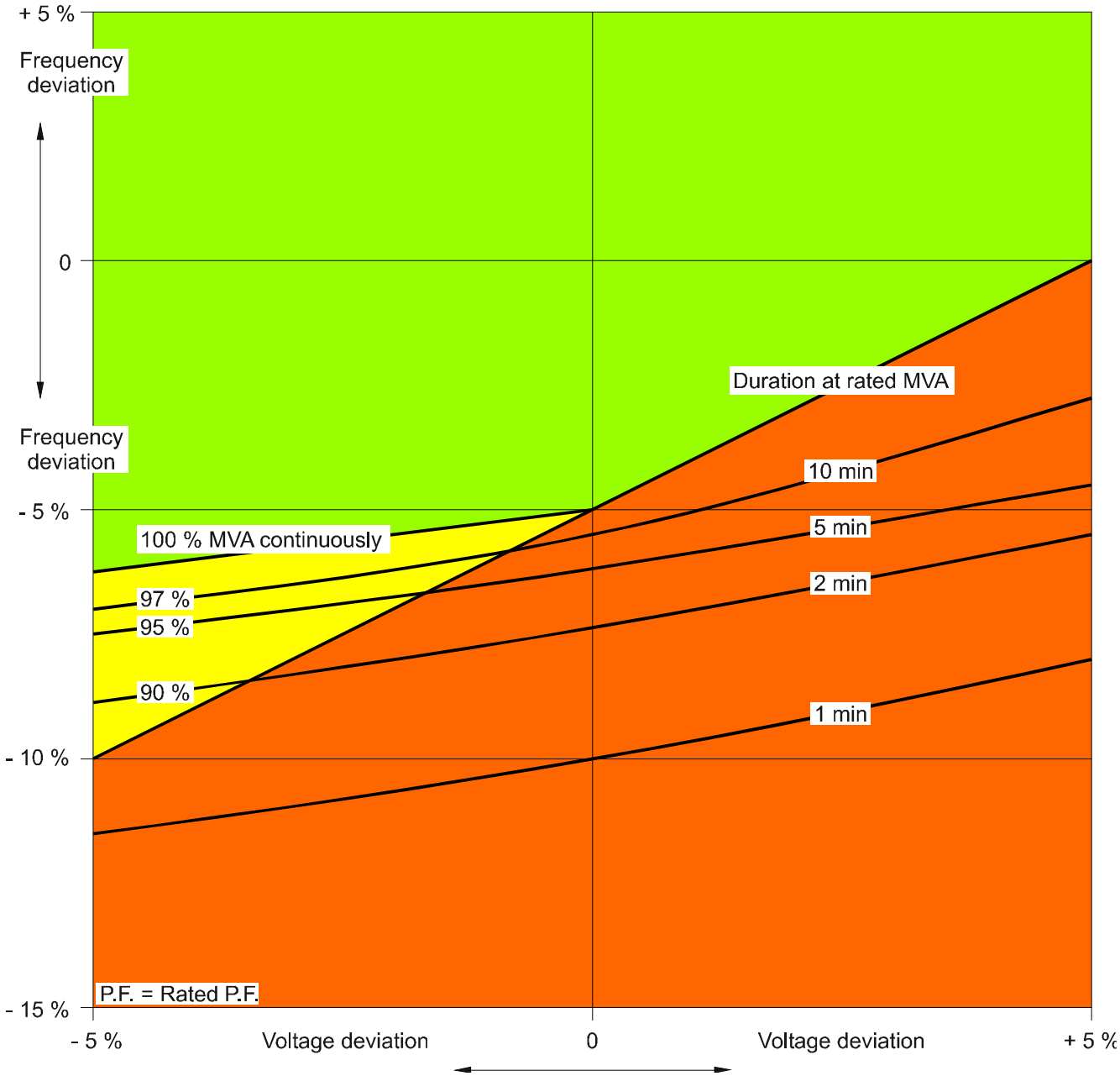
The continuously permissible unbalanced load as specified must not be exceeded under any operating condition. Unbalanced load is defined as the ratio of negative sequence current to rated current, with the rated current not being exceeded in any of the three phases.
The rated current is the permissible stator operation current for the selected cold air temperature.

5.7. Deviation of Voltage and Frequency

Loading of the generator with deviations from the rated generator voltage and/or frequency is only permissible up to the limits shown in attached diagram.

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5.8. Permissible Loading at Rated P.F. During Voltage and Frequency Deviations



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Permissible operating ranges of generator:

Continuous operating with rated MVA

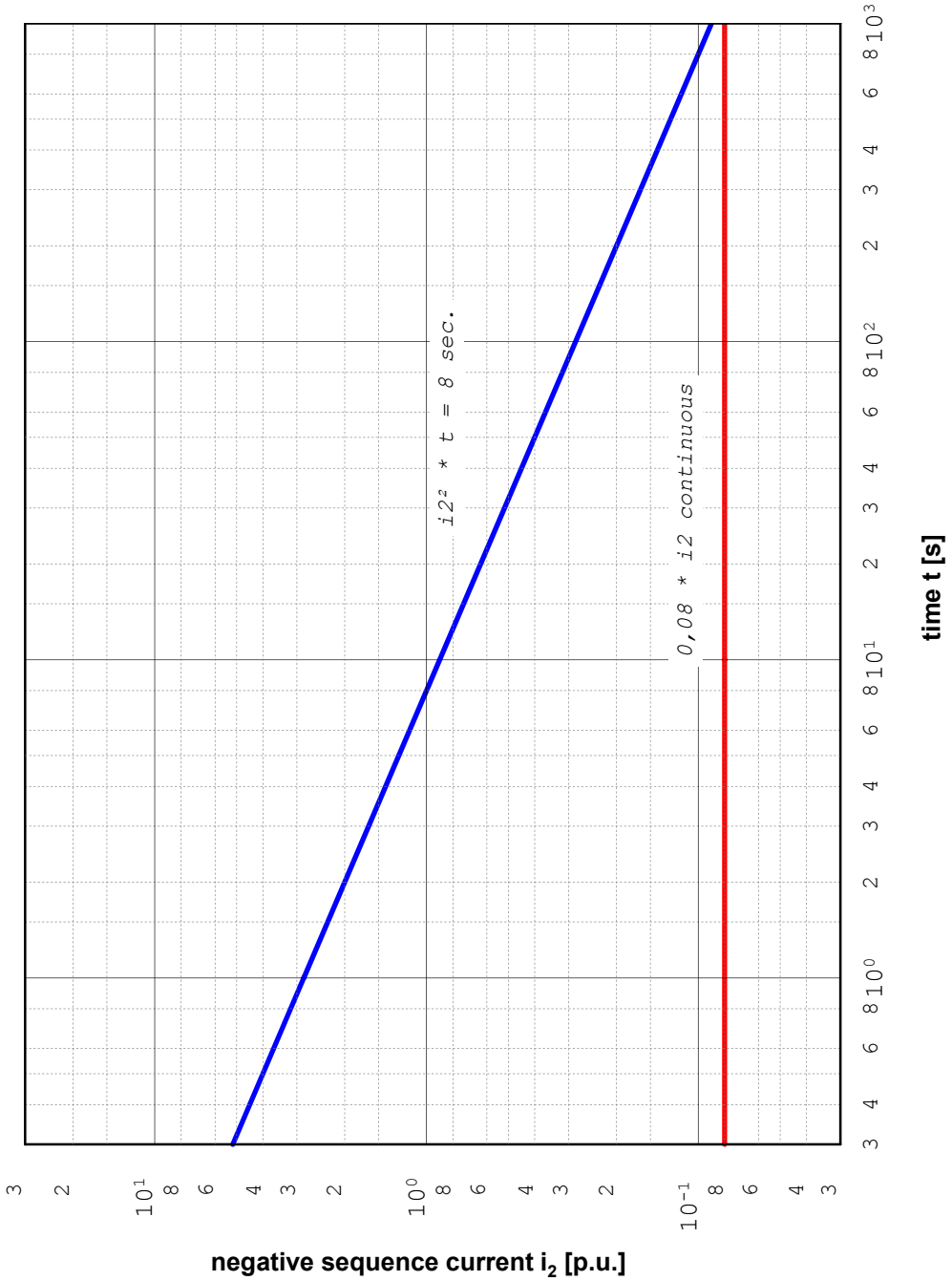
Short time operation with rated MVA[1]; continuous operation is not permissible even at reduced load.

Continuous operation with reduced load or short time operation at rated load.

1) During the two hours following a fault, generator may be operated only in range permissible for continuous operation with rated MVA.

5.9. Unbalanced Load_Time Curve

S_N =	93,176 MVA	PF =	0,85	$T_{Cold\ Air}$ =	50,0 °C
U_N =	15,00 kV	f_N =	50 Hz		
I_N =	3,586 kA	n_N =	3000 rpm		



Max. permitted values of negative sequence current incl. percentage caused by harmonic load.

None of the phase currents may exceed the nominal current.

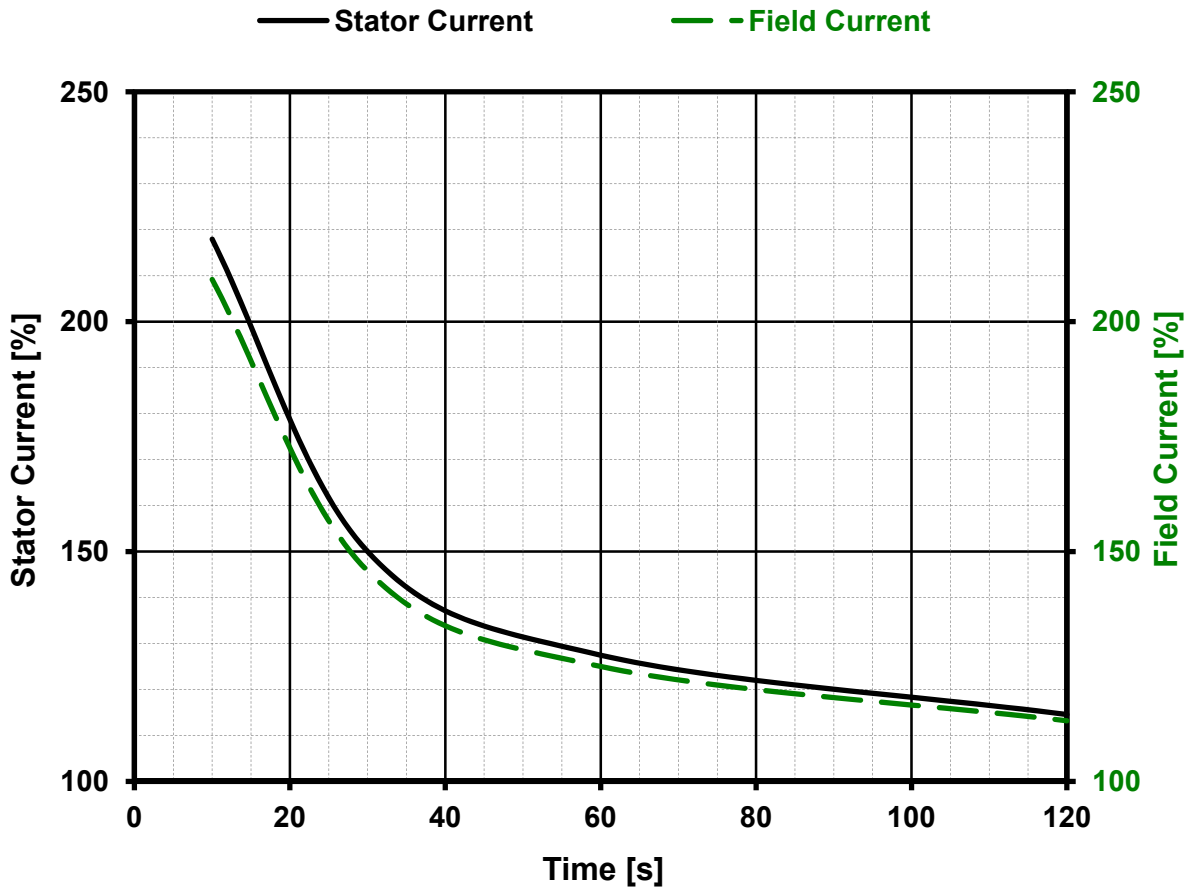
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5.10. Stator Current and Field Voltage versus Time

S_N =	93,176	MVA	PF =	0,85	$T_{Cold\ Air}$ =	50,0	°C
U_N =	15,00	kV	f_N =	50	Hz	I_{fN}=	875	A
I_N =	3,586	kA	n_N =	3000	rpm		

Time [s]	10	30	60	120
Stator Current I/I_N [%]	218	150	127	115
Field Current I_f/I_{fN} [%]	209	146	125	113

Fullfills IEC and ANSI requirements



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The generator is capable of operating at 150 percent of rated stator current for 30 sec.

The generator field winding is capable of operating at 125 percent of rated load field current for 1 min.

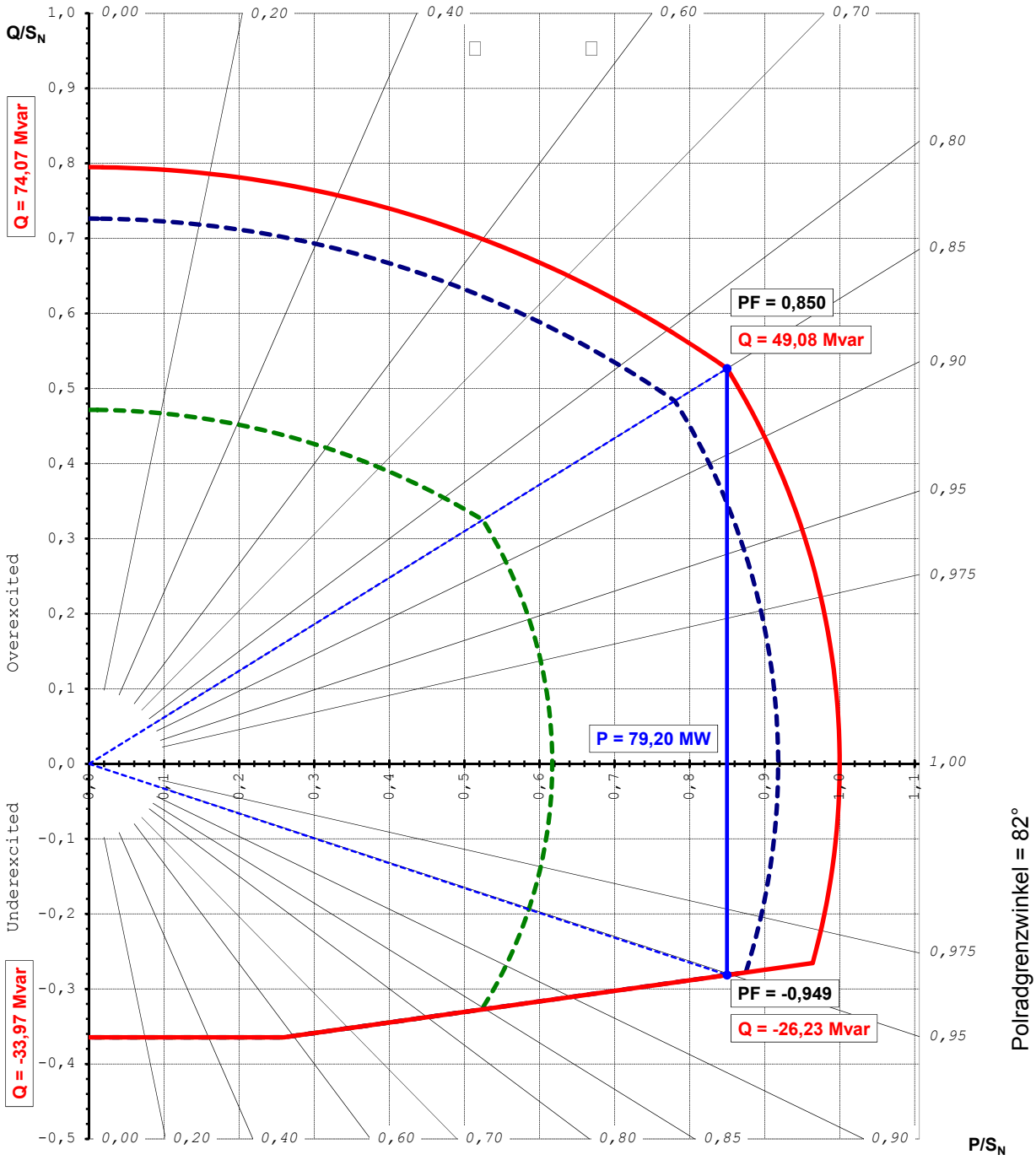
Both requirements are fullfilled starting from stabilized temperatures at rated conditions.

It is recognized that winding temperatures under these conditiones will exceed rated-load values.

Number of such operations should be limited to two times a year (corresponds to ANSI and IEC).

5.11. Reactive Capability Curve

Load Point	Rated		A		B	
S_N =	93,176	MVA	85,541	MVA	57,50	MVA
U_N =	15,00	kV	15,00	kV	15,00	kV
I_N =	3,586	kA	3,292	kA	2,213	kA
f_N =	50	Hz	50	Hz	50	Hz
PF =	0,85		0,85		0,85	
$T_{Cold\ Air}$ =	50,0	°C	50,0	°C	66,0	°C

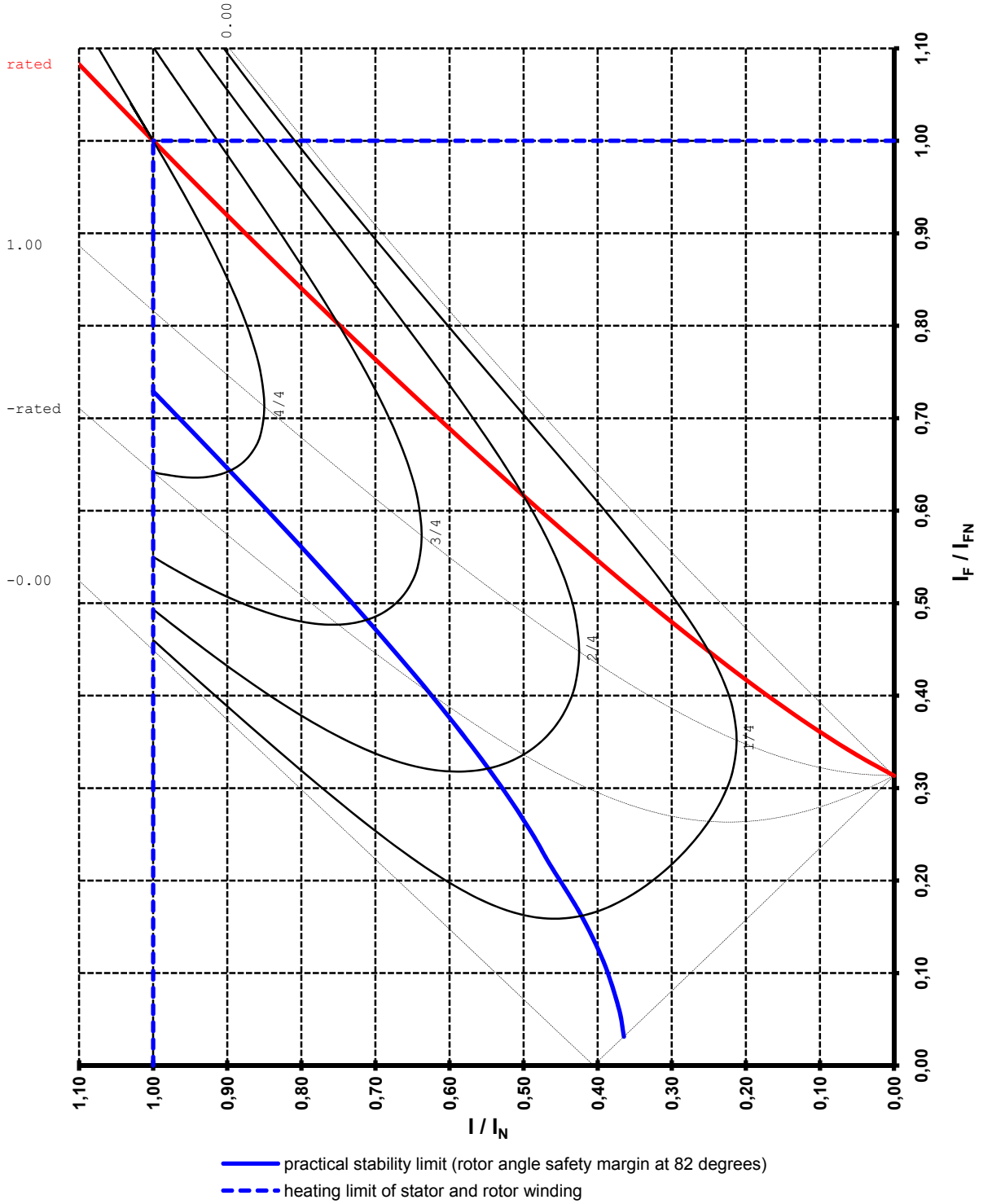


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5.12. V-Curves at Rated Voltage

S_N =	93,176 MVA	PF =	0,85	I_{f0} =	274 A
U_N =	15,00 kV	f_N =	50 Hz	I_{fN} =	875 A
I_N =	3,586 kA	$T_{Cold\ Air}$ =	50,0 °C		

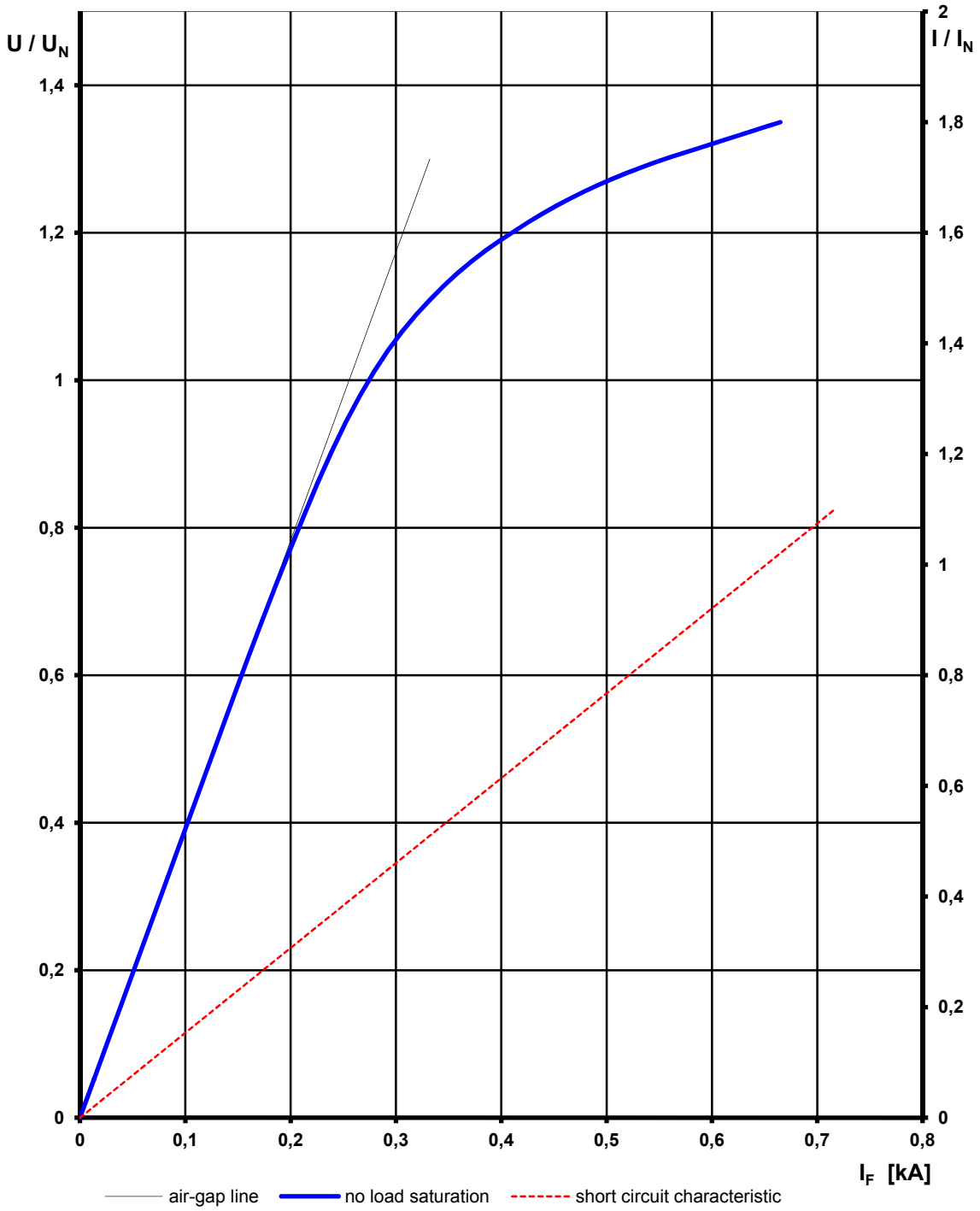
V-Curves Refer to Apparent Power



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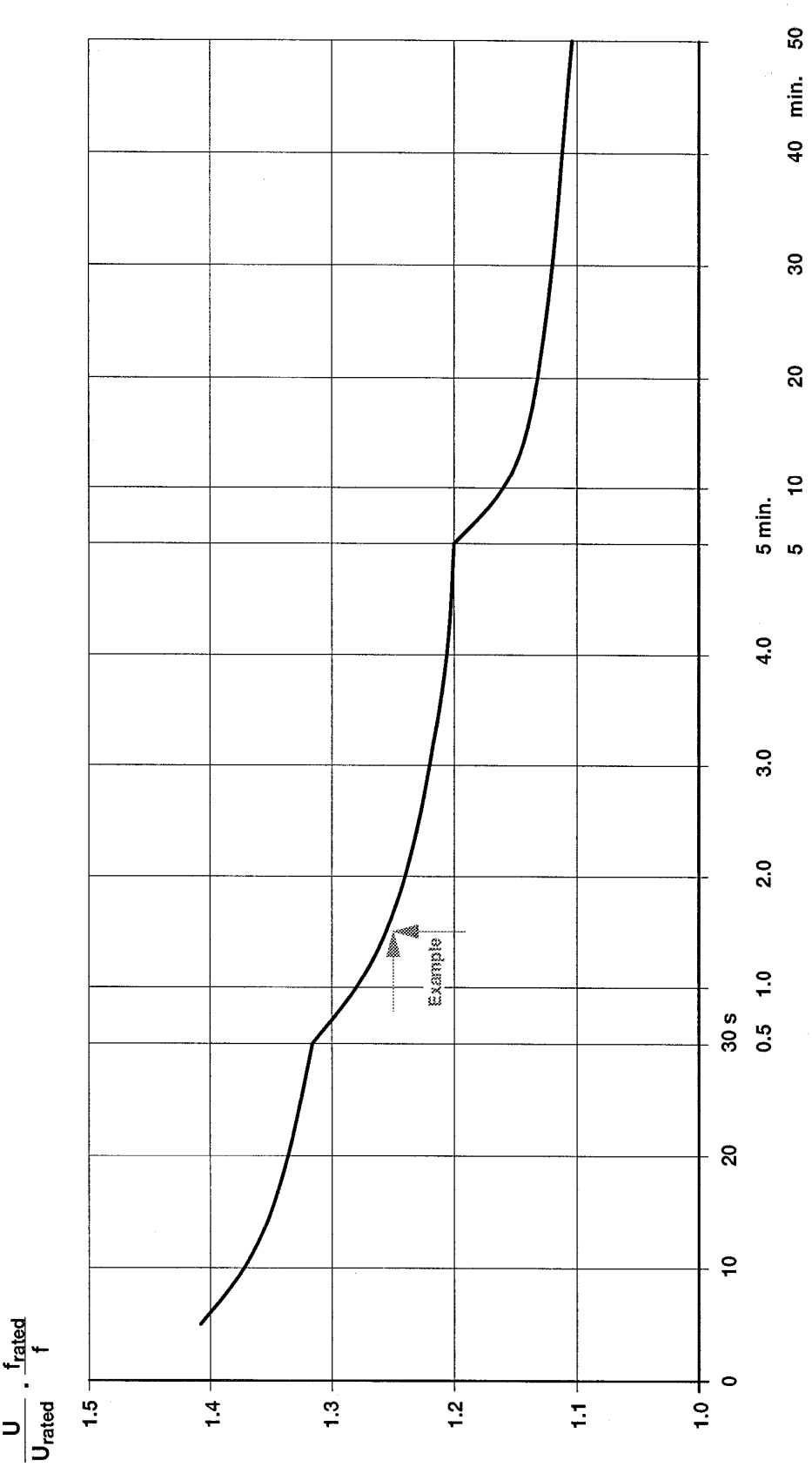
5.13. Short Circuit Characteristic, No Load Saturation

S_N =	93,176	MVA	PF =	0,85	S(1,0) =	7,3	%
U_N =	15,00	kV	SCR =	0,42	S(1,2) =	33,8	%
I_N =	3,586	kA	I_{f0} =	274	A		
f_N =	50	Hz	I_{fk} =	651	A		



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5.14. Limited Duration of Open-Circuit with Overvoltage



Example: *At rated frequency, the generator may be operated with an overvoltage of 1.25 U_{rated} for a maximum of 1.5 minutes. The voltage must be reduced to below 1.1 U_{rated} after this period.*

NOTE:
Overexcitation may cause the core guide bars to overheat. This could lead to stator failure. The limit curve above shows the limits at which the generator can be operated at $U/U_{rated} \cdot f_{rated}/f > 1.1$. Following operation under overvoltage conditions ($U/U_{rated} \cdot f_{rated}/f > 1.1$) the generator must operated at $U/U_{rated} \cdot f_{rated}/f < 1.1$ for a minimum of 15 minutes to cool down. This also applies in cases where the time limit is not exhausted. The generator must not be operated along the limit curve.

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5.15. Electrical Data, Losses and Efficiencies

Load Point						N		A		B	
Standard						IEC 60034		IEC 60034		IEC 60034	
Thermal Classification: Design / Using						F / B		F / B		F / B	
Apparent Power	Active Power			MVA	MW	93,176	79,20	85,541	72,71	57,50	48,875
Cold Air Temp.	Cooling Water Temp.			°C	°C	50,0	45,0	50,0	45,0	66,0	61,0
Voltage				kV		15,00		15,00		15,00	
Voltage Deviation		+	-	%		5,0	5,0	5,0	5,0	5,0	5,0
Armature Current				kA		3,586		3,292		2,213	
Frequency	Speed			Hz	rpm	50	3000	50	3000	50	3000
Power Factor				-		0,85		0,85		0,85	
Excitation Requirements	No load	I_{f0}	U_{f0}	A	V	274	67	274	66	274	65
	4/4-load	I_{fN}	U_{fN}	A	V	875	213	817	195	614	146
	5/4-load	$I_{f5/4}$	$U_{f5/4}$	A	V	1059	258	982	235	716	171
Cooling Air	Losses			kW		1051		964		708	
	Air flow	Temp. rise		m^3/s	K	24,0	41,9	24,0	38,4	24,0	28,2
Sudden-SCC at No-Load and Nominal Voltage	I_S: 3-phase (peak)			kA		53		53		53	
	I_{K3}: 3-ph. (sustained at I_{fN})			kA		4,8		4,5		3,4	
	I_{K2}: 2-ph. (sustained at I_{fN})			kA		7,7		7,2		5,4	
Short Circuit Ratio				(tol. ± 5%)		**0,42**	(≥ 0,40)	0,46		0,68	
Reactances	x''_d	unsat.	sat.	%	%	21,1	**17,1**	19,4	15,7	13,0	10,5
	x'_d	unsat.	sat.	%	%	30,3	27,3	27,9	25,1	18,7	16,8
	x_d	unsat.	sat.	%	%	255	238	234	218	157	147
	x''_q	unsat.	sat.	%	%	23,2	18,8	21,3	17,2	14,3	11,6
	x'_q	unsat.	sat.	%	%	54,4	49,2	49,3	44,6	32,9	29,8
	x_q	unsat.	sat.	%	%	242	206	222	189	150	127
	x_2	unsat.	sat.	%	%	22,1	17,9	20,3	16,5	13,7	11,1
	x_0	unsat.		%		11,0		10,1		6,8	
	x_{leak}	unsat.		%		16,6		15,2		10,2	
Time constants at 95°C winding temperature	T''_d	T_q''		s	s	0,029	0,073	0,029	0,075	0,029	0,075
	T'_d	T_q'		s	s	1,005	0,442	1,005	0,436	1,005	0,432
	T'_{d0}	T_{q0}'		s	s	9,079	2,500	9,079	2,500	9,079	2,500
	T''_{d0}	T_{q0}''		s	s	0,043	0,150	0,043	0,150	0,043	0,150
	T_a			s		0,329		0,329		0,329	
Resistance at 20°C	Stator winding / phase			mΩ		3,00		3,00		3,00	
	Rotor winding			mΩ		182,88		182,88		182,88	
Voltage regulation	PF = rated P.F.			%		42,7		40,7		32,8	
	PF = 1,00			%		37,0		35,0		26,0	
Max. unbalanced load	Continuous			%		8		8		8	
	Short time $i_2^2 * t$			s		8		8		8	
Power at PF = 0	Underexcited			Mvar		34,0		34,0		34,0	
	Overexcited			Mvar		74,1		67,7		43,9	
Winding temp. rise	Stator (RTD)			K	°C	66	116	59	109	39	105
Winding temp.	Rotor (average)			K	°C	55	105	49	99	32	98
Losses	Bearing losses			kW		60		60		60	
	Windage losses			kW		260		260		260	
	Core losses			kW		169		169		169	
	Short circuit losses			kW		398		336		152	
	Rotor I^2R losses			kW		190		166		93	
	Total losses			kW		1077		990		734	
Efficiencies with / without tol. at brushless excitation and rated P.F. (incl. bearing losses)	4/4-load			%	%	**98,66**	**98,55**	98,66		98,52	
	3/4-load			%	%	98,61	98,49	98,58		98,28	
	2/4-load			%	%	98,36	98,20	98,27		97,71	
	1/4-load			%		97,29	---	97,08		95,86	

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6.0. Operating and Setting Values

Kriterium PARAMETER			S_N=93,176 MVA		Einstellwert *SETTING VALUE*				Einheit UNIT
			Betrieb OPERATING		Meldung ALARM HIGH		Turbine Schutzausl TURBINE TRIP		
		Ausgangsleistung *POWER OUTPUT*	>62,7	≤62,7 *COOLER EMER-GENCY OPERA-TION* ****	>62,7	≤62,7 *COOLER EMER-GENCY OPERA-TION* ****	>62,7	≤62,7 *COOLER EMER-GENCY OPERA-TION* ****	MVA
		KKS *TAG NUMBER*							
PHASE/SLOT	U	V20MKA10CT010	116	102	121		126		°C
	V	V20MKA10CT020							
Nuttemperatur	W	V20MKA10CT030							
Ständer	U	V20MKA10CT011							
STATOR SLOT	V	V20MKA10CT021							
TEMPERATURE	W	V20MKA10CT031							
Pt100	U	V20MKA10CT012							
	V	V20MKA10CT022							
	W	V20MKA10CT032							
Siemens SPARE	U	V20MKA10CT013							
Siemens SPARE	V	V20MKA10CT023							
Siemens SPARE	W	V20MKA10CT035							
Warmlufttemperatur WARM AIR TEMPER. Doppel – Pt100 DOUBLE – PT100		V20MKA10CT060	92	90					°C
Kaltlufttemperatur Doppel - Pt100	TS TE	V20MKA10CT050	50	60	55	65	60	70	°C
COLD AIR TEMPERATURE DOUBLE – PT100	ES EE	V20MKA10CT055							
Lagertemperatur	TS TE	V20MKD10CT010	92*		97*		102*		°C
BEARING TEMPERATURE	ES EE	V20MKD20CT010							
Leckwasserüber-wachung	TS	V20MKA10CL110			X				
	TE	V20MKA10CL111					X*****		
LEAKAGE WATER DETECTION	ES	V20MKA10CL120			X				
	EE	V20MKA10CL121					X*****		
Relative Wellen-schwingung **	TS	V20MKD10CY011	90		165		240		µm
	TE	V20MKD10CY012							
RELATIVE SHAFT VIBRATION **	ES	V20MKD20CY011							
	EE	V20MKD20CY012							
Absolute Lagerbock schwingung ***	TS	V20MKD10CY010	3,8		7,5		11,8		mm/s
	TE	V20MKD10CY020							
		V20MKD10CY030							
ABSOLUTE BEARING VBRATION ***	ES	V20MKD20CY010							
	EE	V20MKD20CY020							
		V20MKD20CY030							

Die Betriebs- und Einstellwerte beziehen sich auf Maximalleistung des Generators bei entsprechender Kaltlufttemperatur.
THE OPERATING AND SETTING VALUES REFER TO MAXIMUM OUTPUT AT CORRESPONDING COOLING AIR TEMPERATURE.

* Die angegebenen Temperaturen sind Rechenwerte und werden nach der Inbetriebnahme korrigiert.
* *THE STATED TEMPERATURES ARE CALCULATED VALUES AND WILL BE CORRECTED AFTER INITIAL START-UP.*

** s_{p-p} nach ISO 7919-3 / ACCORDING TO ISO 7919–3
*** v_{eff} nach ISO 10816-3 / ACCORDING TO ISO 10816–3

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7.0. Generator Startup Diagram

	Actual condition
1 Command: Start up generato	$q_{cold\ air} \geq$ -20 °C
	trip limit “cooling air temperature HH” may be deactivated [2]
Bearing oil supply system	in operation
Jacking oil supply	in operation [1]
Cooling system	in operation
Bearing oil inlet temperature/pressure	see Dimensional Drawing Text
Anticondensation heating system / dryer	in operation
Measuring devices and supervisory equipment	in operation
Automatic voltage regulator	ready for operation
Generator protection	no error
2 Command: Run up generator	
Anticondensation heating system / dryer	out of operation for n > 50 rpm
Speed	n ≈ 90% rated speed
Jacking oil supply	out of operation [1]
Vibrations	within the limits, see Dimensional Drawing Text
Bearing metal temperatures	within the limits, see Dimensional Drawing Text
Field circuit breaker	closed
Set point for rated voltage	set
Speed	n = rated speed
3 Synchronizing, parallelling and loading	$q_{cold\ air} \geq$ 0 °C
	trip limit “cooling air temperature HH” must be activated [2]
Synchronizing	
Parallelling	
Loading	to required load, however, only within the region of the capability curve

[1] The specific switching-on speed is shown in the *Dimensional Drawing Text* (chapter “Technical Data”).

[2] Relevant to gas turbines only!

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SIEMENS
ENERGY SECTOR
GN ERF (Erfurt plant)

AUXILIARY WIRING DIAGRAMS GENERATOR

PROJECT	VILNIUS Biomass
ORDER NUMBER	EG000367
PURCHASER	
FINAL CUSTOMER/USER	Vilniaus Kogeneracine Jegaine
DATE OF ISSUE	2017, Dec. 19

Revision A 2017, Dec. 19
Revision B 2018, Apr. 16
Revision C 2018, Nov. 15

NUMBER OF PAGES 79

INFORMATION ABOUT CHANGES

no.	sh. index	Date	Name	Description of changes
1	a	19.12.2017	Möbius	first release for customer
2	b	16.04.2018	Rabe	V20 added; MTB adapted; first workshop release
3	c	15.11.2018	Rabe	revision as built
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	3	TABLE OF CONTENTS	Revision C	15.11.2018	19.12.2017	Rabe
	4	TABLE OF CONTENTS	Revision C	15.11.2018	19.12.2017	Rabe
	5	TABLE OF CONTENTS	Revision C	15.11.2018	19.12.2017	Rabe
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+V20MKA10GE050	59	NEUTRAL SIDE CUBICLE ANTICONDENSATION HEATER	Revision B 16.04.2018	19.12.2017	Rabe
+V20MKA10GE050	60	Klemmenplan : =+V20MKA10GE050-X1		19.12.2017	
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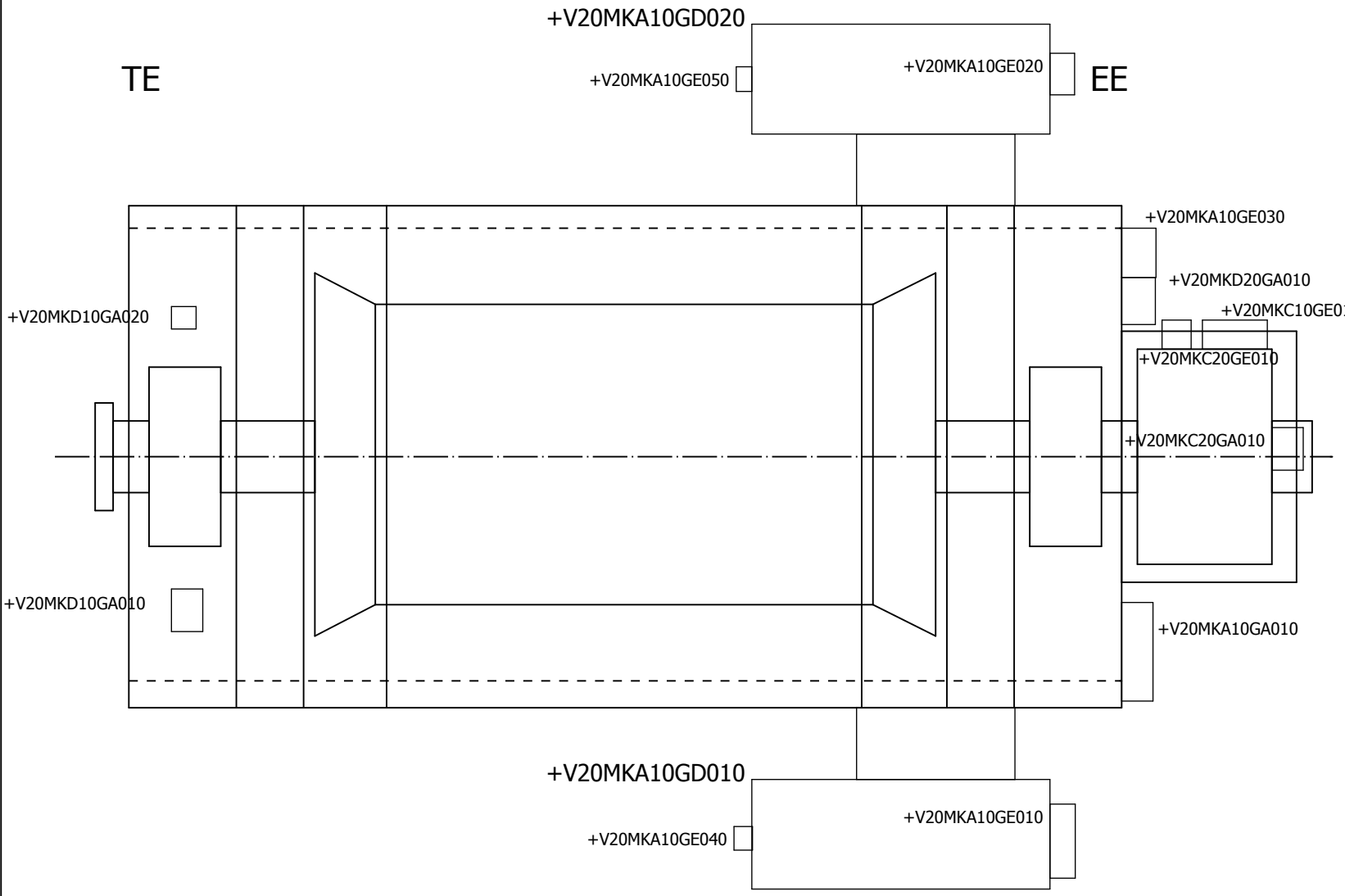
KKS	DESCRIPTION	TYPE	MANUFACTURER
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=V20MKA10CT020-B1	STATOR SLOT THERMOMETER 2	4-123317	TMG
=V20MKA10CT030-B1	STATOR SLOT THERMOMETER 3	4-123317	TMG
=V20MKA10CT011-B1	STATOR SLOT THERMOMETER 4	4-123317	TMG
=V20MKA10CT021-B1	STATOR SLOT THERMOMETER 5	4-123317	TMG
=V20MKA10CT031-B1	STATOR SLOT THERMOMETER 6	4-123317	TMG
=V20MKA10CT012-B1	STATOR SLOT THERMOMETER 7	4-123317	TMG
=V20MKA10CT022-B1	STATOR SLOT THERMOMETER 8	4-123317	TMG
=V20MKA10CT032-B1	STATOR SLOT THERMOMETER 9	4-123317	TMG
=V20MKA10CT013-B1	STATOR SLOT THERMOMETER 10 SPARE	4-123317	TMG
=V20MKA10CT023-B1	STATOR SLOT THERMOMETER 11 SPARE	4-123317	TMG
=V20MKA10CT033-B1	STATOR SLOT THERMOMETER 12 SPARE	4-123317	TMG
=V20MKD10CT010-B1	BEARING METAL THERMOM. TE	WQ 0232-PVDF	TMG
=V20MKD20CT010-B1	BEARING METAL THERMOM. EE	WQ 0232-PVDF	TMG
=V20MKA10CT050-B1	COLD AIR THERMOMETER TE	WQ 0233	TMG
=V20MKA10CT055-B1	COLD AIR THERMOMETER EE	WQ 0233	TMG
=V20MKA10CT060-B1	WARM AIR THERMOMETER	WQ 0233	TMG
=V20MKA10CT062-B1	WARM AIR TEMPERATURE EXCITER	WQ 0233	TMG

KKS	DESCRIPTION	TYPE	MANUFACTURER
=V20MKA10CL110-B1	LEAKAGE WATER SENSOR TE ALARM	SITRANS LVL100 (7ML5745-1BA42-1BA0)	SIEMENS
=V20MKA10CL111-B1	LEAKAGE WATER SENSOR TE TRIP	SITRANS LVL100 (7ML5745-1BA42-1BA0)	SIEMENS
=V20MKA10CL120-B1	LEAKAGE WATER SENSOR EE ALARM	SITRANS LVL100 (7ML5745-1BA42-1BA0)	SIEMENS
=V20MKA10CL121-B1	LEAKAGE WATER SENSOR EE TRIP	SITRANS LVL100 (7ML5745-1BA42-1BA0)	SIEMENS
=V20MKD10CY011-B1	REL. SHAFT VIBRATION SENSOR TE-X	330106-05-30-05-02-00	BENTLY NEVADA
=V20MKD10CY011-A1	PROXIMITOR 9m, 200mV/mil	330180-91-00	BENTLY NEVADA
=V20MKD10CY012-B1	REL. SHAFT VIBRATION SENSOR TE-Y	330106-05-30-05-02-00	BENTLY NEVADA
=V20MKD10CY012-A1	PROXIMITOR 9m, 200mV/mil	330180-91-00	BENTLY NEVADA
=V20MKD20CY011-B1	REL. SHAFT VIBRATION SENSOR EE-X	330106-05-30-05-02-00	BENTLY NEVADA
=V20MKD20CY011-A1	PROXIMITOR 9m, 200mV/mil	330180-91-00	BENTLY NEVADA
=V20MKD20CY012-B1	REL. SHAFT VIBRATION SENSOR EE-Y	330106-05-30-05-02-00	BENTLY NEVADA
=V20MKD20CY012-A1	PROXIMITOR 9m, 200mV/mil	330180-91-00	BENTLY NEVADA
=V20MKD10CY010-B1	ABSOL. BEARING VIBRATION SENSOR TE-A	330500-02-00	BENTLY NEVADA
=V20MKD10CY020-B1	ABSOL. BEARING VIBRATION SENSOR TE-B	330500-02-00	BENTLY NEVADA
=V20MKD10CY030-B1	ABSOL. BEARING VIBRATION SENSOR TE-C	330500-02-00	BENTLY NEVADA
=V20MKD20CY010-B1	ABSOL. BEARING VIBRATION SENSOR EE-A	330500-02-00	BENTLY NEVADA
=V20MKD20CY020-B1	ABSOL. BEARING VIBRATION SENSOR EE-B	330500-02-00	BENTLY NEVADA
=V20MKD20CY030-B1	ABSOL. BEARING VIBRATION SENSOR EE-C	330500-02-00	BENTLY NEVADA
=V20MKD10CY013-B1	KEYPHASOR	330106-05-30-05-02-00	BENTLY NEVADA
=V20MKD10CY013-A1	PROXIMITOR 9m, 200mV/mil	330180-91-00	BENTLY NEVADA
=V20MKA10AH110-E01	HEATER TE	ERCH III/38	Schniewindt
=V20MKA10AH110-E02	HEATER EE	ERCH III/38	Schniewindt

Consumer List

no.	KKS	Description	Rated Power	Rated Voltage	400V 50Hz	230V 50Hz	24V DC		Start	Operation	Standstill	Notes
1	=V20MKA10AH110-E01	GENERATOR HEATER TE	1600 W	400V 50Hz	1600 W				1600 W		1600 W	
2	=V20MKA10AH110-E02	GENERATOR HEATER EE	1600 W	400V 50Hz	1600 W				1600 W		1600 W	
3	=V20MKC10AH110-E01	EXCITER HEATER	100 W	200V 50Hz	100 W				100 W		100 W	
4	=V20MKC10AH110-E02	EXCITER HEATER	100 W	200V 50Hz	100 W				100 W		100 W	
5	=V20MKA10AH111-E101/E102	MTB NEUTRAL SIDE HEATER	300W	200V 50Hz		300 W			300 W	300 W	300 W	
6	=V20MKA10AH111-E103/E104	MTB LINE SIDE HEATER	300W	200V 50Hz		300 W			300 W	300 W	300 W	
7	=V20MKA10CL110-111	LEAKAGE WATER SENSOR TE	1 W	24V DC			1 W		1 W	1 W	1 W	
8	=V20MKA10CL120-121	LEAKAGE WATER SENSOR EE	1 W	24V DC			1 W		1 W	1 W	1 W	
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30	**TOTAL ELECTRICAL CONSUMPTION [W]**				**3400 W**	**600 W**	**2 W**		**4002 W**	**602 W**	**4002 W**	

TOP VIEW - SCHEMATICAL DRAWING



+V20MKA10GA010
JUNCTION BOX MEASURING

+V20MKD10GA010
JUNCTION BOX VIBRATION MEASUREMENT TE

+V20MKD20GA010
JUNCTION BOX VIBRATION MEASUREMENT EE

+V20MKA10GE030
JUNCTION BOX VOLTAGE

+V20MKC20GE010
JUNCTION BOX EXCITER FIELD; HEATER

+V20MKC20GA010
JUNCTION BOX ROTOR GROUND FAULT DETECTION

+V20MKC10GE010
JUNCTION BOX PERMANENT MAGNET GENERATOR

+V20MKD10GA020
JUNCTION BOX ROTOR EARTHING

+V20MKA10GD010
LINE SIDE CUBICLE

+V20MKA10GE010
LINE SIDE CUBICLE JUNCTION BOX

+V20MKA10GE040
LINE SIDE CUBICLE JUNCTION BOX HEATER

+V20MKA10GD020
NEUTRAL SIDE CUBICLE

+V20MKA10GE020
NEUTRAL SIDE CUBICLE JUNCTION BOX

+V20MKA10GE050
NEUTRAL SIDE CUBICLE JUNCTION BOX HEATER

b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	
			Drawn	Möbius		
			Appr.	Rabe		
REVISION	Date	Name	NORM		Replacement for	Replaced by

SIEMENS
ENERGY SECTOR

AUXILIARY JUNCTION BOXES
OVERVIEW
SCHEMATICAL DRAWING

=
+ CABLING

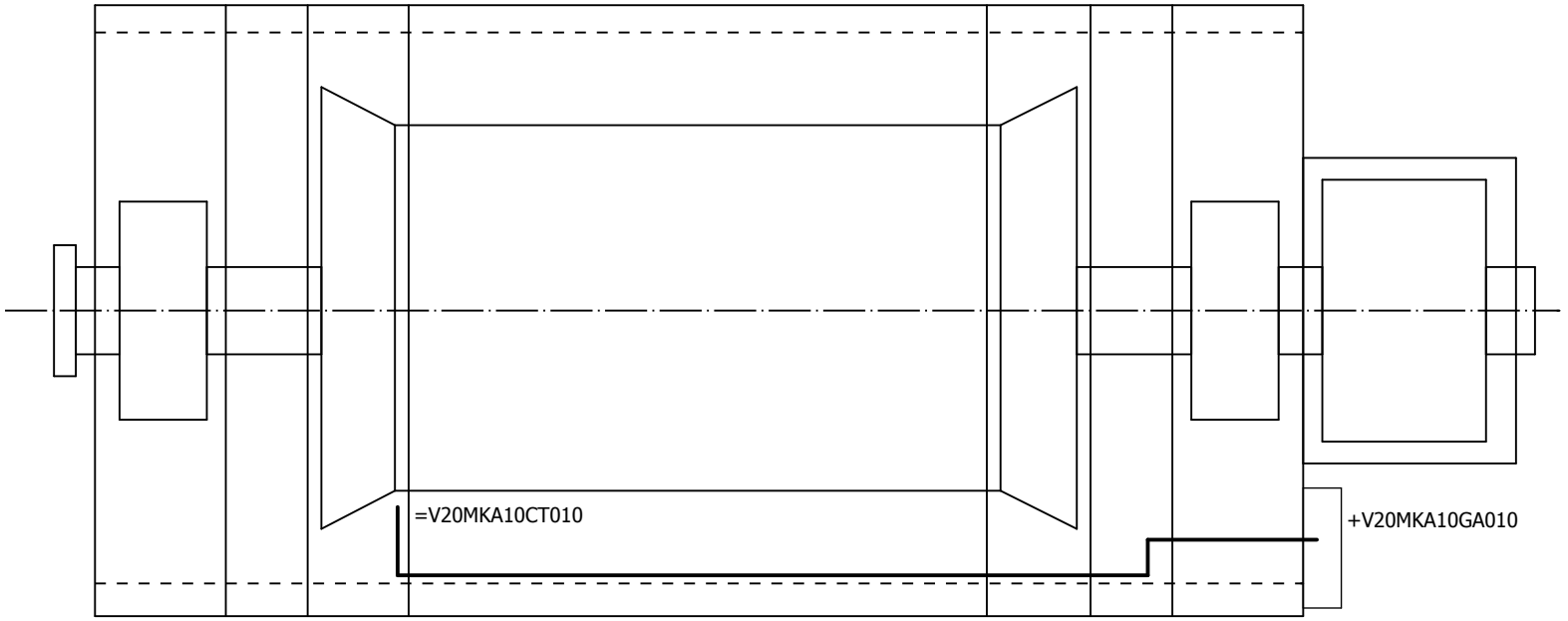
EG000367 | DPPPG-70152441

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TOP VIEW - SCHEMATICAL DRAWING

TE

EE



+V20MKA10GA010
JUNCTION BOX MEASURING

REMARKS FOR ASSEMBLY AT FACTORY

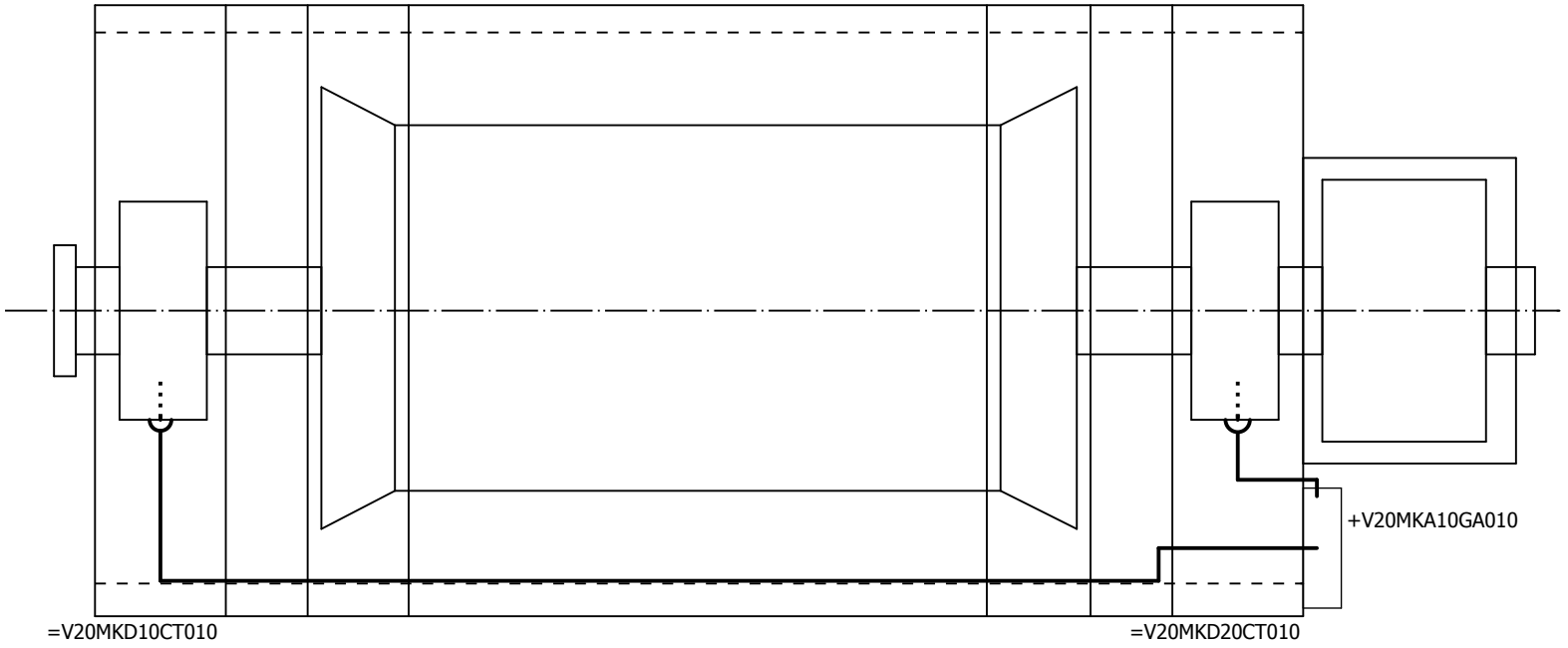
Check all devices after mounting

REMARKS FOR ASSEMBLY AT SITE

NONE

			Date	19.12.2017	VILNIUS Biomass		SIEMENS ENERGY SECTOR	CABLING STATOR SLOT THERMOMETER LOCATION DIAGRAM	=	
			Drawn	Möbius					+ CABLING	
			Appr.	Rabe				EG000367	DPPPG-70152441	Page 10
REVISION	Date	Name	NORM		Replacement for	Replaced by				Pg. 79

TOP VIEW - SCHEMATICAL DRAWING



REMARKS FOR ASSEMBLY AT FACTORY

Check all devices after mounting

RTD WITH PLUG CONNECTOR

+V20MKA10GA010
JUNCTION BOX MEASURING

REMARKS FOR ASSEMBLY AT SITE

NONE

			Date	19.12.2017	VILNIUS Biomass	
			Drawn	Möbius		
			Appr.	Rabe		
REVISION	Date	Name	NORM		Replacement for	Replaced by

SIEMENS
ENERGY SECTOR

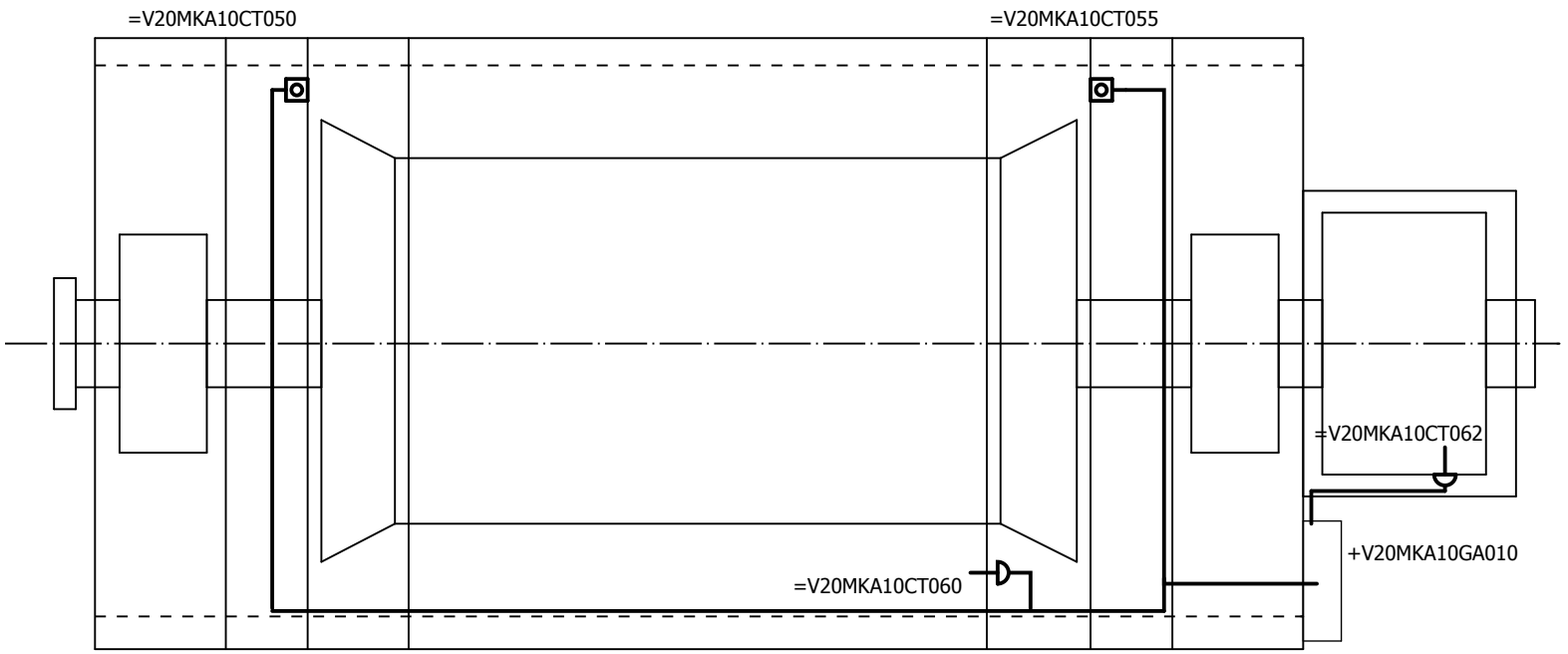
CABLING
BEARING THERMOMETER
LOCATION DIAGRAM

EG000367 | DPPPG-70152441

=
+ CABLING

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TOP VIEW - SCHEMATICAL DRAWING



+V20MKA10GA010
JUNCTION BOX MEASURING

REMARKS FOR ASSEMBLY AT FACTORY

Check all devices after mounting

WITH ANGLE BRACKET

IN THREADED HOLE G 1/2"

REMARKS FOR ASSEMBLY AT SITE

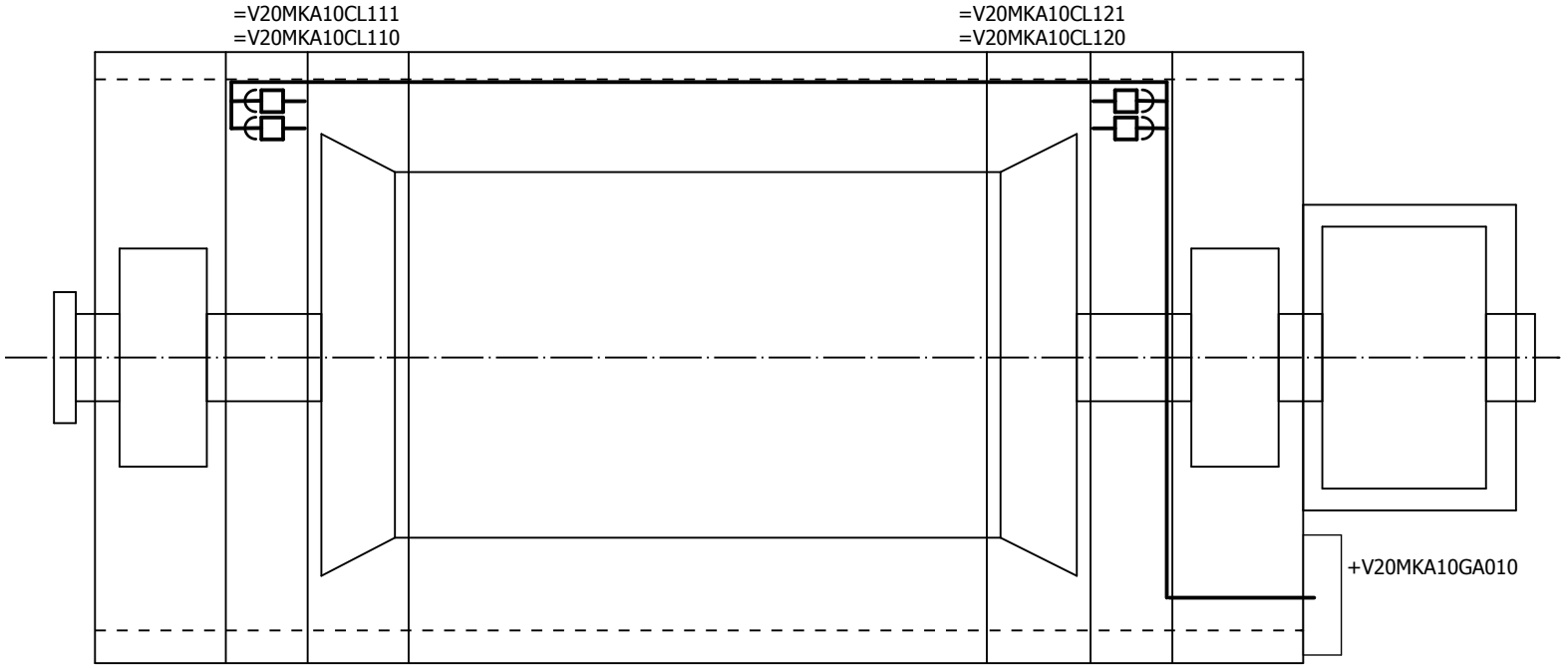
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			Drawn	Möbius				+ CABLING	
			Appr.	Rabe				EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by		Page	12
								Pg.	79

TOP VIEW - SCHEMATICAL DRAWING

TE

EE



REMARKS FOR ASSEMBLY AT FACTORY

Check all devices after mounting

Leakage water detector SITRANS LVL100
in leakage water collector of cooler

● HAN 3A PLUG

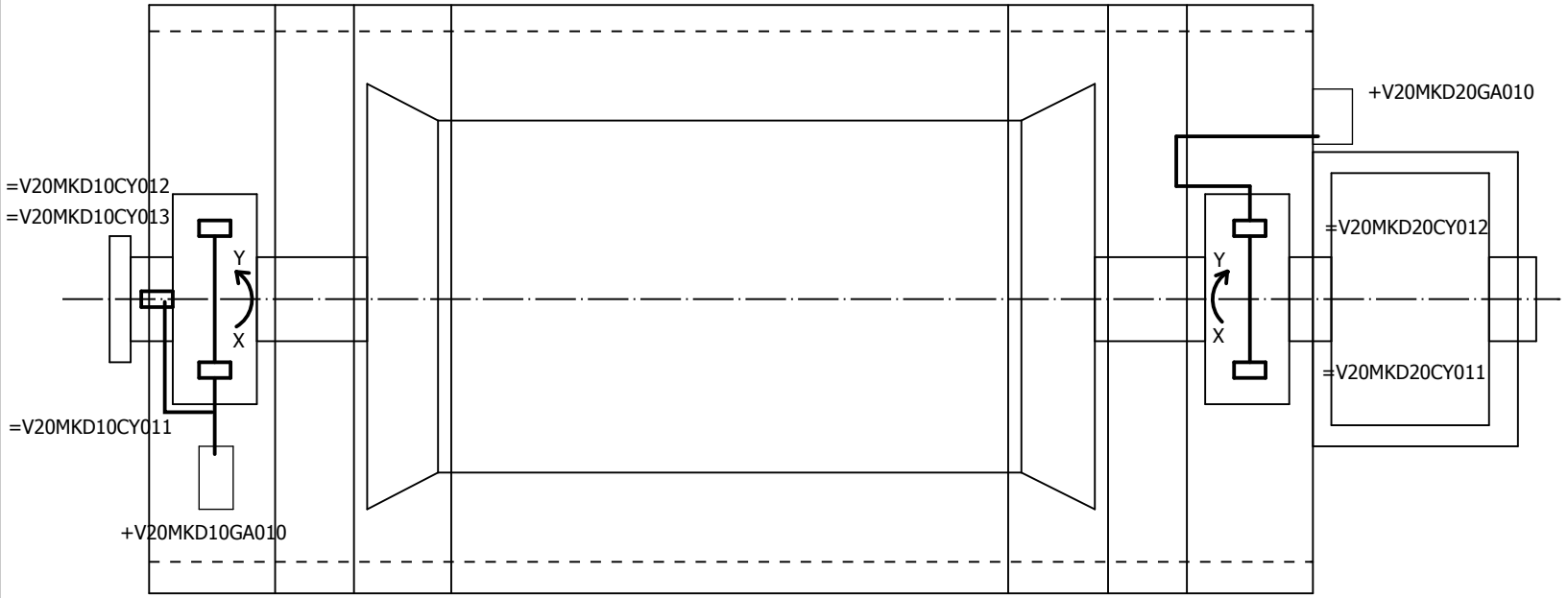
+V20MKA10GA010
JUNCTION BOX MEASURING

REMARKS FOR ASSEMBLY AT SITE

CONNECT PLUG CONNECTORS TO
LEAKAGE WATER ELECTRODES

			Date	19.12.2017	VILNIUS Biomass		SIEMENS ENERGY SECTOR	CABLING LEAKAGE WATER DETECTION LOCATION DIAGRAM	=	
			Drawn	Möbius					+ CABLING	
			Appr.	Rabe					EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by			Page	13
									Pg.	79

TOP VIEW - SCHEMATICAL DRAWING



REMARKS FOR ASSEMBLY AT FACTORY

Check all devices after mounting

PROBE HOUSING
PROXIMITORS ARRANGED IN JUNCTION BOX

+V20MKD10GA010
JUNCTION BOX VIBRATION MEASUREMENT TE

+V20MKD20GA010
JUNCTION BOX VIBRATION MEASUREMENT EE

REMARKS FOR ASSEMBLY AT SITE

NONE

c	15.11.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	
			Drawn	Möbius		
			Appr.	Rabe		
REVISION	Date	Name	NORM		Replacement for	Replaced by

SIEMENS
ENERGY SECTOR

CABLING
RELATIVE SHAFT VIBRATION
LOCATION DIAGRAM

=
+ CABLING

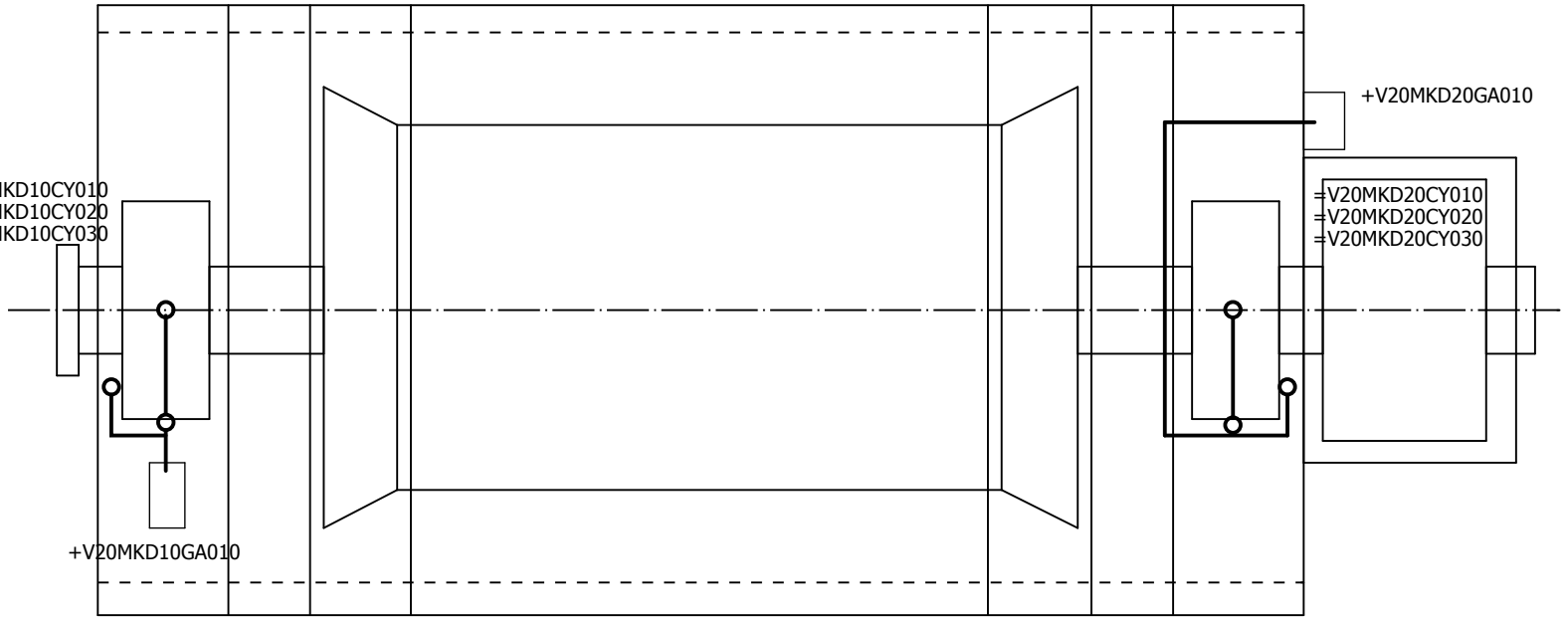
EG000367 | DPPPG-70152441

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TOP VIEW - SCHEMATICAL DRAWING

TE

EE



REMARKS FOR ASSEMBLY AT FACTORY

Check all devices after mounting

+V20MKD10GA010
JUNCTION BOX VIBRATION MEASUREMENT TE

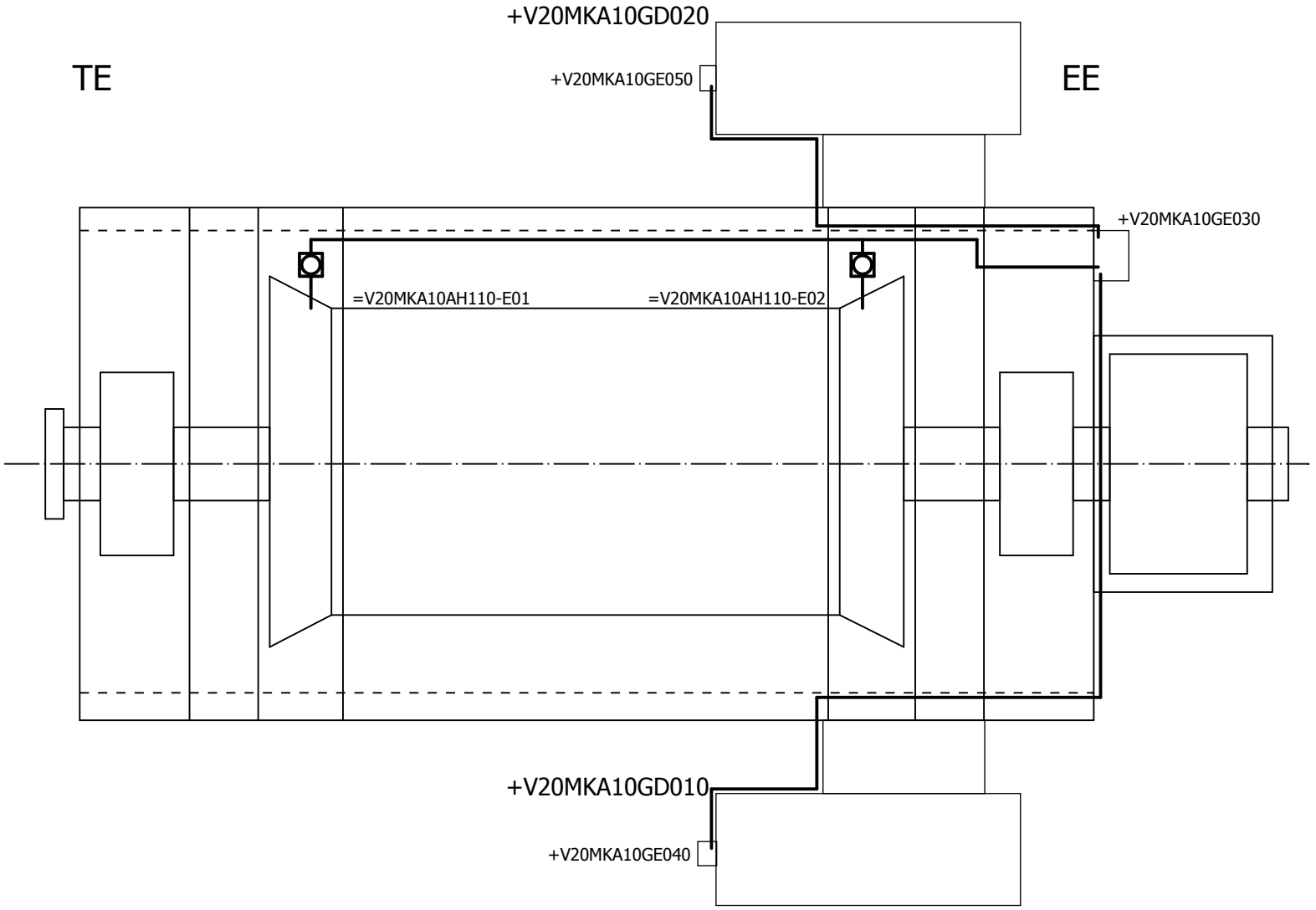
+V20MKD20GA010
JUNCTION BOX VIBRATION MEASUREMENT EE

REMARKS FOR ASSEMBLY AT SITE

NONE

c	15.11.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	CABLING ABSOL. BEARING VIBRATION LOCATION DIAGRAM	=	
			Drawn	Möbius				+ CABLING	
			Appr.	Rabe			EG000367	DPPPG-70152441	Page 15
REVISION	Date	Name	NORM		Replacement for	Replaced by			Pg. 79

TOP VIEW - SCHEMATICAL DRAWING



REMARKS FOR ASSEMBLY AT FACTORY

Check all devices after mounting

WITH ANGLE BRACKET

+V20MKA10GE030
JUNCTION BOX VOLTAGE

+V20MKA10GD010
LINE SIDE CUBICLE

+V20MKA10GE040
LINE SIDE CUBICLE JUNCTION BOX HEATER

+V20MKA10GD020
NEUTRAL SIDE CUBICLE

+V20MKA10GE050
NEUTRAL SIDE CUBICLE JUNCTION BOX HEATER

REMARKS FOR ASSEMBLY AT SITE

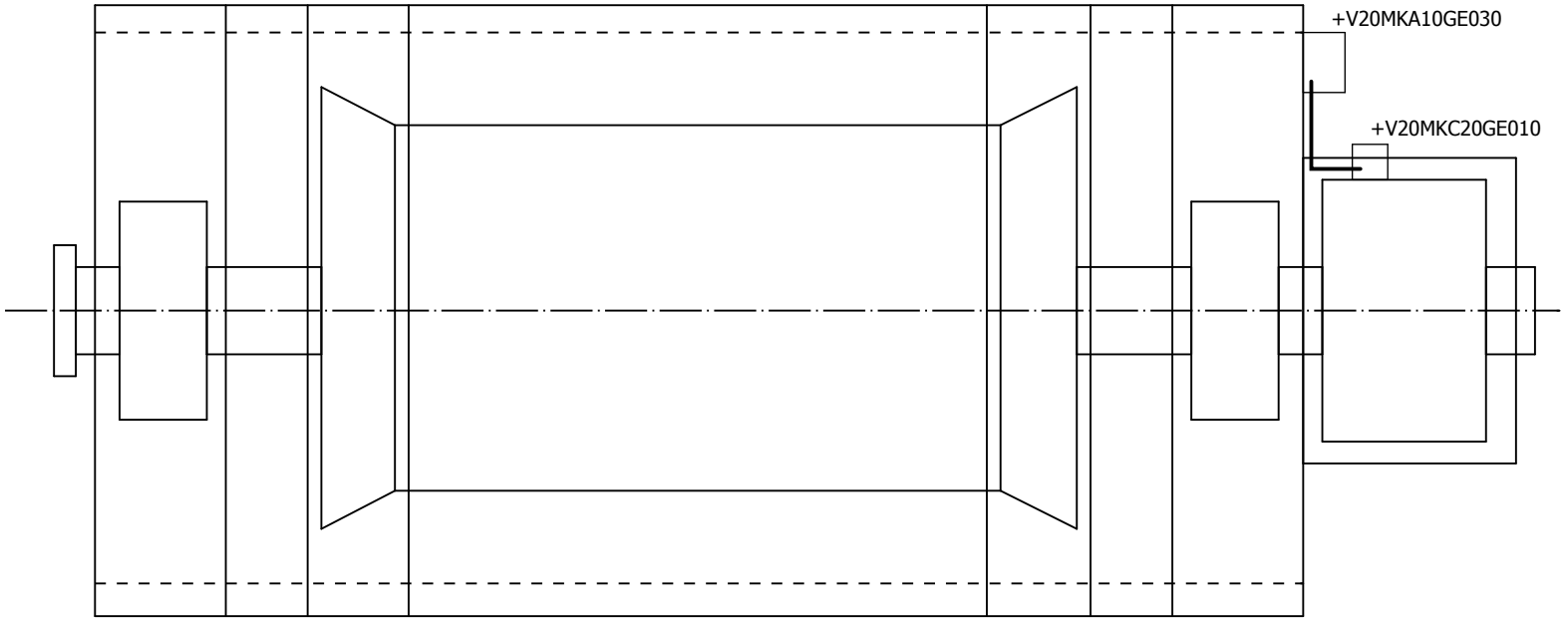
NONE

b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass		SIEMENS ENERGY SECTOR	CABLING ANTICONDENSATION HEATER LOCATION DIAGRAM	=	
			Drawn	Möbius					+ CABLING	
			Appr.	Rabe					EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by			Page	16
									Pg.	79

TOP VIEW - SCHEMATICAL DRAWING

TE

EE



REMARKS FOR ASSEMBLY AT FACTORY

Check all devices after mounting

+V20MKA10GE030
JUNCTION BOX VOLTAGE

+V20MKC20GE010
JUNCTION BOX EXCITER FIELD; HEATER

REMARKS FOR ASSEMBLY AT SITE

NONE

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	CABLING EXCITER LOCATION DIAGRAM	=	
			Drawn	Möbius				+ CABLING	
			Appr.	Rabe				EG000367 DPPPG-70152441	Page 17
REVISION	Date	Name	NORM		Replacement for	Replaced by			Pg. 79

MANUFACTURER HÄWA
STANDARD CASING
40/40/20
DEGREE OF PROTECTION
IP66

TAPPED HOLES IN REAR WALL
(SIEMENS)

FLANGE PLATE AT
BOTTOM
(CUSTOMER)

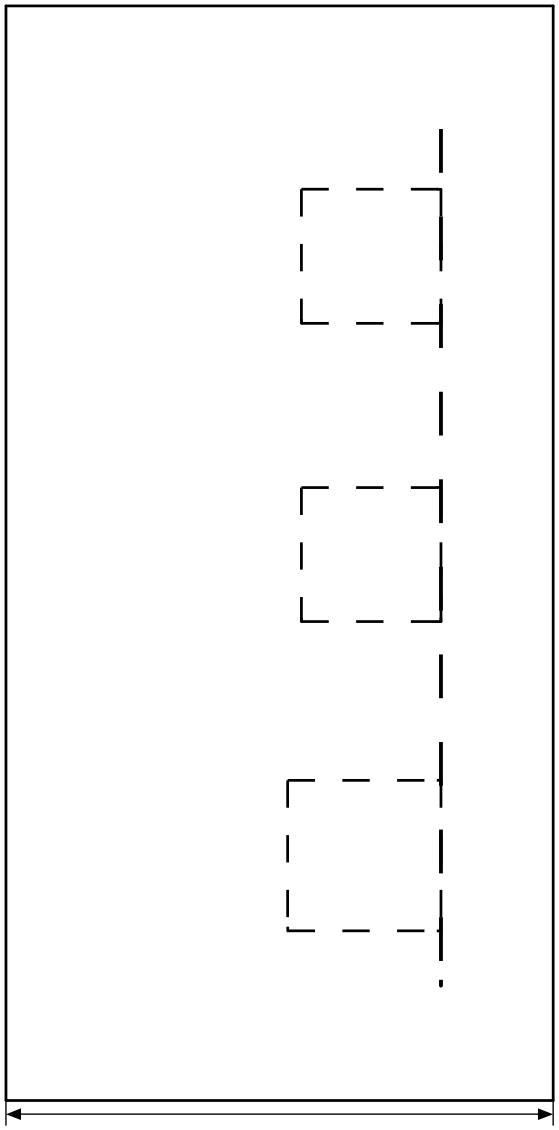
MOUNTING RAIL
TS 35 (EN60715)

ALL DIMENSIONS IN MM

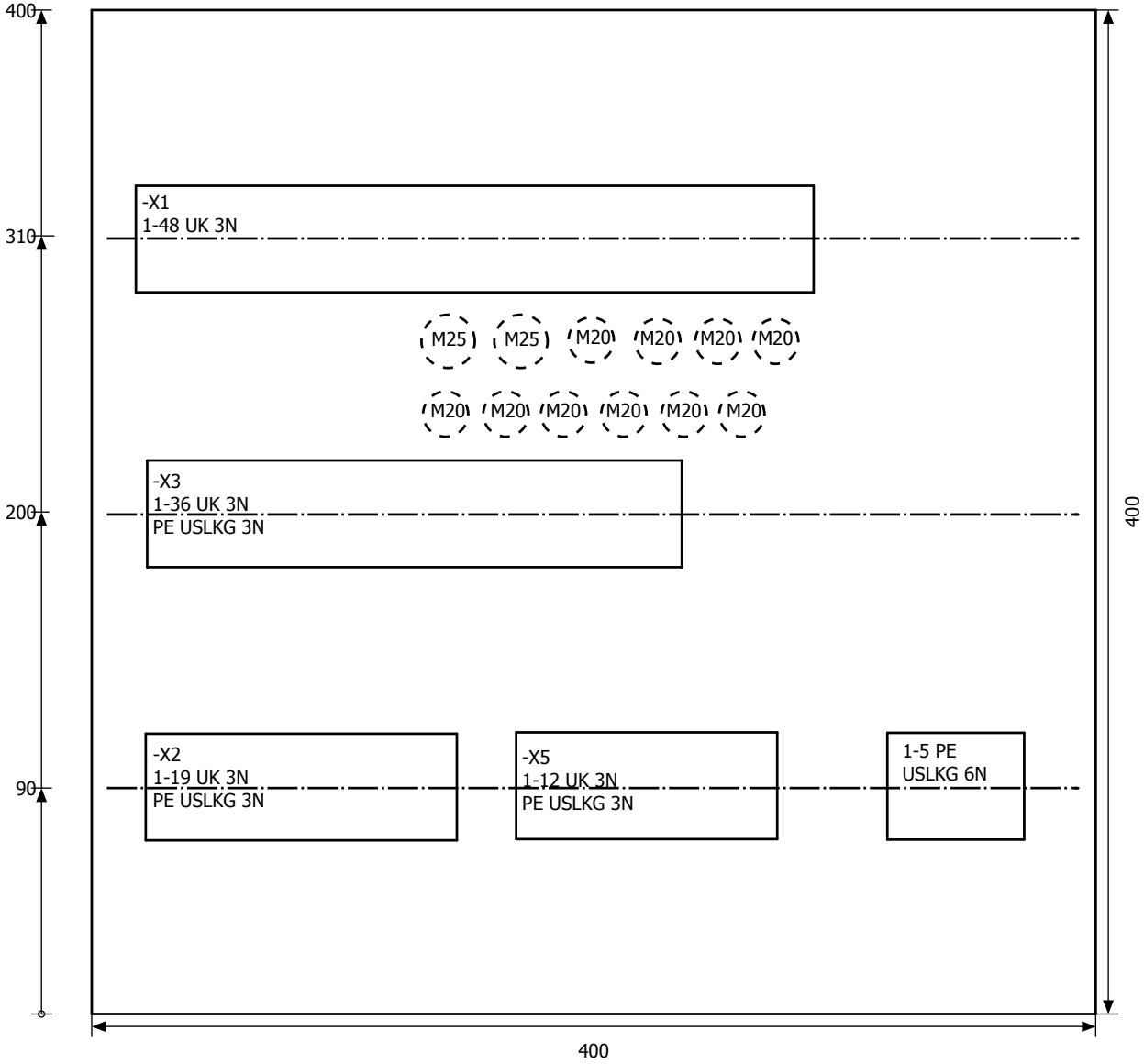
COLOUR: RAL 7035

SCALE 1:2(A3)

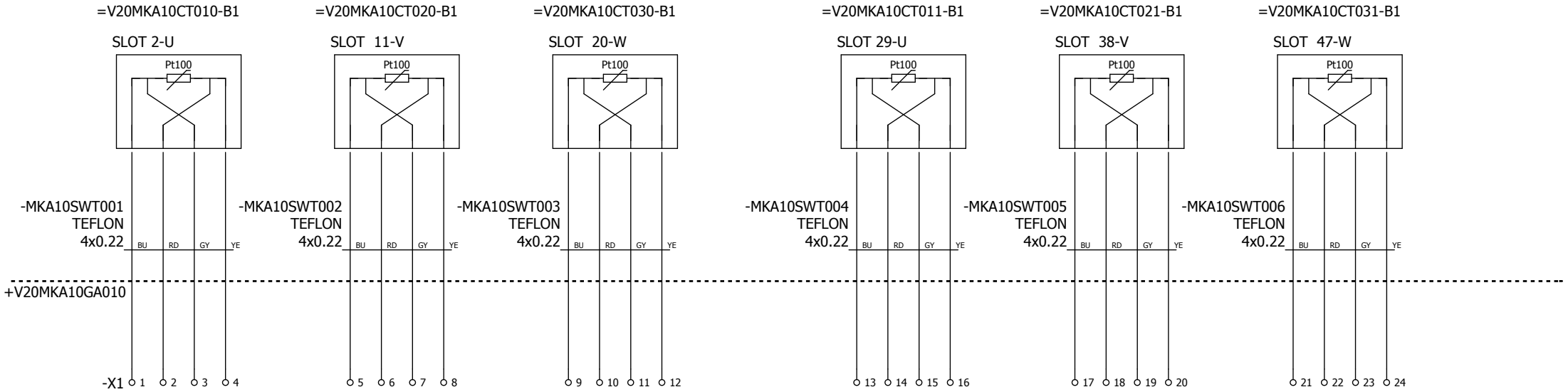
VIEW ON RIGHT HAND SIDE



FRONT VIEW WITHOUT COVER



b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass		SIEMENS ENERGY SECTOR	JUNCTION BOX MEASURING MOUNTING PLATE	DPPPG-70160082	=
			Drawn	Möbius						+ V20MKA10GA010
			Appr.	Rabe					EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by				Page 18 / Pg. 79



b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	
			Drawn	Möbius		
			Appr.	Rabe		
REVISION	Date	Name	NORM		Replacement for	Replaced by

SIEMENS
ENERGY SECTOR

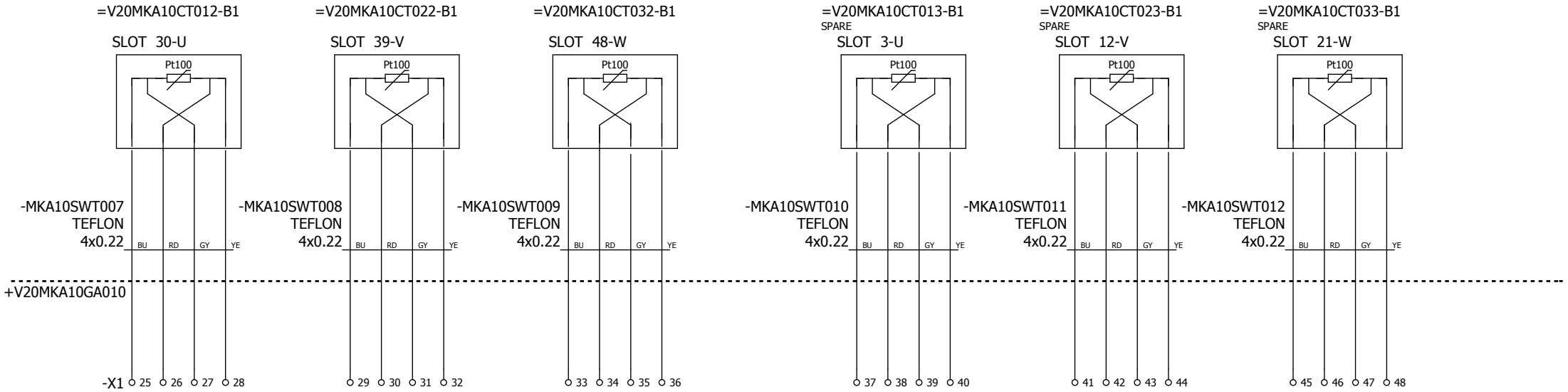
JUNCTION BOX MEASURING
STATOR WINDING TEMPERATURE

DPPPG-70160082

EG000367 DPPPG-70152441

= + V20MKA10GA010

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Pg. 79



b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	
			Drawn	Möbius		
			Appr.	Rabe		
REVISION	Date	Name	NORM		Replacement for	Replaced by

SIEMENS
ENERGY SECTOR

JUNCTION BOX MEASURING
STATOR WINDING TEMPERATURE

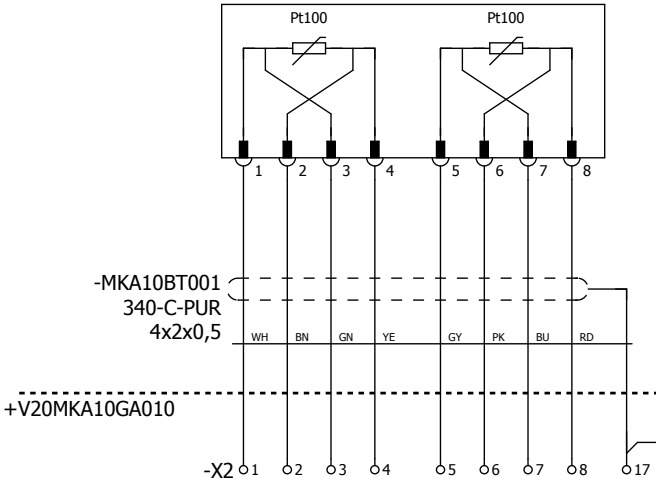
DPPPG-70160082

EG000367 | DPPPG-70152441

=
+ V20MKA10GA010

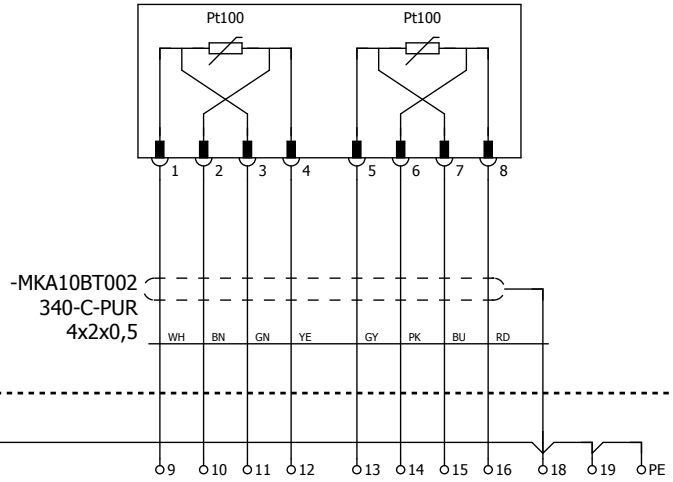
BEARING METAL TEMP. TE
DOUBLE ELEMENT

=V20MKD10CT010-B1



BEARING METAL TEMP. EE
DOUBLE ELEMENT

=V20MKD20CT010-B1



TE ... TURBINE END
EE ... EXCITER END

			Date	19.12.2017	VILNIUS Biomass	
			Drawn	Möbius		
			Appr.	Rabe		
REVISION	Date	Name	NORM		Replacement for	Replaced by

SIEMENS
ENERGY SECTOR

JUNCTION BOX MEASURING
BEARING TEMPERATURE

DPPPG-70160082

EG000367 | DPPPG-70152441

= + V20MKA10GA010

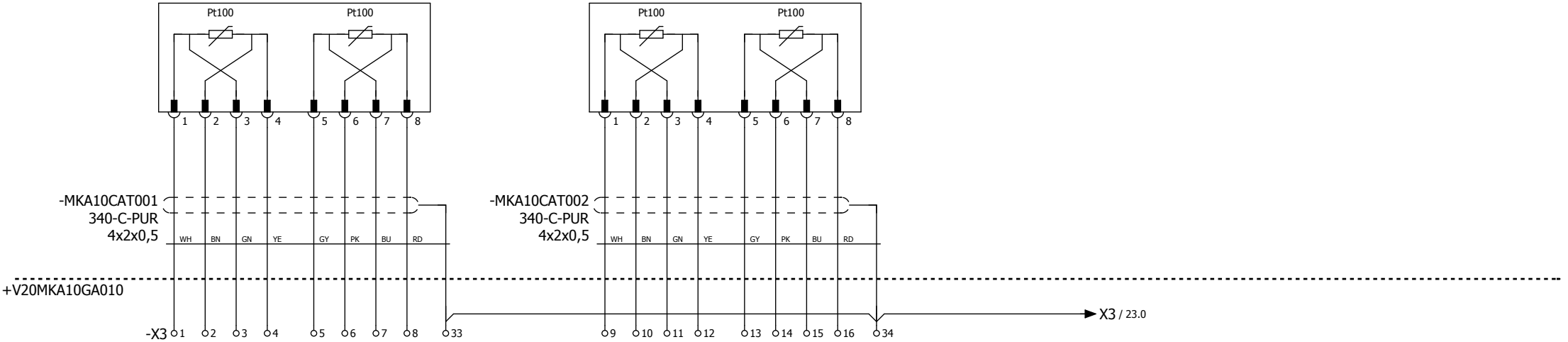
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Pg. 79

COLD AIR TEMP. TE
DOUBLE ELEMENT

=V20MKA10CT050-B1

COLD AIR TEMP. EE
DOUBLE ELEMENT

=V20MKA10CT055-B1



TE ... TURBINE END
EE ... EXCITER END

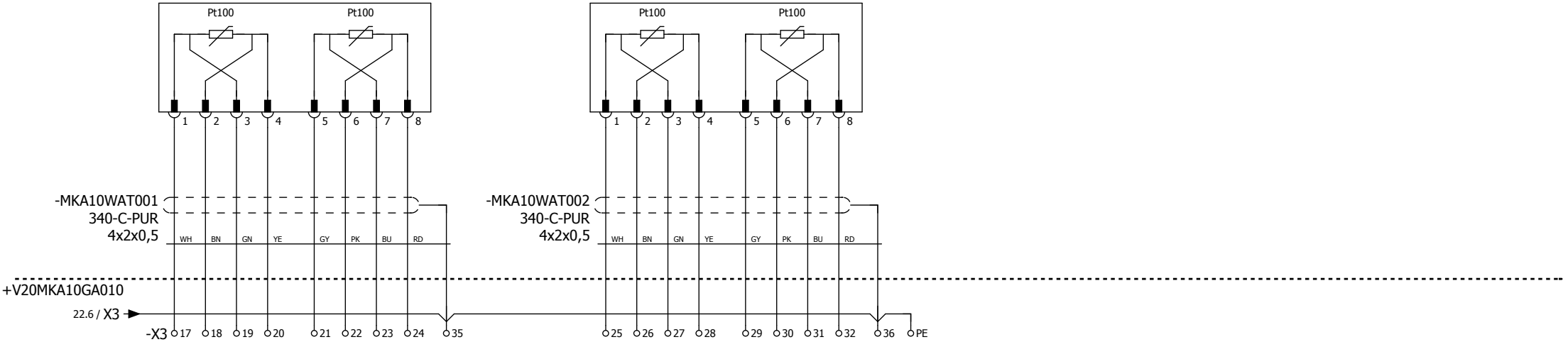
			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX MEASURING COLD AIR TEMPERATURE	DPPPG-70160082	= + V20MKA10GA010
			Drawn	Möbius					
			Appr.	Rabe				EG000367 DPPPG-70152441	Page 22
REVISION	Date	Name	NORM		Replacement for	Replaced by			Pg. 79

WARM AIR TEMPERATURE
DOUBLE ELEMENT

=V20MKA10CT060-B1

WARM AIR TEMPERATURE EXCITER
DOUBLE ELEMENT

=V20MKA10CT062-B1

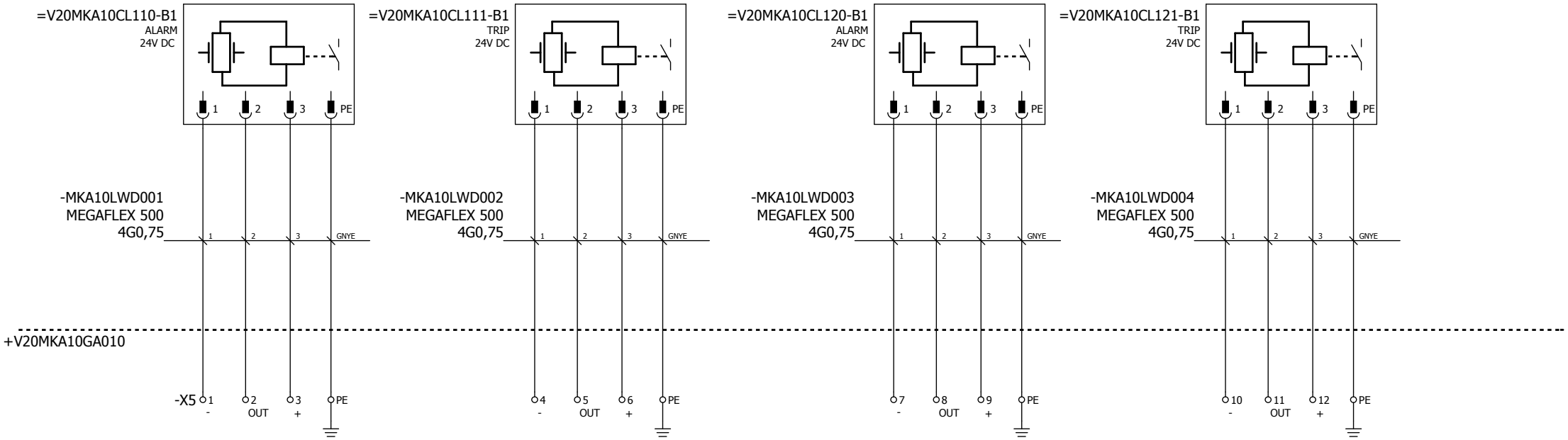


TE ... TURBINE END
EE ... EXCITER END

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX MEASURING WARM AIR TEMPERATURE	DPPPG-70160082	= + V20MKA10GA010
			Drawn	Möbius					
			Appr.	Rabe				EG000367 DPPPG-70152441	Page 23
REVISION	Date	Name	NORM		Replacement for	Replaced by			Pg. 79

LEAKAGE WATER SENSOR TE

LEAKAGE WATER SENSOR EE



TE ... TURBINE END
EE ... EXCITER END

			Date	19.12.2017	VILNIUS Biomass	
			Drawn	Möbius		
			Appr.	Rabe		
REVISION	Date	Name	NORM		Replacement for	Replaced by

SIEMENS
ENERGY SECTOR

JUNCTION BOX MEASURING
LEAKAGE WATER DETECTION

DPPPG-70160082 | =
EG000367 | DPPPG-70152441 | + V20MKA10GA010

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Pg. 79

Terminal diagram

item designation	Lev.	no. cable	type cable	Terminal strip =+V20MKA10GA010-X1 destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	type cable	MKA10SWT001	MKA10SWT002	MKA10SWT003	MKA10SWT004	MKA10SWT005	MKA10SWT006	MKA10SWT007	MKA10SWT008	page / track
													TEFLON	TEFLON	TEFLON	TEFLON	TEFLON	TEFLON	TEFLON	TEFLON	
SLOT 2-U							1	=V20MKA10CT010-B1					BU								19 0
=							2	=V20MKA10CT010-B1					RD								19 1
=							3	=V20MKA10CT010-B1					GY								19 1
=							4	=V20MKA10CT010-B1					YE								19 1
SLOT 11-V							5	=V20MKA10CT020-B1						BU							19 2
=							6	=V20MKA10CT020-B1						RD							19 2
=							7	=V20MKA10CT020-B1						GY							19 2
=							8	=V20MKA10CT020-B1						YE							19 2
SLOT 20-W							9	=V20MKA10CT030-B1							BU						19 3
=							10	=V20MKA10CT030-B1							RD						19 3
=							11	=V20MKA10CT030-B1							GY						19 4
=							12	=V20MKA10CT030-B1							YE						19 4
SLOT 29-U							13	=V20MKA10CT011-B1								BU					19 5
=							14	=V20MKA10CT011-B1								RD					19 5
=							15	=V20MKA10CT011-B1								GY					19 5
=							16	=V20MKA10CT011-B1								YE					19 6
SLOT 38-V							17	=V20MKA10CT021-B1									BU				19 6
=							18	=V20MKA10CT021-B1									RD				19 6
=							19	=V20MKA10CT021-B1									GY				19 7
=							20	=V20MKA10CT021-B1									YE				19 7
SLOT 47-W							21	=V20MKA10CT031-B1										BU			19 8
=							22	=V20MKA10CT031-B1										RD			19 8
=							23	=V20MKA10CT031-B1										GY			19 8
=							24	=V20MKA10CT031-B1										YE			19 8
SLOT 30-U							25	=V20MKA10CT012-B1											BU		20 0
=							26	=V20MKA10CT012-B1											RD		20 1
=							27	=V20MKA10CT012-B1											GY		20 1
=							28	=V20MKA10CT012-B1											YE		20 1
SLOT 39-V							29	=V20MKA10CT022-B1												BU	20 2
=							30	=V20MKA10CT022-B1												RD	20 2
=							31	=V20MKA10CT022-B1												GY	20 2
=							32	=V20MKA10CT022-B1												YE	20 2

SEPARATION PLATE
SEPARATION WITH TS-K

Terminal diagram

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	MKA10SWT009	MKA10SWT010	MKA10SWT011	MKA10SWT012	page / track
				Terminal strip =+V20MKA10GA010-X1												
SLOT 48-W						⊙	33	=V20MKA10CT032-B1								20 3
=						⊙	34	=V20MKA10CT032-B1			RD					20 3
=						⊙	35	=V20MKA10CT032-B1			GY					20 4
=						⊙	36	=V20MKA10CT032-B1			YE					20 4
SLOT 3-U						⊙	37	=V20MKA10CT013-B1				BU				20 5
=						⊙	38	=V20MKA10CT013-B1				RD				20 5
=						⊙	39	=V20MKA10CT013-B1				GY				20 5
=						⊙	40	=V20MKA10CT013-B1				YE				20 6
SLOT 12-V						⊙	41	=V20MKA10CT023-B1					BU			20 6
=						⊙	42	=V20MKA10CT023-B1					RD			20 6
=						⊙	43	=V20MKA10CT023-B1					GY			20 7
=						⊙	44	=V20MKA10CT023-B1					YE			20 7
SLOT 21-W						⊙	45	=V20MKA10CT033-B1						BU		20 8
=						⊙	46	=V20MKA10CT033-B1						RD		20 8
=						⊙	47	=V20MKA10CT033-B1						GY		20 8
=						⊙	48	=V20MKA10CT033-B1						YE		20 8
						○										
						○										
						○										
						○										
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						○										

SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GA010-X1	DPPPG-70160082	= + V20MKA10GA010
			Drawn	Möbius					
			Appr.	Rabe				EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by			Page 26 Pg. 79

Terminal diagram

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	MKA10BT001	MKA10BT002	page / track
				Terminal strip =+V20MKA10GA010-X2										
BEARING METAL TEMP. TE							1	=V20MKD10CT010-B1	1		WH			21 1
=							2	=V20MKD10CT010-B1	2		BN			21 1
=							3	=V20MKD10CT010-B1	3		GN			21 1
=							4	=V20MKD10CT010-B1	4		YE			21 1
=							5	=V20MKD10CT010-B1	5		GY			21 2
=							6	=V20MKD10CT010-B1	6		PK			21 2
=							7	=V20MKD10CT010-B1	7		BU			21 2
=							8	=V20MKD10CT010-B1	8		RD			21 2
BEARING METAL TEMP. EE							9	=V20MKD20CT010-B1	1			WH		21 4
=							10	=V20MKD20CT010-B1	2			BN		21 4
=							11	=V20MKD20CT010-B1	3			GN		21 5
=							12	=V20MKD20CT010-B1	4			YE		21 5
=							13	=V20MKD20CT010-B1	5			GY		21 5
=							14	=V20MKD20CT010-B1	6			PK		21 5
=							15	=V20MKD20CT010-B1	7			BU		21 6
=							16	=V20MKD20CT010-B1	8			RD		21 6
BEARING METAL TEMP. TE							17							21 2
BEARING METAL TEMP. EE							18							21 6
=							19							
=							PE							

SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GA010-X2	DPPPG-70160082	=	
			Drawn	Möbius					+ V20MKA10GA010	
			Appr.	Rabe						
REVISION	Date	Name	NORM		Replacement for	Replaced by		EG000367	DPPPG-70152441	Page 27 Pg. 79

Terminal diagram

item designation	Lev.	no. cable	type cable	Terminal strip =+V20MKA10GA010-X3 destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	type cable	MKA10CAT001	MKA10CAT002	MKA10WAT001	MKA10WAT002	page / track
COLD AIR TEMP. TE							1	=V20MKA10CT050-B1	1				WH				22 1
=							2	=V20MKA10CT050-B1	2				BN				22 1
=							3	=V20MKA10CT050-B1	3				GN				22 1
=							4	=V20MKA10CT050-B1	4				YE				22 1
=							5	=V20MKA10CT050-B1	5				GY				22 2
=							6	=V20MKA10CT050-B1	6				PK				22 2
=							7	=V20MKA10CT050-B1	7				BU				22 2
=							8	=V20MKA10CT050-B1	8				RD				22 2
COLD AIR TEMP. EE							9	=V20MKA10CT055-B1	1					WH			22 3
=							10	=V20MKA10CT055-B1	2					BN			22 4
=							11	=V20MKA10CT055-B1	3					GN			22 4
=							12	=V20MKA10CT055-B1	4					YE			22 4
=							13	=V20MKA10CT055-B1	5					GY			22 4
=							14	=V20MKA10CT055-B1	6					PK			22 4
=							15	=V20MKA10CT055-B1	7					BU			22 5
=							16	=V20MKA10CT055-B1	8					RD			22 5
WARM AIR TEMPERATURE							17	=V20MKA10CT060-B1	1						WH		23 1
=							18	=V20MKA10CT060-B1	2						BN		23 1
=							19	=V20MKA10CT060-B1	3						GN		23 1
=							20	=V20MKA10CT060-B1	4						YE		23 1
=							21	=V20MKA10CT060-B1	5						GY		23 2
=							22	=V20MKA10CT060-B1	6						PK		23 2
=							23	=V20MKA10CT060-B1	7						BU		23 2
=							24	=V20MKA10CT060-B1	8						RD		23 2
WARM AIR TEMPERATURE EXCITER							25	=V20MKA10CT062-B1	1							WH	23 3
=							26	=V20MKA10CT062-B1	2							BN	23 4
=							27	=V20MKA10CT062-B1	3							GN	23 4
=							28	=V20MKA10CT062-B1	4							YE	23 4
=							29	=V20MKA10CT062-B1	5							GY	23 4
=							30	=V20MKA10CT062-B1	6							PK	23 4
=							31	=V20MKA10CT062-B1	7							BU	23 5
=							32	=V20MKA10CT062-B1	8							RD	23 5

SEPARATION PLATE
SEPARATION WITH TS-K

Terminal diagram

Terminal strip
=+V20MKA10GA010-X3

item designation	no. cable / type cable	destination A	terminal	link	terminal number	destination B	terminal	no. cable / type cable	MKA10CAT001 340-C-PUR	MKA10CAT002 340-C-PUR	MKA10WAT001 340-C-PUR	MKA10WAT002 340-C-PUR	page / track
COLD AIR TEMP. TE					33								22 2
COLD AIR TEMP. EE					34								22 5
WARM AIR TEMPERATURE					35								23 2
WARM AIR TEMPERATURE EXCITER					36								23 5
=					PE								

SEPARATION PLATE
SEPARATION WITH TS-K

REVISION	Date	Name		
Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GA010-X3
Drawn	Möbius			
Appr.	Rabe			
NORM		Replacement for	Replaced by	

DPPPG-70160082 | = | + V20MKA10GA010
EG000367 | DPPPG-70152441 | Page 29 | Pg. 79

Terminal diagram

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	type cable	MKA10LWD001 MEGAFLEX 500	MKA10LWD003 MEGAFLEX 500	MKA10LWD002 MEGAFLEX 500	MKA10LWD004 MEGAFLEX 500	page / track
				Terminal strip =+V20MKA10GA010-X5													
LEAKAGE WATER SENSOR TE							1	=V20MKA10CL110-B1	1				1				24 1
=							2	=V20MKA10CL110-B1	2				2				24 1
=							3	=V20MKA10CL110-B1	3				3				24 1
=							4	=V20MKA10CL111-B1	1								24 3
=							5	=V20MKA10CL111-B1	2								24 3
=							6	=V20MKA10CL111-B1	3								24 3
LEAKAGE WATER SENSOR EE							7	=V20MKA10CL120-B1	1					1			24 5
=							8	=V20MKA10CL120-B1	2					2			24 5
=							9	=V20MKA10CL120-B1	3					3			24 6
=							10	=V20MKA10CL121-B1	1								24 7
=							11	=V20MKA10CL121-B1	2								24 8
=							12	=V20MKA10CL121-B1	3								24 8
LEAKAGE WATER SENSOR TE							PE	=V20MKA10CL110-B1	PE				GNYE				24 2
=							PE	=V20MKA10CL111-B1	PE						GNYE		24 4
LEAKAGE WATER SENSOR EE							PE	=V20MKA10CL120-B1	PE					GNYE			24 6
=							PE	=V20MKA10CL121-B1	PE							GNYE	24 8

SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass		SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GA010-X5	DPPPG-70160082	= + V20MKA10GA010	
			Drawn	Möbius							
			Appr.	Rabe					EG000367	DPPPG-70152441	Page 30 Pg. 79
REVISION	Date	Name	NORM		Replacement for	Replaced by					

MANUFACTURER HÄWA
STANDARD CASING K12-30/20
DEGREE OF PROTECTION IP65

TAPPED HOLES

MOUNTING RAIL TS 35 (EN60715)

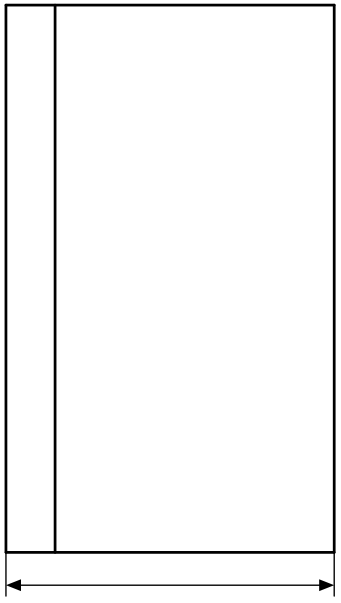
ALL DIMENSIONS IN MM

SCALE 1:2 (A3)

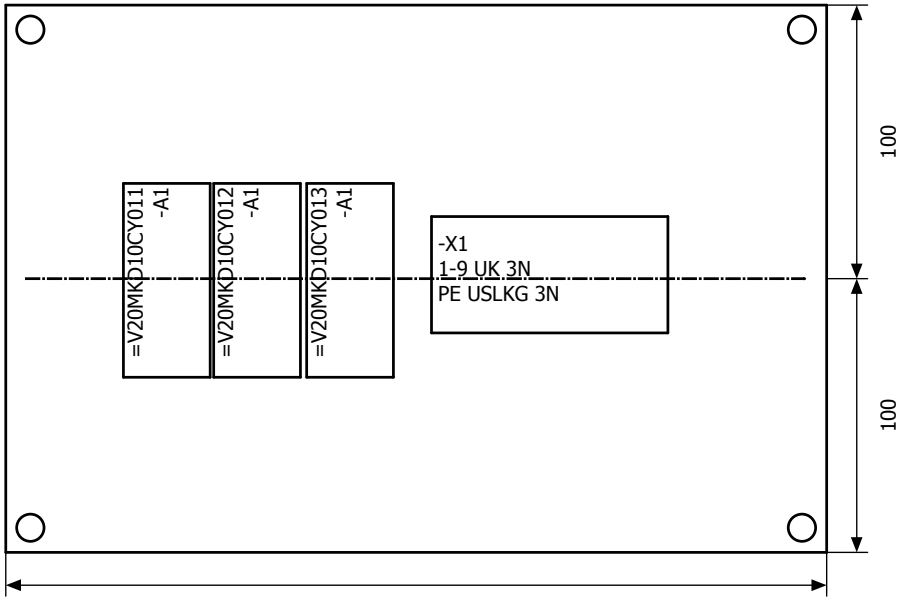
BOTTOM SIDE FOR CUSTOMER CONNECTION DRILLED AT SITE

COLOUR: RAL 7035

VIEW ON RIGHT HAND SIDE

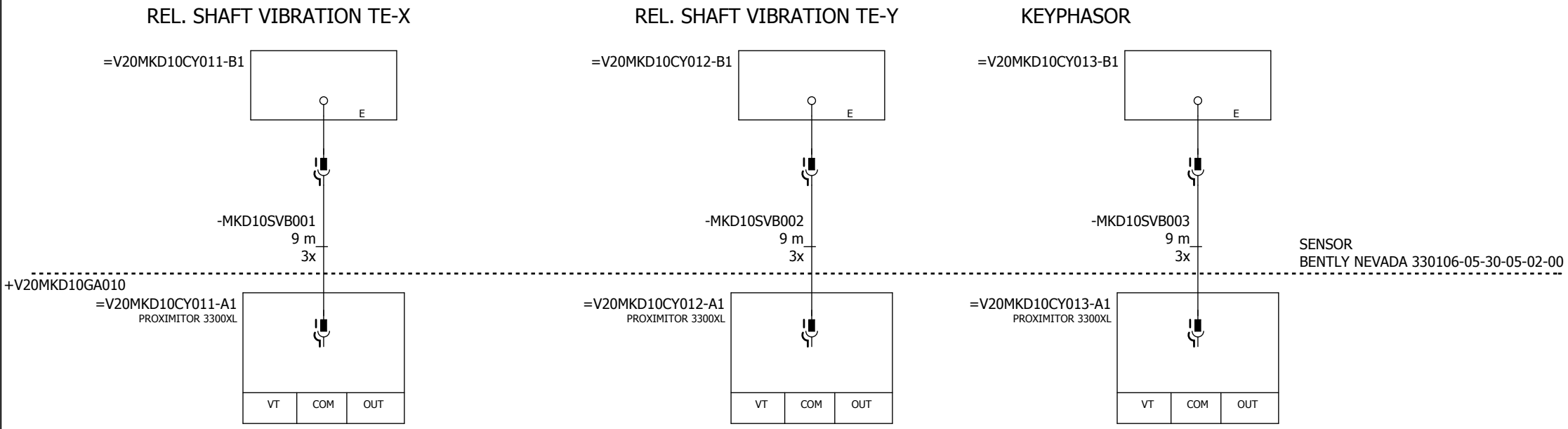


FRONT VIEW WITHOUT COVER



			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX VIBRATION MOUNTING PLATE TURBINE END	DPPPG-70160083	= + V20MKD10GA010
			Drawn	Möbius					
			Appr.	Rabe				EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for / Replaced by				Page 31 / Pg. 79

BEARING TE



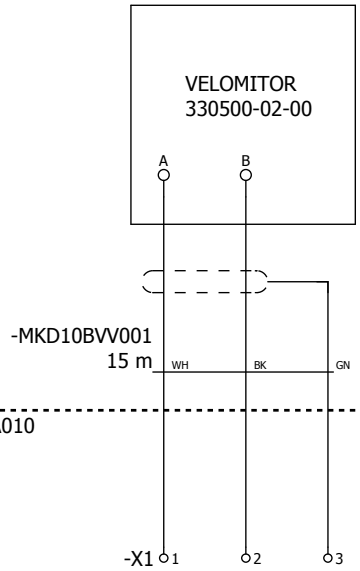
TE ... TURBINE END
EE ... EXCITER END

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX RELATIVE SHAFT VIBRATION DRIVE END	DPPPG-70160083	=
			Drawn	Möbius					+ V20MKD10GA010
			Appr.	Rabe				EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by			Page 32 / Pg. 79

BEARING TE

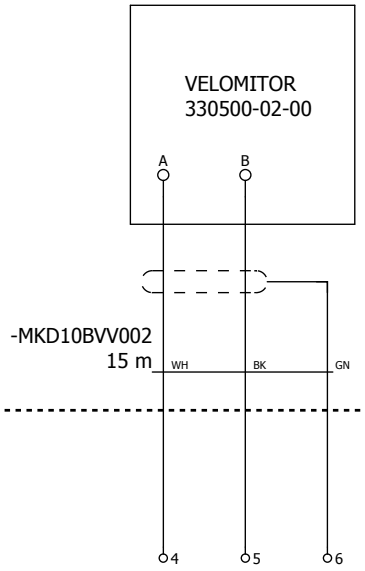
ABS. BEARING VIBRATION TE-A

=V20MKD10CY010-B1
VERTICAL



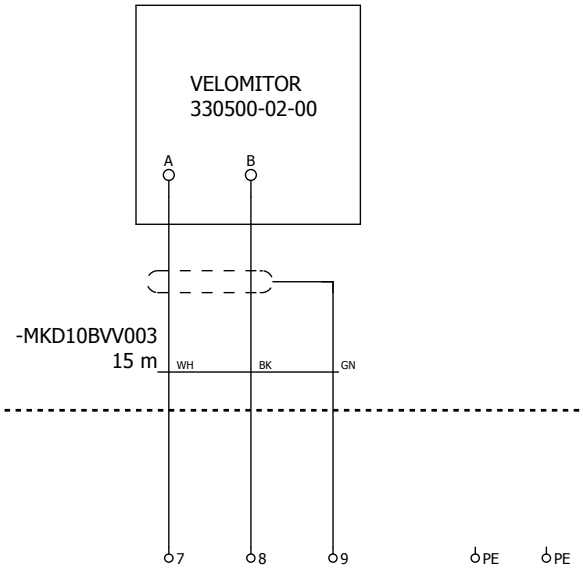
ABS. BEARING VIBRATION TE-B

=V20MKD10CY020-B1
HORIZONTAL



ABS. BEARING VIBRATION TE-C

=V20MKD10CY030-B1
AXIAL



TE ... TURBINE END
EE ... EXCITER END

b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX MEASURING ABSOLUTE BEARING VIBRATION TURBINE END	DPPPG-70160083	=	
			Drawn	Möbius					+ V20MKD10GA010	
			Appr.	Rabe				EG000367	DPPPG-70152441	Page 33
REVISION	Date	Name	NORM		Replacement for	Replaced by				Pg. 79

Terminal diagram

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	MKD10BVV001	MKD10BVV002	MKD10BVV003	page / track
				Terminal strip =+V20MKD10GA010-X1											
ABS. BEARING VIBRATION TE-A						⊙	1	=V20MKD10CY010-B1	A			WH			33 1
=						⊙	2	=V20MKD10CY010-B1	B			BK			33 1
=						⊙	3					GN			33 1
ABS. BEARING VIBRATION TE-B						⊙	4	=V20MKD10CY020-B1	A				WH		33 3
=						⊙	5	=V20MKD10CY020-B1	B				BK		33 4
=						⊙	6						GN		33 4
ABS. BEARING VIBRATION TE-C						⊙	7	=V20MKD10CY030-B1	A					WH	33 6
=						⊙	8	=V20MKD10CY030-B1	B					BK	33 6
=						⊙	9							GN	33 7
=						⊙	PE								
=						⊙	PE								
						○									
						○									
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SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKD10GA010-X1	DPPPG-70160083
			Drawn	Möbius				= + V20MKD10GA010
			Appr.	Rabe				
REVISION	Date	Name	NORM		Replacement for	Replaced by	EG000367	DPPPG-70152441

MANUFACTURER HÄWA
STANDARD CASING K12-30/20
DEGREE OF PROTECTION IP65

TAPPED HOLES

MOUNTING RAIL TS 35 (EN60715)

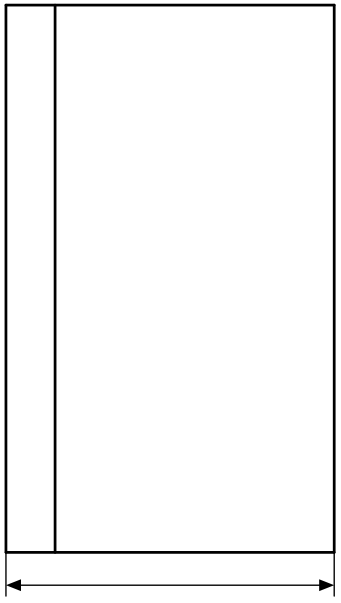
ALL DIMENSIONS IN MM

SCALE 1:2 (A3)

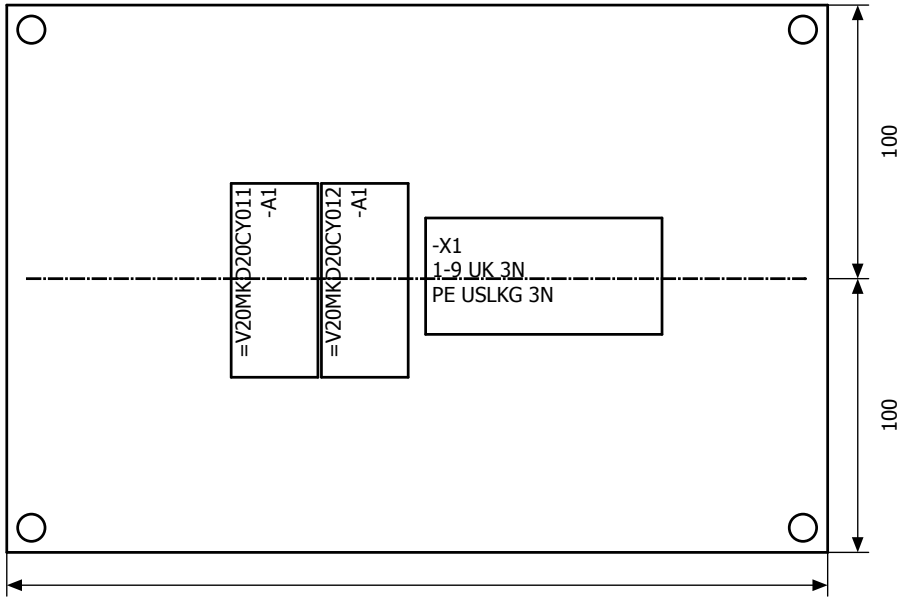
BOTTOM SIDE FOR CUSTOMER CONNECTION DRILLED AT SITE

COLOUR: RAL 7035

VIEW ON RIGHT HAND SIDE



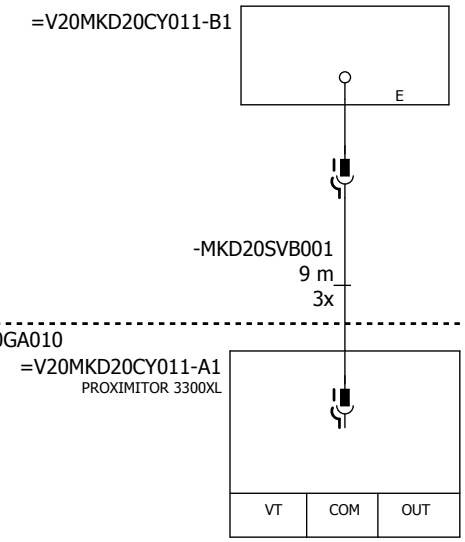
FRONT VIEW WITHOUT COVER



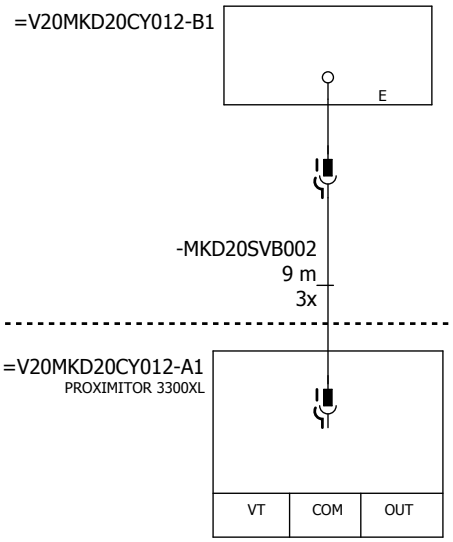
			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX VIBRATION MOUNTING PLATE TURBINE END	=	
			Drawn	Möbius				+ V20MKD20GA010	
			Appr.	Rabe				EG000367 DPPPG-70152441	Page 35
REVISION	Date	Name	NORM		Replacement for	Replaced by			Pg. 79

BEARING EE

REL. SHAFT VIBRATION EE-X



REL. SHAFT VIBRATION EE-Y



SENSOR
BENTLY NEVADA 330106-05-30-05-02-00

PROXIMITOR 9m, 200µm pp
BENTLY NEVADA 330180-91-00

TE ... TURBINE END
EE ... EXCITER END

			Date	19.12.2017	VILNIUS Biomass	
			Drawn	Möbius		
			Appr.	Rabe		
REVISION	Date	Name	NORM		Replacement for	Replaced by

SIEMENS
ENERGY SECTOR

JUNCTION BOX VIBRATION
RELATIVE SHAFT VIBRATION
NON DRIVE END

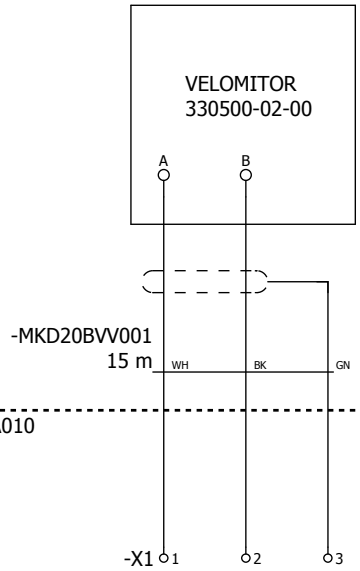
=
+ V20MKD20GA010

EG000367 | DPPPG-70152441

BEARING EE

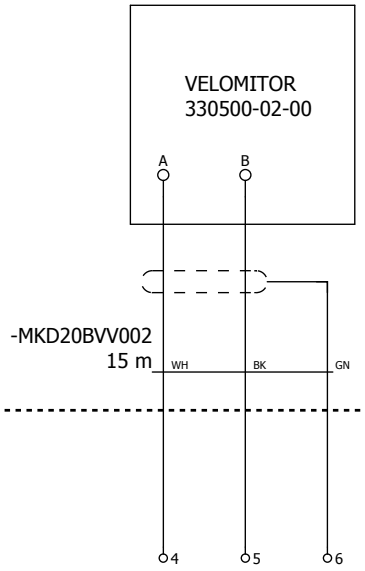
ABS. BEARING VIBRATION EE-A

=V20MKD20CY010-B1
VERTICAL



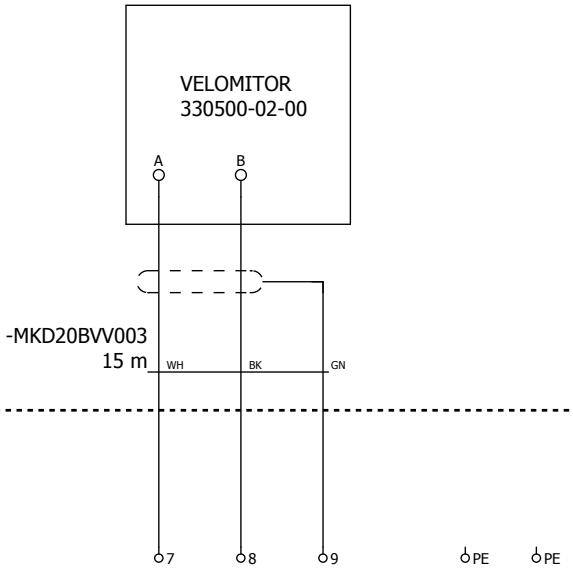
ABS. BEARING VIBRATION EE-B

=V20MKD20CY020-B1
HORIZONTAL



ABS. BEARING VIBRATION EE-C

=V20MKD20CY030-B1
AXIAL



+V20MKD20GA010

TE ... TURBINE END
EE ... EXCITER END

b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	
			Drawn	Möbius		
			Appr.	Rabe		
REVISION	Date	Name	NORM		Replacement for	Replaced by

SIEMENS
ENERGY SECTOR

JUNCTION BOX MEASURING
ABSOLUTE BEARING VIBRATION
EXCITER END

=
+ V20MKD20GA010

EG000367 | DPPPG-70152441

Page 37
Pg. 79

Terminal diagram

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number		destination B	terminal	Lev.	no. cable	MKD20BVV001	MKD20BVV002	MKD20BVV003	page / track
				Terminal strip =+V20MKD20GA010-X1												
ABS. BEARING VIBRATION EE-A						⊙	1		=V20MKD20CY010-B1	A			WH			37 1
=						⊙	2		=V20MKD20CY010-B1	B			BK			37 1
=						⊙	3						GN			37 1
ABS. BEARING VIBRATION EE-B						⊙	4		=V20MKD20CY020-B1	A				WH		37 3
=						⊙	5		=V20MKD20CY020-B1	B				BK		37 4
=						⊙	6							GN		37 4
ABS. BEARING VIBRATION EE-C						⊙	7		=V20MKD20CY030-B1	A					WH	37 6
=						⊙	8		=V20MKD20CY030-B1	B					BK	37 6
=						⊙	9								GN	37 7
=						⊙	PE									
=						⊙	PE									
						○										
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SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKD20GA010-X1	=
			Drawn	Möbius				+ V20MKD20GA010
			Appr.	Rabe				
REVISION	Date	Name	NORM		Replacement for	Replaced by	EG000367	DPPPG-70152441

MANUFACTURER HÄWA
STANDARD CASING K12-30/20
DEGREE OF PROTECTION IP65

TAPPED HOLES

MOUNTING RAIL TS 35 (EN60715)

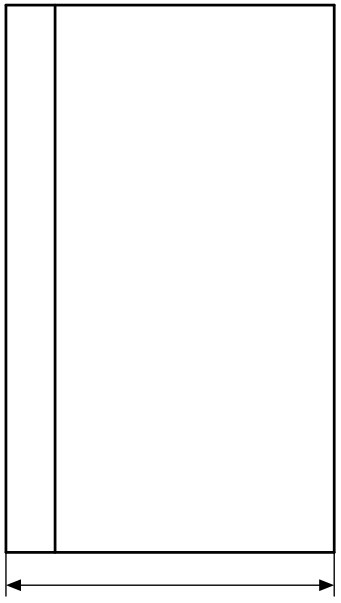
ALL DIMENSIONS IN MM

SCALE 1:2 (A3)

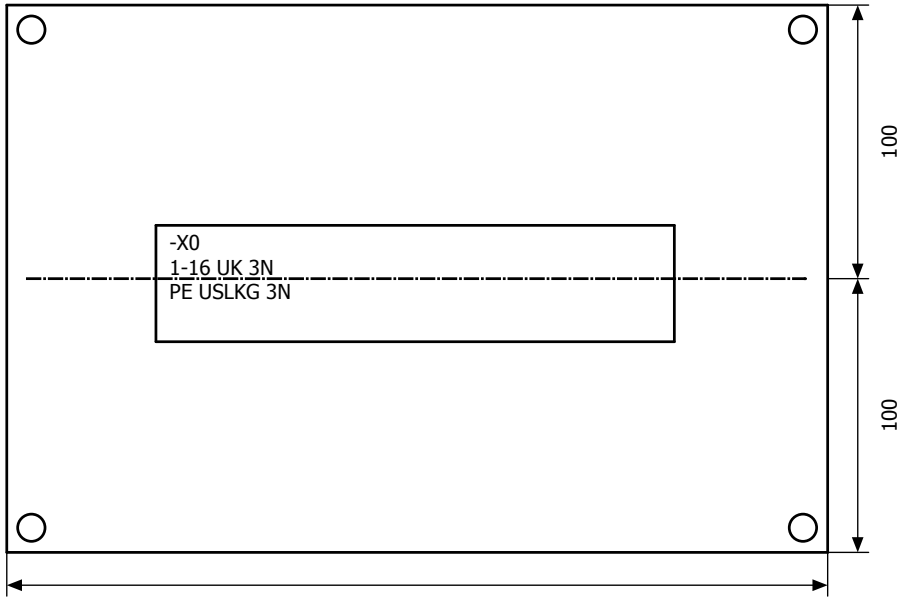
BOTTOM SIDE FOR CUSTOMER CONNECTION DRILLED AT SITE

COLOUR RAL 7035

VIEW ON RIGHT HAND SIDE



FRONT VIEW WITHOUT COVER



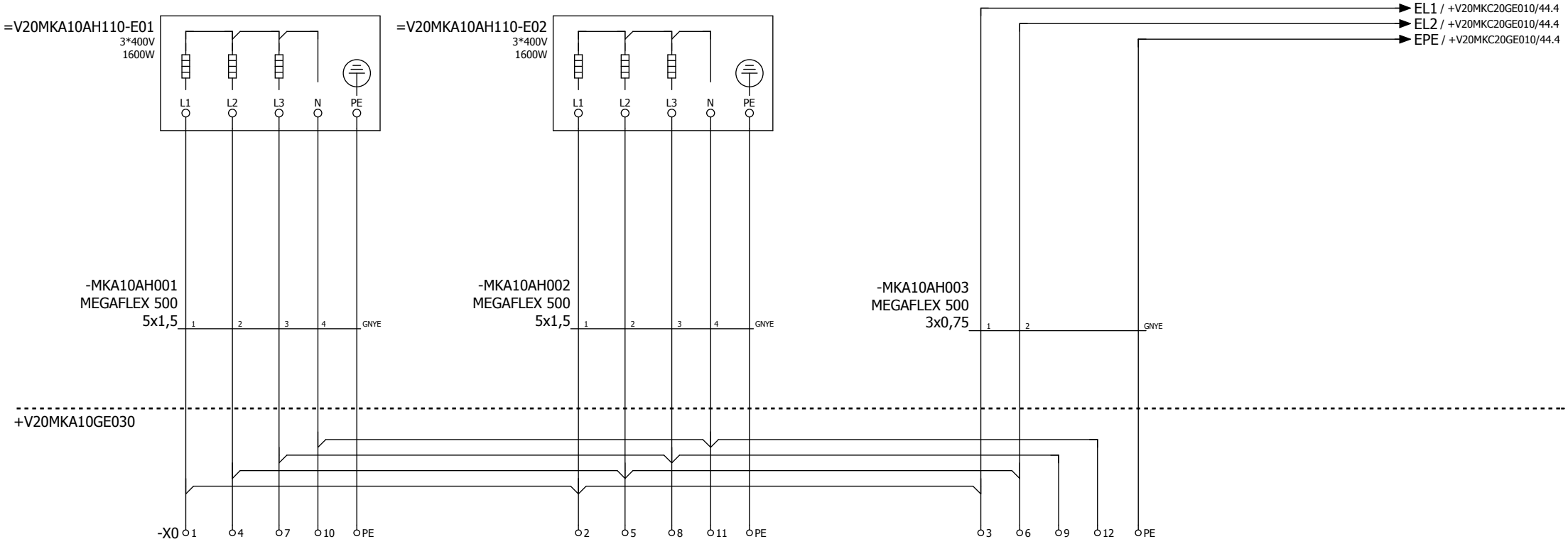
			Date	19.12.2017	VILNIUS Biomass		JUNCTION BOX VOLTAGE MOUNTING PLATE	DPPPG-70160084	=	
			Drawn	Möbius					+ V20MKA10GE030	
			Appr.	Rabe						
REVISION	Date	Name	NORM		Replacement for	Replaced by		EG000367	DPPPG-70152441	Page 39 / Pg. 79

SIEMENS
ENERGY SECTOR

GENERATOR HEATER TE

GENERATOR HEATER EE

TO EXCITER HEATER



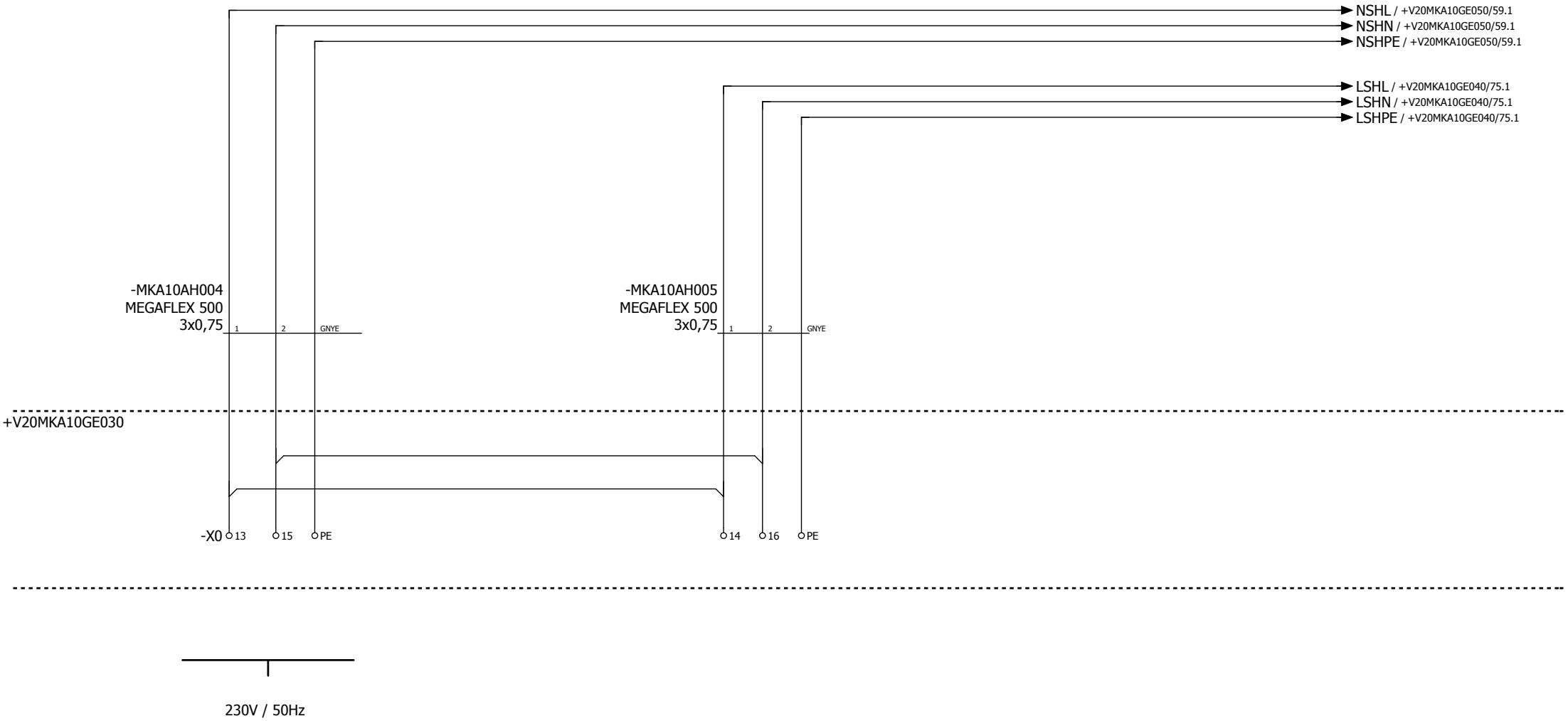
400V / 50Hz

TE ... TURBINE END
EE ... EXCITER END

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX VOLTAGE	DPPPG-70160084	=
			Drawn	Möbius					+ V20MKA10GE030
			Appr.	Rabe					
REVISION	Date	Name	NORM		Replacement for	Replaced by		EG000367 DPPPG-70152441	Page 40 / Pg. 79

TO NSC HEATER

TO LSC HEATER



230V / 50Hz

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX VOLTAGE	DPPPG-70160084	= + V20MKA10GE030
			Drawn	Möbius					
			Appr.	Rabe				EG000367 DPPPG-70152441	Page 41 Pg. 79
REVISION	Date	Name	NORM		Replacement for	Replaced by			

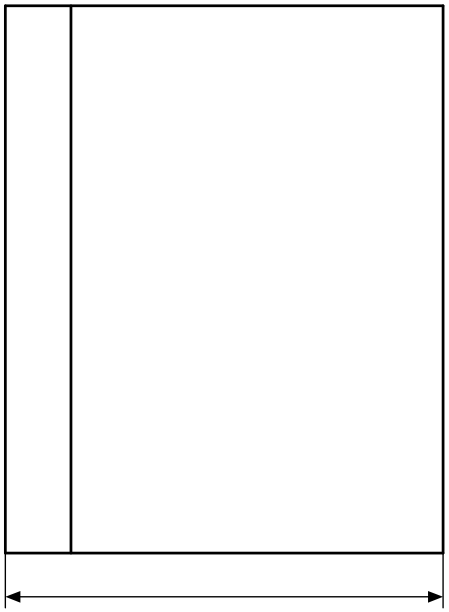
Terminal diagram

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	type cable	MKA10AH001 MEGAFLEX 500	MKA10AH002 MEGAFLEX 500	MKA10AH003 MEGAFLEX 500	MKA10AH004 MEGAFLEX 500	MKA10AH005 MEGAFLEX 500	page / track
				Terminal strip =+V20MKA10GE030-X0														
GENERATOR HEATER TE							1	=V20MKA10AH110-E01	L1				1					40 1
GENERATOR HEATER EE							2	=V20MKA10AH110-E02	L1					1				40 3
TO EXCITER HEATER							3	+V20MKC20GE010-X41	1						1			44 4
GENERATOR HEATER TE							4	=V20MKA10AH110-E01	L2				2					40 1
GENERATOR HEATER EE							5	=V20MKA10AH110-E02	L2					2				40 3
TO EXCITER HEATER							6	+V20MKC20GE010-X41	3						2			44 6
GENERATOR HEATER TE							7	=V20MKA10AH110-E01	L3				3					40 1
GENERATOR HEATER EE							8	=V20MKA10AH110-E02	L3					3				40 4
TO EXCITER HEATER							9											
GENERATOR HEATER TE							10	=V20MKA10AH110-E01	N									40 2
GENERATOR HEATER EE							11	=V20MKA10AH110-E02	N									40 4
TO EXCITER HEATER							12											
TO NSC HEATER							13	+V20MKA10GE050-X1	1							1		59 4
TO LSC HEATER							14	+V20MKA10GE040-X1	1								1	75 4
TO NSC HEATER							15	+V20MKA10GE050-X1	3							2		59 5
TO LSC HEATER							16	+V20MKA10GE040-X1	3								2	75 5
GENERATOR HEATER TE							PE	=V20MKA10AH110-E01	PE				GNYE					40 2
GENERATOR HEATER EE							PE	=V20MKA10AH110-E02	PE					GNYE				40 4
TO EXCITER HEATER							PE	+V20MKC20GE010-X41	4						GNYE			44 7
TO NSC HEATER							PE	+V20MKA10GE050-X1	5							GNYE		59 6
TO LSC HEATER							PE	+V20MKA10GE040-X1	5								GNYE	75 6

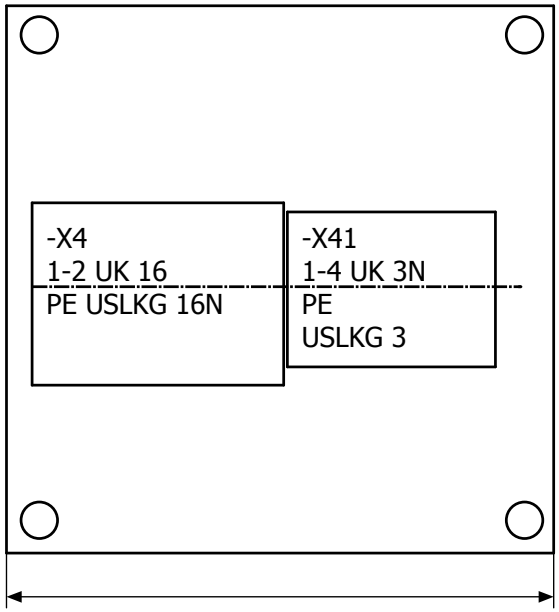
SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GE030-X0	DPPPG-70160084	=	
			Drawn	Möbius					+ V20MKA10GE030	
			Appr.	Rabe				EG000367	DPPPG-70152441	Page 42
REVISION	Date	Name	NORM		Replacement for	Replaced by				Pg. 79

VIEW ON RIGHT HAND SIDE



FRONT VIEW WITHOUT COVER



MANUFACTURER HÄWA
STANDARD CASING K12-15/15
DEGREE OF PROTECTION IP65

TAPPED HOLES

MOUNTING RAIL TS 35 (EN60715)

ALL DIMENSIONS IN MM

SCALE 1:2 (A3)

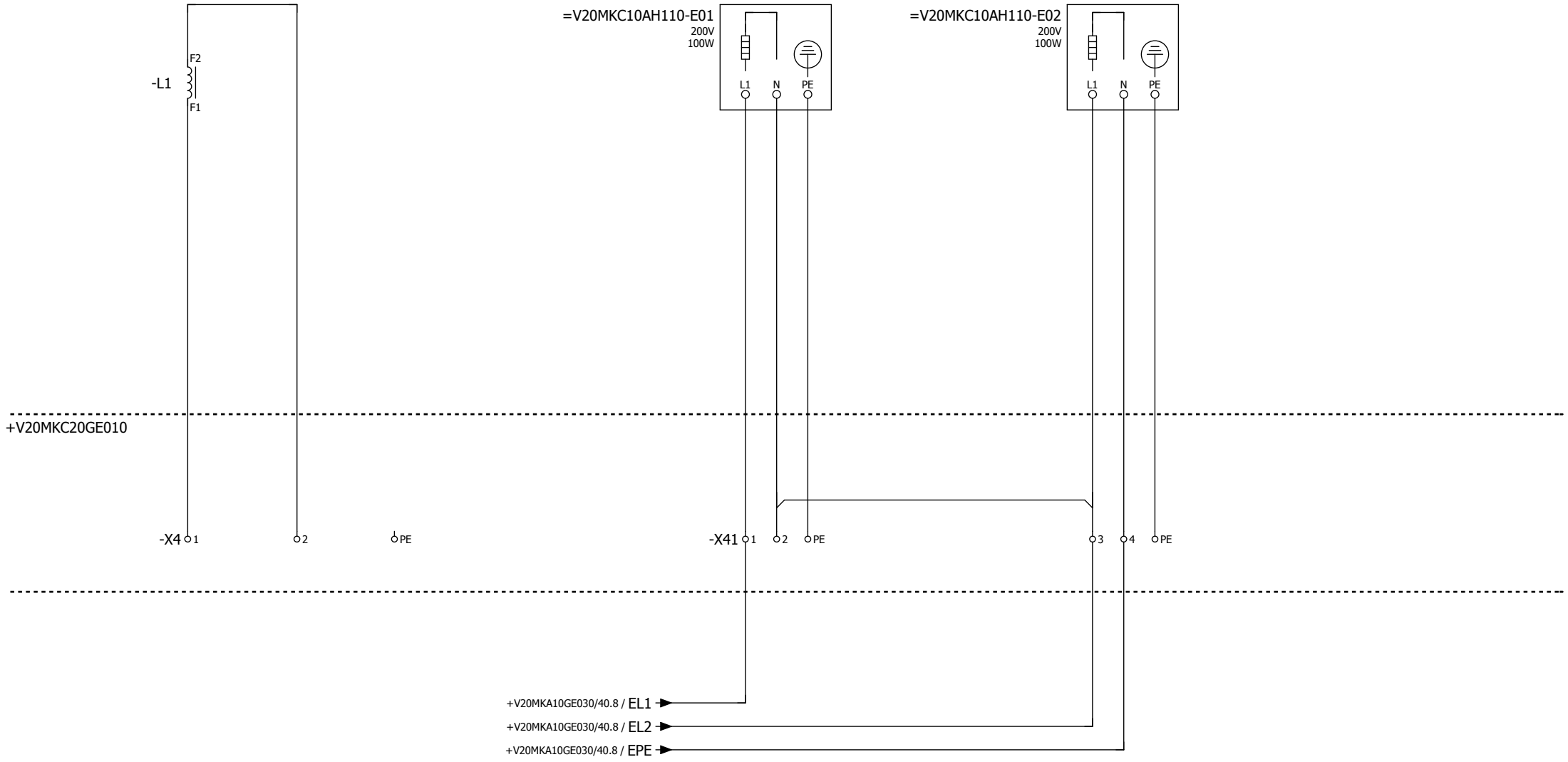
BOTTOM SIDE FOR CUSTOMER CONNECTION DRILLED AT SITE

COLOUR RAL 7035

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX EXCITER FIELD; HEATER MOUNTING PLATE	DPPPG-70160085	= + V20MKC20GE010
			Drawn	Möbius					
			Appr.	Rabe				EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by			Page 43 Pg. 79

FIELD WINDING

EXCITER 2x HEATER



			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX EXCITER FIELD; HEATER	DPPPG-70160085	=
			Drawn	Möbius					+ V20MKC20GE010
			Appr.	Rabe				EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by			Page 44 / Pg. 79

Terminal diagram

Terminal strip =+V20MKC20GE010-X4

item designation	Lev. / no. cable / type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev. / no. cable / type cable	page / track
FIELD WINDING					1	-L1	F1		44 1
=					2	-L1	F2		44 1
=					PE				

SEPARATION PLATE
SEPARATION WITH TS-K

REVISION	Date	Name	Date 19.12.2017 / Drawn Möbius / Appr. Rabe / NORM	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKC20GE010-X4	DPPPG-70160085	= / + V20MKC20GE010
				Replacement for / Replaced by			EG000367 / DPPPG-70152441	Page 45 / Pg. 79

Terminal diagram

item designation	MEGAFLEX 500 type cable	MKA10AH003 no. cable	Lev.	Terminal strip =+V20MKC20GE010-X41 destination A	terminal	link	terminal number	destination B	terminal	type cable	Lev.	page / track
EXCITER 2x HEATER	1			+V20MKA10GE030-X0	3		1	=V20MKC10AH110-E01	L1			44 4
=							2	=V20MKC10AH110-E01	N			44 4
=	2			+V20MKA10GE030-X0	6		3	=V20MKC10AH110-E02	L1			44 6
=	GNYE			+V20MKA10GE030-X0	PE		4	=V20MKC10AH110-E02	N			44 7
=							PE	=V20MKC10AH110-E01	PE			44 5
=							PE	=V20MKC10AH110-E02	PE			44 7

SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKC20GE010-X41	DPPPG-70160085
			Drawn	Möbius				= + V20MKC20GE010
			Appr.	Rabe				
REVISION	Date	Name	NORM		Replacement for	Replaced by	EG000367	DPPPG-70152441 Page 46 Pg. 79

MANUFACTURER HÄWA
STANDARD CASING K12-20/20
DEGREE OF PROTECTION IP65

TAPPED HOLES

MOUNTING RAIL TS 35 (EN60715)

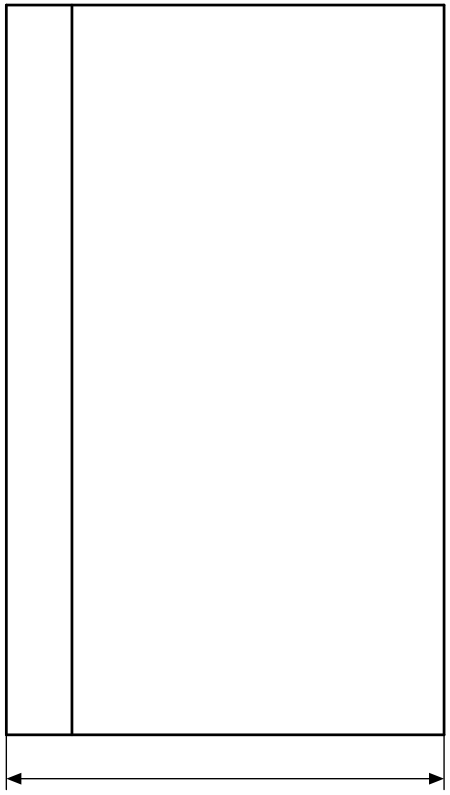
ALL DIMENSIONS IN MM

SCALE 1:2 (A3)

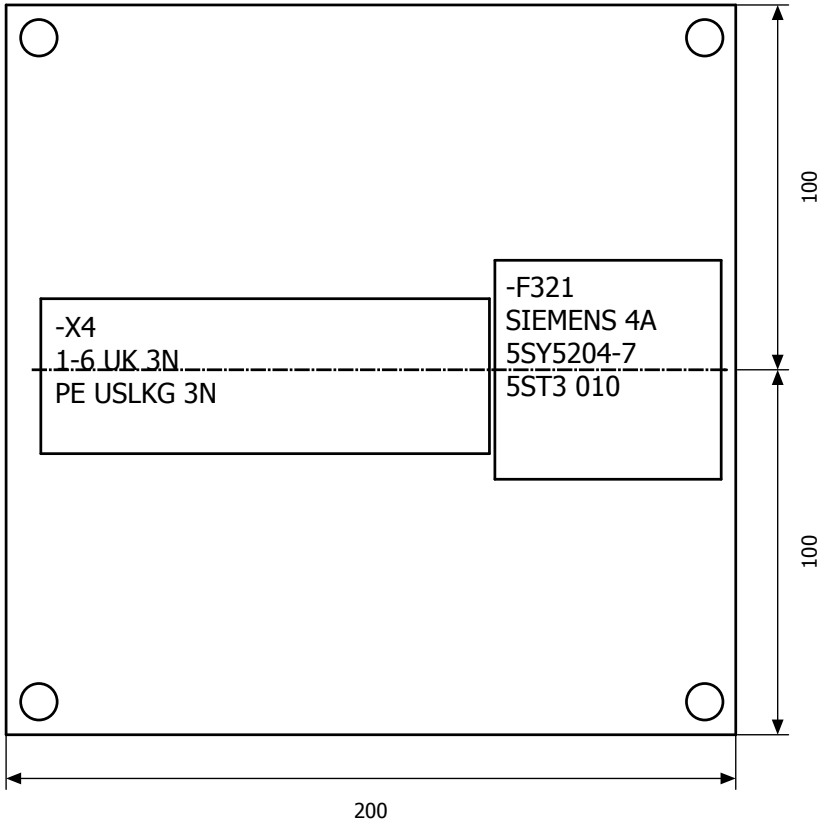
BOTTOM SIDE FOR CUSTOMER CONNECTION DRILLED AT SITE

COLOUR RAL 7035

VIEW ON RIGHT HAND SIDE

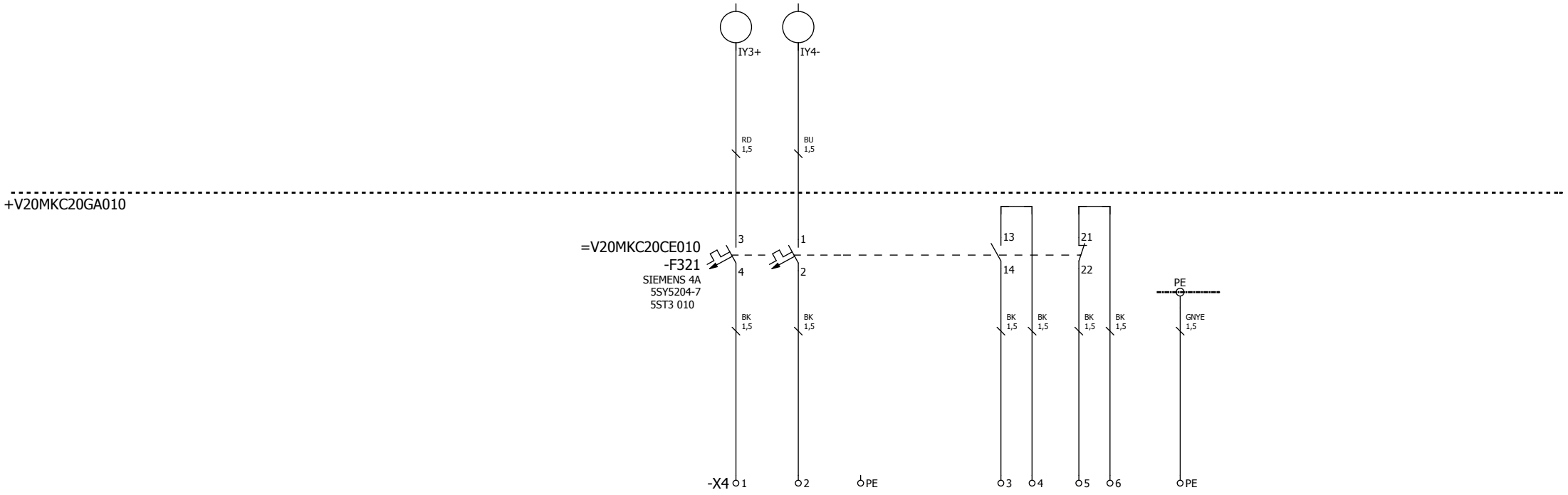


FRONT VIEW WITHOUT COVER



			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX ROTOR EARTH FAULT DETECTION MOUNTING PLATE	DPPPG-70160086	= + V20MKC20GA010
			Drawn	Möbius					
			Appr.	Rabe				EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by			Page 47 Pg. 79

EXCITATION VOLT. MEASUREMENT



			Date	19.12.2017	VILNIUS Biomass		SIEMENS ENERGY SECTOR	JUNCTION BOX ROTOR EARTH FAULT DETECTION	DPPPG-70160086	= + V20MKC20GA010
			Drawn	Möbius						
			Appr.	Rabe					EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by				Page 48 Pg. 79

Terminal diagram

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	type cable	1,5 mm²	page / track
				Terminal strip =+V20MKC20GA010-X4										
EXCITATION VOLT. MEASUREMENT							1	=V20MKC20CE010-F321	4				BK	48 4
=							2	=V20MKC20CE010-F321	2				BK	48 4
=							3		14				BK	48 6
=							4		13				BK	48 6
=							5		22				BK	48 6
=							6		21				BK	48 6
=							PE							
=							PE		PE				GNYE	48 7

SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKC20GA010-X4	DPPPG-70160086
			Drawn	Möbius				= + V20MKC20GA010
			Appr.	Rabe				
REVISION	Date	Name	NORM		Replacement for	Replaced by	EG000367	DPPPG-70152441

Page 49
Pg. 79

MANUFACTURER HÄWA
STANDARD CASING K12-40/20
DEGREE OF PROTECTION IP65

TAPPED HOLES

MOUNTING RAIL TS 35 (EN60715)

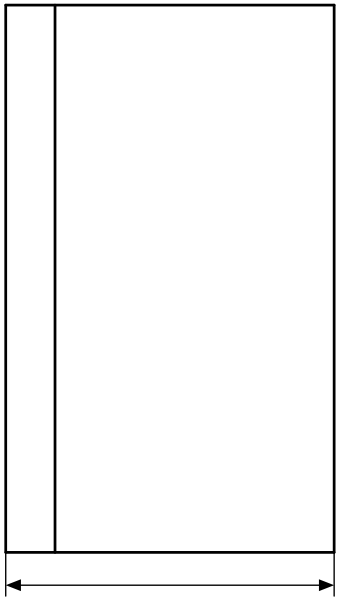
ALL DIMENSIONS IN MM

SCALE 1:2 (A3)

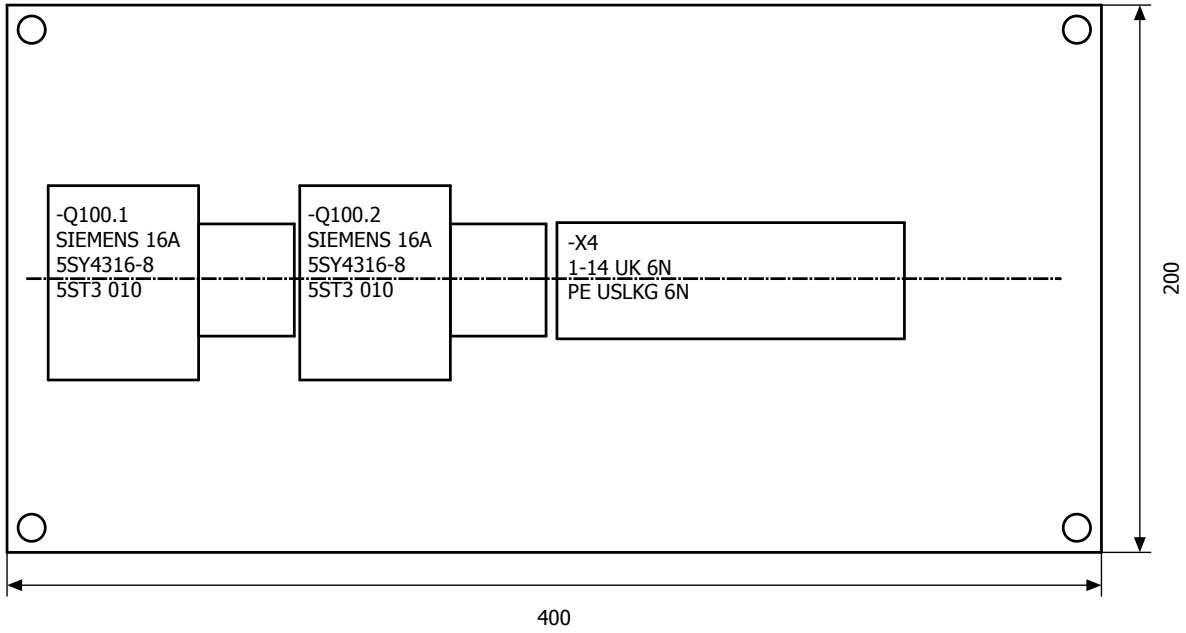
BOTTOM SIDE FOR CUSTOMER CONNECTION DRILLED AT SITE

COLOUR RAL 7035

VIEW ON RIGHT HAND SIDE

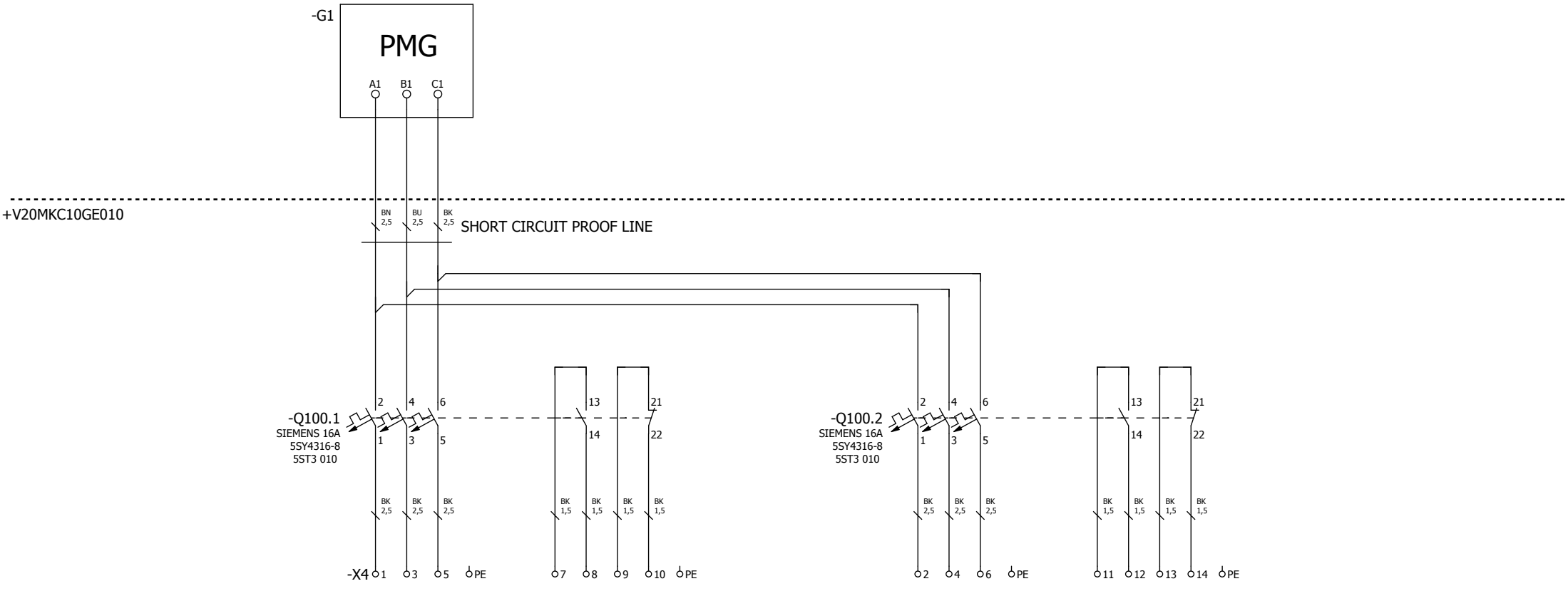


FRONT VIEW WITHOUT COVER



			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX PERMANENT MAGNET GENERATOR MOUNTING PLATE	DPPPG-70160087	= + V20MKC10GE010
			Drawn	Möbius					
			Appr.	Rabe				EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by			Page 50 Pg. 79

PILOT EXCITER



			Date	19.12.2017	VILNIUS Biomass	
			Drawn	Möbius		
			Appr.	Rabe		
REVISION	Date	Name	NORM		Replacement for	Replaced by

SIEMENS
ENERGY SECTOR

JUNCTION BOX
PERMANENT MAGNET GENERATOR

DPPPG-70160087

EG000367 DPPPG-70152441

= + V20MKC10GE010

Terminal diagram

Terminal strip =+V20MKC10GE010-X4

item designation	type cable	destination A	terminal	link	terminal number	destination B	terminal	type cable	1,5 mm²	2,5 mm²	page	track
PILOT EXCITER					1	-Q100.1	1			BK	51	2
=					2	-Q100.2	1			BK	51	5
=					3	-Q100.1	3			BK	51	2
=					4	-Q100.2	3			BK	51	5
=					5	-Q100.1	5			BK	51	2
=					6	-Q100.2	5			BK	51	5
=					7	-Q100.1	13		BK		51	3
=					8	-Q100.1	14		BK		51	3
=					9	-Q100.1	21		BK		51	4
=					10	-Q100.1	22		BK		51	4
=					11	-Q100.2	13		BK		51	7
=					12	-Q100.2	14		BK		51	7
=					13	-Q100.2	21		BK		51	7
=					14	-Q100.2	22		BK		51	7
=					PE							
=					PE							
=					PE							
=					PE							

SEPARATION PLATE
SEPARATION WITH TS-K

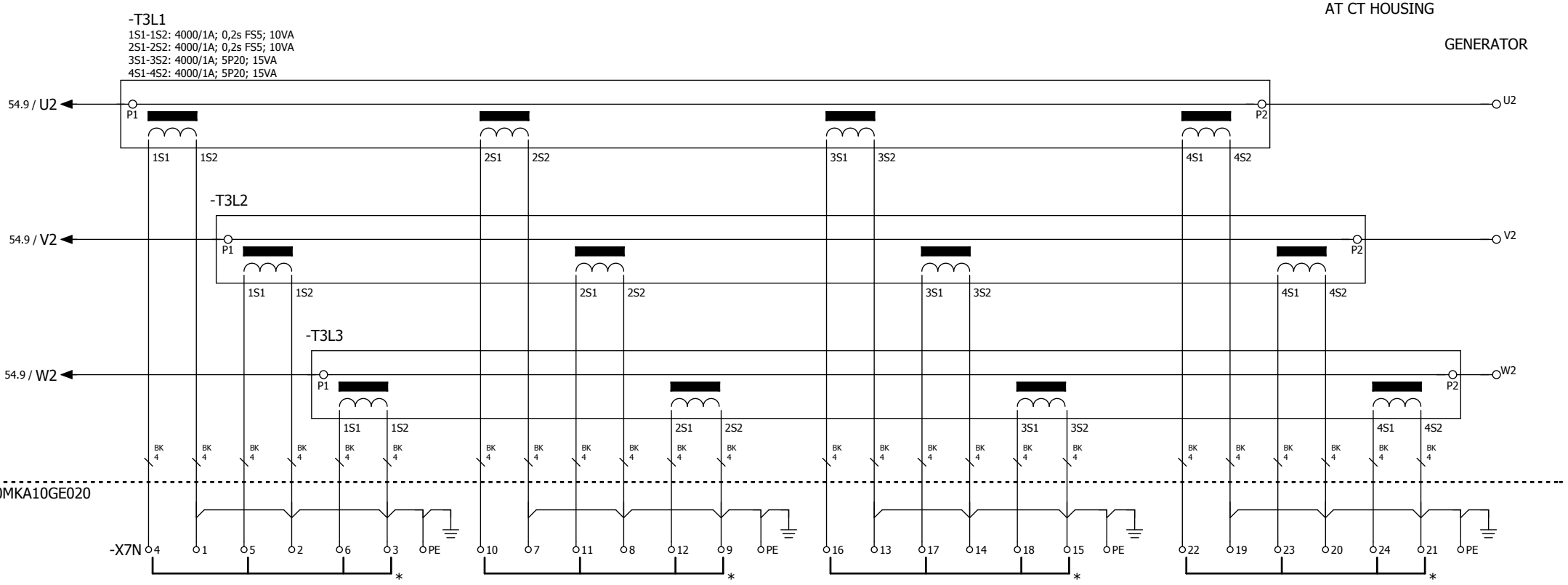
Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKC10GE010-X4	DPPPG-70160087
Drawn	Möbius				= + V20MKC10GE010
Appr.	Rabe				EG000367 / DPPPG-70152441
REVISION / Date / Name / NORM		Replacement for / Replaced by			Page 52 / Pg. 79

MEDIUM VOLTAGE COMPARTMENT
NEUTRAL SIDE

+V20MKA10GD020

CT CORES ARE EARTHED
ON SECONDARY SIDE
BY EARTHING SCREWS
AT CT HOUSING

GENERATOR



MEASURING

MEASURING

GENERATOR PROTECTION
AND SYNCHRONIZATION CUBICLE

GENERATOR PROTECTION
AND SYNCHRONIZATION CUBICLE

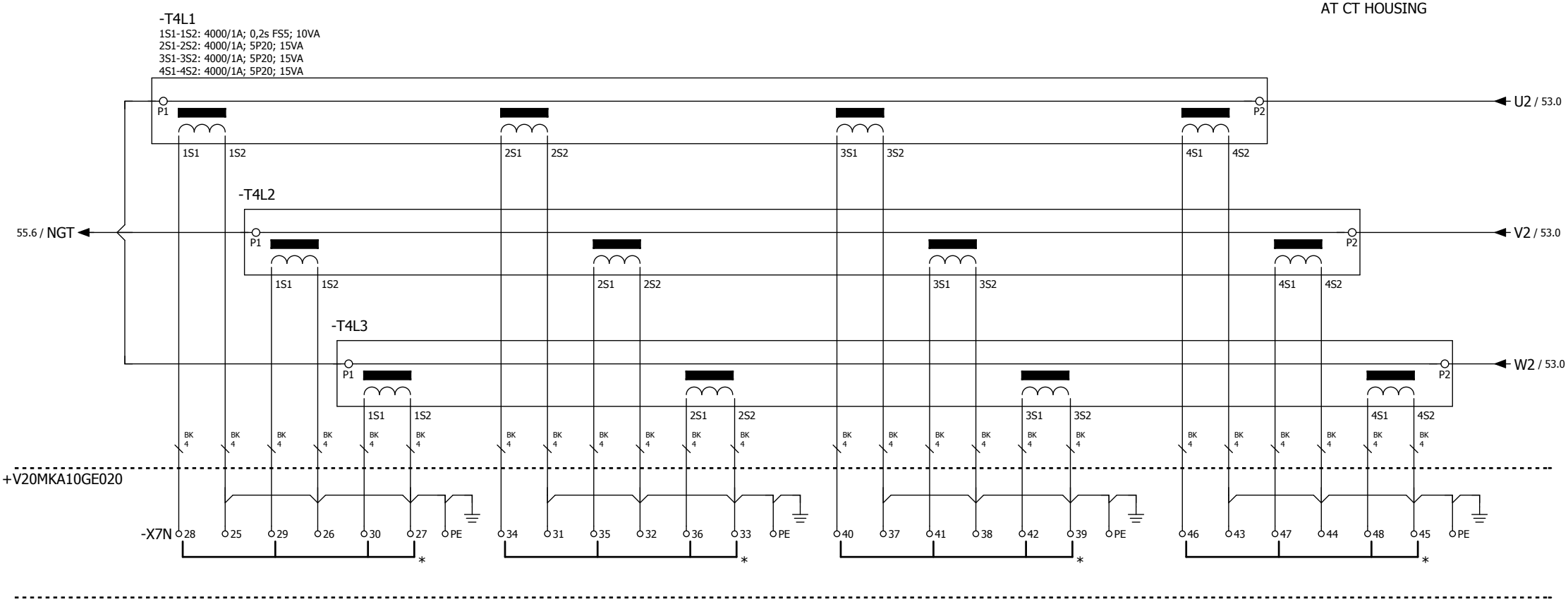
* REMOVE LINKS DURING ERECTION OR COMMISSIONING

b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	NEUTRAL SIDE CUBICLE CURRENT TRANSFORMER	=	
			Drawn	Möbius				+ V20MKA10GE020	
			Appr.	Rabe				EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by		Page	53
								Pg.	79

MEDIUM VOLTAGE COMPARTMENT NEUTRAL SIDE

+V20MKA10GD020

CT CORES ARE EARTHED
ON SECONDARY SIDE
BY EARTHING SCREWS
AT CT HOUSING



MEASURING

GENERATOR PROTECTION
AND SYNCHRONIZATION CUBICLE

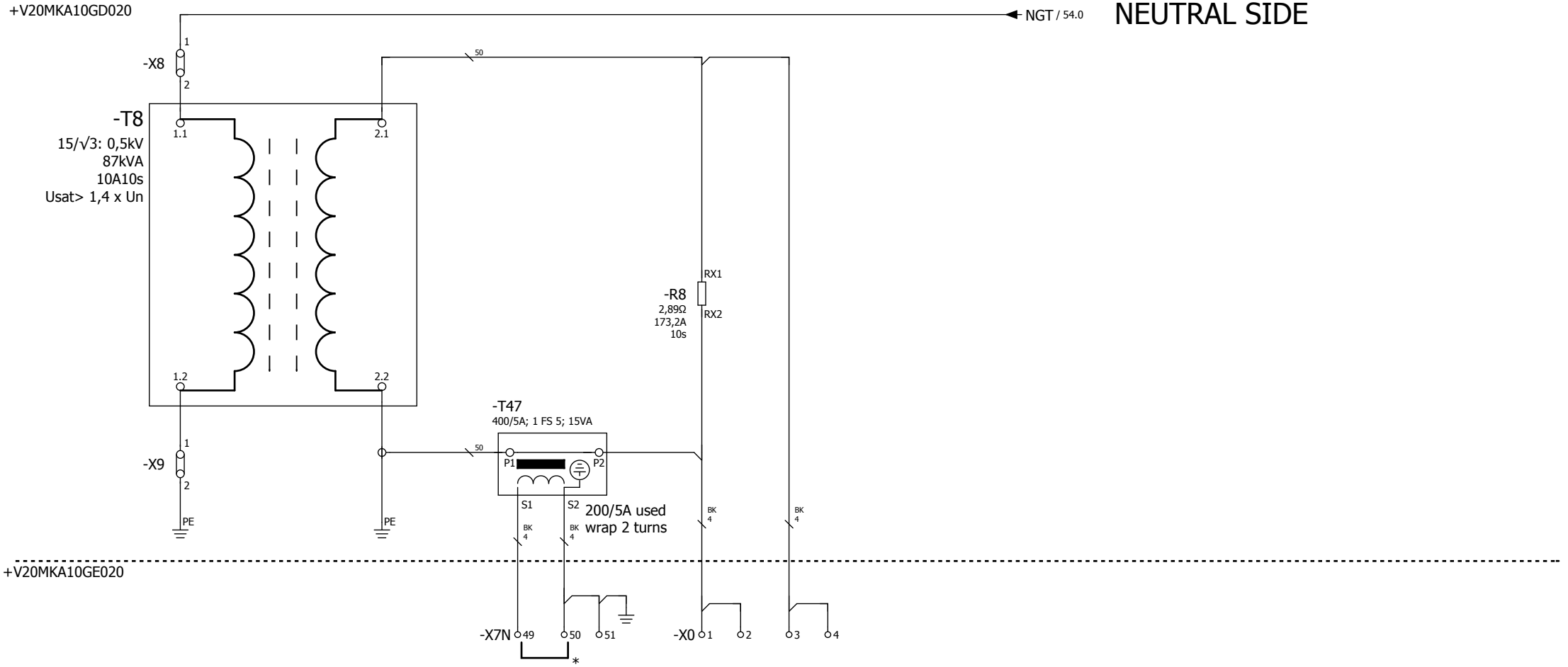
GENERATOR PROTECTION
AND SYNCHRONIZATION CUBICLE

GENERATOR PROTECTION
AND SYNCHRONIZATION CUBICLE

* REMOVE LINKS DURING ERECTION OR COMMISSIONING

b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	NEUTRAL SIDE CUBICLE CURRENT TRANSFORMER	= + V20MKA10GE020
			Drawn	Möbius				
			Appr.	Rabe			EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by		Page 54 / Pg. 79

MEDIUM VOLTAGE COMPARTMENT
NEUTRAL SIDE



PROTECTION

* REMOVE LINKS DURING ERECTION OR COMMISSIONING

b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	
			Drawn	Möbius		
			Appr.	Rabe		
REVISION	Date	Name	NORM		Replacement for	Replaced by

SIEMENS
ENERGY SECTOR

NEUTRAL SIDE CUBICLE
GROUNDING TRANSFORMER

= + V20MKA10GE020

EG000367 | DPPPG-70152441

Terminal diagram

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	type cable	4 mm²	page / track
								Terminal strip =+V20MKA10GE020-X0						
							1	+V20MKA10GD020-R8	RX2				BK;BK	55;55 4;3
							2							
							3	+V20MKA10GD020-R8	RX1				BK	55 4
							4							

SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GE020-X0	=
			Drawn	Möbius				+ V20MKA10GE020
			Appr.	Rabe			EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by		Page 56 / Pg. 79

Terminal diagram

Terminal strip
=+V20MKA10GE020-X7N

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	type cable	4 mm²	page / track
							1	+V20MKA10GD020-T3L1	1S2				BK	53 1
							2	+V20MKA10GD020-T3L2	1S2				BK	53 2
							3	+V20MKA10GD020-T3L3	1S2				BK	53 2
							4	+V20MKA10GD020-T3L1	1S1				BK	53 1
							5	+V20MKA10GD020-T3L2	1S1				BK	53 1
							6	+V20MKA10GD020-T3L3	1S1				BK	53 2
							7	+V20MKA10GD020-T3L1	2S2				BK	53 3
							8	+V20MKA10GD020-T3L2	2S2				BK	53 4
							9	+V20MKA10GD020-T3L3	2S2				BK	53 4
							10	+V20MKA10GD020-T3L1	2S1				BK	53 3
							11	+V20MKA10GD020-T3L2	2S1				BK	53 3
							12	+V20MKA10GD020-T3L3	2S1				BK	53 4
							13	+V20MKA10GD020-T3L1	3S2				BK	53 5
							14	+V20MKA10GD020-T3L2	3S2				BK	53 6
							15	+V20MKA10GD020-T3L3	3S2				BK	53 6
							16	+V20MKA10GD020-T3L1	3S1				BK	53 5
							17	+V20MKA10GD020-T3L2	3S1				BK	53 5
							18	+V20MKA10GD020-T3L3	3S1				BK	53 6
							19	+V20MKA10GD020-T3L1	4S2				BK	53 7
							20	+V20MKA10GD020-T3L2	4S2				BK	53 8
							21	+V20MKA10GD020-T3L3	4S2				BK	53 8
							22	+V20MKA10GD020-T3L1	4S1				BK	53 7
							23	+V20MKA10GD020-T3L2	4S1				BK	53 8
							24	+V20MKA10GD020-T3L3	4S1				BK	53 8
							25	+V20MKA10GD020-T4L1	1S2				BK	54 1
							26	+V20MKA10GD020-T4L2	1S2				BK	54 2
							27	+V20MKA10GD020-T4L3	1S2				BK	54 2
							28	+V20MKA10GD020-T4L1	1S1				BK	54 1
							29	+V20MKA10GD020-T4L2	1S1				BK	54 1
							30	+V20MKA10GD020-T4L3	1S1				BK	54 2
							31	+V20MKA10GD020-T4L1	2S2				BK	54 3
							32	+V20MKA10GD020-T4L2	2S2				BK	54 4

SEPARATION PLATE
SEPARATION WITH TS-K

Terminal diagram

Terminal strip
=+V20MKA10GE020-X7N

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	type cable	4 mm²	page / track
							33	+V20MKA10GD020-T4L3	2S2			BK		54 4
							34	+V20MKA10GD020-T4L1	2S1			BK		54 3
							35	+V20MKA10GD020-T4L2	2S1			BK		54 3
							36	+V20MKA10GD020-T4L3	2S1			BK		54 4
							37	+V20MKA10GD020-T4L1	3S2			BK		54 5
							38	+V20MKA10GD020-T4L2	3S2			BK		54 6
							39	+V20MKA10GD020-T4L3	3S2			BK		54 6
							40	+V20MKA10GD020-T4L1	3S1			BK		54 5
							41	+V20MKA10GD020-T4L2	3S1			BK		54 5
							42	+V20MKA10GD020-T4L3	3S1			BK		54 6
							43	+V20MKA10GD020-T4L1	4S2			BK		54 7
							44	+V20MKA10GD020-T4L2	4S2			BK		54 8
							45	+V20MKA10GD020-T4L3	4S2			BK		54 8
							46	+V20MKA10GD020-T4L1	4S1			BK		54 7
							47	+V20MKA10GD020-T4L2	4S1			BK		54 8
							48	+V20MKA10GD020-T4L3	4S1			BK		54 8
							49	+V20MKA10GD020-T47	S1			BK		55 3
							50	+V20MKA10GD020-T47	S2			BK		55 3
							51							55 3
							PE							53 3
							PE							53 5
							PE							53 7
							PE							53 9
							PE							54 3
							PE							54 5
							PE							54 7
							PE							54 9
							○							
							○							
							○							
							○							
							○							

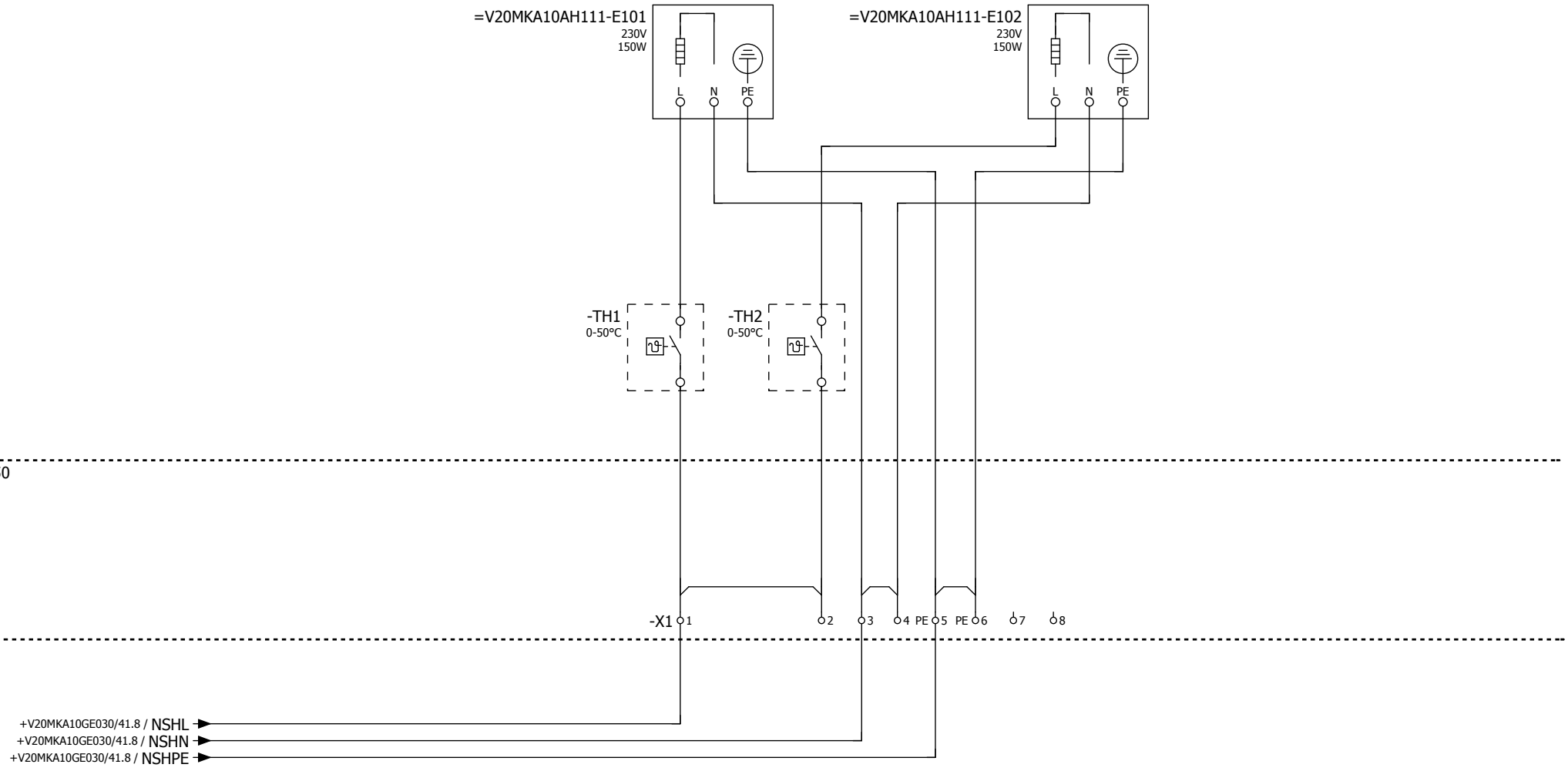
SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GE020-X7N	= + V20MKA10GE020
			Drawn	Möbius				
			Appr.	Rabe				
REVISION	Date	Name	NORM		Replacement for	Replaced by	EG000367	DPPPG-70152441 Page 58 Pg. 79

+V20MKA10GD020

MEDIUM VOLTAGE COMPARTMENT
NEUTRAL SIDE

NEUTRAL SIDE CUBICLE HEATER



b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	
			Drawn	Möbius		
			Appr.	Rabe		
REVISION	Date	Name	NORM		Replacement for	Replaced by

SIEMENS
ENERGY SECTOR

NEUTRAL SIDE CUBICLE ANTICONDENSATION HEATER

=
+ V20MKA10GE050

EG000367 | DPPPG-70152441 | Page 59 | Pg. 79

Terminal diagram

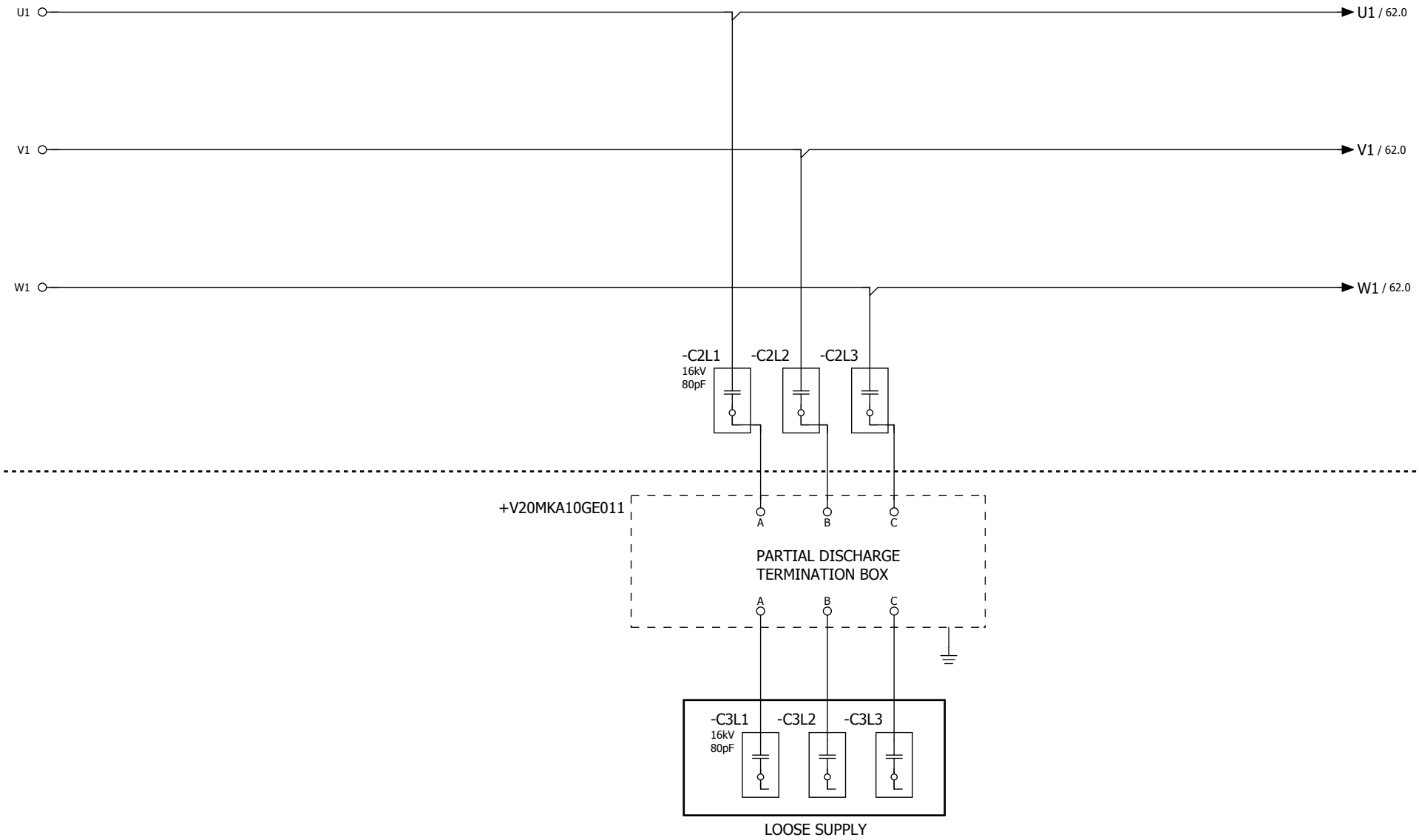
item designation	MEGAFLEX 500 type cable	MKA10AH004 no. cable	Lev.	Terminal strip =+V20MKA10GE050-X1 destination A	terminal	link	terminal number	destination B	terminal	Lev. type cable	no. cable	page / track
NEUTRAL SIDE CUBICLE HEATER		1		+V20MKA10GE030-X0	13		1	-TH1				59 4
=							2	-TH2				59 5
=		2		+V20MKA10GE030-X0	15		3	=V20MKA10AH111-E101	N			59 4
=							4	=V20MKA10AH111-E102	N			59 7
PE	GNYE			+V20MKA10GE030-X0	PE		5	=V20MKA10AH111-E101	PE			59 5
=							6	=V20MKA10AH111-E102	PE			59 7
NEUTRAL SIDE CUBICLE HEATER							7					
=							8					

SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GE050-X1	=
			Drawn	Möbius				+ V20MKA10GE050
			Appr.	Rabe			EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by		Page 60 Pg. 79

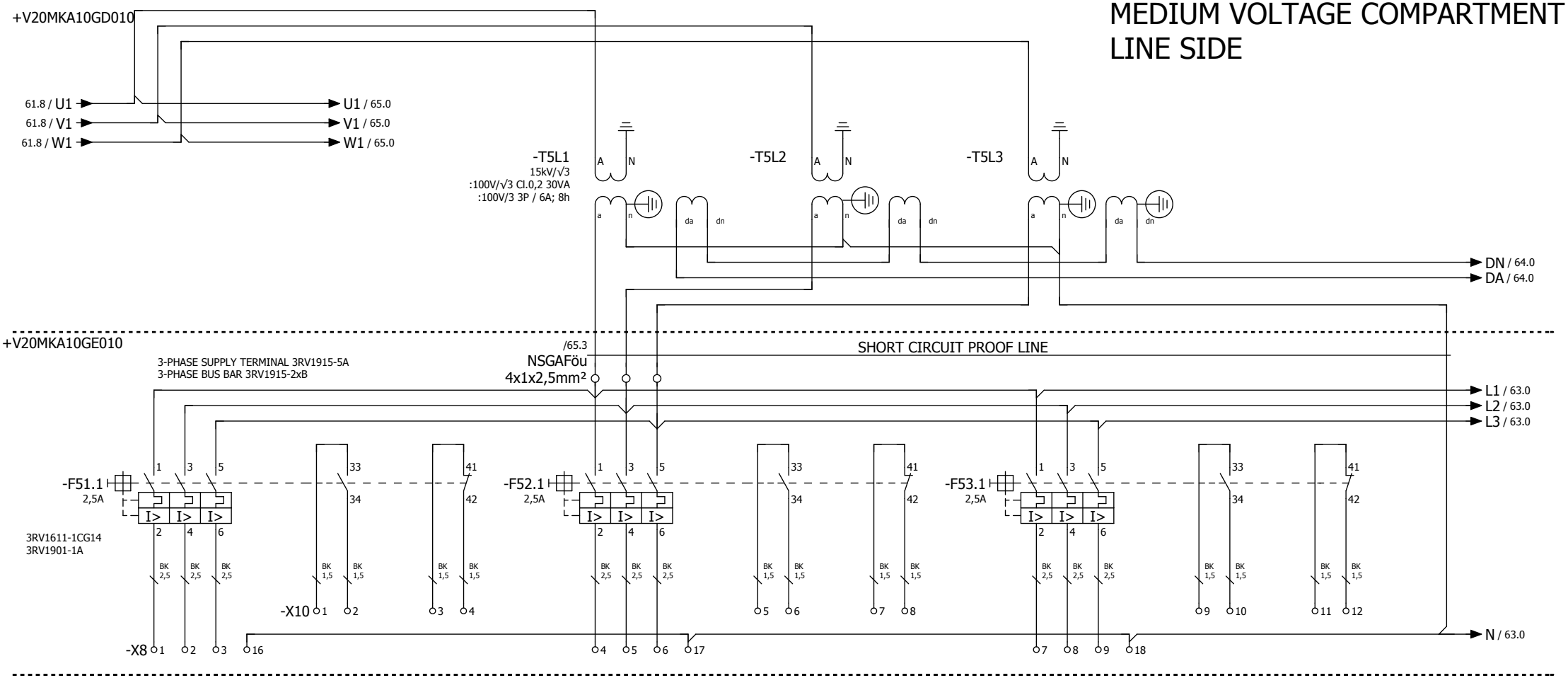
MEDIUM VOLTAGE COMPARTMENT
LINE SIDE CUBICLE

GENERATOR



b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	LINE SIDE CUBICLE PARTIAL DISCHARGE MEASUREMENT		=	
			Drawn	Möbius					+ V20MKA10GE010	
			Appr.	Rabe				EG000367	DPPPG-70152441	Page 61
REVISION	Date	Name	NORM		Replacement for	Replaced by				Pg. 79

MEDIUM VOLTAGE COMPARTMENT
LINE SIDE



PROTECTION

VOLTAGE REGULATION

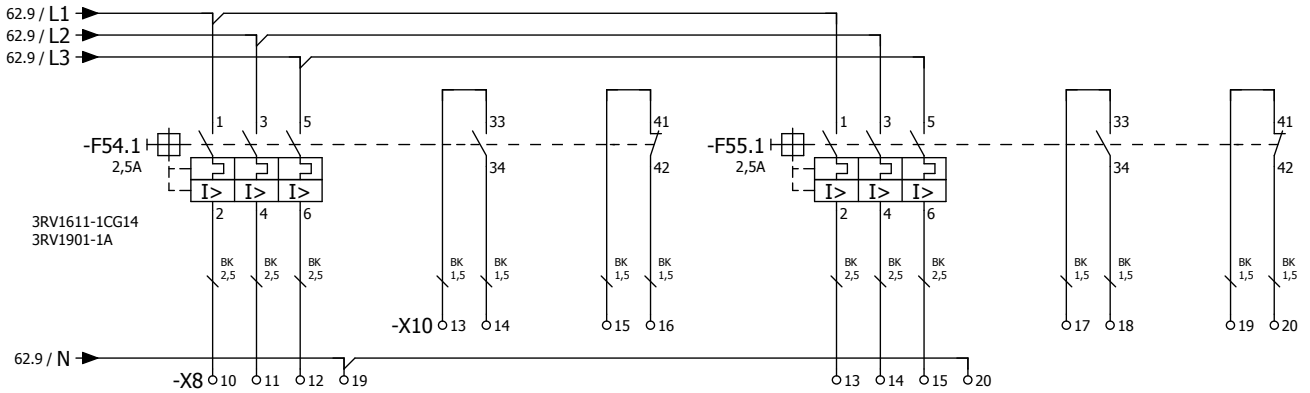
PROTECTION

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	LINE SIDE CUBICLE VOLTAGE TRANSFORMER	=	
			Drawn	Möbius				+ V20MKA10GE010	
			Appr.	Rabe				EG000367 DPPPG-70152441	Page 62
REVISION	Date	Name	NORM		Replacement for	Replaced by			Pg. 79

+V20MKA10GD010

MEDIUM VOLTAGE COMPARTMENT
LINE SIDE

+V20MKA10GE010



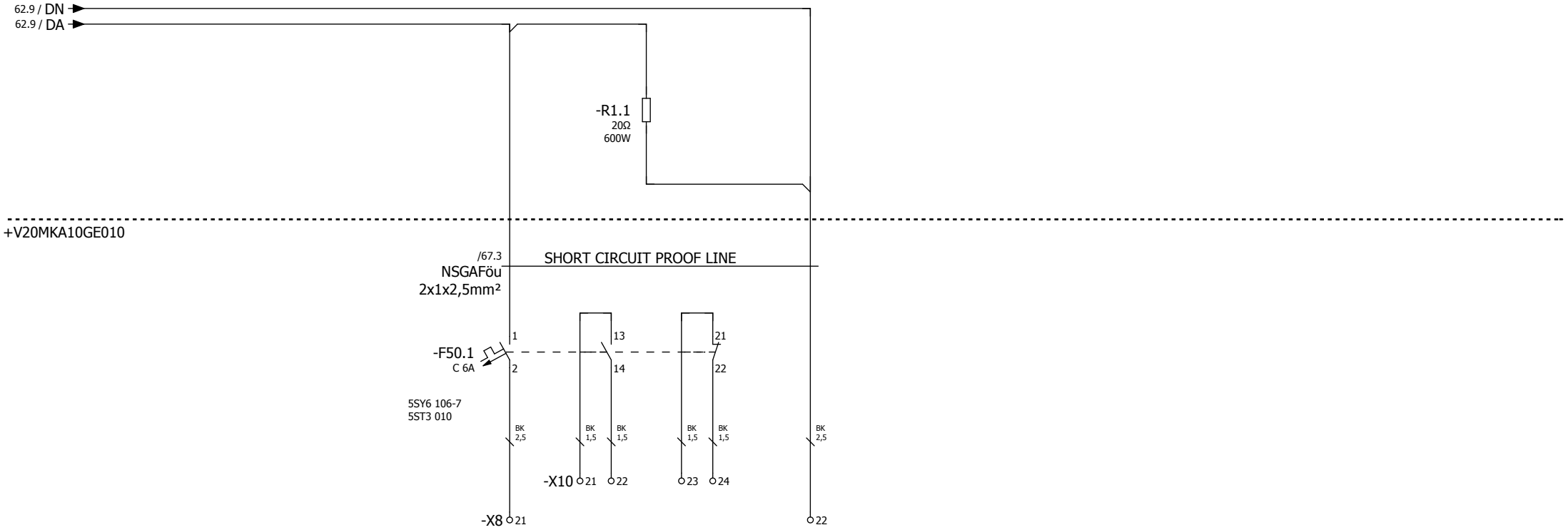
MEASUREMENT

SYNCHRONIZATION

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	LINE SIDE CUBICLE VOLTAGE TRANSFORMER	=	
			Drawn	Möbius				+ V20MKA10GE010	
			Appr.	Rabe				EG000367 DPPPG-70152441	Page 63
REVISION	Date	Name	NORM		Replacement for	Replaced by			Pg. 79

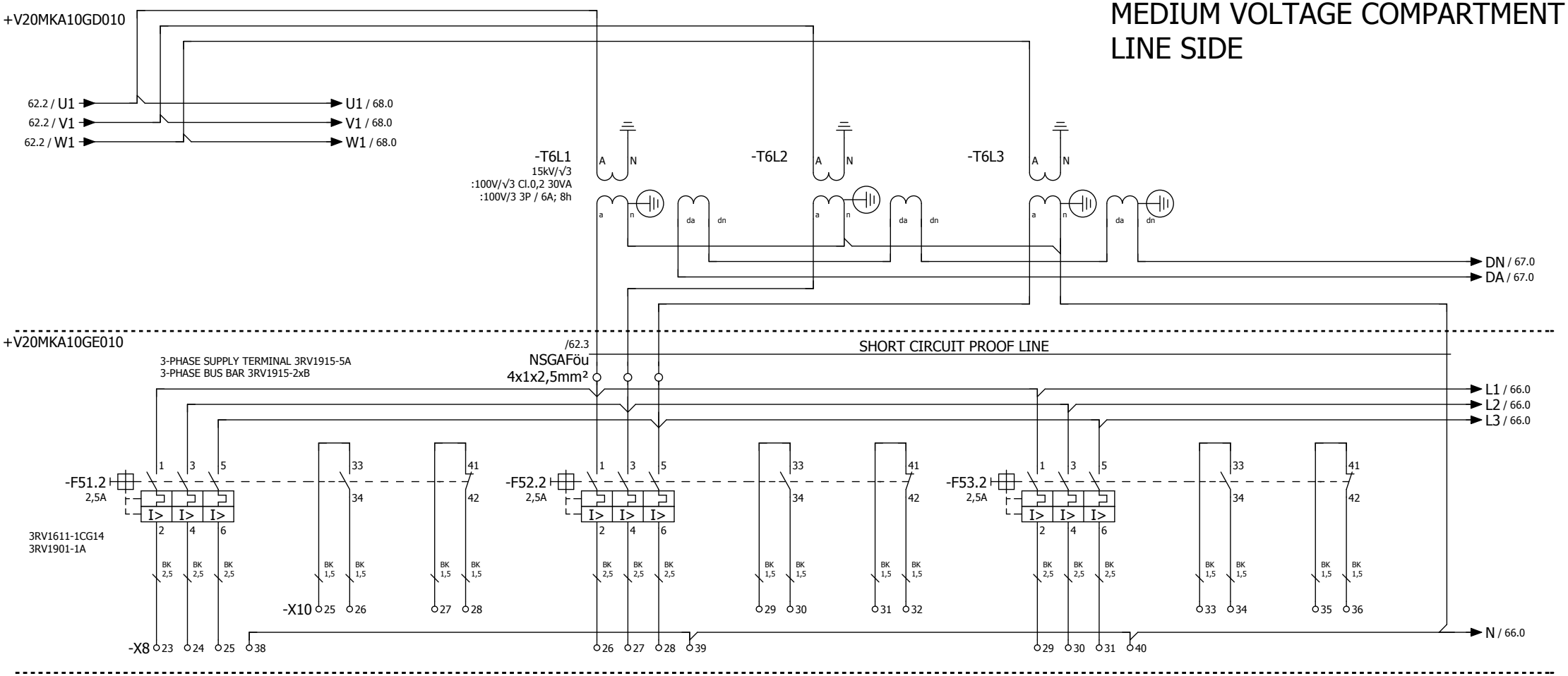
+V20MKA10GD010

MEDIUM VOLTAGE COMPARTMENT
LINE SIDE



			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	LINE SIDE CUBICLE VOLTAGE TRANSFORMER	=	
			Drawn	Möbius				+ V20MKA10GE010	
			Appr.	Rabe				EG000367 DPPPG-70152441	Page 64
REVISION	Date	Name	NORM		Replacement for	Replaced by			Pg. 79

MEDIUM VOLTAGE COMPARTMENT
LINE SIDE



PROTECTION

VOLTAGE REGULATION

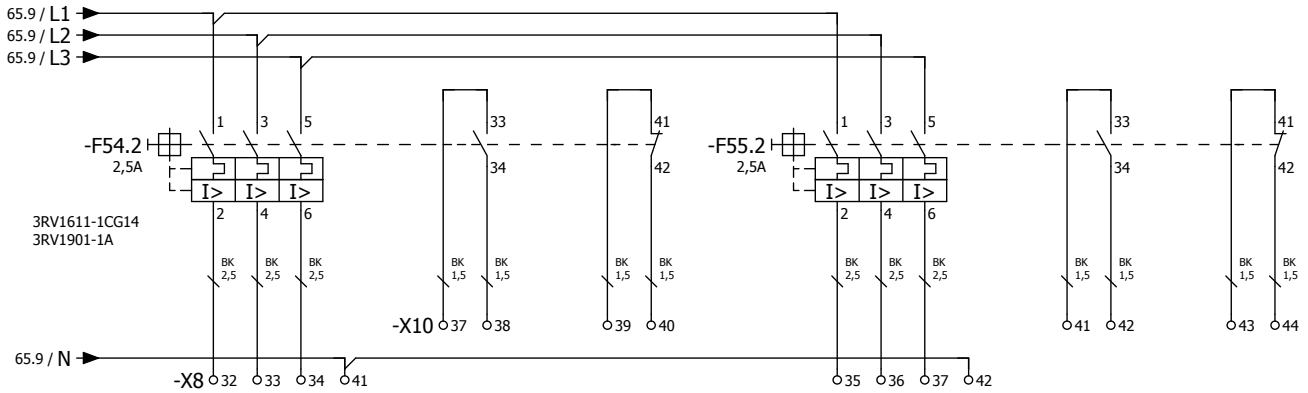
PROTECTION

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	LINE SIDE CUBICLE VOLTAGE TRANSFORMER	=	
			Drawn	Möbius				+ V20MKA10GE010	
			Appr.	Rabe				EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by		Page	65
								Pg.	79

+V20MKA10GD010

MEDIUM VOLTAGE COMPARTMENT
LINE SIDE

+V20MKA10GE010



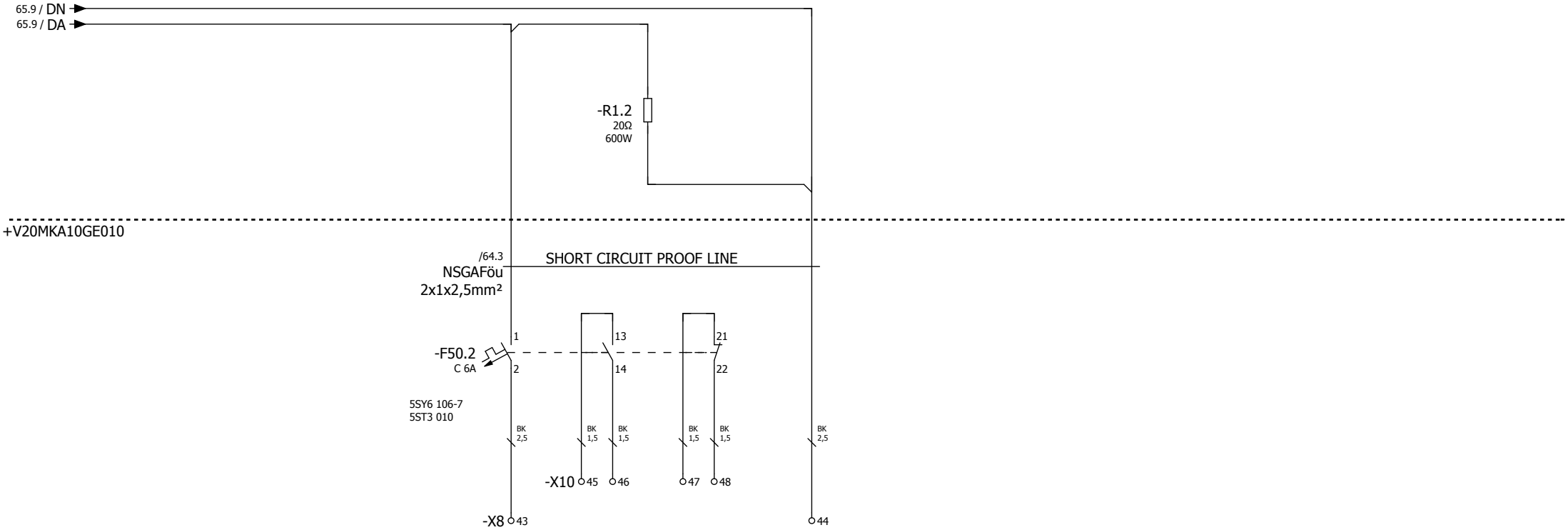
MEASUREMENT

SYNCHRONIZATION

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	LINE SIDE CUBICLE VOLTAGE TRANSFORMER	=	
			Drawn	Möbius				+ V20MKA10GE010	
			Appr.	Rabe				EG000367 DPPPG-70152441	Page 66
REVISION	Date	Name	NORM		Replacement for	Replaced by			Pg. 79

+V20MKA10GD010

MEDIUM VOLTAGE COMPARTMENT
LINE SIDE

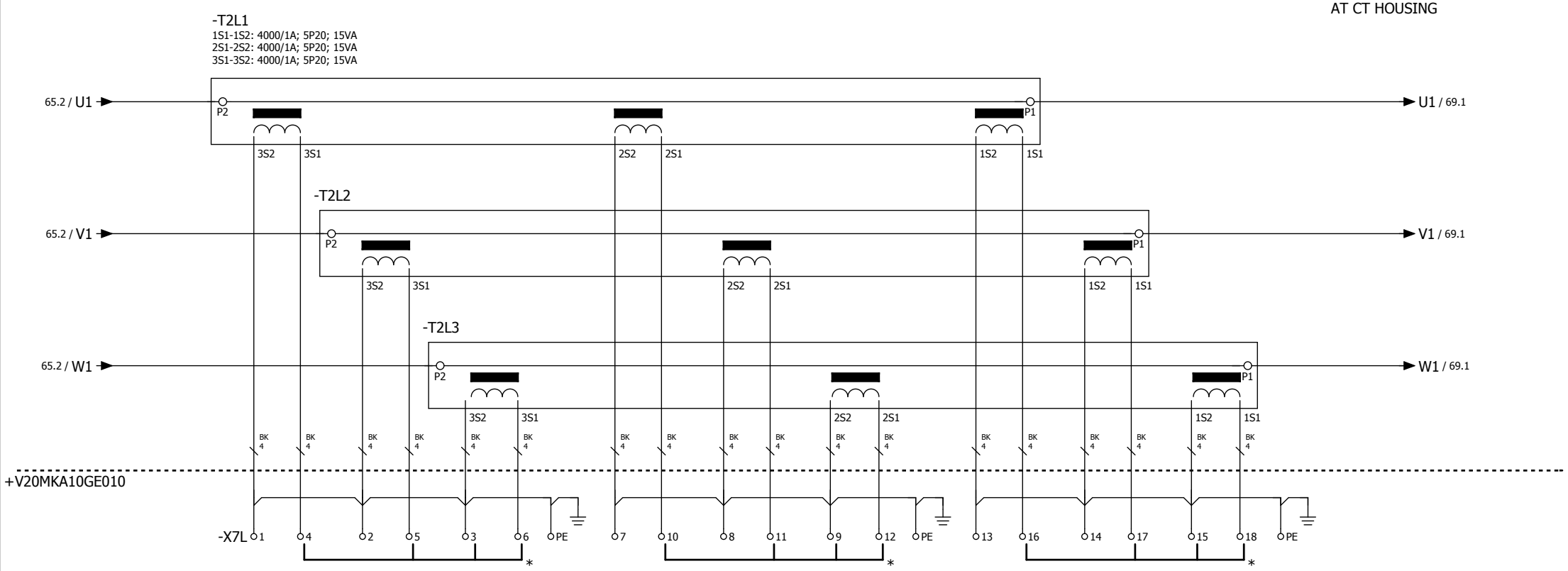


			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	LINE SIDE CUBICLE VOLTAGE TRANSFORMER	=	
			Drawn	Möbius				+ V20MKA10GE010	
			Appr.	Rabe				EG000367 DPPPG-70152441	Page 67
REVISION	Date	Name	NORM		Replacement for	Replaced by			Pg. 79

MEDIUM VOLTAGE COMPARTMENT
LINE SIDE

+V20MKA10GD010

CT CORES ARE EARTHED
ON SECONDARY SIDE
BY EARTHING SCREWS
AT CT HOUSING

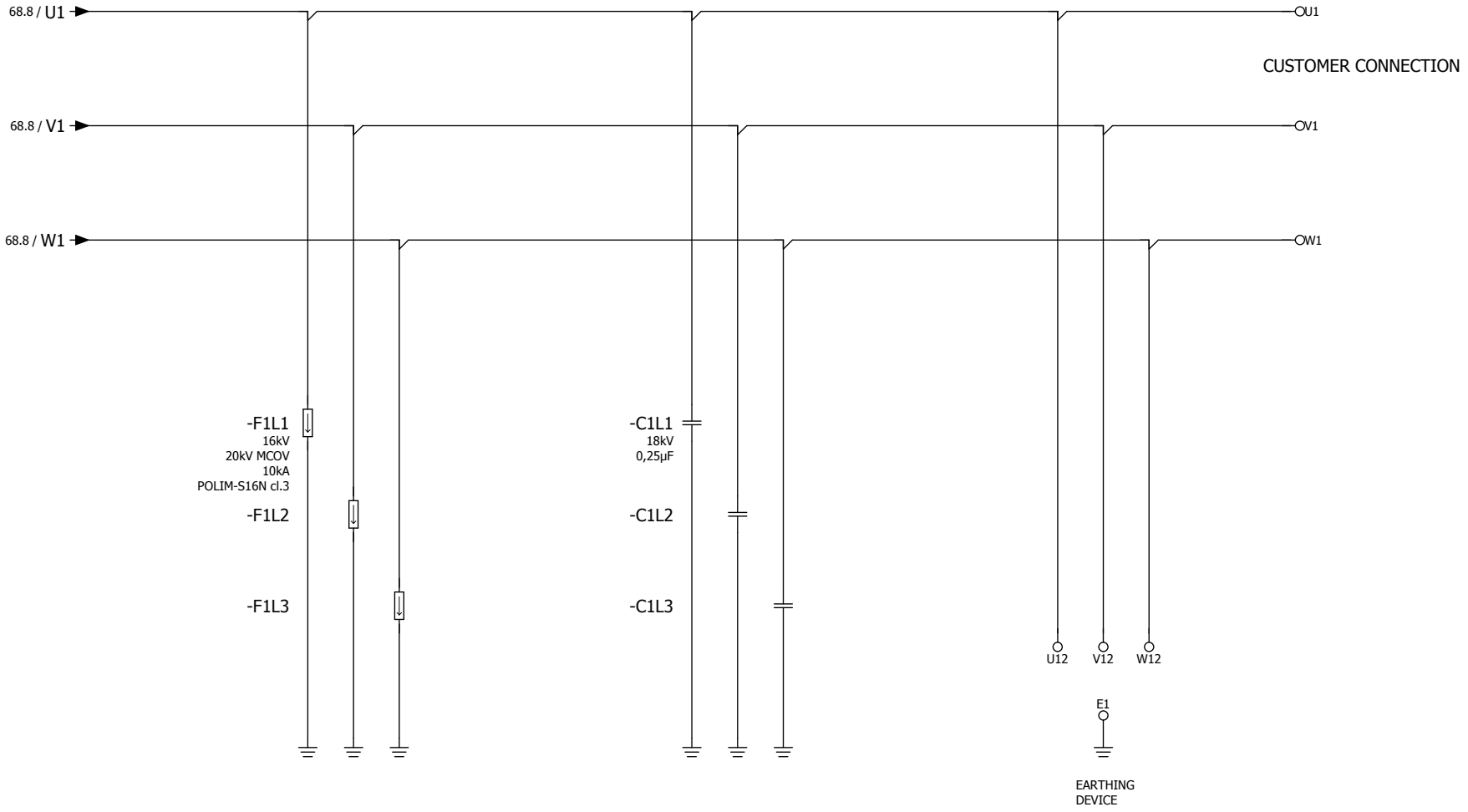


* REMOVE LINKS DURING ERECTION OR COMMISSIONING

b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	LINE SIDE CUBICLE CURRENT TRANSFORMER	=	
			Drawn	Möbius				+ V20MKA10GE010	
			Appr.	Rabe				EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by		Page	68
								Pg.	79

+V20MKA10GD010

MEDIUM VOLTAGE COMPARTMENT
LINE SIDE



b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	LINE SIDE CUBICLE SURGE ARRESTORS / CAPACITORS		=	
			Drawn	Möbius					+ V20MKA10GE010	
			Appr.	Rabe				EG000367	DPPPG-70152441	Page 69
REVISION	Date	Name	NORM		Replacement for	Replaced by				Pg. 79

Terminal diagram

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	type cable	4 mm²	page / track
								Terminal strip =+V20MKA10GE010-X7L						
							1	+V20MKA10GD010-T2L1	3S2			BK		68 1
							2	+V20MKA10GD010-T2L2	3S2			BK		68 2
							3	+V20MKA10GD010-T2L3	3S2			BK		68 2
							4	+V20MKA10GD010-T2L1	3S1			BK		68 1
							5	+V20MKA10GD010-T2L2	3S1			BK		68 2
							6	+V20MKA10GD010-T2L3	3S1			BK		68 3
							7	+V20MKA10GD010-T2L1	2S2			BK		68 3
							8	+V20MKA10GD010-T2L2	2S2			BK		68 4
							9	+V20MKA10GD010-T2L3	2S2			BK		68 5
							10	+V20MKA10GD010-T2L1	2S1			BK		68 4
							11	+V20MKA10GD010-T2L2	2S1			BK		68 4
							12	+V20MKA10GD010-T2L3	2S1			BK		68 5
							13	+V20MKA10GD010-T2L1	1S2			BK		68 6
							14	+V20MKA10GD010-T2L2	1S2			BK		68 6
							15	+V20MKA10GD010-T2L3	1S2			BK		68 7
							16	+V20MKA10GD010-T2L1	1S1			BK		68 6
							17	+V20MKA10GD010-T2L2	1S1			BK		68 7
							18	+V20MKA10GD010-T2L3	1S1			BK		68 7
							PE							68 3
							PE							68 5
							PE							68 8

SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GE010-X7L	=	
			Drawn	Möbius				+ V20MKA10GE010	
			Appr.	Rabe					
REVISION	Date	Name	NORM		Replacement for	Replaced by	EG000367	DPPPG-70152441	Page 70 / Pg. 79

Terminal diagram

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	W21	W25	2,5 mm²	page / track
				Terminal strip =+V20MKA10GE010-X8											
PROTECTION							1	-F51.1	2					BK	62 1
=							2	-F51.1	4					BK	62 1
=							3	-F51.1	6					BK	62 1
VOLTAGE REGULATION							4	-F52.1	2					BK	62 3
=							5	-F52.1	4					BK	62 3
=							6	-F52.1	6					BK	62 3
PROTECTION							7	-F53.1	2					BK	62 6
=							8	-F53.1	4					BK	62 6
=							9	-F53.1	6					BK	62 6
MEASUREMENT							10	-F54.1	2					BK	63 1
=							11	-F54.1	4					BK	63 1
=							12	-F54.1	6					BK	63 1
SYNCHRONIZATION							13	-F55.1	2					BK	63 3
=							14	-F55.1	4					BK	63 3
=							15	-F55.1	6					BK	63 3
PROTECTION							16								
VOLTAGE REGULATION							17								
PROTECTION							18	+V20MKA10GD010-T5L3							62;62 6;5
MEASUREMENT							19								
SYNCHRONIZATION							20								
							21	-F50.1	2					BK	64 3
							22	+V20MKA10GD010-T5L3				BK;BK			62;64 7;4
PROTECTION							23	-F51.2	2					BK	65 1
=							24	-F51.2	4					BK	65 1
=							25	-F51.2	6					BK	65 1
VOLTAGE REGULATION							26	-F52.2	2					BK	65 3
=							27	-F52.2	4					BK	65 3
=							28	-F52.2	6					BK	65 3
PROTECTION							29	-F53.2	2					BK	65 6
=							30	-F53.2	4					BK	65 6
=							31	-F53.2	6					BK	65 6
MEASUREMENT							32	-F54.2	2					BK	66 1

SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GE010-X8	=
			Drawn	Möbius				+ V20MKA10GE010
			Appr.	Rabe			EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by		Page 71 / Pg. 79

0	1	2	3	4	5	6	7	8	9

Terminal diagram

Terminal strip =+V20MKA10GE010-X8

item designation	type cable	destination A	terminal	link	terminal number	destination B	terminal	type cable	W21 NSGAFöu	W25 NSGAFöu	2,5 mm²	page / track	
MEASUREMENT					33	-F54.2	4				BK	66	1
=					34	-F54.2	6				BK	66	1
SYNCHRONIZATION					35	-F55.2	2				BK	66	3
=					36	-F55.2	4				BK	66	3
=					37	-F55.2	6				BK	66	3
PROTECTION					38								
VOLTAGE REGULATION					39								
PROTECTION					40	+V20MKA10GD010-T6L3						65;65	6;5
MEASUREMENT					41								
SYNCHRONIZATION					42								
					43	-F50.2	2				BK	67	3
					44	+V20MKA10GD010-T6L3				BK;BK		65;67	7;4

SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass		SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GE010-X8	=
			Drawn	Möbius					+ V20MKA10GE010
			Appr.	Rabe				EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by		Page 72	Pg. 79

Terminal diagram

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	type cable	1,5 mm²	page / track
				Terminal strip =+V20MKA10GE010-X10										
PROTECTION							1	-F51.1	33				BK	62 2
=							2	-F51.1	34				BK	62 2
=							3	-F51.1	41				BK	62 2
=							4	-F51.1	42				BK	62 2
VOLTAGE REGULATION							5	-F52.1	33				BK	62 5
=							6	-F52.1	34				BK	62 5
=							7	-F52.1	41				BK	62 5
=							8	-F52.1	42				BK	62 5
PROTECTION							9	-F53.1	33				BK	62 7
=							10	-F53.1	34				BK	62 7
=							11	-F53.1	41				BK	62 8
=							12	-F53.1	42				BK	62 8
MEASUREMENT							13	-F54.1	33				BK	63 2
=							14	-F54.1	34				BK	63 2
=							15	-F54.1	41				BK	63 2
=							16	-F54.1	42				BK	63 2
SYNCHRONIZATION							17	-F55.1	33				BK	63 5
=							18	-F55.1	34				BK	63 5
=							19	-F55.1	41				BK	63 5
=							20	-F55.1	42				BK	63 5
							21	-F50.1	13				BK	64 3
							22	-F50.1	14				BK	64 3
							23	-F50.1	21				BK	64 4
							24	-F50.1	22				BK	64 4
PROTECTION							25	-F51.2	33				BK	65 2
=							26	-F51.2	34				BK	65 2
=							27	-F51.2	41				BK	65 2
=							28	-F51.2	42				BK	65 2
VOLTAGE REGULATION							29	-F52.2	33				BK	65 5
=							30	-F52.2	34				BK	65 5
=							31	-F52.2	41				BK	65 5
=							32	-F52.2	42				BK	65 5

SEPARATION PLATE
SEPARATION WITH TS-K

Terminal diagram

item designation	Lev.	no. cable	type cable	destination A	terminal	link	terminal number	destination B	terminal	Lev.	no. cable	type cable	1,5 mm²	page / track
				Terminal strip =+V20MKA10GE010-X10										
PROTECTION							33	-F53.2	33				BK	65 7
=							34	-F53.2	34				BK	65 7
=							35	-F53.2	41				BK	65 8
=							36	-F53.2	42				BK	65 8
MEASUREMENT							37	-F54.2	33				BK	66 2
=							38	-F54.2	34				BK	66 2
=							39	-F54.2	41				BK	66 2
=							40	-F54.2	42				BK	66 2
SYNCHRONIZATION							41	-F55.2	33				BK	66 5
=							42	-F55.2	34				BK	66 5
=							43	-F55.2	41				BK	66 5
=							44	-F55.2	42				BK	66 5
							45	-F50.2	13				BK	67 3
							46	-F50.2	14				BK	67 3
							47	-F50.2	21				BK	67 4
							48	-F50.2	22				BK	67 4

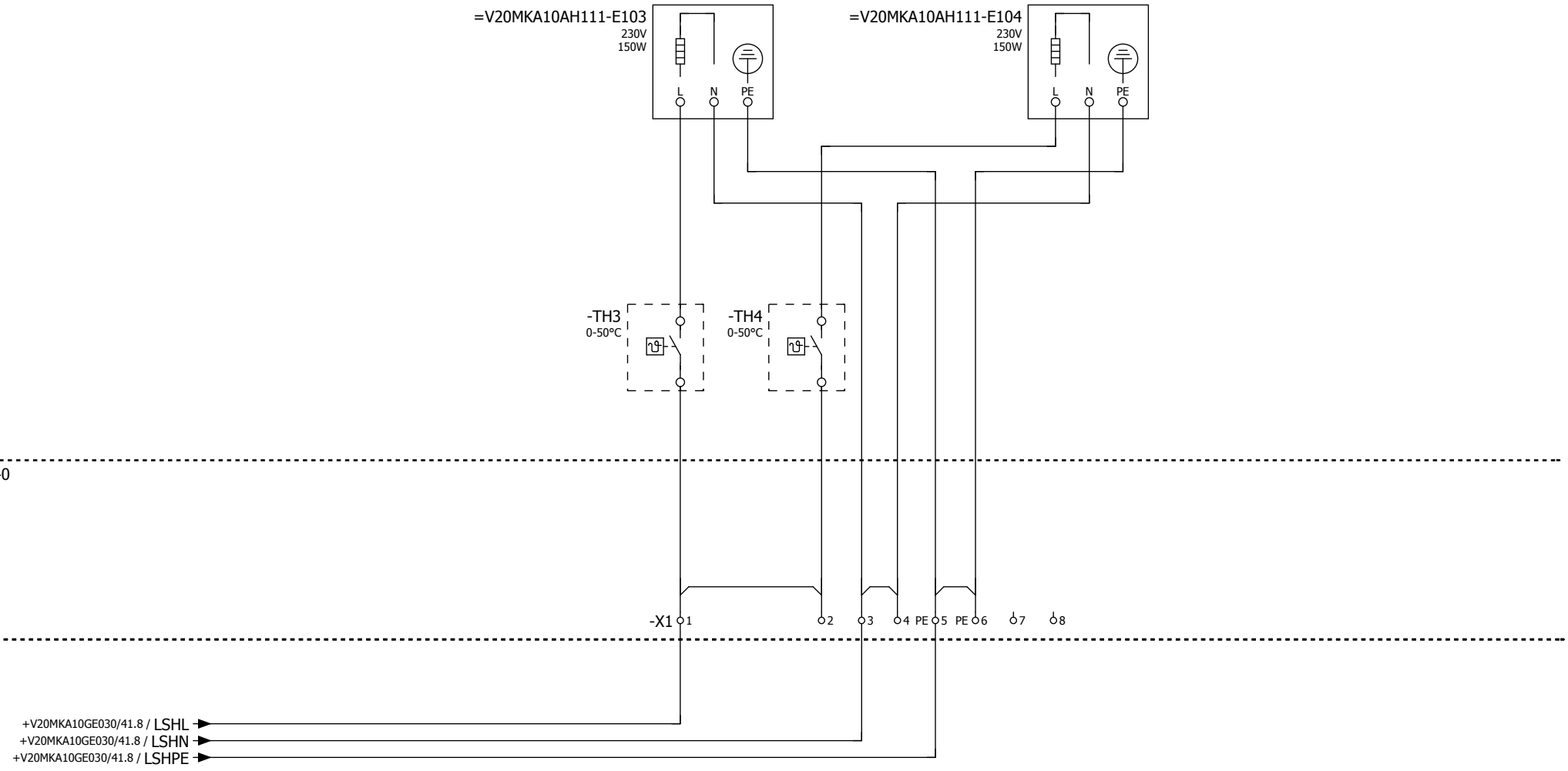
SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GE010-X10	=
			Drawn	Möbius				+ V20MKA10GE010
			Appr.	Rabe			EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by		Page 74 / Pg. 79

+V20MKA10GD010

MEDIUM VOLTAGE COMPARTMENT
LINE SIDE

LINE SIDE CUBICLE HEATER



b	16.04.2018	Rabe	Date	19.12.2017	VILNIUS Biomass		SIEMENS ENERGY SECTOR	LINE SIDE CUBICLE ANTICONDENSATION HEATER	=	
			Drawn	Möbius					+ V20MKA10GE040	
			Appr.	Rabe					EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by			Page	75
									Pg.	79

Terminal diagram

item designation	MEGAFLEX 500 type cable	MKA10AH005 no. cable	Lev.	Terminal strip =+V20MKA10GE040-X1 destination A	terminal	link	terminal number	destination B	terminal	type cable	Lev.	page / track
LINE SIDE CUBICLE HEATER	1			+V20MKA10GE030-X0	14		1	-TH3				75 4
=							2	-TH4				75 5
=	2			+V20MKA10GE030-X0	16		3	=V20MKA10AH111-E103	N			75 4
=							4	=V20MKA10AH111-E104	N			75 7
PE	GNYE			+V20MKA10GE030-X0	PE		5	=V20MKA10AH111-E103	PE			75 5
=							6	=V20MKA10AH111-E104	PE			75 7
LINE SIDE CUBICLE HEATER							7					
=							8					

SEPARATION PLATE
SEPARATION WITH TS-K

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	Klemmenplan : =+V20MKA10GE040-X1	=
			Drawn	Möbius				+ V20MKA10GE040
			Appr.	Rabe			EG000367	DPPPG-70152441
REVISION	Date	Name	NORM		Replacement for	Replaced by		Page 76 / Pg. 79

MANUFACTURER HÄWA
STANDARD CASING K08-15/15
DEGREE OF PROTECTION IP66
TAPPED HOLES

MOUNTING RAIL TS 35 (EN60715)

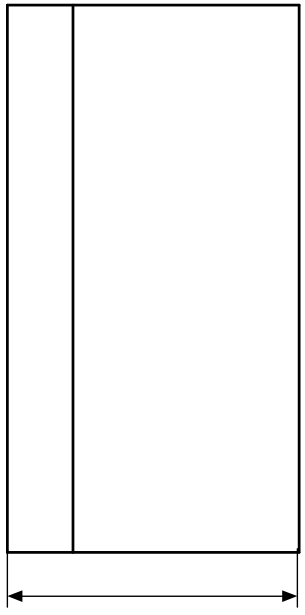
ALL DIMENSIONS IN MM

SCALE 1:2 (A3)

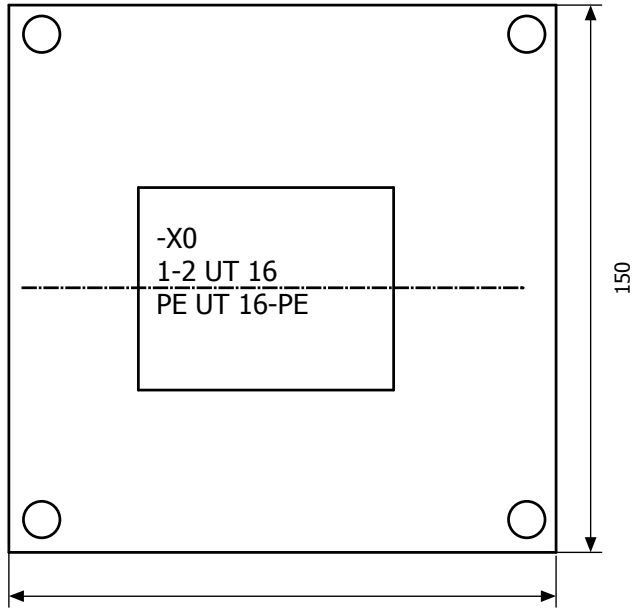
BOTTOM SIDE FOR CUSTOMER CONNECTION DRILLED AT SITE

COLOUR: RAL 7035

VIEW ON RIGHT HAND SIDE



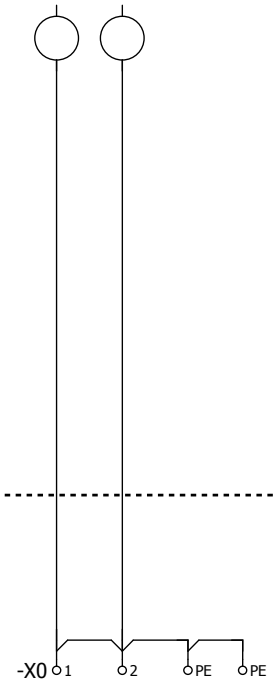
FRONT VIEW WITHOUT COVER



			Date	19.12.2017	VILNIUS Biomass		JUNCTION BOX ROTOR EARTHING MOUNTING PLATE	=	
			Drawn	Möbius				+ V20MKD10GA020	
			Appr.	Rabe				EG000367 DPPPG-70152441	Page 77
REVISION	Date	Name	NORM		Replacement for	Replaced by			Pg. 79

SIEMENS ENERGY SECTOR

ROTOR EARTHING BRUSHES
TE



+V20MKD10GA020

TE ... TURBINE END
EE ... EXCITER END

			Date	19.12.2017	VILNIUS Biomass	SIEMENS ENERGY SECTOR	JUNCTION BOX ROTOR EARTHING	=
			Drawn	Möbius				+ V20MKD10GA020
			Appr.	Rabe			EG000367	DPPPG-70152441 Page 78
REVISION	Date	Name	NORM		Replacement for	Replaced by		Pg. 79

Terminal diagram

Terminal strip
=+V20MKD10GA020-X0

item designation	type cable	destination A	terminal	link	terminal number	destination B	terminal	type cable	page	track
					1	-V1			78	2
					2	-V2			78	3
					PE					
					PE					

SEPARATION PLATE
SEPARATION WITH TS-K