

SIEMENS ELECTRIC MACHINES s.r.o.

VILNIUS Wte (Lithuania) NEUTRAL AND LINE CUBICLE

MAINTENANCE BOOK Document n° 17.121.SIE.200

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1.1 **MANUALS**

Medium Voltage switchboard LINE and/or NEUTRAL panels, protection degree up to IP55

“CE-LS” series



Instruction for the installation, start up and maintenance

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1 IMPORTANT SAFETY NOTES & WARNINGS

This manual aims to provide all the necessary information in order to correctly carry out the following operations:

- Handling
- Installation
- Operation
- Maintenance

Equipment operation depends on proper handling, installation, and maintenance. Neglecting fundamental requirements may lead to injury of personnel, failure of the equipment and property damage.

Safety as described in this instruction book involves two conditions:

- Personal injury.
- Product or property damage

1.1 Safety notations

Safety notations alert personnel to possible death, injury or property damage situations. The safety notations appear before the step in which the condition applies. The one safety notice and three hazard levels notations are:

DANGER

“Danger” indicates a hazardous situation that has a high probability of death, severe injury, and substantial property damage.

WARNING

“Warning” indicates a hazardous situation that has some probability of severe injury and substantial property damage.

CAUTION

“Caution” indicates a hazardous situation that may result in minor or moderate injury and/or property damage.

NOTE: “NOTICE” indicates a statement of company policy as it relates to the safety of personnel or protection of property.

Personnel installing, operating, or maintaining this equipment must have thorough knowledge of all applicable local, regional, industry, government, and OSHA safety procedures as well as commonly accepted safe working practices. Personnel working in or around this equipment must also exhibit common sense and good judgment regarding the potential hazards for themselves and other personnel in the area. These instructions are intended for use by fully qualified personnel and are not a substitute for adequate training, experience and supervision.

In the event of any queries or regarding operations not described here below, consult our office. CASAGRANDE ELETTROCOSTRUZIONI S.P.A. declines any responsibility in the event of failure to comply with these instructions or in the event of operations not indicated in the manual. For any clarification, further information or spares, contact our office at the following address, always citing the registration number of the device concerned.

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NOTE: Please refer to the relative instruction booklets for devices not produced by us mounted on this switchboard.

2 DESCRIPTION

The "CE-CSLIP55" series has been designed for use in power plants, in production plants and transformer stations, up to 17.5kV, for neutral grounding of alternators and transformers and for the line connection of alternators.

The structure design of this kind of cubicle, if an high protection degree is requested, can be particularly suitable for outdoor installation.

The cubicles are used for the protection of alternators against earth faults (neutral point treatment) and/or for supplying energy to the grid (line side cubicle).

For different machinery powers and network electrical lay out, many solutions are available for neutral earthing:

- grounding resistor with stainless steel sheet "grids" elements
- neutral grounding transformer with on the secondary side a ballast resistor
- stator earth fault detection by means of CT or VT
- Center star isolated from the earth

In the line side & neutral side cubicle CT's and VT's could be installed for measuring or protection.

They are normally built without internal separation between the components, also if some segregation can be realised on request.

See the relative drawings "General Arrangement" and "Electrical drawing" for more details.

2.1 Compliance with standards

The " CE-CSLIP55" series complies with the principal Italian and International standards and to the following in particular:

- CEI 17-6 Italian standard pamphlet 2058
- IEC 298 International standard
- IEC 62271-200 International standard
- IEC 694 International standard
- IEC 865 International standard
- DPR 547/55 italian law

For the compliance to others standards (ANSI, IEEE, etc.) contact our technical office.

The acceptance tests are performed in our test premises.

2.2 Electrical characteristics

Rated voltage	kV	Up to17.5
Insulation level: impulse withstand voltage test voltage 50 Hz 1 min.	kV kV	Up to 95 Up to 38
Rated current	A	500÷7000
Rated frequency	Hz	50/60
Short circuit withstand capacity	kA	Up to 50

2.3 Normal service conditions

Maximum temperature	°C(°F)	+45 (+113)
Minimum temperature	°C(°F)	-15 (+5)
Optimal range temperature	°C(°F)	+40 ÷ -5 (+104 ÷ +23)
Height	m(ft)	≤ 1000 (≤ 3280)
Maximum relative humidity	%	95

For other conditions please contact our office.

2.4 Construction characteristics

2.4.1 General properties

- 1 The switchboards of the type in subject can be built with a degree of protection up to IP55 for metal enclosure and IPXX for the internal part of the cubicle.

The structure is built with much attention to those particular requirements in order to guarantee an high protection against external environmental factors (rain, etc). See figure 1 and 2 for details and examples.

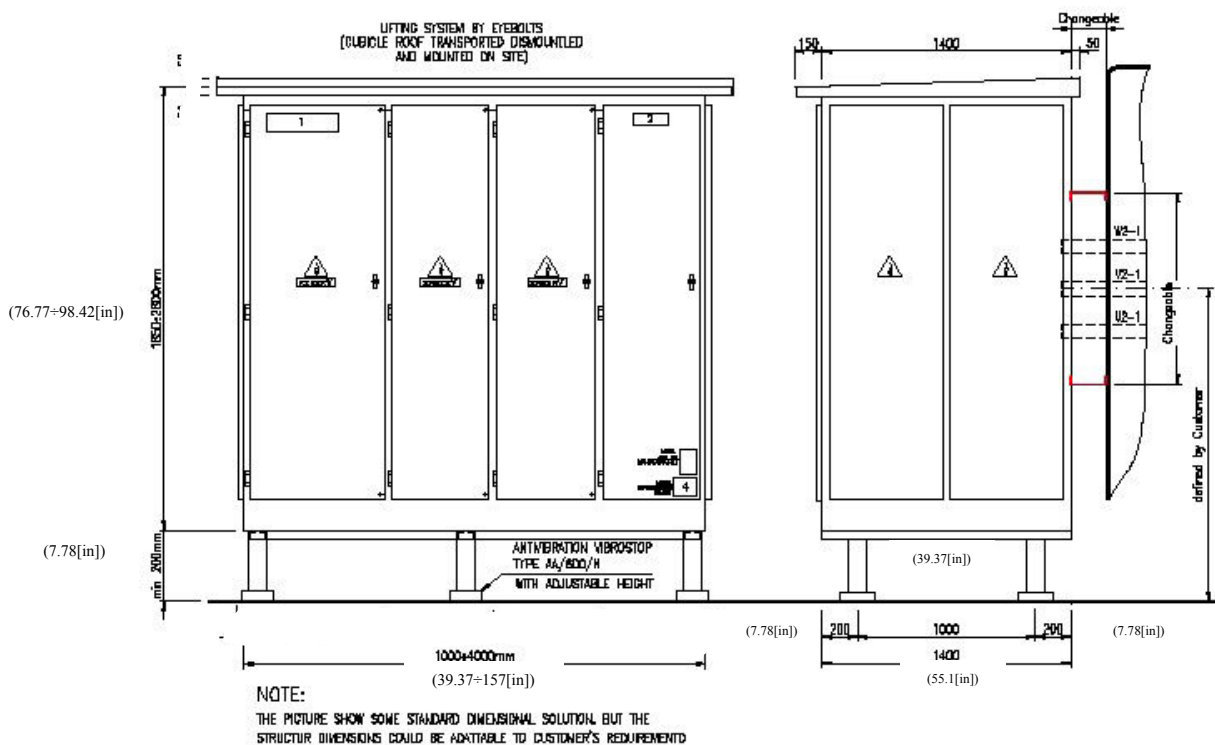


Figure 1: example with outdoor roof, base support, LV internal cubicle

- 2 The external surfaces are covered with removable panels, bolted to the structure with or without handles, made in such a way to prevent ingress of water.
- 3 The roof could be made, essentially, in two ways, according to the final position of the panel: if outdoor (see figure 1), it has a little slope, a larger projection all around and could be removable for transport to site; when it is for indoor use (see figure 2), it is plane and normally fixed.
- 4 The lay-out of this series is completely modular, thanks to a load bearing structure made with galvanized steel profile, which length could be increased with 25mm(1[in]) step to step, bolted together and covered with welded steel sheets; on request the structure could be entirely welded.

This allows to obtain a big range of dimensions, in order to be adapted to many type of generators and situations, the internal layout is studied for every cubicle in detail for the equipment to be mounted.

The figure 1 and 2 shown some of the constructive possibility, with internal/external Low Voltage cubicle, plane/slope roof, cable/bars Line exit, etc. Some of these particulars will be described later.

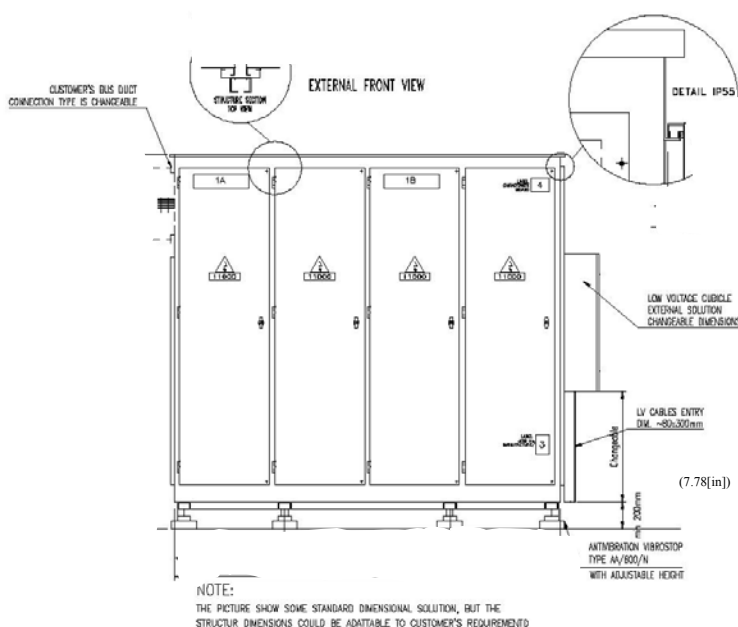


Figure 2: example with indoor roof, LV external cubicle

- 5 The individual structures are made of die-bended sheet steel elements of no less than 2 mm thickness. They are normally painted following Casagrande's standard for outdoor panels or, on request, following customer's specification; the standard procedure is:
 - a) Blasting of the surfaces
 - b) Cleaning (1 or 2 steps)
 - c) Coating (electrostatic painting) min 70µm(2.76x10⁻³[in])

On request, it is possible to paint the panels following customer's specification; see project documentation for details.

- 6 The metal nuts and bolts are galvanized and passivated with minimum film thickness of 12 microns.
- 7 Particular attention has been given to the objective of ensuring the greatest possible safety to the operators, thanks to the use of lockable doors or removable panels, built in the way already described.

2.4.2 Particulars

- 1 The terminal blocks of the internal components (CT, VT, NGR, Heaters) are accessible in total safety, even with the bars under voltage thanks to their position, in a metal box installed inside the cubicle or on the outside of the cubicle (see figure 3 and 4).



Figure 3: LV cubicle, some internal view (on the left with ballast resistors)



Figure 4: LV cubicle installed on the external side of the panel

Figure 5: LV cubicle for heaters terminals on the external side of the panel

On request, the terminals of the internal equipment could be mounted in more boxes, as shown in the figure 5 for the terminals of the heaters.

The LV cubicle can also be mounted inside the MV cubicle, separated from the MV equipment with an aluminium sheet that create a separated box; see figure 6).

Figure 6: LV cubicle internal to the panel structure



- 2 Eventual low voltage accessories (internal lighting fixtures, thermostat, terminal boards, etc.) are metallically partitioned from the medium voltage circuits and are accessible in maximum protection against the risk of fire.
- 3 The use of epoxy resin MV insulators and other insulating material of self extinguish type, give a big guarantee against fire dangers. The rubber coated cable is exclusively of anti-fire propagating type (CEI 20-22). On request, LV cable for VT connection could be of type for short circuit proof 1,8/3kV.
- 4 The voltage insulation level is guaranteed by using the required distance between the phases and the earth and by using insulation material (GPO3, which up to 10kV/mm) in places where the distance is not sufficient (see figure 7).



Figure 7: insulation plate installed in the cubicle

2.4.3 MV cubicle Entrance/Exit

- 1 The MV cubicle Entrance is normally realised with bus bars contained in a coupling flange built following customer's various standards. If required, the connection between generator terminals and cubicle bars is realised by flexible joints (see figure 8), in order to avoid vibrations during generator operation and to allow an easy connection on site; on the counter part connection holes of elliptical forms are provided (see figure 9).



Figure 8: flexible joints connection and coupling flange

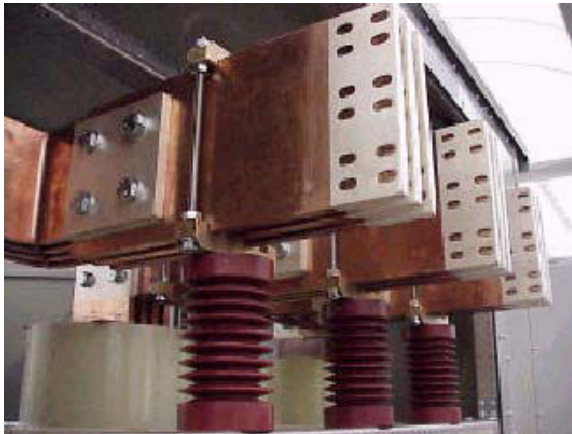


Figure 9: fixed connection with elliptical holes

MV Entrance can be realised also by cables; in this case they pass through an opening in the rear or bottom side of the cubicle, with holes and cable glands for cable entry, requested. The exit plate can be done in non magnetic material or insulating (see figure 10 as example).

In some application, the entering is done using a frame to weld on the generator and then bolted to the cubicle structure (see figure 11).

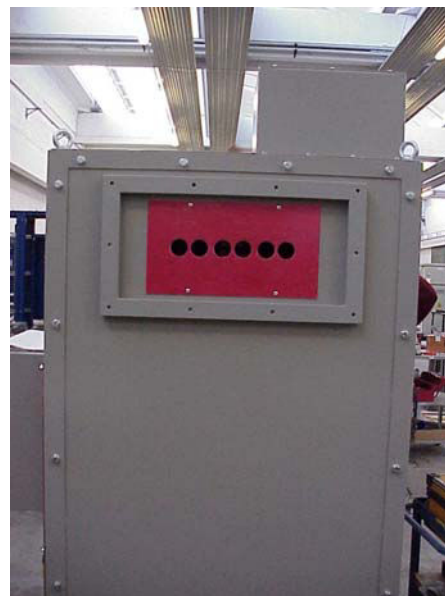
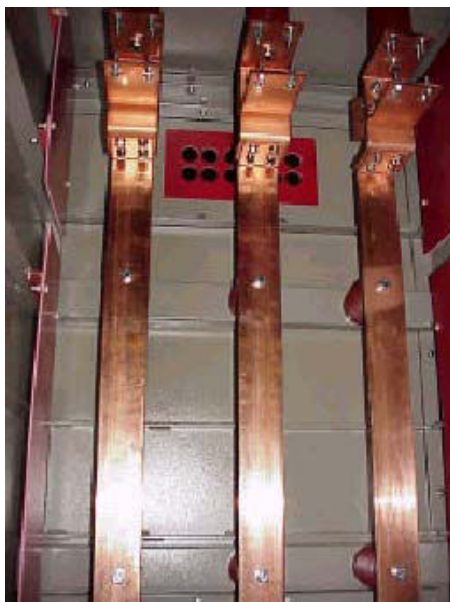


Figure 10: MV cubicle prepared for cable entry

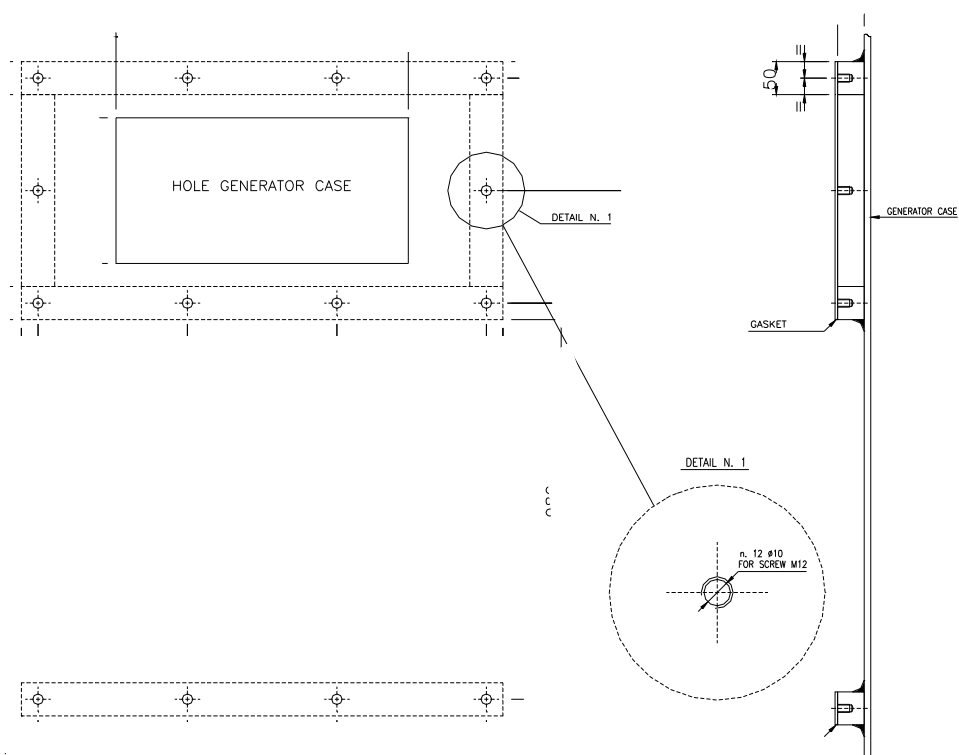


Figure 11: coupling flange detail

- 2 MV cubicle Exit: also the exit of LINE side cubicle, could be made from the bottom, top or the front side by cables (figure 12), or by bus duct (figure 13). In any case, are provided drilled gland plates to close the output in compliance with the selected cables.

Figure 12: Line side cubicles realised for cables exit



- 3 MV Neutral point: the earthing of the neutral of the generator, could be made in a lot of ways, depending of the customer's configuration; there could be a NGT with a NGR at the secondary, or with a MV NGR; see project document for details.

The number and type of CT's depend on the generator configuration, such as the decision to put line side compartment and neutral side compartment in the same cubicle or to split them (see in figure 14 for the two solutions for neutral treatment); see the relative drawings for details.

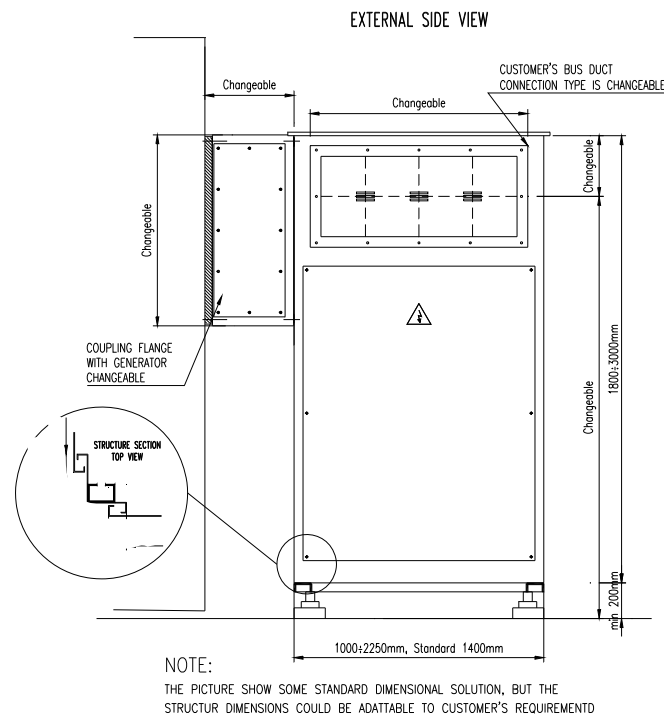


Figure 13: Line side cubicle realised for bus bar exit



Figure 14: Neutral point treatment solutions.

3 RECEIPT, TRANSPORTATION AND STORAGE

3.1 Receipt

On receipt check the conditions of the cubicle, check that the packing is not damaged and check if the name plate details correspond with those specified in the order confirmation.

Check that the LINE / NEUTRAL side cubicles are supplied with all the accessories specified in the order confirmation.

Contact our offices in the event of queries.

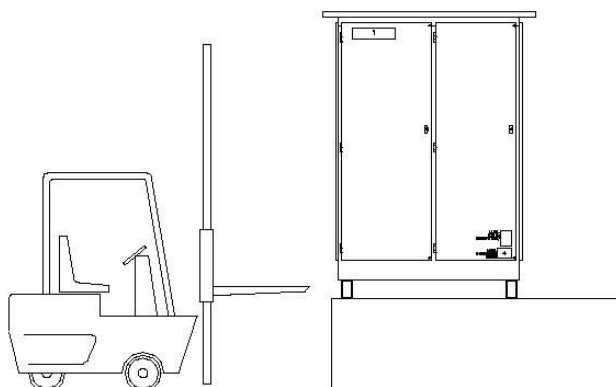
3.2 Lifting

This kind of cubicles could be lifted in 3 ways:

- by means of a lift truck (if it is mounted on wooden pallets – see figure 15)
- from above using suitable hoisting equipment, the lifting hooks of which are to be attached only to the eyebolts on the cubicle (figure 16); if foreseen remove the particular tools for lifting on site, replacing them with the bolts and plastic washer supplied with the panel.
- from bottom using suitable hoisting equipment, the hooks of which are to be attached only to the lateral lift ring on the switchboard.

A particular crane must be used, able to lift the panel through no°4 chain, one for each lift ring, that must be quite vertical from the bottom of the panel to the crane connection: see figure 15 and 16 for more detail. The lateral lift ring (figure 17), usually, arrive on site bolted in their position or are placed in a box inside the panel.

Figure 15: lifting by truck



SUGGESTION:

1) To lift the cubicles, in order to avoid to ruin the steel surface and roof of the cubicles, is better to use polyester lifting cord, instead of steel chain.

2) When the panels arrive on site closed in a wood case for marine transport, the case is normally foreseen for lift by the same type of crane just described; take the case from the bottom, positioning the chain in the predisposed places.

CAUTION

We advise against, making the compartments slide on rollers as it could cause damage to bases of the same

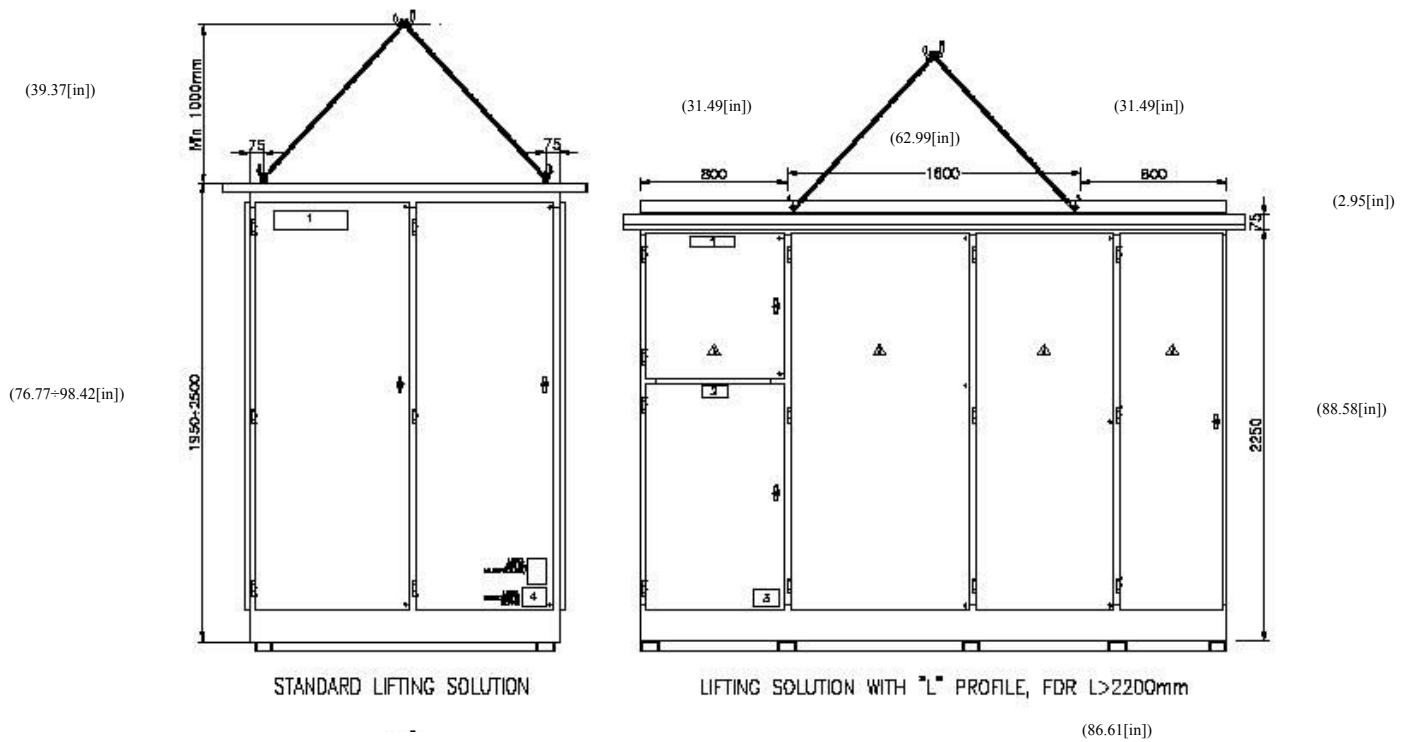
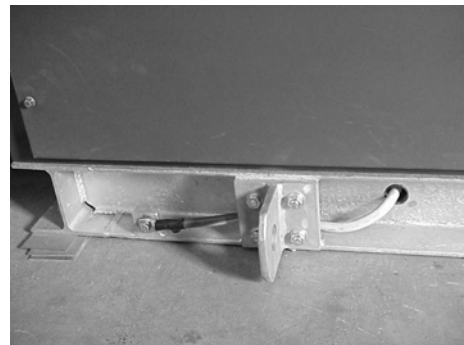
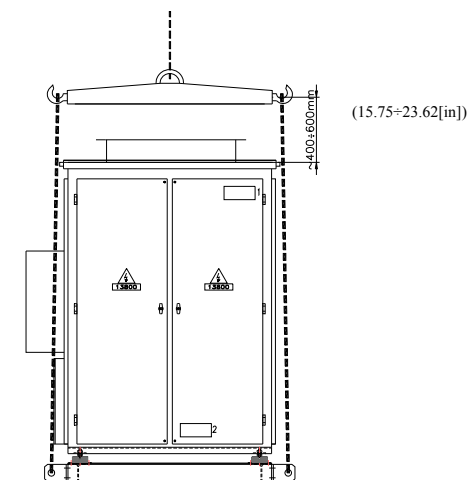


Figure 16: lifting using hoisting equipment

Figure 17: lifting by crane from bottom (EXAMPLE) and lifting tool detail



3.3 Warehouse storage

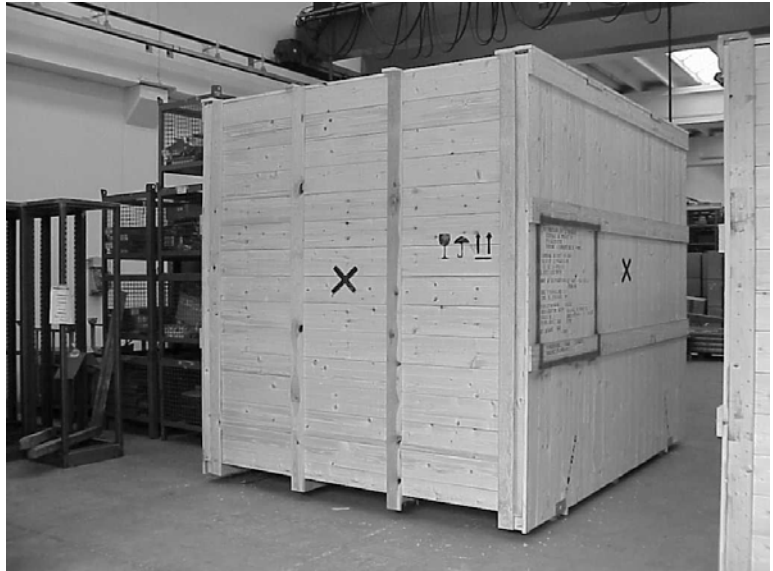
If they are not to be installed immediately, store the compartments in an area that is protected against the elements, in atmospheric conditions which are not excessively damp, and which are non-corrosive.

Particularly against condensation, if necessary, heat the room or connect the cubicle heaters.

It is advisable not to remove the plastic covering for the dispatch of loose compartments.

If required, the panel can be packed with marine packaging, to avoid environmental problems during storage and transportation.

The accessories, like bus duct, connection flange, basements etc. are packed separately in a smaller case.



4 INSTALLATION

4.1 Positioning

4.1.1 Laying

- The floor on which the board is to be positioned must be levelled to guarantee the best possible assembly. If the floor is not well levelled serious operational problems may occur.
- After the positioning of the board, it should be secured, and if necessary, fixed together with the adjacent cubicles.
- After the correct positioning, connect the panel to the generator/bus duct (IF PRESENT):
 1. remove lateral or front panels of the cubicle in order to permit internal operation
 2. put supplied gasket on the connection flange
 3. bolt the flange with generator/bus duct
 4. connect the bus bar to generator lead or bus duct using supplied bolts; normally the flexible joints are not supplied.
- The premises must guarantee adequate air circulation, it is also preferable that the room has windows and is not completely closed.
- It is necessary to make sure that the door openings are not obstructed.

IMPORTANT NOTE:

IN THE COUPLING POINT USE THE SUPPLIED GASKET AND/OR RAIN PREVENT SYSTEM: INSTALL IT VERY CAREFULLY IN ORDER TO GUARANTEE THE DECLARED PROTECTION DEGREE.

4.1.2 Foundations

This kind of cubicles are carefully constructed on metal base frame.

For the drilling of the floor slab for the fixture of the power cables and auxiliary cables, refer to the foundation drawing that is normally sent with the switchboard documentation.

The floor to which the board is to be fixed must have a plane maximum tolerance of 0,3%, both in a longitudinal and vertical direction.

There are two systems for panel fixing to the floor:

1. Using expansion anchor bolts for heavy loads.
2. Using chemical anchor bolts: drill the hole, insert the chemical glue and then insert and fix the threaded bar.

For both the cases, the anchors are usually supplied with the panel.

In the event of the use of expansion rods, it is necessary to align the rods so that they correspond to the foundation drawings, levelling them so as to obtain a plane tolerance of a maximum of 0,3% and then block them with rapid cement. The flooring is then to be completed in such a way that there is projection of 1-2 mm in relation to the floor plane.

In the event of fastening without base rods, the line side & neutral side cubicles, after the preparation of the floor for the expansion blocks, should be fixed starting from the center.

Sometimes, these cubicles are provided with a support base frame, with or without anti vibration feet, made of galvanized iron steel; prepare this foundation before to put on the panel and drill it on the base (see relative drawings for details).

NOTE: If the floor is not well levelled serious operational problems may occur.

4.2 Electrical connections

DANGER

Before making primary source connections, verify that the primary cables are de-energized and the equipment is properly grounded

4.2.1 Connection of the main circuits

For the connection of the bus bar it is necessary to check that the connection surfaces are lean and that you are applying the bolt driving torque in conformity with the regulations.

The contact surfaces must be carefully cleaned with a dry cloth and lubricated with a layer vaseline. Should the silver plated surfaces be blackened as the result of the presence of sulphur dioxide in the atmosphere, clean using alcohol or other similar solvent.

The above instructions are also valid for the external circuit connections.

Should the connection be made by cable, it is also necessary to check the MV cable shielded earthing in accordance with the switchboard composition wiring diagram.

The application of anomalous mechanical stress to the terminals is to be avoided.

It is also necessary to make sure that the connection operation has not changed the electrical distances prescribed by the IEC 71 regulations.

It is also advisable to make sure that there is no loss of isolation and control fluids.

Select the cable section according to the operating voltage and the estimated maximum short circuit voltage of the installation, bearing in mind the dimensions of attachment points supplied in the board.

The connection contact surfaces must be free of burs deformations caused by drilling or any knocks received.

No pressure must be applied to the connection points.

4.2.2 Auxiliary and secondary circuits connection

The connection removed by the manufacturer for transportation reasons must be reintegrated in accordance with the numbering and diagrams.

Connections with the external circuits must be undertaken carefully and in accordance with the relative installation diagrams.

In particular the secondary current transformer circuits (CT) shall not show any open circuit condition, while the secondary voltage transformer circuits (VT) shall not be short circuited, the cable polarity is however to be maintained.

4.2.3 Grounding connections

The grounding bars separated for transportation purposes are to be reconnected and the main grounding bar must be connected to the grounding system of the installation.

The device supports must be grounded in the area indicated by the manufacturer making sure all the joints are well tightened and that electric continuity exists.

Grounding connection must also be assured for the devices in which this connection is required for the function (i.e. CT, VT, resistors, disconnecting switch, etc.).

The same attention must be given in the resumption and setting up of grounding connections of the auxiliary circuits.

The switch board includes, in the internal side, a copper Earthing bus bar (dimensioned for the thermal stresses due to the short circuit current), for panel ground connection; on request is possible the installation of specific grounding pad (normally 150x100x10mm(5.9x3.9x0.4[in])), for ground connection of cables shields.

The earthing bars can be:

- rigidly connected to the panel basement and on the left or right side of the basement, are foreseen two grounding pads normally 50x50x20mm(1.9x1.9x0.7[in]) with a M12 hole, for the grounding connection of the panel itself (see photo here on right);

OR

- exit directly from the cubicle in order to give a contact point to the customer earth system (see figure 18 for example).

OR

- be only internal, with holes and bolts for fixing earth cables arriving from the site.



Figure 18: example grounding pad

Structure: all structural members are solidly fastened together by special screws ensuring a good contact between the connected parts.

Doors: are connected to the frame by a 25mm² (0.04[in²]) cross section copper braid.

Components: all main components such as CT, VT, etc., are positively earthed (see figure 19)

CAUTION

Ground the panel by means of conductors of dimensions in accordance with the current regulations and using the ground circuit of the cubicle provided.



Figure 19: example equipment grounding

5 STARTING UP

5.1 Preliminary operations

All precautions should be taken to guarantee the safety of the personnel and the equipment, and in accordance with the warning plates.

Before putting into operation it is necessary to check everything that has been mounted on the premises, for example:

- check the correct tightening of the nuts and bolts
- check the correct connection of the medium and low voltage cables
- check the correct tightening of the screws of the terminal boards
- for each component (switches, fuses, protection relays, etc.) carry out the operations as indicated in the relative instruction booklets
- inspect any sectioning contacts.

5.1.1 Mechanical functioning verification

Before putting into operation, it is advisable to repeat the checks indicated in the present instructions:

- Check the mechanical function and the interlocks.
- Check the mechanical function of the isolator switch and the relative interlocks (if required).

5.1.2 Electrical functioning verification

DANGER

Do not exceed the listed voltages for the voltage class of the equipment under test. Disconnect the shunt connected coils such as potential transformers. Do not test sensors or relays with high voltage. Disconnect all sensors and relays before applying voltage.

Insulation resistance test:

Perform measuring by means of Megger, between phases and to earth on both main and auxiliary circuits to check the insulation resistance (Megger voltage: 2500V for main circuits and 500V for secondary circuits).

The minimum values of resistance to earth may be the following: a few tens of MOhm for the main circuits and a few MOhm for the secondary circuits.

Power frequency insulation test:

The repetition of this test is neither necessary nor recommended except in case of modifications on the circuits. Should it be repeated than a voltage which is not exceeding 75% of the test voltage of the new equipment shall be used, excluding the components that have allowable test levels lower than those of the cubicle.

Operation test:

Perform tests on the secondary circuits to check the correct remote controlled operation of the operating mechanism, indications, protections and of all other circuits connected to components outside the cubicle.

Check the correct operation of the ventilators and heaters.

5.2 Starting up operations

After having completed the mechanical and electrical tests described in the previous paragraphs make sure that all the protections removed during the installation of the switchboard are replaced.

WARNING

Before taking in operation of the cubicle, remember to place all the duplicates of the keys necessary to operate the key interlocks in a place that is inaccessible to the operational personnel.

6 MAINTENANCE

DANGER

There are hazards of electrical shocks and/or burns whenever working in or around electrical equipment. Turn off power ahead of the switchgear before performing any inspection or maintenance operations. Check incoming line terminals to verify that the equipment is de-energized and grounded. Check out-going terminals to ensure that no back-feed condition exists.

6.1 Inspection frequency

In order to avoid the risk of decline to dangerous levels of insulation, it is advisable to make a first inspection after about 6 months from the starting up.

In order to establish the inspection frequency, it is necessary to take into consideration not only the cubicle, but also the settings relating to the individual components.

6.2 Maintenance operations

Hereafter follows a list of the principal maintenance operations to be undertaken on the switchboard and on the components:

- remove any dust and dirt, preferably using a vacuum cleaner;
- remove dust from the isolating parts using clean and dry cloths;
- carry out the maintenance operations on each component, in conditions of complete safety, as indicated in the relative instructions;
- visually inspect the isolating single locks and the bar joints;
- remove dust from the air inlet/outlet vents with a dry brush;
- inspect the sectioning contacts, removing any traces of blackening on the silver polished surfaces for currents of 1,000 A, using alcohol and once again protect the surfaces with a thin layer of grease for electrical contacts (type: MOLIDAL EL5);
- check the function of the locks and interlocks;
- check the function of the space heaters and the calibration of the thermostats, ensuring that these have been in operation for at least four hours;
- check the insulation resistance.

6.3 Maintenance recording

The results of the verifications and of any measure shall be nicely recorded on a register that can be use to define the frequency of the inspections. The same register could be important to attract the attention on some part of the plant asking for a more precise vigilance.

The measures taken with the Megger can offer a precise situation about an eventual reduction of insulation.

6.4 Resumption of operations

After the maintenance operations replace all the mechanical and electrical protective elements and carry out all the operations necessary to *start up* the cubicle.

6.5 End of life of product

This products are manufactured to meet or exceed the standards of compliance for quality and environmental management systems in accordance with ISO 9001 and ISO 14001. All of these items can be supplied with a certificate of quality.

Methods of disposal

Disposal can be carried out in a manner of ways depending upon material of product. Below is the recommended method of disposal for various raw materials.

The duty of Casagrande Elettrocostruzioni is to facilitate subsequent recycling or disposal at the end of product life. During disposal of the product, it is always necessary to act in accordance with local legal requirements in force.

Raw material	Recommended method of disposal
Metal material (Fe, Cu, Al, Ag, Zn, W, ect.)	Separation and recycling
Thermoplasts	Recycling or disposal
Epoxy resin	Separation of metal and disposal of remains
Rubber	Disposal
Oil (transformer oil)	Draining and recycling or proper disposal
SF6 gas	Discharging from equipment and recycling or proper disposal
Packing material	Recycling or disposal

7 INTERNAL FAULT: CAUSES, PREVENTION and SAFETY

Failure within the enclosure of metal-enclosed cubicle or switchgear as those object of this manual, due either to a defect or an exceptional service condition or bad operation, may initiate an internal arc.

The cubicle supplied is built following the prescription of the main electrical applicable standard (see chapter "Compliance with standards"), and include many design and constructive detail to avoid more possible this event.

So, there is little probability of such an event occurring, but it cannot be completely disregarded, especially after many years of functioning, often with little preventive maintenance done on it.

Below are listed the most important constructive points considered together with some location, arc fault causes and counter measures to use on site and during switchboard life in order to decrease the probability of internal arcs.

7.1 Measures taken in cubicle construction

The most important are the following.

- The structure of the cubicle is built with such material and thickness to reduce more possible at the mechanical and thermal stress during an overpressure explosion due to an internal arc fault;
- The cubicle is built considering adequate dimensions and internal air volume;
- High protection degree in order to avoid moisture and dust entering in the cubicle;
- The distance between phases and phases to earth are normally bigger than foreseen by the applicable standard;
- Where applicable, are foreseen interlocks between switches and mechanical components;
- Choosing of qualified and high efficiency components and equipments;
- Pressure relief device are installed on the top or the rear side of the panels (see drawings for more details), in order to allow the exit of internal over pressure due to an arc with relative gaseous and vaporous hot substance.
- Anti ferro resonance resistor realised on the Voltage transformer circuit in order to avoid this electrical influences.

7.2 Locations, fault causes and example of measures decreasing the probability of internal fault or reducing the risk

See table in next page, derived from IEC 62271-200, in which are shown the safety measures to take care during installation, start up and maintenance of the cubicle.

In conclusion, important for people safety and cubicle good life and efficiency are the following points:

- Correct installation on site before start-up (see relative chapter in the manual);
- Regular and well done maintenance (see relative chapter in the manual);
- not stay near the pressure relief device during cubicle functioning in front;
- access and operating on the cubicle only to skilled people.

Locations where internal faults are more likely to occur	Possibles causes of internal faults	Example of measures
Cable boxes Connection points	<i>Faulty installation</i>	Avoid of crossed cable connections. Checking of workmanship on site.
	<i>Failure of solid or liquid insulation</i>	Checking of workmanship and/or dielectric test on site (see manual in chapter "STARTING UP" point "Electrical functioning verification"). Regular checking of liquid levels (if applicable)
Disconnectors; Switches; Earthing switches	<i>Bad operation</i>	Instructions to personnel about the In-service / Out-service operation sequence.
Circuit breakers	<i>Insufficient maintenance</i>	Regular programmed maintenance. Instructions to personnel. See manual in chapter "MAINTENANCE"
Bolted connections and contacts	<i>Corrosion</i>	Use of corrosion inhibiting coating and/or grease. Check of connections during normal maintenance (see manual in chapter "MAINTENANCE")
	<i>Faulty assembly</i>	Checking of workmanship during installation on site, use skilled people.
AI locations	<i>Error by personnel</i>	Limitation of access and operation on the cubicle to skilled people. Use and respect of the locks and interlocks foreseen. Instruction to personnel. Check internally the cubicle before energies, attention to don't forget tools or what else inside.
	<i>Ageing under electric stress</i>	Regular programmed inspection of the equipments status.
	<i>Pollution, moisture, dust inlet, vermin, etc.</i>	Measures to ensure that the specified service conditions are achieved. If the cubicle is not installed immediately, store them in an area that is protected against the elements, in atmospheric conditions which are not excessively damp, which are non corrosive and without chemical agents. Particularly against condensation, if necessary, heat the room or feed the heaters installed.

8 SPECIAL TOOLS (if present)

On request, the cubicle is supplied with some tools to use for commissioning and/or maintenance or only for access to the cubicle. See the list below which show the most common; for more detail refer to the specific project documentation.

8.1 Short Circuit Bar

This tool is normally use during commissioning or start – up in order to realise the Short Circuit Test.

In fact, to perform this test (carried out to plot the short circuit saturation curve – excitation current versus line current or to function test some transformer and generator main and back up protection functions), a short circuit must be laid between the generator stator and the generator circuit breaker / step-up transformer.

In order to realise easily this Short Circuit point, we supply bars in copper of correct section to install directly on line exit connection points.

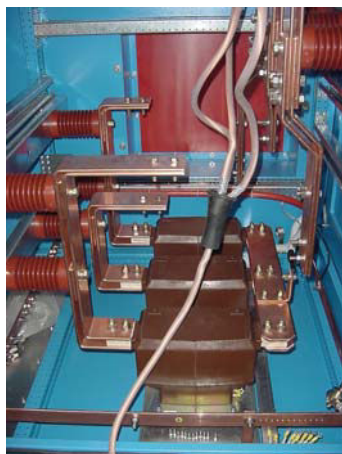
The bar will be able to withstand the short circuit current for 1 sec and the rated current for ~1/2÷1 hour.

IMPORTANT: REMOVE THE BARS AFTER TEST AND BEFORE CONNECT THE LINE EXIT CABLES / BUS DUCT.



8.2 Flexible earthing device

This tool is supplied on request, and must be used before entering in the cubicle to ensure earth of the system for people safety.



The tool is composed by ball stud installed on phase and earth bar + flexible cable and handle stick to fix the earth cable on the balls.

See product instruction for more detail.

IMPORTANT: THE SYSTEM SHOULD BE ALREADY DE-ENERGISED AND EARTHED BEFORE HANDLING THIS TOOL: IT IS AN ADDITIONAL MEASURE TO PREVENT PEOPLE SAFETY.

ONLY SKILLED AND INFORMED PEOPLE SHOULD DO THIS OPERATION.

FOR MORE, REFER TO SAFETY RULES PRESENT IN THE PLANT / SITE.



9 EXAMPLE OF COSTRUCTIVE SOLUTIONS

Figure 20: front (on the left) and rear (on the right) view





Figure 21: example of internal arrangements

10 ANNEX

Information schedule SCH019 rev.03 del 15/01/2014

BOLTS AND NUTS TIGHTENING

With reference to the position 5.1 of the Technical Instruction IT P 10, this schedule give an indication to the operators about the recommended bolts and nuts tightening values during the switchboards assembly.

1) COLD GALVANISED STEEL BOLTS TIGHTENING – BASE TABLE

The values showns in the Table 1 (Base Table) are valid for Cold Galvanised steel bolts and nuts, depending on the resistance category, for the coupling of steel components.

Table 1

Nominal Bolt section	Tightening torque MA (Nm) 1 Kgm = 9.81 Nm Standard UNI EN 20898/1					
	NORMALE			ALTA RESISTENZA		
	4.6	5.6	6.9	8.8	10.9	12.9
M4	0,9	1,3	2,4	2,9	4,1	5
M5	1,9	2,5	4,9	5,8	8,2	9,8
M6	3,2	4,3	8,4	10	14,2	16,8
M8	8	10,7	20,3	24,4	34,6	40,7
M10	15,8	21,4	40,7	48,9	68,2	82,5
M12	27,5	36,6	71,3	84,6	119,2	142,7
M14	43,8	59,1	113,1	134,5	188,5	224,2
M16	67,2	89,7	173,2	203,8	290,5	346,5
M18	92,7	123,3	239,5	280,3	397,5	479,1
M20	130,4	174,3	336,3	397,5	560,6	672,7

2) COPPER BARS WITH COLD GALVANISED STEEL BOLTS TIGHTENING

The tightening torque for the fixing and connection of Copper bars, with Cold galvanised steel bolts, must be reduced of 15% with reference to the Resistance category 8,8: see Table 2.

Table 2

Nominal Bolt section	Tightening torque MA (Nm) 1 Kgm = 9.81 Nm
M4	2,4
M5	4,9
M6	8,4
M8	20,6
M10	41,3
M12	71,4
M14	113,5
M16	172,0
M18	236,6
M20	335,5

3) COPPER BARS WITH STAINLESS STEEL BOLTS TIGHTENING

The tightening torque for the fixing and connection of Copper bars, with Stainless steel bolts, must be reduced of 25% with reference to the Table 1 Resistance category 8,8; the same values must be applied for the threaded connection elements used in the cubicle assembling and for the MV support insulator fixing: see Table 3.

Table 3

Nominal Bolt section	Tightening torque MA (Nm) 1 Kgm = 9.81 Nm
M4	2,1
M5	4,3
M6	7,4
M8	18,1
M10	36,2
M12	62,6
M14	99,5
M16	150,8
M18	207,4
M20	294,2

4) ALUMINIUM BARS WITH STAINLESS STEEL BOLTS TIGHTENING

The tightening torque for the fixing and connection of Aluminium bars, with Stainless steel bolts, must be reduced of 45% with reference to the Table 1 Resistance category 8,8: see Table 4.

Furthermore, for this last kind of bars, these value must be considered together with plate washer of big diameter (type UNI 6593), or with plastic washer (type DIN 2093), which allow a more uniform distribution of the connection pressure; the bolts are self locked type.

Table 4

Nominal Bolt section	Tightening torque MA (Nm) 1 Kgm = 9.81 Nm
M4	1,6
M5	3,1
M6	5,4
M8	13,2
M10	26,4
M12	45,7
M14	72,6
M16	110,1
M18	151,4
M20	214,7

5) ALUMINIUM BARS WITH COLD GALVANISED STEEL BOLTS TIGHTENING

The tightening torque for the fixing and connection of Aluminium bars, with Cold galvanised steel bolts 8.8, must be reduced of 35% with reference to the Table 1 Resistance category 8,8: see Table 5.

Furthermore, for this last kind of bars, these value must be considered together with plate washer of big diameter (type UNI 6593), or with plastic washer (type DIN 2093), which allow a more uniform distribution of the connection pressure.

Table 5

Nominal Bolt section	Tightening torque MA (Nm) 1 Kgm = 9.81 Nm
M6	6,5
M8	15,9
M10	31,8
M12	55
M14	87,4
M16	132,5
M18	182,2
M20	258,4

6) COPPER BARS WITH STAINLESS STEEL BOLTS AND KALEI TYPE NUTS TIGHTENING

The tightening torque for the fixing and connection of Copper bars, with stainless steel bolts and KALEI type nuts: see Table 6.

Table 6

Nominal Bolt section	Tightening torque MA (Nm) 1 Kgm = 9.81 Nm
M8	19,1
M10	21,8
M12	55,3

7) STAINLESS STEEL BOLTS AND COPPER BLOCKS TIGHTENING

The tightening torque for the fixing and connection of stainless steel bolts and copper blocks based on MORSA – eni drawing: see Table 7.

Table 7

Nominal Bolt section	Tightening torque MA (Nm) 1 Kgm = 9.81 Nm
M8	20,3

Tightening torque tolerance $\pm 10\%$

(Table are derived from the technical characteristic of the bolts and nuts used, considering the attrition coefficient of the material coupled)

15/01/2014

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Vidutinės įtampos skirstomojo skydo LINIJOS ir (arba) NEUTRALIOS plokštės, apsaugos laipsnis iki IP55

„CE-LT“ SERIJA



Montavimo, parengimo eksploatuoti ir priežiūros instrukcija

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1	2016-04-05	Bendras atnaujinimas	Brunelli M.	Casagrande C.	Casagrande R.
0	2014-05-09	Bendras atnaujinimas	Brunelli M.	Casagrande C.	Casagrande R.
Perž.	Data	Aprašymas	Išleido	Patikrino	Patvirtino

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puslapis

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1 SVARBIOS SAUGOS PASTABOS IR ĮSPĖJIMAI

Šiuo vadovu siekiama pateikti visą reikalingą informaciją, kad būtų galima atlikti tolesnes operacijas:

- Kilnojimas
- Montavimas
- Eksploatavimas
- Priežiūra

Įrangos veikimas priklauso nuo tinkamo kilnojimo, montavimo ir priežiūros.

Jei nebus laikomasi pagrindinių reikalavimų, gali susižaloti personalas, sutrikti įrangos veikimas ir gali būti padaryta žalos turtui.

Kaip aprašyta šiame instrukcijų vadove, sauga padeda išvengti dviejų dalykų:

- Asmens sužalojimo;
- Žalos produktui ar nuosavybei.

1.1 Saugos pranešimai

Saugos pranešimai įspėja personalą apie situacijas, kurios gali sukelti mirtį, sužalojimą arba žalą turtui.

Saugos pranešimai rodomi prieš veiksmą, kuriam taikoma šį sąlyga.

Vienas saugos pranešimas ir trys pavojaus lygio pranešimai yra šie:

PAVOJUS

„Pavojus“ nurodo pavojingą situaciją, kurioje kyla didelė mirties, rimto sužalojimo arba didelio turto sugadinimo tikimybė.

ĮSPĖJIMAS

„Įspėjimas“ nurodo pavojingą situaciją, kurioje kyla tam tikra mirties, rimto sužalojimo arba didelio turto sugadinimo tikimybė.

ATSARGIAI

„Atsargiai“ nurodo pavojingą situaciją, kurioje galima nežymiai arba vidutiniškai susižaloti ir (arba) sugadinti turtą.

PASTABA: „PASTABA“ nurodo bendrovės politikos pareiškimą, susijusį su personalo sauga arba turto apsauga.

Šią įrangą montuojantis, eksploatuojantis arba prižiūrintis personalas privalo gerai išmanyti visas taikomas vietines, regionines, pramonės, vyriausybės arba Darbų saugos ir sveikatos administracijos (DSSA) saugos procedūras, o taip pat bendrai priimtas saugaus darbo praktikas. Šioje įrangoje ir aplink ją dirbantis personalas privalo vadovautis bendru protu ir tinkamai atsižvelgti į galimus pavojus sau arba kitiems šioje teritorijoje esantiems darbuotojams. Šios instrukcijos yra skirtos naudoti tik visiškai kvalifikuotam personalui ir nepakeičia atitinkamo mokymo, patirties ir priežiūros.

Kilus bet kokiems klausimams arba abejonėms dėl toliau neaprašytų operacijų, kreipkitės į mūsų biurą. „CASAGRANDE ELETTROCoSTRUZIONI S.P.A“. neprisiima jokios atsakomybės, jei nebus laikomasi šių instrukcijų arba jei bus vykdomos vadove nenurodytos operacijos. Dėl bet kokio paaiškinimo, papildomos informacijos arba atsarginių dalių kreipkitės į mūsų biurą tolesniu adresu, visada nurodydami susijusio įrenginio registracijos numerį.

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PASTABA: Norėdami sužinoti apie šiame skirstomajame skyde sumontuotus ne mūsų pagamintus įrenginius, žr. atitinkamus instrukcijų vadovus.

2 APRAŠYMAS

„CE-CSLIP55“ serija buvo sukurta naudoti iki 17,5 kV jėgainėse, gamybos įrangoje ir transformatorinėse neutraliam generatorių ir transformatorių įžeminimui ir generatorių prijungimui prie linijos.

Kai reikia didelio apsaugos laipsnio, šios rūšies kabinos konstrukcijos dizainas gali būti ypač tinkamas montuoti lauke.

Kabinos yra naudojamos generatorių apsaugai nuo įžeminimo klaidų (neutralaus taško naudojimo) ir (arba) norint tiekti energiją į tinklą (kabina linijos pusėje).

Neutraliam įžeminimui siūloma daug sprendimų, skirtų įvairiai mechanizmų galiai ir tinklo elektros įrenginių išsidėstymui:

- įžeminimo varžas su nerūdijančio plieno plokščių tinkliniais elementais;
- neutralaus įžeminimo transformatorius su balastiniu varžu papildomoje pusėje;
- statoriaus įžeminimo klaidos aptikimas naudojant ST arba IT;
- centrinė žvaigždė izoliuota nuo žemės.

Linijos pusės ir neutralios pusės kabinos ST ir IT turėtų būti sumontuotos matavimui arba apsaugai.

Jos paprastai yra sukonstruotos be vidinių komponentų pertvarų, bet pageidaujant, gali būti įrengtos tam tikros pertvaros.

Norėdami daugiau informacijos, žr. atitinkamus brėžinius „Bendras išsidėstymas“ ir „Elektros schema“.

2.1 Standartų atitiktis

„CE-CSLIP55“ serija atitinka pagrindinius Italijos ir tarptautinius standartus, o ypač tolesnius:

- CEI 17-6 Italijos standarto brošiūra 2058
- IEC 298 tarptautinis standartas
- IEC 62271-200 tarptautinis standartas
- IEC 694 tarptautinis standartas
- IEC 865 tarptautinis standartas
- DPR 547/55 Italijos įstatymas

Dėl kitų standartų (ANSI, IEEE ir pan.) atitikties, kreipkitės į mūsų technikos skyrių.

Tinkamumo bandymai atliekami mūsų bandymų patalpose.

2.2 Elektros įrangos savybės

Vardinė tampa	kV	Iki 17,5
Izoliacijos lygis: impulsinė atlaikoma įtampa bandomoji įtampa 50 Hz 1 min.	kV kV	Iki 95 Iki 38
Vardinė srovė	A	500–7000
Vardinis dažnis	Hz	50/60
Trumpo sujungimo atlaikymo galia	kA	Iki 50

2.3 Įprastos darbinės sąlygos

Aukščiausia temperatūra	°C(°F)	+45 (+113)
Žemiausia temperatūra	°C(°F)	-15 (+5)
Optimalus temperatūros intervalas	°C(°F)	+40 ÷ -5 (+104 ÷ +23)
Aukštis	m(ft)	≤ 1000 (≤ 3280)
Didžiausia santykinė drėgmė	%	95

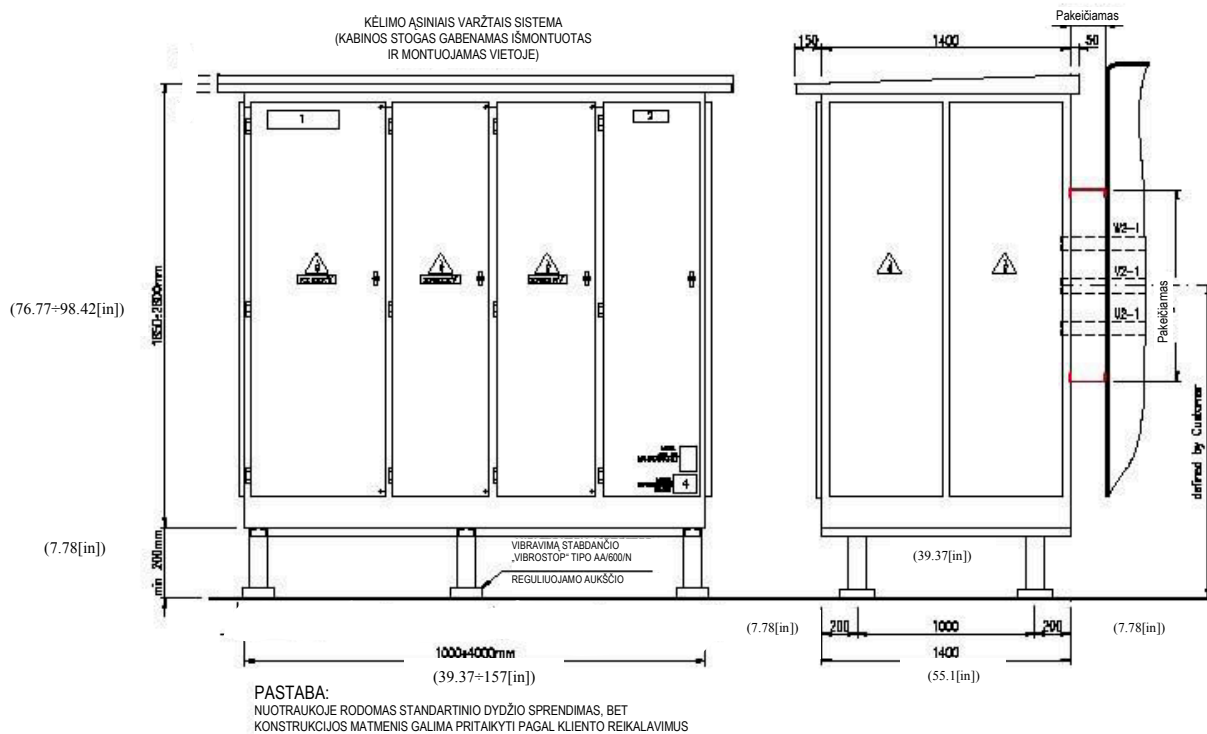
Dėl kitų sąlygų prašome kreiptis į mūsų biurą.

2.4 Konstrukcijos savybės

2.4.1 Bendrosios savybės

- Čia aprašomo tipo skirstomieji skydai galia būti konstruojami su apsaugos laipsniu iki IP55 metaliniam korpusui ir iki IPXX kabinos vidinėms dalims.

Konstrukcija pastatyta daug dėmesio atkreipiant į šiuos konkrečius reikalavimus, siekiant užtikrinti didelį apsaugos nuo išorinių aplinkos veiksnių (lietaus ir pan.) laipsnį. Duomenys ir pavyzdžiai pateikiami 1 ir 2 paveikslė.

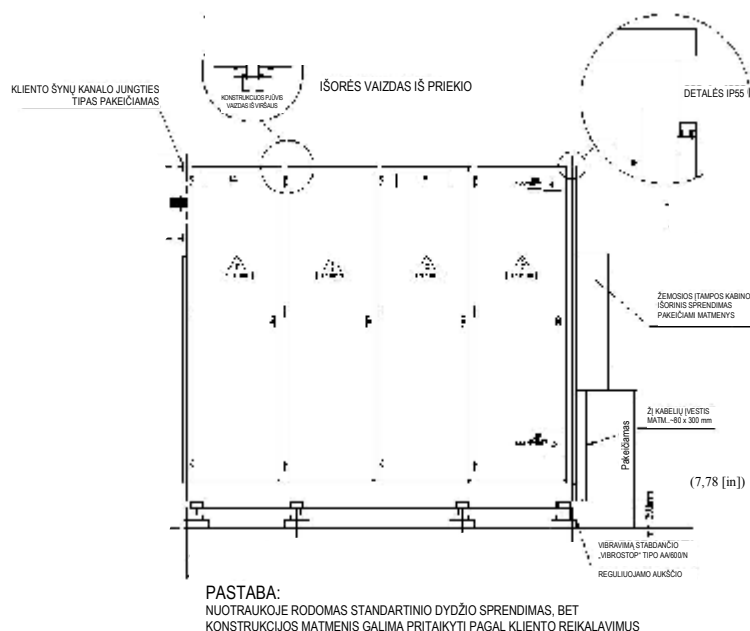


1 paveikslas: pavyzdys su lauko stogu, pagrindo atrama, žemosios įtampos vidaus kabina

- 2 Išoriniai paviršiai yra padengti nuimamomis prie konstrukcijos varžtais priveržtomis plokštėmis, su rankenomis arba be jų, pagamintomis taip, kad į vidų nepatektų vandens.
- 3 Stogas iš esmės gali būti įrengtas dviem būdais, atsižvelgiant į galutinę plokštės padėtį: jei bus naudojama lauke (žr. 1 paveikslą), stogas turi nedidelį nuolydį, didesnį išsikišimą per visą paviršių ir gali būti nuimamas norint nugabenti į vietą; kai kabina skirta naudoti viduje (žr. 2 paveikslą), stogas plokščias ir paprastai jau pritvirtintas.
- 4 Šios serijos išsidėstymas yra visiškai modulinis dėl krūvį laikančiosios konstrukcijos, kuri pagaminta iš cinkuoto plieno profiliuotio, kurio ilgį galima žingsnis po žingsnio padidinti 25 mm (1 [in]), kartu suveržiant arba padengiant virintomis plieno plokštėmis; pageidaujant, konstrukcija gali būti visiškai suvirinta.

Šitaip galima gauti įvairiausius dydžius, kad būtų galima juos pritaikyti skirtingų rūšių generatoriams ir situacijoms, kiekvienos kabinos vidinis išsidėstymas yra detalai ištirtas ir pritaikytas montuojamai įrangai.

1 ir 2 paveikslė pateikiamos kai kurios konstrukcijos galimybės su vidine/išorine žemosios įtampos kabina, plokščiu/nuolaidžiu stogu, kabelių/strypų linijos išvadu ir t. t. Kai kurios iš šių detalių bus aprašytos vėliau.



2 paveikslas: pavyzdys su vidiniu stogu, ži išorinė kabina

- 5 Atskiros konstrukcijos yra pagamintos iš ne mažiau nei 2 mm storio šlapiuojant sulenktu lakštinio plieno elementu. Jos paprastai yra nudažytos vadovaujantis „Casagrande“ išorinėms plokštėms taikomu standartu arba, pageidaujant, vadovaujantis kliento specifikacija: standartinė procedūra yra tokia:
 - a) Paviršių nupūtimas;
 - b) Valymas (1 arba 2 etapai);
 - c) Padengimas (elektrostatiniais dažais) min 70 μm ($2,76 \times 10^{-3}$ [in]).

Pageidaujant, plokštės galima nudažyti pagal kliento specifikaciją; išsamesnės informacijos žr. projekto dokumentacijoje.

- 6 Metalinės veržlės ir varžai yra cinkuoti ir dengti mažiausiai 12 mikronų storio plėvele.
- 7 Ypatingas dėmesys suteiktas siekiui užtikrinti kuo didesnę saugumą operatoriams, naudojant užrakinamas duris ar nuimamas plokštas, sukonstruotas pirmiau aprašytu būdu.

2.4.2 Detalės

- 1 Vidinių komponentų (ST, JT, NIV, šildytuvų) gnybtynus galima pasiekti visiškai saugiai net tada, kai šynomis teka įtampa, nes jie yra kabinoje sumontuotame arba kabinos išorėje esančiame metaliniame gaubte (žr. 3 ir 4 paveikslą).



3 paveikslas: ŽĮ kabina, dalies vaizdas iš vidaus (kairėje su balastiniais varžtais)



4 paveikslas: ŽĮ kabina, sumontuota plokštės išorinėje pusėje

5 paveikslas: ŽĮ kabina šildytuvų gnybtams išorinėje plokštės pusėje

Pageidaujant, vidinės įrangos gnybtai gali būti sumontuoti keliose dėžėse, kaip parodyta 5 paveiksle su šildytuvų gnybtais.

ŽĮ kabina taip pat gali būti sumontuota VĮ kabinos viduje, atskirta nuo VĮ įrangos aliuminine plokšte, kuri suformuoja atskirą dėžę (žr. 6 paveikslą).

6 paveikslas: ŽĮ kabinos vidus su plokščių konstrukcija

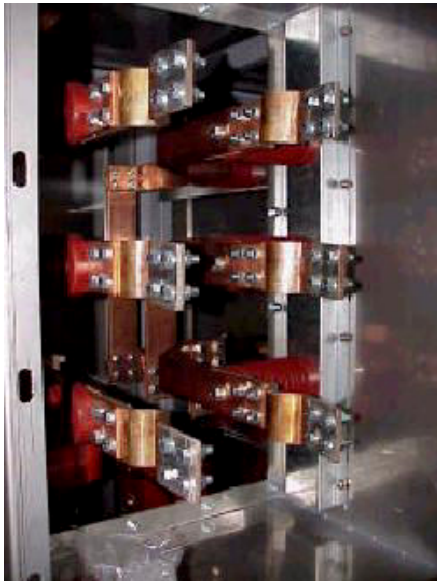
- 2 Bet kokie žemosios įtampos priedai (vidiniai apšvietimo įrenginiai, termostatai, gnybtų plokštės ir t. t.) yra metaline pertvara atskirtos nuo vidutinės įtampos kontūrų ir jas galima pasiekti su didžiausia apsauga nuo gaisro rizikos.
- 3 Epoksidinės dervos VĮ izoliatorių ir kitokios savaimės gesinančios izoliacinės medžiagos naudojimas suteikia didelę garantiją nuo gaisro pavojų. Guma dengtas kabelis yra išskirtinai tik gaisrą stabdančio tipo (CEI 20-22). Pageidaujant, ŽĮ kabelis IT jungčiai gali būti atsparus 1,8/3 kV trumpam jungimui.
- 4 Įtampos izoliacijos lygis garantuojamas naudojant reikiamą atstumą tarp fazių ir įžeminimo bei naudojant izoliacinę medžiagą (GPO3, kuri išlieka iki 10 kV/mm) tose vietose, kur atstumo nepakanka (žr. 7 paveikslą).



7 paveikslas: kabinoje sumontuota izoliacinė plokštė

2.4.3 VĮ kabinos įvadas/išvadas

- 1 VĮ kabinos įvadas paprastai įrengiamas sumontuojant magistralines šynas jungiamojo moveje, sukonstruotoje vadovaujantis įvairiais standartais. Jei reikia, jungtis tarp generatoriaus gnybtų ir kabinos magistralių yra įrengiama lanksčiomis jungtimis (žr. 8 paveikslą), kad būtų išvengta vibracijos veikiant generatoriui ir būtų galima lengvai prijungti vietoje; priešingos pusės yra įrengtos ovalo formos angos jungtimis (žr. 9 paveikslas).



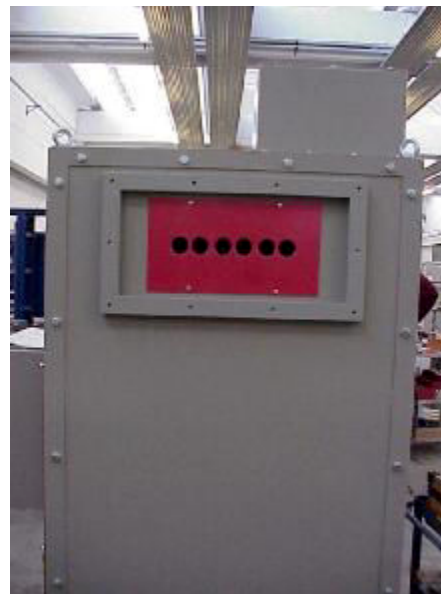
8 paveikslas: lanksčioji jungtis ir jungiamoji mova



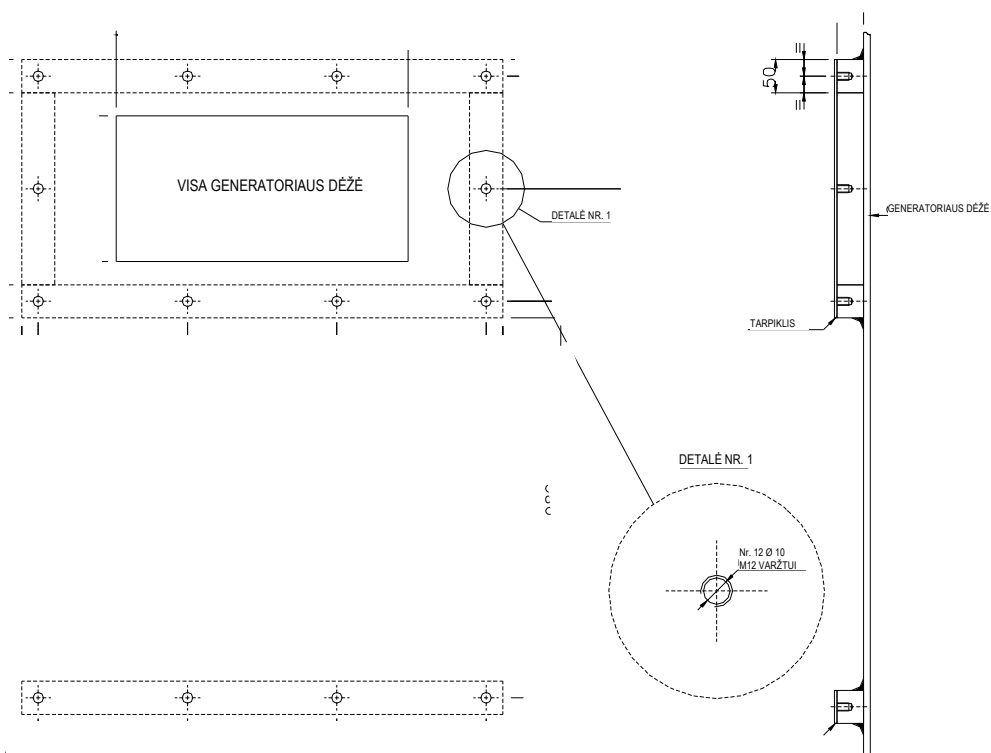
9 paveikslas: fiksuota jungtis su ovaliomis angomis

VĮ įvadas gali taip pat būti įrengtas naudojant kabelius; šiuo atveju, jie prakišami pro angą galinėje arba apatinėje kabinos pusėje naudojant kabelio pravedimui reikalingas angas bei riebokšlius. Išvado plokštė gali būti iš nemagnetinės medžiagos arba izoliuojanti (pavyzdys pateikiamas 10 paveiksle).

Kai kuriose naudojimo vietose, įvadas įrengiamas naudojant prie generatoriaus privirinamą rėmą, kuris vėliau priveržiamas prie kabinos konstrukcijos (žr. 11 paveikslą).



10 paveikslas: Kabelio įvadui įrengta VJ kabina



11 paveikslas: jungiamosios movos planas

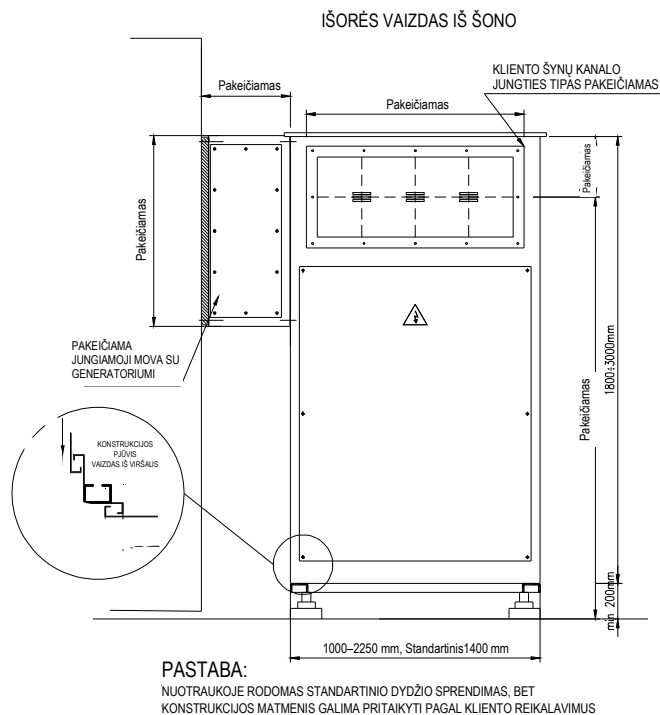
- 2 VĮ kabinos išvadas: taip pat ir LINIJOS pusės kabina gali būti įrengta apatinėje, viršutinėje arba priekinėje kabelių dalyje (12 paveikslas) arba naudojant šynų kanalą (13 paveikslas). Bet koku atveju, išvadui uždaryti tiekiamos išgręžtos riebokšlių plokštės, atitinkančios pasirinktus kabelius.

12 paveikslas: linijos pusės kabinos, skirtos kabelių išvadui



- 3 VĮ neutralus taškas: generatoriaus neutralus įžeminimas gali būti atliekamas daugybe būdų, kurie priklauso nuo kliento konfigūracijos; gali būti naudojamas NIT su papildomu NIV arba su VĮ NIV; duomenys pateikiami projekto dokumente.

ST skaičius ir tipas priklauso nuo generatoriaus konfigūracijos, pavyzdžiui, sprendimo įrengti linijos pusės skyrių ir neutralios pusės skyrių toje pačioje kabinoje arba juos padalyti (14 paveiksle pateikiami du neutralaus įrengimo sprendimai); duomenys pateikiami atitinkamuose brėžiniuose.



13 paveikslas: linijos pusės kabina, įrengta su šynų magistralės išvadu



14 paveikslas: neutralaus taško įrengimo sprendimai.

3 GAVIMAS, GABENIMAS IR LAIKYMAS

3.1 Gavimas

Gavę patikrinkite kabinos būklę, apžiūrėdami, ar pakuotė nepažeista ir patikrinkite, ar gamyklinės plokštelės duomenys atitinka užsakymo patvirtinime nurodytus duomenis.

Patikrinkite, ar LINIJOS / NEUTRALIOS pusės kabinos yra tiekiamos su visais užsakymo patvirtinime nurodytais priedais.

Kilus neaiškumų, kreipkitės į mūsų skyrius.

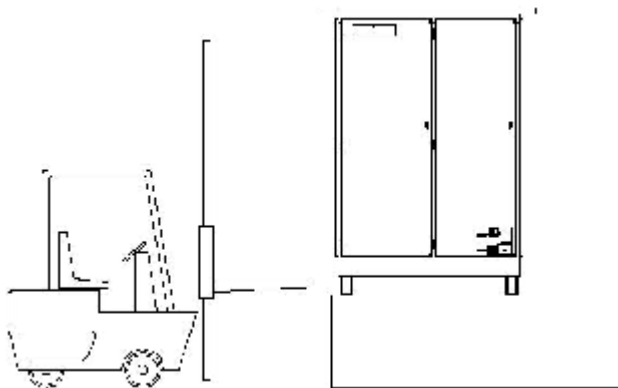
3.2 Kėlimas

Šios rūšies kabinas galima kelti 3 būdais:

- šakiniu krautuvu (jei sumontuoti ant medinių padėklų – žr. 15 paveikslą);
- iš viršaus, naudojant specialią kėlimo įrangą, kurios kėlimo kabliai turi būti pritvirtinti tik kilpiniais varžtais prie kabinos (16 paveikslas); jei numatyta, išimkite konkrečius kėlimo įrankius vietoje, pakeisdami jas kartu su plokšte tiekiamais varžtais ir plastikinėmis poveržlėmis;
- iš apačios, naudojant tinkamą kėlimo įrangą, kurios kabliai turi būti pritvirtinti tik prie skirstomojo skydo.

Būtina naudokite specialų kraną, kuris gali pakelti plokštę pro 4 grandines (po vieną kėlimo žiedui), kurios turi būti gana vertikalios nuo plokštės apačios iki kranų jungties: detalesnė informacija pateikiama 15 ir 16 paveikslė. Šoninis kėlimo žiedas (17 paveikslas) paprastai pristatomas priveržtas savo padėtyje arba dedamas į dėžę plokštės viduje.

15 paveikslas: kėlimas šakiniu krautuvu

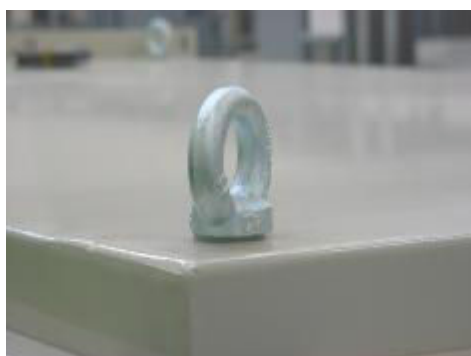
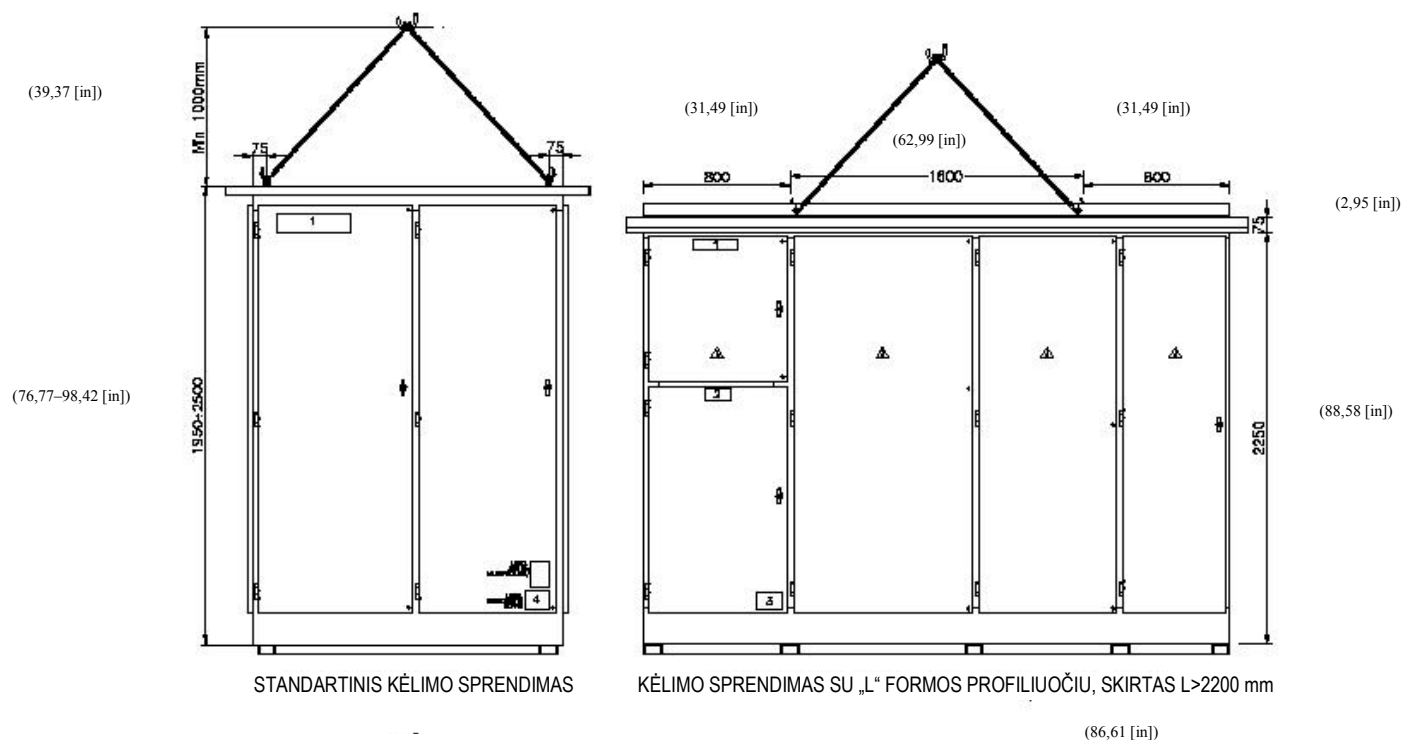


PASIŪLYMAS:

- 1) kad nesugadintumėte kabinų plieninio paviršiaus ir stogo, norint pakelti, geriau naudoti poliesterio kėlimo virvę vietoj plieninės grandinės;
- 2) kai plokštės pristatomos į vietą uždarytos medinėje dėžėje gabenimui jūra, dėžė paprastai yra numatyta kelti to paties tipo kranu, kaip ką tik aprašyta; ištraukite dėžę iš apačios, pastatydami grandines tam skirtose vietose.

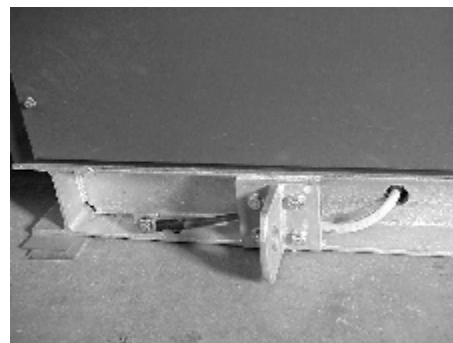
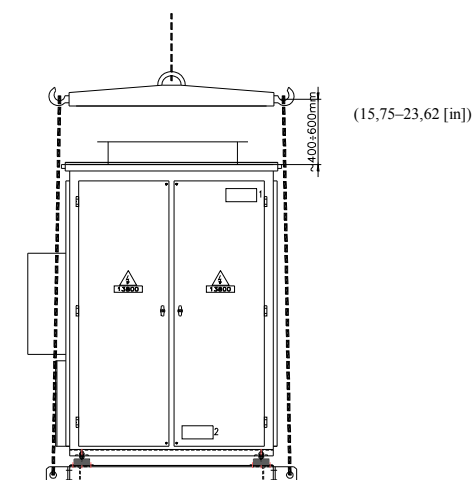
ATSARGIAI

Nerekomenduojame rengti skyrių nuolydžio ant velenų, nes galite sugadinti jo pagrindą



16 paveikslas: kėlimas naudojant kėlimo įrangą

17 paveikslas: kėlimas kranu iš apačios (PAVYZDYS) ir kėlimo įrankio planas



3.3 Sandėliavimas

Jeigu skyriai nėra montuojami iš karto, laikykite juos vietoje, kuri apsaugota nuo oro sąlygų, kurios nėra per daug drėgnos ir per daug korozinės.

Ypač apsaugai nuo kondensacijos, jei reikia, pašildykite patalpą arba prijunkite kabinos šildytuvus.

Rekomenduojama nenuimti plastikinio gaubto, skirto laisviems skyriams siųsti.

Ji reikia, plokštė gali būti supakuota į jūrinę pakuotę, kad būtų išvengta su aplinka susijusių problemų laikant ir gabenant.

Tokie priedai, kaip pavyzdžiui, šynų vamzdžiai, jungiamoji mova, pagrindai ir t. t. yra supakuoti atskirai mažesnėje dėžėje.



4 MONTAVIMAS

4.1 Pozicionavimas

4.1.1 Pastatymas

- Grindys, ant kuriuo plokštė turi būti pastatyta, turi būti lygios ir garantuoti kuo geriausią surinkimą. Jei grindys nėra gerai sulygiuotos, gali kilti didelių eksploataavimo problemų.
- Pastačius plokštę, ją reikia sutvirtinti ir, jei reikia, pritvirtinti prie šalia esančių kabinų.
- Tinkamai pastatę, prijunkite plokštę prie generatoriaus/šynų vamzdžio (JEI YRA):
 1. nuimkite šonines arba priekines kabinos plokštes, kad būtų galima dirbti viduje;
 2. uždėkite duotą tarpiklį ant jungiamosios movos;
 3. priveržkite jungę prie generatoriaus/šynos vamzdžio;
 4. prijunkite šynų magistralę prie generatoriaus laido arba šynų vamzdžio naudodami duotus varžtus; lanksčios jungtys paprastai netiekiamos.
- Patalpos turi užtikrinti tinkamą oro cirkuliaciją, taip pat rekomenduojama, kad patalpoje būtų langas ir jis nebūtų visiškai uždarytas.
- Reikia įsitikinti, kad durų angos nėra užblokuotos.

SVARBI PASTABA:

SUJUNGIMO VIETOJE NAUDOKITE DUOTĄ TARPIKLĮ IR (ARBA) APSAUGOS NUO LIETAUS SISTEMĄ: SUMONTUOKITE LABAI ATSARGIAI, KAD UŽTIKRINTUMĖTE DEKLARUOTĄ APSAUGOS LAIPSNĮ.

4.1.2 Pagrindai

Šios rūšies kabinos turi būti atsargiai montuojamos ant metalinio pagrindo rėmo.

Gręždami grindlentes prie maitinimo laidų ir pagalbinių laidų tvirtinimo detalėms, vadovaukitės pagrindo brėžiniu, kuris paprastai siunčiamas su skirstomojo skydo dokumentacija.

Grindys, prie kurių turi būti tvirtinamas skydas, turi būti plokščios su daugiausiai 0,3 % nuolydžiu išilgine ir vertikalia kryptimi.

Plokštei prie grindų tvirtinti naudojamos dvi sistemos:

1. Pleištinį inkarinių varžtų naudojimas sunkiems kroviniams;
2. Cheminių inkarinių varžtų naudojimas: išgręžkite angą, įpilkite cheminių klijų, o tada įstatykite ir pritvirtinkite srieginį strypą.

Abiem atvejais, inkariniai varžtai paprastai tiekiami kartu su plokšte.

Jei naudojami pleištiniai strypai, reikia suderinti strypus taip, kad jie atitiktų įrengimo brėžinius; reikia suniveliuoti juos taip, kad plokštumos paklaida būtų daugiausiai 0,3 %, o tada užblokuoti juos greitai stingstančiu cementu. Tada grindų dangą reikia užbaigti taip, kad palyginus su grindų plokštuma, liktų 1–2 mm išsikišimas.

Jei tvirtinama be pagrindo strypų, linijos pusės ir neutralios pusės kabinos po grindų paruošimo naudoti su pleištiniais blokais, turėtų būti tvirtinamos pradedant nuo centro.

Kartais šios kabinos tiekiamos su atraminiu pagrindo rėmu, su arba be vibravimą stabdančios apačios, pagamintos iš cinkuoto geležies plieno; paruoškite šį pagrindą iš anksto, kad uždėtumėte ant plokštės ir išgręžkite jame angas (duomenis žr. susijusiuose brėžiniuose).

PASTABA: jei grindys nėra gerai sulygiuotos, gali kilti didelių eksploataavimo problemų.

4.2 Elektros įrangos jungtys

PAVOJUS

Prieš atlikdami pagrindinio šaltinio jungtis, patikrinkite, ar pagrindiniai laidai yra atjungti nuo energijos tinklo ir įranga yra tinkamai įžeminta

4.2.1 Pagrindinių kontūrų prijungimas

Norint prijungti magistralinę šyną, reikia patikrinti, ar jungties paviršiai yra švarūs ir jų naudojate reglamentus atitinkantį varžtų veržimo momentą.

Kontaktiniai paviršiai turi būti kruopščiai nuvalyti sausa šluoste ir sutepti vazelino sluoksniu. Jei sidabru dengti paviršiai pajuoduos dėl ore esančio sieros dioksido, nuvalykite naudodami alkoholį arba kitą panašų tirpiklį.

Pirmiau pateiktos instrukcijos taip pat taikomos išorinio kontūro jungtims.

Jei jungčiai naudojamas laidas, taip pat reikia patikrinti VĮ kabelio ekranuotą įžeminimą, vadovaujantis skirstomojo skydo sudėties elektros schema.

Stenkitės netaikyti netinkamo mechaninio spaudimo gnybtams.

Taip pat reikia įsitikinti, kad atlikta jungtis nepakeitė IES 71 reglamentuose nustatytų atstumų tarp elektros įrenginių.

Taip pat rekomenduojama įsitikinti, kad neprarasta izoliacija ir būtina patikrinti skysčius.

Laido pjūvį pasirinkite vadovaudamiesi darbine įtampa ir rekomenduojama didžiausia izoliacijos trumpo jungimo srove, atkreipdami dėmesį į skyde numatytą sujungimo vietų dydžius.

Jungčių kontaktiniai paviršiai negali turėti atplaišų ar deformacijų, kurias sukėlė grėžimas ar kokie nors smūgiai.

Sujungimo vietoms negali būti taikomas joks spaudimas.

4.2.2 Pagalbinių ir antrinių kontūrų prijungimas

Gamintojo gabenimo tikslais atjungtos jungtys, turi būti atstatytos vadovaujantis numeravimu ir schemomis.

Jungtys su išoriniais kontūrais turi būti įrengtos atsargiai ir vadovaujantis susijusiomis izoliavimo schemomis.

Ypač antriniai srovės transformatorių kontūrai (ST) negali būti jokios atviro kontūro būklės, o tuo tarpu, antriniai įtampos transformatorių kontūrai (IT) negali turėti trumpo jungimo, tačiau reikia išlaikyti kabelių poliškumą.

4.2.3 Įžeminimo jungtys

Įžeminimo strypai, kurie buvo atskirti gabenimo tikslais, turi būti vėl prijungti ir pagrindinė įžeminimo magistralė turi būti prijungta prie instaliacijos įžeminimo sistemos.

Įrenginio atramos turi būti įžemintos gamintojo nurodytoje vietoje įsitikinant, kad visos jungtys gerai priveržtos ir užtikrintas elektros tęstinumas.

Įžeminimo jungtis taip pat turi būti užtikrinta įrenginiams, kuriuose jungtis reikalinga veikimui (t. y., ST, IT, varžams, atjungikliui ir t. t.).

Tokį patį dėmesį reikia skirti pagalbinių kontūrų atnaujinimui ir įžeminimo jungčių nustatymui.

Skirstomasis skydas vidinėje pusėje turi varinę įžeminimo magistralinę šyną (jos dydis pritaikytas šiluminiais stresams dėl trumpo jungimo srovės) plokštės įžeminimo jungčiai; pageidaujant, galima sumontuoti specialų įžeminimo pagrindą (paprastai 150 x 100 x 10 mm (5,9 x 3,9 x 0,4 [in])), ekranuotų kabelių įžeminimo jungčiai.

Įžeminimo strypai gali būti:

- tvirtai prijungti prie plokštės pagrindo kairėje arba dešinėje pagrindo pusėje; numatytos dvi įžeminimo plokštės, kurių dydis paprastai 50 x 50 x 20 mm (1,9 x 1,9 x 0,7 [in]) su M12 anga, pačios plokštės įžeminimo jungčiai (žr. dešinėje pateiktą nuotrauką);

ARBA

- išvesti tiesiai iš kabinos, kad užtikrintų kontaktinį tašką su įžeminimo sistema (pavyzdys, pateikiamas 18 paveiksle).

ARBA

- gali būti tik vidiniai, su angomis ir varžtais, skirtais iš vietos atvedamų laidų įžeminimui.



18 paveikslas: įžeminimo pagrindo pavyzdys

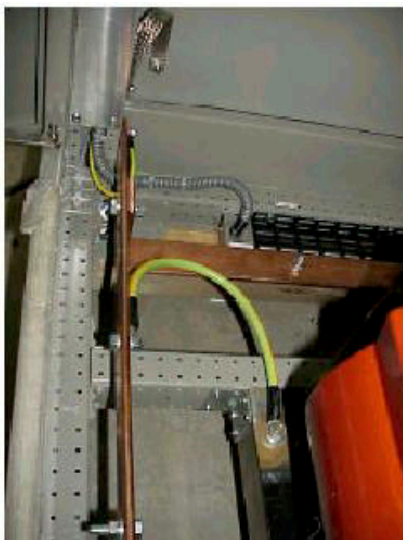
Konstrukcija: visi konstrukcijos elementai yra tvirtai sujungti vienas su kitu specialiais varžtais, užtikrinančiais gerą sąlytį tarp sujungtų dalių.

Durys: yra prijungtos prie rėmo 25 mm² (0,04 [in²]) skerspjūvio varinė juosta.

Komponentai: visi pagrindiniai komponentai, pavyzdžiui ST, IT ir t. t. yra teigiamai įžeminti (žr. 19 paveikslą)

ATSARGIAI

Įžeminkite plokštę laidininkais, kurių dydis atitinka srovės reglamentus ir naudokite duotą kabinos įžeminimo kontūrą.



19 paveikslas: žeminimo įrangos pavyzdys

5 PARENGIMAS EKSPLOATuoti

5.1 Preliminarios operacijos

Reikia imtis visų apsaugos priemonių siekiant užtikrinti personalo ir įrangos saugą bei laikytis įspėjamosiose plokštėse pateiktų nurodymų.

Prieš pradėdant eksploatuoti, reikia patikrinti viską, kas buvo sumontuota patalpose, pavyzdžiui:

- patikrinkite, ar tinkamai priveržtos veržlės ir varžtai;
- patikrinkite, ar tinkamai priveržti vidutinės ir žemos įtampos kabeliai;
- patikrinkite, ar tinkamai priveržti gnybtų plokščių varžtai;
- atlikite veiksmus su kiekvienu komponentu (jungikliais, saugikliais, apsauginėmis relėmis ir t. t.), kaip nurodyta atitinkamuose instrukcijų vadovuose;
- patikrinkite bet kokius atjungimo kontaktus.

5.1.1 Mechaninio veikimo patikra

Prieš pradėdant eksploatuoti, rekomenduojama pakartoti šiose instrukcijose nurodytas patikras:

- patikrinkite mechaninį veikimą ir blokavimo įtaisus;
- patikrinkite izoliavimo jungiklio mechaninę funkciją ir susijusius blokavimo įtaisus (jei reikia).

5.1.2 Elektros įrangos veikimo patikra

PAVOJUS

Neviršykite bandomos įrangos įtampos klasei nurodytos įtampos. Atjunkite šuntavimu sujungtas rites, pavyzdžiui, potencialo transformatorius. Netikrinkite jutiklių ar relijų aukštoje įtampoje. Prieš taikydami įtampą, atjunkite visus jutiklius ir reles.

Izoliacijos atsparumo bandymas

Atlikite matavimą naudodami megerį ir pamatuodami tarp fazių ir žemės pagrindiniame ir pagalbiniame kontūruose, kad patikrintumėte izoliacijos atsparumą (megerio įtampa: 2500 V pagrindiniams kontūrams ir 500 V antriniams kontūrams).

Mažiausios atsparumo įžeminimui reikšmės gali būti tokios: kelios dešimtys megaomų pagrindiniams kontūrams ir keli megaomai antriniams kontūrams.

Maitinimo dažnio izoliavimo bandymas

Šio bandymo kartojimas nereikalingas ir nerekomenduojamas, išskyrus tada, kai keičiamas kontūras. Jei reikia pakartoti, naudokite įtampą, kuri neviršija 75 % naujos įrangos bandymo įtampos, išskyrus komponentus, kurių leidžiamas bandymo lygis žemesnis už kabinos.

Veikimo bandymas

Atlikite bandymus antriniuose kontūruose, kad patikrintumėte, ar tinkamai veikia nuotoliniu būdu valdomas operatyvinis mechanizmas, įspėjamieji įtaisai, apsaugai ir visi kiti prie kabinos išorėje esančių komponentų prijungti kontūrai.

Patikrinkite, ar tinkamai veikia ventiliatoriai ir šildytuvai.

5.2 Eksploatavimo pradžia

Užbaigę mechaninius ir elektros įrangos bandymus, aprašytus ankstesniuose skirsniuose, įsitikinkite, kad visi skirstomojo skydo montavimo metu nuimti apsaugai yra vėl sumontuoti.

I S P Ė J I M A S

Prieš pradėdami eksploatuoti kabiną, nepamirškite padėti spynoms skirtų raktų atgal į vietą, kad jie būtų neprieinami eksploatuojančiam personalui.

6 PRIEŽIŪRA

PAVOJUS

Dirbant su elektros įranga arba šalia jos, kyla elektros šoko ir (arba) nusideginimo pavojus. Prieš atlikdami bet kokius patikros arba priežiūros darbus, išjunkite skirstomojo įrenginio priekyje esantį maitinimą. Patikrinkite linijos įvado gnybtus, siekdami įsitikinti, kad įrangos energija išjungta ir įžeminta. Patikrinkite išvado gnybtus įsitikindami, kad nėra atgalinio tiekimo būklės.

6.1 Tikrinimo dažnumas

Siekiant išvengti pavojingo izoliacijos lygio sumažėjimo rizikos, rekomenduojama pirmą patikrą atlikti praėjus maždaug 6 mėnesiams po paleidimo.

Norint nustatyti patikros dažnumą, reikia atsižvelgti ne tik į kabiną, bet taip pat į su asmeniniais komponentais susijusius nustatymus.

6.2 Priežiūros operacijos

Toliau pateikiamas pagrindinių priežiūros operacijų, kurias reikia atlikti skirstomajam skydui ir komponentams, sąrašas:

- pašalinkite bet kokias dulkes ir nešvarumus – geriausia naudoti dulkių siurbį;
- naudodami švarias ir sausas šluostes, nuvalykite dulkes nuo izoliuojančių dalių;
- atlikite kiekvieno komponento priežiūros operacijas visiškai saugiomis sąlygomis, kaip nurodyta susijusiose instrukcijose;
- vizualiai patikrinkite atskirų užraktų ir magistralių jungčių izoliaciją;
- sausu šepetiu išvalykite dulkes iš oro įtekėjimo/ištekėjimo angų;
- patikrinkite atjungimo kontaktus ir naudodami alkoholį pašalinkite bet kokius pajuodavimus nuo 1 000 A srovei pritaikytų sidabru poliruotų paviršių, o tada dar kartą patepkite paviršius plonu elektros kontaktams skirtu tepalo sluoksniu (tipas: MOLIDAL EL5);
- patikrinkite spynų ir užraktų veikimą;
- patikrinkite patalpų šildytuvų veikimą ir termostatų kalibravimo duomenis įsitikindami, kad jie veiks bent kelias valandas;
- patikrinkite izoliacijos atsparumą.

6.3 Priežiūros registravimas

Patikrų ir bet kokių matavimų rezultatai turi būti tinkamai užregistruoti registre, kurį galima naudoti norint nustatyti patikrų intervalus. Šis registravimas gali būti svarbus norint atkreipti dėmesį į tam tikrą įrangos dalį su prašymu išlikti atidesniems.

Su megeriu atliekami matavimai gali tiksliai nustatyti izoliacijos sumažėjimą.

6.4 Eksploatavimo atnaujinimas

Po priežiūros operacijų pakeiskite visas mechanines ir elektrines apsaugines dalis ir atlikite visas operacijas, reikalingas *kabinai* paleisti.

6.5 Produkto naudojimo pabaiga

Šis produktas pagamintas taip, kad atitiktų arba viršytų kokybės ir aplinkosaugos valdymo sistemų standartus ISO 9001 ir ISO 14001. Visi šie elementai gali būti tiekiami su kokybės sertifikatu.

Šalinimo metodai

Šalinti galima skirtingais būdais, priklausančiais nuo produkto medžiagos. Toliau pateikiamas įvairių žaliavų rekomenduojamas šalinimo metodas.

„Casagrande Elettrocostruzioni“ pareiga – palengvinti tolesnį perdirbimą ar šalinimą produkto naudojimo pabaigoje. Šalinant produktą, visada būtina elgtis vadovaujantis taikomų vietinių teisės aktų reikalavimais.

Žaliava	Rekomenduojamas šalinimo metodas
Metalinės medžiagos (Fe, Cu, Al, Ag, Zn, W ir t. t.)	Atskyrimas ir perdirbimas
Termoplastas	Perdirbimas arba šalinimas
Epoksidinė derva	Metalo atskyrimas ir likučių šalinimas
Guma	Šalinimas
Alyva (transformatorių alyva)	Išleidimas ir perdirbimas arba tinkamas šalinimas
SF6 dujos	Išėmimas iš įrangos ir perdirbimas arba tinkamas šalinimas
Pakavimo medžiaga	Perdirbimas arba šalinimas

7 VIDINIS GEDIMAS: PRIEŽASTYS, PREVENCIJA ir SAUGA

Sutrikimai metalu dengtos kabinos korpuse arba skirstomajame įrenginyje, pavyzdžiui, aprašytame šiame vadove, įvykę dėl defekto, išskirtinės veikimo būklės arba blogo eksploataavimo, gali sukelti vidinį elektros lanką.

Tiekama kabina yra sukonstruota vadovaujantis pagrindinio taikomo elektros įrangos standarto nurodymais (žr. skyrių „Standartų atitiktis“) ir apima daug dizaino ir konstrukcinių detalių, kad būtų išvengta bet kokių gedimų.

Taigi, mažai tikimybės, kad taip galėtų atsitikti, bet negalima visiškai to nepaisyti, ypač po daugelio metų veikimo, dažniausiai atliekant mažai priežiūros.

Toliau išvardijami svarbiausi konstrukciniai punktai, į kuriuos reikia atsižvelgti, taip pat vieta, elektros lanko gedimų priežastys ir sprendimo priemonės, kurias reikia naudoti vietoje arba skirstomojo skydo eksploataavimo metu, norint sumažinti vidinio elektros lanko tikimybę.

7.1 Priemonės taikomos kabinos konstrukcijoje.

Svarbiausios yra nurodytos toliau.

Kabinos konstrukcija yra pagaminta iš tokios medžiagos ir yra tokio storio, kad kuo labiau sumažintų mechaninį ir šiluminį stresą įvykus viršslėgio sprogitui dėl vidinio elektros lanko gedimo;

Kabina sukonstruota atsižvelgiant į tinkamus matmenis ir vidinį oro tūrį;

Didelis apsaugos laipsnis siekiant išvengti, kad į kabiną nepatektų drėgmė ir dulkės;

Atstumas tarp fazių ir fazių bei žemės paprastai yra didesnis nei numatyta taikomame standarte;

Jei taikoma, tarp jungiklių ir mechaninių komponentų naudojami užraktai;

Aukštos kokybės ir didelio efektyvumo komponentų ir įrangos pasirinkimas;

Slėgio išleidimo įtaisas yra sumontuotas viršutinėje ir galinėje plokščių pusėje (daugiau duomenų pateikiama brėžiniuose), kad būtų galima išleisti vidinį viršslėgį dėl su dujinėmis arba garinėmis karštomis medžiagomis kilusio elektros lanko.

Įtampos transformatoriaus kontūre yra įrengtas antiferomagnetinio rezonanso varžtas, skirtas išvengti šios elektros įtakos.

7.2 Vietos, gedimų priežastys ir vidinių gedimų tikimybę mažinančios arba riziką mažinančios priemonės

Žr. iš IEC 62271-200 paimtą lentelę sekančiame puslapyje, kurioje pateikiamos saugos priemonės, kurių reikia imtis kabiną montuojant, paleidžiant ir atliekant jos priežiūrą.

Trumpai tariant, žmonių saugumui ir tinkamam kabinos eksploatavimui ir efektyvumui svarbūs tolesni aspektai:

tinkamas sumontavimas vietoje prieš paleidžiant (žr. atitinkamą šio vadovo skyrių);

reguliari ir gerai atliekama priežiūra (žr. atitinkamą šio vadovo skyrių);

negalima būti netoli slėgio išleidimo prietaiso tada, kai priekyje veikia kabina;

kabiną atidaryti ir joje operacijas vykdyti gali tik kvalifikuoti asmenys.

Vietos, kur didžiausia vidinių gedimų tikimybė	Galimos vidinių gedimų priežastys	Priemonių pavyzdys
Kabelių dėžės Sujungimo vietos	<i>Klaidingas sumontavimas</i>	Venkite jungčių, kai kabeliai susiraizgę. Patikrinkite montavimo kokybę vietoje.
	<i>Kietos arba skystos izoliacijos sutrikimas</i>	Montavimo kokybės ir (arba) dielektrinio bandymo vietoje patikra (žr. vadovo skyriaus „PALEIDIMAS“ punktą „Elektros įrangos veikimo patikra“). Reguliarus skysčio lygio tikrinimas (jei taikoma)
Atjungikliai; Jungikliai; Įžeminimo jungikliai	<i>Blogas veikimas</i>	Instrukcijos personalui apie vidinio / išorinio veikimo seką.
Grandinės pertraukikliai	<i>Nepakankama priežiūra</i>	Reguliari planinė priežiūra. Instrukcijos personalui. Žr. vadovą skyriuje „PRIEŽIŪRA“
Varžtinės jungtys ir kontaktai	<i>Korozija</i>	Naudokite koroziją sulaikančią dangą ir (arba) tepalą. Patikrinkite jungtis įprastos priežiūros metu (žr. vadovą skyriuje „PRIEŽIŪRA“)
	<i>Klaidingas surinkimas</i>	Kokybės montavimo vietoje patikrinimas; pasitelkite tik kvalifikuotus asmenis.
Visos vietos	<i>Personalo klaida</i>	Priėjimas prie kabinos ir operacijų kabinoje vykdomas ribojamas ir tai leidžiama tik kvalifikuotiems asmenims. Naudokite ir saugokite numatytas spynas ir užraktus. Nurodymas personalui. Prieš įjungdami energiją, patikrinkite kabinos vidų ir pažiūrėkite, ar neužmiršote jokių įrankių ar kitų daiktų.
	<i>Senėjimas esant elektros stresui</i>	Reguliari planinė įrangos būklės patikra.
	<i>Tarša, drėgmė, patenkančios dulkės, kenkėjai ir t. t.</i>	Priemonės, skirtos užtikrinti, kad būtų pasiektos nurodytos veikimo sąlygos. Jei kabina nemontuojama iš karto, laikykite ją vietoje, kuri apsaugota nuo oro sąlygų, kuri yra ne per daug drėgna, korozinė ir be cheminių medžiagų. Jei reikia, apsaugai nuo kondensacijos, pašildykite patalpą arba įjunkite energijos tiekimą sumontuotiems šildytuvams.

8 SPECIALŪS ĮRANKIAI (jei yra)

Pageidaujant, kabina tiekama su kai kuriais įrankiais, skirtais naudoti paleidimui ir (arba) priežiūrai arba tik prieigai prie kabinos. Žr. tolesnį sąrašą, kuriame pateikiami dažniausiai naudojami įrankiai; daugiau duomenų žiūrėkite specialioje projekto dokumentacijoje.

8.1 Trupo jungimo strypas

Šis įrankis paprastai naudojamas parengimo eksploatuoti arba paleidimo metu tam, kad būtų galima atlikti trumpo jungimo bandymą.

Iš tikrųjų, norint atlikti šį bandymą (atliekamas norint parengti trumpo jungimo suaktyvinimo kreivę – įsijungimo srovę palyginus su linijos srove, arba norint atlikti kokio nors transformatoriaus arba generatoriaus pagrindinės ir pagalbinės apsaugos funkcijas), trumpas sujungimas turi būti įrengtas tarp generatoriaus statoriaus ir generatoriaus grandies perjungiklio / pakopinio transformatoriaus.



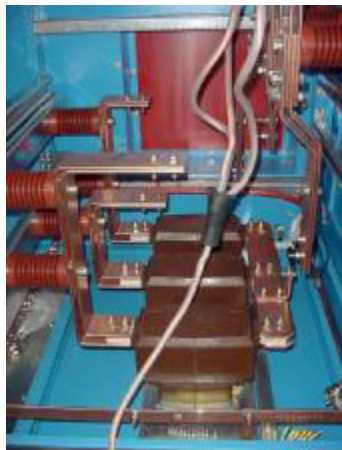
Norint lengvai įrengti šio trumpo jungimo vietą, tiekiami tinkamo pjūvio variniai strypai, kurie montuojami tiesiogiai linijos išvado jungčių vietose.

Strypas sugebės atlaikyti trumpo jungimo srovę 1 sekundę, o vardinę srovę ~1/2–1 val.

SVARBU: PO BANDYMO IR PRIEŠ PRIJUNGdami LINIJOS IŠVADO KABELIUS / ŠYŲ VAMZDĮ, STRYPUS IŠIMKITE.

8.2 Lankstus įžeminimo įtaisas

Šis įrankis tiekiamas pageidaujant ir jį reikia naudoti prieš einant į kabiną, norint užtikrinti sistemos įžeminimą žmonių saugumui.



Įrankis yra sudarytas iš statramsčio su rutuliu, sumontuoto ant fazės ir įžeminimo strypo + lankstaus kabelio ir rankenos įžeminimo kabeliui ant rutulio tvirtinti.

Daugiau informacijos žiūrėkite produkto instrukcijoje.

SVARBU: PRIEŠ NAUDOJANT ŠĮ ĮRANKĮ, ENERGIJOS TIEKIMAS JAU TURĖTŲ BŪTI IŠJUNGtas IR ĮŽEMINTAS; TAI PAPILDOMA

PRIMONĖ NORINT UŽTIKRINTI ŽMONIŲ SAUGUMĄ.

TIK KVALIFIKUOTI IR INFORMUOTI ASMENYS GALI ATLIKTI ŠIĄ OPERACIJĄ.

DAUGIAU INFORMACIJOS ŽIŪRĖKITE GAMYKLOS / VIETOS SAUGOS TAISYKLĖSE.

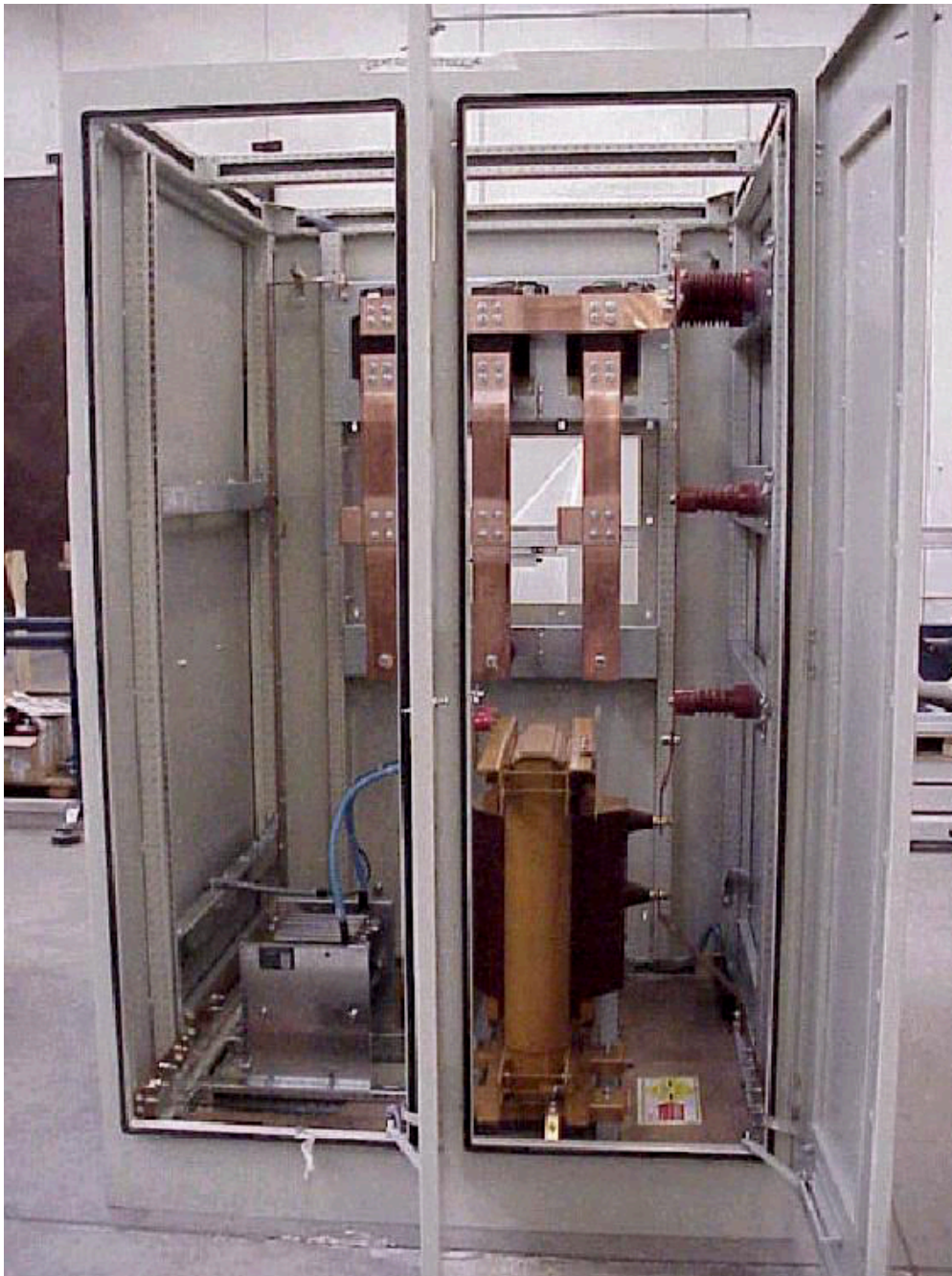


9 KONSTRUKCIJOS SPRENDIMŲ PAVYZDYS



20 paveikslas: vaizdas iš priekio (kairėje) ir galo (dešinėje)





21 paveikslas: vidaus išsidėstymo pavyzdys

10 PRIEDAS

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PVM ir mokesčių mokėtojo kodas IT 00663680239

1.2 SUPPLIERS' CATALOGUE

Surge arrester

MWK



Product description:

- Metal-oxide (MO) surge arrester without spark gap, designed and type tested according to IEC 60099-4, with own ABB metal-oxide resistors since more than 30 years
- Direct molded silicone housing in patented design for best environmental robustness
- 100% in-house production – fully in charge of complete process
- High quality, safe and reliable, maintenance free
- For alternating current (AC) systems
- For indoor and outdoor installations

Especially recommended for overvoltage protection of:

- MV distribution transformer
- MV cable and cable termination
- MV capacitor and capacitor bank
- Further MV distribution equipment

Additional certification:

- Fire and smoke behavior tested and classified according to EN 45545-2

Technical data

Classification according to IEC 60099-4

Arrester class	SL, Station Low
Line discharge class (LD)	2
Nominal discharge current I_n (8/20 μ s)	10 kA _{peak}
Repetitive charge transfer rating Q_{rs}	1.6 As (C)
Rated thermal energy	
W_{th} at $T_{amb} = 40\text{ °C}$	5.0 kJ/kV (U_p) = 6.25 kJ/kV (U_c)
W_{th} at $T_{amb} = 55\text{ °C}$	4.5 kJ/kV (U_p) = 5.625 kJ/kV (U_c)
High current impulse I_{hc} (4/10 μ s)	100 kA _{peak}
Long duration current impulse	550 A for 2000 μ s
Short circuit rating I_s	20 kA _{rms} for 0.2 s

Power frequency voltage versus time characteristics (TOV)

With no prior duty energy input

U_{TOV} at $t = 1\text{ s}$	1.155 U_r = 1.444 U_c
U_{TOV} at $t = 3\text{ s}$	1.130 U_r = 1.412 U_c
U_{TOV} at $t = 10\text{ s}$	1.089 U_r = 1.361 U_c

With prior duty energy input of 4.5 kJ/kV (U_p) = 5.625 kJ/kV (U_c)

U_{TOV} at $t = 1\text{ s}$	1.101 U_r = 1.376 U_c
U_{TOV} at $t = 3\text{ s}$	1.075 U_r = 1.343 U_c
U_{TOV} at $t = 10\text{ s}$	1.049 U_r = 1.312 U_c

Mechanical loads

Torque	50 Nm
Tensile strength axial	1200 N
Short term load SSL perpendicular to axis	153 Nm
Long term load SLL perpendicular to axis	88 Nm

Service conditions

Ambient air temperature T_{amb}	–60 to +55 °C (for temperatures up to 80 °C consider instructions of application guidelines)
Altitude of installation	up to 1800 m (for higher altitudes contact ABB)
Frequency of system voltage	15 to 62 Hz

Electrical data

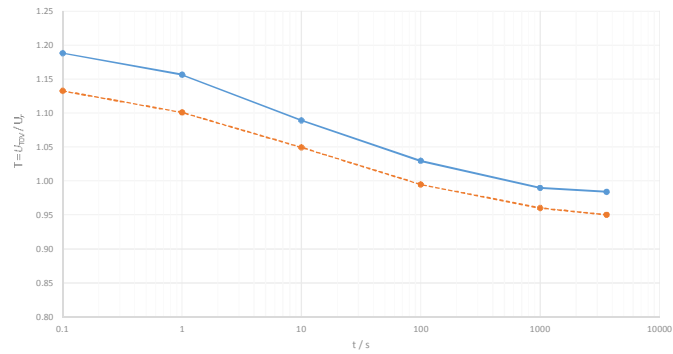
Rated voltage	Continuous operating voltage	Residual voltage U_{res} at specified impulse current (Maximum value)									
		Steep current impulse wave 1/...μs		Lightning current impulse wave 8/20 μs					Switching current impulse wave 30/60 μs		
		5 kA	10 kA	1 kA	2.5 kA	5 kA	$I_n=10$ kA	20 kA	125 A	250 A	500 A
U_r	U_c										
kV _{rms}	kV _{rms}	kV _{peak}	kV _{peak}	kV _{peak}	kV _{peak}	kV _{peak}	kV _{peak}	kV _{peak}	kV _{peak}	kV _{peak}	kV _{peak}
5.0	4	12.7	13.5	10.5	11.1	11.7	12.3	14.1	9.2	9.5	9.9
6.3	5	15.9	16.8	13.1	13.9	14.6	15.4	17.6	11.4	11.9	12.4
7.5	6	19.1	20.2	15.8	16.7	17.5	18.5	21.1	13.7	14.3	14.8
8.8	7	22.2	23.5	18.3	19.4	20.3	21.5	24.6	16.0	16.6	17.2
10.0	8	25.4	26.9	21.0	22.2	23.3	24.6	28.1	18.3	19.0	19.7
11.3	9	28.6	30.2	23.6	25.0	26.2	27.7	31.6	20.5	21.4	22.2
12.5	10	31.7	33.5	26.1	27.7	29.0	30.7	35.0	22.8	23.7	24.6
13.8	11	34.9	36.9	28.8	30.5	32.0	33.8	38.6	25.1	26.1	27.1
15.0	12	38.1	40.3	31.4	33.3	34.9	36.9	42.1	27.4	28.5	29.6
16.3	13	41.2	43.6	34.0	36.0	37.8	40.0	45.6	29.6	30.8	32.0
17.5	14	44.3	46.9	36.6	38.7	40.6	43.0	49.1	31.9	33.2	34.4
18.8	15	47.5	50.3	39.2	41.5	43.6	46.1	52.6	34.2	35.5	36.9
20.0	16	50.7	53.7	41.9	44.3	46.5	49.2	56.1	36.5	37.9	39.4
21.3	17	53.8	56.9	44.4	47.0	49.3	52.2	59.6	38.7	40.2	41.8
22.5	18	57.0	60.3	47.1	49.8	52.3	55.3	63.1	41.0	42.6	44.3
23.8	19	60.2	63.7	49.7	52.6	55.2	58.4	66.6	43.3	45.0	46.8
25.0	20	63.3	67.0	52.2	55.3	58.0	61.4	70.0	45.5	47.3	49.2
26.3	21	66.5	70.4	54.9	58.1	60.9	64.5	73.6	47.8	49.7	51.6
27.5	22	69.7	73.7	57.5	60.9	63.9	67.6	77.1	50.1	52.1	54.1
28.8	23	72.9	77.1	60.1	63.7	66.8	70.7	80.6	52.4	54.5	56.6
30.0	24	76.0	80.4	62.7	66.4	69.6	73.7	84.1	54.6	56.8	59.0
31.3	25	79.2	83.8	65.3	69.2	72.5	76.8	87.6	56.9	59.2	61.5
32.5	26	82.3	87.1	68.0	72.0	75.5	79.9	91.1	59.2	61.6	64.0
33.8	27	85.4	90.4	70.5	74.7	78.3	82.9	94.6	61.4	63.9	66.4
35.0	28	88.6	93.8	73.1	77.4	81.2	86.0	98.1	63.7	66.3	68.8
36.3	29	91.8	97.2	75.8	80.2	84.2	89.1	101.6	66.0	68.7	71.3
37.5	30	94.9	100.4	78.3	82.9	87.0	92.1	105.0	68.2	71.0	73.7
38.8	31	98.1	103.8	81.0	85.7	89.9	95.2	108.6	70.5	73.4	76.2
40.0	32	101.3	107.2	83.6	88.5	92.8	98.3	112.1	72.8	75.7	78.7
41.3	33	104.5	110.6	86.2	91.3	95.8	101.4	115.6	75.1	78.1	81.2
42.5	34	107.6	113.8	88.8	94.0	98.6	104.4	119.1	77.3	80.4	83.6
43.8	35	110.8	117.2	91.4	96.8	101.5	107.5	122.6	79.6	82.8	86.0
45.0	36	114.0	120.6	94.1	99.6	104.5	110.6	126.1	81.9	85.2	88.5
46.3	37	117.1	123.9	96.6	102.3	107.3	113.6	129.6	84.1	87.5	90.9
47.5	38	120.3	127.3	99.2	105.1	110.2	116.7	133.1	86.4	89.9	93.4
48.8	39	123.4	130.6	101.9	107.9	113.1	119.8	136.6	88.7	92.3	95.9
50.0	40	126.5	133.9	104.4	110.6	116.0	122.8	140.0	90.9	94.6	98.3
51.3	41	129.7	137.3	107.1	113.4	118.9	125.9	143.6	93.2	97.0	100.8
52.5	42	132.9	140.7	109.7	116.1	121.8	129.0	147.1	95.5	99.4	103.2
53.8	43	136.1	144.0	112.3	118.9	124.8	132.1	150.6	97.8	101.8	105.7
55.0	44	139.2	147.3	114.9	121.6	127.6	135.1	154.1	100.0	104.1	108.1

Housing

Continuous operating voltage	Creepage distance	Flashover distance	Recommended clearances		Height H	Weight	Insulation withstand voltage of housing			
							1.2/50 µs		50 Hz, 60 s, wet	
							required values acc. to EN/IEC	guaranteed	required values acc. to EN/IEC	guaranteed
U _c			E	F						
kV _{rms}	mm	mm	mm	mm	mm	kg	kV _{peak}	kV _{peak}	kV _{DC}	kV _{DC}
4	269	183	60	110	187	1.3	16	96	8	41
5	269	183	60	110	187	1.4	21	96	10	41
6	269	183	70	110	187	1.4	25	96	12	41
7	269	183	80	110	187	1.5	28	96	13	41
8	269	183	90	110	187	1.5	32	96	15	41
9	344	223	100	110	227	1.9	37	116	17	50
10	344	223	110	120	227	1.9	40	116	19	50
11	418	263	120	130	267	2.2	44	137	21	58
12	418	263	130	140	267	2.2	48	137	23	58
13	418	263	140	150	267	2.3	52	137	24	58
14	418	263	150	160	267	2.3	56	137	26	58
15	418	263	160	170	267	2.4	60	137	28	58
16	492	303	170	180	307	2.7	64	158	30	67
17	492	303	180	190	307	2.7	68	158	32	67
18	492	303	190	200	307	2.8	72	158	34	67
19	492	303	200	210	307	2.8	76	158	36	67
20	492	303	209	220	307	2.9	80	158	37	67
21	567	343	220	230	347	3.2	84	179	39	76
22	567	343	229	240	347	3.2	88	179	41	76
23	567	343	239	250	347	3.3	92	179	43	76
24	567	343	249	260	347	3.3	96	179	45	76
25	641	383	259	270	387	3.6	100	200	47	85
26	641	383	269	280	387	3.6	104	200	48	85
27	641	383	279	290	387	3.7	108	200	50	85
28	641	383	289	300	387	3.7	112	200	52	85
29	641	383	299	310	387	3.8	116	200	54	85
30	641	383	309	320	387	3.8	120	200	56	85
31	865	503	319	330	507	4.7	124	262	58	111
32	865	503	329	340	507	4.7	128	262	59	111
33	865	503	339	350	507	4.8	132	262	61	111
34	865	503	349	360	507	4.8	136	262	63	111
35	865	503	359	370	507	4.9	140	262	65	111
36	865	503	369	380	507	4.9	144	262	67	111
37	865	503	379	390	507	5.0	148	262	69	111
38	865	503	389	400	507	5.0	152	262	71	111
39	865	503	398	409	507	5.1	156	262	72	111
40	865	503	408	419	507	5.1	160	262	74	111
41	865	503	418	429	507	5.2	164	262	76	111
42	939	543	428	439	547	5.2	168	283	78	120
43	939	543	438	449	547	5.4	172	283	80	120
44	939	543	448	459	547	5.4	176	283	82	120

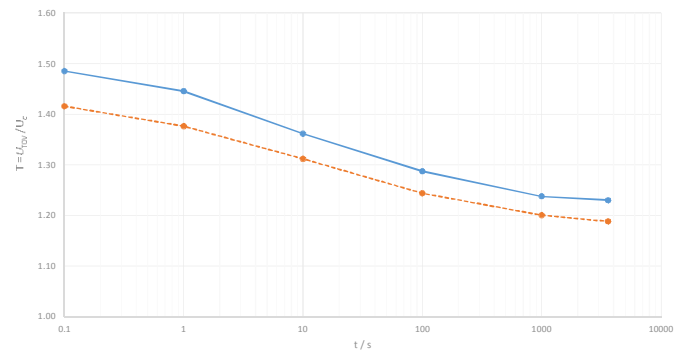
TOV Characteristics

Power frequency voltage-versus time characteristics (TOV) based on U_r



- without prior duty energy input
 - with prior duty 4.5 kJ/kV (U_r) = 5.625 kJ/kV (U_c) energy input
- Samples preheated to 60 °C

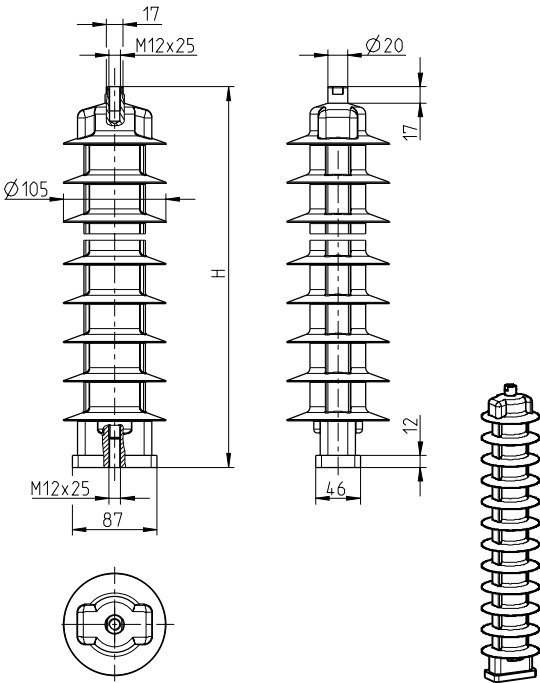
Power frequency voltage-versus time characteristics (TOV) based on U_c



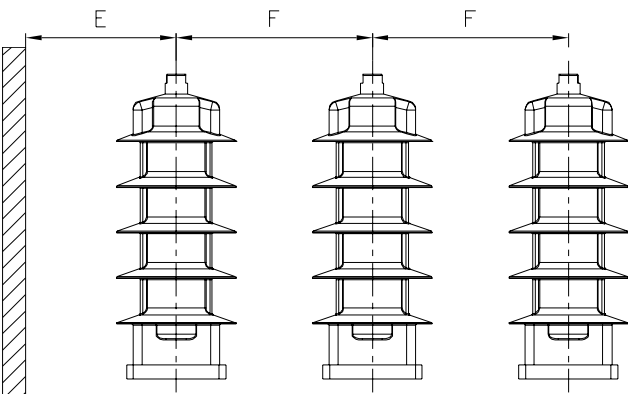
- without prior duty energy input
 - with prior duty 4.5 kJ/kV (U_r) = 5.625 kJ/kV (U_c) energy input
- Samples preheated to 60 °C

Dimensions

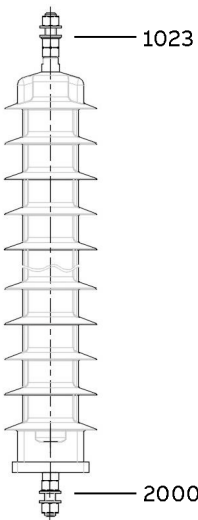
Standard dimensions without accessories



Dimensions according to outline drawing HAWA 480785
Outline drawings with accessories on request



Structure of type designation with optional accessories (Example)

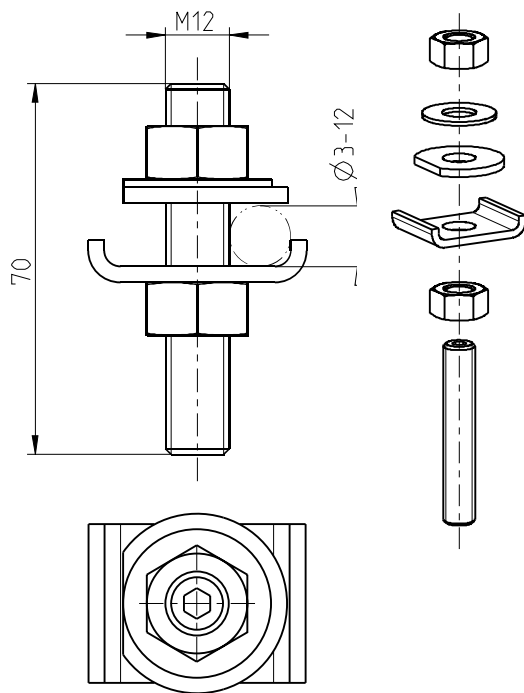


MWK 24 / 1023 / 2000

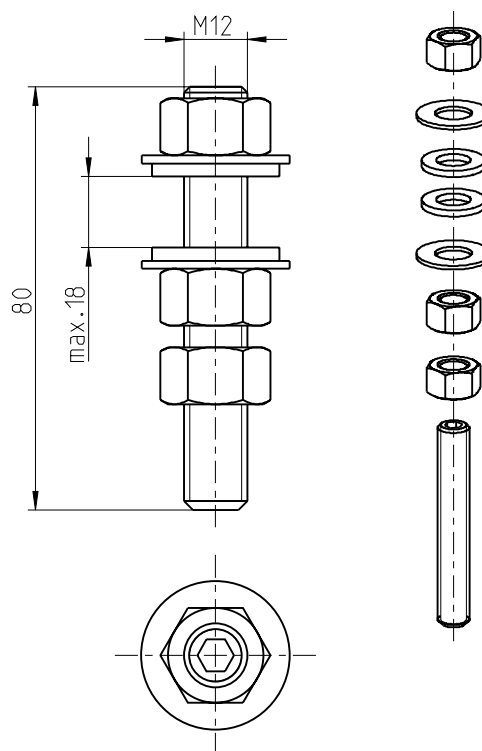
Type of surge arrester
 U_c = Continuous operating voltage
Type of top accessory (optional)
Type of bottom accessory (optional)

Common Top Accessories (optional)

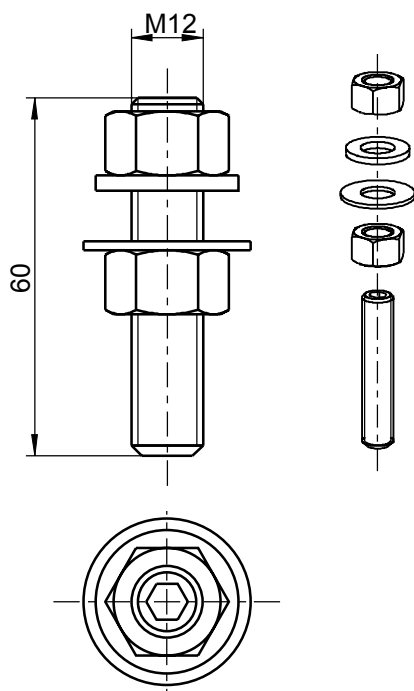
Type 1002 Clamp type connector (stainless steel)



Type 1023 Threaded stud with nuts M12x80 (stainless steel)

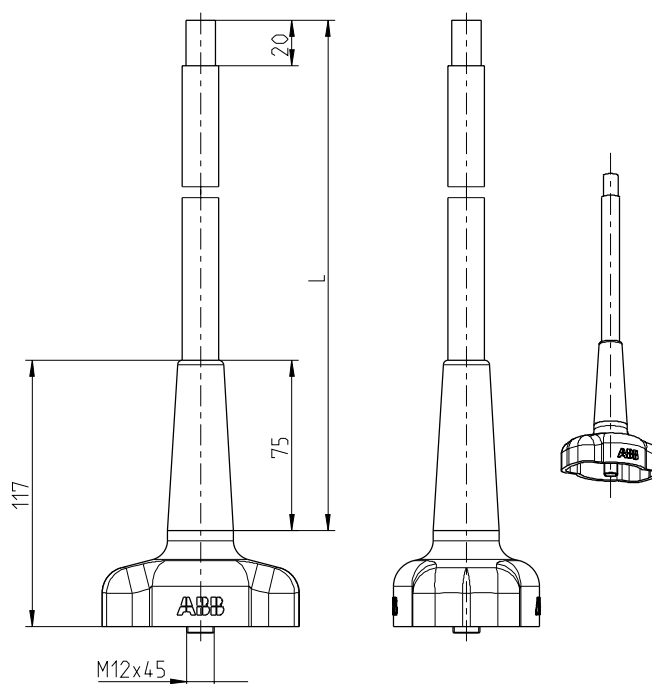


Type 1028 Threaded stud with nuts M12x60 (stainless steel)

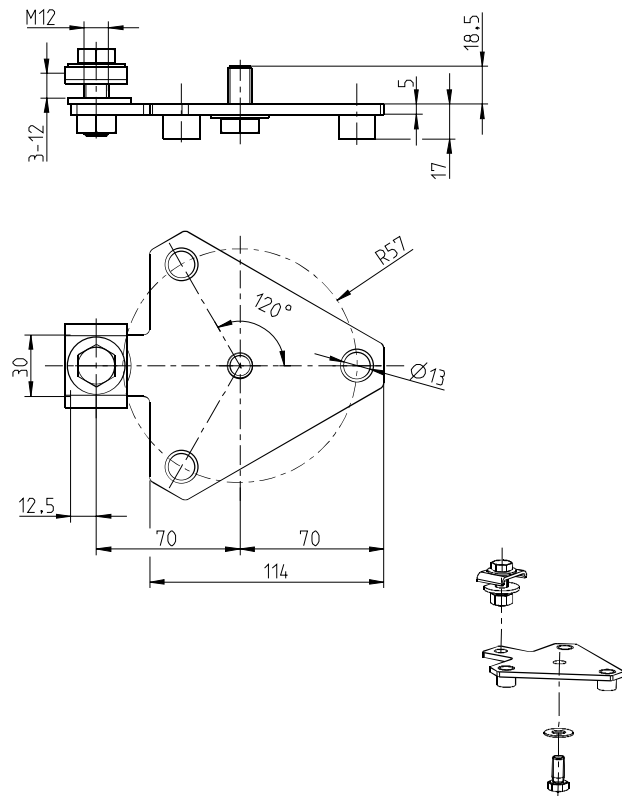
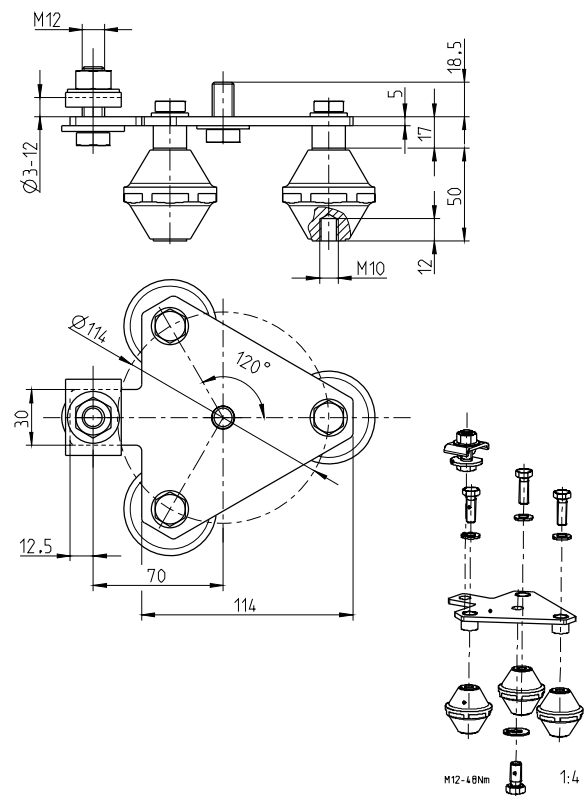


Type 1061 Cap with cable L = 250 mm

Type 1062 Cap with cable L = 500 mm

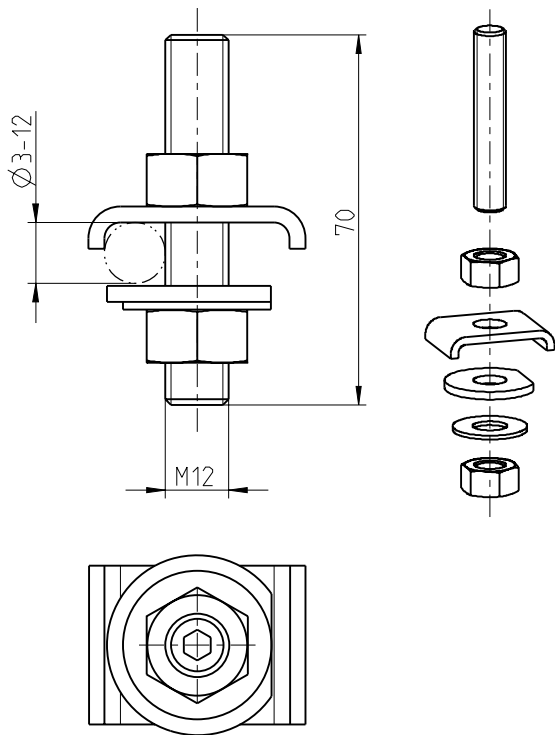


Common Bottom Accessories (optional)

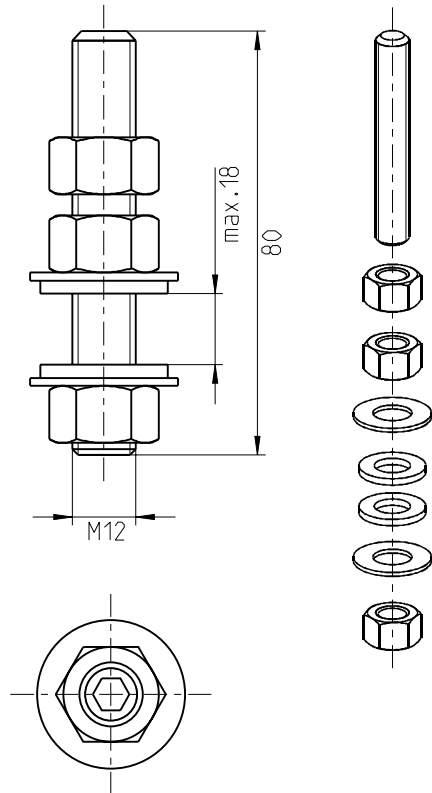
Type 2150 3-point base plate

Type 2151 3-point base plate insulated


Common Bottom Accessories (optional)

Type 2020 Clamp type connector (stainless steel)



Type 2000 Threaded stud with nuts M12x80 (stainless steel)



For more information please contact:

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Note

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Our products are certified according ISO 9001, 14001, 18001 and IRIS

For detailed information for dimensioning of our products see following ABB documents:

- Application guidelines
 - Overvoltage protection
 - Metal oxide surge arresters in medium voltage systems
- Application guidelines
 - Overvoltage protection
 - Metal oxide surge arresters in railway facilities

For pdf or print version please send E-mail to:
sales.sa@ch.abb.com

LAMP 36

SLIM ENCLOSURE LAMP

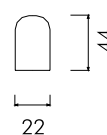
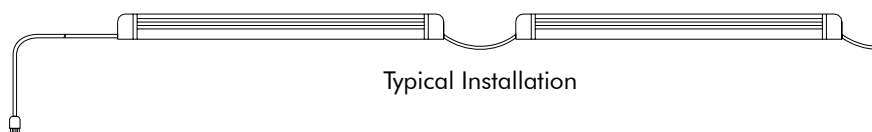
Slim and versatile fluorescent lamp. More units can be connected together in a chain up to a total power of 100W, by using the addition interconnection cable including in the packaging.



Features	Unit	LAMP3604	LAMP3605	LAMP3605-115V	LAMP3606	LAMP3606-115V	LAMP3607	LAMP3608
Power supply	V/Hz	230/50	230/50	115/60	230/50	115/60	230/50	230/50
Lamp type	-	T5 fluorescent lamp with integrated electronic ballast						
Power consumption	W	6	8		13		21	28
Service life	hrs	5000						
Connection	-	Plug-in cable 1.8 m long inside the package						
Series of lamps	-	Possible with male/male extension cable, max 100W total series						
Casing	-	Plastic, white						
Protection degree/class	-	IP20/Class II						
Operating temperature	°C(°F)	-20/+50 (-4/+122)						
Storage temperature	°C(°F)	-45/+80 (-49/+176)						
Mounting	-	Screws, hidden behind the lamp						
Dimensions HxWxD	mm	270x44x22	345x44x22		570x44x22		910x44x22	1210x44x22
Weight	kg	0.33	0.36		0.50		0.53	0.60
Conformity	-	CE						

Accessories

Door limit switch without block	FINCOR
Door limit switch	FINRIP
Safety flashing device with lamp switch	FSL
Safety flashing device with lamp and auxiliary switches	FSLA
Plastic bracket	STAF36
Plastic clip	CLIP36



Warning signs
and delineators

Safety
equipment

Short-circuiting &
earthing systems

Voltage detectors
and indicators

Saving kits

Clamps for MV installations and substations

Attachment (C-Type)

Hexagonal end-fitting. A circumferential braking system prevents the clamp from turning under the weight of the cable. Separates by simple pulling.

Earth cable connection

With a crimped lug (12 mm Ø hole).

Material

Aluminium alloy except MT-814, MT-1911 and MT-1921: copper-aluminium bronze.

Reference	Weight (kg)	Dimensions (mm)	Conductors (mm)
MT-812-C	0.320	35 x 79 x 143	• Ø 5-16 — 0-16
MT-813-C	0.330	35 x 79 x 169	• 40 x 16
MT-814/2-C	0.660	85 x 56 x 192	• Ø 5-28
MT-814/3-C	0.620	85 x 56 x 195	• Ø 18-33
MT-815-C	0.650	44 x 100 x 180	• 5-35 — 16-40 — 5-40
MT-815-E			
MT-815-S			
MT-815-S1			
MT-1911-E	0.580	For permanent fixed point Ø 20 mm and round conductors Ø 8 to 18 mm	
MT-1911-S1			
MT-1921-E	0.69	For permanent fixed point Ø 25 mm and round conductors Ø 10 to 25 mm	
MT-1921-S1			



MT-812-C



MT-813-C



MT-814/2-C
MT-814/3-C



MT-815-C



MT-815-S1



MT-1911-S1
MT-1921-S1



MT-1911-E
MT-1921-E

Earth clamps

Copper aluminium bronze earth clamps.

For bare conductors.

Reference	Weight (kg)	Connection	Conductors (mm)
MT-840/1	0.48	Connector: TO-08 - 35 mm ²	• Ø 6-25 — 0-25
MT-841	0.48	Connector: ≤ 50 mm ²	• Ø 6-25 — 0-30



MT-840/1



MT-841

For fixed point.

Reference	Weight (kg)	Connection conductors (mm)
MT-1911	0.58	Spheric fixed points MT-2951 Ø 20 mm Round conductors Ø 8 to 18 mm
MT-1921	0.69	Spheric fixed points MT-3951 Ø 25 mm Round conductors Ø 10 to 25 mm



MT-1911
MT-1921

Fixed points

IEC-61230

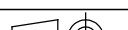
MT-2951
MT-3951
MT-3952



MT-2951/1
MT-2951/2
MT-3951/1
MT-3952/1

For flat conductors.

Reference	Sphere dimension	Weight (g)	Fixing
MT-2951	Ø 20 mm	130	Thread: M 12
MT-2951/1	Ø 20 mm	180	Bolt: M 12 - L = 35 mm
MT-2951/2	Ø 20 mm	200	Bolt: M 12 - L = 45 mm
MT-3951	Ø 25 mm	240	Thread: M 12
MT-3952	Ø 25 mm	240	Thread: M 16
MT-3951/1	Ø 25 mm	300	Bolt: M 12 - L = 45 mm
MT-3952/1	Ø 25 mm	350	Bolt: M 16 - L = 45 mm

A	Modifica isolatore da 305 a 304mm							01/11	S.F.
Ed.	Descrizione/Description							Data/Date	Firma/Sign
MODIFICHE/REVISIONS									
		TOLL. QUOTE LIBERE (TOLERANCE RATE)	TOLL. QUOTE LIBERE ANG. (ANG. TOLERANCE RATE)	SCALA/SCALE	DATA/DATE	FIRMA/DRAWN	VISTO/CHECKED		
		UNI-ISO 2768-m		1:10	09.09.10	Fornacciari			
OGGETTO/PART NAME POWER CAPACITOR CONDENSATORE DI RIFASAMENTO						CODICE/PART NR. 415620037R EDIZ./EDIT. A			

DUCATI energia Via M.E. Lepido, 182 - 40132 Bologna - Italy Phone ++39- 0516411511 - Fax. ++39- 051402040	Title Installation Use and Maintenance Manual	Document No. GI-MAN-003		
Ducati p.n.	Customer	Rev. 00	Date 01/01/2008	Page 3/3

1 INSTALLATION

1.1 BASE (Valid for supply of capacitor banks)

The site designated for the set up of the power factor correction or filter bank must consist of a perfectly flat concrete bed fitted with holes for fixing the frames of the capacitors, inductances and other equipment as indicated in the attached drawings. The steel screw anchors are not included.

The concrete bed must be calculated on the basis of the mass of the capacitors and inductances.

When a filter is to be installed it is important that there be no closed metallic turns near the inductances. For this reason any reinforcement of the concrete bed should be formed of rods which are not closed and the intersections should be insulated with small plastic sheets with a thickness of several tenths of a millimetres.

In addition, the earth connections of the support legs of the inductance must not form a closed turn.

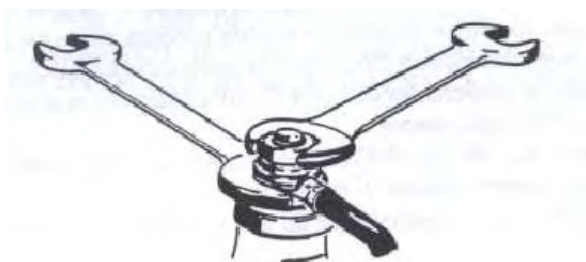
1.2 INSTALLATION

The materials necessary for constructing the capacitor or filter bank are listed in the provided bill of materials. Finding them is quite easy since each group of components has a label bearing the product code which can be found in the list itself. The list also includes the progressive number of the item. This number makes it possible to find the item on the assembly drawing which clearly illustrates the operations necessary to assemble the components.

For a correct mechanical assembly of the system make sure that all connections with screws and nuts are perfectly locked by using torque wrenches compatible with the diameter of the screws.

Ensure that the contact areas of electrical connections are perfectly clean and free of fins and dinging.

The connections to the porcelain bushing of the capacitors must be tightened 12Nm for M12 stud and 18Nm for M16 stud at maximum. For this purpose use a dynamometric wrench. When tightening use a second wrench on the lower nut of the terminal so that the two wrenches move in opposite directions. The earthing terminals of the capacitor are tightened in the same way.



During mounting operations, never grip the insulators to move the capacitor.

When the inductances of a filter have aluminum terminals a CU/AL plate included with the material must be placed between them and the copper connection.

In addition, the connections between the C.T. and the protection relays must be prepared. The protection relays must be mounted on the panel where the automatic main switch of the power factor correction system is located. The connections must be made according to the attached diagrams of the unbalance protection and, if the case requires, of overload protection.



FINECORSA INTERBLOCCO PER CIRCUITI AUSILIARI E DI SERVIZIO INTERLOCK LIMIT SWITCHES FOR AUXILIARY AND SERVICE CIRCUITS



gr. 57

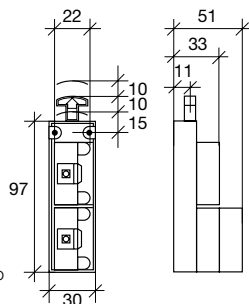


gr. 101

E' un dispositivo che viene azionato direttamente da ogni porta dell'armadio elettrico. Di norma vengono collegati sul primo elemento di contatto (unico su cui può intervenire il dispositivo di interblocco) i circuiti ausiliari degli apparecchi di manovra. I restanti contatti montati posteriormente, vengono utilizzati per i circuiti di servizio, quali ad esempio: accensione luce armadio, inserimento ventole, condizionatore, segnalatori acustici, colonnine luminose. A porte aperte può essere commutato manualmente mediante una comoda ancorretta, contrassegnata da una freccia, realizzando svariate funzioni⁽³⁾.
This device is activated directly by each door of the cabinet. The auxiliary circuits of the switchgear are usually connected on the first contact element (the only one on which the interlock device can act). The remaining contacts mounted to the rear are used for the service circuits such as, for example: switching on of the cabinet light, activation of fans, conditioner, audible signals, beacons. With the doors open, it can be activated manually using a handy button marked by an arrow, performing various functions⁽³⁾.

			050FI01 ⁽¹⁾
			050FI10 ⁽²⁾
			050FI03 ⁽¹⁾
			050FI12 ⁽²⁾
			050FI01 ⁽¹⁾ + FCP + FAP
			050FI10 ⁽²⁾ + FCP + FAP

Il ripristino delle condizioni normali avviene ad ogni chiusura della porta dell'armadio
Normal conditions are reset each time the door of the cabinet is closed.

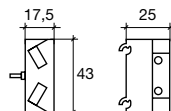


ELEMENTI DI CONTATTO PER FINECORSA INTERBLOCCO⁽⁴⁾ CONTACT ELEMENTS FOR INTERLOCK LIMIT SWITCH⁽⁴⁾



gr. 23

contatto/contact	schema/diagram	colore protezione/colour of protection	
1NA			▲ 030FA-P
1NC			▲ 030FC-P



CARATTERISTICHE TECNICHE/TECHNICAL DATA

RISPONDEZZA ALLE NORME CONFORMING TO STANDARDS

IEC 947-5-1 VDE 0660 - UTE - BSI CENELEC

OMOLOGAZIONI / APPROVALS

CSA (CANADA) / UL (USA)

GRADO PROTEZIONE MORSETTI TERMINAL DEGREE OF PROTECTION

IP 2X secondo/conforming to IEC 529

MOMENTO TORCENTE MORSETTI TERMINAL TORQUE

↻ 1,5 Nm, vite M4 serrafilo autosollevante imperdibile $\geq 3 \text{ mm}^2 \leq 2 \times 2,5 \text{ mm}^2$
↻ 1,5 Nm screw M4 self-lifting captive cable clamp $\geq 3 \text{ mm}^2 \leq 2 \times 2,5 \text{ mm}^2$

TENSIONE NOMINALE DI ISOLAMENTO UI RATED INSULATION VOLTAGE U_i

750 V secondo/conforming to IEC 947-5-1

CORRENTE NOMINALE TERMICO Ith RATED THERMAL CURRENT I_{th}

10A

POTENZE NOMINALI DI IMPIEGO RATED OPERATIONAL POWER

Secondo/conforming to IEC 947-5-1
catAC15

Tensione/Voltage U_e	V	60	110	220	380	500	600
Corrente/Current I_e	A	10	6	3	2	1,5	1,2

(1) A lancio di corrente.

(2) Di minima tensione.

(3) Per combinazioni diverse, acquistare elementi di contatto separati.

(4) Per prestazioni e caratteristiche dei contatti, vedere capitolo relativo nel catalogo pulsantiera "Serie EL-SG e 30" forniti con viti di fissaggio.

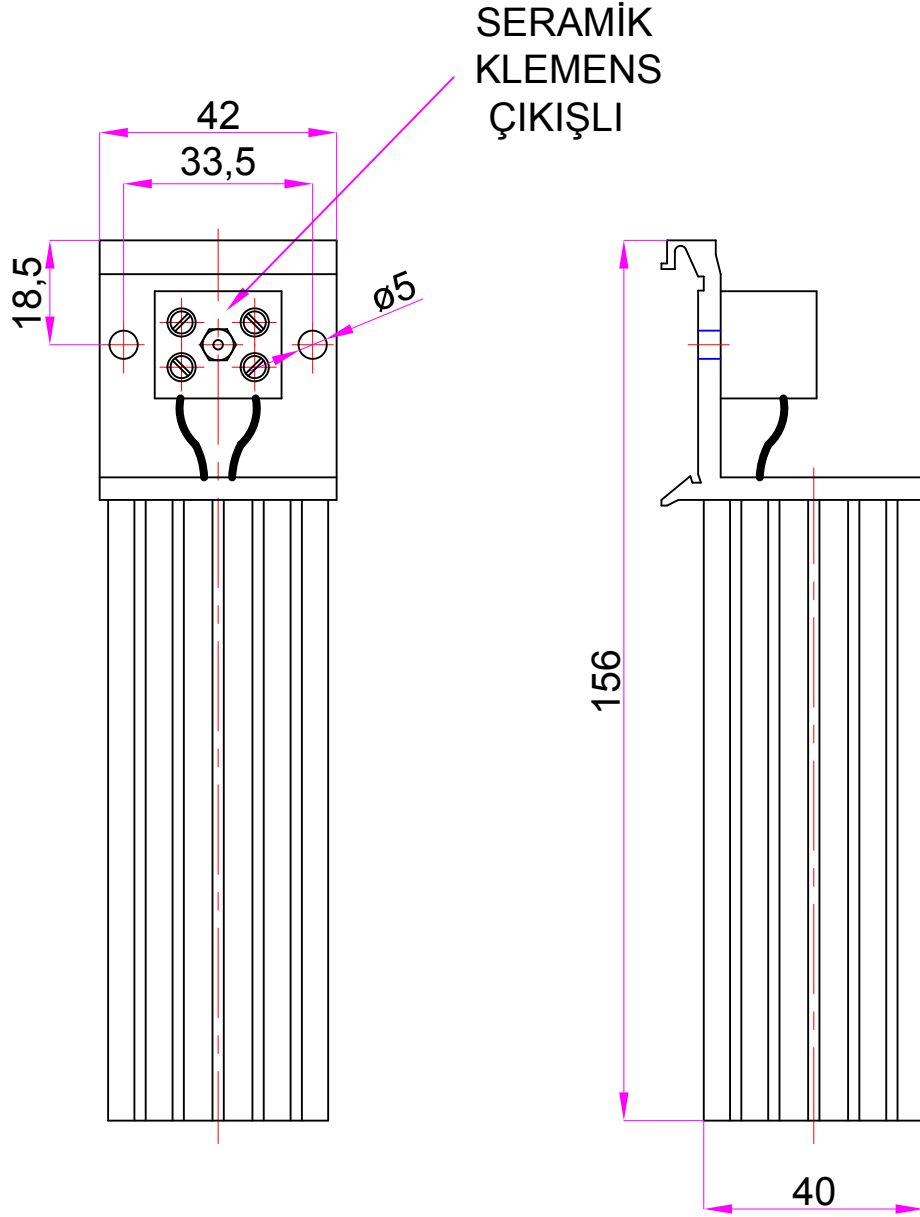
(1) Current inrush

(2) With minimum voltage

(3) For different combinations, purchase separate contact elements

(4) For contact performance and characteristics, see the related chapter in the push-button catalogue "Series EL SG e 30" c/w lock screws

REV 1		
REV 2		
REV 3		

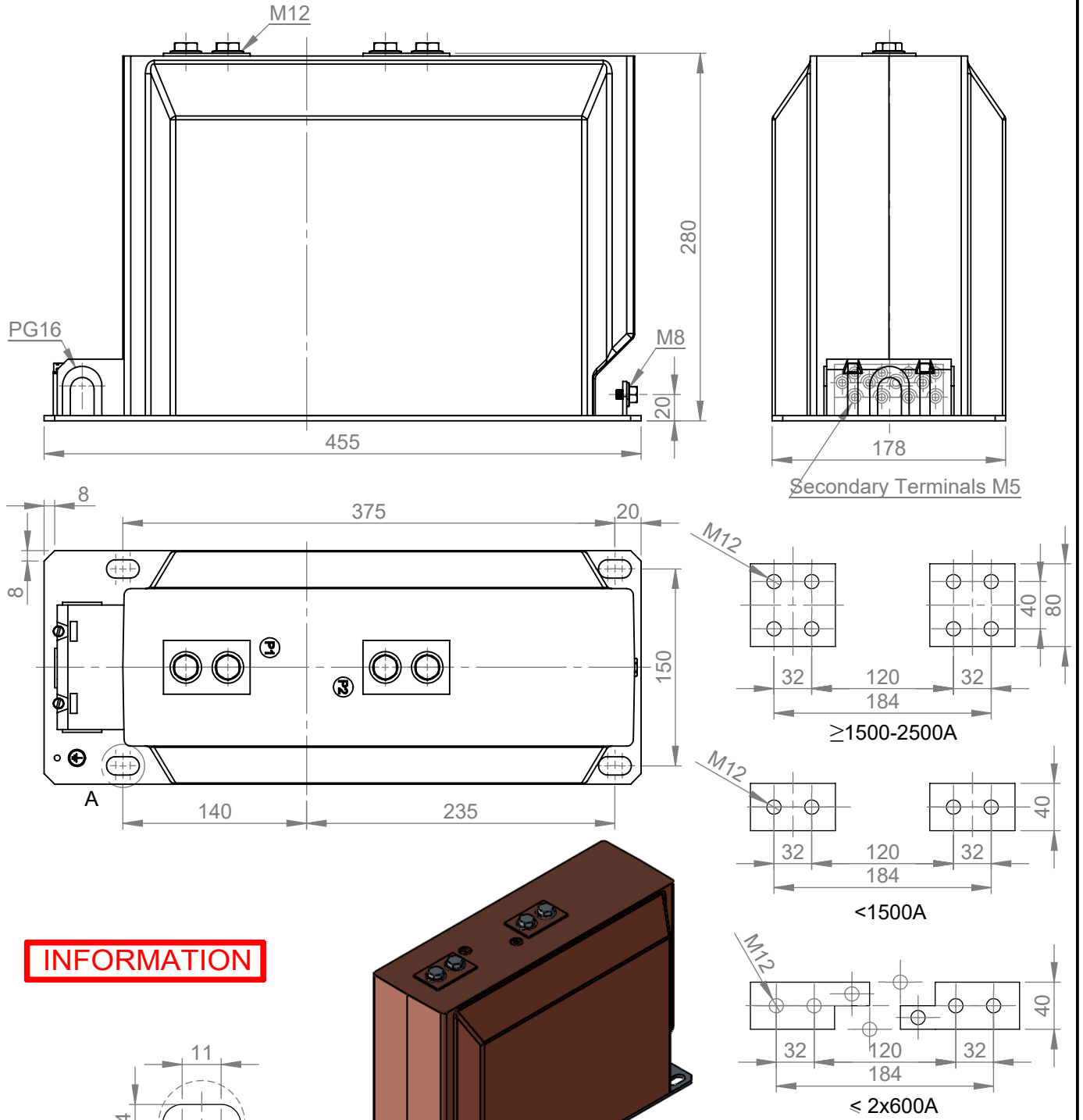


Çalışma Gerilimi : 100V (max.120V)
Rezistans Gücü : 300W

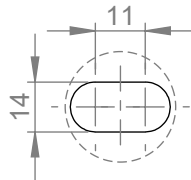
NOT : TÜM ÖLÇÜLER mm'DİR.

ADET	PARÇANIN ADI	POZ	MALZ.ÖLÇÜSÜ	MALZ.KOD.	RESİM NO.DİN	MALZ.TÜRÜ
DEĞİŞİKLİK	ÇİZEN	TARİH	ADI	İMZA	ESİTAŞ	
TOLERANS DİN 7168-m	KONTROL	12/12/2014	M.AKSU			
	HAZIRLAYAN		T.DEMIRCAN			
ÖLÇEK ---	47 Ω 100V (max.120V) 300W 60 sn. TOPRAK KAÇAK DİRENCİ			ONAY	HAM.MALZ.KODU	REZİSTANS 6835
					YARI MAMÜL.MALZ.KODU	
					8125-00	

REV 1	Base plate code has been added.	18/07/2013
REV 2		
REV 3		



INFORMATION



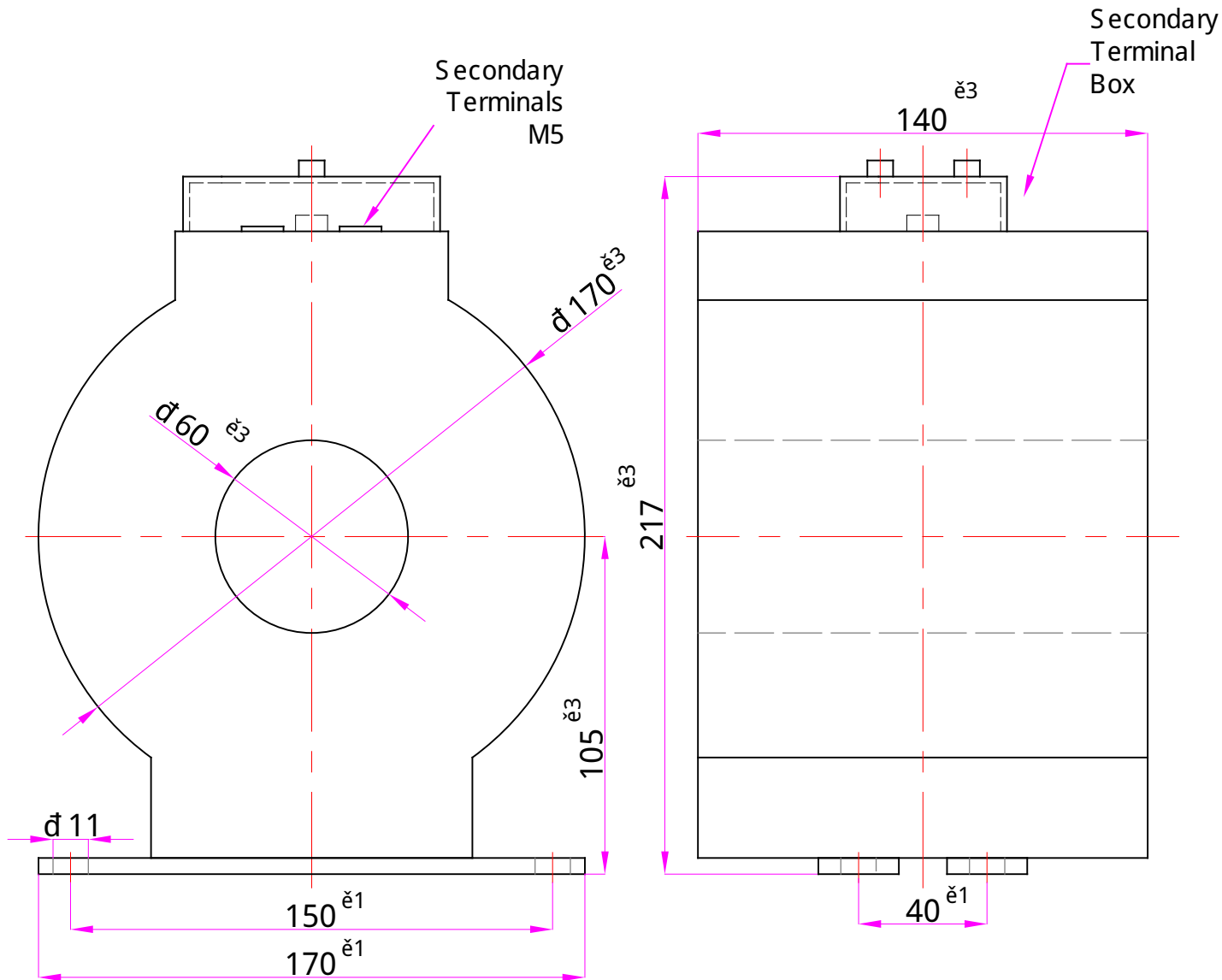
A-DETAIL
SCALE 3:1

NOTE: All dimensions are in mm.
Secondary terminals are at P1 (at P2 according to request).
Small deviations in dimensions and construction possible.

TIGHTENING TORQUE (Nm)	Min.	Max.
M5 (Secondary Terminal)	2.5	3.5
M8 (Ground Terminal)	15	20
M12 (Primary Terminal)	60	70

UNIT	PARTNAME	ITEM	MTRL.DIMEN.	MTRL.COD.	DRAWING NO.	CAST RESIN
REV.	DRW.BY	DATE	NAME	SIGNATURE		
TOLERANCE	CONTROL	DATE	NAME	SIGNATURE		
DIN 7168-g	PREPARED BY	CHECK BY	RAW.MTRL.CODE		ALT SAC 4401	
SCALE	ATB 20-3A (NEW) CURRENT TRANSFORMER				SEMI FINISHED MTRL.	
					5776-00	

REV 1		
REV 2		
REV 3		

**INFORMATION**

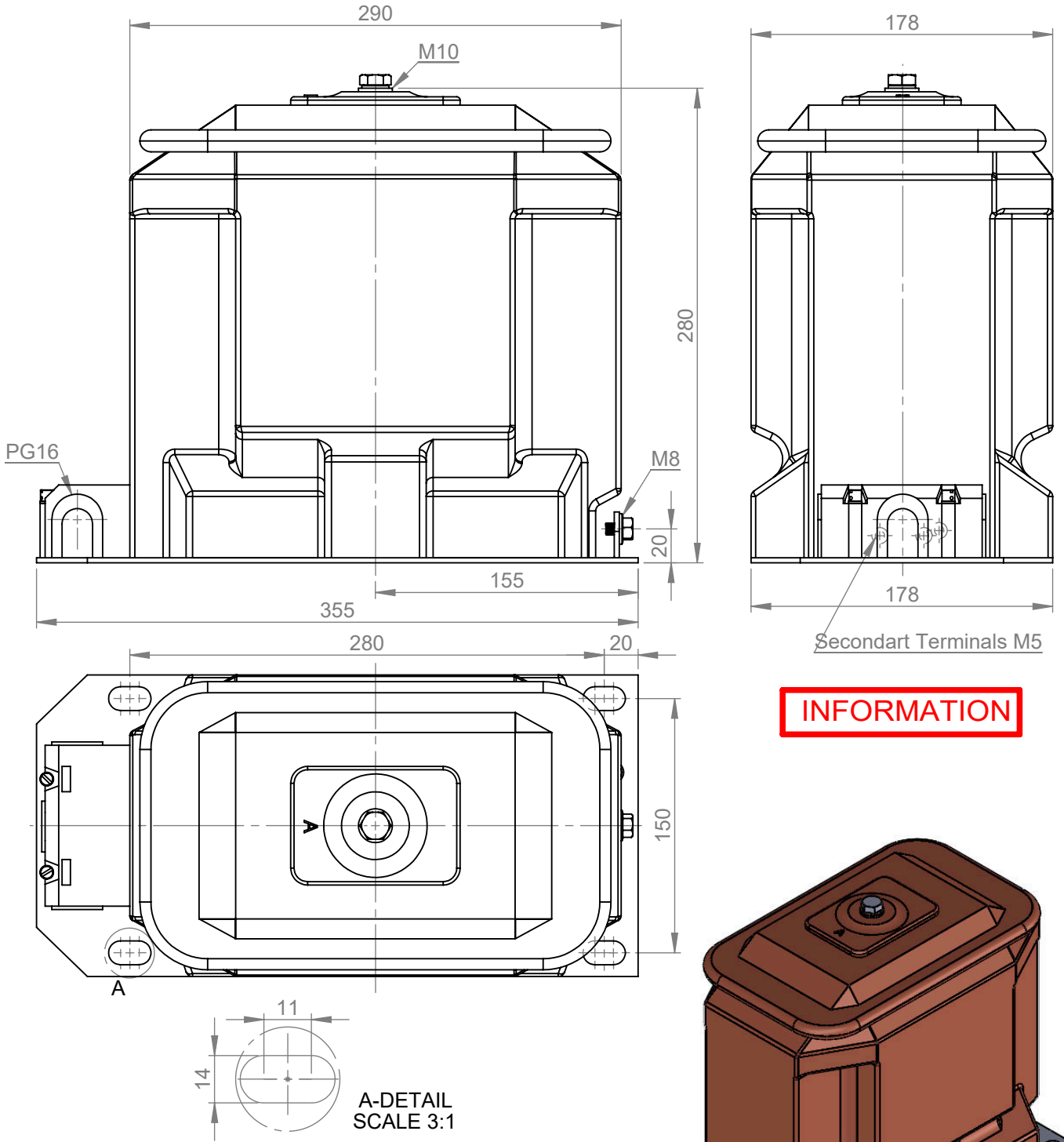
Insulation Material: Cast Resin

NOTE: - All dimensions are in mm.

- Small deviations in dimensions and construction possible.

						CAST RESIN
UNIT	PARTNAME	ITEM	MTRL.DIMEN	MTRL.COD.	DRAWING NO.	MTRL.TYPE
REV.	DRW.BY	DATE	NAME	SIGNATURE	ESMAH	
TOLERANCE	CONTROL	07/08/2012	M.AKSU			
	PREPARED BY		T.DEMIRCAN			
			CHECK BY		RAW.MTRL.CODE	
SCALE	KAT $\varnothing 60$ - $\varnothing 170$ -140 INDOOR RING TYPE L.V. CURRENT TRANSFORMER				SEMI FINISHED MTRL.	
					OFFER NUMBER	5837

REV 1	The drawing has been revised.	20/06/2011
REV 2		
REV 3		



TIGHTENING TORQUE (Nm)	Min.	Max.
M5 (Secondary Terminal)	2.5	3.5
M8 (Ground Terminal)	15	20
M10 (Primary Terminal)	30	40

Note: All dimensions are in mm.
Small deviations in dimensions and construction possible.

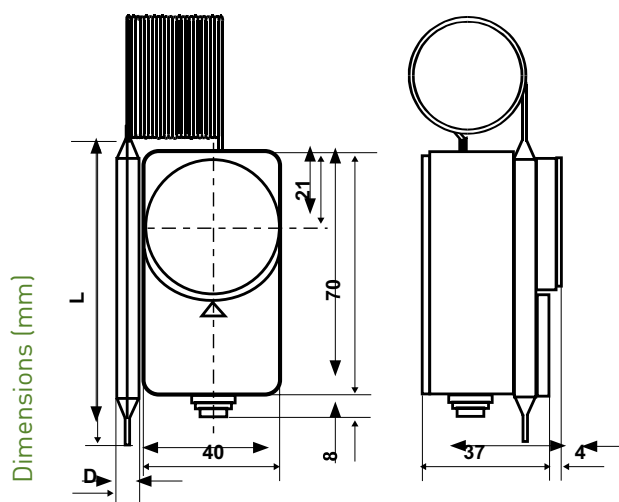
UNIT	PARTNAME	ITEM	MTRL.DIMEN.	MTRL.COD.	DRAWING NO.	CAST RESIN MTRL.TYPE
REV.	DRW.BY	DATE	NAME	SIGNATURE		
TOLERANCE DIN 7168-g	CONTROL	DATE	NAME	SIGNATURE		
SCALE	PREPARED BY	CHECK BY	VTB 20-K VOLTAGE TRANSFORMER			ALT SAC 3934
					RAW.MTRL.CODE	5382-00
					SEMI FINISHED MTRL.	

Thermostats with capillary and bulb for remote mounting

Thermostats with capillary to control the temperature in the boilers, in the air-conditioning and cooling systems, in household appliances, in electrical furnaces.



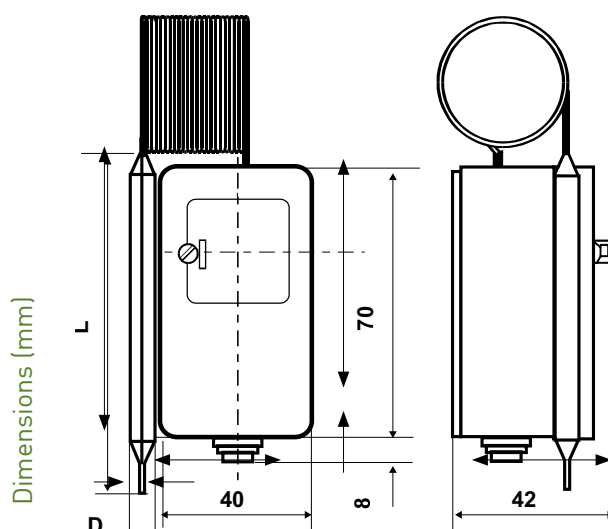
Type	L	D
C04A3	69	6,5
C04B3	65	5
C04C2	144	6
C04D2	144	6
C04E3	69	6,5



	Temperature range °C	Differential K	Calibration accuracy °C	Maximum bulb temperature °C	Admissible body temperature °C	Capillary length mt	Protection level
C04A3	10 ÷ 90	6 ± 1	± 3	150	120	1	IP40
C04B3	50 ÷ 300	8 ± 2	± 3	350	120	1,5	IP40
C04C2	- 20 ÷ 40	2 ± 0,5	± 2	80	60	1,5	IP40
C04D2	- 35 ÷ 20	2 ± 0,5	± 2	80	50	1,5	IP40
C04E3	40 ÷ 120	6 ± 2	± 3	150	120	1	IP40



Type	L	D
C04A3RI	69	6,5
C04B3RI	87	5
C04C2RI	144	6
C04D2RI	144	6
C04E3RI	69	6,5

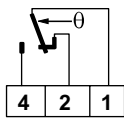


C04A3RI	10 ÷ 90	6 ± 1	± 3	150	120	1	IP40
C04B3RI	50 ÷ 300	8 ± 2	± 3	310	120	1,5	IP40
C04C2RI	- 20 ÷ 40	2 ± 0,5	± 2	80	60	1,5	IP40
C04D2RI	- 35 ÷ 20	2 ± 0,5	± 2	80	50	1,5	IP40
C04E3RI	40 ÷ 120	6 ± 2	± 3	150	120	1	IP40

*The differential is subtracted from the range value. The differential values refer to a thermal gradient of 1K/hour in liquid and 4K/hour in air.

ELECTRICAL FEATURES

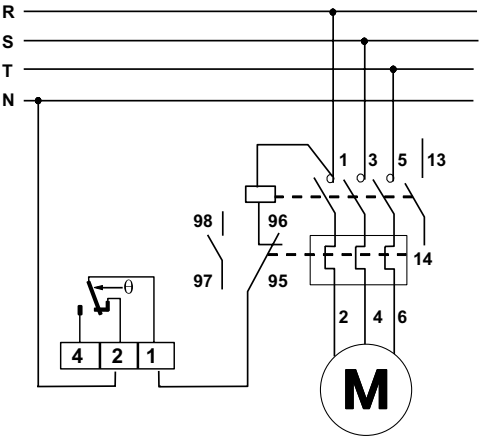
Two directions microswitch of instant action with AGcdO contacts.
Contact parameters in compliance with EN 60730-1:
15(6)A 250V~ 50Hz.



Parameters in compliance with EN 60947-5-1:
Nominal insulation voltage: U_i 380V~.
Nominal continuous current: I_{th} 15A.
Nominal operating current I_e

	220V~	250V~	380V~
Resistive load	AC-12	15A	10A
Inductive load	AC-15	2,5A	1,5A
Direct current	DC-13	0,2A	-

EXAMPLE OF ELECTRICAL CONNECTION



STANDARDS AND CERTIFICATES

Compliance with standards EN 60947-5-1, EN 60730-1.

INSTALLATION

Wall mounting for the thermostat body.
The bulb with capillary can be mounted remotely and is provided with seal caps or copper casing with GC 1/2 connection.

OPERATION

When the temperature increases: 1-2 are opening, 1-4 are closing.
Liquid expansion function.

FEATURES

Sensing element with stainless steel diaphragm.
Copper bulb and capillary. Copper bulb and capillary, tinned for types C04C2 and C04D2.
Base in shock-proof self-extinguishing thermoplastic material V0.
Electrical connection output with PVC cable gland.
The storage and transport temperature corresponds to the thermostat's body admissible temperature.
Unit weight 0,16 Kg.

ACCESSORIES



303298LA
Cable gland G1/2 for connection output in shock-proof self-extinguishing thermoplastic material V0.



G28
Copper sheath Gc 1/2 PN10 bar, length 177mm, supplied with spring to fix the capillary.
(Dimensions page 7)



G23
Seal cap Gc 1/2 PN10 bar, without sheath.
(Dimensions page 7)

EXECUTION UPON REQUEST WITH SPECIAL TEMPERATURE RANGE

	Temperature (1) range °C	Scale (*) angle °C	Range in execution fixed calibration
C04A xx yy	0 ÷ 120	80	10 ÷ 80
C04B xx yy	10 ÷ 300	250	
C04C xx yy	-35 ÷ 60	60	- 20 ÷ 60
C04D xx yy	-35 ÷ 60	75	
C04E xx yy	10 ÷ 320	270	

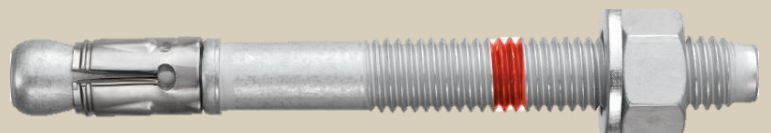
Note: Special temperature range is chosen in the range of temperature (1) and must always exceed the set value "scale angle" (*).
Example: C04 - 10/50, special execution C02, temperature range -10 ÷ 50°C, scale angle 60°C.



HST-3 EXPANSION ANCHOR

Technical Datasheet

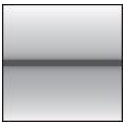
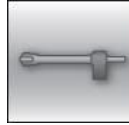
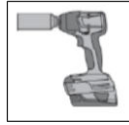
Update: Apr-18



HST3 Expansion anchor

Ultimate-performance expansion anchor for cracked concrete and seismic

Anchor version	Benefits
 HST3 HST3-R (M8-M24)	- Highest resistance for reduced member thickness, short spacing and edge distances - Increased undercut percentage in combination with optimized coating - Suitable for non-cracked and cracked concrete C 12/15 to C 80/95 - Highly reliable and safe anchor for structural seismic design with ETA C1/C2 approval - Flexibility with two embedment depths included in the ETA
 HST3-BW HST3-R-BW (M8-M24)	- Minimum edge and spacing distances reduced by up to 25% compared to HST - Design tension resistance increased by up to 66% compared to HST - Product and length identification mark facilitates quality control and inspection

Base material	Load conditions
 Concrete (non-cracked)  Concrete (cracked)	 Static/ quasi-static  Seismic ETA-C1/C2  Fire resistance
Installation conditions	Other information
 Hammer drilled holes  Diamond drilled holes  Hollow drill- bit drilling  Impact wrench with adaptative torque module	 European Technical Assessment  CE conformity  PROFIS Anchor design Software  FM approved

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical assessment ^{a)}	DIBt, Berlin	ETA-98/0001 / 2018-02-09
Fire test report	DIBt, Berlin	ETA-98/0001 / 2018-02-09
Shock approval	FOCP, Zurich	BZS D 08-602 / 2016-08-17

a) All data given in this section according to ETA-98/0001, issue 2017-20-07.

Static and quasi-static loading (for a single anchor)

All data in this section applies to:

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- **Steel** failure
- Minimum base material thickness
- Concrete C 20/25, $f_{ck,cube} = 25 \text{ N/mm}^2$

Effective anchorage depth for static

Anchor size			M8	M10		M12		M16		M20	M24
Eff. Anchorage depth	h_{ef}	[mm]	47	40	60	50	70	65	85	101	125

Mean ultimate resistance

Anchor size			M8	M10		M12		M16		M20	M24
Non-cracked concrete											
Tension N _{Ru,m}	HST3/HST3-BW	[kN]	15,9	17,0	29,2	23,7	33,2	35,1	52,5	68,1	79,7
	HST3-R/HST3-R-BW		15,9	17,0	29,2	23,7	33,2	35,1	52,5	68,1	79,7
Shear V _{Ru,m}	HST3/HST3-BW	[kN]	14,5	23,0	24,8	35,7	37,2	57,2	58,1	88,1	98,7
	HST3-R/HST3-R-BW		16,5	26,9	26,6	32,7	38,5	51,0	66,8	102,1	120,8
Cracked concrete											
Tension N _{Ru,m}	HST3/HST3-BW	[kN]	10,6	12,1	19,9	16,9	26,6	25,0	37,5	48,5	53,1
	HST3-R/HST3-R-BW		11,3	12,1	19,9	16,9	26,6	25,0	37,5	48,5	53,1
Shear V _{Ru,m}	HST3/HST3-BW	[kN]	14,5	23,0	24,8	35,7	37,2	57,2	58,1	88,1	98,7
	HST3-R/HST3-R-BW		16,5	26,9	26,6	32,7	38,5	51,0	66,8	102,1	120,8

Characteristic resistance

Anchor size			M8	M10		M12		M16		M20	M24
Non-cracked concrete											
Tension N _{Rk}	HST3/HST3-BW	[kN]	12,0	12,8	22,0	17,9	25,0	26,5	39,6	51,3	60,0
	HST3-R/HST3-R-BW		12,0	12,8	22,0	17,9	25,0	26,5	39,6	51,3	60,0
Shear V _{Rk}	HST3/HST3-BW	[kN]	13,8	21,9	23,6	34,0	35,4	54,5	55,3	83,9	94,0
	HST3-R/HST3-R-BW		15,7	25,6	25,3	31,1	36,7	48,6	63,6	97,2	115,0
Cracked concrete											
Tension N _{Rk}	HST3/HST3-BW	[kN]	8,0	9,1	15,0	12,7	20,0	18,9	28,2	36,5	40,0
	HST3-R/HST3-R-BW		8,5	9,1	15,0	12,7	20,0	18,9	28,2	36,5	40,0
Shear V _{Rk}	HST3/HST3-BW	[kN]	13,8	21,9	23,6	34,0	35,4	54,5	55,3	83,9	94,0
	HST3-R/HST3-R-BW		15,7	24,3	25,3	31,1	36,7	48,6	63,6	97,2	115,0

Design resistance

Anchor size			M8	M10		M12		M16		M20	M24
Non-cracked concrete											
Tension N _{Rd}	HST3/HST3-BW	[kN]	8,0	8,5	14,7	11,9	16,7	17,6	26,4	34,2	40,0
	HST3-R/HST3-R-BW		8,0	8,5	14,7	11,9	16,7	17,6	26,4	34,2	40,0
Shear V _{Rd}	HST3/HST3-BW	[kN]	11,0	17,5	18,9	27,2	28,3	43,6	44,2	67,1	62,7
	HST3-R/HST3-R-BW		12,6	20,5	20,2	24,9	29,4	38,9	50,9	77,8	88,5
Cracked concrete											
Tension N _{Rd}	HST3/HST3-BW	[kN]	5,3	6,1	10,0	8,5	13,3	12,6	18,8	24,4	26,7
	HST3-R/HST3-R-BW		5,7	6,1	10,0	8,5	13,3	12,6	18,8	24,4	26,7
Shear V _{Rd}	HST3/HST3-BW	[kN]	11,0	16,2	18,9	23,6	28,3	42,9	44,2	67,1	62,7
	HST3-R/HST3-R-BW		12,6	16,2	20,2	23,6	29,4	38,9	50,9	77,8	83,9

Recommended loads^{a)}

Anchor size		M8	M10		M12		M16		M20	M24	
Non-cracked concrete											
Tension N _{Rec}	HST3/HST3-BW	[kN]	5,7	6,1	10,5	8,5	11,9	12,6	18,8	24,4	28,6
	HST3-R/HST3-R-BW		5,7	6,1	10,5	8,5	11,9	12,6	18,8	24,4	28,6
Shear V _{Rec}	HST3/HST3-BW	[kN]	7,9	12,5	13,5	19,4	20,2	31,1	31,6	47,9	44,8
	HST3-R/HST3-R-BW		9,0	14,6	14,5	17,8	21,0	27,8	36,3	55,5	63,2
Cracked concrete											
Tension N _{Rec}	HST3/HST3-BW	[kN]	3,8	4,3	7,1	6,1	9,5	9,0	13,4	17,4	19,0
	HST3-R/HST3-R-BW		4,0	4,3	7,1	6,1	9,5	9,0	13,4	17,4	19,0
Shear V _{Rec}	HST3/HST3-BW	[kN]	7,9	11,6	13,5	16,8	20,2	30,6	31,6	47,9	44,8
	HST3-R/HST3-R-BW		9,0	11,6	14,5	16,8	21,0	27,8	36,3	55,5	59,9

a) With overall partial safety factor for action $\gamma = 1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations,

Seismic loading (for a single anchor)

All data in this section applies to:

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Minimum base material thickness
- Concrete C 20/25, $f_{ck,cube} = 25 \text{ N/mm}^2$
- $\alpha_{gap} = 1,0$ (using Hilti seismic filling set)

Effective anchorage depth for seismic C2 and C1

Anchor size	M8	M10	M12	M16	M20	M24
Eff, Anchorage depth h_{ef} [mm]	47	60	70	85	101	-

Characteristic resistance in case of seismic performance C2

Anchor size		M8	M10	M12	M16	M20	M24	
Tension N _{Rk, seis}	HST3 / HST3-BW	[kN]	3,0	10,4	17,9	24,0	31,1	-
	HST3-R / HST3-R-BW		3,4	10,4	17,9	24,0	31,1	-
Shear V _{Rk, seis}	HST3 / HST3-BW	[kN]	9,9	19,0	28,6	48,5	84,3	-
	HST3-R / HST3-R-BW		9,9	17,2	27,6	42,5	67,4	-

Design resistance in case of seismic performance C2

Anchor size		M8	M10	M12	M16	M20	M24
Tension $N_{Rd, se}$	HST3 / HST3-BW [kN]	2,0	6,9	11,9	16,0	20,7	-
	HST3-R / HST3-R-BW	2,3	6,9	11,9	16,0	20,7	-
Shear $V_{Rd, se}$	HST3 / HST3-BW [kN]	7,9	15,2	22,9	38,8	66,3	-
	HST3-R / HST3-R-BW	7,9	13,8	22,1	34,0	53,9	-

Characteristic resistance in case of seismic performance C1

Anchor size		M8	M10	M12	M16	M20	M24
Tension $N_{Rk, se}$	HST3 / HST3-BW [kN]	7,5	12,0	17,9	24,0	31,1	-
	HST3-R / HST3-R-BW	7,5	12,0	17,9	24,0	31,1	-
Shear $V_{Rk, se}$	HST3 / HST3-BW [kN]	16,6	25,8	39,0	60,9	99,4	-
	HST3-R / HST3-R-BW	19,5	28,4	44,3	70,2	99,4	-

Design resistance in case of seismic performance C1

Anchor size		M8	M10	M12	M16	M20	M24
Tension $N_{Rd, se}$	HST3 / HST3-BW [kN]	5,0	8,0	11,9	16,0	20,7	-
	HST3-R / HST3-R-BW	5,0	8,0	11,9	16,0	20,7	-
Shear $V_{Rd, se}$	HST3 / HST3-BW [kN]	13,3	20,6	31,2	48,7	66,3	-
	HST3-R / HST3-R-BW	15,6	22,7	33,2	54,5	66,3	-

Fire resistance

All data in this section applies to:

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- **Steel** failure
- Minimum base material thickness
- Concrete C 20/25, $f_{ck, cube} = 25 \text{ N/mm}^2$
- Hilti technical data for concrete strength class C55/67 to C80/95: for a structural element that fulfills the requirements according to DIN EN 1992-1-2 the fire resistance of C20/25 could be assumed.
- partial safety factor for resistance under fire exposure $\gamma_{M, fi} = 1,0$ (in absence of other national regulations)

Effective anchorage depth for static

Anchor size			M8	M10		M12		M16		M20	M24
Eff. Anchorage depth	h_{ef}	[mm]	47	40	60	50	70	65	85	101	125

Characteristic resistance

Anchor size			M8	M10		M12		M16		M20	M24
Fire Exposure R30											
Tension N _{Rk,fi}	HST3/HST3-BW	[kN]	0,9	1,5	2,4	2,3	5,0	4,4	7,1	9,1	12,6
	HST3-R/HST3-R-BW		1,9	1,8	3,0	3,2	5,0	4,7	7,1	9,1	12,6
Shear V _{Rk,fi}	HST3/HST3-BW	[kN]	0,9	1,5	2,4	2,3	5,2	4,4	9,7	15,2	21,9
	HST3-R/HST3-R-BW		4,9	4,7	11,8	8,9	17,1	16,9	31,9	37,0	62,8
Fire Exposure R120											
Tension N _{Rk,fi}	HST3/HST3-BW	[kN]	0,6	0,8	0,9	0,8	1,3	1,5	2,4	3,8	5,4
	HST3-R/HST3-R-BW		1,5	1,5	2,4	2,5	4,0	3,8	5,6	7,3	10,1
Shear V _{Rk,fi}	HST3/HST3-BW	[kN]	0,6	0,8	0,9	0,8	1,5	1,5	2,4	3,8	5,4
	HST3-R/HST3-R-BW		1,7	2,0	3,3	3,3	4,8	6,2	9,0	14,1	20,3

Design resistance

Anchor size		M8	M10		M12		M16		M20	M24	
Fire Exposure R30											
Tension	HST3/HST3-BW	[kN]	0,9	1,5	2,4	2,3	5,0	4,4	7,1	9,1	12,6
N _{Rd,fi}	HST3-R/HST3-R-BW		1,9	1,8	3,0	3,2	5,0	4,7	7,1	9,1	12,6
Shear	HST3/HST3-BW	[kN]	0,9	1,5	2,4	2,3	5,2	4,4	9,7	15,2	21,9
V _{Rd,fi}	HST3-R/HST3-R-BW		4,9	4,7	11,8	8,9	17,1	16,9	31,9	37,0	62,8
Fire Exposure R120											
Tension	HST3/HST3-BW	[kN]	0,6	0,8	0,9	0,8	1,3	1,5	2,4	3,8	5,4
N _{Rd,fi}	HST3-R/HST3-R-BW		1,5	1,5	2,4	2,5	4,0	3,8	5,6	7,3	10,1
Shear	HST3/HST3-BW	[kN]	0,6	0,8	0,9	0,8	1,5	1,5	2,4	3,8	5,4
V _{Rd,fi}	HST3-R/HST3-R-BW		1,7	2,0	3,3	3,3	4,8	6,2	9,0	14,1	20,3

Materials

Mechanical properties

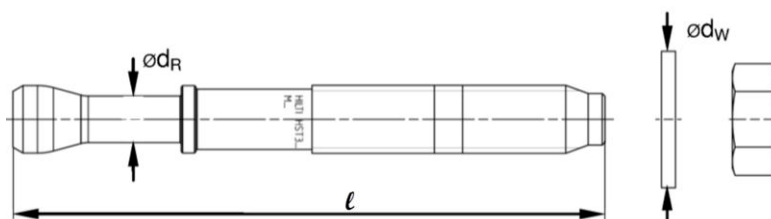
Anchor size		M8	M10	M12	M16	M20	M24
Nominal tensile strength $f_{uk,thread}$	HST3/HST3-BW	800	800	800	720	700	530
	HST3-R/HST3-R-BW	720	710	710	650	650	650
Yield strength $f_{yk,thread}$	HST3/HST3-BW	640	640	640	576	560	450
	HST3-R/HST3-R-BW	576	568	568	520	520	500
Stressed cross-section A_s		36,6	58,0	84,3	157	245	353
Moment of resistance W		31,2	62,3	109	277	541	935
Char, bending resistance $M^{0}_{Rk,s}$	HST3/HST3-BW	30	60	105	240	457	595
	HST3-R/HST3-R-BW	27	53	93	216	425	730

Material quality

Part		Material
Expansion sleeve	HST3/HST3-BW	M10, M16: Galvanized or Stainless steel M8, M12, M20, M24: Stainless steel
	HST3-R/HST3-R-BW	Stainless steel A4
Bolt	HST3/HST3-BW	Carbon steel, galvanized, coated (transparent)
	HST3-R/HST3-R-BW	Stainless steel A4, cone coated (transparent)
Washer	HST3/HST3-BW	Galvanized
	HST3-R/HST3-R-BW	Stainless steel A4
Hexagon nut	HST3/HST3-BW	Strength class 8
	HST3-R/HST3-R-BW	Stainless steel A4, coated

Anchor dimensions of HST3, HST3-BW, HST3-R, HST3-R-BW

Anchor size	M8	M10	M12	M16	M20	M24
Maximum length of anchor $\ell_{max} \leq$ [mm]	260	280	350	475	450	500
Shaft diameter at the cone d_R [mm]	5,60	6,94	8,22	11,00	14,62	17,4
Length of expansion sleeve ℓ_s [mm]	13,6	16,0	20,0	25,0	28,3	36,0
Diameter of washer $d_w \geq$ [mm]	15,57	19,48	23,48	29,48	36,38	43,38

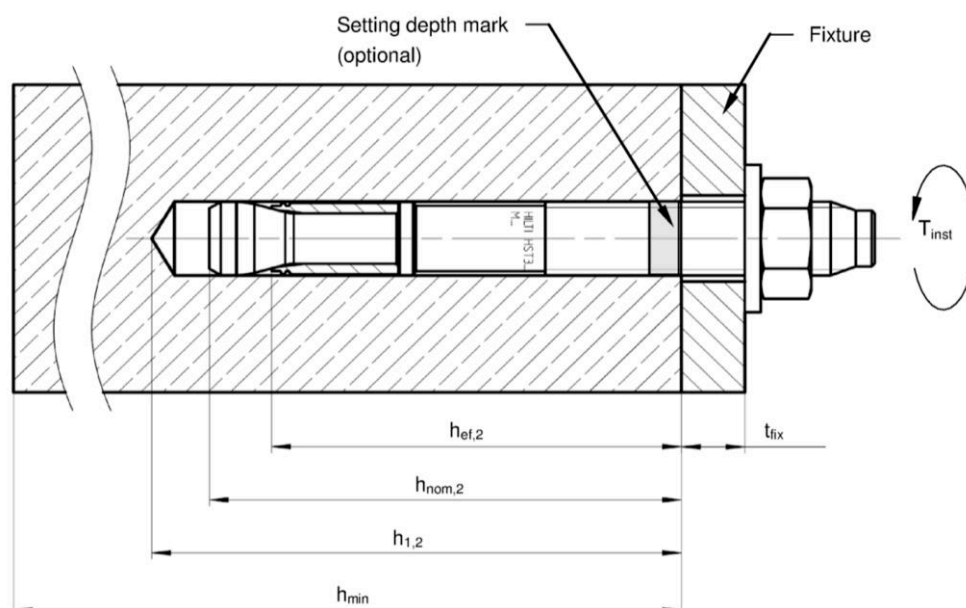


Setting information

Setting details

Anchor size			M8	M10	M12	M16	M20	M24
Nominal diameter of drill bit	d_o	[mm]	8	10	12	16	20	24
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	12,5	16,5	20,55	24,55
Effective embedment depth	$h_{ef,1}$	[mm]	-	40	50	65	-	-
	$h_{ef,2}$	[mm]	47	60	70	85	101	125
Drill hole depth ¹⁾	$h_{1,1} \geq$	[mm]	-	53	68	86	-	-
	$h_{1,2} \geq$		59	73	88	106	124	151
Thread engagement length	$h_{nom,1}$	[mm]	-	48	60	78	-	-
	$h_{nom,2}$	[mm]	54	68	80	98	116	143
Maximum diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22	26
Torque moment	T_{inst}	[Nm]	20	45	60	110	180	300
Maximum thickness of fixture	$t_{fix,max}$	[mm]	195	220	270	370	310	330
Width across	SW	[mm]	13	17	19	24	30	36

1) In case of diamond drilling +5 mm for M8 to M10 and +2 mm for M12 to M24.



Installation equipment

Anchor size	M8	M10	M12	M16	M20	M24
Rotary hammer	TE2(-A) – TE30(-A)				TE40 – TE80	
Diamond coring tool	DD-30W, DD-EC1					
Setting tool	Hilti S7W 6AT 22A – SI-AT-A22			-		
Hollow drill bit	-		TE-CD, TE-YD			
Other tools	hammer, torque wrench, blow out pump					

Setting parameters of HST3 / HST3-R for M8 and M10

Anchor Size			M8			M10		
Concrete class			C20/25 to C50/60 ^{a)} C55/67 to C80/95 ^{b)}		C12/15 ^{b)} C16/20 ^{b)}	C12/15 to C16/20 ^{a)}	C20/25 to C50/60 ^{a)} C55/67 to C80/95 ^{b)}	C12/15 ^{b)} C16/20 ^{b)}
Effective anchorage depth	h_{ef}	[mm]	47		47	40	60	60
Minimum base material thickness	h_{min}	[mm]	80	100	100	80	100	120
Minimum spacing in <i>non-cracked</i> concrete	s_{min}	[mm]	35	35	35	50	40	70
	for $c \geq$	[mm]	55	50	65	95	100	90
Minimum spacing in <i>cracked</i> concrete	s_{min}	[mm]	35	35	35	40	40	45
	for $c \geq$	[mm]	50	50	55	90	100	85
Minimum edge distance in <i>non-cracked</i> concrete	c_{min}	[mm]	40	40	50	50	60	80
	for $s \geq$	[mm]	50	50	80	190	90	120
Minimum edge distance in <i>cracked</i> concrete	c_{min}	[mm]	40	40	40	45	60	70
	for $s \geq$	[mm]	50	50	75	180	90	120
Critical spacing for splitting failure and concrete cone failure	$s_{cr,sp}$	[mm]	141		188	168	180	240
	$s_{cr,N}$	[mm]	141		141	120	180	180
Critical edge distance for splitting failure and concrete cone failure	$c_{cr,sp}$	[mm]	71		94	84	90	120
	$c_{cr,N}$	[mm]	71		71	60	90	90

Setting parameters of HST3 / HST3-R for M12 and M16

Anchor Size			M12			M16		
Concrete class			C20/25 to C50/60 ^{a)}	C20/25 to C50/60 ^{a)} C55/67 to C80/95 ^{b)}	C12/15 ^{b)} C16/20 ^{b)}	C20/25 to C50/60 ^{a)}	C20/25 to C50/60 ^{a)} C55/67 to C80/95 ^{b)}	C12/15 ^{b)} C16/20 ^{b)}
Effective anchorage	h_{ef}	[mm]	50	70		65	85	85
Minimum base material	h_{min}	[mm]	100	120	140	120	140	160
Minimum spacing in <i>non-cracked</i> concrete	s_{min}	[mm]	55	50	60	110	75	90
	for c	[mm]	110	100	70	140	140	145
Minimum spacing in <i>cracked</i> concrete	s_{min}	[mm]	50	50	50	80	65	70
	for $c \geq$	[mm]	105	90	70	120	130	125
Minimum edge distance in <i>non-cracked</i> concrete	c_{min}	[mm]	60	60	55	90	65	110
	for $s \geq$	[mm]	210	120	110	190	240	170
Minimum edge distance in <i>cracked</i> concrete	c_{min}	[mm]	55	60	55	80	65	90
	for $s \geq$	[mm]	210	120	110	170	240	165
Critical spacing for splitting failure and concrete cone failure	$s_{cr,sp}$	[mm]	180	210		280	208	340
	$s_{cr,N}$	[mm]	150	210		210	195	255
Critical edge distance for splitting failure and concrete cone failure	$c_{cr,sp}$	[mm]	90	105		140	104	170
	$c_{cr,N}$	[mm]	75	105		105	98	128

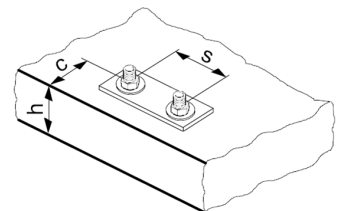
Setting parameters of HST3(-BW) / HST3-R(-BW) for M20 and M24

Anchor Size			M20		M24	
Concrete class			C20/25 to C50/60 ^{a)} C55/67 to C80/95 ^{b)}	C12/15 ^{b)} C16/20 ^{b)}	C20/25 to C50/60 ^{a)} C55/67 to C80/95 ^{b)}	C12/15 ^{b)} C16/20 ^{b)}
Effective anchorage	h_{ef}	[mm]	101		125	125
Minimum base material	h_{min}	[mm]	160	200	250	250
Minimum spacing in <i>non-cracked</i> concrete	HST3	s_{min} [mm]	120	90	125	180
	HST3-BW	for $c \geq$ [mm]	180	130	255	375
	HST3-R	s_{min} [mm]	120	90	125	180
	HST3-R-BW	for $c \geq$ [mm]	180	130	205	375
Minimum spacing in <i>cracked</i> concrete	HST3	s_{min} [mm]	120	90	125	140
	HST3-BW	for $c \geq$ [mm]	180	130	180	325
	HST3-R	s_{min} [mm]	120	90	125	140
	HST3-R-BW	for $c \geq$ [mm]	180	130	130	325
Min. edge distance in <i>non-cracked</i> concrete	HST3	c_{min} [mm]	120	80	170	260
	HST3-BW	for $s \geq$ [mm]	180	180	295	400
	HST3-R	c_{min} [mm]	120	80	150	260
	HST3-R-BW	for $s \geq$ [mm]	180	180	235	400
Min. edge distance in <i>cracked</i> concrete	HST3	c_{min} [mm]	120	80	125	230
	HST3-BW	for $s \geq$ [mm]	180	180	240	295
	HST3-R	c_{min} [mm]	120	80	125	230
	HST3-R-BW	for $s \geq$ [mm]	180	180	140	295
Critical spacing for splitting failure and concrete cone failure	$s_{cr,sp}$	[mm]	384		375	500
	$s_{cr,N}$	[mm]	303		375	375
Critical spacing for splitting failure and concrete cone failure	$c_{cr,sp}$	[mm]	192		188	250
	$c_{cr,N}$	[mm]	152		188	188

a) Data covered by ETA-98/0001 issue 2017-20-07.

b) Data covered by Hilti Technical Data

For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.



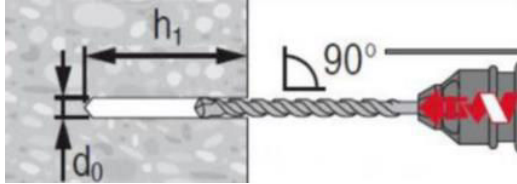
Setting instructions

*For detailed information on installation see instruction for use given with the package of the product

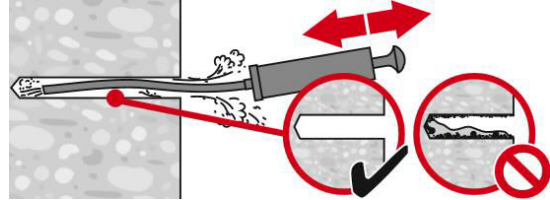
Setting instruction for HST3, HST3-BW, HST3-R, HST3-R-BW

Hammer drilling (M8, M10, M12, M16, M20, M24)

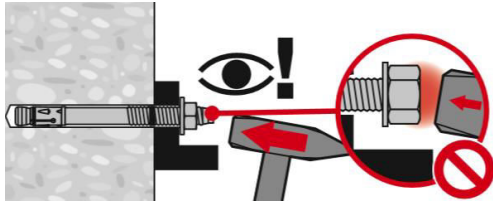
1. Drill the hole



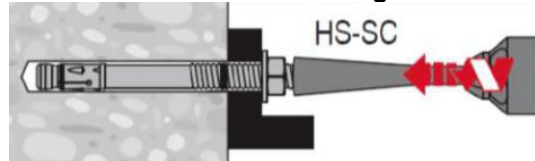
2. Clean the hole



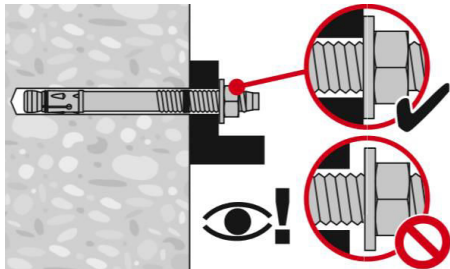
3a. Insert the anchor with hammer



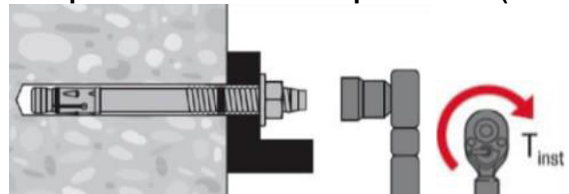
3a. Insert the anchor with setting tool HS-SC



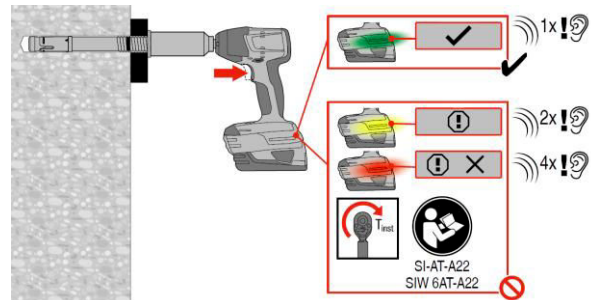
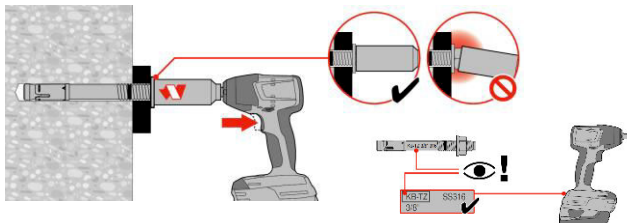
4. Check



5a. Torque with calibrated torque wrench (M8-M24)

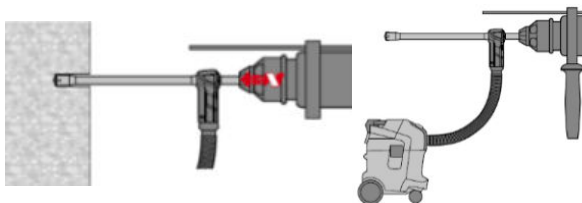


5b. Torque with impact wrench with Adaptive torque module (M8-M12)

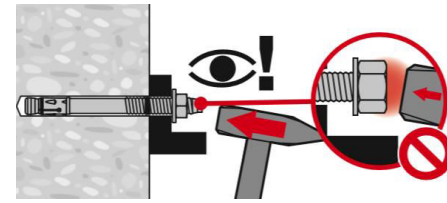


Hollow Drill Bit (M16, M20, M24), no cleaning required

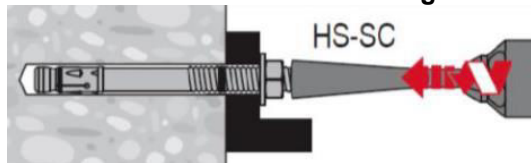
1. Drill the hole with the Hollow drill bit



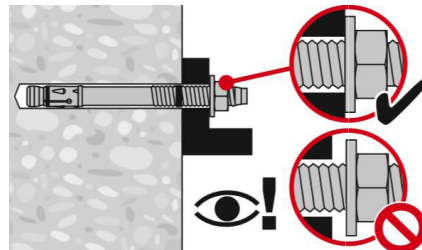
2a. Insert the anchor with hammer



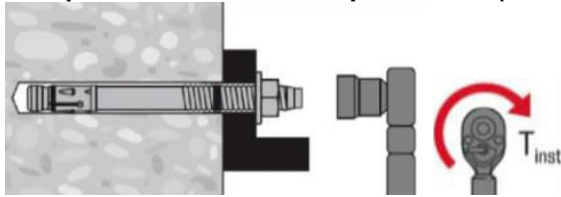
2b. Insert the anchor with setting tool HS-SC



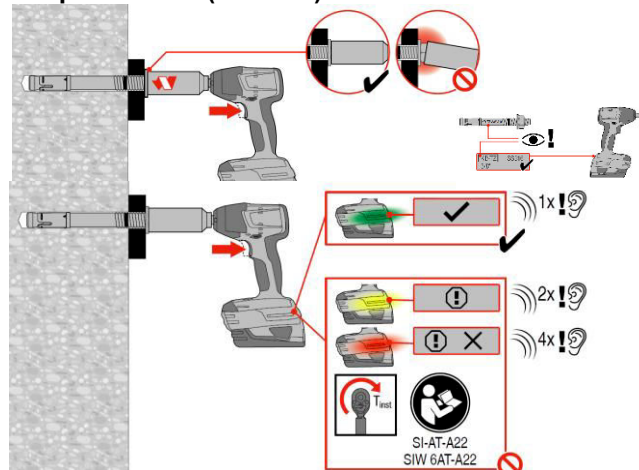
3. Check



5a. Torque with calibrated torque wrench (M8-M24)

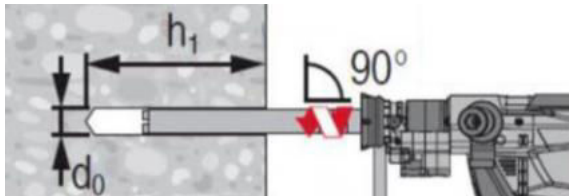


5b. Torque with impact wrench with Adaptive torque module (M8-M12)

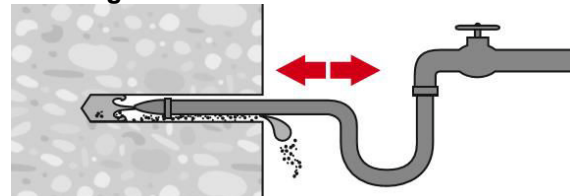


Diamond coring (M8, M10, M12, M16, M20, M24)

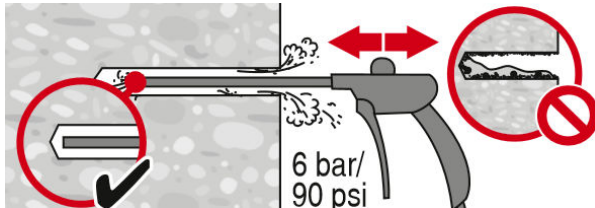
1. Core the hole



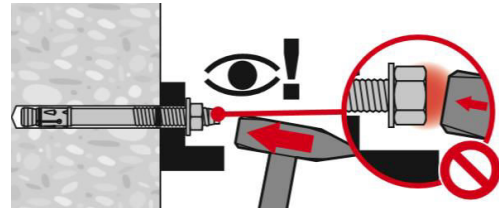
2. Flushing



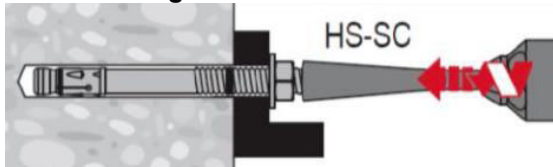
3. Clean the hole



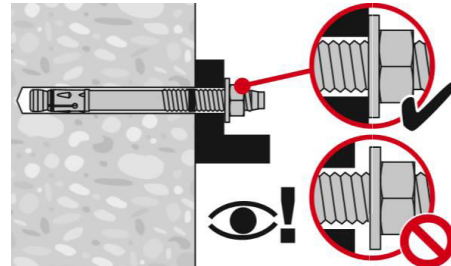
4a. Insert the anchor with hammer



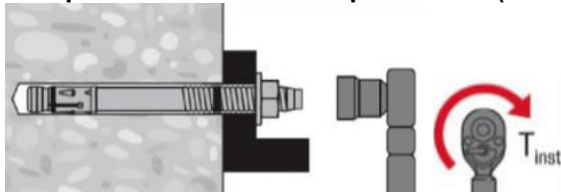
4b. Use a setting tool HS-SC



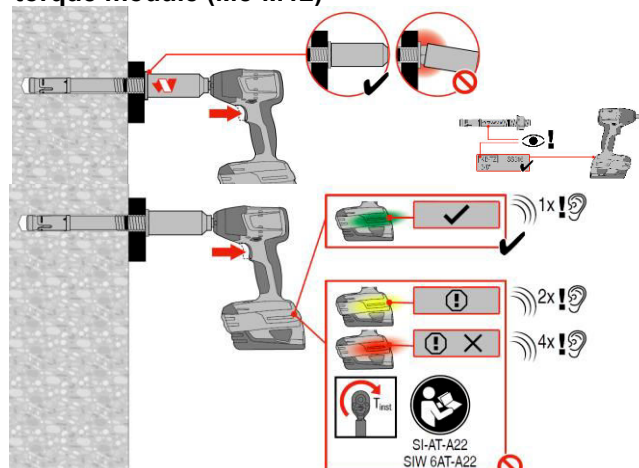
5. Check



6a. Torque with calibrated torque wrench (M8-M24)



6b. Torque with impact wrench with Adaptive torque module (M8-M12)





BUS Coupler Installation Guide

Epoxy Mica Capacitor Partial Discharge Sensors

Document ID: BUS Coupler Installation Guide



This symbol indicates Caution; there is a risk of electrical shock.



This symbol indicates Caution; important safety and/or maintenance information.



This symbol indicates important product information.



This symbol indicates Protective Conductor Terminal.



BUS Coupler Installation Guide

August	2016	Version 5.0	[Updated installation procedure, 1.3, 2.3, 4.3 add cable distance limitation to 4.1]
June	2013	Version 4.6.5	[addition for Adalet 316L Box field wiring condition]
October	2012	Version 4.6.4	[ISO-039 drawing update-Affects Fibreglass Term Box Only]
March	2012	Version 4.6.3	[ATEX/IECEX changes to marking label]
February	2012	Version 4.6.2	[ATEX/IECEX changes- remove fibreglass Term Box]
January	2012	Version 4.6.1	[ATEX, IECEX and torque spec changes]
August	2011	Version 4.5	[C-UL-us revisions]
November	2010	Version 4.4	[Addition of IECEX]
October	2009	Version 4.3	[Incorporate changes from 3.7 version; Clarification of section 2.2, Fig 12 & 14 changed, Appendix F updated & Figure 1]
June	2009	Version 4.2	[remove item #5 Shock Mounts on page 58]
April	2009	Version 4.1	[Appendix G added for ATEX]
November	2008	Version 3.5	[copper strap in Appendix B]
November	2008	Version 3.4	[copper strap]
August	2008	Version 3.3	[surge capacitor]
March	2008	Version 3.2	[company address]
December	2005	Version 3.1	[Appendix F added]
August	2003	Version 3.0	
May	2003	Version 2.4	
May	2000	Version 2.3	
July	1999	Version 2.2	
March	1999	Version 2.1	

This document is a guide only. It is not a machine-specific detailed instruction.

The installation of BUS couplers should be directed by an IRIS specialist or performed by a person trained in the installation procedure to ensure that the integrity of the system is not impaired. A companion document, the Iris Verification Guide, provides guidance on how to validate the installation.

Iris Power LP cannot take responsibility for installations performed by others.

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This document was originally composed in English and was subsequently translated into other languages. The fidelity of subsequent translations cannot be guaranteed. In case of conflict between the English version and another language version, the English version takes precedence.



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ATTENTION

Read Before Starting Installation

WARNING:

Installations are often carried out in conjunction with winding replacement or remedial work on an electrical rotating machine or dry type transformer. It is possible to have a partial discharge sensor installation partially completed but interrupted for high voltage testing. Refer to Section Offline testing 9 for technical guidance.

NOTES:

The Epoxy Mica Capacitor (EMC) sensor should be kept clean during the installation. Painting or coating the EMC with foreign materials may degrade the electrical tracking resistance of the EMCs. The surface of the EMC may be cleaned with cloth moistened with alcohol. If in doubt of the compatibility of the solvent with the EMC, contact Iris Field Service Technical Support [ref. Section 6].

The 6.9 kV and 16 kV EMCs may be mounted in any orientation – vertical upright, horizontal or suspended - where there is sufficient electrical clearance using the supplied metal clamps. The 25/28 kV EMCs can only be mounted in the vertical position when using the standard metal mounting clamps. For horizontal, suspended or tilted mounting of the 25/28 kV EMCs, refer to Section 11 for technical guidance.



Special mounting plates for installing EMCs on curved surfaces, such as within the isolated phase bus-bar (IPB) duct, are available from Iris and can be supplied upon request.

For windings with operating temperatures exceeding 90 °C at the copper conductor, mica tape and epoxy resin (not supplied with sensor kits) or high temperature silicone rubber tapes (also not supplied) should be used in place of the supplied insulating Boot. Copper temperatures tend to be 5 °C to 15 °C higher than indicated on the imbedded RTDs or thermocouples.



If proposing to use a PDA-IV™ test instrument to measure partial discharge to be installed in a BUS sensor configuration, consult Iris Field Service Technical Support for details on appropriate coaxial cable installation and verification requirements.



Do's and Don'ts



Do...

- Pay attention to electrical clearances, phase-to-phase, phase to its neutral and phase-to-ground/earth.
- Solidly ground/earth the termination box with the shortest possible conductor.
- Ground/earth the coaxial cable conduit at one location and ensure that this is the only point of grounding.
- Follow IRIS installation procedures.



Don't...

- **Don't** ever use adhesive backed cable tie anchors or standoffs to fasten the coaxial cables in place unless anchors are additionally secured by mechanical means.
- **Don't** run coaxial cables over high voltage components where they could eventually fall onto those components.
- **Don't** ever connect IPB ducts electrically together, or ground/earth across insulated supports using solid runs of metal conduit. Use non-conducting spacers, PVC conduit or insulators to maintain isolation between IPB phases and ground/earth.
- **Don't** bend high voltage cables to a radius less than 7 times the cable diameter.
- **Don't** mount 25/28 kV EMCs in any orientation other than upright unless special mounting blocks are used.
- **Don't** run coaxial cable conduit in parallel to the IPB shorting bridge and closer than 1 m (3 ft) to it.

1 Introduction

1.1 EMC Sensors

Epoxy Mica Capacitors or EMCs are high frequency sensors used to detect Partial Discharges (PD) occurring within stator windings of motors and generators, switchgears and dry type transformers [Figure 1]. The sensors are often referred to as BUS Couplers. EMC sensors can be used with the TGA-B™, TGA-BP™, or TGA-SB™ portable instrument, and the PDTrac™, PDTracII™, BusTrac™, BusTracII™, MCPDTracII™, MarineTracII™, BusGuard™ and BusGuardII™ continuous monitors. i

For information about the instruments or systems, please refer to the appropriate product brochure or user manual, or contact your Iris Sales Representative [ref. Section 6].

The EMCs are permanently installed external to the machine and transformer winding, on the main power connection or bus-bar, hence the name “BUS Coupler” or “BUS Sensor”. For installations on medium voltage metalclad switchgear, the EMCs are often located within the apparatus cubicles. Refer to the publication BUS Coupler Installation Guide for Switchgear for information on EMC installations for switchgear.

After installation, the time for a high frequency pulse to travel between the two EMCs connected to the same phase has to be measured. This “delay time” is used by the test instrument to discriminate between partial discharges originating within the machine or transformer and disturbances originating from the bus-bar and the electrical system. This is called a directional time-of-arrival installation of signal separation. It is this ability to separate the “machine” and “system” pulses that allows for accurate assessment of the PD data obtained during testing.



Figure 1.
6.9 kV, 16 kV and 25/28 kV
EMCs



NOTE: For information about verification and measuring delay times, please refer to the Iris Verification Guide or contact Iris Field Service Technical Support [ref. Section 6].

- 1 TGA-B, TGA-BP, TGA-SB, PDTrac, PDTracII, BusTrac, BusTracII, MCPDTracII, MarineTracII, BusGuard, BusGuardII are products of Iris Power

Often motors and transformers (and sometimes generators) are connected to the system using long lengths of power cable. Where the cable length is greater than 30 m (100 ft), a single sensor per phase can be mounted at the motor/transformer/generator terminals and still achieve disturbance discrimination similar to a two-sensor directional system. This is possible because the high frequency “system” pulses that might normally be detected by the test instrument are severely attenuated by the power cable and, therefore, are not recognized by the test instrument as a partial discharge pulse. Please contact Iris Field Service Technical Support if unsure whether a single-ended installation is appropriate for your application [ref. Section 6].

1.2 Description of EMCs

EMCs are made from high quality tracking resistant electrical grade epoxy, fully-rated for 6.9 kV, 16 kV, 25 kV or 28 kV phase-to-phase class installations [Figure 1].

This epoxy encapsulates an internal mica capacitor stack having a capacitance of 80 pF $\pm$ 4 pF [ref. Section 1.3]. The EMCs have a minimum partial discharge extinction voltage of 8 kV, 18.6 kV, 29 kV and 32.3 kV ac respectively, at 1 pC sensitivity and tested according to ASTM D1868 and IEC 60270.

All Iris EMCs are ac hi-pot (proof) tested for 1 minute at voltages shown in Section 1.3, Technical Specifications.

The EMCs resemble post type insulators and, except for the high voltage termination, require no further insulation to be applied in the field.

Figure 1 shows the four EMC types, in three sizes, offered by Iris. The physical dimensions and weight for each type are shown in Section 1.3, Technical Specifications.

All four voltage classes of EMCs have embedded brass terminals, top and bottom, to which the electrical connections are made [Figure 2 - EMC Cross Section]. The low voltage terminal is recessed into the bottom of the epoxy and contains a 3/8 in. stainless steel plug. This plug is drilled and tapped to accept a small slotted screw to which the centre conductor of a 50 Ω coaxial cable is attached. The brass terminal on the high voltage (top) end of the EMC is drilled and tapped to accept a 3/8 in. fine thread brass bolt. The high voltage cable supplied comes with an “L” shaped ring lug crimped on one end, which is used for bolting the cable to the top of the EMC.

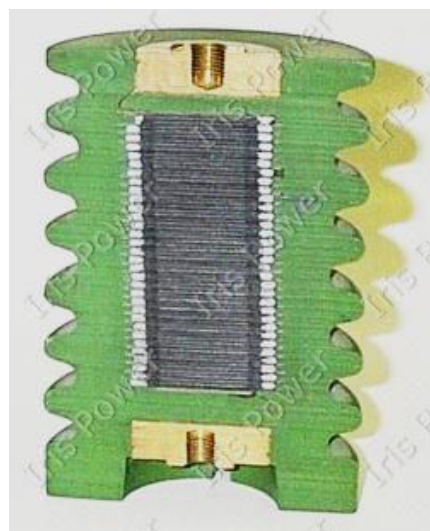


Figure 2 - EMC Cross Section



1.3 Technical Specifications

Table 1 Sensor Specifications

Sensor		
Sensor type	Capacitive	
Nominal capacitance, pF	80 ± 4	
Dissipation Factor, %	0.10	
Nominal bandwidth into 50 Ω, MHz	40 – 350 (-3 dB)	
Rated voltage, kV	6.9; 16; 25; 28	
BIL, kV	175 for 16 kV EMC > 200 for 25 kV EMC	
Test voltage, for coupler rated:	AC, kV for 1 minute	DC, kV for 1 minute
6.9 kV	15	> 50
16 kV	33	> 50
25 kV	51	> 50
28 kV	57	> 50
Connections	High Voltage	One point brass terminal, accepts 3/8" bolt (about 10 mm-no metric analog)
	Low Voltage	One point steel terminal, accepts 3/32 in (about 4 mm-no metric analog) screw
Mounting method	1. Two steel clamps or 2. Fiberglass mounting blocks; see Section 2.4 and 11	
Applicable standard compliance	IEC 60034 Part 27-2; IEEE 1434, ANSI/IEEE C37.20.2-1987	



Sensor (Continued)			
Colour	Grass green		
Dimensions/ Weight for coupler rated:	Height	Diameter	Weight
6.9 kV	95 mm (3.75 in)	89 mm (3.5 in)	1.1 kg (2.4 lb)
16 kV	127 mm (5.1 in)	89 mm (3.5 in)	1.6 kg (3.5 lb)
25/28 kV	206 mm (8.1 in)	89 mm (3.5 in)	2.0 kg (4.4 lb)
Operating temperature, °C (°F)	-50 to +130 (-58 to +266)		

Table 2 HV / LV Cable Specifications

High Voltage Jumper Cable		
High Voltage Cable	Ethylene propylene rubber (EPR) red jacket, semi-conductive tape wrapped stranded copper	
Voltage Rating and Gauge	For 6.9 kV and 16 kV EMC	For 25 kV and 28 kV EMC
	15 kV / [#2 AWG]	35 kV / [1/0 AWG]
Maximum Operating Temperature	+90 °C	
Supplied length, per coupler [one end is terminated into a right angled lug; the other is open and trimmable]	610 mm / 2 ft	
Top of the coupler insulation	Silicone Rubber Boot™ rated to 105 °C	
Low Voltage Cable		
Cable type	RF Coaxial cable type RG58 C/U MIL-17	
Supplied length	Reel of 152 m / 500 feet per 6-EMC sensor kit Reel of 76 m / 250 feet per 3-EMC sensor kit	
Maximum Operating Temperature	-40 to +85 °C (Refer to Section 4 for different ratings)	



1.4 Installation Schedule

A typical double-ended (6-sensor) installation can take from 2 to 4 days depending on the unit, mounting locations, amount of work performed in advance and the number of people assigned to the job. For a typical installation supervised by an Iris specialist, the customer should provide 2 to 3 people, based on the complexity of the installation, to support the Iris specialist on-site. For single-ended (3-sensor) installations, a duration of 1 to 1.5 days with 2 people for support is typical.

The BUS sensor installation procedure is divided into several components. However, some aspects of the various components are interdependent and should be done in a logical order to avoid repeating work or idling. With this in mind, a suggested schedule is as follows:

Part 1

- Safety Training and Site Orientation of Iris specialist (if required)
- Isolate unit / get the required permits / access unit / remove covers etc...
- Select the locations for mounting the EMCs and termination box. Select routing for any conduit.
- Consult the Iris Verification Guide to confirm the suitability of the selected locations using the site verification procedures.
- Review list of materials required (conduit lengths, mounting hardware and tools required etc.).
- Start to mark and drill the holes for the EMC mounting plates – design and fabricate any custom mounting bracket supports required.

Part 2

- Install the termination box.
- Install metallic conduit (rigid or flexible) for the coaxial cables between the EMCs and termination box where required. Pay attention to any areas that may have high magnetic fields.



The coaxial cable **must** run along a grounded/earthed metal surface. When routing the coaxial cable inside a metallic enclosure, it may not be necessary to run the cable in conduit.

- Cut and prepare coaxial cable ends – each pair of coaxial cables for the same phase must be of equal lengths.
- Push the high voltage cable through the insulating Boot and attach the cable to the EMC.



The high voltage end of the EMC **must** be insulated, even if installed in an area of all bare bus-bar. The only exception would apply for installation of EMC inside an IPB duct where there is limited distance from the top of the coupler to the bus-bar conductor.

- Connect the coaxial cables in the appropriate manner to the sensors.

Part 3

- Mount the EMCs at the required locations and run the coaxial cables to the termination box.
- Connect the high voltage cable from the EMC to the high voltage bus-bar or terminal.
- Perform initial verification according to Iris Verification Guide and check that coaxial cables of the same phase are the same in lengths.
- Solder the coaxial cables to the circuit board behind the termination panel.
- Perform final verification according to Iris Verification Guide.
- Insulate the high voltage bus-bar connection point as required and secure the coaxial cables.



2 EMC Sensor Installation

2.1 Overview

Normally, two EMCs are installed on each phase (6 per winding) and are referred to as a “sensor pair”.

A typical BUS sensor installation normally consists of 3 “Machine” sensors, 3 “System” sensors and a termination box (a double-ended installation). For most dry type transformers, motors and some smaller generators, only 3 “Machine” sensors and a termination box may be required (a single-ended installation). The EMCs are normally located in metal enclosures such as machine terminal boxes, bus-bar ducts, circuit breaker cubicles or transformer and/or occasionally surge protection cubicles. The termination box is usually located midpoint between the EMC locations for a double-ended installation or on the outside of the terminal box for a single-ended installation.

2.2 EMC Sensor Location

A review of the electrical arrangement and schematic drawings will assist in the planning of the installation and will help identify the most probable locations for the EMCs. However, once at site, a visual inspection of the proposed EMC locations is always necessary to confirm that EMC placements will not interfere with or compromise the designed electrical integrity of the equipment. Consult Iris Field Service Technical Support if in doubt about the correct application and location of EMCs [ref. Section 0].

For each phase, the first set of EMC is mounted at the motor, generator or transformer terminals and is referred to as the “**Machine**” sensor (Figure 2. Schematic of a BUS Directional Sensor Installation). This sensor measures the PD originating within the machine stator winding or high voltage apparatus.



Install the “Machine” sensor at the main leads (or as close as possible to the stator or transformer winding) for maximum sensitivity to the winding PD.

For double-ended installations, the second sensor must be installed a minimum distance of 2 metres (about 7 feet) along the bus-bar from the “**Machine**” sensor and is referred to as the “**System**” sensor. This second coupler permits the test instrument to recognize system disturbance and ensure that it is not counted as Unit PD. System disturbance and Unit PD are recognized and classified by the test instrument based on the time and direction of pulse arrival.

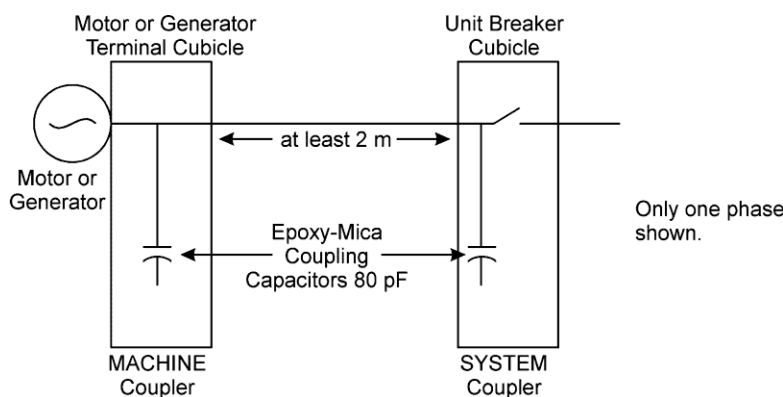


Figure 2. Schematic of a BUS Directional Sensor Installation

The **“System” sensors** are typically installed within the generator main bus-bar duct. In some cases, this sensor may be installed in the potential transformer (PT) cubicle or in the circuit breaker cubicle.



If there is a choice in the System coupler installation locations, a preference should be given to the optimal distance from the “Machine” sensors, 3-7 m (10-25 ft) along the bus-bar. There are limitations to the maximum distance of the “System” sensor from the “Machine” sensor, please consult Iris Field Service Technical Support

Please contact Iris Field Service Technical Support if the “System” sensor is to be placed on a tap-off of the main bus-bar to ensure the verification for installations involving taps has been satisfied. [See the Iris Verification Guide.] If there is no PT cubicle, then the “System” sensors can be fitted into the circuit breaker cubicle.

It is desirable that there be no feeders, splits, CTs, PTs or similar devices located between the coupler pairs on any given phase. The presence of such between the sensors can lead to signal distortion and imperfect disturbance separation. It is therefore preferred to connect both “Machine” and “System” sensors between the main terminals and these devices. Where there is insufficient length of bus-bar (less than 2 m or 7 ft) or insufficient space between the high voltage terminals of the winding and such devices, then the “Machine” sensor should still be installed as close to the terminals as possible. The “System” sensor, in this case, will have to be mounted beyond these devices and there may be some effect on the response from the “System” sensor.

If under special circumstances that the “Machine” sensors have to be installed after such devices, a sensitivity comparison is necessary to find the extent of attenuation that may have been caused. It is the purpose of the sensor installation verification to determine the behaviour and coupler response in order to understand how data collection may be affected in these cases. **Please contact Iris Power for more information, assistance or the verification service.**

In some cases, surge capacitors are present near the machine or transformer terminals. In this situation, it may be necessary to install the “Machine” sensors on the bus-bars near the surge capacitors.



Do not connect the EMC to the top of the surge capacitor or after the cable connecting the surge capacitor to the bus-bar; connect the EMCs directly to the bus-bar.

Connect the EMC closer to the winding than to the surge capacitor, and at least 1 m (3 ft) away along the bus-bar from the surge capacitor. Hence the “Machine” coupler connection point should always be closer to the winding than the surge capacitor connection point. If the separation between “Machine” sensor connection point and the surge capacitor connection point is less than 1 m (3 ft) along the bus-bar, then a coupler response comparison with and without the surge capacitor is recommended. Please contact Iris Power if this service is required.

When selecting the location for mounting the EMCs, ensure there is sufficient space to install the EMCs without compromising the electrical clearance and the high voltage integrity (BIL) of the output bus-bar. There must be adequate voltage clearance between the low voltage portion of the EMC and coaxial cable to any high voltage component. Similarly, the high voltage portion of the EMC (including insulated top of the EMC) and the HIGH VOLTAGE cables must be a safe distance from any grounded/earthed structures and other phases.

The recommended and absolute minimum distances in air between insulated high voltage and low voltage components are:

Table 3 High Voltage Clearance Requirements

EMC Rated Voltage	Recommended	Minimum
6.9 kV	25 mm (1 in)	6 mm (0.25 in)
16 kV	50 mm (2 in)	20 mm (0.75 in)
25/28 kV	150 mm (6 in)	63 mm (2.5 in)



Figure 3. EMC Mounted in a Bus-bar Duct

Generally, there is sufficient room within the terminal box or bus-bar duct to house the EMC. However, it is not uncommon to modify the existing bus-bar duct or terminal box to accommodate the EMC installation, provided electrical clearances can be maintained.

Figure 3 shows where an access point was cut in the bus-bar duct to accommodate the installation. When selecting the location to install the EMCs, consideration must be given to the necessary conduit run [see Section 4].

Coaxial cables may be run inside machine and transformer terminal boxes, and PT cubicles etc. to a suitable exit point for the conduit. When routing the coaxial cables from the EMCs to the coupler termination box, the coaxial cables must be run along a grounded/earthed metallic surface.

Once a location is selected, then verification using site verification couplers (SVCs) should be performed in accordance with the Iris Verification Guide.

2.3 High Voltage Connection

The high voltage side of the EMC is connected to the generator, motor or transformer terminals/bus-bar using the supplied high voltage cable. The cable is fully insulated for 15 kV or 35 kV class of operation (supplied according to EMC voltage rating) and is unshielded; therefore, no electrical stress relief is required. The high voltage cable should be routed so as to maintain adequate electrical clearances to ground/earth and to other phases for the voltage class of the machine or transformer [Ref. Table 3 High Voltage Clearance Requirements].



The high voltage cables are trimmable and should be kept as short as practical. However, the supplied 35 kV cable is very rigid. If it is too short and installed without a smooth bend, it may transfer mechanical tension to the top of the EMC due to thermal expansion and contraction of the bus-bar, resulting in coupler damage.



CAUTION: The 25/28 kV EMCs should only be mounted upright unless mounting blocks are used [see 11]. Refer to Section 2.4 for EMC Sensor Mounting considerations. The 6.9 kV and 16 kV EMCs may be mounted in any orientation (upright, horizontal, or suspended).

Determine where the EMC high voltage cable connection will be made to the machine or transformer. There are basically three choices as shown below:

2.3.1.1 High Voltage Cable

The 15 kV and 35 kV insulated high voltage cable supplied by Iris can be connected directly to a terminal or bus-bar.



[Note: These EMCs in Figure 4 have yet to be insulated.]

**Figure 4 . EMC Connected to a Bus-bar
in Duct**



CAUTION: Although rare, some bus-bars have a semi-conductive coating over the insulation; usually it is black in colour. In this case, the insulation should NOT be disturbed and another connection point should be used for the EMCs. Contact Iris Technical Support if in doubt.



Figure 5 - Use of copper strap to make connection (yet to be insulated)



In the event that there is limited space between the top of the EMC and the bus-bar, a few options can be considered.

2.3.1.3 Straight Cable Lug

Use a straight cable lug on the high voltage cable to connect it to the EMC high voltage terminal and mount the EMC at a sufficient distance away from the connection point. Please observe adequate electrical clearances.



Figure 6 Use of straight lug

2.3.1.4 Uninsulated high voltage cable

A short, flexible and un-insulated conductor can be connected directly between the EMC high voltage terminal and the bus-bar. Caution should be exercised to ensure that the conductor never comes in contact or reduces electrical clearances to low voltage or other phases. A braid type conductor is **NOT** recommended. The supplied high voltage cable with carefully stripped insulation (to preserve the black semi-conductive tapes) would be a choice as shown in Figure 7



Figure 7 . High Voltage Connection with a Stripped High Voltage Cable

2.3.1.5 Copper Strap

In certain circumstances, where there is a sufficient distance (more than 400 mm or 16 in) between the top of the coupler and the bus-bar connection point (longitudinal distance along the length of bus-bar and not headroom above coupler), a copper conductor can be installed directly between the EMC high voltage terminal and the bus-bar. Note that the conductor should have an “S” bend in it to allow for bus-bar movement due to longitudinal thermal movement and 100/120 Hz vibrations (shown in Figure 8). The distance between the S-bend and the coupler should exceed 300 mm (12 in) to allow for some flexibility. Please note that copper thicker than 2 mm or copper that has not been annealed is too rigid for such connection. Care should be taken if the high voltage bus-bar experiences large thermal movement; otherwise the EMC can be damaged by a tight connection.



This connection type is **NOT** recommended for installations in IPB or on machines that are frequently power cycled!

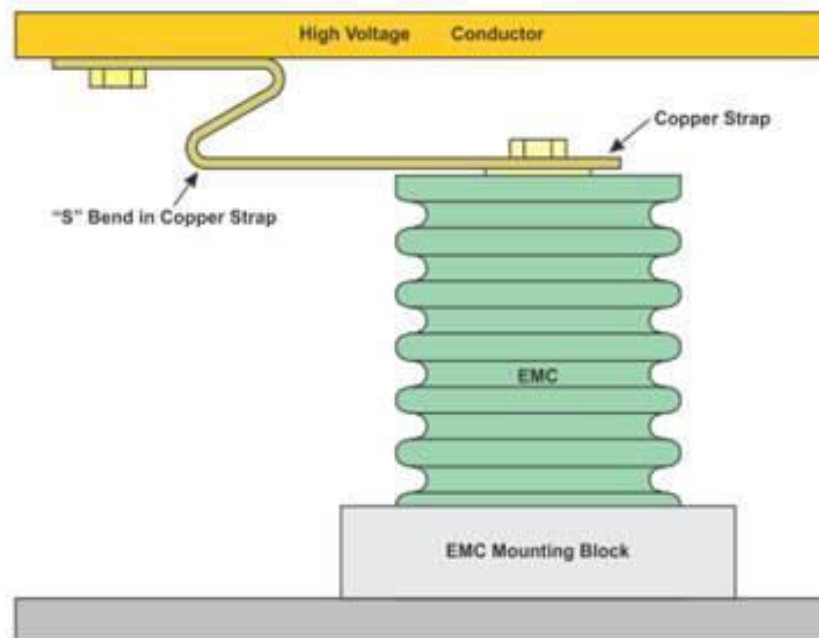


Figure 8 Application of an Annealed Copper Strap to Connect to Non-vibrating Conductor

2.3.2 Steps for preparing the high voltage cable:

1. Temporarily attach a high voltage cable to the EMC and select the most suitable mounting location. See Section 2.4 for EMC Sensor Mounting Considerations.



Figure 9 Typical Installation

- Ensure that the bending radius of the high voltage cable is not less than 7 times of the cable diameter. It is preferable that the high voltage cable be oriented to curve back across the top of the EMC once installed [Figure 9] .
- Ensure main clearances, phase-to-phase and phase-to-ground/earth, are not compromised [Table 3].



2. Determine where the high voltage cable will connect to the terminal or bus-bar and whether existing connection bolts can be used or if new holes are required. The installation kit provides the appropriate brass hardware in both metric (M10) and imperial (3/8 in) sizes.
3. Assuming the insulated high voltage cable is to be connected to the EMC, determine the length of cable required to connect the top terminal of the EMC to the selected spot on the bus-bar or connector. Allow sufficient length so the cable will not be under tension. Trim the high voltage cable to suit and crimp on the straight ring lug (supplied with the coupler kit) or a cable lug suitable for the installation.



Where there is minimum separation between the “Machine” and “System” sensors that is not much longer than 2 m (6 ft), the high voltage cables must be cut to identical lengths for each sensor pair.

4. If the supplied high voltage cable is not used, then an unshielded cable of equivalent or larger copper conductor size must be used and kept to a minimum length. Iris recommends a maximum length of 600 mm (2 ft).



CAUTION: The Epoxy Mica Capacitor (EMC) sensor should be kept clean during the installation. Painting or coating the EMC with foreign materials may degrade the electrical tracking resistance of the EMCs. The surface of the EMC may be cleaned with cloth moistened with alcohol. If in doubt of the compatibility of the solvent with the EMC, contact Iris Field Service Technical Support [ref. Section 6.1].

2.4 EMC Sensor Mounting Considerations

Each EMC is clamped into place on a suitable flat surface using the two-piece mounting clamp (supplied with coupler kits). The mounting clamp should fit snugly and securely in the machined groove at the base of the EMC. If this is not the case, please contact Iris Field Service Technical Support. The 6.9 kV and 16 kV EMCs may be mounted in any orientation (vertical upright, horizontal or suspended) - where there is sufficient electrical clearance.



CAUTION: The 25/28 kV EMCs should only be mounted upright unless mounting blocks are used.

For installations that require mounting of the 25/28 kV EMC not in the vertical upright position, Iris can, as an option, supply special mounting blocks manufactured for that purpose. Iris can also supply as an option, mounting brackets fabricated to “tilt” the EMC at no greater than a 45° angle from the vertical. See Section 11 for further information, or contact Iris Field Service Technical Support.

The standard two-piece mounting bracket slides into a machined groove at the base of the EMC and has four slotted holes to accommodate M6 or ¼ in bolts for securing the brackets in place. Use the dimensioned drawing in Section 7 to lay out and drill the holes for the EMC mounting brackets. The holes can be drilled using an M7 or 5/16 in drill bit, or if the hole is to be tapped use an M5 or 13/64 in drill bit.

Iris also supplies, as an option, steel mounting plates for installing EMCs within the IPB duct or on other curved surfaces as shown in Figure 10. The plate is used to give the EMC a flat mounting surface and stability to reduce mechanical stresses on the EMC.



Mounting the plate and brackets **lengthwise** along the duct allows for maximum clearance and mechanical rigidity.

Please contact Iris Field Service Technical Support for further information [ref. Section 6].



Figure 10. EMC Mounted on Standard Curved Surface Mounting Plate



Figure 11. EMC on a Custom Fabricated Mounting Plate

In some situations, a plate on which the EMCs will be secured will need to be custom fabricated on-site and installed, an example of which is shown in Figure 11.



When installing 6.9 kV & 16 kV couplers in the horizontal position, the mounting brackets should be aligned vertically (at 12 and 6 o'clock of the EMC) as shown in Figure 12.

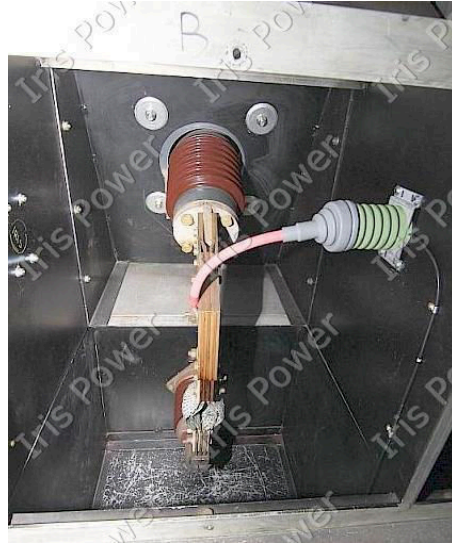


Figure 12. Horizontal Mounting of 16 kV EMC

2.5 Insulating the EMC

The high voltage connection at the top of the EMC must be insulated regardless of the location selected for the installation. The only exception is when the EMC is installed inside an IPB duct and there is insufficient room for the insulation.



A preformed silicone rubber mould, or “Boot” (supplied with coupler kits) seals tightly over the high voltage cable and the first shed of the EMC.

Both the Boot and tapes are designed for normal operating temperatures (below 90 °C or 219 °F) and non-radiation environments. For other application areas, the customer must provide suitable insulation.

Steps for Insulating the EMC with the Boot:

1. Prior to installing the Boot, position the EMC and determine which way the EMC clamps will be mounted, and the position where the coaxial cable will exit the EMC in relationship to the mounting clamps.

Due to the nature of the high voltage cable connection to the top of the EMC, the cable will be offset from centre and may influence the preferred orientation with respect to the coaxial cable. Therefore, when planning the installation of the EMC, ensure the slot for the coaxial cable exit (at the bottom of the EMC) is oriented in a direction not facing the mounting bracket.

2. The Boot has a two-step “neck” to accommodate either the 15 kV or 35 kV high voltage cables. When installing with the 35 kV cable, trim off the smaller diameter “neck”. Care must be taken to ensure that the remaining part of the Boot is not damaged. Use a sharp knife or razor knife for trimming the Boot.



3. Take the Boot in hand and collapse it like an accordion. The Boot will be installed over top of the right angled lug. If desired, smear a light coat of silicone approximately 50 mm (2 in) up the high voltage cable from the right angled lug, which will act as a lubricant and facilitate sliding the Boot on the cable. The recommended silicone is “Clear Guide”, a wire pulling lubricant or SU5005RTV silicone adhesive (both of them not provided), which is both a lubricant and a sealant.

4. Carefully insert the right angled lug through the neck of the Boot. Slide and push the Boot high enough so that there is sufficient clearance to install and tighten the bolt through the lug to the top of the EMC.



5. Bolt the high voltage cable to the top of the EMC; check the orientation of the cable before tightening to ensure that the cable will bend smoothly with sufficient curvature over the top of the EMC. Place a small dab of "Loc-tite" (not provided) on the brass bolt and tighten in place.

6. Start the lip of the Boot over the first shed of the EMC, place hands on each side and gently stretch and roll the Boot to the front of the EMC using a slightly downward pressure. This will force the Boot over the shed and snap into place. The Boot should **ONLY** cover the first shed of the EMC. No lubrication or sealing is required.





7. Once the Boot is positioned over the EMC, straighten the high voltage cable and position the neck of the Boot so that it is in a relaxed position as shown.
8. Wipe off any excess silicone. If RTV silicone adhesive is being used, allow it to set for half an hour before installation.



CAUTION: Do not paint the silicone rubber Boot or the EMC.

9. To remove the Boot from the EMC - with both hands, hold the rim of the Boot and gently pull it away from the EMC and at the same time peel it back towards the high voltage cable.



In the event that the Boot is a loose fit over the 15 kV cables (the same cables used with the 6.9 kV and 16 kV couplers), it is recommended that two half-lap layers of Silicone Guideline tape be wrapped around the top of the Boot and cable. This will seal the top rim of the Boot to the cable, preventing the ingress of moisture and contaminants. Iris recommends a full layer (i.e. the width of the tape) of Silicone Guideline tape on the boot and a full layer on the high voltage cable be applied as shown.



3 Termination Box Installation

3.1 Overview



For ATEX/IECEX Standard (Stainless Steel) Termination Box Installation instruction, see Appendix H. For c-UL-us Listed Termination Boxes, entries to the devices covered must be suitable for Class II, Division 2, Groups F and G Hazardous Locations, temperature range of $-20\text{ }^{\circ}\text{C} \leq T_{amb} \leq 50\text{ }^{\circ}\text{C}$, and must be installed in accordance with the wiring methods of the US National Electrical Code (See Appendix G).

There are 4 types of termination boxes:			
List	Photograph	Description	Certification
1		PDTrac Termination Box (Fibreglass, with a latched lid)	None
2		Standard Termination Box (Fibreglass)	None
3		Stainless Steel Termination Box for Hazardous Locations	ATEX/IECEX certified c-UL-us certified
4		Stainless Steel Termination Box for Ordinary Locations	None



Figure 13. Standard Termination Box

Each type of termination box contains the BNC jacks and the terminal circuit board(s) to which the coaxial cables from the EMCs are terminated [Figure 13].

RG58 (50 Ω) coaxial cables are used to connect the EMCs to the circuit board. The circuit board contains a 1500 Ω resistance and 75 V surge arrester (spark gap) on each connector. The resistors ensure that the normal voltage from all EMCs will be less than 600 mV, depending on the operating voltage of the winding [refer to Section 5. Sensor Maintenance].

For Iris continuous monitors (Trac, TracII, Guard and GuardII units), please refer also to the appropriate installation guides.



CAUTION: Iris EMC sensors must be connected to an Iris termination box or approved equivalent at all times to provide safety to the installation and personnel.

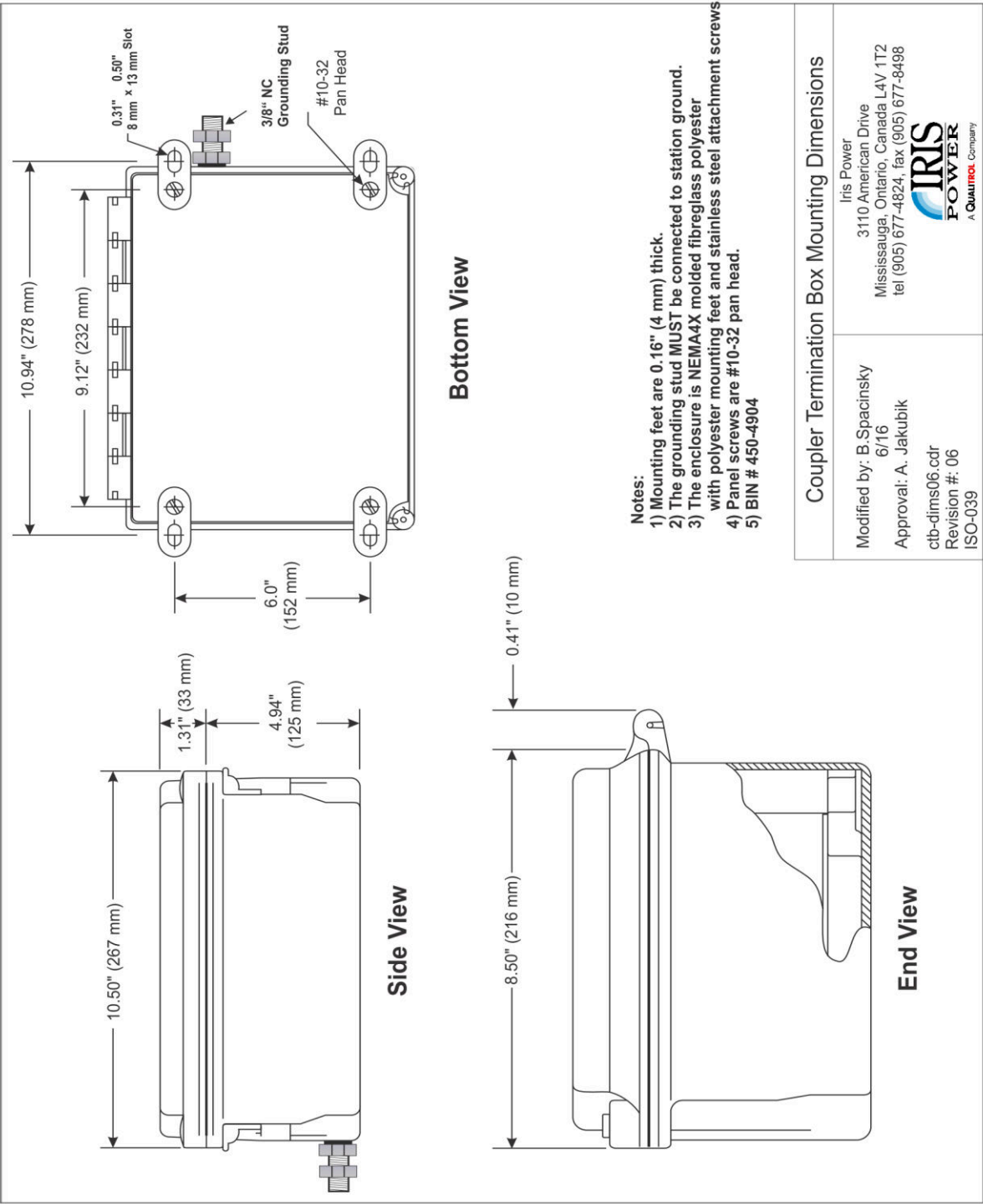


Figure 14 - Standard Fiberglass Termination Box

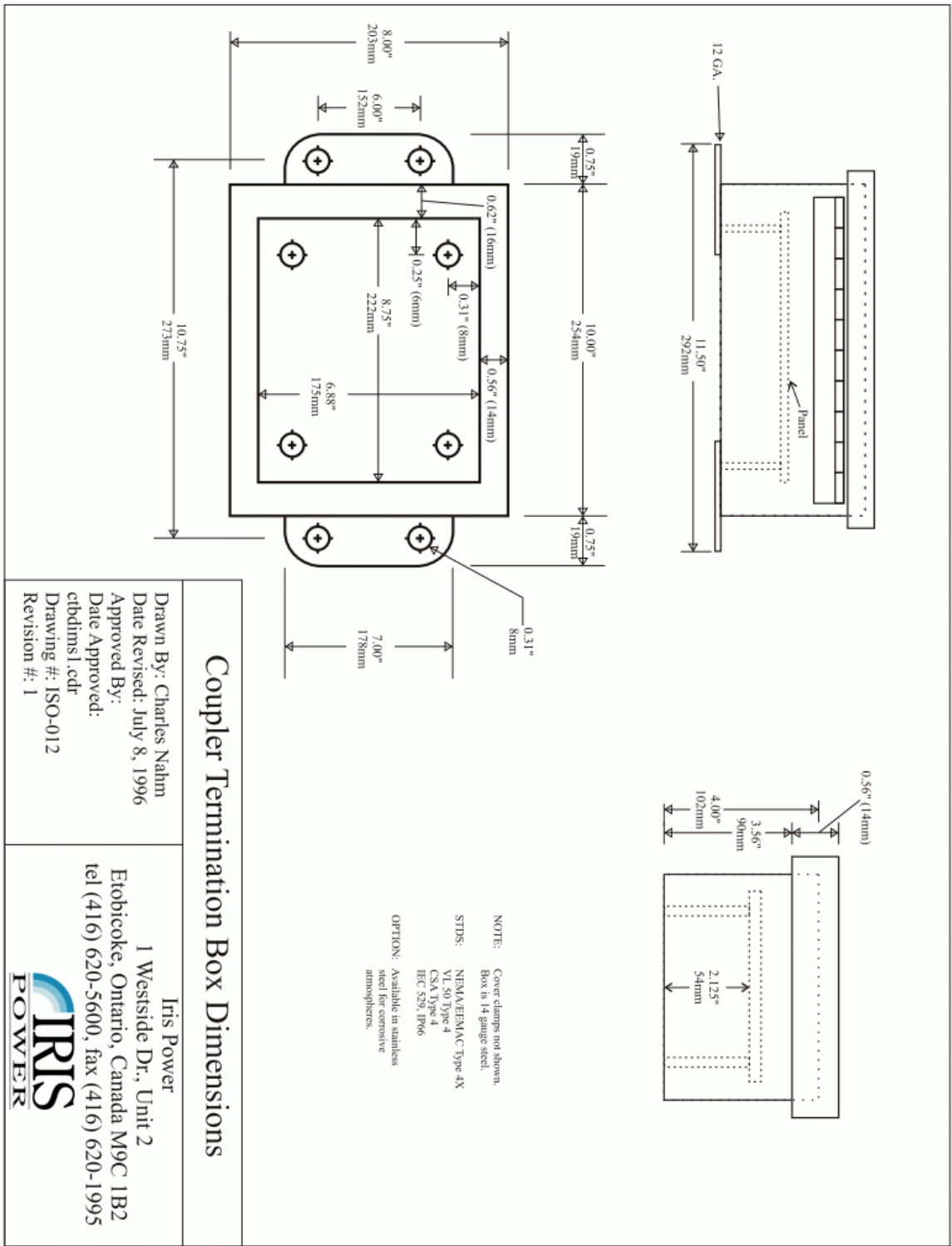


Figure 15 - Stainless Steel Termination Box for Ordinary Locations

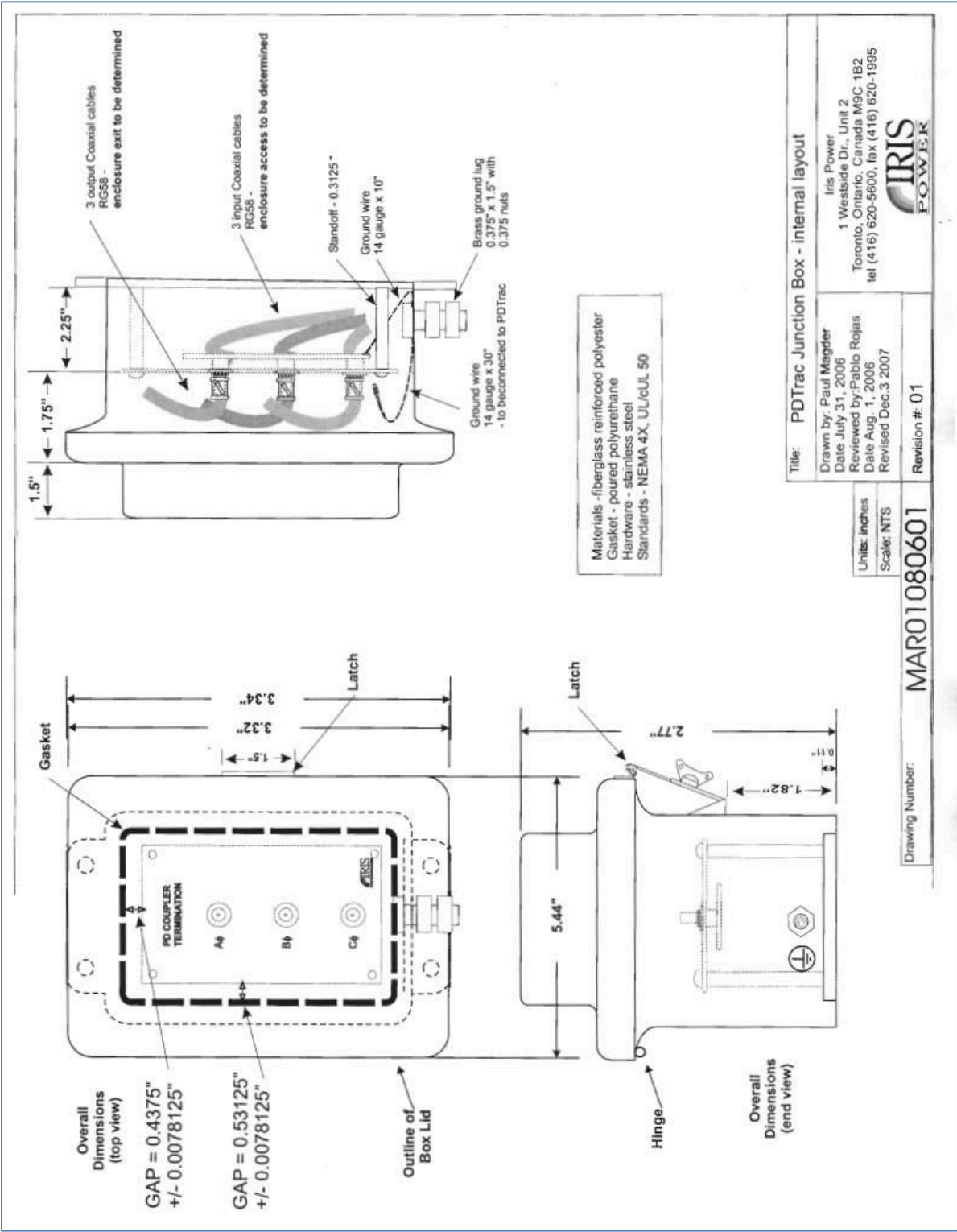


Figure 16 - PDTrac Termination Box

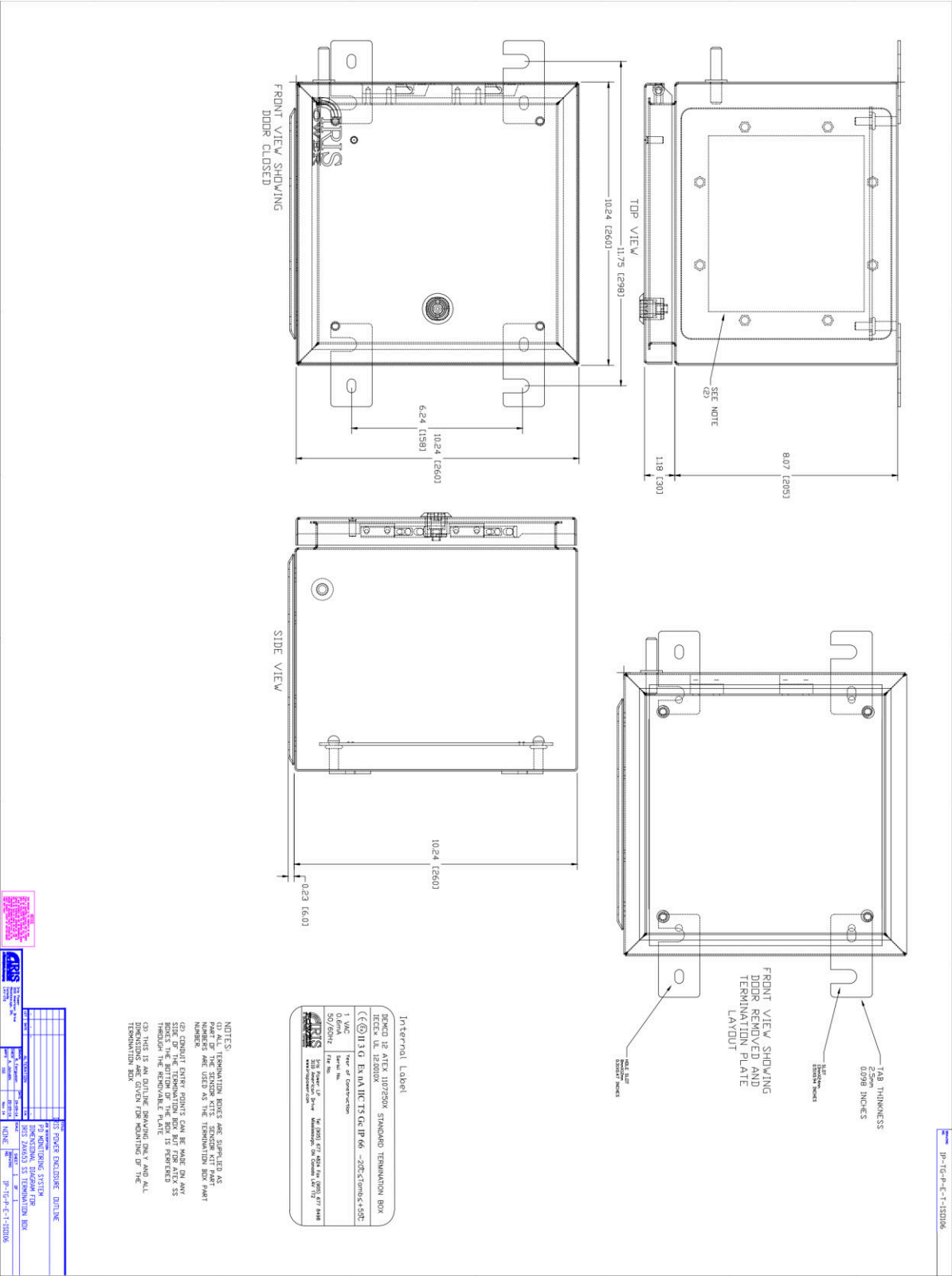


Figure 17 - Stainless Steel Termination Box for Hazardous Locations



3.2 Installation

Mount the termination box at a location as central as possible between the sensor pairs to minimize the length of coaxial cable required. If it is not possible to centrally locate the termination box, excess cable (less than about 11 m / 36 ft) can be stored in an open loop or zigzag (not coiled) fashion inside the space behind the circuit boards in the termination box. A second box (not supplied with coupler kit) is required to store longer lengths of coaxial cable. The termination box is mounted with the door hinge at the bottom and the locking clips at the top as shown in Figure 13.

The standard termination box is a NEMA 4X (equivalent to IP 66) corrosion-resistant fiberglass box with no knockout provision for coaxial cable access. Iris has an optional stainless steel box for special applications, use in petrochemical plants and corrosive environments; however, this would have to be specified at the time of order. The coaxial cable access location (top, bottom, sides or back) and hole size are determined at the time of installation, and punched or drilled before mounting the box.

The termination box can be mounted on any vertical surface, such as a wall, the side of a cubicle, structural beam or motor/generator/transformer terminal box, preferably at approximately eye level. The termination box itself does not require power but a 110/220 V power outlet should be accessible nearby for supplying power to the Iris portable instrument.

Steps for Installing the Termination Box:

1. Determine a suitable location for the termination box.
2. Remove the metal panel from the box, and set it safely aside for later use.
3. Drill/punch out the appropriate size hole(s) for the coaxial cable conduit(s) at the desired location(s) on the termination box and install a suitable fitting. [See Table 5 for information about conduit sizes]
4. Using the dimensioned drawing in Section 7, mark the locations of holes for mounting the box.
5. Mount the termination box by drilling and tapping, or using bolts as necessary.



Figure 18



Keep the ground/earth wire as short as possible

6. Run the #4 AWG (about 25 mm²) copper wire with green PVC jacket (supplied with coupler kits), or alternatively a 25 mm² insulated cable, from the ground/earth bolt on the right side of the termination box



Figure 18] to a permanent station ground/earth location. This bolt is used to ground/earth the components inside the termination box.



4 Coaxial Cable Installation

4.1.1 Overview

The coaxial cable connects the low voltage terminal of the EMC to the termination circuit board behind the metal panel inside the termination box. The coaxial cables from a sensor pair in a phase of a double-ended installation must be of the same lengths. They must be routed along a grounded/earthed metal surface from the EMC to the termination box. To minimize conduit runs, all coaxial cables can be run through a common conduit.

Partial discharge pulses have an extremely fast rise time and very low amplitude. These result in weak signal strength and high sensitivity to attenuation. For this reason, the type and the length of cable used to detect partial discharges are critical to a good measurement.

Please follow the limits below in to minimize attenuation and signal distortion:

Table 4 Total Maximum Length of cable from EMC to PD Instrument Including Leads

Cable type	Maximum length	<u>Typical</u> operating temperature range
*RG-316 /U	18 meters / 60 ft	-70°C to +200°C
**RG-58 C/U	30 m / 100 ft	-40 °C to +85 °C
***RG-58 A/U	30 m / 100 ft	-20 °C to +150 °C
****RG-8 U	75 m / 250 ft	-40°C to +80°C

* Limited length, wide temperature limits

** Default cable included in the supplied coupler installation kit

*** For high temperature applications

**** Consult Iris before application

Any lengths of the supplied RG58 coaxial cable (from sensor to measuring instrument) in excess of 30 m (100 ft) will increase signal attenuation. Special care should be taken in such installations.



4.2 Installation

Depending on the routing, the coaxial cables may be run through enclosures or metallic conduit, or a combination of both to the termination box. Whenever the coaxial cables exit a metal enclosure, they must run in grounded rigid or flexible metallic conduit. Both coaxial cables on a given phase are required to be of identical lengths.



CAUTION: The coaxial cables should be run away from and **not** on open cable trays alongside power cables!

Never run the conduit in close proximity to the IPB ground/earth shorting bridge or the machine current carrying conductor! The induced circulating currents may heat up the conduit and melt the insulation of the coaxial cables inside.



The conduit must provide a continuous ground/earth plane and should **only be grounded/earthed at a single point** to avoid circulating currents. Multiple ground/earth points along a conduit may result in high circulating currents, which may cause the conduit to overheat and fuse the coaxial cable insulation. This is especially true in installations involving IPBs.



CAUTION: When installing conduit between various IPB components, be very careful not to inadvertently short circuit or jumper any IPB insulated gaps. An insulated nylon bushing or a short section ~ 50-100 mm (2-4 in) of PVC conduit installed at the EMC coaxial cable exit point will be sufficient to insulate the conduit from the IPB duct. It may also be necessary to insulate the conduit from the clamps and hangers to avoid ground/earth loops [Refer also to 10 for more details].

In order to avoid damage to the coaxial cables, all conduit sizes should comply with local electrical safety codes. In the absence of local codes, the minimum conduit sizes in Table 5 are recommended.

Table 5 Conduit Sizes
Meets or exceeds Canadian Electrical Safety Code, Part 1, Rule 12-1014

Coaxial Cables	Conduit Size	NOTE: These measurements are for rigid conduit only and should be increased one size for the 3 to 12 coaxial cable installations if a flexible conduit is used.
3 to 6 Coaxial Cables	20 mm (¾ in)	
9 Coaxial Cables	25 mm (1 in)	
12 Coaxial Cables	32 mm (1¼ in)	
18 Coaxial Cables	40 mm (1½ in)	
24 Coaxial Cables	50 mm (2 in)	

4.3 Steps for Installing the Coaxial Cable:

1. Determine the route for conduit runs from each set of EMCs to the termination box. Conduit is not required inside metal cubicles and enclosures where the coaxial cable can be securely fastened at intervals against a grounded/earthed metal surface.



Avoid routing the cables on a ceiling or at a high level of the cabinet or enclosure where high voltage conductors are present below. Use a route that the coaxial cable can avoid falling onto high voltage conductors.

Do not use self-adhesive fasteners unless they are mechanically secured as shown below.



Figure 19 Mechanically Secured Tie Down

2. For each EMC, determine the path that the cable will take from the EMC to the termination box.
3. Install the conduit between the EMC and the termination box. Since the conduit should only be grounded/earthed at one point, install conduit insulators as required.
4. Determine the total length of coaxial cable required to reach each EMC in a pair. Often, longer coaxial cable will be needed for one sensor in a pair than the other since the termination box cannot always be centred between the pair. Select the longest cable length measured for each pair, add 3 m (10 ft) extra and cut two cables of this length.
Coaxial cable lengths of each sensor pair should be within +/-25 mm (1 in).



If a PDA-IV instrument is to be used, the coaxial cables will be of different lengths. Contact Iris Field Service Technical Support for PDA-IV cable details.

5. Label the coaxial cables according to the chart below for easy identification:

Phase	Machine Sensor	System Sensor
A	M1	S1
B	M2	S2
C	M3	S3

4.4 Preparing Coaxial Cable at EMC End

For Motor Applications within Nuclear Plant Containment, see Motor Applications within Nuclear Plant Containment12.

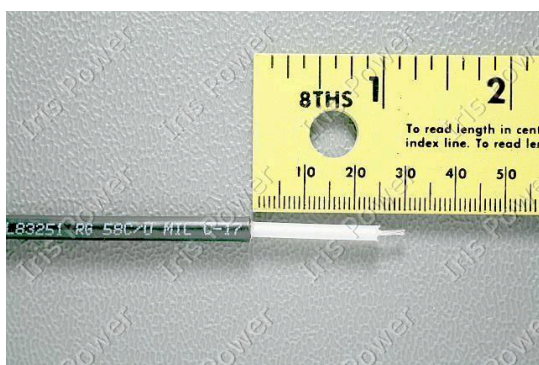


Figure 20. Trimming of Coaxial Cable

1. Cut the outer jacket back approximately 25 mm (1 in).
2. Carefully trim off the exposed shield flush with the jacket.
3. Trim back the centre conductor insulation approximately 10 mm (3/8 in).

4. Crimp on the supplied ring lug.
5. Check for and smooth out any ruffled shield wires to avoid puncturing the heat shrinkable tubing to be applied in the next step.
6. Position the black heat shrinkable tubing over the trimmed area of the jacket and centre conductor, including the barrel of the cable lug.
7. Using a heat gun, shrink the tubing into position to ensure the coaxial shield will be isolated from ground/earth.



Figure 21. Finished Coaxial Cable Connection



CAUTION: Overheating during the shrink process (step 7) may damage the centre conductor insulation, resulting in the centre conductor grounding to the outer shield.

Check that no stray strands of the shield pierce through the tubing.



Figure 22. Bottom of EMC

8. Prior to installing the coaxial cable, insert a screwdriver into the slot in the stainless steel plug in the bottom of the EMC and turn it slightly clockwise to check that the plug is tight.
9. Dab a small quantity of “Loc-tite” on the coaxial terminal screw, and then wipe off any excess.

10. Position the ring lug at the 9 o'clock position from the machined groove and tighten the screw. Do not exit directly through the groove or try to press the portion covered by the heat-shrinkable tubing into the groove, instead form a three quarter-loop as shown in Figure 23.

If the EMC is to be installed in a caustic environment, such as petrochemical plants, or subject to severe vibration, a covering of RTV (silicone rubber) can be applied over the exposed brass insert, ring lug and coaxial cable.



Figure 23. Coaxial Cable Connection



11. Once all the coaxial cables have been connected to the EMCs, the EMCs can be permanently mounted in the machine or transformer unit. Once mounted, route the coaxial cable to the conduit, ensuring that the cable is run along a grounded/earthed surface. Always fasten the coaxial cables in place using mechanical fasteners.



Never secure the coaxial cables in place using adhesive backed clips etc.



The coaxial cables **MUST** only be placed adjacent to the low voltage portion of the EMC and secured to a ground/earth plane.



Never place the coaxial cable adjacent to or coil it around the high voltage end (top) of the EMC or any high voltage component of the machine or transformer.



Avoid running the coaxial cable over the top of the high voltage bus-bar or terminals, where failure of a clamp or support may allow the coaxial cable to fall onto a high voltage component.

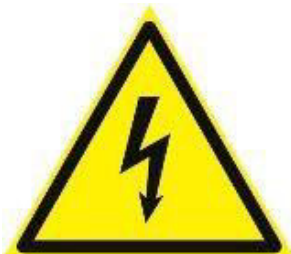
12. It is often necessary to pull slack or excess lengths of coaxial cable back through the conduits to a suitable storage location. Therefore, the practice of bundling and taping the coaxial cables together should be avoided. Although this practice does make the cable pulling process more manageable, it will create difficulties as the installation process continues.
13. Pull any excess cable through the conduit and out through the termination box. Note that unless the termination box is centred between the couplers, three of the coaxial cables will have longer lengths. When pulling the cables, take care not to kink or damage them.
14. Once the coaxial cables have been pulled, there should be a minimum of 3 m (10 ft) of cable from each EMC extending out of the termination box. Perform the initial (trial) verification test as per the Iris Verification Guide.
15. Once satisfied with the verification, trim the coaxial cable having the least excess or slack protruding from the termination box in each pair, leaving about 400 mm (16 in) extending from the box to provide enough slack to allow for hard wiring to the BNC jacks. Trim the identical length from the other cable in each pair.



When trimming the coaxial cable, trim the same amount off both cables of each pair.



16. Approximately 11 m (36 ft) of excess coaxial cable can be stored in open loops inside the termination box. If there is an excessive length of coaxial cable to be stored, it may be necessary to install a second box, or the coaxial cable can be pulled back into the machine or transformer terminal box and secured in open loops there.
17. The excess cable should be formed into an open loop, that is in a zigzag way, and NOT a coil. A coil can increase the inductance of the cable and distort the partial discharge pulses. If the coaxial cable is pulled back into the machine or transformer terminal box, ensure that it is securely fastened by mechanical means away from the high voltage electrical components.



WARNING: If the machine or transformer must be energized before the coaxial cables are soldered to the termination circuit board or before the ground/earth connection to the termination box is complete, remove the cable insulation and connect the centre conductor and shield together, and ground/earth both securely before energizing. Otherwise high voltages will be present at the coaxial cables. Do not attempt to terminate the coaxial cables when the machine or transformer is still operating. The termination should be completed after the machine or transformer has stopped. The same precaution applies also to high voltage testing [See Off-line Testing].

4.5 Preparing Coaxial Cables for Soldering



Figure 24. Trimmed Coaxial Cable

1. Trim the outer shield of the coaxial cable about 10 mm (3/8 in).
2. Carefully un-braid the shield, divide the strands into two equal parts and then twist them together to consolidate the loose strands [Figure 24].

3. Strip the centre conductor insulation to approximately 6 mm (1/4 in.) from the twisted shield.



Be aware of the reversed or inverted orientation of the termination panel when connecting the coaxial cables to the back of it. Transposition of “Machine” and “System” or top and bottom phase connections is easily done. Self-check before proceeding.



Figure 25. Coaxial Cable Prepared for soldering to Termination Circuit Board

4. Insert the exposed conductors into the fork terminals with the centre conductor in the middle fork and each of the shield conductor parts in the two side forks [Figure 25].
5. Secure all the coaxial cables in place with cable ties attached to the circuit board. At this point, tighten only the cable tie nearest the connection to be soldered.
6. Solder the connections. Soldering the same terminal on each of the coaxial cables in turn will allow sufficient time for the insulation to cool before soldering the next terminal.



Care must be taken during soldering to avoid overheating the conductors and fusing the insulation between the shield and the centre conductor. Do not try to solder all 3 points on a given cable in quick succession. Solder one point only on the first cable, move to the next cable and then the third one, then go back to another point on the first cable, and so on.

7. Inspect the soldered joints to ensure proper soldering and no missed or cold (dry) soldered joints exist.
8. Check that no stray strands are shorting out the centre conductor terminal and the shield terminals.
9. Trim the excess protruded strands flush with the fork terminal.



Figure 26. Trimmed and Soldered Connection

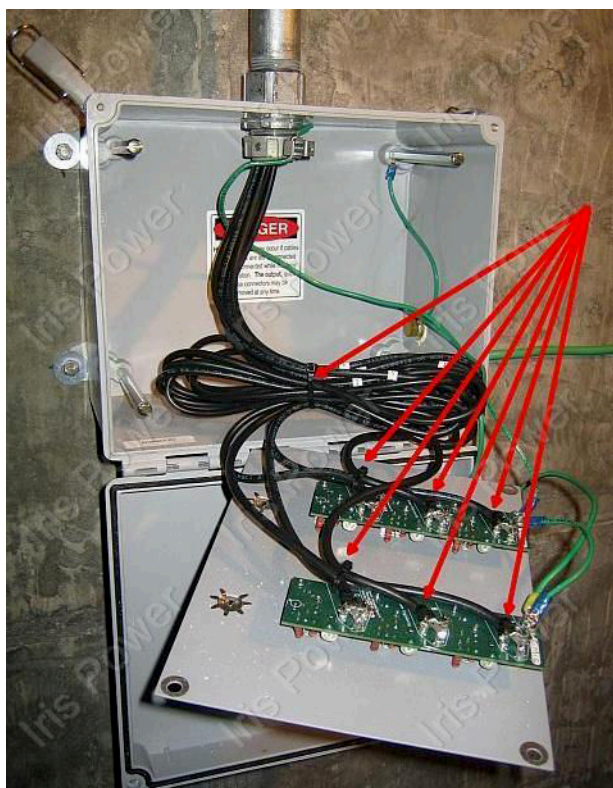


Figure 27. Securing Coaxial Cable with Cable Ties

10. Position the coaxial cables and use the last remaining cable tie on the circuit board to secure the three cables in a bundle and provide stress relief.

11. Secure the excess coaxial cable neatly inside the termination box. **Figure 27**
12. For most installations, the excess coaxial cable (no more than 11 m or 36 ft) can be stored in an open loop fashion inside the fibreglass termination box [Figure 29]. Secure the excess cable as described in steps 10 and 11.



Figure 28. Completed installation



Figure 29. Securing Excess Coaxial Cable in Termination Box

13. Reinstall the metal panel within the box and secure using the four screws provided.
14. Verify the connection of the ground/earth wire.



5 EMC Maintenance

5.1 EMC Function Verification

Since the sensor system does not have active (powered up) electronic components the electrical characteristics of the system should remain constant over the life of the system or the machine that is installed on to. Normal functioning of the system should be checked every time the periodic on-line testing is performed by measuring the ac voltage at all BNC connectors of the termination box. The voltages should be similar and within the values from the table below:

Table 6 Expected Terminal Voltages

Line Voltage (kV, phase-to-phase)	Expected Termination Voltage (mVrms)	
	50 Hz	60 Hz
3.3	58 ~ 86	69 ~ 103
4.16	74 ~ 110	87 ~ 131
6.6	115 ~ 173	138 ~ 206
11	192 ~ 288	229 ~ 344
13.8	240 ~ 360	288 ~ 432
18	314 ~ 470	376 ~ 564
22	383 ~ 575	459 ~ 689
26	453 ~ 679	543 ~ 815

It may be necessary to recheck the installation and measure again the delay time if the sensors are to be relocated due to the change in the machine design (for example, if the existing outgoing bus-bar is getting replaced) or if the coaxial cables are disconnected, replaced or re-routed for some reasons. In this case the sensor re-verification is recommended following the procedures outlined in the Iris Verification Guide. Please contact Iris Power Technical Support or Field Service for more information.

5.2 Periodic Maintenance

The system was designed to work practically maintenance-free providing it is functioning within recommended operations and ambient limits; see section Technical Specifications 1.3. No routine maintenance on the EMCs is required. They should be inspected for physical damage (such as cracks) and for cleanliness during any major outage of the monitored equipment. At the same time, it should be known that some airborne pollution usually mixed with moisture or oil can contaminate the surfaces of the high voltage parts of the system (high voltage jumper cable and the EMC itself) and could provide a low resistance path for electrical tracking. The local conditions should be considered at the time of the EMC installation to avoid contamination and/or dripping the water or other liquids on to the EMC surface.



In hot climates or other places where the moisture condensation is suspected, the sensors should be visually inspected on a regular basis confirming they are free from contaminations or water leaks. Unusually high PD readings during the regular testing session could also point out to some electrical tracking happening nearby.

If the sensors will be installed in the environment with a probability of gaseous acidic vapour in the area, please consult Iris Power for further recommendations.

The EMC surface should be clean and light green in colour. If there are any visible signs of deposits on the EMCs, the surface of the EMC may be cleaned with a lint-free cloth moistened with an alcohol-based solvent or specialised high voltage component cleaner to reduce the risk of electrical tracking.

5.3 Electrical testing

If it is necessary to perform some electrical tests on the machine or transformer after the installation of the sensors is complete, refer to **Appendix** Off-line Testing of this Installation Guide for information regarding these considerations.



6 *Iris Power LP Contact Information*

Email:	Technical Support – techsupport.iris@qualitrolcorp.com
	General Inquiries – info@irispower.com
	Sales – sales.iris@qualitrolcorp.com
	Field Service – fsadmin@irispower.com
	Field Service Scheduling – scheduling@irispower.com
Phone:	+1-905-677-4824
	Between 09:00 and 17:00 (GMT-5hrs)
Fax:	+1-905-677-8498
Address:	Iris Power LP
	3110 American Drive
	Mississauga, ON L4V1T2
	Canada



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Glossary

Terms	Definitions
BusGuard™ BusGuardII™ BusTrac™ BusTracII™ MCPDTracII™ MarineTracII™	Continuous PD monitoring system using BUS EMCs in a double-ended installation as PD sensors
Sensor Pair	Two EMCs on a given phase, to allow disturbance discrimination.
Delay Time	The time measured in nanoseconds that a high frequency pulse takes to travel from one sensor to the other in a BUS directional installation.
Directional (BUS) Installation	Sensor Pair - One connected to the machine terminals and a second at least 2 m (7 ft) away. Disturbance separation is done by direction and time of pulse arrival.
EMC	Epoxy Mica Capacitor – 80 pF high voltage partial discharge sensor.
Single-Ended Installation	An installation using 3 EMCs (one per phase) installed at the machine or transformer terminals.
Double-Ended Installation	A directional (BUS) installation using 6 EMCs (two per phase), one installed at the machine or transformer terminals and the second towards the system.
Machine Sensor	EMC mounted on/near the machine or transformer terminals, closer to the winding.
PDTrac™ PDTracII™	Continuous PD monitoring system using 3 EMCs in a single-ended installation as PD sensors
System Sensor	In a double-ended installation the EMC mounted closer to the system.
Post Insulators	An insulator that is used to support high voltage bus-bars.
Feeders, splits	Taps off of the bus-bar to auxiliary circuits.
CTs, PTs	Current and potential transformers used to monitor operating parameters.
TGA-B™	Portable test instrument to measure PD using BUS couplers as PD sensors – provides 2D & 3D results.
Rise-time	Time a pulse takes to increase from 10%-90% of its magnitude.
IPB	Isolated Phase Bus-bar, the design of the machine output conductors where each phase is enclosed in its own grounded/earthed enclosure; typically runs from the generator to step-up transformer.



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7 Dimensional Drawings

7.1 EMC Mounting Clamps

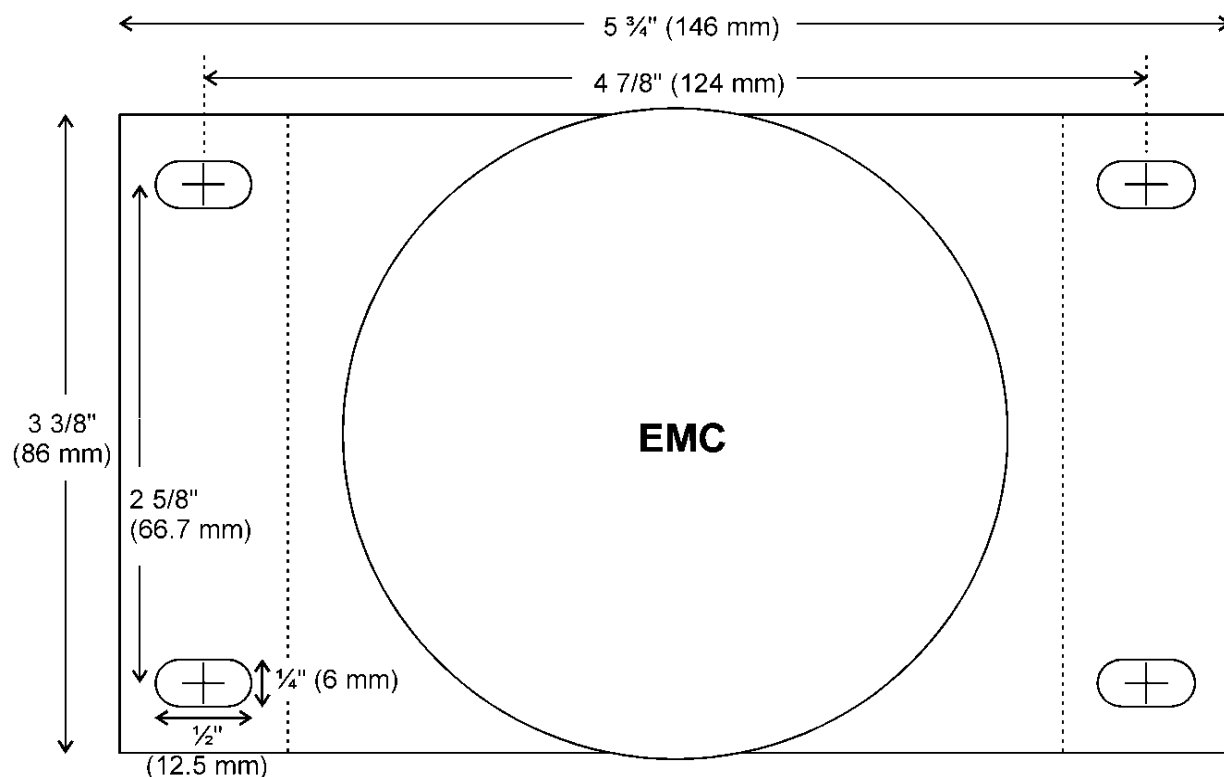


Figure 30 Mounting Clamp Arrangement & Dimensions

(To scale, this drawing can be used as a template if printed on a *Letter* size paper)



7.2 Standard Termination Box Dimensions

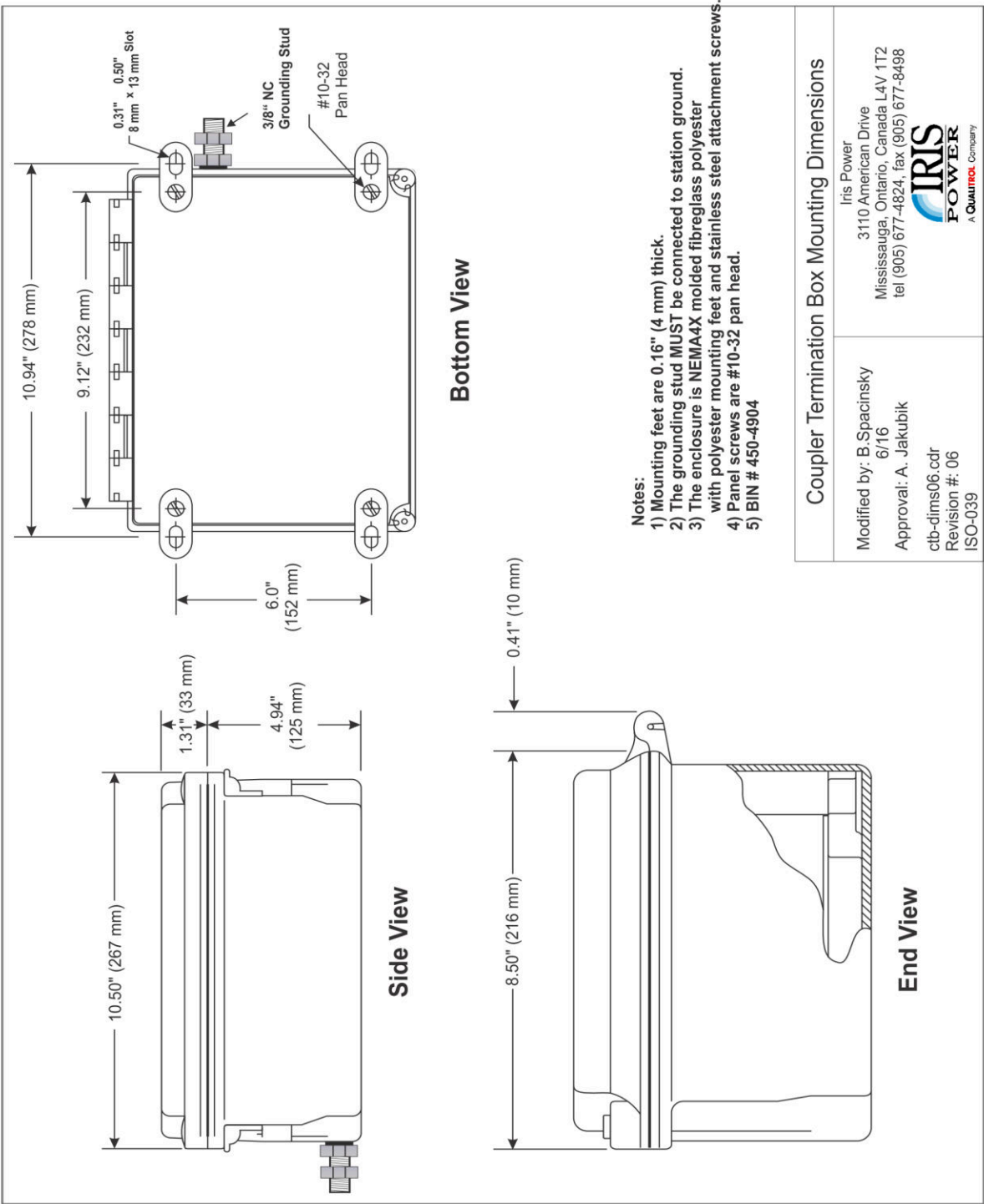


Figure 31 Standard Termination Box Dimensions.



8 Installation Materials

BUS sensor kits may comprise of either 3 or 6 EMCs. The table below shows the contents of a complete 6-EMC sensor installation kit supplied by Iris. Other materials may be substituted provided the materials used are intended for electrical use and are compatible with the electrical installation.



Additional items, which are **NOT SUPPLIED** by Iris, but may be required to complete an installation, are shown on the next page of this Appendix.

8.1 Contents of a six EMC BUS coupler kit

Item	Quantity	Product Description
Epoxy Mica Capacitor	6	80 pF capacitor sensor, fitted with coaxial cable crimping ring lug and screw at base
High Voltage Jumper Cable	6	15 kV #2 AWG or 35 kV #1/0 AWG - insulated jumper cable, 610 mm (24 in) long with L-shaped ring lug attached
Straight Ring Lug	6	1/2 in lug for #2 AWG or #1/0 AWG high voltage jumper cable
Brass Bolt Sets	6 sets	3/8 in bolt (1 in imperial thread) with lock washer and flat washer
	6 sets	M10 bolt with lock washer and flat washer
Insulated Boot	6	Preformed high-voltage insulating boot
Mounting Clamps	6 sets	Preformed steel brackets
Coaxial Cable	152 m (500 ft)	RG58 C/U 50 Ω coaxial cable
Polyolefin Heat Shrinkable Tubing	6	50 mm (2 in) lengths
Termination Box	1	NEMA 4X corrosion proof moulded polyester fibreglass enclosure with termination circuit boards.
Ground/earth Wire	3 m (10 ft)	600 V insulated wire #4 AWG (Green)



8.2 Optional Materials and Hardware Supplied by Iris

Item	Typical Quantities	Product Description
25/28 kV EMC Mounting Block	3	2-piece fibreglass mounting block
Angled Support Bracket	3	45° angle aluminum bracket
IPB Mounting Plate	3	Steel mounting plate for curved surface See Figure 6 of this Installation Guide



8.3 ADDITIONAL MATERIALS

For a complete BUS sensor installation, depending on the configuration and layout, additional materials (**not supplied by Iris**) may be required. These additional materials may include some or all of the following:

Include some of all of the following:

Metallic Conduit	Rigid or flexible may be used. Conduit should have electrical continuity over the length and requires single point grounding/earthing to avoid ground/earth current circulation. Grounding at the termination box preferred. Recommended conduit sizes for: 3 coaxial cables – 20 mm (¾ in) 6 coaxial cables – 25 mm (1 in) 12 coaxial cables – 32 mm (1¼ in)	
Miscellaneous Conduit Fittings	To run conduit from the EMC to the termination box Note: pull boxes are recommended at every 5 m (16 ft) or two right-angle bends	
Conduit Mounting Brackets	Insulated clamps/brackets may be required to avoid circulating currents in the conduit.	
Nuts, bolts, lock & plate washers M6 or ¼-20 x 1 in	For Termination Box mounting – Quantity 4 For EMC Mounting Clamps: 3 EMCs- Quantity 12 6 EMCs- Quantity 24	
Miscellaneous Hardware	Depending on the installation, additional hardware and materials for fabricating mounting brackets, and for electrical connections may be required.	
Cable ties and clamps	Required to fasten the coaxial cables into place. No adhesive backed fasteners can be used, unless also secured mechanically.	
Miscellaneous hand tools Electric drill, drill bits, and taps Vacuum cleaner Crimping tool for #2 AWG or #1/0 AWG and #20 AWG ring lug (or closest metric equivalent) Torque wrench Utility knives, wood chisels, files Loc-tite, RTV, epoxy		
++SAP Tape	2 rolls	50 mm (2 in) wide Self-Amalgamating Polymeric Tape, black colour, ROTUNDA 2501
++Silicone Rubber Tape	2 rolls	25 mm (1 in) wide Self Fusing –silicone rubber tape. Orange in colour.
++Electrical Putty	8 strips	50 mm (2 in) wide Electrical putty Supplied in strips 330 mm (13 in) long
++ NOTE: These items are only required if the Boot is NOT used		



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9 Off-line Testing

9.1 Hi-pot Testing

PROVIDED the EMCs are correctly terminated into the grounded/earthed termination box in accordance with this installation guide, it is safe to carry out both ac and dc high potential tests on the stator or transformer winding.



Should there be a need to conduct a winding test AFTER the high voltage connection to the EMC has been made, but BEFORE the coaxial cables have been properly terminated, [see Section 4 Coaxial Cable Installation], then the ends of the coaxial cables must be stripped bare, shields and centre conductors twisted together and both grounded/earthed together.

Each EMC is Hi-pot (proof) tested by Iris at not less than twice the rated voltage plus 1 kV

- 6.9 kV EMCs are tested to 15 kV ac for one minute
- 16 kV EMCs are tested to 40 kV ac for one minute
- 25 kV EMCs are tested to 51 kV ac for one minute
- 28 kV EMCs are tested to 57 kV ac for one minute

The design of the EMC is such that the breakdown and tracking voltages exceed the hi-pot values above. The only two factors that may affect performance during hi-pot testing of the winding is heavy contamination on the EMC and the low voltage end of the EMC is not grounded/earthed. If it is the former case, a visual inspection and cleaning is recommended prior to testing, especially if there is heavy contamination on the bus-bar or other components.

Hi-pot testing of machines that have Iris EMCs installed can be safely carried out without risk of any damage to the EMC up to industry standard levels of:

- AC Hi-pot: twice rated machine phase-to-phase voltage + 1000 V
- DC Hi-pot: $1.7 \times (\text{twice rated machine phase-to-phase voltage} + 1000 \text{ V})$



9.2 Other Off-Line Tests

The presence of the EMCs during other off-line diagnostic tests, for example Partial Discharge, Dissipation/Power Factor tests, IR and PI, will not affect the winding characteristics or have a detectable impact on measured results. The EMCs are 80 pF capacitors, the value of which is negligible in comparison to the winding capacitance and are certified by Iris as partial discharge free up to twice the rated phase-to-ground/earth voltage.



If you have any questions or concerns regarding off-line testing of your machine that has Iris EMCs installed, please feel free to contact Iris Field Service Technical Support.

10 Isolated Phase Bus-bar Considerations



Important: When installing conduit between various IPB components, be very careful not to inadvertently short circuit or jumper some IPB insulated gaps. An insulated nylon bushing, a PVC junction box or a short section, about 50-100 mm (2-4 in) of PVC conduit installed at the EMC coaxial cable exit point is sufficient to insulate the conduit from the IPB duct. It may also be necessary to insulate the conduit from the conduit clamps and hangers to avoid ground/earth loops.

10.1 Typical IPB Configurations

Figures Figure 32, Figure 33 and Figure 34 illustrate three simplified IPB configurations, showing insulated support mounts and insulated bellows with segregation at the Generator Transformer (Figure 32) or at the Generator (Figure 33). Figure 32 and Figure 33 show systems where each phase is insulated separately and Figure 34 where they are common.

The KEY factor is that the phase ducts are grounded/earthed at ONE point only to ensure that circulating currents within the system are prevented.

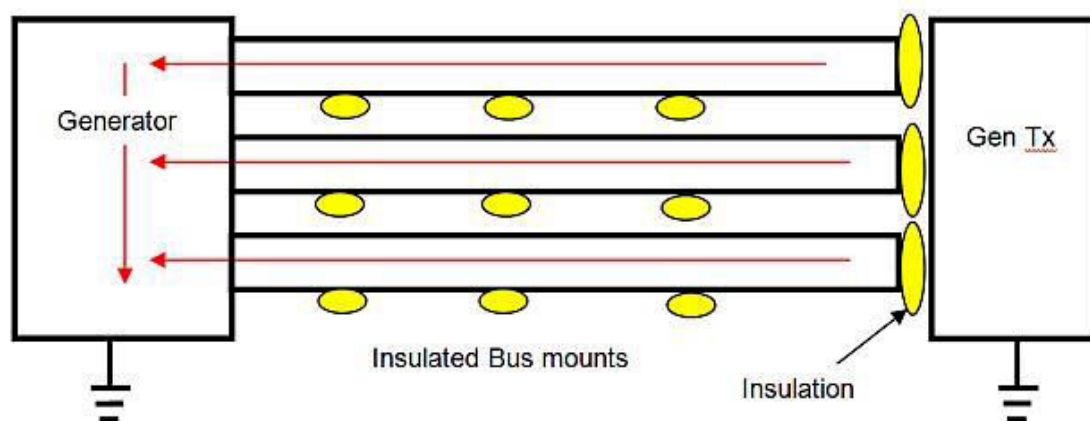


Figure 32 Segregated at Generator Transformer

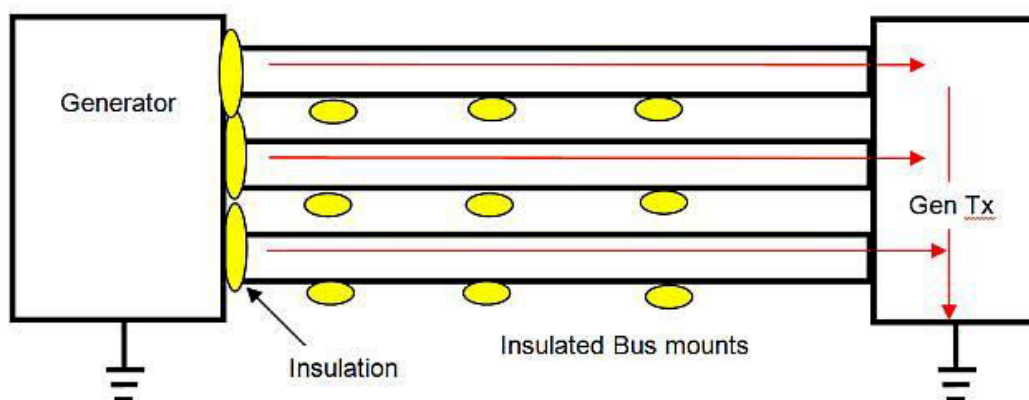


Figure 33 Segregated at Generator

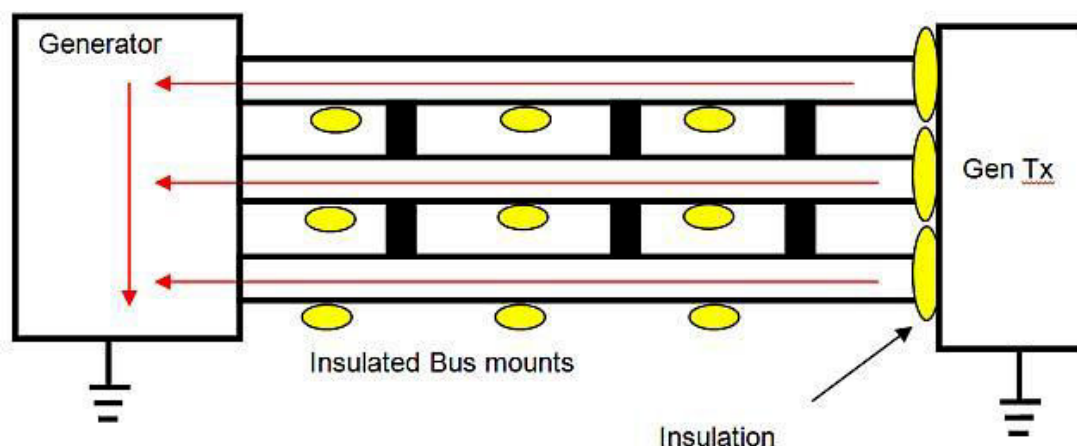


Figure 34. Common Phase Insulation – Segregated at Transformer

10.2 Ground/earth Loop

Figure 35 illustrates the effects of a ground/earth loop in an IPB.

The dotted line indicates the circulating currents in the IPB should it be grounded/earthed at both the Generator and Generator Transformer ends. The dotted/dashed line indicates the effects of a metallic conduit that is grounded/earthed and attached to the IPB.

It should be noted that thousands of amperes of current could flow through a conduit that introduces a second ground/earth on the IPB system and will eventually cause damage to the cables inside.

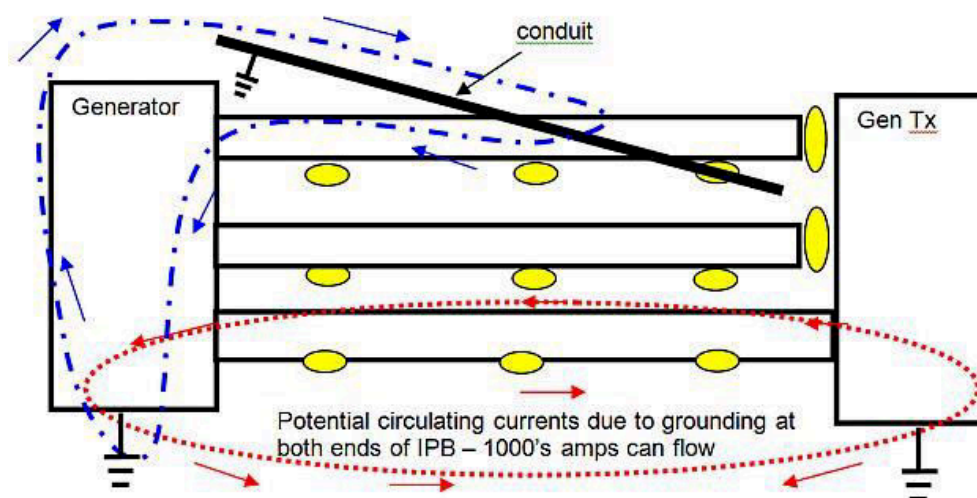


Figure 35. Ground/earth loops

10.3 Typical Conduit Runs with IPB Systems

Figure 36 and Figure 37 illustrate typical conduit runs with insulated conduit supports. Note the conduit is grounded/earthed only at the termination box.

Figure 38 illustrates an alternative method where rigid or flexible plastic conduit is used at the connection between the IPB and the metal conduit; therefore, the conduit is not in a continuous run. Insulated bushings are installed to break up the conduit run, each section of conduit is grounded/earthed individually so as to prevent circulating currents.

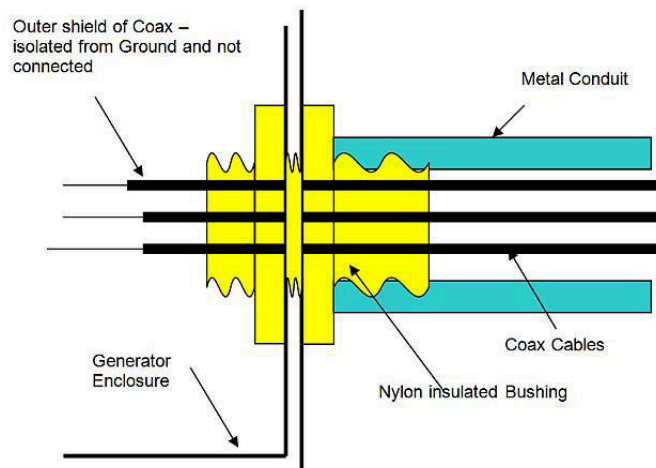


Figure 36. Conduit Run for IPB

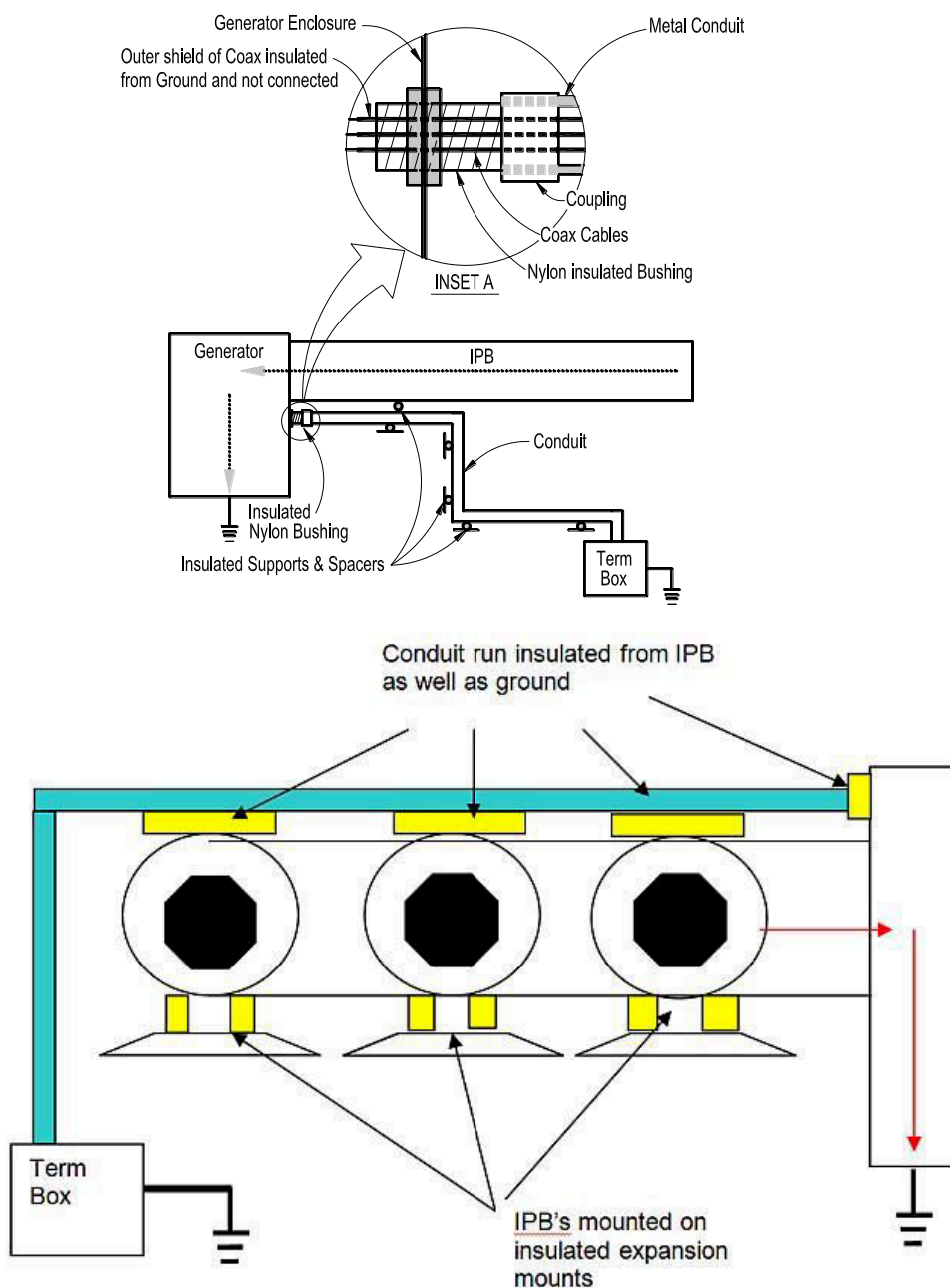


Figure 37. Conduit Run for IPB



NOTE: For both safety and measurement, the conduit **MUST** be grounded/earthed. It is essential that the coaxial cable runs in grounded/earthed metal conduit or against a grounded/earthed plane to reduce unwanted interference.

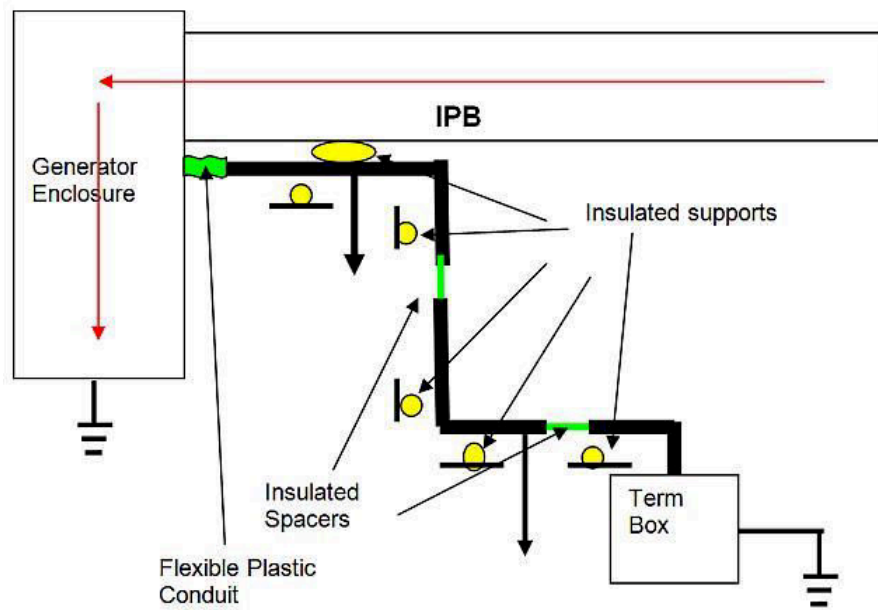


Figure 38. Alternative Conduit Run for IPB

11 25/28 kV EMC Mounting Blocks

Due to its weight and length, the largest Iris EMC (25/28 kV) can only be mounted vertically (upright) using the standard metal mounting clamps. Optional horizontal mounting blocks, called Labadie Blocks, are used when the 25/28 kV EMCs require mounting in any position other than within 45° from the vertical. The blocks may be assembled directly to the unit in horizontal or suspended positions, or mounted to an angled bracket.

11.1 Labadie Block

The Labadie Block¹ was designed for ease of retro-fitting existing installations where the conventional Iris mounting clamps were used. While physically larger, the slotted mounting holes are drilled to the same centres as the conventional steel mounting clamps.

A typical installation would require using three blocks installed at the generator or transformer terminals (“Machine” sensors). On most large turbine generators, the second set of EMCs (“System” sensors) would be installed inside the generator IPB in an upright position.



Figure 39. Labadie block for 25/28 kV EMC

Selecting Mounting Location

- Temporarily assemble (finger tighten) one block to be used for laying out the mounting positions for the EMC and drilling the fixing holes.
- When selecting the location for mounting, ensure that there is sufficient room for the mounting block and adherence to all electrical clearances [Table 3 High Voltage Clearance Requirements]

¹ This special mounting block was designed for and named after the Ameren UE, Labadie Power Plant.

Assembling the Block:



Figure 40. Trial Fit of Mounting Block

1. Trial fit the EMCs to the Labadie Block. Due to machining tolerances, it may be necessary to try several EMCs in a given block to achieve the best fit. Once properly fitted, the EMC should contact the block in two positions. The space between the two mounting block sections should be equally spaced. The bottom of the EMC should be flush with the mounting block [Figure 40].

2. Once the EMC has been paired with the block, disassemble and apply a bead of epoxy around the machined mating surfaces of the block [Figure 41]. The epoxy is used to fill the space where the EMC is not in contact with the block. The epoxy has a setting time of approximately 20 minutes, so prepare the assemblies one at a time.



Figure 41. Epoxy Bead in Mounting Block



3. Match the coaxial cable duct machined in the block with the cut-out groove on the EMC [Figure 40]. This is extremely important since there must be a channel for the coaxial cable to exit. Once the epoxy sets, it is impossible to adjust the base.
4. Bolt the assembly together, using “Loc-tite” at the nuts, and apply equal pressure on each bolt. Once tight, the spacing should be equal on each side and the faces parallel [Figure 42].



Figure 42. Mounting Block Attached to EMC



NOTE: When tightening the bolts, only sufficient pressure should be applied so that the EMC cannot be rotated within the block. Over tightening may damage the EMC. Loc-tite (or other thread locker) must be used.



Figure 43. Bottom of EMC Flush with Mounting Block

5. After tightening, wipe off the excess epoxy that has extruded out and then allow it to set (approximately 20 minutes).
6. If the base of the EMC is not flush with the bottom of the mounting block, file the bottom of the EMC using a medium file until flush.
7. Fill the bolt holes with epoxy to permanently lock the block.
8. Assemble the coaxial cable as described in Section 4. A small amount of epoxy can be applied inside the cut-out to secure the coaxial cable in place [Figure 43].



Figure 44. Tape Insulated 25/28 kV EMC

9. Insulate the top of the EMC as described in Section 2.5 using the pre-formed Boot or with tapes in accordance with the Product Update for Tape Insulation
10. The assembled EMC is now ready to be mounted in the unit.

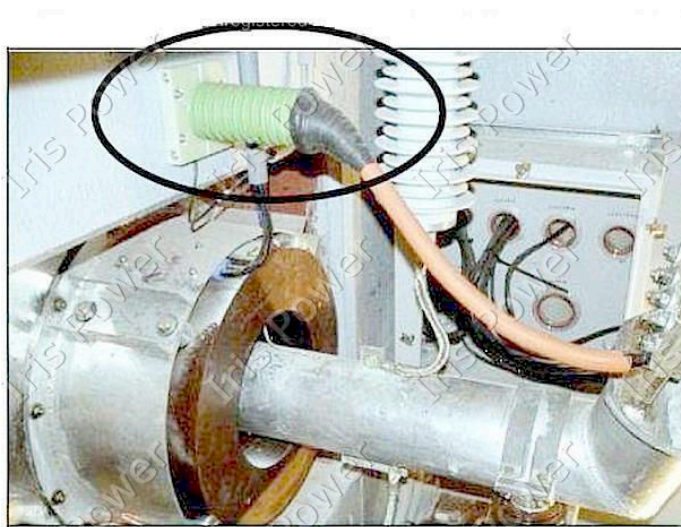
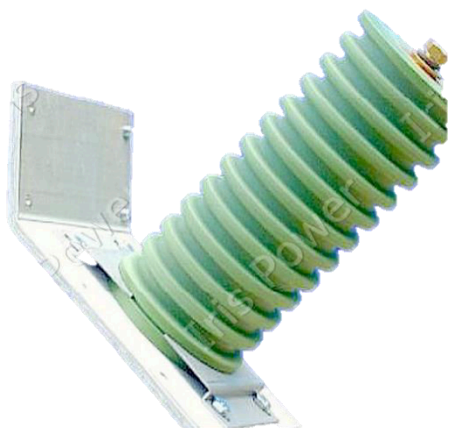


Figure 45. 25 kV EMC Mounted Horizontally

A 25 kV EMC mounted horizontally using a mounting block at a generator terminal.

11.245° Angle EMC Mounting Bracket



The 45° bracket requires no special instructions. Mount the optional bracket at a suitable location and then follow the standard installation procedures, electrical clearances and precautions.

Figure 46. 25/28 kV EMC Angle Mounting

12 Motor Applications within Nuclear Plant Containment



Figure 47: Trimming of Coaxial Cable



Figure 48 Coaxial Cable Insulated Connection



Figure 49: Bottom of EMC

1. Cut the coaxial cable outer jacket back approximately 25 mm (1 in.)
2. Carefully trim off the exposed wire mesh and metal foil shields.
3. Trim back the centre conductor insulation approximately 10 mm (3/8 in.)

4. Crimp on the supplied ring lug.
5. Position self amalgamating EPR tape centered over trimmed area of jacket and centre conductor.
6. Wrap at least two layers of EPR tape around coaxial cable so that it covers both the jacket and centre conductor insulation as shown, up to the barrel of the cable lug.
7. Prior to installing the coaxial cable, check that the stainless steel plug (shown by red arrow in Figure 37) is tight in the bottom of the EMC.
8. Dab a **small quantity** of "Loc-tite" on the coaxial cable terminal screw, and then wipe off excess.

To complete the coaxial cable installation, follow steps 9 to 16 in Section Coaxial Cable Installation of this guide.

Coaxial Cable Insulated Connection



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13 Instructions for c-UL-us Termination Box

 LISTED 28DP ULTBYYMMDD## Standard Termination Box for use in Hazardous Locations: Class I, Division 2, Groups A, B, C & D; Class II, Division 2, Groups F & G. 1VAC 50/60Hz 0.6A Max Ambient Temp.: 50°C IRIS POWER LP	
	
The Standard Termination Box for Hazardous Location uses the Stainless Steel Hoffman Enclosure.	
	UL - Underwriters Laboratories Inc. C - CANADA - Accepted by Authorities Having Jurisdiction (AHJs), OSHA, insurance interests, labour unions, plant management, fire officials and electrical inspectors in all Provinces and Territories US - USA - Accepted by Authorities Having Jurisdiction (AHJs), OSHA, insurance interests, labor unions, plant management, fire officials and electrical inspectors.
28DP	UL Internal Control # (based on category, also known as QUZW #) for "Process Control Equipment for use in Hazardous (Classified) Locations".
Standards used to evaluate product	• ISA 12.12.01-2011 - NONINCENDIVE ELECTRICAL EQUIPMENT FOR USE IN CLASS I AND II, DIVISION 2, AND CLASS III, DIVISIONS 1 AND 2 HAZARDOUS (CLASSIFIED) LOCATIONS • CSA C22.2 NO. 213 - NON-INCENDIVE ELECTRICAL EQUIPMENT FOR USE IN CLASS I, DIVISION 2 HAZARDOUS LOCATIONS (1987 EDITION) - Edition 1 - Issue Date 1987/03/01 • CAN/CSA-C22.2 No. 61010-1, 2nd Edition, 2004-07, (Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements)
Model Designation	Standard Termination Box for Hazardous Location
Class I, Division 2, Groups A, B, C & D	Class I, Division 2 location is a location: • in which volatile flammable liquids or flammable gases are



	handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or break down of such containers or systems or in case of abnormal operation of equipment; or • in which ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment; or • that is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided. Groups A (Acetylene) B (Hydrogen) C (Ethylene) D (Propane)
Class II, Division 2, Groups F & G	Class II, Division 2 location is a location: where combustible dust is not normally in the air in quantities sufficient to produce explosive or ignitable mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but combustible dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment; Groups F (Coal) G (Grain)
1 V ac 50/60 Hz 0.6 A	Electrical rating
Maximum Ambient Temperature.: 50 °C	Rated maximum ambient temperature is +50 °C.
IRIS POWER LP	Listee name
For c-UL-us Listed Termination Boxes, entries to the devices covered must be suitable for Class II, Division 2, Groups F and G Hazardous Locations, temperature range of $-20\text{ °C} \leq T_{amb} \leq 50\text{ °C}$, and must be installed in accordance with the wiring methods of the National Electrical Code.	

14 Instructions for ATEX & IECEx Termination Box

ATEX and IECEx Marking Labels	
DEMKO 12 ATEX 1107250X IECEX UL 12.0010X Standard Termination Box CE Ex II 3 G Ex nA IIC T5 Gc IP66 -20°C ≤ Tamb ≤ +55°C 1 VAC 0.6mA 50/60 Hz Year of Construction Serial No. File No.  Iris Power LP 3110 American Drive, Mississauga, ON Canada L4V 1T2 www.irispower.com Tel (905) 677-4824 Fax (905) 677-8498	The Standard Termination Box for Hazardous Location uses the Stainless Steel Hoffman Enclosure. 
DEMKO	Previously the Danish government-owned testing and certification laboratory, now wholly owned by Underwriters Labs (UL)
12 ATEX 1107250X	This is the EC-Type Examination certification number – Equipment or Protective system intended for use in Potentially explosive atmospheres Directive 94/9/EC and in compliance with EN 60079-0:2009 and EN60079-15:2010.
IECEX UL 12.0010X	This is the International IECEx certification number Certification based on standards: IEC60079-0:2010 Edition 5 IEC60079-15:2010 Edition 4
The X denotes special conditions	Conditions of safe use as found in the Certificates: - Ambient Temperature Range is -20 °C ≤ Ta ≤ +55 °C. - Bushings, glands, conduit entries or other enclosure entry components used with the termination boxes must be rated IP66 to the requirements of EN/IEC 60529 - Termination boxes are for use in Pollution Degree 2 environments as defined by IEC 60664-1
	CE marking is used by the manufacturer as a declaration that he considers that the product in question has been manufactured in conformity with all applicable provisions and requirements of Directive 94/9/EC and that the product has been the subject of the appropriate conformity assessment procedures.



 II 3 G	ATEX – from the French – ATmospheres EXplosibles. - Electrical Equipment for Use in Explosive Atmospheres (Directive 94/9/EC). Directive 94/9/EC is a directive adopted by the European Union (EU) to facilitate free trade in the EU by aligning the technical and legal requirements in the Member States for products intended for use in potentially explosive atmospheres. II - Equipment Group- Non-mining (Above Ground/earth) 3 - Equipment Category, which is equal to ZONE 2 – normal protection used where explosive atmosphere is unlikely to occur and would be infrequent or for a short time. G - Type of explosive atmosphere - Gas, vapour, mist
Ex	Explosive protection symbol
nA	Protection concept is non-sparking. How it works is that there are no arcs, sparks or hot surfaces
IIC	Gas group Hydrogen/Acetylene
T5	Maximum surface temperature of equipment is 100 °C. This means it can be installed in areas where the gas ignition temperature is above 100 °C.
Gc	Equipment Protection Level- this is the level of protection assigned to equipment based on its likelihood of becoming a source of ignition. Gc is gas atmospheres, “enhanced” level of protection
IP66	Ingress Protection, Solids=6=Totally protected against dust Liquids=6=Protected against high pressure water jets and heavy seas. Must utilize IP66 ATEX/IECEx Certified suitable fittings for Installation to maintain IP66 rating.
-20 °C ≤ Tamb ≤ +55 °C	Rated ambient temperature range
For Instructions on putting the EMCs into service, use, assembling and dismantling, maintenance, installation and adjustment see sections 1 and 2 of this Guide	
The electrical ratings of the Termination Box is: 1 V ac, 0.6 mA , 50/60 Hz	



Installation of Hazardous Locations Stainless Steel Standard Termination Box (c-UL-us, ATEX/IECEX) & Fibreglass PDTrac Termination Box (c-UL-us only)

Overview

The termination box contains the BNC jacks and the circuit board to which the coaxial cables from the EMC sensors are terminated.

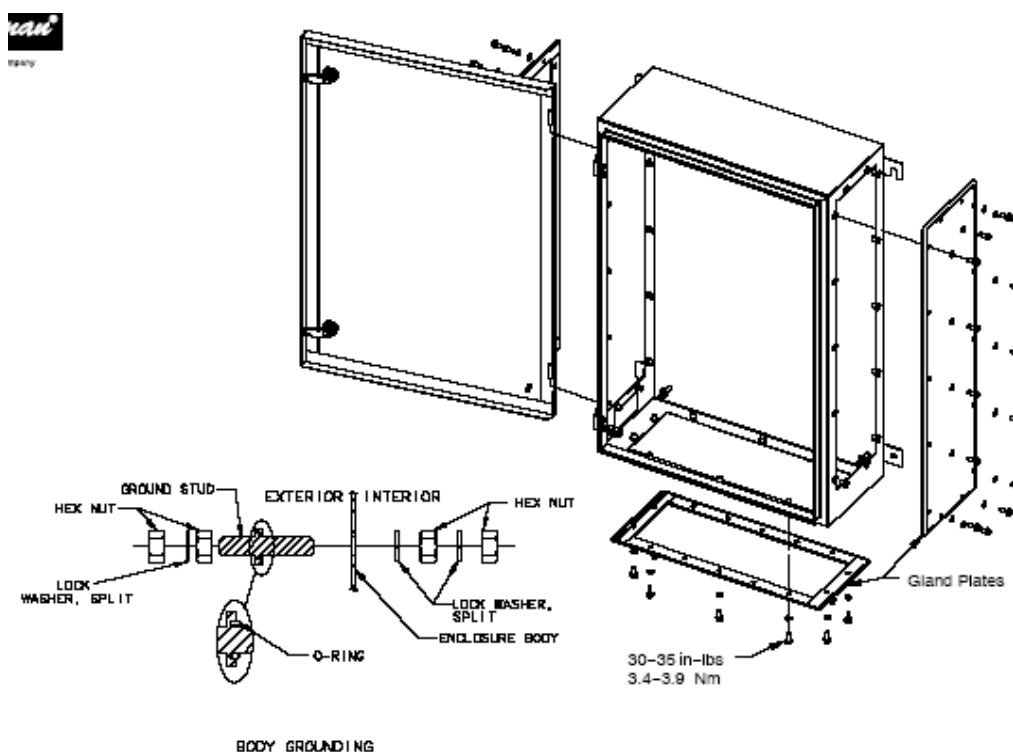
RG58 (50 Ω) coaxial cables are used to connect the EMCs to the circuit board. The circuit board contains a 1500 Ω resistor and 75 V surge arrester (spark gap) on each connector. The resistor ensures that the normal voltage from all EMCs will be less than 600 mV, depending on the operating voltage of the winding.

Both coaxial cables on a given phase are required to be of identical lengths. Mount the termination box in a central location between the sensor pairs to minimize the coaxial cable required. If it is not possible to centrally locate the termination box, excess cable not more than 11 m (36 ft) can be stored in an open loop (not coiled) inside the termination box. A second box (not supplied) is required to store longer lengths of coaxial cable.

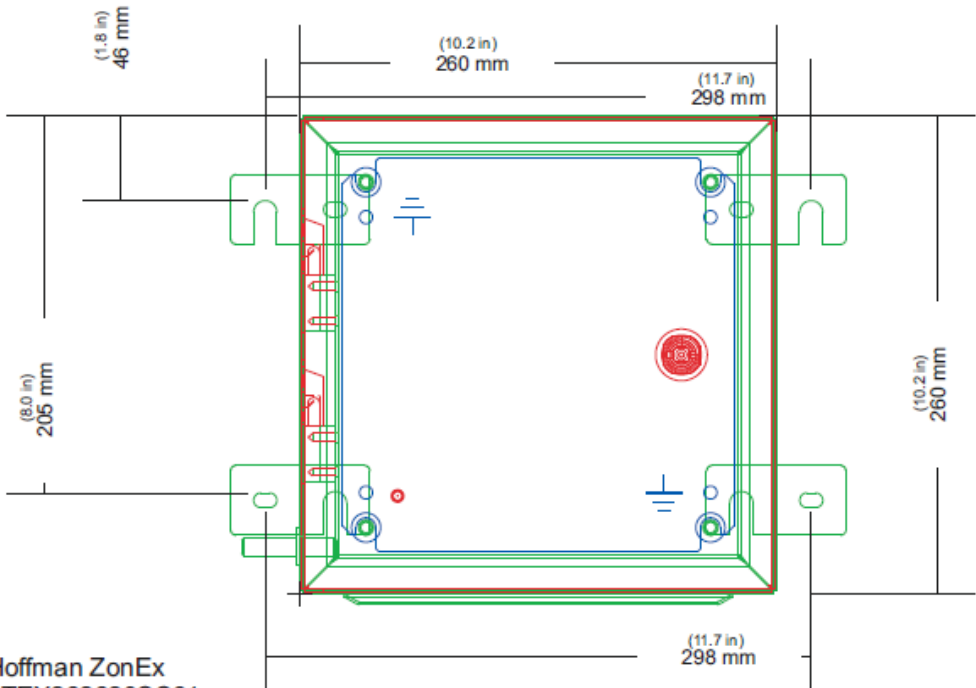
For Iris continuous monitors (Tracs, TracIIs, Guards and GuardIIs), please refer to the appropriate installation guides.

- 1 The Hazardous Location Standard Termination box is a 316 Stainless Steel Box. It has lift-off door hinges and **one** removable gland plate, located on the bottom. (The drawing shown has three gland plates.)

This gland plate is used for the coaxial cable access.





2	Hole size is determined at the time of installation and punched or drilled before mounting (see conditions on next page). Utilize IP66 ATEX/ IECEx/ CI II, Div 2 Certified suitable fittings for Installation to maintain IP66 rating. Note: 1. Only drill holes in gland plates (see gland plate location). 2. Do not drill holes closer than ¼ inch (6.35 mm) from the edge. 3. Visually inspect gaskets, locks and screws after each opening of covers or removing of gland plates.
3	Steps for Installing the Termination Box: • Determine a suitable location for the termination box. • Remove the metal panel with circuit board from the box, and set safely aside for later use. • Drill/punch out the appropriate size hole for the coaxial cable conduit in the bottom gland plate of the termination box and install a suitable adapter. [See Error! Reference source not found. for information about conduit sizes]
4	Mark the location for holes. Note: This is the Hoffman ZonEx 316 enclosure.  Hoffman ZonEx ATEX262620SS61 Standard Termination Box



5	Alternate Adalet 316L enclosure 316 L SS Enclosure Adalet VH4X6-101006U-B Option Gasket Material: Cover- 1/4" thick BISCO Silicone with Acrylic PSA, Part # HT805A Gland Plates- 1/8" thick BISCO Silicone with Acrylic PSA, Part # HT805A Optional pressure sensitive adhesive (PSA) Material part # HT805S Quarter turn-NBR Enclosure Material: #14 GA. (0.60) 316L Stainless Steel with #3/4 Brush finish As per the conditions of use for this enclosure under Adalet/Scott Fetzer Co DEMKO 09ATEX147278U/IECEX UL 09.0013U, "For ambient temperatures below -10 °C and above +60 °C use field wiring suitable for both minimum and maximum ambient temperatures." Note: Iris has rated this Termination Box for use as ambient -20 °C to +55 °C.
6	Note: This is the Adalet 316L Enclosure

7	 Hazardous Location EMC Termination Box with Ground/earth bolt To ground/earth, run the #4 AWG copper wire (supplied, green jacket) from the ground/earth bolt on the left side of the termination box to a permanent station ground/earth location. This bolt is used to ground/earth the components inside the termination box and also the metallic conduit. This should be the only point where the conduit is grounded/earthed to minimize the risk of circulating currents due to differing ground/earth potentials.
8	The termination box can be mounted on any vertical surface, such as a wall, the side of a cubicle, structural beam or motor/generator/transformer terminal box, preferably at approximately eye level. The termination box itself does not require power but a 110/220 V power outlet should be accessible nearby for supplying power to the Iris portable instrument.



Iris Power Field Services

Iris Power offers installation supervision services for all of its PD systems. Our field specialist will arrive on site and provide supervision to staff directly involved in the installation process. A written installation report is also provided.

Iris Power Educational Services

Iris Power professional training (designed to achieve hands-on performance based objectives) prepares operations, maintenance, and engineering personnel to test, configure, operate and maintain Iris Power products.

Iris Power Accelerated Delivery

Iris Power provides accelerated delivery on many products and services including replacements, spare parts and repairs.

About Iris Power

Established in 1990, Iris Power offers sensors, monitors and diagnostic solutions to evaluate the true condition of generators, motors, dry-type transformers and air-insulated switchgear in order to reduce the risk of failures and plan necessary maintenance. Iris Power condition based monitoring solutions are trusted on over 15,000 machines across power utilities and industrial sites worldwide. In 2010, Iris Power LP was acquired by Qualitrol Corporation, a global leader in condition based monitoring and an independent subsidiary of Fortive Corp.

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Resistors

Stationary

Neutral Grounding



Short circuits between phase and ground can result in irreversible damage to networks and equipments; it is therefore of the utmost importance to be able to control and reduce their effects: Grounding Resistors limit the fault current that arises due to phase-neutral short circuits. Grounding through resistor offers several advantages with respect to alternative methods (such as insulated grounding, direct grounding or grounding through a reactance). The main advantages are: easier detection of fault location, limitation of fault current, no transient over voltages.

Relevant parameters in the design of a Neutral Grounding Resistor may vary greatly: Microelettrica has developed a line of standard products (for the most common requirements) along with tailored products, each developed and customised according to the required project characteristics. Our products range from Low Voltage systems (<1kV) to High Voltage (132kV insulation class), and from very low fault current values (tens of Amps) to very high (>10kA).

The essential parameters needed to design a Grounding Resistor are:

- Nominal Voltage
- Fault Current
- Fault Duration (10s is customary)



Microelettrica Scientifica

Resistors

Other relevant parameters are:

- Protection degree of enclosure: from IP00 - i.e. no enclosure - to IP55, standard solution IP23
- Enclosure finish: our standard is mild galvanised, but different stainless steel grades (such as AISI304 or AISI316) are available. Painting in the desired RAL colour is also an option
- Continuous current rating; it may affect significantly the performance of the resistor, especially when high IP degrees are required
- Environment and Elevation: we design resistors for the harshest industrial or natural settings
- Auxiliary components: during our many years of operation we have selected a number of trusted suppliers for a wide choice of components, such as Current Transformers, Switches, Disconnectors, etc.

Applications

Energy



KNORR-BREMSE



Microelettrica Scientifica

Microelettrica Scientifica S.p.A. Via Lucania, 2 20090 Buccinasco - Italy
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Spare parts

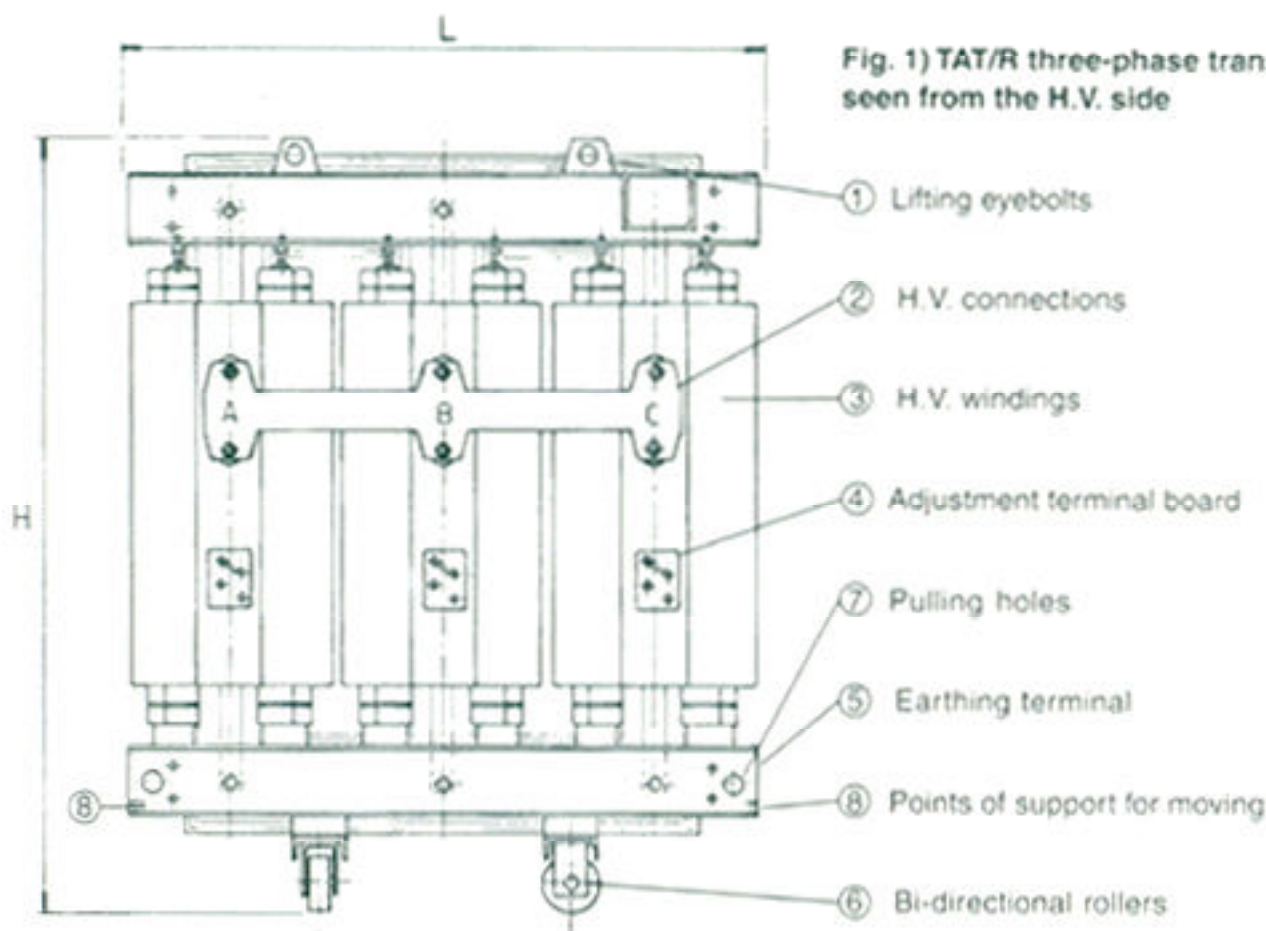


Overview

The transformers in the TAT/R series, made by OCREV, comply with the current standards CEI 14-8 and IEC 726. The difference of this type of transformer compared to impregnated dry types lies in the windings which are completely vacuum encapsulated in epoxy resin forming a compact mass which, besides protecting the winding from the damp, dust and other polluting substances, guarantees good insulation of the live parts and an excellent behaviour in the event of short circuits.

Packing

Humidity does not normally influence how cast-resin transformers work. They will not need any packing if the distance to be travelled is short provided they are protected from the rain. If the distance, or storage is long however, or if they are going to be exposed to bad weather for any length of time, we suggest covering them with a plastic packing material. If they are to be shipped overseas pack them inside wooden crates or containers.



ATTENTION: Fig. 1) is only to be considered an illustration



Handling instructions

To lift the unpacked transformer use the holes provided or, if provided, the eye-bolts on the top. We recommend lifting the transformer with the aid of 4 cables with a maximum angle of 60° . For moving along the floor use sliding rollers placing them in the direction you want to go.

Under no circumstances lean against the windings or their connections when moving the transformer. Use only the metal points of support. Failure to follow these instructions could damage the transformer.

Storage

The best place to store resin transformers is a dry, well ventilated place. To prevent dust from collecting, cover the transformer with a sheet of plastic. After a long period in the warehouse at a temperature of below 0°C or in a very damp place, the transformer must be dried before energizing it.

Installation

Cast-resin transformers are designed for indoor installation, having an IP00 level of protection. For this reason, the place of installations must be dry and completely waterproof. If the transformer is to be installed outdoors it must be placed inside a cubicle with a minimum level of protection equal to IP23.

Certain measures must be taken during installation.

- All packing material, fixing and lifting means must be removed.
- Clean the transformer if necessary, especially the cannels through which cooling air flows.
- Check that the windings have not moved, that the compression bolts on the top wedges and the tie rods on the nucleus are correctly positioned and secure.
- Lock the rollers so the transformer cannot move. Damper blocks can be used which, besides locking the rollers, will considerably reduce noise.
- All parts or accessories disassembled to facilitate transport must be reassembled.
- Pay particular attention to the place of installation which must be adequately ventilated to guarantee effective cooling of the transformer.



Connecting to the mains

Prior to energizing the transformer there are a few points to be considered:

- all the electrical connections must be well secure and their contact surface must be sufficiently large and thoroughly clean;
- the cables and, of course, all the connections, must be at a safe distance from live parts (see table 1 on this subject);
- check that the voltage variation and adjustment links are positioned according to the enclosed diagrams and that the columns have the same connection arrangements;
- the transformer must be earthed with the appropriate terminal;
- any control temperature devices must be connected and checked to see that they carry out their functions;
- if the transformer is equipped with fans for forced ventilation, check functioning of the control circuits and rotation direction of the fans.

Ratio of transformation adjustment

The transformers in the TAT/R series are equipped with a ratio of transformation adjustment. This adjustment is agreed upon with the customer beforehand and can have a minimum of 3 positions ($\pm 5\%$ of the nominal value). A greater number of positions is possible if requested.

Adjustment is carried out phase by phase by moving the links on the front of the H.V. columns. Particular attention must be paid in placing the links: they must be arranged in the same position on the three H.V. columns.

ATTENTION:

before doing any work on the transformer make certain it is disconnected from the electricity mains.

Under no circumstances must the transformer be touched when it is energized. Even going beyond the insulation distance could be a hazard source for people and things.



Starting the transformer

All the connecting points of the auxiliary circuits and accessories must be installed at a distance far enough away from the high voltage points (windings, connectors and terminals). The distances to comply with are given in the following table:

Table 1

Insulation class (kV)	Shock peak voltage (kV)	Minimum distance according to IEC 71-3
7.2	60	90
12	75	120
17.5	95	220
24	125	220
36	170	320

Maintenance

Cast-resin transformers do not normally need any maintenance but it is good practice, at regular intervals, to:

- remove any dust on the transformer and to make sure the cooling channels are not clogged;
- check tightness of the connections;
- make sure the control devices are all working properly.

Spare parts

The Cast-resin transformers of our production range are assembled according to a modular system. Their disassembly is only allowed in our workshop.

Overloads

Our cast-resin transformers are designed to produce their rated output for an unlimited time, observing the temperatures indicated by the standards. Unexpected overloads will shorten transformer life.

On the other hand, a transformer can be subject to temporary overloading under well defined conditions. The duration and value of the overload depend on the power produced and room temperature at the time of the overload. So with a time constant which, in this case is half an hour, the permitted overload with a room temperature of 20° C will be:

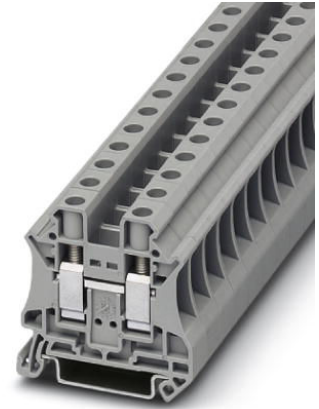
	Duration of the overload (Hours)				
	12	8	4	2	1
Preliminary load in % of the rated output	Overload in % of I_N				
25	6	8	15	25	32
50	6	8	15	22	30
75	5	7	13	22	27

I_N nominal current

This table has been taken from the CEI 905 standard "guide for loading dry transformers". Average heating of the windings equal to 100 K for dry transformers in class F has been taken into account. The absolute temperature that the hottest point in the windings can reach is 190° C. This temperature must not be exceeded for any reason.

UT 10

Order No.: 3044160



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3044160>

Feed-through modular terminal block, Connection method: Screw connection, Cross section: 0.5 mm² - 16 mm², AWG 20 - 6, Width: 10.2 mm, Color: gray, Mounting type: NS 35/7.5, NS 35/15



Commercial data

GTIN (EAN)	 4 017918 960445
sales group	A800
Pack	50 pcs.
Customs tariff	85369010
Catalog page information	Page 27 (CL1-2011)

Product notes

WEEE/RoHS-compliant since:
01/01/2003



<http://www.download.phoenixcontact.com>
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Technical data

General

Number of levels	1
Number of connections	2
Color	gray

Insulating material	PA
Inflammability class according to UL 94	V0

Dimensions

Width	10.2 mm
Length	47.7 mm
Height NS 35/7.5	47.5 mm
Height NS 35/15	55 mm

Technical data

Maximum load current	76 A (with 16 mm ² conductor cross section)
Rated surge voltage	8 kV
Pollution degree	3
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-1
Nominal current I _N	57 A
Nominal voltage U _N	1000 V
Open side panel	ja

Connection data

Note	Note: Product releases, connection cross sections and notes on connecting aluminum cables can be found in the download area.
Conductor cross section solid min.	0.5 mm ²
Conductor cross section solid max.	16 mm ²
Conductor cross section stranded min.	0.5 mm ²
Conductor cross section stranded max.	16 mm ²
Conductor cross section AWG/kcmil min.	20
Conductor cross section AWG/kcmil max	6
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.5 mm ²
Conductor cross section stranded, with ferrule without plastic sleeve max.	10 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.5 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve max.	10 mm ²
2 conductors with same cross section, solid min.	0.5 mm ²
2 conductors with same cross section, solid max.	4 mm ²

2 conductors with same cross section, stranded min.	0.5 mm ²
2 conductors with same cross section, stranded max.	4 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	6 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	2.5 mm ²
Connection method	Screw connection
Stripping length	10 mm
Internal cylindrical gage	A6
Screw thread	M4
Tightening torque, min	1.5 Nm
Tightening torque max	1.8 Nm

Certificates / Approvals



Certification

CB, CSA, CUL, DNV, GL, LR, RS, UL, VDE-PZI

Certification Ex:

IECEX, KEMA-EX

Accessories

Item	Designation	Description
Assembly		
3047167	ATP-UT	Partition plate, Length: 50 mm, Width: 2 mm, Height: 48 mm, Color: gray
3047028	D-UT 2,5/10	End cover, Length: 47.7 mm, Width: 2.2 mm, Height: 48.4 mm, Color: gray
0801762	NS 35/ 7,5 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m

1207640	NS 35/ 7,5 PERF 755MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 7.5 mm, width 35 mm, length: 755 mm
1207653	NS 35/ 7,5 PERF 955MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 7.5 mm, width 35 mm, length: 955 mm
1207666	NS 35/ 7,5 PERF 1155MM	NS 35 DIN rail, height 7.5 mm, length 1155 mm
0801733	NS 35/ 7,5 PERF 2000MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 7.5 mm, width 35 mm, length: 2000 mm
0801681	NS 35/ 7,5 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1201756	NS 35/15 AL UNPERF 2000MM	DIN rail, deep drawn, high profile, unperforated, 1.5 mm thick, material: aluminum, height 15 mm, width 35 mm, length 2000 mm
1201895	NS 35/15 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m
1207679	NS 35/15 PERF 755MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 15 mm, width 35 mm, length: 755 mm
1207682	NS 35/15 PERF 955MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 15 mm, width 35 mm, length: 955 mm
1207695	NS 35/15 PERF 1155MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 15 mm, width 35 mm, length: 1155 mm
1201730	NS 35/15 PERF 2000MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 15 mm, width 35 mm, length: 2000 mm
1201714	NS 35/15 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1201798	NS 35/15-2,3 UNPERF 2000MM	DIN rail, material: Steel, unperforated, 2.3 mm thick, height 15 mm, width 35 mm, length: 2 m

Bridges

3005947	FBS 2-10	Plug-in bridge, Number of positions: 2, Color: red
3047060	RB UT 10-(2,5/4)	Reducing bridge, Number of positions: 2, Color: red
3047086	RB UT 10-ST(2,5/4)	Reducing bridge, Number of positions: 2, Color: red

General

5146040	CLIP-PROJECT ADVANCED	Multilingual software for easy planning of Phoenix Contact on DIN rails together with the integrated TRABTECH-select software module for planning comprehensive surge protection concepts.
5146053	CLIP-PROJECT PROFESSIONAL	Multi-lingual software for terminal strip project planning. A marking module allows professional labeling of markers and labels for marking terminal blocks, conductors, cables and devices. The additionally integrated software module TRABTECH-select for planning comprehensive surge protection concepts.

Marking

0816210	TMT 10 R	Markers for terminal blocks with 10 mm pitch, perforated, unprinted, for all terminal blocks with ZB and ZBF keyway, can be labelled using a thermo transfer printer, 1 roll = 1,000 strips, 10 labels/strips, strip height: 6.4 mm
0818069	UC-TM 10	UniCard materials for labeling terminal blocks with a marker groove, 48-section, can be labeled with BLUEMARK and CMS-P1-PLOTTER, color: white
0824605	UC-TM 10 CUS	UniCard sheets, for labeling terminal blocks with a zack marker strip groove, can be printed as per customer requirements
0829142	UCT-TM 10	UniCard materials for thermal transfer printer, for labeling terminal blocks with a marker groove, 36-section, can be labeled with THERMOMARK CARD and BLUEMARK LED, color: white
0829623	UCT-TM 10 CUS	Terminal block marking, can be labeled as per customer specifications
3047361	WS UT 10	Warning sign for UT terminal blocks
0811228	X-PEN 0,35	Marker pen without ink cartridge, for manual labeling of markers, labeling extremely wipe-proof, line thickness 0.35 mm
0824941	ZB 10 CUS	Terminal block marking, can be labeled as per customer specifications
1053001	ZB 10:UNBEDRUCKT	Zack strip, unprinted: 10-section, for individual labeling with M-PEN, ZB-T or CMS system, sufficient for 100 terminal blocks, for a terminal width of 10.2 mm, color: White
1053014	ZB10,LGS:FORTL.ZAHLEN	Zack strip, 10-section, printed horizontally: with the numbers, 1-10, 11-20 etc. up to 991-1000, color: white
1053030	ZB10,LGS:GLEICHE ZAHLEN	Zack strip, 10-section, printed horizontally: with identical numbers, 1/1/1, 2/2/2 etc. up to 100/100/100, color: white
1053412	ZB10,LGS:L1-N,PE	Zack strip, printed horizontally, strips with 10 labels, L1, L2, L3, N, PE, L1, L2, L3, N, PE, color: white
1053438	ZB10,LGS:U-N	Zack marker strip, printed horizontally, strips with 10 labels, U, V, W, N, GND, U, V, W, N, GND, color: White
1053027	ZB10,QR:FORTL.ZAHLEN	Zack strip, 10-section, printed vertically: with consecutive numbers, 1-10, 11-20 a.s.o. up to 991-1000, color: white
5060883	ZB10/WH-100:UNBEDRUCKT	Zack strip, unprinted: 10-section, for individual labeling with M-PEN, ZB-T or CMS system, large batch, sufficient for labeling 1000 terminal blocks, for a terminal width of 10.2 mm, color: White
1050525	ZB10:SO/CMS	Zack strip, 10-section, divisible, special printing, marking according to customer requirements

Plug/Adapter

3047112	AGK 4-UT 10	Pick-off terminal block, Connection method: Screw connection, Cross section: 0.5 mm ² - 16 mm ² , AWG 20 - 6, Width: 8.2 mm, Height: 34.7 mm, Color: gray, Mounting type: On base element
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Tools

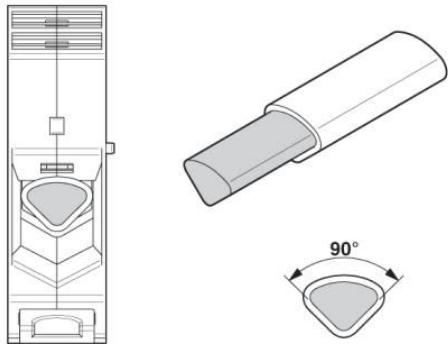
1205066	SZS 1,0X4,0 VDE	Screwdriver, bladed, VDE insulated, size: 1.0 x 4.0 x 100 mm, 2-component grip, with non-slip grip
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Diagrams/Drawings

Circuit diagram



Schematic diagram



Connecting aluminum cables. Further notes can be found in the download area

Address

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Feed-through terminal block - UT 4 - 3044102

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Feed-through terminal block, Connection method: Screw connection, Cross section: 0.14 mm² - 6 mm², AWG: 26 - 10, Width: 6.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15

Why buy this product

- ✓ The large wiring space enables the connection of solid and stranded conductors without ferrules, even above the nominal cross section
- ✓ As well as saving space, the compact design enables user-friendly wiring in a small amount of space
- ✓ Optimum screwdriver guidance through closed screw shafts
- ✓ Tested for railway applications
- ✓ The cable entry funnel enables the use of conductors with ferrules and plastic collars within the nominal cross section



Key Commercial Data

Packing unit	1 STK
Minimum order quantity	50 STK
Weight per Piece (excluding packing)	9.600 g
Custom tariff number	85369010
Country of origin	Germany

Technical data

General

Number of levels	1
Number of connections	2
Potentials	1
Nominal cross section	4 mm ²
Color	gray
Insulating material	PA
Flammability rating according to UL 94	V0

Feed-through terminal block - UT 4 - 3044102

Technical data

General

Area of application	Railway industry
	Machine building
	Plant engineering
	Process industry
Rated surge voltage	8 kV
Degree of pollution	3
Overvoltage category	III
Insulating material group	I
Maximum load current	41 A (with 6 mm ² conductor cross section)
Nominal current I _N	32 A (with 4 mm ² conductor cross section)
Nominal voltage U _N	1000 V
Open side panel	Yes
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Result of surge voltage test	Test passed
Surge voltage test setpoint	9.8 kV
Result of power-frequency withstand voltage test	Test passed
Power frequency withstand voltage setpoint	2.2 kV
Result of the test for mechanical stability of terminal points (5 x conductor connection)	Test passed
Result of bending test	Test passed
Bending test rotation speed	10 rpm
Bending test turns	135
Bending test conductor cross section/weight	0.14 mm ² / 0.2 kg
	4 mm ² / 0.9 kg
	6 mm ² / 1.4 kg
Tensile test result	Test passed
Conductor cross section tensile test	0.14 mm ²
Tractive force setpoint	10 N
Conductor cross section tensile test	4 mm ²
Tractive force setpoint	60 N
Conductor cross section tensile test	6 mm ²
Tractive force setpoint	80 N
Result of tight fit on support	Test passed
Tight fit on carrier	NS 35
Setpoint	1 N

Feed-through terminal block - UT 4 - 3044102

Technical data

General

Result of voltage-drop test	Test passed
Requirements, voltage drop	$\leq 3.2 \text{ mV}$
Result of temperature-rise test	Test passed
Short circuit stability result	Test passed
Conductor cross section short circuit testing	4 mm ²
Short-time current	0.48 kA
Conductor cross section short circuit testing	6 mm ²
Short-time current	0.72 kA
Result of thermal test	Test passed
Proof of thermal characteristics (needle flame) effective duration	30 s
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2008-03
Test spectrum	Service life test category 1, class B, body mounted
Test frequency	$f_1 = 5 \text{ Hz}$ to $f_2 = 150 \text{ Hz}$
ASD level	1.857 (m/s ²) ² /Hz
Acceleration	0,8 g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2008-03
Shock form	Half-sine
Acceleration	5 g
Shock duration	30 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Behavior in fire for rail vehicles (DIN 5510-2)	Test passed
Flame test method (DIN EN 60695-11-10)	V0
Oxygen index (DIN EN ISO 4589-2)	>32 %
NF F16-101, NF F10-102 Class I	2
NF F16-101, NF F10-102 Class F	2
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg

Feed-through terminal block - UT 4 - 3044102

Technical data

General

Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	6.2 mm
End cover width	2.2 mm
Length	47.7 mm
Height NS 35/7,5	47.5 mm
Height NS 35/15	55 mm

Connection data

Connection method	Screw connection
Connection in acc. with standard	IEC 60947-7-1
Note	Note: Product releases, connection cross sections and notes on connecting aluminum cables can be found in the download area.
Conductor cross section solid min.	0.14 mm ²
Conductor cross section solid max.	6 mm ²
Conductor cross section AWG min.	26
Conductor cross section AWG max.	10
Conductor cross section flexible min.	0.14 mm ²
Conductor cross section flexible max.	6 mm ²
Min. AWG conductor cross section, flexible	26
Max. AWG conductor cross section, flexible	10
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.14 mm ²
Conductor cross section flexible, with ferrule without plastic sleeve max.	4 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.14 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve max.	4 mm ²
2 conductors with same cross section, solid min.	0.14 mm ²
2 conductors with same cross section, solid max.	1.5 mm ²
2 conductors with same cross section, stranded min.	0.14 mm ²
2 conductors with same cross section, stranded max.	1.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	2.5 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.14 mm ²

Feed-through terminal block - UT 4 - 3044102

Technical data

Connection data

2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	1.5 mm ²
Connection in acc. with standard	IEC/EN 60079-7
Conductor cross section solid min.	0.14 mm ²
Conductor cross section solid max.	6 mm ²
Conductor cross section AWG min.	26
Conductor cross section AWG max.	10
Conductor cross section flexible min.	0.14 mm ²
Conductor cross section flexible max.	4 mm ²
Stripping length	9 mm
Internal cylindrical gage	A4
Screw thread	M3
Tightening torque, min	0.6 Nm
Tightening torque max	0.8 Nm

Standards and Regulations

Connection in acc. with standard	CSA
	IEC 60947-7-1
Flammability rating according to UL 94	V0

Environmental Product Compliance

China RoHS	Environmentally Friendly Use Period = 50
	For details about hazardous substances go to tab "Downloads", Category "Manufacturer's declaration"

Feed-through terminal block - UT 6 - 3044131

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Feed-through terminal block, Connection method: Screw connection, Cross section: 0.2 mm² - 10 mm², AWG: 24 - 8, Width: 8.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15

Why buy this product

- ✓ The large wiring space enables the connection of solid and stranded conductors without ferrules, even above the nominal cross section
- ✓ As well as saving space, the compact design enables user-friendly wiring in a small amount of space
- ✓ Optimum screwdriver guidance through closed screw shafts
- ✓ Tested for railway applications
- ✓ The cable entry funnel enables the use of conductors with ferrules and plastic collars within the nominal cross section



Key Commercial Data

Packing unit	50 STK
Minimum order quantity	50 STK
GTIN	 4 017918 960438
GTIN	4017918960438
Weight per Piece (excluding packing)	13.900 g
Custom tariff number	85369010
Country of origin	Germany

Technical data

General

Number of levels	1
Number of connections	2
Potentials	1
Nominal cross section	6 mm ²
Color	gray
Insulating material	PA
Flammability rating according to UL 94	V0

Feed-through terminal block - UT 6 - 3044131

Technical data

General

Area of application	Railway industry
	Machine building
	Plant engineering
	Process industry
Rated surge voltage	8 kV
Degree of pollution	3
Overvoltage category	III
Insulating material group	I
Maximum load current	57 A (with 10 mm ² conductor cross section)
Nominal current I _N	41 A
Nominal voltage U _N	1000 V
Open side panel	Yes
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Result of surge voltage test	Test passed
Surge voltage test setpoint	9.8 kV
Result of power-frequency withstand voltage test	Test passed
Power frequency withstand voltage setpoint	2.2 kV
Result of the test for mechanical stability of terminal points (5 x conductor connection)	Test passed
Result of bending test	Test passed
Bending test rotation speed	10 rpm
Bending test turns	135
Bending test conductor cross section/weight	0.2 mm ² / 0.2 kg
	6 mm ² / 1.4 kg
	10 mm ² / 2 kg
Tensile test result	Test passed
Conductor cross section tensile test	0.2 mm ²
Tractive force setpoint	10 N
Conductor cross section tensile test	6 mm ²
Tractive force setpoint	80 N
Conductor cross section tensile test	10 mm ²
Tractive force setpoint	90 N
Result of tight fit on support	Test passed
Tight fit on carrier	NS 35
Setpoint	5 N
Result of voltage-drop test	Test passed
Requirements, voltage drop	≤ 3.2 mV
Result of temperature-rise test	Test passed
Short circuit stability result	Test passed

Feed-through terminal block - UT 6 - 3044131

Technical data

General

Conductor cross section short circuit testing	6 mm ²
Short-time current	0.72 kA
Conductor cross section short circuit testing	10 mm ²
Short-time current	1.2 kA
Result of thermal test	Test passed
Proof of thermal characteristics (needle flame) effective duration	30 s
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2008-03
Test spectrum	Service life test category 1, class B, body mounted
Test frequency	f ₁ = 5 Hz to f ₂ = 150 Hz
ASD level	1.857 (m/s ²) ² /Hz
Acceleration	0,8 g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2008-03
Shock form	Half-sine
Acceleration	5 g
Shock duration	30 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Behavior in fire for rail vehicles (DIN 5510-2)	Test passed
Flame test method (DIN EN 60695-11-10)	V0
Oxygen index (DIN EN ISO 4589-2)	>32 %
NF F16-101, NF F10-102 Class I	2
NF F16-101, NF F10-102 Class F	2
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	8.2 mm
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Feed-through terminal block - UT 6 - 3044131

Technical data

Dimensions

End cover width	2.2 mm
Length	47.7 mm
Height NS 35/7,5	47.5 mm
Height NS 35/15	55 mm

Connection data

Connection method	Screw connection
Connection in acc. with standard	IEC 60947-7-1
Note	Note: Product releases, connection cross sections and notes on connecting aluminum cables can be found in the download area.
Conductor cross section solid min.	0.2 mm ²
Conductor cross section solid max.	10 mm ²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	8
Conductor cross section flexible min.	0.2 mm ²
Conductor cross section flexible max.	10 mm ²
Min. AWG conductor cross section, flexible	24
Max. AWG conductor cross section, flexible	8
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.25 mm ²
Conductor cross section flexible, with ferrule without plastic sleeve max.	6 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.25 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve max.	6 mm ²
2 conductors with same cross section, solid min.	0.2 mm ²
2 conductors with same cross section, solid max.	2.5 mm ²
2 conductors with same cross section, stranded min.	0.2 mm ²
2 conductors with same cross section, stranded max.	2.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	4 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.25 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	1.5 mm ²
Connection in acc. with standard	IEC/EN 60079-7
Conductor cross section solid min.	0.2 mm ²
Conductor cross section solid max.	10 mm ²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	8
Conductor cross section flexible min.	0.2 mm ²
Conductor cross section flexible max.	6 mm ²
Stripping length	10 mm
Internal cylindrical gage	A5

Feed-through terminal block - UT 6 - 3044131

Technical data

Connection data

Screw thread	M4
Tightening torque, min	1.5 Nm
Tightening torque max	1.8 Nm

Standards and Regulations

Connection in acc. with standard	CSA
	IEC 60947-7-1
Flammability rating according to UL 94	V0

Environmental Product Compliance

China RoHS	Environmentally Friendly Use Period = 50
	For details about hazardous substances go to tab "Downloads", Category "Manufacturer's declaration"

Test disconnect terminal block - UTME 6 - 3047400

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Test disconnect terminal block, Connection method: Screw connection, Cross section: 0.2 mm² - 10 mm², AWG 24 - 8, Width: 8.2 mm, Color: gray, Mounting type: NS 35/7.5, NS 35/15

Product description

Test disconnect terminal block

Why buy this product

- ☒ Feed-through terminal blocks of the same shape are available
- ☒ Clear
- ☒ Clear selection thanks to printed switching symbols
- ☒ Easy operation
- ☒ Six function shafts
- ☒ Compact design
- ☒ Flexible and comprehensive accessories
- ☒ Reliably snapped into the end positions
- ☒ Contact made via screw terminal points

Key commercial data

Packing unit	0
Minimum order quantity	50
Catalog page	Page 71 (CL1-2011)
GTIN	 4 046356 291101
Custom tariff number	85369010
Country of origin	POLAND

Technical data

General

Number of levels	1
Number of connections	2
Color	gray
Insulating material	PA
Inflammability class according to UL 94	V0

Dimensions

Width	8.2 mm
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Test disconnect terminal block - UTME 6 - 3047400

Technical data

Dimensions

Length	100.8 mm
Height NS 35/7.5	49.6 mm
Height NS 35/15	57.1 mm

Technical data

Maximum load current	30 A
Rated surge voltage	6 kV
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-1
Nominal current I _N	30 A
Nominal voltage U _N	500 V
Open side panel	ja
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Surge voltage test setpoint	7.3 kV
Result	Test passed
Power frequency withstand voltage setpoint	1.89 kV
Result	Test passed
Checking the mechanical stability of terminal points (5 x conductor connection)	Test passed
Bending test rotation speed	10 rpm
Bending test turns	135
Bending test conductor cross section/weight	0.2 mm ² / 0.2 kg
Bending test conductor cross section/weight	6 mm ² / 1.4 kg
Bending test conductor cross section/weight	10 mm ² / 2 kg
Result of bending test	Test passed
Conductor cross section tensile test	0.2 mm ²
Tractive force setpoint	10 N
Conductor cross section tensile test	6 mm ²
Tractive force setpoint	80 N
Conductor cross section tensile test	10 mm ²
Tractive force setpoint	90 N
Tensile test result	Test passed
Tight fit on carrier	NS 35
Setpoint	5 N
Result	Test passed
Result	Test passed
Temperature-rise test	Test passed
Conductor cross section short circuit testing	4 mm ²
Short-time current	0.48 kA
Short circuit stability result	Test passed

Test disconnect terminal block - UTME 6 - 3047400

Technical data

Technical data

Ageing test for screwless modular terminal block temperature cycles	192
Result	Test passed
Proof of thermal characteristics (needle flame) effective duration	30 s
Result	Test passed

Connection data

Conductor cross section solid min.	0.2 mm ²
Conductor cross section solid max.	10 mm ²
Conductor cross section stranded min.	0.2 mm ²
Conductor cross section stranded max.	10 mm ²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	8
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule without plastic sleeve max.	6 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve max.	6 mm ²
2 conductors with same cross section, solid min.	0.2 mm ²
2 conductors with same cross section, solid max.	2.5 mm ²
2 conductors with same cross section, stranded min.	0.2 mm ²
2 conductors with same cross section, stranded max.	2.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	4 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.25 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	2.5 mm ²
Connection method	Screw connection
Stripping length	10 mm
Internal cylindrical gage	A5
Screw thread	M4
Tightening torque, min	1.5 Nm
Tightening torque max	1.8 Nm

Classifications

eclass

eCl@ss 4.0	27141120
eCl@ss 4.1	27141120
eCl@ss 5.0	27141120

Test disconnect terminal block - UTME 6 - 3047400

Classifications

eclass

eCl@ss 5.1	27141120
eCl@ss 6.0	27141120

etim

ETIM 2.0	EC000897
ETIM 3.0	EC000897
ETIM 4.0	EC000897

unspsc

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410
UNSPSC 13.2	39121410

Accessories

Accessories

Assembly

End cover - D-UTME 6 - 3047426



End cover, Length: 100.8 mm, Width: 2.2 mm, Height: 49.6 mm, Color: gray

Cover profile - AP-ME METER - 3034361



Cover profile, for covering terminal strips, snapped onto APT-ME cover profile carrier or APH-ME end bracket. A cover profile carrier should be positioned at the ends and at intervals of around 40 cm. Length supplied: 1 m

Cover profile - APH-ME - 3034374



Cover profile carrier for mounting on NS 35/7.5 DIN rail for attaching the cover profile AP-ME

Test disconnect terminal block - UTME 6 - 3047400

Accessories

Cover profile - APT-ME - 3034358



Cover profile carrier for mounting on NS 35/7.5 DIN rail for attaching the cover profile AP-ME

Spacer plate - DP PS-8 - 3036741



Spacer plate, Color: red

Bridges

Plug-in bridge - FBS 2-8 - 3030284



Plug-in bridge, Number of positions: 2, Color: red

Plug-in bridge - FBS 3-8 - 3030297



Plug-in bridge, Number of positions: 3, Color: red

Plug-in bridge - FBS 4-8 - 3030307



Plug-in bridge, Number of positions: 4, Color: red

Test disconnect terminal block - UTME 6 - 3047400

Accessories

Plug-in bridge - FBS 5-8 - 3030310



Plug-in bridge, Number of positions: 5, Color: red

Plug-in bridge - FBS 10-8 - 3030323



Plug-in bridge, Number of positions: 10, Color: red

Plug-in bridge - FBS 6-8 - 3032470



Plug-in bridge, Number of positions: 6, Color: red

Plug-in bridge - FBSRH 2-8 - 3033802



Plug-in bridge, Number of positions: 2, Color: red

Plug-in bridge - FBSRH 3-8 - 3033803



Plug-in bridge, Number of positions: 3, Color: red

Plug-in bridge - FBSRH 4-8 - 3033804



Plug-in bridge, Number of positions: 4, Color: red

Test disconnect terminal block - UTME 6 - 3047400

Accessories

Plug/Adapter

Test adapter - PS-8 - 3031005



Test adapter, Color: red

Test adapter - PAI-4-FIX OG - 3034455



Test adapter, Color: orange

Test adapter - PAI-4-FIX BU - 3032729



Test adapter, Color: blue

Test adapter - PAI-4-FIX BK - 3032774



Test adapter, Color: black

Test adapter - PAI-4-FIX RD - 3032732



Test adapter, Color: red

Test disconnect terminal block - UTME 6 - 3047400

Accessories

Test adapter - PAI-4-FIX GN - 3032758



Test adapter, Color: green

Test adapter - PAI-4-FIX BN - 3032787



Test adapter, Color: brown

Test adapter - PAI-4-FIX VT - 3032761



Test adapter, Color: violet

Test adapter - PAI-4-FIX GY - 3032790



Test adapter, Color: gray

Test adapter - PAI-4-FIX YE - 3032745



Test adapter, Color: yellow

Tools

Test disconnect terminal block - UTME 6 - 3047400

Accessories

Screwdriver - SZS 1,0X4,0 VDE - 1205066



Screwdriver, bladed, VDE insulated, size: 1.0 x 4.0 x 100 mm, 2-component grip, with non-slip grip

Connecting bridge - C-ME 6/2 - 3034442



Connecting bridge, Length: 5 mm, Width: 16 mm, Height: 5 mm, Color: orange

Switching lock - S-ME 6 - 3034439



Switching lock, Length: 12 mm, Width: 8.2 mm, Color: white

End clamp - CARRIER 35-8 - 3034387



End clamp, Width: 8.2 mm, Color: gray, Mounting type: NS 35/7.5, NS 35/15

Switching jumper - SB-ME 2-8 - 3034468



Switching jumper, Length: 24.7 mm, Width: 16.4 mm, Height: 47.42 mm, Number of positions: 2, Color: gray/orange

Connecting bridge - C-ME 6/3 - 3034390

Connecting bridge, Color: orange

Test disconnect terminal block - UTME 6 - 3047400

Accessories

Covering hood - AH-ME - 3240265



Cover, for the contact- and dust-protected encapsulation of the components

Switching jumper - SB-ME 2-8 - 3034468



Switching jumper, Length: 24.7 mm, Width: 16.4 mm, Height: 47.42 mm, Number of positions: 2, Color: gray/orange

Switching jumper - SB-ME 3-8 - 3032800



Switching jumper, Length: 24.7 mm, Width: 24.6 mm, Height: 47.42 mm, Number of positions: 3, Color: gray/orange

Switching jumper - SB-ME 4-8 - 3034484

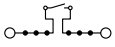


Switching jumper, Length: 24.7 mm, Width: 32.8 mm, Height: 47.42 mm, Number of positions: 4, Color: gray/orange

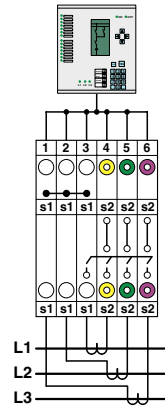
Drawings

Test disconnect terminal block - UTME 6 - 3047400

Circuit diagram

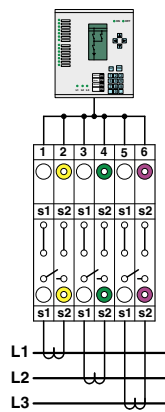


Schematic diagram



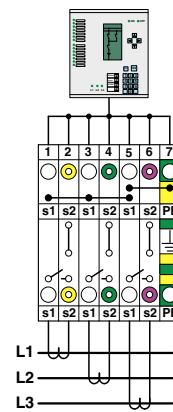
Interlinked three-phase current transformer set

Schematic diagram



Simple three-phase current transformer set

Schematic diagram



Interlinked three-phase current transformer set with grounded star point



CIRCUIT-BREAKER FOR VOLTAGE TRANSFORMER,
1CO, S00, 2.5A

General technical data:

product brand name		SIRIUS
product designation		Circuit breaker for distance relay
Size of the circuit-breaker		S00
Number of poles / for main current circuit		3
Product function		
• removable terminal for auxiliary and control circuit		No
• overload protection		Yes
• phase disturbance recognition		Yes
• short-circuit to earth recognition		No
Product component		
• auxiliary switch		Yes
• undervoltage release mechanism		No
• trip indicator		Yes
Product extension		
• auxiliary switch		Yes
• optional / motor drive		No
Impulse voltage resistance / rated value	V	6,000
Protection class IP / on the front		IP20
Protection against electrical shock		finger-safe

Installation altitude / at a height over sea level / maximum	m	2,000
Resistance against shock		15g / 11 ms
Ambient temperature		
• during transport	°C	-50 ... +80
• during storage	°C	-50 ... +80
• during operating	°C	-20 ... +70

Main circuit:		
Operating voltage / rated value	V	400
type of voltage		AC
Mechanical operating cycles as operating time / of the main contacts / typical		10,000
Frequency of operation / at AC-3 / according to IEC 60947-6-2	1/h	15

Auxiliary circuit:		
Design of the auxiliary switch		integrated, transverse
Number of change-over switches / for auxiliary contacts		1

Protection function:		
Adjustable response current / of the current-dependent overload release	A	2.5 ... 2.5
Breaking capacity limit short-circuit current (I_{cu})		
• at 400 V / rated value	kA	50

Installation/mounting/dimensions:		
Type of mounting		screw and snap-on mounting onto 35 mm standard mounting rail according to DIN EN 50022
mounting position		any
Depth	mm	75
Height	mm	90
Width	mm	45

Connections:		
Arrangement of electrical connectors / for main current circuit		front side
Design of the electrical connection		
• for main current circuit		screw-type terminals
• for auxiliary and control current circuit		screw-type terminals
Type of the connectable conductor cross-section		
• for main contacts		
• solid		2x (0.5 ... 1.5 mm ²), 2x (0.75 ... 2.5 mm ²)
• finely stranded		
• with conductor end processing		2x (0.5 ... 1.5 mm ²), 2x (0.75 ... 2.5 mm ²)
• stranded		2x (0.5 ... 1.5 mm ²), 2x (0.75 ... 2.5 mm ²)

- for auxiliary contacts
- solid
- finely stranded / with conductor end processing

2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²)

2x (0.5 ... 1.5 mm²), 2x (0.75 ... 2.5 mm²)

Certificates/approvals:

General Product Approval



GOST



KETI



UL

Test Certificates

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Further information:

Information- and Downloadcenter (Catalogs, Brochures,...)

<http://www.siemens.com/industrial-controls/catalogs>

Industry Mall (Online ordering system)

<http://www.siemens.com/industrial-controls/mall>

Cax online generator:

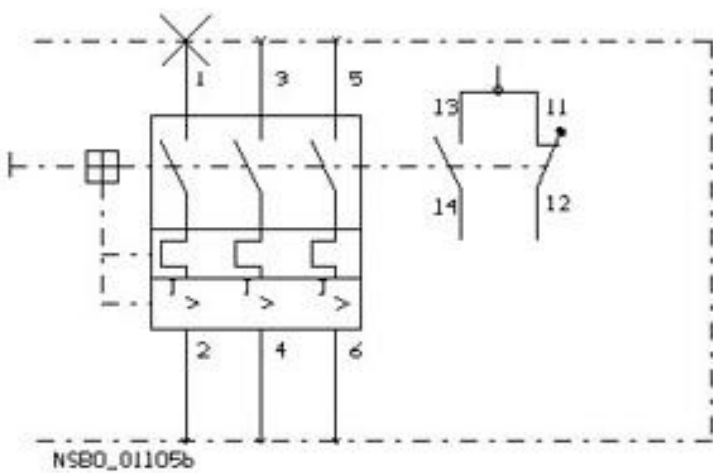
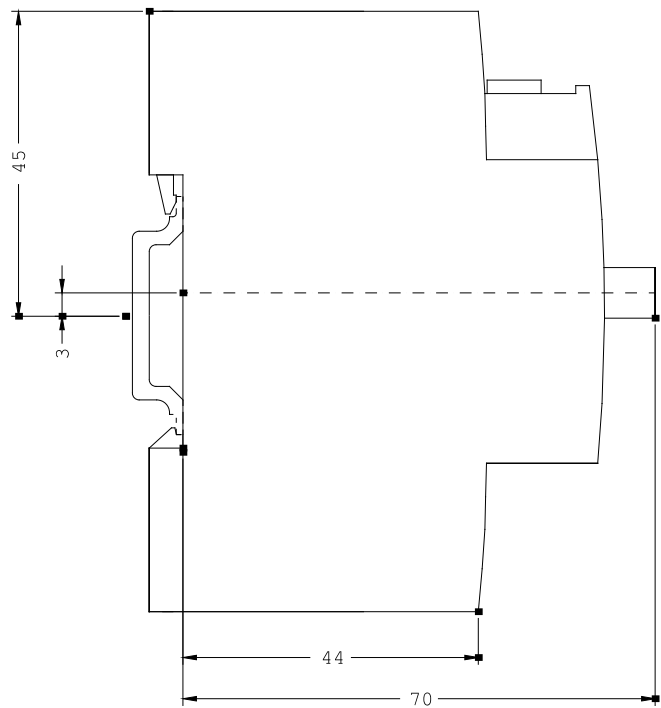
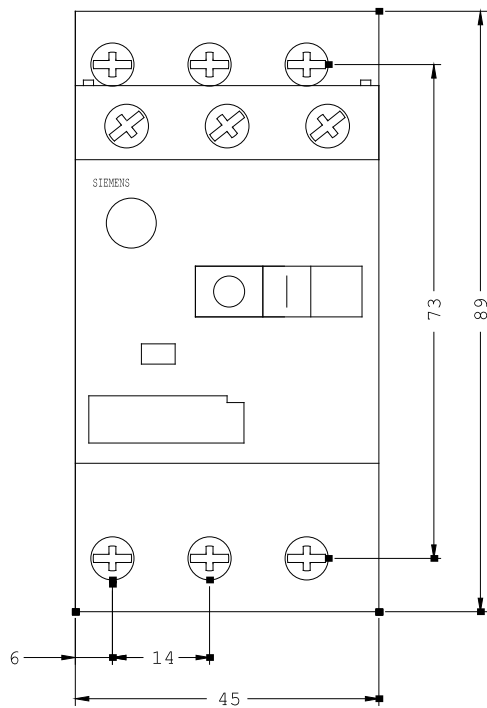
<http://www.siemens.com/cax>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

<http://support.automation.siemens.com/WW/view/en/3RV1611-1CG14/all>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, ...)

http://www.automation.siemens.com/bilddb/cax_en.aspx?mlfb=3RV1611-1CG14



last change:

Feb 11, 2013



CIRCUIT BREAKER 230/400V 10KA, 1-POLE, C, 6A, D=70MM

Similar to image

Technical data:		
Type of mounting		Quick assembly system
type of voltage		AC/DC
Height	mm	90
Width	mm	18
Depth	mm	76
mounting position		any
Mounting depth	mm	70
Current / for AC / rated value	A	6
Tripping characteristic class		C
Supply voltage		
• for AC / rated value	V	400
• with single-phase operation / with AC / rated value	V	230
• with multi-phase operation / with AC / rated value	V	400
Switching capacity current		
• in accordance with IEC 60947-2 / rated value	kA	35
• with DC / in accordance with IEC 60947-2 / rated value	kA	15
• acc. to EN 60898 / rated value	kA	10
Breaking capacity short-circuit current (Icn)		

• with DC / in accordance with EN 60898-2	kA	10
• with AC / in accordance with UL 1077 and CSA C22.2 No.235	kA	5
Active power loss / at rated value current / with AC / in warm operating state / per pole	W	0.9
Number of pitch units for width		1
Product feature / sealable		Yes
Degree of pollution		3
Ambient temperature	°C	-25 ... +55
Ambient temperature • during storage	°C	-40 ... +75
Position / of power supply cord		Any
Product property / properties for main switches in accordance with EN 60204-1		Yes
Mechanical operating cycles as operating time / typical		20,000
Overvoltage class		3
Product equipment / touch-protection		Yes
Resistance against shock / according to IEC 60068-2-27		150m/s ² at 11ms half-sine
Insulation voltage • with single-phase operation / with AC / rated value	V	250
• with multi-phase operation / with AC / rated value	V	440
AWG number • as encoded connectable conductor cross-section		14 ... 4
Section de conducteur raccordable • solid	mm ²	0.75 ... 35
• multibrin	mm ²	0.75 ... 35
• finely stranded • with wire end processing	mm ²	0.75 ... 25
Product component • combined terminal top		Yes
• combined terminal bottom		Yes
Tightening torque • with screw-type terminals	N·m	2.5 ... 3
Tightening torque (lbf·in) • with screw connection	lbf·in	22 ... 26
Product feature • [not supplied - silicon-free]		Yes
• halogen-free		Yes
Number of test cycles / for environmental testing / in accordance with IEC 60068-2-30		6
Item designation / according to DIN EN 61346-2		F

Certificates/approvals:

General Product Approval



CCC



GOST



IMQ



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UL



VDE

Declaration of Conformity



EG-Konf.

Test Certificates

[Special Test Certificate](#)

Shipping Approval



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Further information:

Information- and Downloadcenter (Catalogs, Brochures,...)

<http://www.siemens.com/lowvoltage/catalogs>

Industry Mall (Online ordering system)

<http://www.siemens.com/lowvoltage/mall>

Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

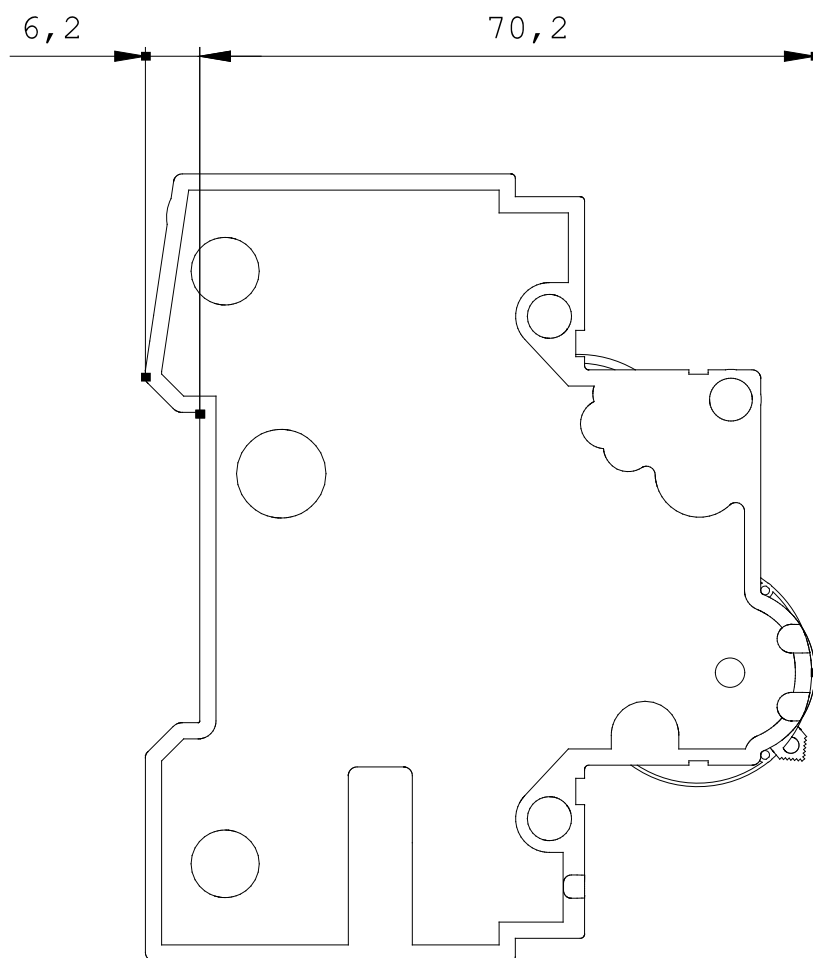
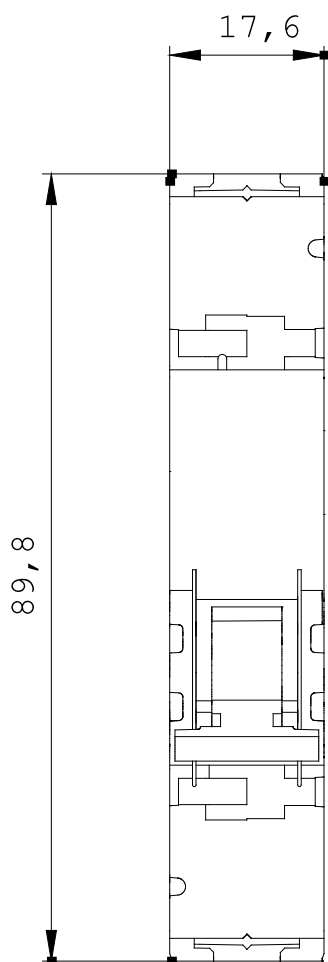
<http://support.automation.siemens.com/WW/view/en/5SY4106-7/all>

Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, ...)

http://www.automation.siemens.com/bilddb/cax_en.aspx?mlfb=5SY4106-7

CAX-Online-Generator

<http://www.siemens.com/cax>



last change:

Dec 31, 2012

CIRCUIT BREAKER 400V 10KA, 2-POLE, C, 3A, D=70MM



Model	
product brandname	SENTRON
Product designation	Miniature circuit breakers
General technical data	
Number of poles	2
Number of poles / Note	2P
Tripping characteristic class	C
circuit-breaker / Design	5SY4
Mechanical service life (switching cycles) / typical	20 000
Overvoltage category	3
Voltage	
Type of voltage	AC/DC
Insulation voltage	
• with multi-phase operation / at AC / rated value	440 V
Supply voltage	
Supply voltage / at AC / rated value	400 V
Supply voltage frequency	
• rated value	50/60 Hz

Protection class	
Protection class IP	IP20, with connected conductors
Energy limiting class	3
Switching capacity	
Switching capacity current	
• acc. to EN 60898 / rated value	10 kA
• acc. to IEC 60947-2 / rated value	35 kA
Dissipation	
Power loss [W]	
• for rated value of the current / at AC / in hot operating state / per pole	1.3 W
• maximum	2.6 W
Electricity	
rated current I _n / IEC, DIN/VDE / at 40 Cel	2.82 A
Current / at AC / rated value	3 A
Product details	
Product feature / Touch protection	Yes
Product component	
• combined terminal top	Yes
• combined terminal bottom	Yes
Product feature	
• Properties for main switches in accordance with EN 60204-1	Yes
• halogen-free	Yes
• sealable	Yes
• silicon-free	Yes
Product extension / can be installed / supplementary devices	Yes
Product function	
Product function / neutral conductor switching	No
Short circuit	
Breaking capacity short-circuit current (I_{cn})	
• at AC / acc. to UL 1077 and CSA C22.2 No.235	5 kA
Number	
Number of test cycles / for environmental testing / acc. to IEC 60068-2-30	6
Connections	
Connectable conductor cross-section / stranded	
• minimum	0.75 mm ²

• maximum	35 mm ²
Connectable conductor cross-section	
• solid	
— minimum	0.75 mm ²
— maximum	35 mm ²
• finely stranded / with core end processing	
— minimum	0.75 mm ²
— maximum	25 mm ²
AWG number / as coded connectable conductor cross section	
• minimum	14
• maximum	4
Tightening torque [lbf·in] / with screw-type terminals	
• minimum	22 lbf·in
• maximum	26 lbf·in
Tightening torque / with screw-type terminals	
• minimum	2.5 N·m
• maximum	3 N·m
Position / of power supply cord	Any

Mechanical Design

Height	90 mm
Width	36 mm
Depth	76 mm
Mounting position	any
Installation depth	70 mm
Number of width units	2
Mounting type	Quick assembly system
Net weight	318 g

Environmental conditions

Influence of the surrounding temperature	Max. 95% humidity
Vibration resistance / acc. to IEC 60068-2-6	50m/s ² at 25 to 150Hz and 60m/s ² at 35Hz (4sec)
Ambient temperature	
• minimum	-25 °C
• maximum	55 °C
• during storage / minimum	-40 °C
• during storage / maximum	75 °C

Certificates

Equipment marking / acc. to DIN EN 61346-2	F
--	---

General Product Approval



CCC



IMQ



UL



VDE



RCM

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Declaration of Conformity



EG-Konf.

Test Certificates

[spezielle](#)
[Prüfbescheinigungen](#)
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Shipping Approval



ABS



BUREAU
VERITAS



LRS

Shipping Approval



RINA

Further information

Information- and Downloadcenter (Catalogs, Brochures,...)

<http://www.siemens.com/lowvoltage/catalogs>

Industry Mall (Online ordering system)

<https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=5SY4203-7>

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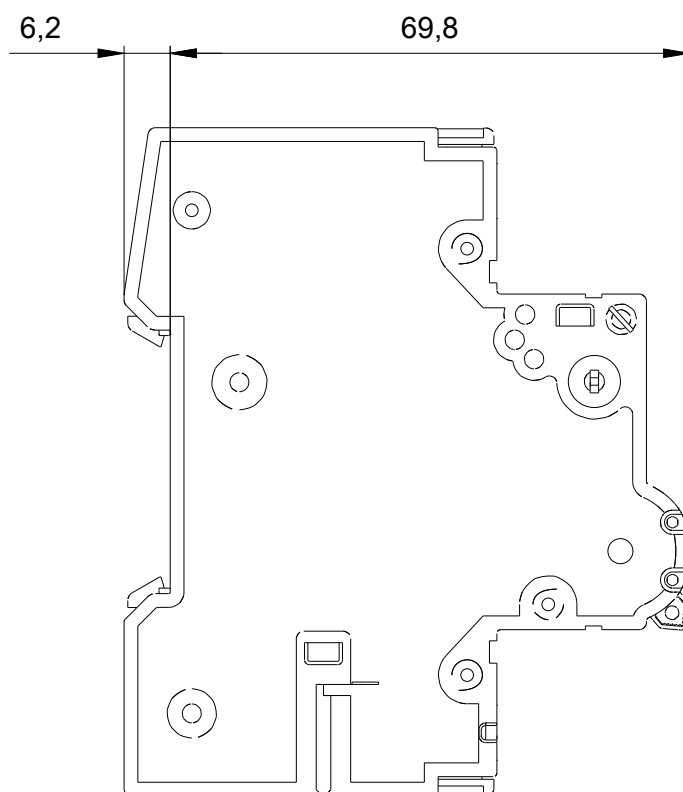
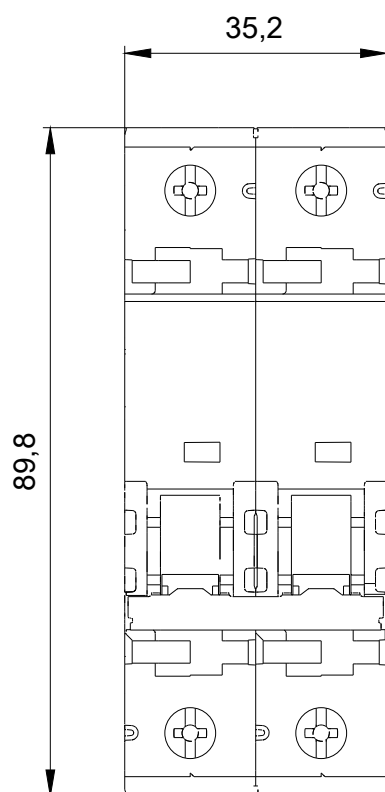
http://www.automation.siemens.com/bilddb/cax_en.aspx?mlfb=5SY4203-7

CAX-Online-Generator

<http://www.siemens.com/cax>

Tender specifications

<http://www.siemens.com/specifications>



ISOLATOR 32A SINGLE POLE



Figure similar

Model	
Product brand name	SETRON
Product designation	On/Off switches
Type of light source	Not applicable
Mounting type / for light source	Not applicable
Design of the switching function	Switch disconnecter
General technical data	
Number of poles	1
Short-circuit current rating	10 kA
Type of voltage	AC
Protection class	
Protection class IP	Other
Switching capacity	
Switching capacity current / rated value	0.096 kA
Main circuit	
Operating voltage / rated value	250 V

Operating current / rated value	32 A
---------------------------------	------

Appearance

Color / of the lens	Not applicable
---------------------	----------------

Product details

Product component / Signal lamp	No
---------------------------------	----

Product function

Product function / positive opening (acc. to DIN VDE 0113)	No
--	----

Number

Number of NC contacts	0
Number of NO contacts	1
Number of CO contacts	0

Mechanical Design

Height	89.8 mm
Depth	74.5 mm
Installation depth	70 mm
Number of width units	1

General Product Approval	Declaration of Conformity
--------------------------	---------------------------



Further information

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<http://www.siemens.com/lowvoltage/catalogs>

Industry Mall (Online ordering system)

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Service&Support (Manuals, Certificates, Characteristics, FAQs,...)

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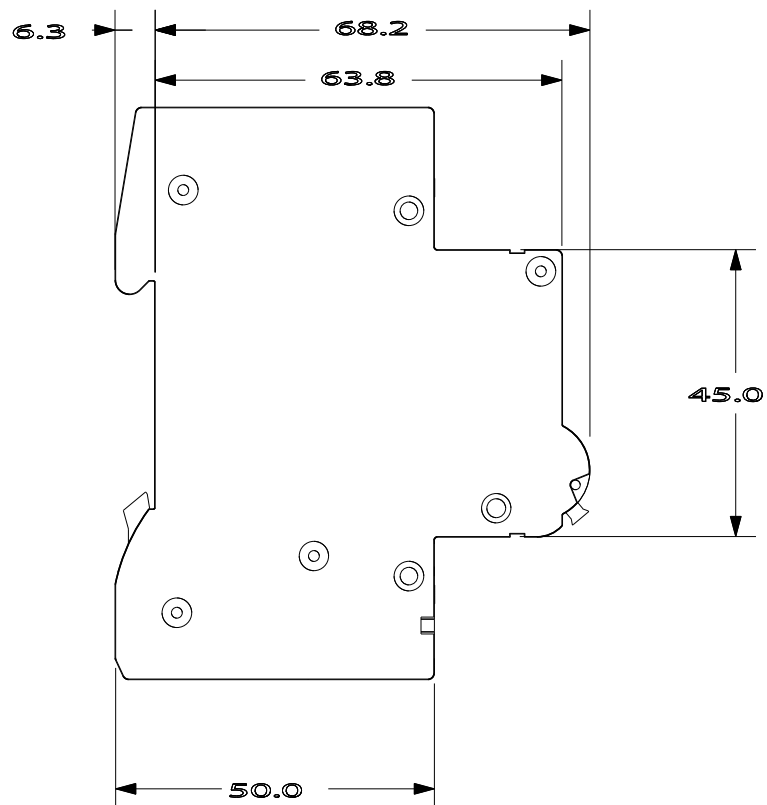
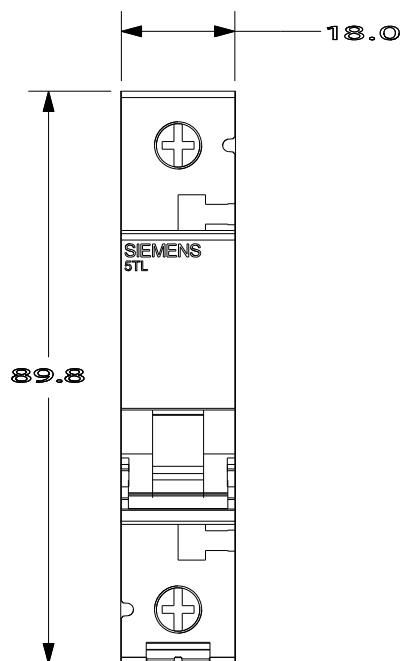
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CAX-Online-Generator

<http://www.siemens.com/cax>

Tender specifications

<http://www.siemens.com/specifications>



ANTI-CONDENSATION HEATER NiCr THERMOSTAT NATURAL VENTILATION

MODEL

KT

APPLICATION

- Cabinets for Electrical Distribution
- Cabinets for Industrial Automation

FEATURES

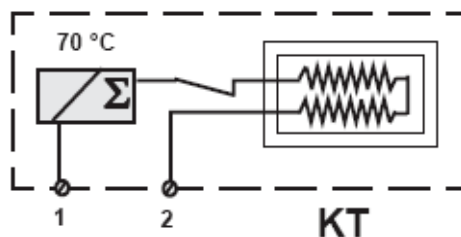
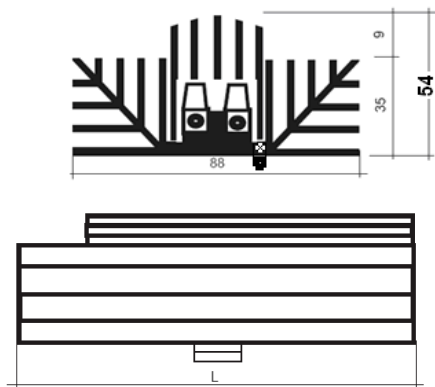
- Input Voltage 110/230/380VAC
- Din Rail mounting
- 70° inside thermostat

DESCRIPTION

Anti-condensation heater avoids any condensation forming inside the electrical cabinets by maintaining the temperature above the dew point. Heater element is made by a Ni-Cr wire resistance wound on a ceramic support and closed into an Aluminium square tube and regulated by an inner thermo-switch that disconnects it when temperature is over 70 °C. Are available various powers and voltage, over those in the table, on demand.

	TECHNICAL SPECIFICATIONS	UNIT	VALUE
1.	HEATING ELEMENT	--	NiCr
2.	RATED VOLTAGE	Vac	110/230/380
3.	RATED VOLTAGE RANGE	Vac	See table
4.	HEATING POWER 230VAC	W	See table
5.	TOLERANCE on nominal heating power	%	10%
6.	FREQUENCY	Hz	50-60
7.	OPERATING TEMPERATURE	°C	-30° +60°
8.	STORAGE TEMPERATURE	°C	-40 +90°
9.	PROTECTION DEGREE IEC 60529	IP	IP 20
10.	CONNECTIONS - TERMINAL-BLOCKS L-N-PE	mmq	0,5 – 2,5
11.	OVERVOLTAGE CATEGORY according to EN 60335-1	--	II
12.	ISOLATION VOLTAGE (1' min)	Vac	2500
13.	APPLICABLE STANDARD	--	EN 60335-1
14.	HEATSINK	--	Black anodized extruded aluminium profile
15.	MOUNTING EN 50022	--	DIN-RAIL 35mm
16.	WEIGHT	Kg	See table
17.	MARKING	--	CE
18.	CONNECTORS	--	Terminal-Blocks 6mm ² PE FAST-ON 6,3x0,8mm

DIMENSION



ANTI-CONDENSATION HEATER NiCr THERMOSTAT NATURAL VENTILATION

CODE	DESCRIPTION	POWER [W]	VOLTAGE [Vac]	DIM L /A/S [mm]	WEIGHT [Kg]
R2030110	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	30	110-120V	155/88/54	0,460
R2030230	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	30	220-240V	155/88/54	0,460
R2030380	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	30	380-400V	155/88/54	0,460
R2050110	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	50	110-120V	155/88/54	0,570
R2050230	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	50	220-240V	155/88/54	0,570
R2050380	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	50	380-400V	155/88/54	0,570
R2100110	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	100	110-120V	185/88/54	0,670
R2100230	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	100	220-240V	185/88/54	0,670
R2100380	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	100	380-400V	185/88/54	0,670
R2150110	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	150	110-120V	230/88/54	0,850
R2150230	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	150	220-240V	230/88/54	0,850
R2150380	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	150	380-400V	230/88/54	0,850
R2250110	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	250	110-120V	270/88/54	1,050
R2250230	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	250	220-240V	270/88/54	1,050
R2250380	ANTI-CONDENSATION HEATER WITH THERMOSTAT KT	250	380-400V	270/88/54	1,050

IPA

indoor post insulator

FEATURES

Red epoxy resin post insulator for indoor use with OT58 brass fittings.

Used as support for indoor Medium Voltage bus bars.

Operating temperature from -25°C to +100°C.

REFERENCE STANDARDS

IEC 60273; IEC 60660

ROUTINE TESTS

- Visual and dimensional check
- Bending stress
- Glass transition temperature

TESTS ON DEMAND

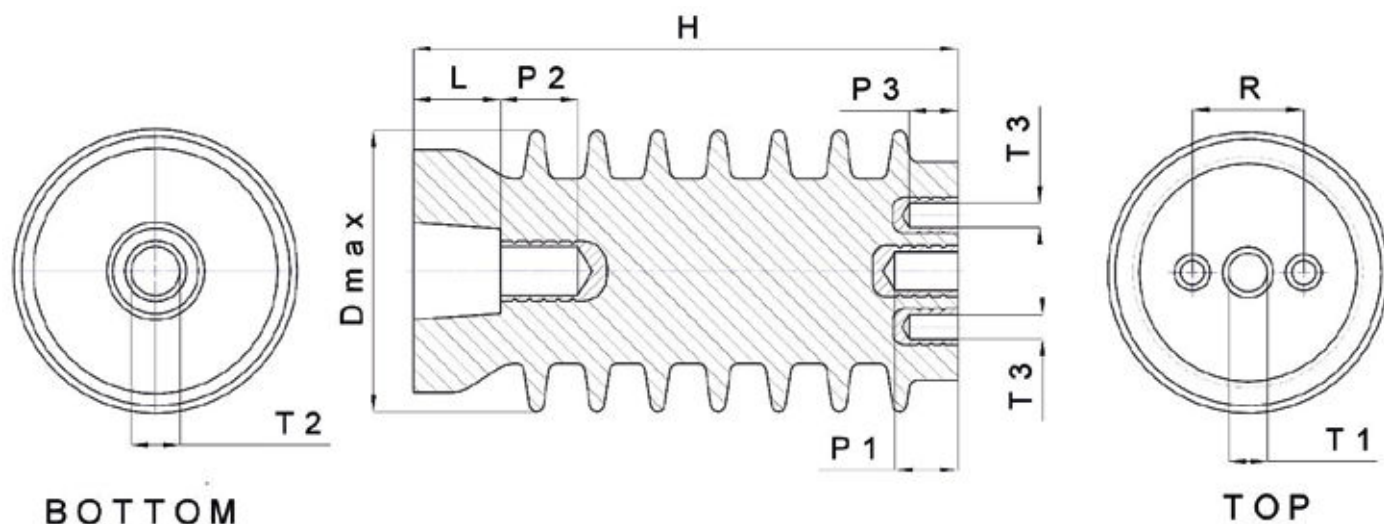
- Power frequency voltage withstand test
- Partial discharges measurement
- Dry lightning impulse voltage withstand test
- Deflection under load at normal ambient temperature conditions
- Water absorption test



IEC 60273	Name	Drawing	Max. Operating voltage	Lightning impulse voltage withstand	Power frequency voltage withstand	Ultimate bending stress
JO 4 - 40	IPA 3,6/4000	01004	3,6 kV	40 kV	11 kV	4 kN
JO 10 - 40	IPA 3,6/10000	03608				10 kN
JO 10 - 60	IPA 4,8/10000	04808				10 kN
JO 4 - 60	IPA 7,2/4000	07204	7,2 kV	60 kV	22 kV	4 kN
JO 8 - 60	IPA 7,2/8000	07208				8 kN
JO 4 - 75	IPA 12/4000	10010	12 kV	75 kV	30 kV	4 kN
JO 8 - 75	IPA 12/8000	10020				8 kN
JO 16 - 75	IPA 12/16000	10025				16 kN
JO 8 - 95	IPA 17,5/8000	20020	17,5 kV	95 kV	42 kV	8 kN
JO 16 - 95	IPA 17,5/16000	20026				16 kN
JO 4 - 125	IPA 24/4000 Enel DJ1053	24210	24 kV	125 kV	55 kV	4 kN
	IPA 24/3000 Enel DJ1056	24220				
	IPA 24/4000	24225				
JO 8 - 125	IPA 24/8000	30030	36 kV	170 kV	77 kV	8 kN
JO 10 - 125	IPA 24/10000	30026				10 kN
JO 4 - 170	IPA 36/4000	40010				4 kN
JO 8 - 170	IPA 36/8000	40012	40,5 kV	200 kV	105 kV	8 kN
JO 10 - 170	IPA 36/10000	40026				10 kN
JO 6 - 200	IPA 40,5/6000	40360				6 kN
JO 4 - 200	IPA 40,5/4000	40470				4 kN

IPA

indoor post insulator



IEC 60273	Name	Drawing	H	Dmax	T1	P1	T2	P2	L	T3	P3	R	Creepage distance	Class IEC 60815	Weight (kg)
JO 4 - 40	IPA 3,6/4000	01004	60	60	M12	19	M12	19	0	---	---	---	>70	classe C	0,5
JO 10 - 40	IPA 3,6/10000	03608	60	82	M12	18	M12	18	0	M6	15	36	>85	classe C	0,45
JO 10 - 60	IPA 4,8/10000	04808	80	82	M12	18	M16	26	0	M6	15	36	>120	classe C	0,55
JO 4 - 60	IPA 7,2/4000	07204	95	82	M12	26	M12	26	0	---	---	---	>150	classe C	0,55
JO 8 - 60	IPA 7,2/8000	07208	95	82	M12	18	M16	26	18	M8	16	46	>150	classe C	0,6
JO 4 - 75	IPA 12/4000	10010	130	83	M12	18	M16	26	14	M6	15	36	>235	classe B	0,7
JO 8 - 75	IPA 12/8000	10020	130	75	M12	18	M16	26	18	M6	15	36	>175	classe A	0,8
JO 16 - 75	IPA 12/16000	10025	130	116	M16	26	M20	32	36	M10	20	46	>230	classe B	1,5
JO 8 - 95	IPA 17,5/8000	20020	175	83	M12	26	M16	26	35	M6	15	36	>260	classe A	1,1
JO 16 - 95	IPA 17,5/16000	20026	175	116	M16	26	M20	32	36	M10	20	46	>300	classe B	2,2
JO 4 - 125	IPA 24/4000 Enel DJ1053	24210	210	80	M12	26	M16	26	0	M6	15	36	>360	classe A	1,1
	IPA 24/3000 Enel DJ1056	24220	225	80	M12	26	M16	26	0	M6	15	36	>370	classe A	1,2
	IPA 24/4000	24225	225	80	M12	18	M16	26	35	M6	15	36	>370	classe A	1,2
JO 8 - 125	IPA 24/8000	30030	225	93	M12	18	M16	26	18	M6	15	36	> 350	classe A	1,6
JO 10 - 125	IPA 24/10000	30026	225	116	M16	26	M20	32	36	M10	20	46	> 400	classe B	2,6
JO 4 - 170	IPA 36/4000	40010	310	80	M12	18	M16	26	32	M6	15	36	> 520	classe A	1,8
JO 8 - 170	IPA 36/8000	40012	310	98	M12	18	M16	40	60	M6	15	36	> 520	classe A	2,9
JO 10 - 170	IPA 36/10000	40026	310	116	M16	26	M20	32	36	M10	20	46	> 575	classe B	3,4
JO 6 - 200	IPA 40,5/6000	40360	360	98	---	---	M20	32	40	M10	25	46	> 560	classe A	3,8
JO 4 - 200	IPA 40,5/4000	40470	470	98	---	---	M20	32	40	M10	25	30	> 770	classe B	4,2

CT101 rev.0 del 18/07/2017

Vibrostop AA



CARATTERISTICHE Features

- Ampia gamma di portate: carichi da 10 a 9000 daN.
- Funzionamento multidirezionale: ottimo comportamento nel caso di sollecitazioni assiali (trazione e compressione) e tangenziali.
- Elastomero protetto: elevatissima durata nel tempo.
- Grande capacità di resistere agli urti: sono possibili sovraccarichi istantanei di eccezionale entità
- Elevato grado di sicurezza: l'eventuale distruzione degli elastomeri non comporta il distacco delle apparecchiature (es. incendio).

- *Large loads range: between 10 and 9000 daN.*
- *Reacts to vibrations in all directions (tension, compression, shear).*
- *Sheltered elastomer: long lasting.*
- *Big resistance against shocks: very large instant overloads are possible.*
- *Big safety: the hypothetical destruction of the rubber parts does not lead to the detachment of the appliances (ex. fire).*

MATERIALI Materials

- Componenti in gomma: elastomero Vibrostop.
- Componenti in metallo: lega di alluminio, a richiesta verniciatura secondo MIL STD 202 per impiego navale.

- *Rubber components: Vibrostop elastomer.*
- *Metal components: aluminium alloy, on request MIL STD 202 paint for naval appliances.*

APPLICAZIONI Applications

- Motori - Pompe - Condizionatori - Ventilatori - Gruppi elettrogeni - Centrifughe - Apparatı su mezzi di trasporto - Settore ferroviario - Quadri elettrici.

- *Engines - Pumps - Air conditioning units - Fans - Generators - Centrifugal machines - Appliances on means of transportation - Railway industry - Electrical appliances.*

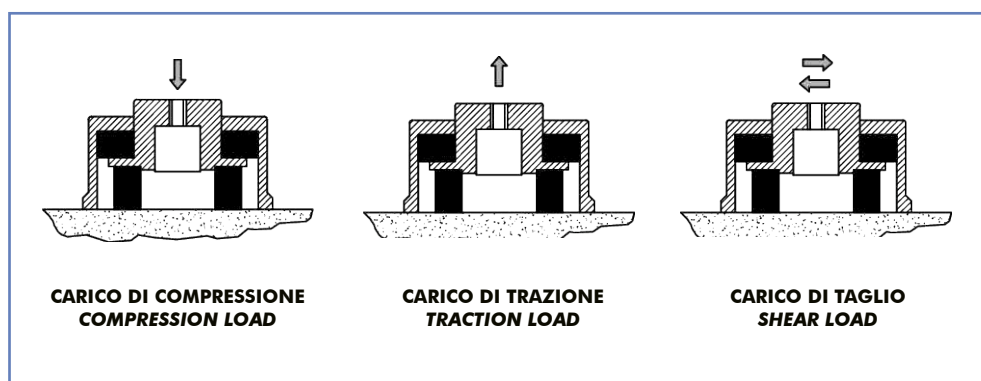
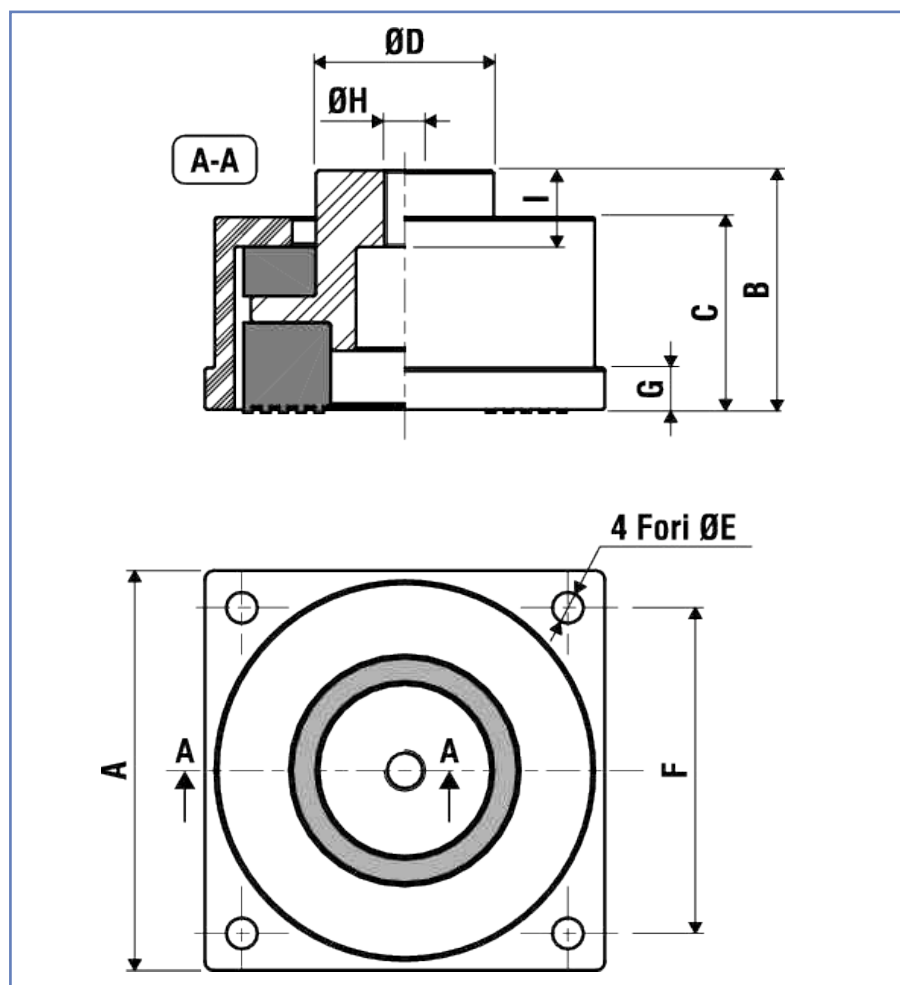
INSTALLAZIONE Installation

- Fissaggio tra macchinario e antivibrante.
- Fissaggio al piano di appoggio.

- *Fixing between machinery and A.V. mounting.*
- *Fixing to the mounting plate.*

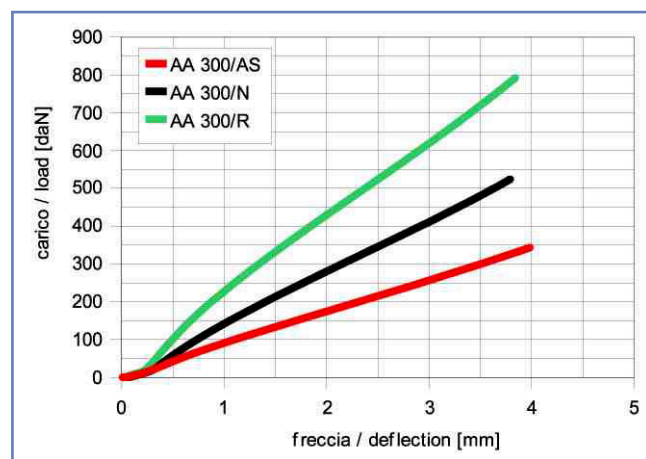
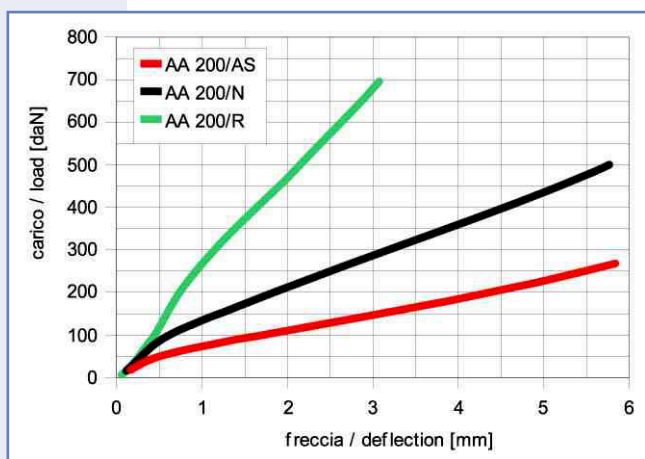
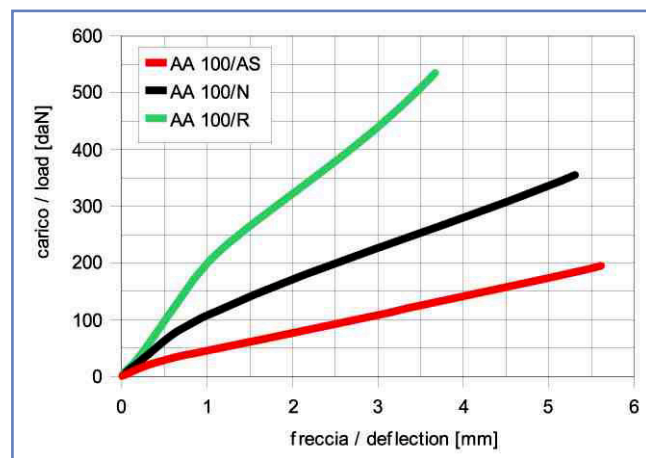
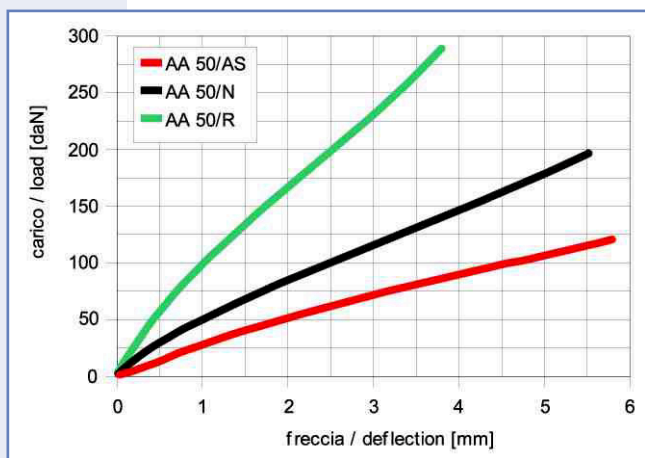
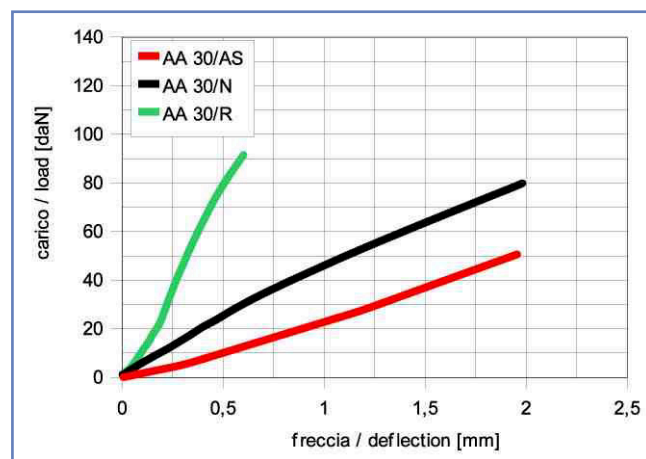
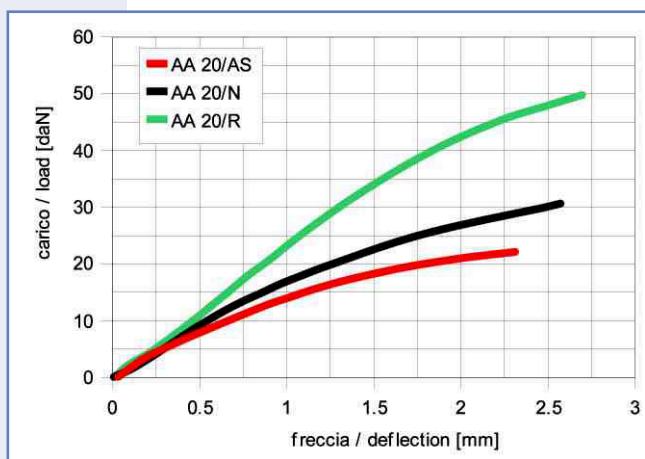
PORTATA LOAD						DIMENSIONI DIMENSIONS								
AS MESCOLA ALTA SESIBILITA' <i>HIGH SENSITIVITY</i> [45° Sh]		N MESCOLA NORMALE <i>NORMAL</i> [60° Sh]		R MESCOLA ALTA RESISTENZA <i>HIGH RESISTANCE</i> [75° Sh]		A	B	C	ØD	ØE	F	G	H	I
TIPO Type	CARICO Load [daN]	TIPO Type	CARICO Load [daN]	TIPO Type	CARICO Load [daN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]		[mm]
AA 20/AS	10 - 15	AA 20/N	20 - 30	AA 20/R	30 - 50	46	28	22	20	3	34	3	M6	22
AA 30/AS	15 - 25	AA 30/N	30 - 50	AA 30/R	50 - 100	54	36	26,5	23	5,5	42	5,5	M8	31
AA 50/AS	25 - 50	AA 50/N	50 - 100	AA 50/R	100 - 200	65	49	35	30	6	52	8	M10	38
AA 100/AS	50 - 100	AA 100/N	100 - 200	AA 100/R	200 - 300	80	54	43	25	6,5	67	8	M12	41
AA 200/AS	100 - 150	AA 200/N	200 - 300	AA 200/R	300 - 400	108	73	55	40	8,5	90	10	M12	25
AA 300/AS	150 - 200	AA 300/N	300 - 400	AA 300/R	400 - 600	136	81,5	65	60	10,5	110	14	M14	25,5
AA 400/AS	200 - 300	AA 400/N	400 - 600	AA 400/R	600 - 800	155	93	74	65	12,5	125	14	M14	25
AA 600/AS	300 - 400	AA 600/N	600 - 800	AA 600/R	800 - 1000	175	95	77	70	14	140	15	M16	27
AA 800/AS	400 - 500	AA 800/N	800 - 1000	AA 800/R	1000 - 1500	180	118	93	75	15	150	16	M18	40
AA 1000/AS	500 - 750	AA 1000/N	1000 - 1500	AA 1000/R	1500 - 2000	205	149	116	100	17,5	164	20	M20	36
AA 1500/AS	750 - 1000	AA 1500/N	1500 - 2000	AA 1500/R	2000 - 4000	220	148	120	80	17	182	18	M20	98
AA 2000/AS	1000 - 2000	AA 2000/N	2000 - 4000	AA 2000/R	4000 - 6000	255	162	137	106	22	205	21	M36	115
AA 4000/AS	2000 - 4000	AA 4000/N	4000 - 6000	AA 4000/R	6000 - 9000	315	160	130	128	27	255	22	M42	59

Dimensioni indicative
Dimensions for reference only



Diagrammi di carico

Load diagrams

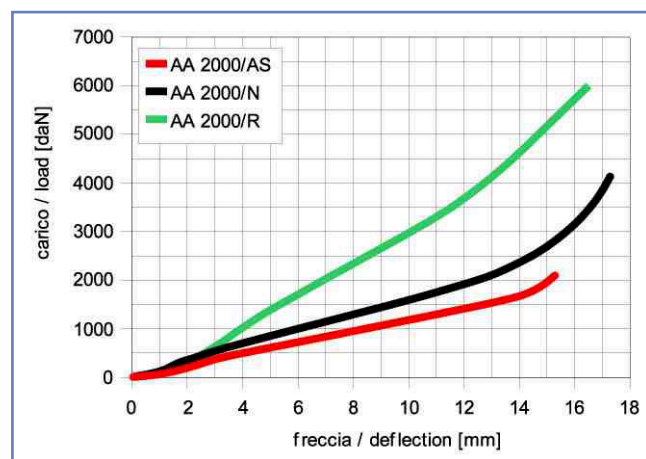
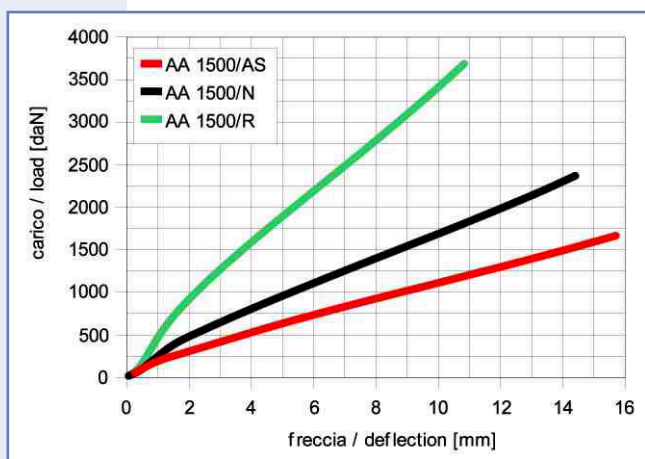
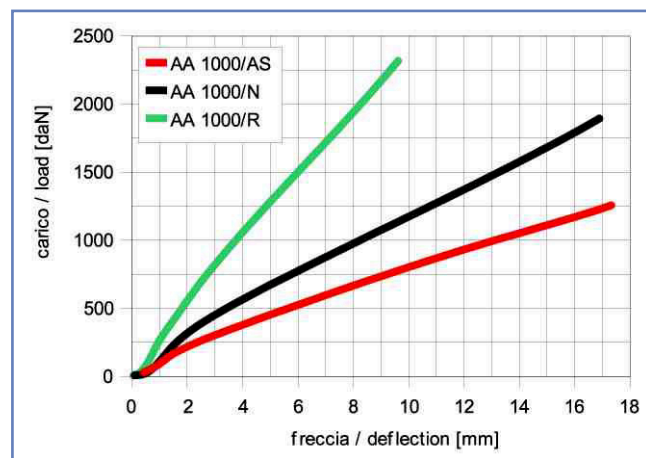
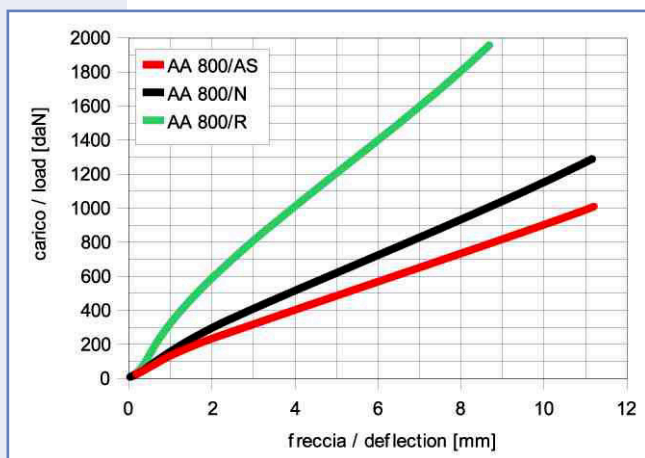
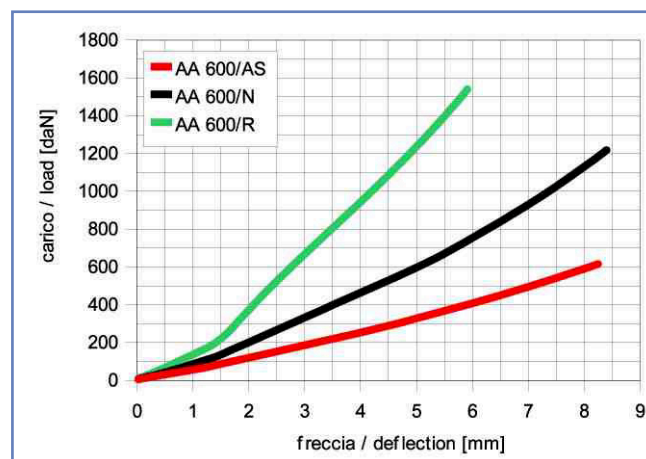
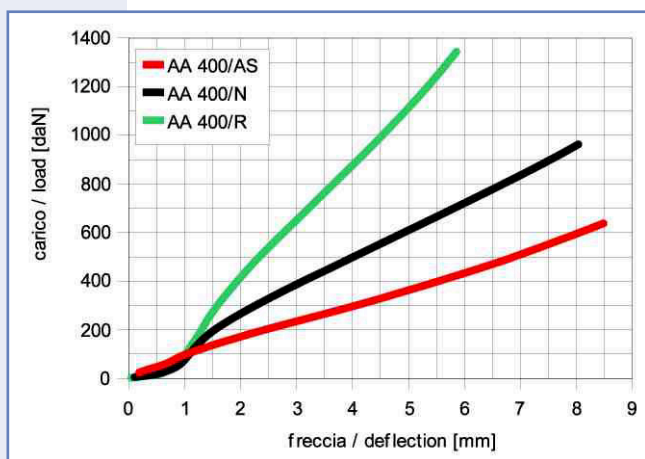


Curve caratteristiche indicative

Performance characteristics for reference only

Diagrammi di carico

Load diagrams



Curve caratteristiche indicative

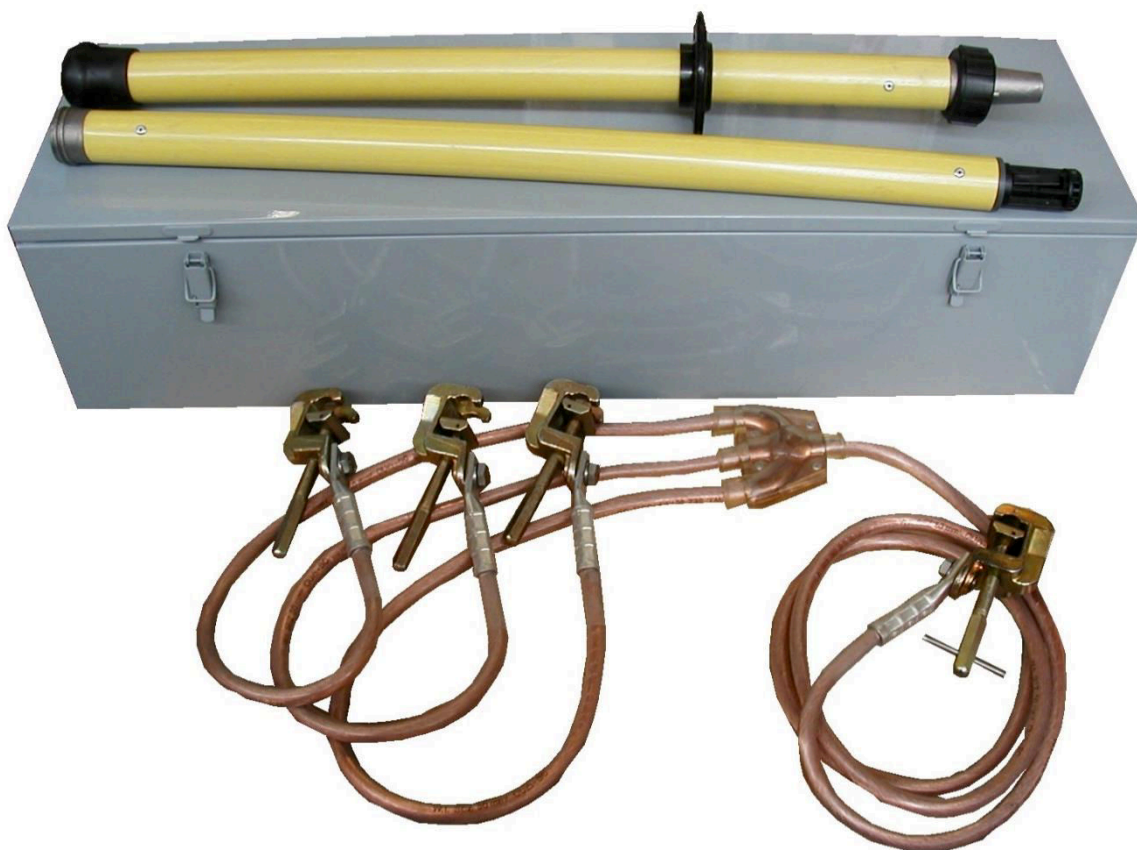
Performance characteristics for reference only

SHORT CIRCUITING AND GROUNDING EQUIPMENT FOR MV ELECTRIC CABINS AND INSTALLATIONS WITH CONTACT CLAMPS FOR BALL FIXED POINTS Ø 25 mm

TYPE **MT/PF25-P5/2**

IN CONFORMITY WITH INTERNATIONAL STANDARD CEI EN 61230 (IEC 61230).

Icc: 12,4 kA eff / 1 s



The device is composed of:

n°3 Screw type contact clamps type **PF25** made by press forged brass with hexagonal tang for connection to the insulating stick.

Clamping capacity: * ball earth fixed points Ø 25 mm;
 * round conductors and flat bars up to 22 mm.

n°3 Short circuit extraflexible electrolytic copper cables, covered by transparent PVC sheath, connecting between them the three contact clamps and the central trifurcating connector, **section 50 mm², length 2 m**, complete, at the extremities, of tinning copper lugs and reinforcements by transparent heat-shrink sheath.

n°1 Central trifurcating connector protected by plastic material.

n°1 Grounding extraflexible electrolytic copper cable, covered by transparent PVC sheath, connecting the central trifurcating connector with the earth clamp. **Section 50 mm², length 2,5 m**, complete, at the extremities, of tinning copper lugs and reinforcements by transparent heat-shrink sheath.

n°1 Ground clamp made by press forged brass. Clamping capacity up to 22 mm.

n°1 Insulating fiberglass stick type **PE2/135 EF** made by epoxy resin reinforced by fiberglass, tube certified in conformity with International Standard CEI EN 61235 (IEC 61235), in two elements connected between them by quick coupler. Total length 1,35 m.

n°1 Metallic carrying case.

Casagrande Elettrocostruzioni SpA

Via Rossini, 24

37060 Castel d'Azzano Verona – Italy

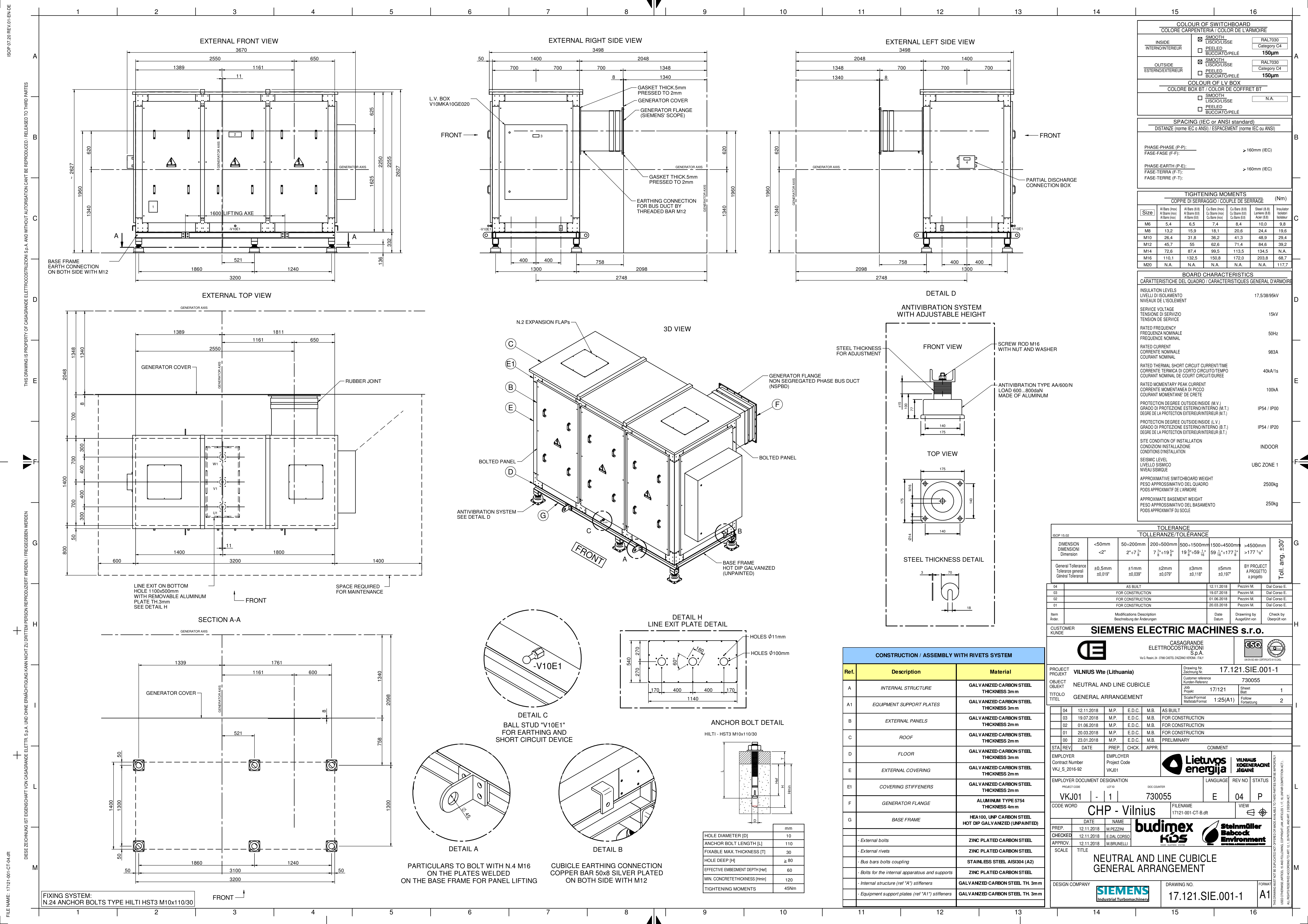
Tel. ++39/045 8546511

Fax ++39/045 8520214

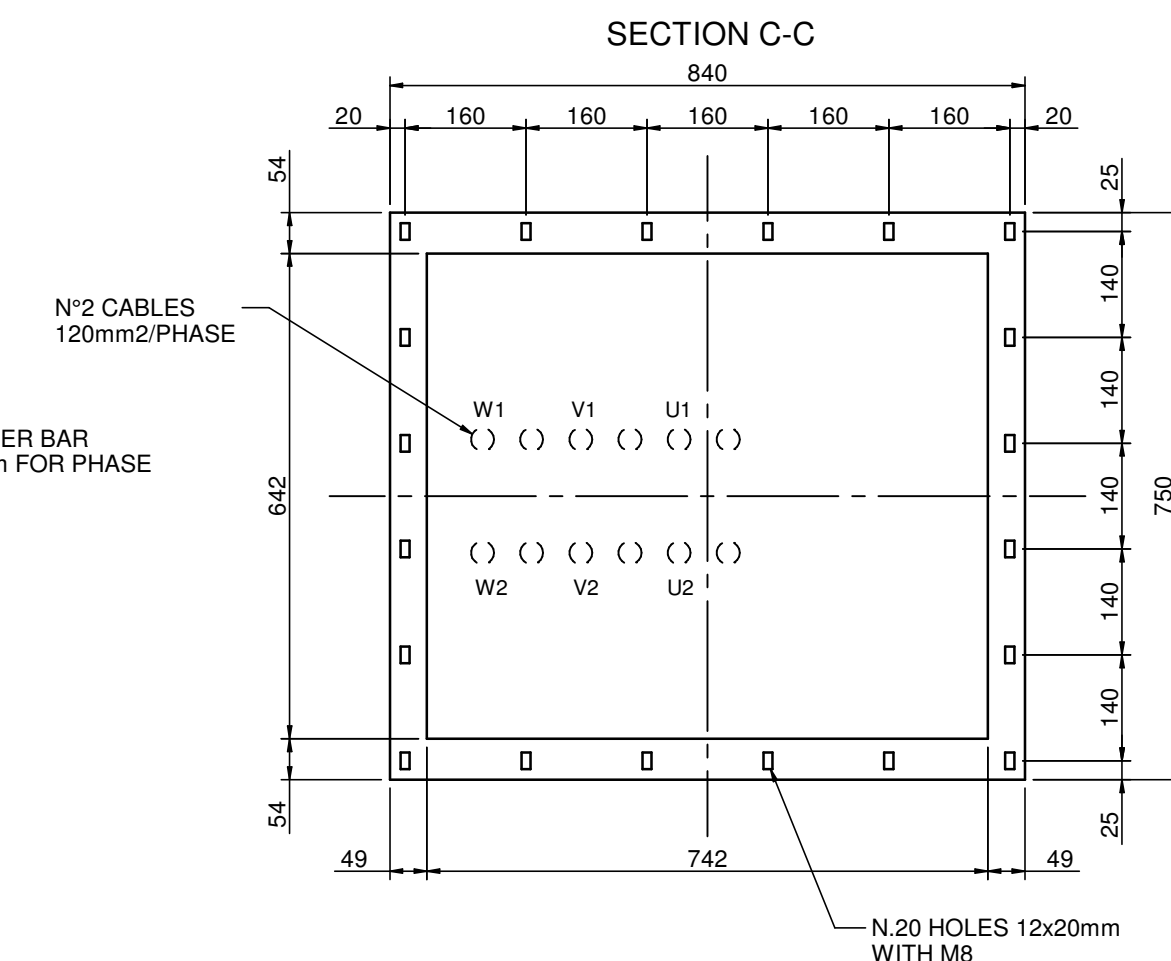
E-mail: info@casagrande.vr.it

Web site: www.casagrande.vr.it

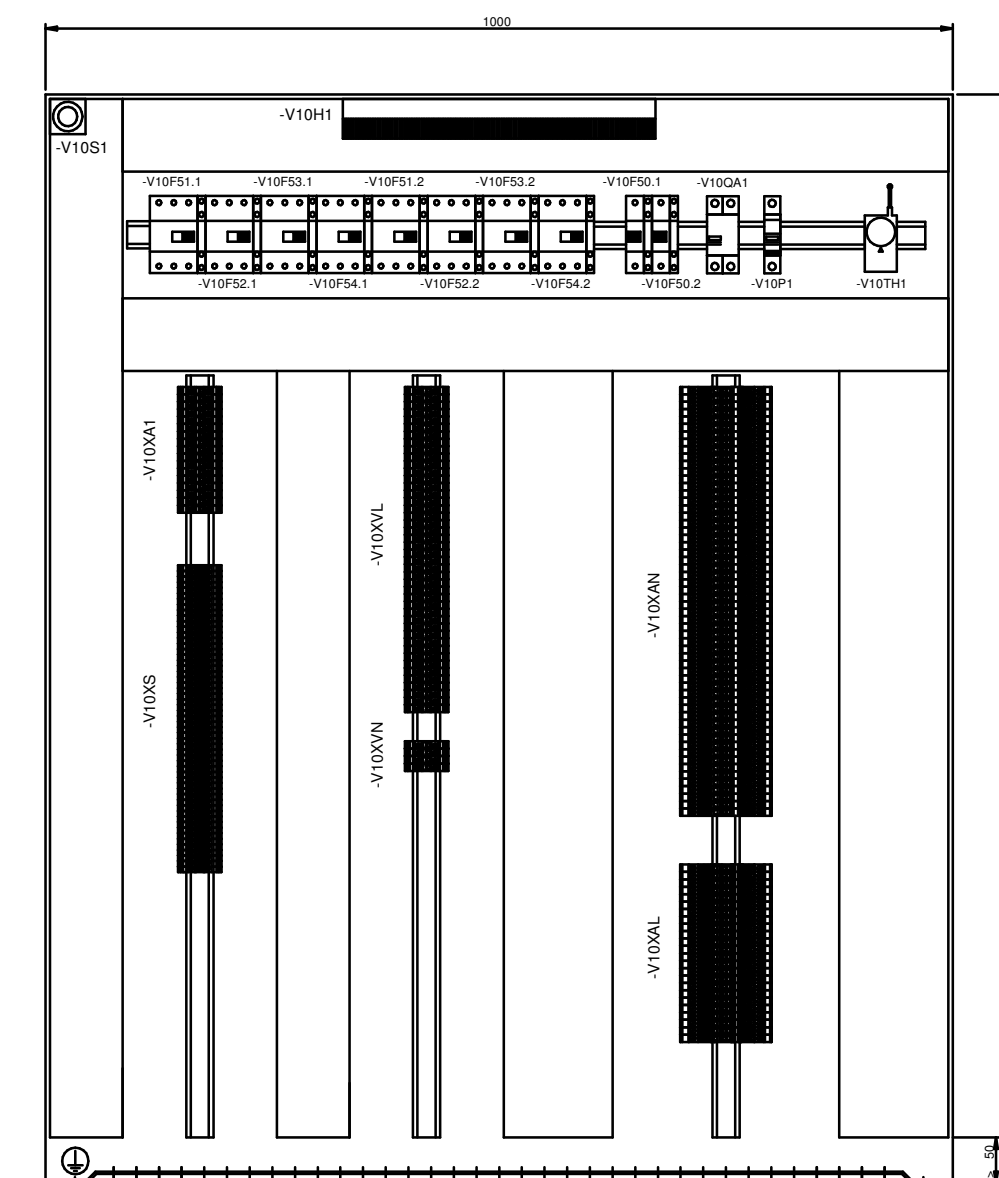
P. IVA e C.F. IT 00663680239



DIESE ZEICHNUNG IST EIGENSCHAFT VON CASAGRANDE ELETTR. S.p.A. UND OHNE ERMÄCHTIGUNG KANN NICHT ZU DRITTEM PERSON REPRODUZIERT WERDEN / FREIGEgeben WERDEN



L.V. BOX DETAIL

[illegible]

N:1 COPPER BAR
100x10mm FOR PHASE

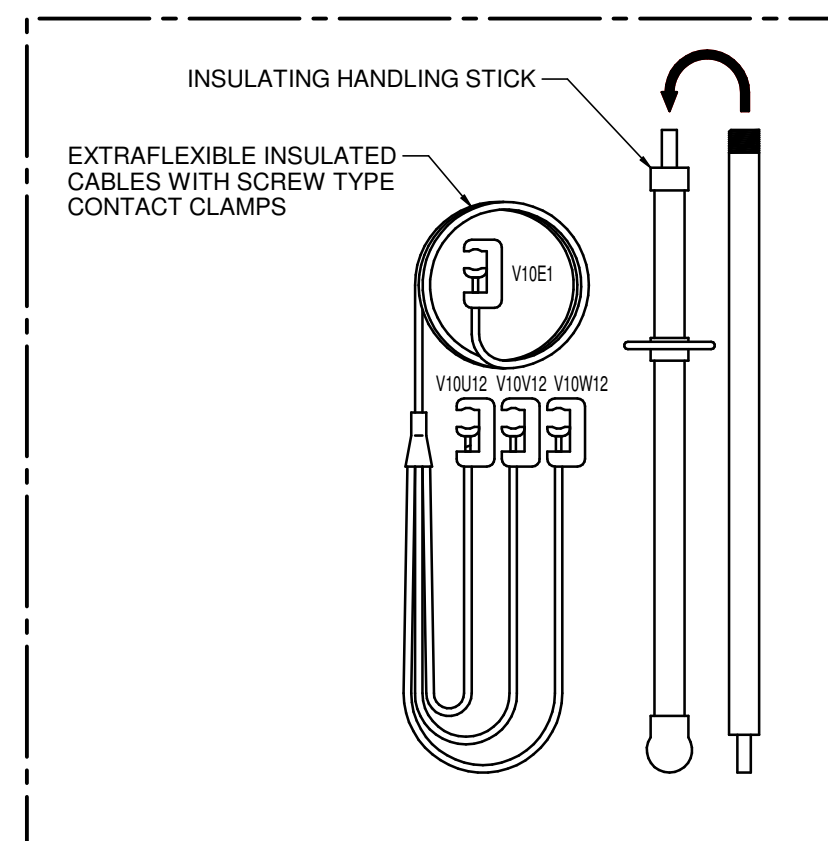
HOLES Ø16mm
WITH M14

20 40

50 50

100

10



04	AS BUILT				11.11.2018	Pezzini M.	Dal Corso E.
03	FOR CONSTRUCTION				19.07.2018	Pezzini M.	Dal Corso E.
02	FOR CONSTRUCTION				01.06.2018	Pezzini M.	Dal Corso E.
01	FOR CONSTRUCTION				20.03.2018	Pezzini M.	Dal Corso E.
Item Ander:	Modifications Description Beschreibung der Änderungen				Date	Drawing by Gezeichnet von	Check by Überprüft von
CUSTOMER KUNDE							
SIEMENS ELECTRIC MACHINES s.r.o.							
					CASAGRANDE ELETTROCOSTRUZIONI S.p.A. Via G. Rossini, 24 - 37060 CASTEL D'AZZANO (VERONA) - ITALY		
					  UNI EN ISO 9001 CERTIFICATO N. 1042		
PROJECT PROJECT		VILNIUS Wte (Lithuania)			Drawing no. Zeichnung Nr.		
OBJECT OBJECT		NEUTRAL AND LINE CUBICLE			Customer reference Kunden-Referenz		
TITOLO TITEL		GENERAL ARRANGEMENT			Job Projekt		Sheet Blatt
					Scale/Format Maßstab/Form		Follow Fortsetzung
					1:25(A1)		/
04	12.11.2018	M.P.	E.D.C.	M.B.	AS BUILT		
03	19.07.2018	M.P.	E.D.C.	M.B.	FOR CONSTRUCTION		
02	01.06.2018	M.P.	E.D.C.	M.B.	FOR CONSTRUCTION		
01	20.03.2018	M.P.	E.D.C.	M.B.	FOR CONSTRUCTION		
00	23.01.2018	M.P.	E.D.C.	M.B.	PRELIMINARY		
STA./REV	DATE	PREP.	CHKD.	APPR.	COMMENT		
EMPLOYER Contract Number VKJ_S_2016-92		EMPLOYER Project Code VKJ01		 Lietuvos energija		VILNIUS KOGENERACIJOS JŲGAINĖ	
EMPLOYER DOCUMENT DESIGNATION					LANGUAGE	REV NO	STATUS
PROJECT CODE		LOT ID		DOC COUNTER			
VKJ01		- 1		730055		E 04 P	
CODE WORD					FILENAME	VIEW	
CHP - Vilnius					17121-001-CT-B.dtt		
PREP	DATE	NAME		 			
CHECKED	12.11.2018	M.PEZZINI					
APPROV.	12.11.2018	E.DAL CORSO					
SCALE	TITLE		NEUTRAL AND LINE CUBICLE GENERAL ARRANGEMENT				
DESIGN COMPANY				DRAWING NO.			FORMAT
				17.121.SIE.001-1			A1

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16						
CUSTOMER CLIENTE PROJECT PROGETTO ELECTRIC EQUIPMENT APPARECCHIATURA ELETTRICA SIEMENS ELECTRIC MACHINES s.r.o. VILNIUS WtE - LITHUANIA Neutral & Line Cubicle for Generator type 1DU2054-8AF02-Z - 25530kVA - 15kV ±5% - 983A - 50Hz ±5% - p.f. 0,85 - 1500 rpm - Short circuit current 40kA/1s (100kA peak) - Insulation levels 17.5/38/95kV																					
03	AS BUILT	12.11.2018	Pezzini M.	Dal Corso E.	CUSTOMER CLIENT					PROJECT PROJET					Drawing Nr. Schéma Nr.						
02	FOR CONSTRUCTION	25.06.2018	Pezzini M.	Dal Corso E.	SIEMENS ELECTRIC MACHINES s.r.o.					VILNIUS WtE - LITHUANIA					17.121.SIE.001-2						
01	FOR CONSTRUCTION	20.03.2018	Pezzini M.	Dal Corso E.	CASAGRANDE ELETTROCOSTRUZIONI S.p.A.  Via G. Rossini, 24 - 37060 CASTEL D'AZZANO VERONA - ITALY  CERTIFIED QUALITY SYSTEM UNI EN ISO 9001 CERTIFICATO 9115.CASL					OBJECT OBJET					Neutral and line cubicle SINGLE LINE & WIRING DIAGRAM					Customer reference Référence du client	
00	PRELIMINARY	18.12.2017	Vesentini M.	Dal Corso E.											730056						
Item Rév	Modifications Description Description Modification	Date Date	Drawing by Rédacteur	Check by Vérificateur						TITLE TITRE					Job Travail						
														17/121		Sheet Page					
														001							
														Scale/Format Echelle/Format		Follow Suivant					
														—		002					

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
GENERAL NOTES NOTE GENERALI															

VARIOUS NOTE
NOTE VARIE

THE DIAGRAM HAS SEEN IN THE FOLLOWING CONDITION:
LO SCHEMA SI OSSERVA NELLE SEGUENTI CONDIZIONI

- M.V. CIRCUIT BREAKER OPENED, CONNECTED AND WITH DISCHARGED SPRINGS
INTERRUTTORE DI MEDIA TENSIONE APERTO, INSERITO E CON MOLLE SCARICHE
- EARTHING SWITCHES OPENED
SEZIONATORE DI TERRA APERTO
- WITHOUT AUXILIARY DC/AC SUPPLY
PRIVO DI ALIMENTAZIONE AUSILIARIA DC/AC
- AUXILIARY CIRCUIT BREAKERS OPENED AND NO TRIPPED
INTERRUTTORI AUSILIARI APERTI E NON SCATTATI

LABELS OF EQUIPMENT:
TARGHETTE DEI MATERIALI

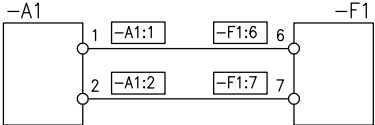
- WITH YELLOW BOTTOM AND BLACK WRITE
CON FONDO GIALLO E SCRITTA NERA
- FIXED BY SCREWS/RIVETS OR GLUE
FISSATE CON VITI/RIVETTI O COLLA

FRONT SYNOPTIC COLOR – BLACK (IF PRESENT)
COLORE DEL SINOTTICO FRONTALE – NERO (SE PRESENTE)

GRAFIC SIMBOLS ARE IN CONFORMITY WITH IEC 60617
SIMBOLOGIA GRAFICA IN CONFORMITA' CON IEC 60617

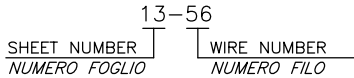
CONDUCTOR IDENTIFICATION
NUMERAZIONE CONDUTTORI

☒ EQUIPMENT/TERMINAL STRIP CONNECTED
APPARECCHIATURA/MORSETTO COLLEGATO

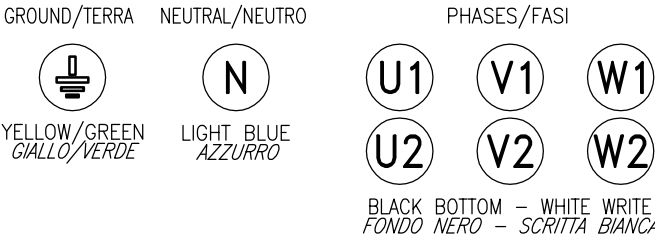


TWO O MORE WIRES UNDER ONE TERMINAL ARE NOT ALLOWED

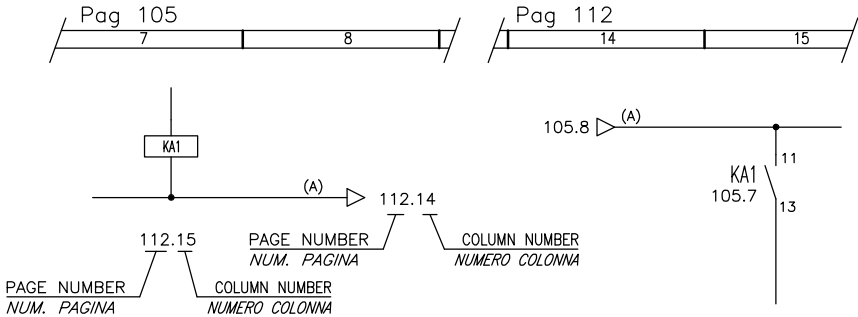
☐ DRAWING SHEET Nr – PROGRESSIVE WIRE
PAGINA DELLO SCHEMA – FILO PROGRESSIVO



BARS IDENTIFICATION
IDENTIFICAZIONE SBARRE



CROSS REFERENCE
RIFERIMENTI INCROCIATI

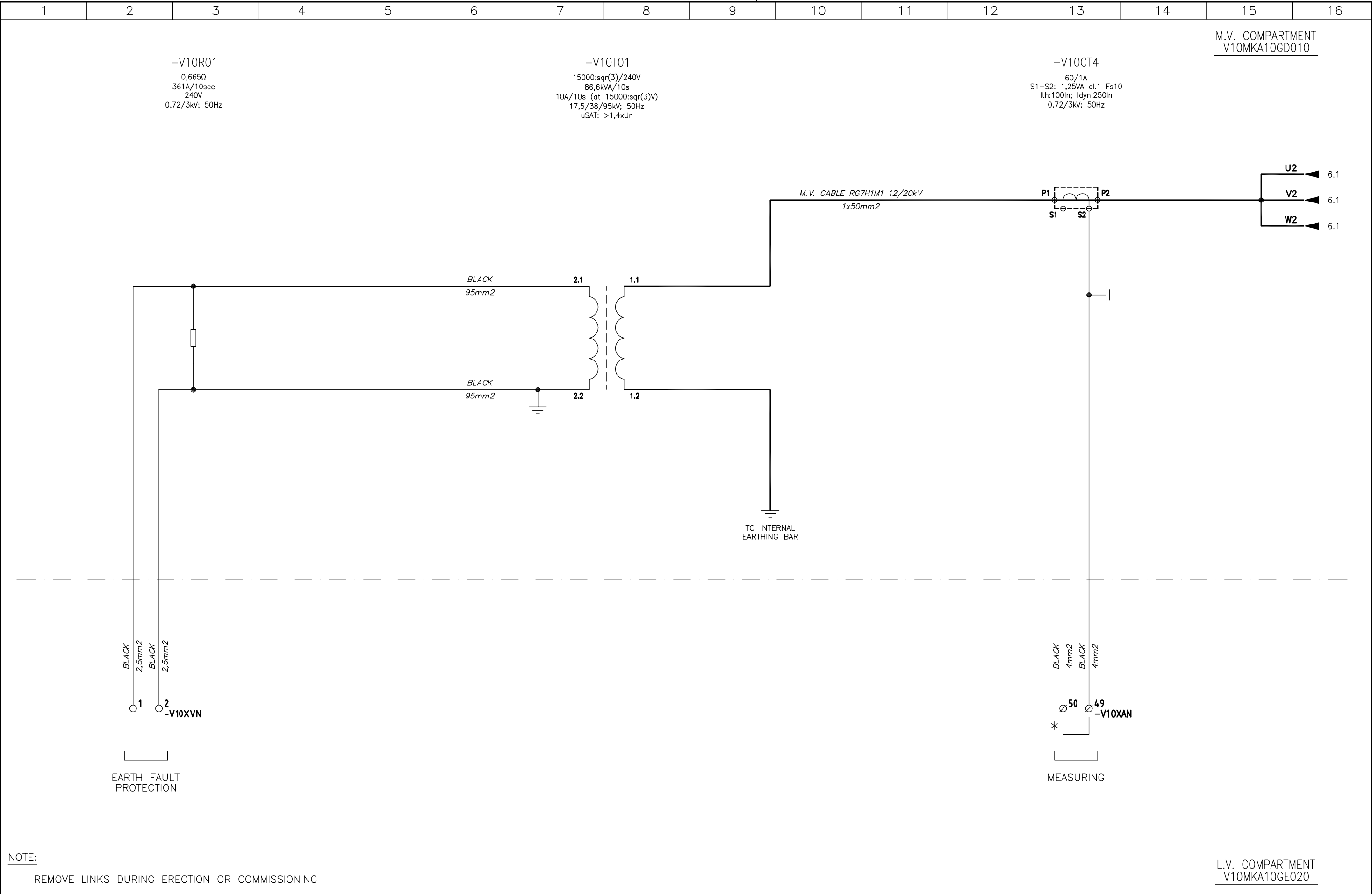


<u>CIRCUITS</u> <i>CIRCUITI</i>		<u>VOLTAGE – CURRENT</u> <i>TENSIONE–CORRENTE</i>	<u>COLOUR</u> <i>COLORE</i>	<u>SECTION</u> <i>SEZIONE</i>	<u>TERMINAL LEGEND</u> <i>LEGENDA MORSETTI</i>		<u>BOARD CHARACTERISTICS</u> <i>CARATTERISTICHE DEL QUADRO</i>	
<u>POWER</u> <i>POTENZA</i>		15kV 50Hz	/	COPPER <i>RAME</i>	○ -V10XV...	MEASURE TERMINAL STRIP <i>MORSETTIERE MISURE</i>	INSULATION LEVELS <i>LIVELLI DI ISOLAMENTO</i>	17.5/38/95kV (IEC)
<u>MOTOR–COMMAND</u> <i>MOTORE–COMANDI</i>		/	BLACK <i>NERO</i>	1,5 mm2 □ H07V–K □ H07Z–K	○ -V10XA...	MEASURE TERMINAL STRIP <i>MORSETTIERE MISURE</i>	SERVICE VOLTAGE <i>TENSIONE DI SERVIZIO</i>	15kV
<u>CONTROL–SIGNALLING</u> <i>CONTROLLO–SEGNALI</i>		/	BLACK <i>NERO</i>	1,5 mm2 □ H07V–K □ H07Z–K	○ -V10XA	AUXILIARY TERMINAL STRIP <i>MORSETTI CIRCUITI AUSILIARI</i>	RATED FREQUENCY <i>FREQUENZA NOMINALE</i>	50Hz
<u>HEATERS–LIGHTING</u> <i>ILLUMINAZIONE–ANTICONDENSA</i>		230Vac 50Hz	BLACK <i>NERO</i>	1,5/2,5 mm2 □ H07V–K ☒ H07Z–K	∅ -V10XS	SIGNAL TERMINAL STRIP <i>MORSETTI SEGNALI</i>	RATED CURRENT <i>CORRENTE NOMINALE</i>	983A
<u>NO VOLTAGE ON SWITCHES</u> <i>CONTATTI LIBERI DA TENSIONE</i>		/	ORANGE <i>ARANCIO</i>	1,5 mm2 □ H07V–K ☒ H07Z–K			RATED THERMAL SHORTH CIRCUIT CURRENT/TIME <i>CORRENTE TERMICA DI CORTO CIRCUITO/TEMPO</i>	40kA/1s
<u>VOLTMETRIC</u> <i>VOLTMETRICO</i>		/100:sqr(3)V /100:3V	BLACK <i>NERO</i>	2,5 mm2 □ H07V–K ☒ H07Z–K			MV SWITCHBOARD PROTECTION DEGREE OUTSIDE/INSIDE <i>GRADO DI PROTEZIONE QUADRO MT ESTERNO/INTERNO</i>	IP54/00
<u>AMMETRIC</u> <i>AMPEROMETRICO</i>		/1A	BLACK <i>NERO</i>	4 mm2 □ H07V–K ☒ H07Z–K			LV PANEL PROTECTION DEGREE OUTSIDE/INSIDE <i>GRADO DI PROTEZIONE PANNELLO BT ESTERNO/INTERNO</i>	IP54/20
<u>EARTH</u> <i>TERRA</i>		/	YELLOW–GREEN <i>GIALLO–VERDE</i>	DEPENDENT OF THE MAXIMUM SECTION OF THE POWER CABLES 1.5 mm2 MINIMUM	<u>TIGHTENING MOMENTS</u> <i>COPPIE DI SERRAGGIO</i>		SEISMIC LEVEL <i>LIVELLO SISMICO</i>	UBC ZONE 1
<u>LAMP AND PUSHBUTTON COLOUR</u> <i>COLORE LAMPADE E PULSANTI</i>				<u>COLOR OF CABINET</u> <i>COLORE CARPENTERIA</i>				
BK	BLACK/NERO	See Outline drawing						
BU	BLUE/BLU							
GN	GREEN/VERDE							
YE	YELLOW/GIALLO							
RD	RED/ROSSO							
WH	WHITE/BIANCO	See Outline drawing						

03	AS BUILT	12.11.2018	Pezzini M.	Dal Corso E.	CUSTOMER CLIENT SIEMENS ELECTRIC MACHINES s.r.o. CASAGRANDE ELETTROCOSTRUZIONI S.p.A. Via G. Rossini, 24 – 37060 CASTEL D'AZZANO VERONA – ITALY	PROJECT PROJET VILNIUS WIE – LITHUANIA OBJECT OBJET Neutral and line cubicle SINGLE LINE & WIRING DIAGRAM TITLE TITRE GENERAL NOTES	Drawing Nr. Schéma Nr. 17.121.SIE.001–2 Customer reference Référence du client 730056 Job Travail 17/121 Sheet Page 002 Scale/Format Echelle/Format – Follow Suivant 003
02	FOR CONSTRUCTION	25.06.2018	Pezzini M.	Dal Corso E.			
01	FOR CONSTRUCTION	20.03.2018	Pezzini M.	Dal Corso E.			
00	PRELIMINARY	18.12.2017	Vesentini M.	Dal Corso E.			
Item Rév	Modifications Description Description Modification	Date Date	Drawing by Rédacteur	Check by Vérificateur			

[illegible]





03	AS BUILT	12.11.2018	Pezzini M.	Dal Corso E.	CUSTOMER <i>CLIENT</i>	SIEMENS ELECTRIC MACHINES s.r.o.	PROJECT <i>PROJET</i>	VILNIUS WIE – LITHUANIA	Drawing Nr. 17.121.SIE.001–2		
02	FOR CONSTRUCTION	25.06.2018	Pezzini M.	Dal Corso E.					Customer reference 730056		
01	FOR CONSTRUCTION	20.03.2018	Pezzini M.	Dal Corso E.					Job 17/121 Sheet 005		
00	PRELIMINARY	18.12.2017	Vesentini M.	Dal Corso E.					Scale/Format — Follow 006		
Item <i>Rév</i>	Modifications Description <i>Description Modification</i>	Date <i>Date</i>	Drawing by <i>Rédacteur</i>	Check by <i>Vérificateur</i>		CASAGRANDE ELETTROCOSTRUZIONI S.p.A. Via G. Rossini, 24 – 37060 CASTEL D'AZZANO VERONA – ITALY	 	OBJECT <i>OBJET</i>	Neutral and line cubicle SINGLE LINE & WIRING DIAGRAM POWER AND MEASURING CIRCUITS		
							TITLE <i>TITRE</i>				





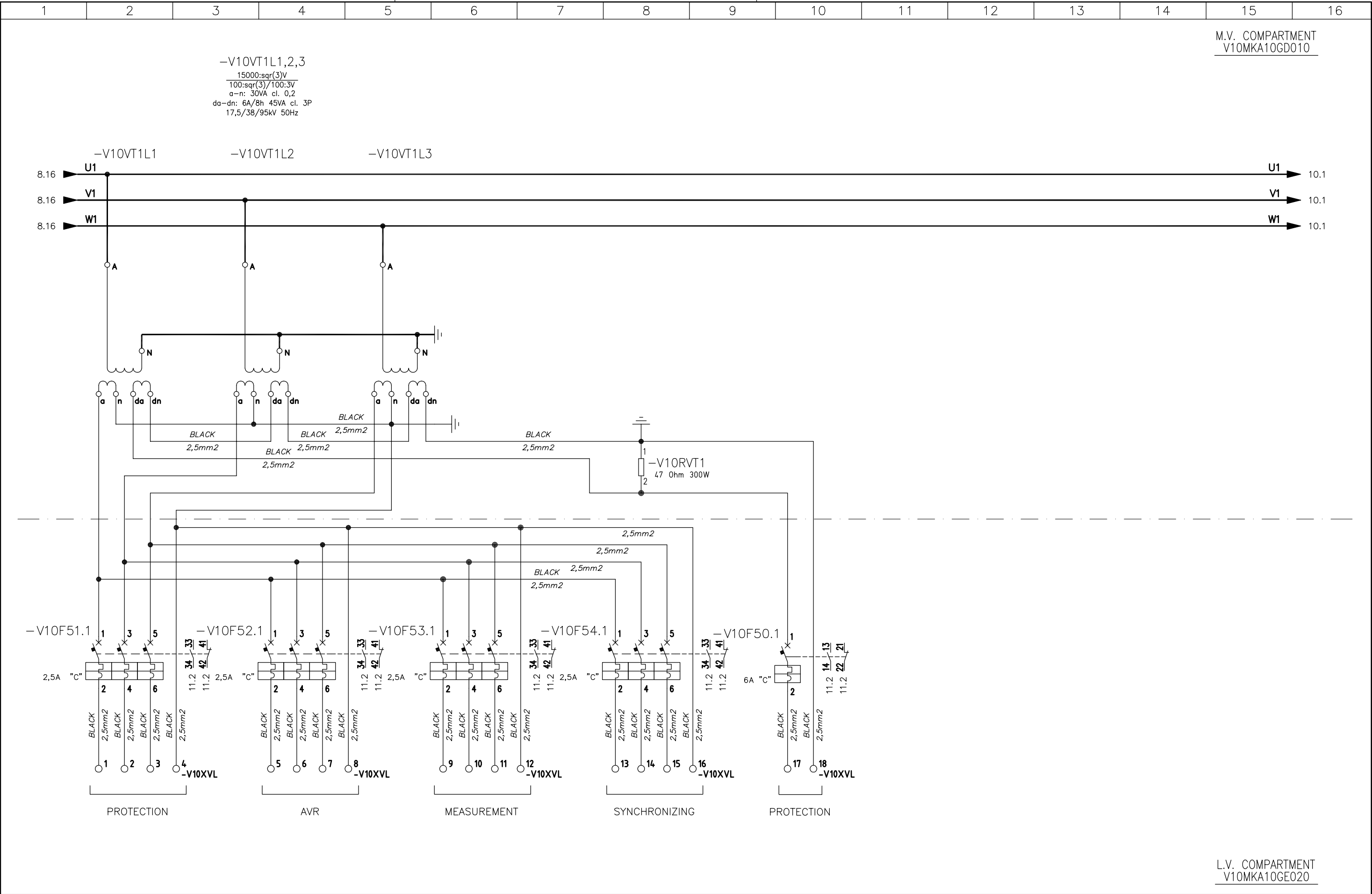


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ISOP 07.18 REV.01-EN-FR

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M.V. COMPARTMENT
V10MKA10GD010

L.V. COMPARTMENT
V10MKA10GE020

03	AS BUILT	12.11.2018	Pezzini M.	Dal Corso E.
02	FOR CONSTRUCTION	25.06.2018	Pezzini M.	Dal Corso E.
01	FOR CONSTRUCTION	20.03.2018	Pezzini M.	Dal Corso E.
00	PRELIMINARY	18.12.2017	Vesentini M.	Dal Corso E.
Item Rév	Modifications Description Description Modification	Date Date	Drawing by Rédacteur	Check by Vérificateur

CUSTOMER
CLIENT

SIEMENS ELECTRIC MACHINES s.r.o.



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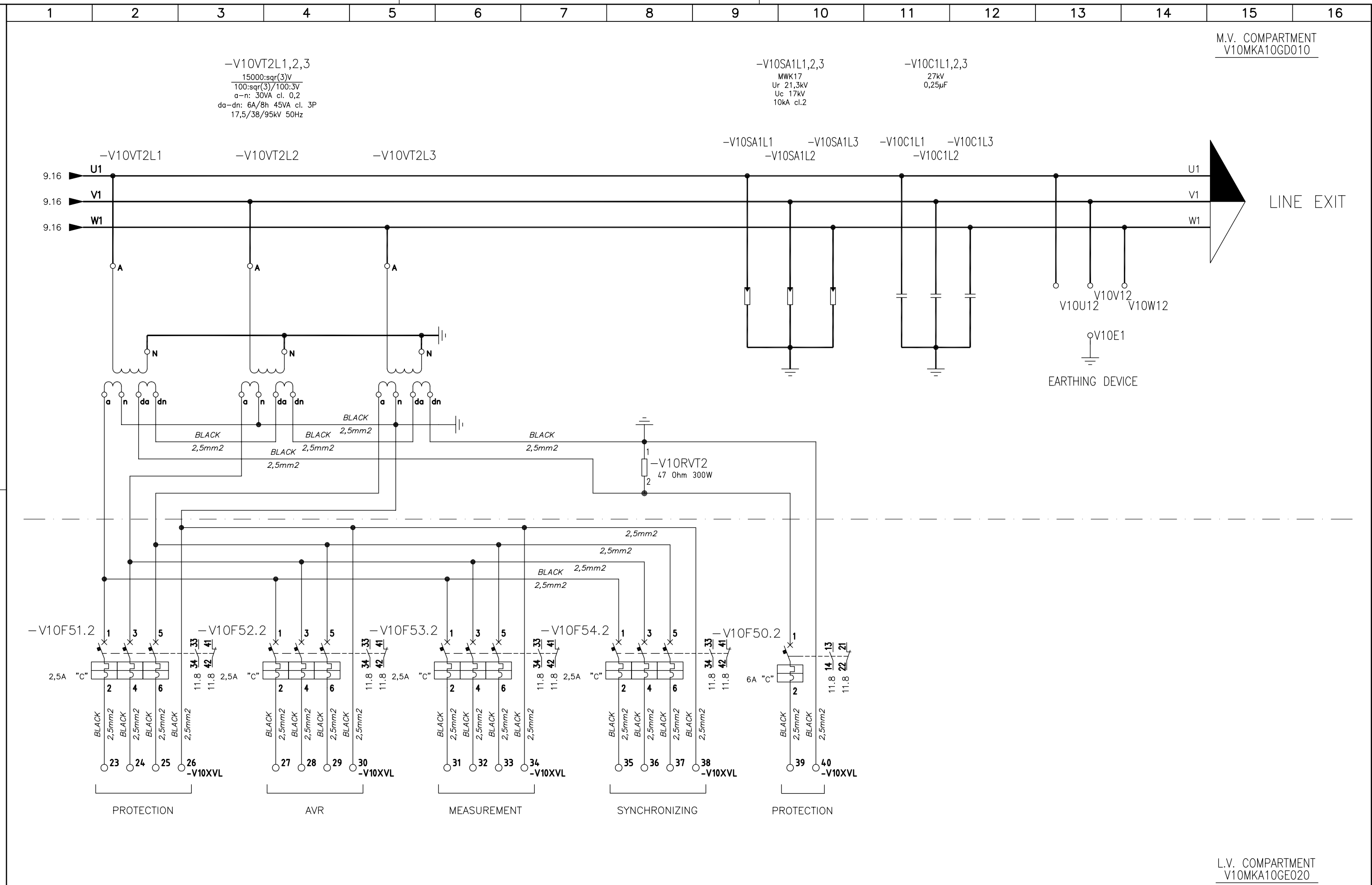
UNI EN ISO 9001 CERTIFICATO 9115.CASL

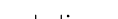


CERTIFIED
QUALITY SYSTEM

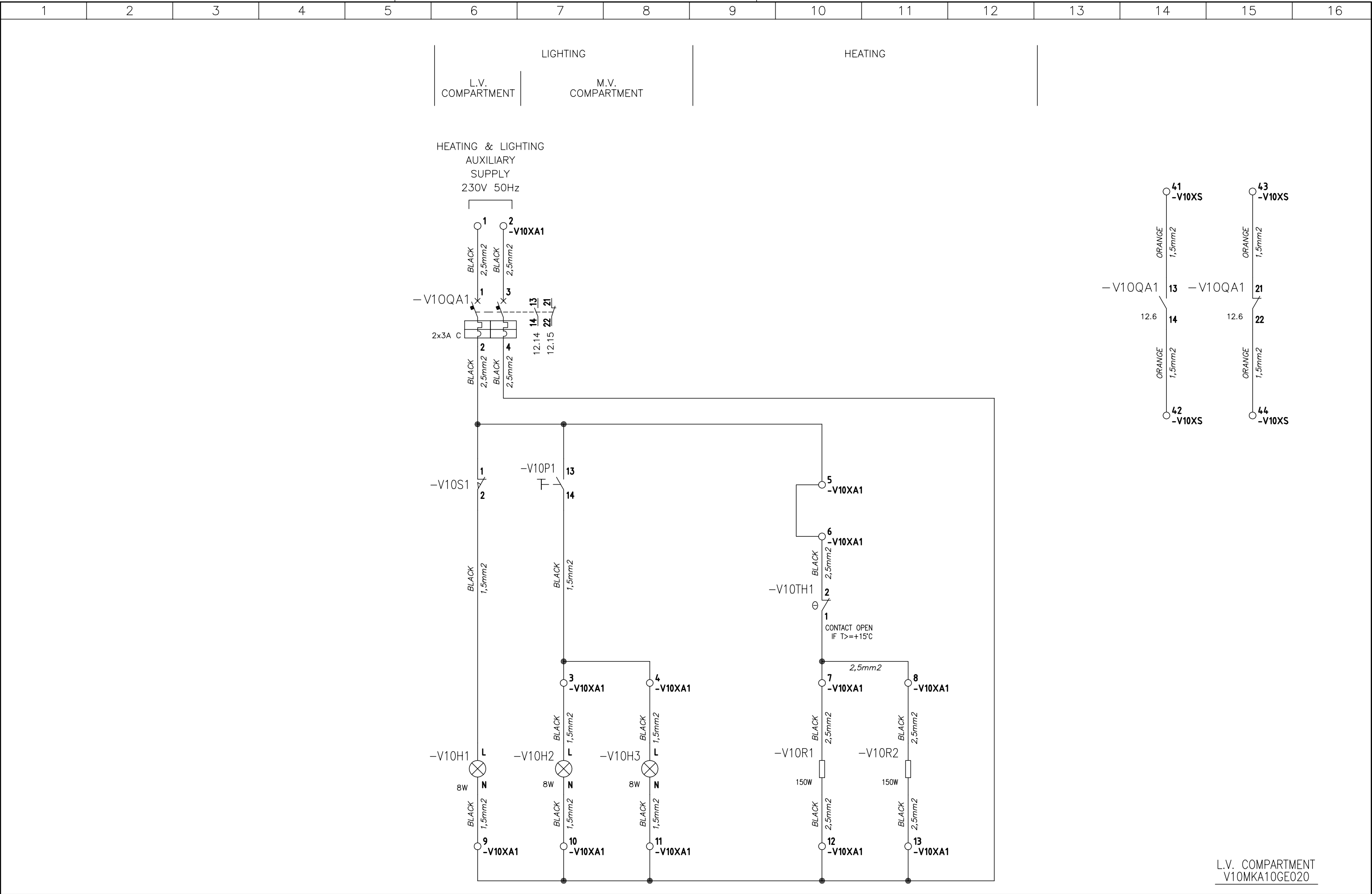
PROJECT PROJET	VILNIUS WIE - LITHUANIA
OBJECT OBJET	Neutral and line cubicle SINGLE LINE & WIRING DIAGRAM
TITLE TITRE	POWER AND MEASURING CIRCUITS

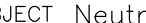
Drawing Nr. <i>Schéma Nr.</i>	17.121.SIE.001-2		
Customer reference <i>Référence du client</i>	730056		
Job <i>Travail</i>	17/121	Sheet <i>Page</i>	009
Scale/Format <i>Echelle/Format</i>	—	Follow <i>Suivant</i>	010



03	AS BUILT	12.11.2018	Pezzini M.	Dal Corso E.	CUSTOMER CLIENT	SIEMENS ELECTRIC MACHINES s.r.o.		CASAGRANDE ELETTROCOSTRUZIONI S.p.A. Via G. Rossini, 24 - 37060 CASTEL D'AZZANO VERONA - ITALY			UNI EN ISO 9001 CERTIFICATO 9115.CASL	PROJECT PROJET	VILNIUS WtE – LITHUANIA	Drawing Nr. Schéma Nr.		17.121.SIE.001-2		
02	FOR CONSTRUCTION	25.06.2018	Pezzini M.	Dal Corso E.										Customer reference Référence du client		730056		
01	FOR CONSTRUCTION	20.03.2018	Pezzini M.	Dal Corso E.										Job Travail	17/121	Sheet Page	010	
00	PRELIMINARY	18.12.2017	Vesentini M.	Dal Corso E.										Scale/Format Echelle/Format	—	Follow Suivant	011	
Item Rév	Modifications Description Description Modification	Date Date	Drawing by Rédacteur	Check by Vérificateur														

L.V. COMPARTMENT
V10MKA10GE020



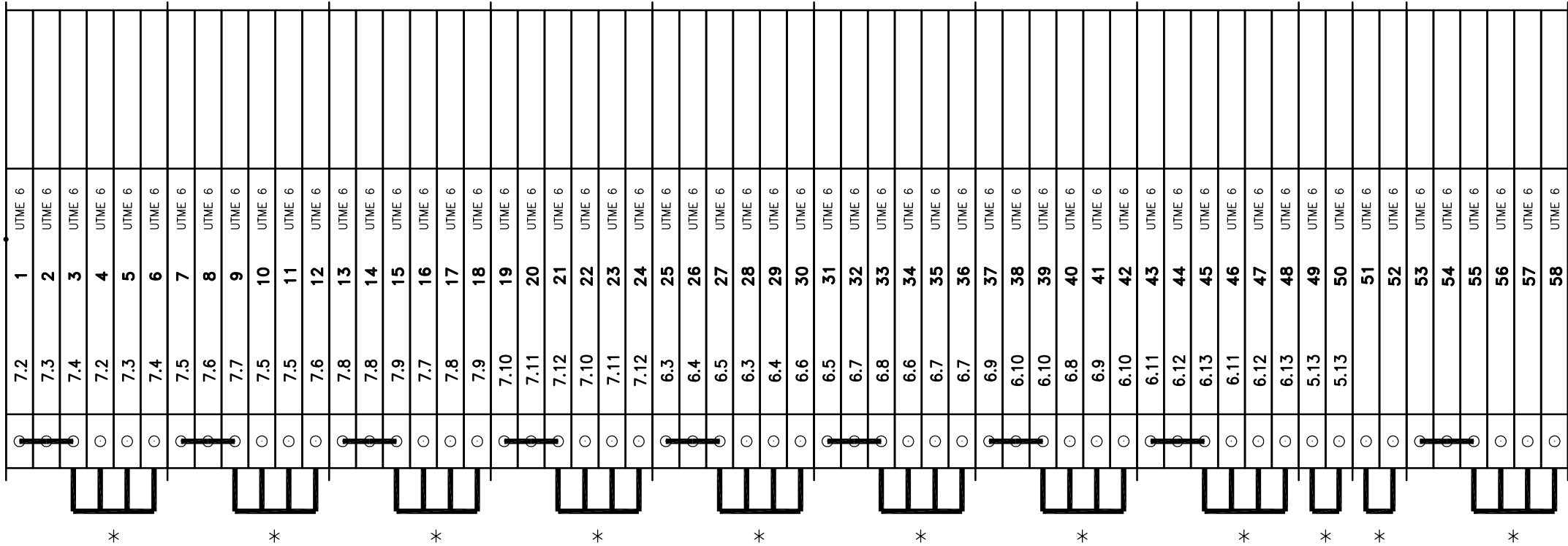
03	AS BUILT	12.11.2018	Pezzini M.	Dal Corso E.	CUSTOMER <i>CLIENT</i>	SIEMENS ELECTRIC MACHINES s.r.o.	PROJECT <i>PROJET</i>	VILNIUS WIE – LITHUANIA	OBJECT <i>OBJET</i>	Neutral and line cubicle SINGLE LINE & WIRING DIAGRAM LIGHTING & HEATING CIRCUIT	Drawing Nr. 17.121.SIE.001–2		
02	FOR CONSTRUCTION	25.06.2018	Pezzini M.	Dal Corso E.							Customer reference 730056		
01	FOR CONSTRUCTION	20.03.2018	Pezzini M.	Dal Corso E.							Job 17/121 Sheet 012		
00	PRELIMINARY	18.12.2017	Vesentini M.	Dal Corso E.							Scale/Format — Follow 013		
Item <i>Rév</i>	Modifications Description <i>Description Modification</i>	Date <i>Date</i>	Drawing by <i>Rédacteur</i>	Check by <i>Vérificateur</i>		CASAGRANDE ELETTROCOSTRUZIONI S.p.A. Via G. Rossini, 24 – 37060 CASTEL D'AZZANO VERONA – ITALY							

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
								TERMINAL TYPE <i>TYPE DE BORNE</i>	WIRE SECTION – USE <i>SECTION DE BORNE</i>	TERMINAL TYPE <i>TYPE DE BORNE</i>	WIRE SECTION – USE <i>SECTION DE BORNE</i>				
								UT 2,5	0,14...4mm ² AWG26...AWG12	UT 6–PE 	0,2...6mm ² AWG24...AWG8				
								UT 4	0,14...6mm ² AWG26...AWG10	UTME 6 (FOR CTs)	0,5...6mm ² AWG20...AWG8				
								UT 6	0,2...10mm ² AWG24...AWG8						
								UT 10	0,5...16mm ² AWG20...AWG6						
								UT 16	1,5...25mm ² AWG16...AWG4						
								UT 35	1,5...50mm ² AWG16...AWG1/0						

WIRE NUMBER <i>NOMBRE DE FIL</i>
TERMINAL TYPE <i>TYPE DE BORNE</i>
TERMINAL NR. <i>NR. BORNE</i>
TERMINAL POS. <i>POS. DE BORNE</i>
BRIDGE <i>PONT</i>

TERMINAL BLOCK -V10XAN



NOTE:

* REMOVE LINKS DURING ERECTION OR COMMISSIONING

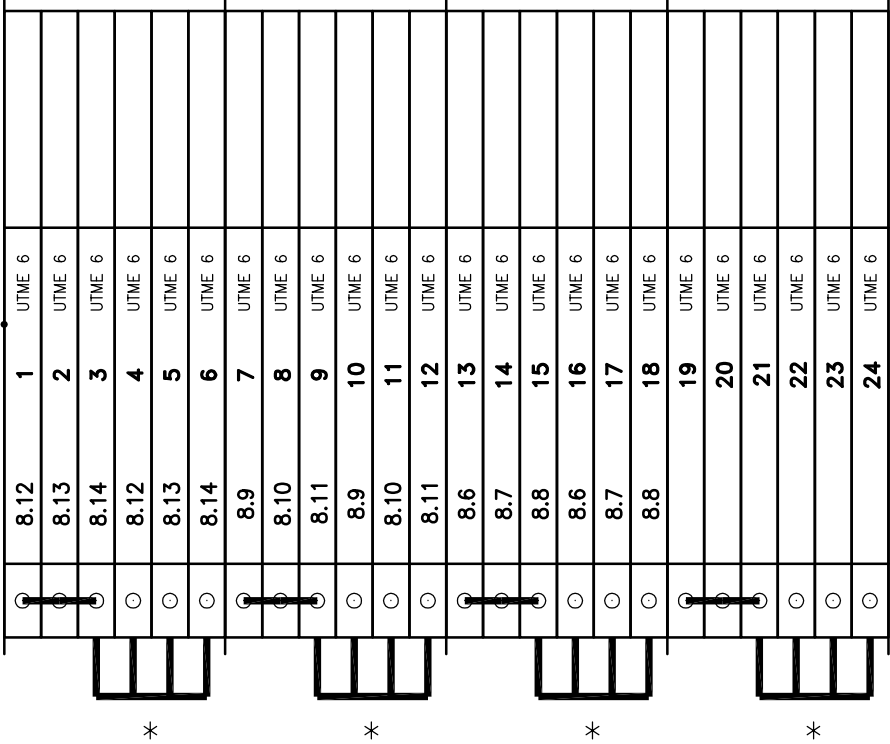
03	AS BUILT	12.11.2018	Pezzini M.	Dal Corso E.	CUSTOMER CLIENT	SIEMENS ELECTRIC MACHINES s.r.o.	 Via G. Rossini, 24 - 37060 CASTEL D'AZZANO VERONA - ITALY	 UNI EN ISO 9001 CERTIFICATO 9115.CASL		PROJECT PROJET	VILNIUS WtE – LITHUANIA		Drawing Nr. Schéma Nr.	17.121.SIE.001–2		
02	FOR CONSTRUCTION	25.06.2018	Pezzini M.	Dal Corso E.						OBJECT OBJET	Neutral and line cubicle SINGLE LINE & WIRING DIAGRAM		Customer reference Référence du client	730056		
01	FOR CONSTRUCTION	20.03.2018	Pezzini M.	Dal Corso E.						TITLE TITRE	TERMINAL BOARD –V10XAN		Job Travail	17/121	Sheet Page	014
00	PRELIMINARY	18.12.2017	Vesentini M.	Dal Corso E.								Scale/Format Echelle/Format	—	Follow Suivant	015	
Item Rév	Modifications Description Description Modification	Date Date	Drawing by Rédacteur	Check by Vérificateur												

1	2	3	4	5	6	7	8

9	10	11	12	13	14	15	16
TERMINAL TYPE TYPE DE BORNE		WIRE SECTION – USE SECTION DE BORNE		TERMINAL TYPE TYPE DE BORNE		WIRE SECTION – USE SECTION DE BORNE	
UT 2,5		0,14...4mm ² AWG26...AWG12		UT 6–PE 		0,2...6mm ² AWG24...AWG8	
UT 4		0,14...6mm ² AWG26...AWG10		UTME 6 (FOR CTs)		0,5...6mm ² AWG20...AWG8	
UT 6		0,2...10mm ² AWG24...AWG8					
UT 10		0,5...16mm ² AWG20...AWG6					
UT 16		1,5...25mm ² AWG16...AWG4					
UT 35		1,5...50mm ² AWG16...AWG1/0					

WIRE NUMBER NOMBRE DE FIL
TERMINAL TYPE TYPE DE BORNE
TERMINAL NR. NR. BORNE
TERMINAL POS. POS. DE BORNE
BRIDGE POINT

TERMINAL BLOCK –V10XAL



03	AS BUILT	12.11.2018	Pezzini M.	Dal Corso E.
02	FOR CONSTRUCTION	25.06.2018	Pezzini M.	Dal Corso E.
01	FOR CONSTRUCTION	20.03.2018	Pezzini M.	Dal Corso E.
00	PRELIMINARY	18.12.2017	Vesentini M.	Dal Corso E.
Item Rév	Modifications Description Description Modification	Date Date	Drawing by Rédacteur	Check by Vérificateur

CUSTOMER
CLIENT

SIEMENS ELECTRIC MACHINES s.r.o.



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UNI EN ISO 9001 CERTIFICATO 9115.CASL



PROJECT PROJET	VILNIUS WtE – LITHUANIA
OBJECT OBJET	Neutral and line cubicle SINGLE LINE & WIRING DIAGRAM
TITLE TITRE	TERMINAL BOARD –V10XAL

Drawing Nr. Schéma Nr.	17.121.SIE.001-2		
Customer reference Référence du client	730056		
Job Travail	17/121	Sheet Page	015
Scale/Format Echelle/Format	—	Follow Suivant	016

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03	AS BUILT	12.11.2018	Pezzini M.	Dal Corso E.
02	FOR CONSTRUCTION	25.06.2018	Pezzini M.	Dal Corso E.
01	FOR CONSTRUCTION	20.03.2018	Pezzini M.	Dal Corso E.
00	PRELIMINARY	18.12.2017	Vesentini M.	Dal Corso E.
Item R�v	Modifications Description Description Modification	Date Date	Drawing by R�dacteur	Check by V�rificateur

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PROJECT
PROJET

VILNIUS WIE - LITHUANIA

OBJECT
OBJET

Neutral and line cubicle
SINGLE LINE & WIRING DIAGRAM

TITLE
TITRE

TERMINAL BOARD -V10XVL, -V10XVN

Drawing Nr. Sch�ma Nr.	17.121.SIE.001-2	
Customer reference R�f�rence du client	730056	
Job Travail	17/121	Sheet Page 016
Scale/Format �chelle/Format	-	Follow Suivant 017

BRIDGE PONT	TERMINAL POS. POS. DE BORNE	TERMINAL NR. NR. BORNE	TERMINAL TYPE TYPE DE BORNE	WIRE NUMBER NOMBRE DE FIL
----------------	--------------------------------	---------------------------	--------------------------------	------------------------------

TERMINAL BLOCK -V10XVL

○	9.2	1	UT 6	
○	9.2	2	UT 6	
○	9.2	3	UT 6	
○	9.3	4	UT 6	
○	9.4	5	UT 6	
○	9.4	6	UT 6	
○	9.4	7	UT 6	
○	9.5	8	UT 6	
○	9.6	9	UT 6	
○	9.6	10	UT 6	
○	9.6	11	UT 6	
○	9.7	12	UT 6	
○	9.8	13	UT 6	
○	9.8	14	UT 6	
○	9.8	15	UT 6	
○	9.9	16	UT 6	
○	9.10	17	UT 6	
○	9.10	18	UT 6	
○		19	UT 6	
○		20	UT 6	
○		21	UT 6	
○		22	UT 6	
○	10.2	23	UT 6	
○	10.2	24	UT 6	
○	10.2	25	UT 6	
○	10.3	26	UT 6	
○	10.4	27	UT 6	
○	10.4	28	UT 6	
○	10.4	29	UT 6	
○	10.5	30	UT 6	
○	10.6	31	UT 6	
○	10.6	32	UT 6	
○	10.6	33	UT 6	
○	10.7	34	UT 6	
○	10.8	35	UT 6	
○	10.8	36	UT 6	
○	10.8	37	UT 6	
○	10.9	38	UT 6	
○	10.10	39	UT 6	
○	10.10	40	UT 6	
○		41	UT 6	
○		42	UT 6	
○		43	UT 6	
○		44	UT 6	

TERMINAL BLOCK -V10XVN

○	5.2	1	UT 6	
○	5.2	2	UT 6	
○		3	UT 6	
○		4	UT 6	

9	10	11	12	13	14	15	16
TERMINAL TYPE TYPE DE BORNE		WIRE SECTION - USE SECTION DE BORNE		TERMINAL TYPE TYPE DE BORNE		WIRE SECTION - USE SECTION DE BORNE	
UT 2,5		0,14...4mm ² AWG26...AWG12		UT 6-PE 		0,2...6mm ² AWG24...AWG8	
UT 4		0,14...6mm ² AWG26...AWG10		UTME 6 (FOR CTs)		0,5...6mm ² AWG20...AWG8	
UT 6		0,2...10mm ² AWG24...AWG8					
UT 10		0,5...16mm ² AWG20...AWG6					
UT 16		1,5...25mm ² AWG16...AWG4					
UT 35		1,5...50mm ² AWG16...AWG1/0					

1	2	3	4	5
---	---	---	---	---

WIRE NUMBER
NOMBRE DE FIL

TERMINAL TYPE
TYPE DE BORNE

TERMINAL NR.
NR. BORNE

TERMINAL POS.
POS. DE BORNE

BRIDGE
PONT

TERMINAL BLOCK – V10XS

○	11.4	1	UT 4	
○	11.4	2	UT 4	
○	11.4	3	UT 4	
○	11.4	4	UT 4	
○	11.4	5	UT 4	
○	11.4	6	UT 4	
○	11.4	7	UT 4	
○	11.4	8	UT 4	
○	11.4	9	UT 4	
○	11.4	10	UT 4	
○	11.4	11	UT 4	
○	11.4	12	UT 4	
○	11.4	13	UT 4	
○	11.4	14	UT 4	
○	11.4	15	UT 4	
○	11.4	16	UT 4	
○	11.4	17	UT 4	

Via G. Rossini, 24 - 37060 CASTEL D'AZZANO VERONA - ITALY

SIEMENS ELECTRIC MACHINES s.r.o.



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OBJECT Neutral and line cubicle
OBJET SINGLE LINE & WIRING DIAGRAM
 TITLE TERMINAL BOARD -V10XS

14	15	16
WIRE TYPE BORNE	WIRE SECTION – USE SECTION DE BORNE	
PE —	0,2...6mm ²	AWG24...AWG8
(FOR CTs)	0,5...6mm ²	AWG20...AWG8

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
REF. REF.	DESCRIPTION DESCRIPTION					SUPPLIER FOURNISSEUR	QUANTITY QUANTITE	REF. REF.	DESCRIPTION DESCRIPTION					SUPPLIER FOURNISSEUR	QUANTITY QUANTITE
-V10CT1L1 -V10CT1L2 -V10CT1L3	CURRENT TRANSFORMER TYPE ATB20-3A 1000/1-1-1A; 17,5/38/95kV 50Hz; lth: 40kA/1s; ldyn: 100kA 1S1-1S2, 2S1-2S2, 3S1-3S2: 15VA cl.5P20 SERIAL NUMBER: 2018/29180 - 2018/29181 - 2018/29182					ESITAS	3	-V10C1L1 -V10C1L2 -V10C1L3	SURGE CAPACITOR 0,25µF 17,5kV TYPE 415620037R 27kV 50Hz SERIAL NUMBER: 8813 - 8830 - 8829					DUCATI	3
-V10CT2L1 -V10CT2L2 -V10CT2L3	CURRENT TRANSFORMER TYPE ATB20-3A 1000/1-1-1-1A; 17,5/38/95kV 50Hz; lth: 40kA/1s; ldyn: 100kA 1S1-1S2, 2S1-2S2: 15VA cl.5P20; 3S1-3S2, 4S1-4S2: 10VA cl.0,2S Fs5 SERIAL NUMBER: 2018/29178 - 2018/29177 - 2018/29179					ESITAS	3	-V10SA1L1 -V10SA1L2 -V10SA1L3	SURGE ARRESTERS TYPE MWK17 Ur: 21,3kV; Uc: 17kV; 10kA; cl. 2; 50Hz SERIAL NUMBER: 11967236 - 11967237 - 11967235					ABB ADDA	3
-V10CT3L1 -V10CT3L2 -V10CT3L3	CURRENT TRANSFORMER TYPE ATB20-3A 1000/1-1-1-1A; 17,5/38/95kV 50Hz; lth: 40kA/1s; ldyn: 100kA 1S1-1S2, 2S1-2S2, 3S1-3S2: 15VA cl.5P20; 4S1-4S2: 10VA cl.0,2S Fs5 SERIAL NUMBER: 2018/29174 - 2018/29175 - 2018/29176					ESITAS	3	-V10EMC1 -V10EMC2 -V10EMC3	PARTIAL DISCHARGE COUPLING CAPACITOR 80pF 16kV SERIAL NUMBER: 55092 - 55097 - 55098					IRIS	3
-V10CT4	CURRENT TRANSFORMER TYPE KAT-60 60/1A; 0,72/3kV 50Hz; lth:100ln; ldyn:250ln S1-S2: 1,25VA cl.1 Fs10 SERIAL NUMBER: 2018/36142					ESITAS	1	-	PARTIAL DISCHARGE COUPLING CAPACITOR 80pF 16kV (LOOSE SUPPLY) SERIAL NUMBER: 55099 - 55100 - 55101					IRIS	3
-V10VT1L1 -V10VT1L2 -V10VT1L3	VOLTAGE TRANSFORMER TYPE VTB 20-K 15000:sqr(3)V/100:sqr(3)/100:3V a-n: 30VA cl. 0,2; da-dn: 6A/8h 45VA cl. 3P SERIAL NUMBER: 2018/71928 - 2018/71929 - 2018/71930					ESITAS	3	-	COUPLER TERMINATION BOX (6 OUTPUTS)					IRIS	1
-V10VT2L1 -V10VT2L2 -V10VT2L3	VOLTAGE TRANSFORMER TYPE VTB 20-K 15000:sqr(3)V/100:sqr(3)/100:3V a-n: 30VA cl. 0,2; da-dn: 6A/8h 45VA cl. 3P SERIAL NUMBER: 2018/71925 - 2018/71926 - 2018/71927					ESITAS	3	-V10U12 -V10V12 -V10W12 -V10E1	EARTHING POINT TYPE MT-3951					CATU	4
-V10RVT1	DUMPING RESISTOR 47ohm 300W					ESITAS	1	-	EARTHING DEVICE TYPE MT/PF25-P5/2 WITH HANDLING STICK					WORK ITALIA	1
-V10RVT2	DUMPING RESISTOR 47ohm 300W					ESITAS	1	-V10F51.1-V10F51.2 -V10F52.1-V10F52.2 -V10F53.1-V10F53.2 -V10F54.1-V10F54.2	AUTOMATIC CIRCUIT BREAKER 3P 2,5A TYPE 3RV CODE 3RV1611-1CG14 AUXILIARY CONTACT MODULE CODE 3RV1901-1A TERMINAL BOARD 3P FOR THREE-PHASE SUPPLY CODE 3RV1915-5A BARS 3P FOR 4 CIRCUIT BREAKER CODE 3RV1915-2CB					SIEMENS	8 8 2 2
-V10T01	NEUTRAL GROUNDING TRANSFORMER TYPE MAT/R RATIO 15000sqr(3)/240V (uSAT: >1,4x15000sqr(3)V) 10A/10s (at 15000/sqr(3)V) 17,5/38/95kV 50Hz SERIAL NUMBER: 70660					OCREV	1	-V10F50.1 -V10F50.2	AUTOMATIC CIRCUIT BREAKER 1P C 6A TYPE 5SY CODE 5SY4106-7 AUXILIARY CONTACT MODULE CODE 5ST3010					SIEMENS	2 2
-V10R01	NEUTRAL GROUNDING RESISTOR 0,665Ω - 240V - 0,72/3kV 50Hz- 361A/10sec SERIAL NUMBER: 3892/18/0001					MICROELETTRICA SCIENTIFICA	1	-V10QA1	AUTOMATIC CIRCUIT BREAKER 2P C 3A TYPE 5SY CODE 5SY4203-7 AUXILIARY CONTACT MODULE CODE 5ST3010					SIEMENS	1 1

03	AS BUILT	12.11.2018	Pezzini M.	Dal Corso E.	CUSTOMER CLIENT	SIEMENS ELECTRIC MACHINES s.r.o.	 CASAGRANDE ELETTROCOSTRUZIONI S.p.A. Via G. Rossini, 24 - 37060 CASTEL D'AZZANO VERONA - ITALY	 UNI EN ISO 9001 CERTIFICATO 9115.CASL	PROJECT PROJET VILNIUS WIE – LITHUANIA	OBJECT OBJET Neutral and line cubicle SINGLE LINE & WIRING DIAGRAM EQUIPMENT LIST	Drawing Nr. Schéma Nr. 17.121.SIE.001–2	
02	FOR CONSTRUCTION	25.06.2018	Pezzini M.	Dal Corso E.							Customer reference Référence du client 730056	
01	FOR CONSTRUCTION	20.03.2018	Pezzini M.	Dal Corso E.							Job Travail 17/121	Sheet Page 018
00	PRELIMINARY	18.12.2017	Vesentini M.	Dal Corso E.							Scale/Format Echelle/Format —	Follow Suivant 019
Item Rév	Modifications Description Description Modification	Date Date	Drawing by Rédacteur	Check by Vérificateur								

1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
REF. REF.	DESCRIPTION DESCRIPTION										SUPPLIER FOURNISSEUR	QUANTITY QUANTITE	REF. REF.	DESCRIPTION DESCRIPTION										SUPPLIER FOURNISSEUR	QUANTITY QUANTITE						
-V10P1	SWITCH ONE POLE 1x32A CODE 5TL1132-0										SIEMENS	1	-	ANTIVIBRATION TYPE AA/600/N, LOAD 600...800daN (MADE of ALUMINUM)										VIBROSTOP	6						
-V10S1	ONE POLE LIMIT SWITCH 300V 10A CODE 050FI01										ELFIN	1	-	ANCHOR BOLTS TYPE HST3 M10x110 50/30										HILTI	24						
-V10TH1	THERMOSTAT -20 to +40°C TYPE C04C2										FANTINI COSMI	1																			
-V10R1 -V10R2	ANTICONDENSATE HEATER 150W 220 to 240Vac 50/60Hz CODE KT150										TORRESAN	2																			
-V10H1	LAMP SUPPORT CODE LAMP3605 WITH FLUORESCENT LAMP 230Vac 50/60Hz 8W										ALFAELECTRIC	1																			
-V10H2 -V10H3	LAMP SUPPORT CODE 60415 WITH FLUORESCENT LAMP 250Vac 50/60Hz 8W										LEGRAND	2																			
-V10XA1 -V10XS -V10XVL -V10XVN	TERMINAL BOARD TYPE UT 4 TERMINAL BOARD TYPE UT 6 TERMINAL BOARD TYPE UT 10										PHOENIX	55 63 2																			
-V10XAL -V10XAN	TERMINAL BOARD TYPE UTME 6 (FOR CTs)										PHOENIX	82																			
V10MKA10GE020	L.V. BOX 1000x1200x300mm TYPE EKO 100.120.30 (MADE of S.S. AISI304 UNPAINTED)										IRINOX	1																			
-	M.V. INSULATOR TYPE IPA 17,5/8000 M.V. INSULATOR TYPE IPA 17,5/16000 M.V. INSULATOR TYPE IPA 24/10000										VENETA ISOLATORI	6 - 19																			

03	AS BUILT		12.11.2018	Pezzini M.	Dal Corso E.	CUSTOMER CLIENT	SIEMENS ELECTRIC MACHINES s.r.o.		PROJECT PROJET VILNIUS WtE - LITHUANIA				Drawing Nr. Schéma Nr.				17.121.SIE.001-2					
02	FOR CONSTRUCTION		25.06.2018	Pezzini M.	Dal Corso E.								Customer reference Référence du client				730056					
01	FOR CONSTRUCTION		20.03.2018	Pezzini M.	Dal Corso E.								Job Travail				17/121		Sheet Page		019	
00	PRELIMINARY		18.12.2017	Vesentini M.	Dal Corso E.								Scale/Format Echelle/Format				-		Follow Suivant		/	
Item Rév	Modifications Description Description Modification			Date Date	Drawing by Rédacteur	Check by Vérificateur	 Via G. Rossini, 24 - 37060 CASTEL D'AZZANO VERONA - ITALY		 UNI EN ISO 9001 CERTIFICATO 9115.CASL		 CERTIFIED QUALITY SYSTEM		OBJECT OBJET Neutral and line cubicle SINGLE LINE & WIRING DIAGRAM EQUIPMENT LIST				TITLE TITRE					

SIEMENS ELECTRIC MACHINES s.r.o.

VILNIUS Wte (Lithuania) NEUTRAL AND LINE CUBICLE

TEST REPORT AND CONFORMITY DECLARATION Document n° 17.121.SIE.030

With reference to:

- Order n. 2453118039-U19

	Page
Title sheet	1
Index Test report and Conformity declaration	2

0	29/10/2018	First Issue	Gelio A.	Dal Corso E.	Brunelli M.
REV.	DATE	DESCRIPTION	WRITTEN	CHECKED	APPROVED

CASAGRANDE ELETTROCOSTRUZIONI

17-121-DC-01 Neutral and Line cubicle – Conformity Declaration
17/121/001 Neutral and Line cubicle – Test Report

ABB SWITZERLAND Ltd

683117-50 M.V. Surge arresters type MWK 17 – Test Report

DUCATI

BC 2834 Surge capacitor type 415.62.0037R – Test Certificate
BC 2835 Surge capacitor type 415.62.0037R – Test Certificate

MICROELETTRICA SCIENTIFICA

BC01/3892/18/001 Earthing resistor type 9730100 – Test Report

OCREV

70660 Neutral grounding transformer type MAT/R – Test Report

IRIS POWER

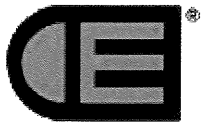
B0711 Epoxy-Mica Capacitors 80pF (± 4 pF) 16 kV – Certificate of Compliance

ESITAS

29174-1 M.V. Current transformer type ATB 20-3A – Test Report
29175-1 M.V. Current transformer type ATB 20-3A – Test Report
29176-1 M.V. Current transformer type ATB 20-3A – Test Report
29177-1 M.V. Current transformer type ATB 20-3A – Test Report
29178-1 M.V. Current transformer type ATB 20-3A – Test Report
29179-1 M.V. Current transformer type ATB 20-3A – Test Report
29180-1 M.V. Current transformer type ATB 20-3A – Test Report
29181-1 M.V. Current transformer type ATB 20-3A – Test Report

36142-1 M.V. Current transformer type KAT 60/170-140 – Test Report

71925-1 M.V. Voltage transformer type VTB 20-K – Test Report
71926-1 M.V. Voltage transformer type VTB 20-K – Test Report
71927-1 M.V. Voltage transformer type VTB 20-K – Test Report
71928-1 M.V. Voltage transformer type VTB 20-K – Test Report
71929-1 M.V. Voltage transformer type VTB 20-K – Test Report
71930-1 M.V. Voltage transformer type VTB 20-K – Test Report



Direzione, sede amministrativa e stabilimento:

37060 CASTEL D'AZZANO (Verona ITALY) Via Rossini, 24 - tel. +39/045/8546511 - fax +39/045/8520214 - info@casagrande.vr.it - www.casagrande.vr.it

To
Siemens Electric Machines s.r.o.
Dràsov 126
66424 – DRASOV (CZECH REP.)

ERKLÄRUNG VON GLEICHFÖRMIGKEIT DECLARATION OF CONFORMITY

Nummer / Number : 17-121-DC-01

Konform / In conformity :

ISO/IEC 2:2004, UNI CEI EN ISO /IEC 17000, UNI CEI EN ISO/IEC 17050

CASAGRANDE ELETTRICITÀ S.p.A., Via Rossini 24 in CASTEL D'AZZANO (VERONA)
We CASAGRANDE ELETTRICITÀ S.p.A., Via Rossini 24, Castel d'Azzano (VERONA)

Italien, erklären, unter unserer Verantwortung, dass Produkt für Bestellung Nr. 2453118039-U19
Italy, declare, under our exclusive responsibility, that the product in your order No.

Datum 11/06/18 Auftrag Nr. 17/121 Anlage: VILNIUS Wte - LITHUANIA
dated our job No. Plant:

Pos. 0010 - MV NEUTRAL AND LINE CUBICLE COMBINED
item

Serien 17/121/001

Serial number

Nach Kontrollen des unseres Personalen, ist konform mit folgende Standards:
following to the verifications of our personnel, is in conformity with the following standards:

- ☒ - European standard CEI EN 62271-1; CEI EN 62271-200
- ☒ - International standard IEC 62271-1; IEC 62271-200
- ☒ - Andere technische Dokumentation / Other technical documentation:

- Bestellung nr. / Purchase order No 2453118039-U19 datum / dated 11/06/18

Castel d'Azzano, 29/11/2018

Responsabile della Garanzia Qualità
Quality Assurance Responsible

CASAGRANDE
ELETTRICITÀ S.p.A.



Bollettino di collaudo quadri Media Tensione e Validazione del progetto Medium Voltage switchboard Test Report and Project Validation

Collaudo / Test Report N°	17/121/001	in data / date	31/10/2018
Commessa / Job N°	17121		
Cliente / Client:	SIEMENS ELECTRIC MACHINES s.r.o.		
Impianto / Plant:	VILNIUS Wte - LITHUANIA		
Ordine / Order n°:	2453118039-U19		
Pos. / Item:	0010 - MV NEUTRAL AND LINE CUBICLE COMBINED		

Collaudo svolto nello stabilimento di / Test performed in the workshop of: ☒ VR ☐ CB

Alla presenza di / To the presence of :

Cliente / Client: ALEX KOPCEVICH Sig. / Mr. SIEMENS ELECTRIC MACHINES
Consulente/Consultant: Sig. / Mr.
Casagrande Elettrocostruzioni S.p.A. Sig. / Mr. GAULE ANDREA

- ☒ Collaudo a Norme: CEI EN 62271-1; IEC 62271-200 E ISTRUZIONI TECNICHE (IT) DI PROVA
Standard for tests: CEI EN 62271-1; IEC 62271-200 and Internal Test Procedure (ITP)
- ☐ Collaudo a Norme: IEEE C37.20.2; IEEE C37.23 E ISTRUZIONI TECNICHE (IT) DI PROVA
Standard for tests: IEEE C37.20.2; IEEE C37.23 and Internal Test Procedure (ITP)

TIPO DI VERIFICHE / KIND OF TESTS:	A	CONTROLLI A VISTA	/	VISUAL CHECKS
	B	CONTROLLI MECCANICI	/	MECHANICAL CHECKS
	C	CONTROLLI ELETTRICI	/	ELECTRICAL CHECKS

A	CONTROLLI A VISTA VISUAL CHECKS	Conformità / In conformity		*NA	NOTE / NOTES:
		Si/Yes	No/No		
1	Controllo dimensioni e verifica apparecchiature Switchboard dimensional and apparatus test RIF. / REF.: "IT P 09"	☒	☐	☐	
2	Controllo verniciatura Painting test RIF. / REF.: "IT P 09"	☒	☐	☐	min. 460... micron Ral 7030... Munsell
3	Finiture speciali Special finishes RIF. / REF.: "IT P 09"	☐	☐	☒	
4	Controllo materiali isolanti Insulating materials check RIF. / REF.: "IT P 09"	☒	☐	☐	
5	Controllo disposizioni e sezioni sbarre Bus-bars disposition and branch connections check RIF. / REF.: "IT P 09"	☒	☐	☐	
6	Controllo connessioni ausiliarie Auxiliary connections check RIF. / REF.: "IT P 09"	☒	☐	☐	
7	Controllo siglatura apparecchi Apparatus labelling check RIF. / REF.: "IT P 09"	☒	☐	☐	
8	Controllo dicitura targhette Plates wording check RIF. / REF.: "IT P 09"	☒	☐	☐	

ANNOTAZIONI AL COLLAUDO / Remarks :
ELENCO STRUMENTI DI PROVA / INSTRUMENT LIST

Codice/Code	Descrizione / Description	usato per/used for	Scad./exp.	Note/Notes
☐ B008	ISA Art. 3	Protection relay test		
☐ B046	ISA DRT S3	Protection relay test		
☐ B081	ISA DRTS 6	Protection relay test		
☒ B009	Eletrotechn laboratorium UH28M	C.3	03/2019	
☒ B042	GMC Instruments METRISO 5000A	C.1	03/2019	
☐ D007	SEBA KMT	C.4		
☒ D008	SEBA KMT	C.4	03/2019	
☐				
☐				
☐				

VALIDAZIONE DEL PROGETTO / PROJECT VALIDATION

Secondo quanto prescritto dal Manuale della Qualità alla Sezione 7.3.6 e dalla Procedura di "Progettazione", dopo positiva verifica della progettazione, poichè il quadro/i in esame:

In conformity with "Quality Manual" section 7.3.6 and procedure "Design", after a positive verification of the job design, as the considered switchboard:

- ☐ è stato sottoposto a collaudo con esito favorevole
has been tested with favorable result
- ☐ non potrà essere verificato in impianto in quanto il contratto non prevede la posa in opera
it cannot be checked during the installation
- ☐ è stato sottoposto a n. fasi di validazione intermedie
has been validated in n. intermediate phases

il Responsabile di Commessa VALIDA la progettazione eseguita, ed assicura che il prodotto soddisfa alle esigenze ed ai requisiti dell'utilizzatore finale.

the Project Manager VALIDATE the design, and assure that the equipment is in conformity with the applications of the user.

Data/Date

Firma del Responsabile di Commessa/Signature of the Project Manager

.....

.....

N.B.: la validazione della progettazione sopra effettuata, non può prescindere da eventuali problematiche riscontratesi successivamente alla posa in opera ed attivazione del quadro.
the design validation, can't consider any other problems discovered during the assembly and test of the switchboard on plant.

		Conforme / In conformity		*NA	NOTE / NOTES:
		Yes	No		
9	Controllo schemi elettrici e meccanici <i>Electrical and mechanical diagrams check</i> RIF. / REF.: "IT P 09"	☒	☐	☐	
10	Verifica circuiti di protezione e messa a terra <i>Earthing and protection circuit test</i> RIF. / REF.: "IT P 09"	☒	☐	☐	
11	Verifica del grado di protezione <i>Degree of protection test</i> RIF. / REF.: "IT P 09"	☒	☐	☐	
12	Controllo distanze in aria e superficiali <i>Air and superficial distances check</i> RIF. / REF.: "IT P 09"	☒	☐	☐	
13	Controllo accessori <i>Accessories elements check</i> RIF. / REF.: "IT P 09"	☒	☐	☐	
14	Controllo pulizia <i>Cleanliness check</i> RIF. / REF.: "IT P 09"	☒	☐	☐	
B	CONTROLLI A MECCANICI MECHANICAL CHECKS	Conforme / In conformity		*NA	NOTE / NOTES:
		Yes	No		
1	Serraggio bulloneria <i>Bolts and nuts tightening</i> RIF. / REF.: "IT P 10"	☒	☐	☐	
2	Funzionamento interruttori e sezionatori <i>Circuit-breakers and isolator switches functioning</i> RIF. / REF.: "IT P 10"	☐	☐	☒	
3	Accessori di cella e funzionamento serrande <i>Compartment's accessories and shutters functioning</i> RIF. / REF.: "IT P 10"	☐	☐	☒	
4	Verifica dei blocchi meccanici ed elettromeccanici <i>Mechanical and electromechanical locks test</i> RIF. / REF.: "IT P 10"	☐	☐	☒	
C	CONTROLLI A ELETTRICI ELECTRICAL CHECKS	Conforme / In conformity		*NA	NOTE / NOTES:
		Yes	No		
1	Prova resistenza isolamento circuiti ausiliari <i>Insulation resistance test on auxiliary circuits</i> RIF. / REF.: "IT P 07"	☒	☐	☐	500 Vdc ≥ 1000 MOhm
2	Misura della resistenza del circuito principale <i>Main bus-bars electric resistance measurement</i> RIF. / REF.: "IT P 06"	☐	☐	☒	 Dc mV
3	Prova di rigidità dielettrica sui circuiti ausiliari <i>Voltage test on auxiliary circuits</i> RIF. / REF.: "IT P 04"	☒	☐	☐	Voltage 50 Hz per/for 60 sec 2 kV <u>Circuit</u> per/for sec kV
4	Prova rigidità dielettrica sui circuiti principali <i>Voltage test at industrial frequency</i> RIF. / REF.: "IT P 05"	☒	☐	☐	Voltage 50 Hz per/for 60 sec 38 kV <u>Circuit</u> per/for sec kV
5	Prova di funzionamento con tensione di esercizio applicata ai dispositivi aux. e di comando <i>Wiring check particularly with regard to the operation of isolator, circuit-breaker, signalling</i> RIF. / REF.: "IT P 08"	☒	☐	☐	
6	Funzionamento apparecchi <i>Apparatus functioning</i> RIF. / REF.: "IT P 08"	☒	☐	☐	

		Conformità / In conformity		*NA	NOTE / NOTES :
		Si/Yes	No/No		
7	Sequenza manovre <i>Operation sequence test</i> RIF. / REF.: "IT P 08"	☒	☐	☐	

*NA = Non applicabile / Not Applicable

DISEGNI E SCHEMI ESECUTIVI / DIAGRAMS AND DRAWINGS

CASAGRANDE		CLIENTE / CLIENT
SPECIFICHE TECNICHE <i>Technical specification</i>		
DISEGNI DIMENSIONALI <i>Dimensional drawings</i>	17.121.SIE.001-1	
SCHEMI FUNZIONALI <i>Functional drawings</i>	17.121.SIE.001-2	
SCHEMI DI CABLAGGIO <i>Wiring drawings</i>	17.121.SIE.001-2	

CARATTERISTICHE TECNICHE / TECHNICAL CHARACTERISTICS

CIRCUITI AUSILIARI / AUXILIARY CIRCUITS		CIRCUITI PRINCIPALI/BUS-BAR COMPARTMENTS	
TENSIONE C.C. <i>D.C. Voltage</i>	 V	TENSIONE DI ESERCIZIO <i>Service voltage</i>	15 kV
TENSIONE C.A. <i>A.C. Voltage</i>	230 V 50 Hz	TENSIONE NOMINALE <i>Rated voltage</i>	17,5 kV
TENSIONE SCALDIGLIE <i>Anticondensation resistance voltage</i>	230 V 50 Hz	TENSIONE DI PROVA 1min - 50Hz <i>Test voltage 50 Hz - 1 min</i>	38 kV
TENSIONE ILLUMINAZIONE <i>Internal lighting voltage</i>	230 V 50 Hz	TENSIONE DI TENUTA AD IMPULSO <i>Impulse withstand voltage</i>	95 kV
CLASSIFICAZIONE / CLASSIFICATION		FREQUENZA NOMINALE <i>Rated frequency</i>	50 Hz
CATEGORIA <i>Category</i>	☒ LSC1 ☐ LSC2A ☐ LSC2B	CORRENTE NOMIN. SBARRE PRINCIPALI <i>Rated current of main bus-bars</i>	983 A
SEGREGAZIONI <i>Partition class</i>	☐ Isolanti PI ☐ Metallic PM	CORRENTE BREVE DURATA 1" <i>Short-time withstand current (1s)</i>	40 kA
CLASSIFICAZIONE Arco Interno <i>IAC Classification</i>		CORRENTE DI CRESTA <i>Peak current</i>	100 kA

MATERIALE MANCANTE / Missing material :

ESITO COLLAUDO: ☒ CONFORME ☐ NON CONFORME
Test Result **In conformity** **Out of conformity**

L'esito si definisce conforme quando tutte le verifiche effettuate sono risultate conformi.

The result is considered in conformity when all the verifications have resulted compliant.

COLLAUDATORE
Testing surveyor

Controllo Qualità
 Casagrande
 Elettrocstruzioni S.p.A.

CONSULENTE
Consultant

CLIENTE
Client

Customer
Ordernumber 683117
Order item 50

Type of arrester MWK 17
Pieces 3
Test station

Test report

Factory tests on Metal-oxide Surge Arresters without gaps (MO-arresters)

Standard: IEC 60099-4, 50Hz

ABB internal test specification: HATW 600 359



This test report contains 4 pages

- Cover sheet
- measured values
- Legend

Factory test carried out



All the tested arresters fulfil the electrical specifications.

Date: 20. August 2018

ABB Switzerland Ltd.
Surge Arresters PPHV
Jurastrasse 45
CH-Wettingen
www.abb.com/arrestersonline

Customer
 Ordernumber 683117
 Order item 50

Type of arrester MWK 17
 Pieces 3
 Test station

Arrester data

Operating voltage U_c = 17.00 kV_{rms}
 AC reference current i_{ref} = 2.20 mA_{pk}
 Frequency f = 50.00 Hz
 PD-Test $U_{PD} = 1.05 \cdot U_c$ = 17.85 kV_{rms}

Test sequence

1. Reference voltage U_{ref} at i_{ref}
 2. Partial discharges PD at U_{PD}
 3. Leakage current i_c at U_c

Required values

U_{ref} = 19.04 22.95 kV_{rms}
 PD ≤ 5.0 pC
 i_c = 0.30 0.90 mA_{pk}

Ambient conditions during test

Airpressure 961.2 mbar_{abs.}
 relative humidity 27.4 %
 Ambient temperature 26.6 °C

Measured

serial number	Date	U_{ref} kV _{rms}	i_c mA _{pk}	PD pC	Passed
11967235	2018-03-14	21.25	0.58	≤ 5.0	OK
11967236	2018-03-14	21.21	0.57	≤ 5.0	OK
11967237	2018-03-14	21.21	0.58	≤ 5.0	OK

** According MO-block allocation

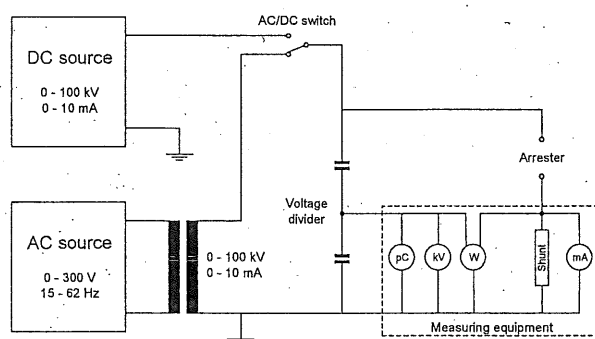
Customer
 Ordernumber
 Order item

683117
 50

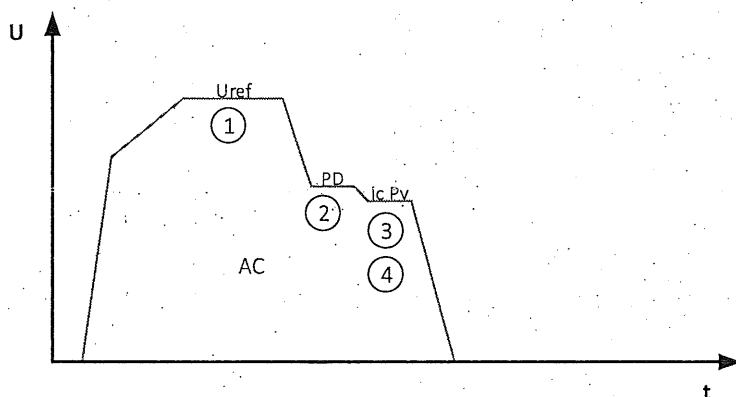
Type of arrester
 Pieces
 Test station

MWK 17
 3

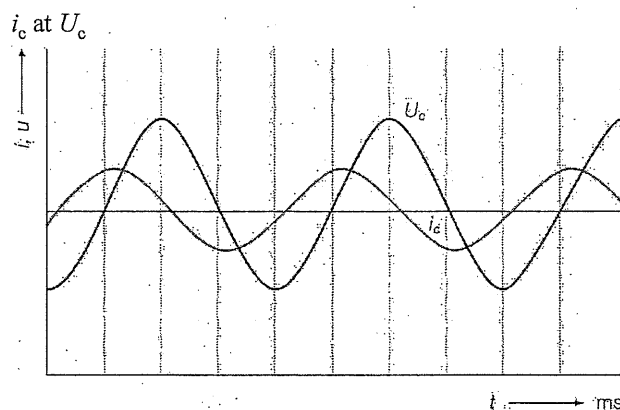
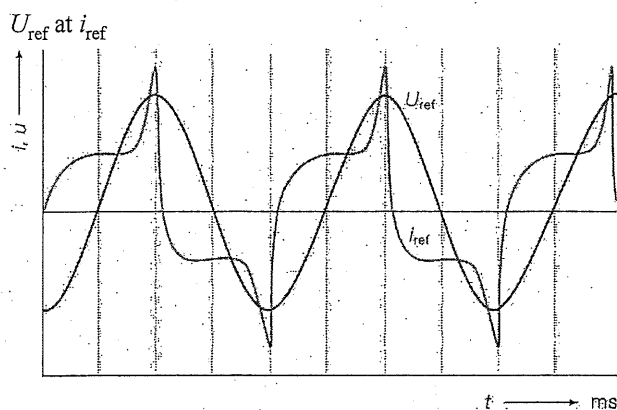
Principle diagram of test circuit



Principle test sequence



Typical current- / voltage curves



Note: the given current and voltage curves are for information only. Deciding for the result of the routine test is exclusively the value in the list of measuring results.

Customer		Type of arrester	MWK 17
Order number	683117	Pieces	3
Order item	50	Test station	

Legend

Routine tests

According to IEC 60099-4 the required routine tests to be made by the manufacturer shall be in minimum the following:

- Measurement of reference voltage U_{ref} . The measured values shall be within a range specified by the manufacturer.
- Residual voltage test. The test may be performed either on complete arresters, assembled arrester units or a single resistor element. In ABB each MO-resistor is routine tested with $I = 10 \text{ kA } 8/20 \text{ } \mu\text{s}$. Therefore, the residual voltage of the complete arrester is taken as the sum of the residual voltages of the MO resistors and not directly measured.
- Internal partial discharge test. This test is performed on each arrester unit. For distribution arresters this is generally the complete arrester.
- Leakage check. This test is not applicable for completely moulded arresters (e.g. for all arresters without a gas volume in the inside).
- Current distribution test for multi-column arresters. This test is carried out on all resistors or groups of resistors connected electrically in parallel, if they are to be installed in one arrester housing.

In addition ABB Switzerland carries out the following routine test:

- Measurement of the continuous current i_c at continuous operating voltage U_c .

Definitions

In IEC 60099-4 are given the following arrester related definitions:

Continuous operating voltage of an arrester U_c : designated permissible r.m.s. value of power-frequency voltage that may be applied continuously between the arrester terminals.

Rated voltage of an arrester U_r : maximum permissible r.m.s. value of power-frequency voltage between its terminals at which it is designated to operate correctly under temporary overvoltage conditions as established in the operating duty tests.

Reference voltage of an arrester U_{ref} : peak value of power-frequency voltage divided by $\sqrt{2}$ which is applied to the arrester to obtain the reference current.

Residual voltage of an arrester U_{res} : peak value of voltage that appears between the terminals of an arrester during the passage of discharge current.

Continuous current of an arrester (i_c): current flowing through the arrester when energized at the continuous operating voltage.

Reference current of an arrester (i_{ref}): peak value (the higher peak value of the two polarities if the current is asymmetrical) of the resistive component of a power-frequency current used to determine the reference voltage of the arrester.

Nominal discharge current of an arrester I_n : peak value of lightning current impulse which is used to classify an arrester.

Routine test report

 DUCATI energia	POWER FACTOR CORRECTION CAPACITORS TEST CERTIFICATE No: BC 2835	Electrical Test Department Date: 4/9/18
---	--	--

TYPE : 415.62.0037R
Rated capacit. : 0,25 µF

Quantity No. : 01
Cap. tolerance : -5+10 %
Nominal Voltage : 27000 V

Reference standard : IEC 60871/ IEEE18
Rated Frequency : 50/60 Hz
Connection : E

Routine test list:

CONSTRUCTION CHECK :	: by drawing No. 415.62.0037R
SEALING TEST :	: at 75 °C for 14 hours
TEST VOLTAGE TERMINAL - TERMINAL :	: 100 kVdc - duration 10 "(sec.)
DISCHARGE TEST ON INTERNAL FUSES :	V disch.=1,7xUn (only for fuses version)

Measurements list:

CAPACITANCE MEASUREMENT :	Instrument TETTEX 2811 - Test voltage 10,1 kV - Freq. 50 Hz
Relative expanded uncertainty 0,13%	Coverage factor kp= 2 , confidence interval: 95% (doc. un-001)
TAN D MEASUREMENTS :	Instrument TETTEX 2811 - Test voltage 10,1 kV - Freq. 50 Hz
Relative expanded uncertainty 6,82%	Coverage factor kp= 2 , confidence interval: 95% (doc. un-002)
DISCHARGE RES. MEASUREMENT :	Instrument Megahommeter GEN RAD 1863, test voltage 500 Vdc
Relative expanded uncertainty 3,65%	Coverage factor kp= 2 , confidence interval: 95% (doc. un-003)
AMBIENT TEMP. MEASUREMENT :	Thermometer SIAP 1167
Relative expanded uncertainty 4,15%	Coverage factor kp= 2 , confidence interval: 95% (doc. un-004)

VALUES RECORDED DURING TESTING

Serial No.	CAPACIT. (µF)	TAN δ (x10r-4)	Disc.dev. (MΩ)	θ (°C)	CAP.20°C (µF)
8813	0,251	2,47	220	25	0,252

Routine test report

 DUCATI energia	POWER FACTOR CORRECTION CAPACITORS TEST CERTIFICATE No: BC 2835 Electrical Test Department Date: 4/9/18
---	--

TYPE : 415.62.0037R
 Rated capacit. : 0,25 μ F

Quantity No. : 11
 Cap. tolerance : -5+10 %
 Nominal Voltage : 27000 V

Reference standard : IEC 60871/ IEEE18
 Rated Frequency : 50/60 Hz
 Connection : E

Routine test list:

CONSTRUCTION CHECK :	: by drawing No. 415.62.0037R
SEALING TEST :	: at 75 °C for 14 hours
TEST VOLTAGE TERMINAL - TERMINAL :	: 100 kVdc - duration 10 "(sec.)
DISCHARGE TEST ON INTERNAL FUSES :	V disch.=1,7xUn (only for fuses version)

Measurements list:

CAPACITANCE MEASUREMENT :	Instrument TETTEX 2811 - Test voltage 10,1 kV - Freq. 50 Hz
Relative expanded uncertainty 0,13%	Coverage factor kp= 2 , confidence interval: 95% (doc. un-001)
TAN D MEASUREMENTS :	Instrument TETTEX 2811 - Test voltage 10,1 kV - Freq. 50 Hz
Relative expanded uncertainty 6,82%	Coverage factor kp= 2 , confidence interval: 95% (doc. un-002)
DISCHARGE RES. MEASUREMENT :	Instrument Megahommeter GEN RAD 1863, test voltage 500 Vdc
Relative expanded uncertainty 3,65%	Coverage factor kp= 2 , confidence interval: 95% (doc. un-003)
AMBIENT TEMP. MEASUREMENT :	Thermometer SIAP 1167
Relative expanded uncertainty 4,15%	Coverage factor kp= 2 , confidence interval: 95% (doc. un-004)

VALUES RECORDED DURING TESTING

Serial No.	CAPACIT. (μ F)	TAN δ (x10 ⁻⁴)	Disc.dev. (M Ω)	θ (°C)	CAP.20°C (μ F)
8814	0,254	2,60	220	25	0,255
8815	0,256	2,74	220	25	0,257
8818	0,257	2,58	220	25	0,258
8820	0,252	2,60	220	25	0,253
8828	0,253	2,65	220	25	0,254
8829	0,254	2,45	220	25	0,255
8830	0,257	2,58	220	25	0,258
8842	0,256	2,60	220	25	0,257
8844	0,251	2,36	220	25	0,252
8855	0,252	2,45	220	25	0,253
8857	0,254	2,56	220	25	0,255



CERTIFICATO DI COLLAUDO RESISTENZE INDUSTRIA TEST REPORT FOR RESISTORS

N° BC01/3892/18/001

CLIENTE: **CASAGRANDE ELETTROCOSTR. SPA**
CUSTOMER:

ORDINE N°: **3585**
PURCHASE ORDER:

DATA: **02-07-2018**
DATE:

CONFERMA N°: **3892/18**
ORDER ACKNOWLEDGMENT:

DATA CONSEGNA: **01-10-2018**
EXWORKS DELIVERY DATE:

QUANTITA': **1**
QUANTITY:

TIPO: **EARTHING RESISTOR**
TYPE:

PRODUZIONE: **settimana / week 40**
PRODUCTION: **anno / year 2018**

DISEGNO: **/**
DRAWING N°:

Foglio **/** Rev. **/**
Sheet:

N° DI SERIE: **da / from 3892/18/0001**
SERIAL N°: **a / to /**

CODICE: **9730100**
CODE:

RIFERIMENTO A M.R.A. (se applicabile): **/**
REFERENCE TO M.R.A. (if applicable):

TEMPERATURA AMBIENTE: **19 °C**
AMBIENT TEMPERATURE:

ESAME VISIVO E DIMENSIONALE: **positivo ✓**
VISUAL AND DIMENSIONAL EXAMINATION: **passed**

VALORE OHMICO MISURATO: **Vedi pag. 2:**
MEASURED OHMIC VALUE: **See page 2:**

RIGIDITA' DIELETTRICA per 60 sec. 50 Hz
DIELECTRIC WITHSTAND for 60 sec. 50 Hz

TENSIONE NOMINALE: **240 V**
RATED VOLTAGE:

TENSIONE DI PROVA: **3000 V** **positivo ✓**
STAGE VOLTAGE: **passed**

TENSIONE DI PROVA AUSILIARI VERSO MASSA: **/** **positivo**
VOLTAGE BETWEEN AUX. CIRCUITS AND EARTH: **passed**

MISURA RESISTENZA DI ISOLAMENTO (MEGGER 1000 Volt)
INSULATION TEST
> 1000 Mohm **positivo ✓**
passed

ELENCO STRUMENTI USATI:
MEASURED INSTRUMENTS:

- | | |
|---|----------|
| 1 Ohmetro elettronico - CROPICO DO4000 | (N°0795) |
| Electronic ohmmeter - CROPICO DO4000 | |
| 2 Prova rigidità dielettrica - SAMAR MID-AT/20S | (N°0798) |
| Dielectric test instruments - SAMAR MID-AT/20S | |
| 3 Megger elettronico - METRISO 5000D-PI | (N°0749) |
| Electronic type megger - METRISO 5000D-PI | |

NORME DI RIFERIMENTO: **CEI EN 60529 ; CEI EN 61439-1**
REFERENCE STANDARDS: **IEC 60529 ; IEC 61439-1**

NOTE: **Dichiarazione di conformità in allegato: DC01/3892/18/001**
REMARKS: **Declaration of conformity in the annex:**





CERTIFICATO DI COLLAUDO RESISTENZE INDUSTRIA
TEST REPORT FOR RESISTORS

N° BC01/3892/18/001

ALLEGATO 1
ENCLOSE 1

VALORE OHMICO SPECIFICATO A 20°C :
RATED OHMIC VALUE AT 20°C:

0,665 ohm

10% 0,732 ohm

-10% 0,599 ohm

RESISTENZA N° 0001
Resistor n° 0001

TERMINALI TERMINAL	VALORE OHMICO MISURATO MEASURED OHMIC VALUE
0 - 1	0,682 ohm

FIRMA RESPONSABILE TEST
TESTING RESPONSIBLE SIGNATURE
D.Abate

FIRMA ENTE COLLAUDO ESTERNO
CUSTOMER REPRESENTATIVE SIGNATURE

DATA
DATE
04/10/2018



**ocrev**

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Tel. + 39 0445 440396
Fax + 39 0445 440395
e-mail info@ocrev.com

TRANSFORMER TEST REPORT

Purchaser : **CASAGRANDE ELETTROCOSTRUZIONI S.p.A.**
Order N° : 3586

Transformer Type : MAT/R Short Duration Power kVA : 86,6 for 10 sec. Standard : IEC 60076-11:2004

Rated Voltage HV : 8660,3 V (15000/√3) Serial Number : 70660 Insulation Level HV : LI 95 - AC 38 kV
Rated Voltage LV : 240,0 V Insulation Level LV : AC 3 kV

Short Duration Current HV : 10,00 A for 10 sec. Phase 1 Impedance : 26,98 %
Short Duration Current LV : 360,8 A for 10 sec. Frequency : 50 Hz

RATIO TEST BY RESISTANCE - POTENTIOMETER METHOD

SWITCH POSITIONS	VOLTS AT NO LOAD	TURNS RATIO	MEASURED
			1 1 - 1 2 / 2 1 - 2 2
	8660 / 240	36,084 ±0,5%	36,103

MEASUREMENT OF NO LOAD LOSSES AND EXCITING CURRENT

WINDING FEEDED : 240 VOLT
Frequency : 50 Hz

Veff	Veff	Vm	Vm	A	Am	W	Pm	CHARACTERISTIC AT NO LOAD AT VOLTAGE AND FREQUENCY RATED	
K=1/1	Volt	K=1/1	Volt	K=1/1	AMP.	K=1/1	W	No load Losses (W)	TESTED
215,87	215,87	215,08	215,08	0,6867	0,6867	84,31	84,00		GUARANT.
240,81	240,81	239,78	239,78	1,0334	1,0334	104,70	104,25		100
265,09	265,09	263,79	263,79	1,4974	1,4974	127,38	126,75	Exciticing Current %	(+15%)
									0,28
									-

MEASUREMENT OF LOAD LOSSES AND SHORT CIRCUIT IMPEDANCE

WINDING FEEDED : 8.660 VOLT
Frequency : 50 Hz
TEMPERATURE : 26,2 °C

Veff	VOLT	A	Am	W2	Pm	CHARACTERISTIC OF LOAD AT 75 °C	
K=1/1		K=1/1	AMP.	K=1/1	W	TESTED	GUARANT.
1983,3	1983,3	8,7432	8,7432	6702,8	6702,8	Load losses Watt 75°C	10414
						Watt 120°C	11939
Vcc a In : 2268,3 V			In : 10,00	Pcc a In : 8767,8 W		Impedance % 75°C	26,98
		CHARACTERISTIC OF LOAD AT 75 °C		I² R loss : 10280,4 W		Add. Loss : 133,7 W	
						28,00 (±10%)	

INDUCED OVERVOLTAGE TEST

Windings energized : 240 V
Test Voltage : 480 V
Frequency of test : 150 Hz. Duration of test : 40 sec.

Result of test : PASSED**SEPARATE SOURCE VOLTAGE WITHSTAND TEST**

TESTING WINDINGS	TEST VOLTAGE APPLIED IN VOLT	DURATION OF TEST IN SECONDS
8660,3	38000	60
240,0	3000	60

Result of test : PASSED**INSULATION RESISTANCE MEASUREMENT by meter at 2500 volts**

F / N > 1000 Mohm

MEASUREMENT OF WINDINGS RESISTANCE

TEMPERATURE 26,2 °C

WINDING	TERMINALS	Ohm
8660	1.1 - 1.2	57,115
WINDING	TERMINALS	mOhm
240	2.1 - 2.2	22,250

PARTIAL DISCHARGE MEASUREMENT LESS THAN 10 pC
(See note on pag.2)

OCREV Srl
Testing Dept

OCREV s.r.l.
Testing Department

APPROVED

Date
11/09/2018



ocrev

Via dell'Industria, 28
Castelgomberto (VI) - IT
Tel. + 39 0445 440396
Fax + 39 0445 440395
e-mail info@ocrev.com

TRANSFORMER TEST REPORT

Client : CASAGRANDE ELETTROCOSTRUZIONI S.p.A.
Comm. N° : 3586

Transformer Type : MAT/R

Short Duration Power kVA : 86,6 for 10 sec.

Standard : IEC 60076-11:2004

Rated Voltage HV : 8660,3 V (15000/ $\sqrt{3}$)
Rated Voltage LV : 240,0 V

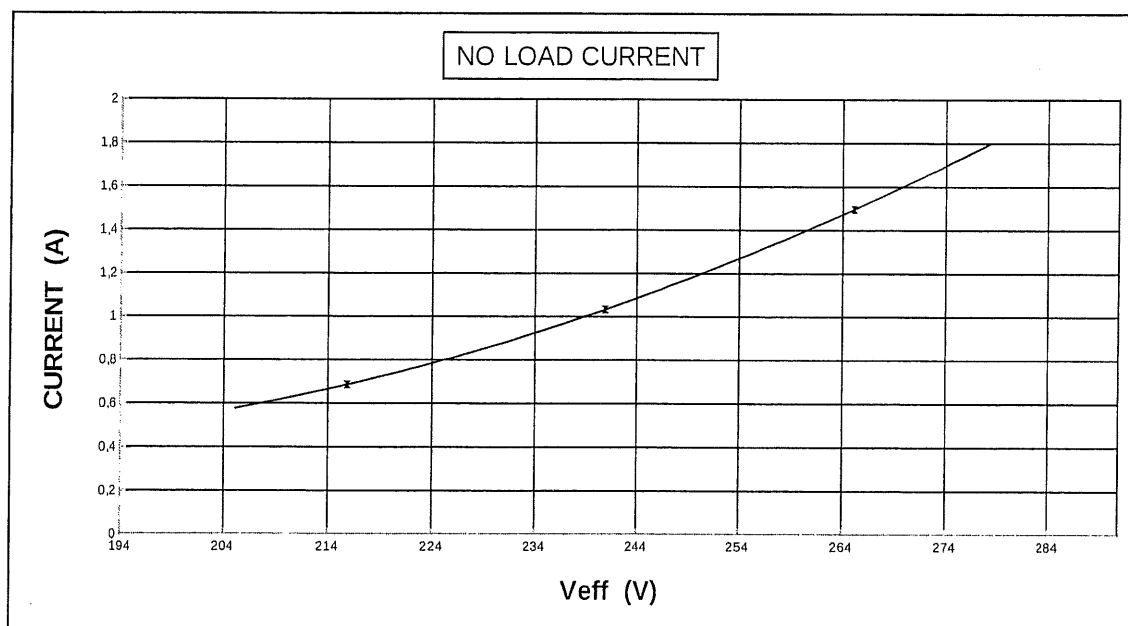
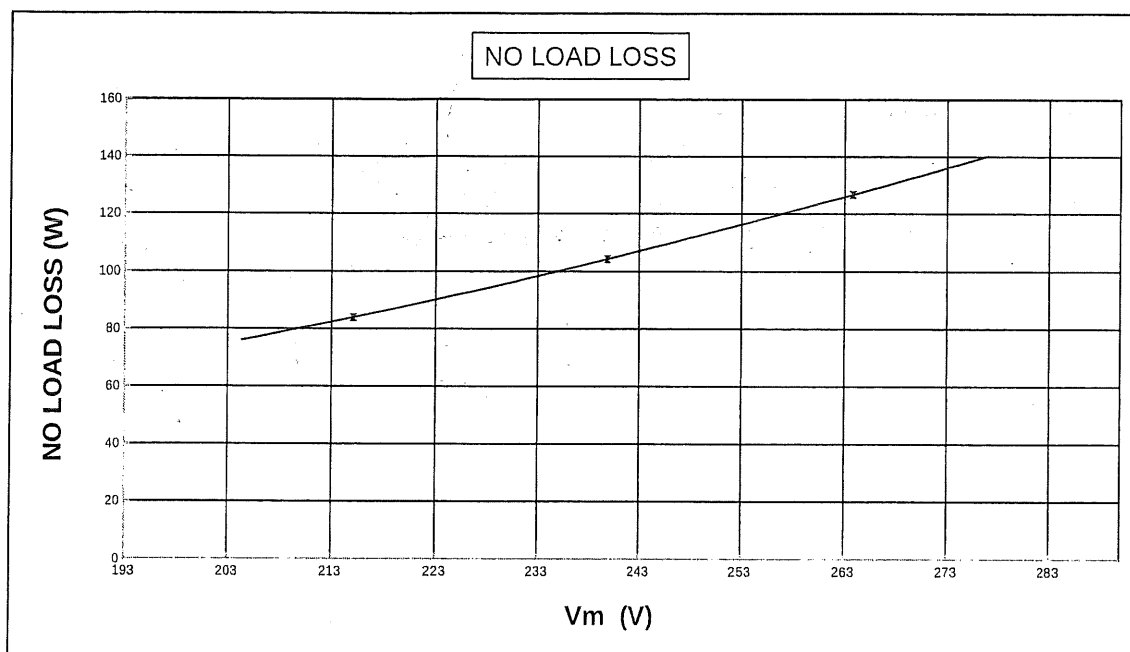
Serial Number : 70660

Insulation Level HV : LI 95 - AC 38 kV
Insulation Level LV : AC 3 kV

Short Duration Current HV : 10,00 A for 10 sec.
Short Duration Current LV : 360,8 A for 10 sec.

Phase 1

Impedance : 26,98 %
Frequency : 50 Hz



The measurement of partial discharges occurred after performing the calibration of the electrical circuit through sample unit (instr. MO824301).

OCREV s.r.l.
Testing Dept.
[Signature]
Ufficio Tecn.
Cliente

OCREV s.r.l.
Testing Department

APPROVED

Date
11/09/18

Certificate of Compliance

This certificate is a statement of compliance for the products listed below. The manufacturer, Iris Power, certifies that the product with serial numbers listed is tested to the required specifications of ASTM D1868 and IEC 60270 standards.

The Item listed herein has been inspected by Iris Power and is in conformance with the contract requirements and approved for shipment.

Product Description: Epoxy-Mica Capacitors - 80pF (± 4 pF) 16kV

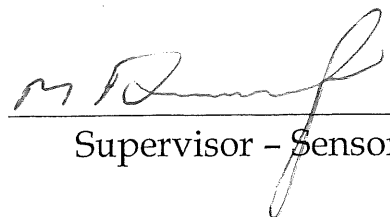
Sales Item Number: B0711

Serial Number	D.I.V. kV	D.E.V. kV	Dissipation Factor $\leq 0.10\%$	Shore Hardness ASTMD2240, A ≥ 90	Maximum Tested Voltage for 1 Min.
55097	28.5	24.2	Pass	Pass	40kV
55100	27.8	26.0	Pass	Pass	40kV
55098	27.9	23.7	Pass	Pass	40kV
55101	21.6	19.4	Pass	Pass	40kV
55099	26.5	23.6	Pass	Pass	40kV
55092	22.8	20.4	Pass	Pass	40kV

Customer/Buyer: Casagrande Elettrocostruzioni S.p.A.

PO#: 3581

Iris File#: 50316120


Supervisor - Sensors


Date



CURRENT TRANSFORMER TEST REPORT
AKIM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-3	Serial No Seri No	2018/29174-1
Type / Tip	ATB 20-3A	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
Project Number		IDYN Dinamik Anma Akımı	100 kA	FREQUENCY Frekans	50Hz
Cust. Item Code		Standard APP. Uygulanan Standart	IEC 61869-2:2012	Insulation Classe İzolasyon Sınıfı	E
Shorttime TH.CUR. Kİ.SÜ.TER.AN. A.(Ith)	40kA/1sec				

Ratio / Çevirme Oranı : 1000/1-1-1-1A

EXPLANATION / Açıklama :

Visual and Mechanical Control (Görsel ve Mekanik Kontrol)	OK	Inter-Turn Over Voltage Test - Proc. B (Sarımlar Arası Aşırı Gerilim Testi - Pros. B) (IEC 61869-2 CLAUSE 7.3.204) 200Hz-30sec	OK
Verification of Terminal Markings (Terminal İşaretlemeleri Doğrulaması)	OK	Composite Error (Birleşik Hata)	OK

İZOLASYON TESTLERİ / Insulation Test (IEC 61869-2 CLAUSE 7.3.1 ve 7.3.3 / 7.3.4)

Primer Yalıtım Testi Power Frq. On Pri.Winding / (60 sec.)	Primerler Arası Yalıtım Testi Between Primer Wndg. / (60 sec.)	Sekonder Yalıtım Testi Pwr. Frq. On Sec. Wndg. / (60 sec.)	Sekonderler Arası Yalıtım Testi Between Secondary Wndg. / (60 sec.)
38 kV		3 kV	3 kV
OK	---	OK	OK

KİSMİ DEŞARJ TESTİ / Partial Discharge Test (IEC 61869-2 CLAUSE 7.3.2)

Gerilim / Voltage	1.2 Um	1.2 Um/V3	Kapasitans / Capacitance (pF)	Gerilim / Voltage (kV)	tan δ (%)
Seviye/Level	3 (pC)	3 (pC)			

POLARİTE TESTİ/Polarity Test +O.K. (IEC 61869-2 CLAUSE 7.3.6)

Kapasitif Değerler Values Capacitive	C1 : PF	C2 : PF
---	---------	---------

Core / Nüve	Primary / Primer (A)	Secondary/Sekonder (A)	Burden / Yük (VA)	Class / Klas	Aşırı Akım Faktörü Over Current Faktor
1	1000	1	15	5P	20
2	1000	1	15	5P	20
3	1000	1	15	5P	20
4	1000	1	10	0,2 S	FS5

SINIF TESTLERİ / Accuracy Class Tests (IEC 61869-2 CLAUSE 7.3.5)

Nüve Core	Primer Primary	Sekonder Second.	Rct (@ 75°C) (Ohm)	Ie (A)	Ek (V)	%	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)
1S1-1S2	1000	1	5.576				3,75			15		
							100				0,39	0
2S1-2S2	1000	1	5.718				3,75			15		
							100				0,44	1
3S1-3S2	1000	1	5.168				3,75			15		
							100				0,44	0
4S1-4S2	1000	1	3.212			1	2,5	0,1	1	10	0,07	2
						5		0,11	1		0,07	2
						20		0,1	1		0,07	1
						100		0,1	0		0,08	0
						120		0,1	0		0,08	0

Date 06.09.2018
Tarih

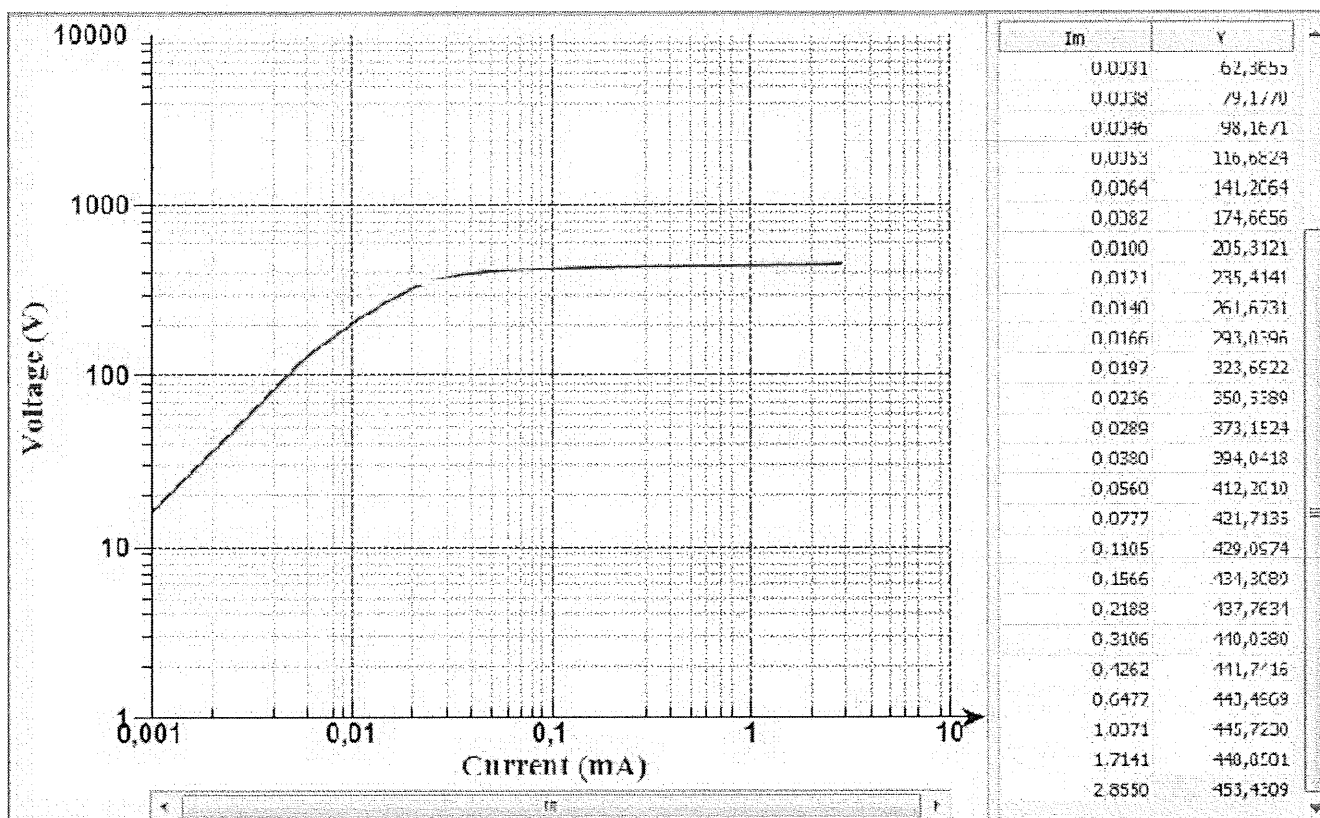
Test Operator
Muharrem DOĞAN

Approved

This is an electronically generated document and requires no signature.
Elektronik olarak Onaylanmıştır. İslak imza gerektirmez.

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 1S1-1S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.576
 Serial No : 2018/29174



Kneepoint Calculation

Vknee

Iknee

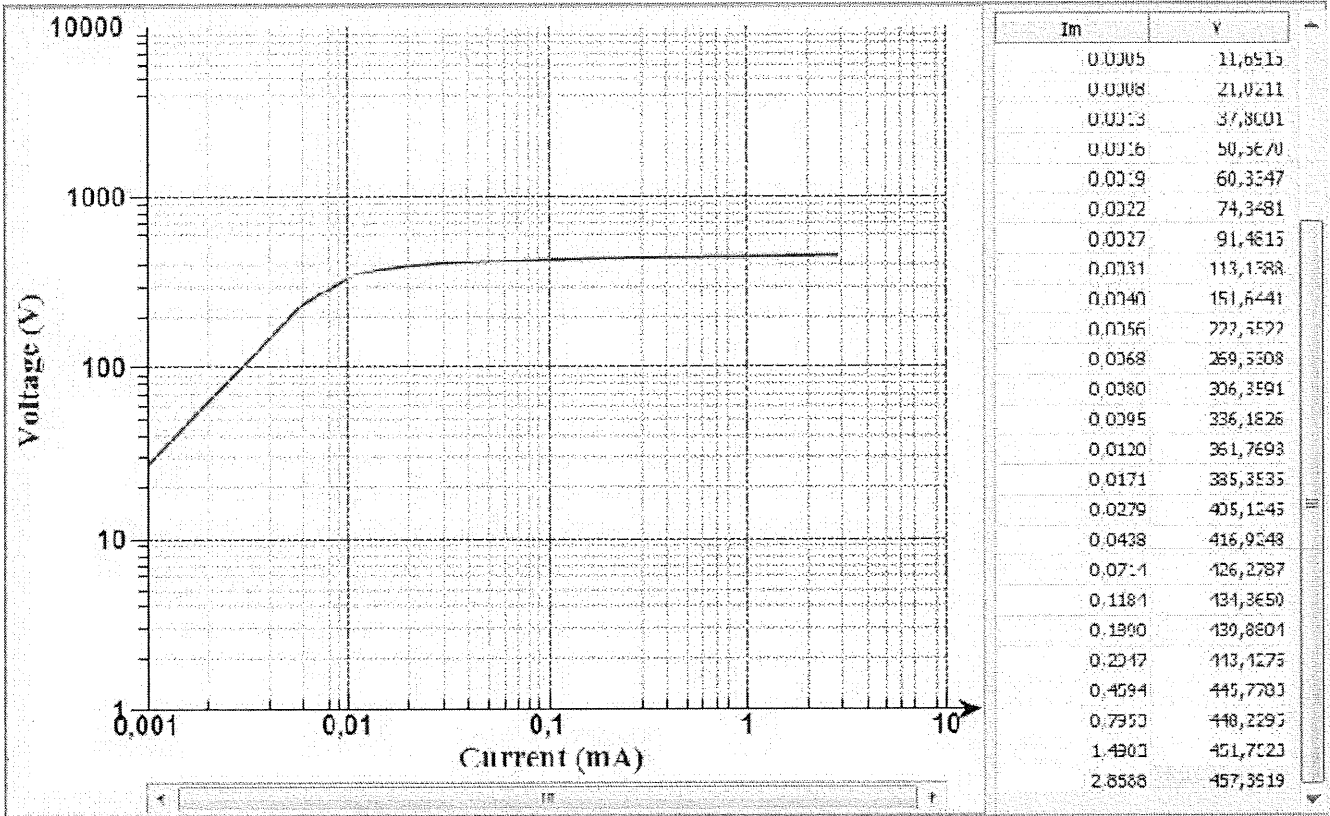
FS

ALF 23.45

Checked by : Muharrem DOĞAN
 Date : 06.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 2S1-2S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.718
 Serial No : 2018/29174



Kneepoint Calculation

V_{knee}

I_{knee}

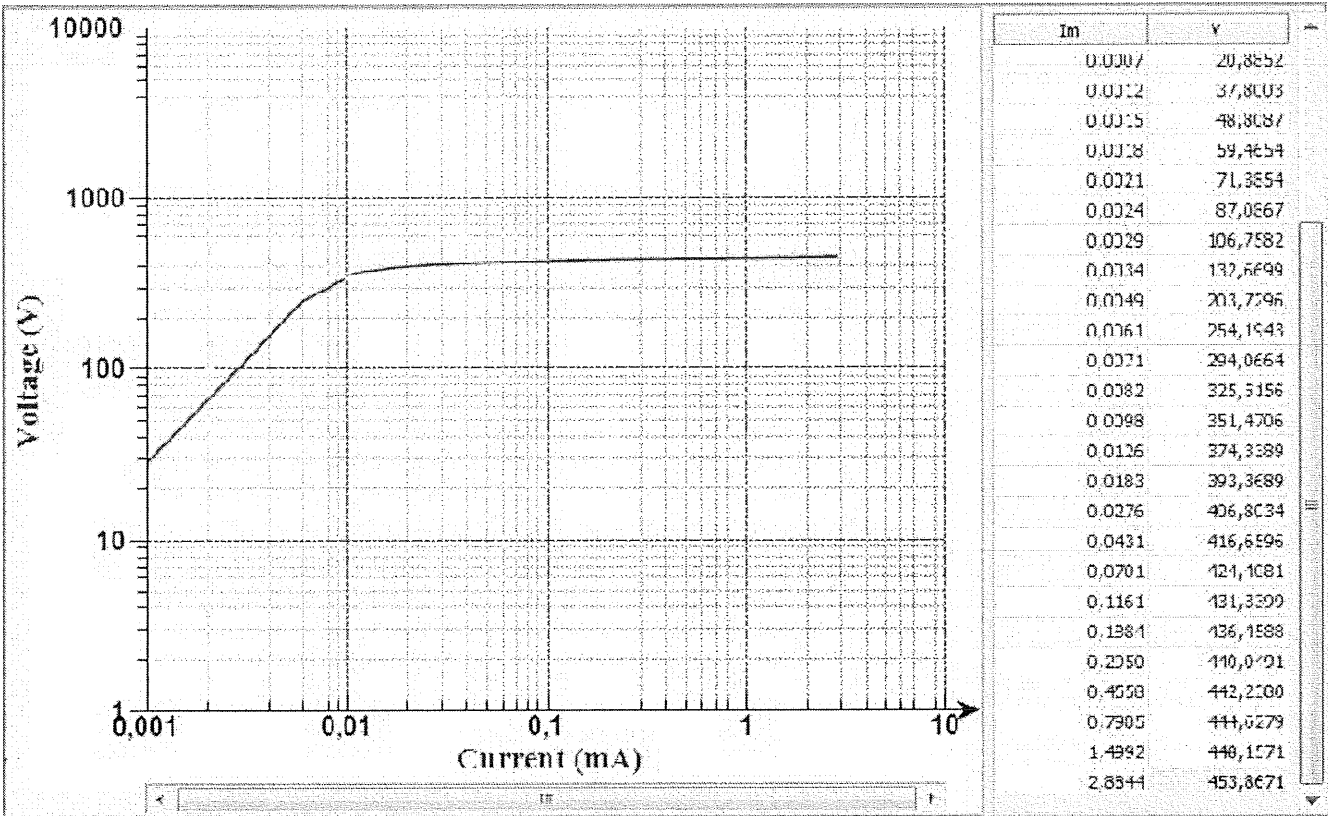
FS

ALF 23.50

Checked by : Muharrem DOĞAN
 Date : 06.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 3S1-3S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.168
 Serial No : 2018/29174



Kneepoint Calculation

Vknee

Iknee

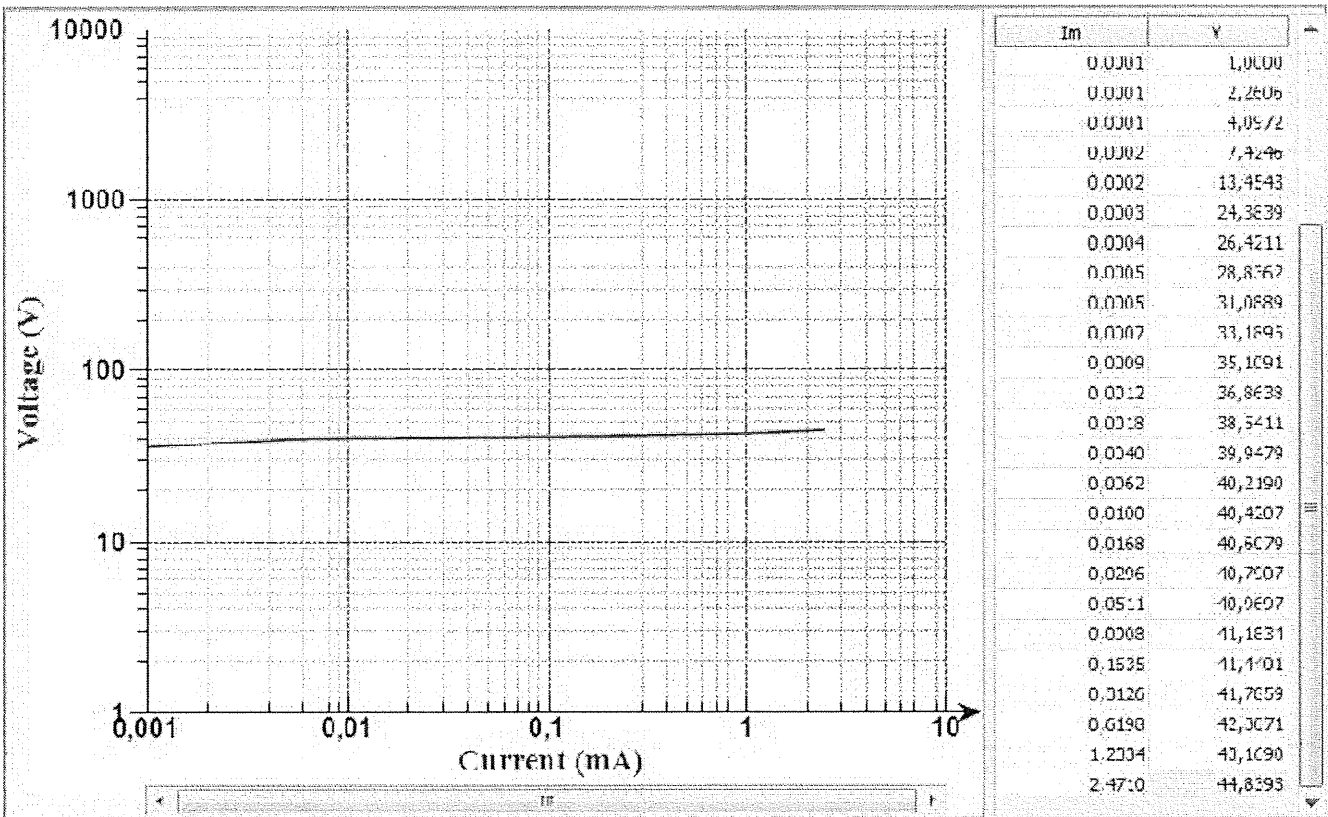
FS

ALF 23.91

Checked by : Muharrem DOĞAN
 Date : 06.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 4S1-4S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 10 / 0,2 S
 DC resistance @ 75°C OHM : 3.212
 Serial No : 2018/29174



Kneepoint Calculation

Vknee

Iknee

FS 3.53

ALF

Checked by : Muharrem DOĞAN
 Date : 06.09.2018

CURRENT TRANSFORMER TEST REPORT
AKIM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-3	Serial No Seri No	2018/29175-1
Type / Tip	ATB 20-3A	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
Project Number		IDYN Dinamik Anma Akımı	100 kA	FREQUENCY Frekans	50Hz
Cust. Item Code		Standard APP. Uygulanan Standart	IEC 61869-2:2012	Insulation Classe İzolasyon Sınıfı	E
Shorttime TH.CUR. Kı.SÜ.TER.AN. A.(Ith)	40kA/1sec				

Ratio / Çevirme Oranı : 1000/1-1-1-1A

EXPLANATION / Açıklama :

Visual and Mechanical Control (Görsel ve Mekanik Kontrol)	☐	Inter-Turn Over Voltage Test - Proc. B (Sarımlar Arası Aşırı Gerilim Testi - Pros. B) (IEC 61869-2 CLAUSE 7.3.204) 200Hz-30sec	☐
Verification of Terminal Markings (Terminal İşaretlemeleri Doğrulaması)	☐	Composite Error (Birleşik Hata)	☐

İZOLASYON TESTLERİ / Insulation Test (IEC 61869-2 CLAUSE 7.3.1 ve 7.3.3 / 7.3.4)

Primer Yalıtım Testi Power Frq. On Pri.Winding / (60 sec.)	Primerler Arası Yalıtım Testi Between Primer Wndg. / (60 sec.)	Sekonder Yalıtım Testi Pwr. Frq. On Sec. Wndg. / (60 sec.)	Sekonderler Arası Yalıtım Testi Between Secondary Wndg. / (60 sec.)
38 kV		3 kV	3 kV
OK	---	OK	OK

KISMİ DEŞARJ TESTİ / Partial Discharge Test (IEC 61869-2 CLAUSE 7.3.2)
DIELECTRIC'S CAPACITANCE and POWER FACTOR TEST

Gerilim / Voltage	1.2 Um	1.2 Um/V3	Kapasitans / Capacitance (pf)	Gerilim / Voltage (kV)	tan δ (%)
Seviye/Level	1 (pC)	1 (pC)			

POLARİTE TESTİ/Polarity Test +O.K. (IEC 61869-2 CLAUSE 7.3.6)

Kapasitif Değerler Values Capacitive	C1 :	PF			
	C2 :	PF			
Core / Nüve	Primary / Primer (A)	Secondary/Sekonder (A)	Burden / Yük (VA)	Class / Klas	Aşırı Akım Faktörü Over Current Faktor
1	1000	1	15	5P	20
2	1000	1	15	5P	20
3	1000	1	15	5P	20
4	1000	1	10	0,2 S	FS5

SINIF TESTLERİ / Accuracy Class Tests (IEC 61869-2 CLAUSE 7.3.5)

Nüve Core	Primer Primary	Sekonder Second.	Rct (@ 75°C) (Ohm)	le (A)	Ek (V)	%	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	
1S1-1S2	1000	1	5.657				3,75			15			
						100					0,44	0	
2S1-2S2	1000	1	5.403				3,75			15			
						100					0,44	0	
3S1-3S2	1000	1	5.367				3,75			15			
						100					0,42	0	
4S1-4S2	1000	1	3.144			1	2,5	0,11	2	10	0,04	4	
						5		0,11	2		0,04	3	
						20		0,1	1		0,05	1	
						100		0,09	1		0,08	0	
						120		0,1	0		0,08	0	

 Date 02.09.2018
 Tarih

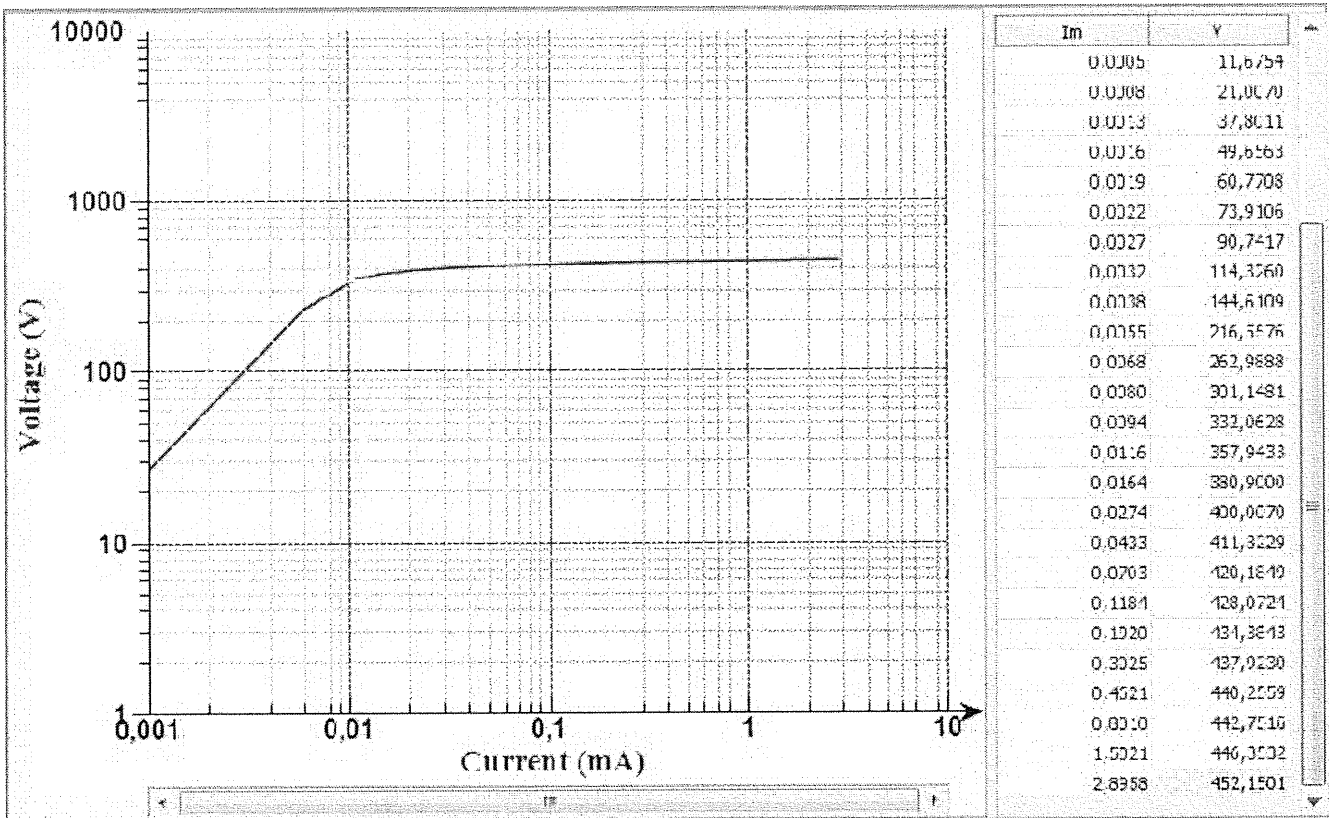
 Test Operator
 Reşat KARAGÖZ

Approved

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Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 1S1-1S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.657
 Serial No : 2018/29175



Kneepoint Calculation

Vknee

Iknee

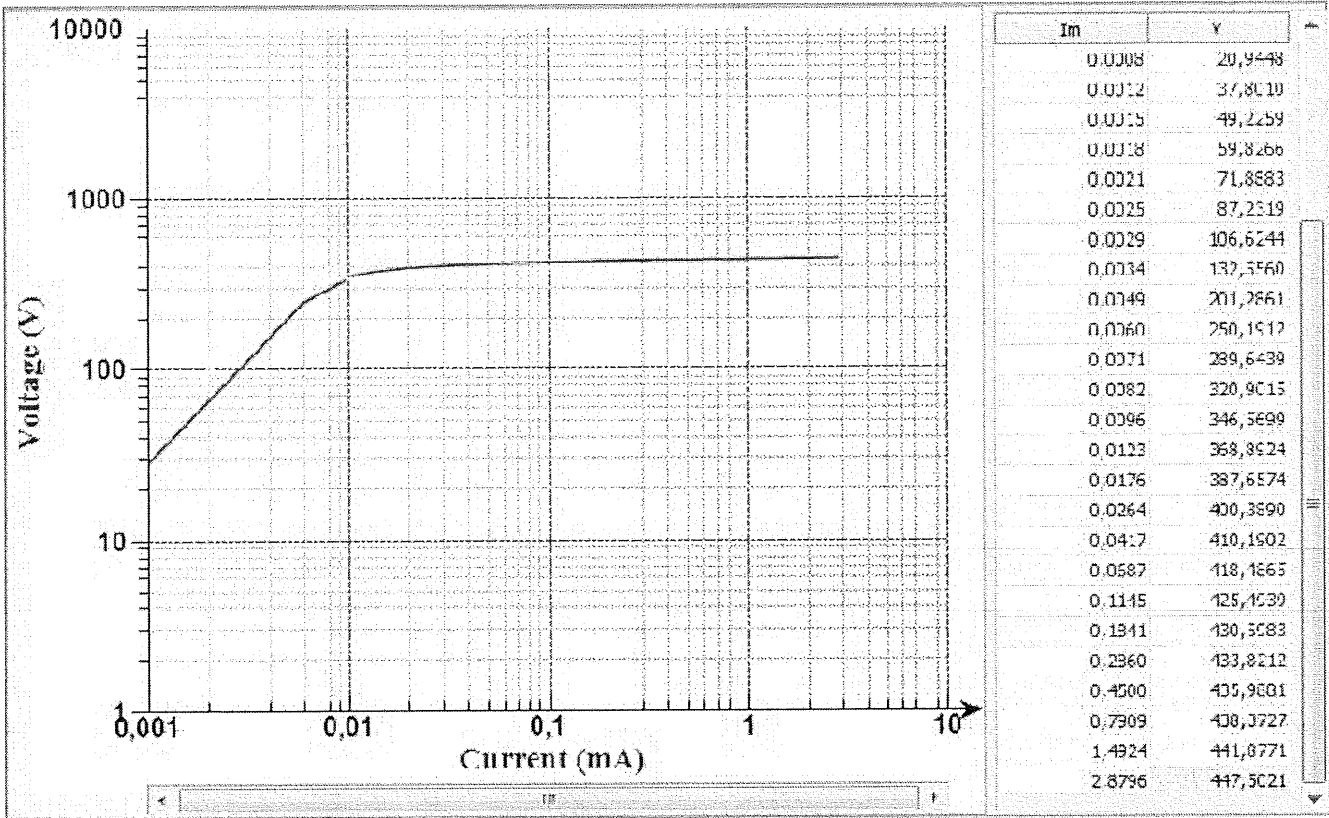
FS

ALF 23.28

Checked by Reşat KARAGÖZ
 Date 02.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 2S1-2S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.403
 Serial No : 2018/29175



Kneepoint Calculation

Vknee

Iknee

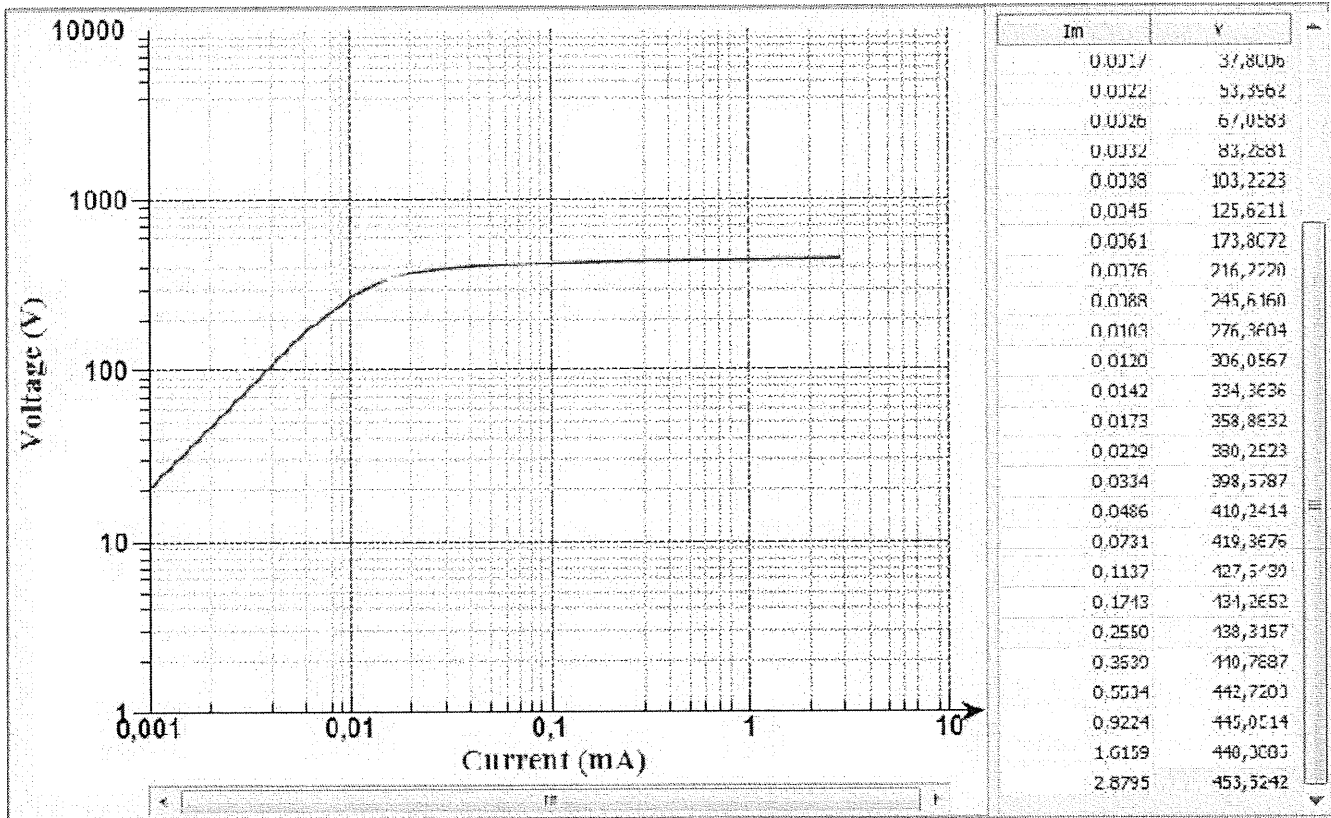
FS

ALF 23.33

Checked by Reşat KARAGÖZ
 Date 02.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 3S1-3S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.367
 Serial No : 2018/29175



Kneepoint Calculation

Vknee

Iknee

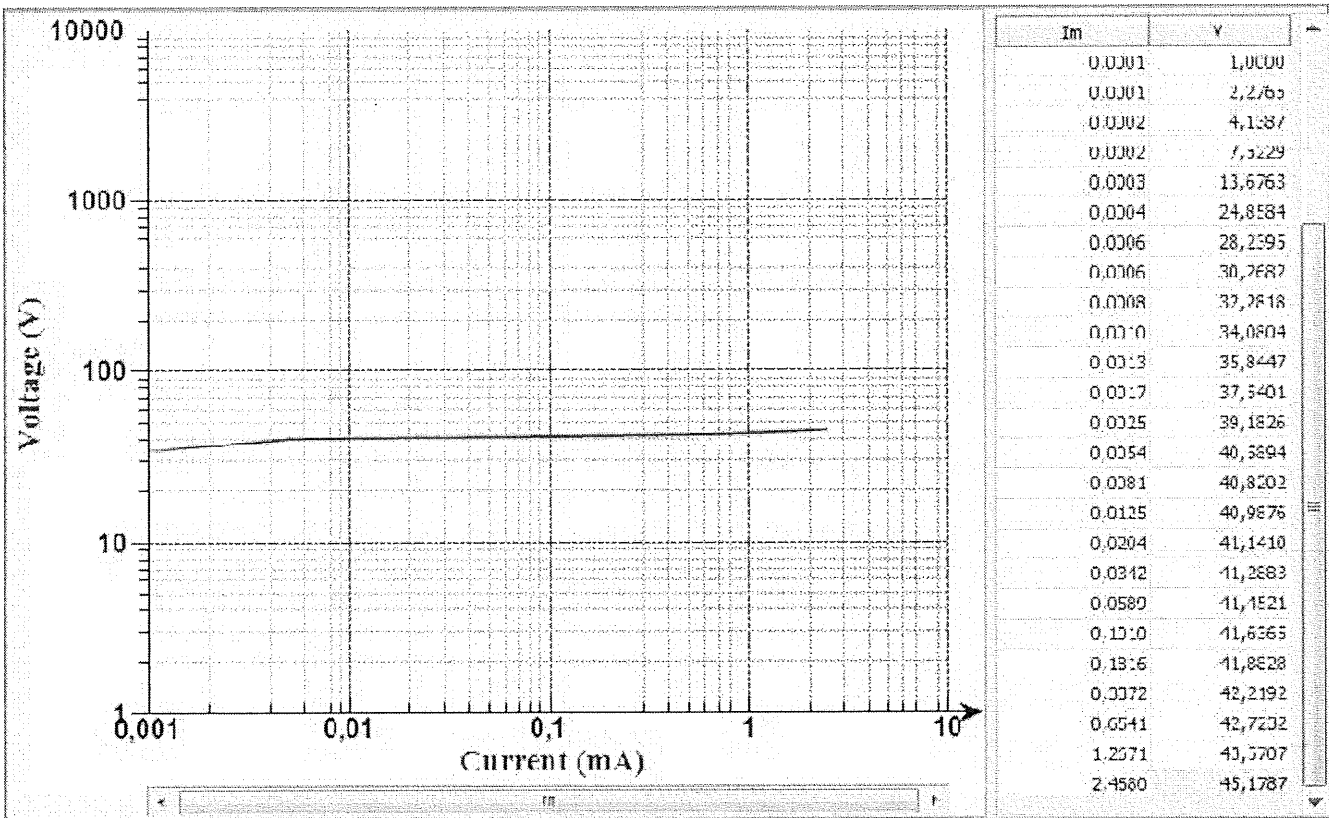
FS

ALF 23.68

Checked by Reşat KARAGÖZ
 Date 02.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 4S1-4S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 10 / 0,2 S
 DC resistance @ 75°C OHM : 3.144
 Serial No : 2018/29175



Kneepoint Calculation

V_{knee}

I_{knee}

FS 3.58

ALF

Checked by Reşat KARAGÖZ
 Date 02.09.2018

CURRENT TRANSFORMER TEST REPORT AKIM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-3	Serial No Seri No	2018/29176-1
Type / Tip	ATB 20-3A	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
Project Number		IDYN Dinamik Anma Akım	100 kA	FREQUENCY Frekans	50Hz
Cust. Item Code		Standard APP. Uygulanan Standart	IEC 61869-2:2012	Insulation Classe İzolasyon Sınıfı	E
Shorttime TH.CUR. Kİ.SÜ.TER.AN. A.(İth)	40kA/1sec				

Ratio / Çevirme Oranı : 1000/1-1-1-1A

EXPLANATION / Açıklama :

Visual and Mechanical Control
(Görsel ve Mekanik Kontrol)

OK

Inter-Turn Over Voltage Test - Proc. B
(Sarımlar Arası Aşırı Gerilim Testi - Pros. B)
(IEC 61869-2 CLAUSE 7.3.204) 200Hz-30sec

OK

Verification of Terminal Markings
(Terminal İşaretlemeleri Doğrulaması)

OK

Composite Error
(Birleşik Hata)

OK

İZOLASYON TESTLERİ / Insulation Test (IEC 61869-2 CLAUSE 7.3.1 ve 7.3.3 / 7.3.4)

Primer Yalıtım Testi Power Frq. On Pri.Winding / (60 sec.)	Primerler Arası Yalıtım Testi Between Primer Wndg. / (60 sec.)	Sekonder Yalıtım Testi Pwr. Frq. On Sec. Wndg. / (60 sec.)	Sekonderler Arası Yalıtım Testi Between Secondary Wndg. / (60 sec.)
38 kV		3 kV	3 kV
OK	---	OK	OK

KİSMİ DEŞARJ TESTİ / Partial Discharge Test (IEC 61869-2 CLAUSE 7.3.2)

Gerilim / Voltage	1.2 Um	1.2 Um/V3	Kapasitans / Capacitance (pF)	Gerilim / Voltage (kV)	tan δ (%)
Seviye/Level	1 (pC)	1 (pC)			

POLARİTE TESTİ/Polarity Test +O.K. (IEC 61869-2 CLAUSE 7.3.6)

Kapasitif Değerler Values Capacitive	C1 :	PF			
	C2 :	PF			
Core / Nüve	Primary / Primer (A)	Secondary/Sekonder (A)	Burden / Yük (VA)	Class / Klas	Aşırı Akım Faktörü Over Current Faktor
1	1000	1	15	5P	20
2	1000	1	15	5P	20
3	1000	1	15	5P	20
4	1000	1	10	0,2 S	FS5

SINIF TESTLERİ / Accuracy Class Tests (IEC 61869-2 CLAUSE 7.3.5)

Nüve Core	Primer Primary	Sekonder Second.	Rct (@ 75°C) (Ohm)	Ie (A)	Ek (V)	%	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	
1S1-1S2	1000	1	5.298				3,75			15			
						100					0,24	0	
2S1-2S2	1000	1	5.479				3,75			15			
						100					0,44	1	
3S1-3S2	1000	1	5.391				3,75			15			
						100					0,44	0	
4S1-4S2	1000	1	3.114			1	2,5	0,11	2	10	0,05	3	
						5		0,11	2		0,05	3	
						20		0,1	1		0,05	1	
						100		0,1	1		0,08	0	
						120		0,1	0		0,08	0	

Date 02.09.2018
Tarih

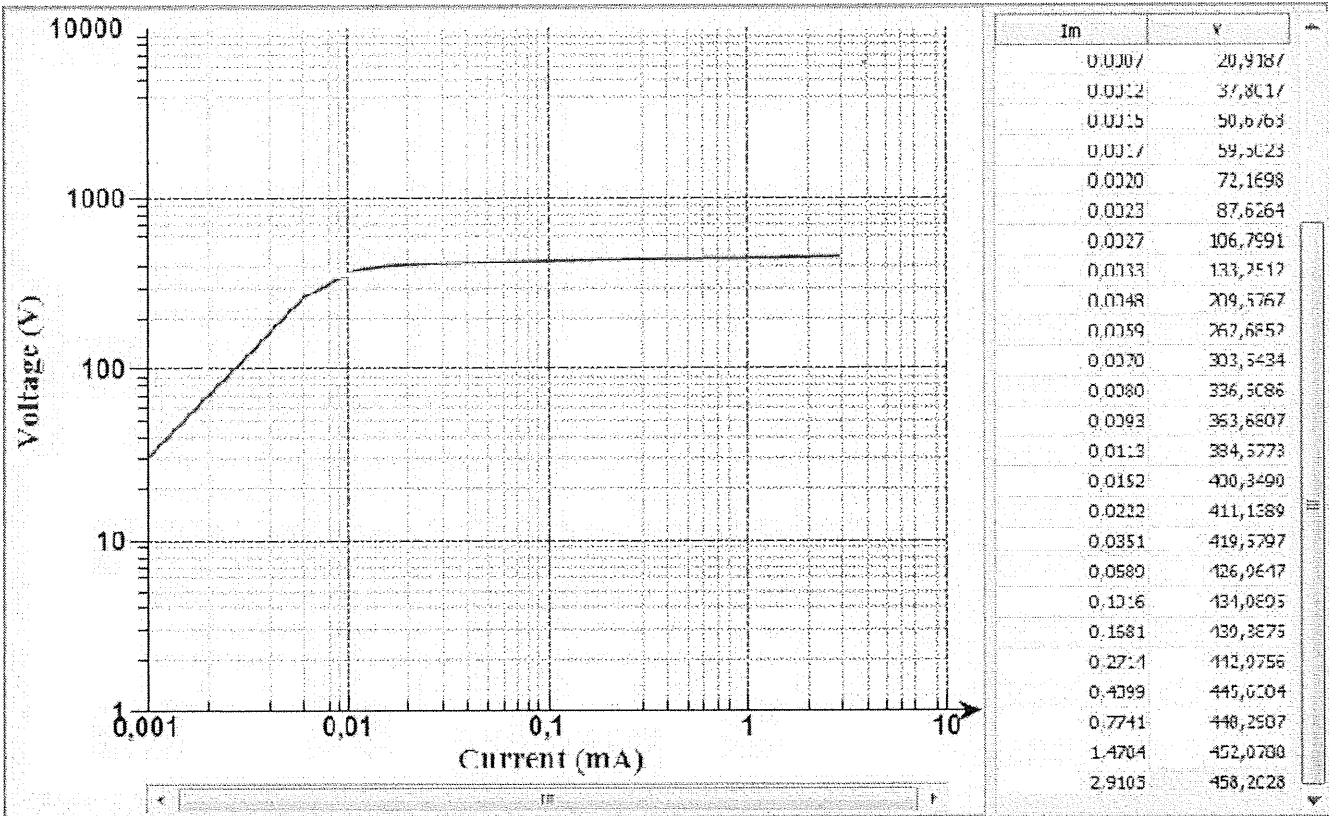
Test Operator
Güven GÜNEŞ

Approved

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Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 1S1-1S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.298
 Serial No : 2018/29176



Kneepoint Calculation

Vknee

Iknee

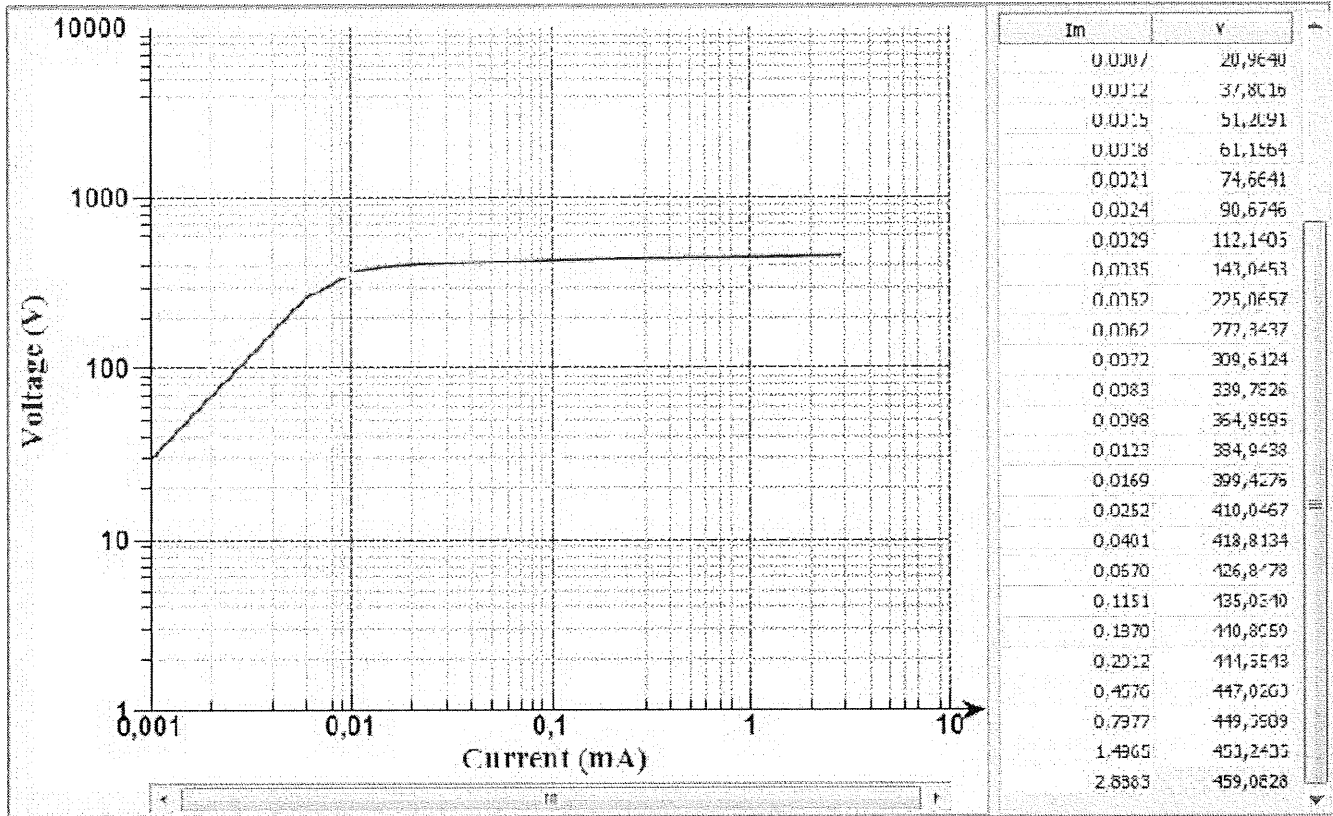
FS

ALF 24.04

Checked by Güven GÜNEŞ
 Date 02.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 2S1-2S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.479
 Serial No : 2018/29176



Kneepoint Calculation

Vknee

Iknee

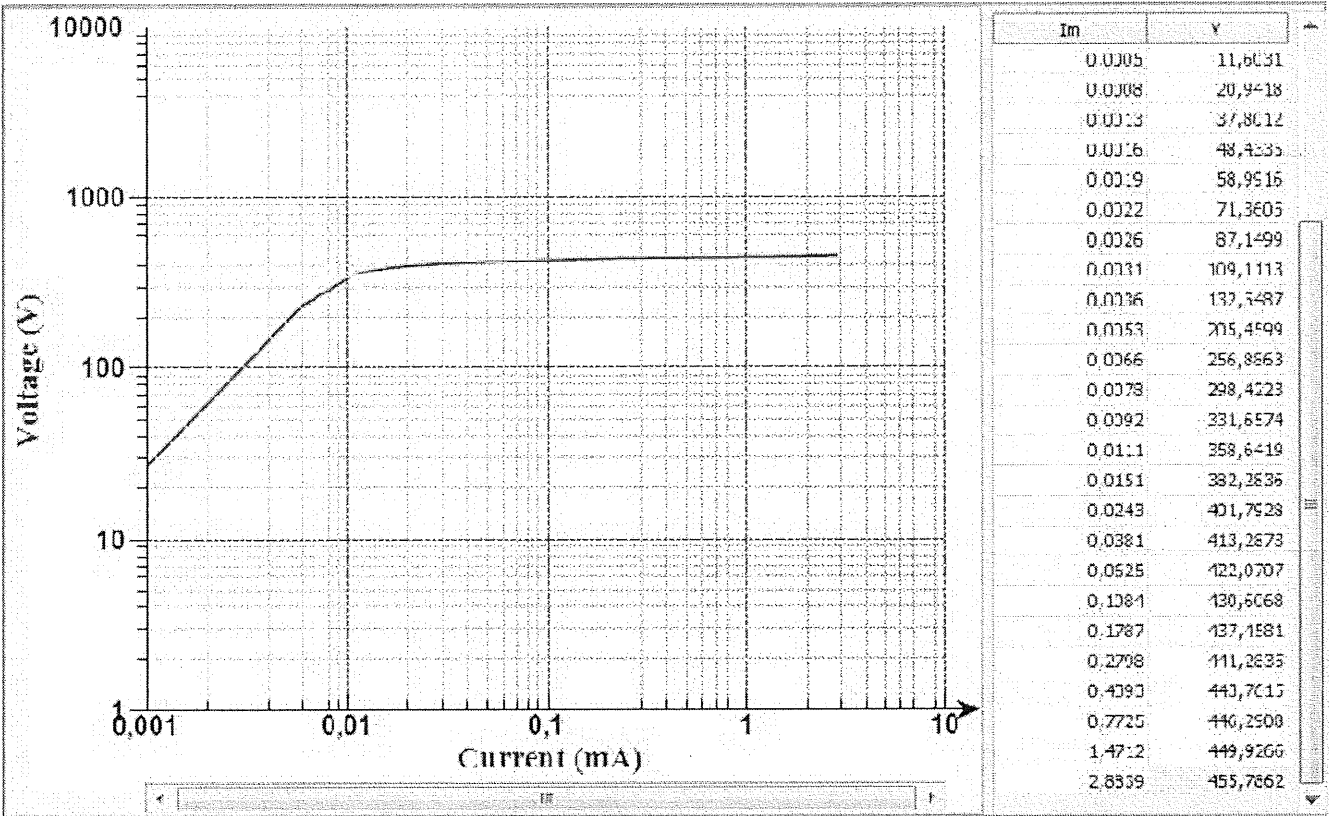
FS

ALF 23.84

Checked by : Güven GÜNEŞ
 Date : 02.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 3S1-3S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.391
 Serial No : 2018/29176



Kneepoint Calculation

Vknee

Iknee

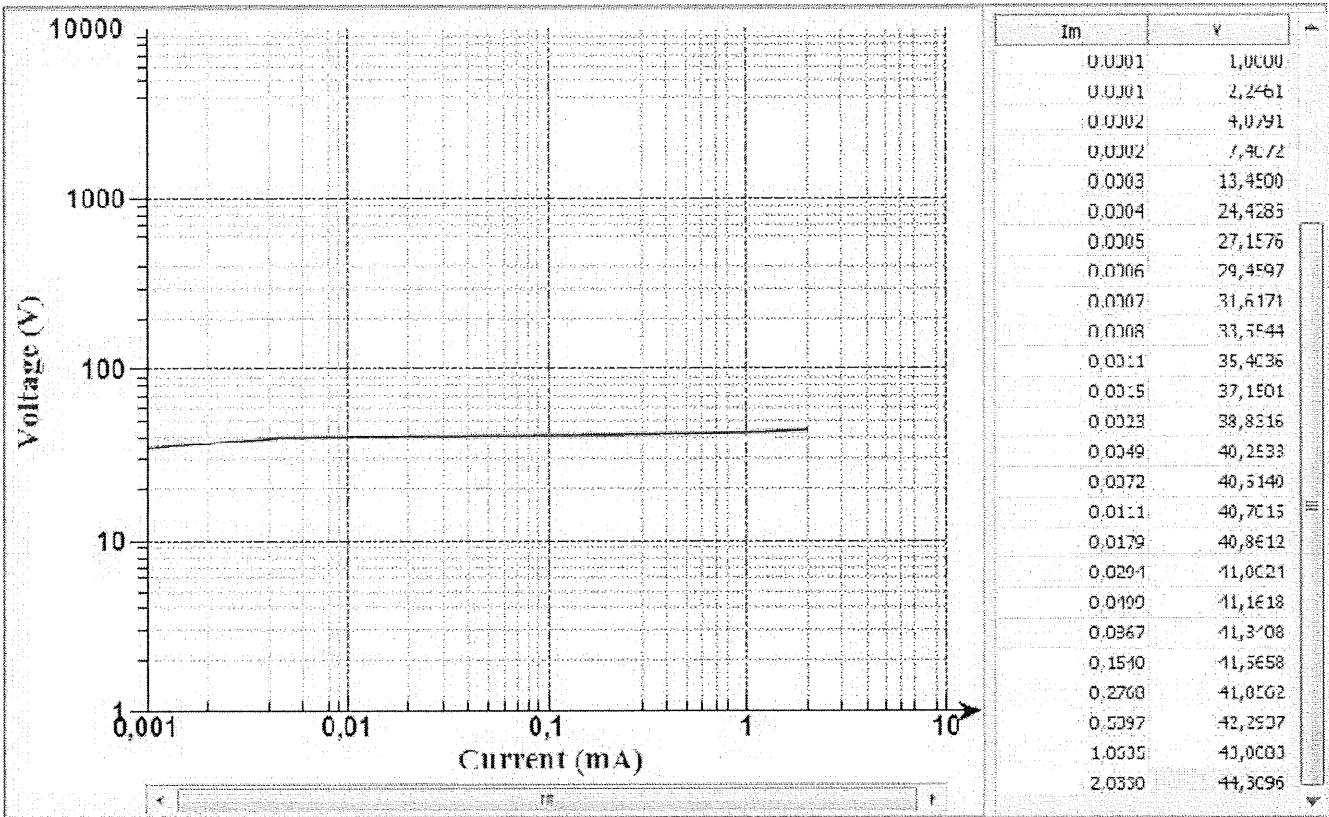
FS

ALF 23.77

Checked by Güven GÜNEŞ
 Date 02.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 4S1-4S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 10 / 0,2 S
 DC resistance @ 75°C OHM : 3.114
 Serial No : 2018/29176



Kneepoint Calculation

V_{knee}

I_{knee}

FS 3.56

ALF

Checked by Güven GÜNEŞ
 Date 02.09.2018

CURRENT TRANSFORMER TEST REPORT

AKIM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-4	Serial No Seri No	2018/29177-1
Type / Tip	ATB 20-3A	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
Project Number		IDYN Dinamik Anma Akımı	100 kA	FREQUENCY Frekans	50Hz
Cust. Item Code		Standard APP. Uygulanan Standart	IEC 61869-2:2012	Insulation Classe İzolasyon Sınıfı	E
Shorttime TH.CUR. Kı.SÜ.TER.AN. A.(İth)	40kA/1sec				

Ratio / Çevirme Oranı : 1000/1-1-1-1A

EXPLANATION / Açıklama :

Visual and Mechanical Control
(Görsel ve Mekanik Kontrol)

OK

Inter-Turn Over Voltage Test - Proc. B
(Sarımlar Arası Aşırı Gerilim Testi - Pros. B)
(IEC 61869-2 CLAUSE 7.3.204) 200Hz-30sec

OK

Verification of Terminal Markings
(Terminal İşaretlemeleri Doğrulaması)

OK

Composite Error
(Birleşik Hata)

OK

İZOLASYON TESTLERİ / Insulation Test (IEC 61869-2 CLAUSE 7.3.1 ve 7.3.3 / 7.3.4)

Primer Yalıtım Testi Power Frq. On Pri.Winding / (60 sec.)	Primerler Arası Yalıtım Testi Between Primer Wndg. / (60 sec.)	Sekonder Yalıtım Testi Pwr. Frq. On Sec. Wndg. / (60 sec.)	Sekonderler Arası Yalıtım Testi Between Secondary Wndg. / (60 sec.)
38 kV		3 kV	3 kV
OK	---	OK	OK

KISMİ DEŞARJ TESTİ / Partial Discharge Test (IEC 61869-2 CLAUSE 7.3.2)

Gerilim / Voltage	1.2 Um	1.2 Um/V3	Kapasitans / Capacitance (pf)	Gerilim / Voltage (kV)	tan δ (%)
Seviye/Level	20 (pC)	1 (pC)			

POLARİTE TESTİ/Polarity Test +O.K. (IEC 61869-2 CLAUSE 7.3.6)

Kapasitif Değerler Values Capacitive	C1 :	PF			
	C2 :	PF			
Core / Nüve	Primary / Primer (A)	Secondary/Sekonder (A)	Burden / Yük (VA)	Class / Klas	Aşırı Akım Faktörü Over Current Faktor
1	1000	1	15	5P	20
2	1000	1	15	5P	20
3	1000	1	10	0,2 S	FS5
4	1000	1	10	0,2 S	FS5

SINIF TESTLERİ / Accuracy Class Tests (IEC 61869-2 CLAUSE 7.3.5)

Nüve Core	Primer Primary	Sekonder Second.	Rct (@ 75°C) (Ohm)	Ie (A)	Ek (V)	%	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)
1S1-1S2	1000	1	5.301				3,75			15		
						100					0,34	1
2S1-2S2	1000	1	5.515				3,75			15		
						100					0,42	0
3S1-3S2	1000	1	3.078			1	2,5	0,11	2	10	0,05	4
						5		0,11	2		0,04	3
						20		0,1	1		0,05	1
						100		0,09	1		0,08	0
						120		0,09	0		0,08	0
4S1-4S2	1000	1	3.141			1	2,5	0,11	3	10	0,01	6
						5		0,1	3		0,01	4
						20		0,09	2		0,03	1
						100		0,09	1		0,07	-0
						120		0,09	0		0,07	-0

Date 03.09.2018
Tarih

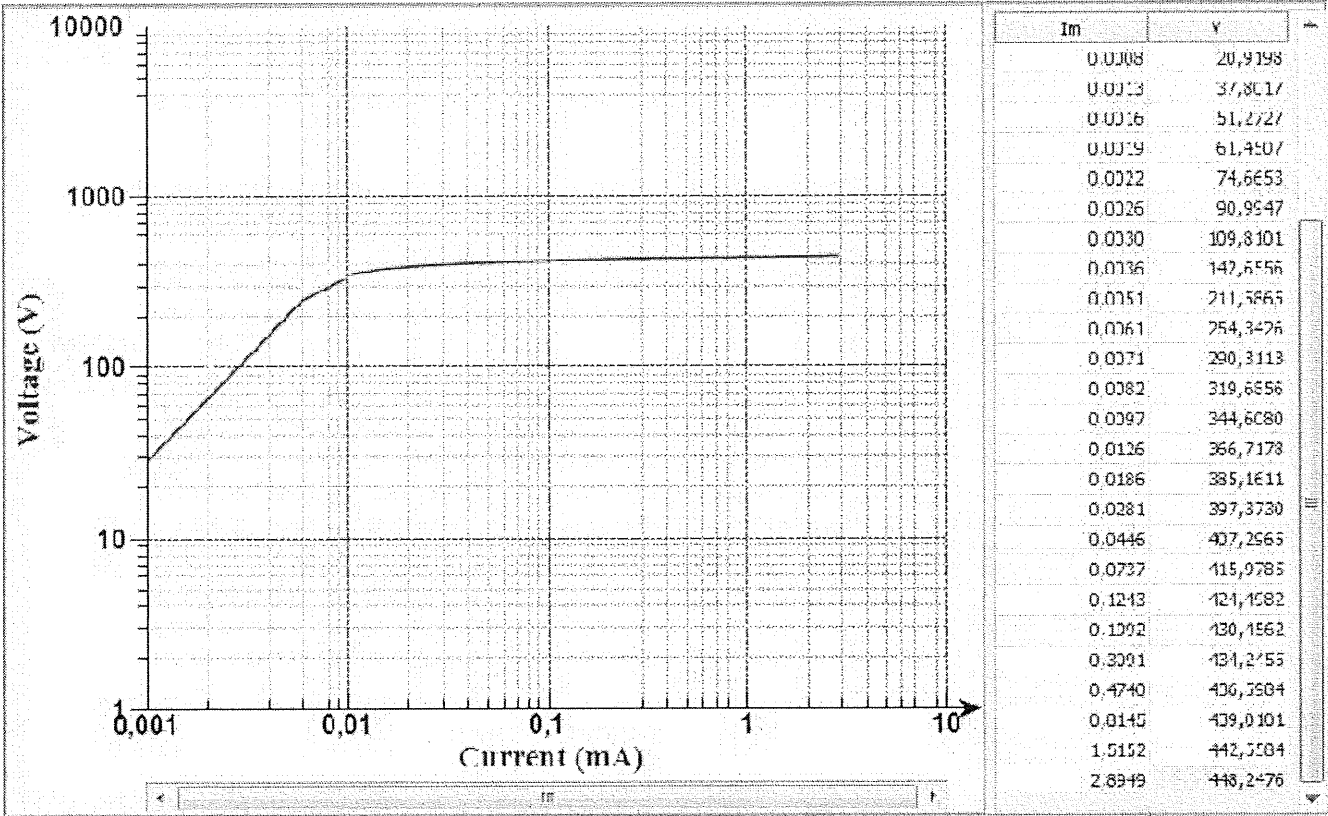
Test Operator
Mert KÜTÜK

Approved

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Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 1S1-1S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.301
 Serial No : 2018/29177



Kneepoint Calculation

Vknee

Iknee

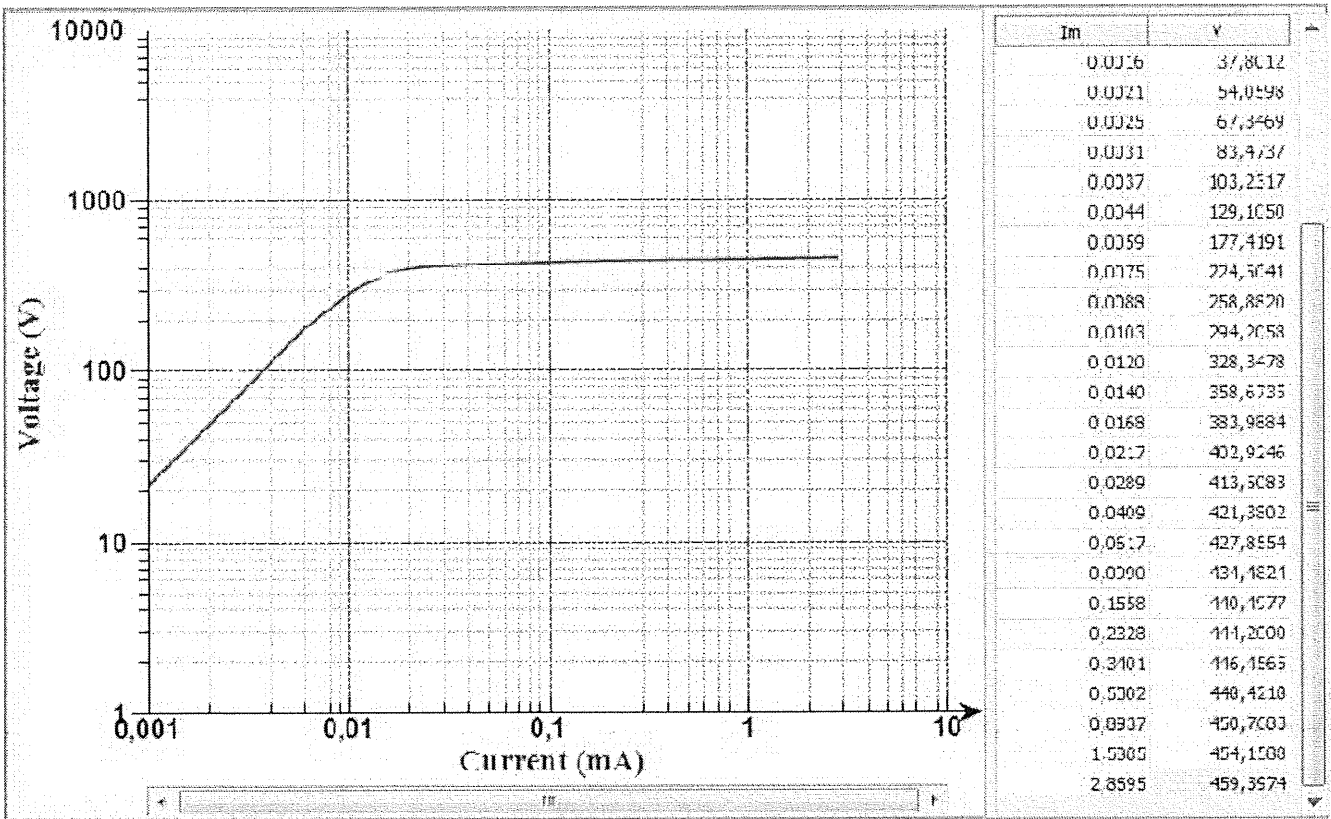
FS

ALF 23.49

Checked by Mert KÜTÜK
 Date 03.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 2S1-2S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.515
 Serial No : 2018/29177



Kneepoint Calculation

Vknee

Iknee

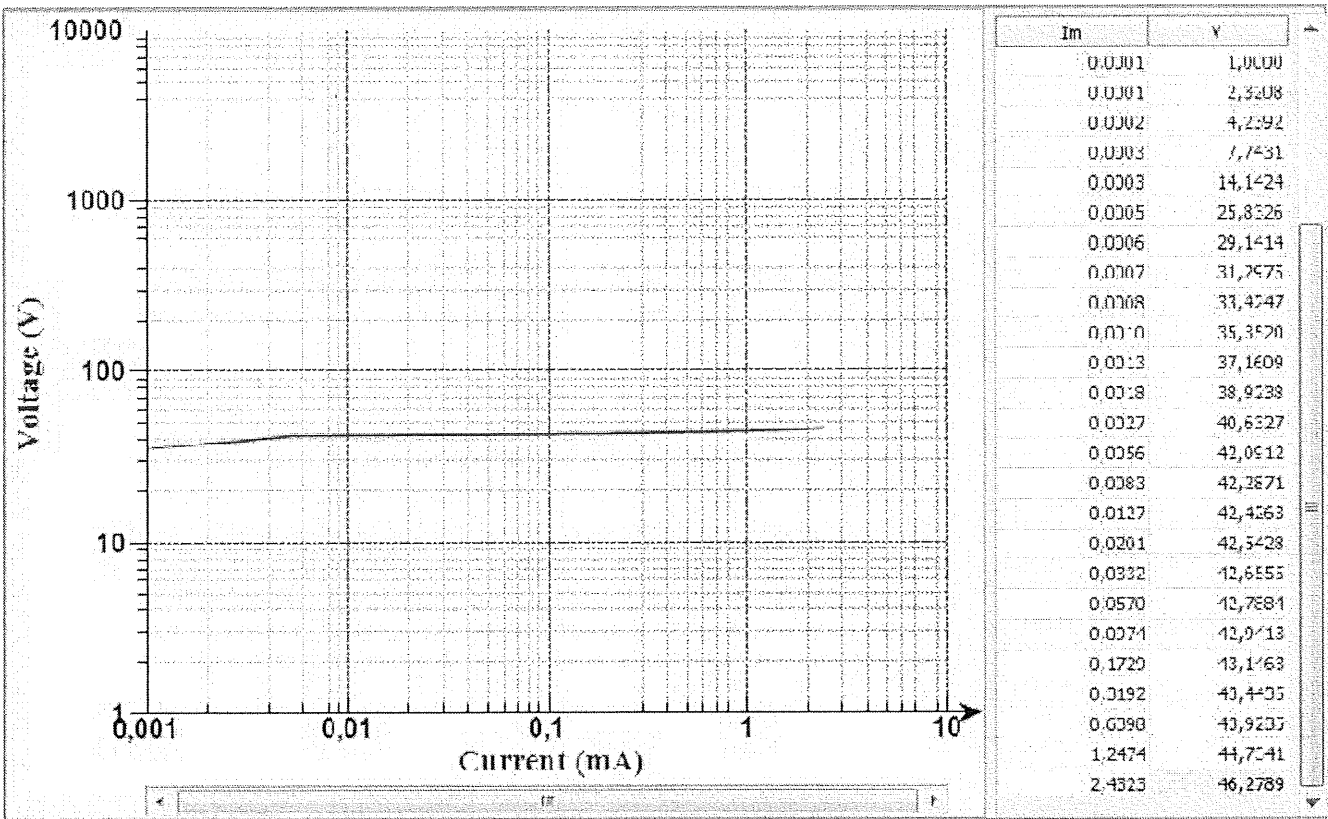
FS

ALF 23.82

Checked by Mert KÜTÜK
 Date 03.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 3S1-3S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 10 / 0,2 S
 DC resistance @ 75°C OHM : 3.078
 Serial No : 2018/29177



Kneepoint Calculation

V_{knee}

I_{knee}

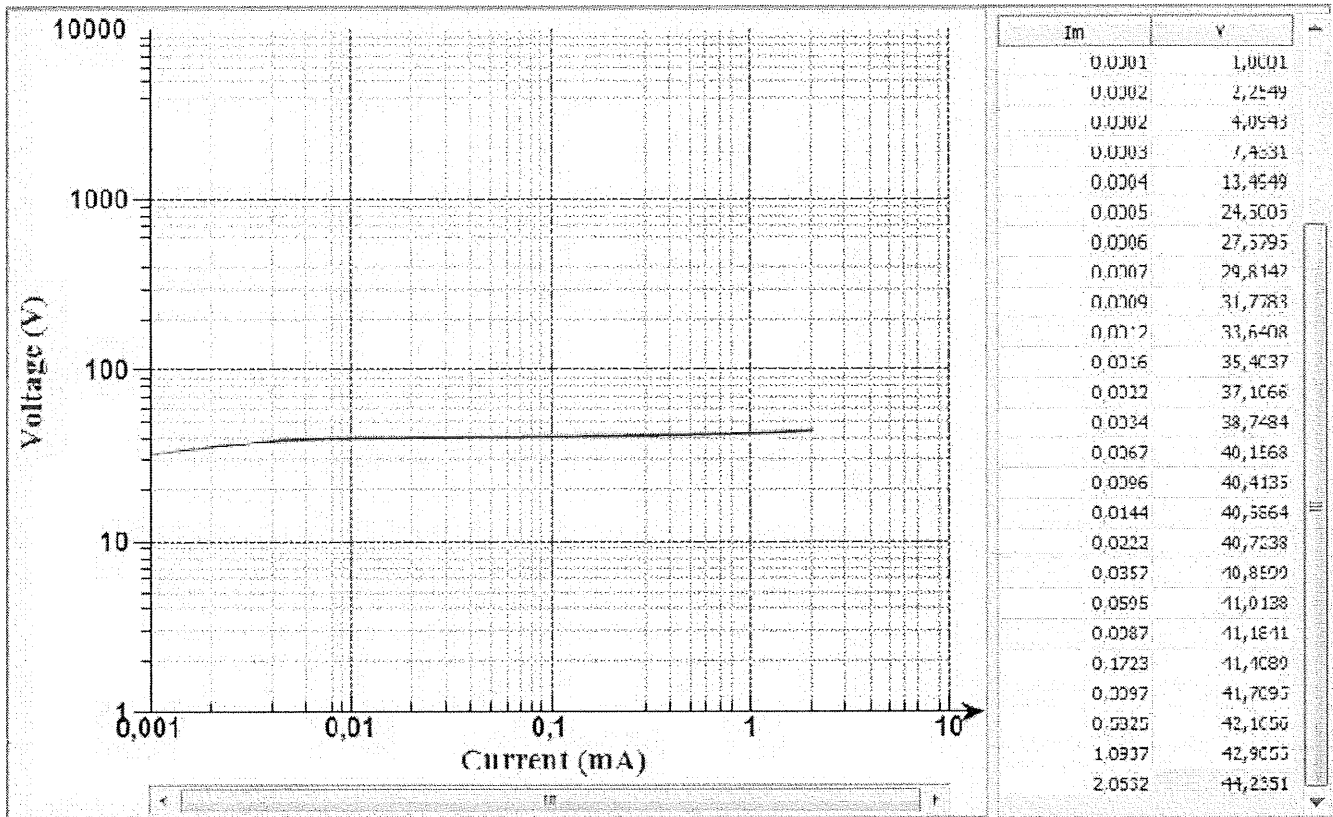
FS 3.70

ALF

Checked by Mert KÜTÜK
 Date 03.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 4S1-4S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 10 / 0,2 S
 DC resistance @ 75°C OHM : 3.141
 Serial No : 2018/29177



Kneepoint Calculation

Vknee

Iknee

FS 3.54

ALF

Checked by Mert KÜTÜK
 Date 03.09.2018



CURRENT TRANSFORMER TEST REPORT
AKIM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-4	Serial No Seri No	2018/29178-1
Type / Tip	ATB 20-3A	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
Project Number		IDYN	100 kA	FREQUENCY Frekans	50Hz
Cust. Item Code		Dinamik Anma Akımı		Insulation Classe İzolasyon Sınıfı	E
Shorttime TH.CUR. Kı.SÜ.TER.AN. A.(Ith)	40kA/1sec	Standard APP. Uygulanan Standart	IEC 61869-2:2012		

Ratio / Çevirme Oranı : 1000/1-1-1-1A

EXPLANATION / Açıklama :

Visual and Mechanical Control (Görsel ve Mekanik Kontrol)	OK	Inter-Turn Over Voltage Test - Proc. B (Sarımlar Arası Aşırı Gerilim Testi - Pros. B) (IEC 61869-2 CLAUSE 7.3.204) 200Hz-30sec	OK
Verification of Terminal Markings (Terminal İşaretlemeleri Doğrulaması)	OK	Composite Error (Birleşik Hata)	OK

İZOLASYON TESTLERİ / Insulation Test (IEC 61869-2 CLAUSE 7.3.1 ve 7.3.3 / 7.3.4)			
Primer Yalıtım Testi Power Frq. On Pri.Winding / (60 sec.)	Primerler Arası Yalıtım Testi Between Primer Wndg. / (60 sec.)	Sekonder Yalıtım Testi Pwr. Frq. On Sec. Wndg. / (60 sec.)	Sekonderler Arası Yalıtım Testi Between Secondary Wndg. / (60 sec.)
38 kV		3 kV	3 kV
OK	---	OK	OK

KİSMİ DEŞARJ TESTİ / Partial Discharge Test (IEC 61869-2 CLAUSE 7.3.2)		DIELECTRIC'S CAPACITANCE and POWER FACTOR TEST	
Gerilim / Voltage	1.2 Um	1.2 Um/V3	Kapasitans / Capacitance (pf) Gerilim / Voltage (kV) tan & (%)
Seviye/Level	7 (pC)	1 (pC)	

POLARİTE TESTİ/Polarity Test +O.K. (IEC 61869-2 CLAUSE 7.3.6)			
Kapasitif Değerler Values Capacitive	C1 :	PF	
	C2 :	PF	

Core / Nüve	Primary / Primer (A)	Secondary/Sekonder (A)	Burden / Yük (VA)	Class / Klas	Aşırı Akım Faktörü Over Current Faktor
1	1000	1	15	5P	20
2	1000	1	15	5P	20
3	1000	1	10	0,2 S	FS5
4	1000	1	10	0,2 S	FS5

SINIF TESTLERİ / Accuracy Class Tests (IEC 61869-2 CLAUSE 7.3.5)													
Nüve Core	Primer Primary	Sekonder Second.	Rct (@ 75°C) (Ohm)	Ie (A)	Ek (V)	%	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	
1S1-1S2	1000	1	5.491				3,75			15			
						100					0,43	1	
2S1-2S2	1000	1	5.058				3,75			15			
						100					0,44	0	
3S1-3S2	1000	1	3.159			1	2,5	0,11	1	10	0,06	3	
						5		0,11	1		0,06	3	
						20		0,1	1		0,06	1	
						100		0,1	1		0,08	0	
						120		0,1	0		0,08	0	
4S1-4S2	1000	1	3.008			1	2,5	0,1	4	10	-0,02	7	
						5		0,1	3		-0,03	4	
						20		0,08	2		0,02	1	
						100		0,09	0		0,07	-0	
						120		0,09	0		0,07	-0	

Date 05.09.2018
Tarih

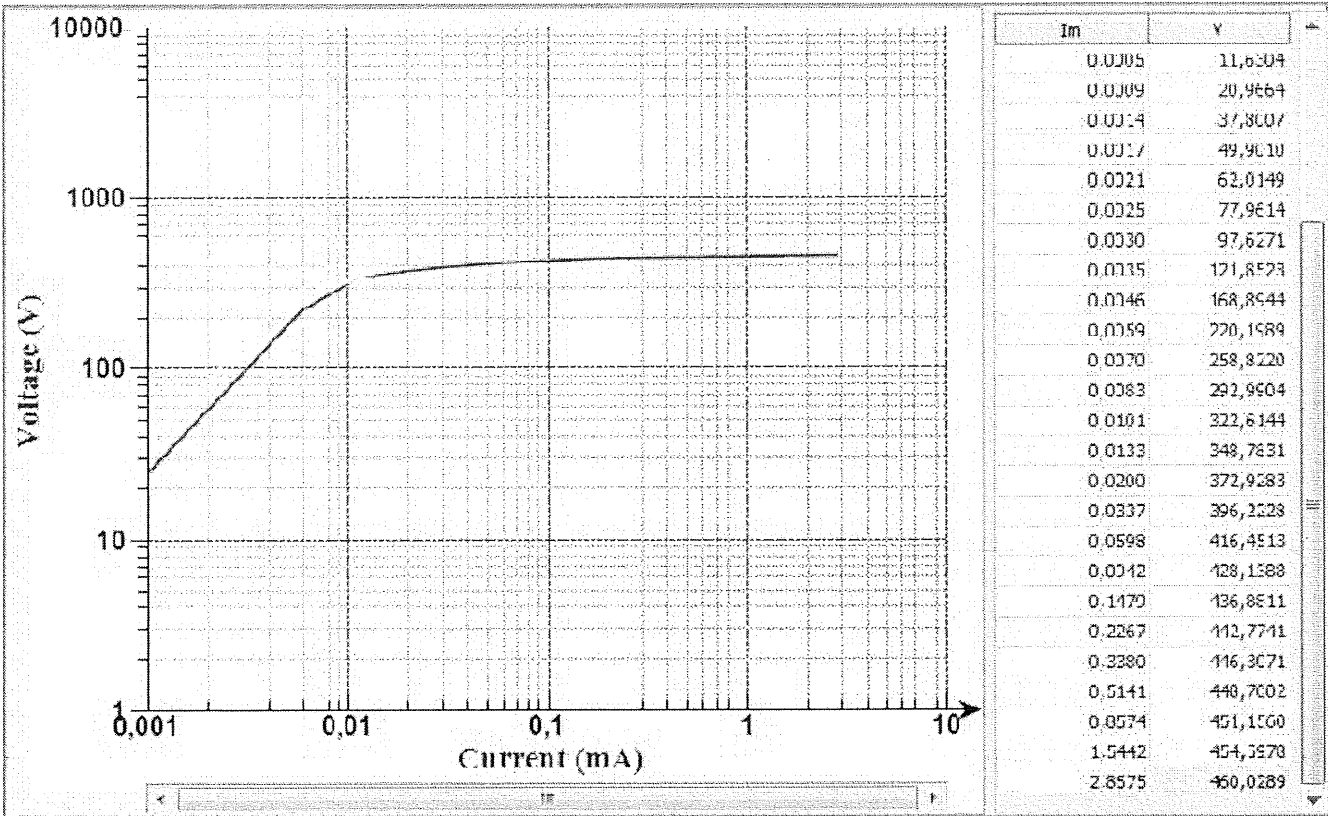
Test Operator
Mert KÜTÜK

Approved

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Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 1S1-1S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.491
 Serial No : 2018/29178



Kneepoint Calculation

V_{knee}

I_{knee}

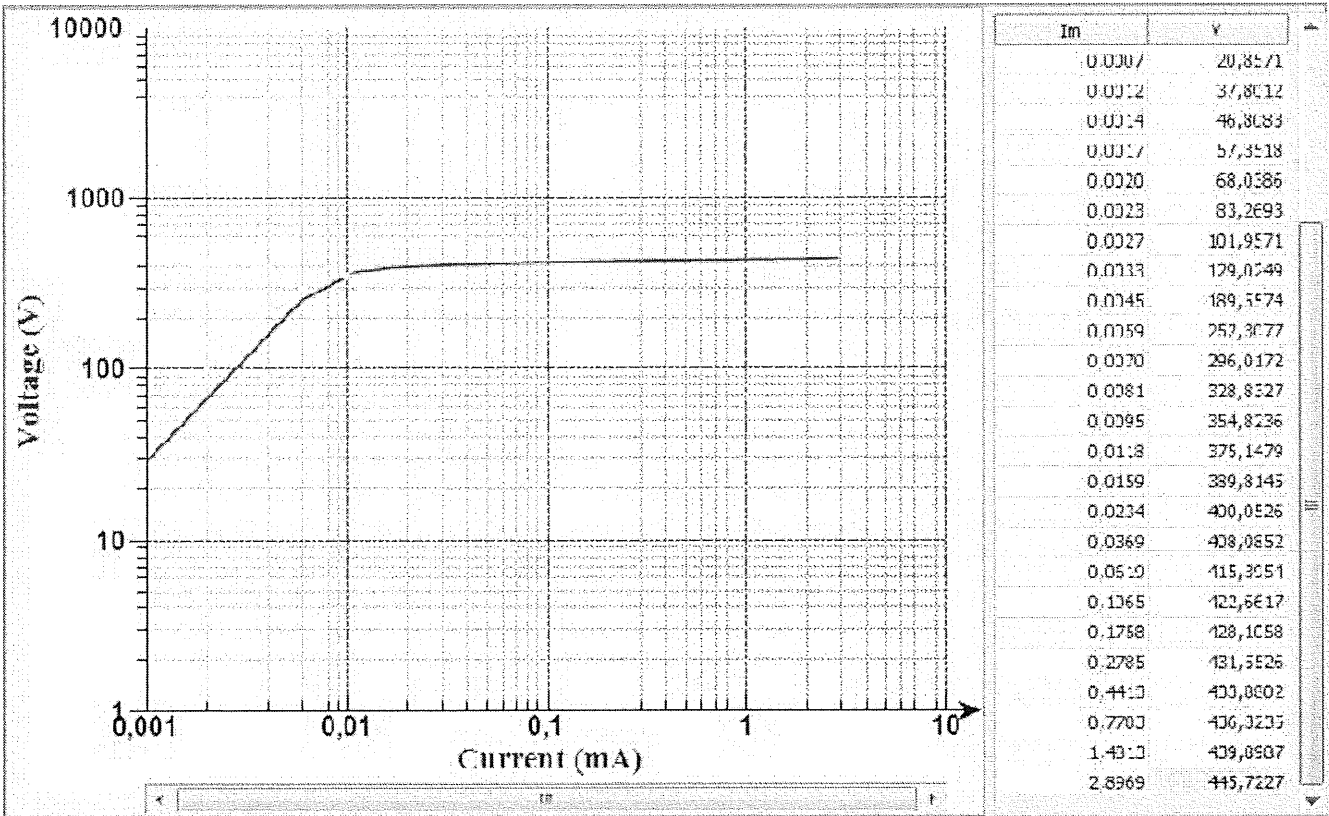
FS

ALF 23.88

Checked by Mert KÜTÜK
 Date 05.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 2S1-2S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.058
 Serial No : 2018/29178



Kneepoint Calculation

Vknee

Iknee

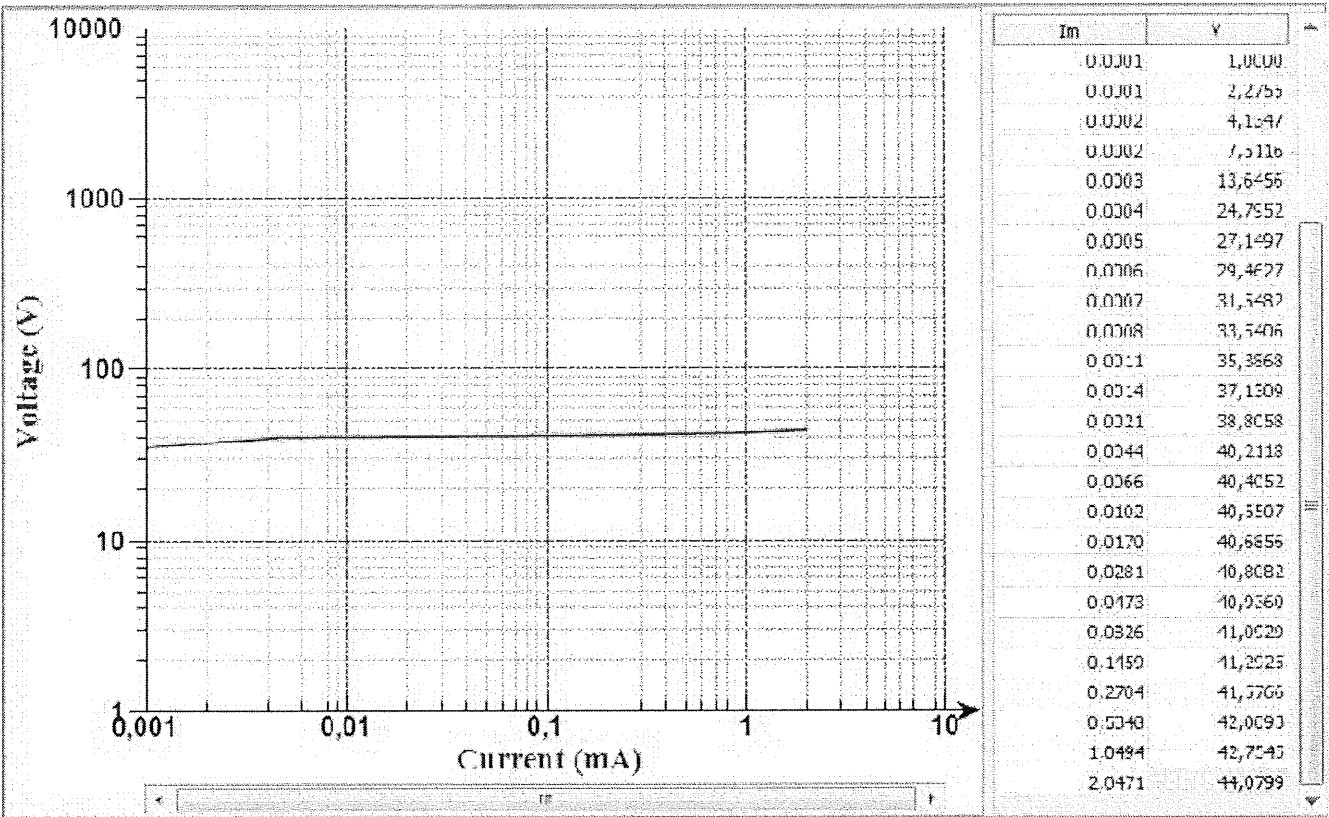
FS

ALF 23.61

Checked by Mert KÜTÜK
 Date 05.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 3S1-3S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 10 / 0,2 S
 DC resistance @ 75°C OHM : 3.159
 Serial No : 2018/29178



Kneepoint Calculation

Vknee

Iknee

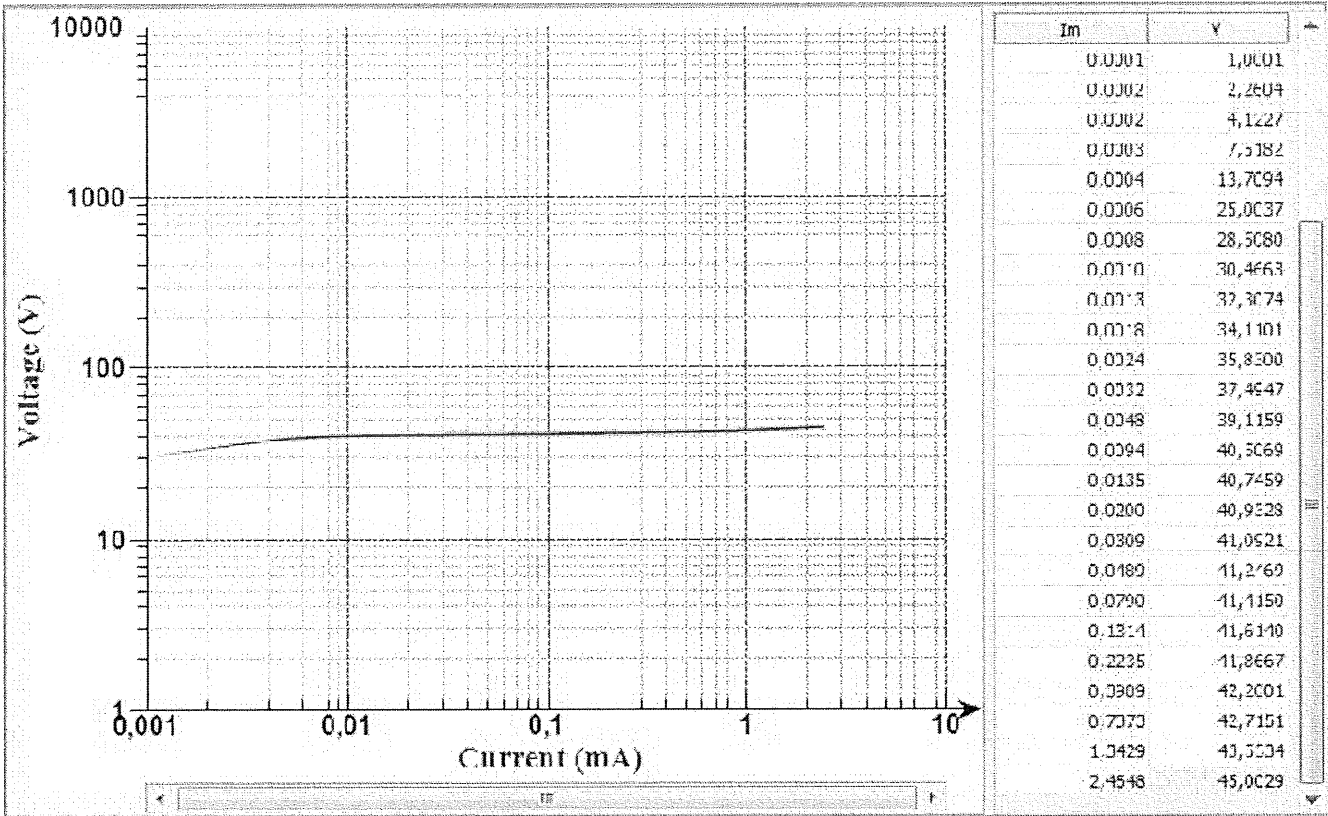
FS 3.53

ALF

Checked by Mert KÜTÜK
 Date 05.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 4S1-4S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 10 / 0,2 S
 DC resistance @ 75°C OHM : 3.008
 Serial No : 2018/29178



CURRENT TRANSFORMER TEST REPORT

AKIM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-4	Serial No Seri No	2018/29179-1
Type / Tip	ATB 20-3A	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
Project Number		IDYN Dinamik Anma Akımı	100 kA	FREQUENCY Frekans	50Hz
Cust. Item Code		Standard APP. Uygulanan Standart	IEC 61869-2:2012	Insulation Classe İzolasyon Sınıfı	E
Shorttime TH.CUR. Kı.SÜ.TER.AN. A.(Ith)	40kA/1sec				

Ratio / Çevirme Oranı : 1000/1-1-1-1A

EXPLANATION / Açıklama :

Visual and Mechanical Control (Görsel ve Mekanik Kontrol)	☐	Inter-Turn Over Voltage Test - Proc. B (Sarımlar Arası Aşırı Gerilim Testi - Pros. B) (IEC 61869-2 CLAUSE 7.3.204) 200Hz-30sec	☐
Verification of Terminal Markings (Terminal İşaretlemeleri Doğrulaması)	☐	Composite Error (Birleşik Hata)	☐

İZOLASYON TESTLERİ / Insulation Test (IEC 61869-2 CLAUSE 7.3.1 ve 7.3.3 / 7.3.4)			
Primer Yalıtım Testi Power Frq. On Pri.Winding / (60 sec.)	Primerler Arası Yalıtım Testi Between Primer Wndg. / (60 sec.)	Sekonder Yalıtım Testi Pwr. Frq. On Sec. Wndg. / (60 sec.)	Sekonderler Arası Yalıtım Testi Between Secondary Wndg. / (60 sec.)
38 kV		3 kV	3 kV
OK	---	OK	OK

KİSMİ DEŞARJ TESTİ / Partial Discharge Test (IEC 61869-2 CLAUSE 7.3.2)		DIELECTRIC'S CAPACITANCE and POWER FACTOR TEST		
Gerilim / Voltage	1.2 Um	1.2 Um/V3	Kapasitans / Capacitance (pF)	Gerilim / Voltage (kV) tan & (%)
Seviye/Level	1 (pC)	1 (pC)		

POLARİTE TESTİ/Polarity Test +O.K. (IEC 61869-2 CLAUSE 7.3.6)			
Kapasitif Değerler Values Capacitive	C1 :	PF	
	C2 :	PF	

Core / Nüve	Primary / Primer (A)	Secondary/Sekonder (A)	Burden / Yük (VA)	Class / Klas	Aşırı Akım Faktörü Over Current Faktör
1	1000	1	15	5P	20
2	1000	1	15	5P	20
3	1000	1	10	0,2 S	FS5
4	1000	1	10	0,2 S	FS5

SINIF TESTLERİ / Accuracy Class Tests (IEC 61869-2 CLAUSE 7.3.5)													
Nüve Core	Primer Primary	Sekonder Second.	Rct (@ 75°C) (Ohm)	Ie (A)	Ek (V)	%	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	
1S1-1S2	1000	1	5.646				3,75			15			
						100					0,42	0	
2S1-2S2	1000	1	5.411				3,75			15			
						100					0,44	0	
3S1-3S2	1000	1	2.998			1	2,5	0,1	1	10	0,05	3	
						5		0,1	1		0,05	3	
						20		0,1	1		0,05	1	
						100		0,09	1		0,08	0	
						120		0,09	0		0,08	0	
4S1-4S2	1000	1	2.991			1	2,5	0,11	2	10	0,05	3	
						5		0,1	2		0,05	3	
						20		0,1	1		0,05	1	
						100		0,09	1		0,07	0	
						120		0,09	0		0,08	0	

Date 07.09.2018
Tarih

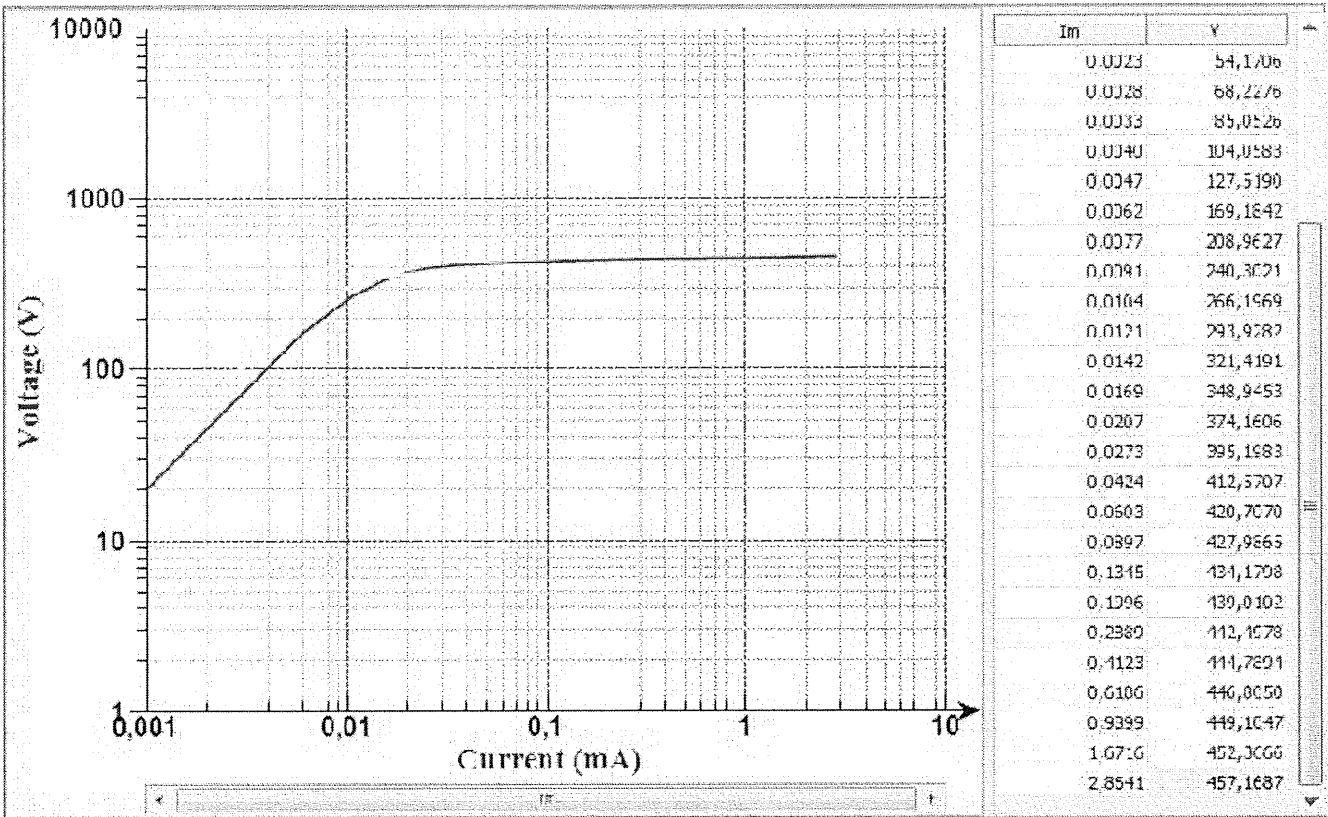
Test Operator
Güven GÜNEŞ

Approved

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Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 1S1-1S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.646
 Serial No : 2018/29179



Kneepoint Calculation

Vknee

Iknee

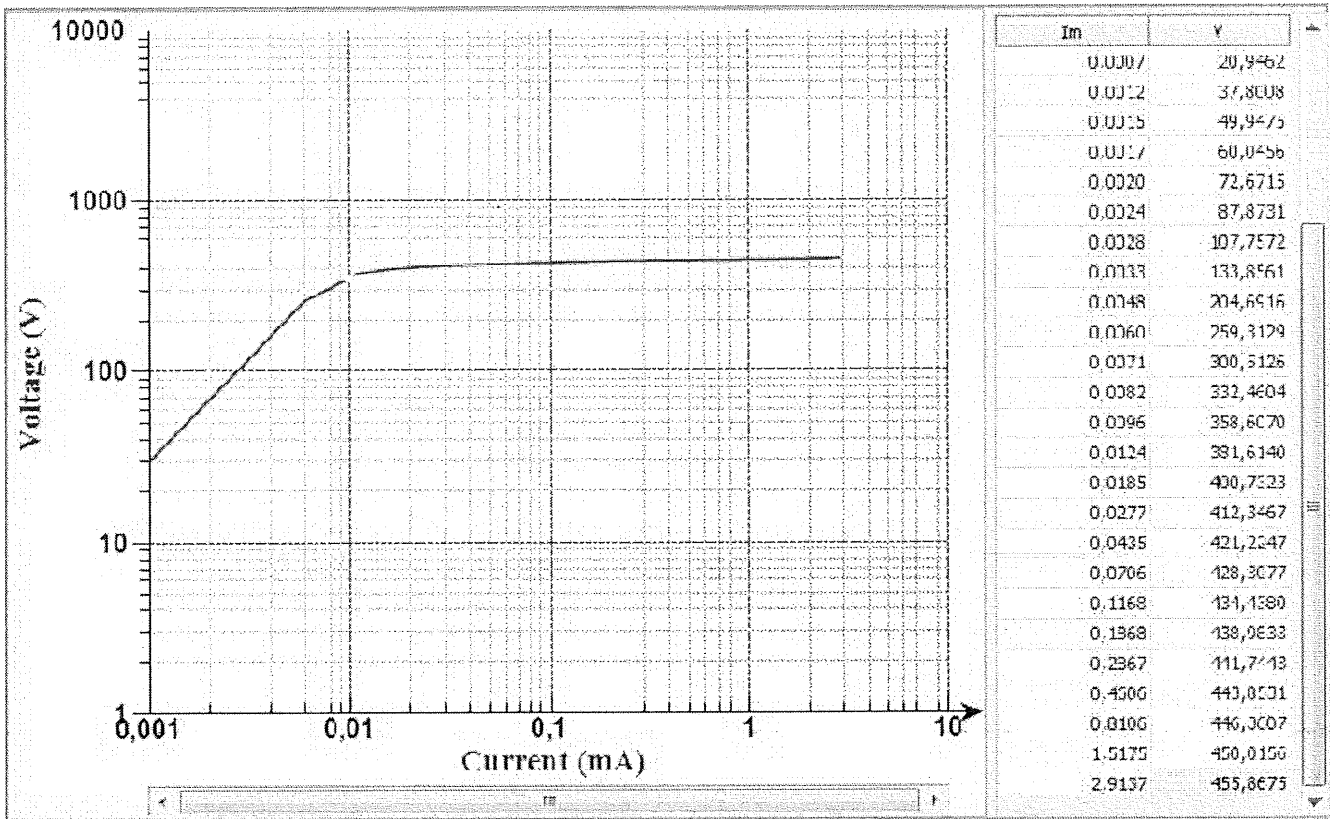
FS

ALF 23.56

Checked by Güven GÜNEŞ
 Date 07.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 2S1-2S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.411
 Serial No : 2018/29179



Kneepoint Calculation

Vknee

Iknee

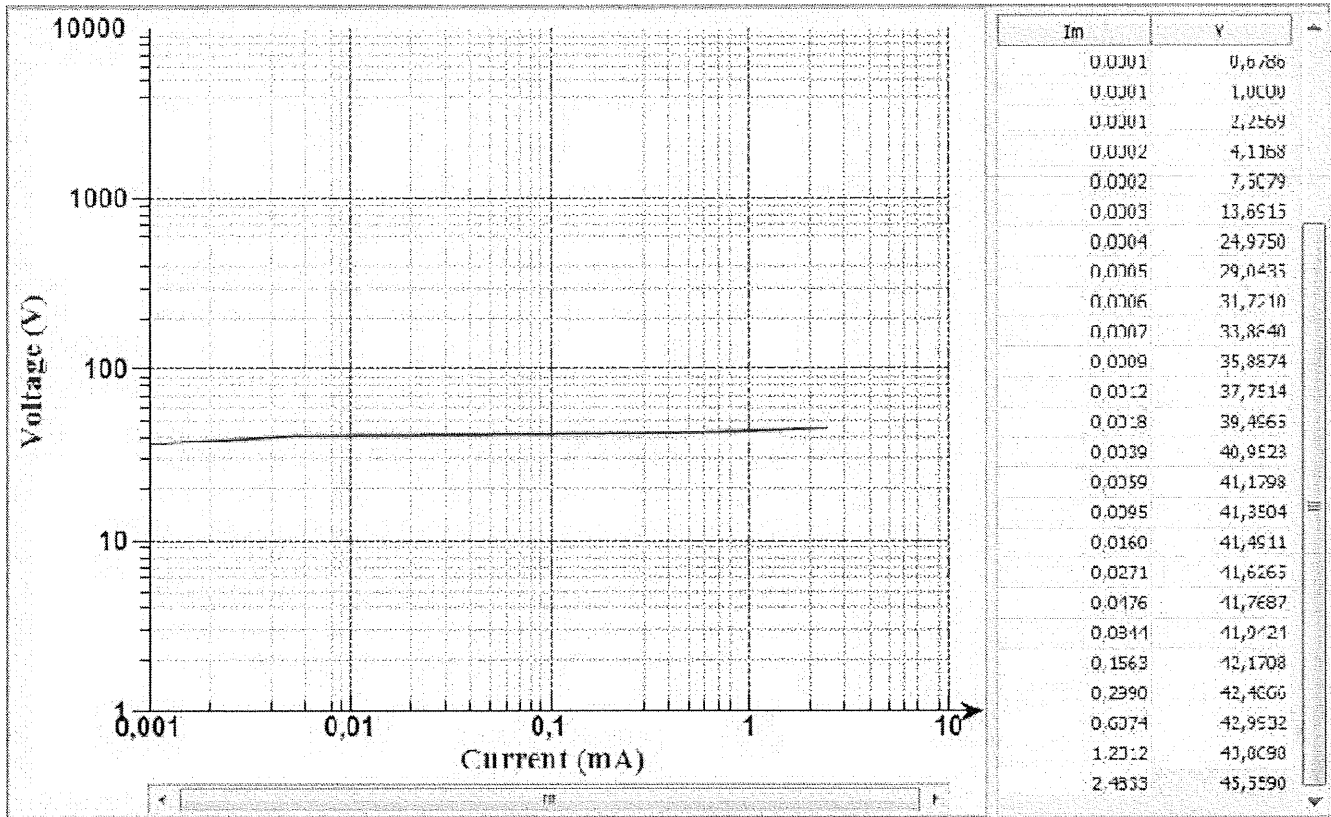
FS

ALF 23.75

Checked by : Güven GÜNEŞ
 Date : 07.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 3S1-3S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 10 / 0,2 S
 DC resistance @ 75°C OHM : 2.998
 Serial No : 2018/29179



Kneepoint Calculation

Vknee

Iknee

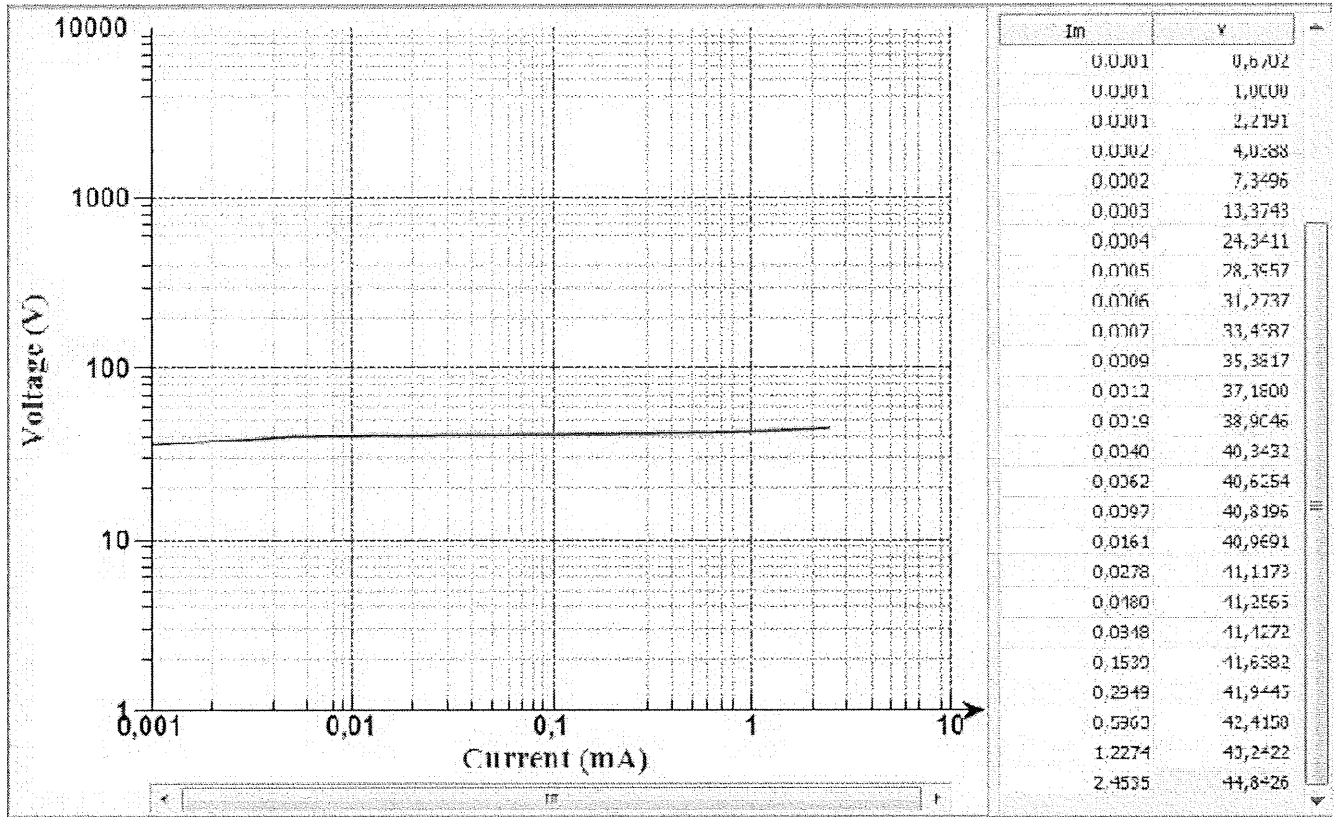
FS 3.65

ALF

Checked by Güven GÜNEŞ
 Date 07.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 4S1-4S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 10 / 0,2 S
 DC resistance @ 75°C OHM : 2.991
 Serial No : 2018/29179



Kneepoint Calculation

Vknee

Iknee

FS 3.60

ALF

Checked by Güven GÜNEŞ
 Date 07.09.2018

CURRENT TRANSFORMER TEST REPORT

AKIM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-5	Serial No Seri No	2018/29180-1
Type / Tip	ATB 20-3A	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
Project Number		IDYN Dinamik Anma Akımı	100 kA	FREQUENCY Frekans	50Hz
Cust. Item Code		Standard APP. Uygulanan Standart	IEC 61869-2:2012	Insulation Classe İzolasyon Sınıfı	E
Shorttime TH.CUR. KLSÜ.TER.AN. A.(Ith)	40kA/1sec				

Ratio / Çevirme Oranı : 1000/1-1-1A

EXPLANATION / Açıklama :

Visual and Mechanical Control
(Görsel ve Mekanik Kontrol)

OK

Inter-Turn Over Voltage Test - Proc. B
(Sarımlar Arası Aşırı Gerilim Testi - Pros. B)
(IEC 61869-2 CLAUSE 7.3.204) 200Hz-30sec

OK

Verification of Terminal Markings
(Terminal İşaretlemeleri Doğrulaması)

OK

Composite Error
(Birleşik Hata)

OK

İZOLASYON TESTLERİ / Insulation Test (IEC 61869-2 CLAUSE 7.3.1 ve 7.3.3 / 7.3.4)

Primer Yalıtım Testi Power Frq. On Pri.Winding / (60 sec.)	Primerler Arası Yalıtım Testi Between Primer Wndg. / (60 sec.)	Sekonder Yalıtım Testi Pwr. Frq. On Sec. Wndg. / (60 sec.)	Sekonderler Arası Yalıtım Testi Between Secondary Wndg. / (60 sec.)
38 kV		3 kV	3 kV
OK	---	OK	OK

KİSMİ DEŞARJ TESTİ / Partial Discharge Test (IEC 61869-2 CLAUSE 7.3.2)

DIELECTRIC'S CAPACITANCE and POWER FACTOR TEST

Gerilim / Voltage	1.2 Um	1.2 Um/V3	Kapasitans / Capacitance (pF)	Gerilim / Voltage (kV)	tan δ (%)
Seviye/Level	3 (pC)	1 (pC)			

POLARİTE TESTİ/Polarity Test +O.K. (IEC 61869-2 CLAUSE 7.3.6)

Kapasitif Değerler Values Capacitive	C1 :	PF			
	C2 :	PF			
Core / Nüve	Primary / Primer (A)	Secondary/Sekonder (A)	Burden / Yük (VA)	Class / Klas	Aşırı Akım Faktörü Over Current Faktor
1	1000	1	15	5P	20
2	1000	1	15	5P	20
3	1000	1	15	5P	20

SINIF TESTLERİ / Accuracy Class Tests (IEC 61869-2 CLAUSE 7.3.5)

Nüve Core	Primer Primary	Sekonder Second.	Rct (@ 75°C) (Ohm)	Ie (A)	Ek (V)	%	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)
1S1-1S2	1000	1	5.304				3,75			15		
						100					0,43	1
2S1-2S2	1000	1	5.268				3,75			15		
						100					0,53	0
3S1-3S2	1000	1	5.085				3,75			15		
						100					0,43	0

Date 04.09.2018
Tarih

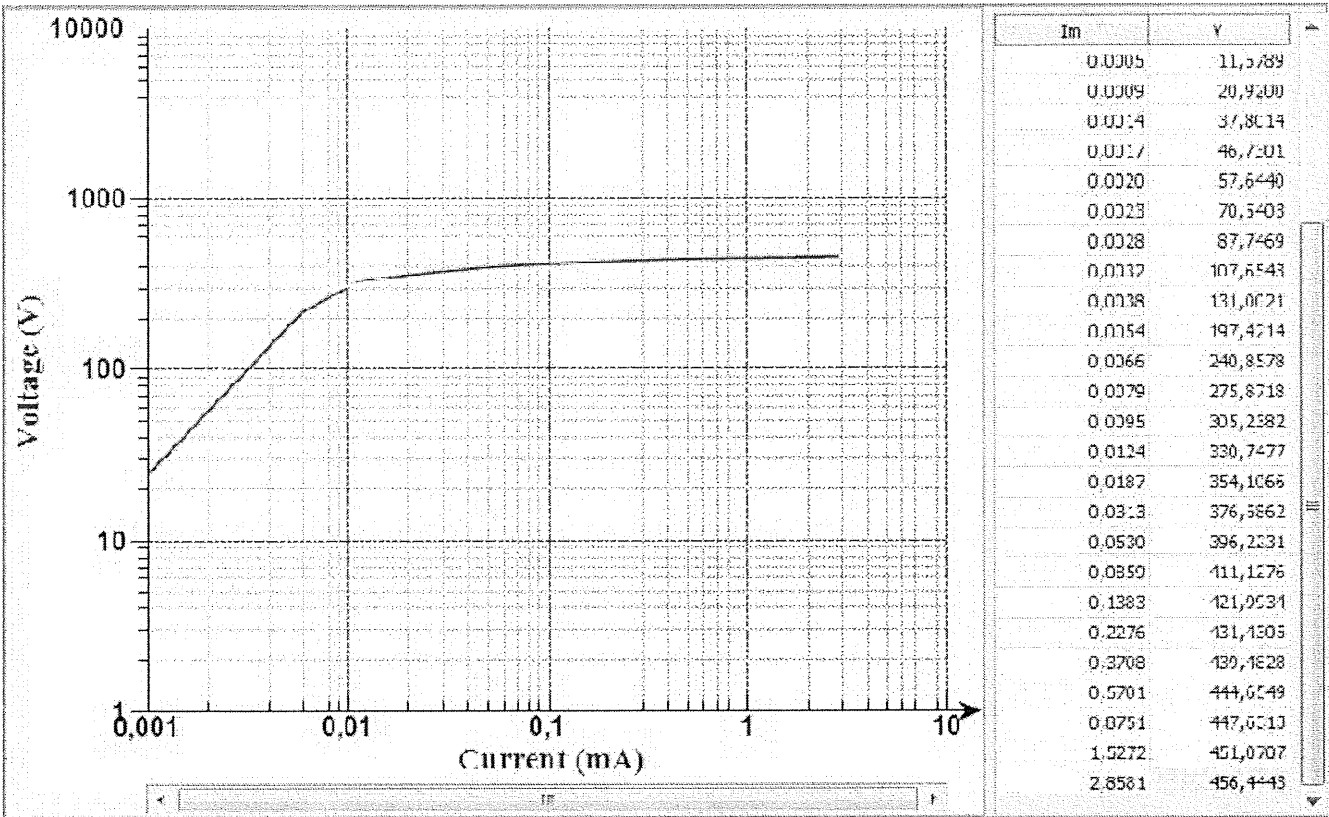
Test Operator
Mehmet KAYA

Approved

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Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 1S1-1S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.304
 Serial No : 2018/29180



Kneepoint Calculation

Vknee

Iknee

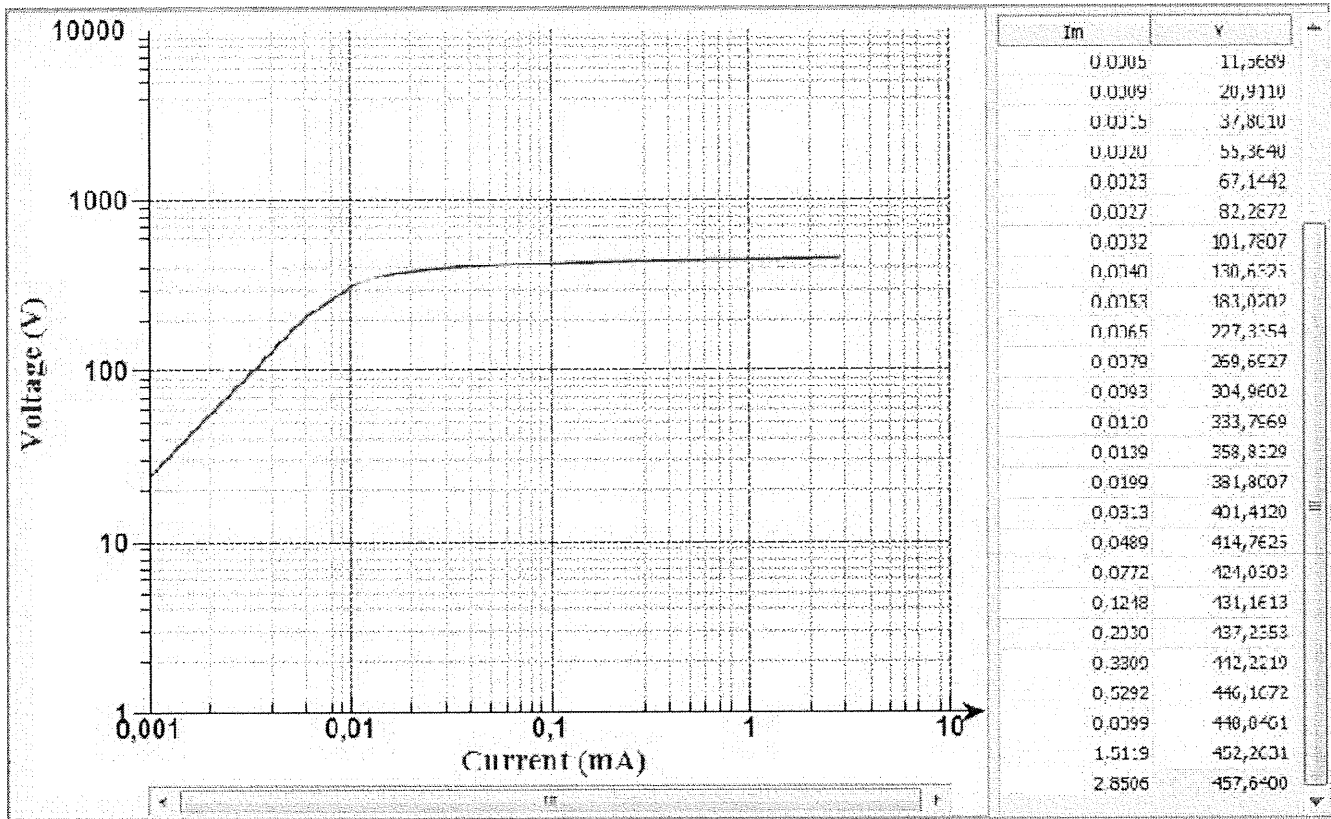
FS

ALF 23.90

Checked by Mehmet KAYA
 Date 04.09.2018

Magnetization Curve

Type : ATB 20-3A
Short time thermal current(kA) : 40kA/1sec
Acc. To : IEC 61869-2:2012
Ratio (A) : 1000/1
Secondary Tap. : 2S1-2S2
Rated voltage (kV) : 17,5/38/95 kV
Frequency (Hz) : 50
Rated burden/accuracy class : 15 / 5P
DC resistance @ 75°C OHM : 5.268
Serial No : 2018/29180



Kneepoint Calculation

Vknee

Iknee

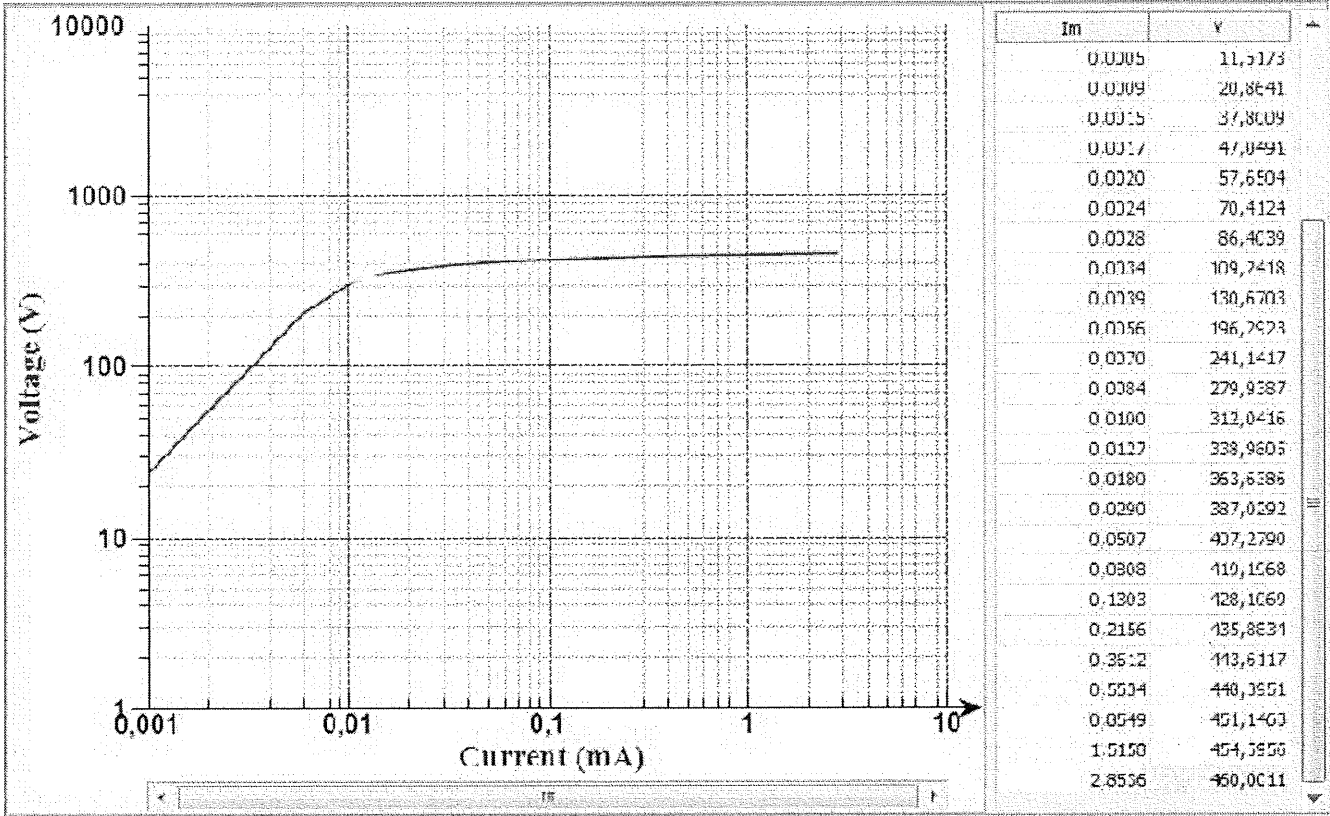
FS

ALF 23.98

Checked by Mehmet KAYA
Date 04.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 3S1-3S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.085
 Serial No : 2018/29180



Kneepoint Calculation

Vknee

Iknee

FS

ALF 24.34

Checked by Mehmet KAYA
 Date 04.09.2018

CURRENT TRANSFORMER TEST REPORT AKIM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-5	Serial No Seri No	2018/29181-1
Type / Tip	ATB 20-3A	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
Project Number		IDYN Dinamik Anma Akımı	100 kA	FREQUENCY Frekans	50Hz
Cust. Item Code		Standard APP. Uygulanan Standart	IEC 61869-2:2012	Insulation Classe İzolasyon Sınıfı	E
Shorttime TH.CUR. Kı.SÜ.TER.AN. A.(Ith)	40kA/1sec				

Ratio / Çevirme Oranı : 1000/1-1-1A

EXPLANATION / Açıklama :

Visual and Mechanical Control
(Görsel ve Mekanik Kontrol)

OK

Inter-Turn Over Voltage Test - Proc. B
(Sarımlar Arası Aşırı Gerilim Testi - Pros. B)
(IEC 61869-2 CLAUSE 7.3.204) 200Hz-30sec

OK

Verification of Terminal Markings
(Terminal İşaretlemeleri Doğrulaması)

OK

Composite Error
(Birleşik Hata)

OK

İZOLASYON TESTLERİ / Insulation Test (IEC 61869-2 CLAUSE 7.3.1 ve 7.3.3 / 7.3.4)

Primer Yalıtım Testi Power Frq. On Pri.Winding / (60 sec.)	Primerler Arası Yalıtım Testi Between Primer Wndg. / (60 sec.)	Sekonder Yalıtım Testi Pwr. Frq. On Sec. Wndg. / (60 sec.)	Sekonderler Arası Yalıtım Testi Between Secondary Wndg. / (60 sec.)
38 kV	---	3 kV	3 kV
OK	---	OK	OK

KİSMİ DEŞARJ TESTİ / Partial Discharge Test (IEC 61869-2 CLAUSE 7.3.2)

Gerilim / Voltage	1.2 Um	1.2 Um/V3	Kapasitans / Capacitance (pf)	Gerilim / Voltage (kV)	tan δ (%)
Seviye/Level	3 (pC)	1 (pC)			

POLARİTE TESTİ/Polarity Test +O.K. (IEC 61869-2 CLAUSE 7.3.6)

Kapasitif Değerler Values Capacitive	C1 :	PF			
	C2 :	PF			
Core / Nüve	Primary / Primer (A)	Secondary/Sekonder (A)	Burden / Yük (VA)	Class / Klas	Aşırı Akım Faktörü Over Current Faktor
1	1000	1	15	5P	20
2	1000	1	15	5P	20
3	1000	1	15	5P	20

SINIF TESTLERİ / Accuracy Class Tests (IEC 61869-2 CLAUSE 7.3.5)

Nüve Core	Primer Primary	Sekonder Second.	Rct (@ 75°C) (Ohm)	Ie (A)	Ek (V)	%	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)
1S1-1S2	1000	1	5.280				3,75			15		
						100					0,54	1
2S1-2S2	1000	1	5.328				3,75			15		
						100					0,44	1
3S1-3S2	1000	1	5.346				3,75			15		
						100					0,43	1

Date 04.09.2018
Tarih

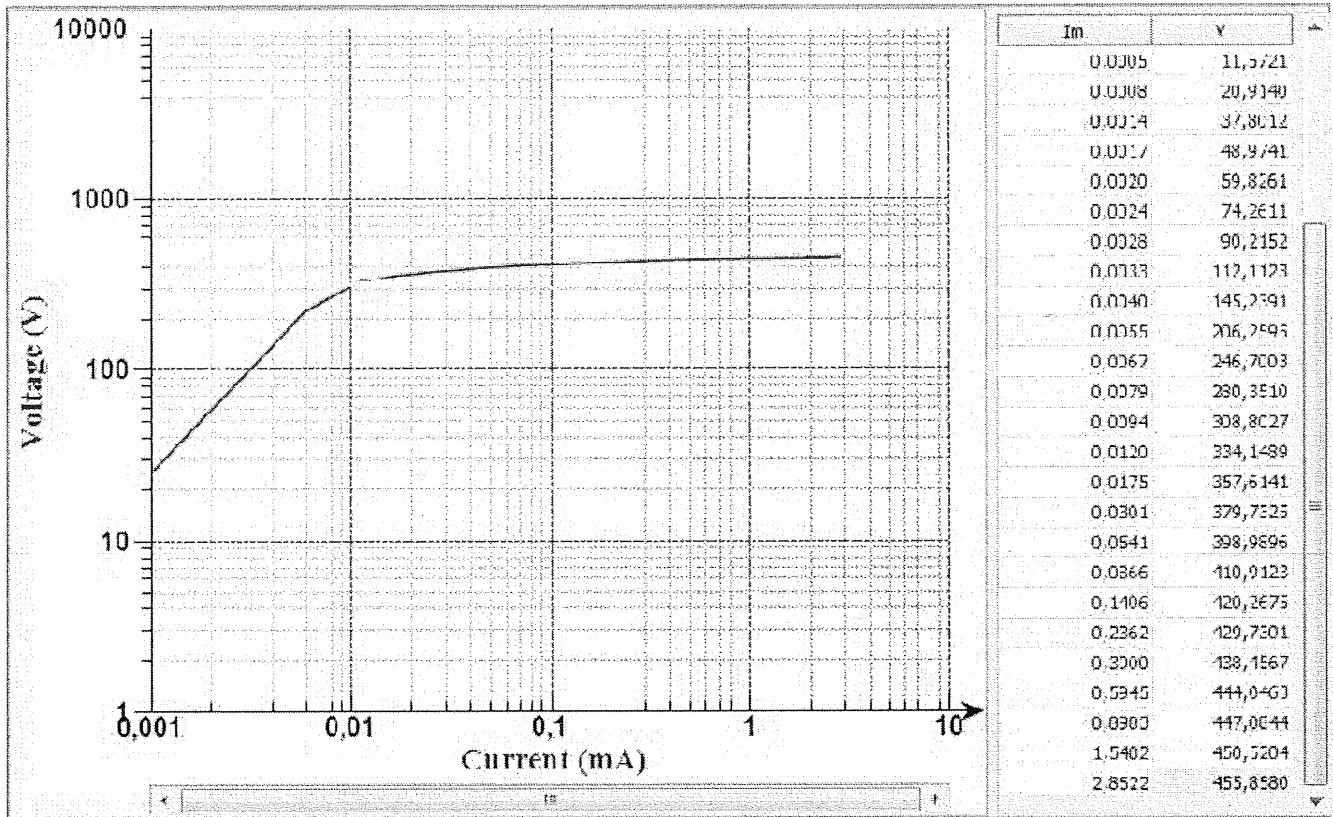
Test Operator
Reşat KARAGÖZ

Approved

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Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 1S1-1S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.280
 Serial No : 2018/29181



Kneepoint Calculation

Vknee

Iknee

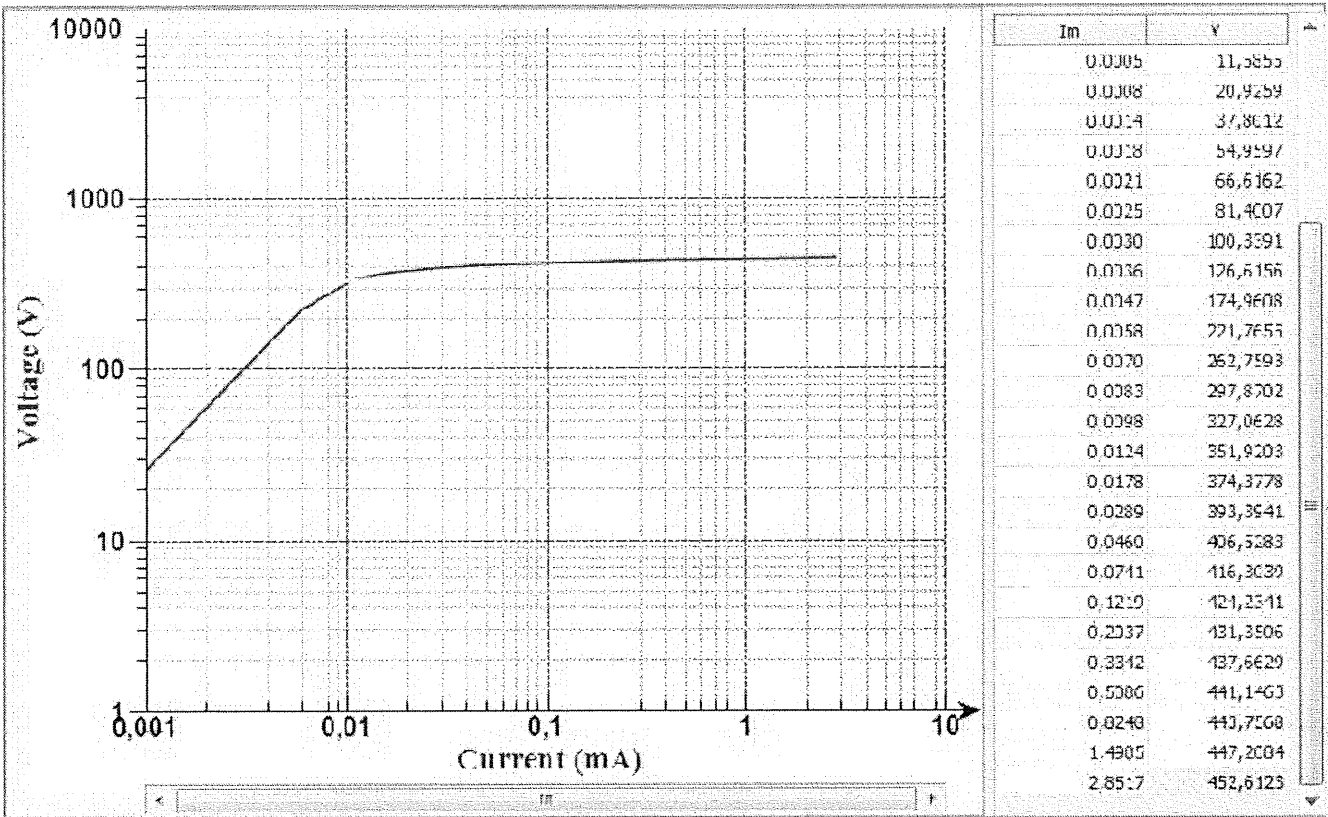
FS

ALF 23.88

Checked by Reşat KARAGÖZ
 Date 04.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 2S1-2S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.328
 Serial No : 2018/29181



Kneepoint Calculation

V_{knee}

I_{knee}

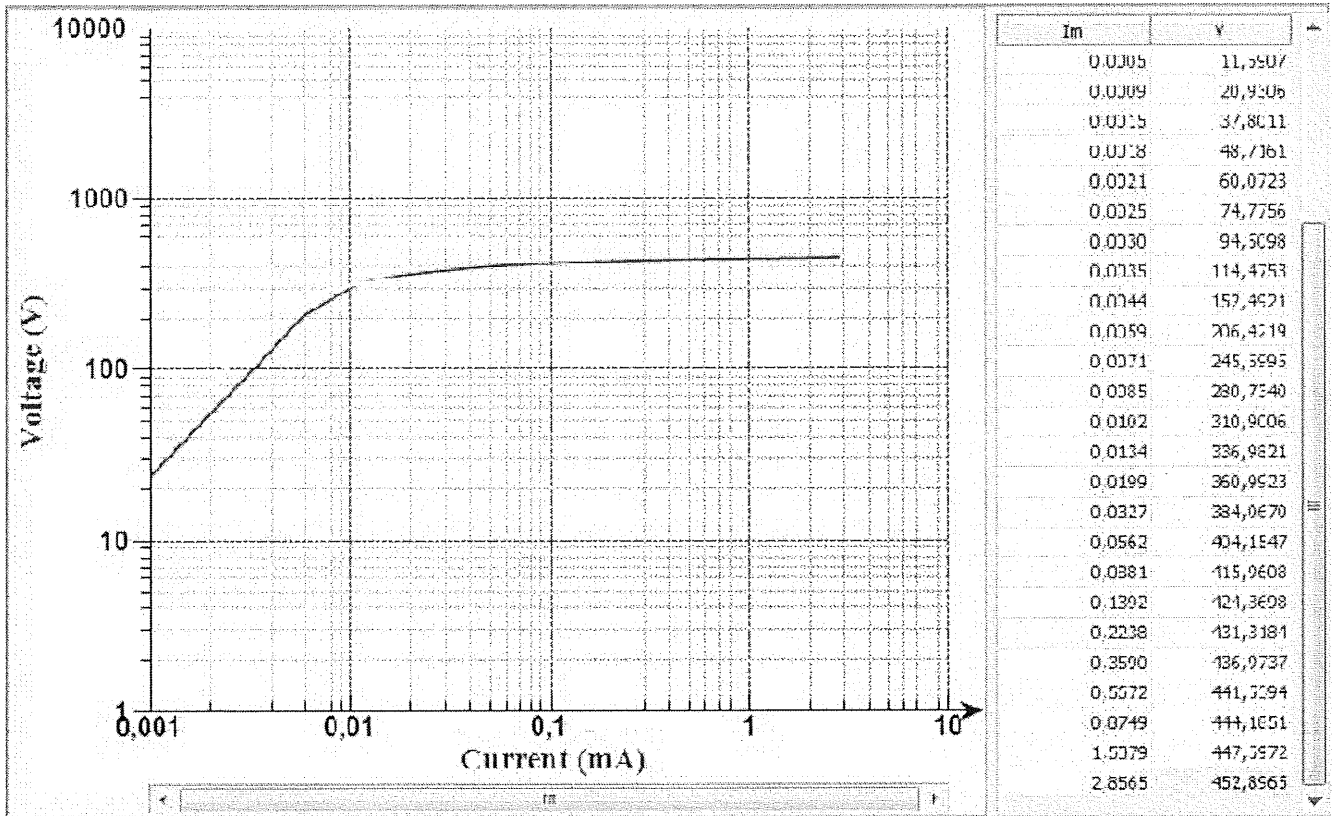
FS

ALF 23.68

Checked by Reşat KARAGÖZ
 Date 04.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 3S1-3S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.346
 Serial No : 2018/29181



Kneepoint Calculation

Vknee

Iknee

FS

ALF 23.66

Checked by Reşat KARAGÖZ
 Date 04.09.2018



CURRENT TRANSFORMER TEST REPORT AKIM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-5	Serial No Seri No	2018/29182-1							
Type / Tip	ATB 20-3A	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583							
Project Number		IDYN Dinamik Anma Akımı	100 kA	FREQUENCY Frekans	50Hz							
Cust. Item Code		Standard APP. Uygulanan Standart	IEC 61869-2:2012	Insulation Classe İzolasyon Sınıfı	E							
Shorttime TH.CUR. Kİ.SÜ.TER.AN. A.(Ith)	40kA/1sec											
Ratio / Çevirme Oranı : 1000/1-1-1A												
EXPLANATION / Açıklama :												
Visual and Mechanical Control (Görsel ve Mekanik Kontrol)		OK	Inter-Turn Over Voltage Test - Proc. B (Sarımlar Arası Aşırı Gerilim Testi - Pros. B) (IEC 61869-2 CLAUSE 7.3.204) 200Hz-30sec		OK							
Verification of Terminal Markings (Terminal İşaretlemeleri Doğrulaması)		OK	Composite Error (Birleşik Hata)		OK							
İZOLASYON TESTLERİ / Insulation Test (IEC 61869-2 CLAUSE 7.3.1 ve 7.3.3 / 7.3.4)												
Primer Yalıtım Testi Power Frq. On Pri.Winding / (60 sec.)		Primerler Arası Yalıtım Testi Between Primer Wndg. / (60 sec.)		Sekonder Yalıtım Testi Pwr. Frq. On Sec. Wndg. / (60 sec.)								
38 kV		---		3 kV								
OK		---		OK								
KİSMİ DEŞARJ TESTİ / Partial Discharge Test (IEC 61869-2 CLAUSE 7.3.2)												
Gerilim / Voltage	1.2 Um	1.2 Um/V3		Kapasitans / Capacitance (pF)								
Seviye/Level	3 (pC)	1 (pC)		Gerilim / Voltage (kV)								
DIELECTRIC'S CAPACITANCE and POWER FACTOR TEST												
tan & (%)												
POLARİTE TESTİ/Polarity Test +O.K. (IEC 61869-2 CLAUSE 7.3.6)												
Kapasitif Değerler Values Capacitive	C1 :	PF										
	C2 :	PF										
Core / Nüve	Primary / Primer (A)	Secondary/Sekonder (A)	Burden / Yük (VA)	Class / Klas	Aşırı Akım Faktörü Over Current Faktör							
1	1000	1	15	5P	20							
2	1000	1	15	5P	20							
3	1000	1	15	5P	20							
SINIF TESTLERİ / Accuracy Class Tests (IEC 61869-2 CLAUSE 7.3.5)												
Nüve Core	Primer Primary	Sekonder Second.	Rct (@ 75°C) (Ohm)	le (A)	Ek (V)	%	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)
1S1-1S2	1000	1	5.328				3,75			15		
						100					0,43	1
2S1-2S2	1000	1	5.354				3,75			15		
						100					0,44	1
3S1-3S2	1000	1	5.284				3,75			15		
						100					0,63	1

Date 04.09.2018
Tarih

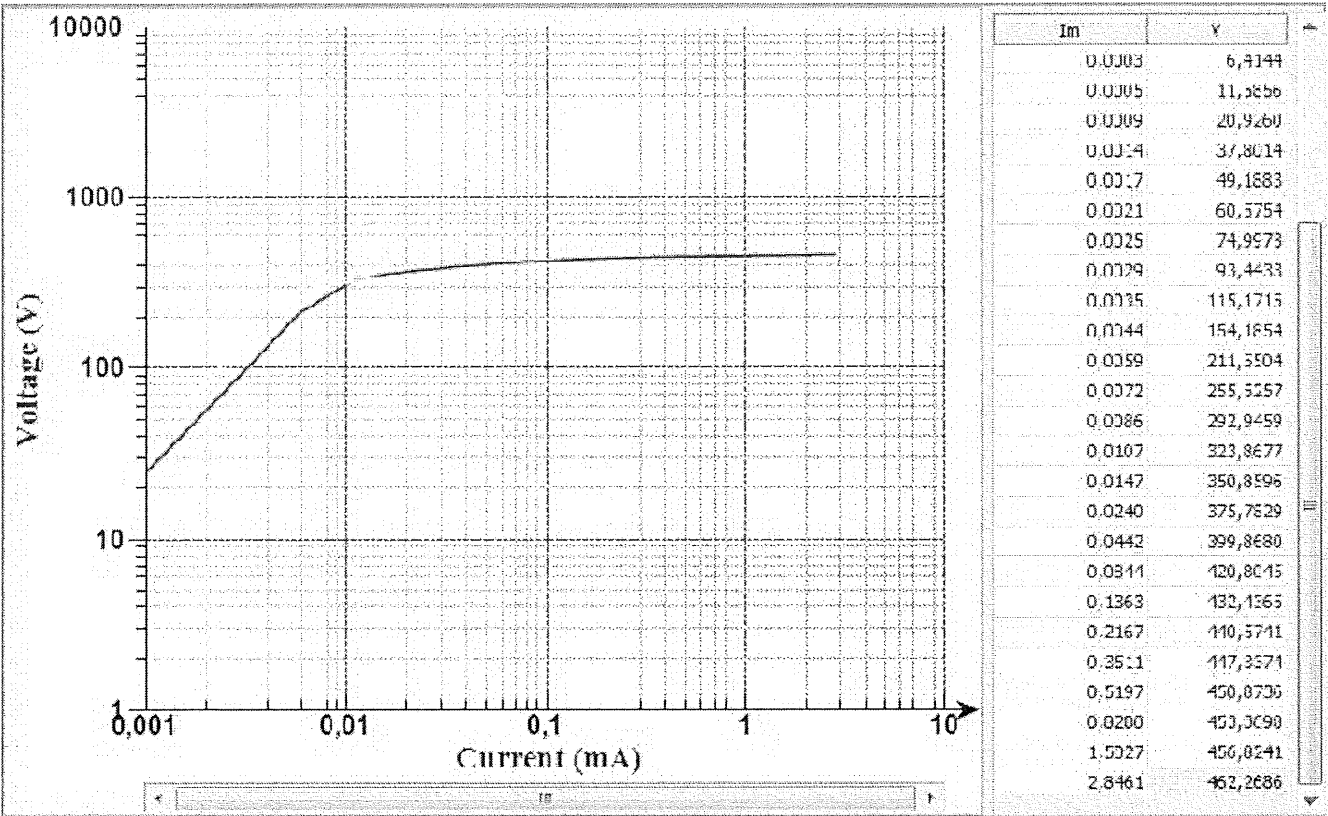
Test Operator
Reşat KARAGÖZ

Approved

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Magnetization Curve

Type : ATB 20-3A
Short time thermal current(kA) : 40kA/1sec
Acc. To : IEC 61869-2:2012
Ratio (A) : 1000/1
Secondary Tap. : 1S1-1S2
Rated voltage (kV) : 17,5/38/95 kV
Frequency (Hz) : 50
Rated burden/accuracy class : 15 / 5P
DC resistance @ 75°C OHM : 5.328
Serial No : 2018/29182



Kneepoint Calculation

Vknee

Iknee

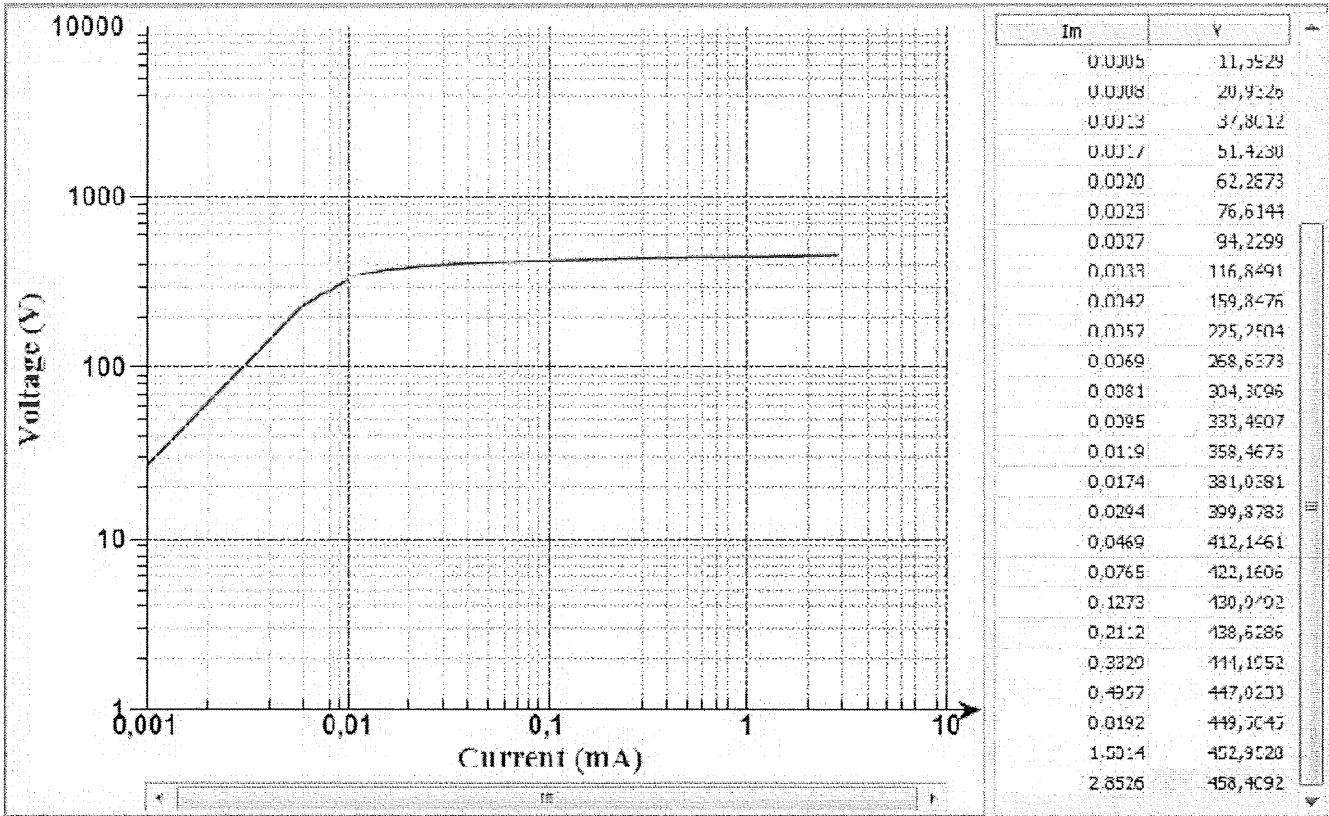
FS

ALF 24.18

Checked by Reşat KARAGÖZ
Date 04.09.2018

Magnetization Curve

Type : ATB 20-3A
Short time thermal current(kA) : 40kA/1sec
Acc. To : IEC 61869-2:2012
Ratio (A) : 1000/1
Secondary Tap. : 2S1-2S2
Rated voltage (kV) : 17,5/38/95 kV
Frequency (Hz) : 50
Rated burden/accuracy class : 15 / 5P
DC resistance @ 75°C OHM : 5.354
Serial No : 2018/29182



Kneepoint Calculation

Vknee

Iknee

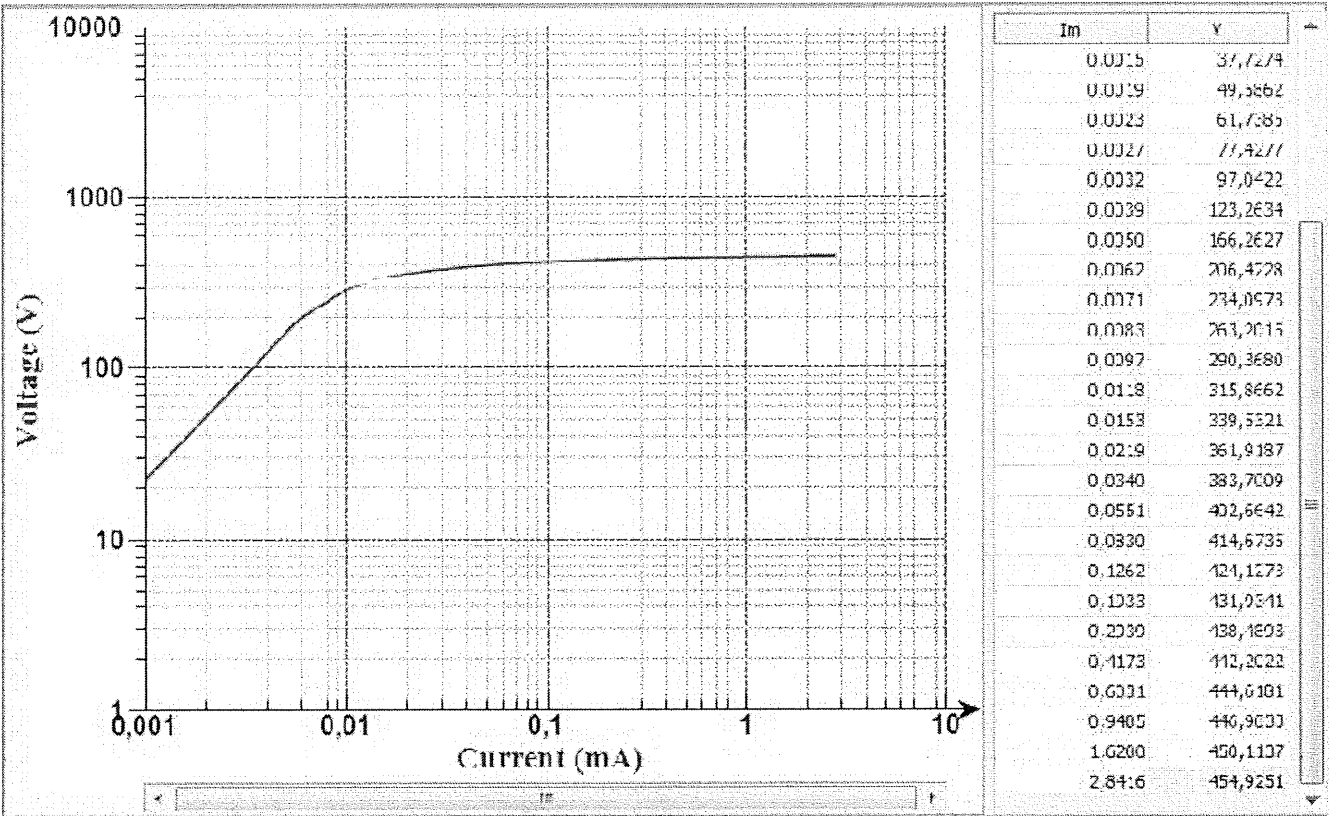
FS

ALF 23.94

Checked by Reşat KARAGÖZ
Date 04.09.2018

Magnetization Curve

Type : ATB 20-3A
 Short time thermal current(kA) : 40kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 1000/1
 Secondary Tap. : 3S1-3S2
 Rated voltage (kV) : 17,5/38/95 kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 15 / 5P
 DC resistance @ 75°C OHM : 5.284
 Serial No : 2018/29182



Kneepoint Calculation

Vknee

Iknee

FS

ALF 23.80

Checked by Reşat KARAGÖZ
 Date 04.09.2018



CURRENT TRANSFORMER TEST REPORT
AKIM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-1	Serial No Seri No	2018/36142-1							
Type / Tip	KAT-60/170-140	Insulation Level Yalıtım Seviyesi	0,72/3/- kV	Customer P.O. No Müşteri Sip.No	3583							
Project Number		IDYN	2.5xlth	FREQUENCY Frekans	50Hz							
Cust. Item Code		Dinamik Anma Akımı		Insulation Classe İzolasyon Sınıfı	E							
Shorttime TH.CUR. Kİ.SÜ.TER.AN. A.(lth)	6kA/1sec	Standard APP. Uygulanan Standart	IEC 61869-2:2012									
Ratio / Çevirme Oranı : 60/1A												
EXPLANATION / Açıklama :												
Visual and Mechanical Control (Görsel ve Mekanik Kontrol)		Inter-Turn Over Voltage Test - Proc. B (Sarımlar Arası Aşırı Gerilim Testi - Pros. B) (IEC 61869-2 CLAUSE 7.3.204) 200Hz-30sec		OK								
Verification of Terminal Markings (Terminal İşaretleme Doğrulaması)		Composite Error (Birleşik Hata)		N/A								
İZOLASYON TESTLERİ / Insulation Test (IEC 61869-2 CLAUSE 7.3.1 ve 7.3.3 / 7.3.4)												
Primer Yalıtım Testi Power Frq. On Pri.Winding / (60 sec.)		Primerler Arası Yalıtım Testi Between Primer Wndg. / (60 sec.)		Sekonder Yalıtım Testi Pwr. Frq. On Sec. Wndg. / (60 sec.)								
3 kV		3 kV		3 kV								
OK		---		OK								
KİSMİ DEŞARJ TESTİ / Partial Discharge Test (IEC 61869-2 CLAUSE 7.3.2)			DIELECTRIC'S CAPACITANCE and POWER FACTOR TEST									
Gerilim / Voltage	1.2 Um	1.2 Um/V3	Kapasitans / Capacitance (pF)	Gerilim / Voltage (kV)	tan δ (%)							
Seviye/Level	(pC)	(pC)										
POLARİTE TESTİ/Polarity Test +O.K. (IEC 61869-2 CLAUSE 7.3.6)												
Kapasitif Değerler Values Capacitive	C1 :	PF										
	C2 :	PF										
Core / Nüve	Primary / Primer (A)	Secondary/Sekonder (A)	Burden / Yük (VA)	Class / Klas	Aşırı Akım Faktörü Over Current Faktor							
1	60	1	1,25	1	FS10							
SINIF TESTLERİ / Accuracy Class Tests (IEC 61869-2 CLAUSE 7.3.5)												
Nüve Core	Primer Primary	Sekonder Second.	Rct (@ 75°C) (Ohm)	le (A)	Ek (V)	%	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Akım Hatası Current Err. (%F)	Faz Hatası Phase Err. (min/dk)
S1-S2	60	1	0.2210				1			1,25		
						5		0,92	13		0,8	33
						20		0,89	11		0,63	19
						100		0,84	5		0,67	7
						120		0,84	4		0,68	6

Date 14.09.2018
Tarih

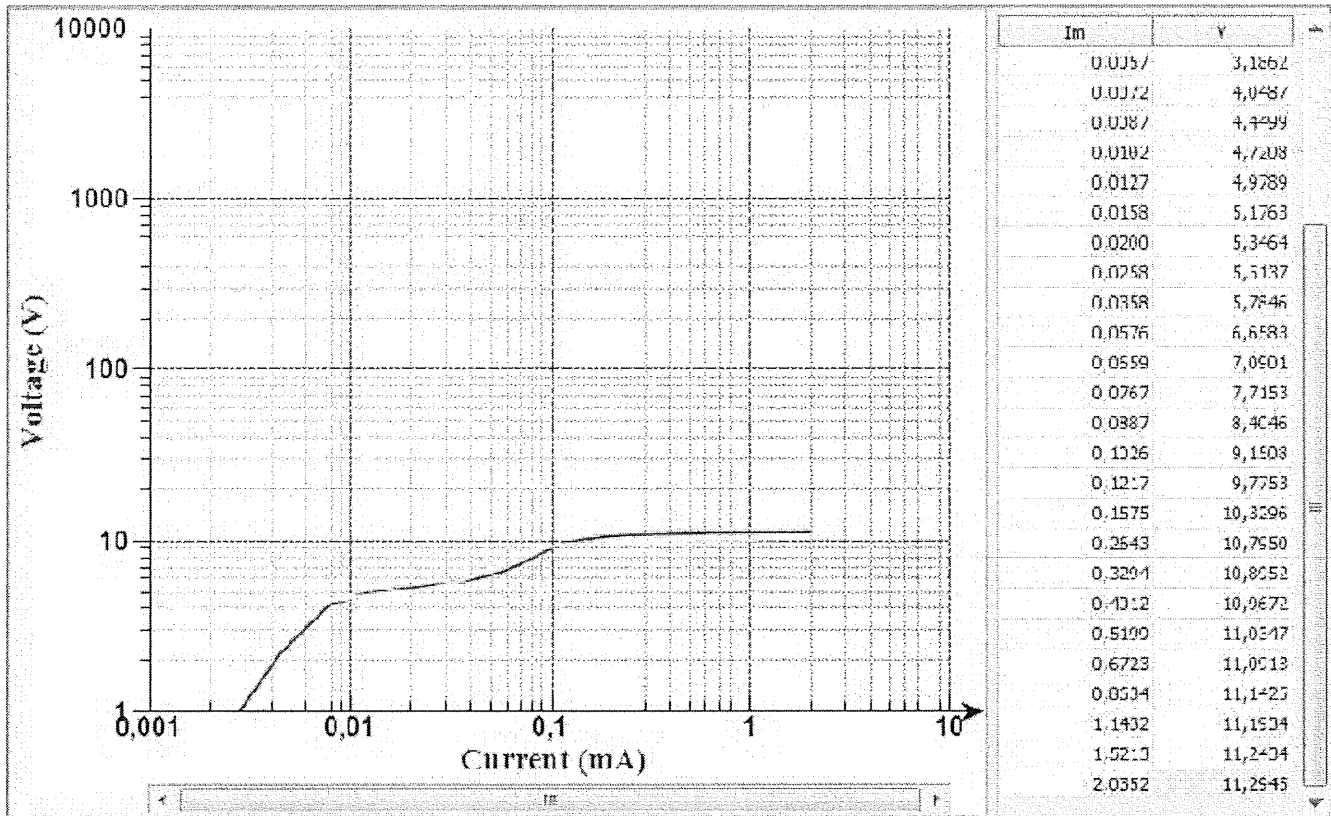
Test Operator
Reşat KARAGÖZ

Approved

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Magnetization Curve

Type : KAT-60/170-140
 Short time thermal current(kA) : 6kA/1sec
 Acc. To : IEC 61869-2:2012
 Ratio (A) : 60/1
 Secondary Tap. : S1-S2
 Rated voltage (kV) : 0,72/3/- kV
 Frequency (Hz) : 50
 Rated burden/accuracy class : 1,25 / 1
 DC resistance @ 75°C OHM : 0.2210
 Serial No : 2018/36142



Kneepoint Calculation

Vknee

Iknee

FS 7.71

ALF

Checked by Reşat KARAGÖZ
 Date 14.09.2018



VOLTAGE TRANSFORMER TEST REPORT
GERİLİM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-2	Serial No Seri No	2018/71925-1
Type / Tip	VTB 20-K	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
PRIMARY TERMINAL PRİMER TERMİNAL	A-N	PRIMARY VOLTAGE PRİMER GERİLİMİ	15/√3kV	FREQUENCY Frekans	50Hz
RATED VOLFAC / AN.GER.YUK.K.SAY		Standard APP. Uygulanan Standart	IEC 61869-3:2011	Insulation Classe İzolasyon Sınıfı	E
1,9Un/8h&1,2Un/Continuous		Project Number Proje No		Cust. İtem Code	

Ratio / Çevirme Oranı : 15/√3/0,1/√3/0,1/3kV		YALITIM TESTLERİ / Insulation Test IEC 61869-3 (CLAUSE 7.3.1/7.3.3/7.3.4)				
EXPLANATION / Açıklama :			VOLTAGE (kV)	FRQ. (Hz)	TIME (sec.)	
		PWR.FRQ.ON PRI.TERMINAL PRİMER YALITIM TESTİ (7.3.1.301a)	3	50	60	
		INDUCED TEST VOLTAGE (7.3.1.301b) ENDÜKLENEN TEST GERİLİMİ	38	200	30	
Visual and Mechanical Control (Görsel ve Mekanik Kontrol)		OK	PWR.FRQ.ON SEC.WNDG. SEK. YALITIM TESTİ (7.3.4)	3	50	60
Verification of Terminal Markings (Terminal İşaretlemeleri Doğrulaması)		OK	BETWEEN SECTIONS BÖLÜMLER ARASI (7.3.3)	3	50	60

KİSMİ DEŞARJ TESTİ / Partial Discharge Test IEC 61869-3 (CLAUSE 7.3.2)			DIELECTRIC'S CAPACITANCE and POWER FACTOR TEST		
Gerilim / Voltage (kV)	1.2Um	1.2Um/V3	Kapasitans / Capacitance (pF)	Gerilim / Voltage (kV)	tan & (%)
Seviye / LEVEL	10 (pC)	1 (pC)			

POLARİTE TESTİ / Polarity Test	+O.K. (IEC 61869-3 CLAUSE 7.3.6)
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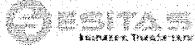
Sekonder Terminal Secondary Terminal	SEKONDER (V) Secondary Voltage	Klas Accuracy Class	YÜK (VA at Cosφ=0.8) Burden
1	100/V3	0,2	30
2	100/3	3 P	45

SINIF TESTLERİ / Accuracy Class Tests IEC 61869-3 (CLAUSE 7.3.5)									
Sargı Winding Core	Primer Primary	Sekonder Second.	%	Yük Burden (VA)	Oran Hatası Ratio Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Oran Hatası Ratio Err. (%F)	Faz Hatası Phase Err. (min/dk)
a-n	15000/V3	100/V3		7,5			30		
			80		+0,17	0		-0,08	+1
			120		+0,16	+1		-0,10	+2
da-dn	15000/V3	100/3		11,25			45		
			5		+1,27	+3		+0,70	+10
			190		+1,12	+3		+0,55	+10

Date 20.07.2018
Tarih

Test Operator
Mehmet KAYA

Approved
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VOLTAGE TRANSFORMER TEST REPORT
GERİLİM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-2	Serial No Seri No	2018/71926-1
Type / Tip	VTB 20-K	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
PRIMARY TERMINAL PRİMER TERMİNAL	A-N	PRIMARY VOLTAGE PRİMER GERİLİMİ	15/√3kV	FREQUENCY Frekans	50Hz
RATED VOLFAC / AN.GER.YUK.K.SAY		Standard APP. Uygulanan Standart	IEC 61869-3:2011	Insulation Classe İzolasyon Sınıfı	E
1,9Un/8h&1,2Un/Continuous		Project Number Proje No		Cust. İtem Code	

Ratio / Çevirme Oranı : 15/√3/0,1/√3/0,1/3kV	YALITIM TESTLERİ / Insulation Test IEC 61869-3 (CLAUSE 7.3.1/7.3.3/7.3.4)			
EXPLANATION / Açıklama :		VOLTAGE (kV)	FRQ. (Hz)	TIME (sec.)
	PWR.FRQ.ON PRI.TERMINAL PRİMER YALITIM TESTİ (7.3.1.301a)	3	50	60
Visual and Mechanical Control (Görsel ve Mekanik Kontrol) Verification of Terminal Markings (Terminal İşaretlemeleri Doğrulaması)	INDUCED TEST VOLTAGE (7.3.1.301b) ENDÜKLENEN TEST GERİLİMİ	38	200	30
	PWR.FRQ.ON SEC.WNDG. SEK. YALITIM TESTİ (7.3.4)	3	50	60
	BETWEEN SECTIONS BÖLÜMLER ARASI (7.3.3)	3	50	60

KİSMİ DEŞARJ TESTİ / Partial Discharge Test IEC 61869-3 (CLAUSE 7.3.2)			DIELECTRIC'S CAPACITANCE and POWER FACTOR TEST		
Gerilim / Voltage (kV)	1.2Um	1.2Um/V3	Kapasitans / Capacitance (pF)	Gerilim / Voltage (kV)	tan & (%)
Seviye / LEVEL	5 (pC)	1 (pC)			

POLARİTE TESTİ / Polarity Test	+O.K. (IEC 61869-3 CLAUSE 7.3.6)
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Sekonder Terminal Secondary Terminal	SEKONDER (V) Secondary Voltage	Klas Accuracy Class	YÜK (VA at Cosφ=0.8) Burden
1	100/V3	0,2	30
2	100/3	3 P	45

SINIF TESTLERİ / Accuracy Class Tests IEC 61869-3 (CLAUSE 7.3.5)									
Sargı Winding Core	Primer Primary	Sekonder Second.	%	Yük Burden (VA)	Oran Hatası Ratio Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Oran Hatası Ratio Err. (%F)	Faz Hatası Phase Err. (min/dk)
a-n	15000/V3	100/V3		7,5			30		
			80		+0,17	+0		-0,09	+2
			120		+0,16	+1		-0,10	+2
da-dn	15000/V3	100/3		11,25			45		
			5		+1,25	+2		+0,71	+9
			190		+1,12	+2		+0,58	+9

Date 04.09.2018
Tarih

Test Operator
Reşat KARAGÖZ

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VOLTAGE TRANSFORMER TEST REPORT
GERİLİM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-2	Serial No Seri No	2018/71927-1
Type / Tip	VTB 20-K	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
PRIMARY TERMINAL PRİMER TERMİNAL	A-N	PRIMARY VOLTAGE PRİMER GERİLİMİ	15/√3kV	FREQUENCY Frekans	50Hz
RATED VOL.FAC / AN.GER.YUK.K.SAY		Standard APP. Uygulanan Standart	IEC 61869-3:2011	Insulation Classe İzolasyon Sınıfı	E
1,9Un/8h&1,2Un/Continuous		Project Number Proje No		Cust. İtem Code	

Ratio / Çevirme Oranı : 15/√3/0,1/√3/0,1/3kV	YALITIM TESTLERİ / Insulation Test IEC 61869-3 (CLAUSE 7.3.1/7.3.3/7.3.4)			
EXPLANATION / Açıklama : Visual and Mechanical Control (Görsel ve Mekanik Kontrol) Verification of Terminal Markings (Terminal İşaretlemeleri Doğrulaması)		VOLTAGE (kV)	FRQ. (Hz)	TIME (sec.)
	PWR.FRQ.ON PRI.TERMINAL PRİMER YALITIM TESTİ (7.3.1.301a)	3	50	60
	INDUCED TEST VOLTAGE (7.3.1.301b) ENDÜKLENEN TEST GERİLİMİ	38	200	30
	PWR.FRQ.ON SEC.WNDG. SEK. YALITIM TESTİ (7.3.4)	3	50	60
	BETWEEN SECTIONS BÖLÜMLER ARASI (7.3.3)	3	50	60

KİSMİ DEŞARJ TESTİ / Partial Discharge Test IEC 61869-3 (CLAUSE 7.3.2)			DIELECTRIC'S CAPACITANCE and POWER FACTOR TEST		
Gerilim / Voltage (kV)	1.2Um	1.2Um/V3	Kapasitans / Capacitance (pf)	Gerilim / Voltage (kV)	tan & (%)
Seviye / LEVEL	1 (pC)	1 (pC)			

POLARİTE TESTİ / Polarity Test	+O.K.	(IEC 61869-3 CLAUSE 7.3.6)
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Sekonder Terminal Secondary Terminal	SEKONDER (V) Secondary Voltage	Klas Accuracy Class	YÜK (VA at Cosφ=0.8) Burden
1	100/V3	0,2	30
2	100/3	3 P	45

SINIF TESTLERİ / Accuracy Class Tests IEC 61869-3 (CLAUSE 7.3.5)									
Sargı Winding Core	Primer Primary	Sekonder Second.	%	Yük Burden (VA)	Oran Hatası Ratio Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Oran Hatası Ratio Err. (%F)	Faz Hatası Phase Err. (min/dk)
a-n	15000/V3	100/V3		7,5			30		
			80		+0,16	+1		-0,10	+2
			120		+0,16	+1		-0,11	+2
da-dn	15000/V3	100/3		11,25			45		
			5		+0,61	+1		+0,09	+7
			190		+0,46	+4		-0,14	+11

Date 05.09.2018
Tarih

Test Operator
Reşat KARAGÖZ

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VOLTAGE TRANSFORMER TEST REPORT
GERİLİM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-2	Serial No Seri No	2018/71928-1
Type / Tip	VTB 20-K	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
PRIMARY TERMINAL PRİMER TERMİNAL	A-N	PRIMARY VOLTAGE PRİMER GERİLİMİ	15/√3kV	FREQUENCY Frekans	50Hz
RATED VOLFAC / AN.GER.YUK.K.SAY		Standard APP. Uygulanan Standart	IEC 61869-3:2011	Insulation Classe İzolasyon Sınıfı	E
1,9Un/8h&1,2Un/Continuous		Project Number Proje No		Cust. İtem Code	

Ratio / Çevirme Oranı : 15/√3/0,1/√3/0,1/3kV	YALITIM TESTLERİ / Insulation Test IEC 61869-3 (CLAUSE 7.3.1/7.3.3/7.3.4)			
EXPLANATION / Açıklama :		VOLTAGE (kV)	FRQ. (Hz)	TIME (sec.)
	PWR.FRQ.ON PRI.TERMINAL PRİMER YALITIM TESTİ (7.3.1.301a)	3	50	60
	INDUCED TEST VOLTAGE (7.3.1.301b) ENDÜKLENEN TEST GERİLİMİ	38	200	30
	PWR.FRQ.ON SEC.WNDG. SEK. YALITIM TESTİ (7.3.4)	3	50	60
Visual and Mechanical Control (Görsel ve Mekanik Kontrol)	OK			
Verification of Terminal Markings (Terminal İşaretleme Doğrulaması)	OK			
	BETWEEN SECTIONS BÖLÜMLER ARASI (7.3.3)	3	50	60

KİSMİ DEŞARJ TESTİ / Partial Discharge Test IEC 61869-3 (CLAUSE 7.3.2)			DIELECTRIC'S CAPACITANCE and POWER FACTOR TEST		
Gerilim / Voltage (kV)	1.2Um	1.2Um/V3	Kapasitans / Capacitance (pf)	Gerilim / Voltage (kV)	tan & (%)
Seviye / LEVEL	4 (pC)	1 (pC)			

POLARİTE TESTİ / Polarity Test	+O.K. (IEC 61869-3 CLAUSE 7.3.6)
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Sekonder Terminal Secondary Terminal	SEKONDER (V) Secondary Voltage	Klas Accuracy Class	YÜK (VA at Cosφ=0.8) Burden
1	100/V3	0,2	30
2	100/3	3 P	45

SINIF TESTLERİ / Accuracy Class Tests IEC 61869-3 (CLAUSE 7.3.5)									
Sargı Winding Core	Primer Primary	Sekonder Second.	%	Yük Burden (VA)	Oran Hatası Ratio Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Oran Hatası Ratio Err. (%F)	Faz Hatası Phase Err. (min/dk)
a-n	15000/V3	100/V3		7,5			30		
			80		+0,16	+1		-0,10	+2
			120		+0,15	+2		-0,11	+2
da-dn	15000/V3	100/3		11,25			45		
			5		+0,63	+3		+0,16	+7
			190		+0,51	+3		-0,03	+10

Date 05.09.2018
Tarih

Test Operator
Reşat KARAGÖZ

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VOLTAGE TRANSFORMER TEST REPORT
GERİLİM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-2	Serial No Seri No	2018/71929-1
Type / Tip	VTB 20-K	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
PRIMARY TERMINAL PRİMER TERMİNAL	A-N	PRIMARY VOLTAGE PRİMER GERİLİMİ	15/√3kV	FREQUENCY Frekans	50Hz
RATED VOL.FAC / AN.GER.YUK.K.SAY		Standard APP. Uygulanan Standart	IEC 61869-3:2011	Insulation Classe İzolasyon Sınıfı	E
1,9Un/8h&1,2Un/Continuous		Project Number Proje No		Cust. İtem Code	

Ratio / Çevirme Oranı : 15/√3/0,1/√3/0,1/3kV	YALITIM TESTLERİ / Insulation Test IEC 61869-3 (CLAUSE 7.3.1/7.3.3/7.3.4)			
EXPLANATION / Açıklama :		VOLTAGE (kV)	FRQ. (Hz)	TIME (sec.)
	PWR.FRQ.ON PRI.TERMINAL PRİMER YALITIM TESTİ (7.3.1.301a)	3	50	60
	INDUCED TEST VOLTAGE (7.3.1.301b) ENDÜKLENELEN TEST GERİLİMİ	38	200	30
Visual and Mechanical Control (Görsel ve Mekanik Kontrol)	PWR.FRQ.ON SEC.WNDG. SEK. YALITIM TESTİ (7.3.4)	3	50	60
Verification of Terminal Markings (Terminal İşaretlemeleri Doğrulaması)	BETWEEN SECTIONS BÖLÜMLER ARASI (7.3.3)	3	50	60

KİSMİ DEŞARJ TESTİ / Partial Discharge Test IEC 61869-3 (CLAUSE 7.3.2)			DIELECTRIC'S CAPACITANCE and POWER FACTOR TEST		
Gerilim / Voltage (kV)	1.2Um	1.2Um/V3	Kapasitans / Capacitance (pf)	Gerilim / Voltage (kV)	tan & (%)
Seviye / LEVEL	1 (pC)	1 (pC)			

POLARİTE TESTİ / Polarity Test	+O.K. (IEC 61869-3 CLAUSE 7.3.6)
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Sekonder Terminal Secondary Terminal	SEKONDER (V) Secondary Voltage	Klas Accuracy Class	YÜK (VA at Cosφ=0.8) Burden
1	100/V3	0,2	30
2	100/3	3 P	45

SINIF TESTLERİ / Accuracy Class Tests IEC 61869-3 (CLAUSE 7.3.5)									
Sargı Winding Core	Primer Primary	Sekonder Second.	%	Yük Burden (VA)	Oran Hatası Ratio Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Oran Hatası Ratio Err. (%F)	Faz Hatası Phase Err. (min/dk)
a-n	15000/V3	100/V3		7,5			30		
			80		+0,18	+1		-0,09	+2
			120		+0,17	+1		-0,09	+2
da-dn	15000/V3	100/3		11,25			45		
			5		+1,96	+2		+1,38	+8
			190		+1,82	+3		+1,23	+9

Date 07.09.2018
Tarih

Test Operator
Güven GÜNEŞ

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VOLTAGE TRANSFORMER TEST REPORT
GERİLİM TRANSFORMATÖRÜ TEST RAPORU

Customer/Müşteri		Order No Sipariş No	618-0662-2	Serial No Seri No	2018/71930-1
Type / Tip	VTB 20-K	Insulation Level Yalıtım Seviyesi	17,5/38/95 kV	Customer P.O. No Müşteri Sip.No	3583
PRIMARY TERMINAL PRİMER TERMİNAL	A-N	PRIMARY VOLTAGE PRİMER GERİLİMİ	15/√3kV	FREQUENCY Frekans	50Hz
RATED VOL.FAC / AN.GER.YUK.K.SAY		Standard APP. Uygulanan Standart	IEC 61869-3:2011	Insulation Classe İzolasyon Sınıfı	E
1,9Un/8h&1,2Un/Continuous		Project Number Proje No		Cust. İtem Code	

Ratio / Çevirme Oranı : 15/√3/0,1/√3/0,1/3kV	YALITIM TESTLERİ / Insulation Test IEC 61869-3 (CLAUSE 7.3.1/7.3.3/7.3.4)			
EXPLANATION / Açıklama :		VOLTAGE (kV)	FRQ. (Hz)	TIME (sec.)
Visual and Mechanical Control (Görsel ve Mekanik Kontrol) Verification of Terminal Markings (Terminal İşaretlemeleri Doğrulaması)	PWR.FRQ.ON PRI.TERMINAL PRİMER YALITIM TESTİ (7.3.1.301a)	3	50	60
	INDUCED TEST VOLTAGE (7.3.1.301b) ENDÜKLEENEN TEST GERİLİMİ	38	200	30
	PWR.FRQ.ON SEC.WNDG. SEK. YALITIM TESTİ (7.3.4)	3	50	60
	BETWEEN SECTIONS BÖLÜMLER ARASI (7.3.3)	3	50	60

KİSMİ DEŞARJ TESTİ / Partial Discharge Test IEC 61869-3 (CLAUSE 7.3.2)			DIELECTRIC'S CAPACITANCE and POWER FACTOR TEST		
Gerilim / Voltage (kV)	1.2Um	1.2Um/V3	Kapasitans / Capacitance (pf)	Gerilim / Voltage (kV)	tan & (%)
Seviye / LEVEL/	6 (pC)	1 (pC)			

POLARİTE TESTİ / Polarity Test	+O.K. (IEC 61869-3 CLAUSE 7.3.6)
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Sekonder Terminal Secondary Terminal	SEKONDER (V) Secondary Voltage	Klas Accuracy Class	YÜK (VA at Cosφ=0.8) Burden
1	100/V3	0,2	30
2	100/3	3 P	45

SINIF TESTLERİ / Accuracy Class Tests IEC 61869-3 (CLAUSE 7.3.5)									
Sargı Winding Core	Primer Primary	Sekonder Second.	%	Yük Burden (VA)	Oran Hatası Ratio Err. (%F)	Faz Hatası Phase Err. (min/dk)	Yük Burden (VA)	Oran Hatası Ratio Err. (%F)	Faz Hatası Phase Err. (min/dk)
a-n	15000/V3	100/V3		7,5			30		
			80		+0,16	+1		-0,10	+2
			120		+0,15	+1		-0,11	+2
da-dn	15000/V3	100/3		11,25			45		
			5		+1,27	+2		+0,83	+5
			190		+1,09	+4		+0,57	+10

Date 05.09.2018
Tarih

Test Operator
Reşat KARAGÖZ

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SIEMENS ELECTRIC MACHINES s.r.o.

VILNIUS Wte (Lithuania) NEUTRAL AND LINE CUBICLE

COATING WORK REPORT Document n° 17.121.SIE.300

With reference to:

- Order n. 2453118039-U19

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0	29/10/2018	First Issue	Gelio A.	Dal Corso E.	Brunelli M.
REV.	DATE	DESCRIPTION	WRITTEN	CHECKED	APPROVED

COATING WORK REPORT

SURFACE PREPARATION				
Date	SEPTEMBER, 14 2018		Ref.	Comm. 17-121
Name of structure	n. 01 switchboard 3200x2200x1400 mm			
DETAILS OF SURFACE PREPARATION				
Switchboard material	☐ stainless steel ☐ aluminium type 5754 ☐ Carbon steel ☒ Galvanized carbon steel			
Rust grade of steel surface	A ☐	B ☐	C ☐	D ☐
Milling imperfections found				
Welding residues				
Surface preparation grade achieved	Sa 2			
Surface profile achieved	Rz > 30µ			
Trade name and type of blast cleaning abrasive	Non metallic abrasive			
Manufacturer of abrasive	Sabbie di Parma srl			
Air Temperature, °C.	26°C			
Surface temperature, °C.	26°C			
Relative humidity, %	54%			
Dew point, °C.	16°C			

The compiler

Roberto
ABATE ROBERTO & C. s.n.c.

COATING WORK REPORT

PAINT APPLICATION			
Date	SEPTEMBER 19, 2018		Ref. Comm. 17-121
Name of structure	n. 01 switchboard 3200x1400x2250 mm		
DETAILS OF PAINT APPLICATION INTERNAL AND EXTERNAL SURFACES			
	1 st coat	2 nd coat	3 rd coat
Date	SEPT 14, 2018	SEPT 18, 2018	
Air Temperature, °C.	26°C	28°C	
Surface temperature, °C.	26°C	28°C	
Relative humidity, %	54%	58%	
Dew point, °C.	16°C	19°C	
Designation of paint and type of coat, product no.	Epoxy primer Intergard 269	Final Coat Interthane 990	
Color	red	Ral 7030	
Batch no			
Paint manufacturer	International	International	
Method of application	Airless Air mix	Airless Air mix	
Mean N.D.F.T.	A = 75 µ	B = 75 µ	
D.F.T.	A (75 µ)	A + B (150 µ)	
D.F.T. Min. achieved	79,2 µ	152,4 µ	
D.F.T. Max. achieved	149,6 µ	224,4 µ	
D.F.T. Mean achieved	110,6 µ	187,3 µ	

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