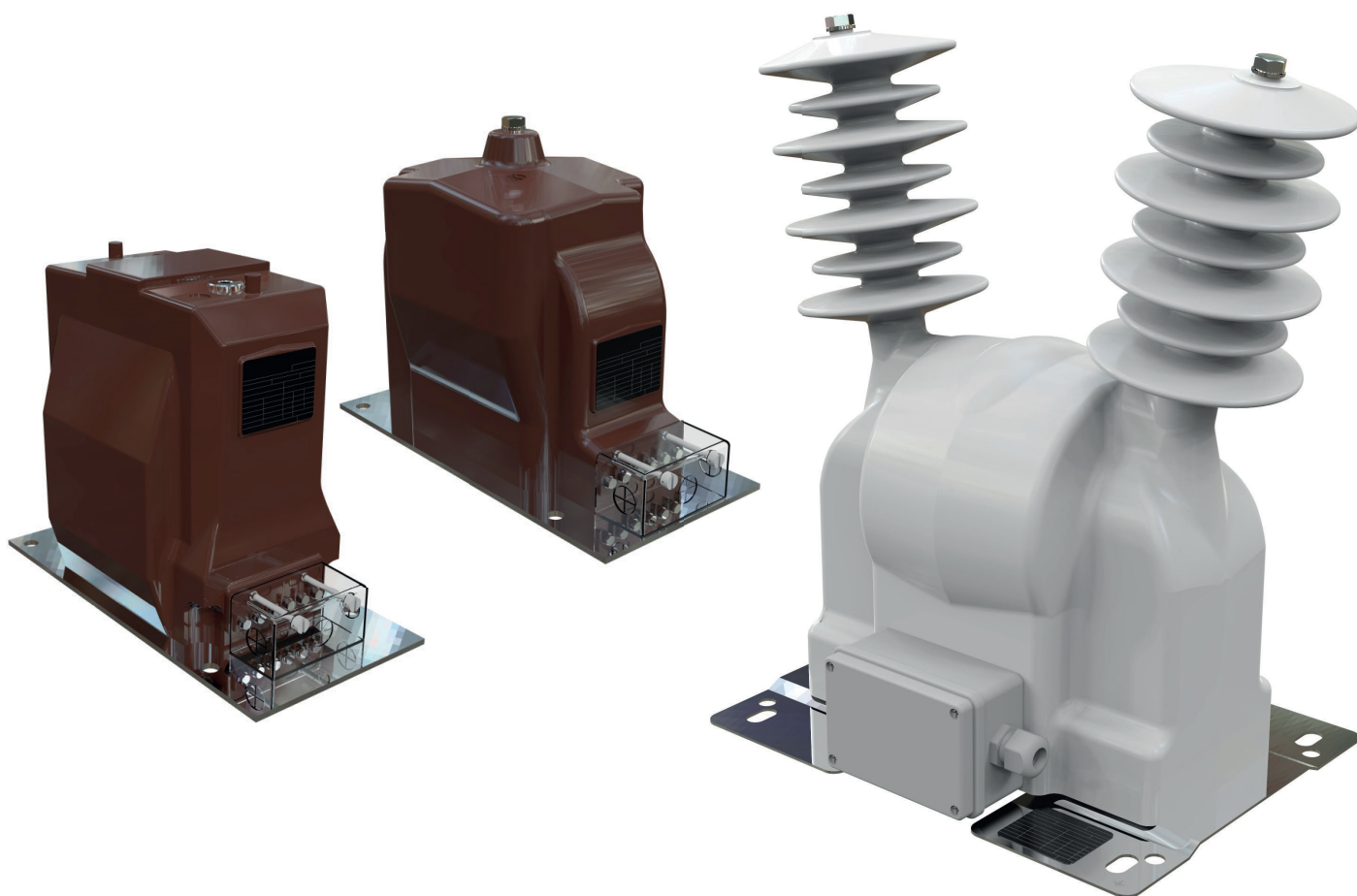




INDOOR & OUTDOOR INSTRUMENT TRANSFORMERS

CURRENT TRANSFORMERS
VOLTAGE TRANSFORMERS



SEMAR IS AN INTERNATIONAL COMPANY
WORKING ON ELECTRONIC SECTOR THAT PRODUCES
TRANSFORMERS AND POWER MODULES SINCE 1973

Founded in Castelfidardo in 1973, Semar began by producing power supplies and transformers for the local musical instrument market. Quickly adapting to the dynamic electronics sector, Semar expanded into new industries, blending established processes with innovation. Today, Semar remains a family-driven company with a strategic vision shared by its 600 employees across multiple sites. Committed to corporate social responsibility, Semar fosters a healthy workplace, supporting local suppliers and using renewable energy. Since 2011, its Italian plant has been powered by a 170 kWh photovoltaic system with ongoing repowering up to 380kwh reducing environmental impact and promoting employee well-being.

High-Accuracy Rogowski coils



1973 Semar Italy - Castelfidardo

The Italian headquarter represents the hub for research and development for the whole Group. Sales team capture customer's needs and communicate with technical engineers which design and realize prototypes, that once validated are shared with international branches for mass production.



2000 Semar Cina - Pinghu, Zhenjiang

The Chinese branch is the production hub for electrical sector of the whole Group. Divided in two production floors, here we concentrate the know-how and production of PCBA and transformer. The wide production capacity of Chinese plant make possible to face orders of high quantities coming from not only international customers but also domestic ones.



2005 Semar Tunisia - Fouchana, Tunisia

Distances are shortened and customers' requirement lead us to meet high standards on delivery time. That's why we decided to set up a factory in Tunisia: focused on winding process, the company is now capable to face elevated production peaks, keeping the efficiency high as requested.



2017 iSemar - Castelfidardo

Start-up composed by a team of qualified engineers with strong experience in electronic field: the scope is to use innovative telecommunication technologies to integrate Semar products with real-time web platform. In addition, we are able to provide integrated IoT solutions with a wide range of innovative sensors.

A NEW AND INNOVATIVE REALITY

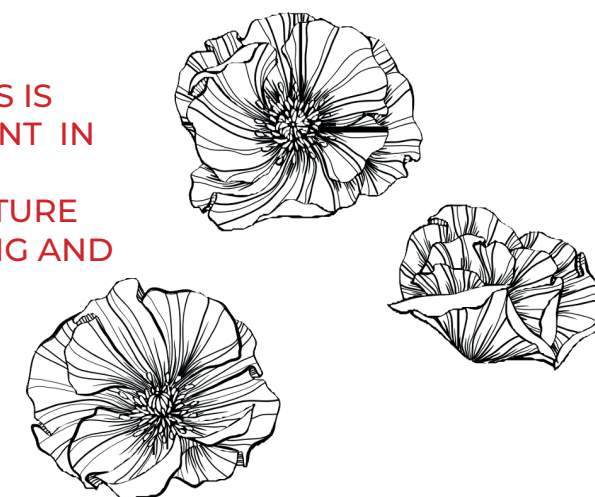
The Semar Electric inauguration took place on May 13th 2022 in Cairo Montenotte (Savona), Italy. The company has been created following the transfer of the Instrument Transformer activity for Medium Voltage application from Schneider Electric to Semar Group. Both companies operate in the electrical industry on a global level and have shared a long and profitable collaboration in the last years. The result of this strong partnership has been the sale agreement of Schneider Electric Cairo Montenotte plant, which has always been specialised in the production of Medium Voltage Instrument Transformers. This represents a unique opportunity for Semar to expand its business, while con-

tinuing to produce low voltage transformers, but to also offering high quality Medium Voltage Instrument Transformers. Semar Electric is planning substantial investments in innovative machinery, improved process based on IoT sensors technology and integrated solutions already developed by iSemar R&D pole. Moreover, a new project for the development of SF6-free Voltage Transformers is currently under deployment in consideration of the environmental sustainability. To get more info and to experience our real-time product configurator tool, you are invited to visit the webpage www.semar-electric.com

Since 2021, the Semar Group has adhered to the SDG programme, goals for sustainable development, promoted by the United Nations. Thanks to these 17 goals, it will be possible to grow uniformly, committing to a system of equal and fair rights for all. Below are the 9 of the 17 established goals to which we adhere. To find out more visit the website www.semar.com For us at Semar, sustain-

nability is a fundamental component of the way we conduct business and make strategic decisions that have an impact on the community. Since 2011, Semar has been implementing and paying special attention to the environment around us. We started our action towards the environment around us by powering production lines with photovoltaic panels. From there we have not stopped!

THE PROJECT FOR THESE UPCOMING YEARS IS MEANLY CONCENTRATED IN OUR NEW PLANT IN CAIRO MONTENOTTE (SAVONA) WHERE WE PLAN TO MOVE IN NEW STRUCTURE THAT IS GOING TO HAVE ALL ENERGY SAVING AND RENEWABLE ENERGY CHARACTERISTIC

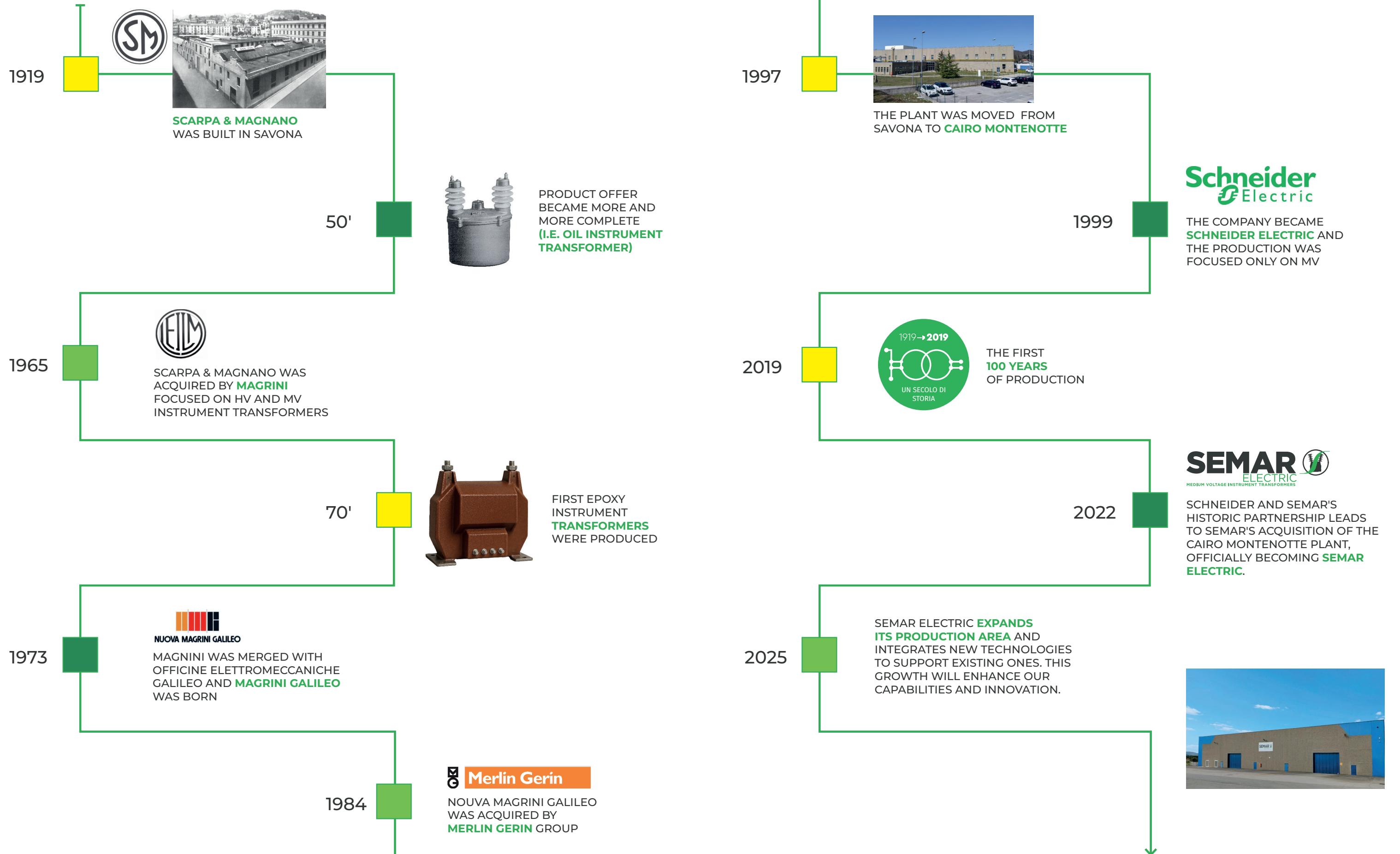


DEVELOPMENT OF NEW INSTALLATIONS

- FROM 3800 SQM TO 8200 SQM
- NEW HEATING PUMPS
- +50% OF PRODUCTION CAPACITY DUE TO NEW MACHINERY
- 1 MW PHOTOVOLTAIC SYSTEM THAT COVERS MORE THAN 60% OF ENERGY CONSUMPTION
- WE WILL NOT USE ANY GAS FOR HEATING OR IN THE PROCESS LINE
- FREE CHARGING ELECTRIC VEHICLES WITH ISEMAR CHARGING STATION
- FULL ELECTRIC INJECTION MACHINES
- INVERTER AIR COMPRESSOR



SEMAR ELECTRIC: A JOURNEY THROUGH INNOVATION



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GENERAL PRESENTATION

Instrument transformers for medium-voltage (MV) applications are essential components that accurately scale high voltages and currents to safer, measurable and standardized levels, enabling accurate metering, protection, and control of electrical power systems while ensuring the safety and reliability of equipment and personnel.

The **Semar Electric Instrument Transformers** achieve optimal performance, enhanced service continuity, increased safety and improved efficiency of monitoring and control systems.

All the Instrument Transformers manufactured and tested in Semar Electric are in compliance with the following IEC standards:

- IEC 61869-2 for Current Transformers (CT)
- IEC 61869-3 for Voltage Transformers (VT)
- IEC 61869-10 for Low Power Current Transformers (LPCT)

The Semar Electric range of instrument transformers is designed for voltages from 0,72 kV to 40,5 kV, rated currents from 5 A to 4000 A and short-time thermal current up to 60 kA x 1 second.

MAIN FEATURES

The inner working parts (windings and magnetic cores) are cast in **epoxy resin with excellent characteristics** for dual function:

1. Guarantee both internal and external electrical insulation
2. Provide enhanced mechanical strength

Product quality overtime is guarantee not only by **50 years experience** in manufacturing epoxy resin insulated instrument transformers, but also by the usage of silica filled epoxy resin which gives:

- **High dielectric strength**, even at high temperatures (18 kV/mm at 180°C for 20.000 hours)
- **Insulation class A** according to IEC 61869-1
- **High ageing performances** on both thermal, resulting from increase in temperature of structures according to IEC 60216-1 (more than 20 years at 120°C), and surface through salt mist withstand
- Lack of emissions of any harmful substances in the case of fire, in conformity with IEC standards IEC 60020-37, IEC 60020-22 and ASTM D 3286

- Outstanding behavior in tropical climates
- High mechanical strength, even at high service: epoxy resin glass transition temperature $\geq 100^{\circ}\text{C}$.

Rigorous production procedures ensure:

- **Insulation quality** – Vacuum casting prevents blisters and blowholes in the resin.
- **Low partial discharge levels** – Achieved through high-quality insulating materials.
- **Reliable electrical performance** – Strong mechanical connections provide high resistance and excellent conductivity at primary and secondary terminals, even under short-circuit conditions.
- **Consistent manufacturing quality** – A computer-controlled system manages and monitors the entire production line, ensuring stable parameters over time.

CERTIFIED QUALITY SYSTEM

Our Semar Electric quality system is certified and complies with the ISO 9001 standard.

Quality is achieved through meticulous planning and continuous monitoring at every stage, from initial design to production and testing, all the way to final delivery and after-sales service.

This commitment is demonstrated through strict adherence to certified quality standards. By following this process, we ensure that each product meets all specified requirements while also providing customers with a structured production and execution schedule that guarantees consistent quality.

Continuous testing on components and during the manufacturing process, combined with strict routine testing in accordance to IEC requirements, ensures a product of absolute reliability.

OUR CERTIFICATIONS >>

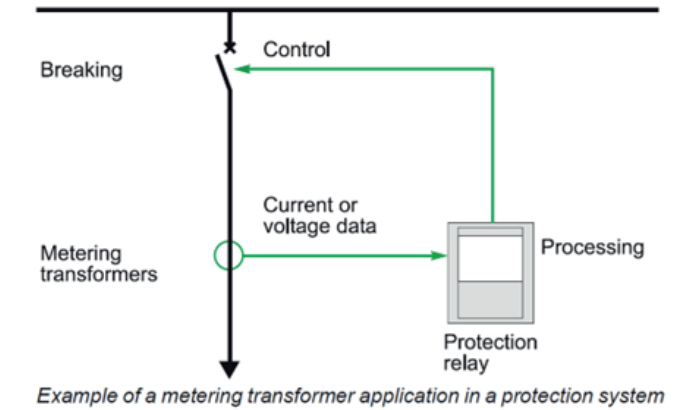


APPLICATIONS

Instrument transformers (CTs - Current Transformers and VTs - Voltage Transformers) play a crucial role in medium voltage (MV) electrical distribution.

Their primary function is to step down high currents and voltages to safer, measurable levels, enabling protection, monitoring, and control of the electrical network by following devices:

- analogue devices, directly using the supplied signal
- digital processing units with a microprocessor, after analogue/digital conversion of the input signal



KEY APPLICATIONS:

1. Power System Protection

Current transformers (CTs) or Low Power Current Transformers (LPCTs) supply signals to **protection relays**, which detect overloads, faults, or short circuits and trigger protective actions to prevent damage to equipment and personnel.

Voltage transformers (VTs) help monitor system conditions, preventing overvoltage events and network imbalances.

2. Measurement and Monitoring

Enable **accurate measurement of current, voltage, power, and energy** for billing and performance analysis.

Provide critical data for **remote monitoring and supervisory control systems (SCADA)** to ensure efficient network operation.

3. Energy Management and Control

Support **power consumption optimization** by providing essential data for demand-side management and renewable energy integration.

Contribute to **Distribution Management Systems (DMS)**, enhancing network reliability and stability.

4. Safety and Galvanic Isolation

Ensure **safe isolation** between measuring devices and primary circuits, protecting operators and equipment from hazardous voltages.

5. Application in Primary and Secondary Substations

Used in **MV substations and transformer stations**, they enable the proper operation of circuit breakers, disconnectors, and other switching devices.

Instrument transformers are essential for the safe and efficient operation of MV distribution networks, enhancing protection, power quality, and smart grid management.

MTBF

With over **1 ML** units installed on the market, Semar Electric's products have established a strong reputation for reliability and durability. Each unit is engineered with an impressive Mean Time Between Failures (MTBF), underscoring Semar Electric's commitment to providing robust and dependable solutions. This high MTBF rate ensures minimal downtime and operational continuity, making our transformers a trusted choice for industries requiring stability and long-lasting performance.

GLASS TRANSITION

Our transformers are built with high standards of quality and performance. The resin used in our products features a high glass transition index, ensuring enhanced stability and durability even under demanding conditions. This quality, combined with a solid reliability index for each transformer, guarantees that our units deliver consistent performance and resilience, making them a dependable choice for various industrial applications.

OVER 1 MILLION SENSORS INSTALLED WORLDWIDE
OVER 50 YEARS OF EXPERIENCE IN EPOXY RESIN CT/VT



CURRENT TRANSFORMER

A Current Transformer (CT) is an instrument transformer used to measure high currents in medium-voltage electrical systems by reducing them to a lower, manageable level for metering and protection devices.

A Current Transformer (CT) has three main functions:

1. **Measurement** for Metering & Energy Monitoring:
CTs reduce high currents to a standard, lower level that can be safely measured by instruments like ammeters, wattmeters, and meters ensuring accurate power consumption monitoring.
2. **Protection** for Protection Relay & Fault Detection:
CTs supply current to protective relays, which detect abnormal conditions like overcurrent, short circuits, or earth faults. If a fault is detected, the relay triggers circuit breakers to isolate the affected section, preventing equipment damage.
3. **Isolation & Safety** by providing Electrical Insulation between High & Low Voltage Circuits:
CTs allow safe current monitoring by electrically isolating the high-voltage power circuit from low-voltage measuring devices to protect instruments and operators.

The Current Transformers are designed and manufactured in conformity with IEC 61869-2 standard.

TYPES

There are three basic types of current transformers:

- **Wound Type**
The wound-type CTs have a primary winding (either a single turn or multiple turns) connected in series directly to the power line or electrical conductor being monitored. The secondary winding, wrapped around the ferromagnetic core, delivers the reduced current (typically 1A or 5A), proportionally scaled down according to the transformation ratio. This current is induced by the magnetic flux concentrated in the core generated by the primary current.
- **Bar Passing Type (or Window Type)**
Bar-type CTs do not have primary winding, but they use the actual cable or bus-bar of the main circuit as primary winding, which is equivalent to a single turn. The Current transformers still provide the full insulation between the primary and secondary circuits.
- **Toroidal Type**
Toroidal CTs also do not have a primary winding that will instead consist of the MV cable that will pass through the central opening of the toroid, which is equivalent to a single turn. The CT does not inherently provide built-in insulation between the primary and secondary circuits, as it relies entirely on the insulation of the conductor itself.

MAIN CHARACTERISTICS

These are defined in IEC 61869-2 standards.

Rated Insulation levels

It refers to the standardized voltage values that define the ability of electrical equipment to withstand dielectric stress without failure. These levels include:

Highest voltage for equipment (Um) e.g.: 24 kV

The highest voltage for equipment (Um) is the highest RMS line-to-line voltage for which an instrument transformer is designed to withstand in terms of its insulation and other related characteristics. It defines the insulation level of the equipment and it represents the maximum voltage that the equipment's insulation system can safely handle under normal operating conditions. It dictates the dielectric tests like partial discharge measurements and impulse voltage withstand tests that the equipment must pass to ensure its reliability and safety.

The highest voltage for equipment (Um) shall be equal to or higher than the highest operating voltage of the system (Usys) where the Instrument Transformer will be installed.

Rated power-frequency withstand voltage (RMS) e.g.: 50 kV

The Rated Power-Frequency Withstand Voltage on primary terminals is the RMS value of the power-frequency voltage that the insulation of the instrument transformer is designed to withstand for a specified duration (typically 1 minute). This test verifies the insulation's ability to withstand continuous operating voltage and temporary overvoltages at the system's normal frequency.

Rated lightning impulse withstand voltage (peak) e.g.: 125 kV

The Rated Lightning Impulse Withstand Voltage on primary terminals is the peak value of the lightning impulse voltage that the insulation of the instrument transformer is designed to withstand without flashover or puncture.

Lightning impulses simulate the very short duration, high-magnitude overvoltages that occur due to lightning strikes on the power system.

Rated frequency (fr)

It's the nominal operating frequency at which the current transformers are designed to function optimally. It is typically 50 Hz or 60 Hz, depending on the power system standard of the region.

Rated primary current (Ipr)

Value of the primary current on which the performance of the CT is based.

The standard values for rated primary current are: 10, 15, 20, 30, 50, 75 A and their decimal multiples or fractions.

Rated secondary current (Isr)

Value of the secondary current on which the performance of the CT is based.

The standard values for rated secondary current are 1 A and 5 A.

Rated Transformation ratio (Kr)

Ratio of the Rated primary current to the rated secondary current. (e.g.: 100/5A)

$K_r = I_{pr} / I_{sr}$

Rated Short-time thermal current (Ith)

Maximum value of the primary current which a transformer will withstand for a specified short time without damage.

It is expressed in kA or in a multiple of the rated primary current (e.g.: 80 x Ipr)

The standard value for the duration of the rated short-time thermal current is 1 s.

Short-time thermal current peak value

Rated dynamic current (Idyn)

Maximum peak value of the primary current which a transformer will withstand, without being damaged electrically or mechanically by the resulting electromagnetic forces.

The standard value of the rated dynamic current (Idyn) is 2,5 times the rated short-time thermal current (Ith).

Rated burden

The value of the burden on which the accuracy requirements of a specification are based.

The standard values for rated secondary rated burden are: 5, 7.5, 10, 15, 20, 30, 50 VA

Accuracy class

It's the designation assigned to an instrument transformer error of which remain within specified limits under prescribed conditions of use.

Defines the limits of error guaranteed on the transformation ratio and on the phase shift under the specified conditions of power and current. Classes 0.5 and 1 are used for metering class P for protection.

The standard accuracy classes for measuring current transformers are: 0,1 – 0,2 – 0,2S – 0,5 – 0,5S – 1

The standard accuracy classes for protective current transformers are: 5P and 10P

Ratio error (ε)

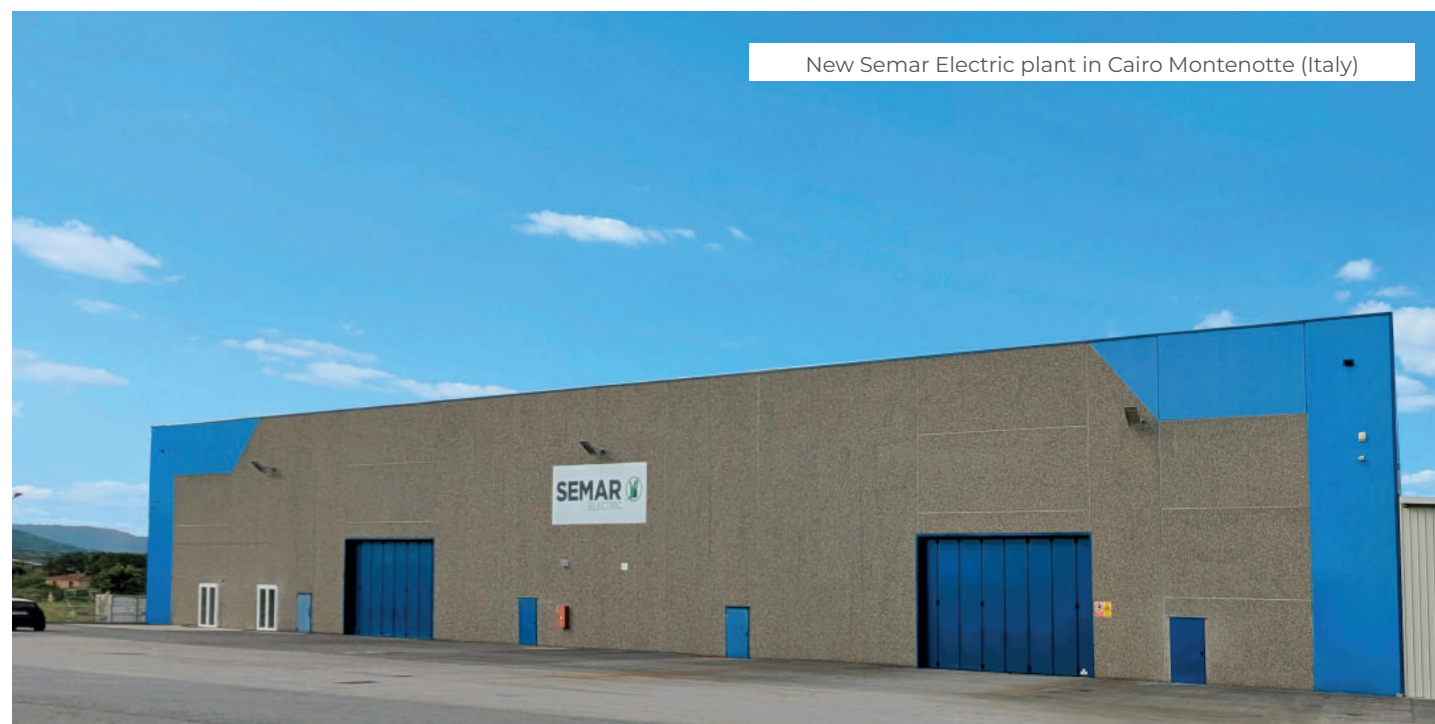
Error which an instrument transformer introduces into the measurement and which arises from the fact that the actual transformation ratio is not equal to the rated transformation ratio.

in the measurement of a current when the transformation ratio is different from the rated value.

Phase displacement (Δφ)

Difference in phase between the primary current phasor and the secondary current phasor.

It is typically expressed in minutes.



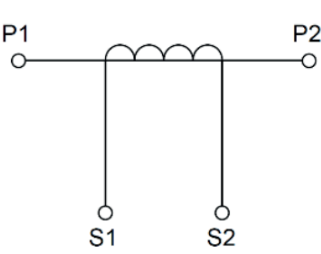
New Semar Electric plant in Cairo Montenotte (Italy)



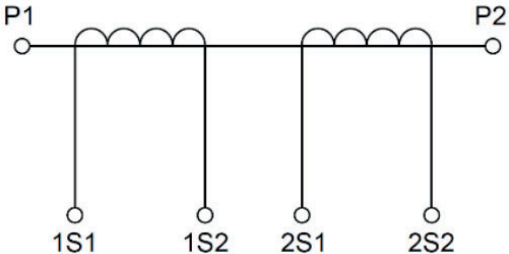
Semar Electric manufacturing area

CONNECTIONS DIAGRAMS

These are defined in IEC 61869-2 standards
Single Ratio Current Transformers



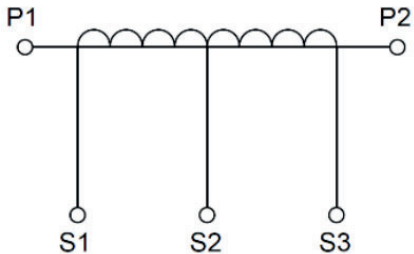
Two secondaries



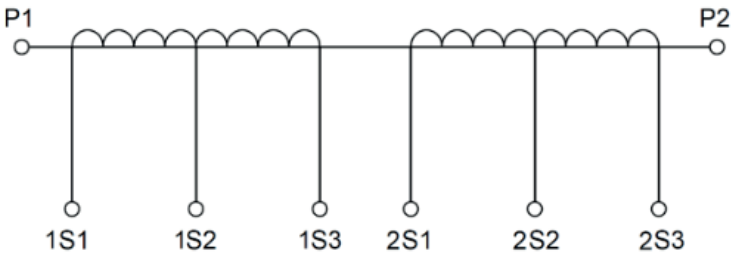
One secondary

Double Ratio Current Transformers

CT with an intermediate tapping on secondary winding:

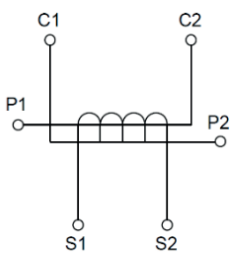


One secondary

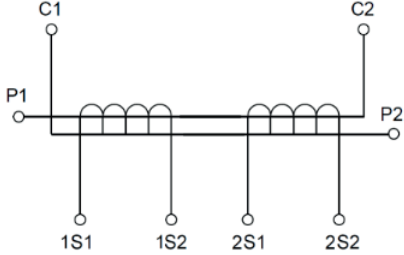


Two secondaries

CT with primary winding in 2 sections intended for connections either in series or in parallel



One secondary



Two secondaries

Primary winding sections in series: Lower Primary Current
Primary winding sections in parallel: Higher Primary Current

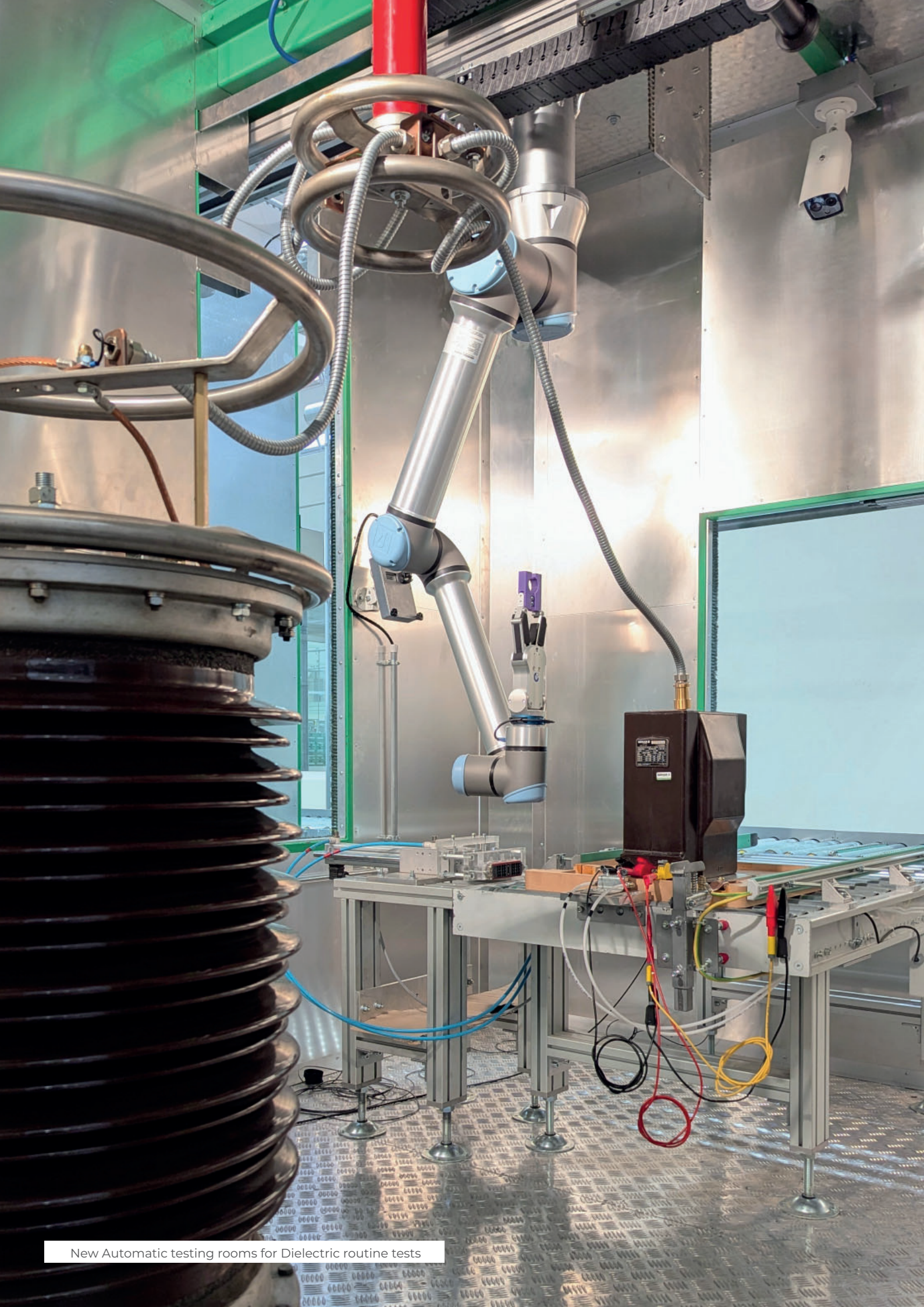
OPERATION CONDITIONS AND SAFETY INSTRUCTIONS

- Always turn off all power supplies before connecting the transformer, in accordance with safety regulations.
- Do not touch the terminals or any other parts of the transformer unless they are known to be safely grounded.
- Always ground the secondary earthing terminal and the metallic base plate, if present.
- If not present, ensure that the transformer fi xing screws at the bottom are properly connected to earth.
- Before energizing the transformer, all connections and fi xings must be checked carefully.
- One of the terminals of each secondary winding must be earthed to prevent dangerous voltages during operation.
- In case of changing ratio with tapping at secondary side, the terminal not used must be left open.
- For CTs with Capacitive divider terminal, if not used it must be connected to earth.

ATTENTION: For Current Transformers (CTs) with more secondary windings, those not in use **MUST BE SHORT-CIRCUITED.**



Middle East Energy 2025 exhibition in Dubai



New Automatic testing rooms for Dielectric routine tests

INDOOR CURRENT TRANSFORMER Models



DESCRIPTION

The **AD12** and **AD13** are Current Transformers for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-2 standard.

The **CTs** are manufactured in conformity with DIN 42600-8 dimensions with insulation voltages up to 17,5 kV.

The **AD12** and **AD13** Current transformers are designed for both single-turn or multi-turn versions, with single or double ratio with possibility to be reconnectable on the secondary side or also at primary side if requested.

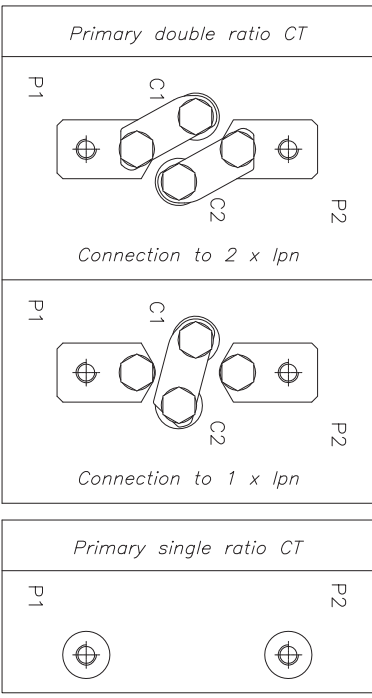
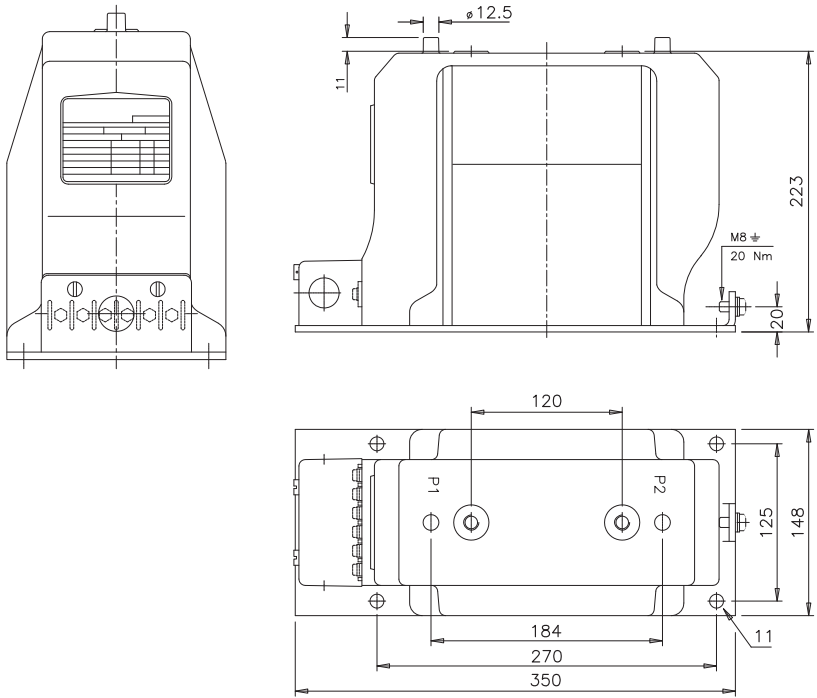
The **Current Transformers** can be mounted in any position by using the proper base plate with M8 Earth connection at the rear. The terminal cover is always provided and it is sealable.



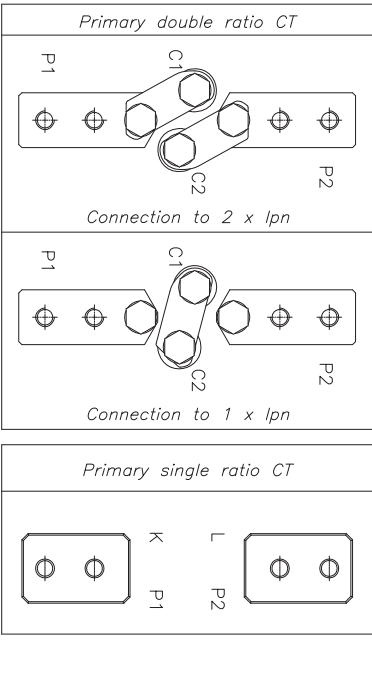
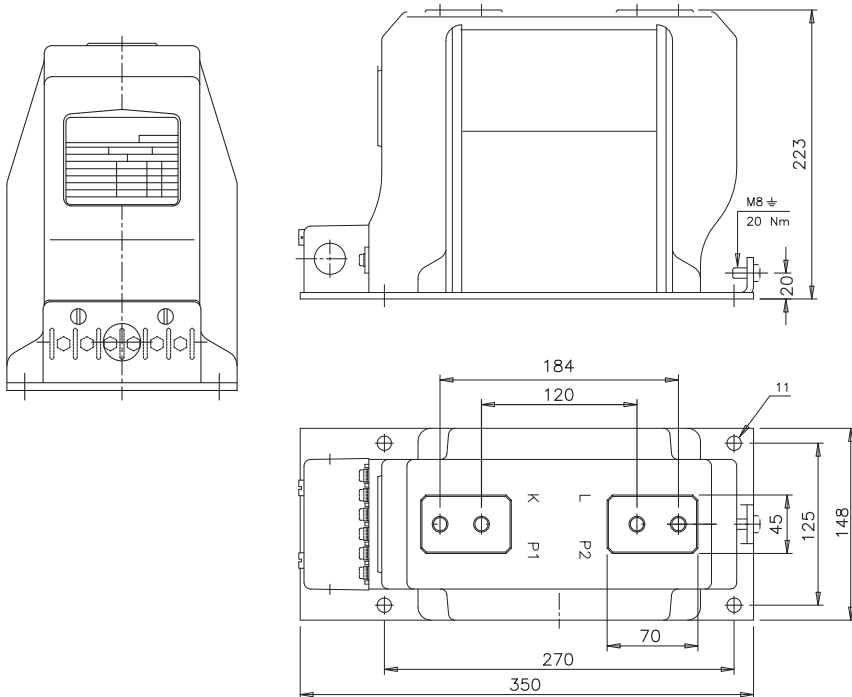
TECHNICAL DATA

		AD12	AD13
Highest voltage for equipment (Um)	kV	7,2	12
Rated power-frequency withstand voltage (RMS)	kV	20	28
Rated lightning impulse withstand voltage (peak)	kV	60	75
Rated frequency (fr)	Hz	50 - 60	
Rated short-time thermal current (Ith)	kA/s	up to 40kA / 1s	up to 60kA / 1s
Rated primary current (Ipr)	A	up to 800	up to 1250
Rated Secondary current (Isr)	A	5 - 1	
Rated dynamic current (Idyn)	kA	2,5 Ith	
Max number of secondaries		3	
Accuracy classes for measure		1 - 0,5 - 0,5S - 0,2 - 0,2S	
Accuracy classes for protection		5P - 10P - PX	
Thermal class		A	
Operating ambient temperature categories	°C	-25/+40	-5/+50
Weight (approx.)	Kg	20	

AD12



AD13



DESCRIPTION

AD21 and **AD22** are Current Transformers for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-2 standard.

The **CTs** are manufactured in conformity with DIN 42600-8 dimensions with insulation voltages up to 24 kV.

The **AD21** and **AD22** Current transformers are designed for both single-turn or multi-turn versions, with single or double ratio with possibility to be reconnectable on the secondary side or also at primary side if requested.

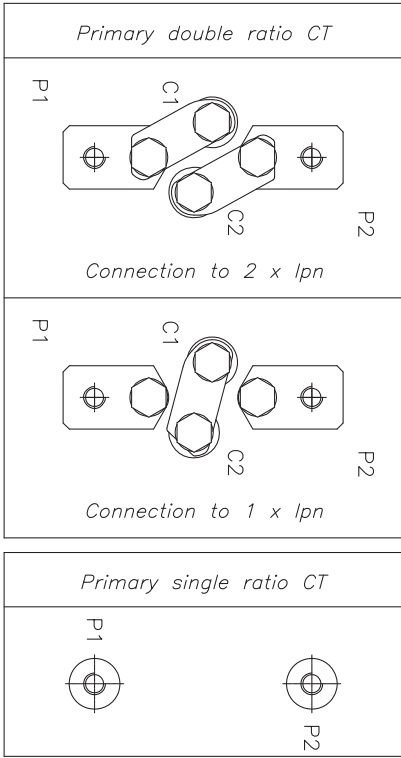
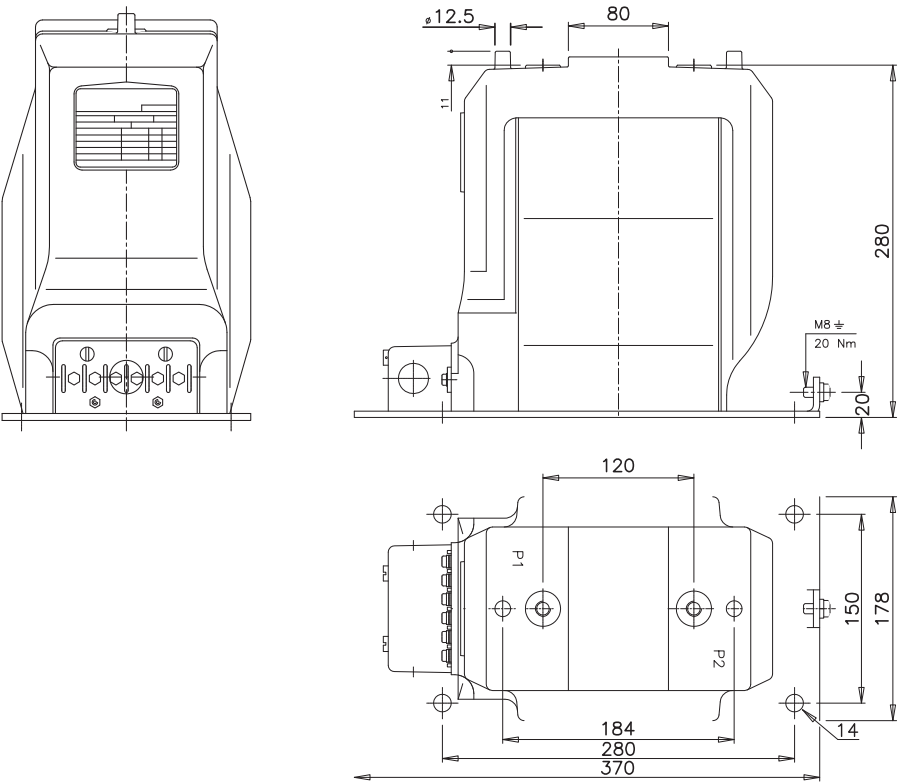
The **Current Transformers** can be mounted in any position by using the proper base plate with M8 Earth connection at the rear. The terminal cover is always provided and it is sealable.



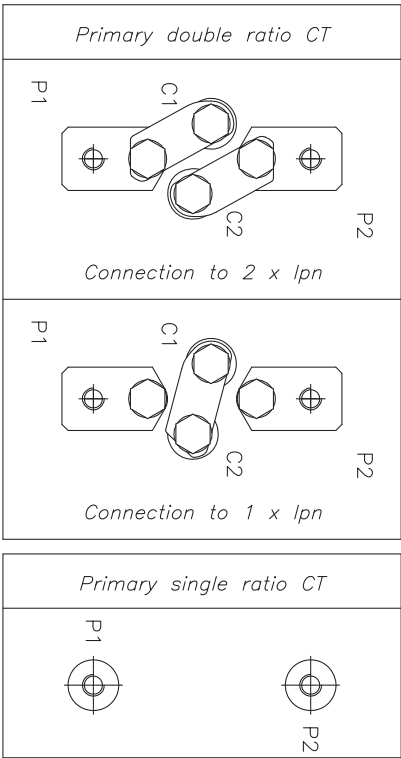
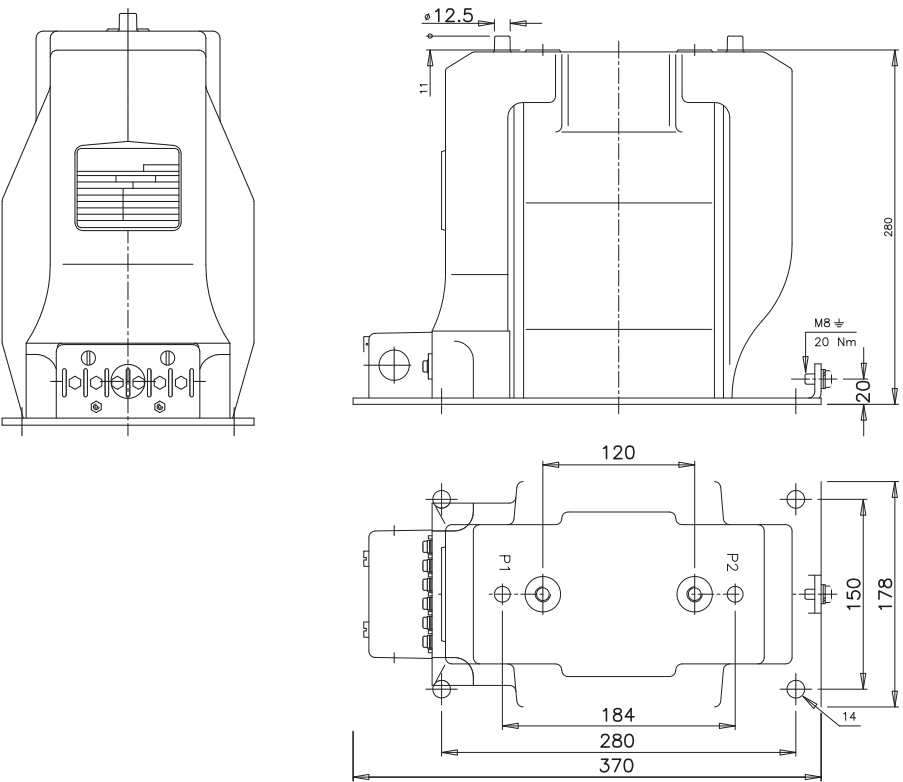
TECHNICAL DATA

		AD21	AD22
Highest voltage for equipment (Um)	kV	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	38	50
Rated lightning impulse withstand voltage (peak)	kV	95	125
Rated frequency (fr)	Hz	50 - 60	
Rated short-time thermal current (Ith)	kA/s	up to 40kA / 1s	
Rated primary current (Ipr)	A	up to 800	
Rated Secondary current (Isr)	A	5 - 1	
Rated dynamic current (Idyn)	kA	2,5 Ith	
Max number of secondaries		3	
Accuracy classes for measure		1 - 0,5 - 0,5S - 0,2 - 0,2S	
Accuracy classes for protection		5P - 10P - PX	
Thermal class		A	
Operating ambient temperature categories	°C	-25/+40	-5/+50
Weight (approx.)	Kg	28	

AD21



AD22



DESCRIPTION

AD23 is a Current Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-2 standard.

The **CT** is manufactured in conformity with DIN 42600-8 dimensions with insulation voltages up to 24 kV.

The **AD23** Current transformer is designed for only single-turn version, with single or double ratio with possibility to be reconnectable on the secondary side.

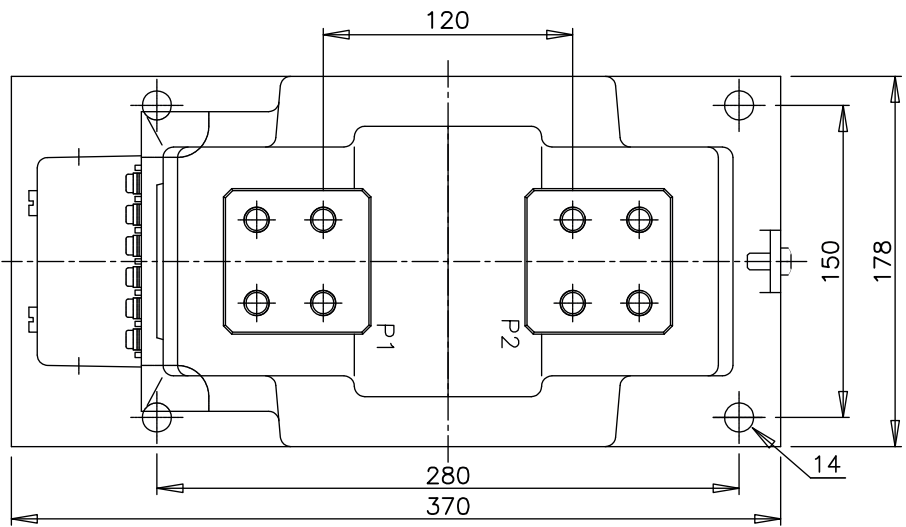
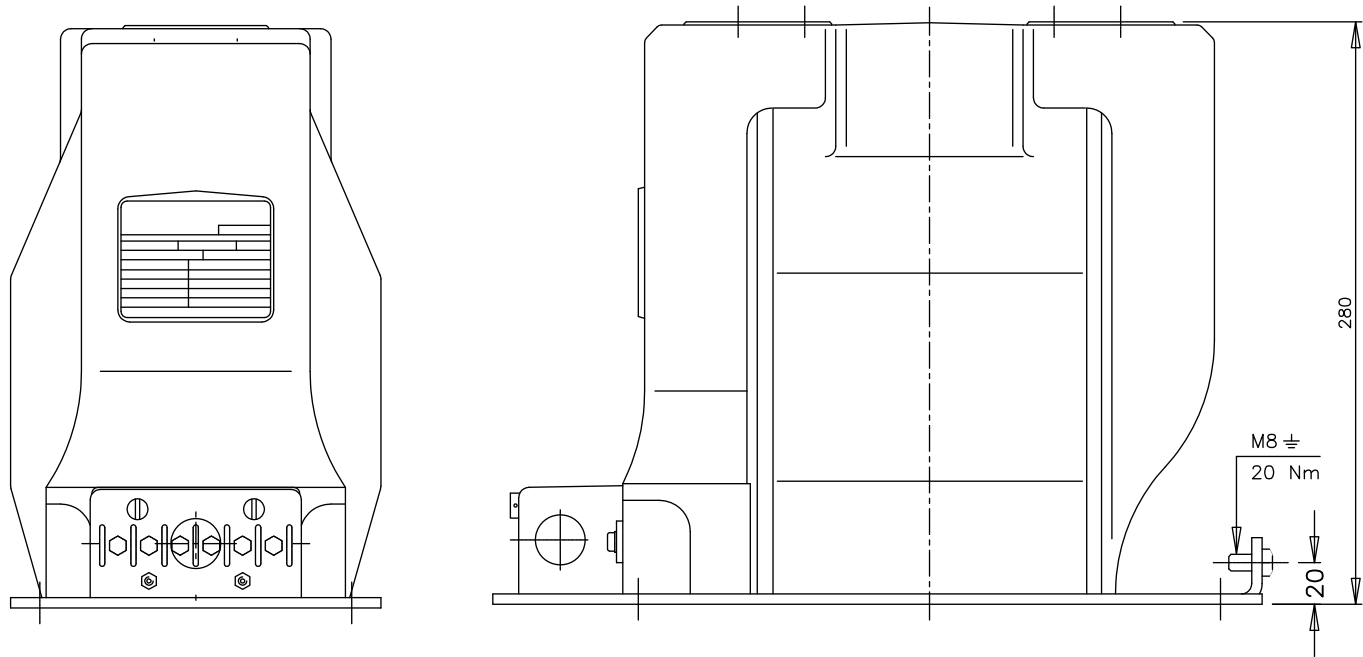
The **Current Transformers** can be mounted in any position by using the proper base plate with M8 Earth connection at the rear. The terminal cover is always provided and it is sealable.



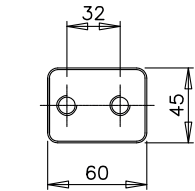
TECHNICAL DATA

AD23					
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated short-time thermal current (Ith)	kA/s	up to 40kA / 1s			
Rated primary current (Ipr)	A	up to 2500			
Rated Secondary current (Isr)	A	5 - 1			
Rated dynamic current (Idyn)	kA	2,5 Ith			
Max number of secondaries		3			
Accuracy classes for measure		1 - 0,5 - 0,5S - 0,2 - 0,2S			
Accuracy classes for protection		5P - 10P - PX			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40 -5/+50			
Weight (approx.)	Kg	30			

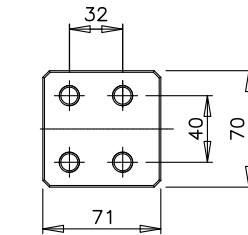
AD23



Detail primary terminals



UP TO I_{PR} 1250A



UP TO I_{PR} 2500A

DESCRIPTION

ARJP1 is a Current Transformers for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-2 standard.

The **CT** is brick/support type with barriers in resin at primary side and insulation voltages up to 24 kV.

The **ARJP1** Current transformer is designed for both single-turn or multi-turn versions, with single or double ratio with possibility to be reconnectable on the secondary side.

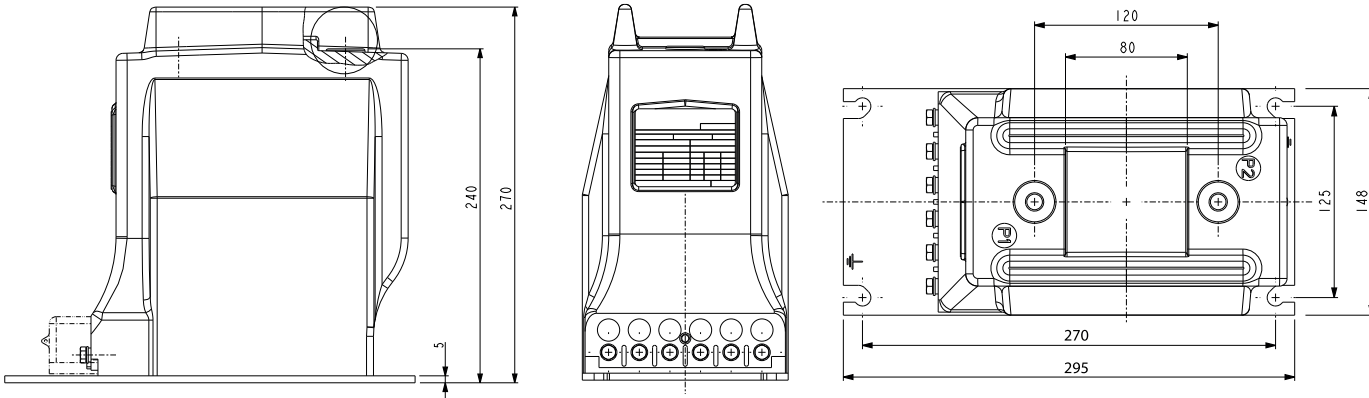
The **Current Transformer** ARJP1 can be provided with its standard flat base plate h.5mm, in the version ARJP1-J with base plate h.25mm or in the version ARJP1-F without any base plate. The terminal cover can be provided as accessory and it is sealable.



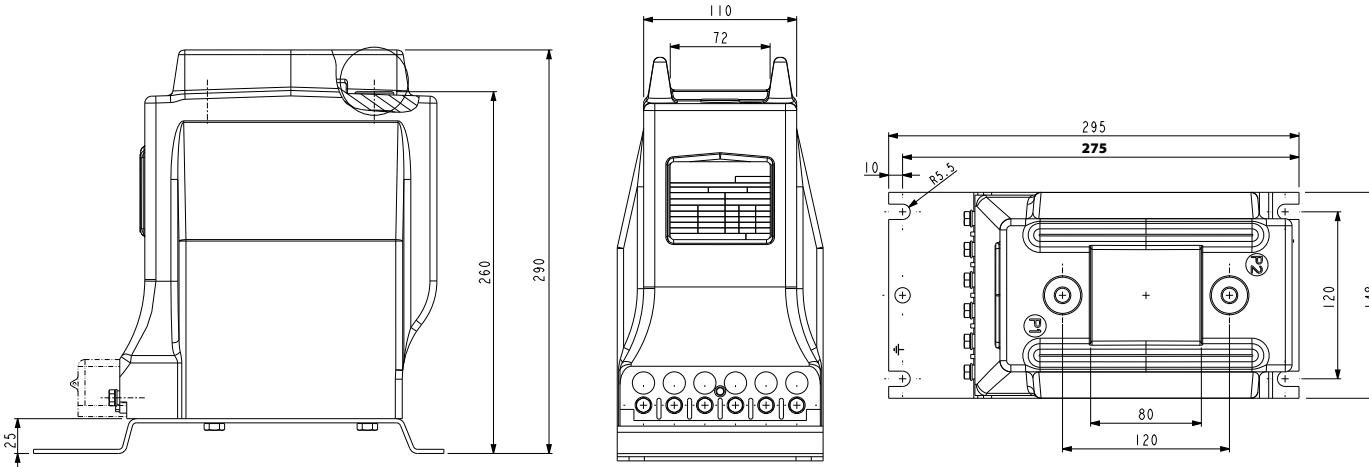
TECHNICAL DATA

ARJP1					
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated short-time thermal current (Ith)	kA/s	up to 50kA / 1s			
Rated primary current (Ipr)	A	up to 800			
Rated Secondary current (Isr)	A	5 - 1			
Rated dynamic current (Idyn)	kA	2,5 Ith			
Max number of secondaries		2			
Accuracy classes for measure		1 - 0,5 - 0,5S - 0,2 - 0,2S			
Accuracy classes for protection		5P - 10P - PX			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40 -5/+50			
Weight (approx.)	Kg	16			

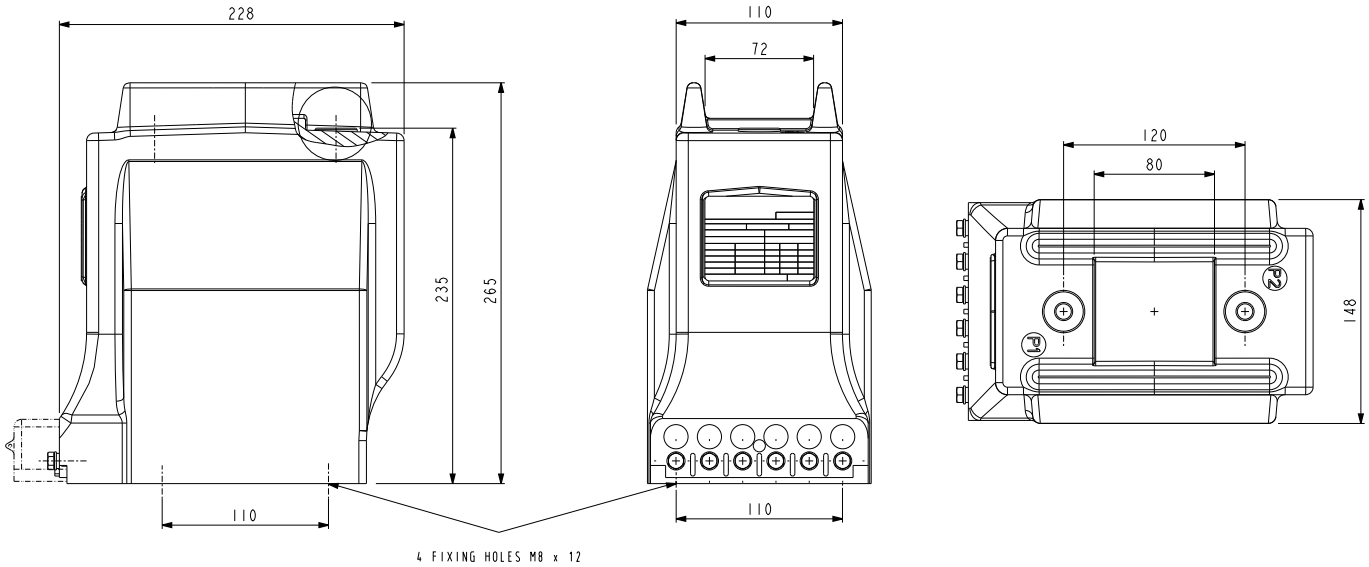
ARJP1



ARJP1-J



ARJP1-F



DESCRIPTION

ARJP2 is a Current Transformers for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-2 standard.

The **CT** is brick/support type with barriers in resin at primary side and insulation voltages up to 24 kV.

The **ARJP2** Current transformer is designed for both single-turn or multi-turn versions, with single or double ratio with possibility to be reconnectable on the secondary side.

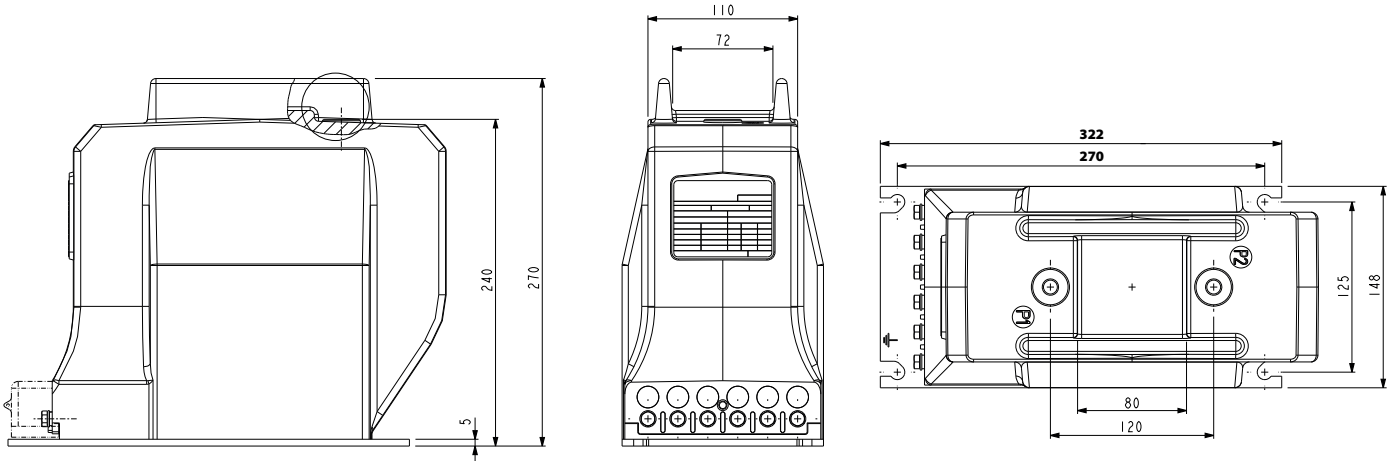
The **Current Transformer ARJP2** can be provided with its standard flat base plate h.5mm, in the version ARJP2-J with base plate h.25mm or in the version ARJP2-F without any base plate. The terminal cover can be provided as accessory and it is sealable.



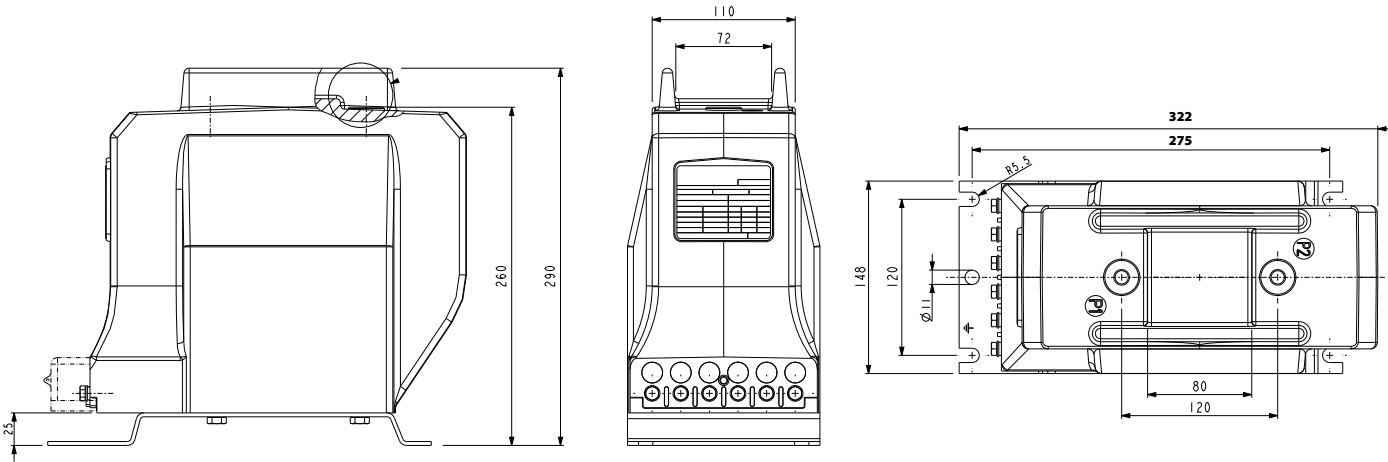
TECHNICAL DATA

ARJP2					
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated short-time thermal current (Ith)	kA/s	up to 50kA / 1s			
Rated primary current (Ipr)	A	up to 800			
Rated Secondary current (Isr)	A	5 - 1			
Rated dynamic current (Idyn)	kA	2,5 Ith			
Max number of secondaries		3			
Accuracy classes for measure		1 - 0,5 - 0,5S - 0,2 - 0,2S			
Accuracy classes for protection		5P - 10P - PX			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40 -5/+50			
Weight (approx.)	Kg	19			

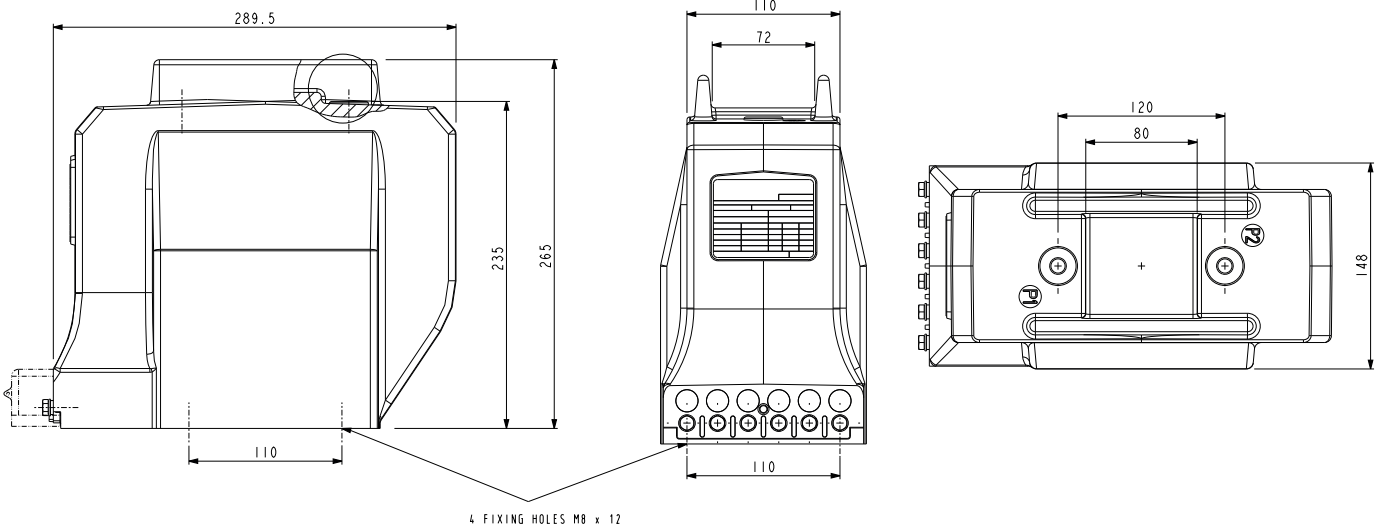
ARJP2



ARJP2-J



ARJP2-F



DESCRIPTION

ARJP3 is a Current Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-2 standard.

The **CT** is a brick/support type with barriers in resin at primary side and insulation voltages up to 24 kV.

The **ARJP3** Current transformer is designed for only single-turn version, with single or double ratio with possibility to be reconnectable on the secondary side.

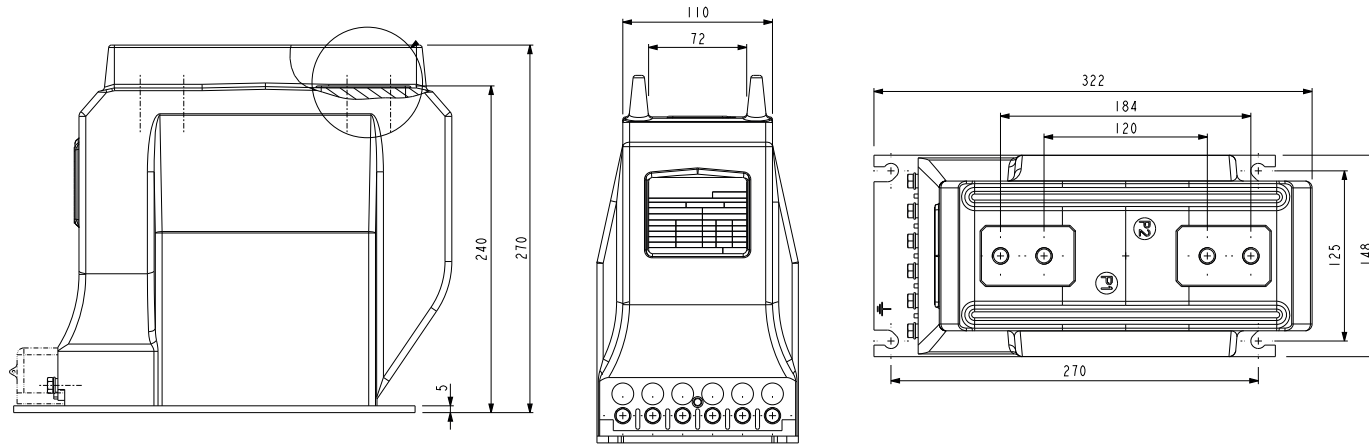
The **Current Transformer ARJP3** can be provided with its standard flat base plate h.5mm, in the version ARJP3-J with base plate h.25mm or in the version ARJP3-F without any base plate. The terminal cover is always provided and it is sealable.



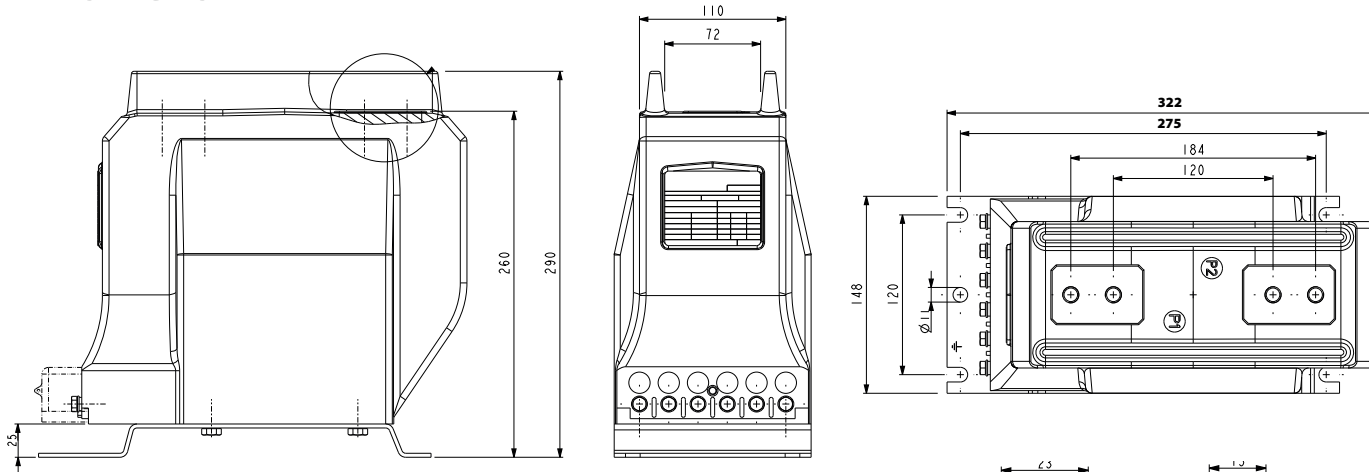
TECHNICAL DATA

ARJP3					
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated short-time thermal current (Ith)	kA/s	up to 60kA / 1s			
Rated primary current (Ipr)	A	up to 1250			
Rated Secondary current (Isr)	A	5 -1			
Rated dynamic current (Idyn)	kA	2,5 Ith			
Max number of secondaries		3			
Accuracy classes for measure		1 - 0,5 - 0,5S - 0,2 - 0,2S			
Accuracy classes for protection		5P - 10P - PX			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40 -5/+50			
Weight (approx.)	Kg	22			

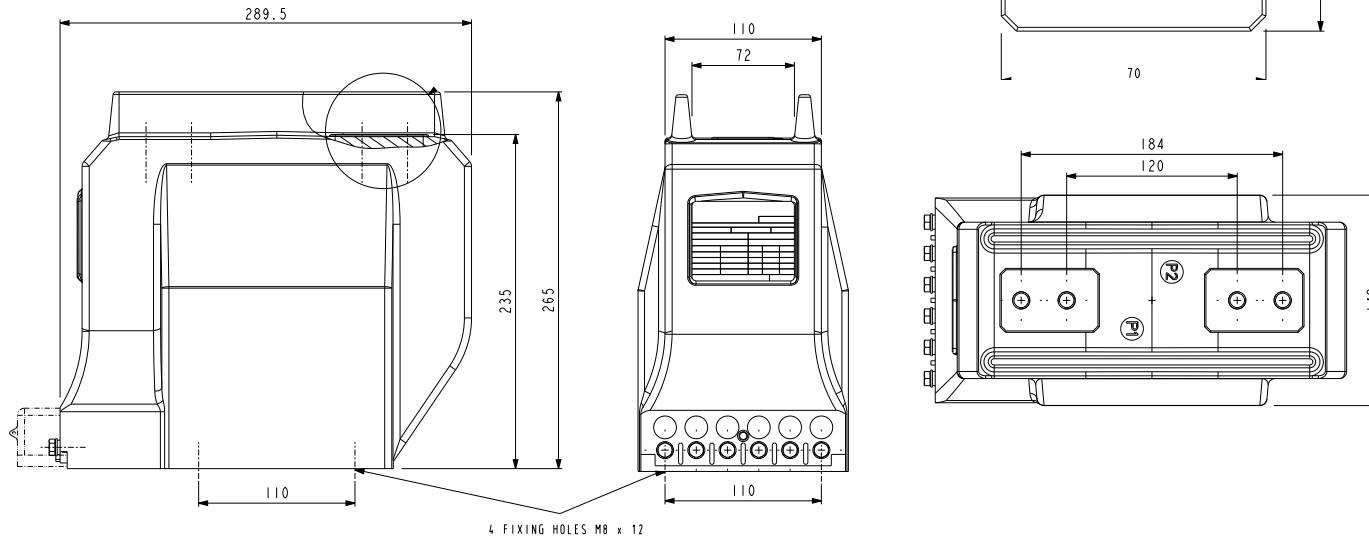
ARJP3



ARJP3-J



ARJP3-F



DESCRIPTION

ARM3 is a Current Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-2 standard.

The **CT** is manufactured in conformity with CEI-UNEL 21009 dimensions with insulation voltages up to 24 kV.

The **ARM3 Current transformer** is designed for both single-turn or multi-turn versions, with single or double ratio with possibility to be reconnectable on the primary side or also at secondary side if requested.

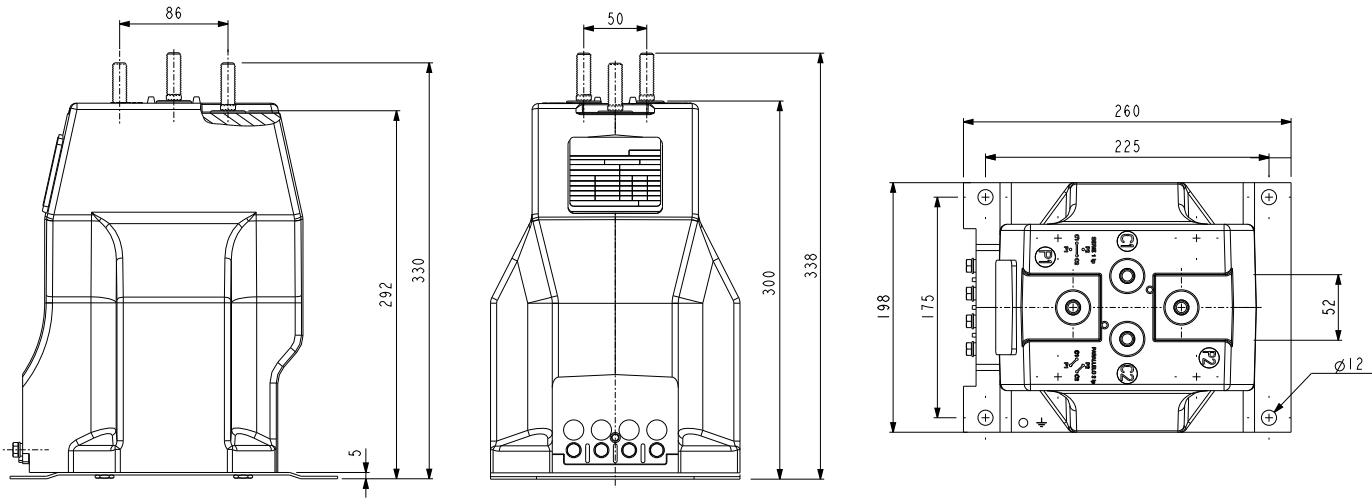
The **Current Transformers ARM3** is provided with its proper base plate or in the version ARM3-F without any base plate. The terminal cover can be provided as accessory and it is sealable.



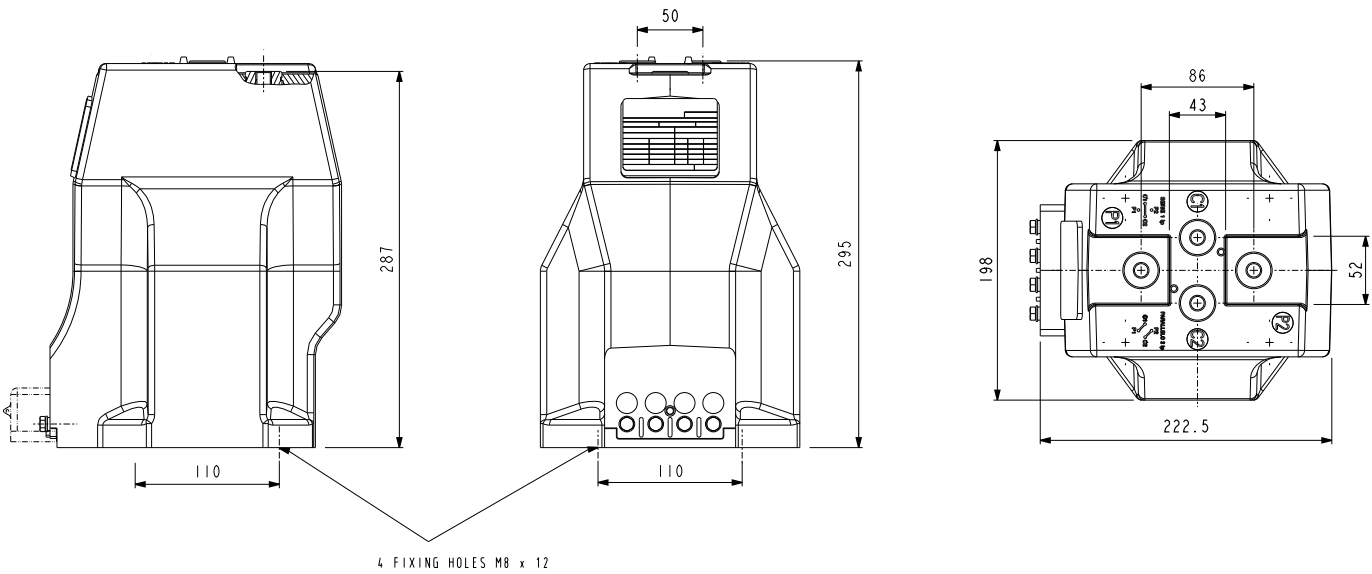
TECHNICAL DATA

ARM3					
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated short-time thermal current (Ith)	kA/s	up to 40kA / 1s			
Rated primary current (Ipr)	A	up to 800			
Rated Secondary current (Isr)	A	5 - 1			
Rated dynamic current (Idyn)	kA	2,5 Ith			
Max number of secondaries		2			
Accuracy classes for measure		1 - 0,5 - 0,5S - 0,2 - 0,2S			
Accuracy classes for protection		5P - 10P - PX			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40 -5/+50			
Weight (approx.)	Kg	20			

ARM3



ARM3 F



DESCRIPTION

ARM4 is a Current Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-2 standard.

The **CT** is manufactured in conformity with CEI-UNEL 21009 dimensions with insulation voltages up to 24 kV.

The **ARM4 Current transformer** is designed for both single-turn or multi-turn versions, with single or double ratio with possibility to be reconnectable on the primary side or also at secondary side if requested.

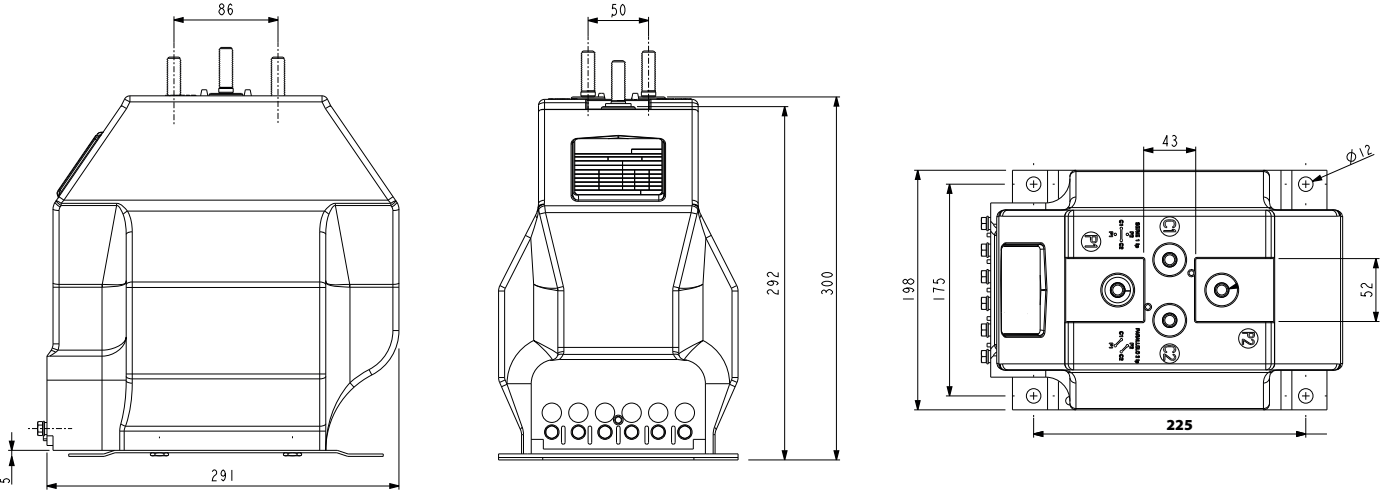
The Current Transformers ARM4 is provided with its proper base plate or in the version ARM4-F without any base plate. The terminal cover can be provided as accessory and it is sealable.



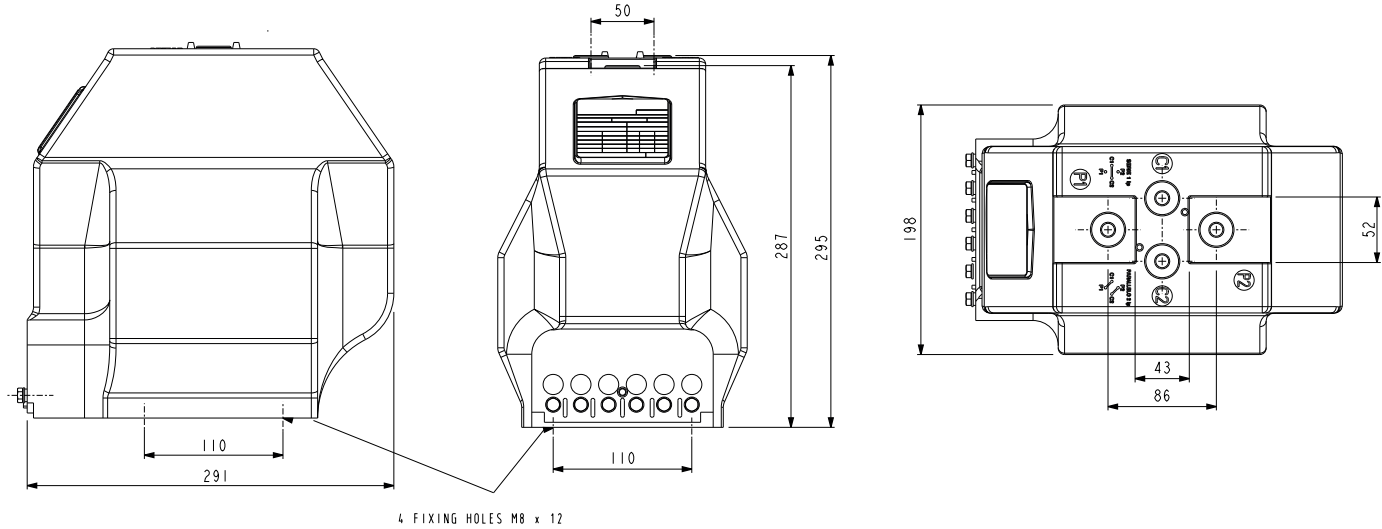
TECHNICAL DATA

ARM4					
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated short-time thermal current (Ith)	kA/s	up to 40kA / 1s			
Rated primary current (Ipr)	A	up to 800			
Rated Secondary current (Isr)	A	5 - 1			
Rated dynamic current (Idyn)	kA	2,5 Ith			
Max number of secondaries		3			
Accuracy classes for measure		1 - 0,5 - 0,5S - 0,2 - 0,2S			
Accuracy classes for protection		5P - 10P - PX			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40 -5/+50			
Weight (approx.)	Kg	20			

ARM4



ARM4-F



ARM6T



DESCRIPTION

ARM6T is a Current Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-2 standard.

The **CT** is a brick/support type with insulation voltages up to 36 kV.

The **ARM6T** Current transformer is designed for both single-turn or multi-turn versions, with single or double ratio with possibility to be reconnectable only at secondary side.

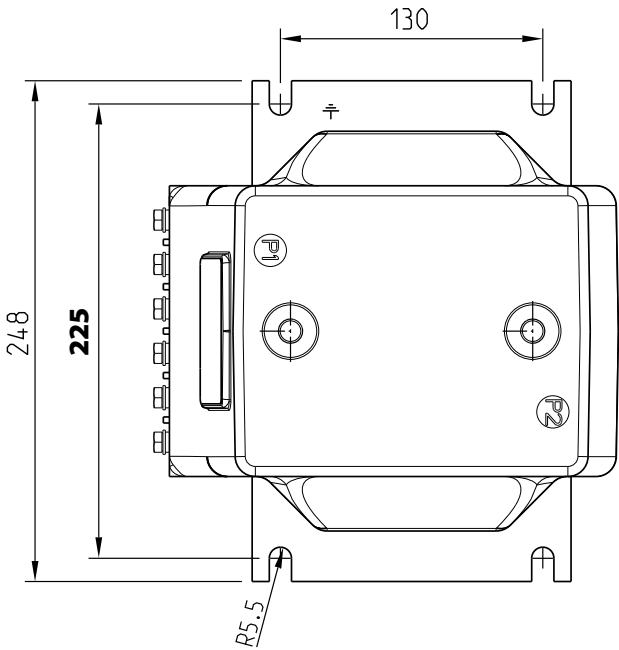
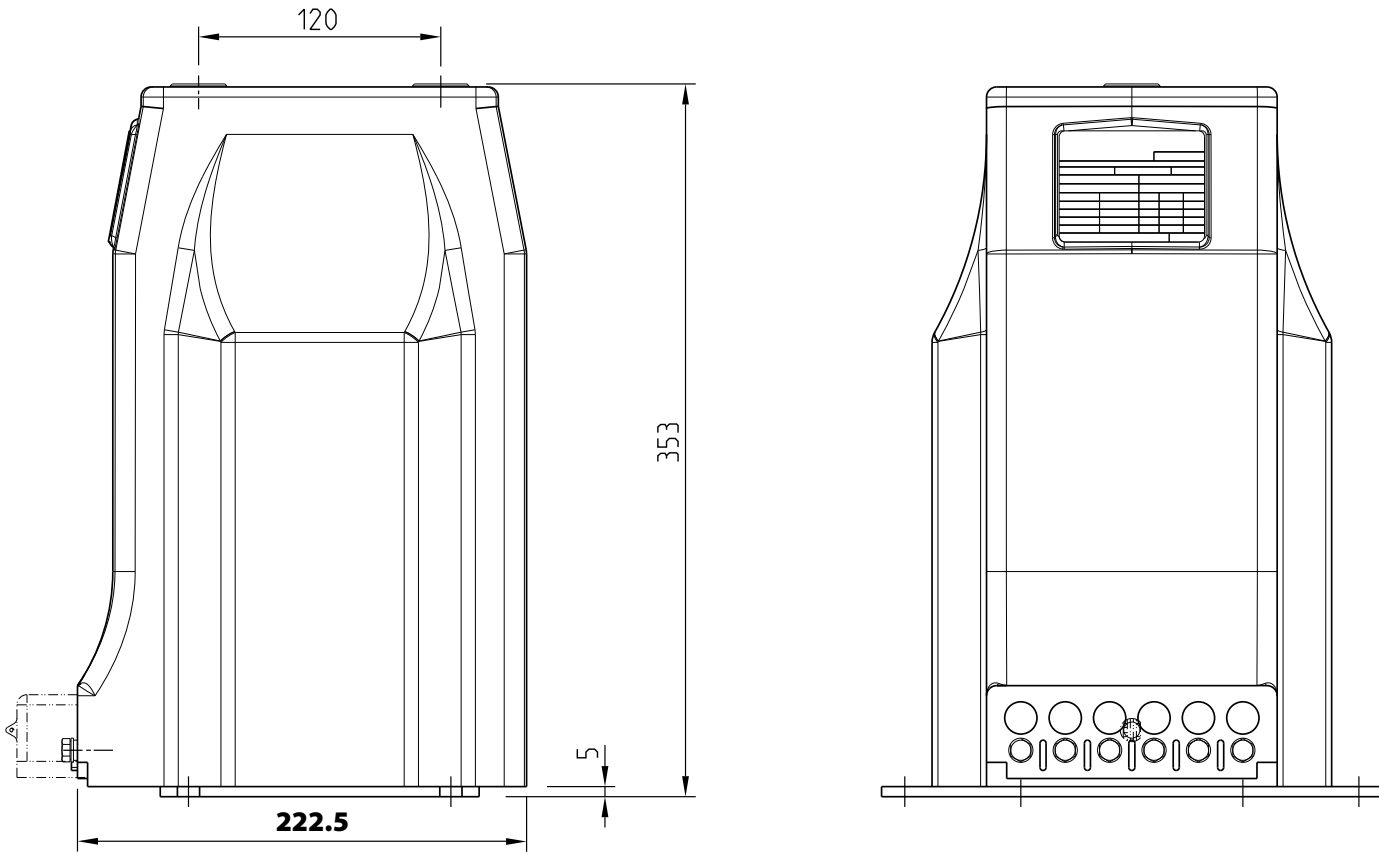
The **Current Transformers ARM6T** is provided with its proper base plate. The terminal cover can be provided as accessory and it is sealable.



TECHNICAL DATA

ARM6T		
Highest voltage for equipment (Um)	kV	36
Rated power-frequency withstand voltage (RMS)	kV	70
Rated lightning impulse withstand voltage (peak)	kV	170
Rated frequency (fr)	Hz	50 - 60
Rated short-time thermal current (Ith)	kA/s	up to 40kA / 1s
Rated primary current (Ipr)	A	up to 800
Rated Secondary current (Isr)	A	5 -1
Rated dynamic current (Idyn)	kA	2,5 Ith
Max number of secondaries		2
Accuracy classes for measure		1 - 0,5 - 0,5S - 0,2 - 0,2S
Accuracy classes for protection		5P - 10P - PX
Thermal class		A
Operating ambient temperature categories	°C	-25/+40 -5/+50
Weight (approx.)	Kg	22

ARM6T



DESCRIPTION

ARM9T is a Current Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-2 standard.

The **CT** is a brick/support type with insulation voltages up to 40,5 kV.

The **ARM9T Current transformer** is designed for both single-turn or multi-turn versions, with single or double ratio with possibility to be reconnectable only at secondary side.

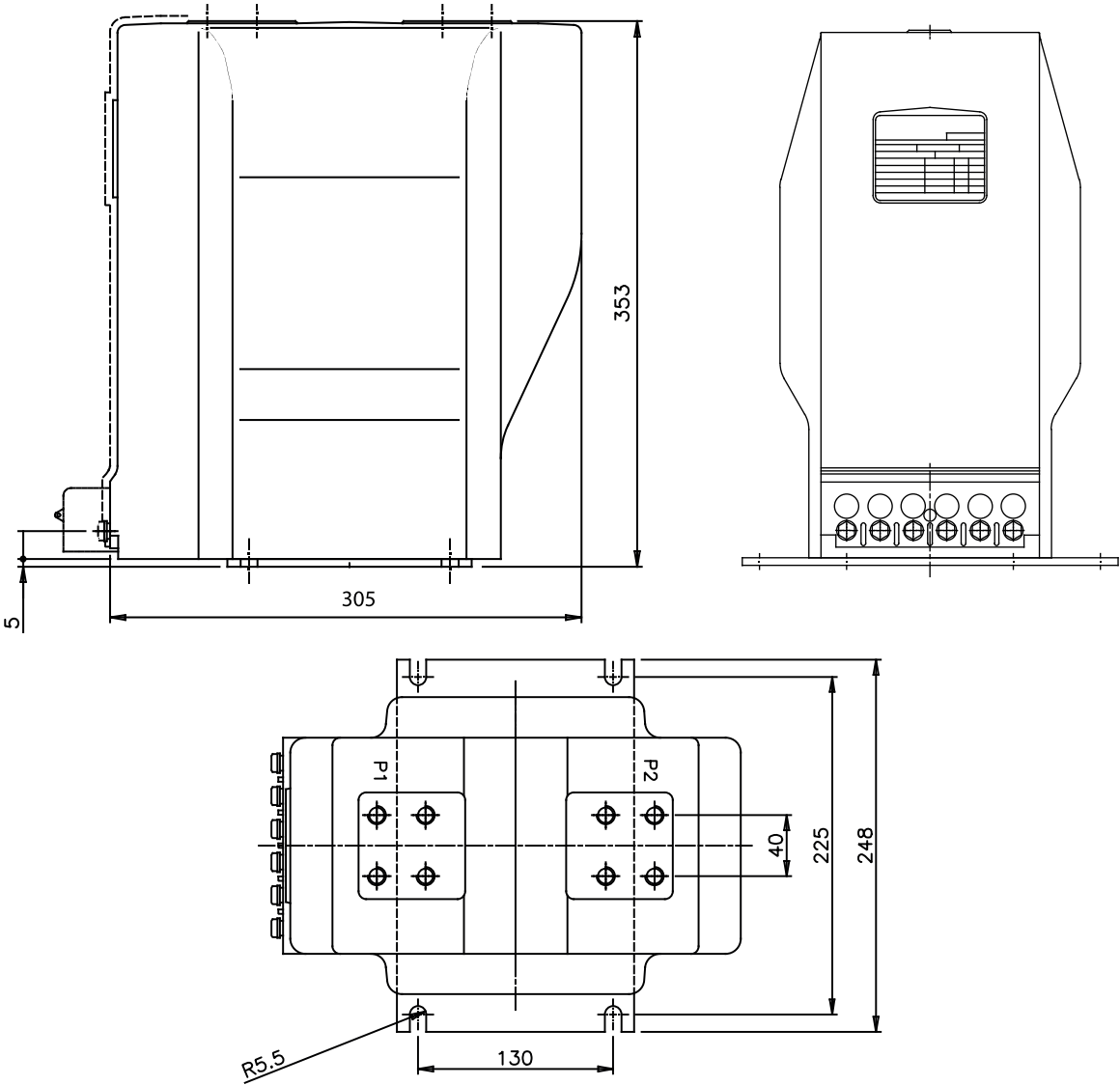
The **Current Transformers ARM9T** is provided with its proper base plate. The terminal cover can be provided as accessory and it is sealable.



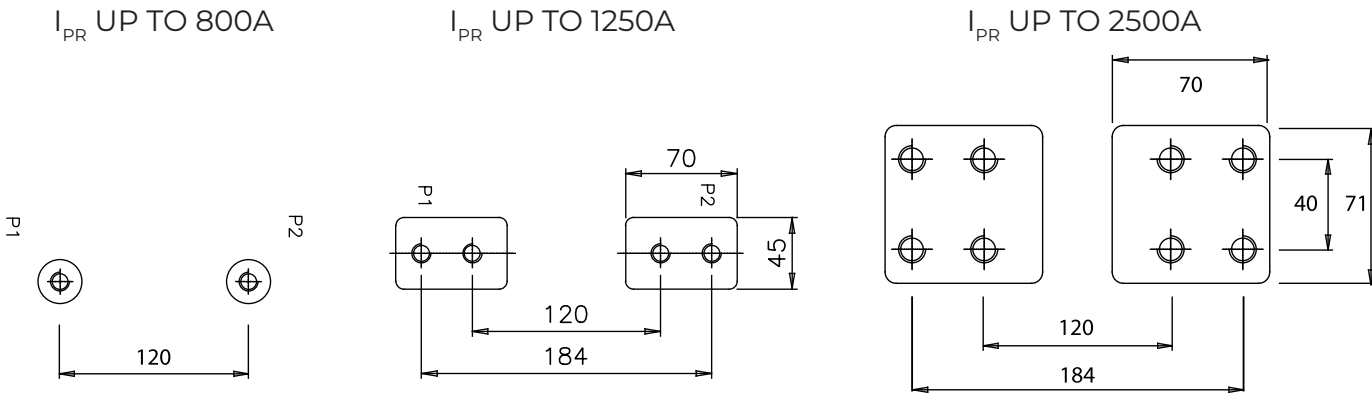
TECHNICAL DATA

ARM9T			
Highest voltage for equipment (Um)	kV	36	40,5
Rated power-frequency withstand voltage (RMS)	kV	70	85
Rated lightning impulse withstand voltage (peak)	kV	170	200
Rated frequency (fr)	Hz	50 - 60	
Rated short-time thermal current (Ith)	kA/s	up to 50kA / 1s	
Rated primary current (Ipr)	A	up to 2500	
Rated Secondary current (Isr)	A	5 -1	
Rated dynamic current (Idyn)	kA	2,5 Ith	
Max number of secondaries		3	
Accuracy classes for measure		1 - 0,5 - 0,5S - 0,2 - 0,2S	
Accuracy classes for protection		5P - 10P - PX	
Thermal class		A	
Operating ambient temperature categories	°C	-25/+40	-5/+50
Weight (approx.)	Kg	35	

ARM9T



PRIMARY TERMINALS DETAIL



VOLTAGE TRANSFORMER

A Voltage Transformer (VT) is an instrument transformer used in medium-voltage electrical systems to convert high voltages into lower, standardized levels suitable for metering, monitoring and protection systems.

A Voltage Transformer (VT) has three main functions:

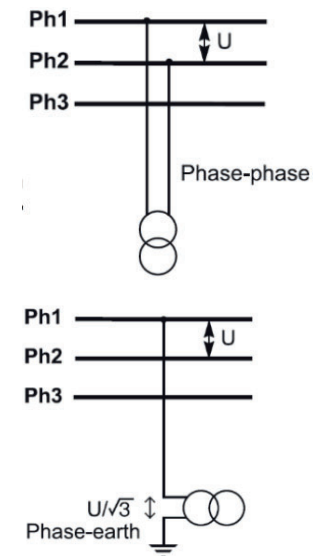
1. **Measurement** for Metering & Monitoring:
VTs accurately scale down high voltages to much lower, standardized values that can be safely measured by conventional instruments like voltmeters and energy meters.
2. **Protection** for Protection Relay
VTs supply the reduced voltage signal to protective relays, which detect if the value exceeds the set thresholds due to faults like overvoltage, phase loss, ect.. If a fault is detected, the relay triggers circuit breakers to isolate the fault, preventing equipment damage.
3. **Isolation & Safety** by providing Electrical Insulation between High & Low Voltage Circuits:
VTs allow safe voltage monitoring by electrically isolating the high-voltage power circuit from low-voltage measuring devices to protect instruments and operators.

The Voltage Transformers are designed and manufactured in conformity with IEC 61869-3 standard.

Voltage Transformer types

There are two basic types of voltage transformers:

- **Phase-Phase Type**
In Phase-Phase (double pole) VTs, the primary winding is connected between two phase conductors for measuring line voltages.
- **Phase-Earth Type**
In Phase-Earth (single pole) VTs, one terminal of the primary is connected to a phase conductor while the other terminal is connected to earth (ground) for measuring phase voltages and Residual Voltage detection.



MAIN CHARACTERISTICS

These are defined in IEC 61869-3 standards.

Rated Insulation levels

It refers to the standardized voltage values that define the ability of electrical equipment to withstand dielectric stress without failure. These levels include:

- **Highest voltage for equipment (Um) e.g.: 24 kV**
The highest voltage for equipment (Um) is the highest RMS line-to-line voltage for which an instrument transformer is designed to withstand in terms of its insulation and other related characteristics. It defines the insulation level of the equipment and it represents the maximum voltage that the equipment's insulation system can safely handle under normal operating conditions. It dictates the dielectric tests like partial discharge measurements and impulse voltage withstand tests that the equipment must pass to ensure its reliability and safety.
- **Rated power-frequency withstand voltage (RMS) e.g.: 50 kV**
The Rated Power-Frequency Withstand Voltage on primary terminals is the RMS value of the power-frequency voltage that the insulation of the instrument transformer is designed to withstand for a specified duration (typically 1 minute). This test verifies the insulation's ability to withstand continuous operating voltage and temporary overvoltages at the system's normal frequency.
- **Rated lightning impulse withstand voltage (peak) e.g.: 125 kV**
The Rated Lightning Impulse Withstand Voltage on primary terminals is the peak value of the lightning impulse voltage that the insulation of the instrument transformer is designed to withstand without flashover or puncture. Lightning impulses simulate the very short duration, high-magnitude overvoltages that occur due to lightning strikes on the power system.

Rated frequency (fr)

It's the nominal operating frequency at which the current transformers are designed to function optimally.

It is typically 50 Hz or 60 Hz, depending on the power system standard of the region.

Rated primary voltage (Upr)

Value of the primary voltage on which the performance of the VT is based.

Rated secondary voltage (U_{sr})

Value of the secondary voltage on which the performance of the VT is based.

Rated Transformation ratio (Kr)

Ratio of the Rated primary voltage to the rated secondary voltage. (e.g.: 20.000/100V)

$$K_r = U_{pr} / U_{sr}$$

Rated Voltage Factor (Fv)

Multiplying factor to be applied to the rated primary voltage to determine the maximum voltage at which a transformer must comply with the relevant thermal requirements for a specific time and with the relevant accuracy requirements.

Thermal Limiting output

Value of the apparent power at rated voltage which can be taken from a secondary winding without exceeding the limits of temperature rise. In this condition there is the possibility of exceeding the limits of voltage error and phase displacement for all secondary windings.

Rated burden

The value of the burden on which the accuracy requirements of a specification are based.

The standard values for rated secondary rated burden are: 5, 7.5, 10, 15, 20, 30, 50 VA

Accuracy class

It's the designation assigned to an instrument transformer error of which remain within specified limits under prescribed conditions of use.

Defines the limits of error guaranteed on the transformation ratio and on the phase shift under the specified conditions of power and current.

The standard accuracy classes for measuring voltage transformers are: 0,2 – 0,5 – 1

The standard accuracy classes for protective voltage transformers are: 3P and 6P

Ratio error (ε)

Error which an instrument transformer introduces into the measurement and which arises from the fact that the actual transformation ratio is not equal to the rated transformation ratio.

Phase displacement (Δφ)

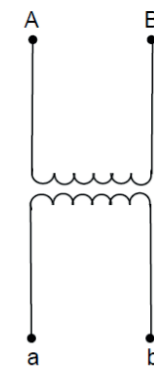
Difference in phase between the primary voltage phasor and the secondary voltage phasor. It is typically expressed in minutes.

CONNECTION DIAGRAMS

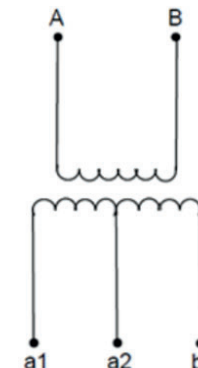
These are defined in IEC 61869-3 standards.

Phase-Phase voltage transformers

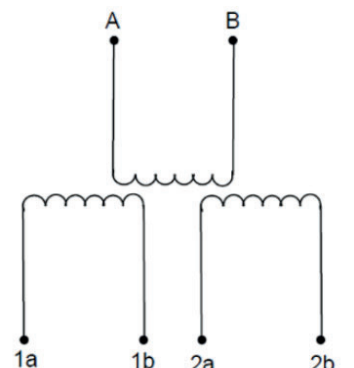
Single-phase transformers with fully insulated terminals



One secondary



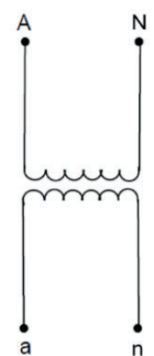
One multi-tap secondary



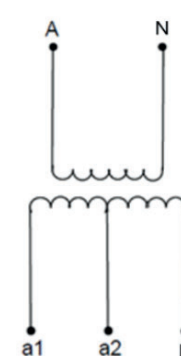
Two secondaries

Phase-Earth voltage transformers

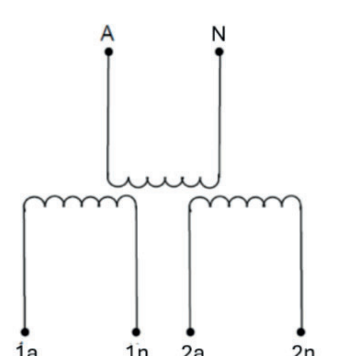
Single-phase transformers with a Neutral primary terminal "N" with reduced insulation



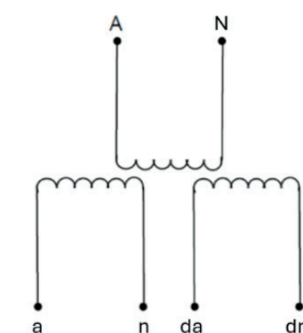
One secondary



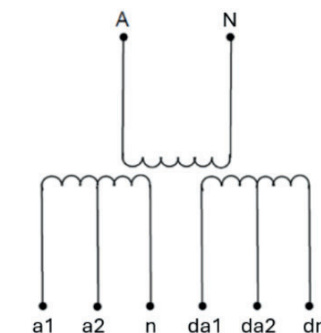
One multi-tap secondary



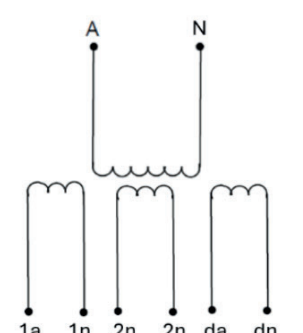
Two secondaries



One secondary and
One residual voltage winding



One multi-tap secondary with
One multi-tap residual voltage winding



Two secondaries and
One residual voltage winding

OPERATION CONDITIONS AND SAFETY INSTRUCTIONS

- Always turn off all power supplies before connecting the transformer, in accordance with safety regulations.
- Do not touch the terminals or any other parts of the transformer unless they are known to be safely grounded.
- Always ground the secondary earthing terminal and the metallic base plate, if present.
- If not present, ensure that the transformer fixing screws at the bottom are properly connected to earth.
- Before energizing the transformer, all connections and fixings must be checked carefully.
- One of the terminals of each secondary winding must be earthed to prevent dangerous voltages during operation.
- In case of changing ratio with tapping at secondary side, the terminal not used must be left open.
- For Phase-Earth VTs, the primary terminal “N” must be earthed.
- When the terminal “N” is provided in the secondary board, it must be connected to the earth terminal through the metallic connector always provided.
- In case of three VTs with residual voltage windings connected in open delta, the “dn” secondary terminal must be earthed on only one of the three VTs.
- It is highly recommended to use LV fuses or LV circuit breakers on the secondary side to protect against secondary short circuits or wiring mistakes.

ATTENTION: For Voltage Transformers (VTs) with more secondary windings, those not in use **MUST REMAIN OPEN**

Ferroresonance phenomenon

Ferroresonance is a non-linear phenomenon that may occur when Phase-Earth Voltage Transformers (VTs) are installed in medium-voltage networks with isolated or non-solidly earthed neutrals.

It results from the interaction between transformer inductance and system capacitances, and can lead to sustained overvoltages, overheating, insulation stress, and possible destruction of the voltage transformer.

Common causes include:

- operation in ungrounded or compensated (Petersen-coil) systems,
- very low secondary load or open-circuit operation of VTs,
- switching transients or irregular network conditions.

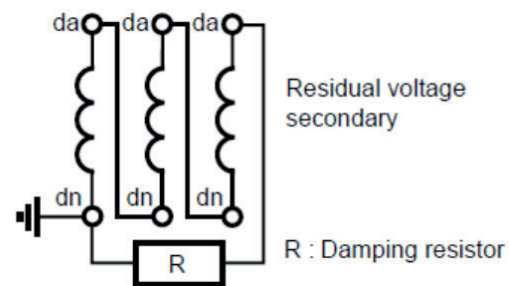
To minimize the risk of ferroresonance, it is recommended to:

- Use open-delta (Δ) connected voltage transformers equipped with a damping resistor.
Important: To avoid a secondary short circuit, it is essential to ensure that the open delta circuit is earthed only once.
- Employ voltage transformers designed with reduced magnetic induction to limit core saturation effects under overexcitation conditions. (with this design the accuracy performances must be reduced)
- Ensure proper earthing of the VT secondary circuits and avoid energizing the system under highly unbalanced or no-load conditions.

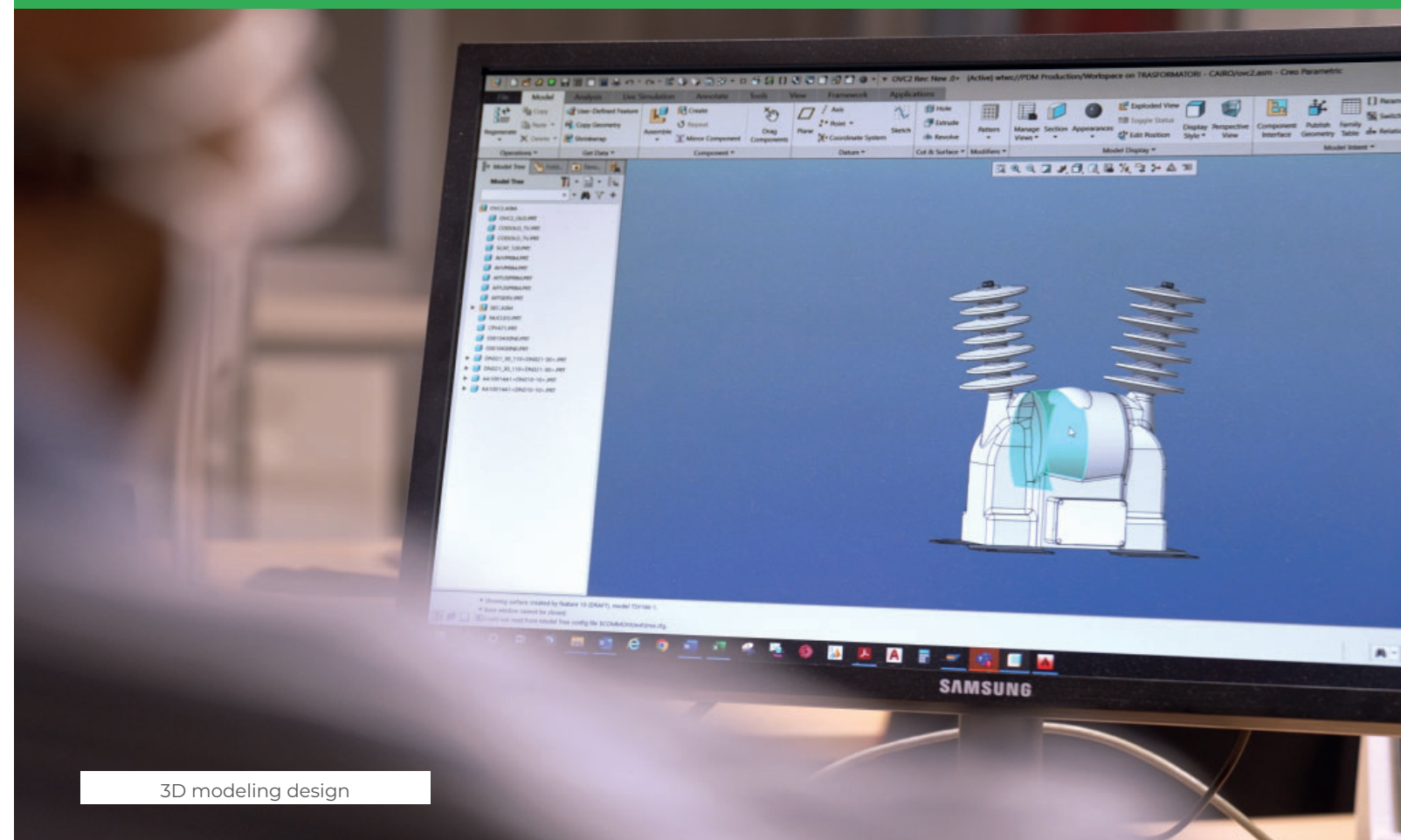
These preventive measures might significantly reduce the probability and severity of ferroresonance events in indoor MV switchgear installations.

Semar Electric strongly recommends the use of damping resistor in open-delta windings for single phase inductive voltage transformers.

Unless otherwise specified, the standard damping resistor value for our products is $\geq 40 \Omega$



INDOOR VOLTAGE TRANSFORMER Models



DESCRIPTION

VDF12 is a Phase-Earth Voltage Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The **VTs** are manufactured in conformity with DIN 42600-9 dimensions with insulation voltages up to 17,5 kV.

The **VDF12** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

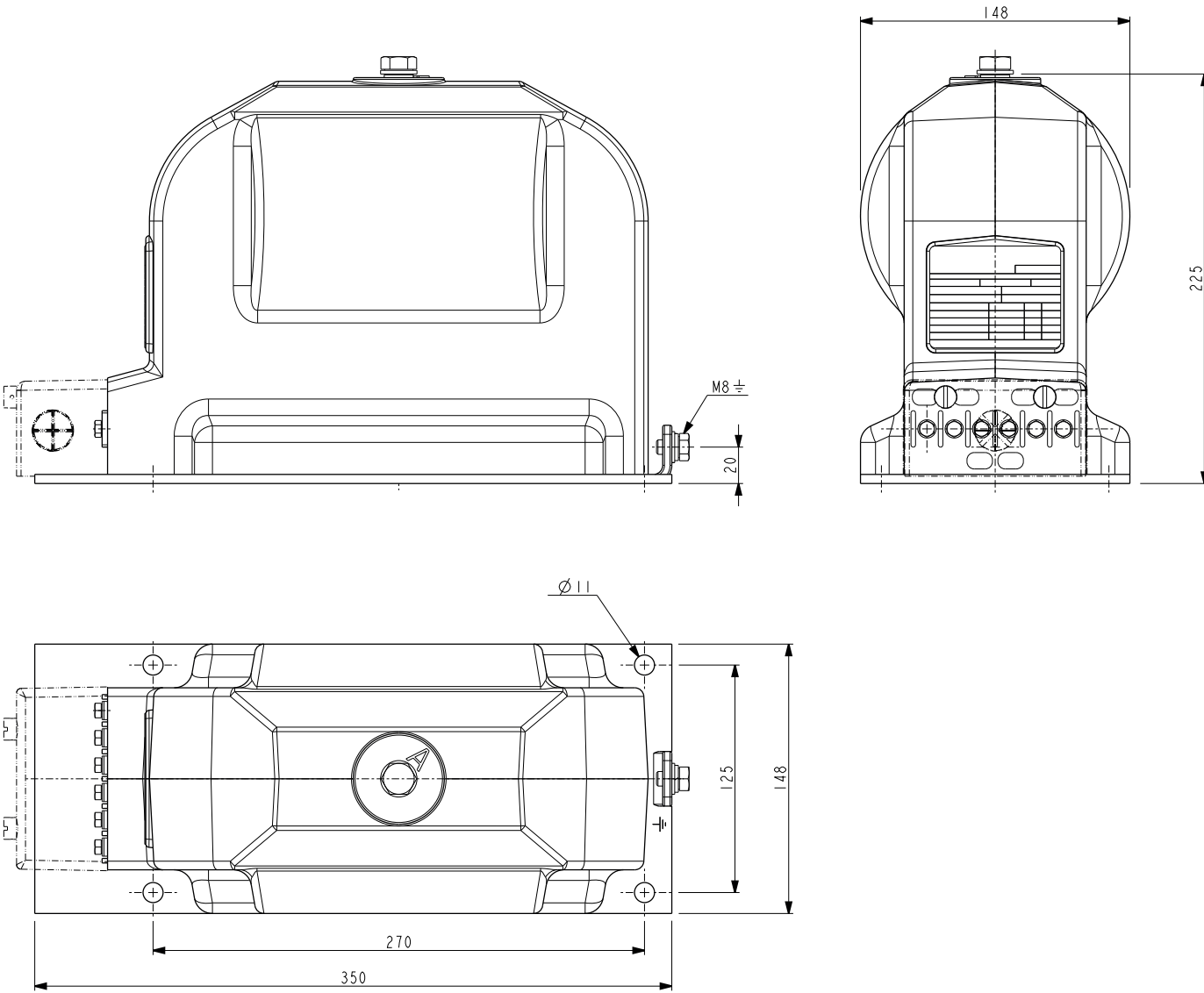
The **Voltage Transformers** can be mounted in any position by using the proper base plate with M8 Earth connection at the rear. The terminal cover is always provided and it is sealable.



TECHNICAL DATA

VDF12				
Highest voltage for equipment (Um)	kV	7,2	12	17,5
Rated power-frequency withstand voltage (RMS)	kV	20	28	38
Rated lightning impulse withstand voltage (peak)	kV	60	75	95
Rated frequency (fr)	Hz	50 - 60		
Rated Voltage factor		1,9 Um / 8 hours		
Rated primary Voltage (Upr)	kV	up to 15/√3		
Rated Secondary Voltage (U _{sr})	V	100/√3 or 110/√3 or 120/√3 - 100/3 or 110/3 or 120/3		
Thermal Limiting output	VA	200		
Max number of secondaries		3		
Accuracy classes for measure		1 - 0,5 - 0,2		
Accuracy classes for protection		3P - 6P		
Thermal class		A		
Operating ambient temperature categories	°C	-25/+40 -5/+50		
Weight (approx.)	Kg	18		

VDF12



DESCRIPTION

VDF21 is a Phase-Earth Voltage Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The **VTs** are manufactured in conformity with DIN 42600-9 dimensions with insulation voltages up to 24 kV.

The **VDF21** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

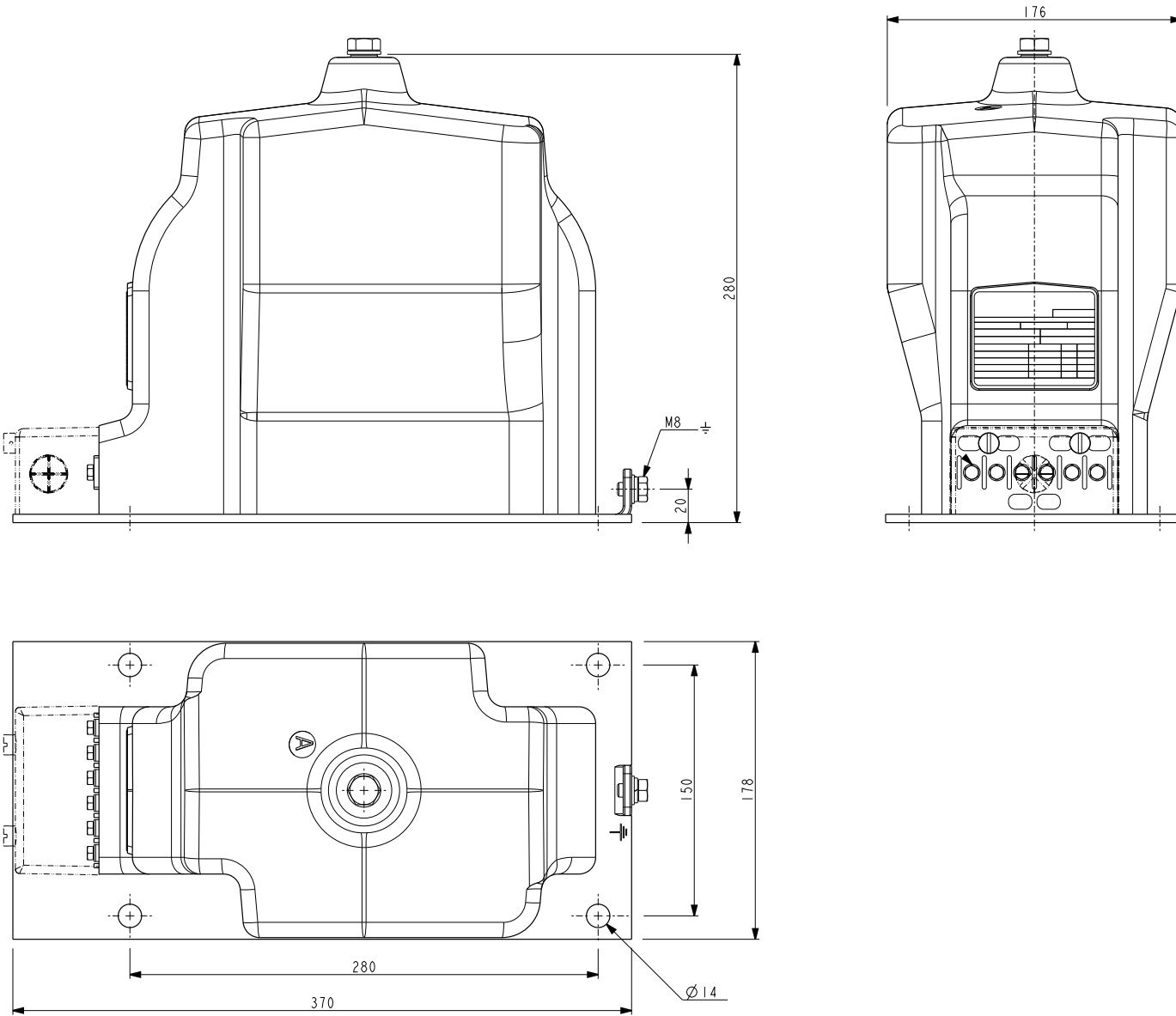
The **Voltage Transformers** can be mounted in any position by using the proper base plate with M8 Earth connection at the rear. The terminal cover is always provided and it is sealable.



TECHNICAL DATA

VDF21					
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated Voltage factor		1,9 Um / 8 hours			
Rated primary Voltage (Upr)	kV	up to 24/√3			
Rated Secondary Voltage (U _{sr})	V	100/√3 or 110/√3 or 120/√3 - 100/3 or 110/3 or 120/3			
Thermal Limiting output	VA	250			
Max number of secondaries		3			
Accuracy classes for measure		1 - 0,5 - 0,2			
Accuracy classes for protection		3P - 6P			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40 -5/+50			
Weight (approx.)	Kg	21			

VDF21



DESCRIPTION

VDC11 is a Phase-Phase Voltage Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The **VTs** are manufactured in conformity with DIN 42600-9 dimensions with insulation voltages up to 12 kV.

The **VDC11** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

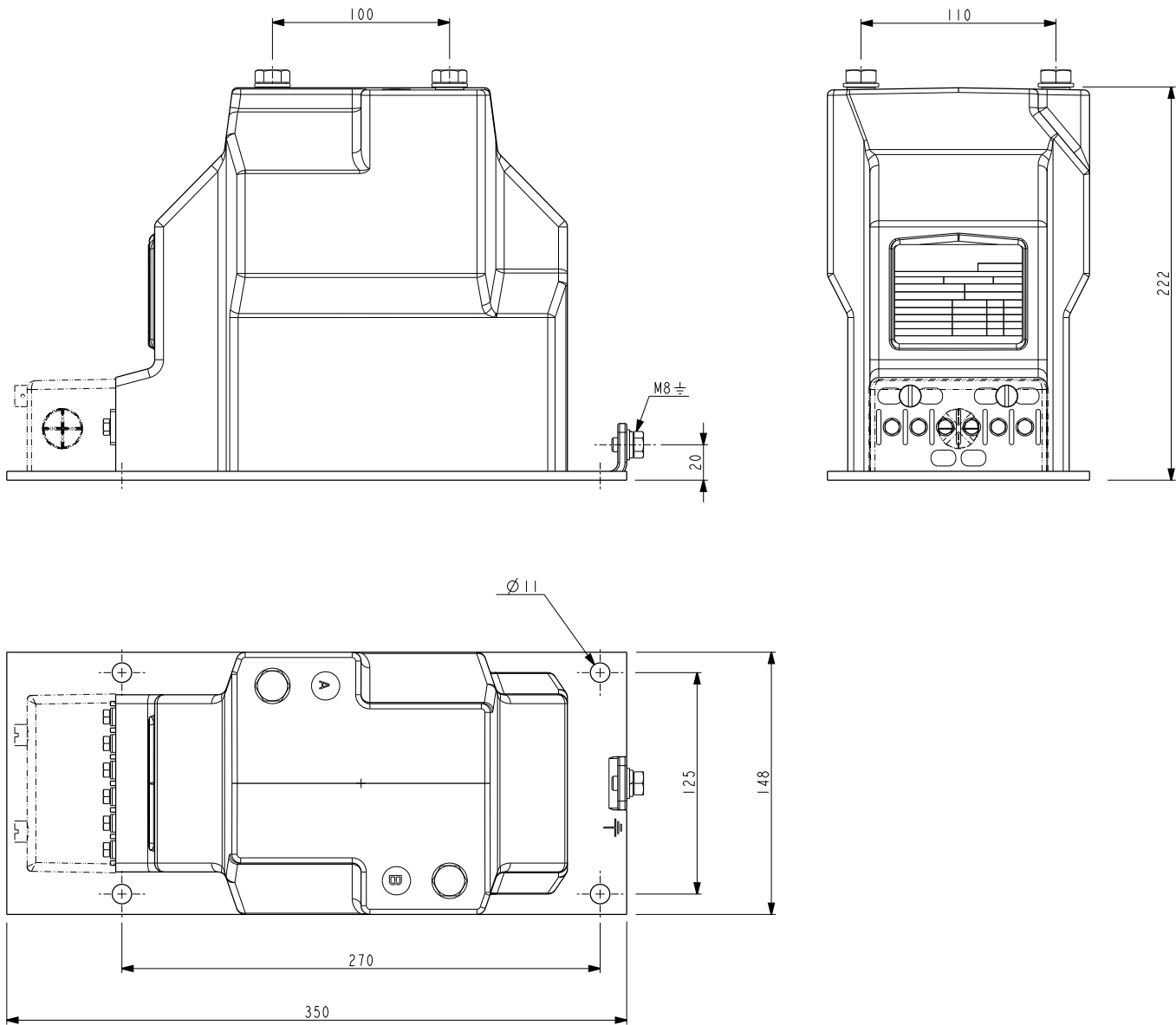
The **Voltage Transformers** can be mounted in any position by using the proper base plate with M8 Earth connection at the rear. The terminal cover is always provided and it is sealable.



TECHNICAL DATA

VDC11			
Highest voltage for equipment (Um)	kV	7,2	12
Rated power-frequency withstand voltage (RMS)	kV	20	28
Rated lightning impulse withstand voltage (peak)	kV	60	75
Rated frequency (fr)	Hz	50 - 60	
Rated Voltage factor		1,2 Um Continuous	
Rated primary Voltage (Upr)	kV	up to 12	
Rated Secondary Voltage (U _{sr})	V	100 or 110 or 120	
Thermal Limiting output	VA	200	
Max number of secondaries		2	
Accuracy classes for measure		1 - 0,5 - 0,2	
Accuracy classes for protection		3P - 6P	
Thermal class		A	
Operating ambient temperature categories	°C	-25/+40	-5/+50
Weight (approx.)	Kg	15	

VDC11



DESCRIPTION

VDC21 is a Phase-Phase Voltage Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The **VTs** are manufactured in conformity with DIN 42600-9 dimensions with insulation voltages up to 24 kV.

The **VDC21** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

The **Voltage Transformers** can be mounted in any position by using the proper base plate with M8 Earth connection at the rear. The terminal cover is always provided and it is sealable.

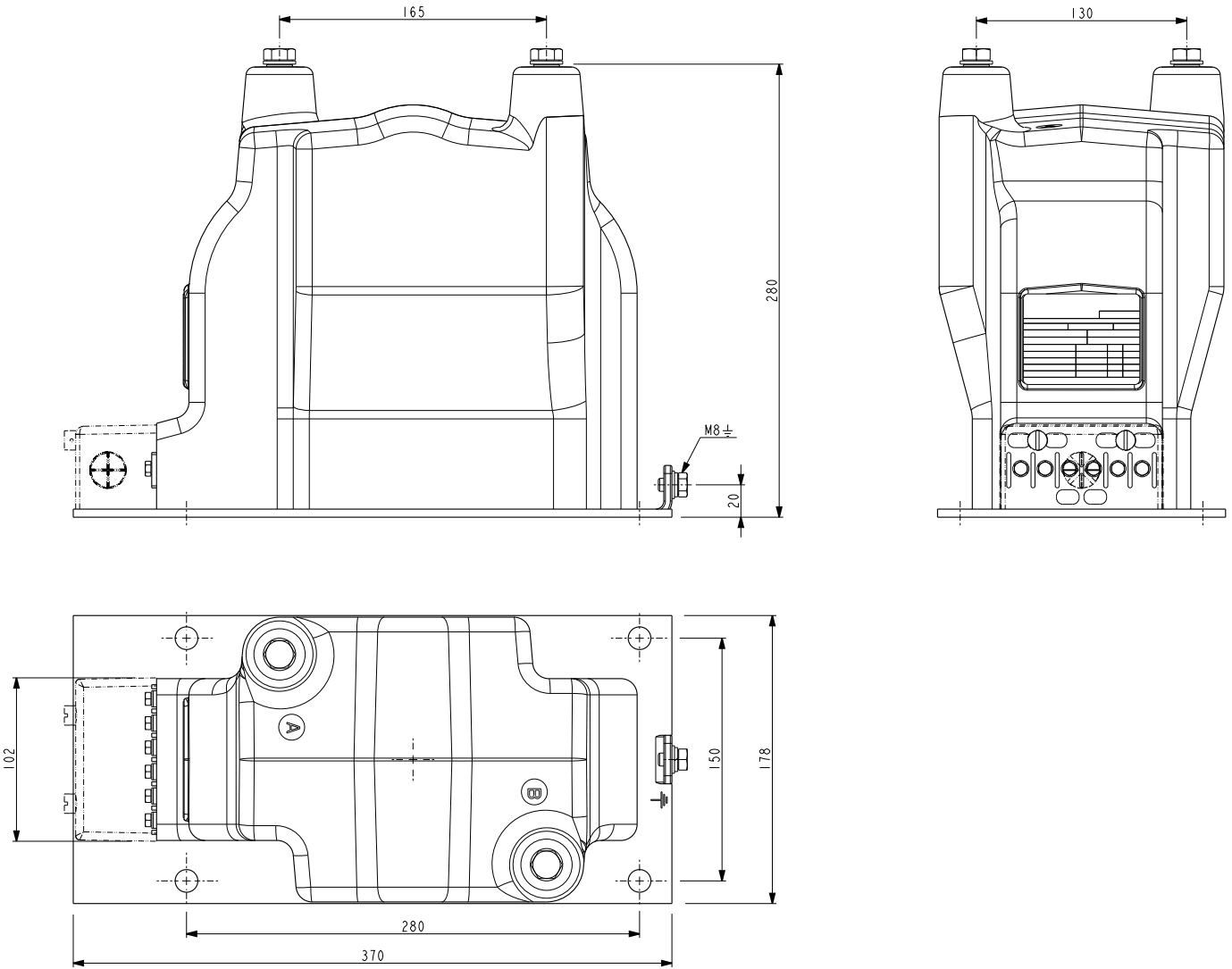


TECHNICAL DATA

TECHNICAL DATA

		VDC21			
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated Voltage factor		1,2 Um Continuous			
Rated primary Voltage (Upr)	kV	up to 24			
Rated Secondary Voltage (U _{sr})	V	100 or 110 or 120			
Thermal Limiting output	VA	300			
Max number of secondaries		3			
Accuracy classes for measure		1 - 0,5 - 0,2			
Accuracy classes for protection		3P - 6P			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40		-5/+50	
Weight (approx.)	Kg	21			

VDC21



DESCRIPTION

VRQ2 is a Phase-Earth Voltage Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The **VTs** have insulation voltages up to 24 kV.

The **VRQ2** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

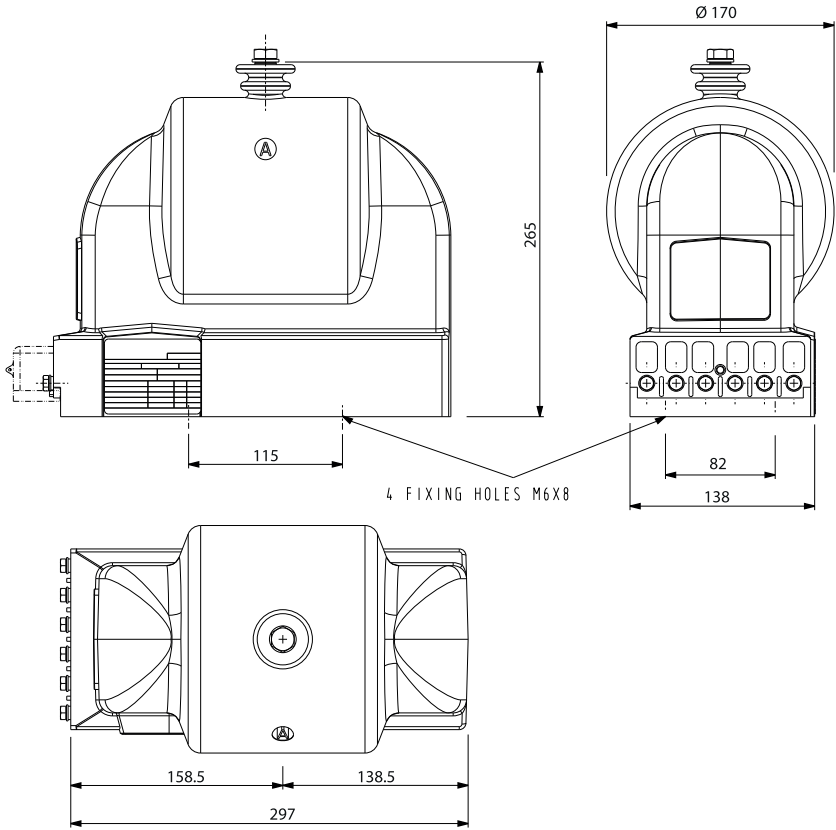
The **Voltage Transformer** is provided without any base plate in the version VRQ2 or with its proper base plate in the version VRQ2-P. The terminal cover can be provided as accessory and it is sealable.



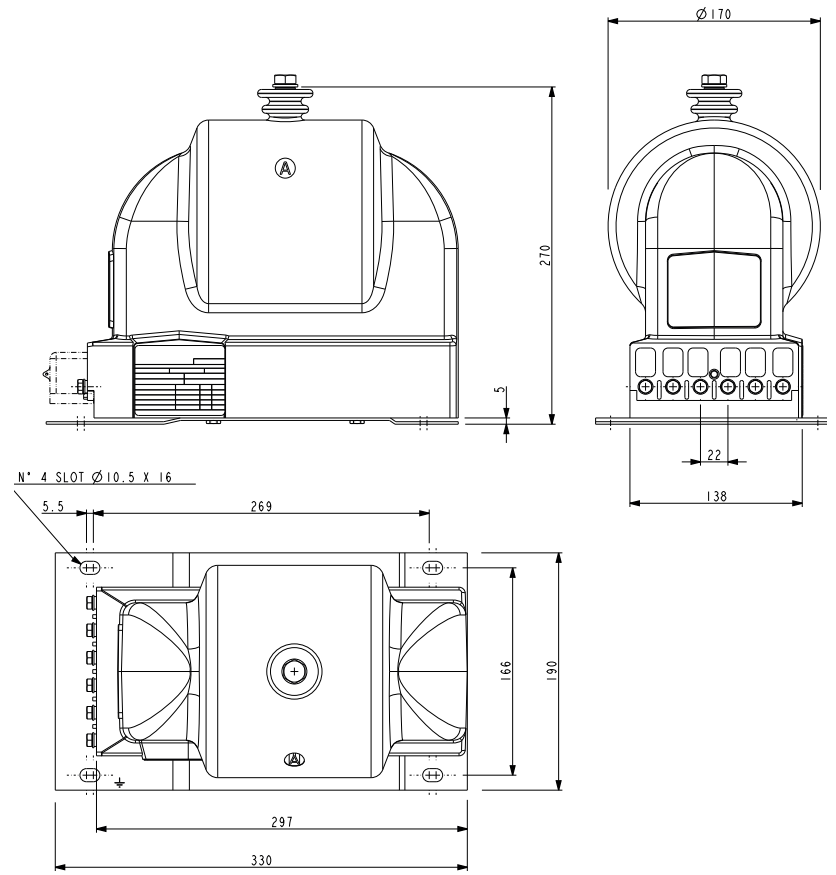
TECHNICAL DATA

VRQ2					
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated Voltage factor		1,9 Um / 8 hours			
Rated primary Voltage (Upr)	kV	up to 24/√3			
Rated Secondary Voltage (U _{sr})	V	100/√3 or 110/√3 or 120/√3 - 100/3 or 110/3 or 120/3			
Thermal Limiting output	VA	250			
Max number of secondaries		3			
Accuracy classes for measure		1 - 0,5 - 0,2			
Accuracy classes for protection		3P - 6P			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40 -5/+50			
Weight (approx.)	Kg	19			

VRQ2



VRQ2-P



DESCRIPTION

VRQ1 is a Phase-Earth Voltage Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The **VTs** have insulation voltages up to 24 kV.

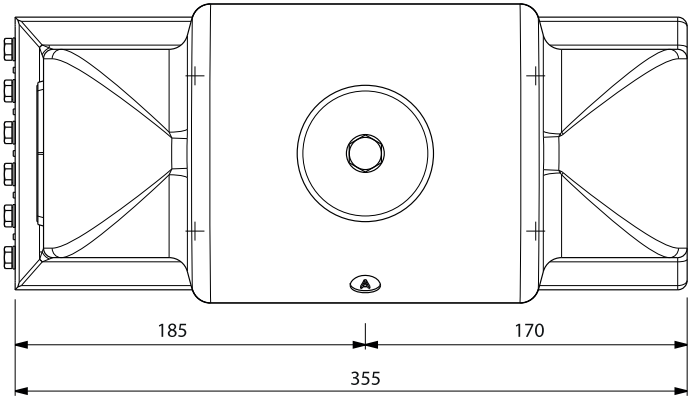
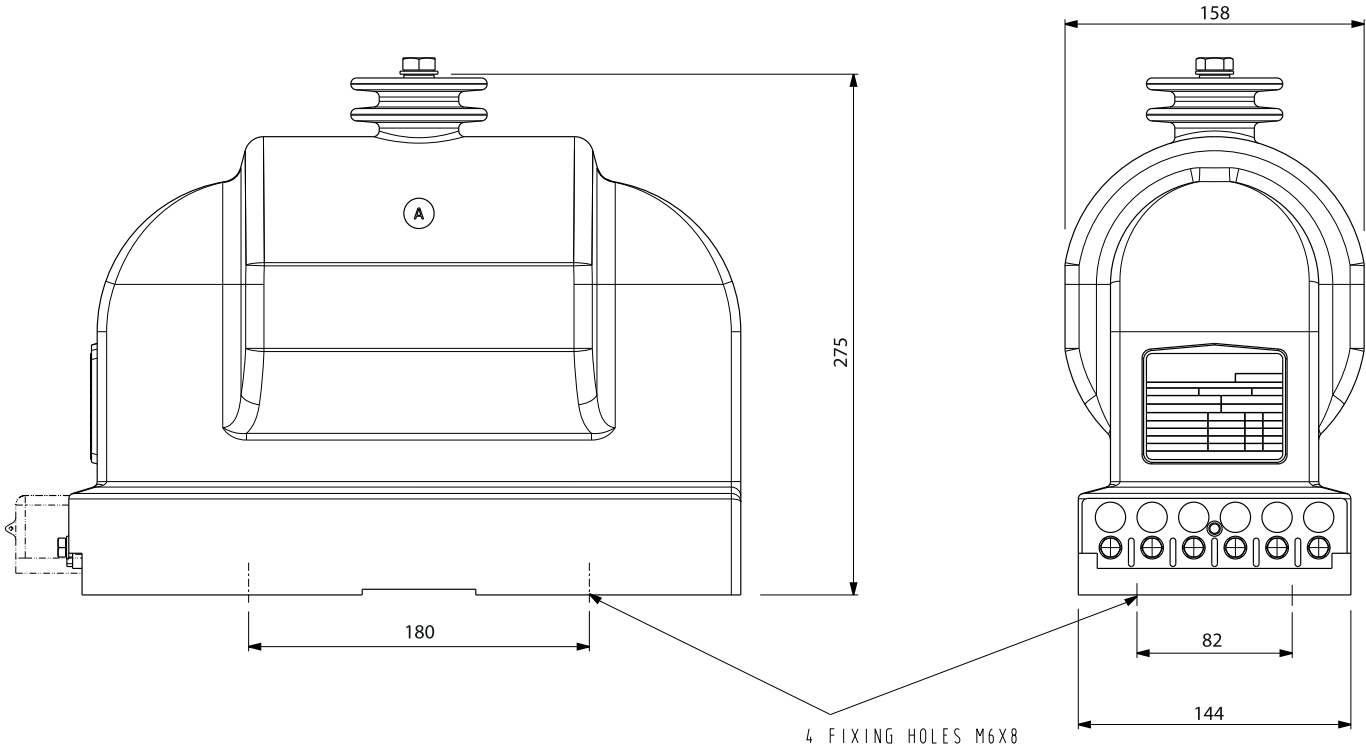
The **VRQ1** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

The **Voltage Transformer** is provided without any base plate. The terminal cover can be provided as accessory and it is sealable.



TECHNICAL DATA

TECHNICAL DATA		VRQ1			
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated Voltage factor		1,9 Um / 8 hours			
Rated primary Voltage (Upr)	kV	up to 24/√3			
Rated Secondary Voltage (U _{sr})	V	100/√3 or 110/√3 or 120/√3 - 100/3 or 110/3 or 120/3			
Thermal Limiting output	VA	300			
Max number of secondaries		3			
Accuracy classes for measure		1 - 0,5 - 0,2			
Accuracy classes for protection		3P - 6P			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40		-5/+50	
Weight (approx.)	Kg	30			



DESCRIPTION

VRF3 is a Phase-Earth Voltage Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The **VTs** have insulation voltages up to 40,5 kV.

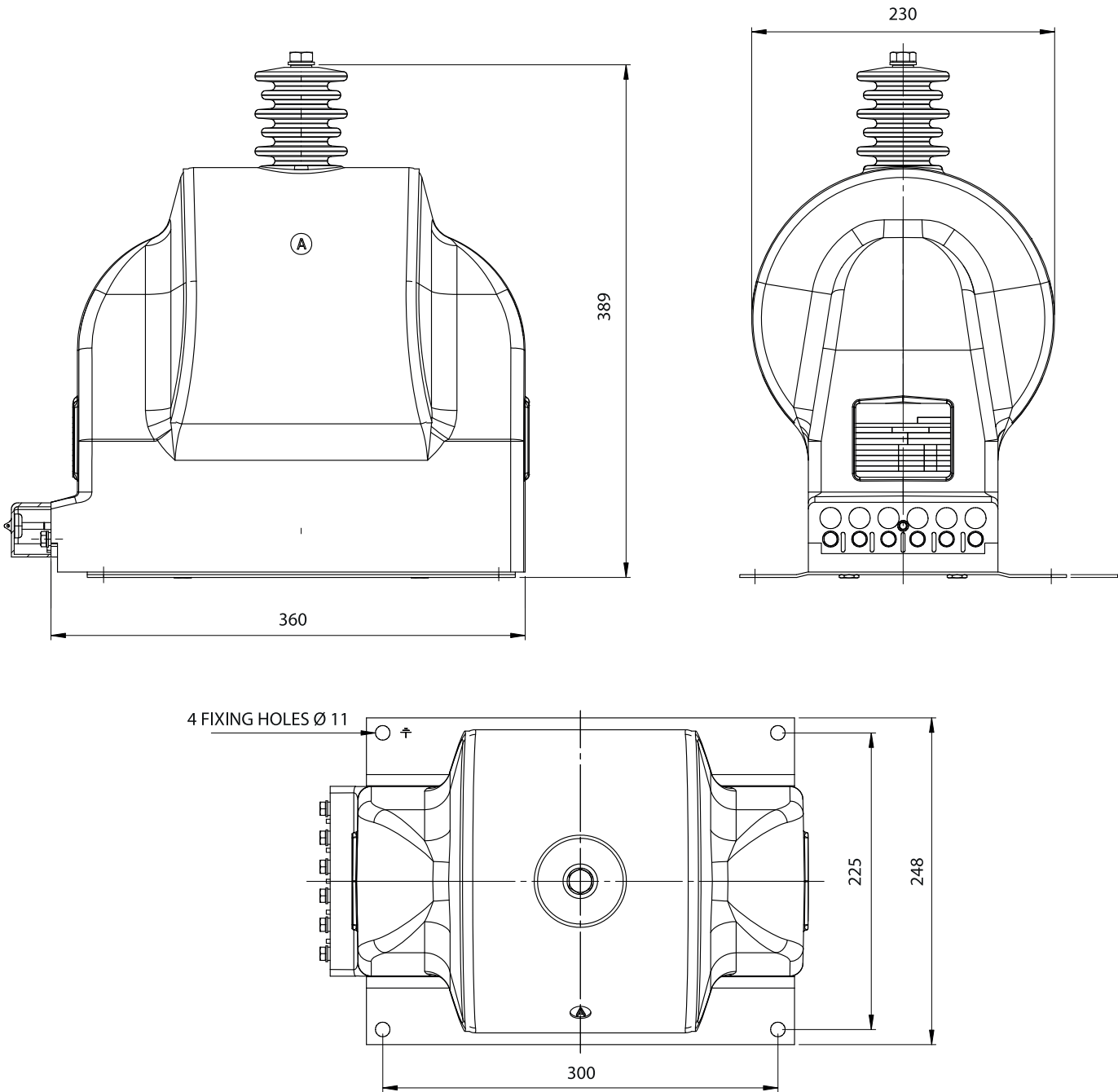
The **VRF3** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

The **Voltage Transformer** is always provided with its proper base plate. The terminal cover can be provided as accessory and it is sealable.



TECHNICAL DATA

VRF3			
Highest voltage for equipment (Um)	kV	36	40,5
Rated power-frequency withstand voltage (RMS)	kV	70	85
Rated lightning impulse withstand voltage (peak)	kV	170	185
Rated frequency (fr)	Hz	50 - 60	
Rated Voltage factor		1,9 Um / 8 hours	
Rated primary Voltage (Upr)	kV	up to 38/√3	
Rated Secondary Voltage (U _{sr})	V	100/√3 or 110/√3 or 120/√3 - 100/3 or 110/3 or 120/3	
Thermal Limiting output	VA	450	
Max number of secondaries		3	
Accuracy classes for measure		1 - 0,5 - 0,2	
Accuracy classes for protection		3P - 6P	
Thermal class		A	
Operating ambient temperature categories	°C	-25/+40	-5/+50
Weight (approx.)	Kg	45	



DESCRIPTION

VRC1 is a Phase-Phase Voltage Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The **VTs** are manufactured in conformity with CEI-UNEL 21008 dimensions with insulation voltages up to 17,5 kV.

The **VRC1** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

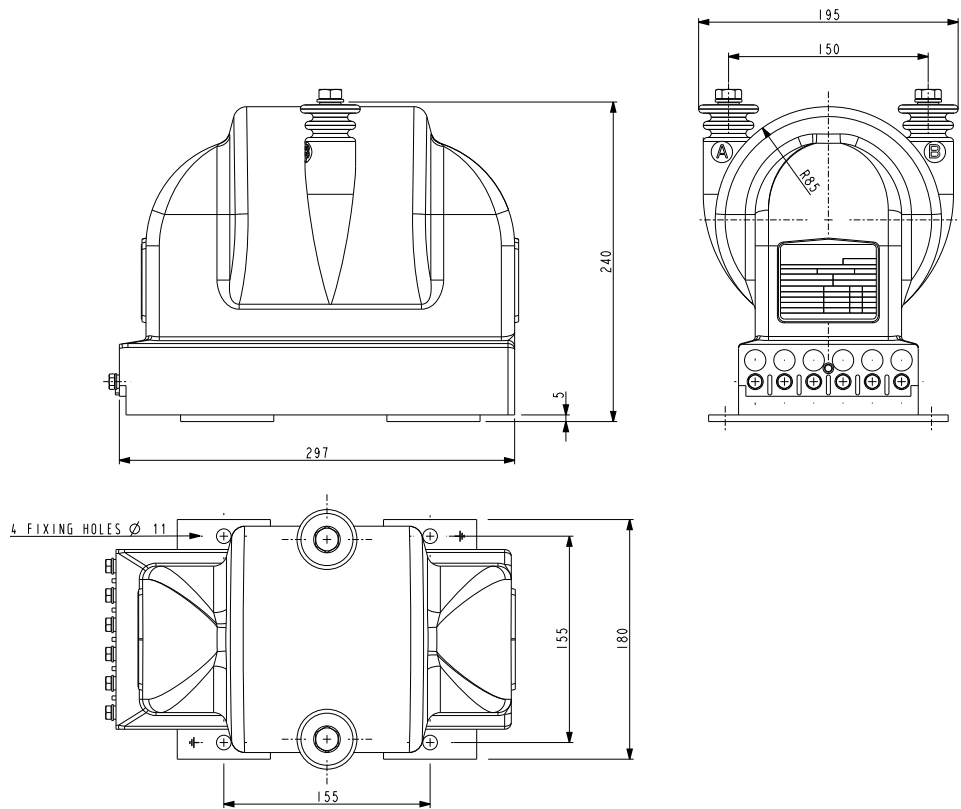
The **Voltage Transformer** is provided with its proper base plate or in the version VRC1-F without any base plate. The terminal cover can be provided as accessory and it is sealable.



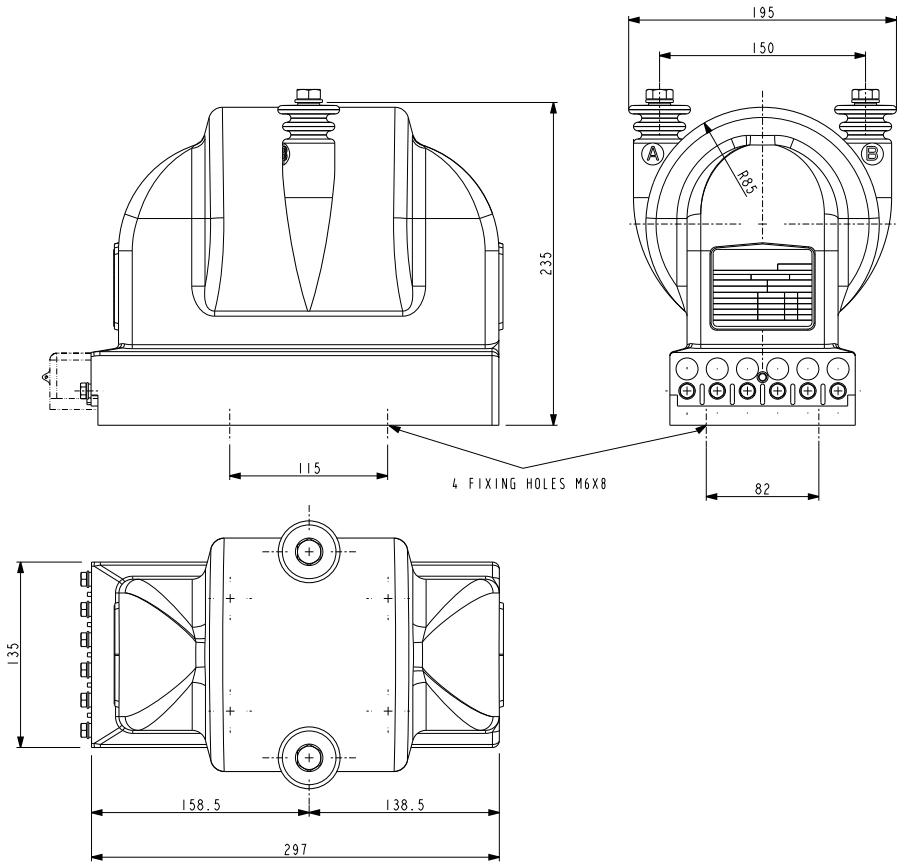
TECHNICAL DATA

VRC1				
Highest voltage for equipment (Um)	kV	7,2	12	17,5
Rated power-frequency withstand voltage (RMS)	kV	20	28	38
Rated lightning impulse withstand voltage (peak)	kV	60	75	95
Rated frequency (fr)	Hz	50 - 60		
Rated Voltage factor		1,2 Um Continuous		
Rated primary Voltage (Upr)	kV	up to 15		
Rated Secondary Voltage (U _{sr})	V	100 or 110 or 120		
Thermal Limiting output	VA	300		
Max number of secondaries		3		
Accuracy classes for measure		1 - 0,5 - 0,2		
Accuracy classes for protection		3P - 6P		
Thermal class		A		
Operating ambient temperature categories	°C	-25/+40 -5/+50		
Weight (approx.)	Kg	15		

VRC1



VRC1-F



DESCRIPTION

VRC2 is a Phase-Phase Voltage Transformer for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The **VTs** are manufactured in conformity with CEI-UNEL 21008 dimensions with insulation voltages up to 24 kV.

The **VRC2** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

The **Voltage Transformer** is provided with its proper base plate or in the version VRC2-F without any base plate. The terminal cover can be provided as accessory and it is sealable.

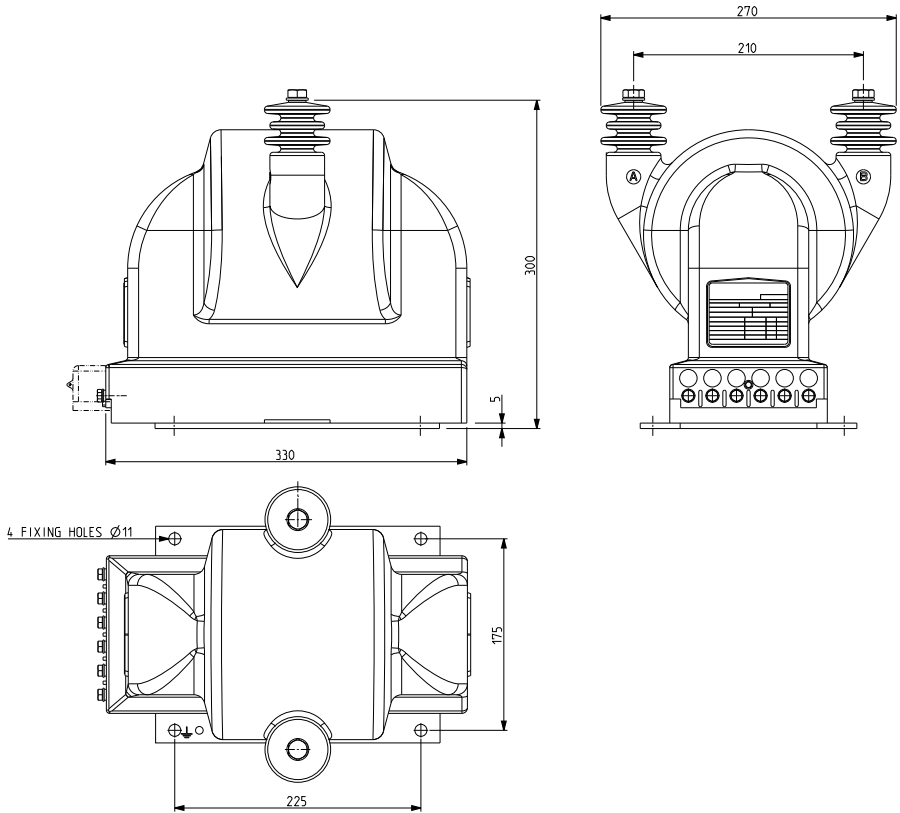


TECHNICAL DATA

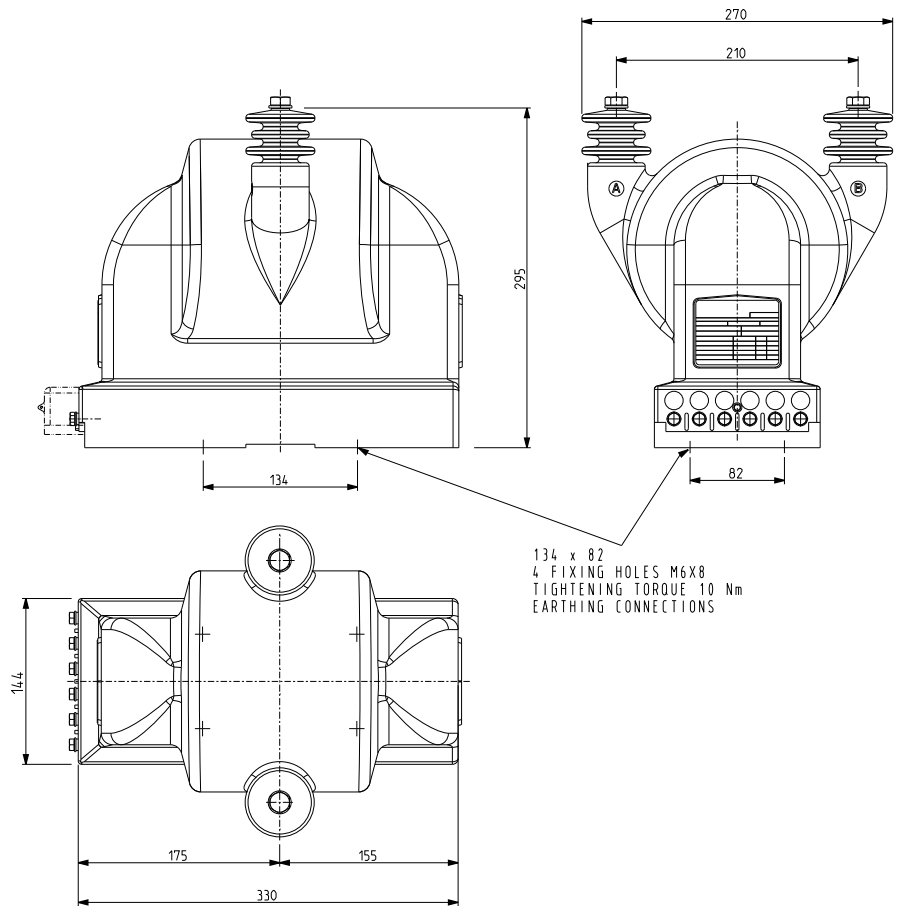
TECHNICAL DATA

		VRC2			
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated Voltage factor		1,2 Um Continuous			
Rated primary Voltage (Upr)	kV	up to 24			
Rated Secondary Voltage (U _{sr})	V	100 or 110 or 120			
Thermal Limiting output	VA	500			
Max number of secondaries		3			
Accuracy classes for measure		1 - 0,5 - 0,2			
Accuracy classes for protection		3P - 6P			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40		-5/+50	
Weight (approx.)	Kg	28			

VRC2



VRC2-F



DESCRIPTION

VRF4 is a Phase-Earth Voltage Transformer with MV Fuse for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The **VTs** is provided with striker pin fuse and have insulation voltages up to 40,5 kV.

The **VRF4** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

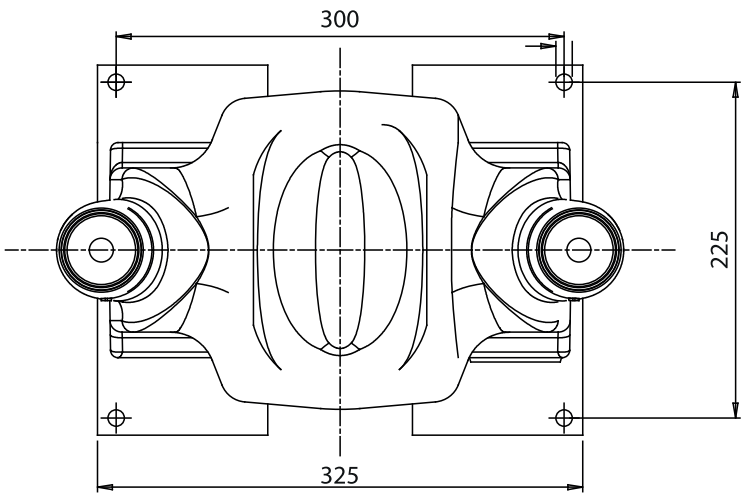
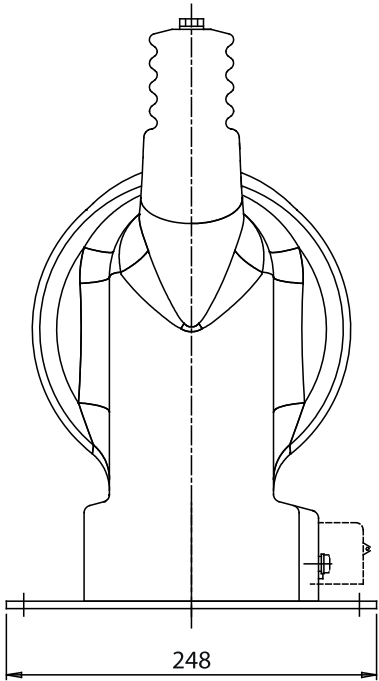
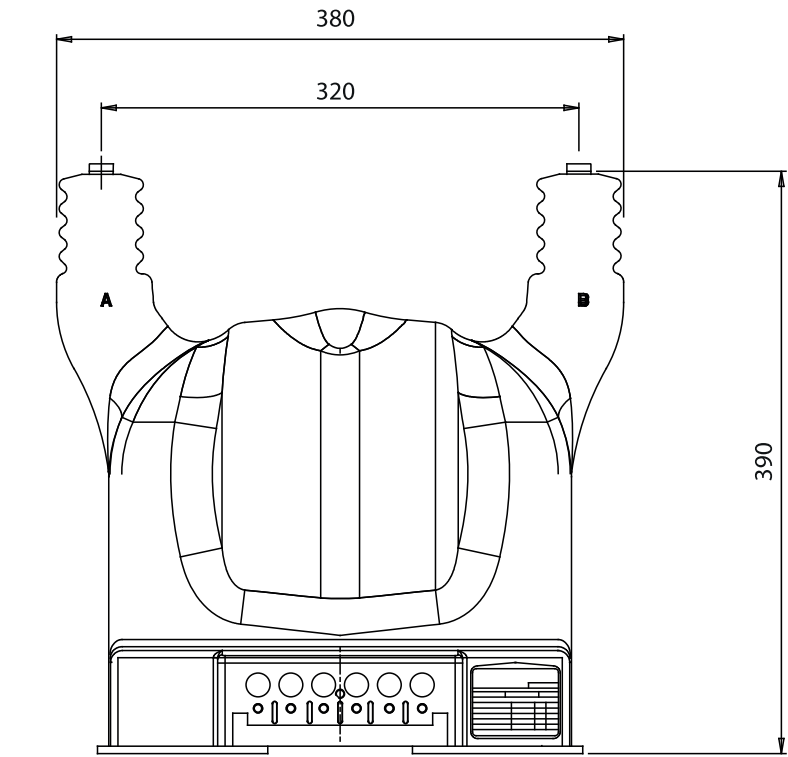
The **Voltage Transformer** is always provided with its proper base plate. The terminal cover can be provided as accessory and it is sealable.



TECHNICAL DATA

VRL3		
Highest voltage for equipment (Um)	kV	36
Rated power-frequency withstand voltage (RMS)	kV	70
Rated lightning impulse withstand voltage (peak)	kV	170
Rated frequency (fr)	Hz	50 - 60
Rated Voltage factor		1,2 Um Continuous
Rated primary Voltage (Upr)	kV	up to 35
Rated Secondary Voltage (U _{sr})	V	100 or 110 or 120
Thermal Limiting output	VA	500
Max number of secondaries		3
Accuracy classes for measure		1 - 0,5 - 0,2
Accuracy classes for protection		3P - 6P
Thermal class		A
Operating ambient temperature categories	°C	-25/+40 -5/+50
Weight (approx.)	Kg	45

VRL3



DESCRIPTION

VRT4 is a Phase-Earth Screened Voltage Transformer for indoor applications, cast in epoxy resin with metallized coating, with excellent performances according to IEC 61869-3 standard.

The **VTs** have insulation voltages up to 24 kV and primary terminal for EN 50181 TYPE A bushing

The **VRT4** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

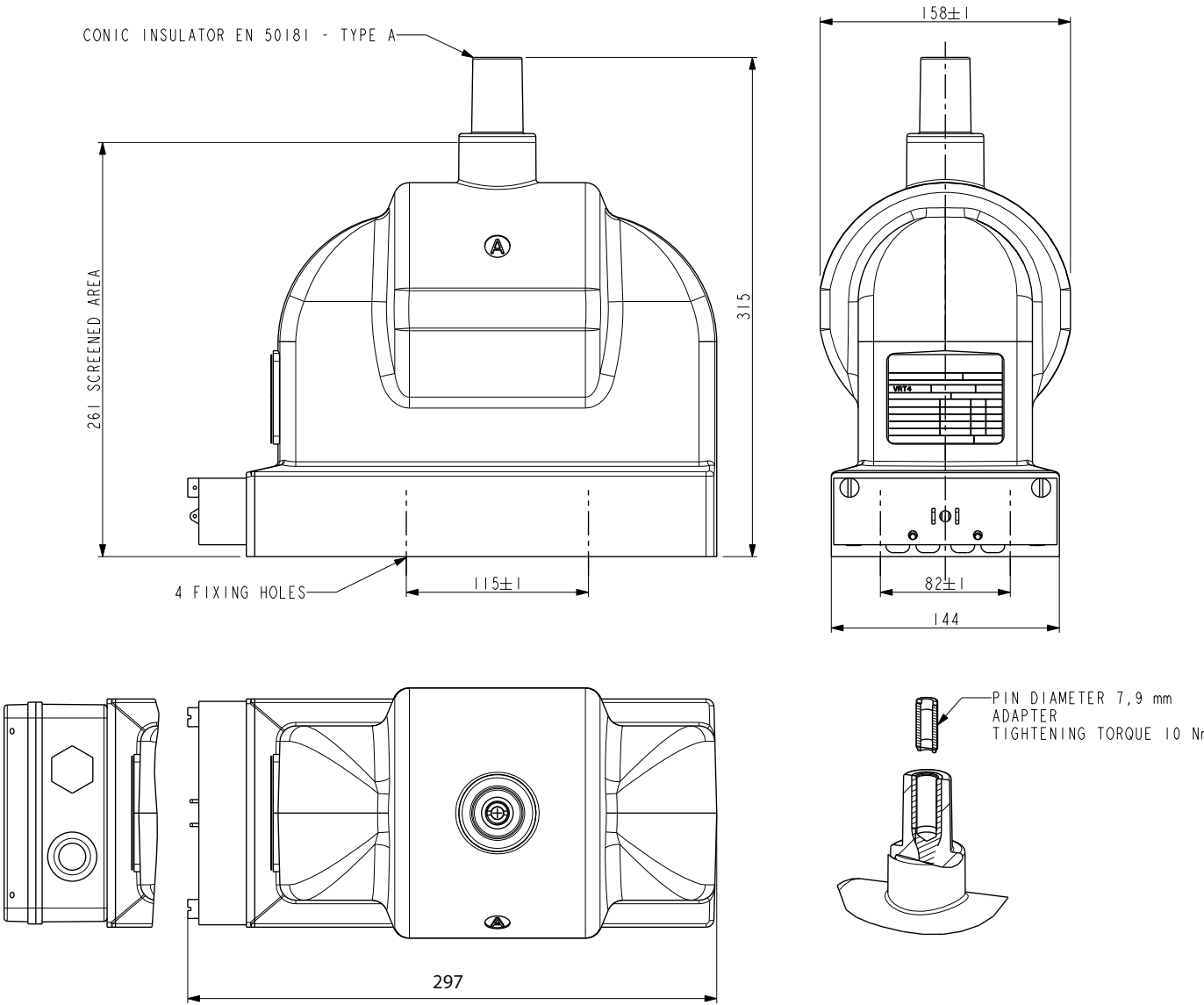
The **Voltage Transformers** is provided without any base plate and it can be mounted in any position by using the four fixing holes at the bottom of the VT. The terminal cover can be provided as accessory and it is sealable.



TECHNICAL DATA

VRT4					
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated Voltage factor		1,9 Um / 8 hours			
Rated primary Voltage (Upr)	kV	up to 24/√3			
Rated Secondary Voltage (U _{sr})	V	100/√3 or 110/√3 or 120/√3 - 100/3 or 110/3 or 120/3			
Thermal Limiting output	VA	250			
Max number of secondaries		3			
Accuracy classes for measure		1 - 0,5 - 0,2			
Accuracy classes for protection		3P - 6P			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40 -5/+50			
Weight (approx.)	Kg	21			

VRT4



DESCRIPTION

VRS3 is a Phase-Earth Voltage Transformer with built-in fuse for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The withdrawable **VTs** have insulation voltage up to 17,5 kV with integrated fuse-holder in resin and provided with MV fuse 2A.

The **VRS3** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

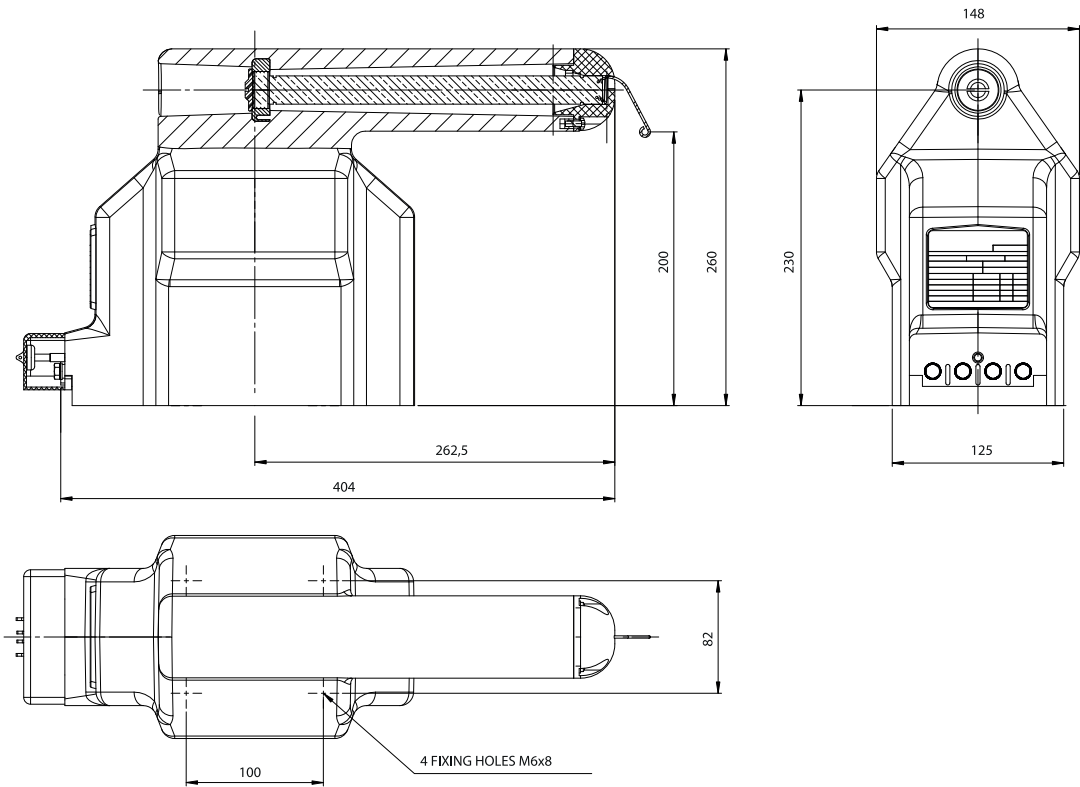
The **Voltage Transformers** is provided without any base plate and it can be mounted in any position by using the four fixing holes at the bottom of the VT. The terminal cover can be provided as accessory and it is sealable.



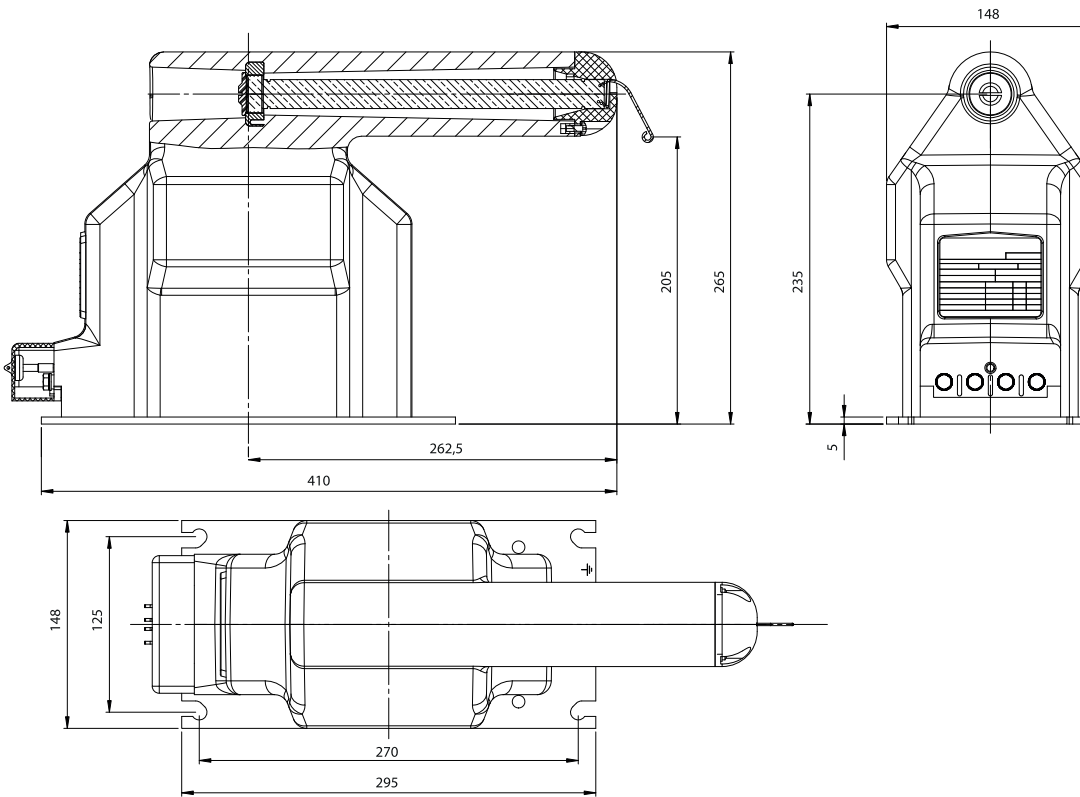
TECHNICAL DATA

VRS3				
Highest voltage for equipment (Um)	kV	7,2	12	17,5
Rated power-frequency withstand voltage (RMS)	kV	20	28	38
Rated lightning impulse withstand voltage (peak)	kV	60	75	95
Rated frequency (fr)	Hz	50 - 60		
Rated Voltage factor		1,9 Um / 8 hours		
Rated primary Voltage (Upr)	kV	up to 15/√3		
Rated Secondary Voltage (U _{sr})	V	100/√3 or 110/√3 or 120/√3 - 100/3 or 110/3 or 120/3		
Thermal Limiting output	VA	200		
Max number of secondaries		2		
Accuracy classes for measure		1 - 0,5 - 0,2		
Accuracy classes for protection		3P - 6P		
Thermal class		A		
Operating ambient temperature categories	°C	-25/+40 -5/+50		
Weight (approx.)	Kg	17		

VRS3



VRS3-P



DESCRIPTION

VRS2C is a Phase-Earth Voltage Transformer with built-in fuse for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The withdrawable **VTs** have insulation voltage up to 24 kV with integrated fuse-holder in resin and provided with MV fuse 2A.

The **VRS2C** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

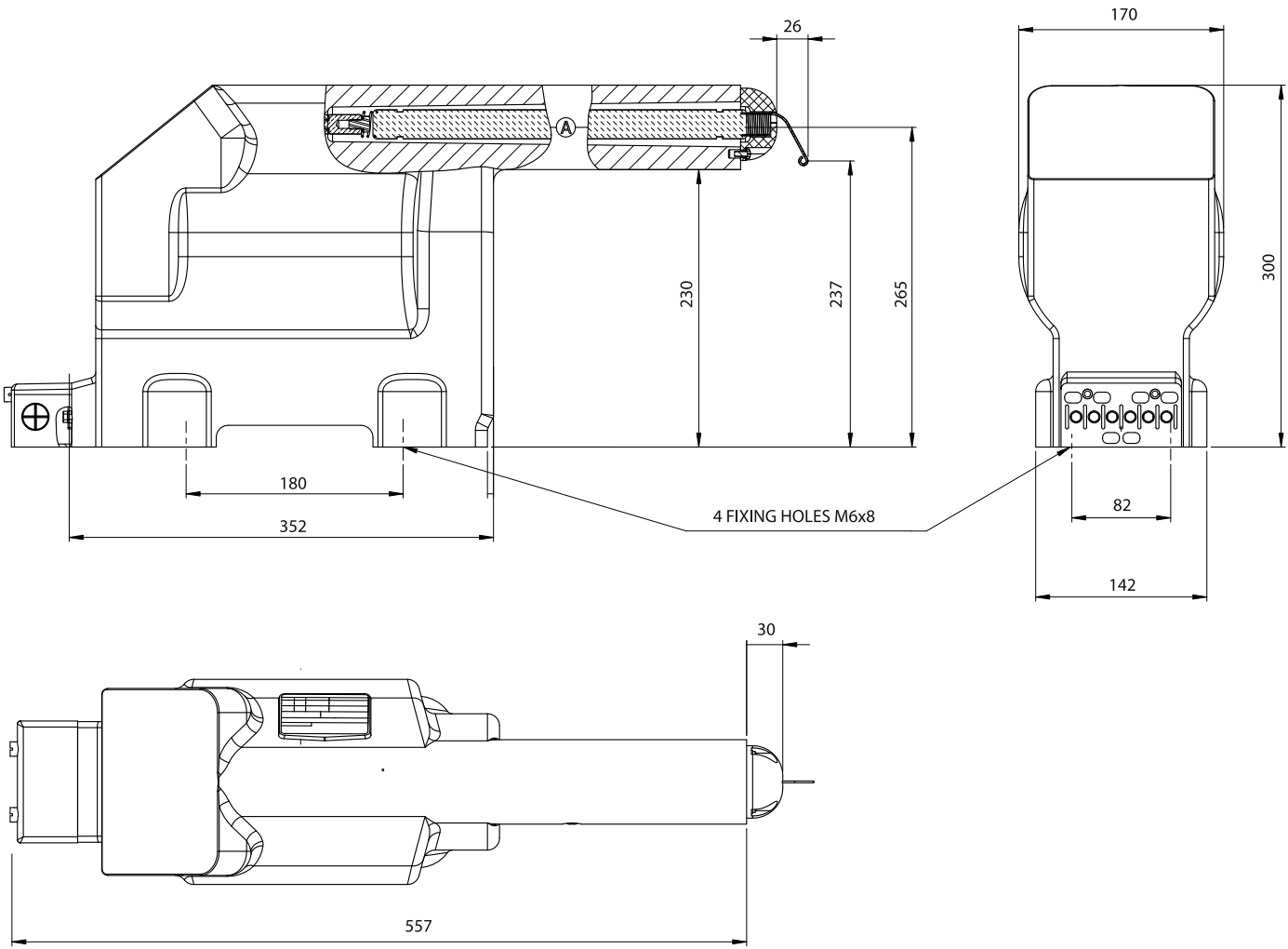
The **Voltage Transformers** is provided without any base plate and it can be mounted in any position by using the four fixing holes at the bottom of the VT. The terminal cover can be provided as accessory and it is sealable.



TECHNICAL DATA

VRS2C					
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated Voltage factor		1,9 Um / 8 hours			
Rated primary Voltage (Upr)	kV	up to 24/√3			
Rated Secondary Voltage (U _{sr})	V	100/√3 or 110/√3 or 120/√3 - 100/3 or 110/3 or 120/3			
Thermal Limiting output	VA	300			
Max number of secondaries		3			
Accuracy classes for measure		1 - 0,5 - 0,2			
Accuracy classes for protection		3P - 6P			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40 -5/+50			
Weight (approx.)	Kg	33			

VRS2C



DESCRIPTION

VRF4 is a Phase-Earth Voltage Transformer with MV Fuse for indoor applications, cast in epoxy resin with excellent performances according to IEC 61869-3 standard.

The **VTs** is provided with striker pin fuse and have insulation voltages up to 40,5 kV.

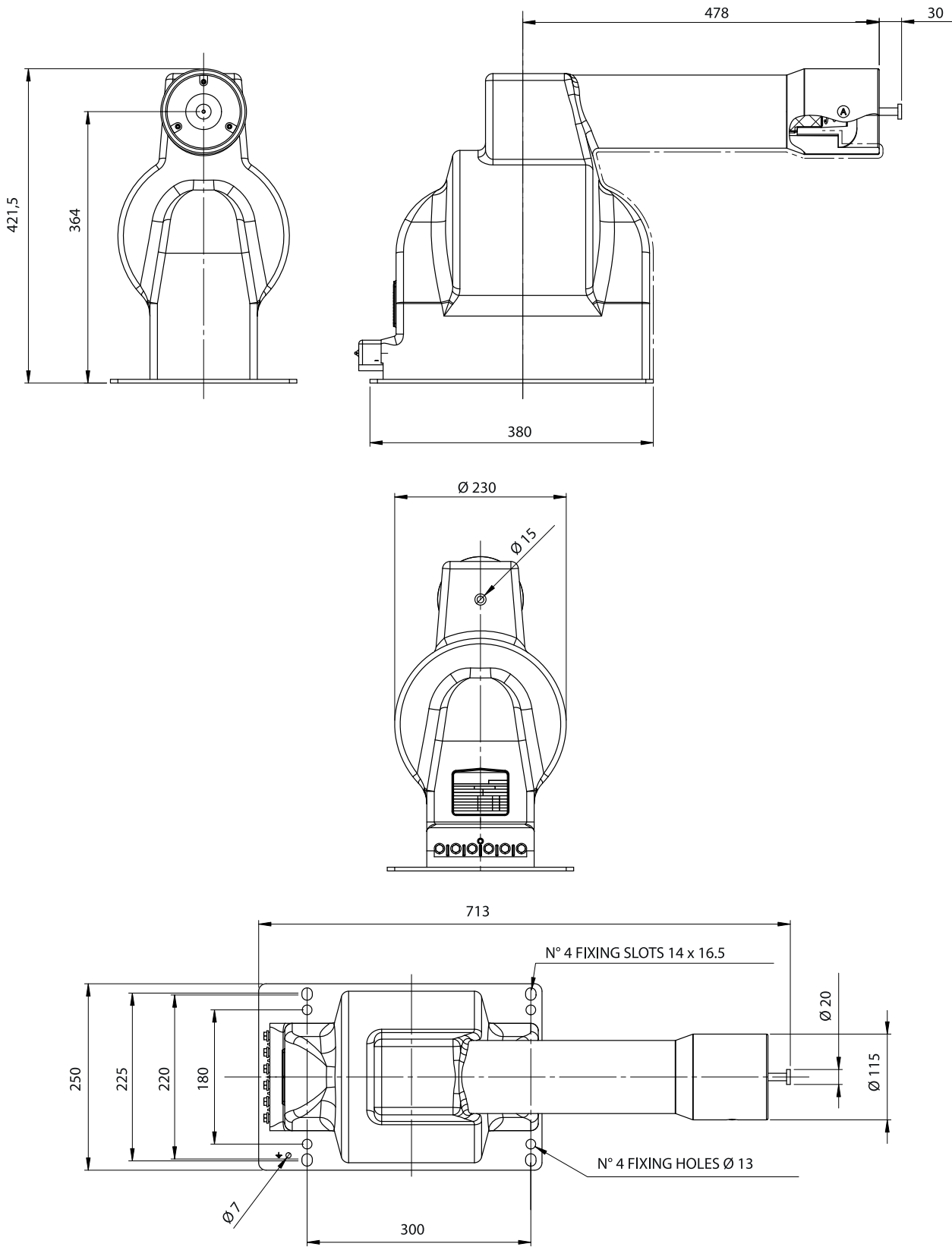
The **VRF4** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

The **Voltage Transformer** is always provided with its proper base plate. The terminal cover can be provided as accessory and it is sealable.



TECHNICAL DATA

VRF4			
Highest voltage for equipment (Um)	kV	36	40,5
Rated power-frequency withstand voltage (RMS)	kV	70	80
Rated lightning impulse withstand voltage (peak)	kV	170	185
Rated frequency (fr)	Hz	50 - 60	
Rated Voltage factor		1,9 Um / 8 hours	
Rated primary Voltage (Upr)	kV	up to 38/√3	
Rated Secondary Voltage (U _{sr})	V	100/√3 or 110/√3 or 120/√3 - 100/3 or 110/3 or 120/3	
Thermal Limiting output	VA	450	
Max number of secondaries		3	
Accuracy classes for measure		1 - 0,5 - 0,2	
Accuracy classes for protection		3P - 6P	
Thermal class		A	
Operating ambient temperature categories	°C	-25/+40	-5/+50
Weight (approx.)	Kg	48	



OUTDOOR INSTRUMENT TRANSFORMERS

The design of Semar Electric outdoor instrument transformers has been developed to ensure reliable operation and long-term performance even under the most severe environmental conditions.

- They are designed to withstand up to pollution level IV as defined in IEC 60815, “Selection and dimensioning of high-voltage insulators for polluted conditions”.
- Ageing resistance is ensured by the application of a high-quality silicone coating on the sandblasted epoxy resin surface, which enhances surface hydrophobicity and minimizes the risk of tracking and erosion over time.

The secondary connections are protected inside a robust polycarbonate enclosure specifically designed for outdoor electrical equipment, compliant with the main international standards (UL, CSA, CE, Lloyd’s Register, Bureau Veritas, FI).

This enclosure provides excellent resistance to UV radiation, temperature variations, and mechanical impact.

The degree of protection, according to IEC 60529, is IP65.

SILICONE PROTECTION SYSTEM



The silicone material used for Semar Electric outdoor transformers is supplied by world-renowned manufacturers.

The use of silicone coatings in high-voltage outdoor applications is a well-established practice to prevent flashover and surface discharges, particularly in heavily polluted or humid environments.

Over 35 years of experience in intensive field applications have demonstrated the efficiency and reliability of silicone coatings on both glass and epoxy insulators.

Extensive laboratory tests performed at Semar Electric laboratories have confirmed all the essential properties for this application, including:

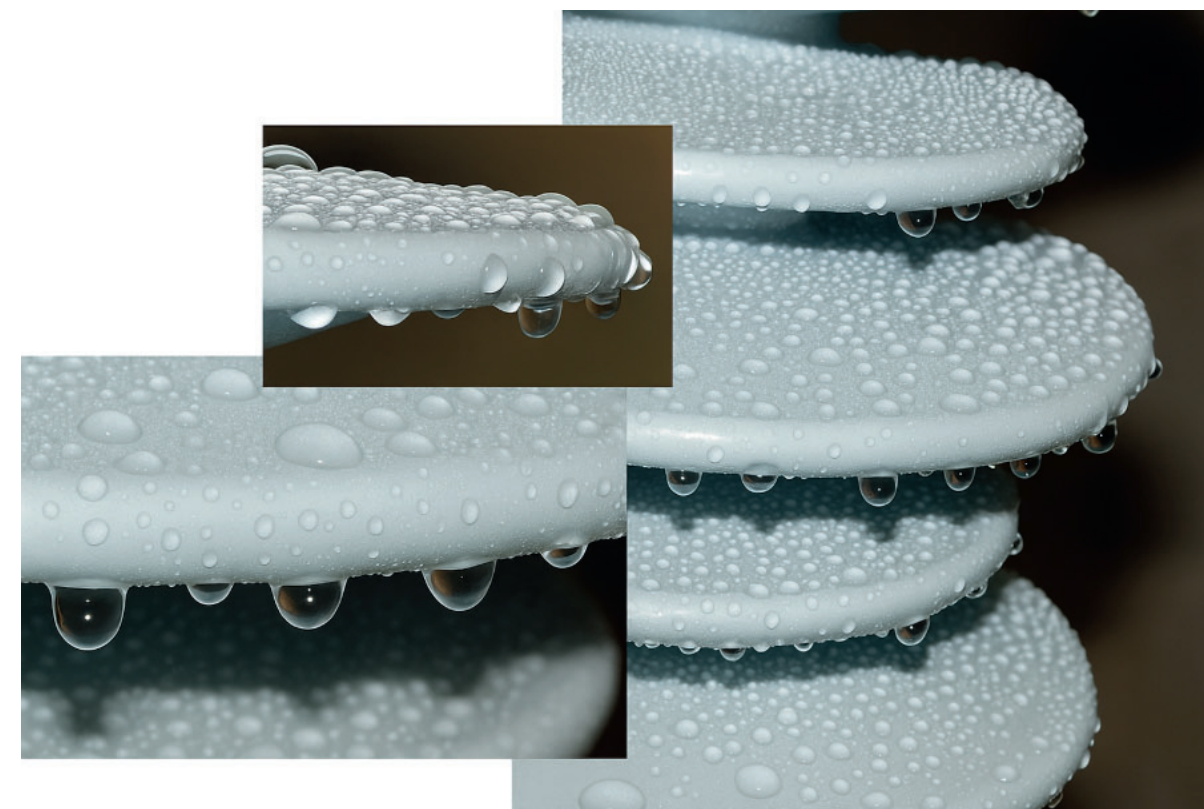
- Volume and surface dielectric strength
- Adhesion to epoxy resin
- Ageing and UV resistance

The tests have shown that epoxy resin coated with silicone ages significantly slower than cycloaliphatic resin of similar geometry.

Furthermore, the surface breakdown strength is higher when using silicone coatings compared to bare resin.

In the event of flashover (e.g., due to overvoltage), silicone has the unique capability to retain its hydrophobic properties, whereas other insulating materials tend to lose these characteristics and may require replacement.

Moreover, silicone maintains its hydrophobicity throughout the transformer’s service life, unlike many polymeric materials that lose these properties after relatively short exposure to environmental stresses.



DESCRIPTION

OAM7 is a Current Transformer for Outdoor applications, cast in epoxy resin with silicone coatin,with excellent performances according to IEC 61869-2 standard.

The VTs provides Protection level IP65 and have insulation voltages up to 40,5 kV.

The **OAM7** Current transformer is designed for both single-turn or multi-turn versions, with single or double ratio with possibility to be reconnectable only at secondary side.

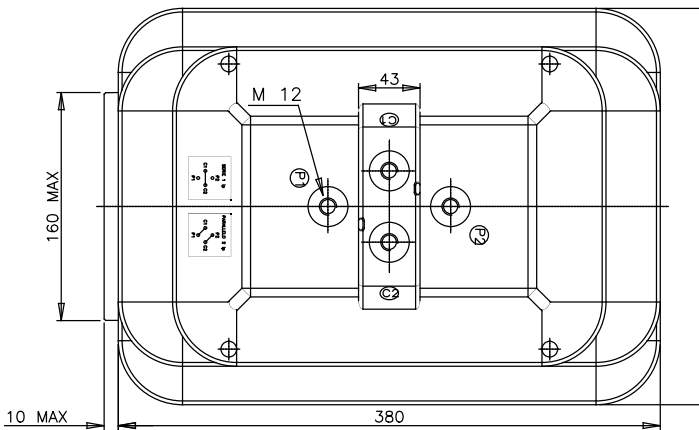
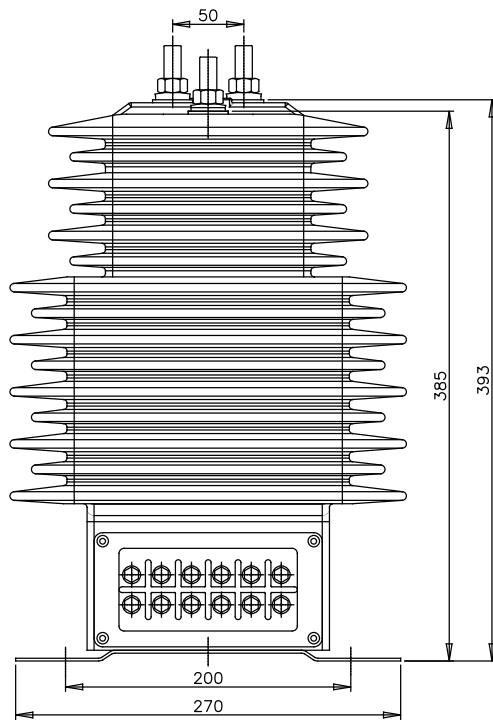
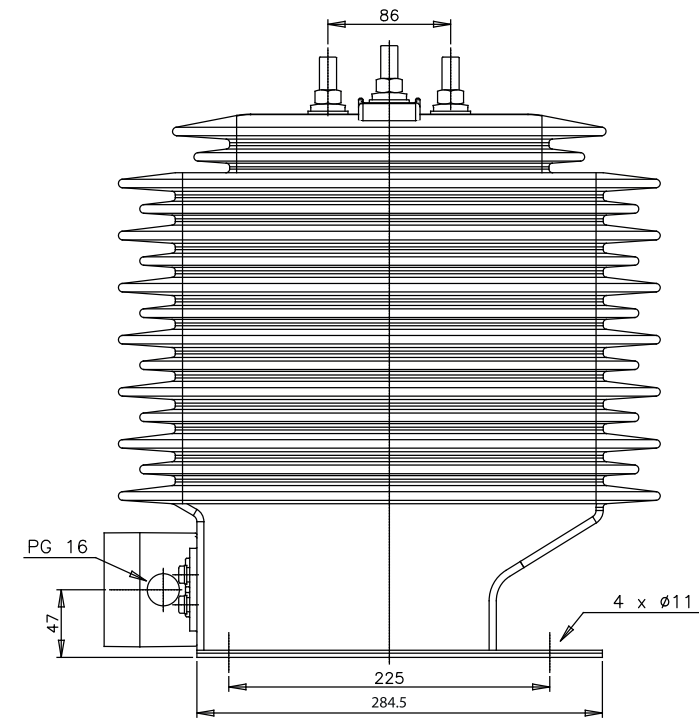
The Current Transformers is always provided with its proper base plate and IP65 sealable terminal cover.



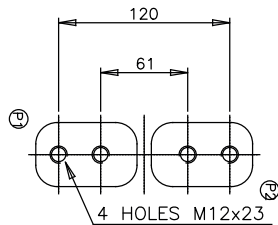
TECHNICAL DATA

OAM7				
Highest voltage for equipment (Um)	kV	24	36	40,5
Rated power-frequency withstand voltage (RMS)	kV	50	70	85
Rated lightning impulse withstand voltage (peak)	kV	125	170	200
Rated frequency (fr)	Hz	50 - 60		
Rated short-time thermal current (Ith)	kA/s	up to 50kA / 1s		
Rated primary current (Ipr)	A	up to 2000		
Rated Secondary current (Isr)	A	5 -1		
Rated dynamic current (Idyn)	kA	2,5 Ith		
Max number of secondaries		3		
Accuracy classes for measure		1 - 0,5 - 0,5S - 0,2 - 0,2S		
Accuracy classes for protection		5P - 10P - PX		
Thermal class		A		
Operating ambient temperature categories	°C	-25/+40 -5/+50		
Weight (approx.)	Kg	45		

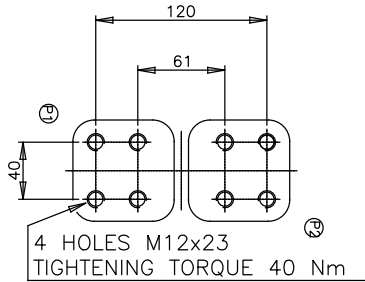
OAM7



IPR UP TO 1600A



IPR UP TO 2000A



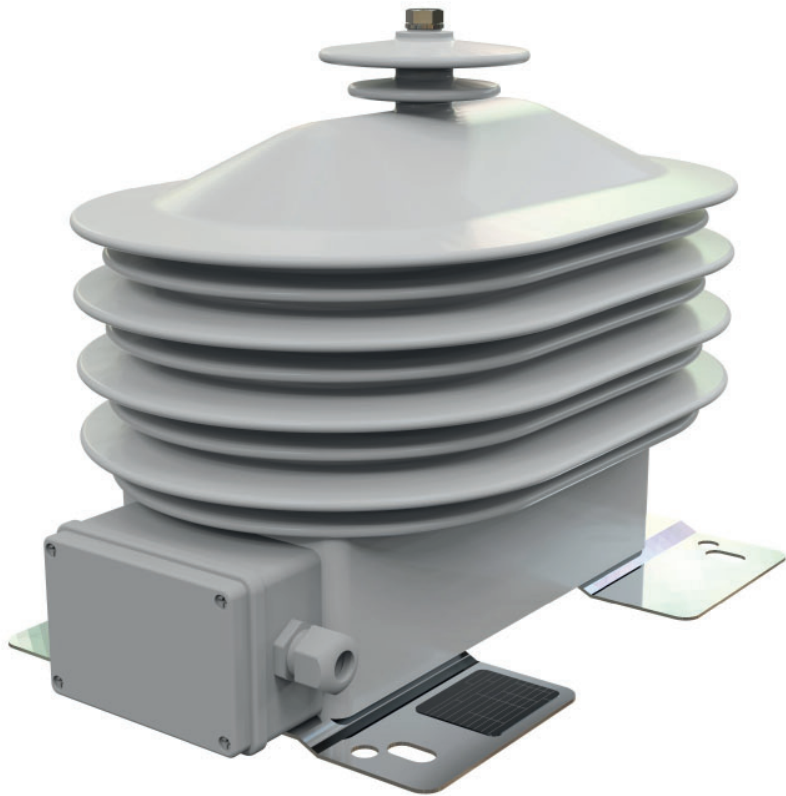
DESCRIPTION

OVF2 is a Phase-Earth Voltage Transformer for Outdoor applications, cast in epoxy resin with silicone coating, with excellent performances according to IEC 61869-3 standard.

The VTs provides Protection level IP65 and have insulation voltages up to 24 kV.

The **OVF2** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

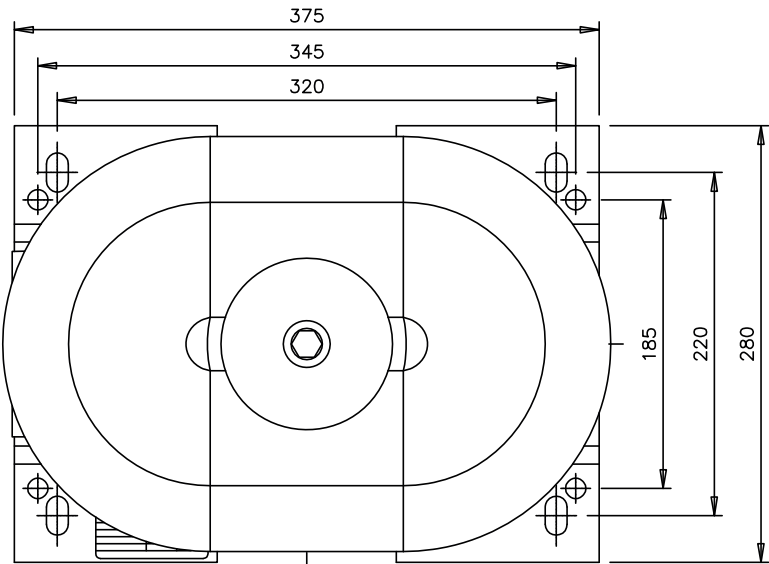
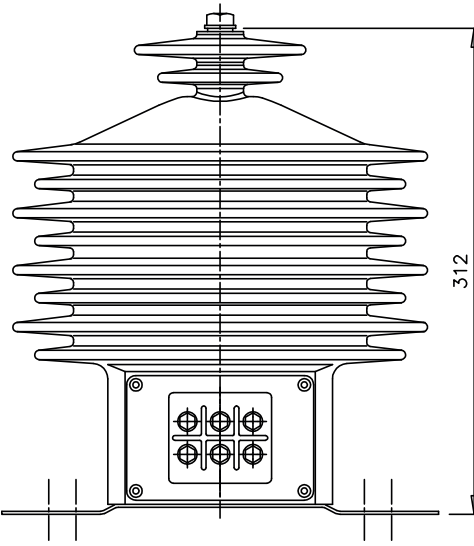
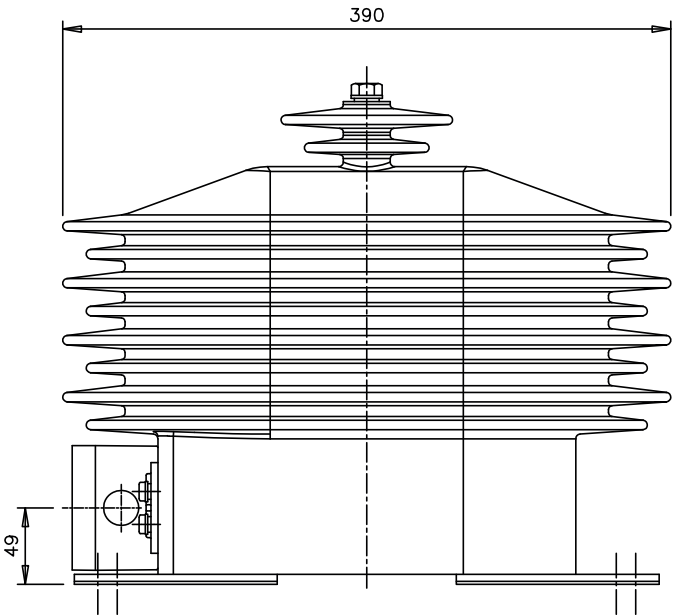
The Voltage Transformer is always provided with its proper base plate and IP65 sealable terminal cover.



TECHNICAL DATA

TECHNICAL DATA		OVF2			
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated Voltage factor		1,9 Um / 8 hours			
Rated primary Voltage (Upr)	kV	up to 24/√3			
Rated Secondary current (Usr)	V	100/√3 or 110/√3 or 120/√3			
Thermal Limiting output	VA	300			
Max number of secondaries		3			
Accuracy classes for measure		1 - 0,5 - 0,2			
Accuracy classes for protection		3P - 6P			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40		-5/+50	
Creepage distance phase-ground	mm	> 750			
Weight (approx.)	Kg	35			

OVF2



DESCRIPTION

OVF3 is a Phase-Earth Voltage Transformer for Outdoor applications, cast in epoxy resin with silicone coating, with excellent performances according to IEC 61869-3 standard.

The VTs provides Protection level IP65 and have insulation voltages up to 36 kV.

The **OVF3** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

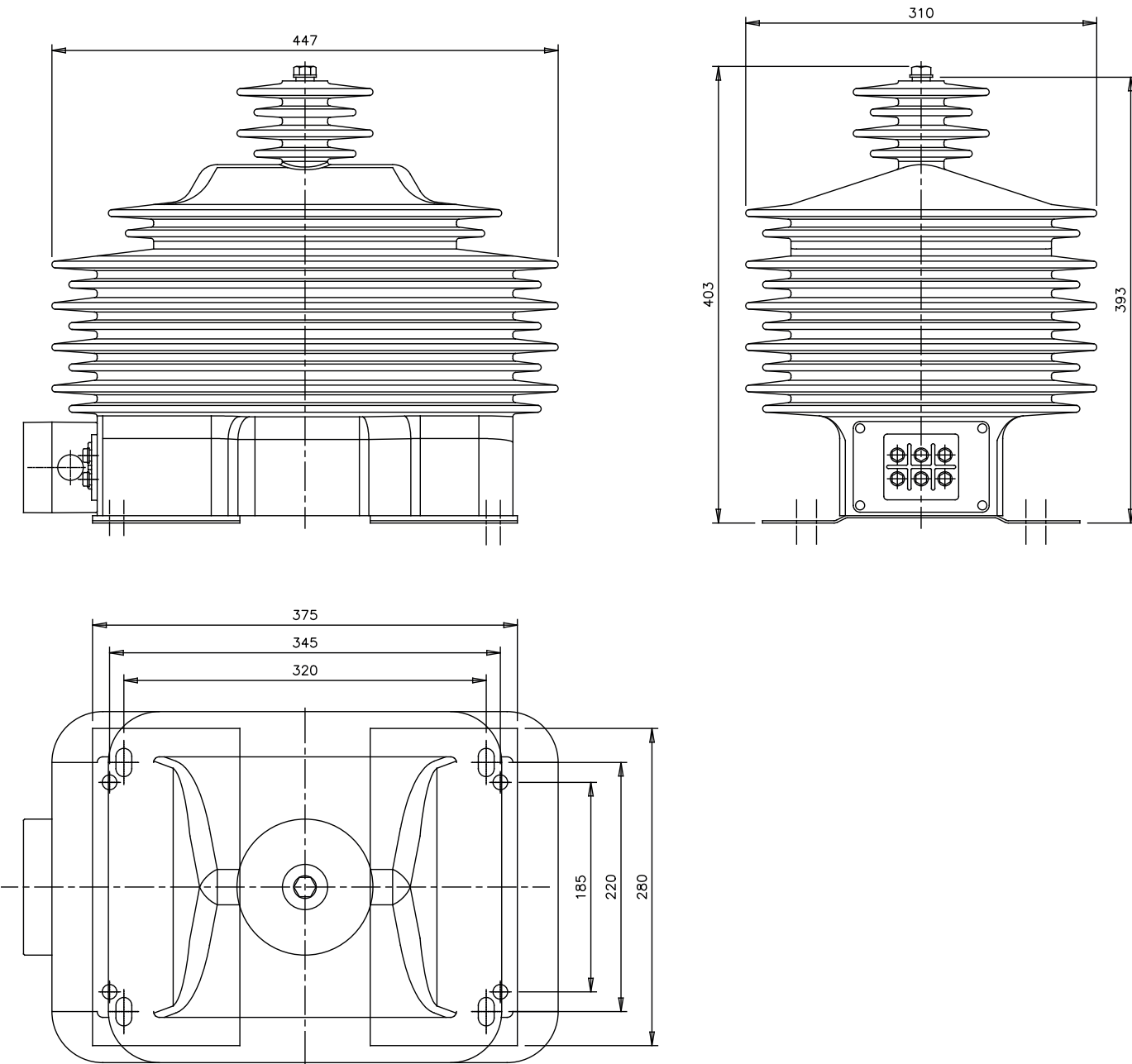
The Voltage Transformer is always provided with its proper base plate and IP65 sealable terminal cover.



TECHNICAL DATA

OVF3		
Highest voltage for equipment (Um)	kV	36
Rated power-frequency withstand voltage (RMS)	kV	70
Rated lightning impulse withstand voltage (peak)	kV	170
Rated frequency (fr)	Hz	50 - 60
Rated Voltage factor		1,9 Um / 8 hours
Rated primary Voltage (Upr)	kV	up to 36/√3
Rated Secondary current (Usr)	V	100/√3 or 110/√3 or 120/√3
Thermal Limiting output	VA	450
Max number of secondaries		3
Accuracy classes for measure		1 - 0,5 - 0,2
Accuracy classes for protection		3P - 6P
Thermal class		A
Operating ambient temperature categories	°C	-25/+40 -5/+50
Creepage distance phase-ground	mm	> 1200
Weight (approx.)	Kg	55

OVF3



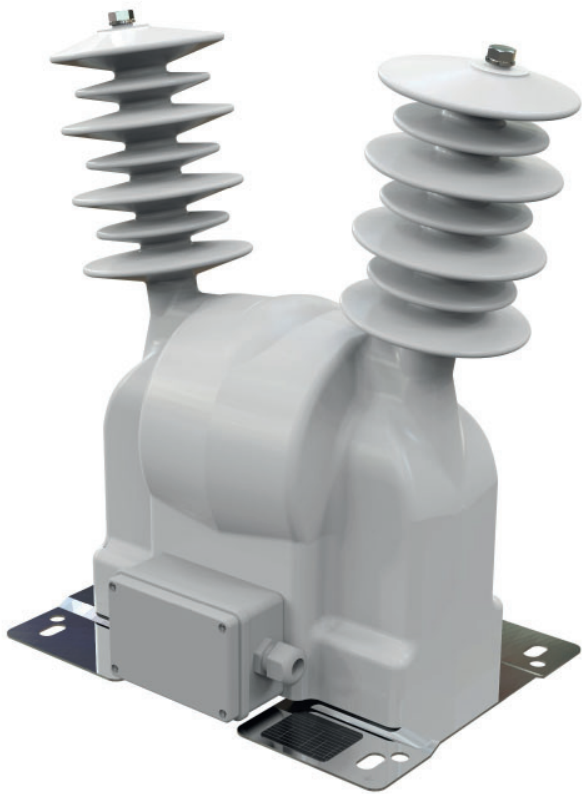
DESCRIPTION

OVC2 is a Phase-Phase Voltage Transformer for Outdoor applications, cast in epoxy resin with silicone coating, with excellent performances according to IEC 61869-3 standard.

The VTs provides Protection level IP65 and have insulation voltages up to 24 kV.

The **OVC2** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

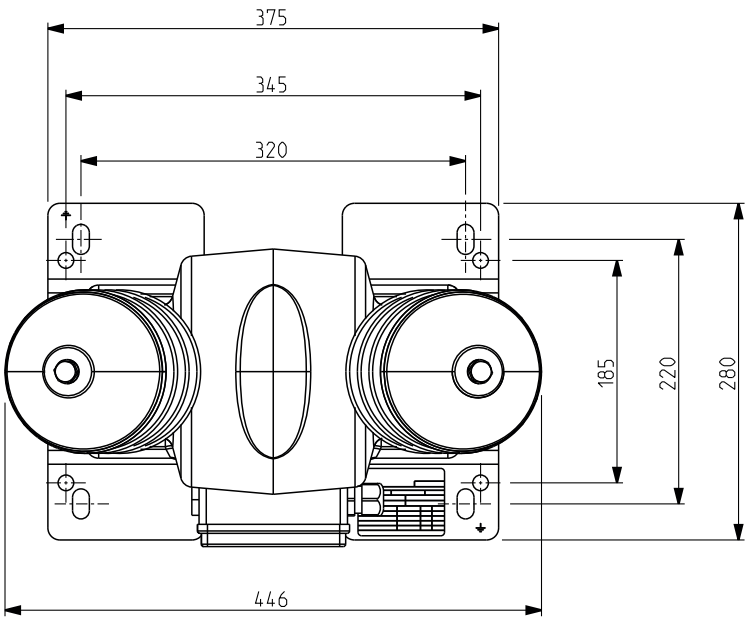
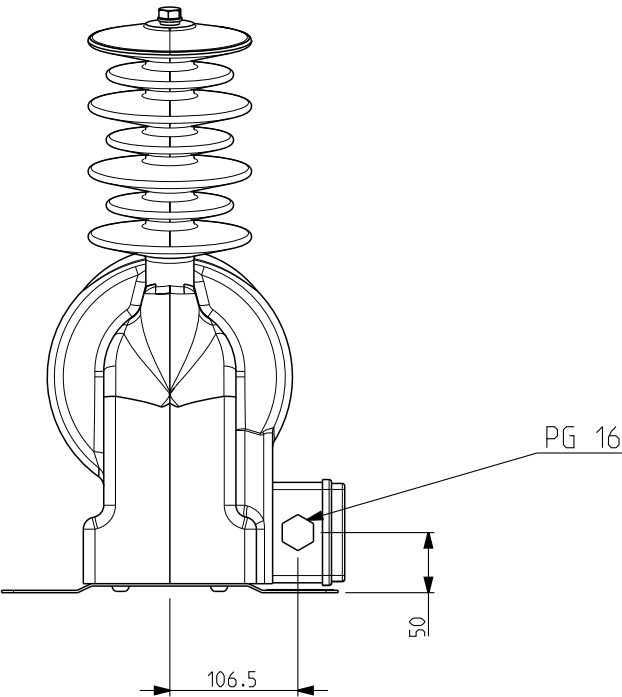
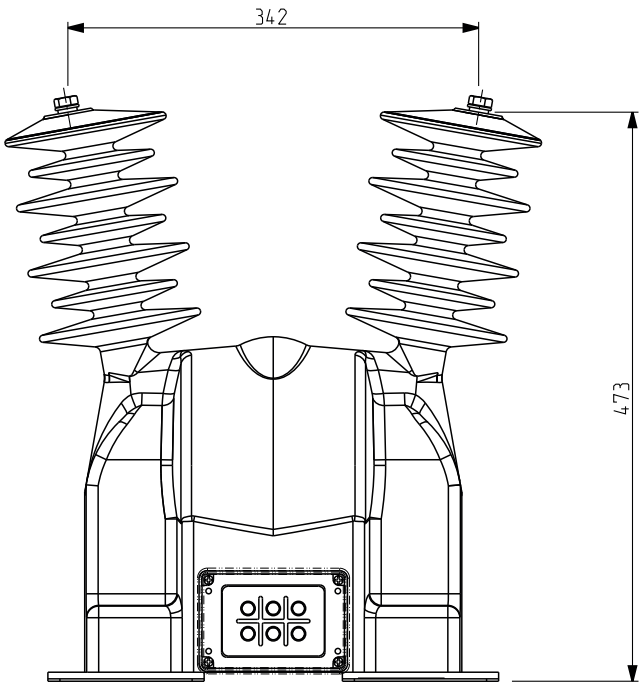
The Voltage Transformer is always provided with its proper base plate and IP65 sealable terminal cover.



TECHNICAL DATA

OVC2					
Highest voltage for equipment (Um)	kV	7,2	12	17,5	24
Rated power-frequency withstand voltage (RMS)	kV	20	28	38	50
Rated lightning impulse withstand voltage (peak)	kV	60	75	95	125
Rated frequency (fr)	Hz	50 - 60			
Rated Voltage factor		1,2 Um Continuous			
Rated primary Voltage (Upr)	kV	up to 24			
Rated Secondary current (Usr)	V	100 or 110 or 120			
Thermal Limiting output	VA	500			
Max number of secondaries		2			
Accuracy classes for measure		1 - 0,5 - 0,2			
Accuracy classes for protection		3P - 6P			
Thermal class		A			
Operating ambient temperature categories	°C	-25/+40 -5/+50			
Creepage distance phase-ground	mm	> 750			
Creepage distance phase-phase	mm	> 1400			
Weight (approx.)	Kg	33			

OVC2



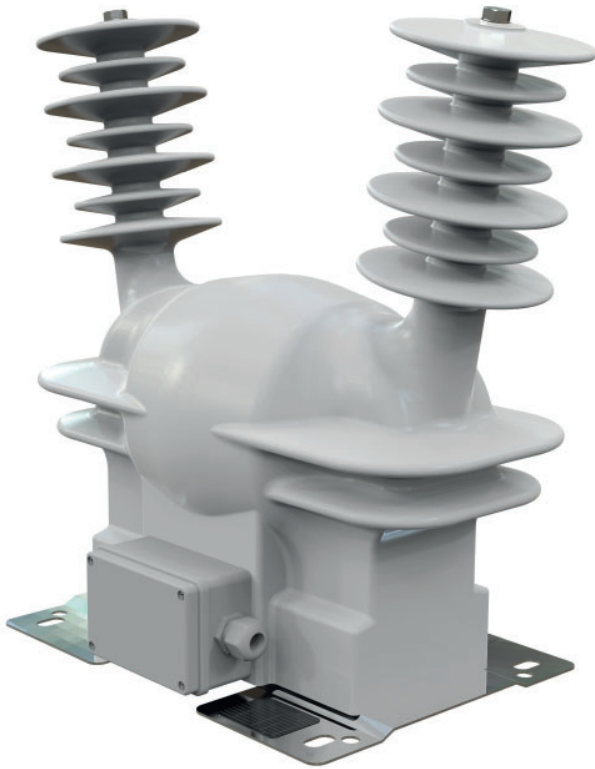
DESCRIPTION

OVC3 is a Phase-Phase Voltage Transformer for Outdoor applications, cast in epoxy resin with silicone coating, with excellent performances according to IEC 61869-3 standard.

The VTs provides Protection level IP65 and have insulation voltages up to 36 kV.

The **OVC3** Voltage transformer is suitable for single or double primary ratio with possibility to be reconnectable on the secondary side.

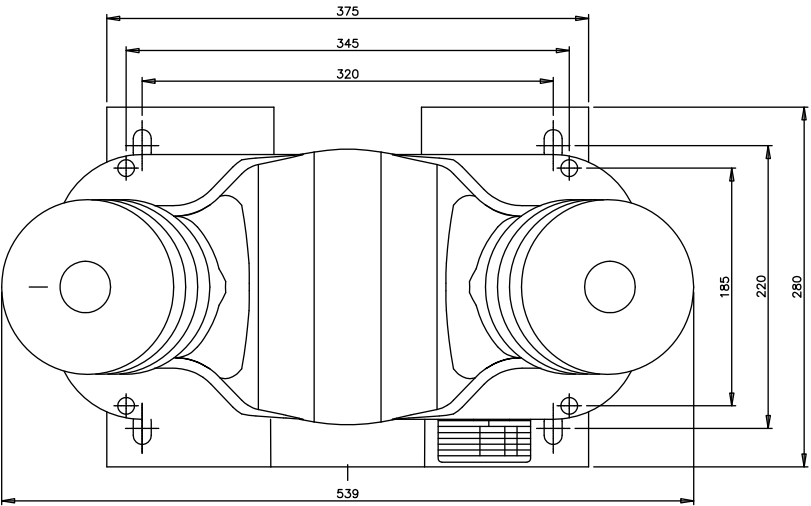
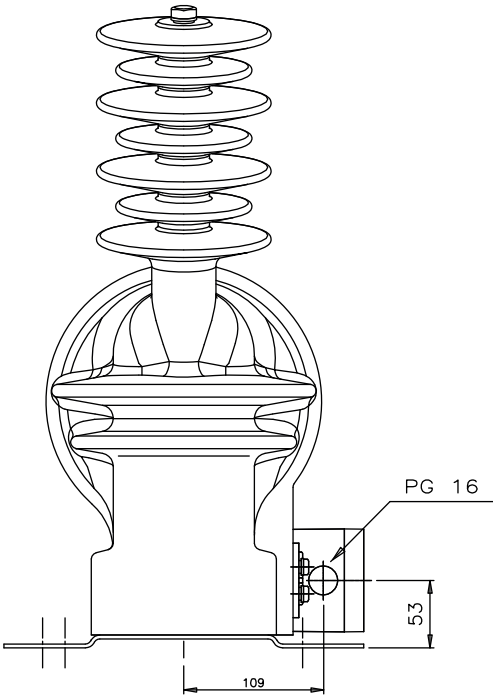
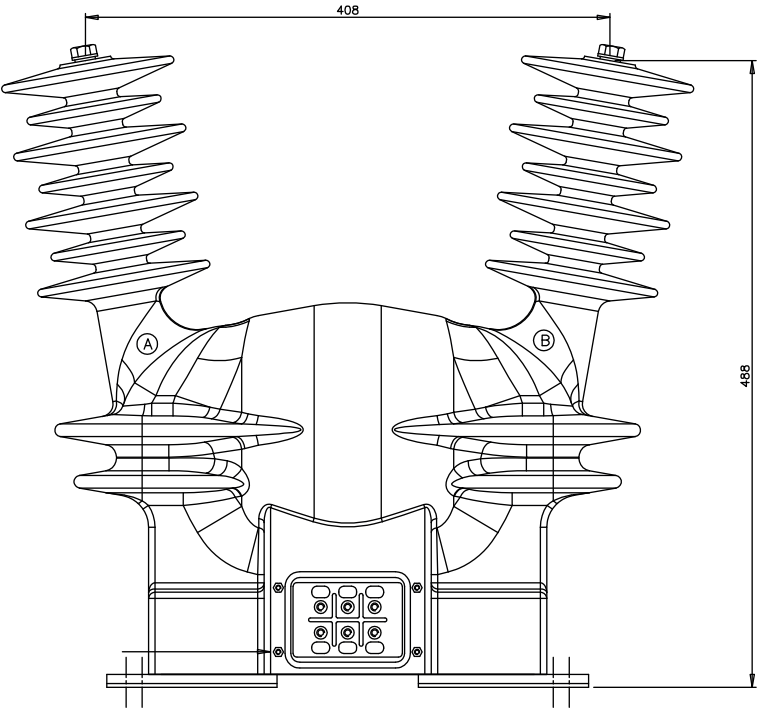
The Voltage Transformer is always provided with its proper base plate and IP65 sealable terminal cover.



TECHNICAL DATA

OVC3		
Highest voltage for equipment (Um)	kV	36
Rated power-frequency withstand voltage (RMS)	kV	70
Rated lightning impulse withstand voltage (peak)	kV	170
Rated frequency (fr)	Hz	50 - 60
Rated Voltage factor		1,2 Um Continuous
Rated primary Voltage (Upr)	kV	up to 36
Rated Secondary current (Usr)	V	100 or 110 or 120
Thermal Limiting output	VA	up to 500
Max number of secondaries		2
Accuracy classes for measure		1 - 0,5 - 0,2
Accuracy classes for protection		3P - 6P
Thermal class		A
Operating ambient temperature categories	°C	-25/+40 -5/+50
Creepage distance phase-ground	mm	> 900
Creepage distance phase-phase	mm	> 1560
Weight (approx.)	Kg	43

OVC3





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