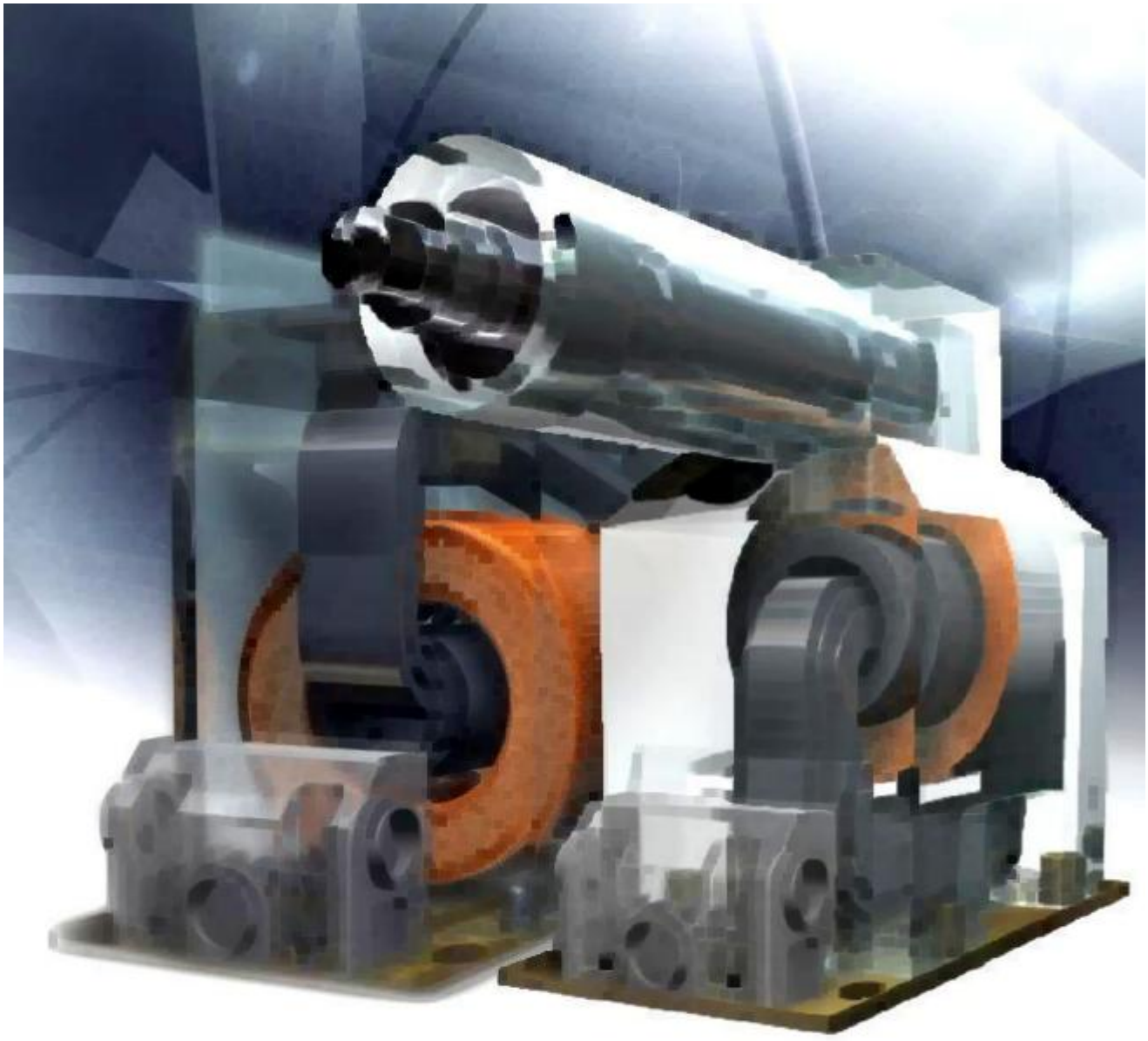
Current and Voltage (potential) Instrument transformers

Instruction for installation, use and maintenance



Content:

Instruction for installation, use and maintenance for Current and Voltage (potential) transformers

This installation, use and maintenance guide is valid for current and voltage transformers operating in outdoor or indoor conditions.

These instructions are valid for Current transformer type: TPU; TPO; TP; TTR; BB; BBO; KOKS; KOFA; IHBF

Voltage transformers types: TJC; TDC; TDO; TJO; TJP; TDP; KGUG; KGUGI; KRED

1. Service conditions

Indoor transformers

The transformers should be mounted in dry indoor conditions where the ambient air is not significantly polluted by dust, smoke, corrosive gases, vapours or salt.

The transformers are designed for standard ambient temperature between –5 °C and +40 °C. The altitude for use should be lower than 1000 m above the sea level. The transformers may be used also in higher or lower ambient temperatures and higher altitudes when agreed between the manufacturer and purchaser.

Outdoor transformers

The transformers should be mounted in outdoor conditions where the ambient air may be polluted by dust, smoke, corrosive cases, vapours or salt.

The transformers are designed for standard ambient temperature between –40°C and +40 °C. The average value of the ambient temperature, measured over a period of 24 hours, should not exceed 35°C.

2. Technical details

The technical details for each individual transformer are mentioned on the rating plate fastened on the transformer. Values mentioned on the rating plate must not be exceeded. Markings used on the rating plate are as follows:

Example of Indoor current transformer label

ABB			**1234567890**
			TPU 40.13
200-400/1/1 A			50 Hz
1S1-1S2	200/1A	5VA cl. 0.5 FS 5	
1S1-1S3	400/1A	10VA cl. 0.5 FS 5	
2S1-2S2	200/1A	5VA cl. 5P15	
2S1-2S3	400/1A	10VA cl. 5P15	
12/28/75 kV			50(1s)/125 kA
2002		IEC 60044-1	
E		TCM 212/95-2150	

Where:

1234567890	serial number
TPU 40.13	transformer type code
50Hz	rated frequency
200-400/1/1 A	rated transformer ratio
1S1-1S2	terminal marking for core number 1, first tap
1S1-1S3	terminal marking for core number 1, second tap
5VA	rated output
0.5, 5P	accuracy classes
FS5	instrument security factor
12/28/75 kV	highest voltage for equipment / power-frequency withstand voltage / rated lightning-impulse voltage
IEC 60044-1	referred standard(s)
50(1s)/125kA	rated short time thermal current (thermal time) / rated dynamic current
2002	year of production
E	temperature class
TCM ……	Type approval mark

Example of Indoor Voltage transformers label

ABB		**1234567890**
		TJC 4
6600:√3/100:√3/100:3 V		50 Hz
a-n	30VA cl.0.5	
da-dn	30VA cl.6P	
7.2/20/60 kV		400 VA
2002	IEC 60044-2	
E	TCM 212/95-2151	

Where:

1234567890	serial number
TJC 4	Transformer type code
50Hz	rated frequency
6600:√3/100: √3/100:3 V	rated voltage ratio
a-n	terminal marking for first secondary winding
da-dn	terminal marking for residual (open-delta) winding
30VA	rated output
0.5, 6P	accuracy classes
12/28/75 kV	highest voltage for equipment / power-frequency withstand voltage / rated lightning-impulse voltage
IEC 60044-2	referred standard
2002	year of production
E	temperature class
TCM……	Type approval mark

3. Instruction for installation

General information

Instrument transformer is an electrical equipment and the electrical installation shall be done by skilled person only. National legislation can set down the minimum age and the criteria for competence of skilled persons working on, with, or near an electrical installation. Where is not the national legislation requirements for competence, the criteria shall be used at least according to EN 50110-1.

Safety instructions

1. Always consider transformer as a part of the circuit to which it is connected, and do not touch the leads and terminals or other parts of the transformer unless they are known to be grounded.
2. Always ground the metallic bases of instrument transformer.
3. Always ground one secondary terminal of the transformer, except if the windings of voltage transformer are connected to open delta. Residual voltage windings connected to open delta must have dn terminal earthed only on one of three transformers (earthing screws at dn terminals of others two transformers have to be removed). When the secondary of transformer is interconnected, there should be only one grounded point to prevent accidental paralleling with system grounding wire. In case of disconnection from the ground, the grounding screw has to be removed from the secondary terminal. Connection between secondary terminal and base plate (ground) is shown on the picture “Crossection of double line terminal box“
4. Always short-circuit the secondary of the current transformer, which is not currently in use to prevent secondary voltages which may be hazardous to personnel or damaging to the transformer’s secondary. The secondary like this must be additionally grounded.
5. Never short-circuit the secondary terminal of a voltage transformer even this is not in use. A secondary short-circuit will cause the unit to overheat and fail in a very short period of time.
6. Protection of single pole insulated voltage transformers against feroresonance phenomena is stated in appendix 3. – Damping of the feroresonance in Voltage transformers type TJC/TJP.
7. In case of the current transformer with voltage indication (coupling electrode included) is secondary terminal box equiped with PE terminal, which is connected with earthing screw to the base plate, which must be generally earthed.
   Connection between secondary terminal and base plate is shown on the picture “Crossection of single line terminal box“
   Attention: Terminal PE must be always earthed, this is hold generally, even if the base plate is removed. In case of disassembling the base plate, producer doesn’t warranting the earthing.

Mounting

Following information is general and some details can differentiate according to type and variants of transformers. It is necessary to combine it with other technical and marketing specifications like catalogues, dimensional drawings and rating plate for specific transformer type.

<u>Indoor current and voltage transformers</u>

The mounting position of the indoor transformer can be freely chosen. The transformer is fixed using the mounting base with four screws M10 and washers. Fastening must be done on a smooth surface.

There is a M8 screw for earthing the transformer on the base plate.

Outdoor current and voltage transformers

The mounting position of the outdoor transformer is only horizontal. The other position can be agreed with the supplier. The transformer is fixed using the mounting base (VT) with four screws M10 and washers or two U profiles (CT) with M12 screws. Fastening must be done on a smooth surface.

There is a M12 screw for grounding of current transformer and M8 screw for grounding of voltage transformer.

Primary connection

Primary terminals of the current transformer are made of cooper and they are silver or tin plated. There are M12 screws used for fastening of primary conductor to the terminal. For primary reconnectable transformers the ratio can be reconnected by changing position of the links fixed by M8 screws without removing already fitted primary conductors.

Maximum allowed torques for screw connections of current transformers:

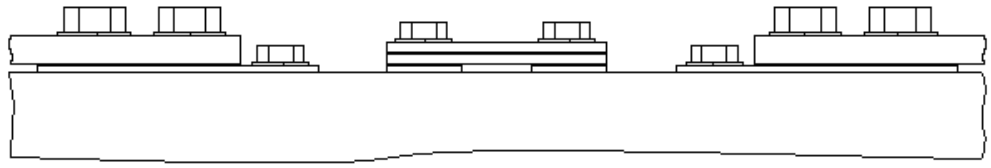
Screw	Max. torque [Nm]	Min. torque [Nm]
M5	3.5	2.8
M6	4	3
M8	20	16
M10	20	16
M12	70	56

Maximum allowed torque for screw connection of voltage transformer is 20 Nm.

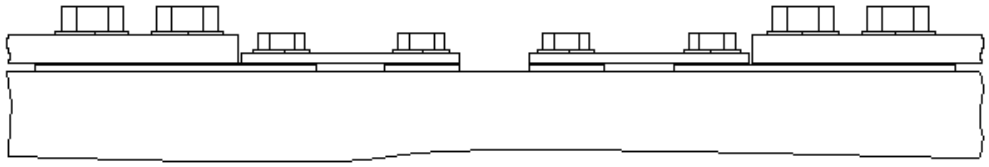
Maximum allowed cantilever strength is: Voltage transformers 2000 N.
Current transformers 5000 N.

Primary reconnectable transformers
PRIMARY CONNECTION

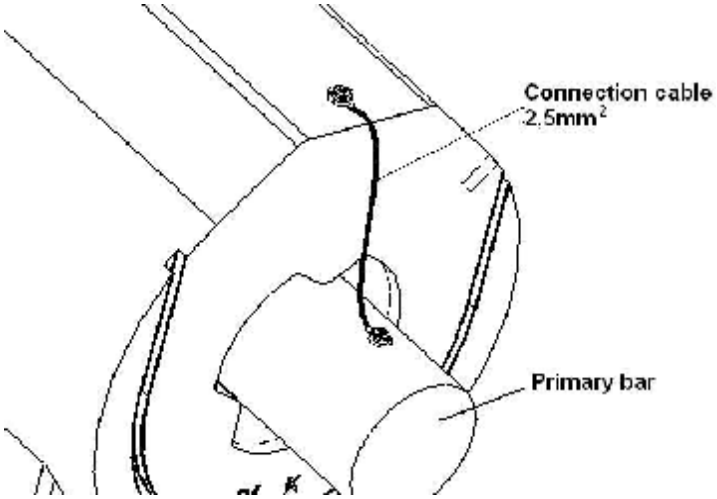
LOW RATIO



HIGH RATIO



In case of Bus CT, there must be always connected CT shielding to the primary bar. Connection must be done at least on one side of the CT. One example of KOKS 12 shielding connection is described on the picture



Secondary connections

The terminals, screws, nuts and washers are made of stainless steel. Secondary grounding screws and secondary terminal fastening screws are made of nickel-plated brass.

The secondary terminal cover box for indoor use is made from the plastic and provided with three detachable threaded inserts Pg16. The terminals are provided with M5 screws for secondary wiring connection and with through going holes for direct earthing of the secondary circuit by M5 screws. The terminal cover is seal able.

The secondary cover for outdoor CT is made of epoxy resin and provided with one insert Pg21. The secondary cover for outdoor VT is made of plastic and provided with two insert Pg21.

Degrees of IP protection

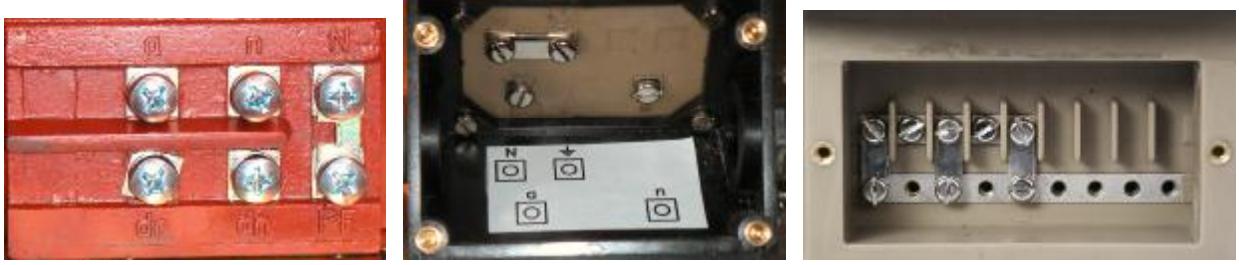
Indoor transformers: IP40, or IP30 for transformers TTR, BB, KOKS

Outdoor transformers: IP54

For terminal marking see appendix 1.

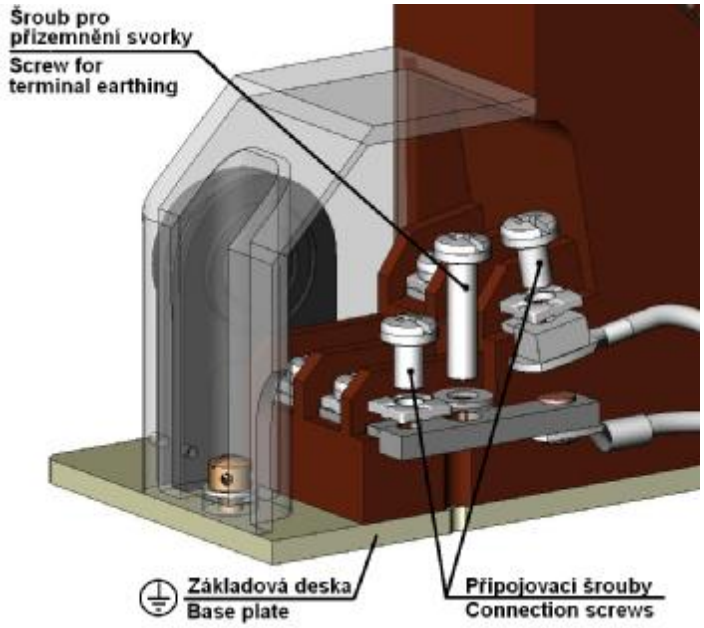
Example of current transformers terminal boxes

TJC,TDC TJC7 TJC,TDC



TJP,TJC,TDC TJO7 TJO6,TDO6

Example of voltage transformers terminal boxes



Cross section of double line secondary terminal box

Capacitive voltage indicator (divider)

The transformer can be supplied with the capacitive voltage indicator on the request. There are two possible solutions:

a. HR – Indicator complies with the IEC 61234-5 standard for high resistive voltage indicators
b. CE – Where the values of capacity C1 and C2 are measured. C1 is the capacitance between primary winding and Ck terminal and C2 is the capacitance between grounded parts and CK terminal. These values are mentioned on the rating plate.

CE capacity according to nominal voltage

Ub (kV)	C1 (pF)	C2 (pF)
3 – 5,5	28 – 55	20 - 90
5,5 – 7,2	23 – 40	
10 – 13,8	19 – 33	
13,8 – 17,5	13 – 23	
20 – 24	10 - 18	

Fuses

The fuse can be a part of a supply of voltage transformers with fuse. We can supply following fuses:

0.3A – 12 and 24 kV products…….fuse type JT6 specially designed for voltage transformers
0.6A – 12 kV products …… …….fuse type JT6 specially designed for voltage transformers
2A – 6.3A all products up to 24 kV …IEC fuses manufacturer SIBA / ABB
2A products for 36kV ……..IEC fuses manufacturer BUSSMANN

4. Instruction for use

Current and Voltage instrument transformers are used:

- to convert large currents or voltage in the primary circuit to an appropriate level for secondary circuit equipment (relays and meters)
- to insulate primary and secondary circuit from each other to protect the secondary equipment from the harmful effects of large current or voltage appearing during the operation (short circuits)

The use of current or voltage transformer for other purpose then described above is forbidden if not agreed with the producer.

Routine test report

Together with instrument transformer are delivered:

- routine test report
- two rating plates (one plastered on the transformer and one free)

The following information can be included on the request. These are free of charge.

- theoretical current/voltage errors and phase displacement values
- theoretical excitation curves

There are additional extra paid reports which can be supplied on request:

- accuracy test report
- magnetizing curve (for current transformers)
- additional labels (if more then 2)
- verification tests

5. Instruction for maintenance

Excessive dust or other kind of pollution must be brushed off the transformer. Polluted transformers can be cleaned with spirit, petrol or toluene.

Traces of arcs and minor surface damages can be easily removed with sandpaper after which the surface is to be treated by applying a thin layer of silicone paste on it.

Instruction for repairing greater surface damages must be requested from the manufacturer.

6. Transport and storage

The permissible transport and storage temperature is from –40 °C to +70 °C. During transport and storage the transformers must be protected against direct sunshine. The transformers are delivered fastened to a transport pallet.

7. Disposal

Materials used in instrument transformers are considered as materials without dangerous environmental impact and materials are not toxic. Disposal of instrument transformers is controlled by national legislation of communal waste.

8. Handling with the transformers

Handling with the transformer is described in the Appendix 4.

9. Normative references

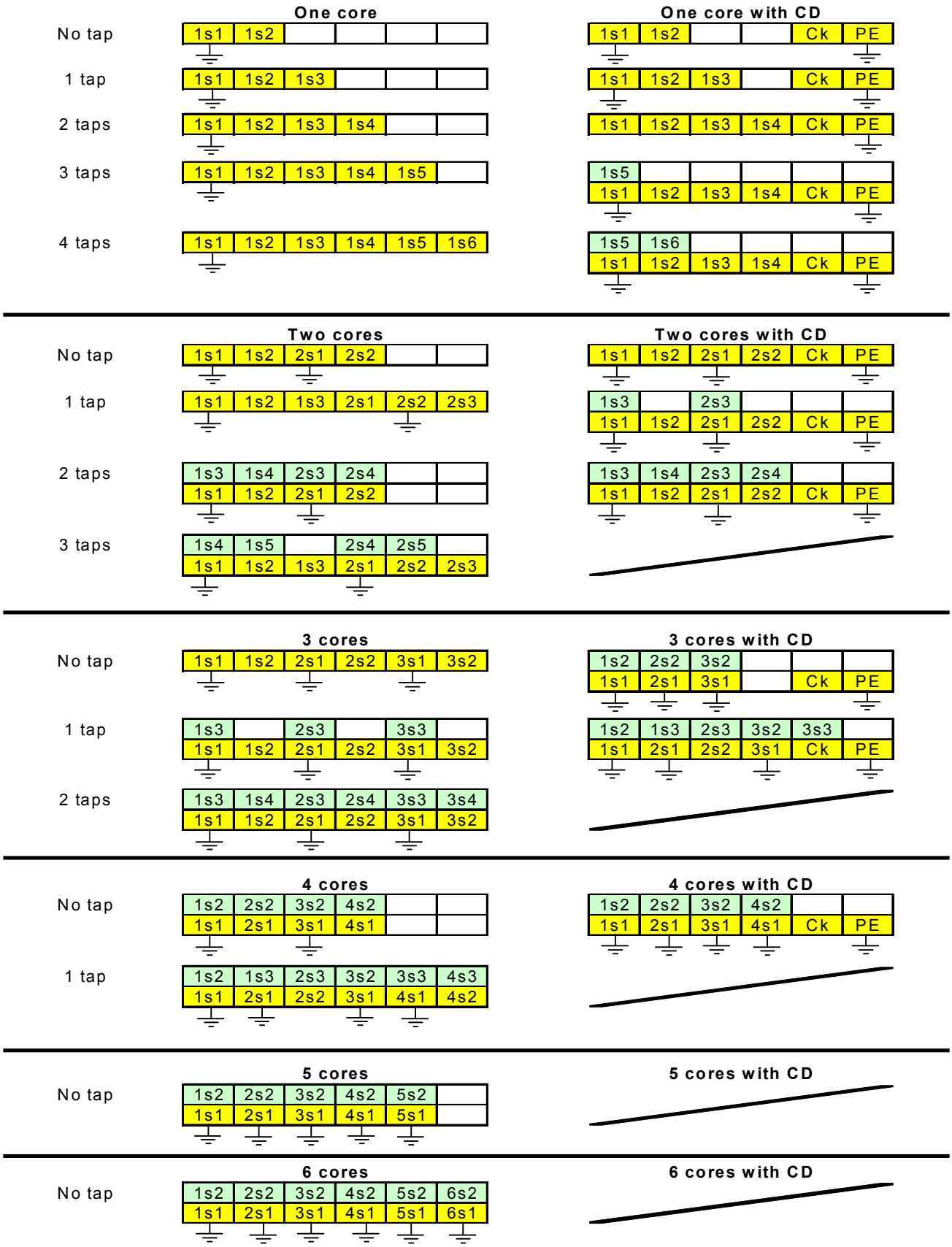
IEC60044-1… Instrument transformers – Current transformers
IEC60044-2… Instrument transformers – Voltage transformers
IEC61243-5… Voltage detectors – Voltage detecting systems (VDS)
IEC60529……Degrees of protection provided by enclosures (IP Code)
ISO12100…… Safety of machinery — Basic concepts, general principles for design
EN 50110-1 …Operation of electrical installations

Current and Voltage transformers are designed, tested and produced according to international or national standards required by custommers and agreed by producer. Specific standard is always mention on the Rating plate of transformer

For example these standards:
IEC 60044-1; IEC 60044-2 ; IEC 60044-6
AS 60044-1; AS 60044-2
AS 1243-1982; AS 1675-1986
ČSN 351301; ČSN 351302; ČSN 351361
ČSN EN 60044-1; ČSN EN 60044-2 ; ČSN EN 60044-6
IEEE Std C57.13.6-2005
ANSI C57.13-1978
CSA Std CAN3-C13-M83
GOST 1516.3-96; GOST 7746-2001
BS 3939:1973 ; BS EN 60044-1

If it is agreed between custommer and producer is possible to deliver also other standard or standards which are mention above with different revision.

Appendix 1. Examples of secondary terminal marking for cast terminal box for current transformers



Examples of secondary terminal marking for cast and assembled (phoenix) terminal box for Voltage transformers

One pole insulated voltage transformer

2 measuring windings	1a	1n	2a	2n	N	PE
Measuring and residual winding	a	n	da	dn	N	PE
2 ratios measuring winding	a1	a2	n		N	PE
One measuring winding	a	n			N	PE

Assembled secondary terminal (Phoenix)

2 measuring and residual winding	1a	1n	2a	2n	da	dn	N	PE
2 measuring double rations winding	1a1	1a2	1n	2a1	2a2	2n	N	PE
2 ratios measuring and residual winding	a1	a2	n	da1	da2	dn	N	PE

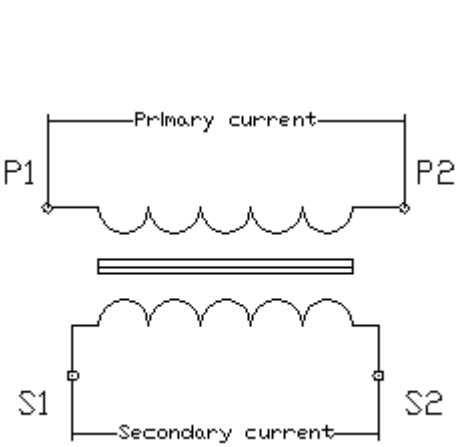
Double pole insulated transformer

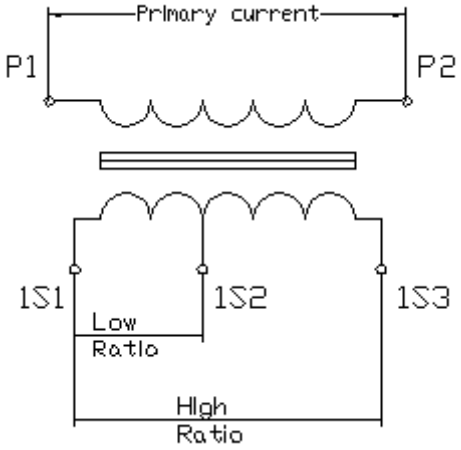
2 measuring windings	1a	1b	2a	2b		PE
2 ratios measuring winding	a1	a2	b			PE
One measuring winding	a	b				PE

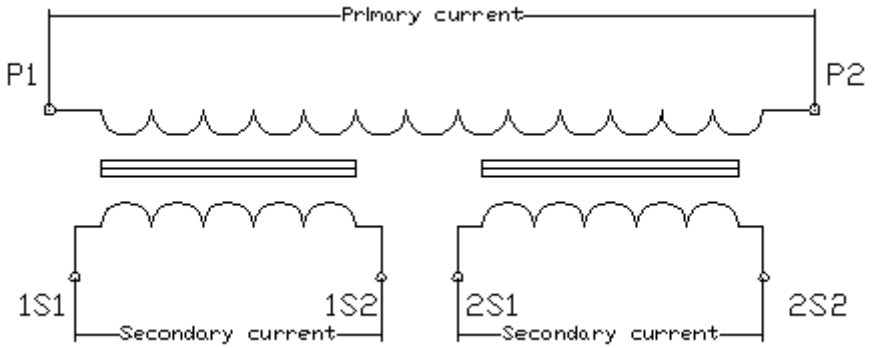
Appendix 2.

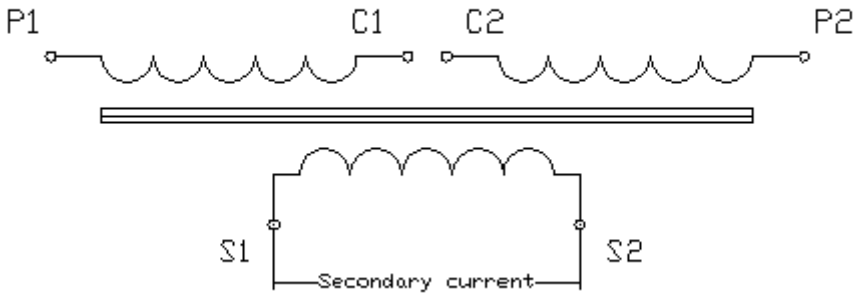
Wiring diagram examples

Current transformers:



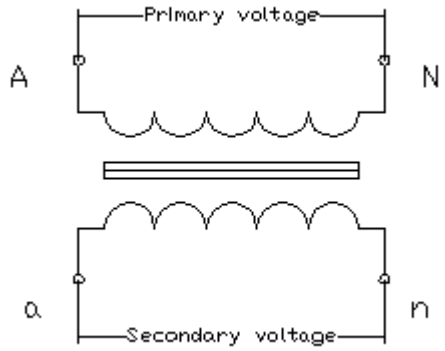


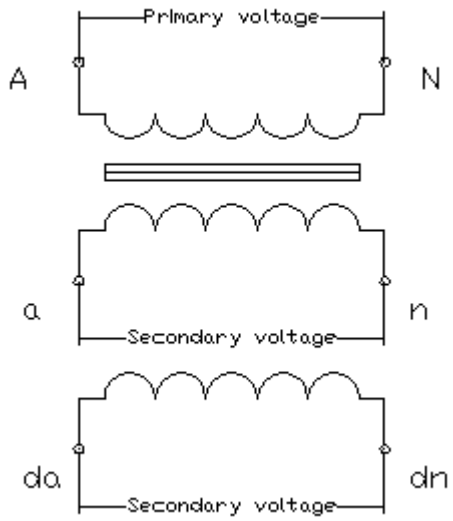


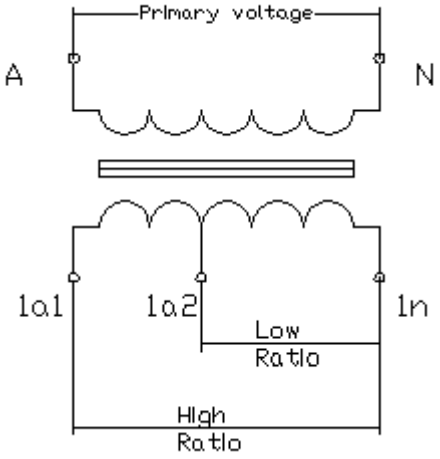


Wiring diagram examples

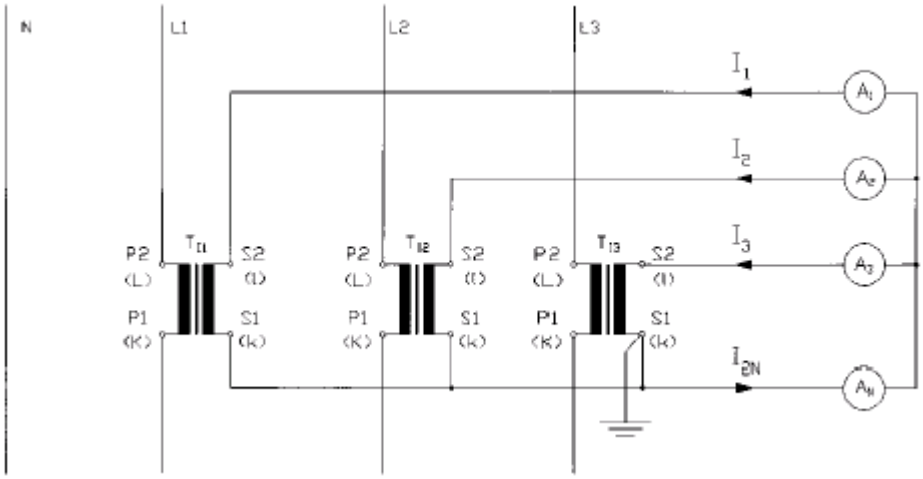
Voltage transformers:

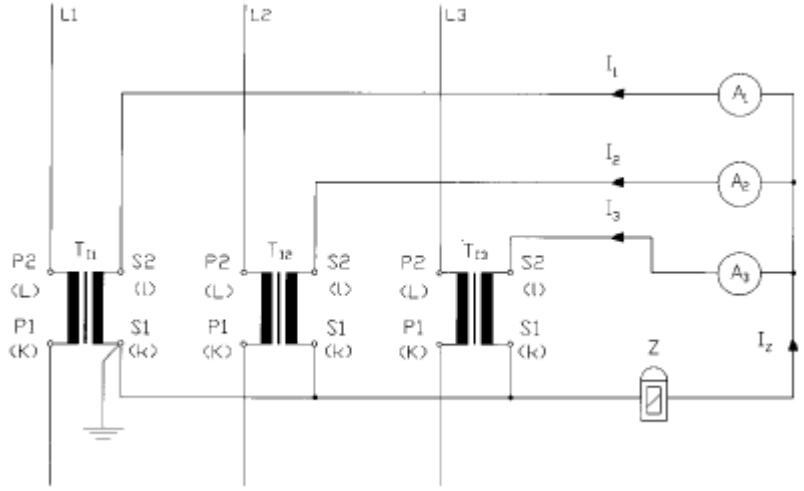


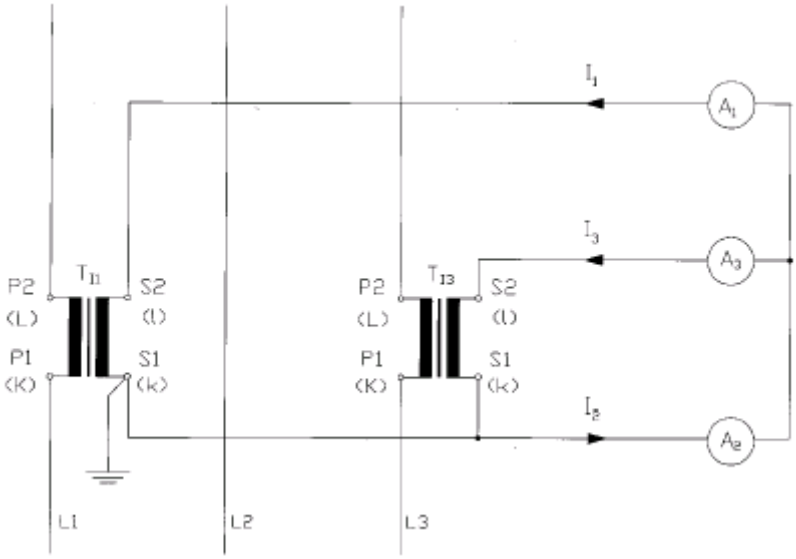




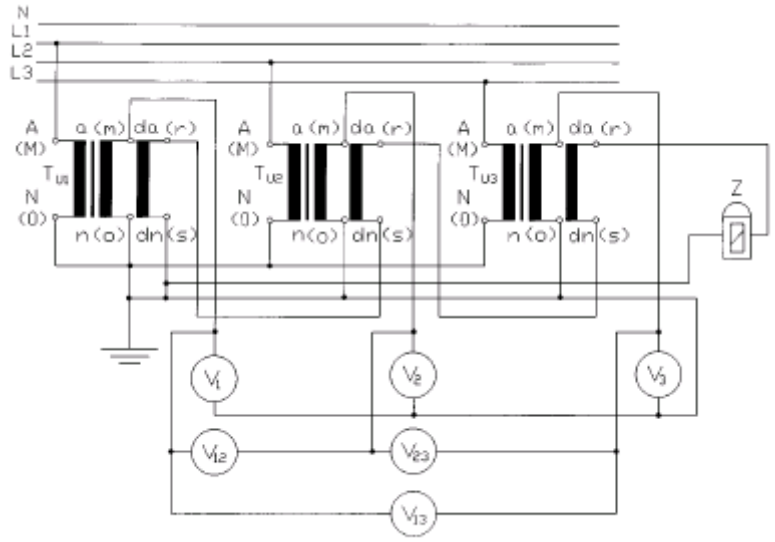
Examples of current transformers connection

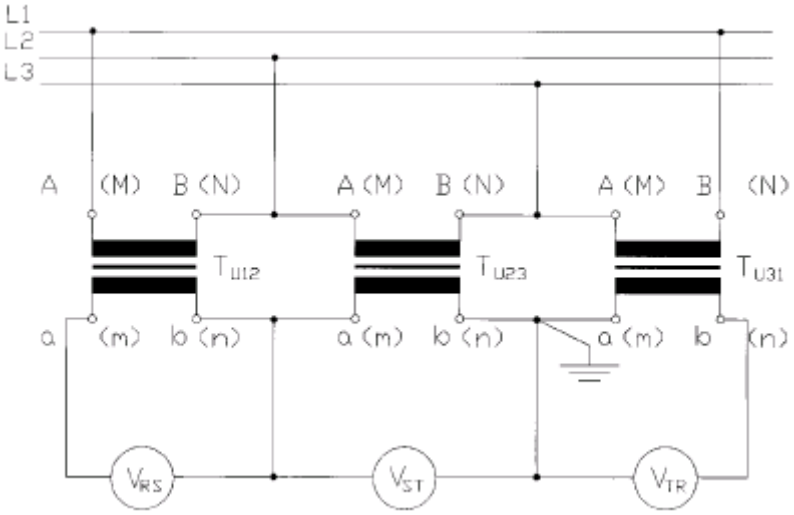


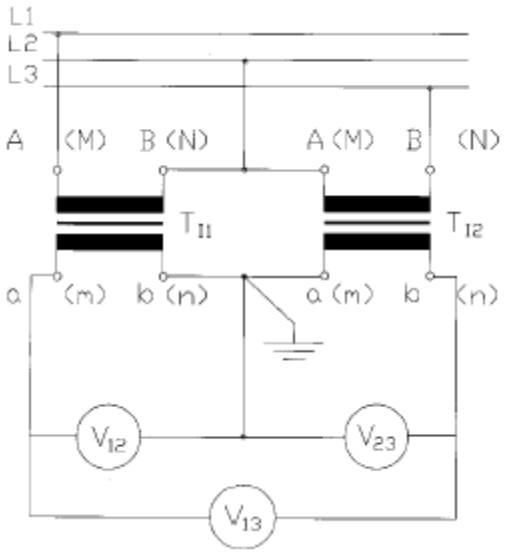




Examples of voltage transformers connection







Appendix 3.

Damping ferroresonance for voltage transformer type TJC/TJP

TECHNICAL BACKGROUND

Ferroresonance is a phenomenon usually characterized by over-voltages and very irregular wave shapes and is associated with the excitation of one or more saturable inductors through capacitance in parallel with nonlinear inductor. The saturable inductor usually is present in the form of an instrument transformer, power transformer or reactor witch utilizes an iron core.

Ferroresonance of single-pole insulated transformers in unearthed network is one of the most common ferroresonance case. Depending on the supply voltage, capacitance and inductance the oscillation can be either periodic (over- or sub-harmonic or with fundamental frequency) or aperiodic.

Using damping resistor or VT guard in the residual voltage secondary, shown in Fig.1, can considerably reduce the risk for ferroresonance.

There is additionally factor that can in some cases reduce or totally eliminate the risk for ferroresonance and it is over-voltage factor. According to IEC standard is the rated over-voltage factor 1.9xUn/ 8h. Higher rated over-voltage factor shift the operating point towards lower flux values of voltage transformer. It results in smaller sensitivity of transformer to some kind of transients usually initiate ferroresonance.

RECOMMENDATION

Rated voltage factor: We recommended using the voltage transformers with the over-voltage factor in the range (2.5-3) xUn/8h. We cannot guarantee the value of the over-voltage factor if the requirements for the secondary winding are too high.

Damping resistor: See the recommended value of damping resistor below:

Voltage of residual winding	Value of Rdamp	Damping power
100:3 V	22 Ω	450 W
110:3 V	27 Ω	450 W

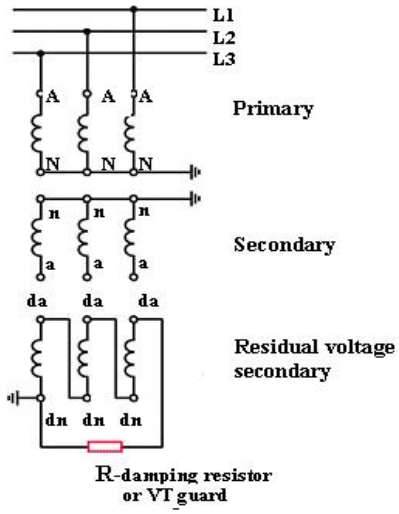


Fig.1.

VT Guard – function

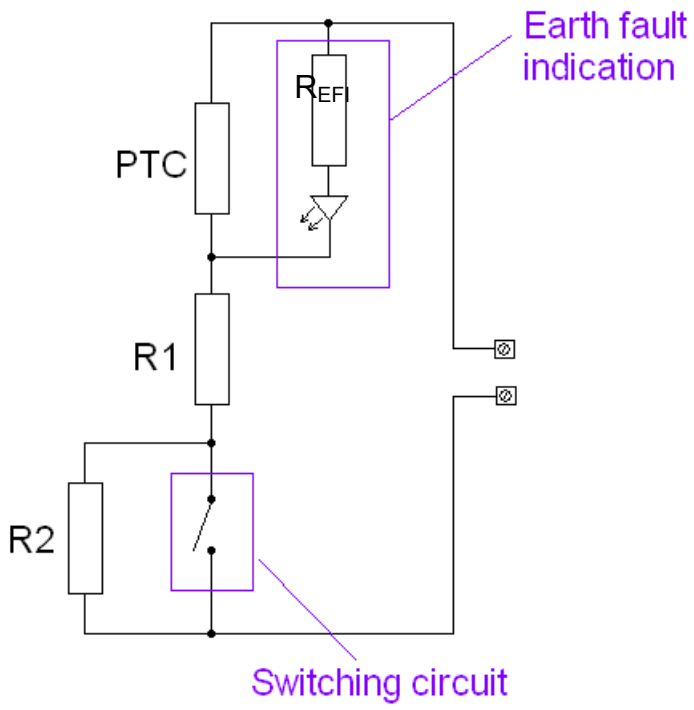
1. *VT-Guard description:*

VT Guard is a preventive device against the ferroresonance phenomenon which may be triggered in power networks with ungrounded or not directly grounded neutral point. VT Guard should be used in cooperation with voltage transformers connected in open delta – more in **User's manual**.

Important: Read the User's manual before use.

2. *Basic operating states:*

Simple diagram



a) In case of full balance in a three-phase network, there is zero voltage on an open delta winding (VT Guard terminals) Uo=0. No current flows through VT Guard. The device isn't active.

b) In case of unbalance in a three-phase network, there is voltage on VT Guard terminals Uo>0.

If the Uo is lower than threshold voltage Ut (Ut =20-24V), then current $I = \frac{Uo}{(R_{PTC} // R_{EFI}) + R1 + R2}$ flows through the device.

Total resistance value is higher then 100ohm and voltage Uo is max 24V in this case. Current flowing thorough the device has very low value.

c) In case Uo is higher then treshold voltage **(ferroresonance)**, the „switching circuit" is switched on and current flows trough R_{PTC}//R_{EFI} and R1. Because of low values of these resistors there is steep increase of current and fast ferroresonance dumping. High current flows trough the device for short time, the PTC resistors arn't warm up significantly.

d) In case Uo is higher then treshold voltage(**earth fault**), the „switching circuit" is switched on and current flows trough R_{PTC}//R_{EFI} and R1. Because of low values of these resistors there is steep increase of current. High current flows trough the device and cause to warm up PTC resistors. PTC resistor increase their resistance (The resistance is proportional to flowing current). Current is limited. Time needed for worming up PTC resistors for Uo = 100V is approximately 1.4s. After earth-fault is removed, the PTC resistors cool-down (approximately 3 min). **It is necessary to mount VT Guard in vertical position far from other thermal sources.**

Appendix 4.

Handling with transformers

There are few possibilities of handling:

1) **Manual handling.**
Transformers are possible to handle by hands in case if the weight of the transformer is not higher than 25kg. Always use the glows in case of manual handling. For grasp of the transformers always use handling grip (see the picture), or the base of the transformer.
Note. Types TJP or TDP never handle by gripping of the fuse holder – risk of break.

2) **Handling by the belt**
Transformers where it is possible, from safety reasons, can be handling by hanging on the belts. Than the handling can be done by hanging of the transformer on the crane.
Note: This system is recommended for types: **TTR, TSR, BB(O), KOKS**. Hanging systems for those types are visualized on pictures.
Safety warning ! Lifting capacity of the belts and the crane has to be 200kg at. Always make sure that the belts hold safely on the crane and on the transformer.

TTR, TSR

KOKS, BB(O)

3) **Handling by the self-locking hooks.**
With transformers which are equiped with handling grips is possible to handle by self-locking hooks hanging on the crane. With transformer without this handling grips is possible to grip the hooks under the base of the transformer.
Note. This system is recommended for types: **TPU, TJC TJP, TDP, TDC, KGUG, KGUGI**. This handling system is vizualized on the pictures.
Safety warning ! Lifting capacity of the hooks and the crane has to be 200kg at least. Always make sure that the hooks hold safely on the crane and on the transformer.

4) Handling by the self-locking hooks under primary screws.

In case of indoor current transformers, which are equiped with primary terminal screws M12, there is possible to hanging the transformer on with self-locking hooks holding under primary. The handling can be done by hanging of the hooks on the crane.
Note. This system is recommended for types:**TPU, IHBF, KOFA, KAKV**. This handling system is vizualized on the picture.
Safety warning! Lifting capacity of the hooks and the crane has to be 200kg at least. Always make sure that the hooks hold safely on the crane and on the transformer.

5) Handling by the chain and loops.

All transformers wich are equiped with the base plate is possible to handle by using chains and loops. Srew the loops (at least M10) into the baseplate and hang on the crane by chains as it is shown on the picture.
Note. This system is recommended for most transformers with baseplate and with weight more than 40kg mainly for types: **TPO, TJO, TDO, TDC7, TJC 7, TJP 7**.
This handling system is vizualized on the picture.
Safety warning! Lifting capacity of the chains, loops and the crane has to be 200kg at least. Always make sure that the loops and chains hold safely on the transformer and chain s hold safely on the crane.

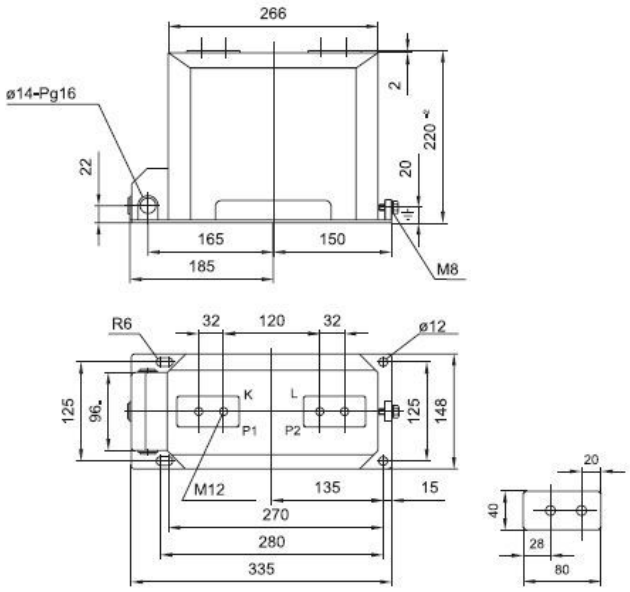
SAFETY WARNING: During the manipulation with transformer is necessary to follow safety work instructions. Never stay under the freight. Always make sure that the freight is safely locked on the crane and make sure that there is no risk of unexpected release or turnover of the freight.

Note: Holding jigs, described in this chapters, are not a part of delivery.

Appendix 5. Dimensional Drawings´

TPU 40.11
TPU 43.11

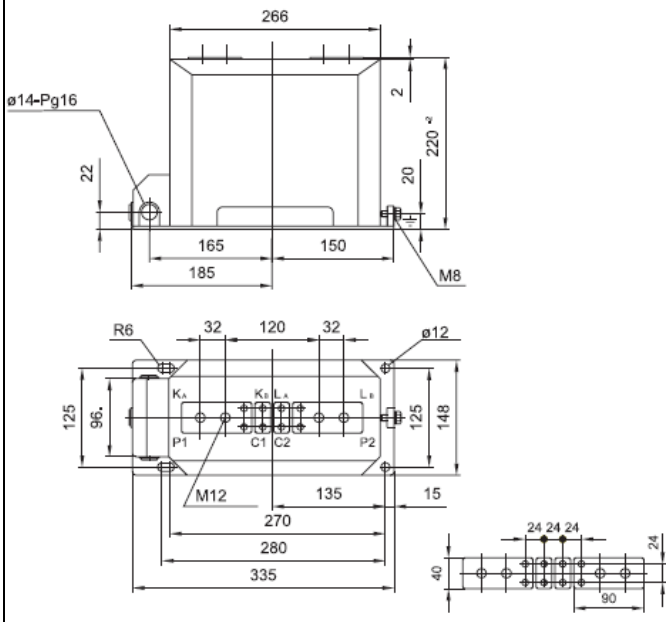
Weight: 20-24 kg



drawing N:	polarity
44614000	P1 to sec. term.
44614010	P2 to sec. term.

TPU 40.12

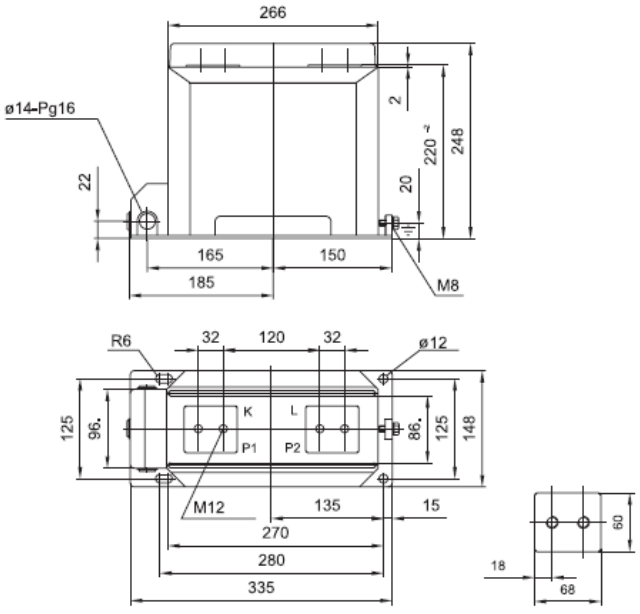
Weight: 20-24 kg



drawing N:	polarity
44614020	P1 to sec. term.
44614030	P2 to sec. term.

TPU 40.13
TPU 43.13

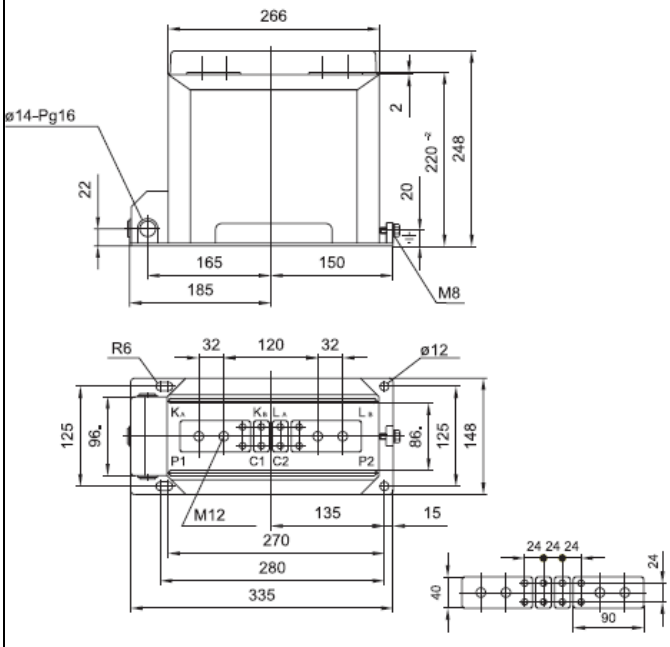
Weight: 20-24 kg



drawing N:	polarity
44614040	P1 to sec. term.
44614050	P2 to sec. term.

TPU 40.14

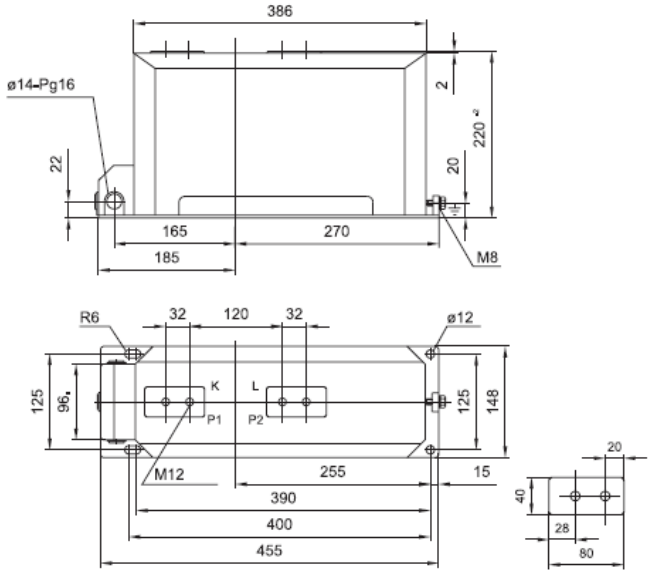
Weight: 20-24 kg



drawing N:	polarity
44614060	P1 to sec. term.
44614070	P2 to sec. term.

TPU 40.21
TPU 43.21

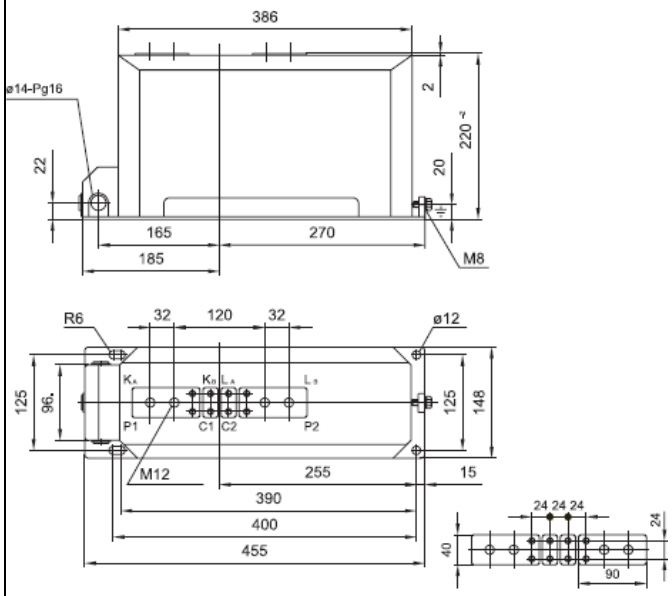
Weight: 32-35 kg



drawing N:	polarity
44614080	P1 to sec. term.
44614090	P2 to sec. term.

TPU 40.22

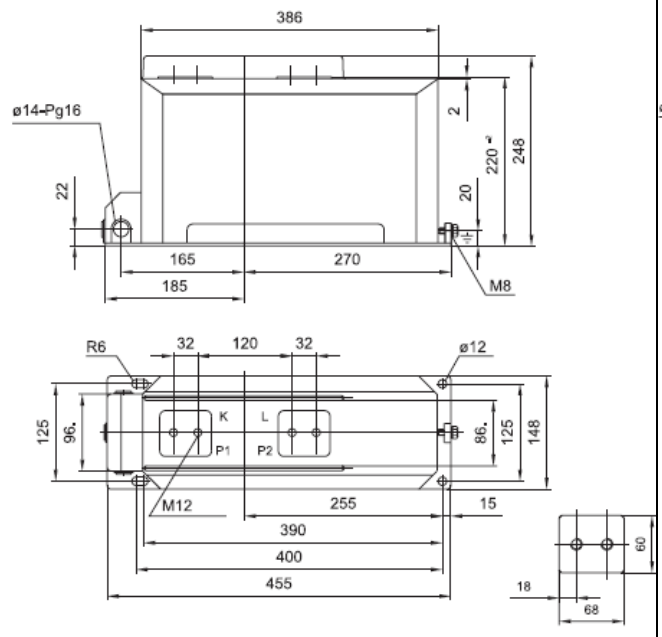
Weight: 32-35 kg



drawing N:	polarity
44614100	P1 to sec. term.
44614110	P2 to sec. term.

TPU 40.23
TPU 43.23

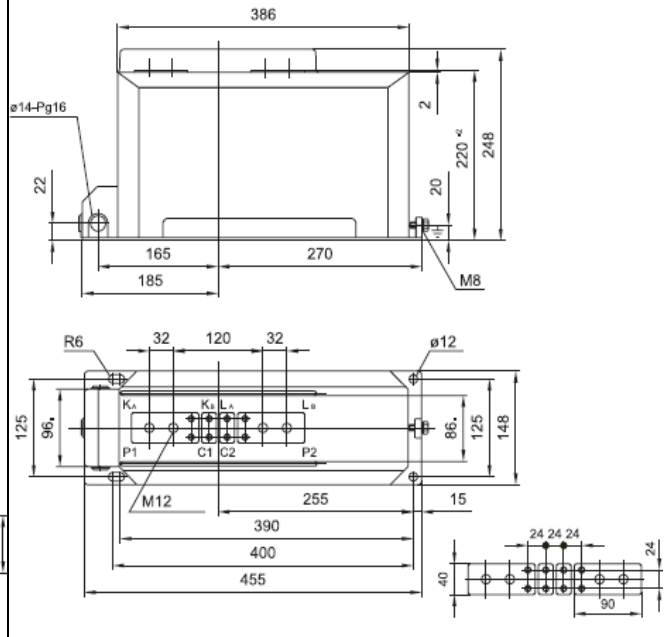
Weight: 32-35 kg



drawing N:	polarity
44614120	P1 to sec. term.
44614130	P2 to sec. term.

TPU 40.24

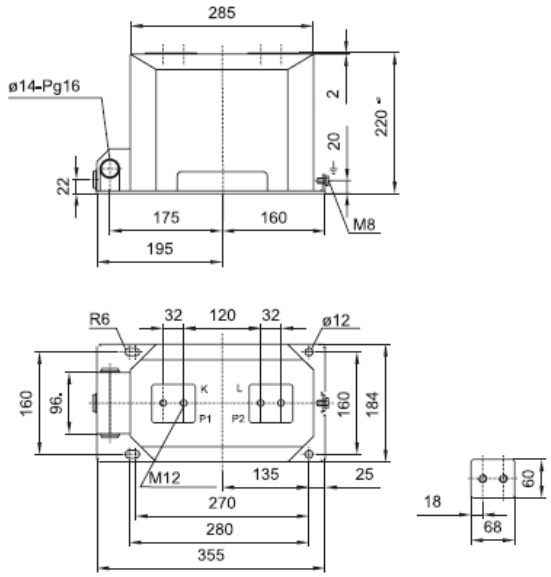
Weight: 32-35 kg



drawing N:	polarity
44614140	P1 to sec. term.
44614150	P2 to sec. term.

TPU 40.31
TPU 43.31

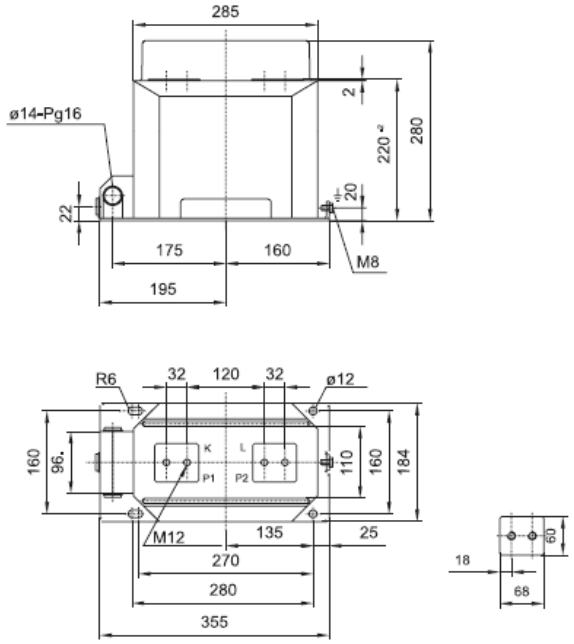
Weight: 23-27 kg



drawing N:	polarity
44614160	P1 to sec. term.
44614170	P2 to sec. term.

TPU 40.33
TPU 43.33

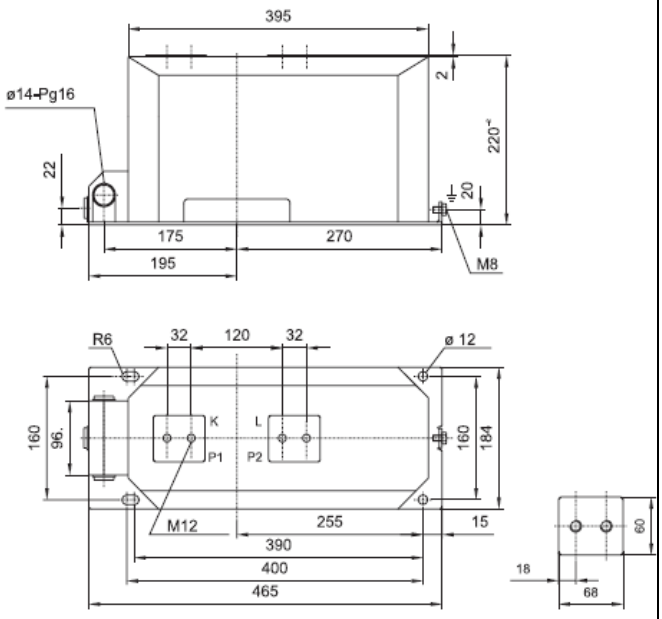
Weight: 23-27 kg



drawing N:	polarity
44614180	P1 to sec. term.
44614190	P2 to sec. term.

TPU 40.41
TPU 43.41

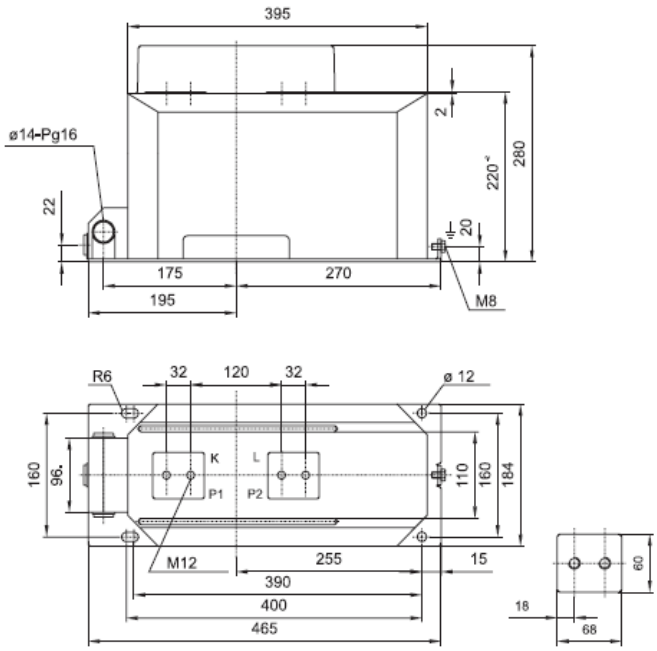
Weight: 35-38 kg



drawing N:	polarity
44614200	P1 to sec. term.
44614210	P2 to sec. term.

TPU 40.43
TPU 43.43

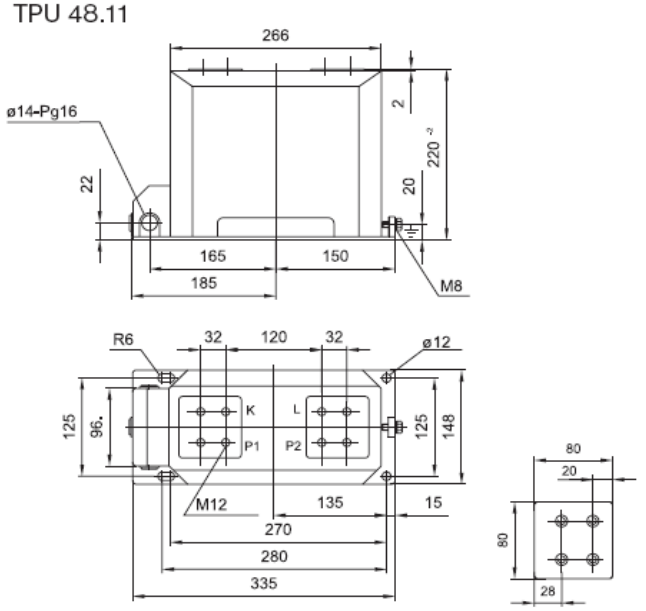
Weight: 35-38 kg



drawing N:	polarity
44614220	P1 to sec. term.
44614230	P2 to sec. term.

TPU 44.11
TPU 45.11
TPU 46.11
TPU 47.11
TPU 48.11

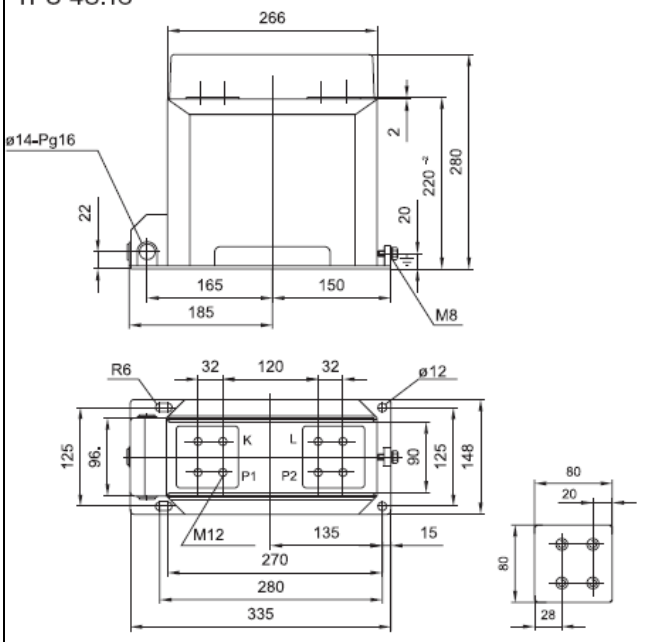
Weight: 25-28 kg



drawing N:	polarity
44614240	P1 to sec. term.
44614250	P2 to sec. term.

TPU 44.13
TPU 45.13
TPU 46.13
TPU 47.13
TPU 48.13

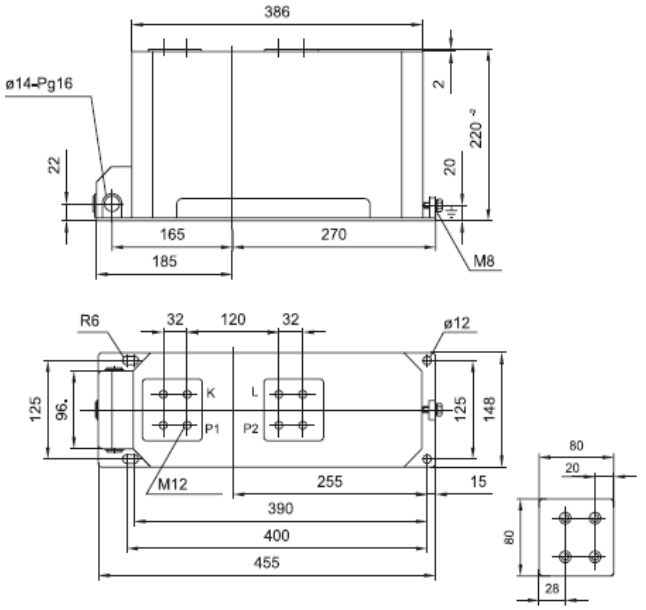
Weight: 25-28 kg



drawing N:	polarity
44614260	P1 to sec. term.
44614270	P2 to sec. term.

TPU 44.21
TPU 45.21
TPU 46.21
TPU 47.21
TPU 48.21

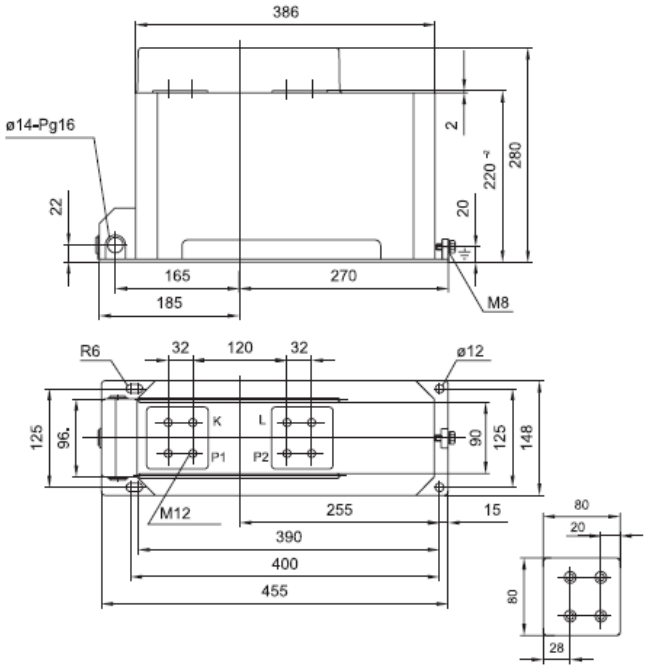
Weight: 40-45 kg



drawing N:	polarity
44614280	P1 to sec. term.
44614290	P2 to sec. term.

TPU 44.23
TPU 45.23
TPU 46.23
TPU 47.23
TPU 48.23

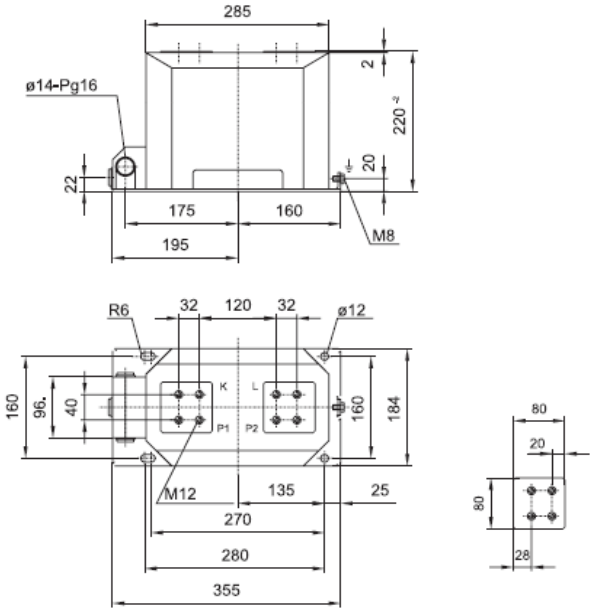
Weight: 40-45 kg



drawing N:	polarity
44614300	P1 to sec. term.
44614310	P2 to sec. term.

TPU 44.31
TPU 45.31
TPU 46.31
TPU 47.31
TPU 48.31

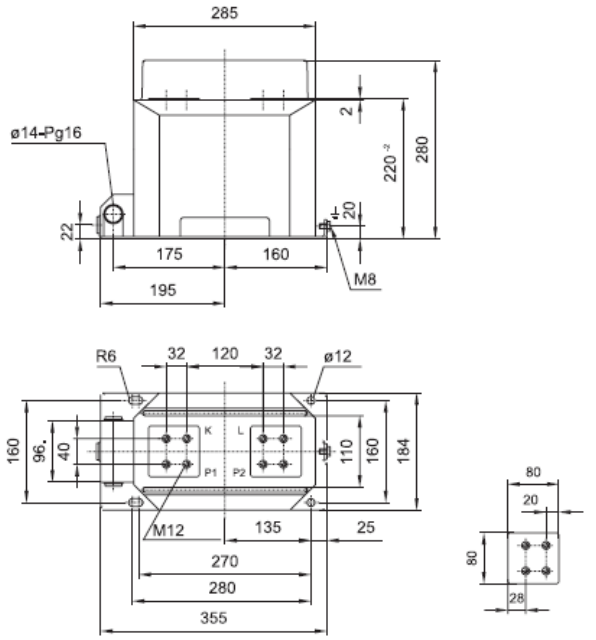
Weight: 28-31 kg



drawing N:	polarity
44614320	P1 to sec. term.
44614330	P2 to sec. term.

TPU 44.33
TPU 45.33
TPU 46.33
TPU 47.33
TPU 48.33

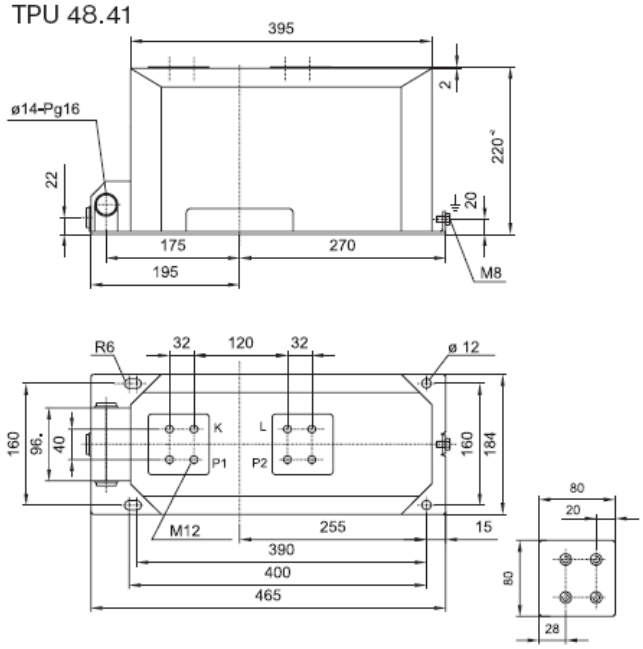
Weight: 28-31 kg



drawing N:	polarity
44614340	P1 to sec. term.
44614350	P2 to sec. term.

TPU 44.41
TPU 45.41
TPU 46.41
TPU 47.41
TPU 48.41

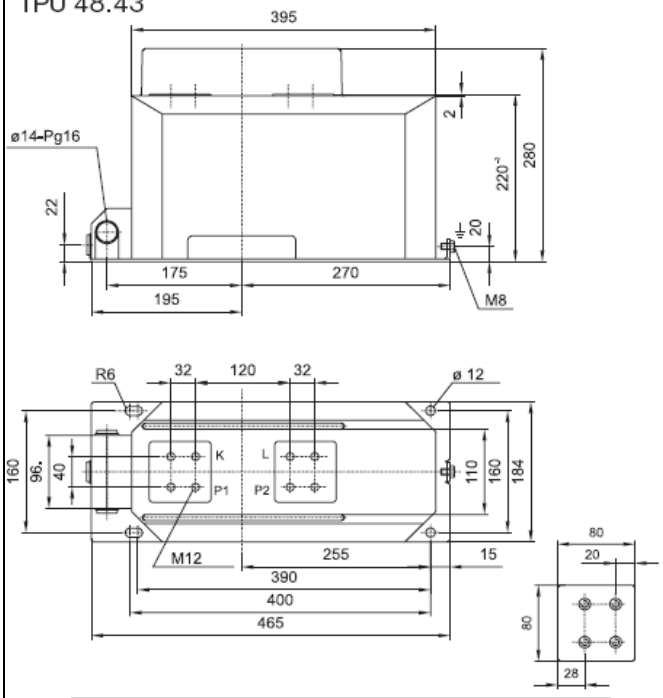
Weight: 43-48 kg



drawing N:	polarity
44614360	P1 to sec. term.
44614370	P2 to sec. term.

TPU 44.43
TPU 45.43
TPU 46.43
TPU 47.43
TPU 48.43

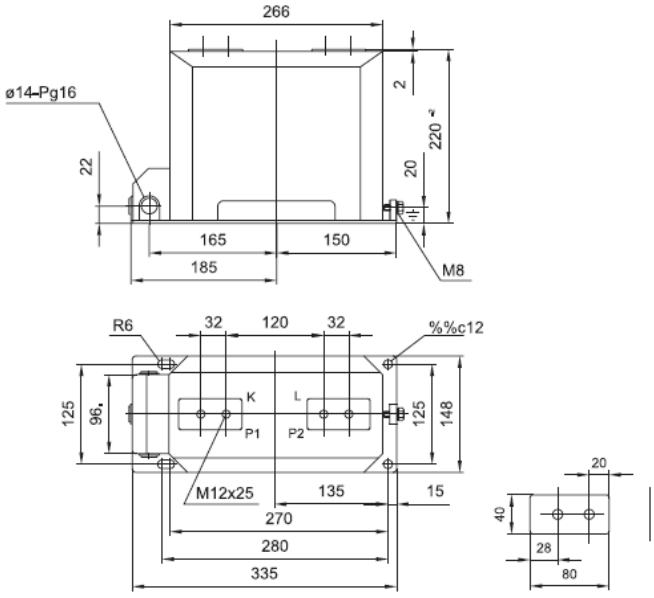
Weight: 43-48 kg



drawing N:	polarity
44614380	P1 to sec. term.
44614390	P2 to sec. term.

TPU 50.11
TPU 53.11

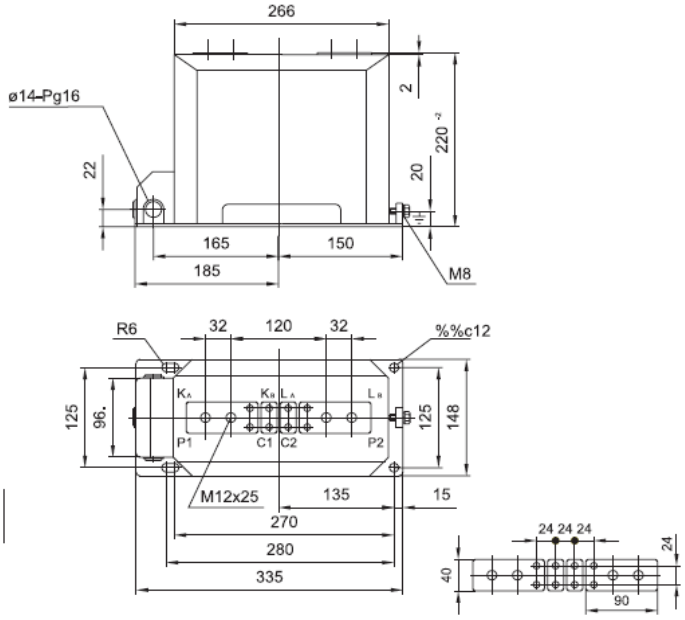
Weight: 20-24 kg



drawing N:	polarity
44614550	P1 to sec. term.
44614560	P2 to sec. term.

TPU 50.12

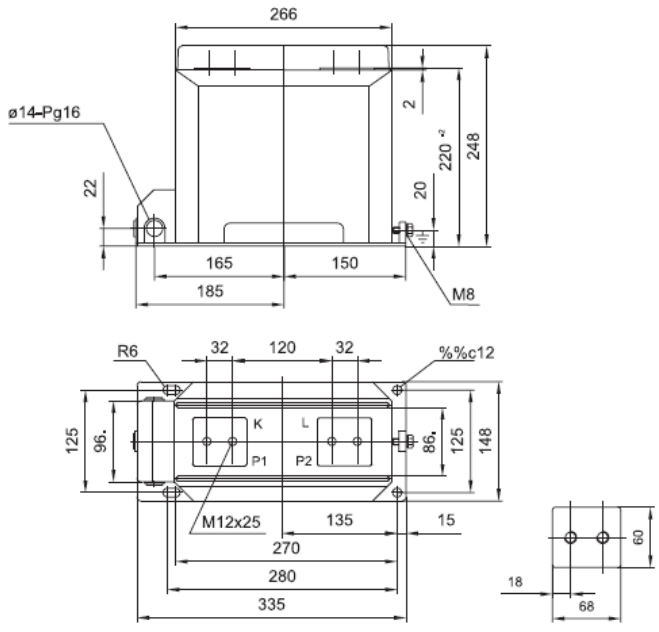
Weight: 20-24 kg



drawing N:	polarity
44614570	P1 to sec. term.
44614580	P2 to sec. term.

TPU 50.13
TPU 53.13

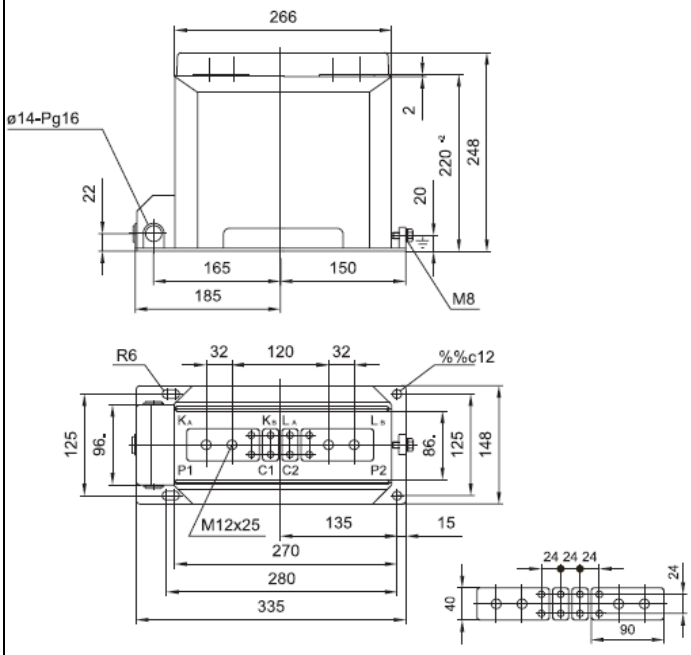
Weight: 20-24 kg



drawing N:	polarity
44614590	P1 to sec. term.
44614600	P2 to sec. term.

TPU 50.14

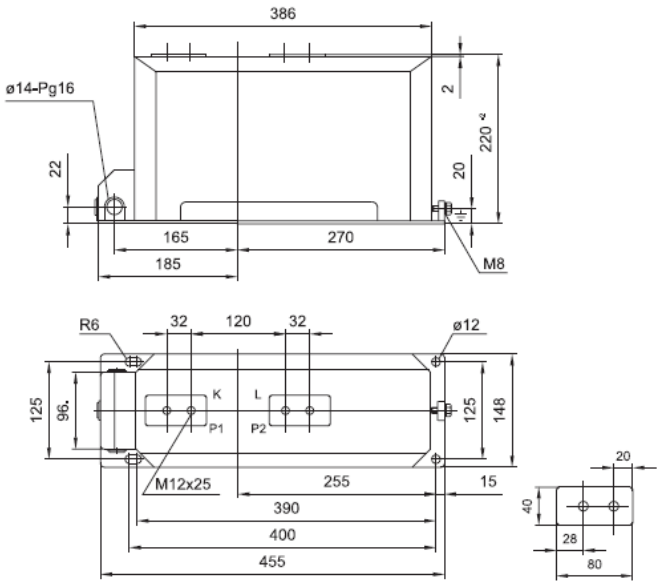
Weight: 20-24 kg



drawing N:	polarity
44614610	P1 to sec. term.
44614620	P2 to sec. term.

TPU 50.21
TPU 53.21

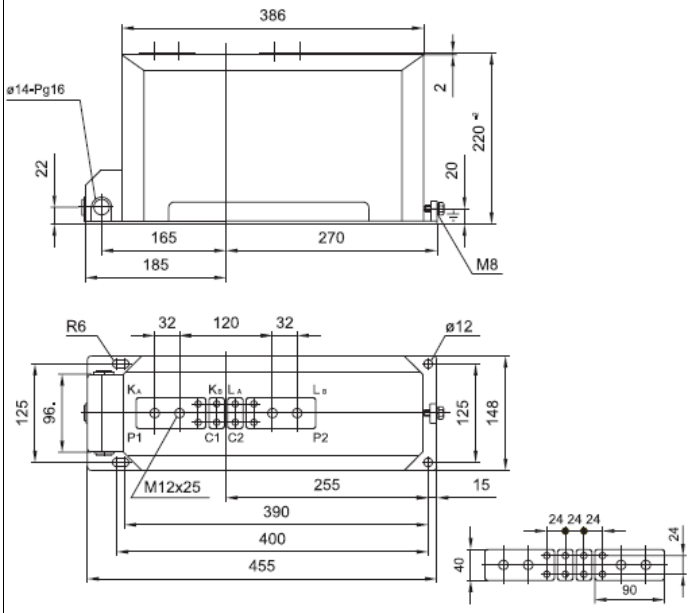
Weight: 32-35 kg



drawing N:	polarity
44614630	P1 to sec. term.
44614640	P2 to sec. term.

TPU 50.22

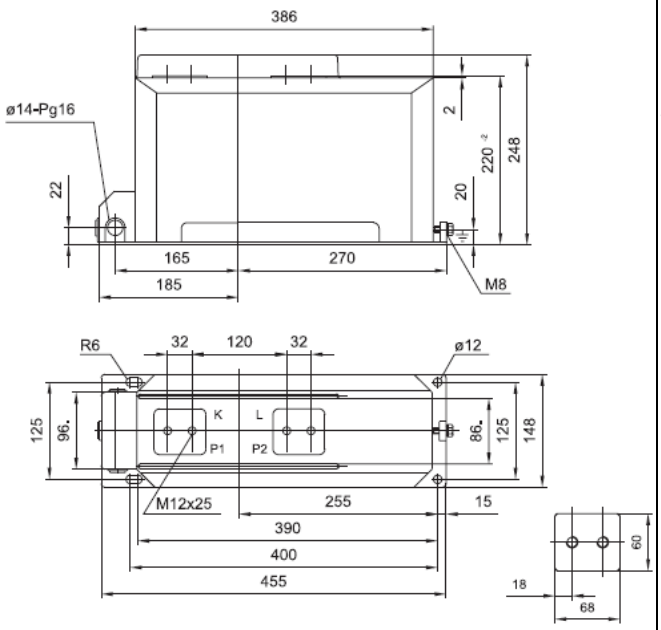
Weight: 32-35 kg



drawing N:	polarity
44614650	P1 to sec. term.
44614660	P2 to sec. term.

TPU 50.23
TPU 53.23

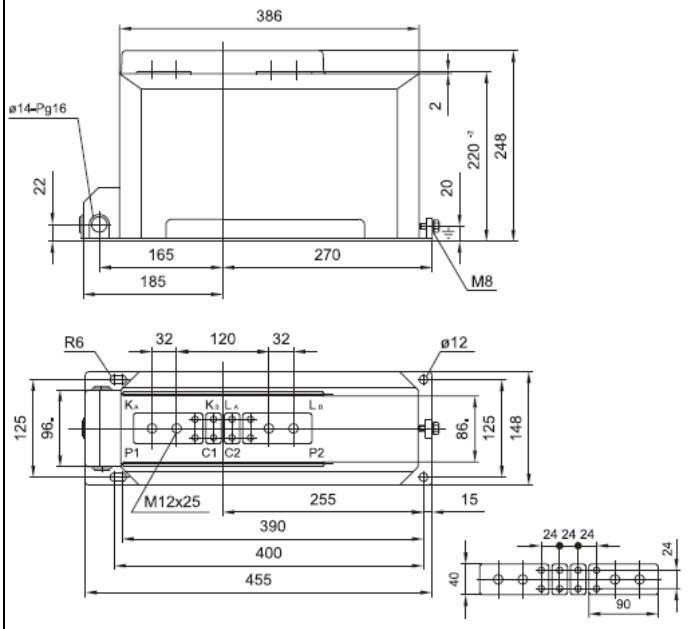
Weight: 32-35 kg



drawing N:	polarity
44614670	P1 to sec. term.
44614680	P2 to sec. term.

TPU 50.24

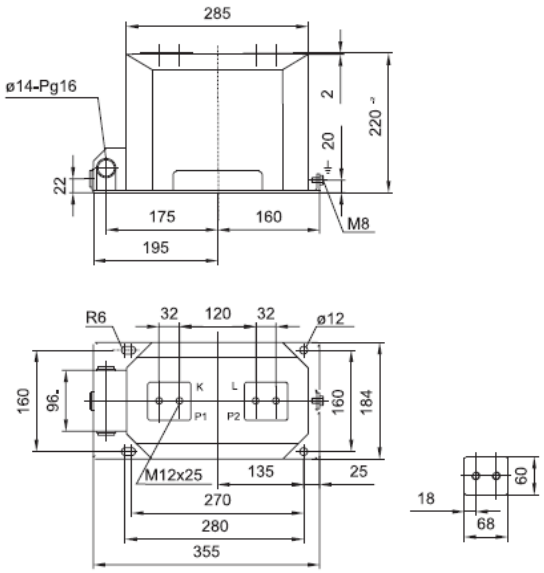
Weight: 32-35 kg



drawing N:	polarity
44614690	P1 to sec. term.
44614700	P2 to sec. term.

TPU 50.31
TPU 53.31

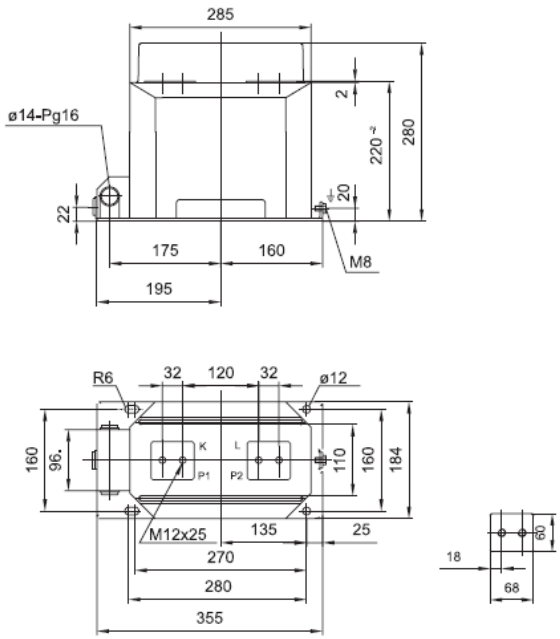
Weight: 23-27 kg



drawing N:	polarity
44614710	P1 to sec. term.
44614720	P2 to sec. term.

TPU 50.33
TPU 53.33

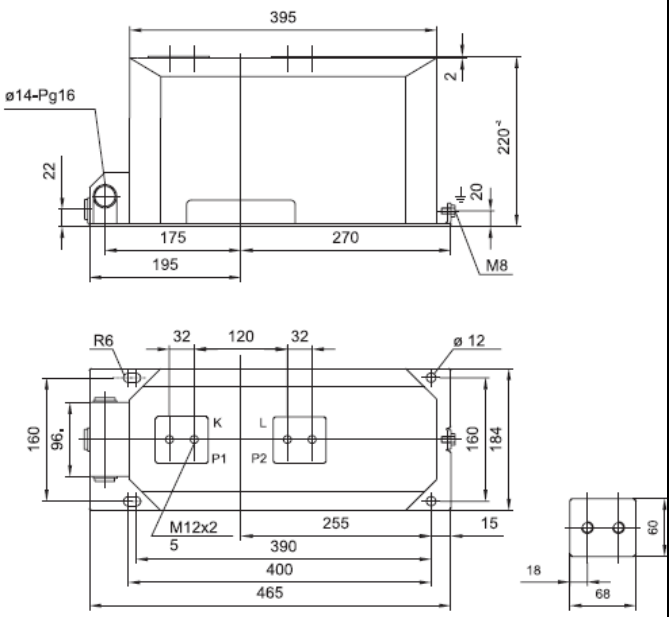
Weight: 23-27 kg



drawing N:	polarity
44614730	P1 to sec. term.
44614740	P2 to sec. term.

TPU 50.41
TPU 53.41

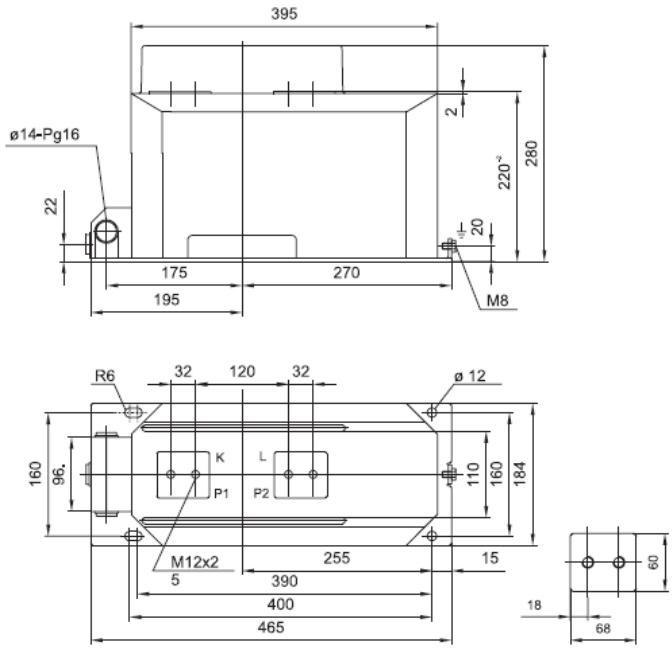
Weight: 35-38 kg



drawing N:	polarity
44614750	P1 to sec. term.
44614760	P2 to sec. term.

TPU 50.43
TPU 53.43

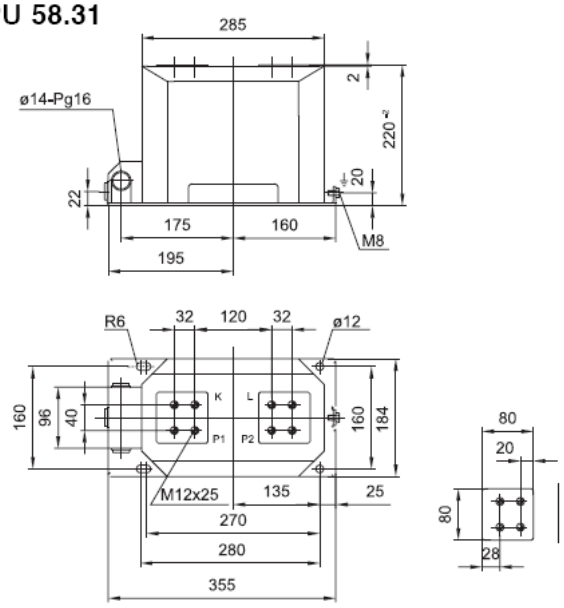
Weight: 35-38 kg



drawing N:	polarity
44614770	P1 to sec. term.
44614780	P2 to sec. term.

TPU 54.31
TPU 55.31
TPU 56.31
TPU 57.31
TPU 58.31

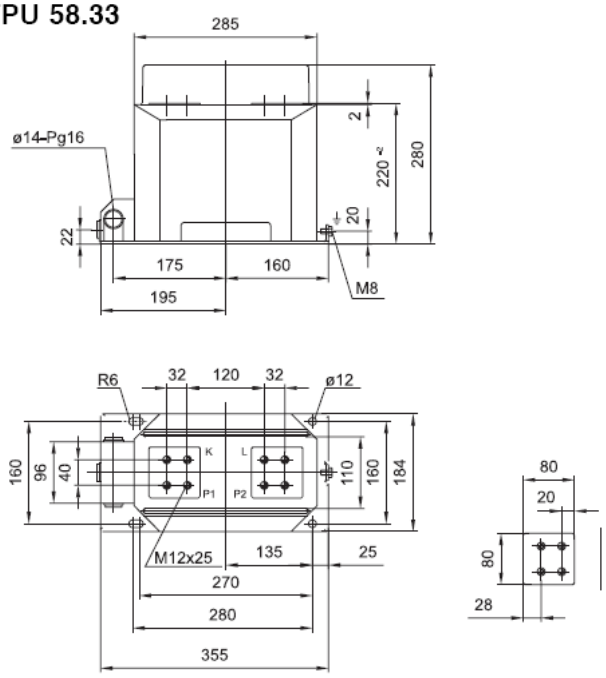
Weight: 28-31 kg



drawing N:	polarity
44614790	P1 to sec. term.
44614800	P2 to sec. term.

TPU 54.33
TPU 55.33
TPU 56.33
TPU 57.33
TPU 58.33

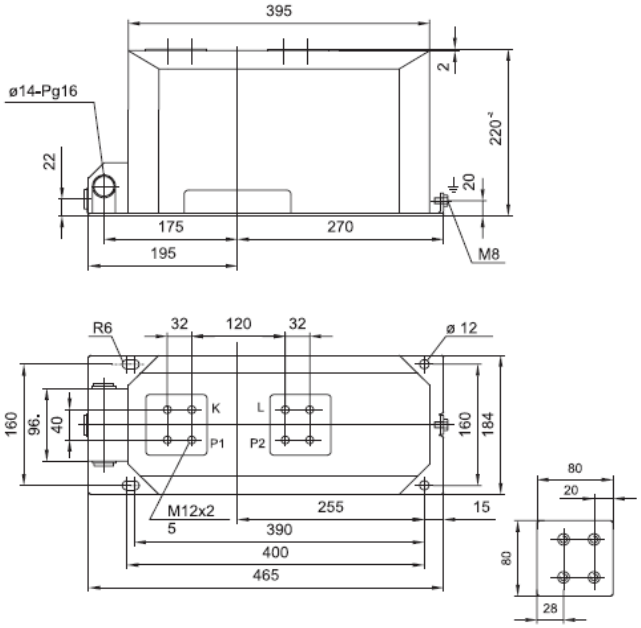
Weight: 28-31 kg



drawing N:	polarity
44614810	P1 to sec. term.
44614820	P2 to sec. term.

TPU 54.41
TPU 55.41
TPU 56.41
TPU 57.41
TPU 58.41

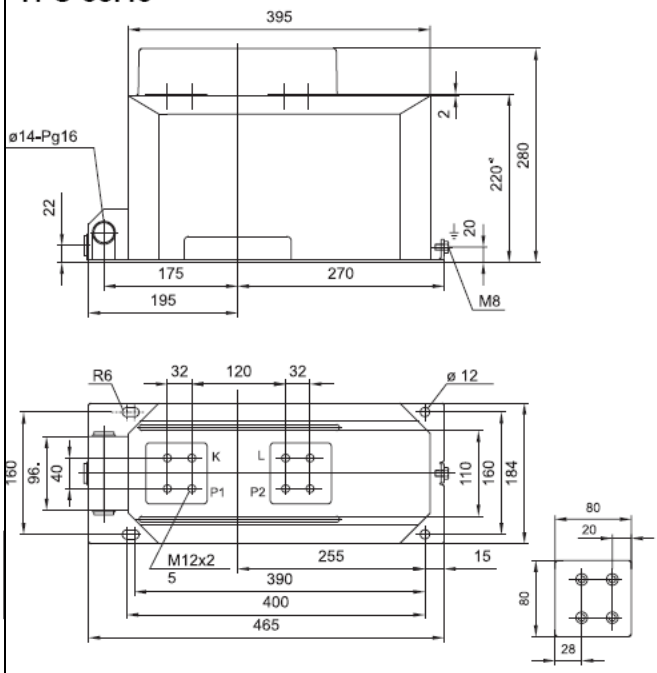
Weight: 43-48 kg



drawing N:	polarity
44614830	P1 to sec. term.
44614840	P2 to sec. term.

TPU 54.43
TPU 55.43
TPU 56.43
TPU 57.43
TPU 58.43

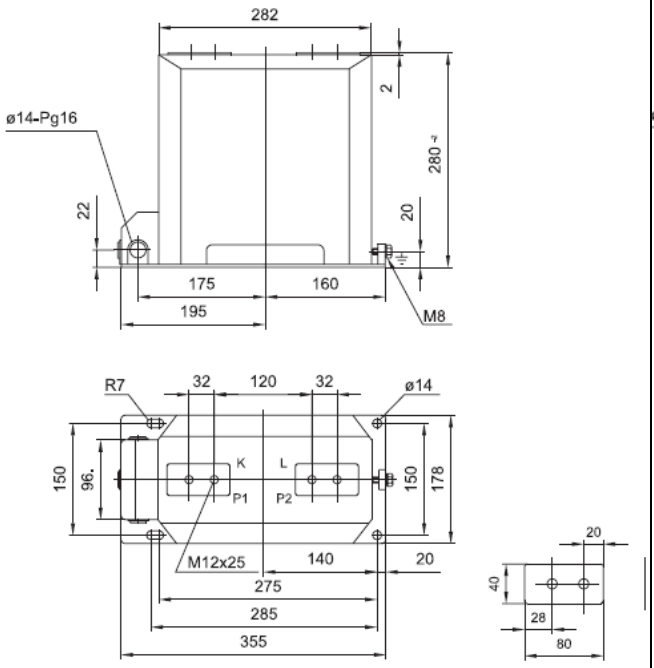
Weight: 43-48 kg



drawing N:	polarity
44614850	P1 to sec. term.
44614860	P2 to sec. term.

TPU 60.11
TPU 63.11

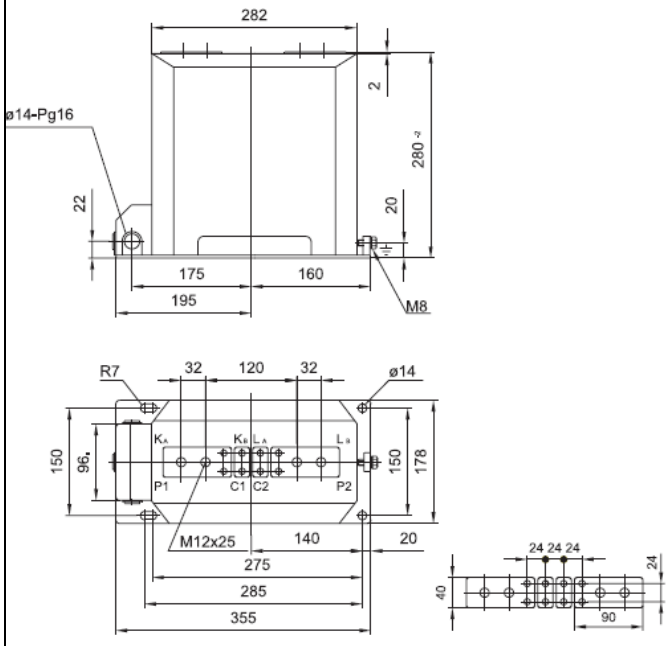
Weight: 31-35 kg



drawing N:	polarity
44615000	P1 to sec. term.
44615010	P2 to sec. term.

TPU 60.12

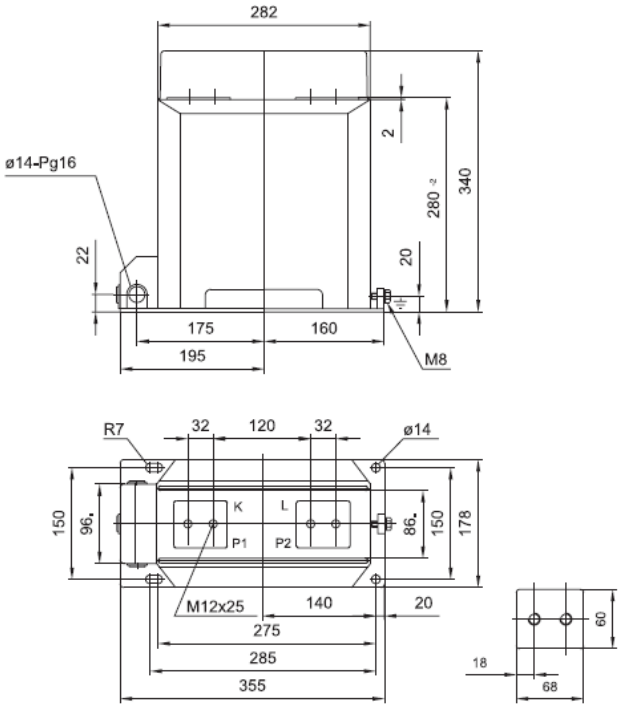
Weight: 31-35 kg



drawing N:	polarity
44615020	P1 to sec. term.
44615030	P2 to sec. term.

TPU 60.13
TPU 63.13

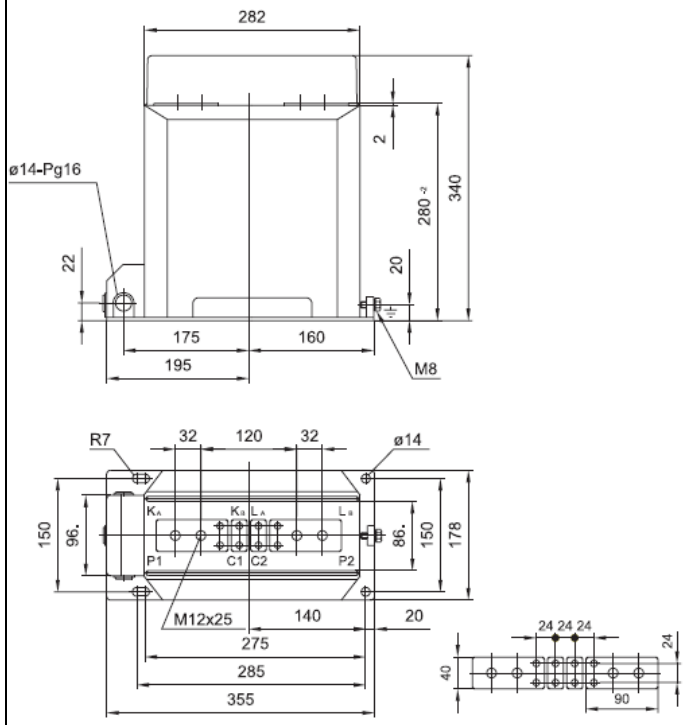
Weight: 31-35 kg



drawing N:	polarity
44615040	P1 to sec. term.
44615050	P2 to sec. term.

TPU 60.14

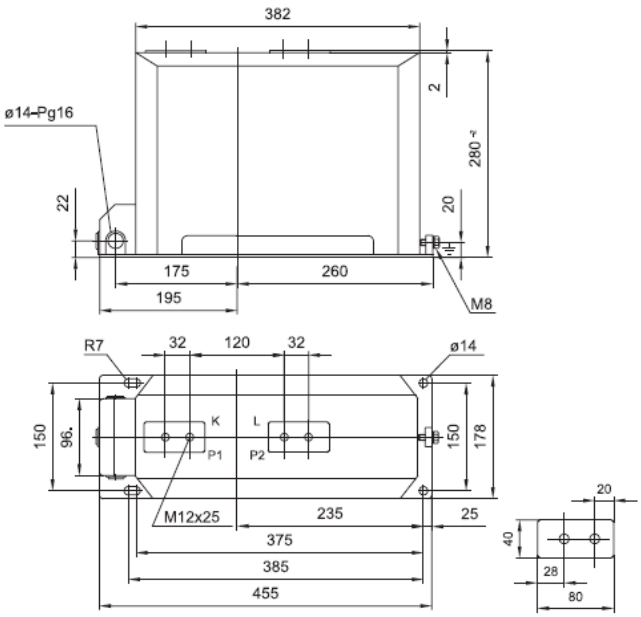
Weight: 31-35 kg



drawing N:	polarity
44615060	P1 to sec. term.
44615070	P2 to sec. term.

TPU 60.21
TPU 63.21

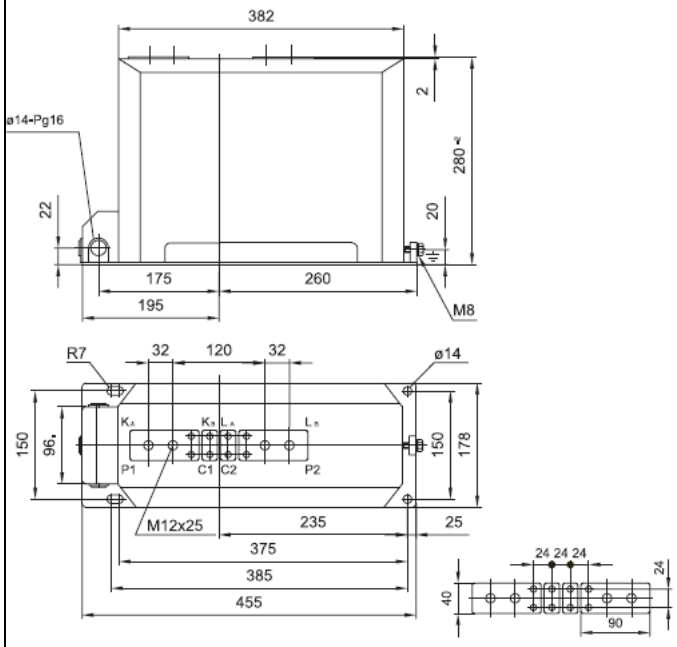
Weight: 43-49 kg



drawing N:	polarity
44615080	P1 to sec. term.
44615090	P2 to sec. term.

TPU 60.22

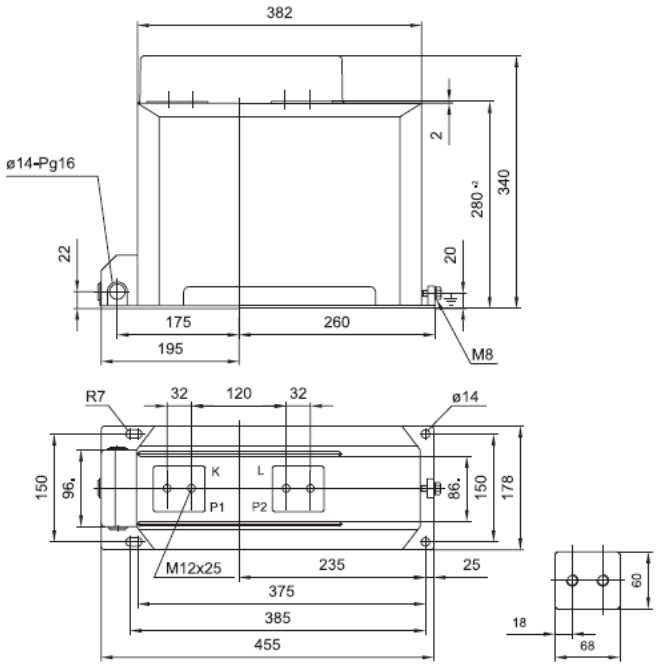
Weight: 43-49 kg



drawing N:	polarity
44615100	P1 to sec. term.
44615110	P2 to sec. term.

TPU 60.23
TPU 63.23

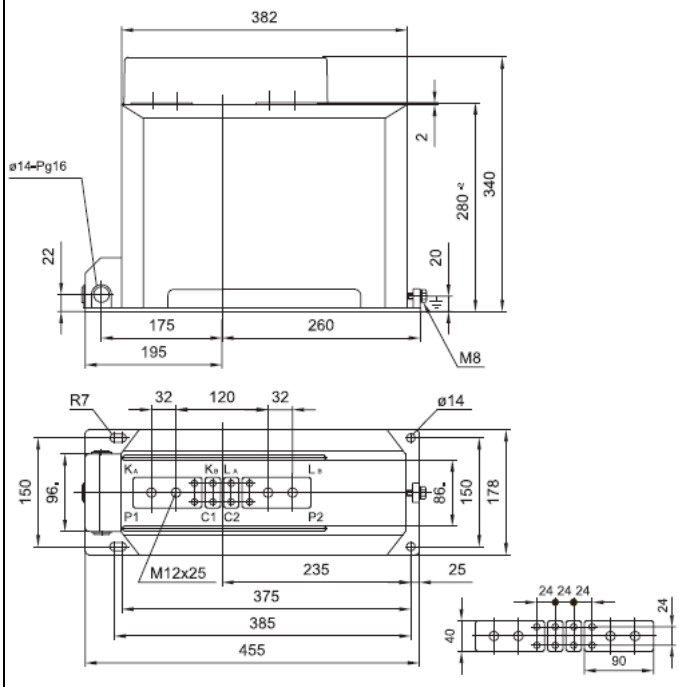
Weight: 43-49 kg



drawing N:	polarity
44615120	P1 to sec. term.
44615130	P2 to sec. term.

TPU 60.24

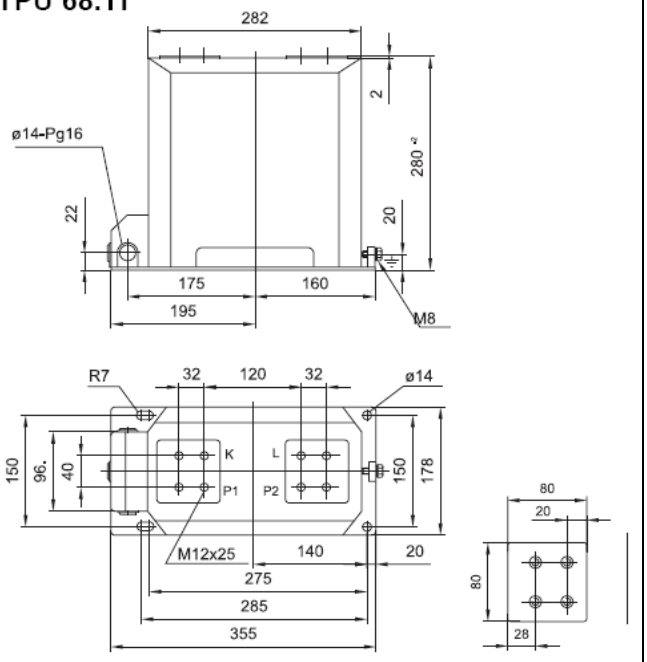
Weight: 43-49 kg



drawing N:	polarity
44615140	P1 to sec. term.
44615150	P2 to sec. term.

TPU 64.11
TPU 65.11
TPU 66.11
TPU 67.11
TPU 68.11

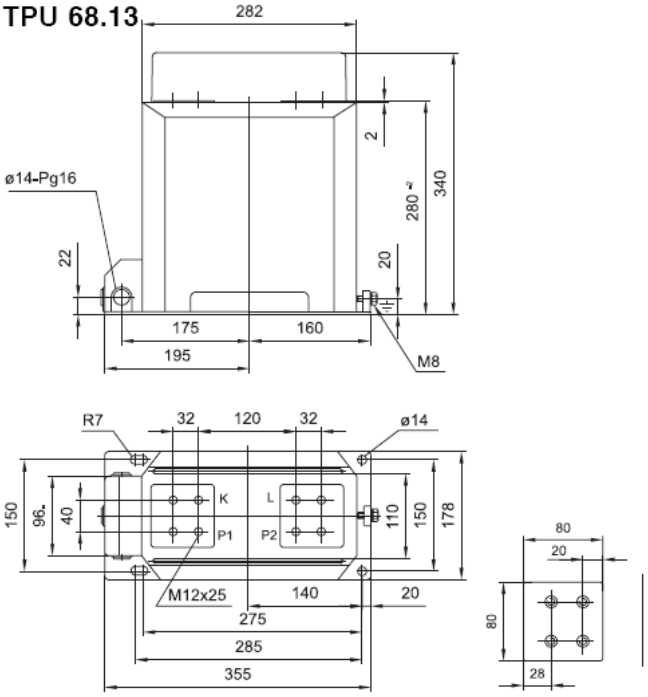
Weight: 36-41 kg



drawing N:	polarity
44615160	P1 to sec. term.
44615170	P2 to sec. term.

TPU 64.13
TPU 65.13
TPU 66.13
TPU 67.13
TPU 68.13

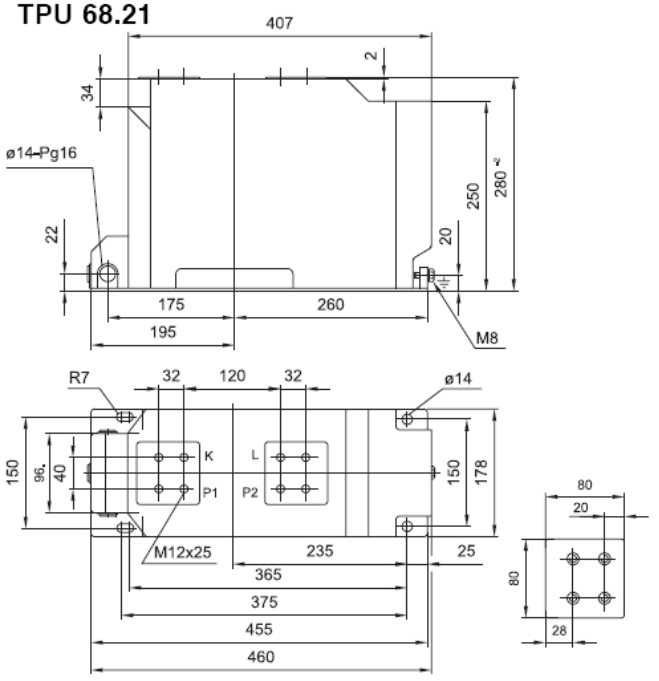
Weight: 36-41 kg



drawing N:	polarity
44615180	P1 to sec. term.
44615190	P2 to sec. term.

TPU 64.21
TPU 65.21
TPU 66.21
TPU 67.21
TPU 68.21

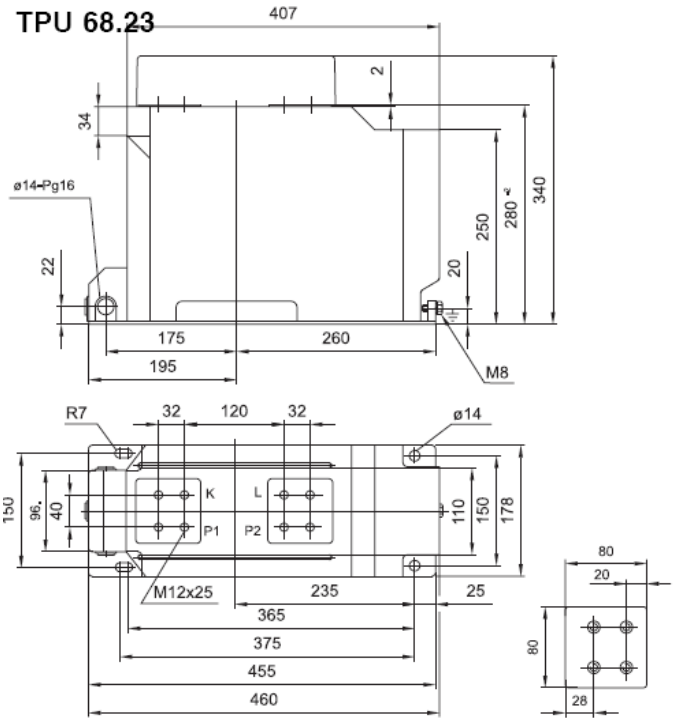
Weight: 50-57 kg



drawing N:	polarity
44615200	P1 to sec. term.
44615210	P2 to sec. term.

TPU 64.23
TPU 65.23
TPU 66.23
TPU 67.23
TPU 68.23

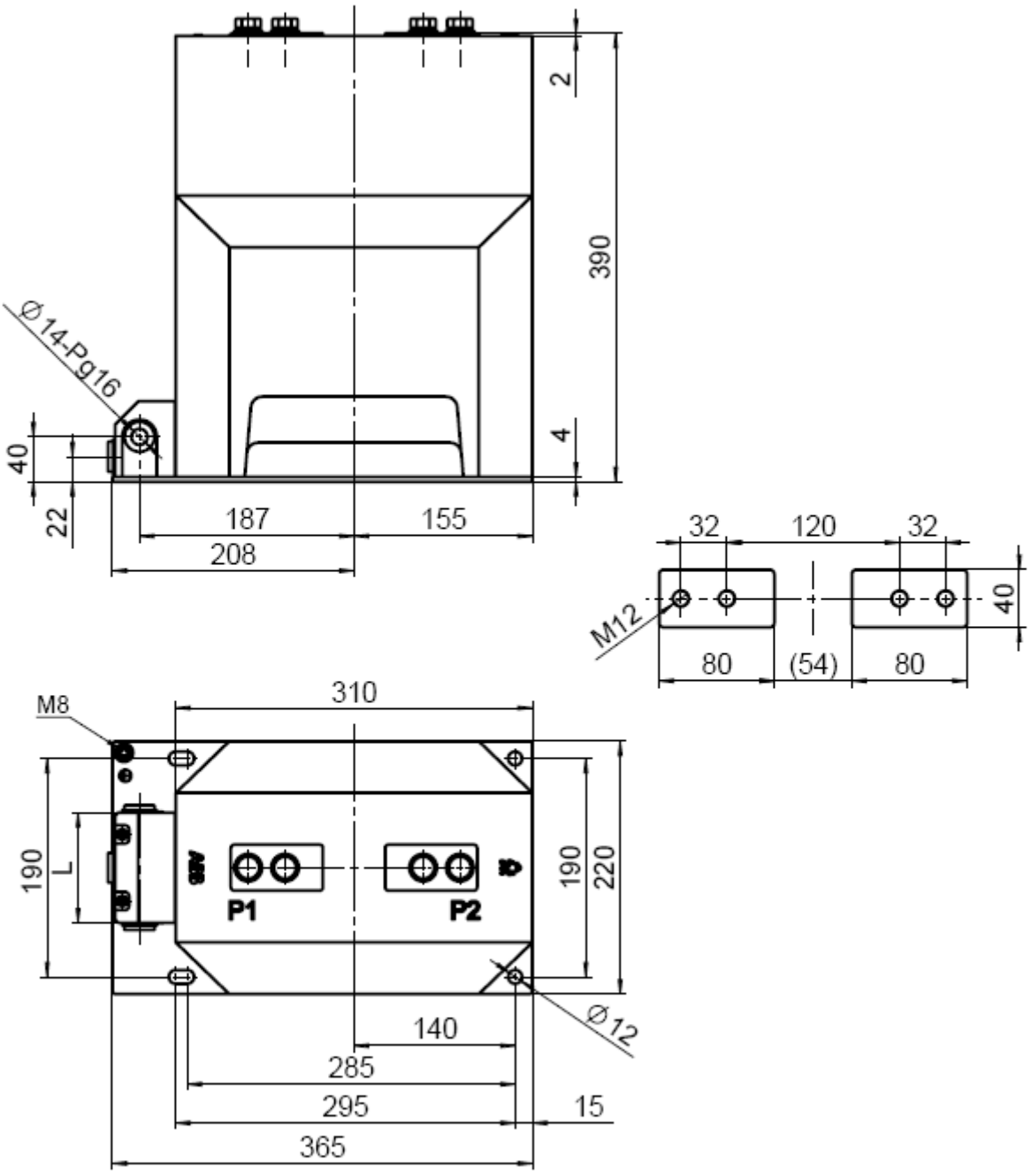
Weight: 50-57 kg



drawing N:	polarity
44615220	P1 to sec. term.
44615230	P2 to sec. term.

TPU 70.51
TPU 73.51

WEIGHT: appr. 49Kg
CREP. DISTANCE: 400mm

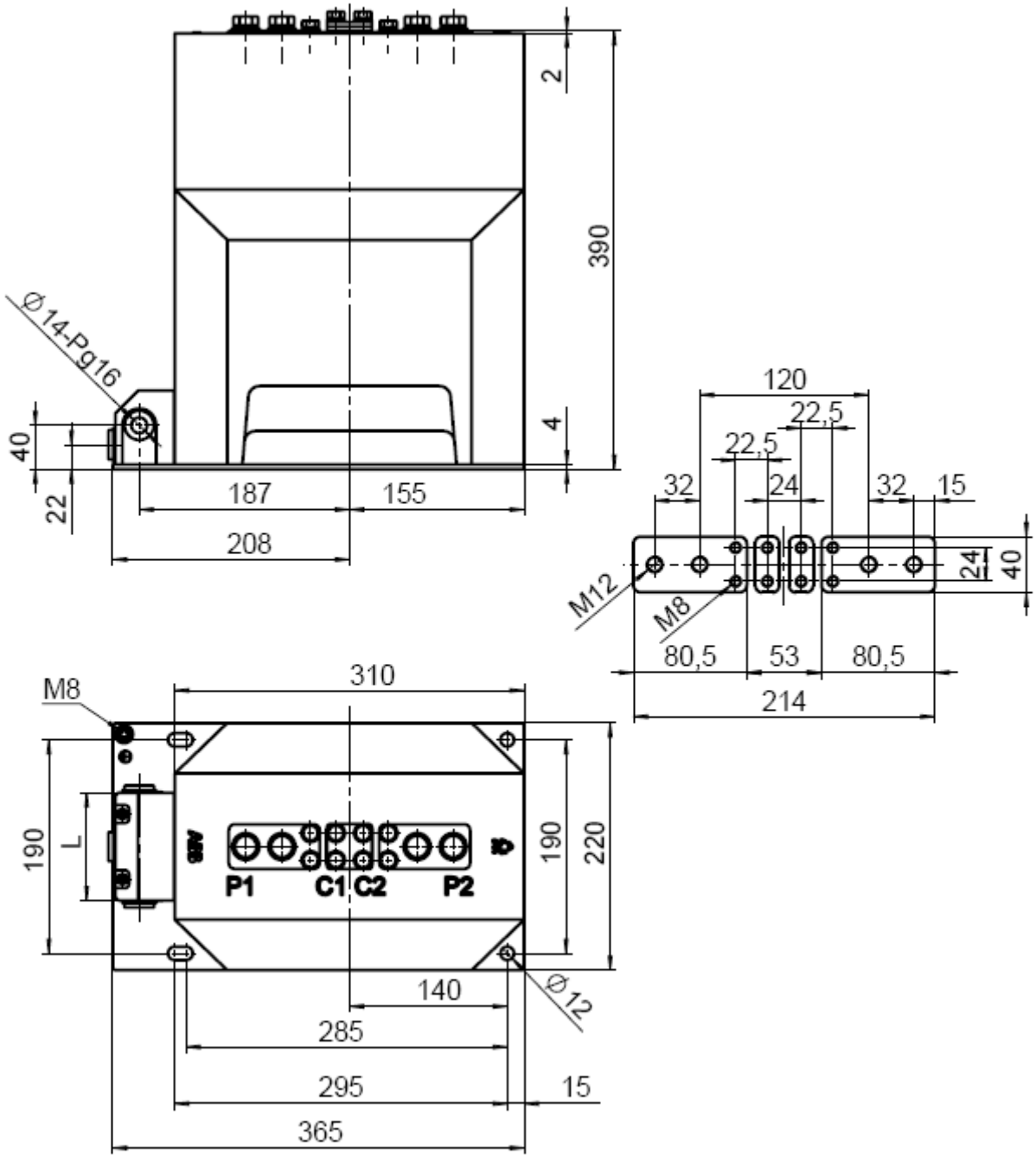


L=96mm for 6 or 12 clamps
L=122mm for 16 clamps

Drawing no.	Polarity
44615730	P1 to secondary term.
44615740	P2 to secondary term.

TPU 70.52
TPU 73.52

WEIGHT: appr. 49Kg
CREP. DISTANCE: 409mm

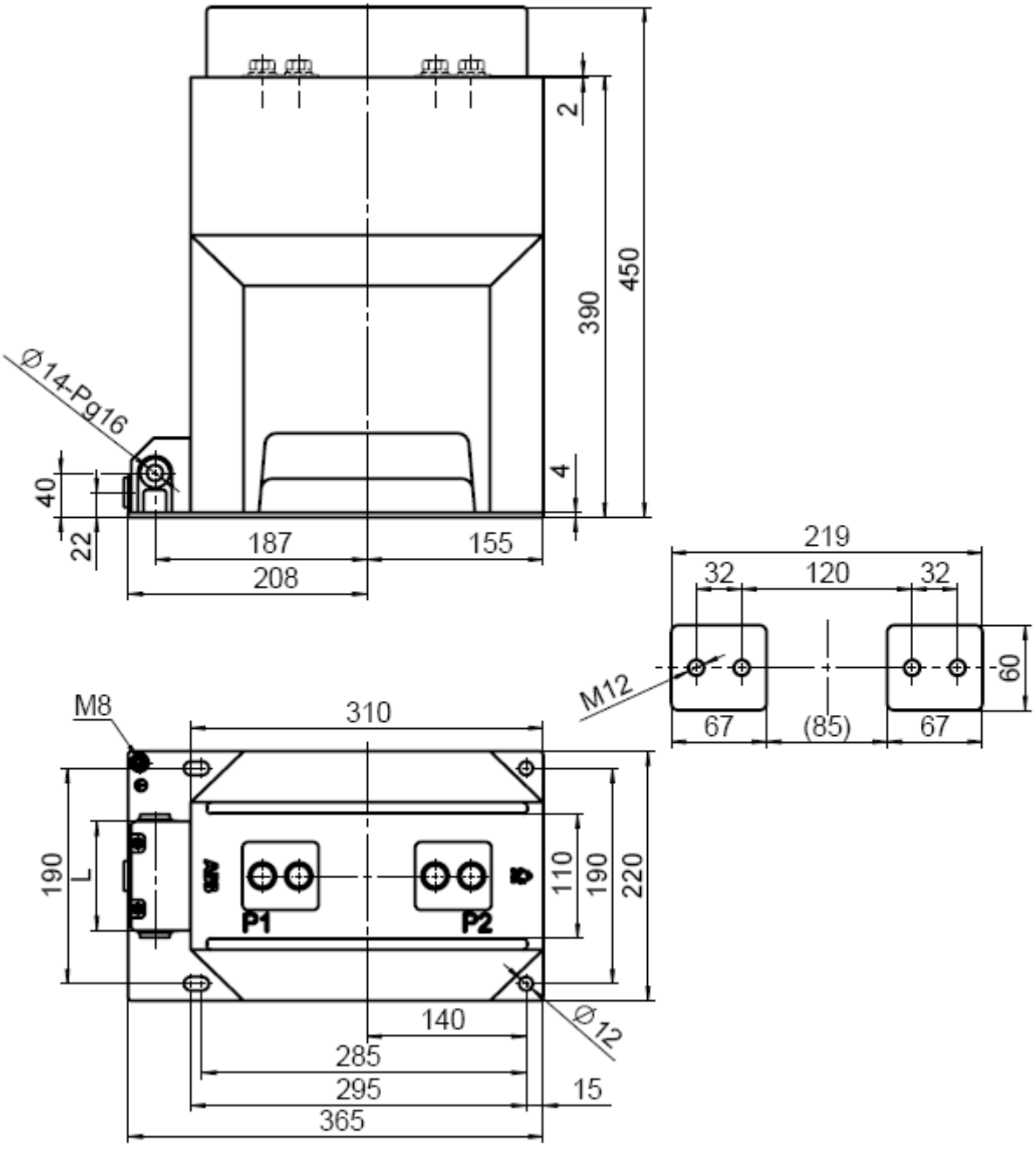


L=96mm for 6 or 12 clamps
L=122mm for 16 clamps

Drawing no.	Polarity
44615750	P1 to secondary term.
44615760	P2 to secondary term.

TPU 70.53
TPU 73.53

WEIGHT: appr. 49Kg
CREP. DISTANCE: 397mm

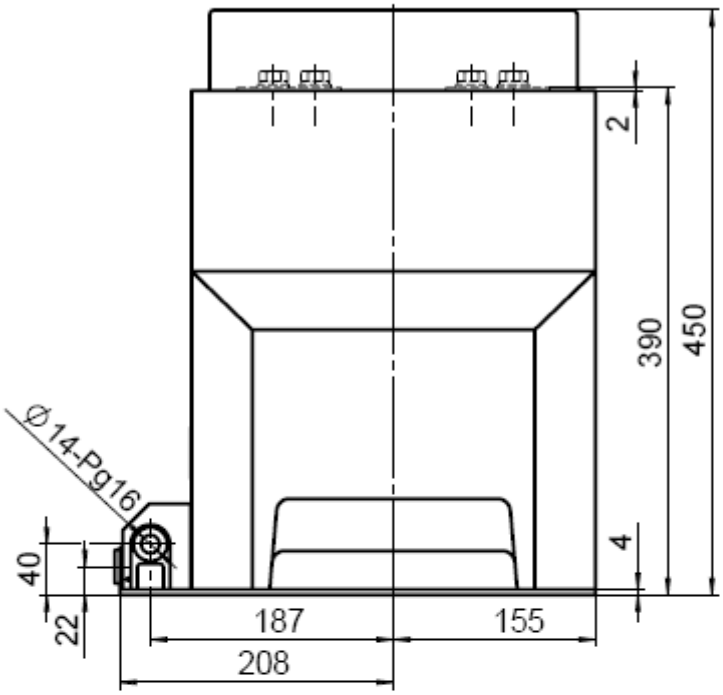


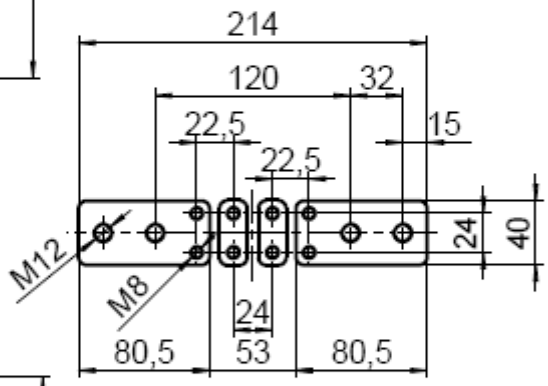
L=96mm for 6 or 12 clamps
L=122mm for 16 clamps

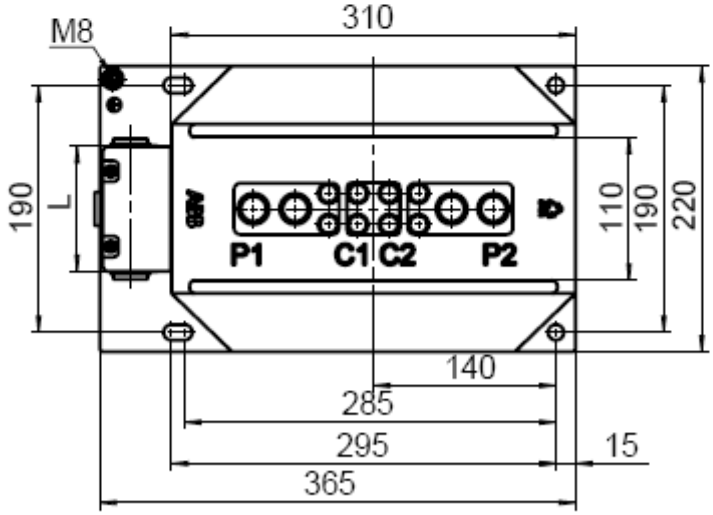
Drawing no.	Polarity
44615650	P1 to secondary term.
44615660	P2 to secondary term.

TPU 70.54
TPU 73.54

WEIGHT: appr. 49Kg
CREP. DISTANCE: 409mm





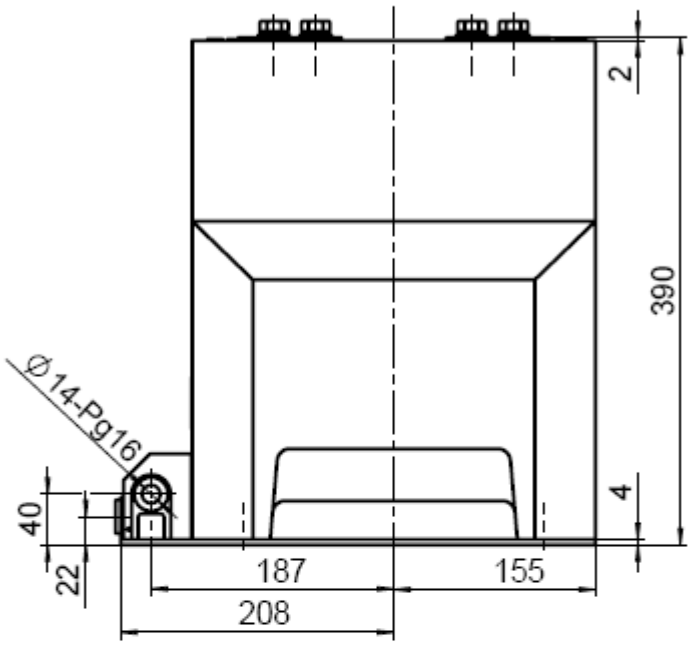


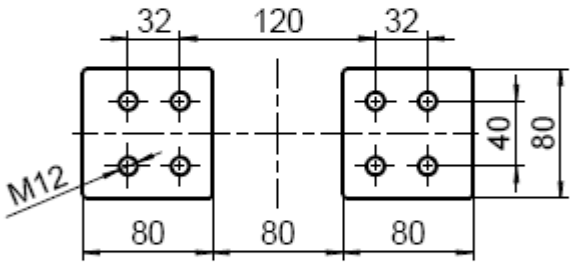
L=96mm for 6 or 12 clamps
L=122mm for 16 clamps

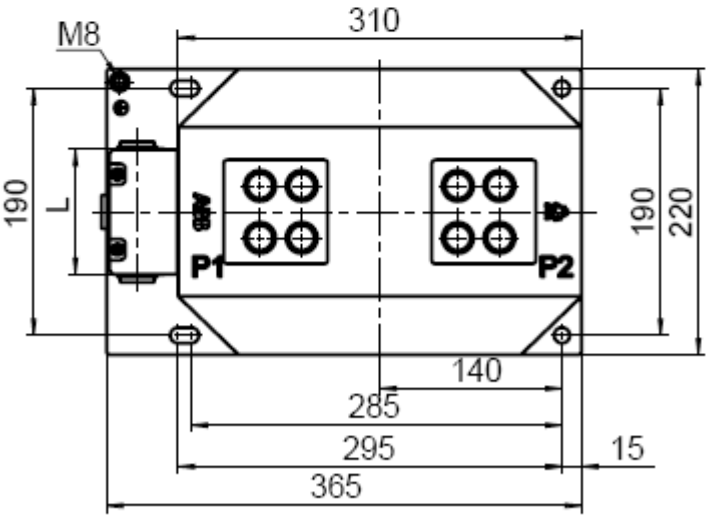
Drawing no.	Polarity
44615710	P1 to secondary term.
44615720	P2 to secondary term.

TPU 74.51
TPU 75.51
TPU 76.51

WEIGHT: appr. 49Kg
CREP. DISTANCE: 386mm





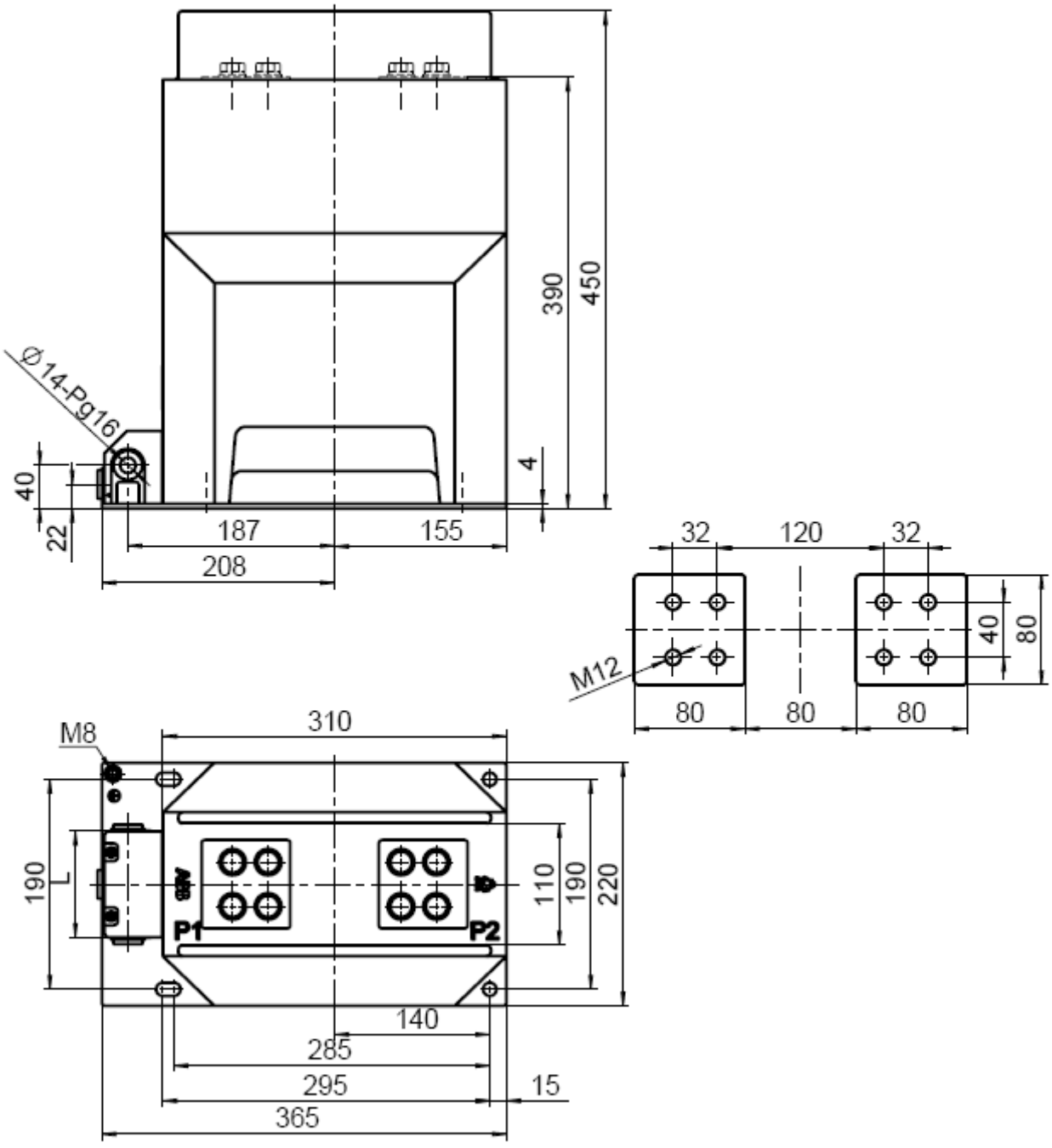


L=96mm for 6 or 12 clamps
L=122mm for 16 clamps

Drawing no.	Polarity
44615690	P1 to secondary term.
44615700	P2 to secondary term.

TPU 74.53
TPU 75.53
TPU 76.53

WEIGHT: appr. 49Kg
CREP. DISTANCE: 386mm

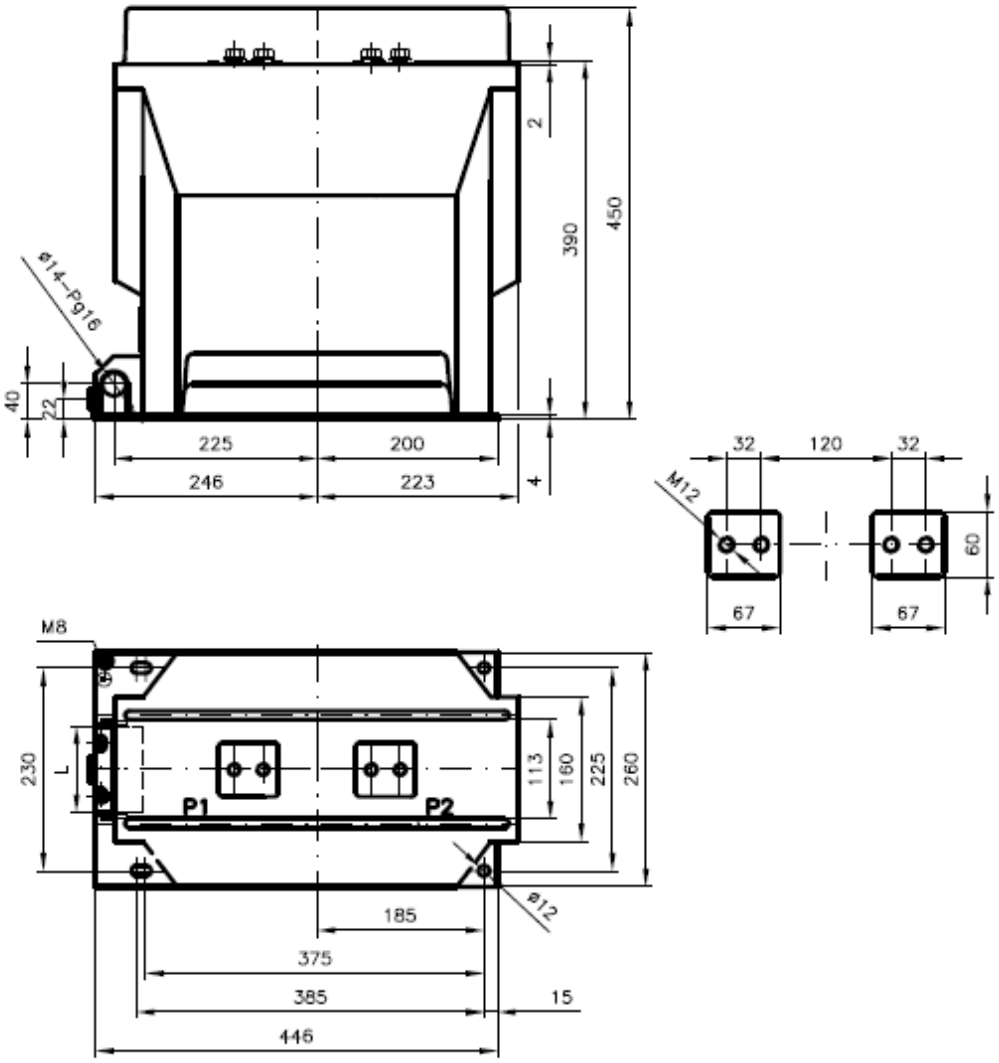


L=96mm for 6 or 12 clamps
L=122mm for 16 clamps

Drawing no.	Polarity
44615670	P1 to secondary term.
44615680	P2 to secondary term.

TPU 70.63
TPU 73.63

WEIGHT: appr. 78kg
CREP. DISTANCE: 463mm

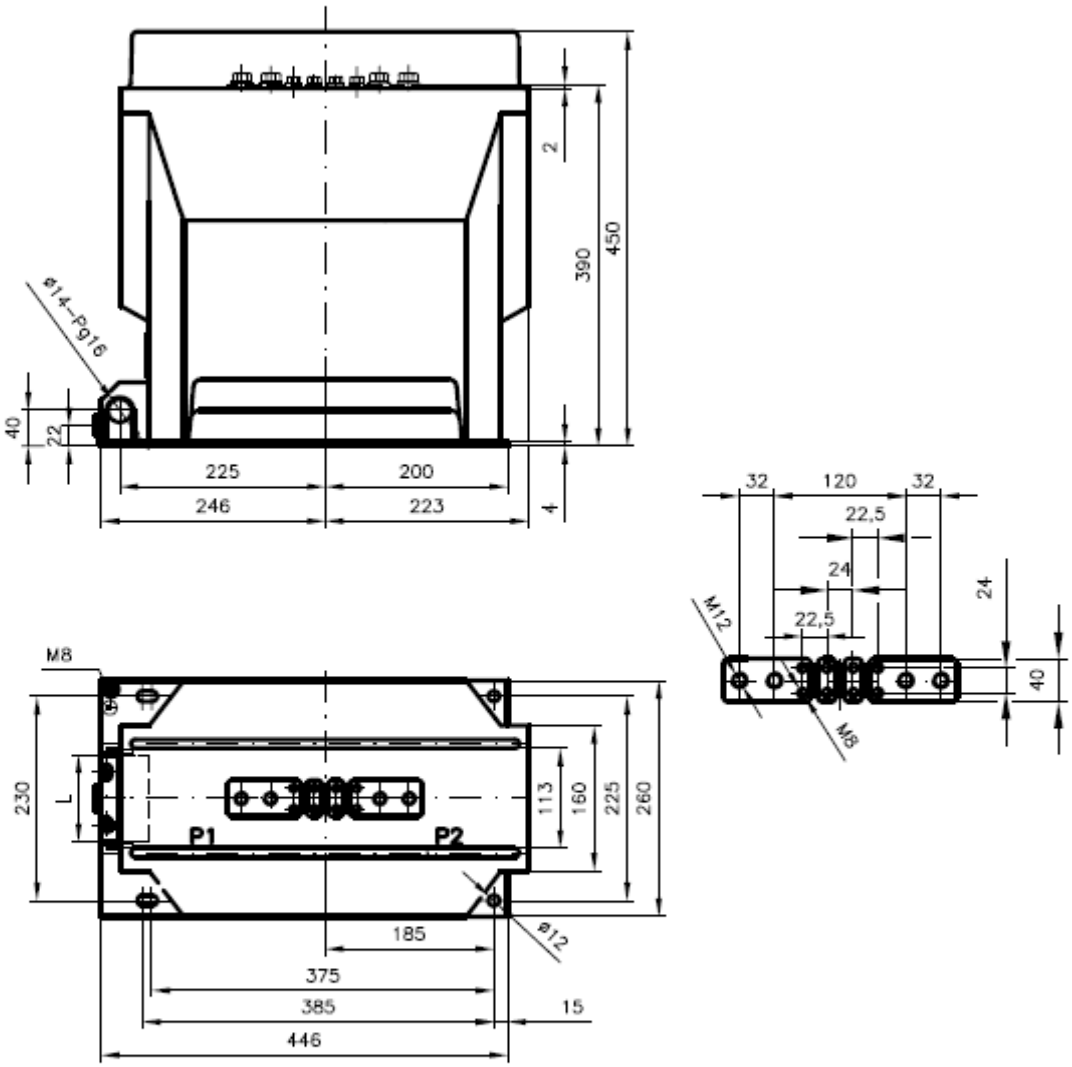


L=96mm for 6 or 12 clamps
L=122mm for 16 clamps

Drawing n.	Polarity
44615570	P1 to secondary term.
44615580	P2 to secondary term.

TPU 70.64
TPU 73.64

WEIGHT: appr. 78kg
CREP. DISTANCE: 456mm

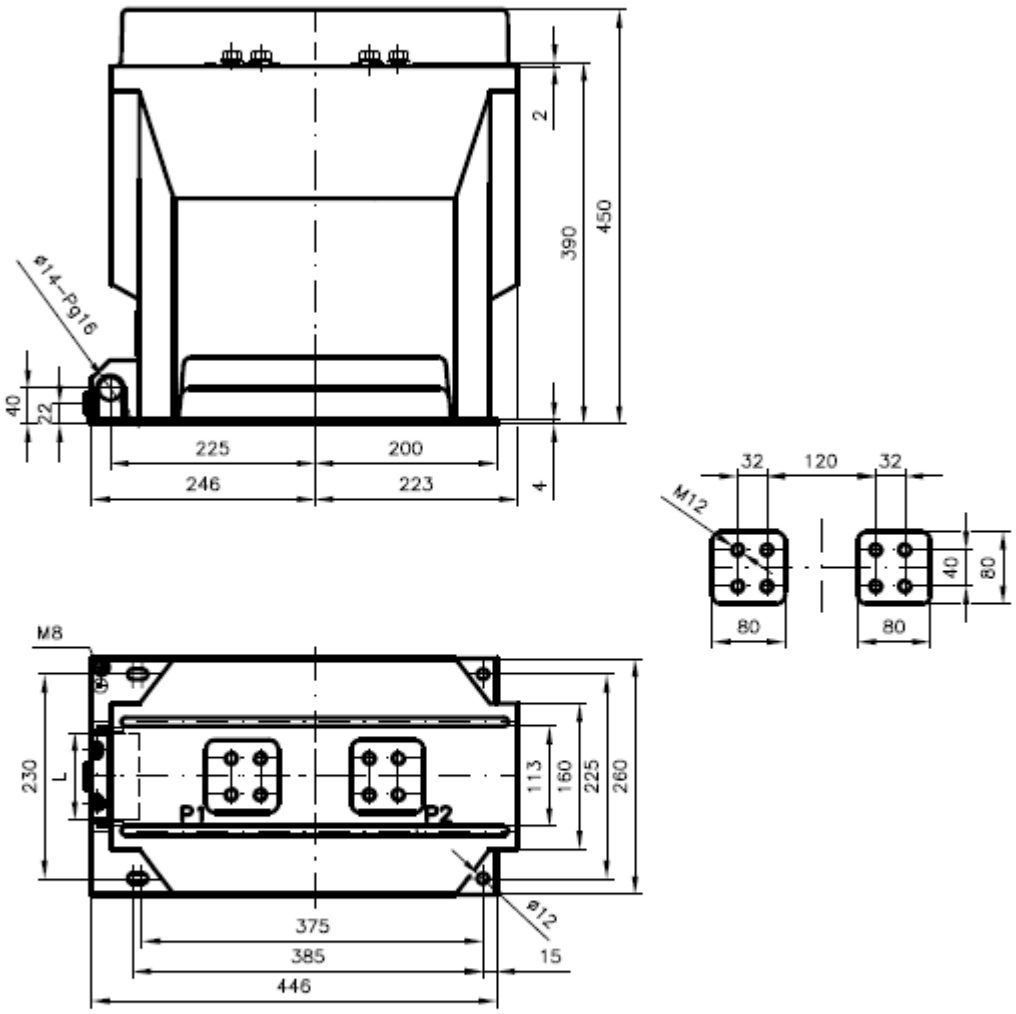


L=96mm for 6 or 12 clamps
L=122mm for 16 clamps

Drawing n.	Polarity
44615610	P1 to secondary term.
44615620	P2 to secondary term.

TPU 74.63
TPU 75.63
TPU 76.63

WEIGHT: appr. 78kg
CREP. DISTANCE: 463mm

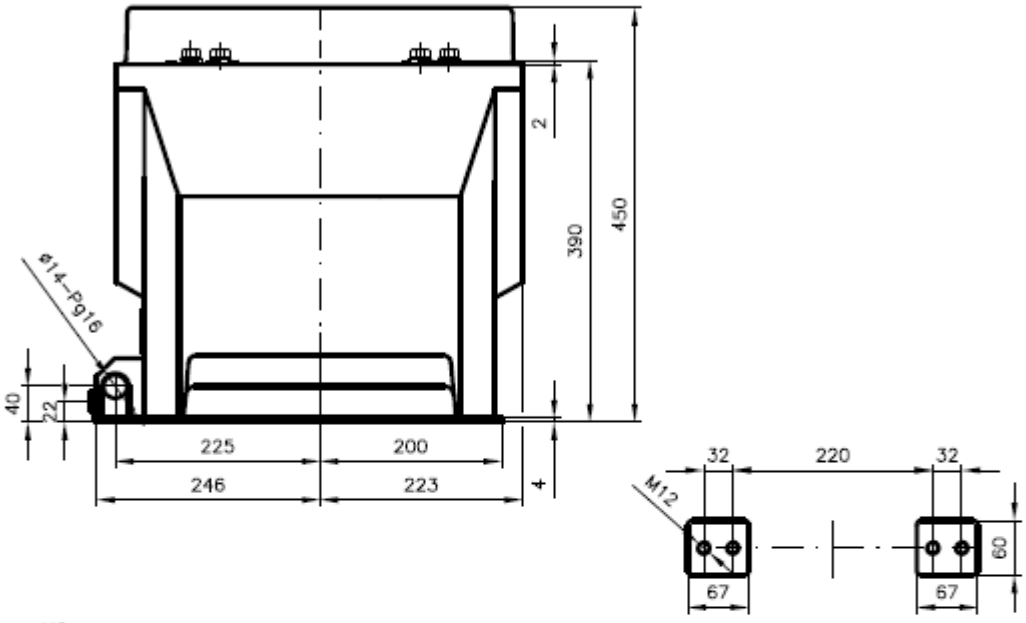


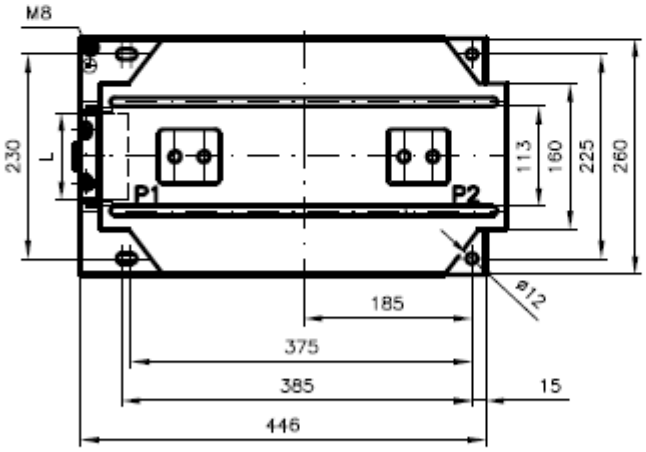
L=96mm for 6 or 12 clamps
L=122mm for 16 clamps

Drawing n.	Polarity
44615590	P1 to secondary term.
44615600	P2 to secondary term.

TPU 70.66
TPU 73.66

WEIGHT: appr. 78kg
CREP. DISTANCE: 413mm



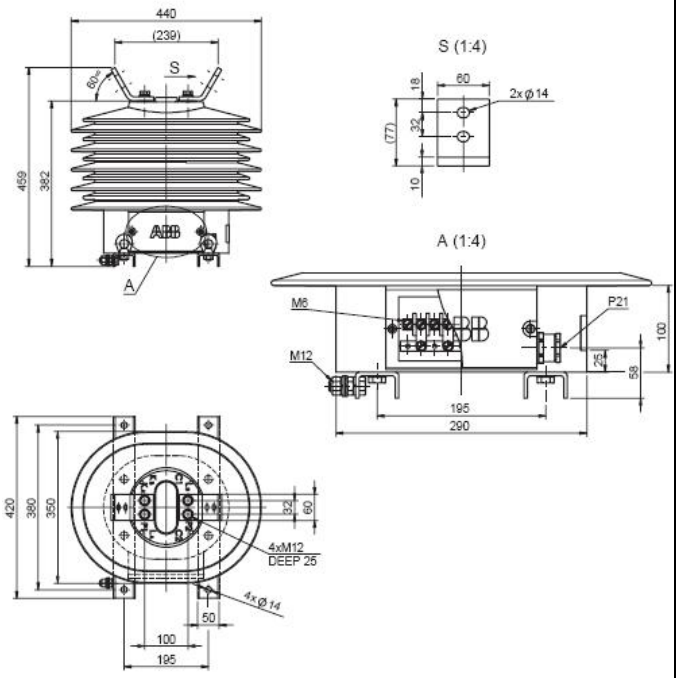


L=96mm for 6 or 12 clamps
L=122mm for 16 clamps

Drawing n.	Polarity
44615630	P1 to secondary term.
44615640	P2 to secondary term.

TPO 60.11

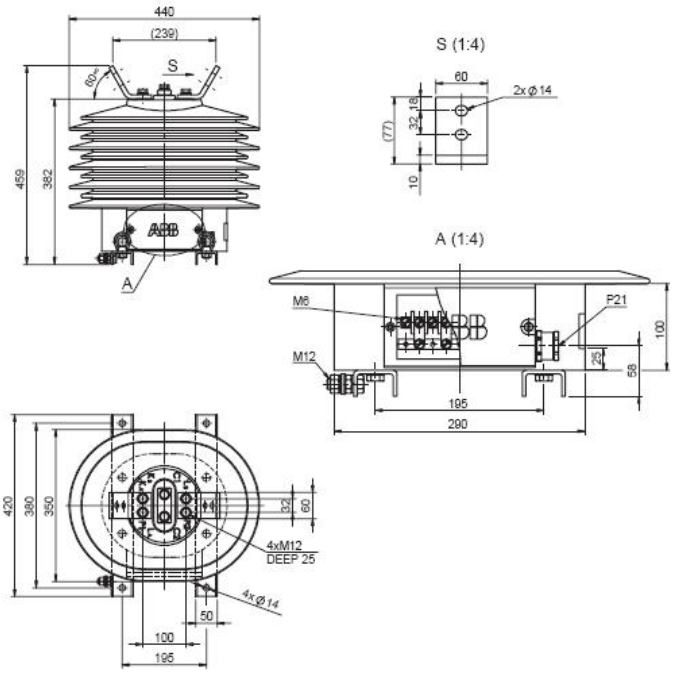
WEIGHT: appr. 62kg
CREEPAGE DISTANCE: 1100mm



Drawing n. 44615820

TPO 60.12

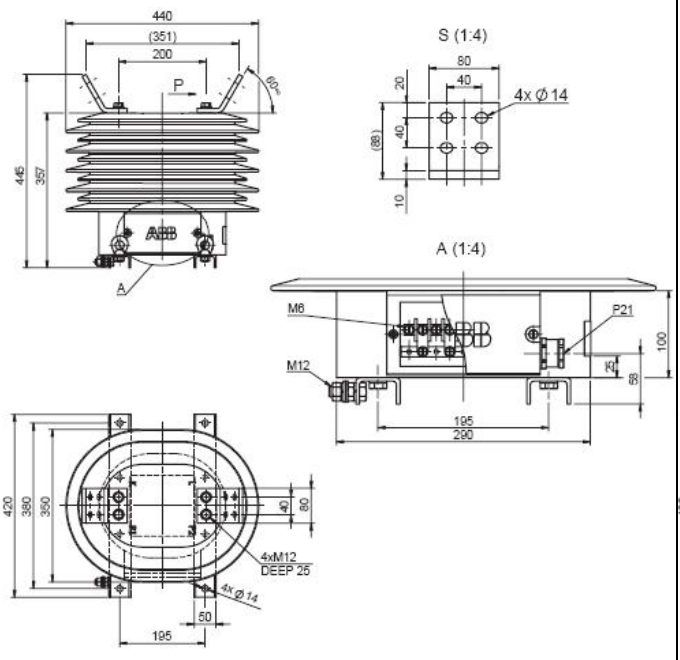
WEIGHT: appr. 62kg
CREEPAGE DISTANCE: 1100mm



Drawing n. 44615830

TPO 61.11 - 63.11

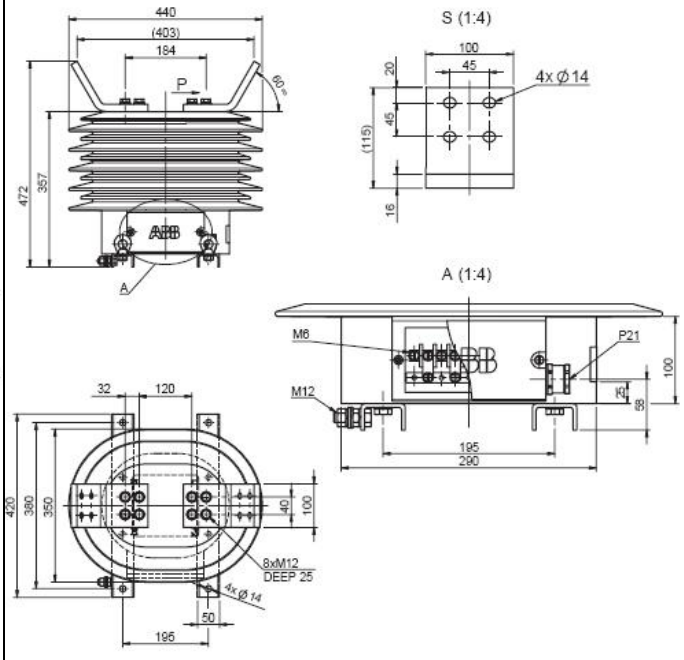
WEIGHT: appr. 62kg
CREEPAGE DISTANCE: 1100mm



Drawing n. 44615840

TPO 64.11 - 66.11

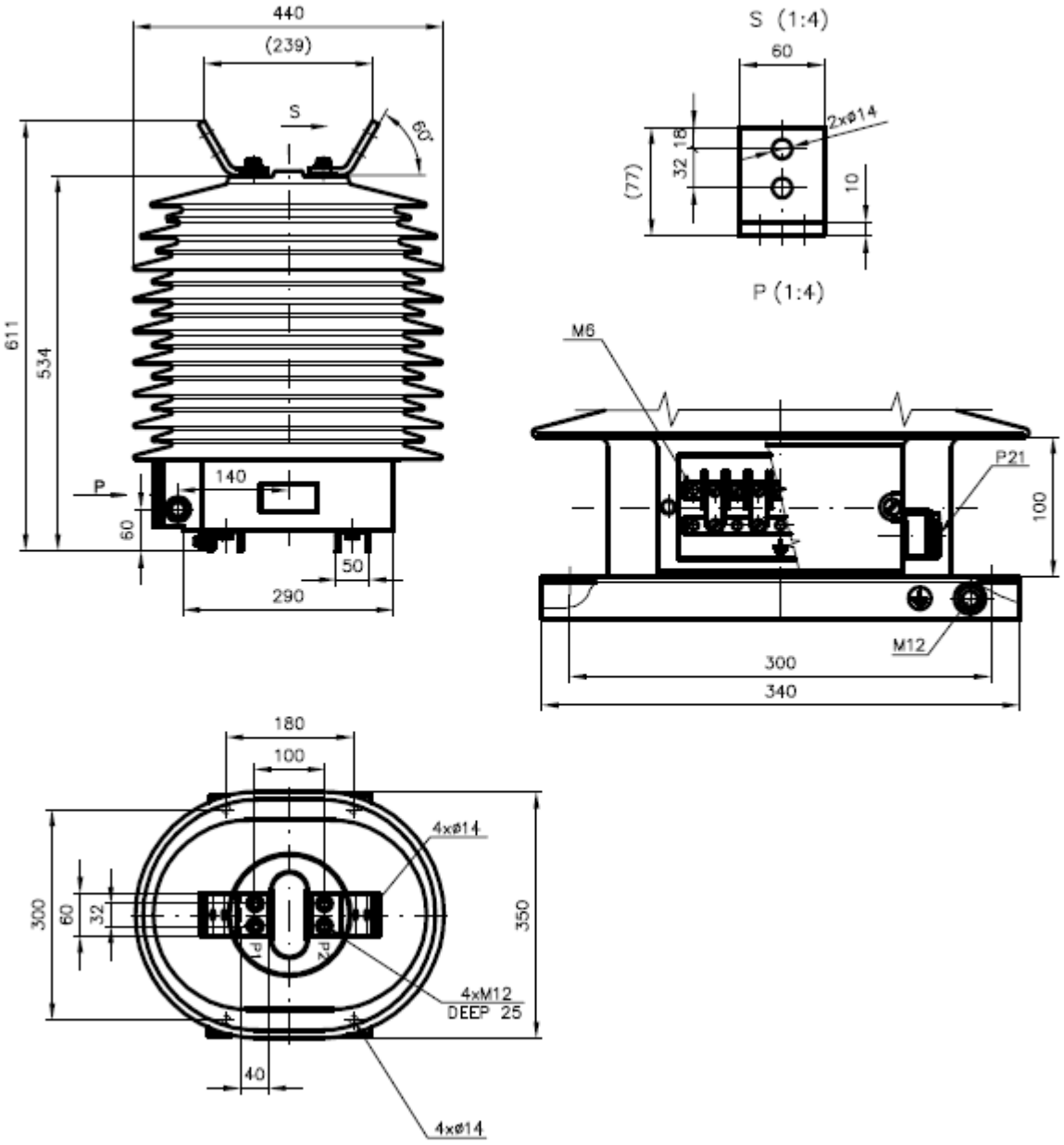
WEIGHT: appr. 62kg
CREEPAGE DISTANCE: 1100mm



Drawing n. 44615850

TPO 70.11

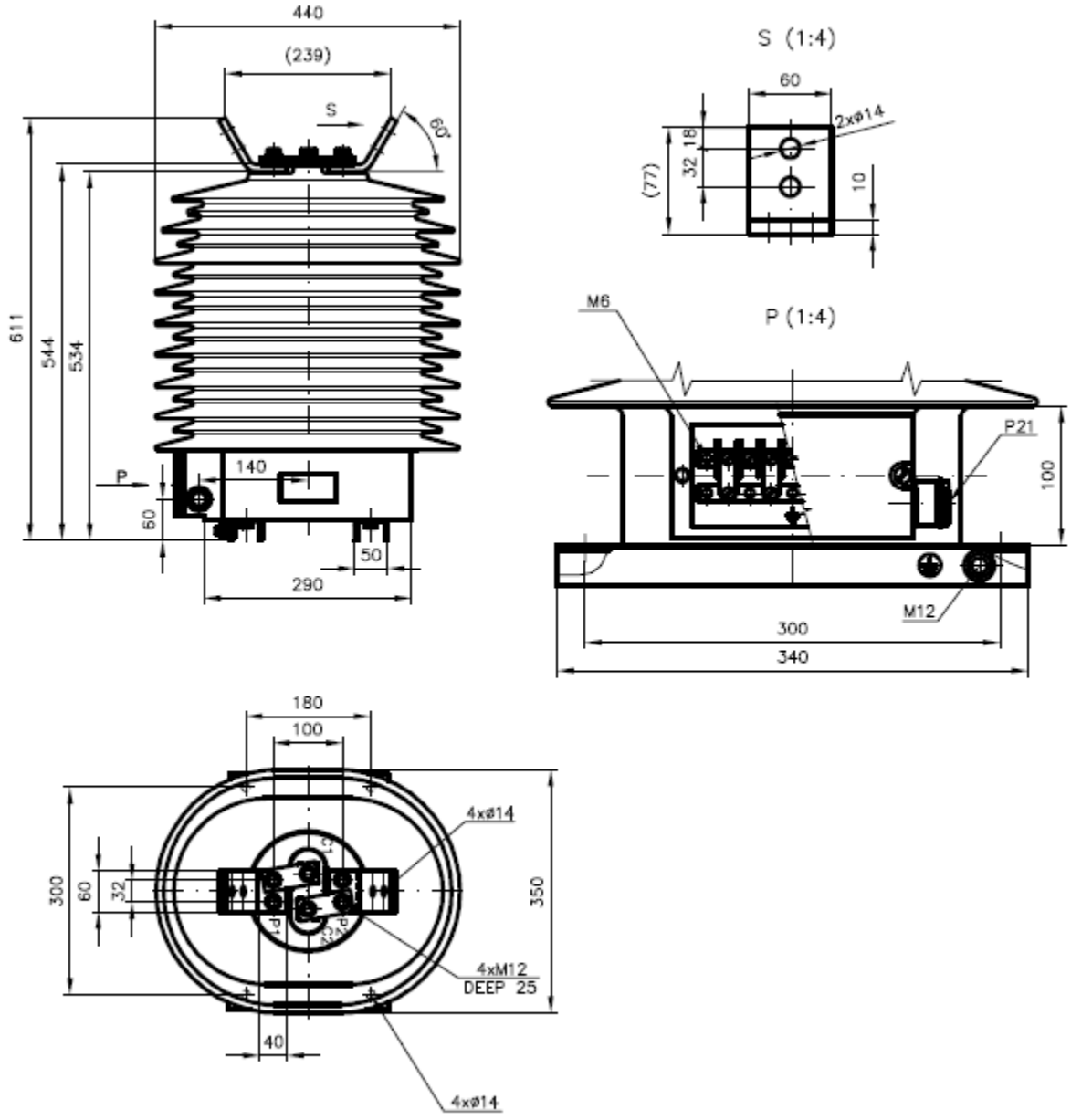
WEIGHT: appr. 90kg
CREP. DISTANCE: 1600mm



Drawing n. 44615790

TPO 70.12

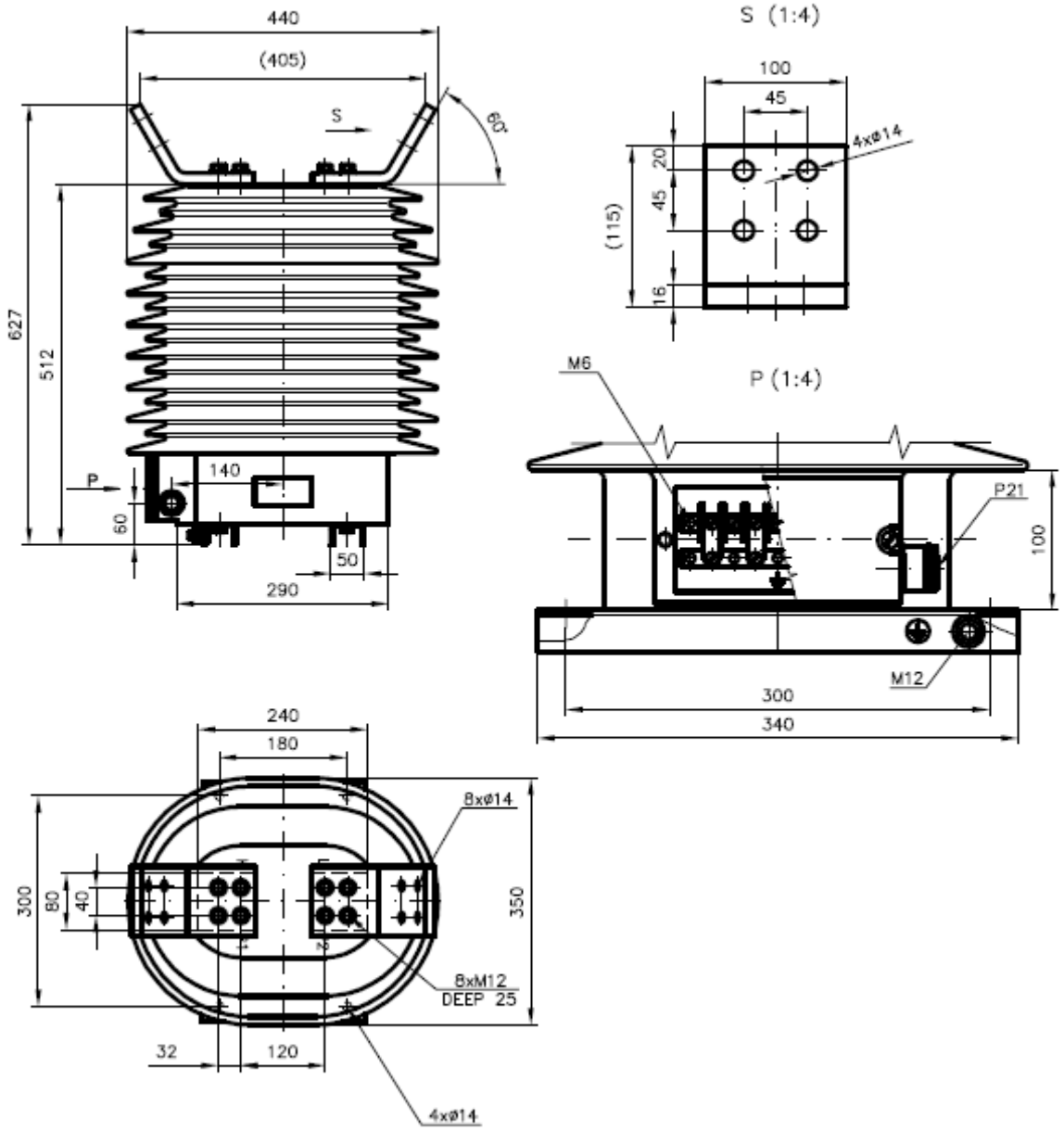
WEIGHT: appr. 90kg
CREP. DISTANCE: 1600mm



Drawing n. 44615800

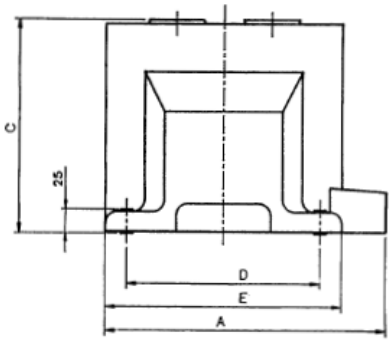
TPO 71.11–76.11

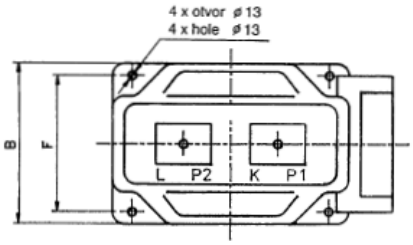
WEIGHT: appr. 90kg
CREP. DISTANCE: 1600mm



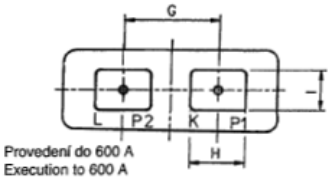
Drawing n. 44615810

TP xx.x

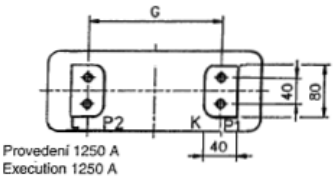




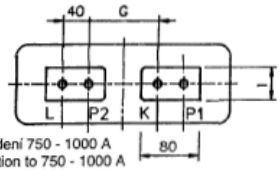
PRIMÁRNÍ SVORKY:
PRIMARY TERMINALS:



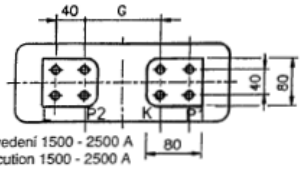
Provedení do 600 A
Execution to 600 A



Provedení 1250 A
Execution 1250 A



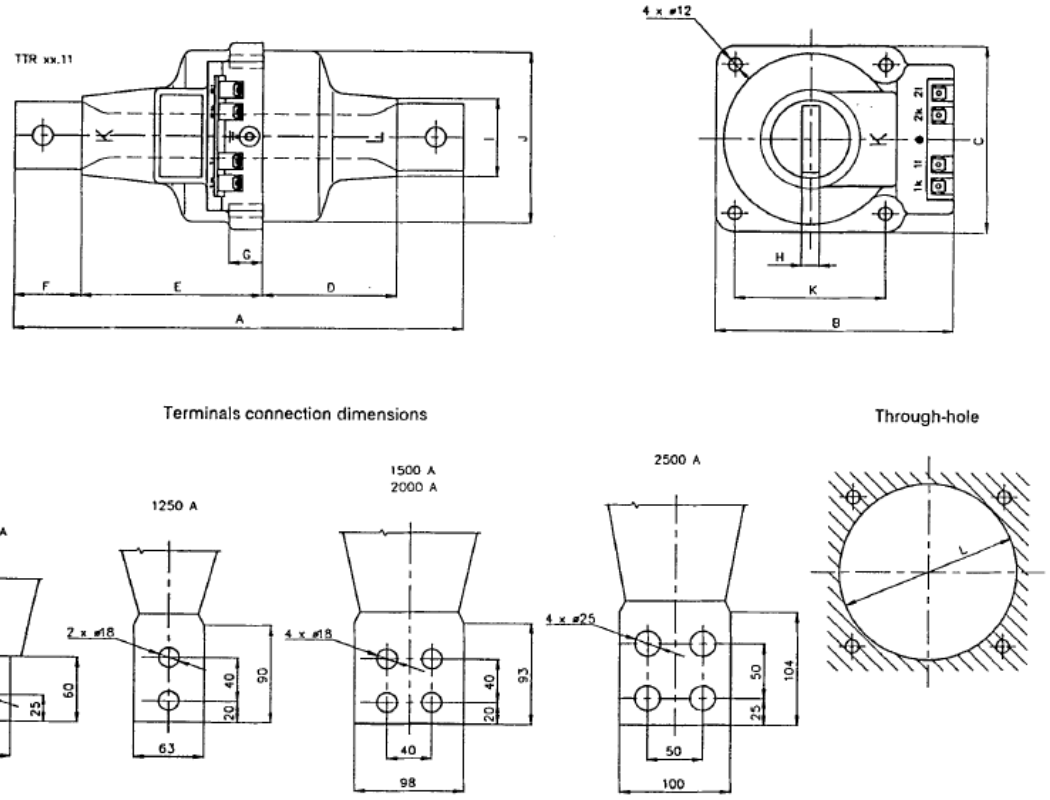
Provedení 750 - 1000 A
Execution to 750 - 1000 A



Provedení 1500 - 2500 A
Execution 1500 - 2500 A

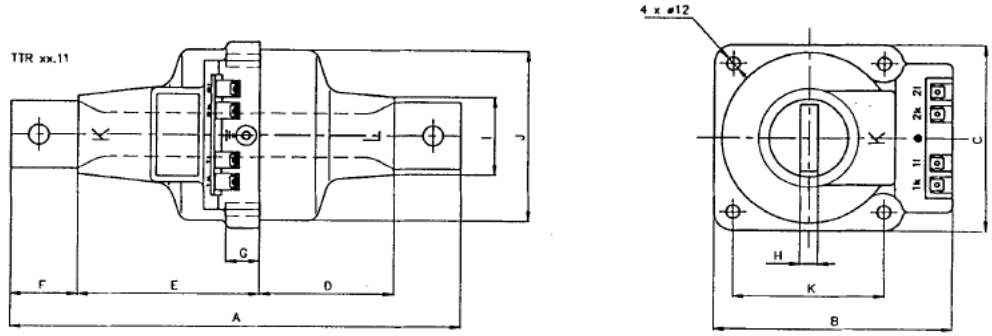
Typ	Izolační napětí (kV)	Primární proud (A)	Rozměr (mm)									Hmotnost (± 2kg) (kg)
Type	Insulation voltage (kV)	Primary current (A)	Dimension (mm)									Weight (± 2kg) (kg)
			A	B	C	D	E	F	G	H	I	
TP 40.1	12	<600	320	160	240	210	274	135	92	60	40	23
TP 40.2		<600	400	160	240	290	354	135	92	60	40	32
TP 41		400	306	160	190	210	260	135	130	40	40	18
TP 42		500-600	306	160	190	210	260	135	130	40	40	18
TP 43		750	306	160	190	210	260	135	50	80	60	18
		1000	306	160	190	210	260	135	50	80	60	18
TP 44		1250	346	185	215	240	300	160	190	40	80	30
		1500	346	185	215	240	300	160	110	80	80	30
TP 45		2000	346	185	215	240	300	160	110	80	80	30
TP 46		2500	346	185	215	240	300	160	110	80	80	30
TP 60.1	25	<600	340	170	255	210	294	135	92	60	40	25
TP 60.2		<600	420	170	255	290	374	135	92	60	40	34
TP 61		400	306	170	255	210	260	135	130	40	40	19
TP 62		500-600	306	170	255	210	260	135	130	40	40	19
TP 63		750	306	170	255	210	260	135	50	80	60	19
		1000	306	170	255	210	260	135	50	80	60	19
TP 64		1250	366	195	255	240	320	160	200	40	80	32
		1500	366	195	255	240	320	160	120	80	80	32
TP 65		2000	366	195	255	240	320	160	120	80	80	32
TP 66		2500	366	195	255	240	320	160	120	80	80	32

TTR 4x.xx



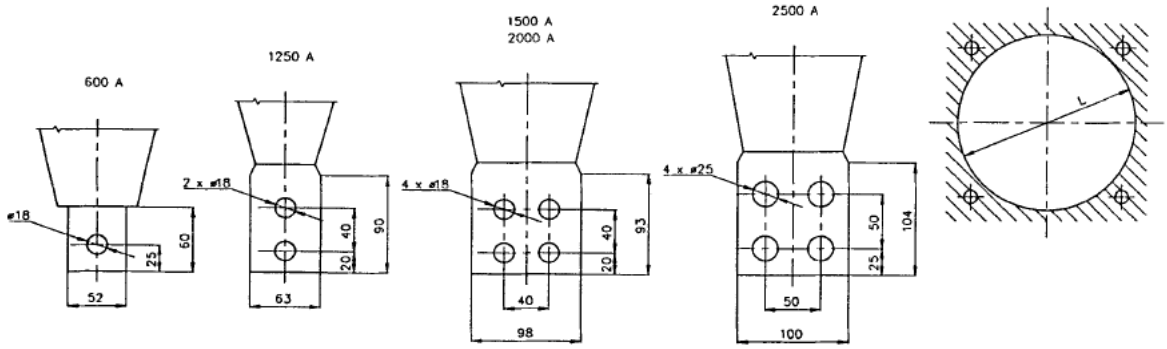
Insulation voltage [kV]	Type	Rated current [A]	Dimensions													Weight [kg]
			A	B	C	D	E	F	G	H	H∞	øI	øJ	K	øL	
12	TTR 41.11	to 600	402	214	170	120	162	60	30	16	6	71	156	136	160	10.0
	TTR 42.11	to 300	500	214	170	220	162	60	30	16	6	71	156	136	160	17.0
	TTR 43.11	750-1250	472	214	170	120	162	95	30	20	10	71	156	136	160	11.0
	TTR 44.11	1500	482	252	208	120	162	100	30	16	20	110	192	174	196	15.0
	TTR 45.11	2000	482	252	208	120	162	100	30	20	20	110	192	174	196	21.0
	TTR 46.11	2500	502	252	208	120	162	110	30	20	20	110	192	174	196	24.0

TTR 6x.xx

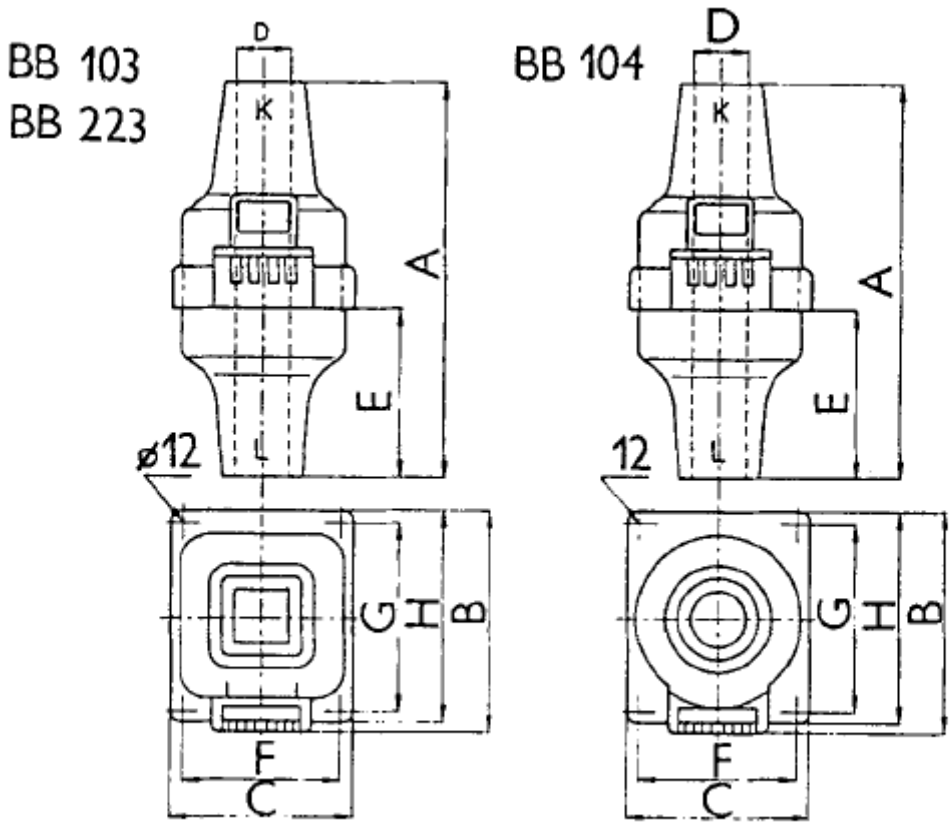


Terminals connection dimensions

Through-hole

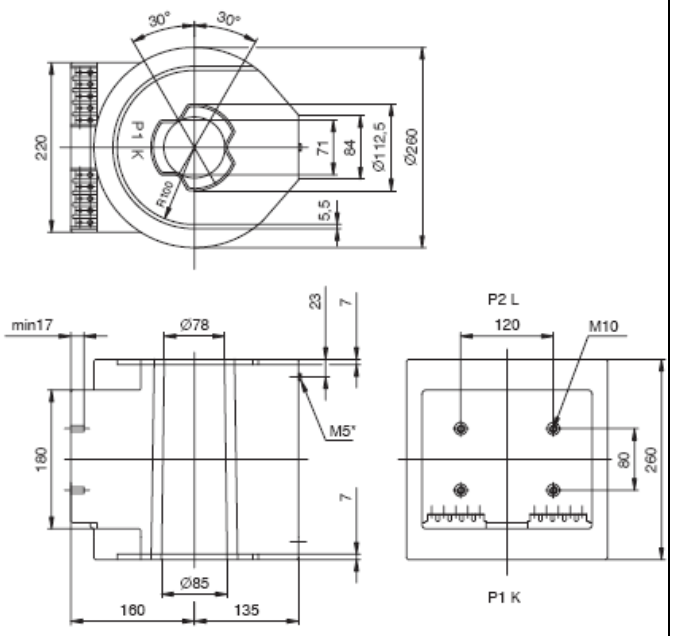


Insulation voltage [kV]	Type	Rated current [A]	Dimensions													Weight [kg]
			A	B	C	D	E	F	G	H	H∞	øI	øJ	K	øL	
25	TTR 61.11	to 600	620	224	180	238	262	60	30	16	6	71	166	146	170	14.0
	TTR 62.11	to 300	680	224	180	298	262	60	30	16	6	71	166	146	170	21.0
	TTR 63.11	750-1250	690	224	180	238	262	95	30	20	10	71	166	146	170	15.0
	TTR 64.11	1500	700	274	230	238	262	100	30	16	20	110	216	190	220	23.0
	TTR 65.11	2000	700	274	230	238	262	100	30	20	20	110	216	190	220	32.0
	TTR 66.11	2500	720	274	230	238	262	110	30	20	20	110	216	190	220	35.0



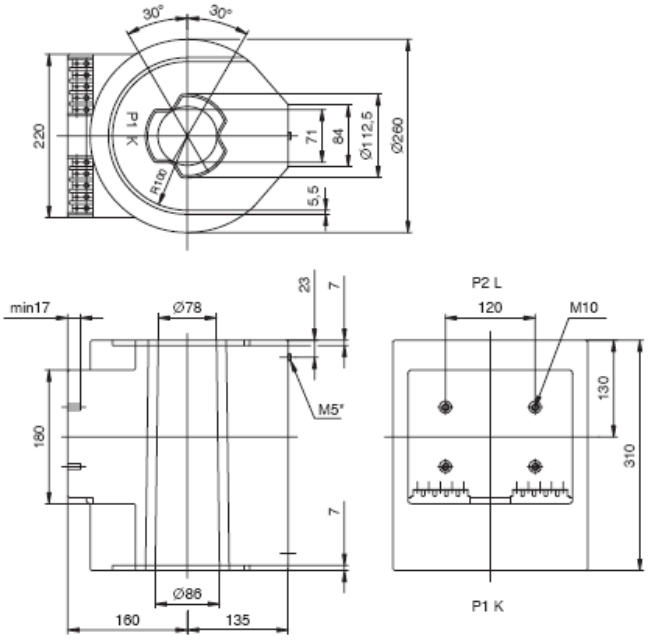
Typ/Type	Rozměry / Dimension								Hmotnost Weight kg
	A	B	C	D	E	F	G	H	
BB 103	280	341	262	□ 116 x 116	132	212	278	328	22,0
BB 104	465	389	322	ø 132	216	275	300	346	45.0
BB 223	500	351	274	□ 116 x 116	238	224	290	340	28.0

TYPE: KOKS 17,5 A31
KOKS 12 A31



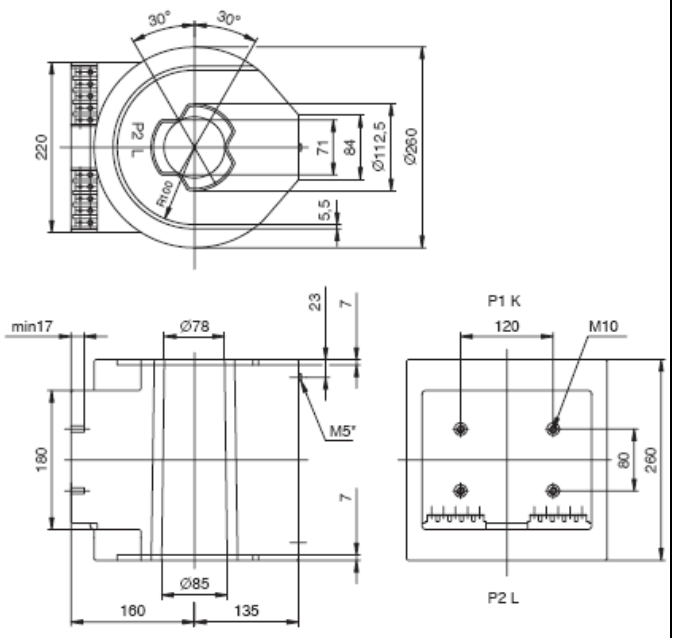
DRAWING NUMBER 44402520
Weight: 35 kg
* Marked M5 terminal must be connected to the primary bar

TYPE: KOKS 17,5 A41
KOKS 12 A41



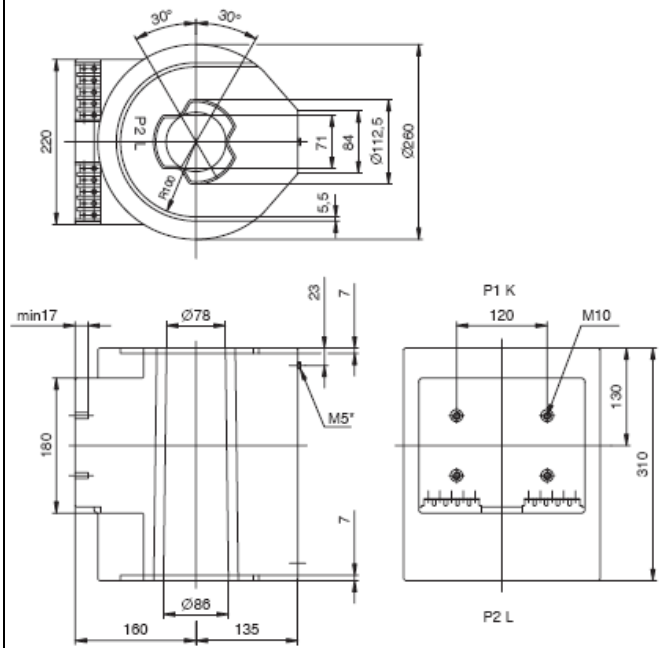
DRAWING NUMBER 44402540
Weight: 50 kg
* Marked M5 terminal must be connected to the primary bar

TYPE: KOKS 17,5 A31
KOKS 12 A31



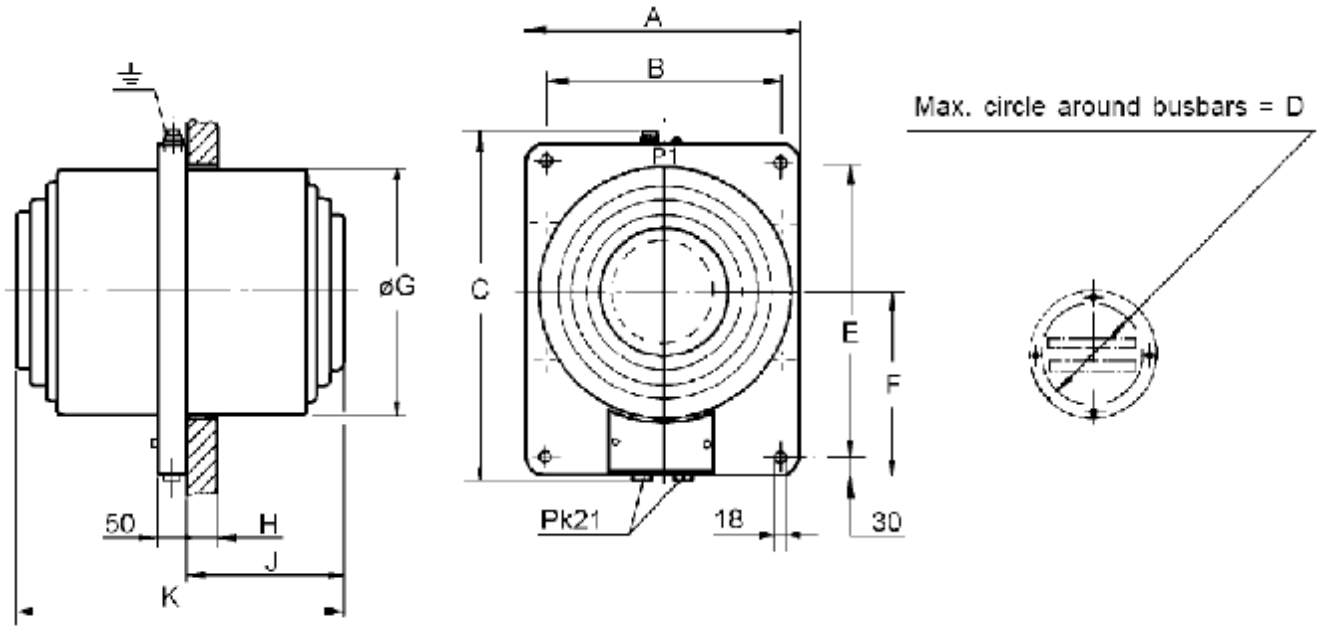
DRAWING NUMBER 44402530
Weight: 35 kg
* Marked M5 terminal must be connected to the primary bar

TYPE: KOKS 17,5 A41
KOKS 12 A41



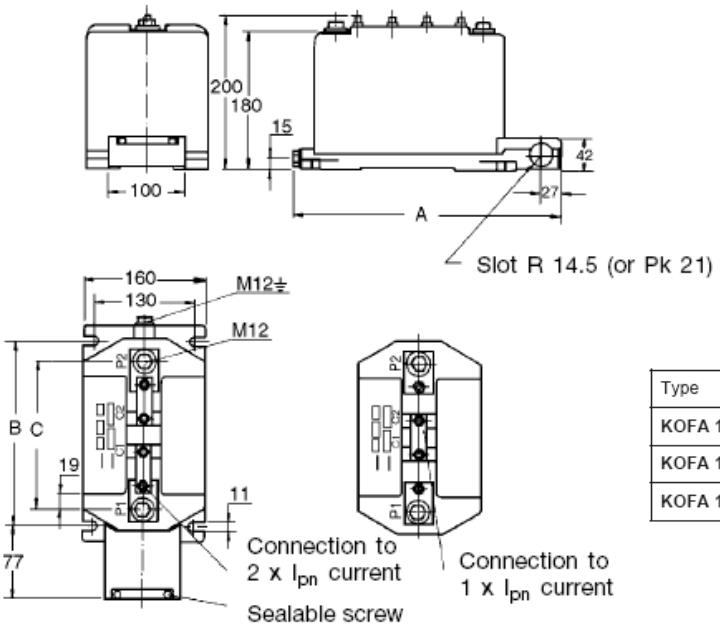
DRAWING NUMBER 44402550
Weight: 50 kg
* Marked M5 terminal must be connected to the primary bar

KOKS 24



Type	A	B	C	D	E	F	G	H	J	K	Weight/kg
KOKS 24 D 11	420	360	525	150	450	282	380	35	190	390	80
KOKS 24 D 21	420	360	525	150	450	282	380	75	245	500	115
KOKS 24 F 11	420	360	525	205	450	282	380	35	195	400	65
KOKS 24 F 21	420	360	525	205	450	282	380	75	250	510	90

Type KOFA 12 B1, D1, B2, D2, F2, B3, D3, F3

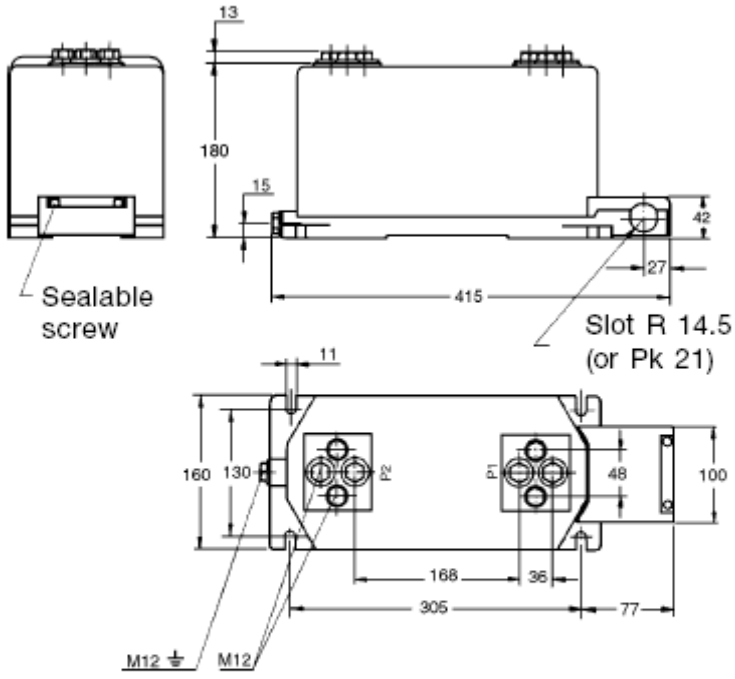


Type	A	B	C
KOFA 12 B 1, D 1	295	185	132
KOFA 12 B 2, D 2, F 2	355	245	192
KOFA 12 B 3, D 3, F 3	415	305	252

Weight approx. 18kg

Creepage distance	160 mm
Arcing distance	150 mm

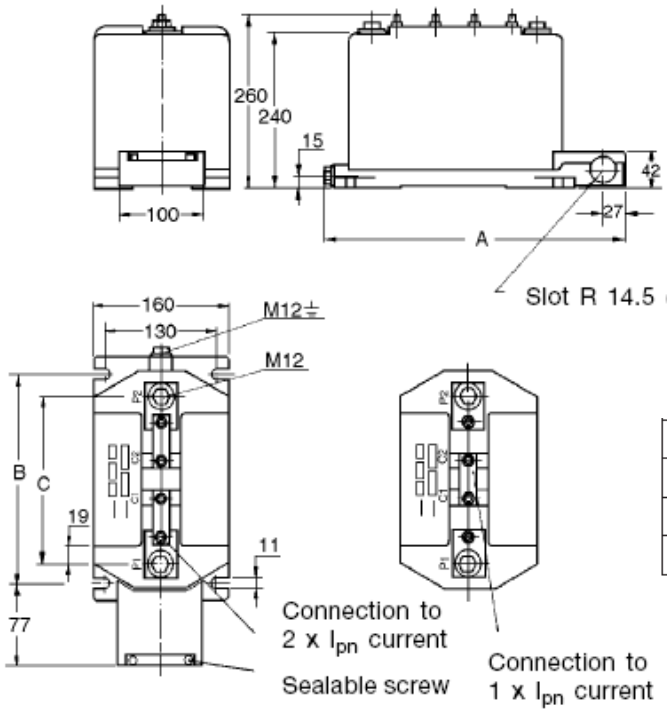
Type KOFA 12 A3, C3, E3



Weight approx. 20kg

Creepage distance	165 mm
Arcing distance	150 mm

Type KOFA 24 B1, D1, B2, D2, F2, B3, D3, F3

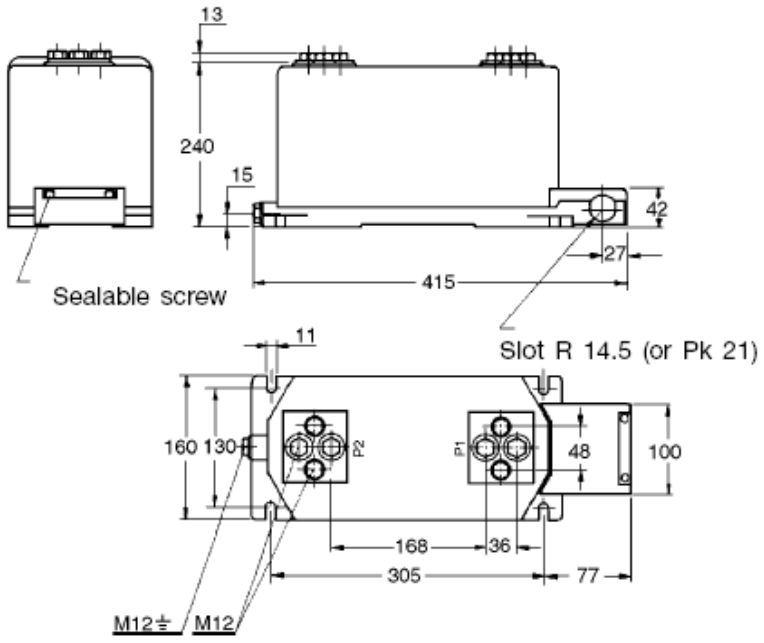


Type	A	B	C
KOFA 24 B 1, D 1	295	185	132
KOFA 24 B 2, D 2, F 2	355	245	192
KOFA 24 B 3, D 3, F 3	415	305	252

Weight approx. 18kg

Creepage distance	220 mm
Arcing distance	210 mm

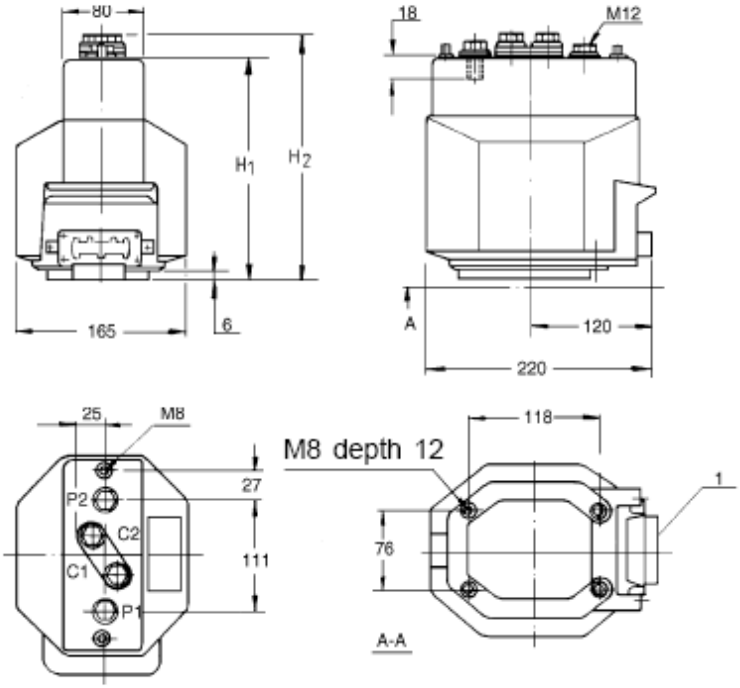
Type KOFA 24 A3, C3, E3



Weight approx. 24kg

Creepage distance	225 mm
Arcing distance	210 mm

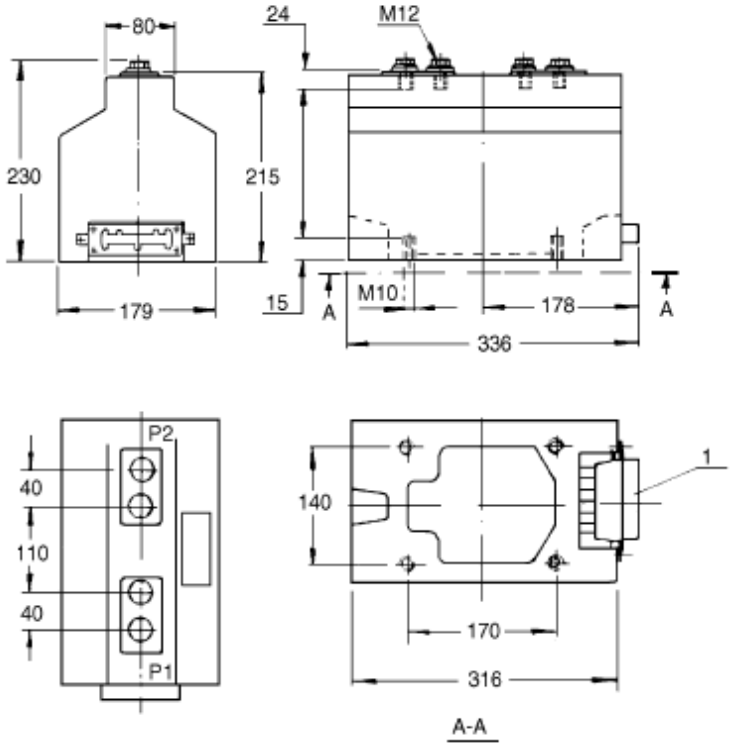
IHBF 12 A, 17 A and 24 C



IHBF 12 A, 17 A H_1 = 212 H_2 = 242
24 C H_1 = 292 H_2 = 322

Weight approx. 19kg

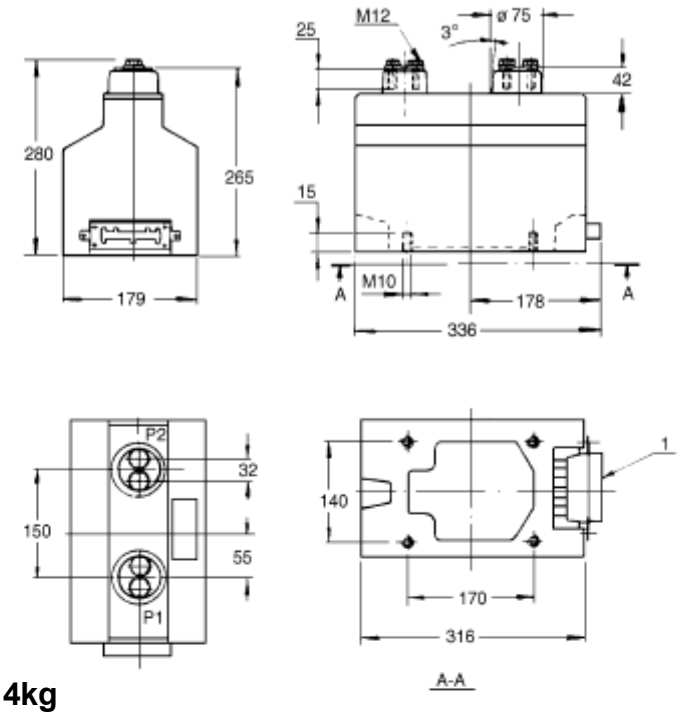
IHBF 12 B and 17 B



1. Plug-in contact

Weight approx. 27kg

IHBF 24 B

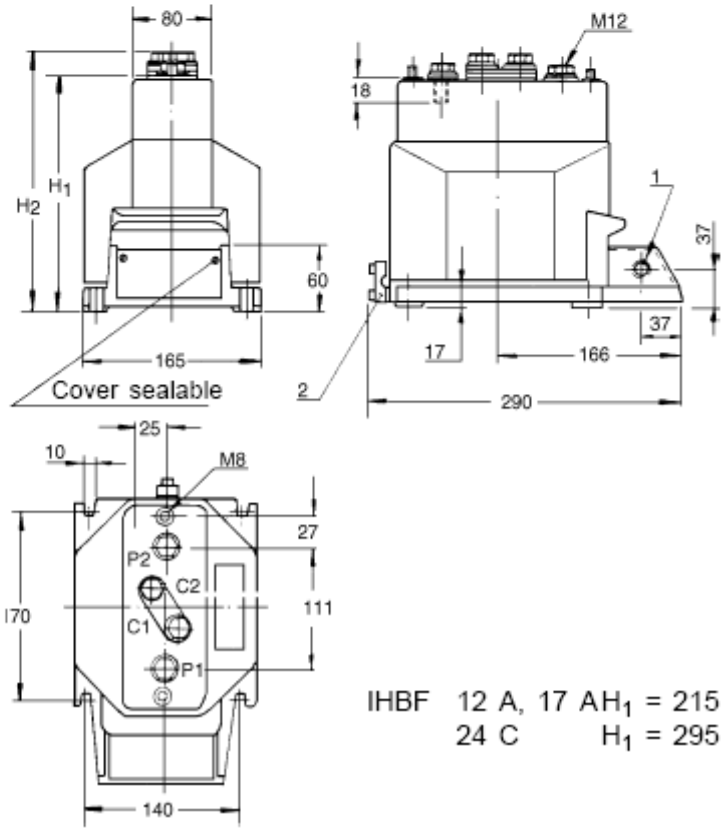


1. Plug-in contact

Weight approx. 14kg

Transformers with base plate, clamp type secondary terminals

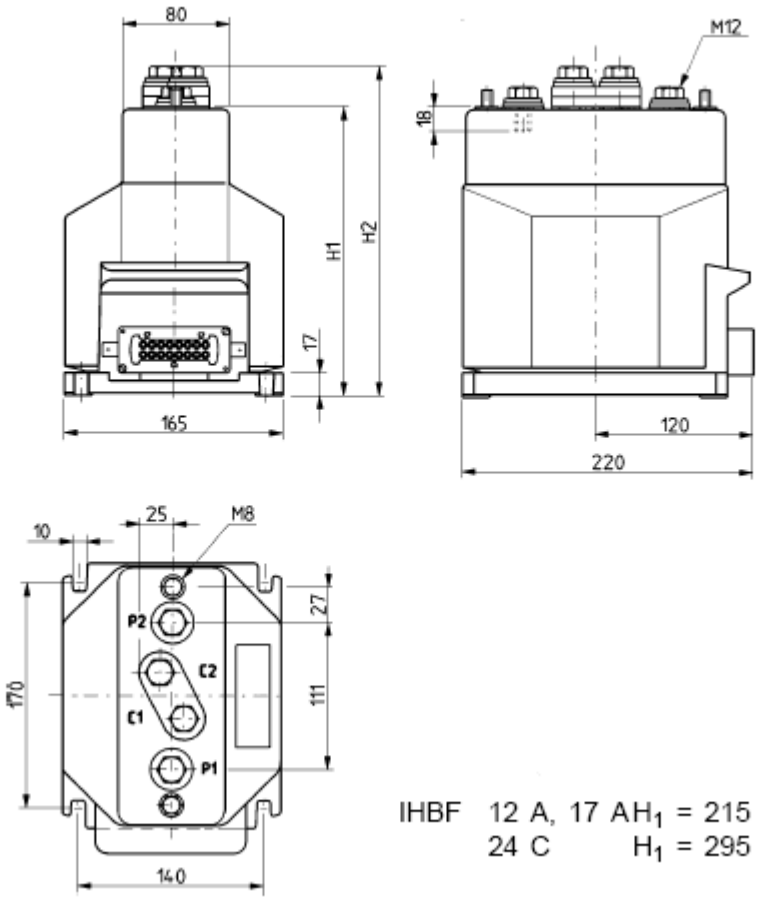
IHBF 12 A, 17 A and 24 C



IHBF 12 A, 17 A H_1 = 215 H_2 = 245
24 C H_1 = 295 H_2 = 325

Weight approx. 14kg

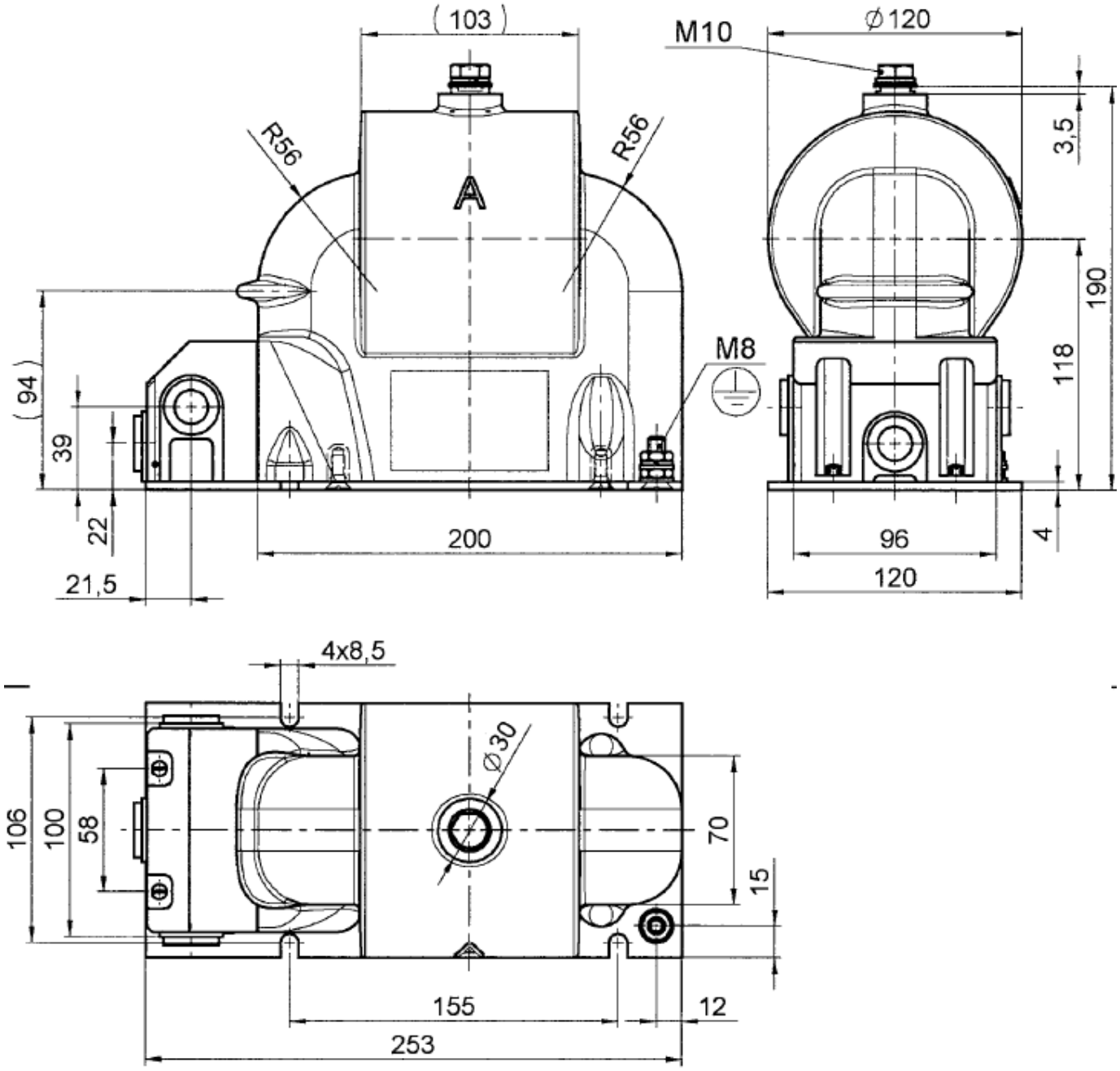
IHBF 12 A, 17 A and 24 C



IHBF	12 A, 17 A	H_1 = 215	H_2 = 245
	24 C	H_1 = 295	H_2 = 325

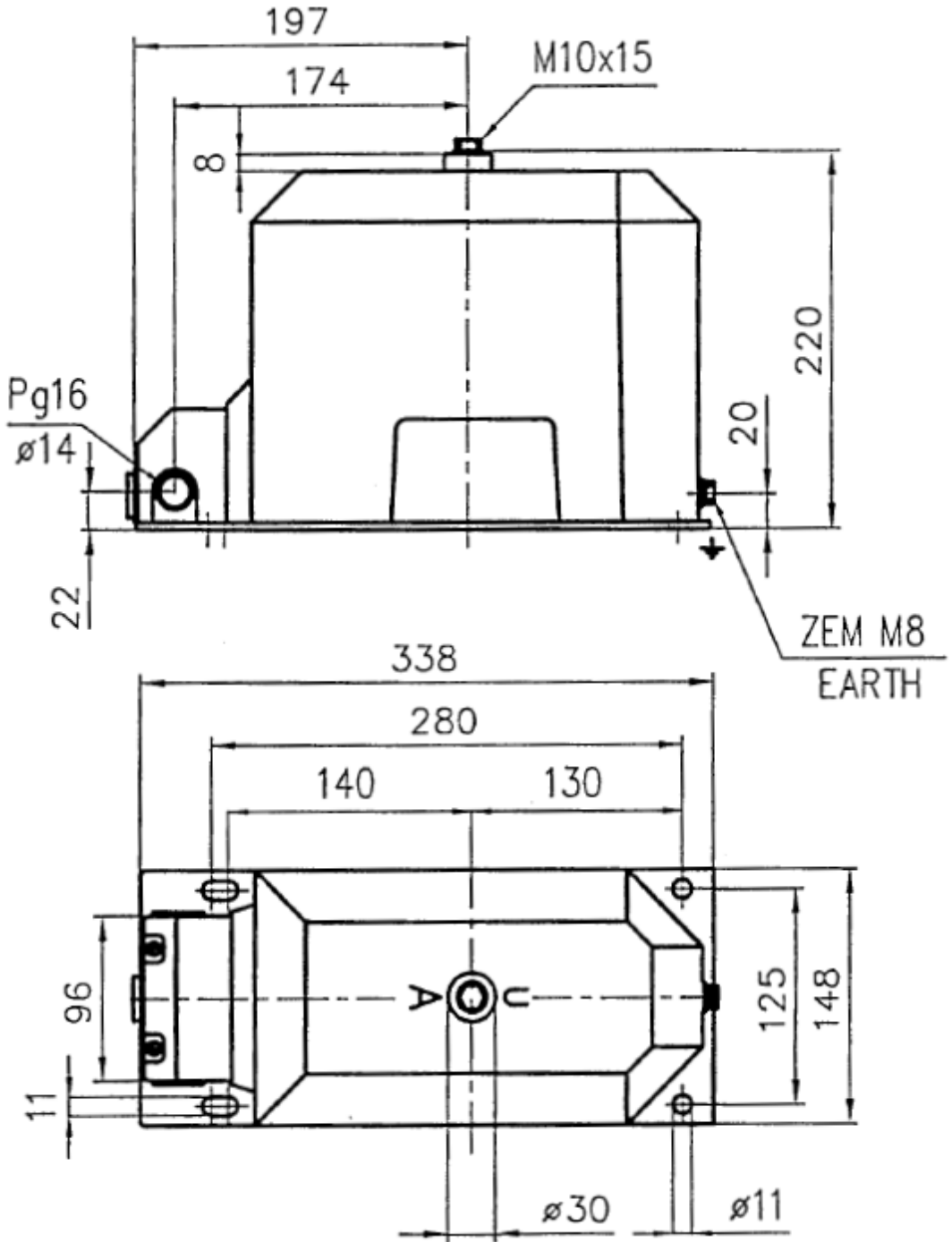
Weight approx. 14kg

TJC 3



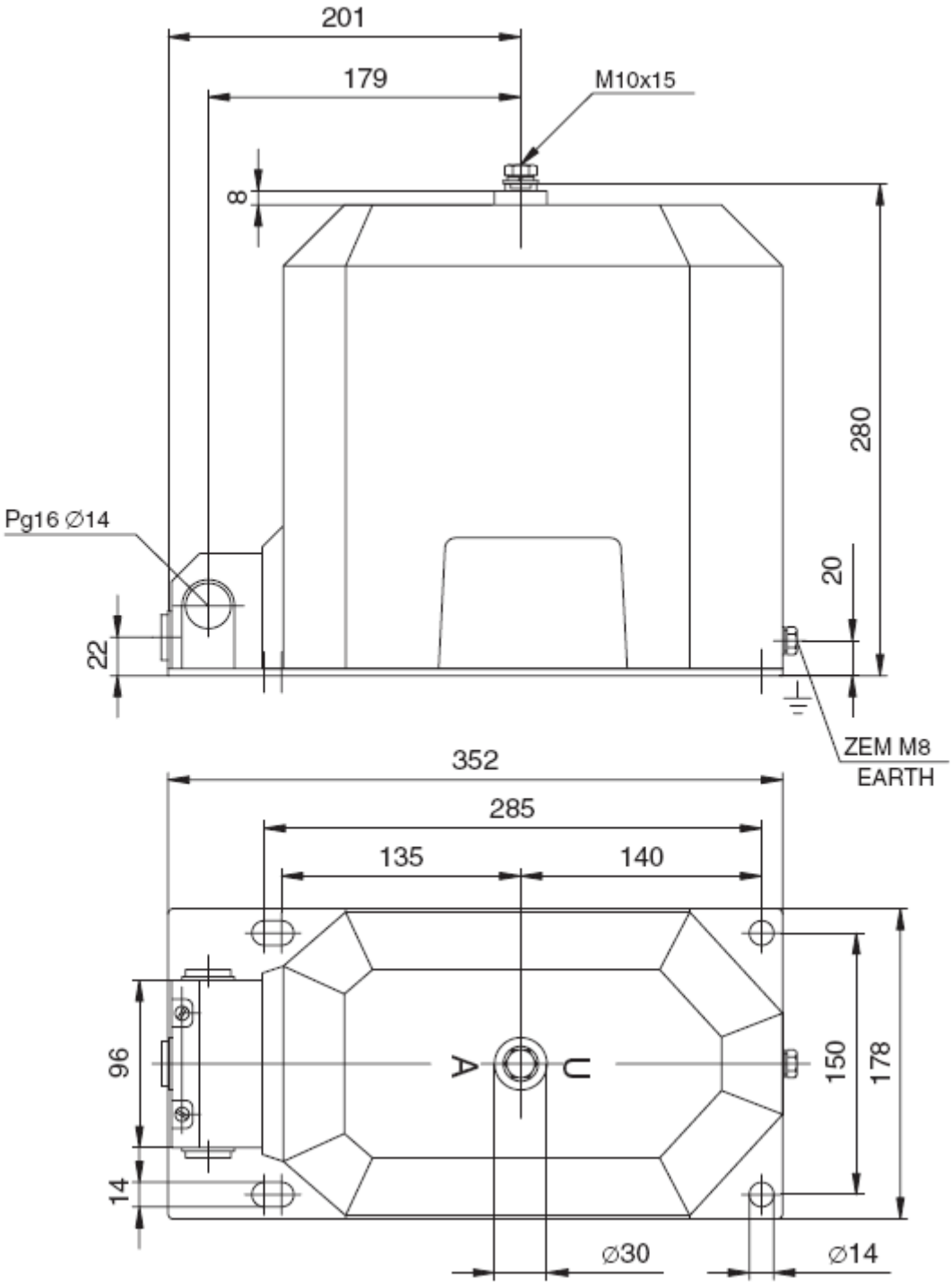
Weight approx. 10kg

TJC 4 , TJC 5



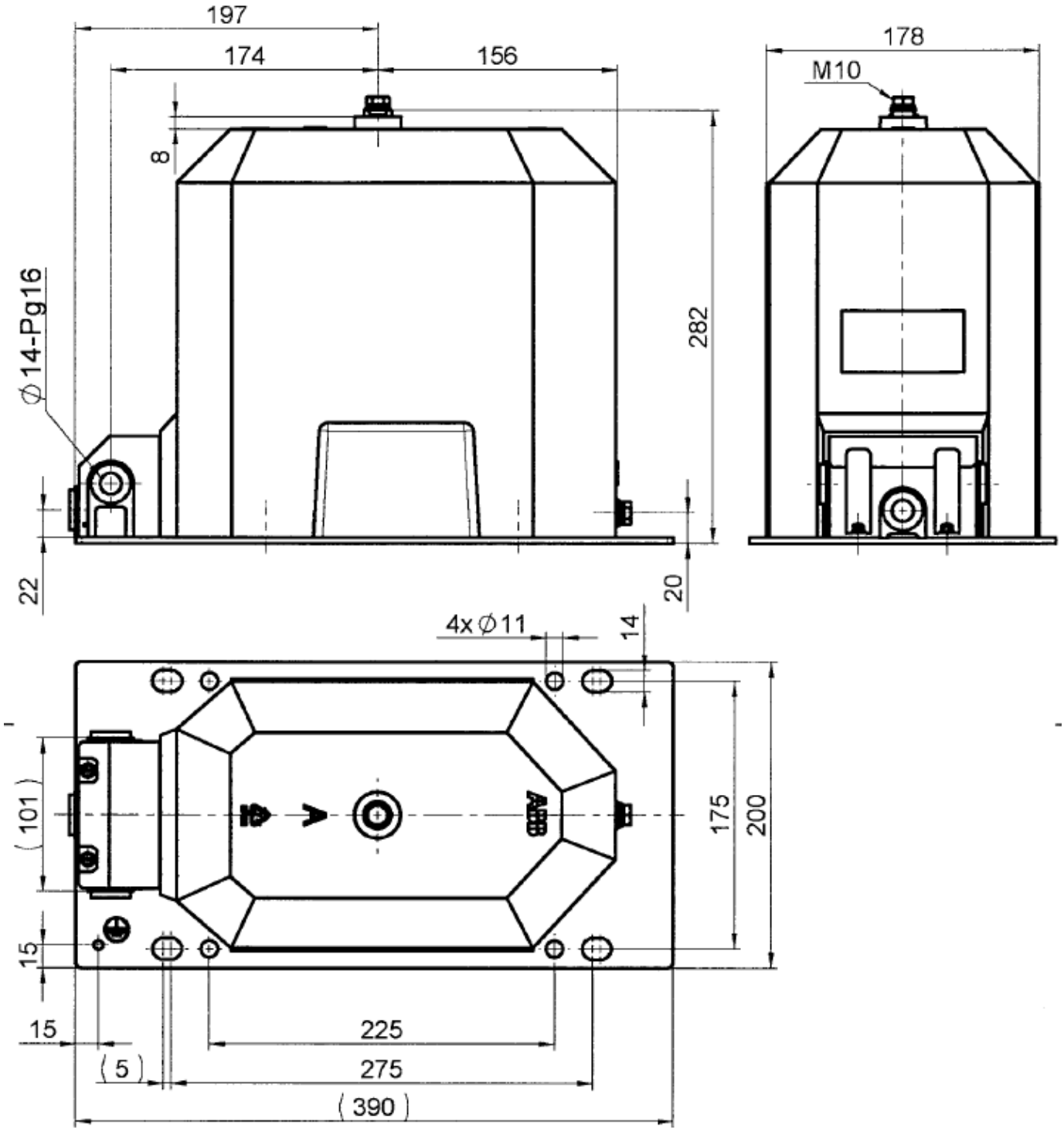
Weight approx. 19kg

TJC 6



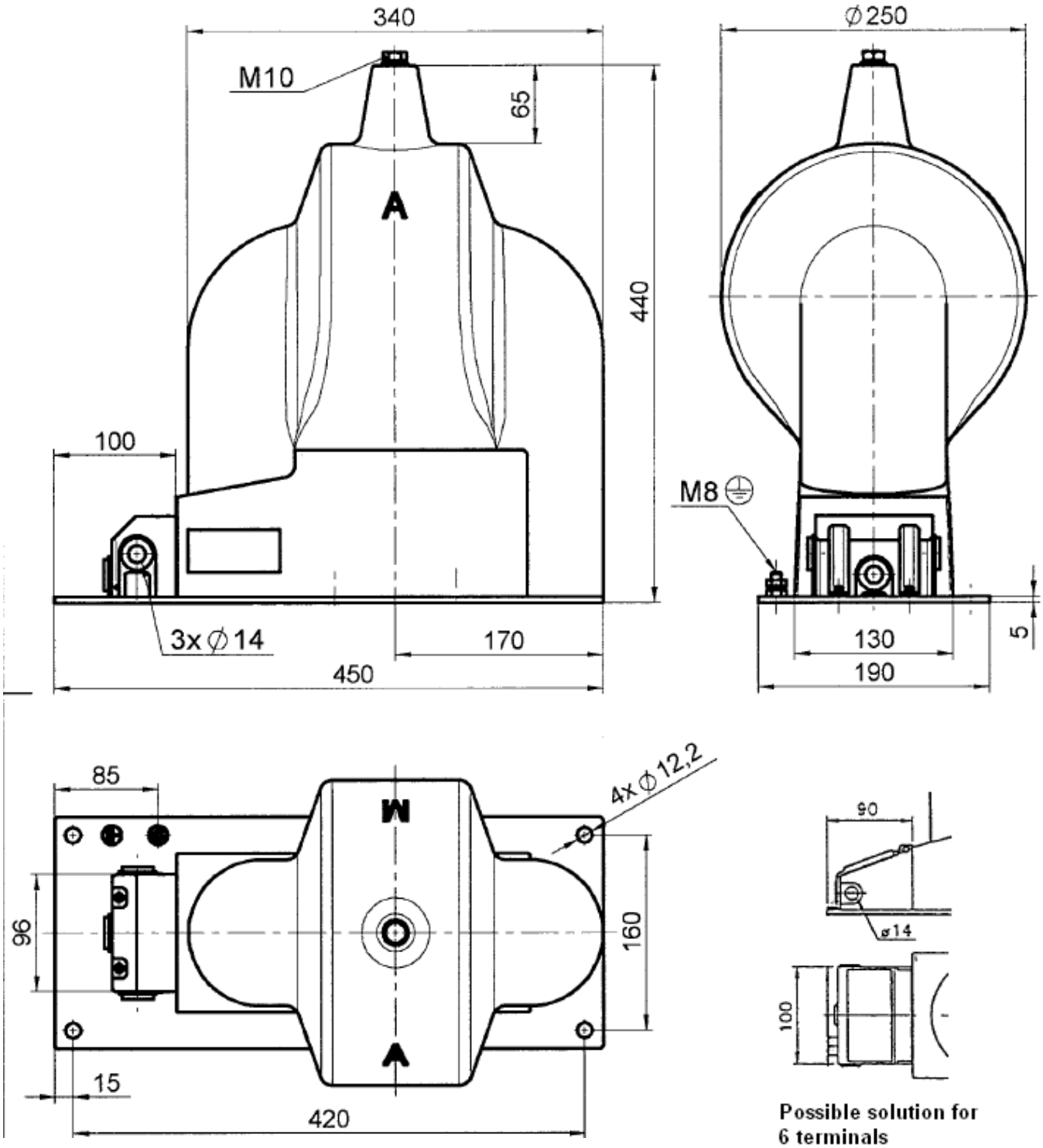
Weight approx. 36kg

TJC 6-G



Weight approx. 36kg

TJC 7

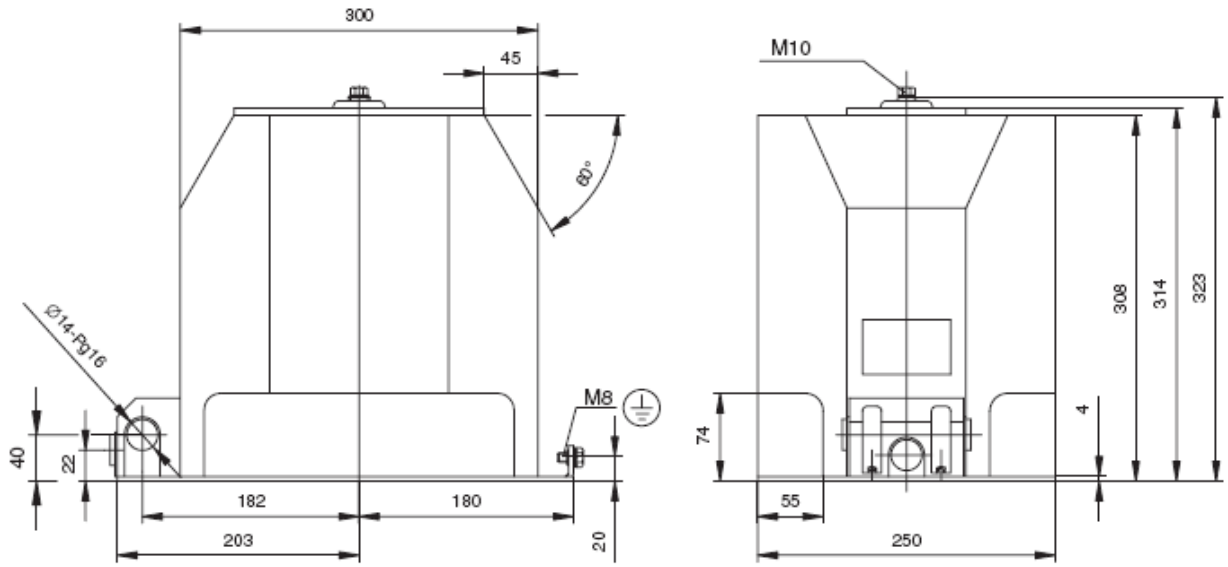


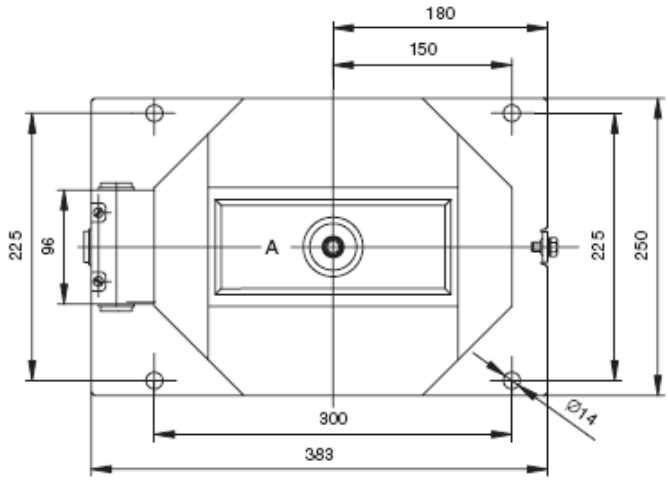
Weight approx. 47kg

TJC 7.1

WEIGHT: appr. 48kg

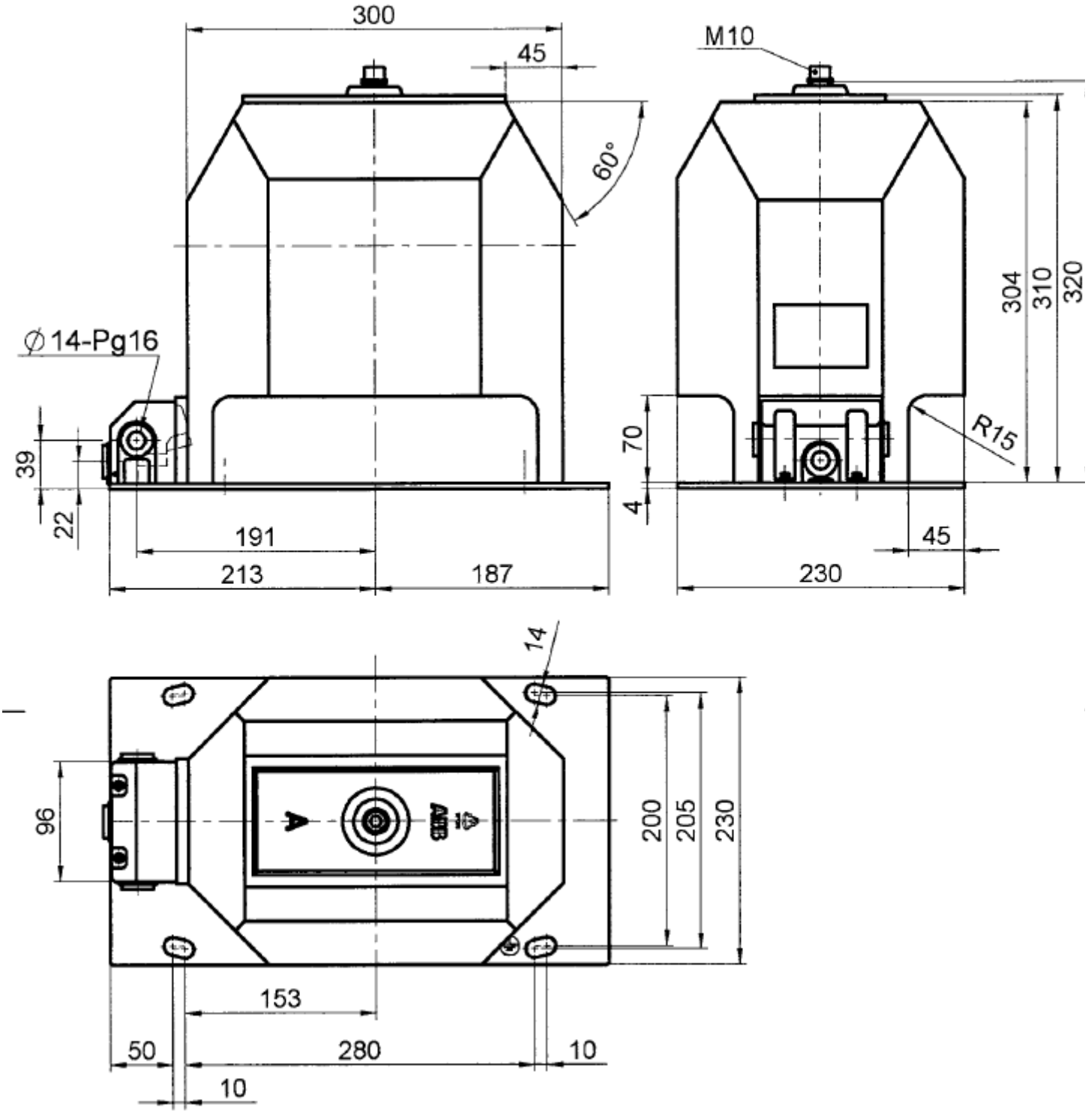
CREP. DISTANCE: 398mm





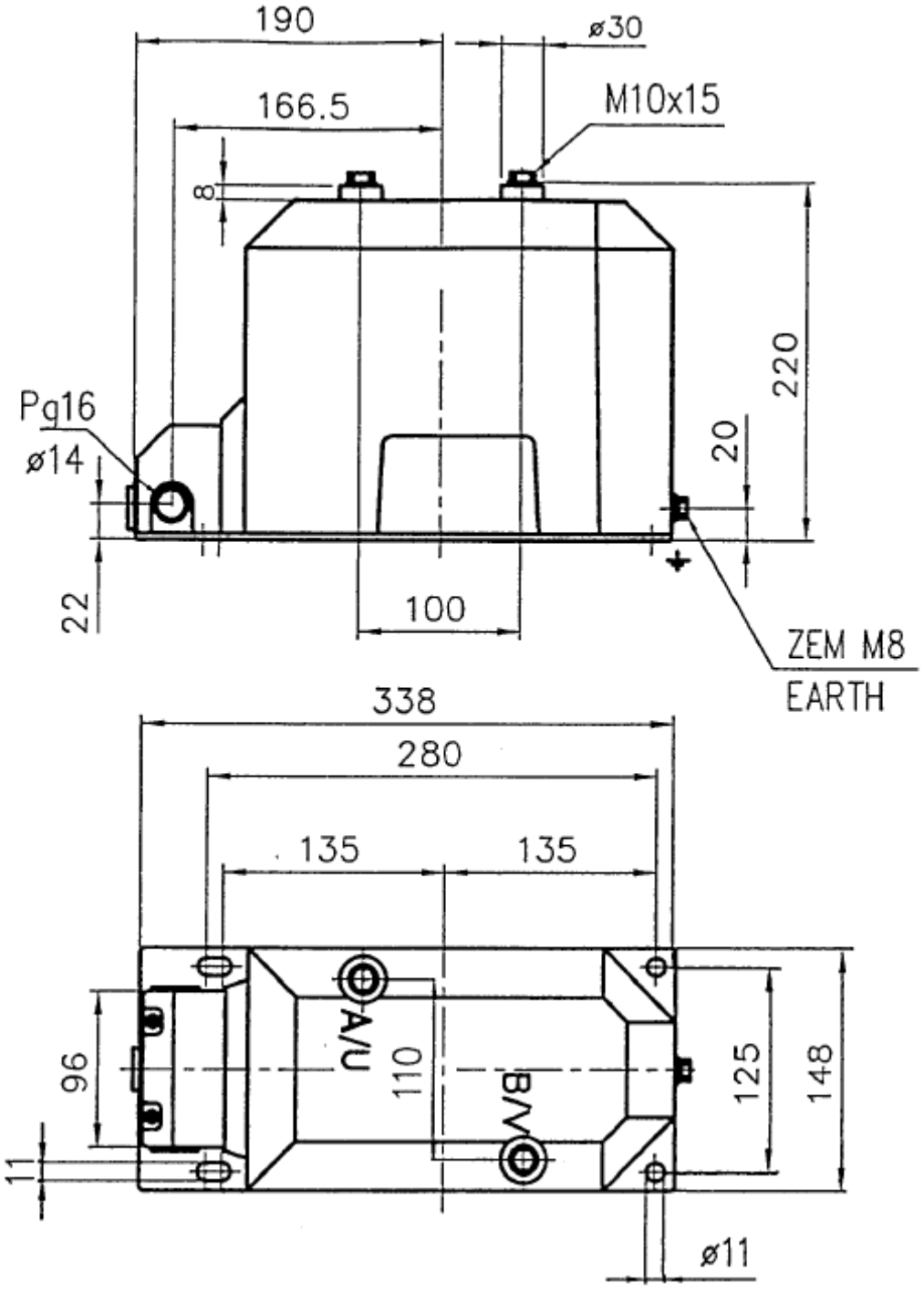
Drawing n. 44204010

TJC 7.0-G **Weight approx.: 45kg**



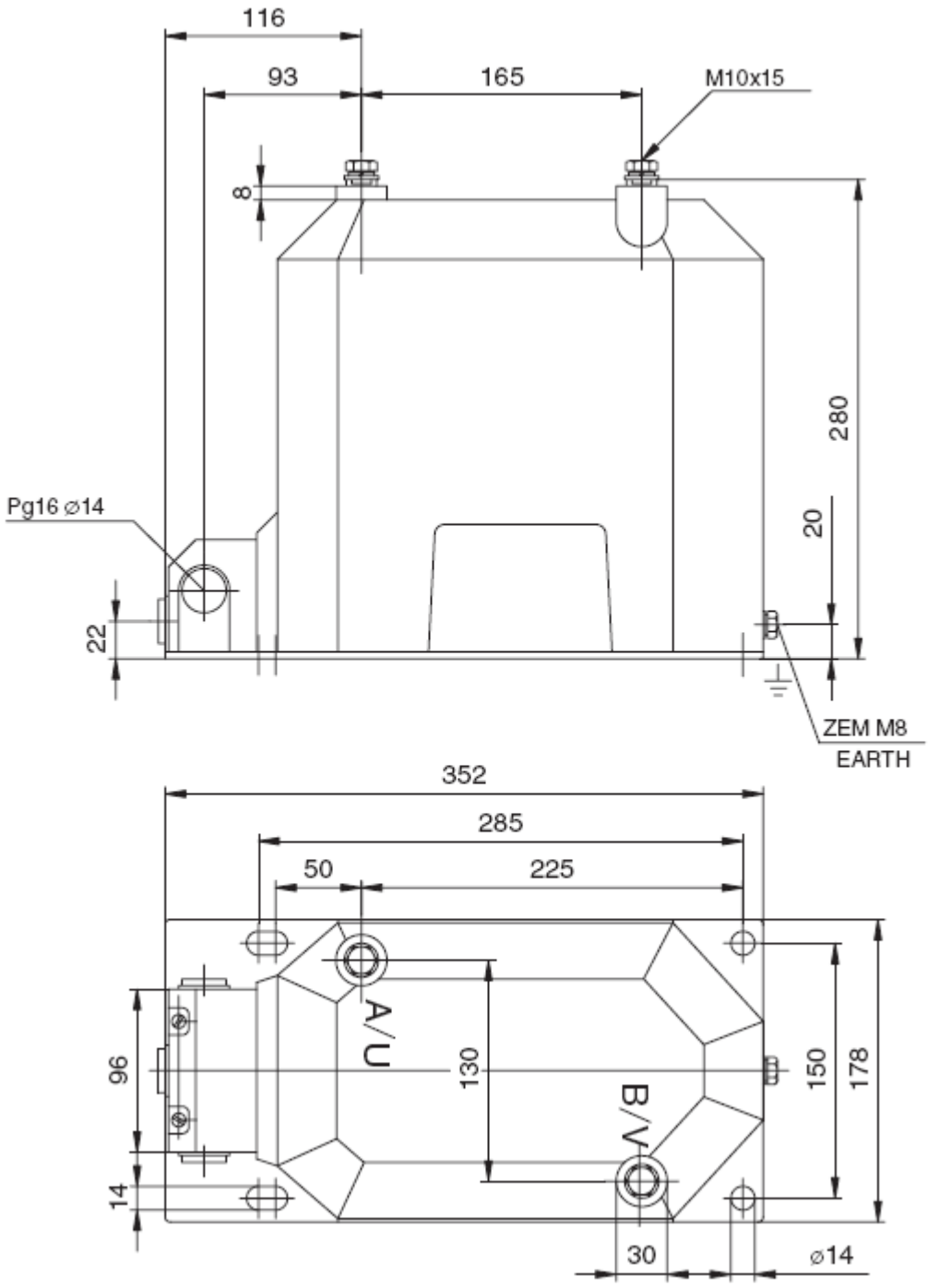
POVRCHOVÁ VZDÁLENOST: 398mm
(CREEPAGE DISTANCE: 398 mm)

TDC 4, TDC 5



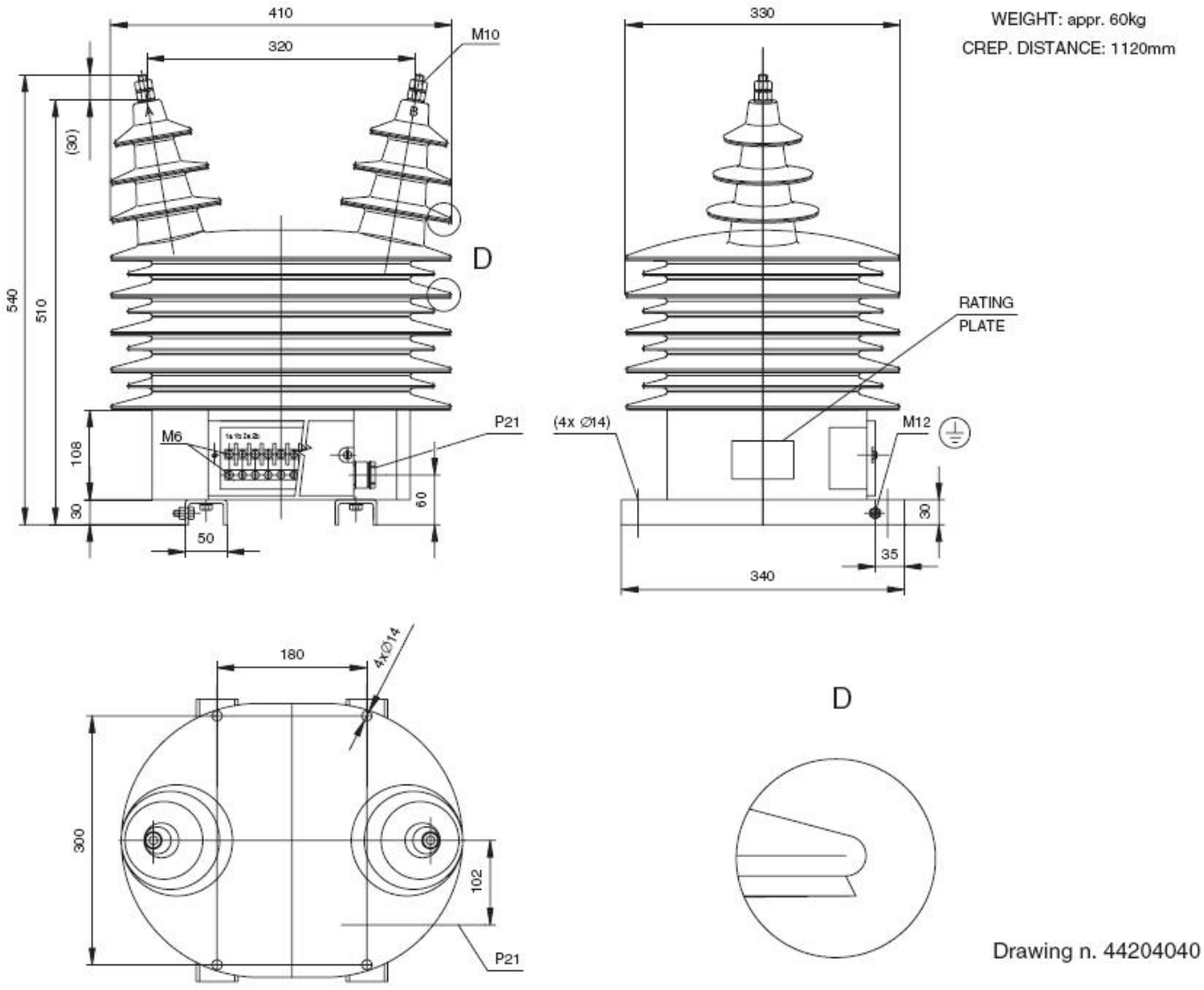
Weight approx. 20kG

TDC 6



Weight approx. 36kg

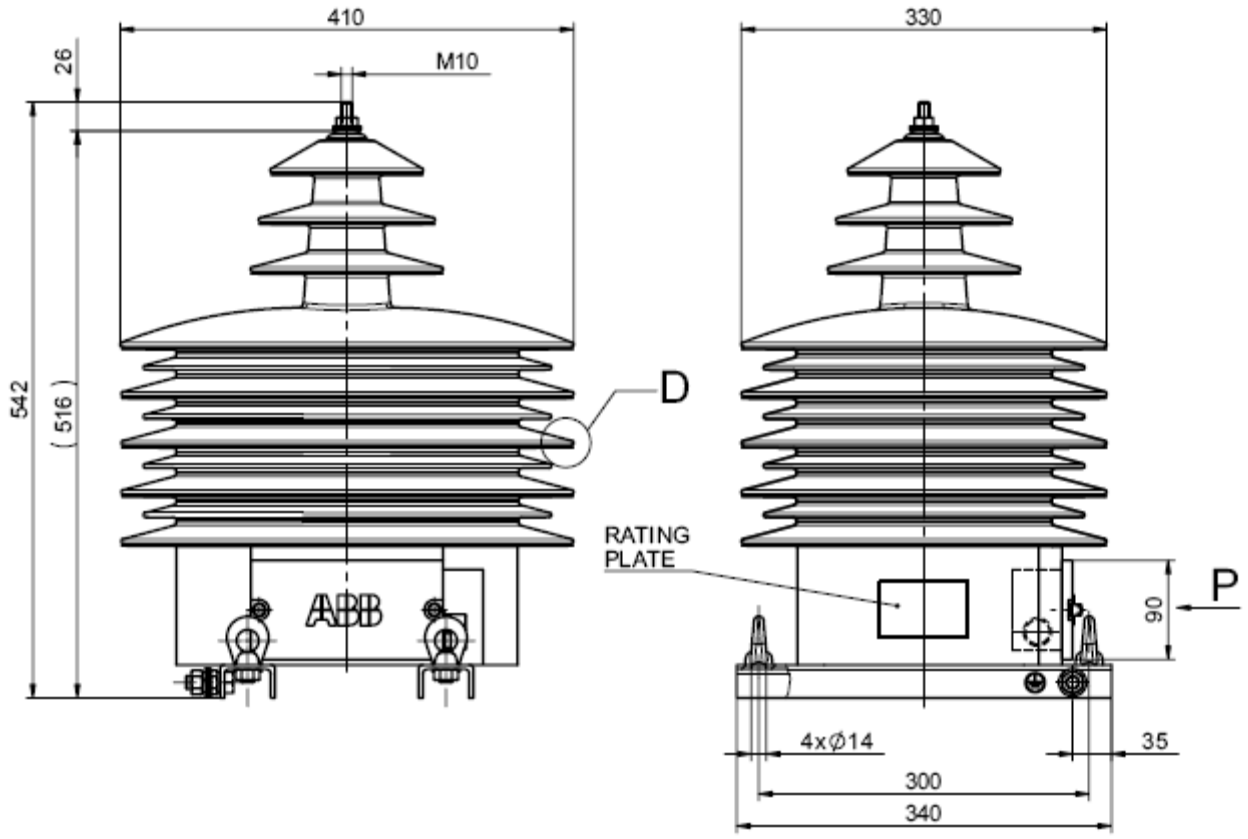
TDO 6



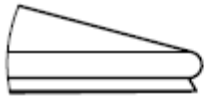
Drawing n. 44204040

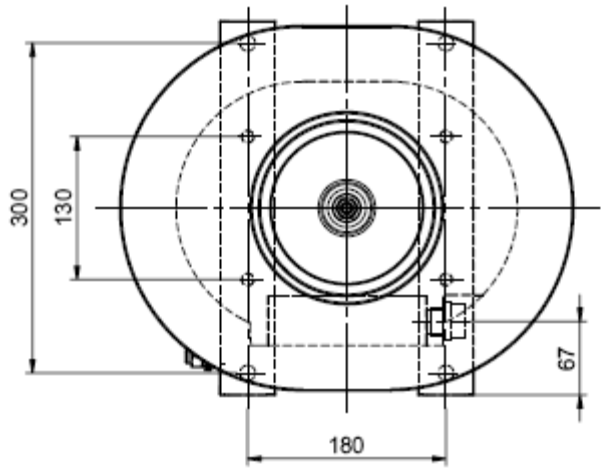
TJO 6

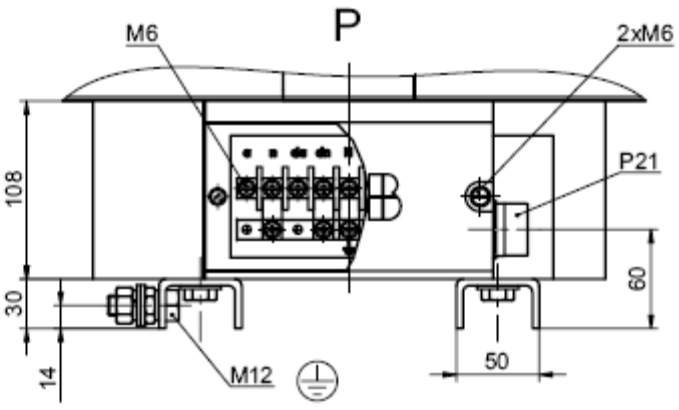
WEIGHT: appr. 57kg
CREEPAGE DISTANCE: 1250mm



D (1:1)

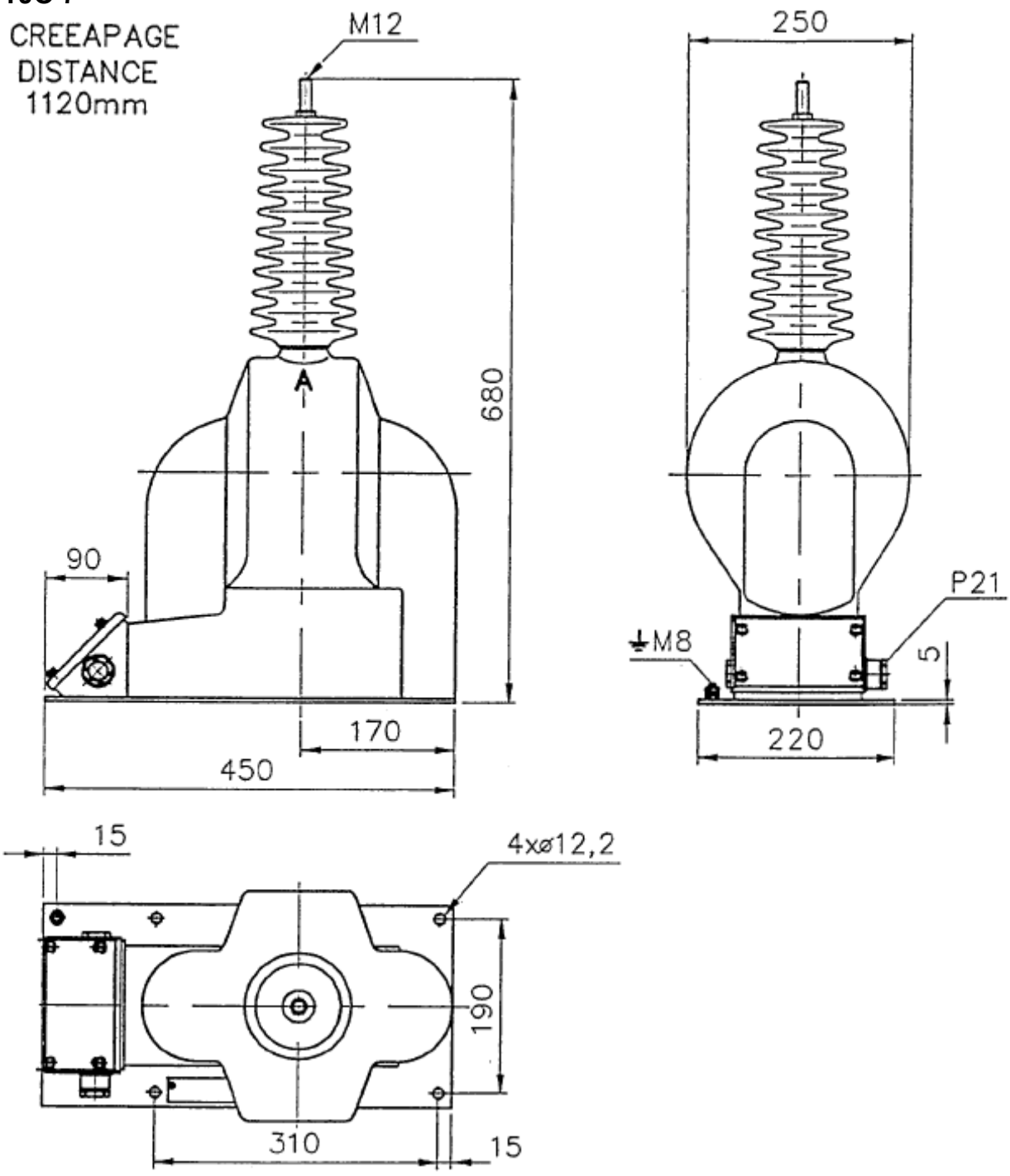






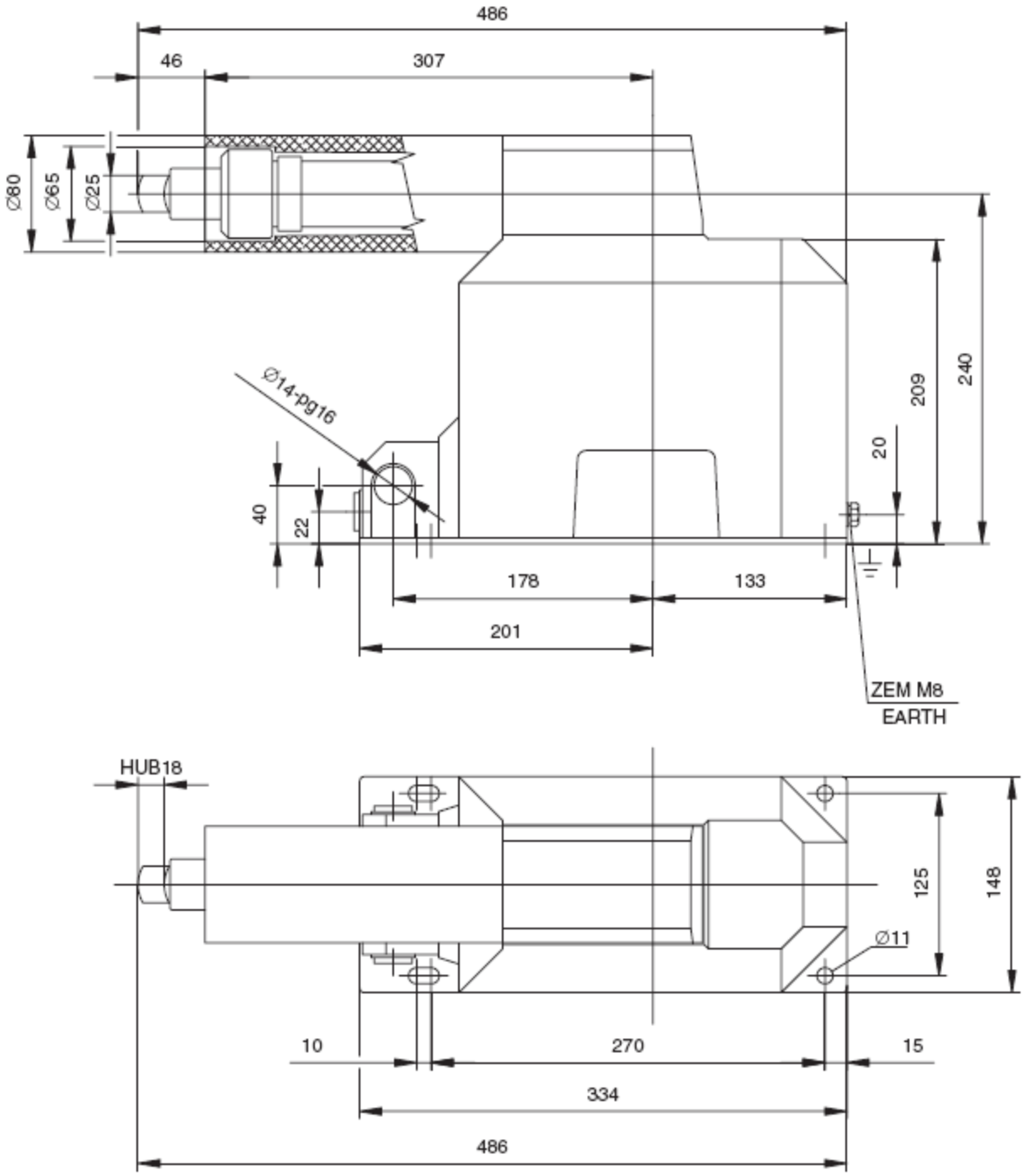
Drawing n. 44204050

TJO 7



Weight approx. 52 kg

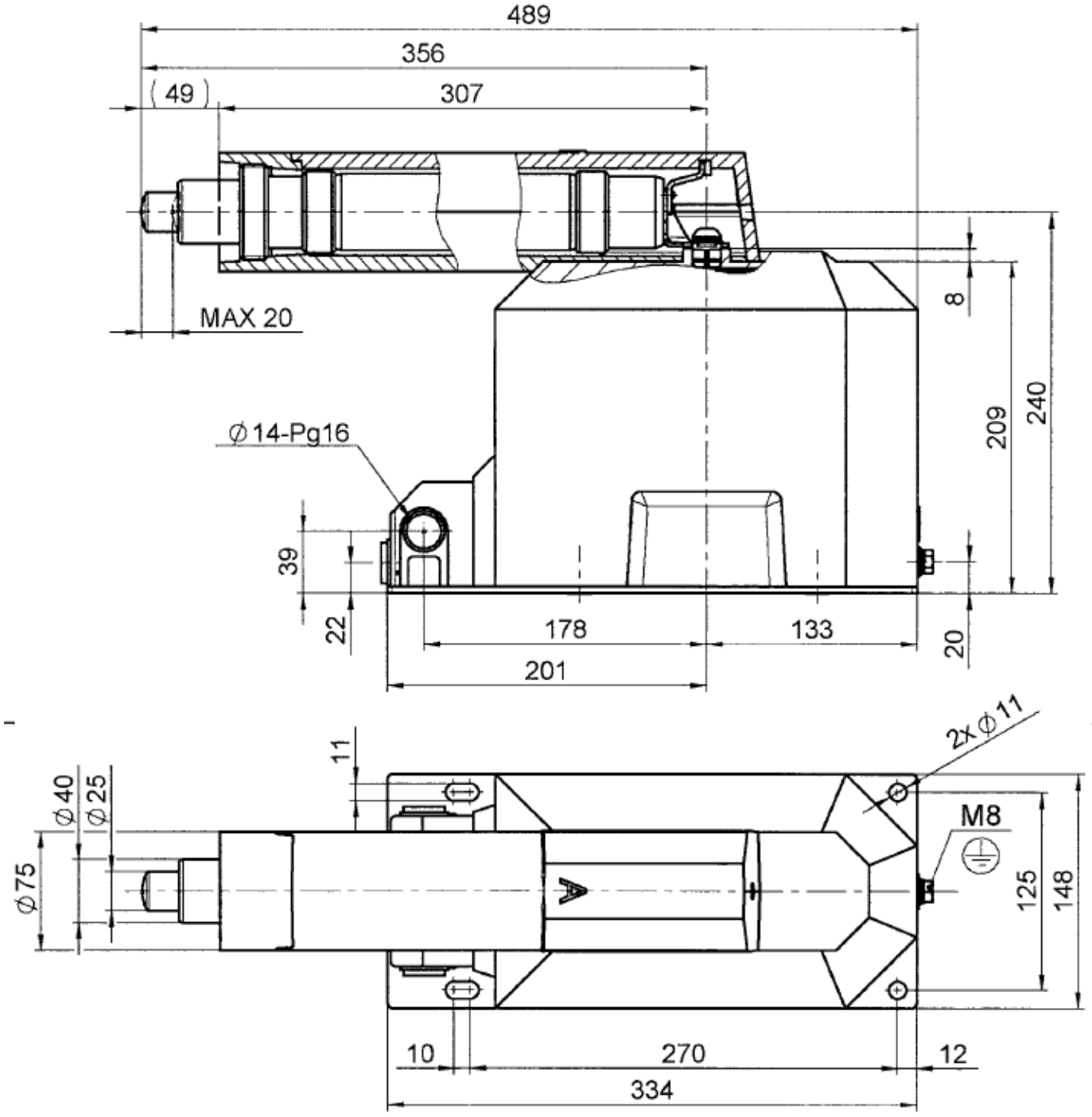
TJP 4.0 TJP 5.0 , fuse IEC 60282-1



Drawing n. 44204060

Weight: 27 kg

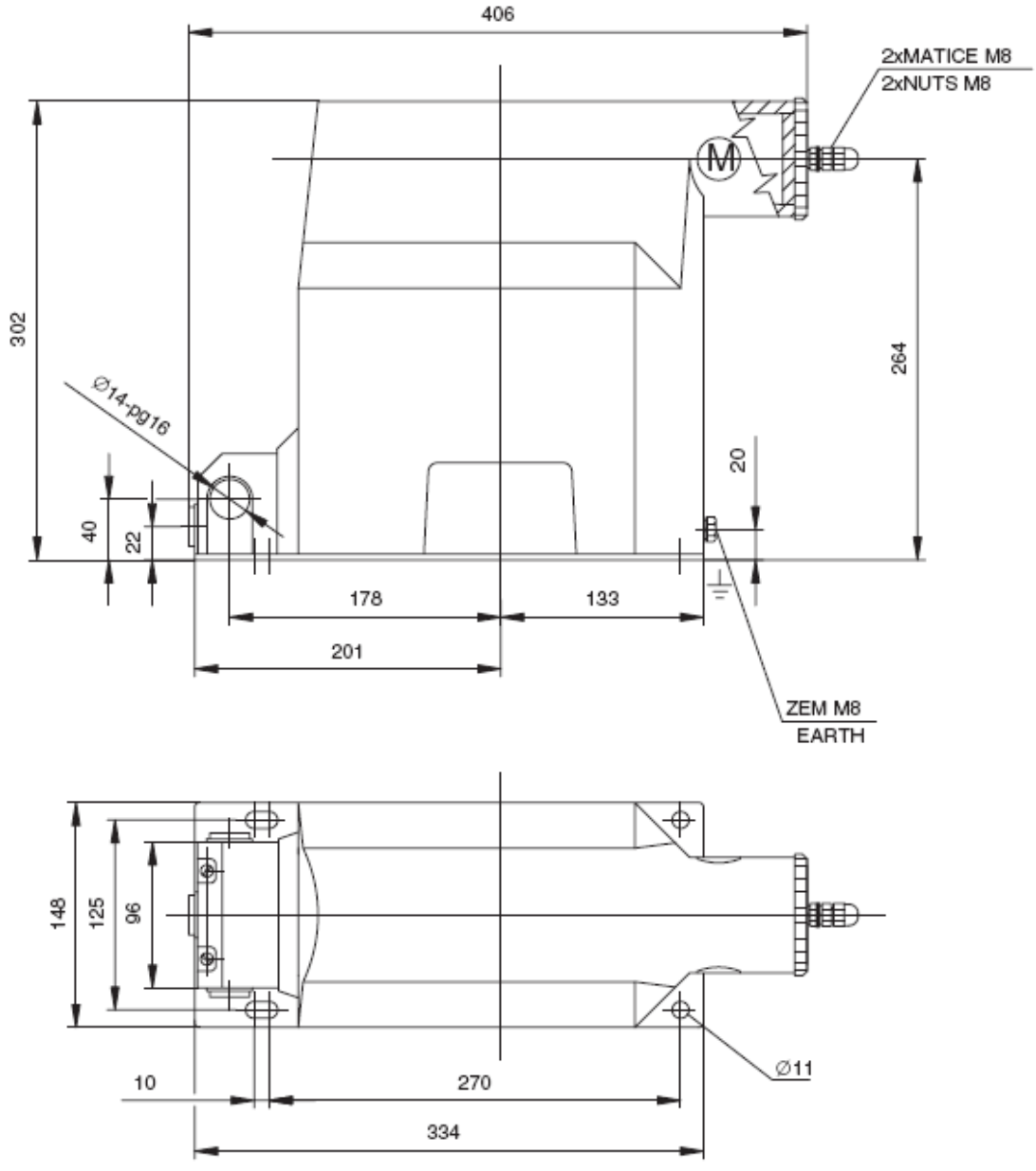
TJP 4.0-F TJP 5.0-F , fuse IEC 60282-1



Weight: 27kg

TJP 4.1 , TJP 5.1 fuse JT6 300,600mA

TJP 4.2 , TJP 5.2 fuse IEC 60282-1



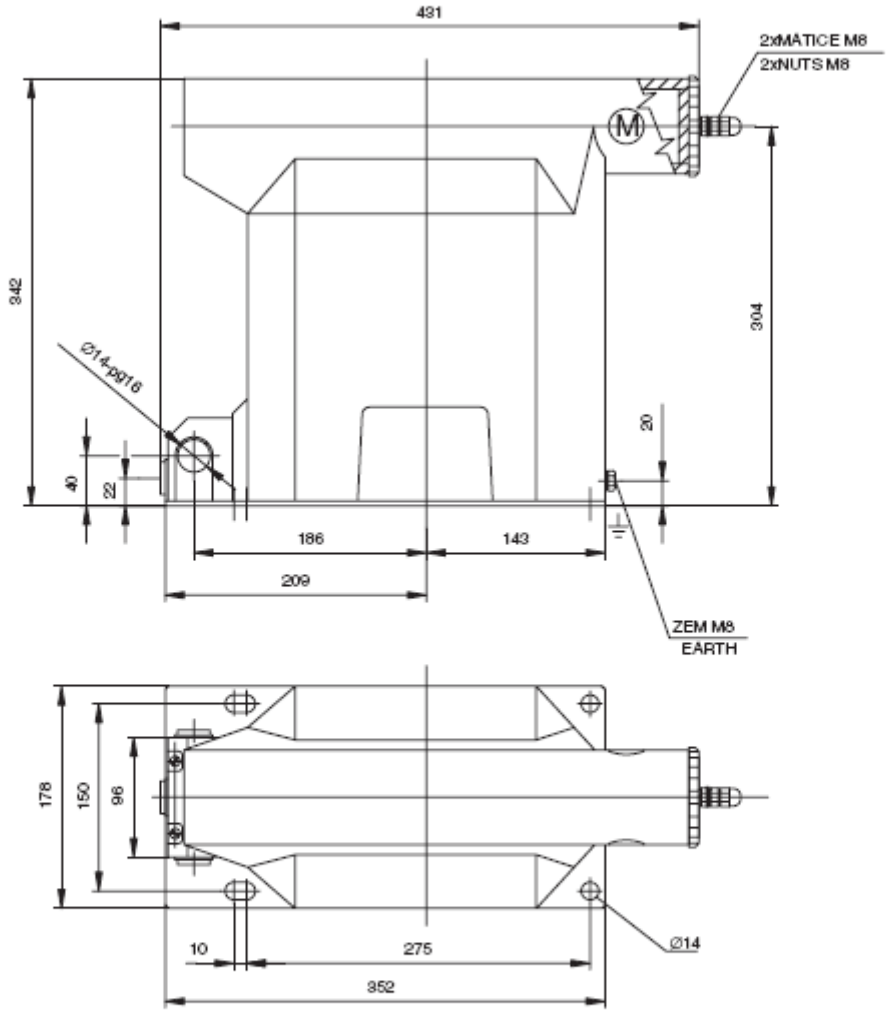
TJP 4.1 , TJP 5.1
Drawing n. 44204080

TJP 4.2 , TJP 5.2
Drawing n. 44204090

Weight: 24 kg

TJP6.1: fuse JT6 300,600mA

TJP6.2: fuse IEC 60282-1



TJP6.1:

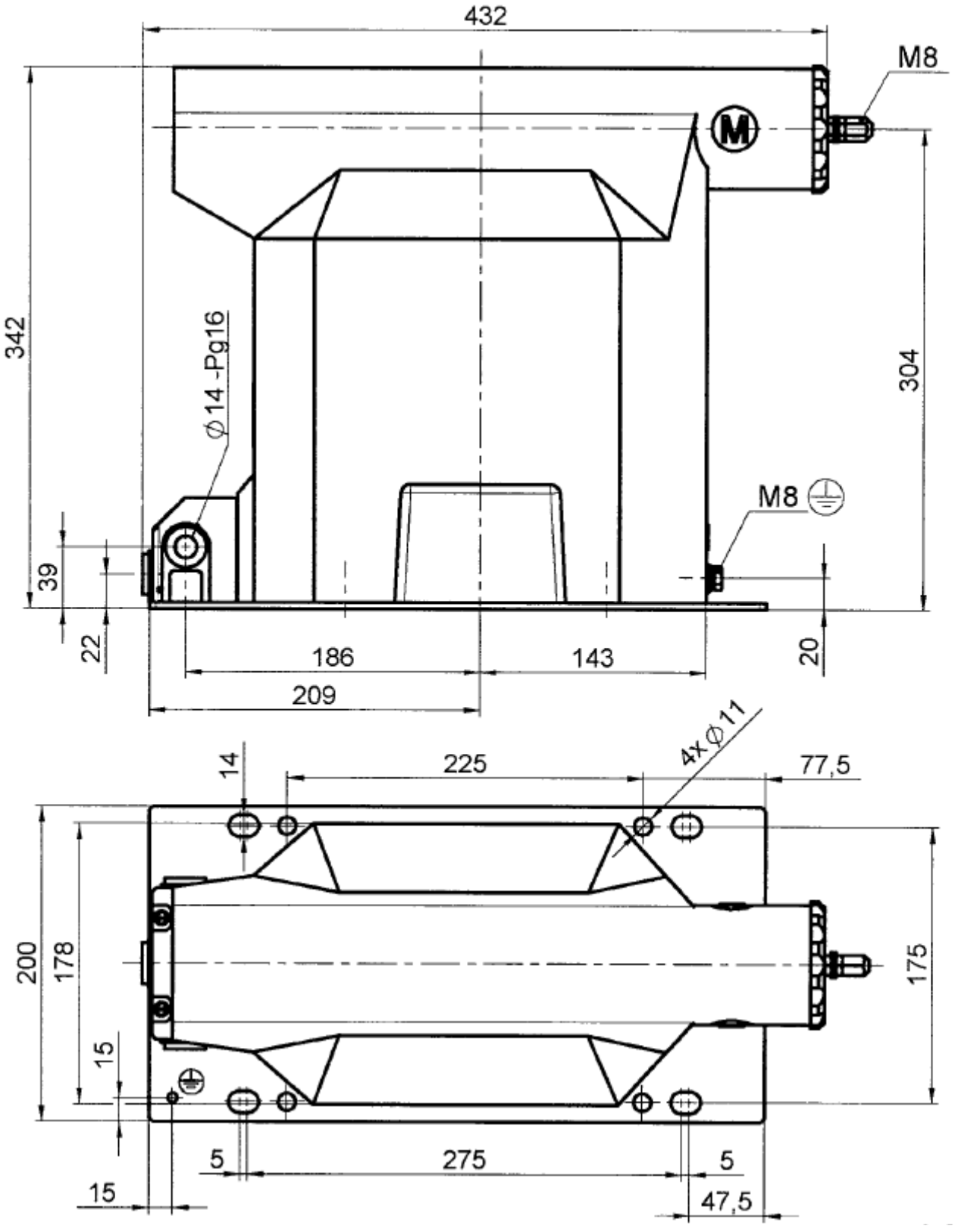
Drawing n. 44203980

Weight: 42 kg

TJP6.2:

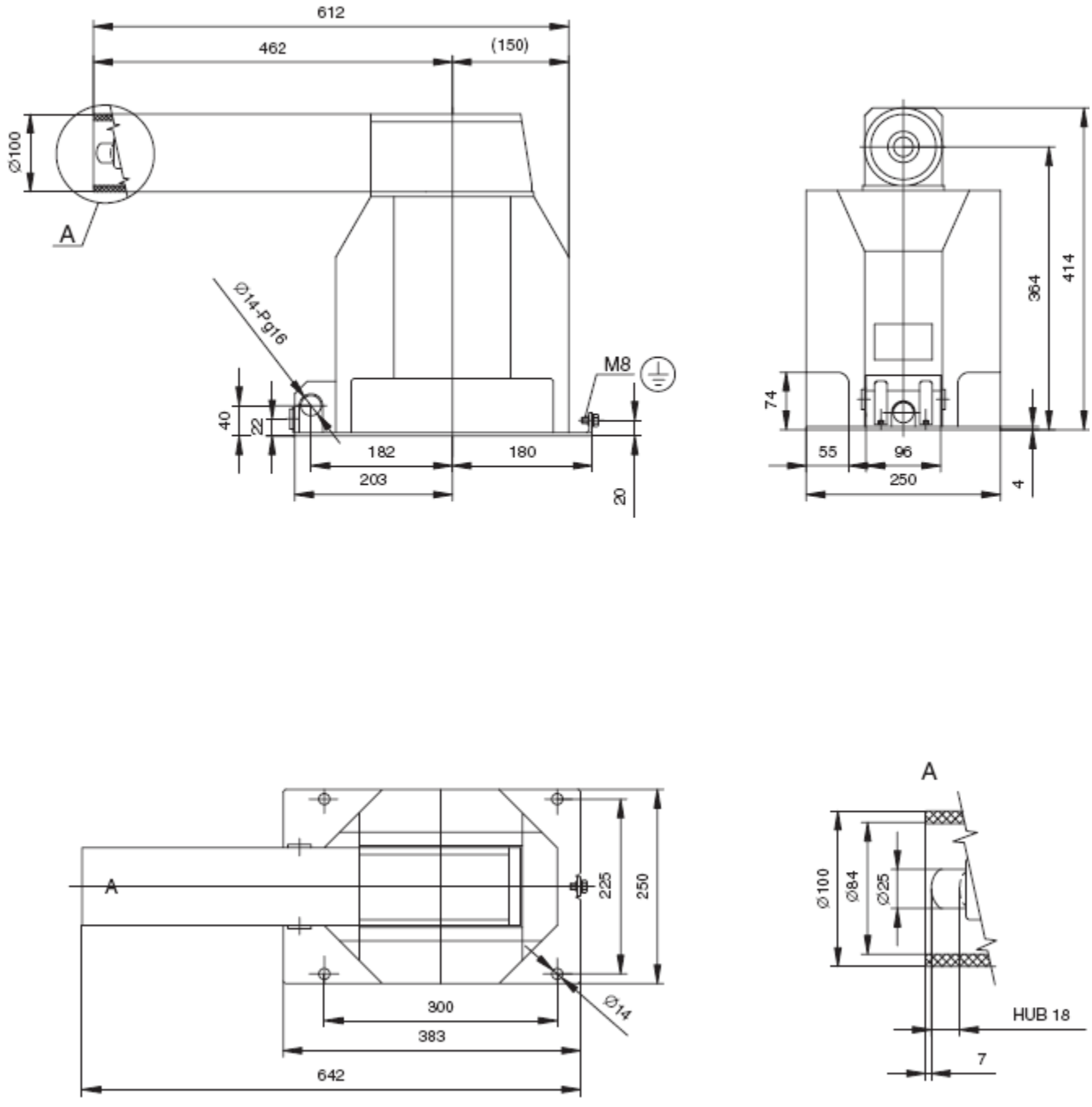
Drawing n. 44203990

TJP 6.2-G fuse IEC 60282-1 **Weight approx.: 42kg**



TJP 7.1

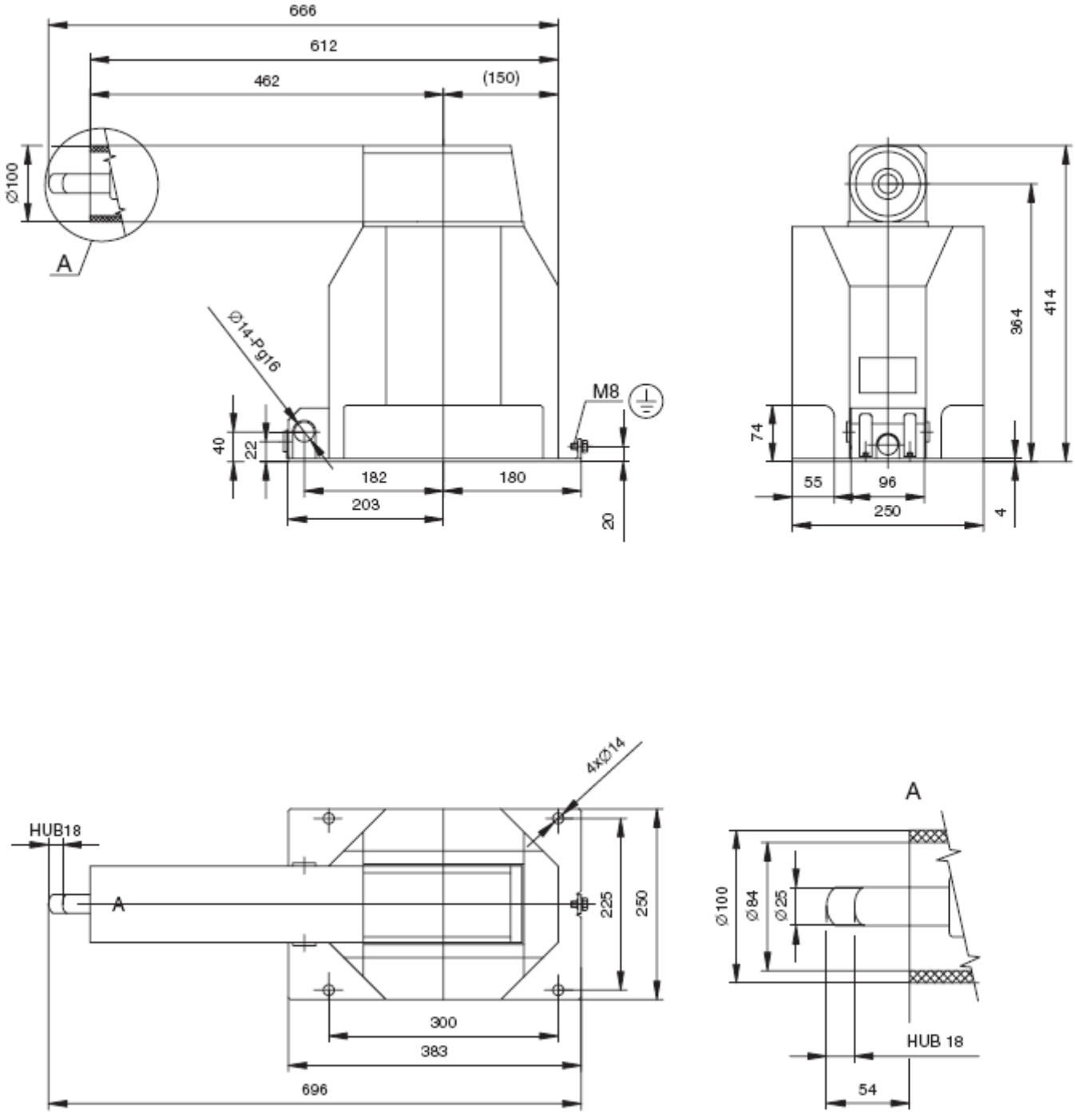
WEIGHT: appr. 54kg
CREP. DISTANCE: 376mm



Drawing n. 44204020

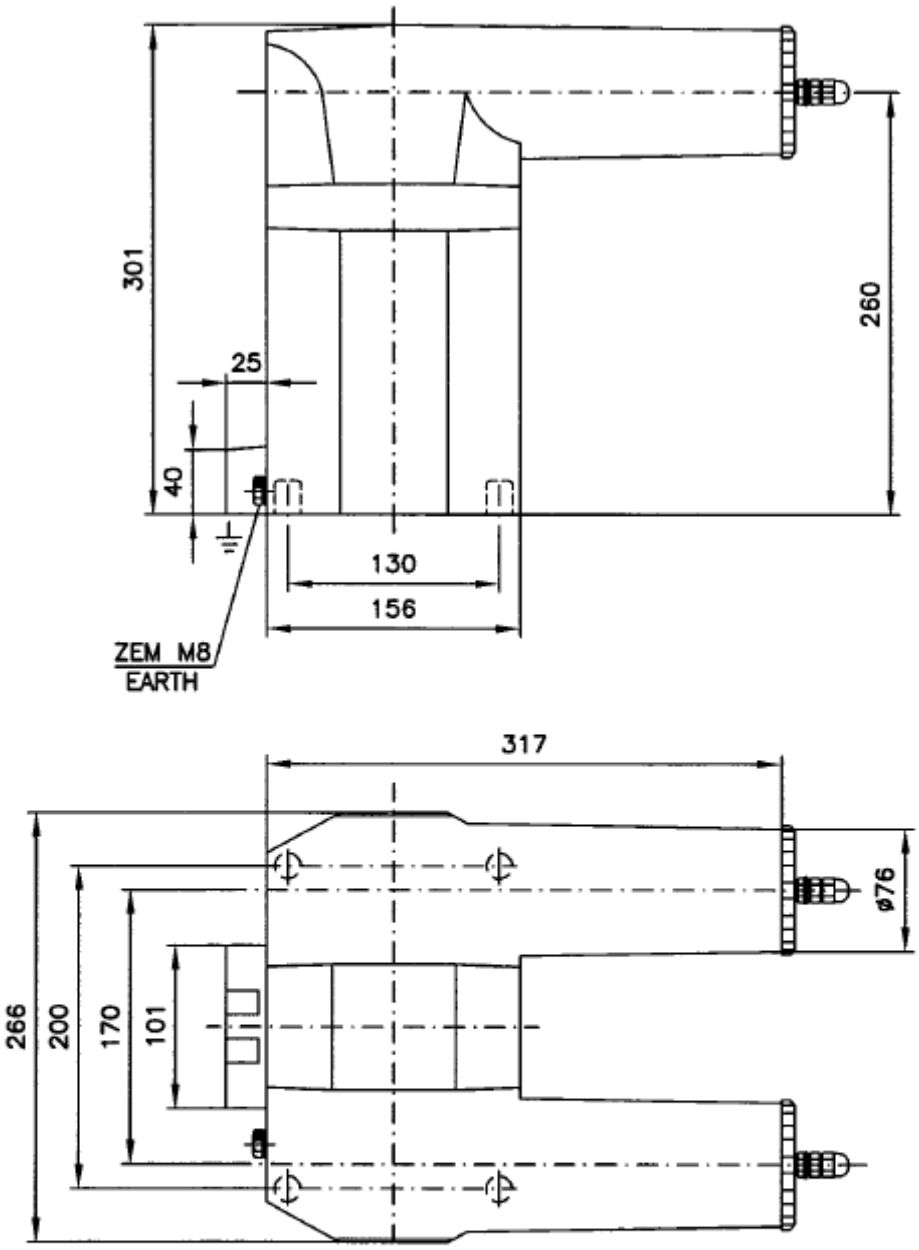
TJP 7.2

WEIGHT: appr. 54kg
CREP. DISTANCE: 344mm



Drawing n. 44204030

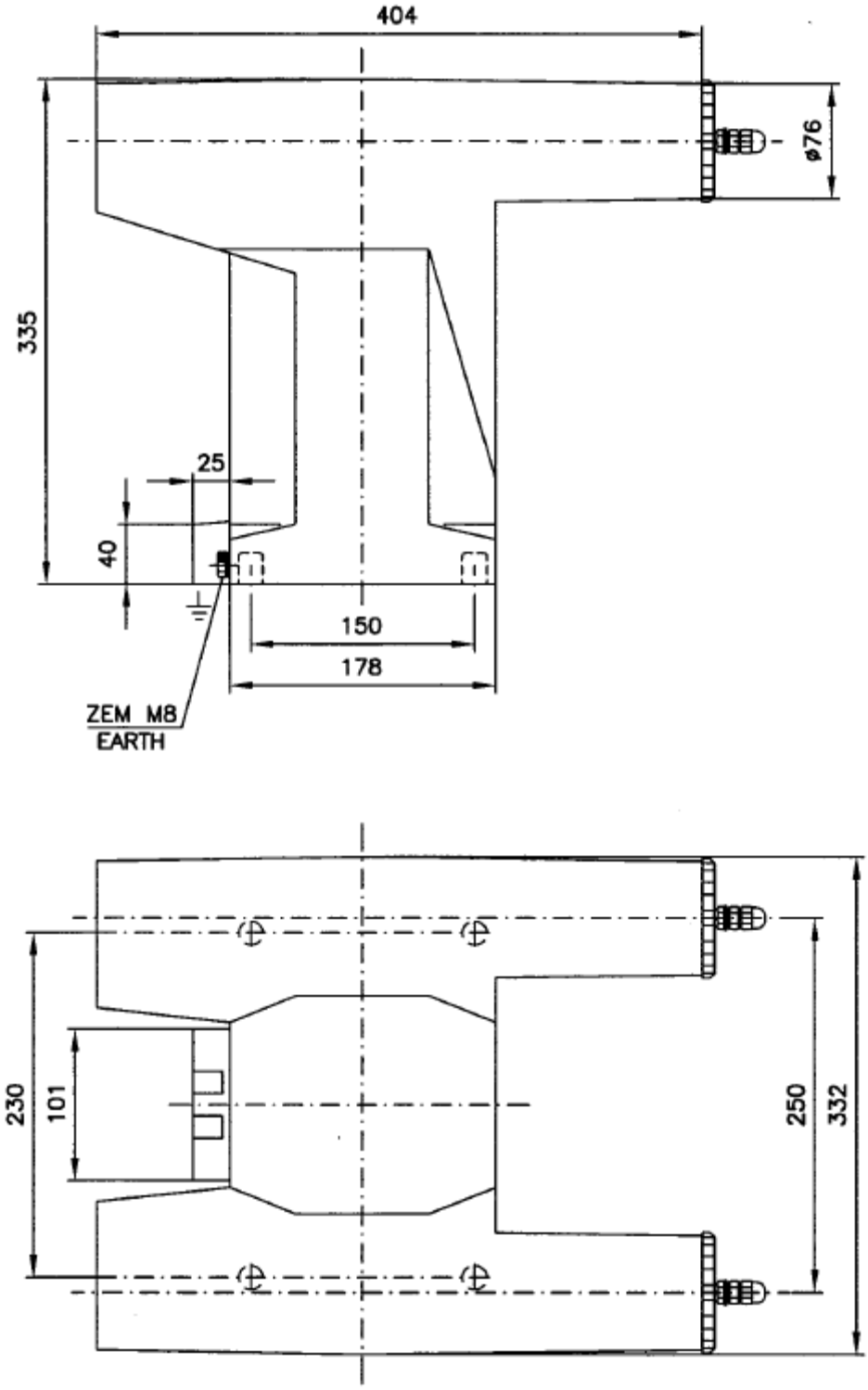
TDP 4.1 fuse JT6 300,600mA **TDP 4.2 Fuse IEC 600282-1**



Drawing n. 44203970

Weight: 29 kg

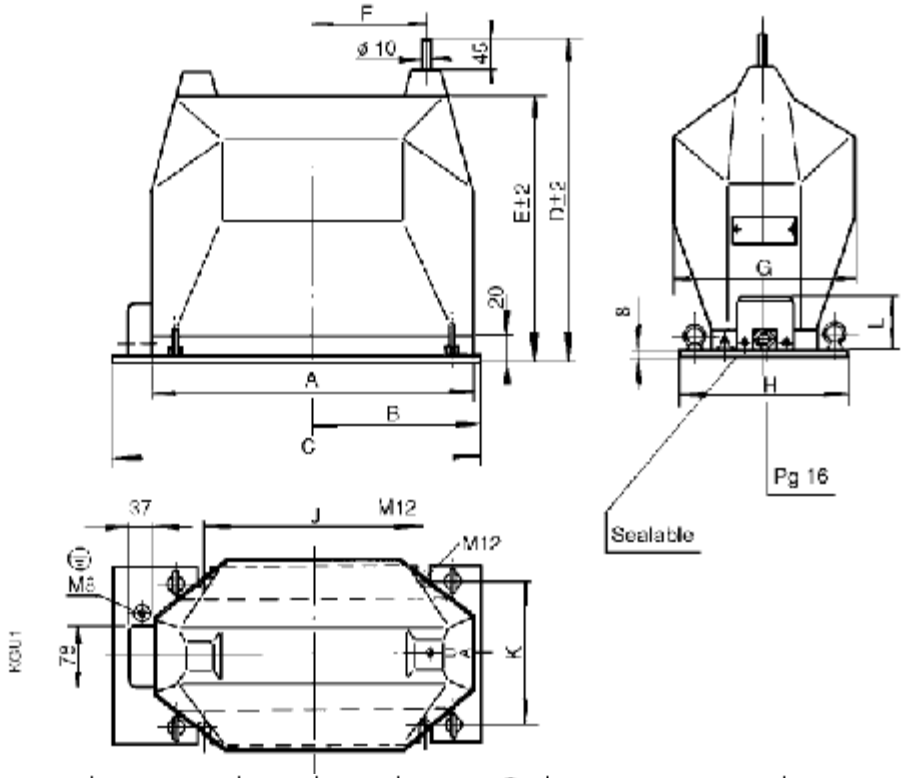
TDP 6.1 fuse JT6 300,600mA **TDP 6.2 Fuse IEC 600282-1**



Drawing n. 44204100

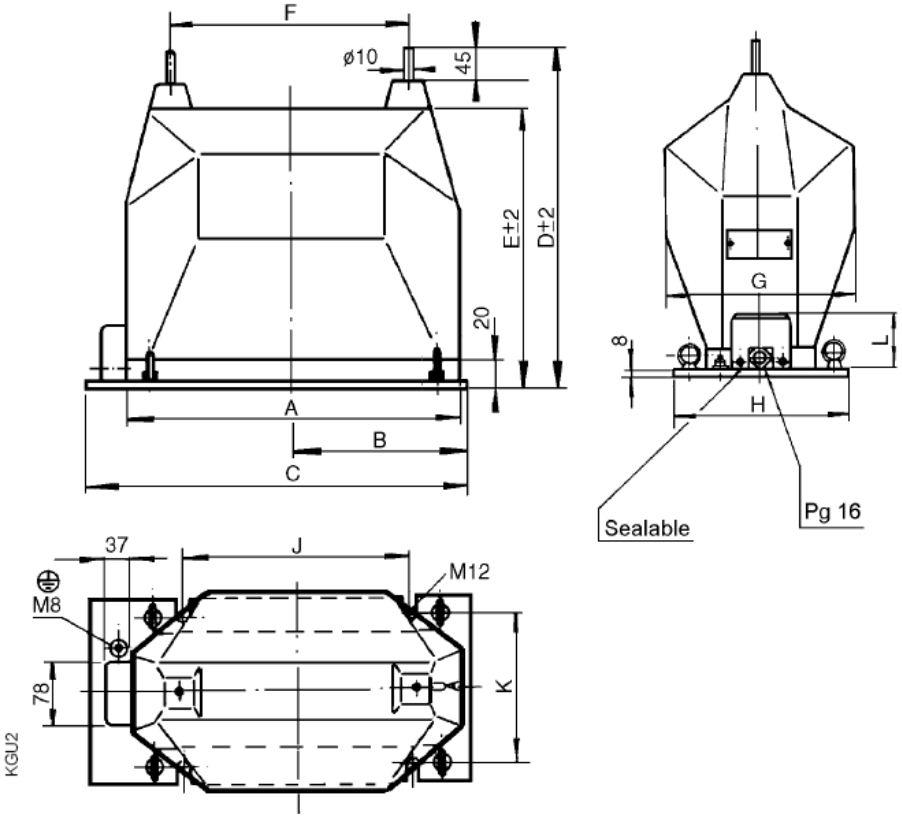
Weight: 38 kg

KGUGI 24 36



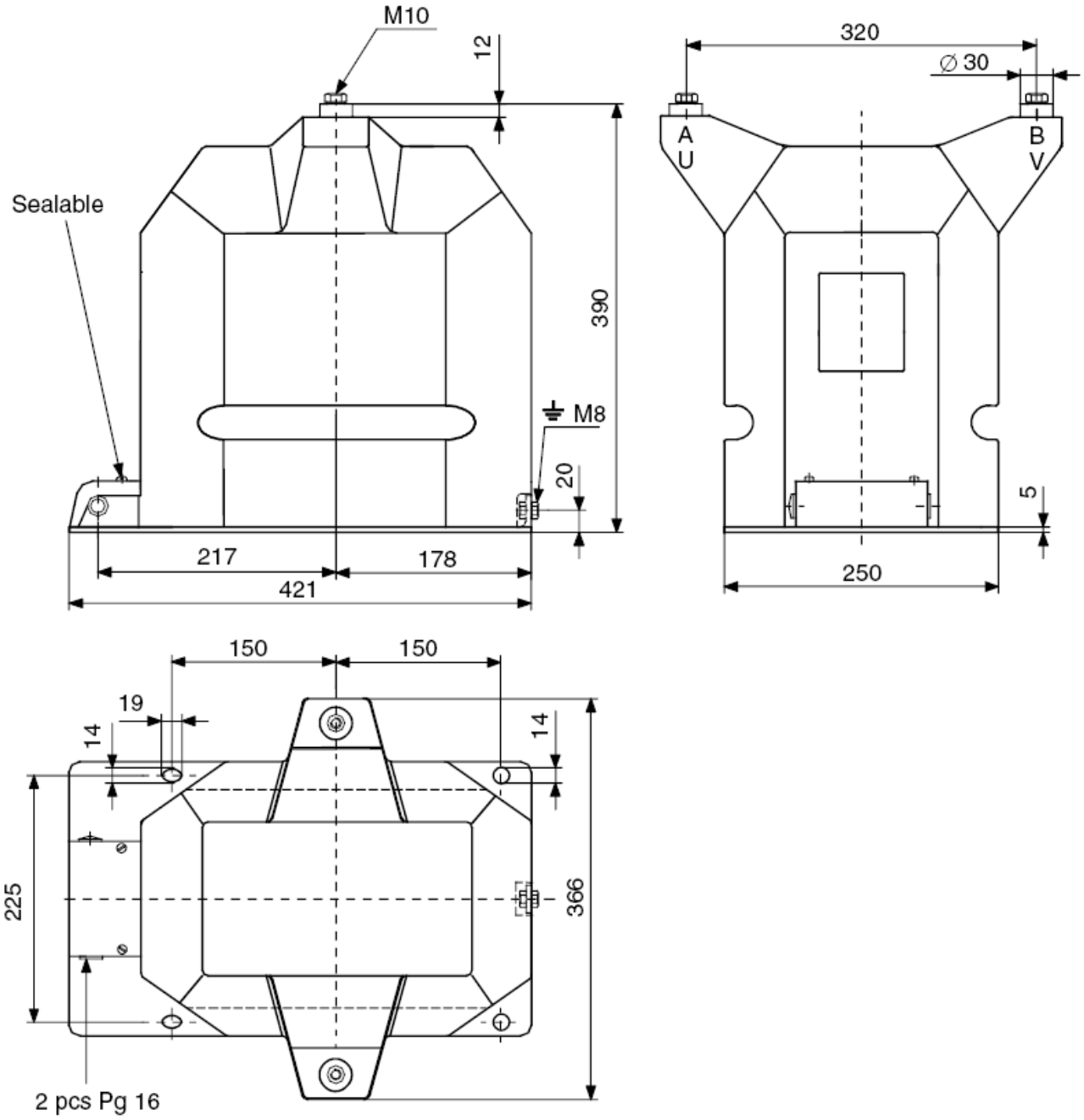
Type	A	B	C	D	E	F	G	H	J	K	L	m/kg
KGUGI 24	391	202	455	376	320	100	222	215	260	179	72	approx. 60
KGUGI 36	443	227	505	427	348	155	248	230	300	186	72	approx. 80

KGUG 24 36



Type	A	B	C	D	E	F	G	H	J	K	L	m/kg
KGUG 24	391	202	455	376	320	200	222	215	260	179	72	approx. 60
KGUG 36	443	227	505	427	348	310	248	230	300	186	72	approx. 80

TDC 7 (KRED 36B1)



Weight approx: 72kg

ABB s.r.o.
PPMV Brno
Vídeňská 117
61900 Brno, Czech Republic
E-mail: info.ejf@cz.abb.com
http://www.abb.cz/ejf