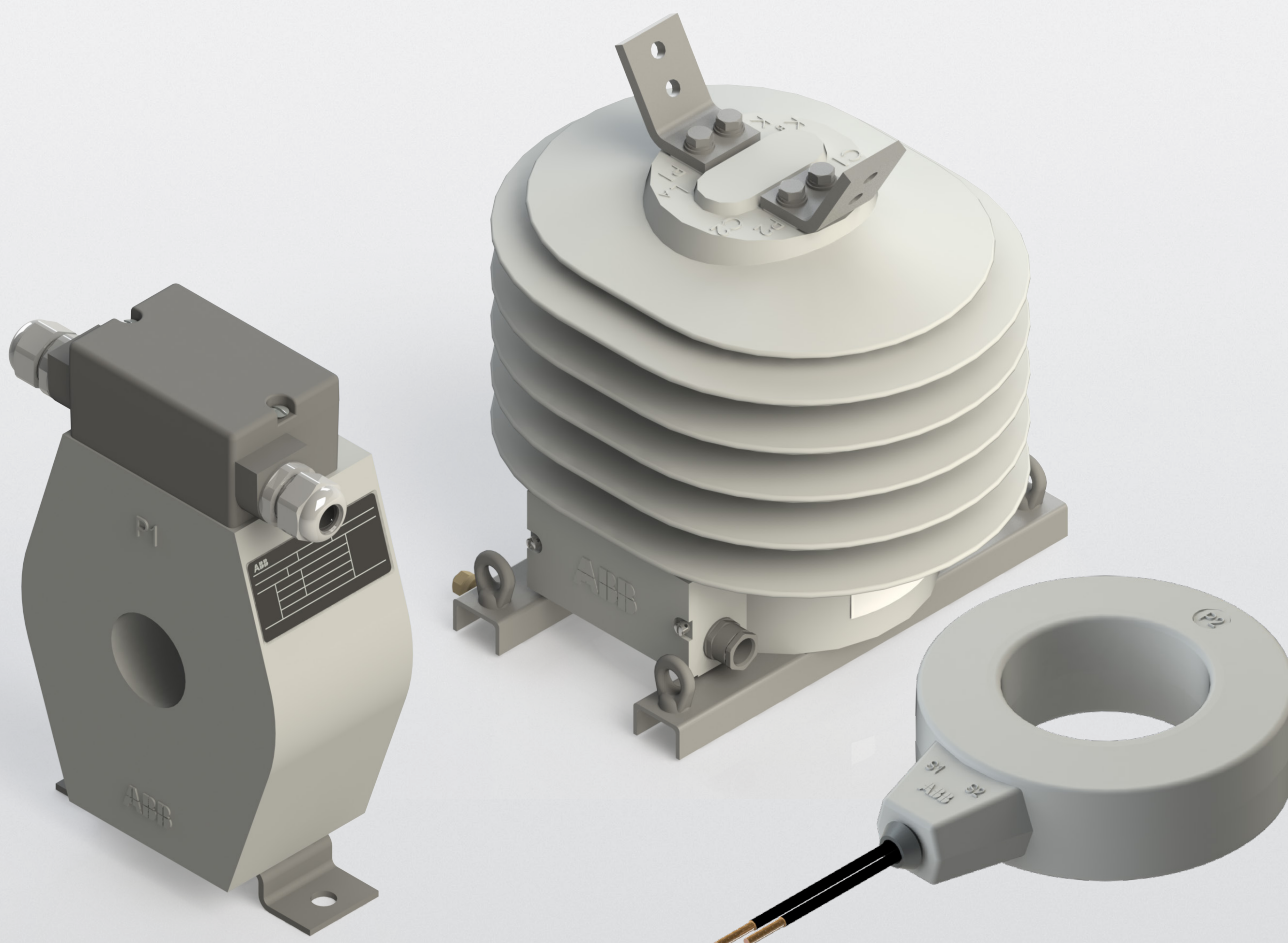


MEDIUM VOLTAGE PRODUCTS

KON, TPO, EZD, KOHU, KOKU, IMT

Instruction for installation,
use and maintenance



Scope of Contents

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Instructions for installation, use and maintenance for current transformers

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

These instructions are valid for

Current transformer type:
KON, TPO, EZD, KOHU, KOKU, IMT

—
01 Example of outdoor
CT's rating plate 74x62
mm (TPO 73.11)

—
02 Example of outdoor
rating plate (KON 17 I2C)

1. General description

The current transformers are designed to supply measurement and protection circuits in high voltage power networks (with admissible voltage up to 40.5 kV and frequency 50 Hz or 60 Hz). This installation, use and maintenance guide is valid for current transformers operating in outdoor conditions type: KON, TPO, EZD, KOHU, KOKU, IMT.

Design versions may differ depending on:

- type CT (support, bushing, cable)
- rated insulation level,
- rated primary current,
- rated secondary current,
- rated power in given accuracy class,
- thermal/dynamic current.

2. Service conditions

The transformers should be mounted in outdoor conditions where the ambient air may be polluted by dust, smoke, corrosive cases, vapors or salt. The current transformers are designed for standard ambient temperature between -40°C and +40°C and altitude lower than 1000 m above the sea level. The average value of the ambient temperature, measured over a period of 24 hours, should not exceed 35°C.

The transformers may be used also in higher or lower ambient temperatures and higher altitudes when agreed between the manufacturer and purchaser.

3. Technical details


The technical details for each individual transformer are mentioned on the rating plate fastened on the transformer. Parameter values indicated on the rating plate must not be exceeded.

ABB		s.n. 1VLT5119053458	
TPO 70.11		50 Hz	
or.n.:736777			
500//1/1A			
1S1-1S2	500/1A	cl.5P20	25VA
2S1-2S2	cl.PX	cl. PX 2/1000	
Ukp≥500.0V. Ios0.1A. Rct≤5.0Ω			
36/70/170 kV		Icth:600A	90.0kg
IEC 61869-2		Ith: 25(3s) kA	40°C
TCM 212/99-3084		Idyn: 62.5 kA	E
		Made by ABB	2019

01

ABB		S/N: 1YMP014KON00024		KON 17 I2C	CURRENT TRANSFORMER
Prod. year	2015	IEC 61869-2		Um 17.5 kV	Mass 56 kg
150-300//5/5 A/A	1S1 - 1S2	PX: Ek<500V I<12mA Rct<12 Ω		f _R	50 Hz
	2S1 - 2S2	10VA 5P10		ext.	120 %
	3S1 - 3S2	-		Temp.	40 °C
	4S1 - 4S2	-		ins.cl.	E
17.5/42/95 kV		Ith:	0.4 kA/1s	Idyn:	100 kA
Made by ABB					

02

SN: 1YMP015TPO00005	serial number
	serial number barcode EFN 128
Type: TPO 70.11	transformer type code
50Hz	rated frequency
40°C	ambient temperature
500//1/1A	rated transformation ratio
ext. 120%	extended primary current
1S1-1S2	terminal marking for core number 1
2S1-2S2	terminal marking for core number 2
25 VA	rated output
cl. 5P20, PX	accuracy classes
Ukp, Ek	knee-point voltage
Rct	resistance at 75°C
36/70/170 kV	rated insulation level highest voltage for equipment / power-frequency withstand voltage / rated lightning-impulse voltage
IEC 61869-2	referred standard(s)
Ith: 25kA/3s Idyn: 62,5 kA	rated short-time thermal current (thermal time) / rated dynamic current
2019	year of production
E	temperature class

Tab. 1. Description markings on the nameplate, based on Picture 01.

Current transformer	Weight
KON 24	app. 24 kg
KON 17 I 2C	app.30 kg
KON 24 I 2C	app.4 3 kg
TPO 6	app. 62 kg
TPO 7	app. 90 kg
EZD	app. 22 kg
KOHU	app. 7 kg
IMT	app. 2 kg
KOKU	app. 4-40kg

Tab. 2. Current transformer weights.

4. Instruction for installation

General information

An instrument transformer is a piece of electrical equipment and its electrical installation shall be done by skilled person only. Observe the provisions of local legislation regarding the minimum age and the competence criteria for personnel working with or in vicinity of electrical installations.

If local legislation is not applicable, the guidelines set forth in EN 50110-1 shall be observed.

Checking current transformer upon arrival

Inspection shall be made upon arrival of current transformer for any signs of damage or tampering incurred during shipment.

If the shipment has been damaged, or current transformer ratings do not comply with order specification, notify the carrier and contact the current transformer manufacturer. Keep the written record of damages until complaint resolution.

Attention: Make sure that current transformer parameters indicated on the rating plate comply with the parameters specified on the order!

Preparations before installation of current transformers

Perform a visual inspection of the current transformer prior to installation paying particular attention to the following points:

- cast resin (enclosure) is in good condition,
- current transformer terminals and surfaces of housing and base are clean and without visible mechanical damages,
- there are no signs of moisture on the current transformer; in case of visible signs of moisture, the transformer must be dried,
- current transformer ratings comply with technical specification of connection.

Before installation there have to be performed the following measurements:

- electric withstand of insulation test under the test voltage in accordance with requirements of standard specifications given in catalogue cards, but value of supplied voltage can not exceed 90% of the test voltage.
- electric withstand test of insulation of secondary windings of the transformer under the test voltage 50 Hz Up = 2 kV during 1 minute.
- the measurement of insulation resistance of secondary winding or windings (towards the ground) using a varindor ohmmeter of the voltage 1000V. The value of resistance can not be less than 100 MΩ

Activities after the installing of the transformer and before bringing it into operation

After the transformer has been installed there have to be made listed inspections:

- visual inspection,
- checking of proper installing (use of all holes for fixing, proper holding down of fixing bolts),
- checking of distances between primary terminals of current transformers and the closest brackets of connecting bars (if the distances or a breaking force are not given in the catalogue card of the current transformer it should be determined, treating the current transformer as a post or bushing insulator type B with durability 750 kg),
- checking of proper grounding of terminals,
- checking of the legalization leaden seal (it applies to the transformers supplying electricity meters).

Attention: All electrical tests listed in these instructions should be done in accommodations meeting the requirements given in the catalogue card in consideration of the ambient temperature and the humidity.

Safety instructions

1. Installed current transformer shall be always considered as part of interconnected circuit. Never attempt to touch the leads, terminals or other parts of the current transformer unless they are known to be properly connected and ground.
2. Always ground the metal base of instrument transformer.
3. Always ground one secondary terminal of the transformer. 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.

One should earth:

- the star point of the scheme of connections „Y”,
- the joint point of two transformers of the scheme of connections „V”,
- one of two joint points of Holmgreen's scheme,
- start point of both „Y” in the differential longitudinal scheme.

If the transformers supply electricity meters it is recommended that the earthing point should be from the side of the flow of the electric energy. Ground terminal can be optionally chosen from each secondary winding in compliance with principles of scheme of connection. This can be done by connection the ground terminal with the winding terminal.

Recommended order of installing of the transformer in the current circuit:

- bars to the transformer,
- the transformer with bars to the base.

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.

Attention: Maintenance of the transformers should be done in accordance with the safety and occupational hygiene requirements for electrical equipment.

Mounting

General and detailed information regarding mounting procedure may differ depending on current transformer type and version. Follow the technical specifications included in catalogues, dimensional drawings and rating plates for specific current transformer type and mounting instructions.

Outdoor current transformer may be mounted in vertical position (horizontal position is allowed for KON). The other position can be agreed with the supplier. The transformer type have to be fixed using two profiles with four M12 screws or flat base. The KOKU 1 type have to be fixed using two or four M10 screws. Fastening must be done on a smooth surface.

On the mounting base there is a M12 or M8 (for KON-24) screw for grounding of current transformer.

Primary connection

Primary terminals of the current transformer are made of cooper and they are silver-plated or tinplated.

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 M12 screws without removing already fitted primary conductors.

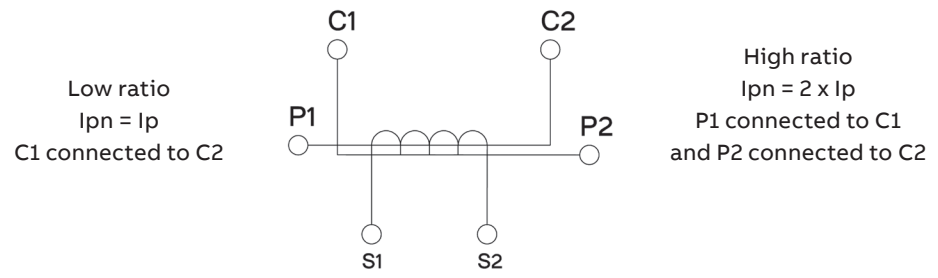
There are no primary connections in cable type current transformers (KOKU, IMT). Current circuit has to be dragged through transformer hole. If shielded cable is used, the shield have to be removed and grounded before the transformer or turn back through the window of current transformer.

Screw	Tightening torque [Nm]	
	Recommended	Max.
M8	8	10
M10	13	18
M12	25	30
M14	45	50
M16	70	75

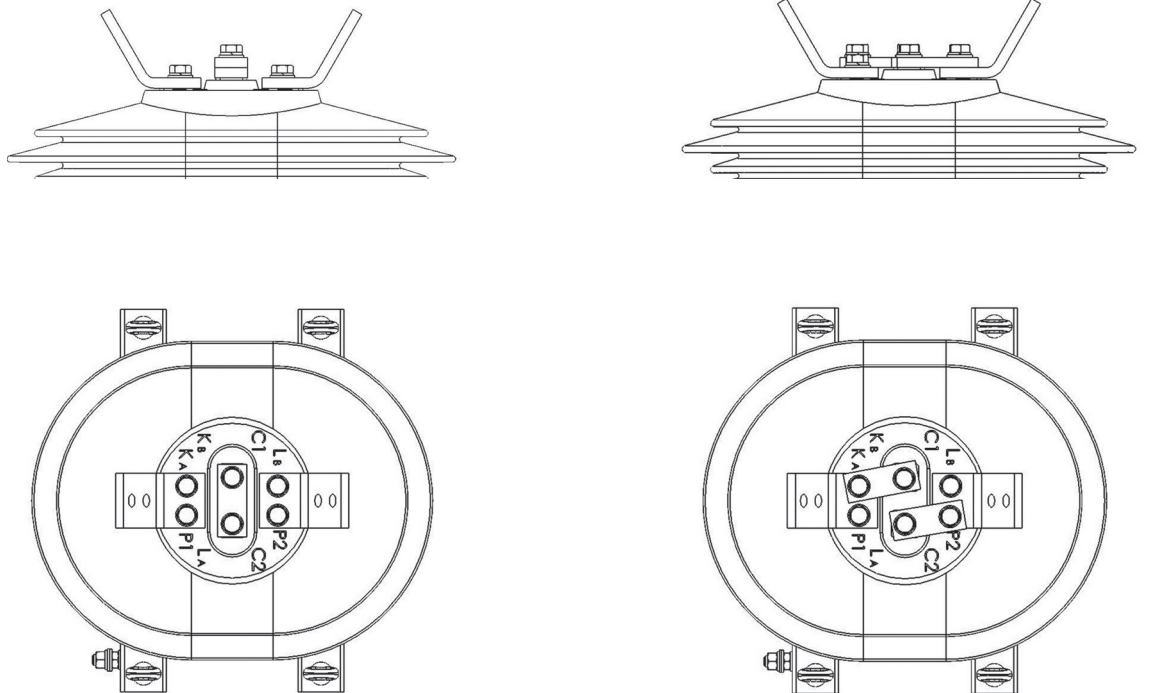
Tab. 3. Recommended tightening torque for steel screws used in current transformers. Maximum allowed cantilever strength for current transformers is 5000 N.

Primary reconnectable transformers

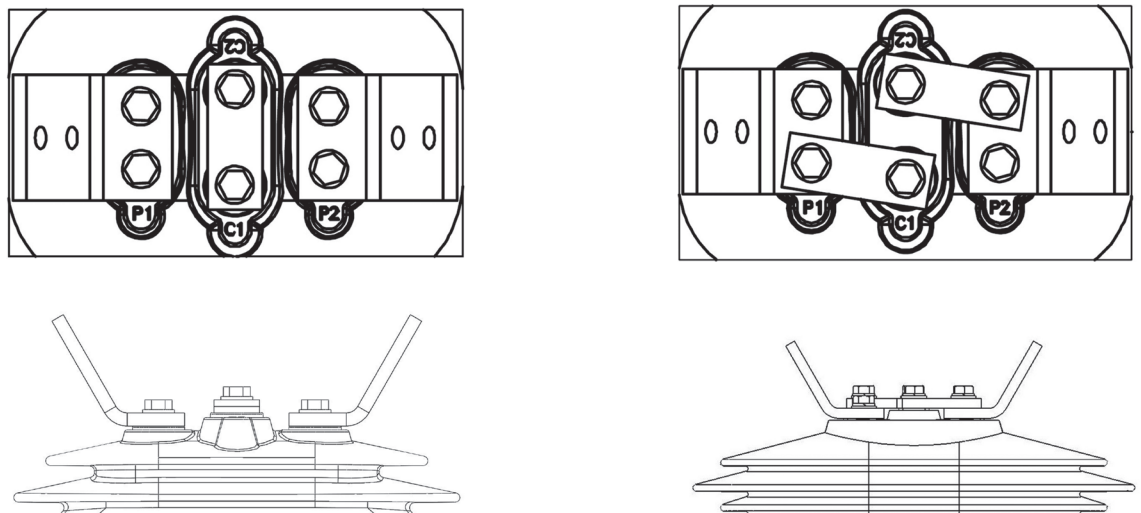
Primary connection



TPO



KON

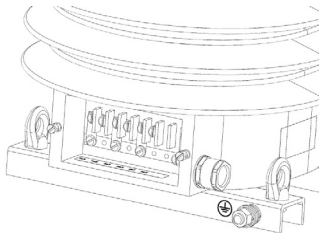


—
03 Example of current transformers terminal boxes

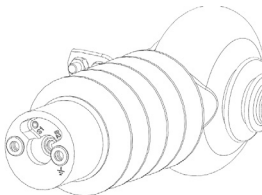
—
04 Label inside of the secondary terminal box indicating each secondary terminal. Available for TPO 6.

Secondary connections

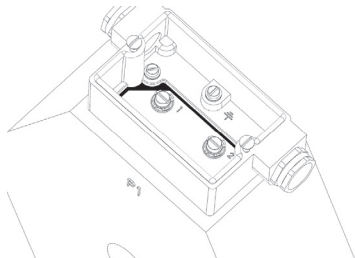
Terminals, terminal screws, nuts and washers are made of brass or stainless steel. The secondary terminals are provided with M6 or M5 screws for wiring connection. The terminal box is provided with one or two PG21 or PG16 (KOKU) cable gland. The cover of the terminal box is provided with lead seal lock. In outdoor transformers degree of IP54 protection for terminal boxes.



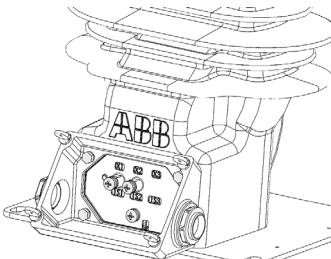
TPO
Terminal box
(max. 12 terminals)



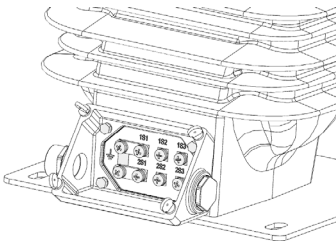
KOHU
(max. 2 terminals)



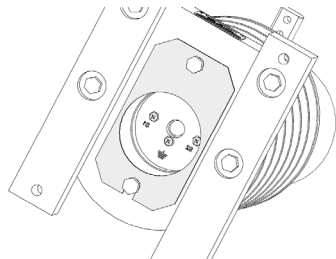
KOKU
(max. 5 terminals)



KON-24
Terminal box
(max. 3 terminals)

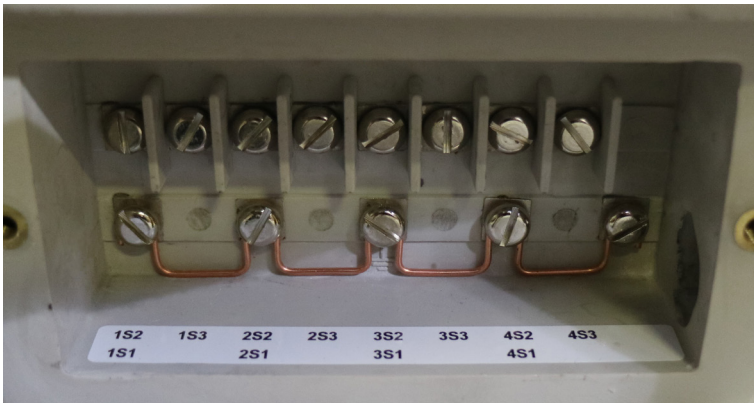


KON-17I2C; KON-24I2C
(max. 6 terminals)



EZD 7961
(max. 2 terminals)

—
03



—
04

5. Maintenance and overviews during exploitation

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.

Overviews during exploitation

Medium voltage instrument transformers in resin insulation are maintenance-free. However, because of work under different environmental conditions during the transformer operation it is advisable to carry out:

- overview of the instrument transformer during operation – only visual control,
- overview of the instrument transformer disconnected from power supply.

Time periods between inspections is regulated by standards, by operation and maintenance manual of switchgears or user requirements.

Overview of the instrument transformer during operation.

The review is based on visual control in accordance with the principles of safety. During the inspection should pay attention to:

- condition of resin body,
- condition of primary terminals,
- condition of support structures.

Attention: Overviews during operations do not apply to the transformers installed in the cubicles.

Overview of the instrument transformer disconnected from power supply

The overview should be done every time before restarting. The overview should include:

- cleaning the surface of instrument transformer,
- checking condition of the transformer resin body surface,
- checking condition of mounting screws and checking the condition of all electrical connections (on primary and secondary terminals and earthing terminals),
- measurement of main insulation resistance,
- measurement of secondary winding insulation resistance.

Attention: Cut off the power supply of transformer before attempting cleaning or repairing operations.

6. Instruction for use

Current instrument transformers are used:

- to convert large currents 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 appearing during the operation (short circuits)

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

For special request can be delivered additional documents as:

- routine test report
- additional rating plate,
- theoretical current errors and phase displacement values,
- theoretical excitation curves,
- accuracy test report,
- magnetizing curve,
- verification tests.

7. Package, transport and storage

The permissible transport and storage temperature is from -40°C up to $+70^{\circ}\text{C}$. During transport and storage the transformers must be protected against direct sunlight. Transformers assigned for export are packed in wooden crates. Current transformer should be shipped in position according to symbols and marks indicated on its packing case and protected against weather conditions. They should be stored in dry and clean places, protected from direct exposure to precipitation and solar radiation.

8. Handling with the transformers

Manual handling.

Transformers are possible to handle by hands in case if the weight of the transformer is not higher than 25kg. For grasp of the transformers always use handling grip, or the base of the transformer. Current transformers type KOHU, KOKU, IMT can be handled by casting. Do not handle the transformer using the cable (if the transformer has it). Always use the gloves in case of manual handling.

Handling by the belt.

Transformers where it is possible, from safety reasons, can be handling by hanging on the belts using the crane. To handle cable type transformers (e.g. KOKU) handling belt has to be inserted through hole in the transformer. If the support transformer need to be handled, the belts should be grid near the center of gravity. Both ends of belts have to be mounted in a crane.

Attention: Lifting capacity of the belts and the crane has to be 200kg at least. Always make sure that the belts hold safely on the crane and on the transformer.



—
05

Note: The lifting eyebolts are not part of standard delivery. It can be ordered as Handling kit (1VL4601302V0101) containing 12pcs of lifting eyebolts and 12pcs of nuts.

Handling by the chain and crane.

Current transformers heavier than 40 kg should be handled by crane with chains and hooks attached to the lifting eyebolts (see picture below). Screw the lifting eyebolts through the baseplate/rail and nuts under baseplate/rail properly. Then attach to the crane's hook using chains.

Attention: 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.

Attention: 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.

9. 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.

10. Normative references

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

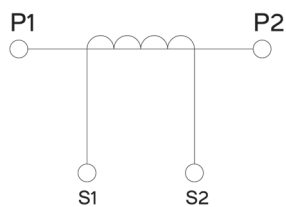
For example these standards:
IEC 61869-1, IEC 61869-2, PN-EN 61869-1, PN-EN 61869-2, GOST 7746-2001

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

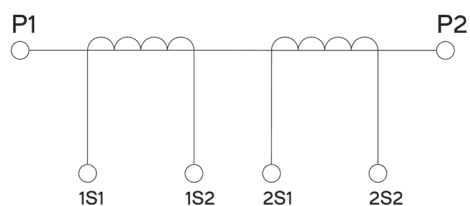
11. Wiring diagram examples

1. CURRENT TRANSFORMERS NOT RECONNECTABLE

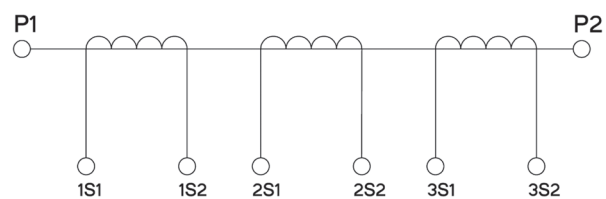
—
a) Current transformer
with one secondary
winding



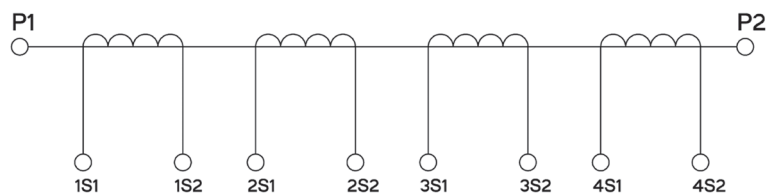
—
b) Current transformer
with two secondary
windings



—
c) Current transformer
with three secondary
windings

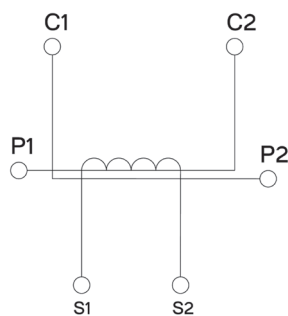


—
d) Current transformer
with four secondary
windings

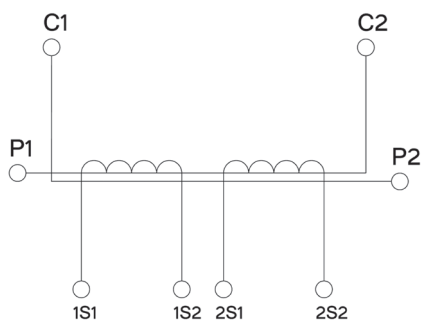


2. CURRENT TRANSFORMERS RECONNECTABLE ON PRIMARY SIDE

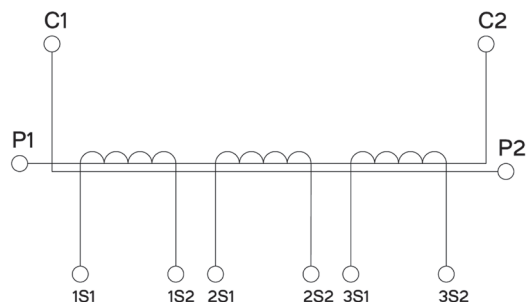
—
a) Current transformer
with one secondary
winding reconnectable
by primary side



—
b) Current transformer
with two secondary
windings reconnectable
by primary side

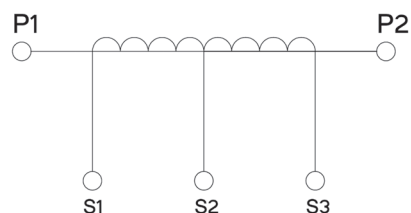


—
c) Current transformer
with three secondary
windings reconnectable
by primary side

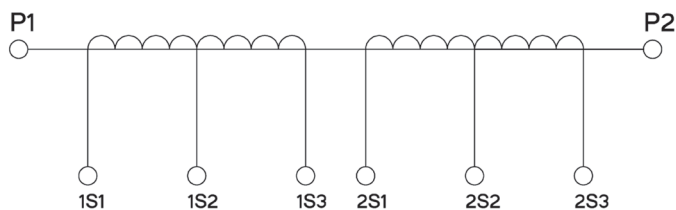


3. CURRENT TRANSFORMERS RECONNECTABLE ON SECONDARY SIDE

—
a) Current transformer
with one reconnectable
secondary winding



—
b) Current transformer
with two reconnectable
secondary windings

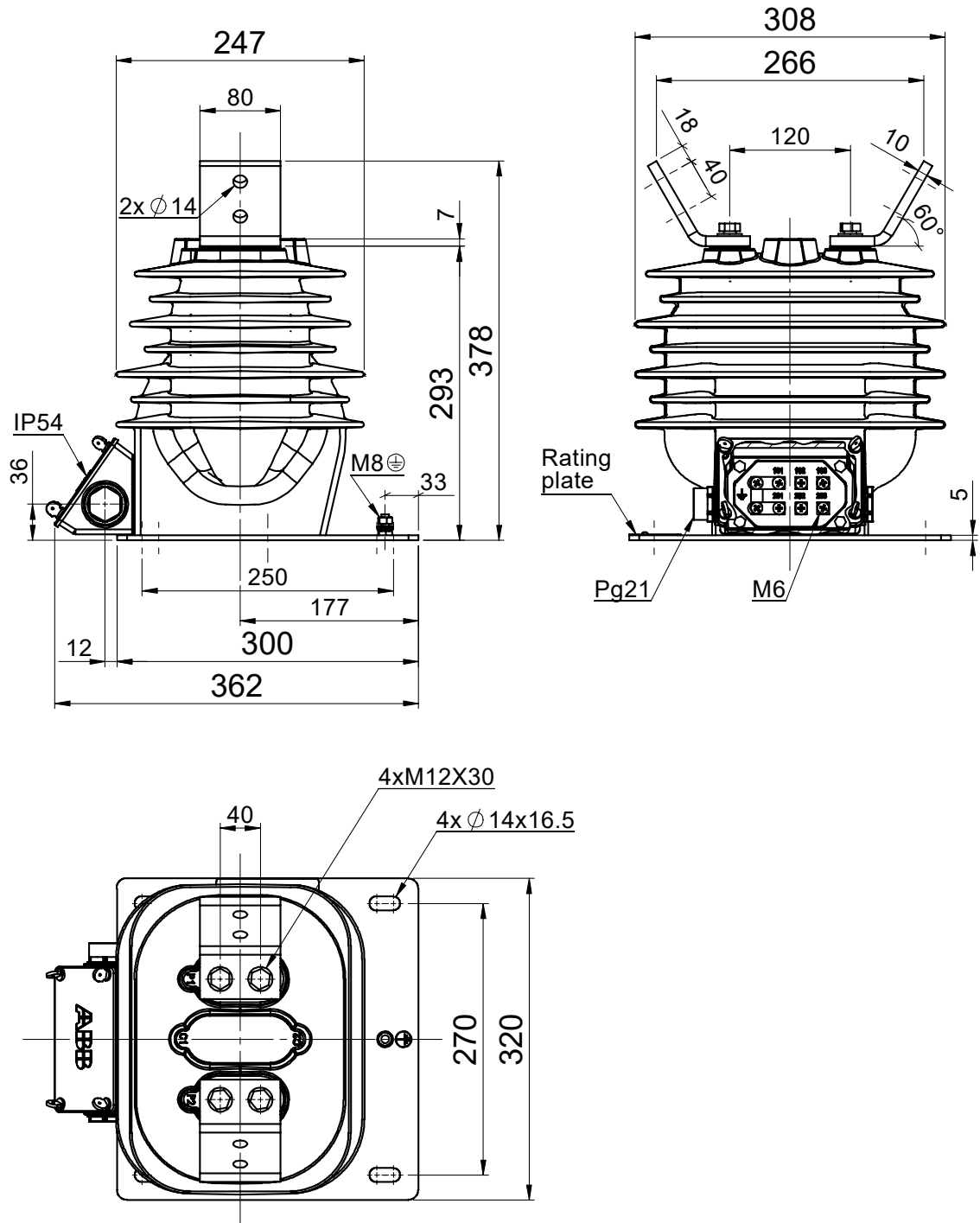


Attention: The number of secondary windings (from 1 to 4 - up to 12 secondary terminals), depends on the combination of technical parameters, such as the accuracy class, burden, short-circuit current, short-thermal current and size of the transformer.

12. Dimensions drawings

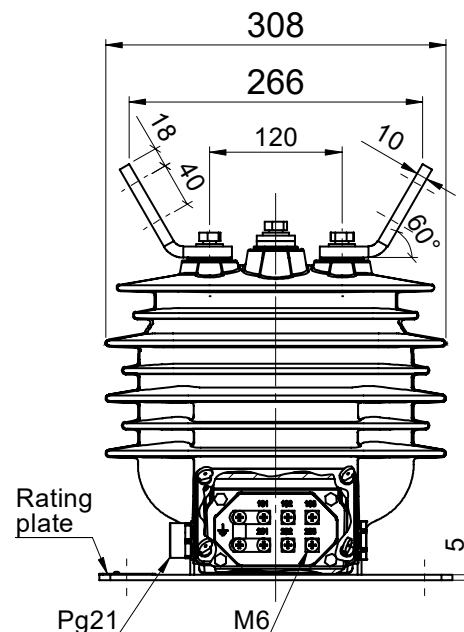
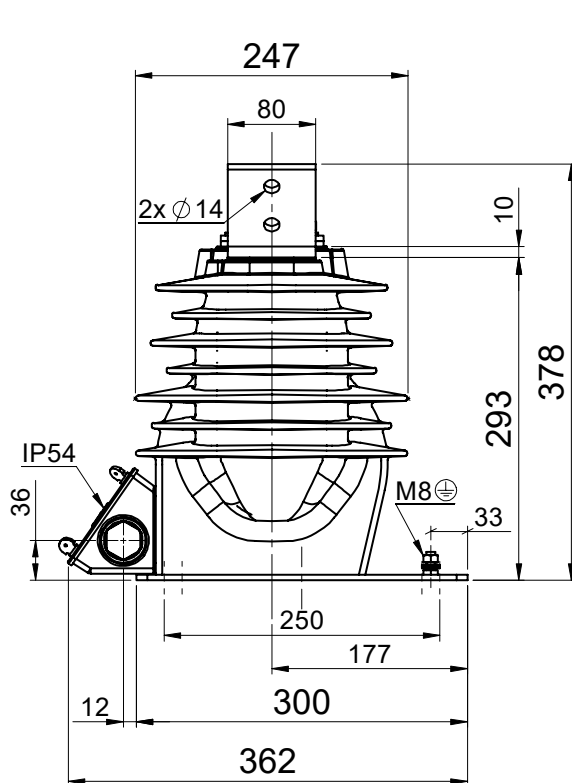
KON-17I2C

Weight approx. 30 kg
Creepage distance: 600 mm



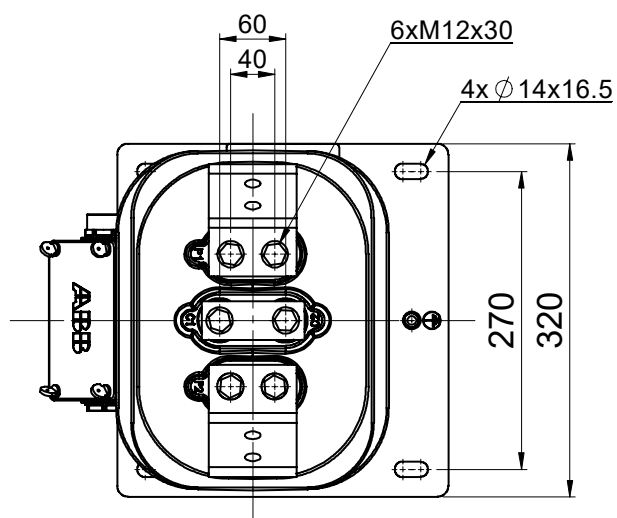
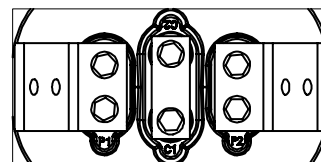
KON-17I2C reconnectable

Weight approx. 30 kg
Creepage distance: 600 mm



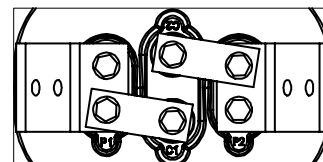
Low ratio

$I_{pn} = I_p$
C1 connected to C2

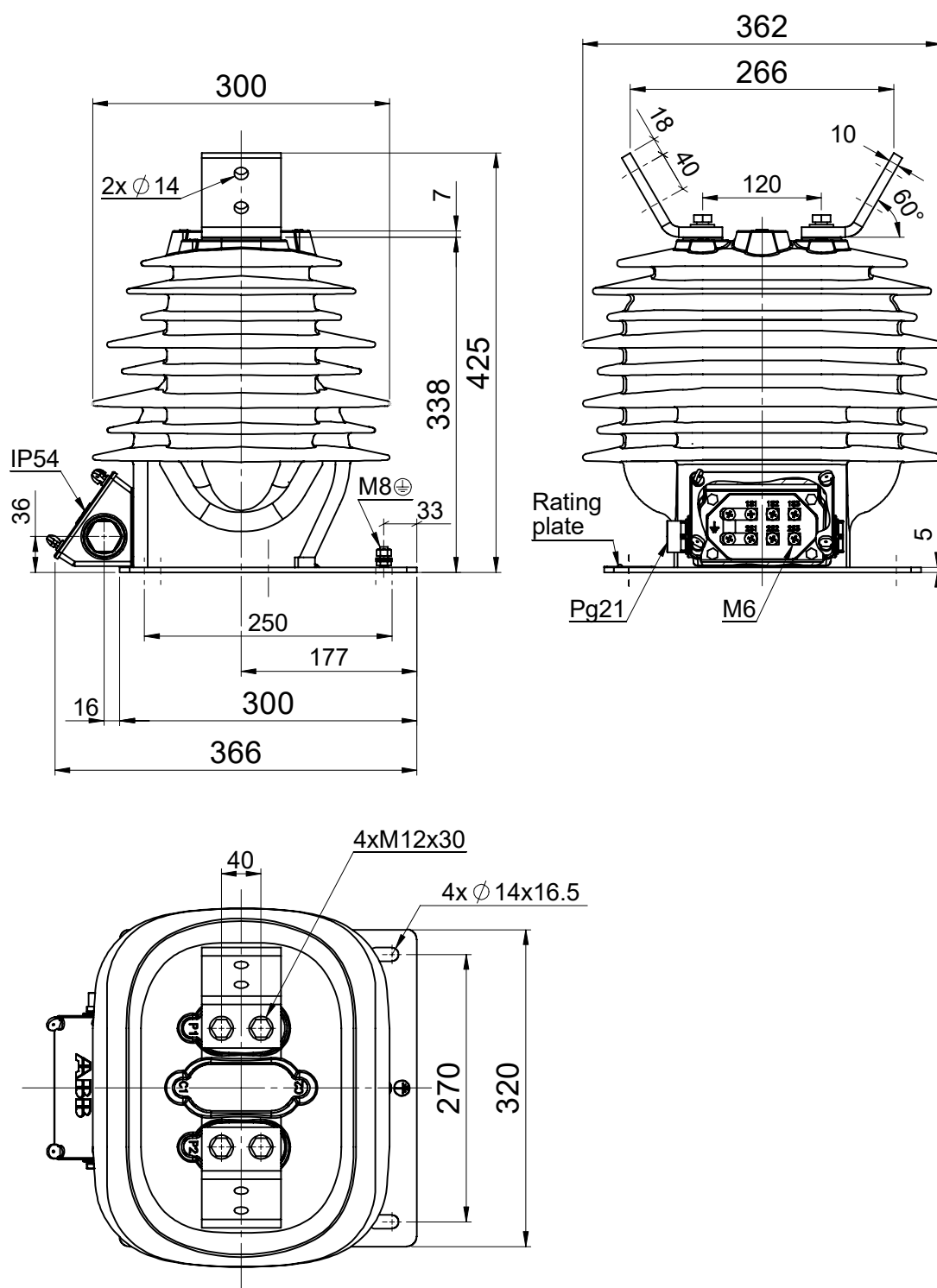


High ratio

$I_{pn} = 2 \times I_p$
P1 connected to C1 and
P2 connected to C2

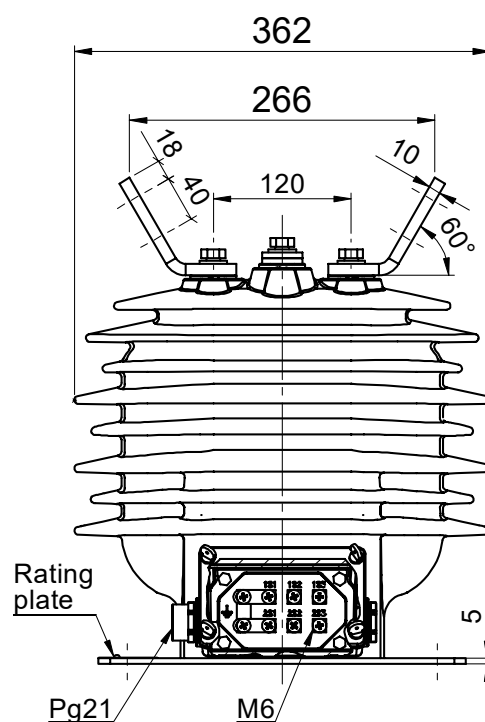
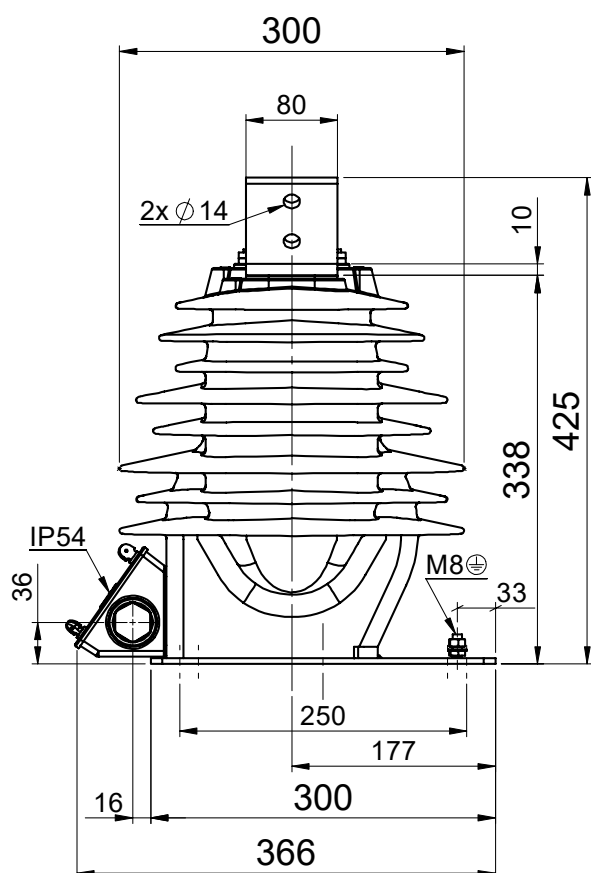


Weight approx. 43 kg
Creepage distance: 800 mm



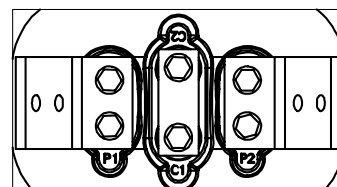
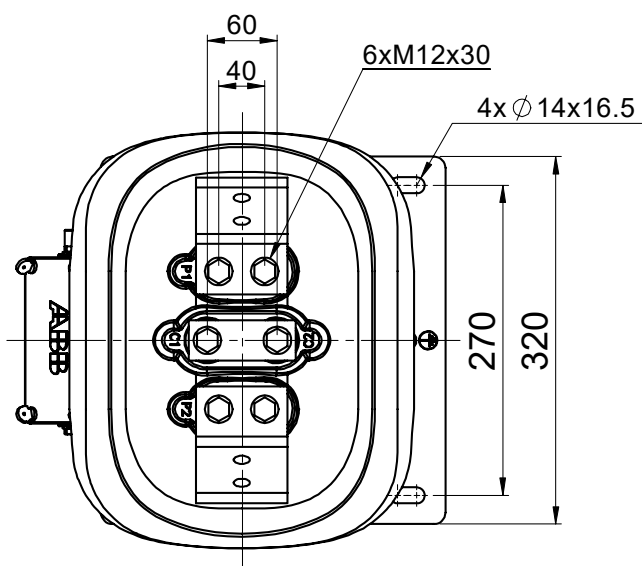
KON-24I2C reconnectable

Weight approx. 43 kg
Creepage distance: 800 mm



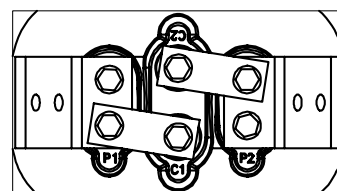
Low ratio

$I_{pn}=I_p$
C1 connected to C2

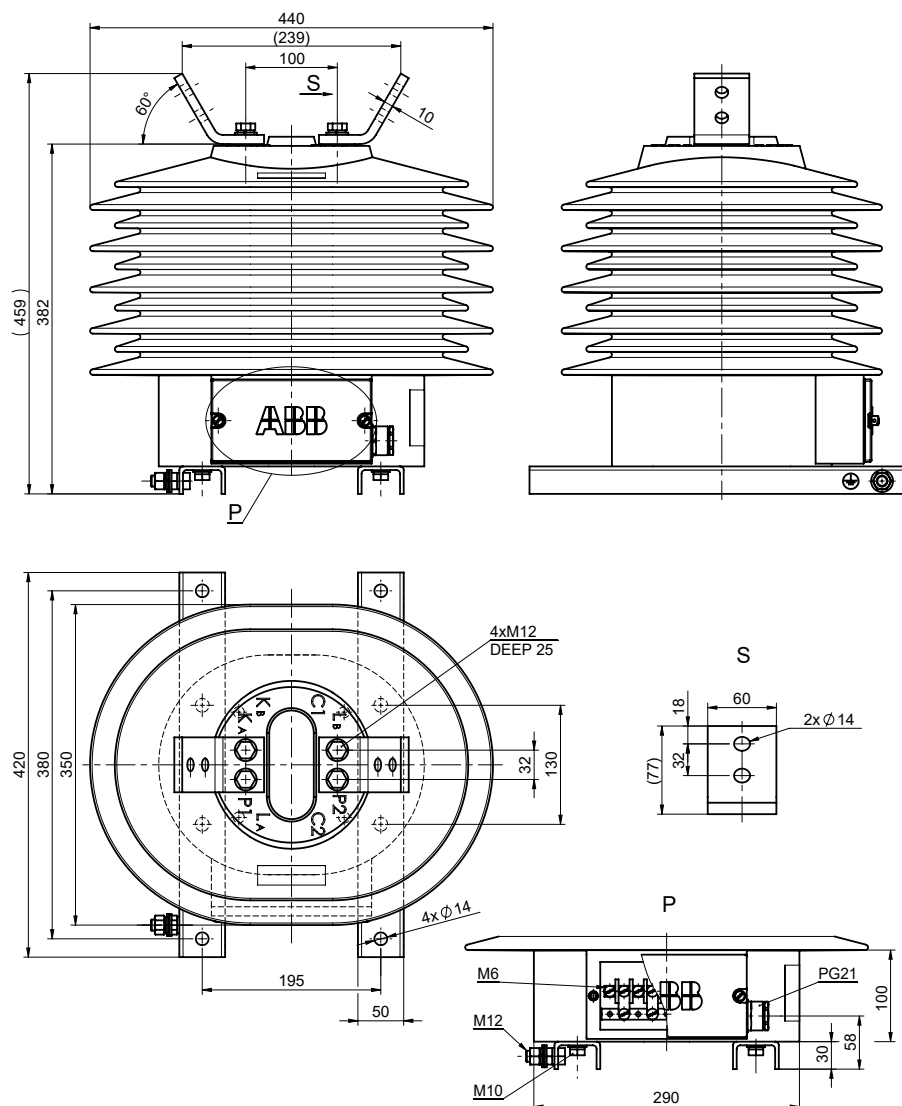


High ratio

$I_{pn}=2 \times I_p$
P1 connected to C1 and
P2 connected to C2

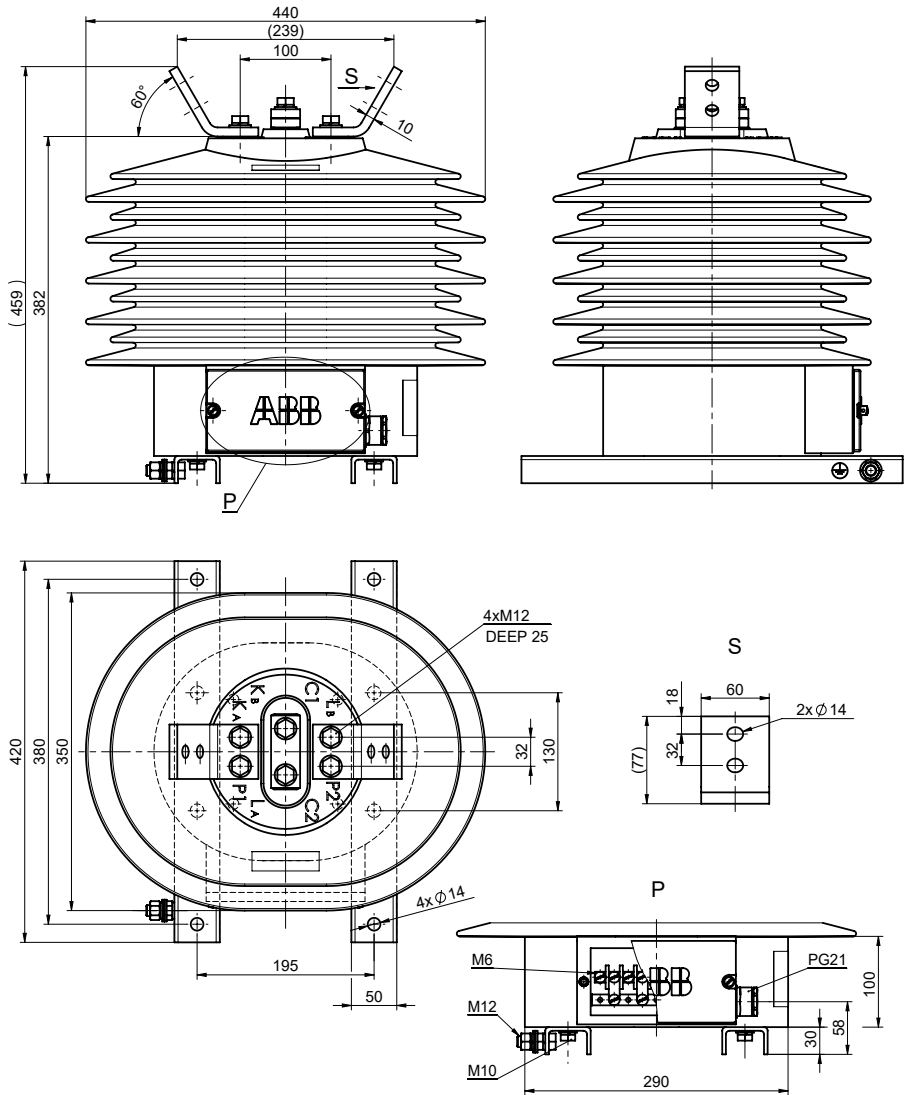


Weight approx. 62 kg
Creepage distance: 1 100 mm

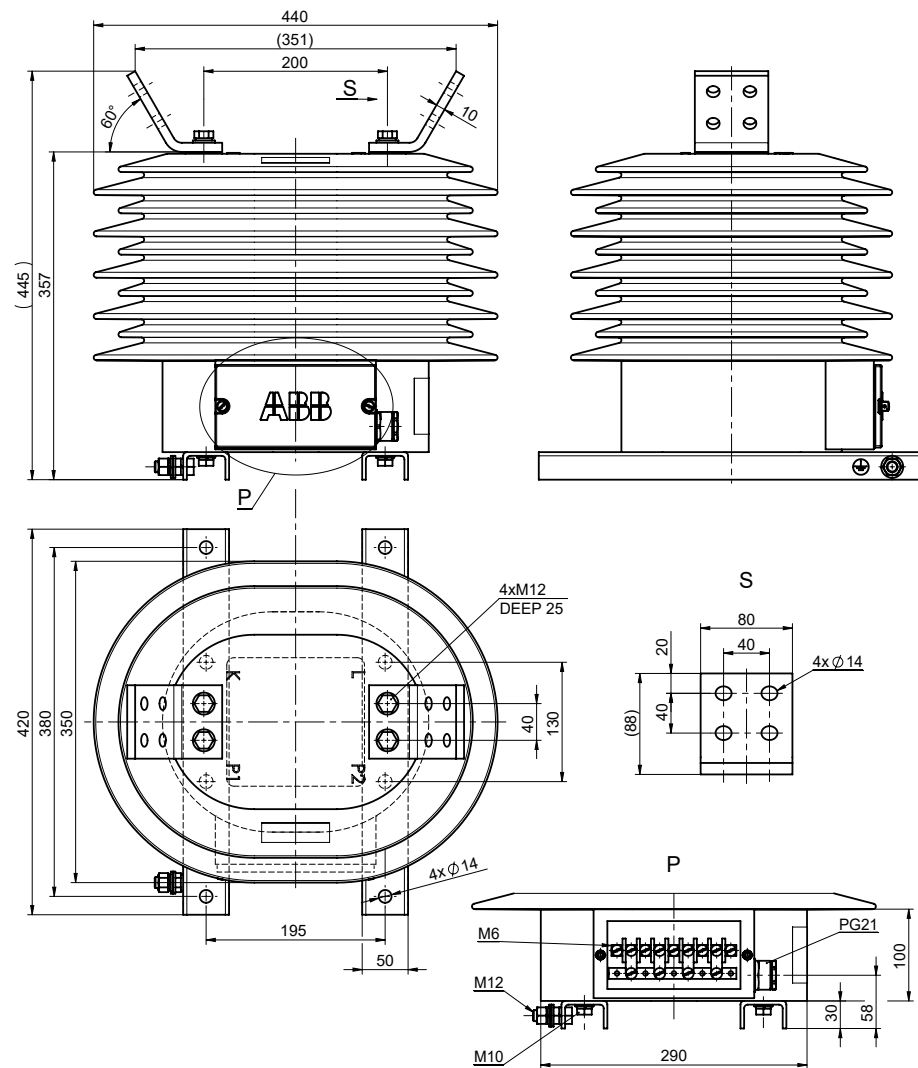


TPO 60.12

Weight approx. 62 kg
Creepage distance: 1 100 mm

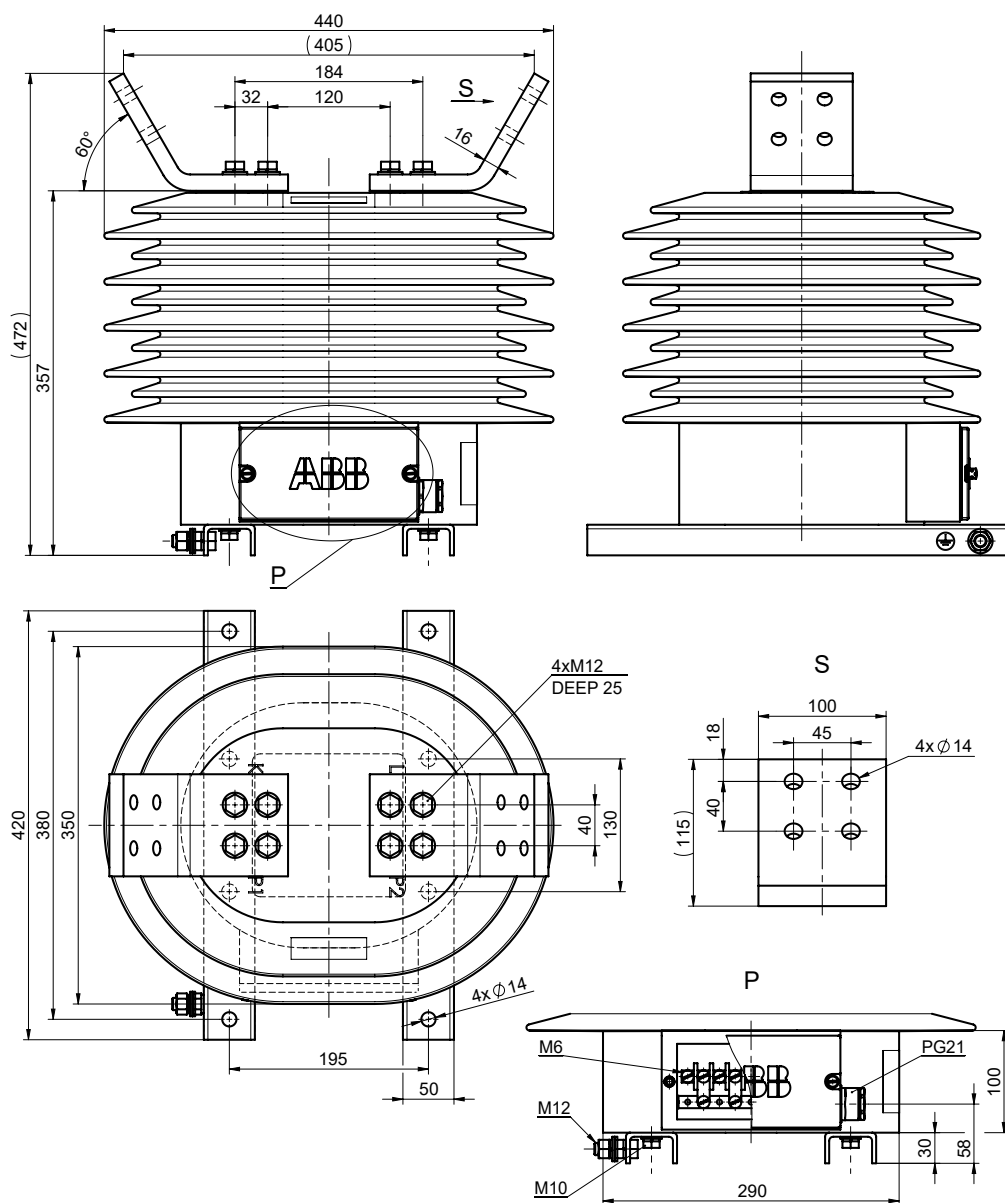


Weight approx. 62 kg
Creepage distance: 1 100 mm



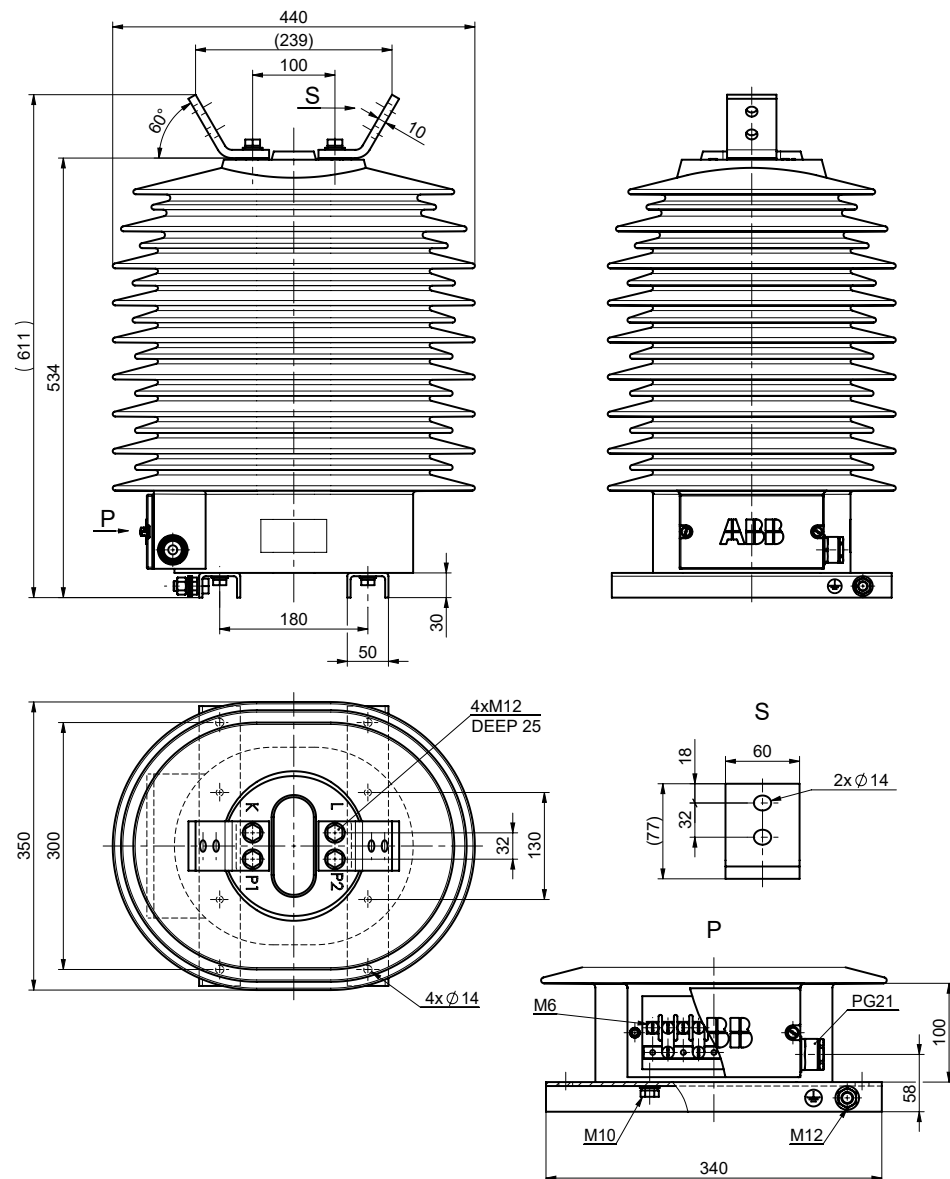
TPO 64.11 – 66.11

Weight approx. 62kg
Creepage distance: 1 100 mm



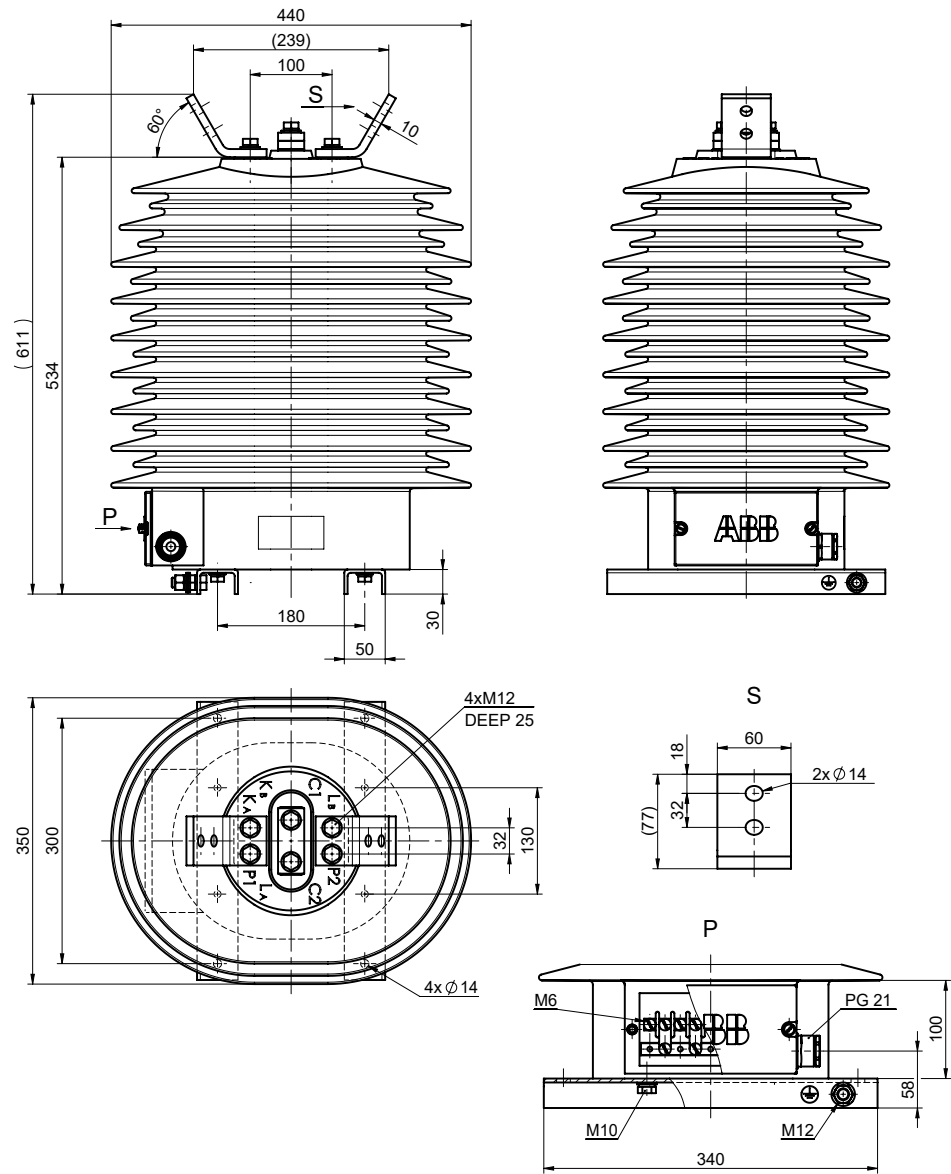
TPO 70.11

Weight approx. 90 kg
Creepage distance: 1 600 mm



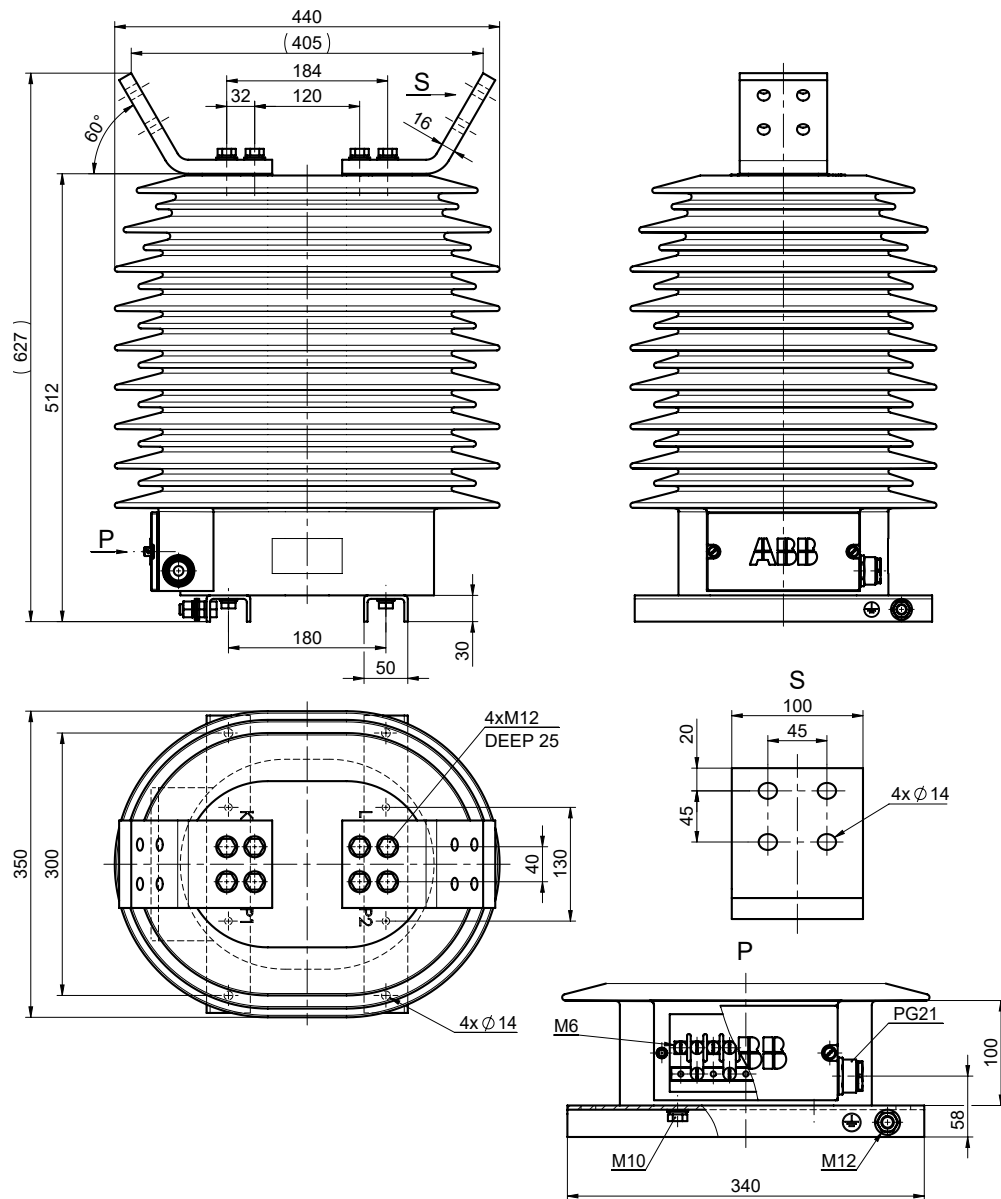
—
TPO 70.12

Weight approx. 90 kg
Creepage distance: 1 600 mm



TPO 71.11 – 76.11

Weight approx. 90 kg
Creepage distance: 1 600 mm



Technical drawing of a 10 kV outdoor air switch (VVO-10) showing front and side views with dimensions.

Front View (Left):

- Overall width: 310
- Width of the main body: 278
- Height of the main body: 341
- Mounting holes: 4xM10
- Terminal spacing: 51
- Terminal width: 97
- Terminal diameter: $\phi 14$
- Terminal length: 11

Side View (Right):

- Overall height: 446
- Width of the main body: 170
- Height of the main body: 406
- Terminal diameter: $\phi 14$
- Terminal length: 11
- Terminal width: 97
- Terminal spacing: 51
- Terminal diameter: $\phi 14$
- Terminal length: 11

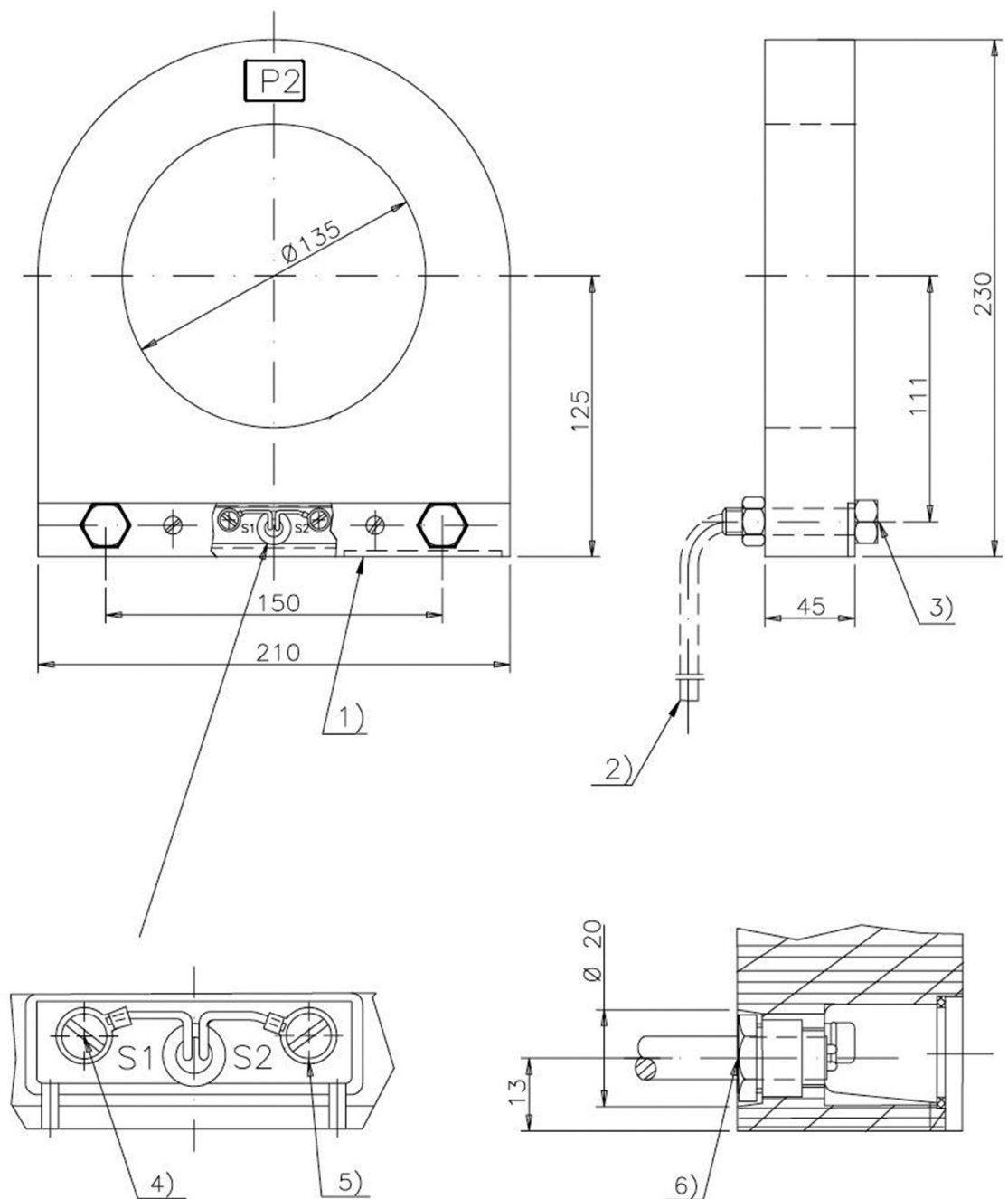
Detail View (Bottom):

- Width: 50
- Height: 16
- Width: 23
- Height: 30
- Terminal diameter: $\phi 14$
- Terminal length: 11

Labels:

- P2
- P1
- B
- B-B 1:3
- 2xM10
- ~1,6 m

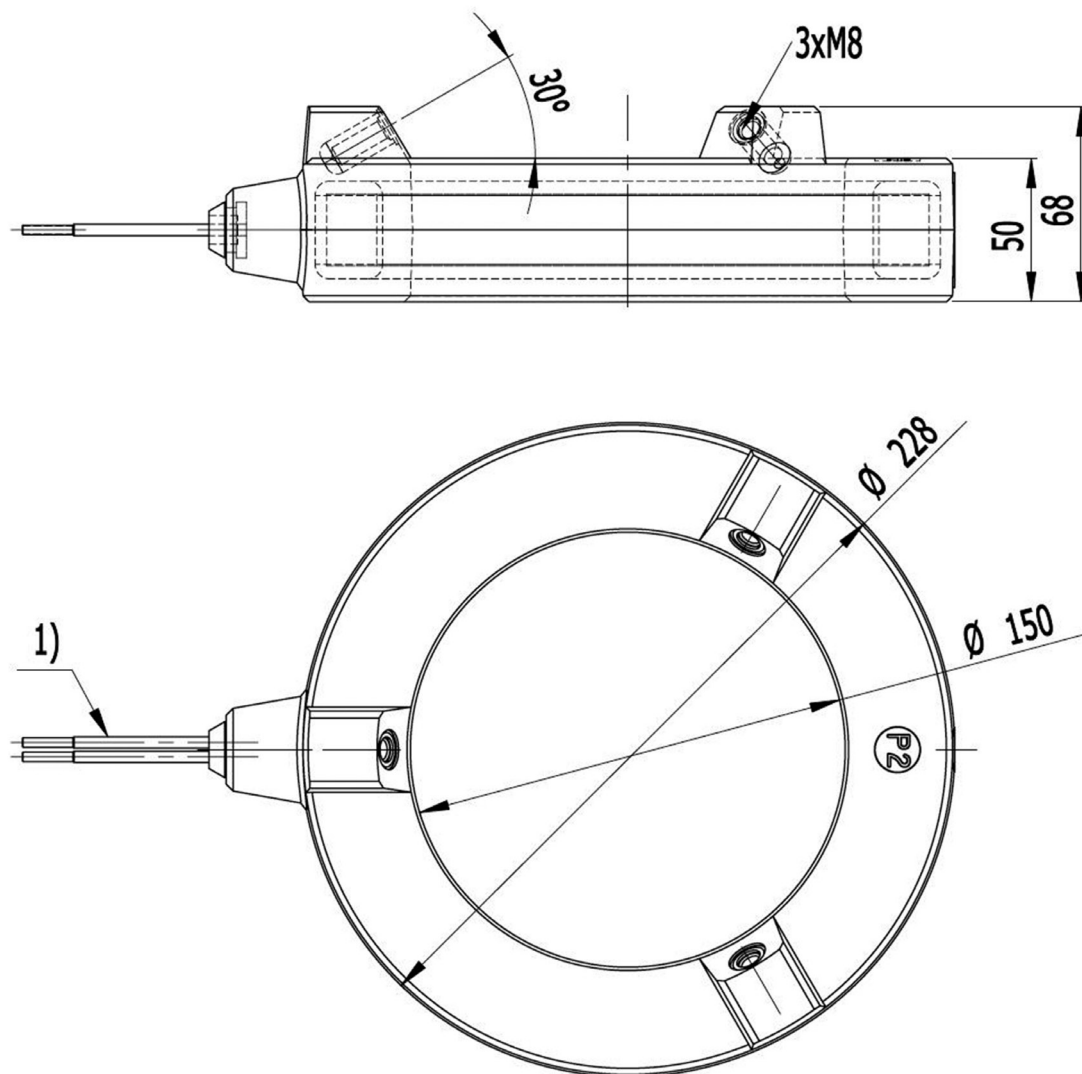
KOKU 072 G3 (G4)



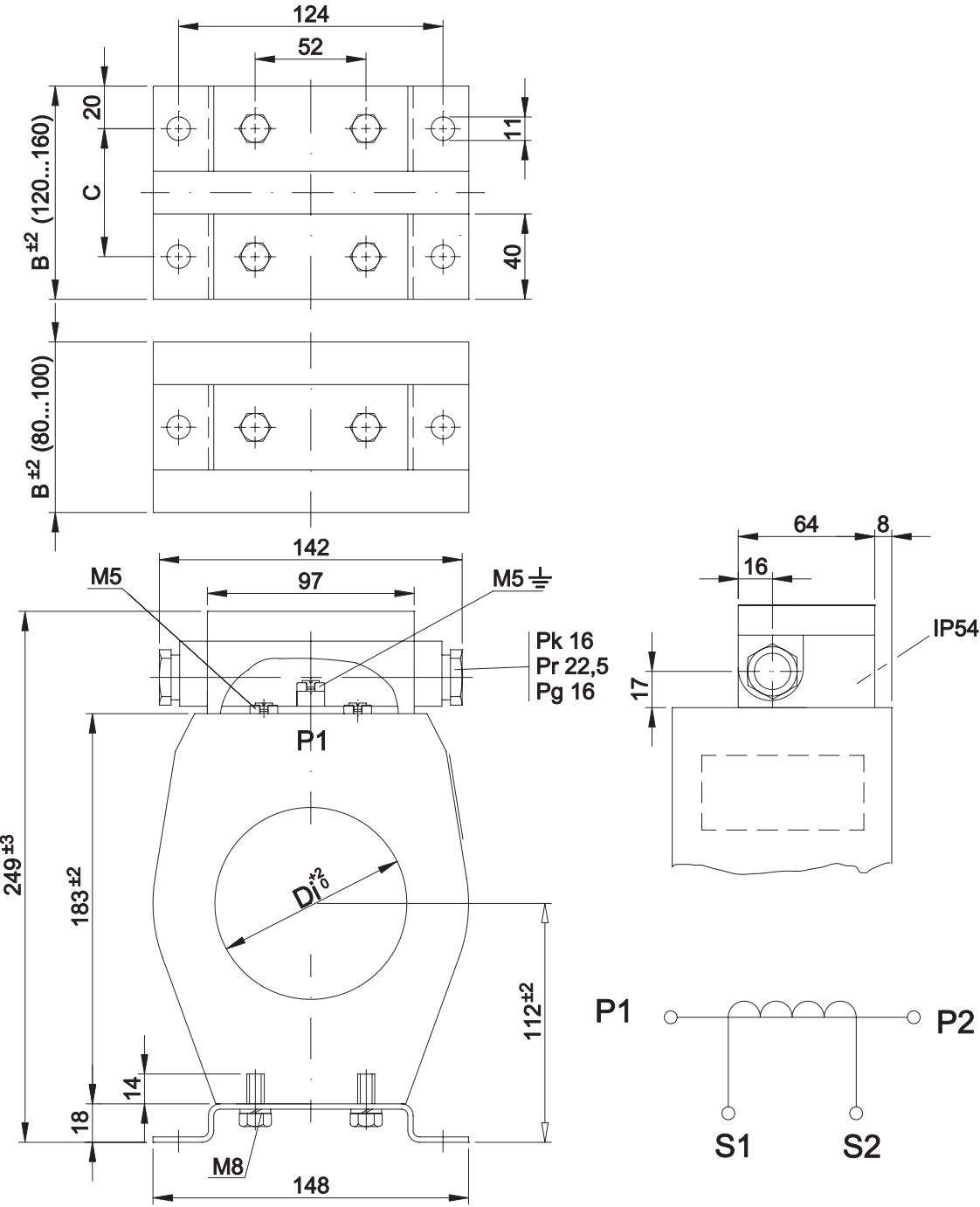
Note:

1. Transformer label
2. Cable length 1,6m
3. Screw M12 x 60
4. 5. Screw M5

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KOKU 072 G5



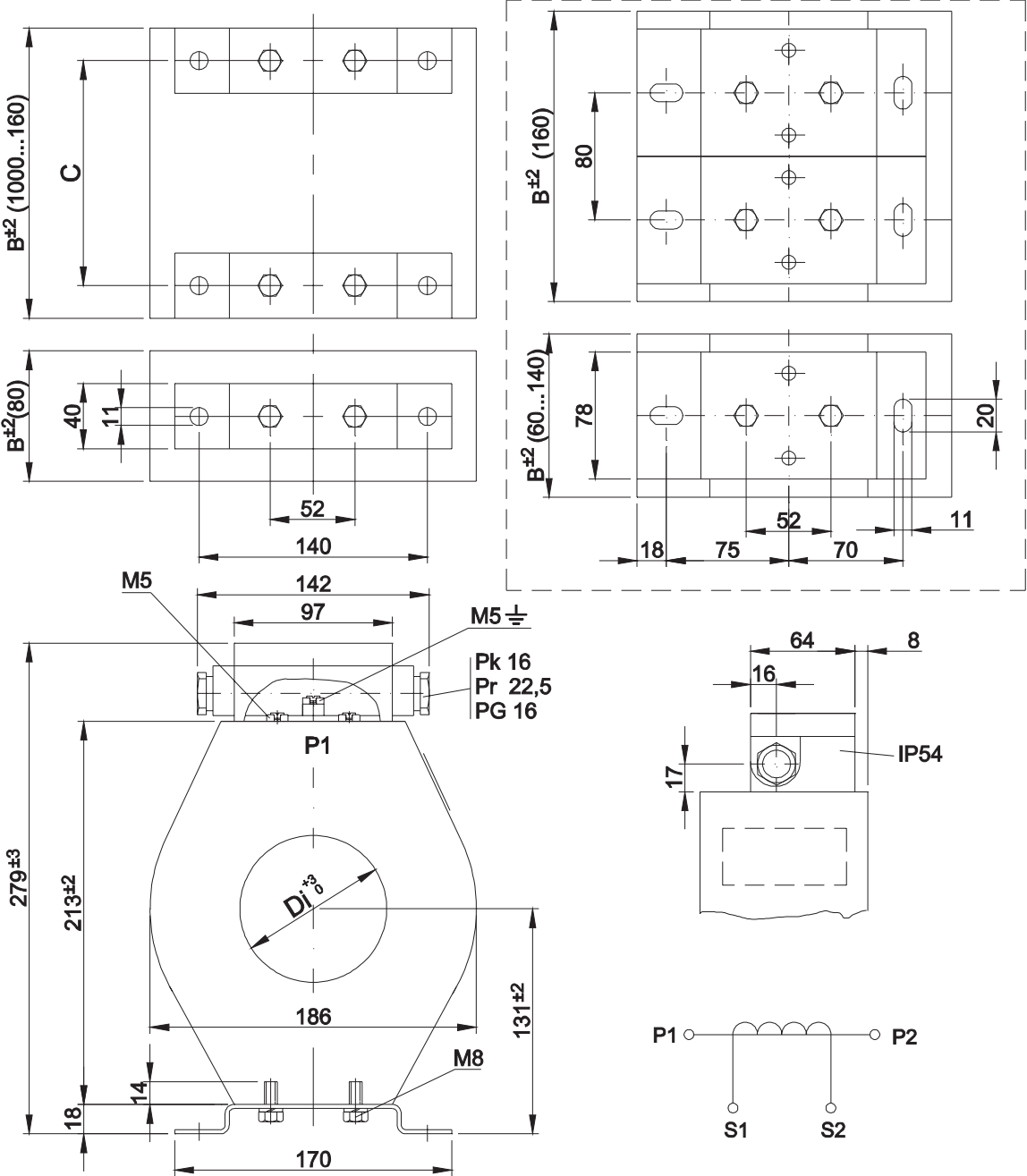
KOKU 1_C_



Di=	33	42	60	70	85
	A	B	D	E	F
B=	8	10	12	14	16
C=	80	100	120	140	160

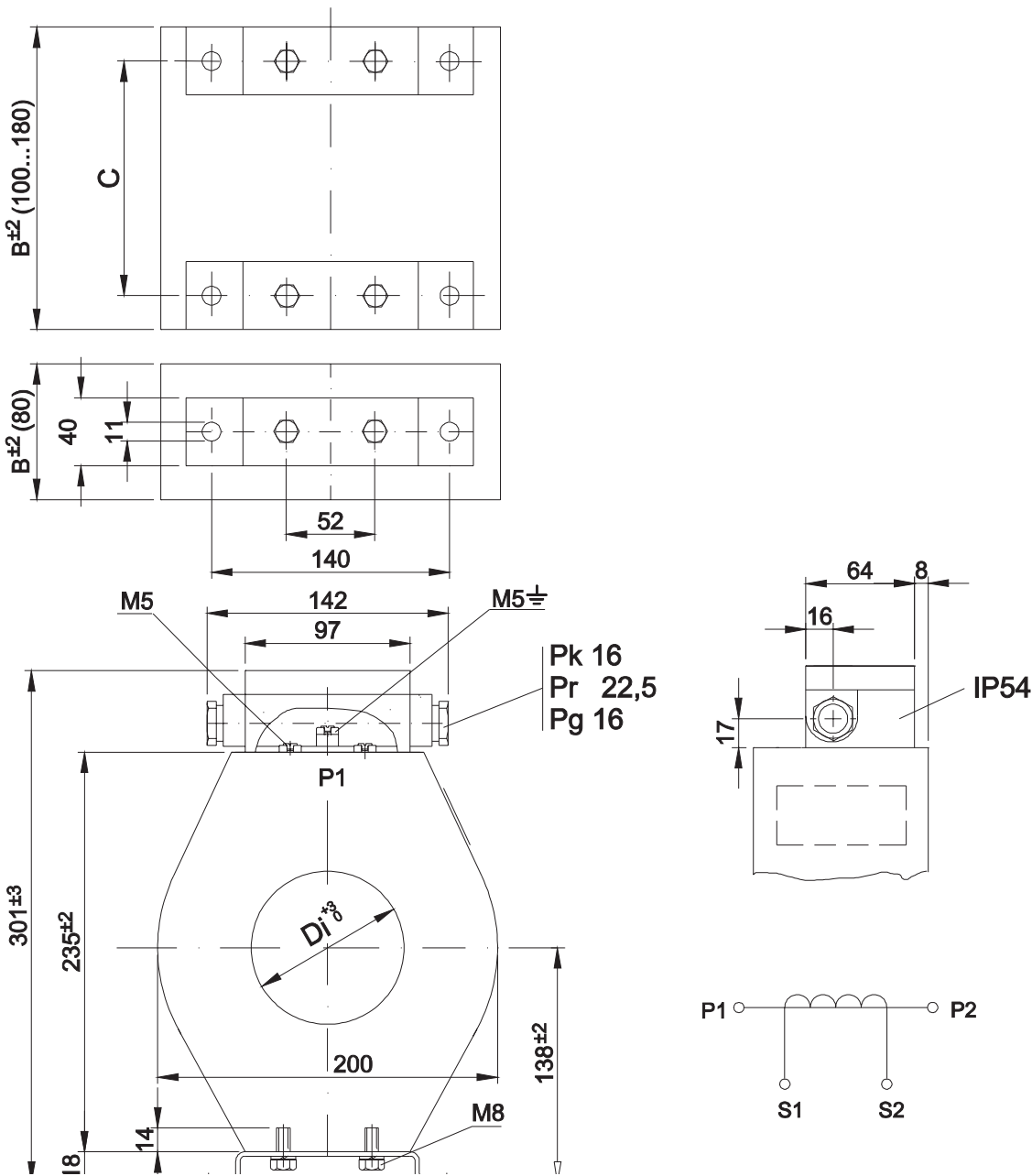
KOKU 1_C_

KOKU 1_F_

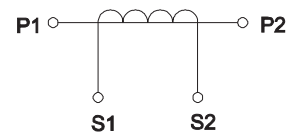


Di=	33	42	60	70	85	90	100	KOKU 1_F_
	A	B	D	E	F	G	H	
	8	10	12	14	16			
B=	80	100	120	140	160			
C=			80	100	120			

KOKU 1_H_

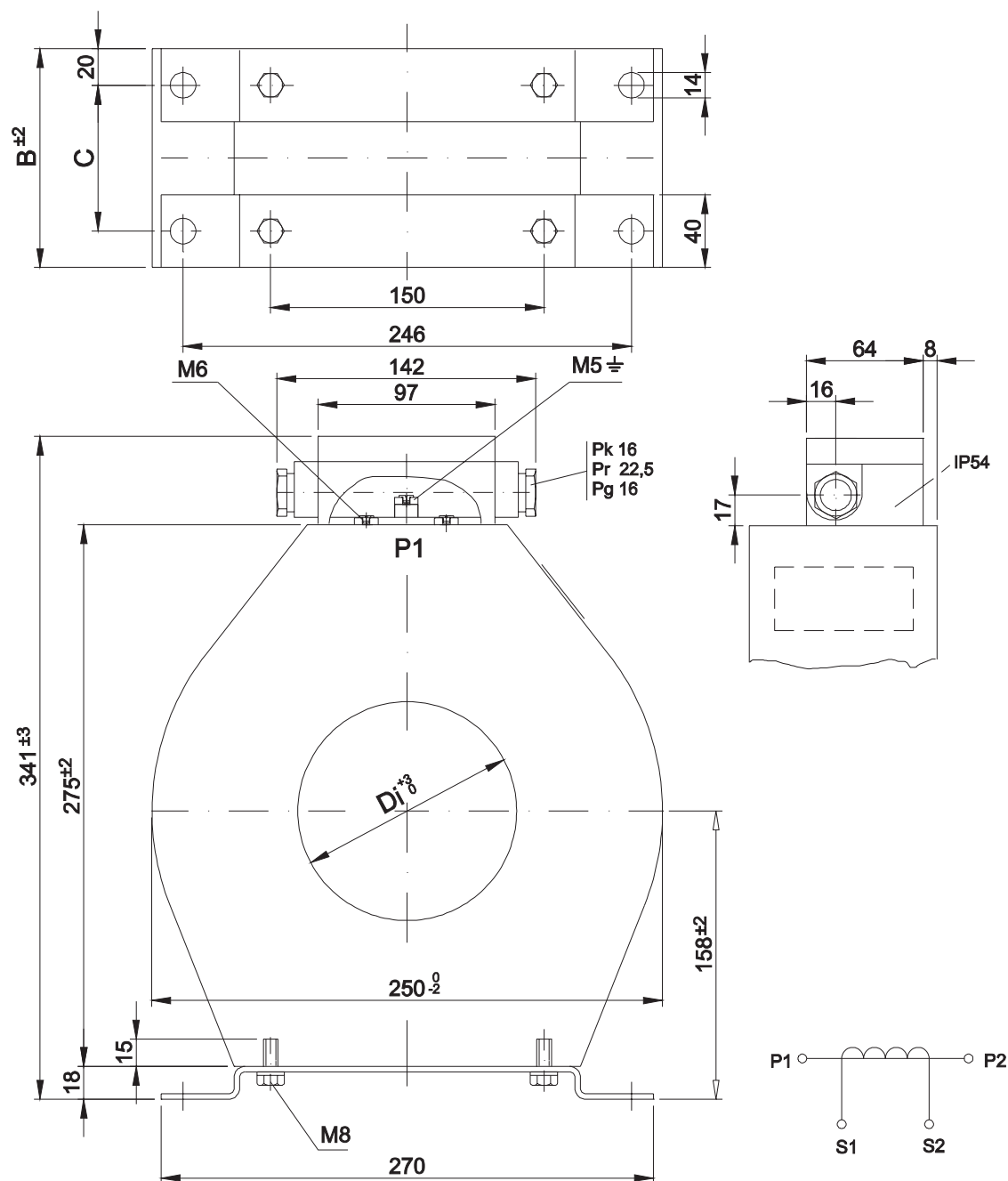


Di=	33	42	60	70	85	90	100	120	KOKU 1_H_
	A	B	D	E	F	G	H	K	
B=	8	10	12	14	16	18			
	80	100	120	140	160	180			
C=		60	80	100	120	140			

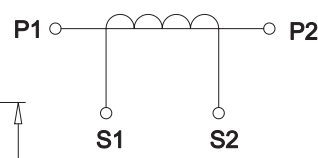


Di=	33	42	60	70	85	90	100	120				
	A	B	D	E	F	G	H	K				
B=	8	10	12	14	16	18	20	22	24	26	28	30
C=	80	100	120	140	160	180	200	220	240	260	280	300
	40	60	80	100	120	140	160	180	200	220	240	260

KOKU 1_K_



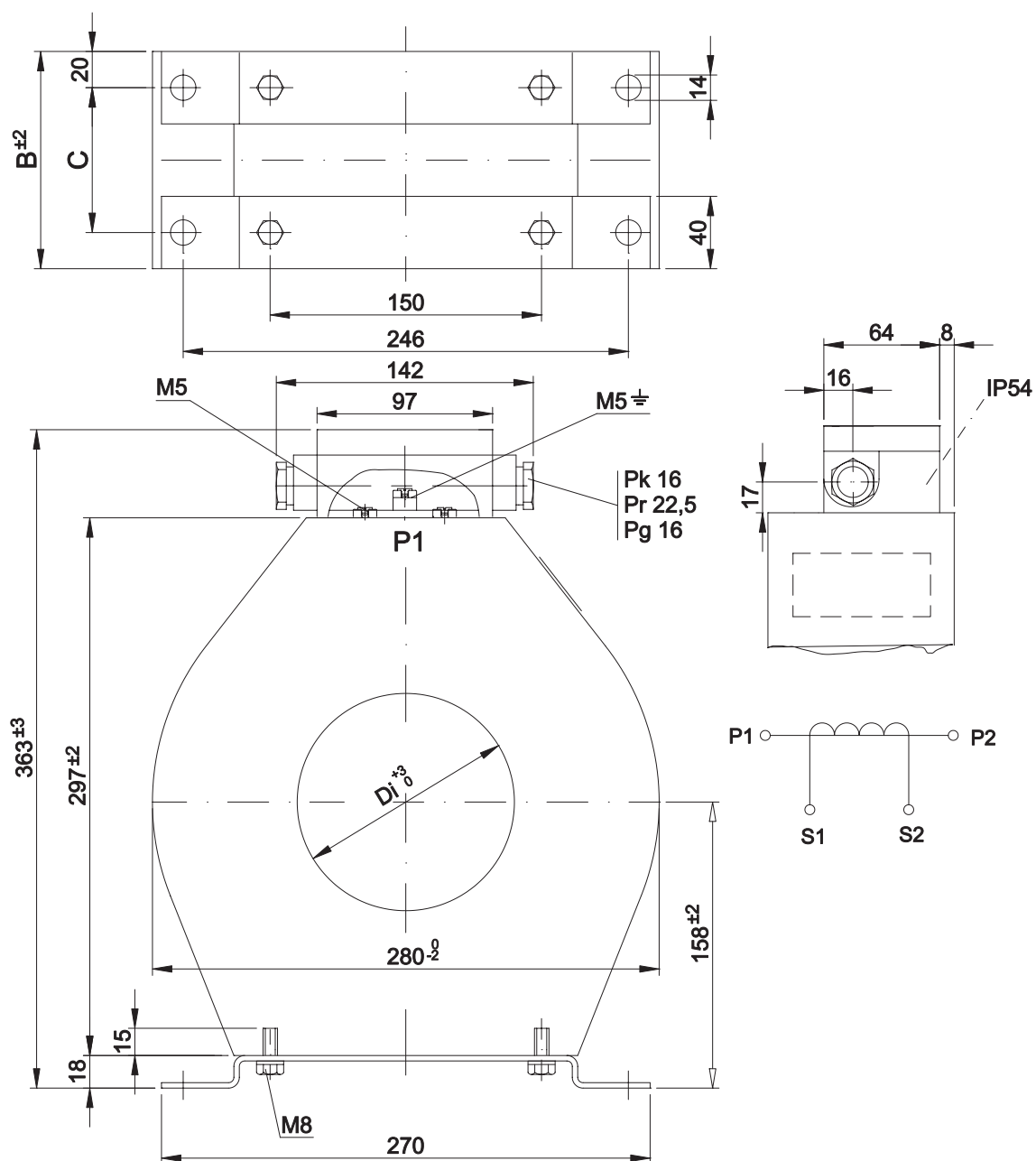
Di=	33	42	60	70	85	90	100	120	155	KOKU 1 K
	A	B	D	E	F	G	H	K	N	
	8	10	12	14	16	18	20			
B=	80	100	120	140	160	180	200			
C=	40	60	80	100	120	140	160			



Di=	33	42	60	70	85	90	100	120	155	180	200
	A	B	D	E	F	G	H	K	N	R	S
	8	10	12	14	16	18	20				
B=	80	100	120	140	160	180	200				
C=	40	60	80	100	120	140	160				

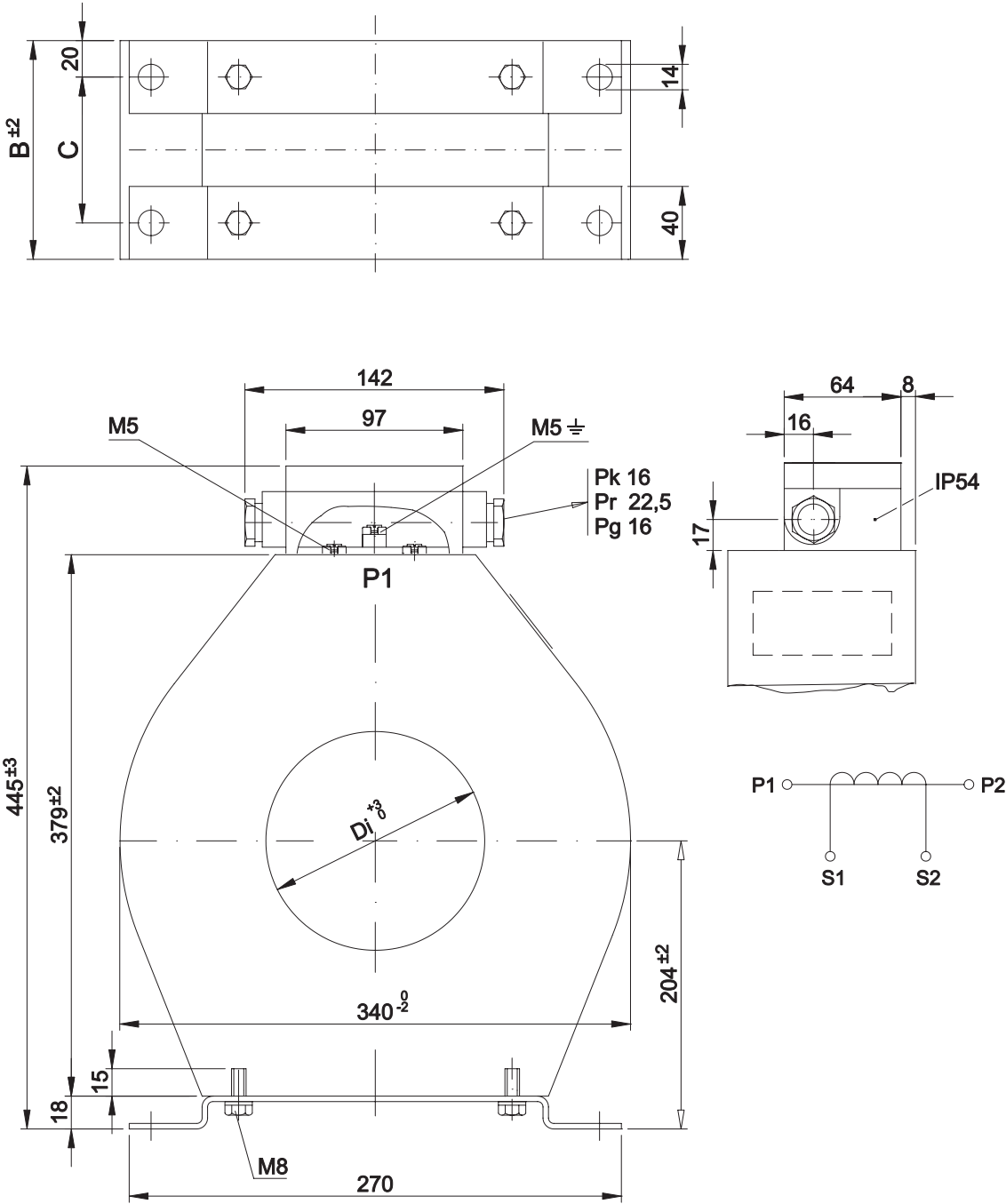
KOKU 1 L

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KOKU 1 _M_



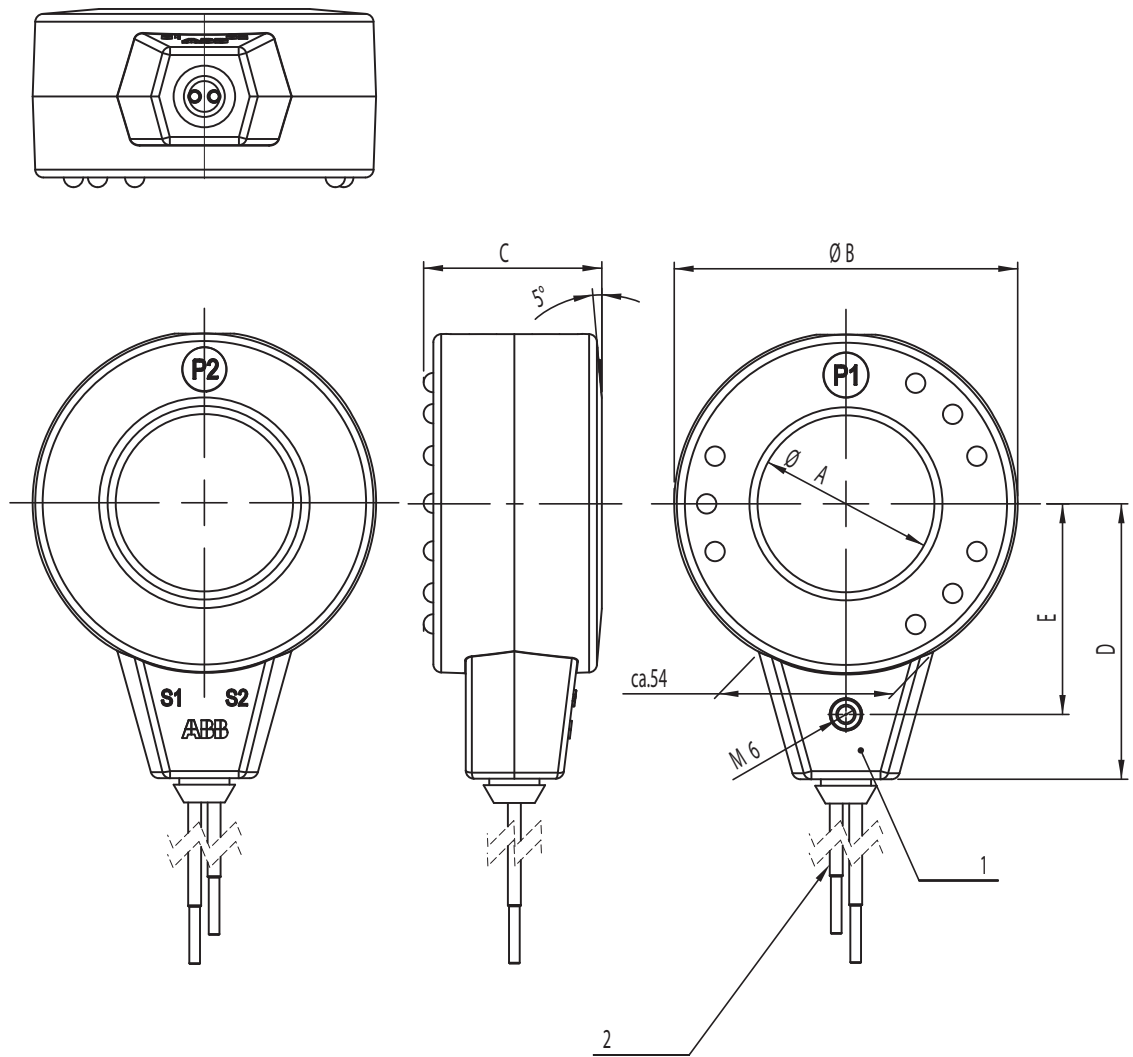
Di=	33	42	60	70	85	90	100	120	155	180	200	<div> <div>KOKU 1_M</div> <div> </div> </div>
	A	B	D	E	F	G	H	K	N	R	S	
	8	10	12	14	16	18	20	22	24			
B=	80	100	120	140	160	180	200	220	240			
C=	40	60	80	100	120	140	160	180	200			

KOKU 1_P_



Di=	42	60	70	85	90	100	120	155	180	200	250	KOKU 1_P
	B	D	E	F	G	H	K	N	R	S	U	
	8	10	12	14	16	18	20					
B=	80	100	120	140	160	180	200					
C=	40	60	80	100	120	140	160					

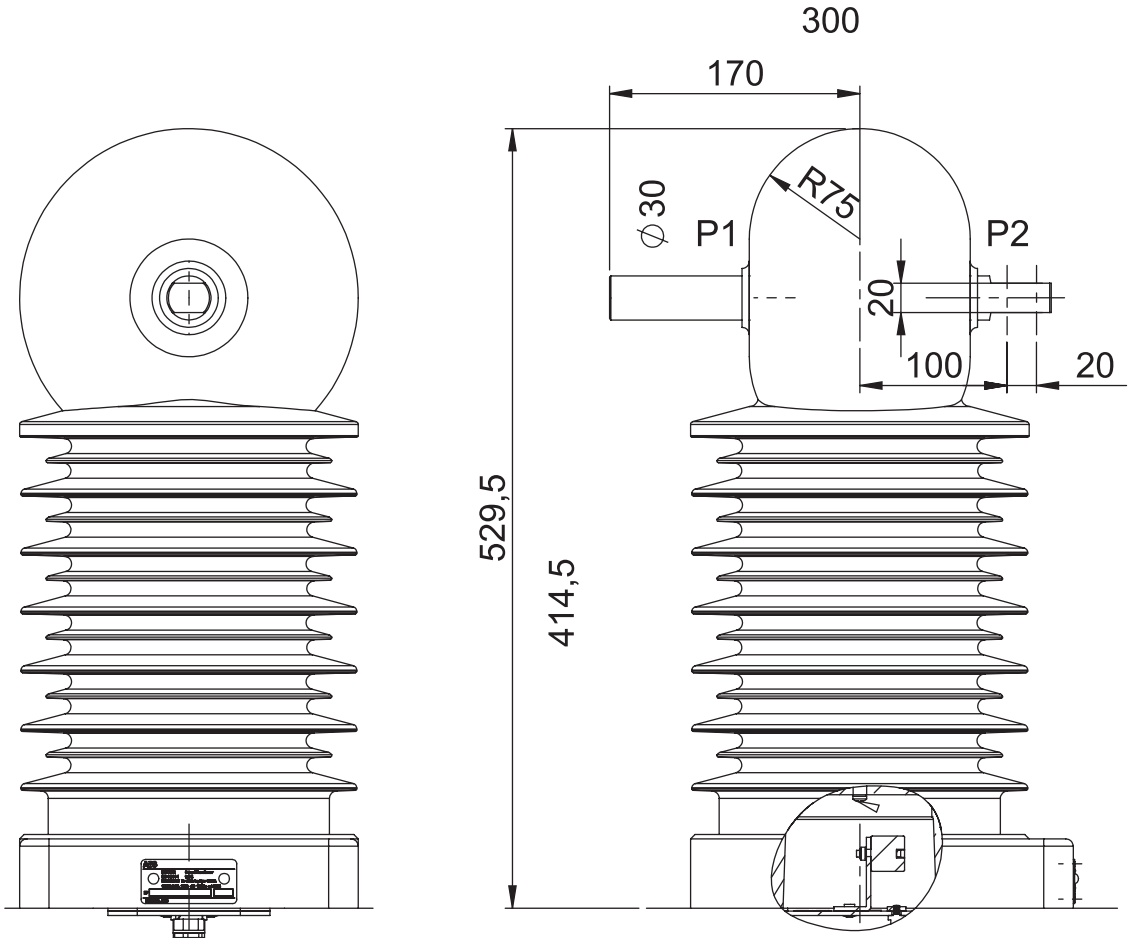
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IMT



- Note:**
- 1. Cast resin
 - 2. Cable 2x2,5 mm2 with length 4m labeled No. "1" i "2";

Ratio	A	B	C	D	E
75/5					
150/5	53	106	55	85	70
250/5					
500/5	73	136	45	100	85
1000/5	95	160	45	112	97

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EZD



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