PRODUCT PORTFOLIO

LOW VOLTAGE

- Current transformers
- Network and safety transformers
- Network autotransformers
- Self-managing voltage regulators
- Toroidal transformers

1969

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1956 MINEL FEPO

LOW-VOLTAGE CURRENT TRANSFORMERS 0.72 kV



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INTRODUCTION

DESCRIPTION

Low-voltage current transformers (for voltage levels up to 0.72 kV) are intended for transforming currents to values suitable for measuring and protection devices. Their technical characteristics comply with standards **IEC 61869-1** and **IEC 61869-2.** The transformer's active part consists of a magnetic core made of cold-rolled oriented steel and a secondary winding (except for the STEM-081 transformer which also has a primary winding). In other types of low-voltage current transformers, the primary winding is a busbar or cable that is passed through the transformer's active part. The transformer's core is encased in epoxy resin or housed in an insulating polycarbonate enclosure, which provides good electrical insulation properties and mechanical protection for the transformer, allowing for its use even under the most unfavorable operating conditions. On almost all transformers, the secondary terminals are covered by a plastic cover that can be sealed.

APPLICATION

Current transformers are designed for indoor installation in electrical distribution panels and systems with a rated voltage of up to 0.72 kV; we also manufacture ST-081-type transformers for outdoor installation, specifically the ST-081SM model. Current transformers are used to supply current circuits for metering or protective devices. Standard versions of current-measuring transformers have a continuous overload capacity of 20% (ext. 120%). Upon customer request, we can manufacture certain models with an even wider measurement range.

INSTALLATION

Transformers can be mounted in any position on rectangular-cross-section busbars or on round-cross-section conductors. The dimensions of the primary conductors are selected based on the transformer openings specified in the dimensional drawings. Transformers can also be mounted on a special stand using two bolts so that the primary conductor passes freely through the transformer opening.

HANDLING

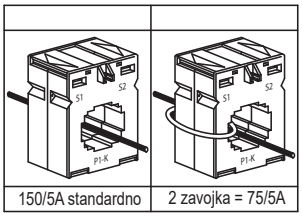
Transformers must not be operated with open secondary terminals, as life-threatening voltages can appear on them, and serious insulation damage can occur.

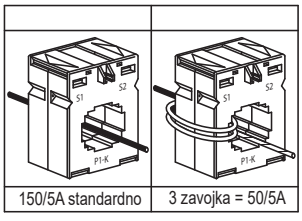
SPECIAL TYPES OF CURRENT TRANSFORMERS

Among these types of transformers, summation-type current transformers, current transformers for differential protection, and split-core cable transformers are particularly noteworthy. All of these transformers are discussed in detail later in this catalog.

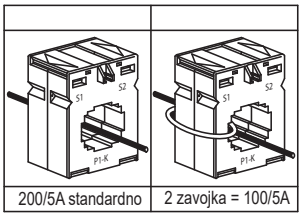
IMPROVEMENT OF THE ACCURACY CLASS OF CURRENT TRANSFORMERS WITH PRIMARY-CONDUCTOR OPENING FOR VOLTAGES UP TO 0. 72 kV

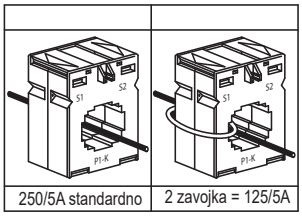
If a better accuracy class is desired of current transformers with an opening for the primary conductor, which is often the case with low primary currents, this is achieved by looping the primary conductor through the transformer's opening multiple times.

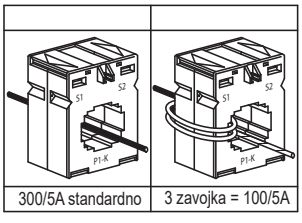




Example: Current transformer with transformation ratio 200/5 A/A can also be used as a 100/5 A/A transformer, provided the primary conductor is passed through its core twice. In this case, the transformer's characteristics remain the same. Transformers for this mode of use are specially factory-marked. Some examples of this type of transformer's use are shown in the diagrams on the left.



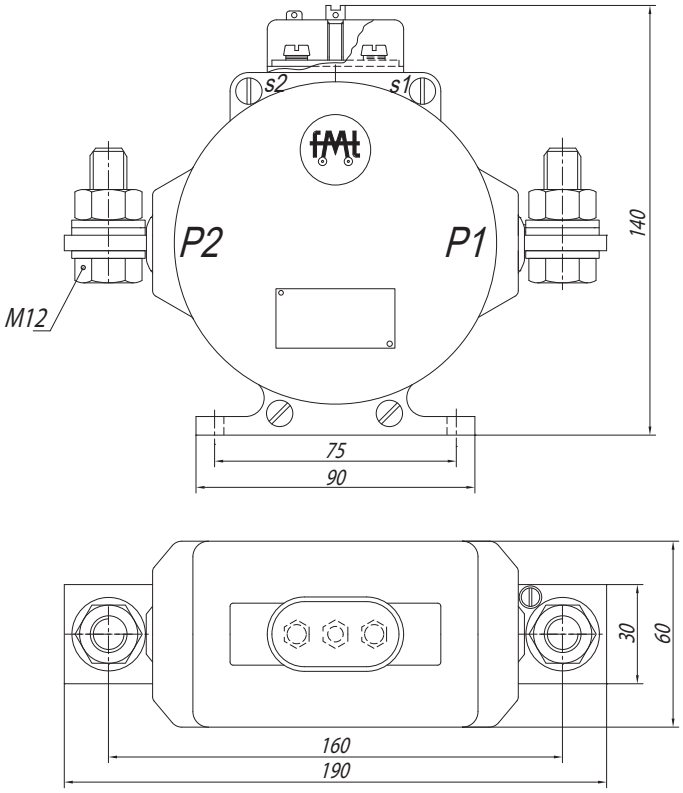




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STEM 081-1





TECHNICAL CHARACTERISTICS FOR **STEM 081-1**

TECHNICAL DATA	STEM 081-1
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated primary current (A)	1 to 250
Rated secondary current (A)	5 (or 1)
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th}
Rated continuous thermal current	I_{cth}=1,2 I_n
Security factor	FS 5
Temperature insulation class	E/B
Mounting	Indoor
Type of basic insulation	Polycarbonate
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~1,5

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.2	0.5	1
1; 5; 7.5; 10; 12.5; 15; 20; 25; 30; 40; 50; 60; 75; 100; 125; 150; 200; 250	2.5	●	●	●
	5	●	●	●
	10	●	●	●
	15	–	●	●

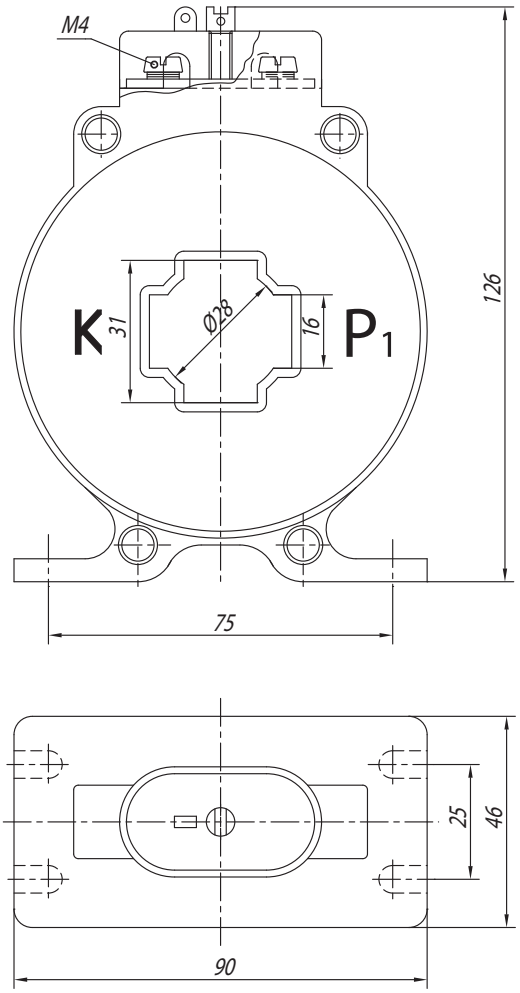
At the customer's request, the characteristics can be different.

The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STEN 081-1.1





TECHNICAL CHARACTERISTICS FOR **STEN 081-1.1**

TECHNICAL DATA	STEN 081-1.1
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	Indoor
Type of basic insulation	Polycarbonate
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~0,95

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
200; 250	2.5	●	●	●
	5	●	●	●
	10	–	–	●
300; 400	2.5	●	●	●
	5	●	●	●
	10	●	●	●
	15	–	–	●
500; 600	2.5	●	●	●
	5	●	●	●
	10	●	●	●
	15	●	●	●

The STEN 081-1.1 model has a Ø28mm, 31x16mm opening.

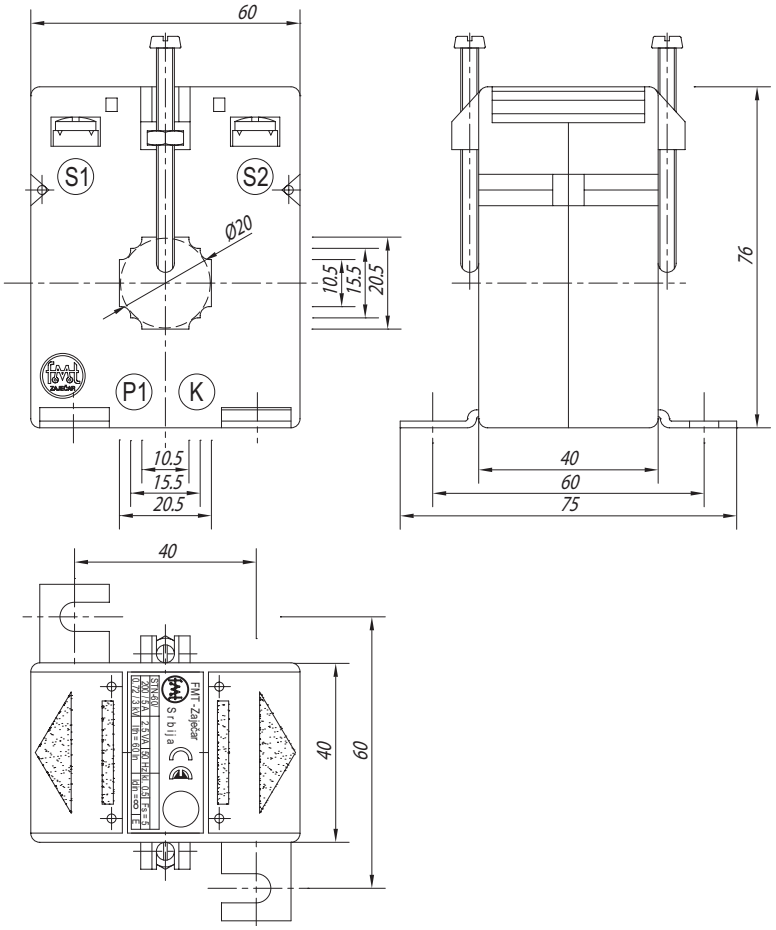
At the customer's request, the characteristics can be different.

The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STN 60/20





TECHNICAL CHARACTERISTICS FOR **STN 60/20**

TECHNICAL DATA	STN 60/20
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=60 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Polycarbonate
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~0,48

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
75	2.5	–	●	●
100	2.5	–	●	●
	5	–	–	●
150	2.5	●	●	●
	5	–	●	●
200	2.5	●	●	●
	5	●	●	●
	10	–	●	●
250; 300	2.5	●	●	●
	5	●	●	●
	10	●	●	●

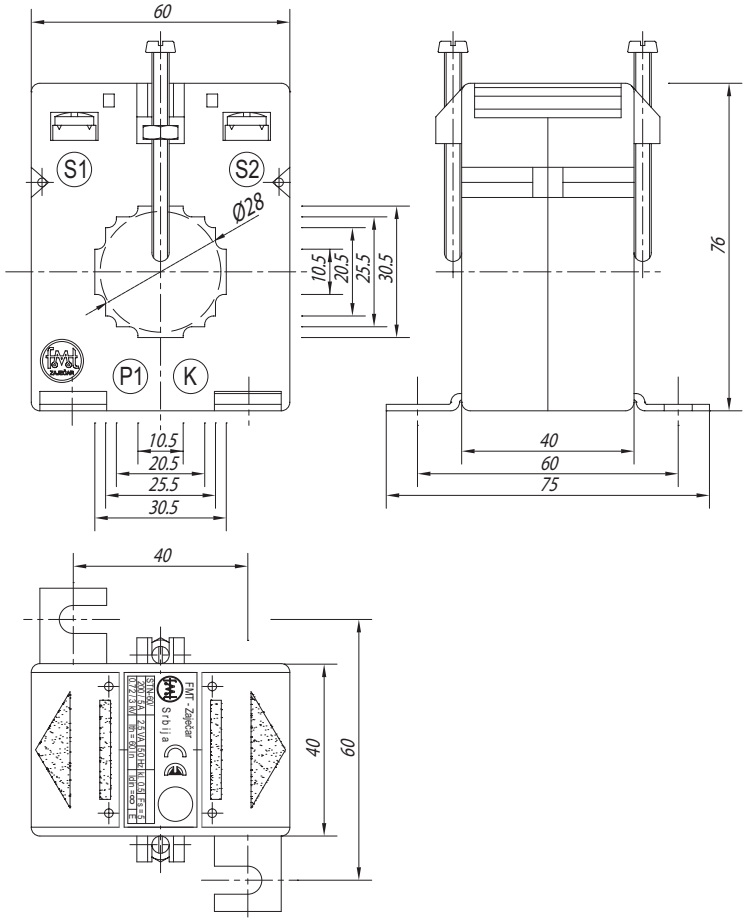
At the customer's request, the characteristics can be different.

The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STN 60/30





TECHNICAL CHARACTERISTICS FOR **STN 60/30**

TECHNICAL DATA	STN 60/30
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=60 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Polycarbonate
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~0,35

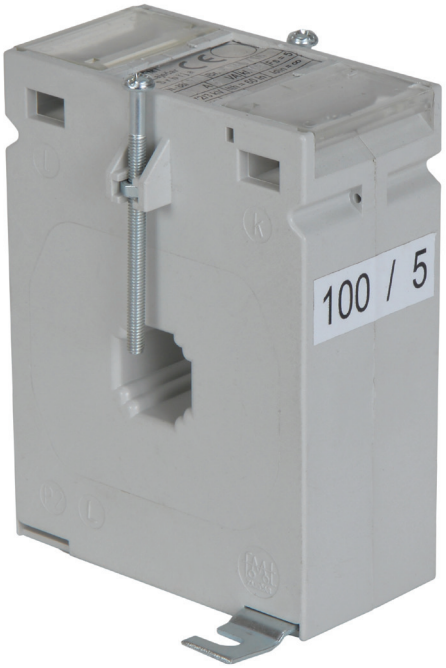
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
150	2.5	–	●	●
200	2.5	●	●	●
	5	–	●	●
250	2.5	●	●	●
	5	●	●	●
300	2.5	●	●	●
	5	●	●	●
400; 500; 600	2.5	●	●	●
	5	●	●	●
	10	●	●	●

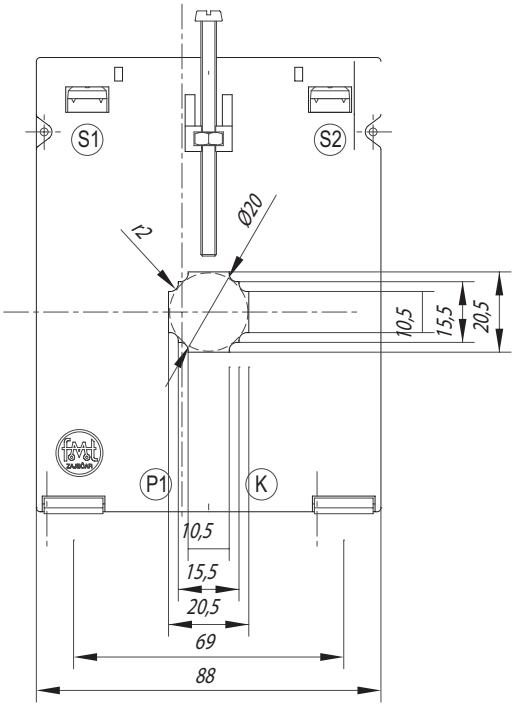
At the customer's request, the characteristics can be different.

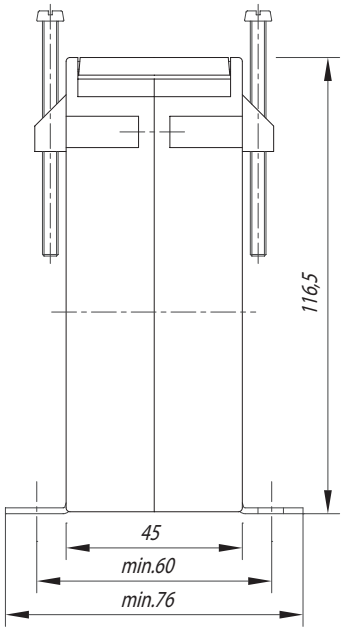
The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STN 88/20







TECHNICAL CHARACTERISTICS FOR **STN 88/20**

TECHNICAL DATA	STN 88/20
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=60 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Polycarbonate
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~1,3

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
50	2.5	–	●	●
75	2.5	●	●	●
	5	-	●	●
100	2.5	●	●	●
	5	●	●	●
	10	–	–	●
150	2.5	●	●	●
	5	●	●	●
	10	–	●	●
200; 250; 300	2.5	●	●	●
	5	●	●	●
	10	●	●	●

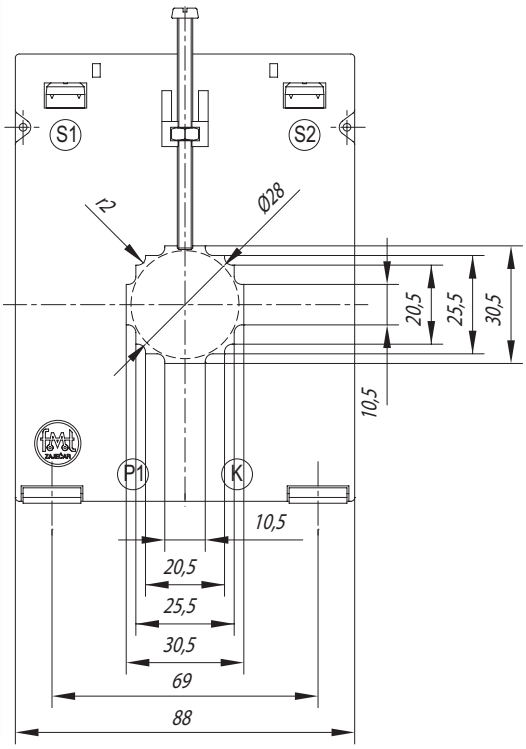
At the customer's request, the characteristics can be different.

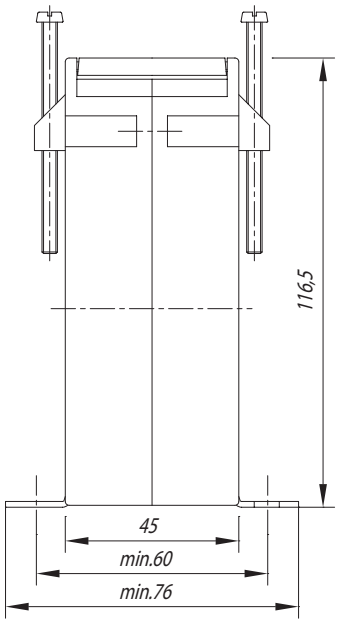
The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STN 88/30







TECHNICAL CHARACTERISTICS FOR **STN 88/30**

TECHNICAL DATA	STN 88/30
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=60 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Polycarbonate
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~1,2

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
50	2.5	–	●	●
75	2.5	●	●	●
	5	–	–	●
100	2.5	●	●	●
	5	●	●	●
	10	–	–	●
150	2.5	●	●	●
	5	●	●	●
	10	–	●	●
200; 250; 300; 400; 500; 600	2.5	●	●	●
	5	●	●	●
	10	●	●	●

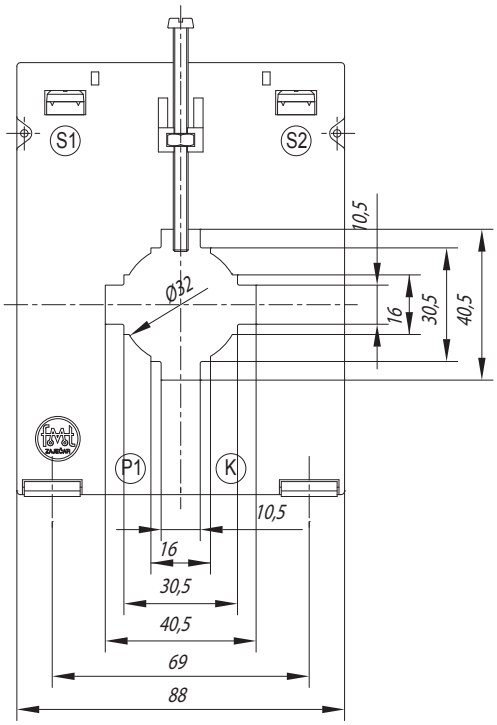
At the customer's request, the characteristics can be different.

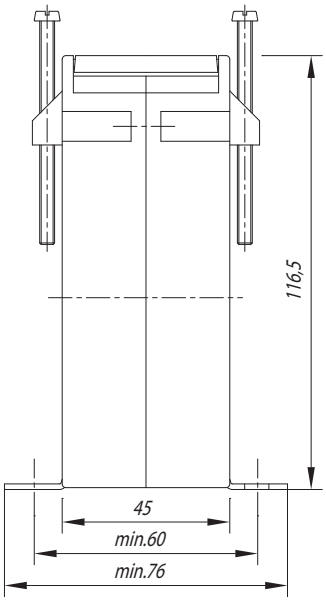
The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STN 88/40







TECHNICAL CHARACTERISTICS FOR **STN 88/40**

TECHNICAL DATA	STN 88/40
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=60 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Polycarbonate
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~1,1

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
100	2.5	–	●	●
	5	–	–	●
150	2.5	●	●	●
	5	●	●	●
	10	–	–	●
200	2.5	●	●	●
	5	●	●	●
	10	–	●	●
250; 300; 400; 500; 600; 750; 800	2.5	●	●	●
	5	●	●	●
	10	●	●	●

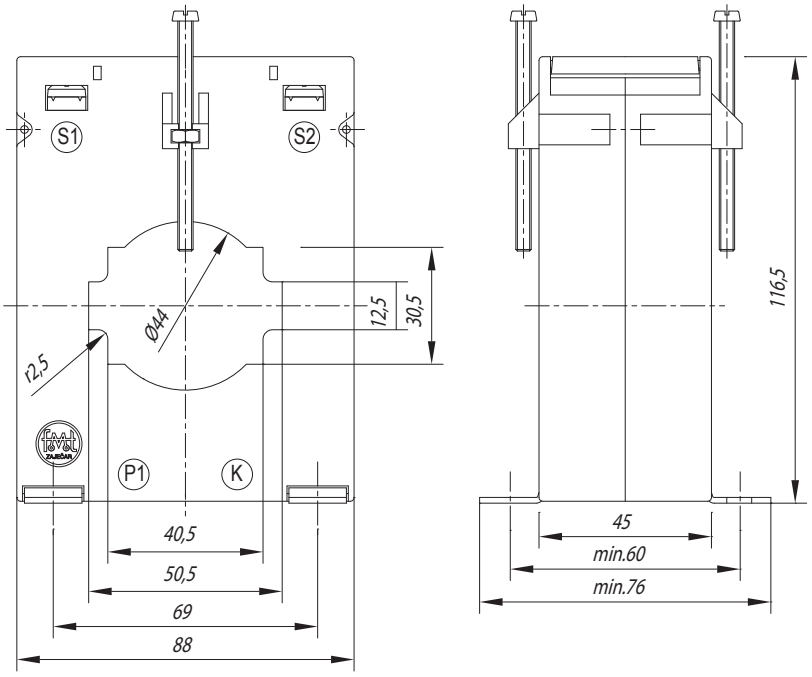
At the customer's request, the characteristics can be different.

The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STN 88/50





TECHNICAL CHARACTERISTICS FOR **STN 88/50**

TECHNICAL DATA	STN 88/50
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=60 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Polycarbonate
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~0,8

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
150	2.5	●	●	●
	5	●	●	●
200	2.5	●	●	●
	5	●	●	●
	10	–	●	●
250; 300; 400; 500 600; 750; 800; 1000	2.5	●	●	●
	5	●	●	●
	10	●	●	●

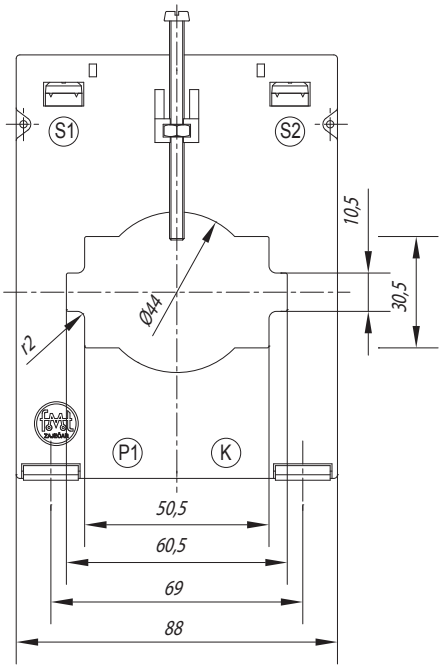
At the customer's request, the characteristics can be different.

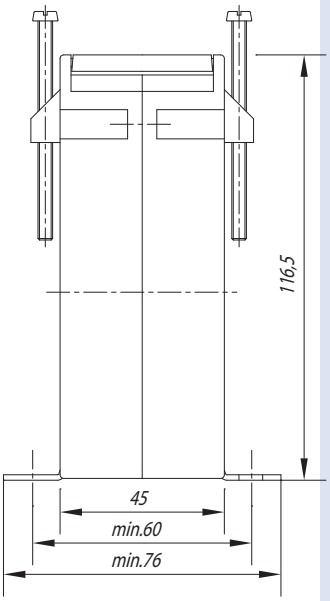
The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STN 88/60







TECHNICAL CHARACTERISTICS FOR **STN 88/60**

TECHNICAL DATA	STN 88/60
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=60 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Polycarbonate
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~0,65

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
150	2.5	●	●	●
	5	–	●	●
200	2.5	●	●	●
	5	●	●	●
	10	–	–	●
250	2.5	●	●	●
	5	●	●	●
	10	–	●	●
300	2.5	●	●	●
	5	●	●	●
	10	–	●	●
400; 500; 600; 750; 800; 1000; 1200; 1250	2.5	●	●	●
	5	●	●	●
	10	●	●	●

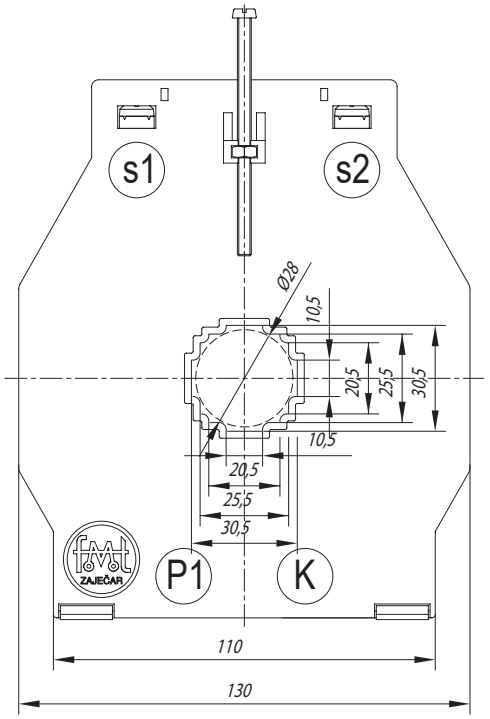
At the customer's request, the characteristics can be different.

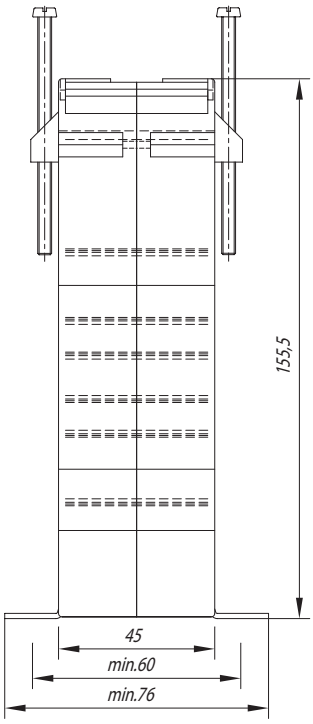
The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STN 130/30







TECHNICAL CHARACTERISTICS FOR **STN 130/30**

TECHNICAL DATA	STN 130/30
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=60 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Polycarbonate
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~3,2

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
50	2.5	●	●	●
	5	●	●	●
	10	–	–	●
75	2.5	●	●	●
	5	●	●	●
	10	–	–	●
100	2.5	●	●	●
	5	●	●	●
	10	–	●	●
150	2.5	●	●	●
	5	●	●	●
	10	–	●	●
200; 250; 300; 400; 500; 600	2.5	●	●	●
	5	●	●	●
	10	●	●	●

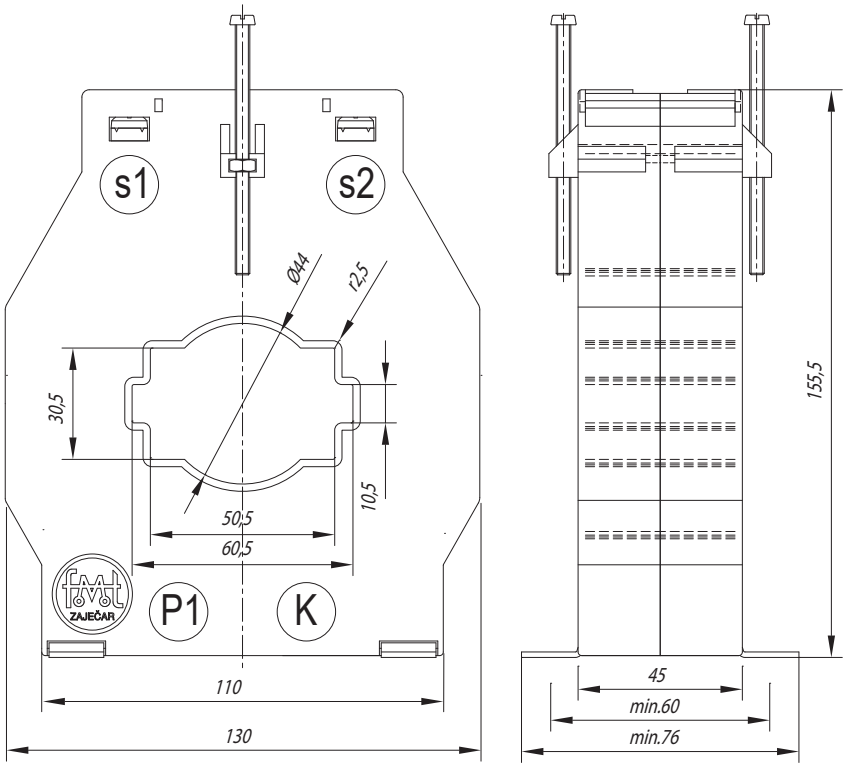
At the customer's request, the characteristics can be different.

The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STN 130/60





TECHNICAL CHARACTERISTICS FOR **STN 130/60**

TECHNICAL DATA	STN 130/60
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=60 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Polycarbonate
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~2,7

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
150; 200	2.5	●	●	●
	5	●	●	●
	10	–	–	●
250; 300; 400; 500; 600; 750; 800; 1000; 1200; 1250	2.5	●	●	●
	5	●	●	●
	10	●	●	●

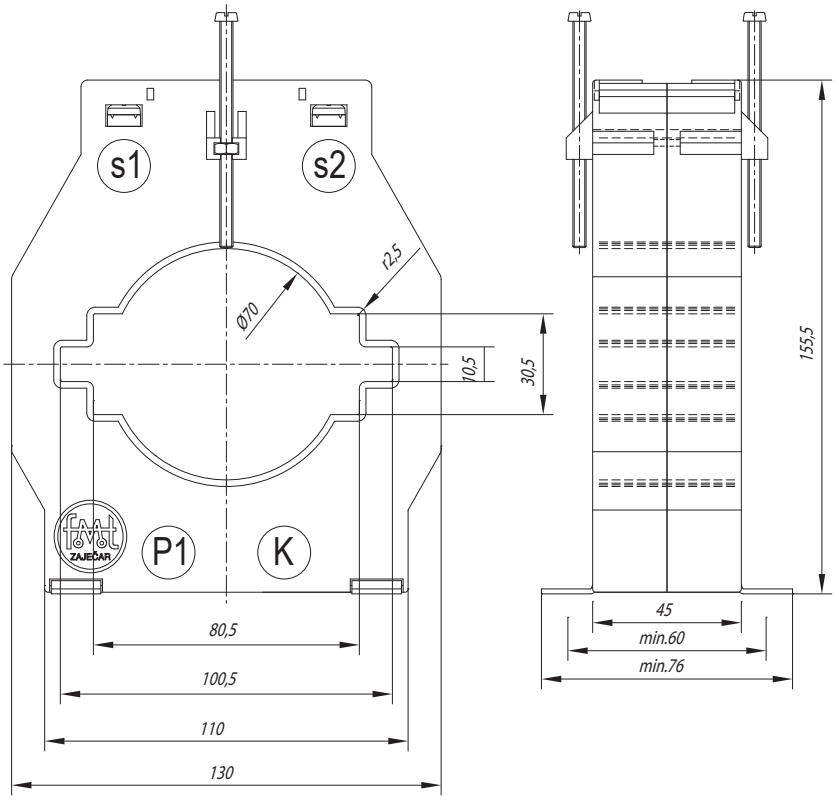
At the customer's request, the characteristics can be different.

The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STN 130/100





TECHNICAL CHARACTERISTICS FOR **STN 130/100**

TECHNICAL DATA	STN 130/100
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=60 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Polycarbonate
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~1,2

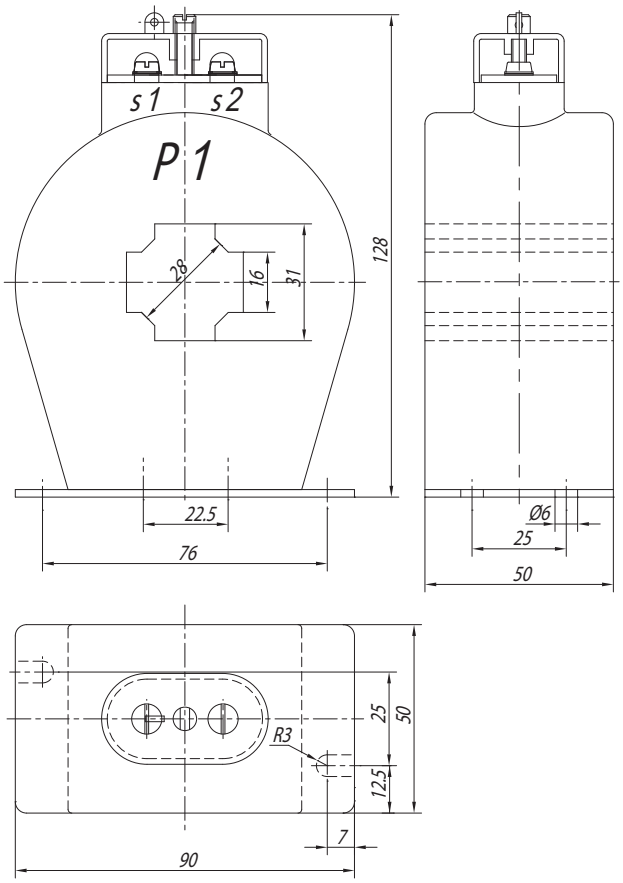
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
800; 1000; 1200; 1250; 1500; 2000; 2500; 3000; 4000	2.5	●	●	●
	5	●	●	●
	10	●	●	●
	15	●	●	●
	30	●	●	●

At the customer's request, the characteristics can be different.

The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STEN 081-1.2, STEN 081-1.3, STEN 081-1.4





STEN 081-1.2

TECHNICAL CHARACTERISTICS FOR **STEN 081-1.2, STEN 081-1.3, STEN 081-1.4**

TECHNICAL DATA	STEN 081-1.2; 1.3, 1.4
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	Indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~0,95

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
200; 250	2.5	●	●	●
	5	●	●	●
	10	–	–	●
300; 400	2.5	●	●	●
	5	●	●	●
	10	●	●	●
	15	–	–	●
500; 600	2.5	●	●	●
	5	●	●	●
	10	●	●	●
	15	●	●	●

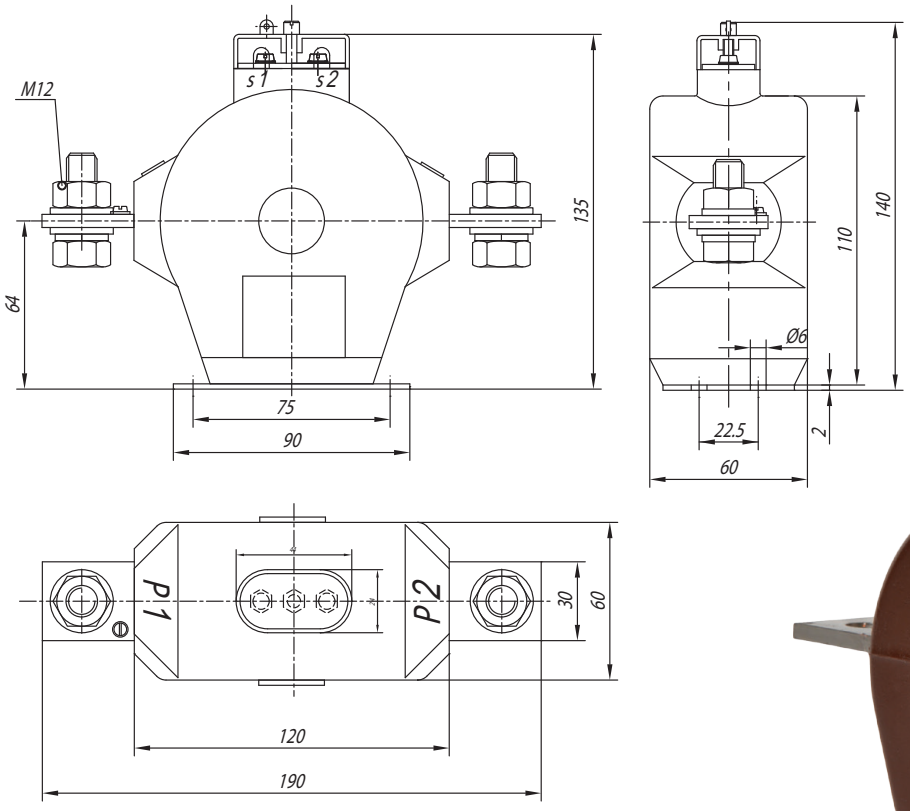
At the customer's request, the characteristics can be different.

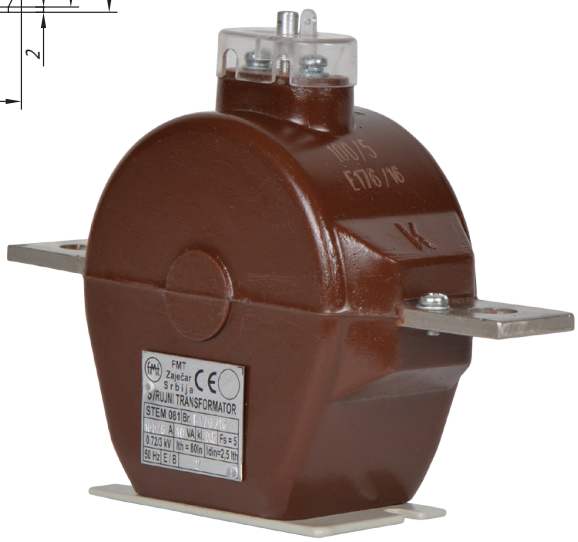
The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

The STEN 081-1.2 model has a Ø28 mm, 31x16mm opening.
The STEN 081-1.3 model has a Ø33mm opening.
The STEN 081-1.4 model has a Ø43mm opening.

CONTENTS

STEM 081-2





TECHNICAL CHARACTERISTICS FOR **STEM 081-2**

TECHNICAL DATA	STEM 081-2
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated primary current (A)	1 to 250
Rated secondary current (A)	5 (or 1)
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th}
Rated continuous thermal current	I_{cth}=1,2 I_n
Security factor	FS 5
Temperature insulation class	E/B
Mounting	Indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~1,5

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.2	0.5	1
1; 5; 7.5; 10; 12.5; 15; 20; 25; 30; 40; 50; 60; 75; 100; 125; 150; 200; 250	2.5	●	●	●
	5	●	●	●
	10	●	●	●
	15	–	●	●

At the customer's request, the characteristics can be different.

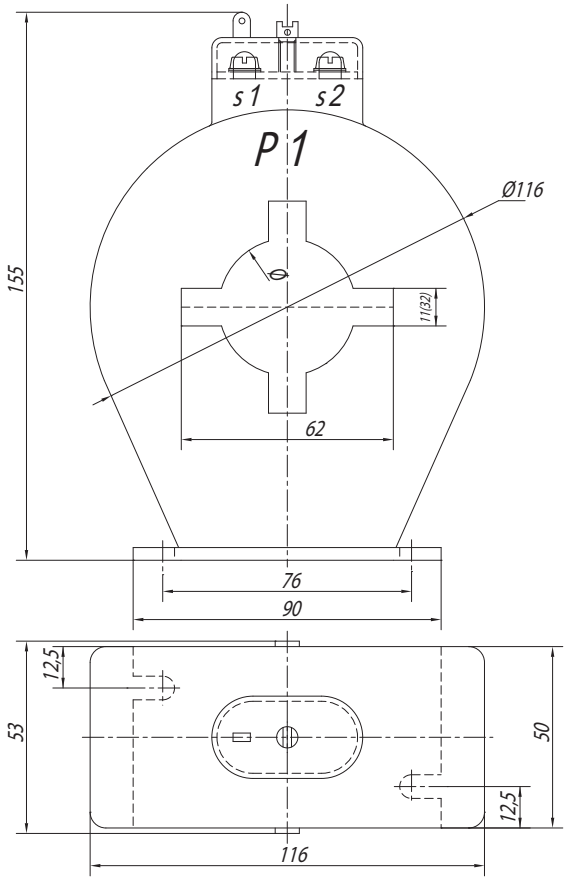
The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STEN 081-2.1, STEN 081-2.2



STEN 081-2.1



TECHNICAL CHARACTERISTICS FOR **STEN 081-2.1, STEN 081-2.2**

TECHNICAL DATA	STEN 081-2.1; STEN 081-2.2
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~1,8

STEN 081-2.1				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
150; 200	2.5	●	●	●
250; 300; 400	2.5	●	●	●
	5	●	●	●
500; 600; 750; 800; 1000; 1200	2.5	●	●	●
	5	●	●	●
	10	●	●	●

STEN 081-2.2				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
200; 250	2.5	●	●	●
300; 400	2.5	●	●	●
	5	●	●	●
500; 600; 750; 800; 1000; 1200; 1500	2.5	●	●	●
	5	●	●	●
	10	●	●	●

The STEN 081-2.1 model has a Ø40mm, 62x11mm opening.
The STEN 081-2.2 model has a Ø45mm, 62x32mm opening.

At the customer's request, the characteristics can be different.

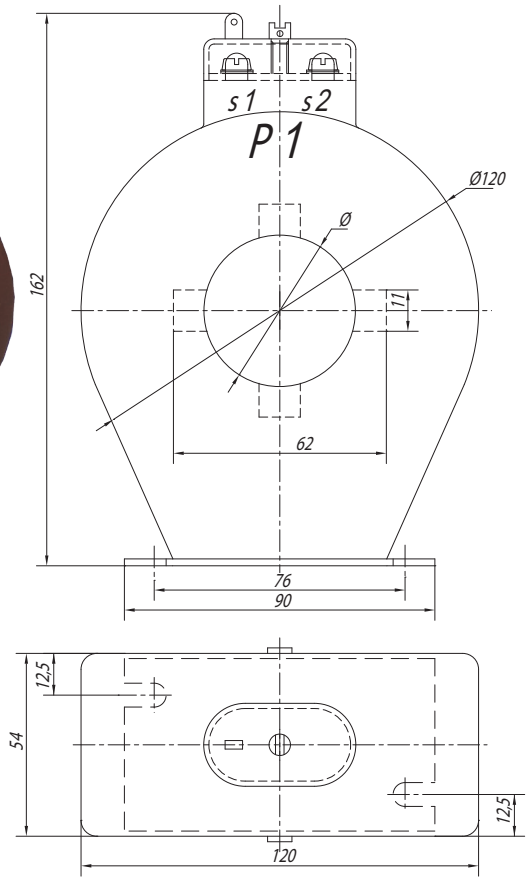
The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STEN 081-3.1, STEN 081-3.2, STEN 081-3.3



STEN 081-3.2





STEN 081-3.3

TECHNICAL CHARACTERISTICS FOR **STEN 081-3.1, STEN 081-3.2, STEN 081-3.3**

TECHNICAL DATA	STEN 081-3.1, STEN 081-3.2, STEN 081-3.3
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~2,5

STEN 081-3.1				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
300; 400; 500; 600	2.5	●	●	●
	5	●	●	●
	10	●	●	●
	15	●	●	●

STEN 081-3.2, STEN 081-3.3				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
600; 750; 800; 1000; 1200	2.5	●	●	●
	5	●	●	●
	10	●	●	●
	15	●	●	●

The STEN 081-3.1 model has a Ø44mm opening.
The STEN 081-3.2 model has a Ø52mm opening.
The STEN 081-3.3 model has a Ø51mm, 62x11mm opening.

At the customer's request, the characteristics can be different.

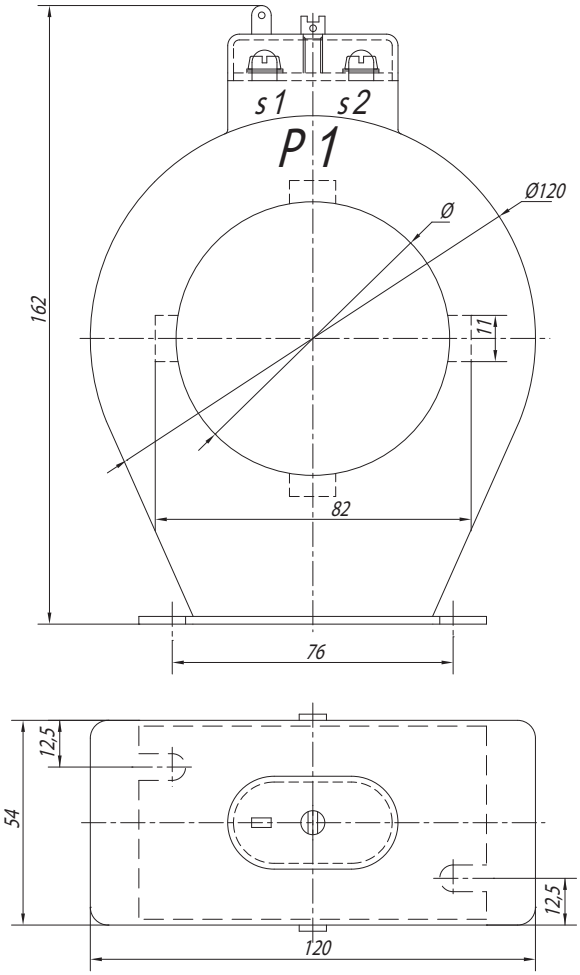
The transformer's mass depends on the transformation ratio, accuracy class and power, and may vary.

CONTENTS

STEN 081-3.4, STEN 081-3.5



STEN 081-3.5



TECHNICAL CHARACTERISTICS FOR **STEN 081-3.4, STEN 081-3.5**

TECHNICAL DATA	STEN 081-3.4, STEN 081-3.5
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~1,12

STEN 081-3.4, STEN 081-3.5				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
1000; 1200; 1250; 1500; 1600	2.5	●	●	●
	5	●	●	●
	10	●	●	●
	15	●	●	●

The STEN 081-3.4 model has a Ø82mm opening.
The STEN 081-3.5 model has a Ø71mm, 82x11mm opening.

At the customer's request, the characteristics can be different.

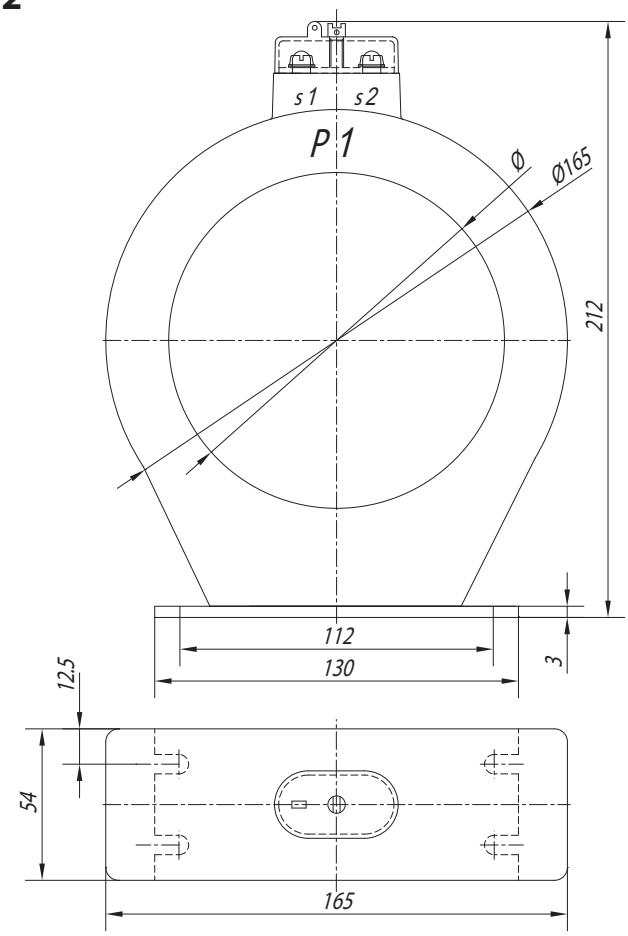
The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STEN 081-4.1, STEN 081-4.2



STEN 081-4.2



TECHNICAL CHARACTERISTICS FOR **STEN 081-4.1, STEN 081-4.2**

TECHNICAL DATA	STEN 081-4.1, STEN 081-4.2
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~3

STEN 081-4.1				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
750; 800; 1000; 1200; 1250; 1500; 1600; 2000; 2500; 3000	2.5	●	●	●
	5	●	●	●
	10	●	●	●
	15	●	●	●
	30	●	●	●

STEN 081-4.2				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
1000; 1200; 1250; 1500; 1600; 2000; 2500; 3000; 4000	2.5	●	●	●
	5	●	●	●
	10	●	●	●
	15	●	●	●
	30	●	●	●

The STEN 081-4.1 model has a Ø102mm opening.

The STEN 081-4.2 model has a Ø120mm opening.

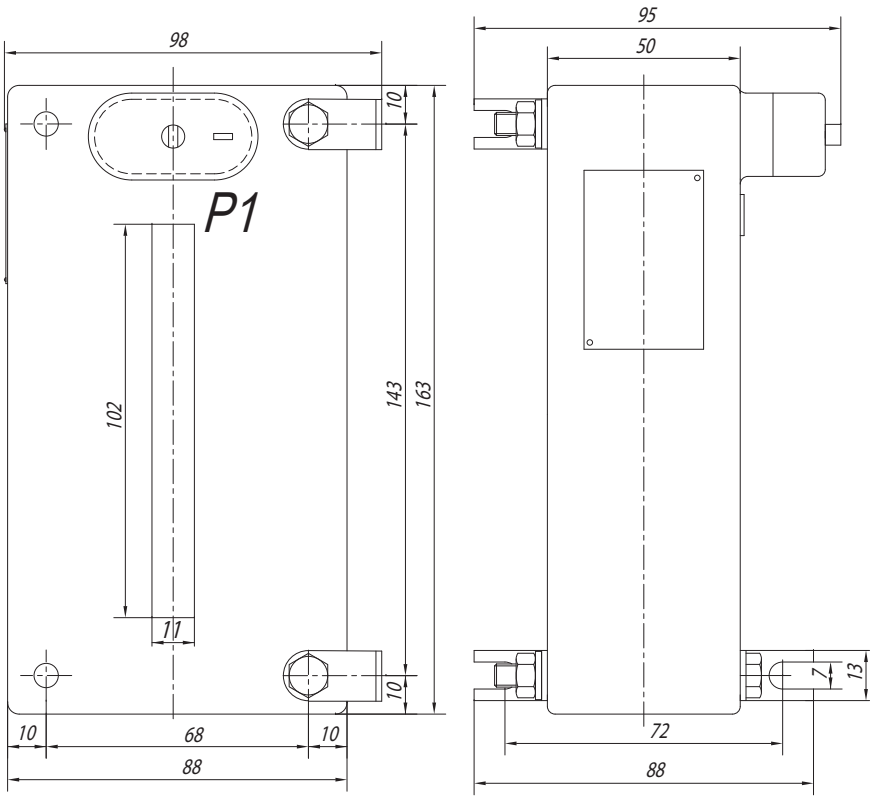
At the customer's request, the characteristics can be different.

The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STEN 081-5





TECHNICAL CHARACTERISTICS FOR **STEN 081-5**

TECHNICAL DATA	STEN 081-5
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~2,1

STEN 081-5				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
800	10	●	●	●
	15	●	●	●
1000; 1200; 1250; 1500; 1600; 2000	10	●	●	●
	15	●	●	●
	30	●	●	●

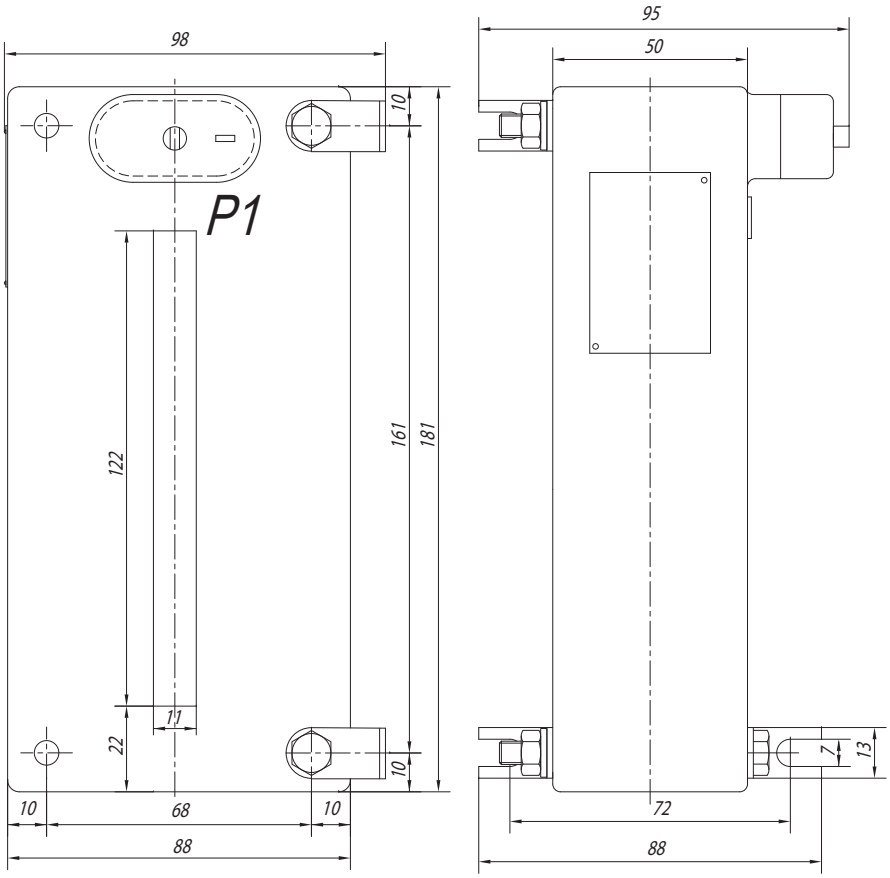
At the customer's request, the characteristics can be different.

The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STEN 081-6





TECHNICAL CHARACTERISTICS FOR **STEN 081-6**

TECHNICAL DATA	STEN 081-6
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass	~2,1

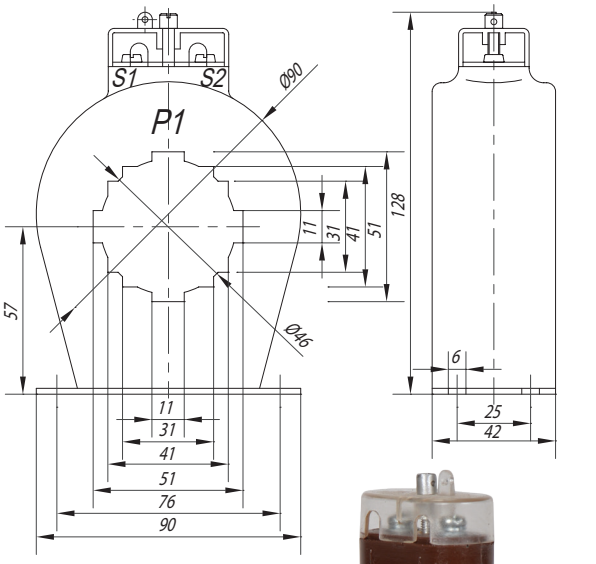
STEN 081-6				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
800	10	●	●	●
	15	●	●	●
1000; 1200; 1250; 1500; 1600; 2500	10	●	●	●
	15	●	●	●
	30	●	●	●

At the customer's request, the characteristics can be different.

The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

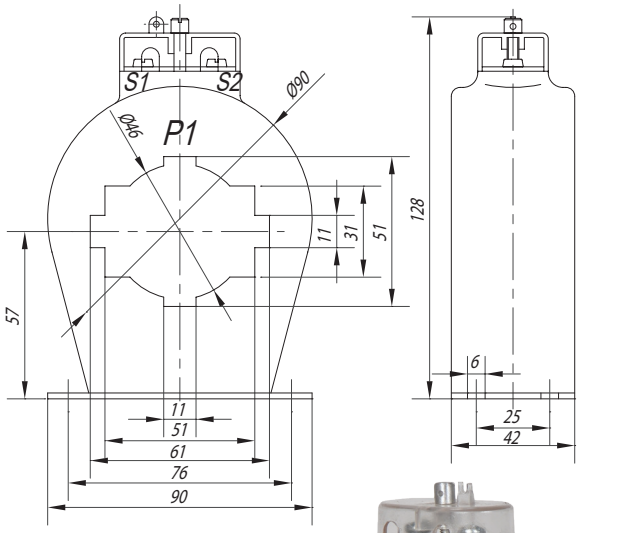
CONTENTS

STEN 081A, STEN 081B



STEN 081A





STEN 081B



TECHNICAL CHARACTERISTICS FOR **STEN 081A, STEN 081B**

TECHNICAL DATA	STEN 081A; STEN 081B
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	Indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass	~0,7

Primary current (A)	Power (VA)	STEN 081A			STEN 081B		
		Accuracy class			Accuracy class		
		0.5	1	3	0.5	1	3
		Secondary current 5A (or 1A)			Secondary current 5A (or 1A)		
250	2.5	●	●	●	●	●	●
	5	●	●	●	–	●	●
	10	–	●	●	–	–	–
300	2.5	●	●	●	●	●	●
	5	●	●	●	–	●	●
	10	–	●	●	–	–	–
400	2.5	●	●	●	●	●	●
	5	●	●	●	●	●	●
	10	●	●	●	–	●	●
500; 600	2,5	●	●	●	●	●	●
	5	●	●	●	●	●	●
	10	●	●	●	●	●	●
	15	●	●	●	–	–	–
750; 800; 1000	2,5; 5; 10; 15	●	●	●	●	●	●

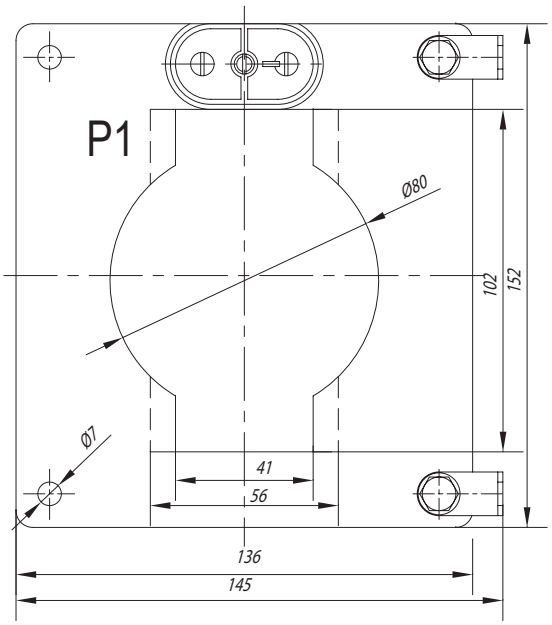
At the customer's request, the characteristics can be different.

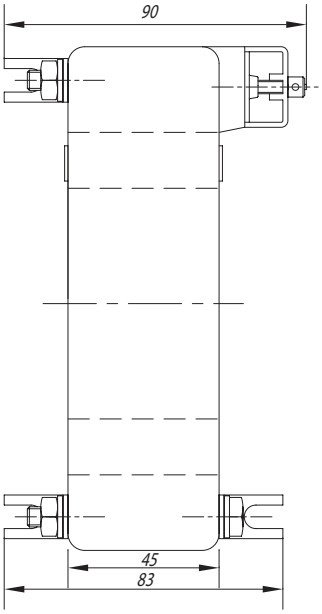
The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STEN 081C-1, STEN 081C-2







TECHNICAL CHARACTERISTICS FOR **STEN 081C-1, STEN 081C-2**

TECHNICAL DATA	STEN 081C-1; STEN 081C-2
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	~1,65

Primary current (A)	Power (VA)	STEN 081C-1			STEN 081C-2		
		Accuracy class					
		0.5	1	3	0.5	1	3
		Secondary current 5A (or 1A)					
800	5	●	●	●	●	●	●
	10	●	●	●	–	●	●
1000; 1200; 1250; 1500; 1600; 2000; 2500; 3000	5	●	●	●	●	●	●
	10	●	●	●	●	●	●
	15	●	●	●	●	●	●

The STEN 081C-1 model has a 41x102mm, Ø80mm opening;
The STEN 081C-2 model has a 56x102mm, Ø80mm opening.

At the customer's request, the characteristics can be different.

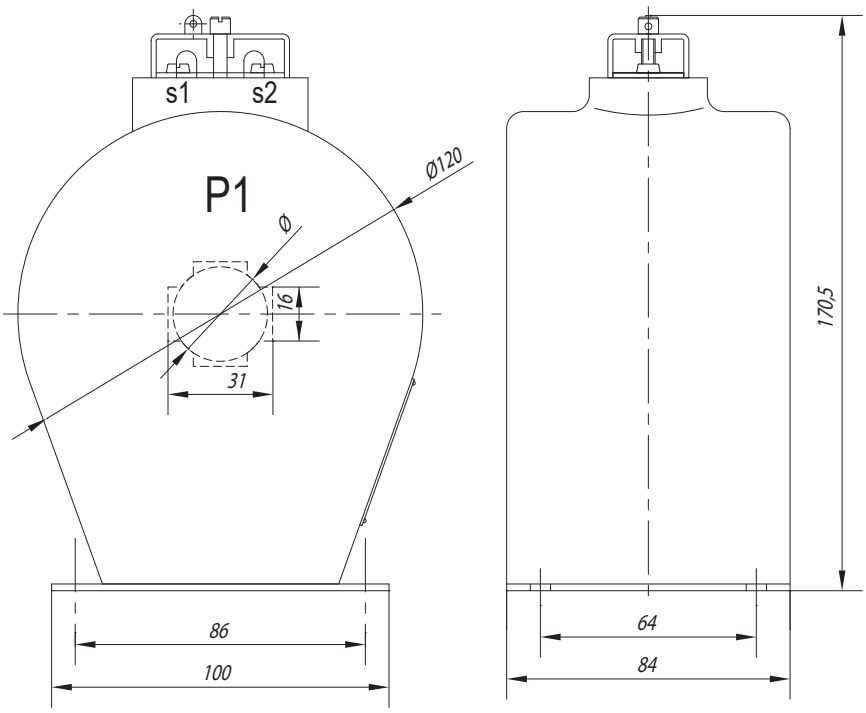
The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STEN 081D*



STEN 081-D-1



TECHNICAL CHARACTERISTICS FOR **STEN 081D***

TECHNICAL DATA STEN 081D	STEN 081D-1	STEN 081D-2	STEN 081D-3	STEN 081D-4
Rated voltage (kV)	0,72			
Ispitni napon 50 Hz, 1 min (eff.) (kV)	3			
Rated freqency (Hz)	50/60			
Rated secondary current (A)	5 or 1			
Rated short-time thermal current	I_{th}=80 I_n			
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited			
Rated continuous thermal current	I_{cth}=1,2 I_n			
Temperature insulation class	E/B			
Mounting	Indoor			
Type of basic insulation	Epoxy resin			
Valid standards	IEC 61869-1, IEC 61869-2			
Mass (kg)	~4,8	~4,8	~4,1	~4,1

The STEN 081D-1 model has a Ø28mm, 31x16mm opening.
The STEN 081D-2 model has a Ø32mm opening.
The STEN 081D-3 model has a Ø52mm opening.
The STEN 081D-4 model has a Ø60mm opening.

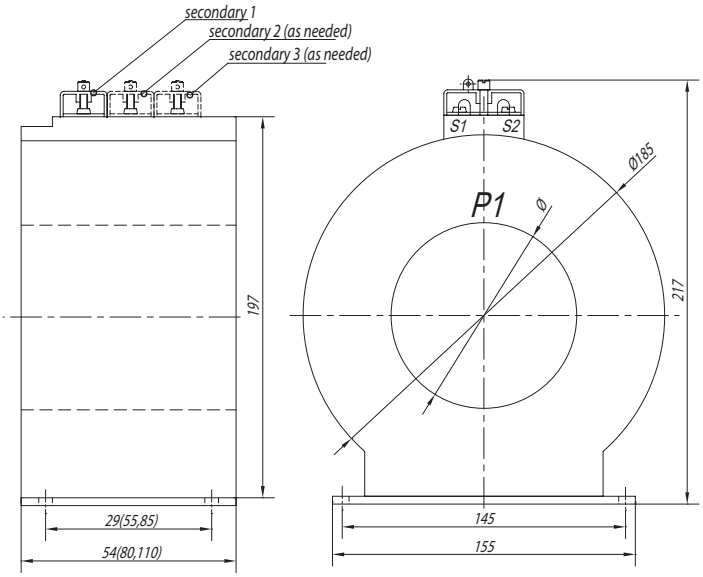
At the customer's request, the characteristics can be different.

The transformer's mass depends on the transformation ratio, accuracy class, and power, and may vary.

Primary current (A)	Power (VA)	STEN 081D-1; STEN 081D-2 Accuracy class				STEN 081D-3; STEN 081D-4 Accuracy class			
		0.5	1	3	5P10	0.5	1	3	5P10
50	2.5	●	●	●	–	–	–	–	–
	5	–	–	●	–	–	–	–	–
75	2.5	●	●	●	●	–	●	●	–
	5	●	●	●	●	–	●	●	–
100	2.5	●	●	●	●	–	●	●	●
	5	●	●	●	●	–	●	●	–
	10	●	●	●	–	–	–	●	–
150	2.5	●	●	●	●	●	●	●	●
	5	●	●	●	●	●	●	●	–
	10	●	●	●	●	–	●	●	–
	15	–	●	●	–	–	–	●	–
200	2,5	●	●	●	●	●	●	●	●
	5	●	●	●	●	●	●	●	●
	10	●	●	●	●	●	●	●	–
	15	●	●	●	●	–	●	●	–
300; 400	2,5	●	●	●	●	●	●	●	●
	5	●	●	●	●	●	●	●	●
	10	●	●	●	●	●	●	●	–
	15	●	●	●	●	–	●	●	–
500; 500; 600; 750; 800; 1000	5	–	–	–	–	●	●	●	●
	10	–	–	–	–	●	●	●	–
	15	–	–	–	–	–	●	●	–

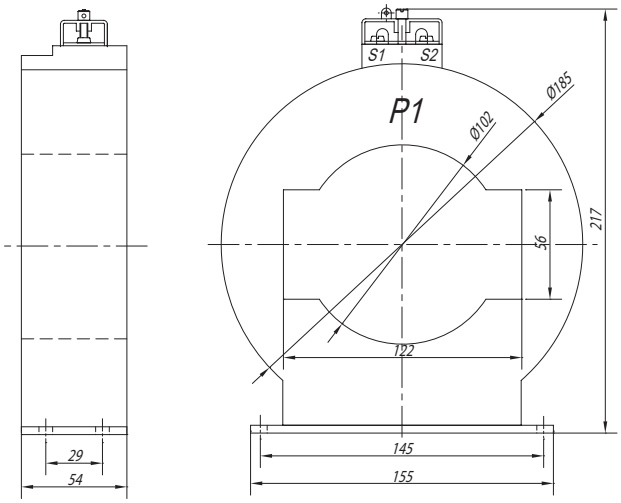
CONTENTS

ST 081-1.1, ST 081-1.2, ST 081-1.3, ST 081-1.4, ST 081-1.5, ST 081-1.6, ST 081-1.7, ST 081-1.8



ST 081 - 1 core,
ST 082 - 2 cores,
ST 083 - 3 cores.

'sp' - secondary switchable
'SM' - outdoor mounting



ST 081-1.8

LOW-VOLTAGE CURRENT TRANSFORMERS

ST 081-1.1, ST 081-1.2, ST 081-1.3, ST 081-1.4, ST 081-1.5, ST 081-1.6, ST 081-1.7, ST 081-1.8

TECHNICAL DATA	ST 081-1.1, ST 081-1.2, ST 081-1.3, ST 081-1.4, ST 081-1.5, ST 081-1.6, ST 081-1.7, ST 081-1.8
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	Indoor/Outdoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	2,5 - 16,5

The ST 081-1.1 model has a Ø52mm opening;
The ST 081-1.2 model has a Ø70mm opening;
The ST 081-1.3 model has a Ø92mm opening;
The ST 081-1.4 model has a Ø102mm opening;
The ST 081-1.5 model has a Ø120mm opening;
The ST 081-1.6 model has a Ø132mm opening;
The ST 081-1.7 model has a Ø51mm, 60x10mm opening;
The ST 081-1.8 model has a Ø102mm, 122x56mm opening.

These transformers are most often made as protection transformers for primary currents from 50 to 300A, but can be made for other classes and powers upon customer request.

They can also be made as measuring transformers for other primary currents, with 1, 2, or 3 cores, or as secondarily switchable (marked with "sp").

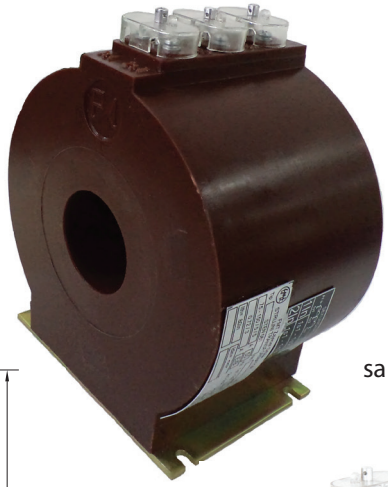
The table lists the rated powers for various rated primary currents and for class 5(10)P10.

The width of the transformer can be 54 mm, 80 mm, or 110 mm as standard, and up to 120 mm.

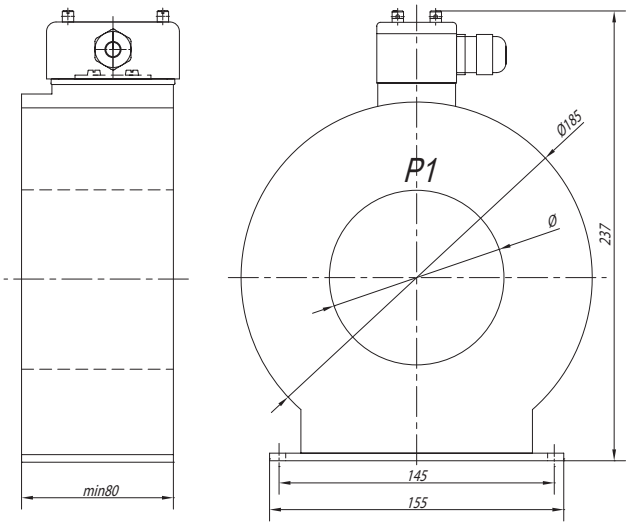
Construction for outdoor mounting is also possible, with an aluminum alloy enclosure for the secondary connectors and an epoxy resin coating for outdoor use. In this case, in addition to the subtype designation, the transformer is marked with “SM”.

*Note: For lower voltage ratios, and depending on the required power and the transformer's internal diameter due to space constraints, they are most often made in the 10P10 class.

CONTENTS



ST 081-1.1
sa 3 sekundara



ST 081 SM

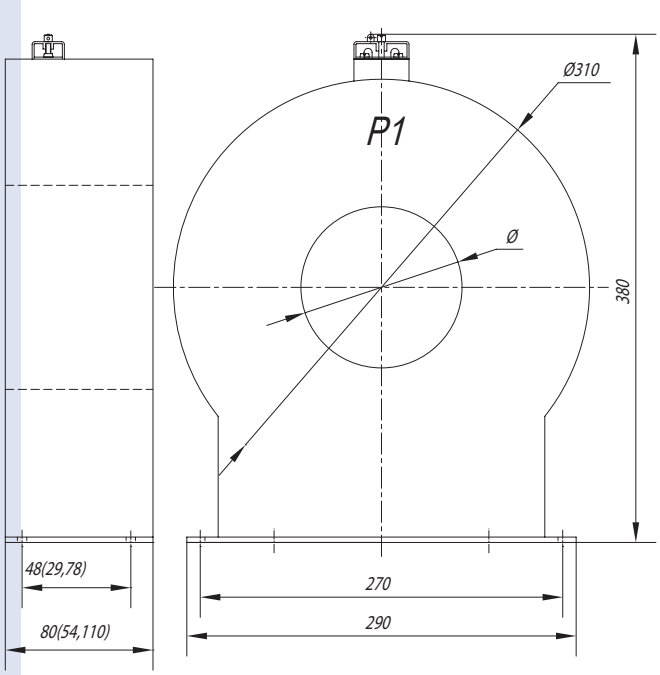


ST 081-1.3

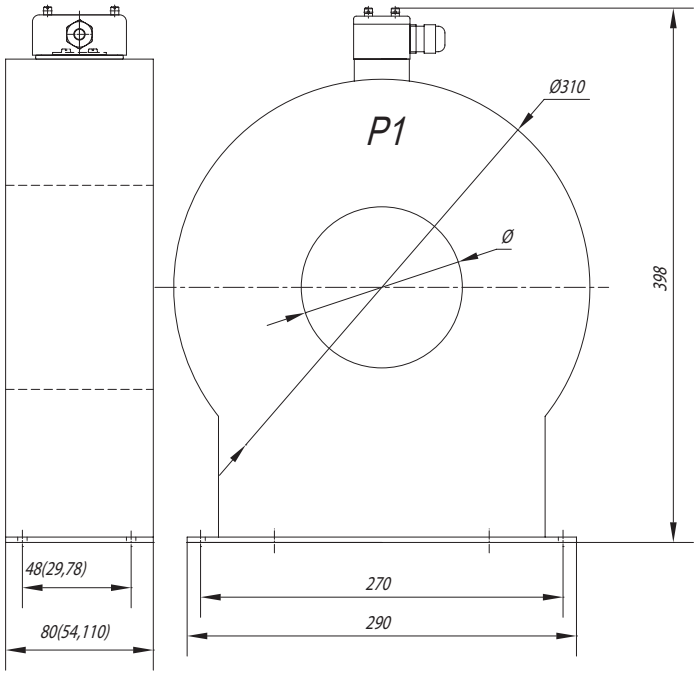
ST 081-1.1, ST 081-1.2, ST 081-1.3, ST 081-1.4, ST 081-1.5, ST 081-1.6, ST 081-1.7, ST 081-1.8									
	Rated primary current (A)	Secondary current 5A (or 1A)							
		Accuracy class 5P10 (10P10)*							
		ST 081-1.1	ST 081-1.2	ST 081-1.3	ST 081-1.4	ST 081-1.5	ST 081-1.6	ST 081-1.7	ST 081-1.8
Rated power (VA)	50	2,5; 5	2,5; 5	2,5; 5	2,5; 5	2,5	–	2,5; 5	–
	75	2,5; 5; 10	2,5; 5; 10	2,5; 5	2,5; 5	2,5	2,5	2,5; 5; 10	2,5
	100	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10	2,5; 5; 10	2,5; 5	2,5	2,5; 5; 10; 15	2,5
	125	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10	2,5; 5; 10	2,5; 5	2,5; 5	2,5; 5; 10; 15	2,5; 5
	150	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5	2,5; 5	2,5; 5; 10; 15	2,5; 5
	200	2,5; 5; 10; 15; 30	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10	2,5; 5	2,5; 5; 10; 15	2,5; 5
	250	2,5; 5; 10; 15; 30	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10	2,5; 5; 10; 15	2,5; 5; 10
	300	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15	2,5; 5; 10	2,5; 5; 10; 15; 30	2,5; 5; 10

CONTENTS

ST 081-2.1, ST 081-2.2, ST 081-2.3, ST 081-2.4, ST 081-2.5, ST 081-2.6, ST 081-2.7, ST 081-2.8



ST 081-2*



ST 081SM-2*

LOW-VOLTAGE CURRENT TRANSFORMERS

ST 081-2.1, ST 081-2.2, ST 081-2.3, ST 081-2.4, ST 081-2.5, ST 081-2.6, ST 081-2.7, ST 081-2.8

TECHNICAL DATA	ST 081-2.1, ST 081-2.2, ST 081-2.3, ST 081-2.4, ST 081-2.5, ST 081-2.6, ST 081-2.7, ST 081-2.8
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	Indoor/Outdoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	4 - 60

The ST 081-2.1 model has a Ø120 mm opening;
The ST 081-2.2 model has a Ø152 mm opening;
The ST 081-2.3 model has a Ø180 mm opening;
The ST 081-2.4 model has a Ø220 mm opening;
The ST 081-2.5 model has a Ø200 mm opening;
The ST 081-2.6 model has a Ø70 mm opening;
The ST 081-2.7 model has a Ø260 mm opening;
The ST 081-2.8 model has a Ø32 mm opening.

These transformers are most often made as protection transformers for primary currents from 50 to 300A, but can be made for other classes and powers upon customer request.

They can also be made as measuring transformers for other primary currents, with 1, 2, or 3 cores, or as secondarily switchable (marked with "sp").

The table lists the rated powers for various rated primary currents and for class 5(10)P10.

The width of the transformer can be 54 mm, 80 mm, or 110 mm as standard, and up to 120 mm.

The transformer's mass depends on the current transformation ratio, accuracy class and rated power and it can vary.

Construction for outdoor mounting is also possible, with an aluminum alloy enclosure for the secondary connectors and an epoxy resin coating for outdoor use. In this case, in addition to the subtype designation, the transformer is marked with "SM".

*Note: For lower voltage ratios, and depending on the required power and the transformer's internal diameter due to space constraints, they are most often made in the 10P10 class.

CONTENTS



ST 081-2.2SM



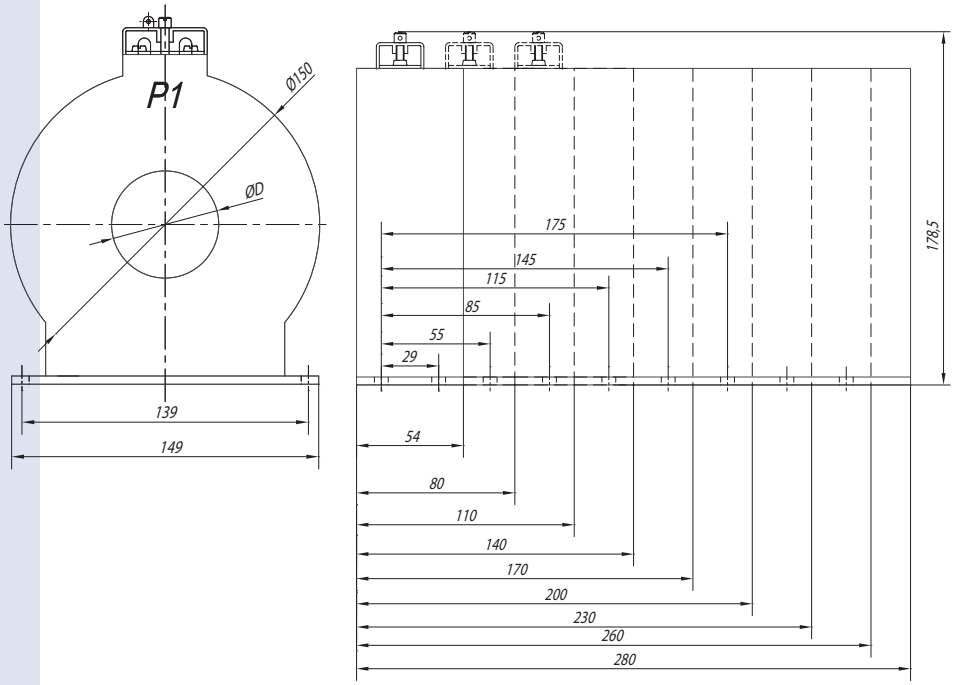
ST 081-2.6

ST 081 - 1 core
ST 082 - 2 cores
ST 083 - 3 cores
'sp' - secondary switchable
'SM' - outdoor mounting

ST 081-2.1, ST 081-2.2, ST 081-2.3, ST 081-2.4, ST 081-2.5, ST 081-2.6, ST 081-2.7, ST 081-2.8									
	Rated primary current (A)	Secondary current 5A (or 1A)**							
		Accuracy class 5P10(10P10)*							
		ST 081-2.1	ST 081-2.2	ST 081-2.3	ST 081-2.4	ST 081-2.5	ST 081-2.6	ST 081-2.7	ST-081-2.8
Rated power (VA)	10	2,5**	2,5**	-	-	-	2,5**	-	2,5**
	15	2,5**	2,5**	2,5**	-	-	2,5**	-	2,5**; 5**
	20	2,5; 5	2,5; 5	2,5	-	2,5**	2,5; 5**	-	2,5; 5; 10**
	30	2,5; 5	2,5; 5;	2,5; 5;	2,5	2,5	2,5; 5; 10**	-	2,5; 5; 10; 15**
	40	2,5; 5; 10	2,5; 5; 10	2,5; 5	2,5	2,5; 5	2,5; 5; 10	-	2,5; 5; 10; 15
	50	2,5; 5; 10; 15	2,5; 5; 10	2,5; 5	2,5; 5	2,5; 5	2,5; 5; 10; 15	-	2,5; 5; 10; 15
	75	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10	2,5; 5	2,5; 5; 10	2,5; 5; 10; 15	2,5	2,5; 5; 10; 15; 30
	100	2,5; 5; 10; 15; 30	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10	2,5; 5; 10	2,5; 5; 10; 15; 30	2,5; 5	2,5; 5; 10; 15; 30
	125	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15	2,5; 5; 10	2,5; 5; 10; 15	2,5; 5; 10; 15; 30	2,5; 5	2,5; 5; 10; 15; 30
	150	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10; 15; 30	2,5; 5	2,5; 5; 10; 15; 30
	200	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10; 15; 30	2,5; 5	2,5; 5; 10; 15; 30
	250	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10	2,5; 5; 10; 15; 30
	300	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10; 15; 30	2,5; 5; 10	2,5; 5; 10; 15; 30

CONTENTS

ST 081-4.1, ST 081-4.2, ST 081-4.3





ST 081-4.1

LOW-VOLTAGE CURRENT TRANSFORMERS **ST 081-4.1, ST-081-4.2, ST-081-4.3**

TECHNICAL DATA	ST 081-4.1, ST 081-4.2, ST 081-4.3
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	Indoor/Outdoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	3 - 15

	Rated primary current (A)	Secondary current 5A or 1A		
		Accuracy class 5P10		
		ST 081-4.1	ST 081-4.2	ST 081-4.3
Rated power (VA)	50	2,5; 5; 10	2,5; 5; 10	2,5; 5
	75	2,5; 5; 10	2,5; 5; 10	2,5; 5; 10
	100	2,5; 5; 10; 15	2,5; 5; 10; 15	2,5; 5; 10
	150	2,5; 5; 10; 15; 30	2,5; 5; 10; 15	2,5; 5; 10; 15
	200	2,5; 5; 10; 15; 30	2,5; 5; 10; 30	2,5; 5; 10; 15
	250	2,5; 5; 10; 15; 30	2,5; 5; 10; 30	2,5; 5; 10; 30
	300	2,5; 5; 10; 15; 30	2,5; 5; 10; 15	2,5; 5; 10; 15; 30

Examples of the type designation:
The ST 081-4.2 – one core, Ø70mm opening;
The ST 082-4.1 – two cores, Ø52mm opening;
The ST 081-4.3-SM sp – one core, for outdoor mounting, secondary switchable, Ø92mm opening.

Possible sizes of openings:
The ST 081-4.1 model has a Ø52 mm opening;
The ST 081-4.2 model has a Ø70 mm opening;
The ST 081-4.3 model has a Ø92 mm opening.

The transformer's width can differ depending on the requested characteristics. Standard values are 54, 80, 110, 140, 170, 200, 230, 260 and 280mm.

These transformers are standardly built for indoor mounting as protection transformers for primary currents from 50 to 300 A.
At the customer's request, they can also be made as measuring transformers for other primary currents, and can be built with 2 or 3 cores, as secondarily switchable ('sp') or for outdoor mounting ('SM').

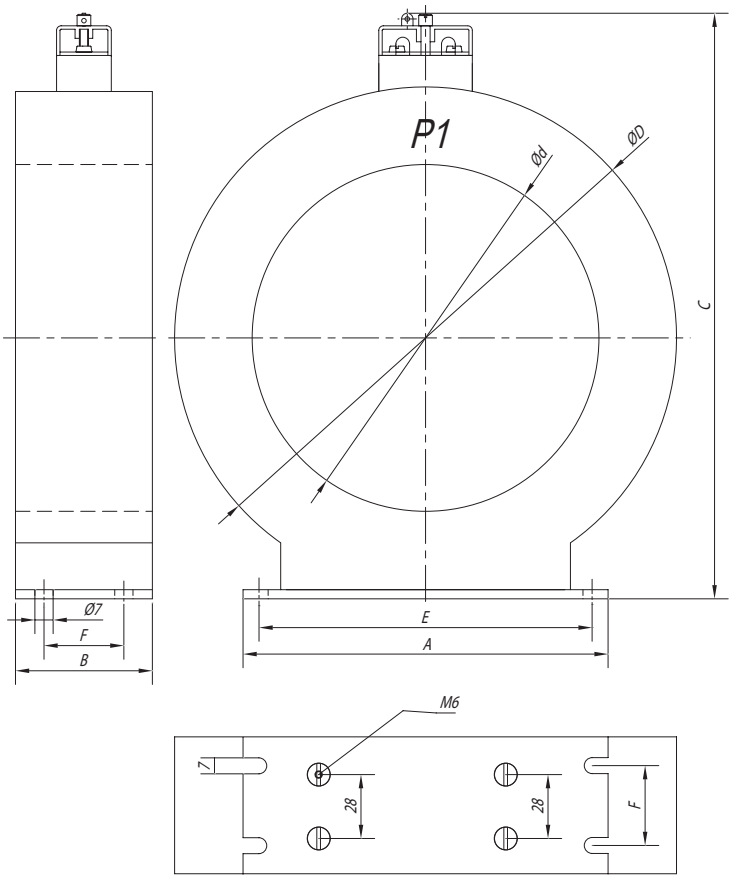
The transformer's weight depends on the voltage ratio, accuracy class, and power, and may vary.

CONTENTS

ST 081A, ST 081C



ST 081-C



CURRENT TRANSFORMERS **ST 081A, ST 081C**

Type of the transformer	Dimensions (mm)							Mass (kg)
	A	B	C	ØD	Ød	E	F	
ST 081A	175	47	246,5	186	132	161	28	~4
ST 081C	160	60	256,5	220	152	146	35	~6

TECHNICAL DATA	ST 081A	ST 081C
Rated voltage (kV)	0,72	
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3	
Rated freqency (Hz)	50 / 60	
Accuracy class	10P	
Rated secondary current (A)	5 (or 1)	
Rated short-time thermal current	$I_{th} = 80\ I_n$	
Rated dynamic current	$I_{dyn} = 2{,}5\ I_{th}$, Practically unlimited	
Rated continuous thermal current	$I_{cth} = 1{,}2\ I_n$	
Temperature insulation class	E/B	
Mounting	Indoor	
Type of basic insulation	Epoxy resin	
Valid standards	IEC 61869-1, IEC 61869-2	
Mass (kg)	~ 4	~ 6

Secondary current 5A or 1A									
Primary current (A)	Power (VA)	ST 081A				ST 081C			
		Accuracy class				Accuracy class			
		10P5	10P10	10P15	10P20	10P5	10P10	10P15	10P20
30	1,25	–	–	–	–	●	–	–	–
40	1,25	–	–	–	–	●	●	–	–
50	1,25	●	–	–	–	●	●	–	–
	2,5	–	–	–	–	●	–	–	–
75	1,25	●	–	–	–	●	●	●	
	2,5	●	–	–	–	●	–	–	–
	5	–	–	–	–	●	–	–	–
100	1,25	●	●	–	–	●	●	–	–
	2,5	●	–	–	–	●	–	–	–
	5	–	–	–	–	–	–	–	–
150	1,25	●	●	–	–	●	●	●	●
	2,5	●	–	–	–	●	●	●	–
	5	●	–	–	–	●	–	–	–
200; 250	1,25	●	●	●	–	●	●	●	●
	2,5	●	●	–	–	●	●	●	●
	5	●	–	–	–	●	●	–	–
300	1,25	●	●	●	●	●	●	●	●
	2,5	●	●	–	–	●	●	●	●
	5	●	–	–	–	●	●	●	–
	10	●	–	–	–	●	–	–	–
	15	–	–	–	–	●	–	–	–

At the customer's request, the characteristics can be different.

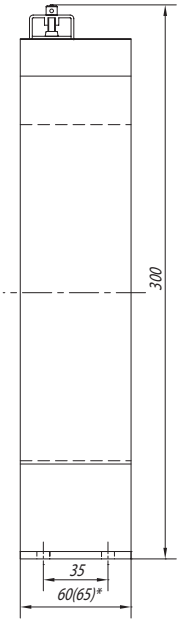
The weight of the transformer depends on the transformation ratio, accuracy class, and power, and may vary.

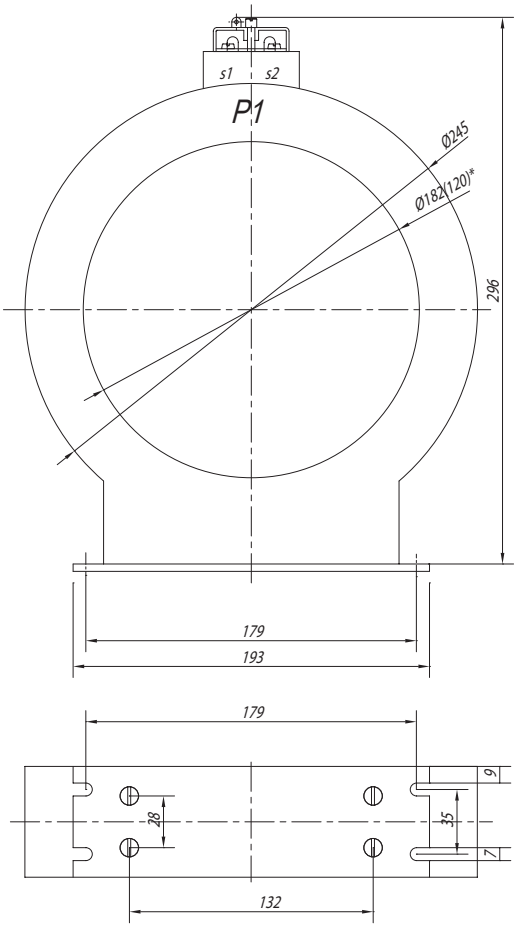
CONTENTS

ST 081B, ST 081B-120



ST 081-B





*Note: Dimensions in the brackets refer to the ST 081B-120 model

CURRENT TRANSFORMERS **ST 081B, ST 081B-120**

TECHNICAL DATA	ST 081B	ST 081B-120
Rated voltage (kV)	0,72	
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3	
Rated freqency (Hz)	50 / 60	
Accuracy class	10P	
Rated secondary current (A)	5 (or 1)	
Rated short-time thermal current	$I_{th} = 80\ I_n$	
Rated dynamic current	$I_{dyn} = 2,5\ I_{th}$, Practically unlimited	
Rated continuous thermal current	$I_{cth} = 1,2\ I_n$	
Temperature insulation class	E/B	
Mounting	Indoor/Outdoor	Indoor
Type of basic insulation	Epoxy resin	
Valid standards	IEC 61869-1, IEC 61869-2	
Mass (kg)	3-15	

Secondary current 5A (or 1A)					
Primary current (A)	Power (VA)	ST-081B		ST-081B-120	
		Accuracy class		Accuracy class	
		10P5	10P10	10P5	10P10
25; 30	1,25	●*	–	●*	–
	2,5	–	–	●*	–
40	1,25	●	–	●	–
	2,5	–	–	●	–
50	1,25	●	●	●	●
	2,5	●	–	●	●
	5	–	–	●	–
75	1,25-2,5	●	●	●	●
	5	–	–	●	●
100	1,25-2,5	●	●	●	●
	5	●	–	●	●
	10	–	–	●	–
150	1,25-2,5	●	●	●	●
	5	●	–	●	●
	10	–	–	●	●
	15	–	–	●	–
200	1,25-5	●	●	●	●
	10	●	–	●	●
	15	–	–	●	●
	30	–	–	●	–
250	1,25-5	●	●	●	●
	10	●	–	●	●
	15	–	–	●	●
	30	–	–	●	–
300	1,25-5	●	●	●	●
	10	●	–	●	●
	15	●	–	●	●
	30	–	–	●	–

The ST 081B model has a Ø182mm opening;
The ST 081B-120 model has a Ø120mm opening;
These transformers are primarily intended for protection for primary currents 50-300A, but they can be made as measuring transformers and for other primary currents, rated power and accuracy class, according to customer specifications.

The ST-081B model can be made with 1 or 2 cores, or as a secondary switchable (marked with “sp”), with 1 core. It can also be manufactured for outdoor mounting with an aluminum alloy enclosure for the secondary connectors and with epoxy resin coating.

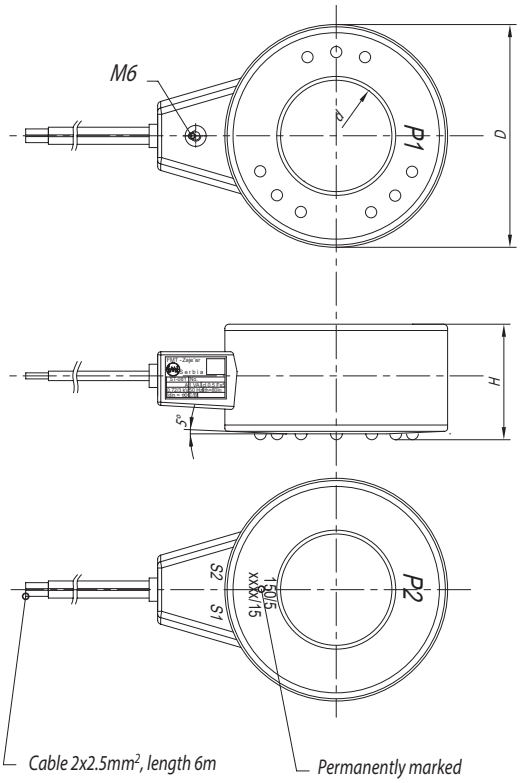
The ST 081B-120 transformer has an opening of Ø120mm and is designed for 1 core and indoor mounting. The weight of the transformer depends on the transformer's transformation ratio and power, and may differ.

*Note: For lower transformation ratios, a 1A secondary current is available.

CONTENTS

ST 081SM/53, ST 081SM/73, ST 081SM/95





Type of the transformer	D(mm)	H(mm)	d(mm)	Primary current (A)
ST 081SM/53	106	55	53	75-400
ST 081SM/73	136	45	73	400-1500
ST 081SM/95	160	45	95	400-1500

LOW-VOLTAGE CURRENT TRANSFORMERS
ST 081SM/53, ST 081SM/73, ST 081SM/95

TECHNICAL DATA	ST 081SM/53	ST 081SM/73	ST 081SM/95
Rated voltage (kV)	0,72		
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3		
Rated freqency (Hz)	50		
Rated secondary current (A)	5 or 1		
Rated short-time thermal current	I_{th}=80 I_n		
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited		
Rated continuous thermal current	I_{cth}=1,2 I_n		
Temperature insulation class	E/B		
Mounting	Outdoor		
Type of basic insulation	Epoxy resin		
Valid standards	IEC 61869-1, IEC 61869-2		
Mass (kg)	~1,45	~1,64	~2

These transformers are intended for outdoor mounting.

Accuracy classes are defined for the total rated power at the end of the conductors of the current transformers' secondary taps. The secondary terminals are 2.5mm² conductors for outdoor installation and are UV-resistant.

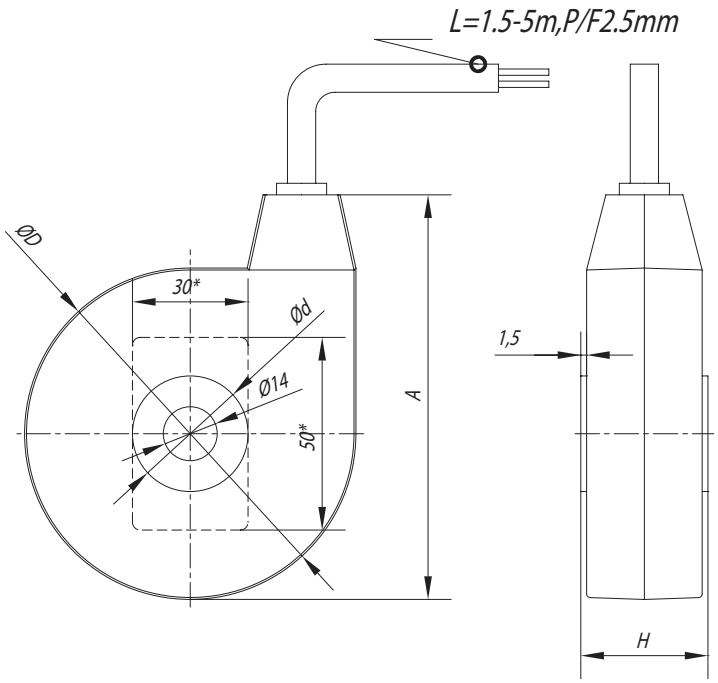
Other classes and powers are also available. They are standardly made with a 6m conductor length, but this can be different upon request.

ST 081SM/53				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
150	2.5	●	●	●
200; 250	2.5	●	●	●
	5	●	●	●
300; 400	2.5	●	●	●
	5	●	●	●
	10	●	●	●

ST 081SM/73, ST 081SM/95				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
400; 500; 600; 750; 800; 1000; 1200; 1250; 1500	2.5	●	●	●
	5	●	●	●
	10	●	●	●

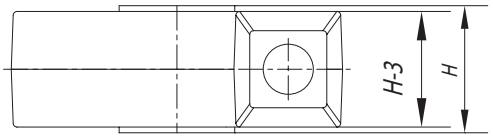
CONTENTS

ST 081P/33, ST 081P/41, ST 081P/41*





ST 081P - SET (Pic. 1)



Type of the transformer	A(mm)	H(mm)	Ød(mm)	ØD(mm)	Primary current)A)
ST 081P/33	105	33	30	86	75-150
ST 081P/41	115	41	25	96	150-300
ST 081P/41*	115	41	30x50*	96	400-600

LOW-VOLTAGE CURRENT TRANSFORMERS FOR FUSE BUSBARS IN THE POWER SUBSTATIONS TYPE
ST 081P/33, ST 081P/41, ST 081P/41*

TECHNICAL DATA	ST 081P/33	ST 081P/41	ST 081P/41*
Rated voltage (kV)	0,72		
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3		
Rated freqency (Hz)	50/60		
Rated secondary current (A)	5 or 1		
Rated short-time thermal current	I_{th}=80 I_n		
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited		
Rated continuous thermal current	I_{cth}=1,2 I_n		
Temperature insulation class	E/B		
Mounting	indoor		
Type of basic insulation	Epoxy resin		
Valid standards	IEC 61869-1, IEC 61869-2		
Mass (kg)	~0,95	~1,46	~1,46

CURRENT TRANSFORMERS ST 081P/*
Current transformers ST 081P/* for fuse bars are intended for direct mounting on the low-voltage busbars below fuse bars.

There are 3 types based on housing dimensions, and all their characteristics are presented in the technical data table. The specified accuracy classes are defined for the total rated power at the end of the secondary terminal cables of the current transformers.

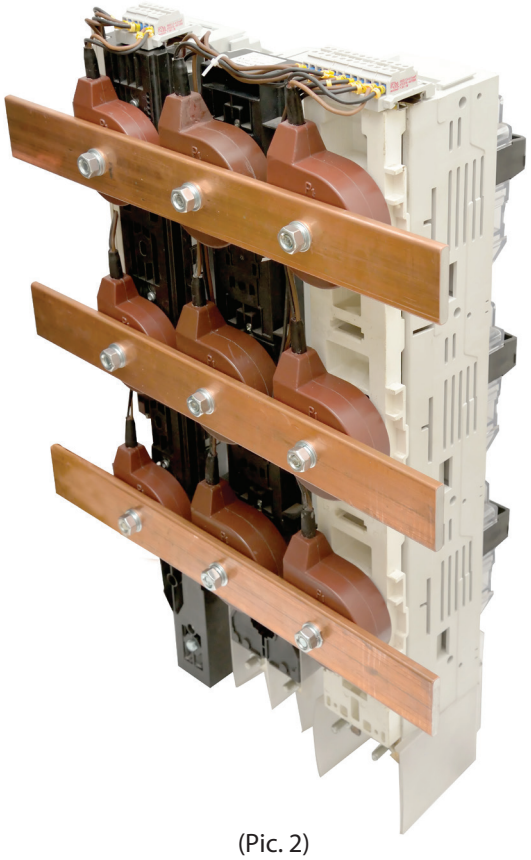
The secondary connectors are P/F 2,5mm^2 conductors, 5m long. The conductor length can be shorter upon request, but must be within the range of 1.5 to 5 m, and the accuracy class of the current transformer is defined for this length.

In the measuring set for one outlet in the power substation there are 3 current transformers (Pic.2) with sealed secondary conductors 2.5 mm^2 as secondary terminals, specially marked and colored.

For busbar "L1":
connector "s1" - yellow, "s2" - yellow-green;
For busbar "L2":
connector "s1" - green, "s2" - yellow-green;
For busbar "L3":
connector "s1" - purple, "s2" - yellow-green.

The set also includes a brass screw with the corresponding screwing parts for attaching the transformer to the busbars, as well as 4 voltage connections in the form of 1.5 mm^2 conductors, also classified in yellow, green, purple and common zero as a blue conductor.

CONTENTS



(Pic. 2)



ST 081P-SET 1 (Pic. 3)

ST 081P/33				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
150	2.5	●	●	●
	3.75	–	●	●
200, 250, 300	2.5	●	●	●
	3.75	●	●	●

ST 081P/41				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
75	2.5	–	●	●
	3.75	–	–	●
100	2.5	●	●	●
	3.75	–	●	●
150	2.5	●	●	●
	3.75	●	●	●

ST 081P/41*				
Primary current (A)	Power (VA)	Secondary current 5A (or 1A)		
		Accuracy class		
		0.5	1	3
400, 500, 600	2.5	●	●	●
	3.75	●	●	●

In addition to this set, which is necessary for connecting the measuring equipment on the one substation output, there is also a variant set, SET 1 (Picture 3), which, in addition to the included kit, has 3 distance insulators and 3 earthing bars.

SET 1 is used for the total measurement of electrical energy on two transformer substation outputs, so that under one fuse bar, the current transformers and one end of the copper busbars are installed, and under the second fuse bar, the insulating spacers and the other end of the copper busbars are installed.

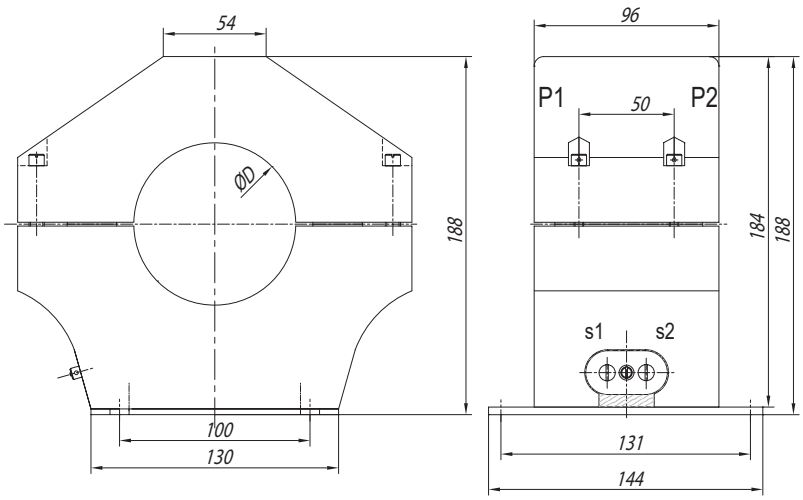
In this setup, the current from both fuse bars passes through the primary conductor of the current transformers.

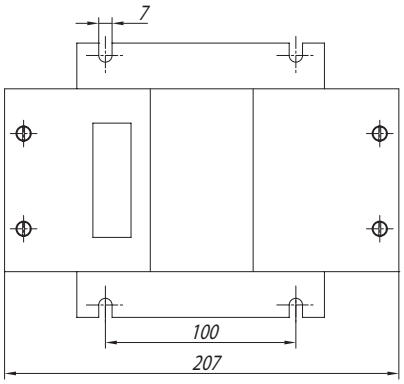
For this type of measurement, SET 1 is selected, with a choice of current transformers for a primary current of 400, 500, or 600 A.

The ST081P current transformers are intended for indoor installation only.

CONTENTS

KT 85, KT 105





Transformer type	Opening ØD (mm)
KT 85	85
KT 105	105



KT 105

SPLIT-CORE CABLE TRANSFORMERS **KT***

USE:

Cable transformers KT can be used for connection of the earth-fault relay. They are mostly used for 3 phase cable lines but also for overhead lines if the input into the power substation is made by cable.

TECHNICAL DATA	KT-85, KT-105
Rated voltage (kV)	Determined by cable
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated frequency (Hz)	50 / 60
Accuracy class	10P
Rated secondary current (A)	5 (or 1)
Rated short-time thermal current	Limited by cable
Rated dynamic current	Practically unlimited
Rated continuous thermal current	I_{cth}= 1,2 I_n
Temperature insulation class	E/B
Mounting	Indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass	~9 - 10

CONSTRUCTION:

They are made in two parts, making installation on the cable very simple. Cable transformers can be used for all voltage levels, as the insulation of the cable serves as the primary insulation.

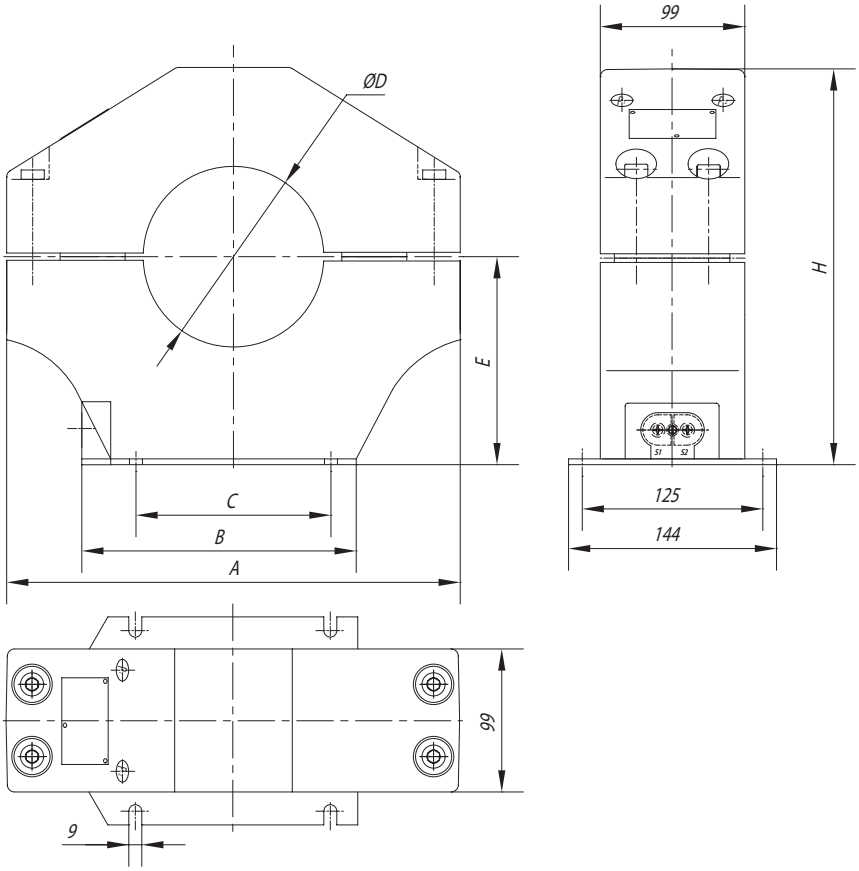
INSTALLATION:

Contact surfaces of the magnetic core must be immaculately clean. The screws for clamping the halves must be tightened evenly and securely, as even a slight air gap significantly affects the relay's operation. When connecting the transformer and the relay terminal, pay attention to the polarity of the ends and the markings on the transformer.

KT 85, KT 105									
Primary current (A)	Power (VA)	KT 85				KT 105			
		Secondary current 5A (or 1A)				Secondary current 5A (or 1A)			
		Accuracy class				Accuracy class			
		10P5	10P10	10P15	10P20	10P5	10P10	10P15	10P20
50	2.5	●	●	–	–	●	●	–	–
	5	●	–	–	–	●	–	–	–
60	2.5	●	●	●	–	●	●	–	–
	5	●	–	–	–	●	–	–	–
75	2.5	●	●	●	●	●	●	–	–
	5	●	●	–	–	●	–	–	–
	10	●	–	–	–	–	–	–	–
100	2,5	●	●	●	●	●	●	●	–
	5	●	●	–	–	●	●		–
	10	●	–	–	–	●	–	–	–
150	2,5	●	●	●	●	●	●	●	●
	5	●	●	●	●	●	●	–	–
	10	●	●	–	–	●	–	–	–
	15	●	–	–	–	●	–	–	–
200	2,5	●	●	●	●	●	●	●	●
	5	●	●	●	●	●	●	●	–
	10	●	●	–	–	●	●	–	–
	15	●	●	–	–	●	–	–	–
250	2,5	●	●	●	●	●	●	●	●
	5	●	●	●	●	●	●	●	●
	10	●	●	●	–	●	●	–	–
	15	●	●	–	–	●	–	–	–
300	2,5	●	●	●	●	●	●	●	●
	5	●	●	●	●	●	●	●	●
	10	●	●	●	●	●	●	–	–
	15	●	●	–	–	●	●	–	–

CONTENTS

KT 125, KT 185





KT 185

SPLIT-CORE CABLE TRANSFORMERS **KT***

Type of the transformer	Dimensions (mm)						Mass (kg)
	A	B	C	ØD	E	H	
KT 125	314	195	135	125	144	274±1	~23
KT 185	334	205	150	185	154	295±1	~19

TECHNICAL DATA	KT 125	KT 185
Rated voltage (kV)	Determined by cable	
Rated freqency (Hz)	50 / 60	
Accuracy class	10P	
Rated secondary current (A)	5 (or 1)	
Rated short-time thermal current	80 I_n	
Rated dynamic current	Practically unlimited	
Rated continuous thermal current	I_{cth}= 1,2 I_n	
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3	
Temperature insulation class	E/B	
Mounting	Indoor	
Type of basic insulation	Epoxy resin	
Valid standards	IEC 61869-1, IEC 61869-2	
Mass (kg)	~23	~19

Primary current (A)	Power (VA)	KT 125					KT 185				
			Accuracy class					Accuracy class			
		I″ (A)	10P5	10P10	10P15	10P20	I″ (A)	10P5	10P10	10P15	10P20
20	2.5	1	●	–	–	–	–	–	–	–	–
30	2.5	1	●	●	●	–	1	●	–	–	–
	5	1	●	–	–	–	–	–	–	–	–
50	2.5	1; 5	●	●	●	●	1	●	●	–	–
	5	1; 5	●	●	–	–	1	●	–	–	–
	10	1; 5	●	–	–	–	–	–	–	–	–
75	2,5	1; 5	●	●	●	●	1; 5	●	●	●	–
	5	1; 5	●	●	●	–	1; 5	●	●	–	–
	10	1; 5	●	–	–	–	1; 5	–	–	–	–
100	2,5	1; 5	●	●	●	●	1; 5	●	●	●	●
	5	1; 5	●	●	●	●	1; 5	●	●	–	–
	10	1; 5	●	●	–	–	1; 5	●	–	–	–
	15	1; 5	●	–	–	–	1; 5	–	–	–	–
150	2,5	1; 5	●	●	●	●	1; 5	●	●	●	●
	5	1; 5	●	●	●	●	1; 5	●	●	●	–
	10	1; 5	●	●	●	–	1; 5	●	●	–	–
	15	1; 5	●	●	–	–	1; 5	●	–	–	–
200	2,5	1; 5	●	●	●	●	1; 5	●	●	●	●
	5	1; 5	●	●	●	●	1; 5	●	●	●	●
	10	1; 5	●	●	●	●	1; 5	●	●	–	–
	15	1; 5	●	●	●		1; 5	●		–	–
250	2,5	1; 5	●	●	●	●	1; 5	●	●	●	●
	5	1; 5	●	●	●	●	1; 5	●	●	●	●
	10	1; 5	●	●	●	●	1; 5	●	●	●	–
	15	1; 5	●	●	●	●	1; 5	●	●	–	–
300	2,5	1; 5	●	●	●	●	1; 5	●	●	●	●
	5	1; 5	●	●	●	●	1; 5	●	●	●	●
	10	1; 5	●	●	●	●	1; 5	●	●	●	–
	15	1; 5	●	●	●	●	1; 5	●	●	–	–

USE:

Cable transformers KT can be used for connection of the earth-fault relay. They are mostly used for 3 phase cable lines but also for overhead lines if the input into the power substation is made by cable.

CONSTRUCTION:

They are made in two parts, making installation on the cable very simple. Cable transformers can be used for all voltage levels, as the insulation of the cable serves as the primary insulation.

INSTALLATION:

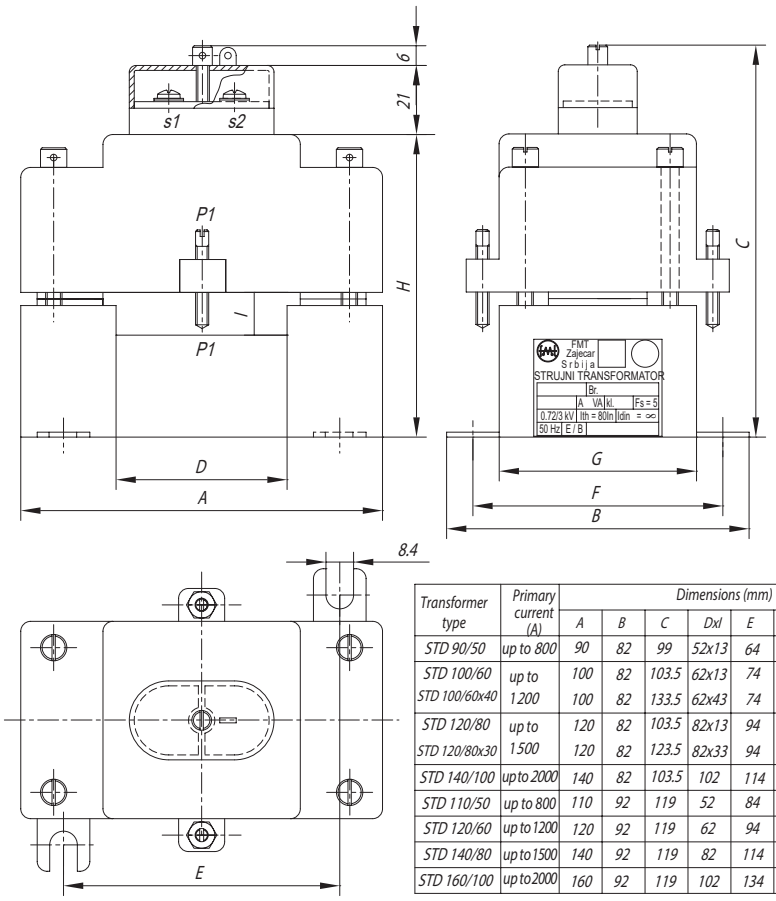
Contact surfaces of the magnetic core must be immaculately clean.
The screws for clamping the halves must be tightened evenly and securely, as even a slight air gap significantly affects the relay's operation.
When connecting the transformer and the relay terminal, pay attention to the polarity of the ends and the markings on the transformer.

CONTENTS

STD */**



STD 140/100



Transformer type	Primary current (A)	Dimensions (mm)							
		A	B	C	Dxl	E	F	G	H
STD 90/50	up to 800	90	82	99	52x13	64	66	50	72
STD 100/60	up to 1200	100	82	103.5	62x13	74	66	50	76.5
STD 100/60x40		100	82	133.5	62x43	74	66	50	106.5
STD 120/80	up to 1500	120	82	103.5	82x13	94	66	50	76.5
STD 120/80x30		120	82	123.5	82x33	94	66	50	96.5
STD 140/100	up to 2000	140	82	103.5	102	114	66	50	76.5
STD 110/50	up to 800	110	92	119	52	84	76	60	92
STD 120/60	up to 1200	120	92	119	62	94	76	60	92
STD 140/80	up to 1500	140	92	119	82	114	76	60	92
STD 160/100	up to 2000	160	92	119	102	134	76	60	92

SPLIT-CORE BUSBAR TRANSFORMERS **STD */****

TECHNICAL DATA	STD */**
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated secondary current (A)	5 or 1
Rated short-time thermal current	I_{th}=80 I_n
Rated dynamic current	I_{dyn}=2,5 I_{th} – Practically unlimited
Rated continuous thermal current	I_{cth}=1,2 I_n
Temperature insulation class	E/B
Mounting	Indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1, IEC 61869-2
Mass (kg)	1-3

STD 110/50, STD 120/60, STD 140/80, STD 160/100				
Type of the transformer	Primary current (A)	Secondary current 5A (or 1A)		
		Accuracy class 0,5 (1, 3)		
		2,5 VA	5 VA	10 VA
STD-110/50 (for currents 300 – 800 A); STD-120/60 (for currents 300 – 1200 A); STD-140/80 (for currents 300 – 1500 A); STD-160/100 (for currents 300 – 2000 A)	300	●	–	–
	400	●	●	–
	500	●	●	●
	600	●	●	●
	750	●	●	●
	800	●	●	●
	1000	●	●	●
	1200	●	●	●
	1250	●	●	●
	1500	●	●	●
	1600	●	●	●
	2000	●	●	●

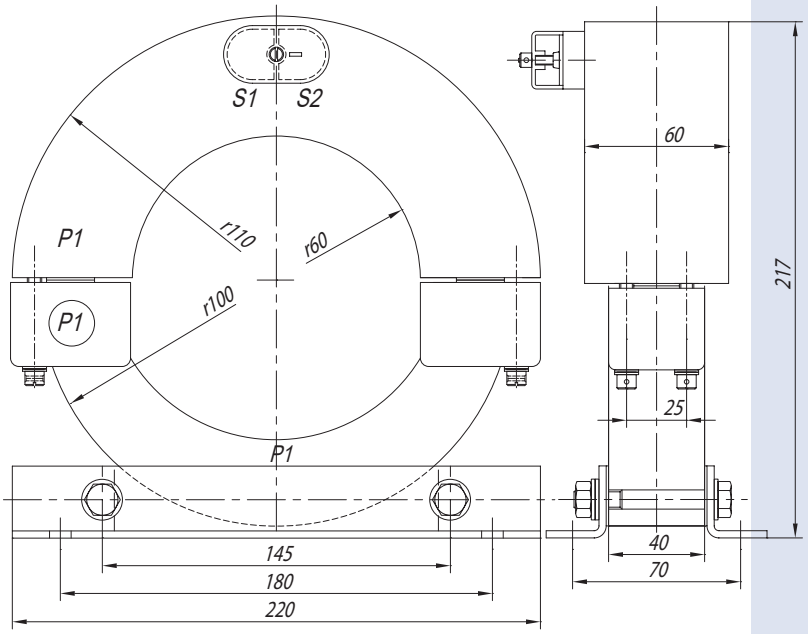
These transformers are manufactured for both measuring and protection applications in classes 0.5, 1, 3, 5P, and 10P for primary currents from 300 A, but can also be manufactured for other primary currents upon customer request.

Mass of the transformer depends on the transformation ratio, accuracy class, and power, and may vary.

CONTENTS

STD 1





The transformer can be made with or without mounting hardware

SPLIT-CORE CABLE TRANSFORMERS **STD 1**

TECHNICAL DATA	STD 1
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50 / 60
Rated secondary current (A)	5 (or 1)
Rated short-time thermal current	$I_{th} = 80\ I_n$
Rated dynamic current	$I_{dyn} = 2{,}5\ I_{th}$, Practically unlimited
Rated continuous thermal current	$I_{cth} = 1{,}2\ I_n$
Temperature insulation class	E/B
Mounting	Indoor
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1; IEC 61869-2
Mass (kg)	~3

These transformers are intended for protection and measuring.

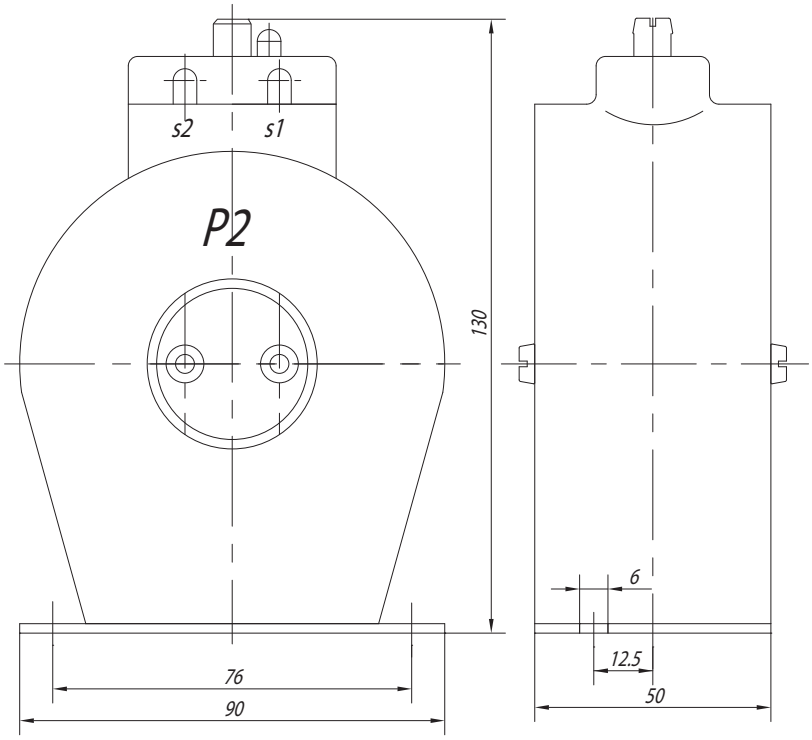
Upon customer request, the characteristics of the transformer can be different.

The mass of the transformer depends on the transformation ratio, accuracy class and rated power and may vary.

Primary current (A)	Power (VA)	Secondary current 5A (or 1A)				
		Accuracy class				
		10P5	10P10	0,5	1	3
75; 100	1,25	●	●	–	–	–
	2,5	●	–	–	–	–
150; 200	2,5	●	●	–	–	–
	5	●	–	–	–	–
250; 300	2,5	●	●	–	–	●
	5	●	●	–	–	●
	10	●	–	–	–	●
400; 500	2,5	●	●	–	●	●
	5	●	●	–	●	●
	10	●	–	–	●	●
600; 750; 800	2,5	●	●	●	●	●
	5	●	●	●	●	●
	10	●	–	–	●	●
1000; 1200; 1250; 1500; 1600; 2000; 2500	2,5	●	●	●	●	●
	5	●	●	●	●	●
	10	●	●	●	●	●

CONTENTS

TSUM 2, TSUM 3, TSUM 4





TSUM 4

SUMMING TRANSFORMER **TSUM ***

Accuracy class	Output power (VA)
0.2	5
0.5*	10*
1	15

TECHNICAL DATA	TSUM 2, TSUM 3, TSUM 4
Rated voltage (kV)	0,72
Rated power-frequency withstand voltage 50 Hz, 1 min (kV)	3
Rated freqency (Hz)	50/60
Rated primary current (A)	5 (or 1)
Rated secondary current (A)	5 (or 1)
Rated short-time thermal current	$I_{th}=80I_n$
Rated dynamic current	$I_{dyn}=2.5I_{th}$
Rated continuous thermal current	$I_{cth}=1.2I_n$
Mounting	Indoor
Temperature insulation class	E/B
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1; IEC 61869-2
Mass(kg)	~1,6

*Characteristics of the transformers we manufacture in series

APPLICATION

The TSUM 2, TSUM 3, and TSUM 4 summing current transformers are used to power measuring instruments in cases where a single instrument is used to measure the current on multiple outputs simultaneously (2, 3, or 4). The primary windings of these transformers are connected to the corresponding secondary windings of the main current transformers in the individual feeders.

SELECTION

When selecting a summing transformer, it is important that the number of turns on the primary windings is in proportion to the primary currents of the main current transformers. During installation, care must be taken to ensure that the individual primary windings are connected to the appropriate main transformers.

For example, suppose the main power transformers in the outputs have transformation ratios of 1000/5 A, 800/5 A, 500/5 A, and 500/5 A. The primary current ratio of these transformers is 10:8:5:5, and the number of turns of the primary windings of the summing transformer must also have this ratio. The corresponding summing transformer is the TSUM 4 transformer with 4 primary windings, with a transformation ratio of (5+5+5+5)/ 5 A. This summing transformer can also be used for connection to main current transformers with a different transformation ratio if the primary current ratio of these transformers is 10:8:5:5 (e.g., 50/5 A, 40/5 A, 25/5 A, and 25/5 A). If a reserve is expected (or exists) in the windings, and one of the main transformers is not installed, then the corresponding (unconnected) primary winding must remain open. If one of the main transformers is disconnected (the winding is unsupplied), the summing transformer is fed from the remaining main transformers.

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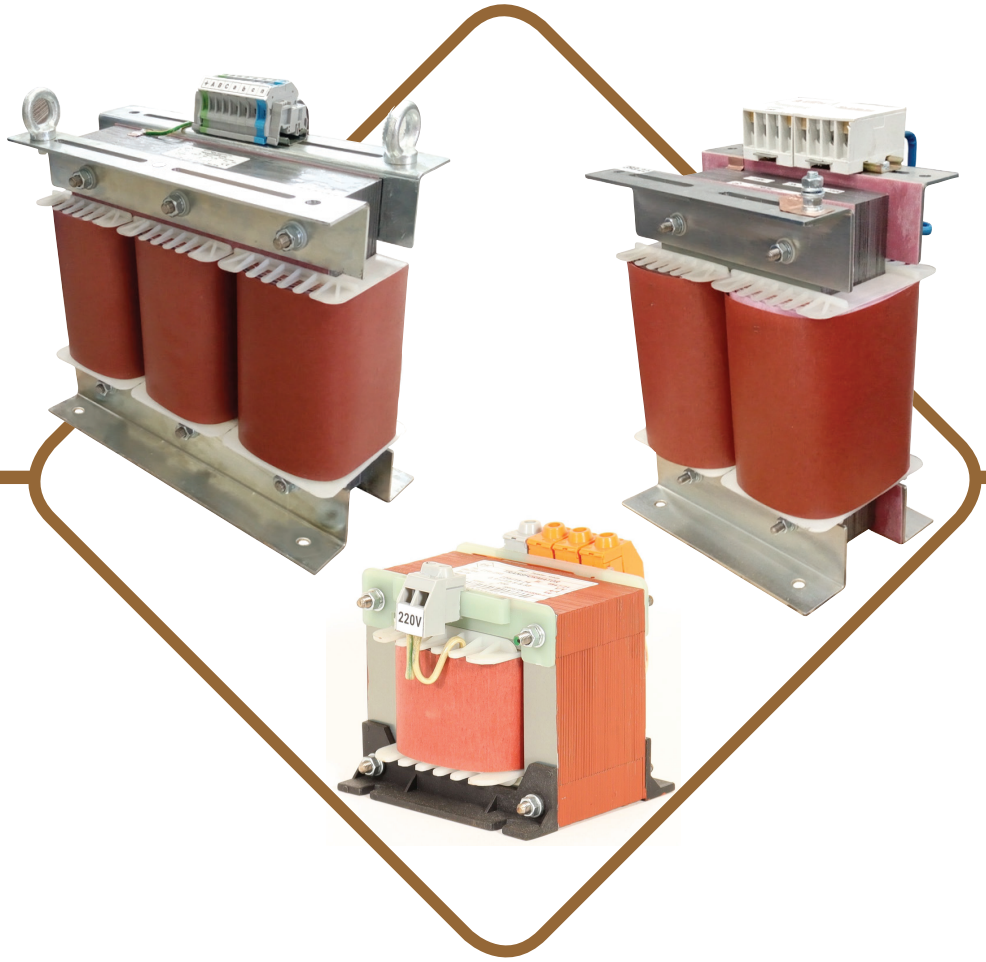
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LOW-VOLTAGE NETWORK AND SAFETY TRANSFORMERS



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INTRODUCTION

DESCRIPTION

These transformers are designed as dry-type transformers, impregnated with epoxy resin in insulation class "F" (maximum temperature 155°C). The transformation ratio in all variants is up to 1 kV.

These transformers can also be manufactured as autotransformers (with a single winding) within the same insulation class. If required, they are installed in protective enclosures with the specified degree of mechanical protection (IP rating).

They are manufactured in compliance with the current **IEC 61558-1** standards according to the following rated power distribution:

- For single-phase isolating transformers with a rated power not exceeding 25 kVA,
- For single-phase safety isolating transformers U''≤50 V with a rated power not exceeding 10 kVA,
- For three-phase isolating transformers with a rated power not exceeding 40 kVA,
- For three-phase safety isolating transformers (U''≤50 V) with a rated power not exceeding 16 kVA.

For power ratings higher than those specified, the applicable standard is **IEC 60076-11.**

The standardized product range includes the following designs:
- ZTU single-phase transformers for power ratings from 10 to 3000 VA;
- MTES single-phase transformers for power ratings from 0.5 to 100 kVA;
- MTI single-phase transformers for power ratings from 2.5 to 50 kVA;
- TTES three-phase transformers for power ratings from 0.1 to 250 kVA;
- TTI three-phase transformers for power ratings from 1.25 to 80 kVA.

APPLICATION

They have an exceptionally wide range of applications in modern electrical networks, industrial environments, and commercial facilities. Since they do not use oil for cooling and insulation, they are environmentally safe, minimally flammable, and suitable for direct installation in indoor spaces occupied by people or housing sensitive equipment.

The most common fields of application for these transformers include:

1. Industrial Plants and Automation

In industry, these transformers are used for the stable power supply of individual machines or sections of production lines:

- Control and signaling circuits (power supply for control panels, PLCs, and contactors operating at lower safety voltages).

- Power supply for industrial machinery (matching standard network voltage to the specific voltage requirements of imported machines and tools).

- Galvanic isolation and protection of sensitive electronics against interference and overvoltages originating from the main power grid.

2. Commercial and Public Buildings

In urban areas, fire safety is a top priority, making dry-type transformers the standard choice for indoor installation:

- Office buildings and shopping malls;

- Hospitals and medical facilities (used as medical isolation transformers to power sensitive medical equipment);

- Hotels, schools, and public institutions.

3. IT Infrastructure and Data Centers

- Data centers and server rooms (facilities requiring uninterruptible power supply utilize dry-type transformers to minimize fire hazards and ensure stable, fluctuation-free voltage).

4. Transport Infrastructure

- Railways and metro stations (powering signaling systems, track switches, indoor lighting, and ventilation systems along tunnels).

- Airports and ports (low-voltage power distribution for guidance systems, runway light signaling, and terminals).

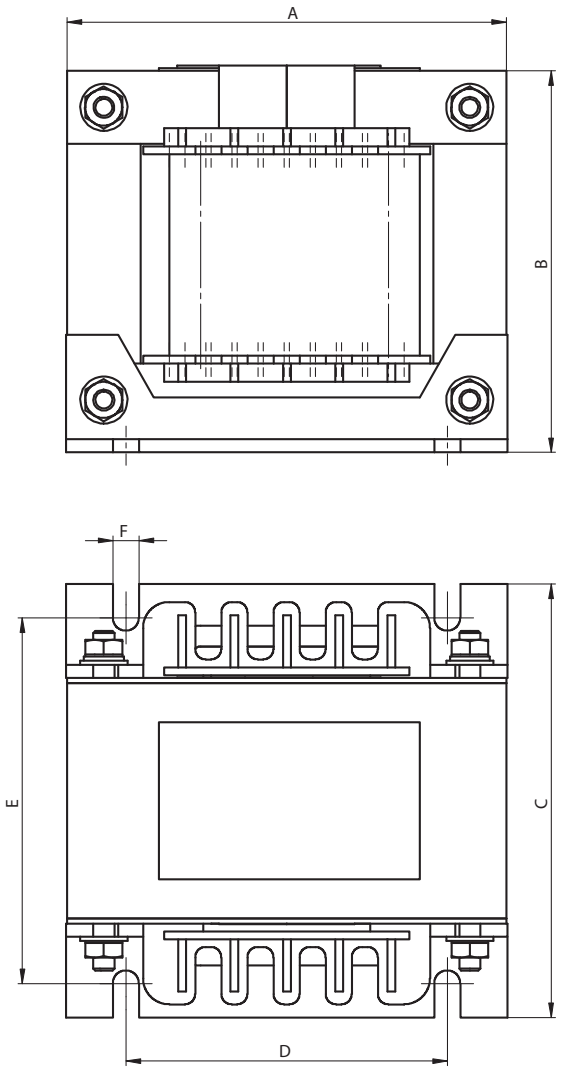
5. Renewable Energy Sources

- Solar and wind power plants

(small dry-type transformers are utilized inside control enclosures and inverter stations to power the system's internal auxiliary consumption, such as communication equipment, sensors, and cooling systems).

ZTU





PORTABLE SAFETY TRANSFORMER TYPE **ZTU-***

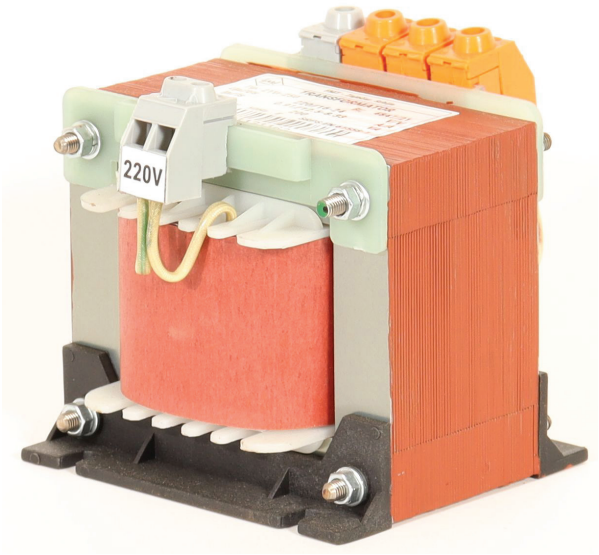
TECHNICAL DATA	ZTU
Highest voltage for equipment (kV)	0,72
Test voltage 50 Hz, 1 min (eff.) (kV)	3
Rated frequency (Hz)	50/60
Rated primary voltage (V)	230, 400 or according to request
Rated secondary voltage (V)	12, 24, 48, 110, 230 or according to request
Temperature class of insulation	B
Mounting	Indoor
Area of application	Every, including tropical
Valid standard	IEC 61558-1

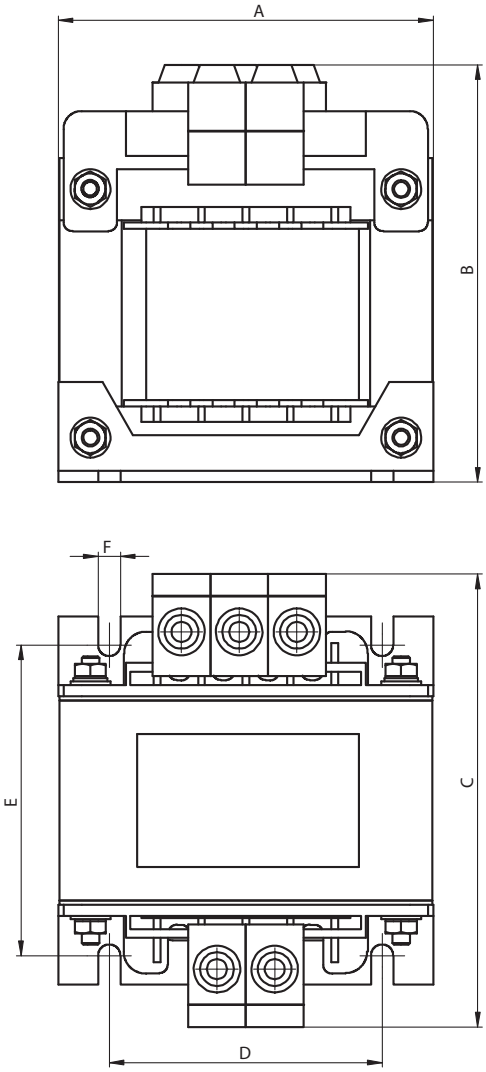
Mass of the transformer depends on the transformation ratio and may vary.

Type of transformer	Rated power (VA)	Dimensions (mm)						Mass (kg)
		A	B	C	D	E	F	
ZTU-10	10	60	50	32	45	25	3,5	0,5
ZTU-16	16	60	50	37	45	28	3,5	0,6
ZTU-20	20	60	50	42	45	36	3,5	0,7
ZTU-25	25	66	55	42	50	33	4,2	0,8

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ZTU

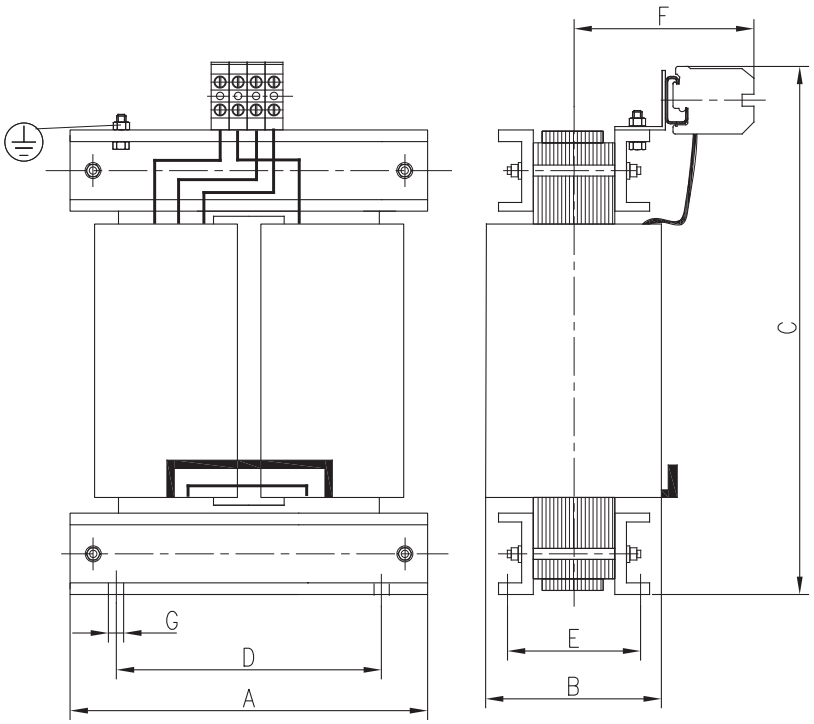


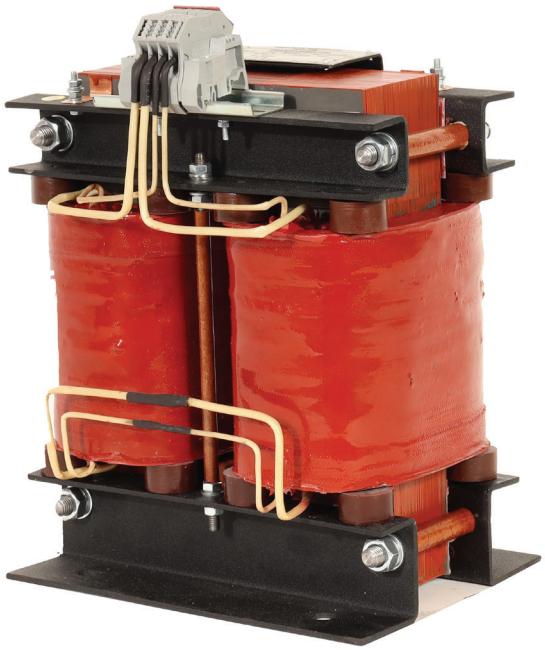


Data table for transformers **ZTU** with higher rated power:

Type of transformer	Rated power (VA)	Dimensions (mm)						Mass (kg)
		A	B	C	D	E	F	
ZTU-31,5	31,5	75	63	85	55	36	4,2	0,95
ZTU-40	40	75	63	85	55	40	4,2	1,0
ZTU-50	50	75	63	95	55	50	4,2	1,3
ZTU-63	63	75	63	95	55	54	4,2	1,5
ZTU-80	80	84	94	92	60	60	5,2	1,7
ZTU-100	100	84	94	102	60	70	5,2	2,2
ZTU-125	125	96	99	103	68	65	5,2	2,5
ZTU-160	160	96	99	113	68	70	5,2	2,85
ZTU-200	200	96	99	113	68	80	5,2	3,4
ZTU-250	250	108	106	113	75	80	5,6	4,1
ZTU-315	315	108	106	117	75	85	5,6	4,6
ZTU-400	400	120	116	120	80	88	6,5	5,5
ZTU-500	500	120	116	130	80	98	6,5	6,5
ZTU-630	630	120	116	140	80	108	6,5	7,5
ZTU-800	800	135	123	130	95	98	6,2	8,5
ZTU-1000	1000	135	131	145	95	113	6,2	10,5
ZTU-1250	1250	150	135	140	105	106	6,5	12,5
ZTU-1600	1600	150	135	160	105	126	6,5	15,0
ZTU-2000	2000	180	164	180	130	120	8,0	19,0
ZTU-2500	2500	180	164	190	130	130	8,0	21,5
ZTU-3000	3000	192	176	170	128/145	136	8,0	26,2

SINGLE-PHASE TRANSFORMERS MTES-*

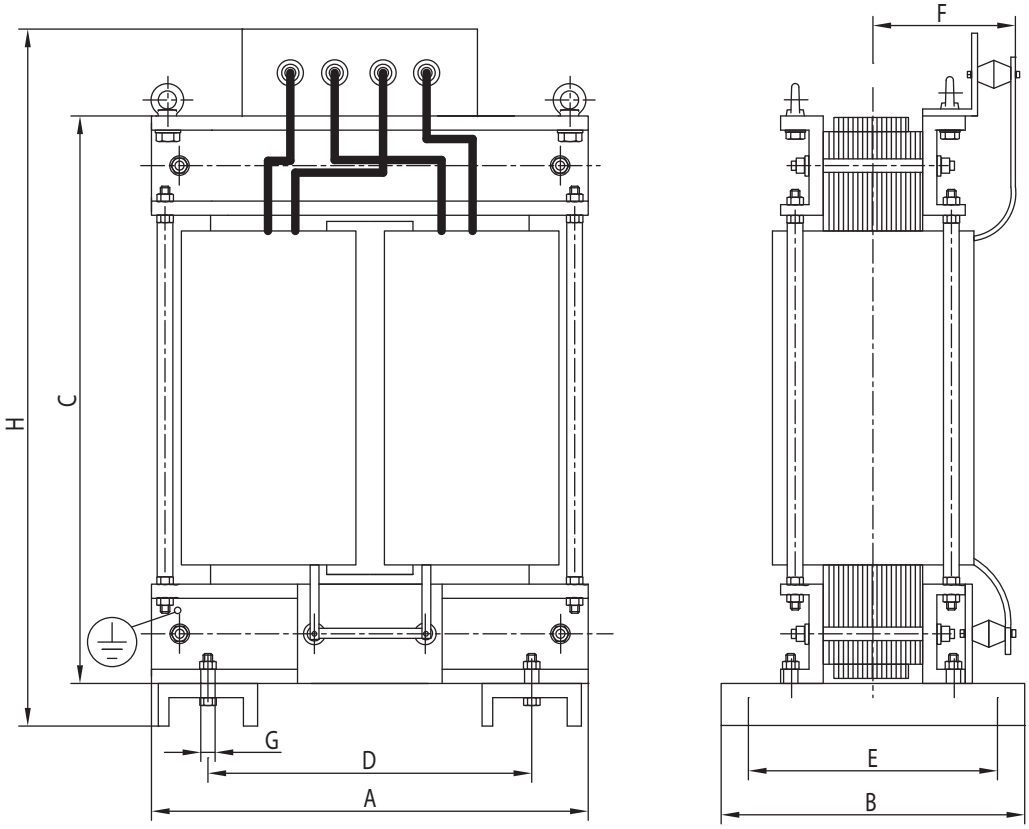




Data table for **MTES** for rated powers from **0.5 kVA** to **16 kVA.**

Type of transformer	Rated power (kVA)	Max. secondary current (A)	Dimensions(mm)							Mass (kg)
			A	B	C	D	E	F	G	
MTES – 0,5	0,5	40	170	120	255	110	84	98	Ø9	9,3
MTES – 0,63	0,63	55	170	125	255	110	85	100	Ø9	10,2
MTES – 0,8	0,8	65	170	131	275	110	95	103	Ø9	12,2
MTES – 1	1	80	170	140	275	110	104	108	Ø9	13,5
MTES – 1,25	1,25	100	190	146	275	120	111	106	Ø11	16,8
MTES – 1,6	1,6	130	190	156	275	120	121	111	Ø11	18,4
MTES – 2	2	165	230	166	335	150	116	111	Ø13	26,0
MTES – 2,5	2,5	200	230	171	335	150	121	114	Ø13	28,0
MTES – 3,15	3,15	200	250	186	335	170	136	121	Ø13	32,5
MTES – 4	4	200	250	196	335	170	146	126	Ø13	37,0
MTES – 5	5	200	260	200	335	180	150	128	Ø13	40,5
MTES – 6,3	6,3	260	260	230	365	180	173	139	Ø13	52,5
MTES – 8	8	330	260	250	385	180	180	143	Ø13	61,0
MTES – 10	10	400	310	240	435	210	161	163	Ø13	78,0
MTES – 12,5	12,5	520	340	250	475	220	168	168	Ø13	92,5
MTES – 16	16	660	340	250	490	220	183	174	Ø15	105,0

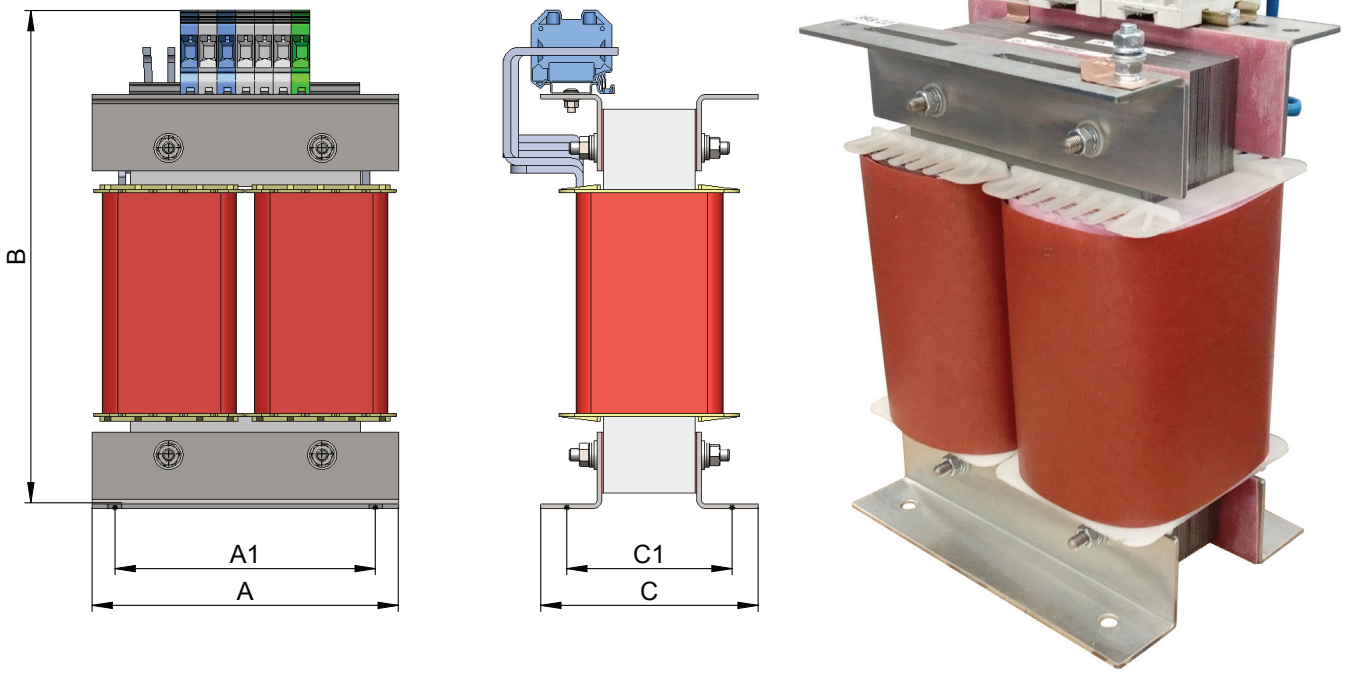
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Data table for **MTES** with rated powers from **20 kVA** to **100 kVA.**

Type of transformer	Rated power (kVA)	Max. secondary current (A)	Dimensions (mm)								Mass (kg)
			A	B	C	D	E	F	G	H	
MTES – 20	20	420	360	450	411	220	340	180	Ø15	505	128,2
MTES – 25	25	520	450	440	481	260	330	175	Ø15	590	165,5
MTES – 31,5	31,5	720	450	455	481	260	345	183	Ø15	590	183,6
MTES – 40	40	720	460	475	481	260	365	195	Ø15	590	210,0
MTES – 50	50	720	460	510	510	270	395	212	Ø17	620	264,0
MTES – 63	63	720	460	530	560	270	415	225	Ø17	670	313,0
MTES – 80	80	720	460	530	600	280	415	225	Ø17	710	351,0
MTES – 100	100	900	490	580	635	280	445	235	Ø17	750	416,0

SINGLE-PHASE TRANSFORMERS MTI-*



MTI single-phase network transformers differ from MTES transformers in that they have a magnetic core assembled from standard-dimension UI laminations.

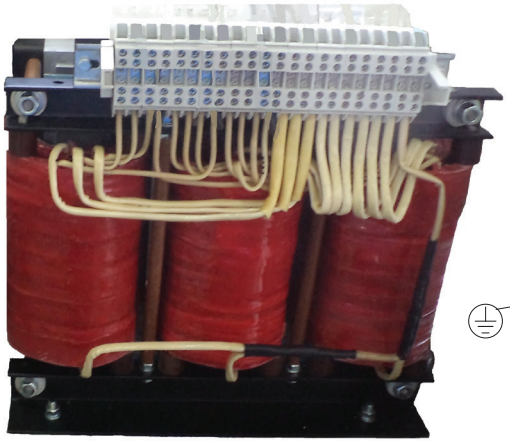
When ordering, be sure to specify the rated power and voltages of the transformer.

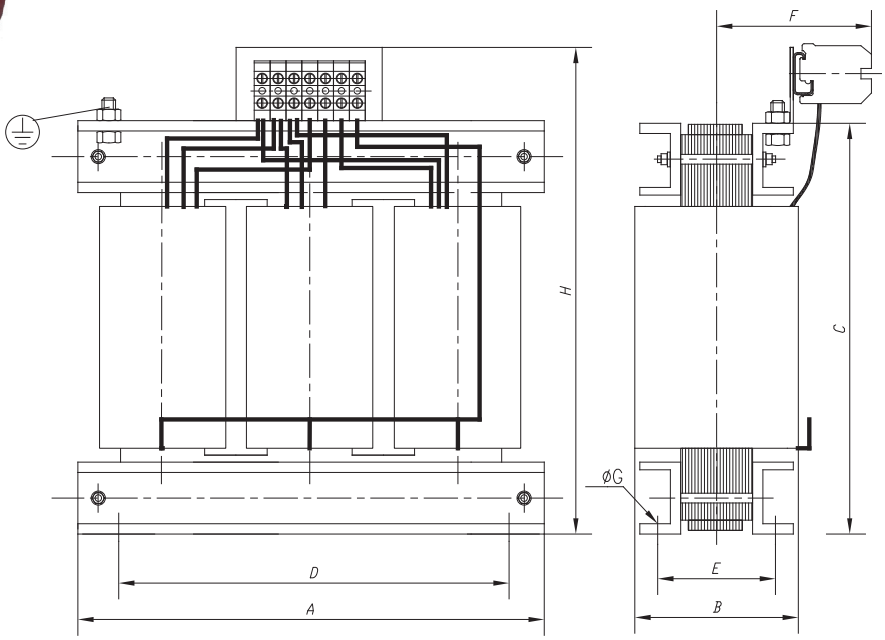
Data table for **MTI** with rated powers from 2.5 kVA to 50 kVA.

Type of transformer	Rated power (kVA)	Max. secondary current (A)	Dimensions (mm)					Mass (kg)
			A	A1	B	C	C1	
MTI – 2.5	2.5	130	200	150	325	145	105	23.5
MTI – 3.15	3.15	230	200	150	325	155	115	27.5
MTI – 4	4	150	240	180	375	165	115	32.7
MTI – 5	5	200	240	180	375	175	125	38.0
MTI – 6.3	6.3	230	240	180	375	185	135	43.3
MTI – 8	8	160	240	180	375	195	145	50.9
MTI – 10	10	200	280	210	425	205	145	63.0
MTI – 12.5	12.5	230	280	210	425	215	155	69.0
MTI – 16	16	130	320	240	475	235	165	90.0
MTI – 20	20	150	320	240	475	245	175	103.5
MTI – 25	25	200	320	240	475	255	185	115.7
MTI – 31.5	31.5	260	400	300	575	305	205	152.0
MTI – 40	40	180	400	300	575	305	205	165.0
MTI – 50	50	200	400	300	575	325	225	200.0

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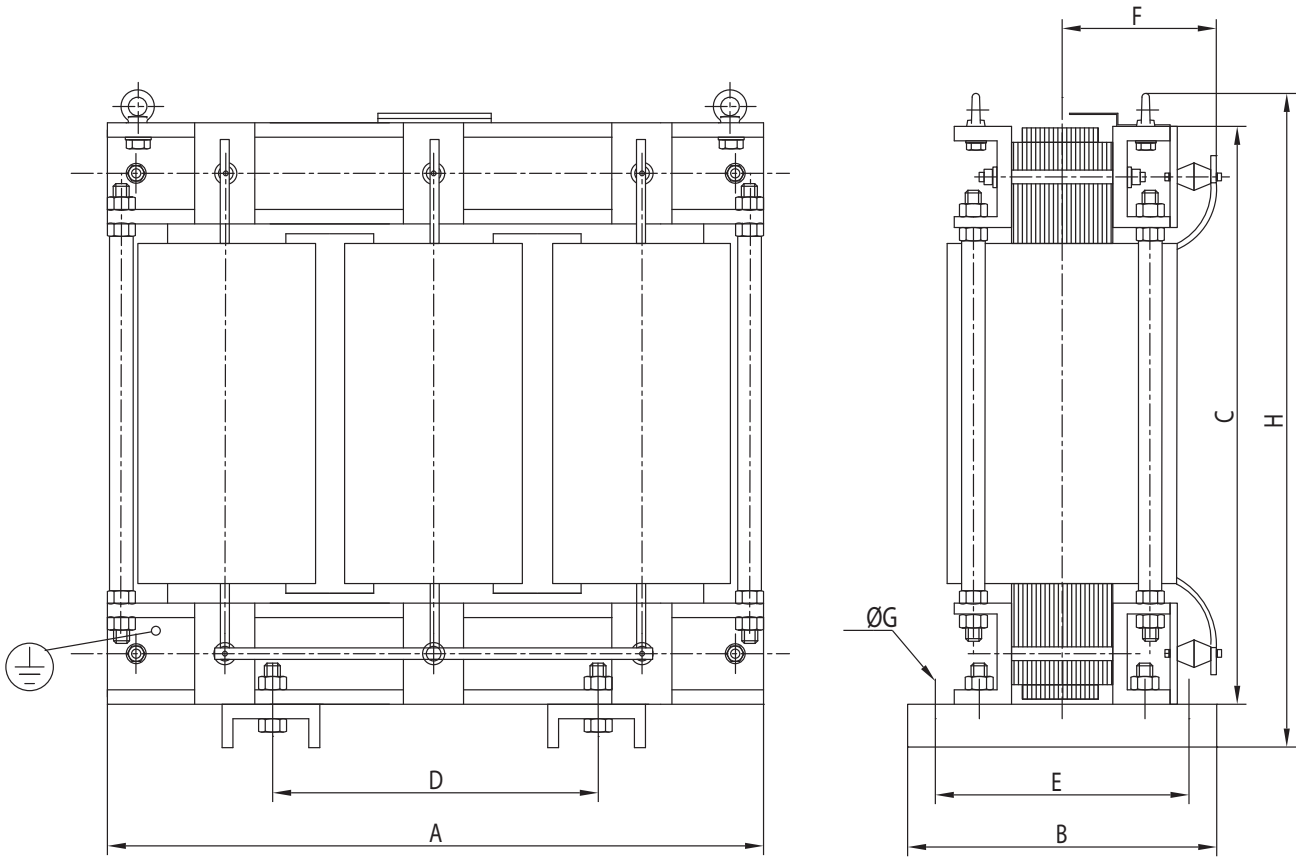
THREE-PHASE TRANSFORMERS TTES-*





Data table for **TTES** with rated powers from **1.25 kVA** to **25 kVA.**

Type of transformer	Rated power (kVA)	Max. secondary current (A)	Dimensions (mm)								Mass (kg)
			A	B	C	D	E	F	G	H	
TTES – 1,25	1,25	65	275	126	230	205	86	100	Ø7	290	20
TTES – 1,6	1,6	65	275	132	230	205	92	104	Ø7	290	23
TTES – 2	2	65	290	142	250	210	102	108	Ø7	310	28,5
TTES – 2,5	2,5	65	290	142	250	210	102	108	Ø7	310	31
TTES – 3,15	3,15	65	290	146	250	210	106	110	Ø7	310	34
TTES – 4	4	100	300	162	275	220	122	118	Ø9	335	41
TTES – 5	5	100	300	162	275	220	122	118	Ø9	335	44,8
TTES – 6,3	6,3	100	370	166	320	280	116	120	Ø9	380	57,8
TTES – 8	8	150	370	172	320	280	122	124	Ø9	380	63,5
TTES – 10	10	150	420	188	355	305	138	132	Ø11	415	79,8
TTES – 12,5	12,5	150	420	198	355	305	148	136	Ø11	415	93
TTES – 16	16	150	450	208	396	350	158	142	Ø11	456	108
TTES – 20	20	150	460	218	396	350	168	146	Ø11	456	130
TTES – 25	25	150	460	232	396	350	182	154	Ø11	456	145

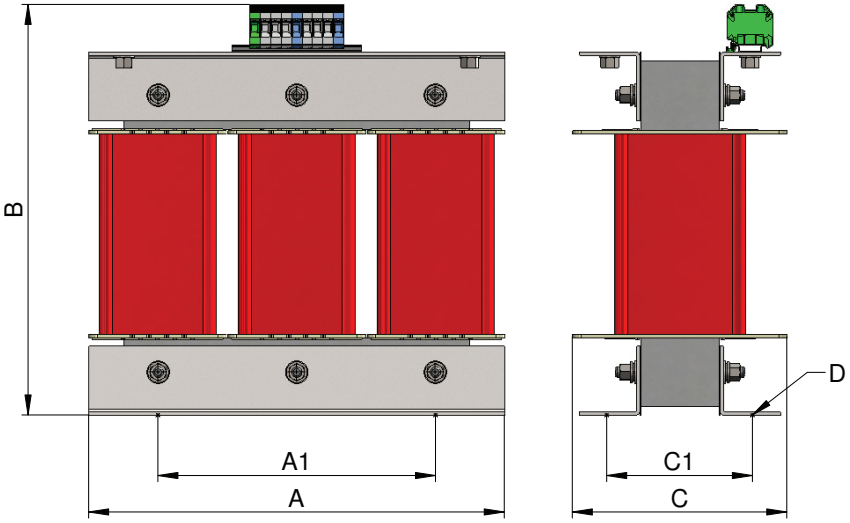


Data table for **TTES** with rated powers from from **31.5 kVA** to **250 kVA**.

Type of transformer	Rated power (kVA)	Max. secondary current (A)	Dimensions (mm)								Mass (kg)
			A	B	C	D	E	F	G	H	
TTES – 31,5	31,5	250	540	495	505	340	355	170	Ø11	595	198
TTES – 40	40	250	570	505	510	360	365	175	Ø11	600	230
TTES – 50	50	250	570	535	510	360	390	180	Ø11	600	265
TTES – 63	63	500	680	535	670	430	380	180	Ø13	775	360
TTES – 80	80	500	680	545	670	430	390	185	Ø13	775	385
TTES – 100	100	630	700	570	730	440	415	190	Ø13	835	465
TTES – 125	125	630	700	600	730	440	440	200	Ø17	850	550
TTES – 160	160	630	760	660	750	480	490	215	Ø17	865	620
TTES – 200	200	630	790	670	750	500	500	225	Ø17	865	700
TTES – 250	250	630	790	710	850	500	535	240	Ø17	965	830

THREE-PHASE TRANSFORMERS TTI-*





TTI three-phase network transformers differ from TTES transformers in that they have a magnetic core assembled from standard-dimension EI laminations.

When ordering, be sure to specify the rated power and voltages of the transformer.

Data table for **TTI*** with rated powers from **3.15 kVA** to **80 kVA.**

Type of transformer	Rated power (kVA)	Max. secondary current (A)	Dimensions (mm)						Mass (kg)
			A	A1	B	C	C1	D	
TTI – 3.15	3.15	160	300	250	325	120	100	11	33.0
TTI – 4	4	200	300	250	325	130	110	11	38.5
TTI – 5	5	250	300	250	325	130	110	11	42.0
TTI – 6.3	6.3	160	360	300	375	140	110	11	52.0
TTI – 8	8	200	360	300	375	150	120	11	59.5
TTI – 10	10	250	360	300	375	160	130	11	70.0
TTI – 12.5	12.5	160	360	300	375	170	140	11	80.0
TTI – 16	16	200	420	350	425	170	140	11	97.0
TTI – 20	20	250	420	350	425	190	150	11	111.0
TTI – 25	25	160	480	400	475	250	160	13	138.5
TTI – 31.5	31.5	160	480	400	475	260	170	13	160.0
TTI – 40	40	200	480	400	475	270	180	13	185.0
TTI – 50	50	250	600	500	575	270	200	13	236.0
TTI – 63	63	250	600	500	575	270	210	13	278.0
TTI – 80	80	250	600	500	575	270	220	13	324.0

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INTRODUCTION

LOW-VOLTAGE NETWORK AUTOTRANSFORMERS

DESCRIPTION

Low-voltage network autotransformers are specific electrical devices used for voltage transformation in low-voltage distribution networks. They differ from standard transformers in that they do not provide galvanic isolation between the secondary and primary electrical circuits. They feature a single common winding, from which the name "autotransformer" is derived.

By replacing two separate windings with a single one, they are significantly more cost-effective than conventional transformers, depending on the transformation ratio; for this reason, they are also referred to as economy-connected transformers.

They are manufactured using the highest-quality magnetic core laminations and copper windings. They are designed as dry-type, epoxy-resin impregnated transformers in insulation class "F" (maximum permissible temperature rise on the transformer is 110°C at a maximum ambient temperature of 40°C). The transformation ratio of the autotransformers can be up to 1 kV across all variants.

MAIN APPLICATIONS AND PURPOSE

- **Improving Voltage Profiles in Three-Phase and Single-Phase Networks:**

  They are utilized on long low-voltage lines experiencing significant voltage drops due to the distance between consumers and the substation (e.g., in rural areas). Under such conditions, end consumers typically do not receive adequate voltage suitable for powering household appliances, electric motors, water pumps, and other equipment with sensitive motor drives. To resolve these issues, a three-phase "step-up" autotransformer rated at 3x400V / 3x900V can be installed. This steps up the voltage to 3x900V, resulting in a 2.25 times lower grid current and consequently a proportionally reduced voltage drop compared to a network without an autotransformer. At the end of the line, just upstream of the consumers, a second "step-down" autotransformer rated at 3x900V / 3x400V is installed, ensuring that consumers receive a high-quality supply voltage.

  In single-phase networks, a "step-up" autotransformer with a 230/520V transformation ratio can be installed at the grid inlet, while a "step-down" autotransformer with a 520/230V transformation ratio is placed inline at the end of the grid. The effect of improving the voltage profile is identical to that in three-phase networks.

  Deploying these autotransformers on a low-voltage network provides:

  - Improvement of the LV line voltage profile;
  - Quality of the delivered energy;
  - Significantly lower investment compared to standard transformers (less material is used);
  - Avoidance of capital expenditure for a new substation, a new 10 kV line, or upgrading the LV line;
  - Flexibility to be installed at various points along the LV line and across individual phases;
  - Fast and simple installation that does not require specialized heavy machinery.

- **Grid Voltage Adaptation:**
  They are used to adapt the voltage to specific requirements of industrial equipment or imported devices from the standard 400/230V to 110V, 120V, or other voltage ratings specified on the equipment.
- **Voltage Regulation:**
  They can frequently be applied to power devices requiring different voltage levels; therefore, they can be manufactured with multiple voltage regulation taps (for manual or automatic control) or utilized for electric motor starting.

DESIGN

To improve voltage profiles in low-voltage networks, we manufacture standard single-phase autotransformers designated as AMTES- (ranging from 5 to 20 kVA), and three-phase autotransformers designated as ATTES- (ranging from 10 to 50 kVA).
For the specified transformation ratio and power rating, the price of a conventional transformer is approximately 25% higher than that of an autotransformer.

Both autotransformer types can be manufactured as **enclosed or open types**, depending on the installation requirements.

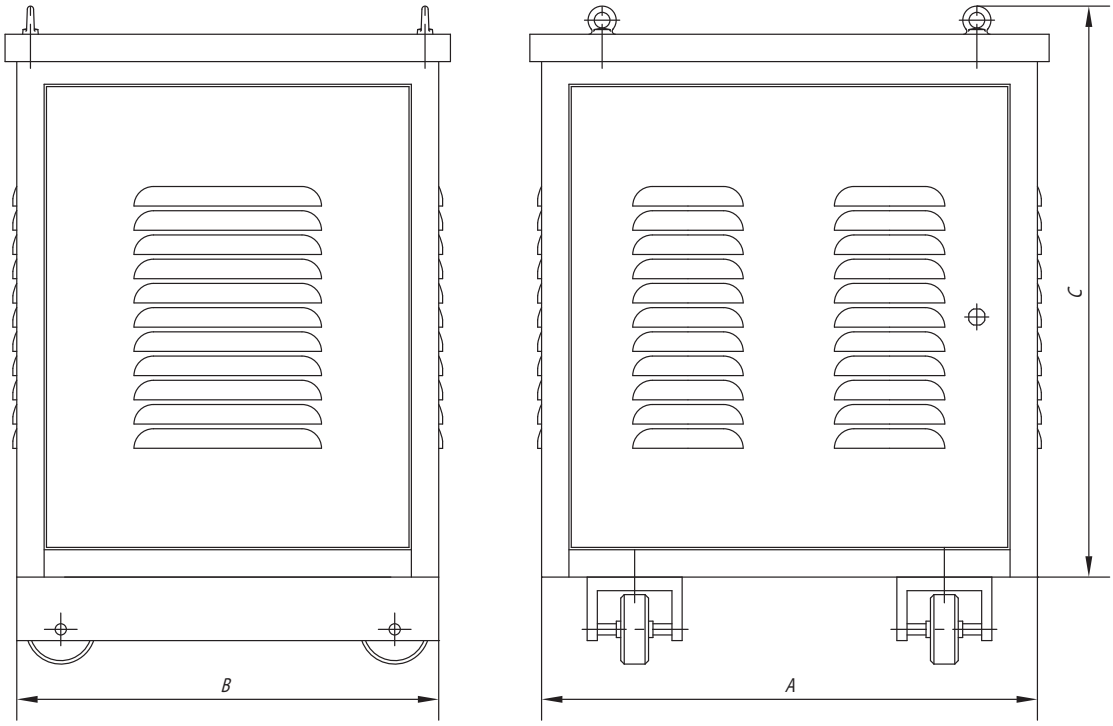
In addition to the autotransformer, **the enclosure houses auxiliary control and protection equipment:**

- **Moulded Case Circuit Breakers** (MCCBs), connected to the voltage side with a rated voltage of 400V. In addition to switching the device on and off, they feature overcurrent protection elements adjustable from (0.8–1) x In, as well as short-circuit protection.
- **Surge arresters** designed to protect the transformer and consumers from atmospheric discharges (lightning strikes).



ENCLOSED THREE-PHASE AUTOTRANSFORMER WITH INTEGRATED OVERLOAD, SHORT-CIRCUIT, EARTH-FAULT, AND SURGE PROTECTION

CONTENTS



Enclosure dimensions for single-phase **AMTES*** autotransformers

Type of autotransformer	Rated power (kVA)	Voltage ratio (V/V)	A (mm)	B (mm)	C (mm)	Mass (kg)
AMTES-5	5	"step-up" 230±5%//520(550) "step-down" 520(550)//230±5%	550	400	500	50
AMTES-6.3	6.3		550	400	500	54
AMTES-8	8		550	400	500	65
AMTES-10	10		600	400	550	75
AMTES-12.5	12.5		600	400	550	90
AMTES-16	16		700	450	630	112
AMTES-20	20		700	450	630	131

NOTE: Custom power ratings and voltage ratios are available upon request

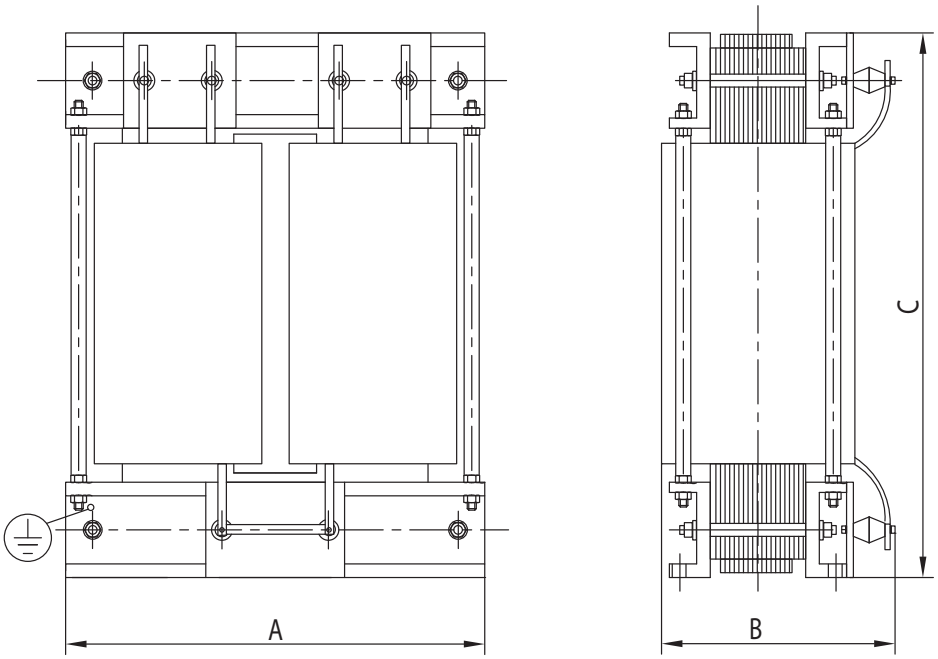
Enclosure dimensions for three-phase **ATTES*** autotransformers

Type of autotransformer	Rated power (kVA)	Voltage ratio (V/V)	A (mm)	B (mm)	C (mm)	Mass (kg)
ATTES-10	10	"step-up" 3x400±5%//3x900(950) "step-down" 3x900(950)//3x400±5%	700	450	630	73
ATTES-12.5	12.5		700	450	630	85
ATTES-16	16		750	450	680	103
ATTES-20	20		750	450	680	121
ATTES-25	25		800	460	750	140
ATTES-31.5	31.5		800	460	750	169
ATTES-40	40		800	460	750	198
ATTES-50	50		800	500	800	257

NOTE: Custom power ratings and voltage ratios are available upon request

OPEN-TYPE SINGLE-PHASE AUTOTRANSFORMER AMTES*





Dimensions of single-phase autotransformer **AMTES***

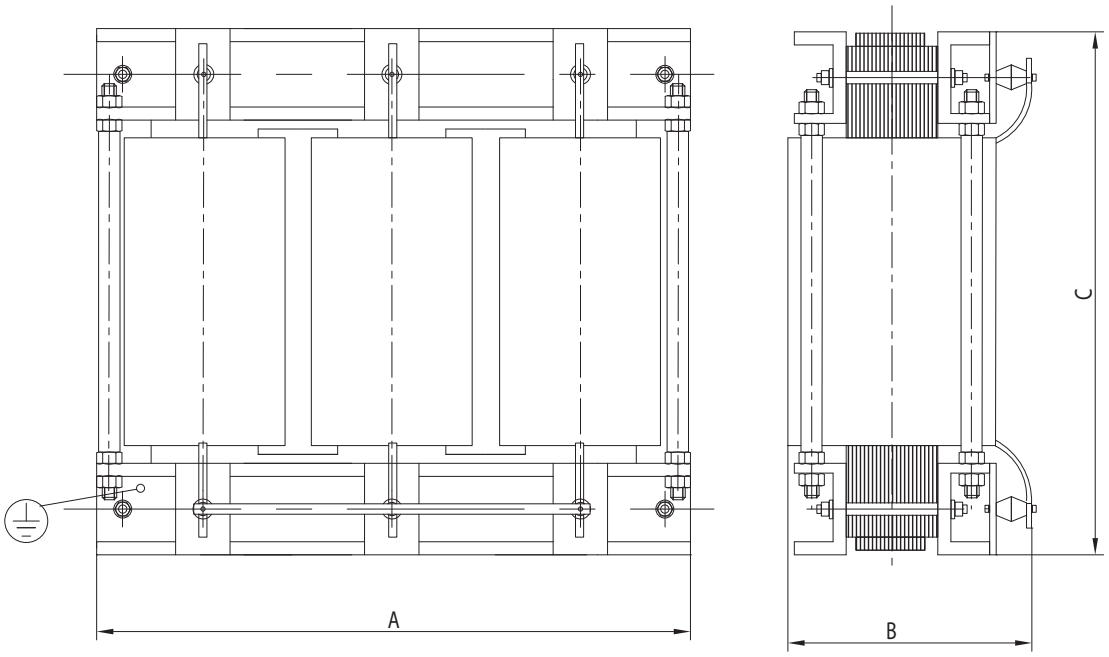
Type of autotransformer	Rated power (kVA)	Voltage ratio (V/V)	A (mm)	B (mm)	C (mm)	Mass (kg)
AMTES-5	5	"step-up" 230±5%//520(550) "step-down" 520(550)//230±5%	250	186	285	33
AMTES-6.3	6.3		250	196	285	37
AMTES-8	8		260	200	285	41
AMTES-10	10		260	230	315	53
AMTES-12.5	12.5		260	250	335	61
AMTES-16	16		310	240	385	78
AMTES-20	20		340	250	425	93

NOTE: Custom power ratings and voltage ratios are available upon request

CONTENTS

OPEN-TYPE THREE-PHASE AUTOTRANSFORMER ATTES*





Dimensions of three-phase autotransfomer **ATTES***

Type of autotransformer	Rated power (kVA)	Voltage ratio (V/V)	A (mm)	B (mm)	C (mm)	Mass (kg)
ATTES-10	10	"step-up" 3x400±5%//3x900(950) "step-down" 3x900(950)//3x400±5%	370	166	315	58
ATTES-12.5	12.5		370	172	320	64
ATTES-16	16		420	188	360	80
ATTES-20	20		420	198	360	93
ATTES-25	25		450	208	410	108
ATTES-31.5	31.5		460	218	420	130
ATTES-40	40		460	232	420	145
ATTES-50	50		540	495	590	198

NOTE: Custom power ratings and voltage ratios are available upon request

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SELF-MANAGING VOLTAGE REGULATORS



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INTRODUCTION 2

CHARACTERISTICS OF SELF-MANAGING VOLTAGE REGULATOR **VROT** 3

ADVANTAGES OF UTILIZING THIS SYSTEM 4

COMPARISON - WITH AND WITHOUT **VROT** IN LOW-VOLTAGE NETWORKS 5

APPLICATION OF THREE-PHASE **VROT-18** IN DISTRIBUTION AND INDUSTRIAL NETWORKS 7

APPLICATION OF SINGLE-PHASE **VROT-18** IN DISTRIBUTION NETWORKS 8

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INTRODUCTION

DESCRIPTION

The self-managing voltage regulator is designed for voltage management and control in low-voltage networks. It balances the load along the line where it is installed, as well as reduce the return current through a neutral conductor for consumers connected downstream of the VROT-* device, thereby improving protection operating conditions and protection selectivity, while also protecting consumers from overvoltage in the event of short circuits between the phase and neutral conductors. It features a high transfer rate of maximum power along the low-voltage line.

The primary components are: a fuse box, a special galvanically isolated dry-type power transformer, and a control box.

Fuse Box

It is equipped with an automatic, high-interrupting-capacity fuse.

The cover is transparent, allowing for visual verification of the status of the switching and protective element.

Control box

It is made of top-quality PVC material with an IP 54 protection rating. It is equipped with electronic circuitry driving the transformer, galvanically isolated from the low-voltage network.

Via a special actuator, the electronics issue the command for the transformer to enter regulation mode. The electronic assembly also features a self-test function.

Dry-type power transformer

This is a special type of self-managing transformer whose operation is based on the principle of controlling the variable structure of a galvanically isolated circuit, and it does not belong to the autotransformer family.

The primary insulation is made of cycloaliphatic epoxy resins for outdoor/indoor mounting, with dimensions optimized relative to the rated power and installation site.

Utmost attention has been given to the design, mechanical, and electrical characteristics regarding thermodynamic and dielectric loads, as well as losses (iron and copper losses), making it highly efficient, reliable, and aesthetically appealing.

PROTECTION AGAINST DIRECT CONTACT

All live parts of the device are fully enclosed.

PRINCIPLE OF OPERATION

Electronics, galvanically isolated from the low-voltage network, monitor the parameters of the low-voltage line at the installation site and execute control according to the pre-programmed software. By installing the device at the designated point on the low-voltage feeder, identical parameters to those on the busbars of the associated 10(20)/0.4 kV substation are achieved, thus implementing a method that mirrors the 10(20)/0.4 kV substation at the installation site.

INSTALLATION METHOD AND LOCATION

The self-managing voltage regulator is mounted on a specially designed, stainless steel console.
It is installed at a height of 1 m below the lowest conductor of the low-voltage network. The connection to the low-voltage network is established by connecting the primary conductors to the line-to-line voltage of the grid, while the secondary side is connected to the phase and neutral conductors.

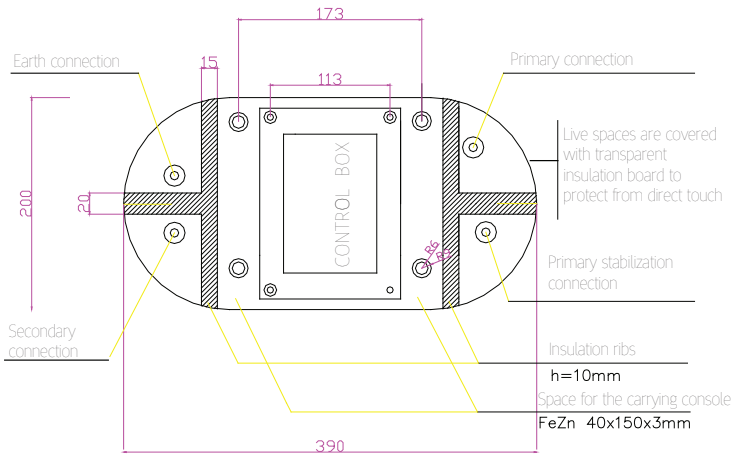
A combined grounding system must be implemented at the installation site.
One power transformer is used per phase, and each has its own fuse box and control box.
The self-managing voltage regulator regulates the voltage independently for each phase.

Bočna strana 1.

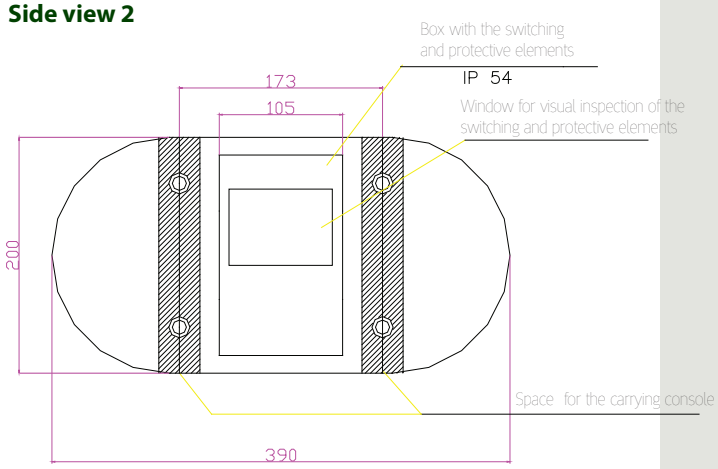
VROT-X



Side view 1



Side view 2



CHARACTERISTICS OF SELF-MANAGING VOLTAGE REGULATORS

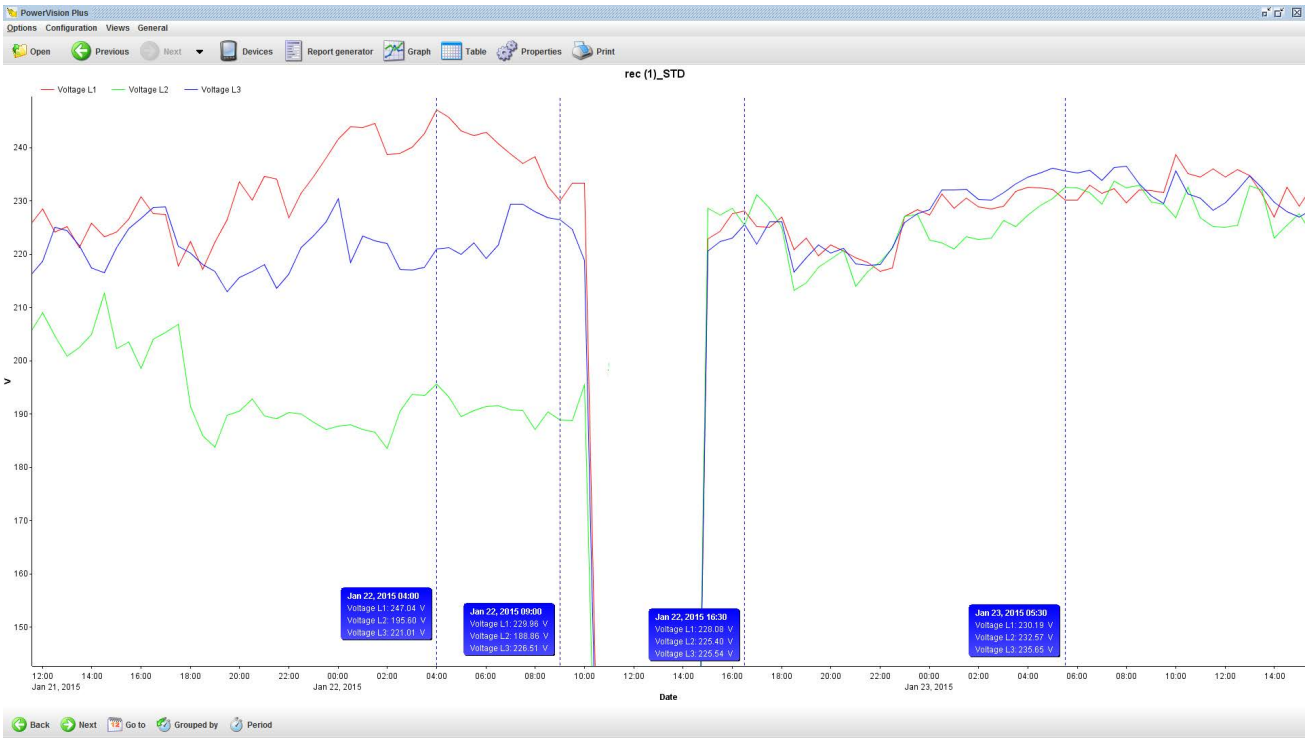
TECHNICAL DATA	VROT-10	VROT-18
Rated power (kVA)	10	18
Rated network voltage (V)	400/231	
Output voltage (V)	230 ± 10%	
Rated insulation level (kV)	1	
Rated power-frequency withstand voltage, 1min (kV)	3	
Rated impulse withstand voltage 1.2/50μs [kV]	6	
Rated output current [A]	44	80
Power losses (in transformer) P_{cun} (W)/P_{fe}(W)	310/50	500/80
Transformer power factor cos φ	0.95	
Degree of mechanical protection	IP 54	
Temperature range	-30°C do +45°C	
Mounting	in any position on the pole	

CONTENTS

ADVANTAGES OF UTILIZING THIS SYSTEM

- **Simple and fast installation**;
- **Low investment costs** during network reconstruction/retrofitting;
- **Significantly higher system efficiency** during power transmission along the low-voltage (LV) line;
- **Reduced energy losses** during transmission to consumers;
- **Capability to transmit significantly higher power over longer distances** while maintaining continuous voltage profiles along the low-voltage line within the limits defined by the IEC 60038 / EN 50160 standards;
- **Eliminated impact of higher harmonics** due to galvanic isolation;
- **Eliminated neutral conductor loading** in the substation during severe unbalances, as I0 = 0 at the installation site;
- **Improved protection operating conditions** for TN-C-S systems;
- **Consumer protection against overvoltage** in the event of a phase-to-neutral short circuit or a neutral conductor breakage (open neutral);
- **Load balancing** across phase conductors;
- **Achieved selectivity and sensitivity of protection operations** along the low-voltage line;
- **Zero-maintenance feeder operation** when combined with aerial bundled cables (ABC), particularly if the power line passes through areas with dense/high vegetation;
- **Highly suitable as a replacement for 10/0.4 kV substations up to 50 kVA** when supplying small consumer loads;
- **Reduced number of outages on the main 10(20) kV lines** (if used as a replacement for 10/0.4 kV substations up to 50 kVA) caused by faults on high-voltage lines that pass through dense vegetation to feed low-capacity 10/0.4 kV substations;
- **Highly suitable for a ring network configuration** consisting of a 10/0.4 kV 250 kVA substation with 5 outgoing feeders of 50 kVA each, specifically for the VROT-18 device type;
- **Highly suitable for application in industrial facilities, large buildings, and commercial centers** for a ditributed power supply system to remote consumers.

THE EFFECT OF VROT INSTALLATION



Effects achieved by installing self-managing voltage regulators in the low-voltage networks

WITH VROT 18 ISNTALLED IN THE LOW-VOLTAGE NETWORK

Rated voltage at power substation 10(20)/0.4kV, 250 kVA Level 1	Used conductor in the low voltage network Level 1 to Level 2	Lenght of the low voltage line [m]	Rated power / Line voltage / Phase voltage at the end of the line LEVEL 2	
			Symmetrical 3 phase	Not symmetrical 1 phase
231/400V	AlFe 3x 25/4mm or X00-A-3x25mm^2	800	16kW/400/230V	7.8kW/230V
		450	30kW/400/230V	13.8kW/230V
		250	50kW/400/230V	18kW/230V
	AlFe 3x 35/6mm or X00-A-3x35mm^2	1100	16kW/400/230V	7.8kW/230V
		500	30kW/400/230V	13.8kW/230V
		300	50kW/400/230V	18kW/230V
	AlFe 3x 50/8mm or X00-A-3x50mm^2	1500	16kW/400/230V	7.8kW/230V
		800	30kW/400/230V	13.8kW/230V
		500	50kW/400/230V	18kW/230V
	X00-A-3x70mm^2	2000	16kW/400/230V	7.8kW/230V
		1000	30kW/400/230V	13.8kW/230V
		600	50kW/400/230V	18kW/230V

X00-A is an aerial bundled cable (ABC) TABLE 1.0

WITHOUT VROT 18 ISNTALLED IN THE LOW-VOLTAGE NETWORK

Rated voltage at power substation 10(20)/0.4kV, 250 kVA Level 1	Used conductor in the low voltage network Level 1 to Level 2	Lenght of the low voltage line [m]	Rated power / Line voltage / Phase voltage at the end of the line LEVEL 2	
			Symmetrical 3 phase	Not symmetrical 1 phase
231/400V	AlFe 4x 25/4mm or X00-A-4x25mm^2	400	16kW/376/217V	5.00kW/207V
		225	30kW/376/217V	8.66kW/207V
		125	50kW/376/217V	15.4kW/207V
	AlFe 4x 35/6mm or X00-A-4x35mm^2	550	16kW/377/218V	5.00kW/207V
		320	30kW/377/218V	8.66kW/207V
		180	50kW/377/218V	15.4kW/207V
	AlFe 4x 50/8mm or X00-A-4x50mm^2	770	16kW/377/218V	5.00kW/207V
		450	30kW/377/218V	8.66kW/207V
		260	50kW/377/218V	15.4kW/207V
	X00-A-3x70+71.5 mm^2	1000	16kW/377/218V	5.00kW/207V
		600	30kW/377/218V	8.66kW/207V
		340	50kW/377/218V	15.4kW/207V

TABLE 1.1

To transmit higher power from the beginning to the end of the line, as well as for distances greater than those shown in "TABLE 1.0", larger conductor cross-sections must be used.

CONTENTS

EFFECTS OF INSTALLING A SINGLE-PHASE VROT INTO A SINGLE-PHASE LOW-VOLTAGE NETWORK

	Method	With VROT 18		Without VROT 18	
Level 2	Phases on the consumer	R	N	R	N
	Power on the consumer	12.70kW		7.61kW	
	Current through the consumer	55.5 A	55.5 A	42.52 A	42.52 A
	Voltage on the consumer	230.00 V		179.00 V	
	Consumer gets the supply via	VROT 18		Al/Fe -2 x 50/8mm^2	
	Connection towards power substation	R	S	R	N
Low voltage power line 1000m	Used conductor	Al/Fe -2 x 50/8mm^2		Al/Fe -2 x 50/8mm^2	
	Current that runs through the line towards power substation	36.60 A	36.60A	42.52 A	42.52 A
	Losses in the low voltage power line [kW]	0.80	0.80	1.08	1.08
TS 10(20)/0.4kV Level 1	Rated voltage at the power substation	230V			

TABLE 2

The problem of continuously maintaining voltage within the limits defined by the IEC 60038 / EN 50160 standard along a low-voltage power line – stretching from the associated 10/0.4 kV substation to the very last consumer under operating conditions ranging from unbalanced to balanced loads – is not easy to solve.

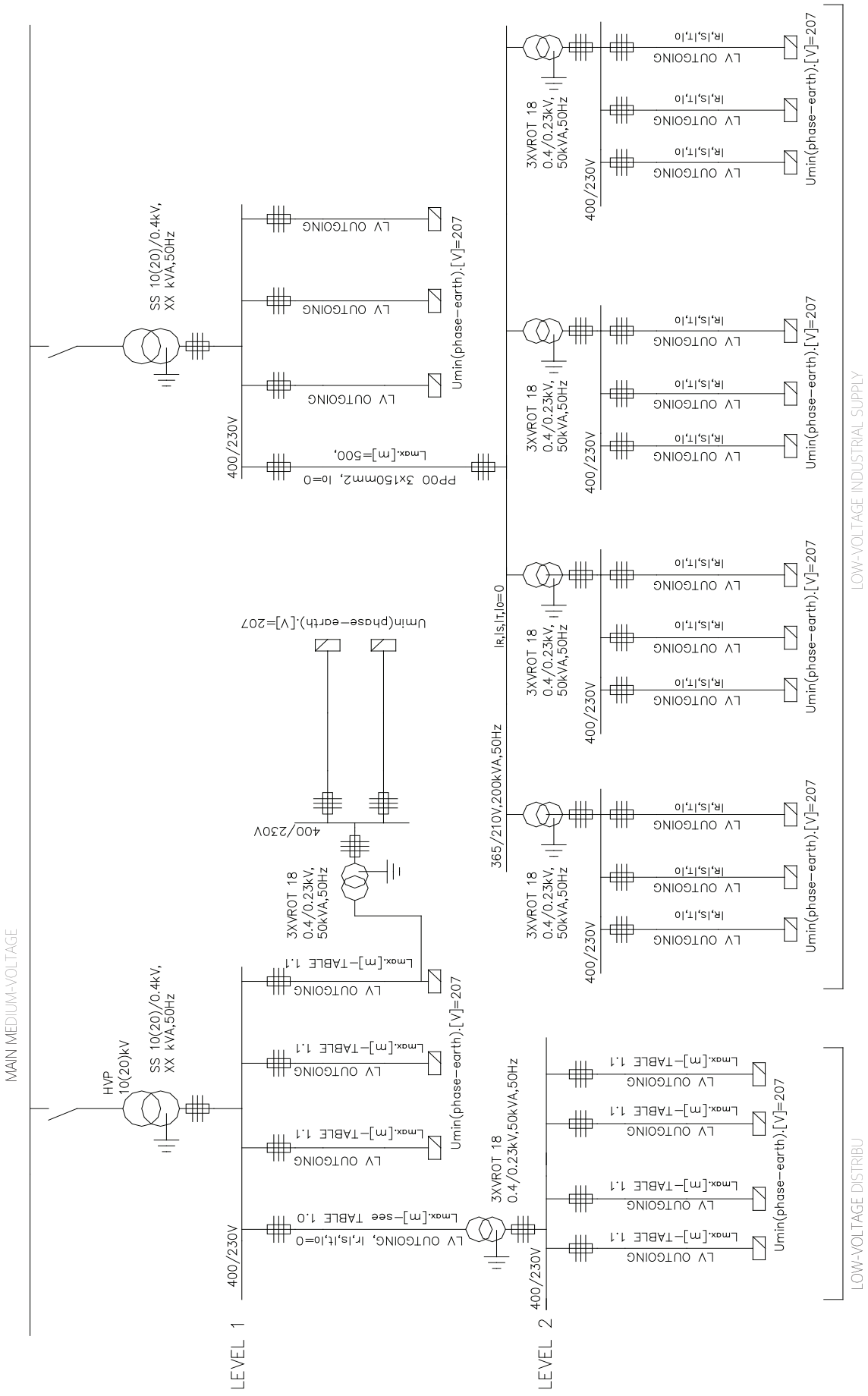
It has been proven that changing the conductor cross-section or increasing the voltage at the associated 10/0.4 kV substation is not an effective method. This is evident from the comparative analysis of the results with and without the VROT-* installation according to Tables 1.0 and 1.1, especially when supplying power to a single-phase consumer, as shown in Table 2.

If the development concept of the medium-voltage and low-voltage network is based on a ring supply via 10/0.4 kV, 250 kVA substations with 5 feeders, then at least one feeder could always be used to supply remote consumers. This is achieved by combining an appropriate conductor cross-section with the VROT-X device, depending on the required load demand in accordance with the presented Table 1.0.

By implementing the aforementioned system for supplying small consumer loads up to 50 kVA, compared to conventional solutions (power transmission via a 10(20) kV power line, 10(20)/0.4 kV, 50 kVA substation), we achieve:

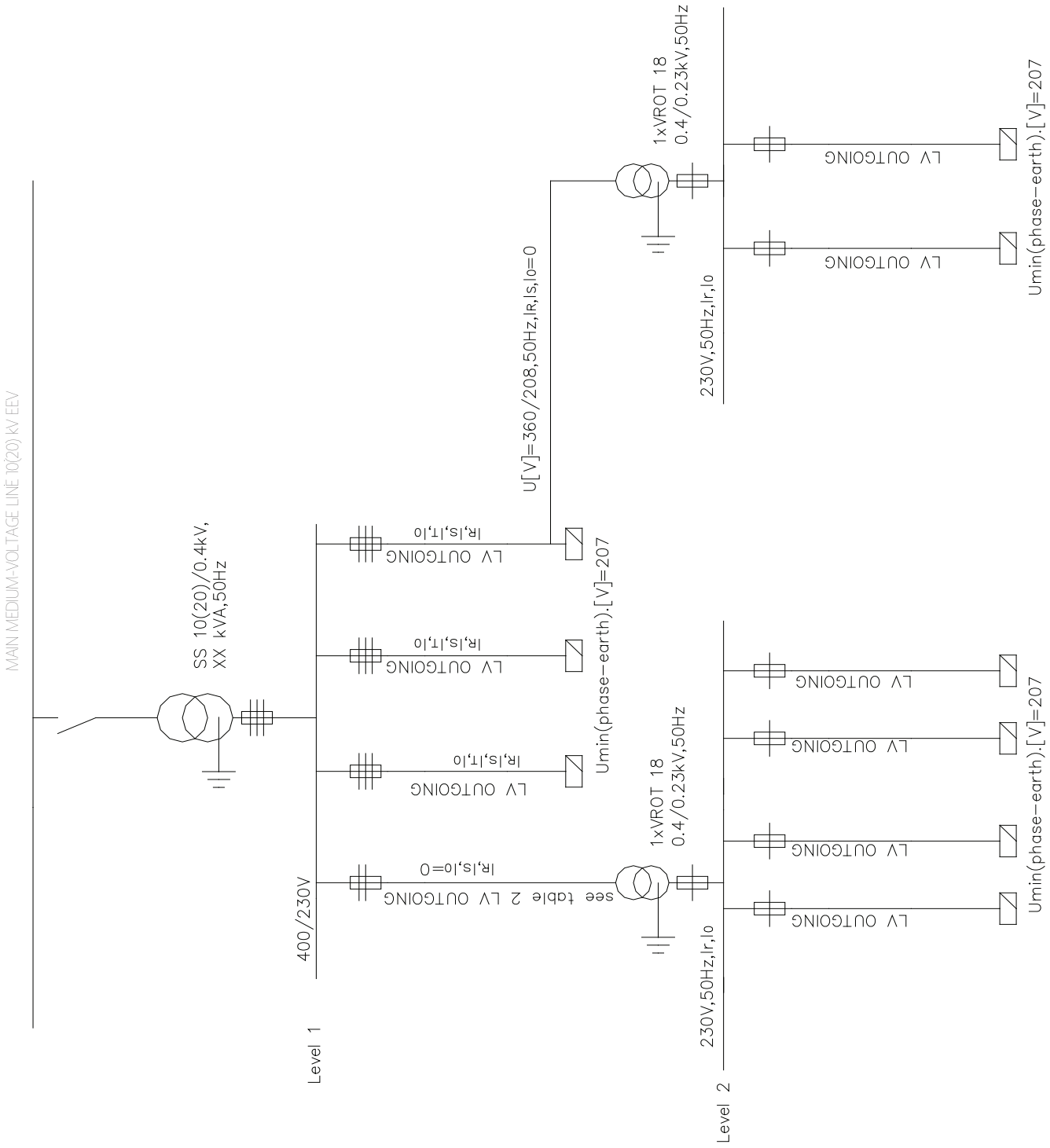
- Lower maintenance costs, especially if the power line passes through areas with dense/high vegetation where right-of-way (corridor) maintenance is required, or when utilizing a high-voltage aerial bundled cable system;
- Faster, cheaper, and easier network maintenance when a low-voltage aerial bundled cable combined with the VROT-X device is used as the primary feeder for supplying small consumer loads, rather than a high-voltage aerial bundled cable system;
- A reduced number of outages on the main 10(20) kV line when bare ACSR (Al/Fe) conductors are used as primary conductors and the line passes through areas with high/dense vegetation.

APPLICATION OF THE THREE-PHASE VROT-18 IN DISTRIBUTION AND INDUSTRIAL NETWORKS

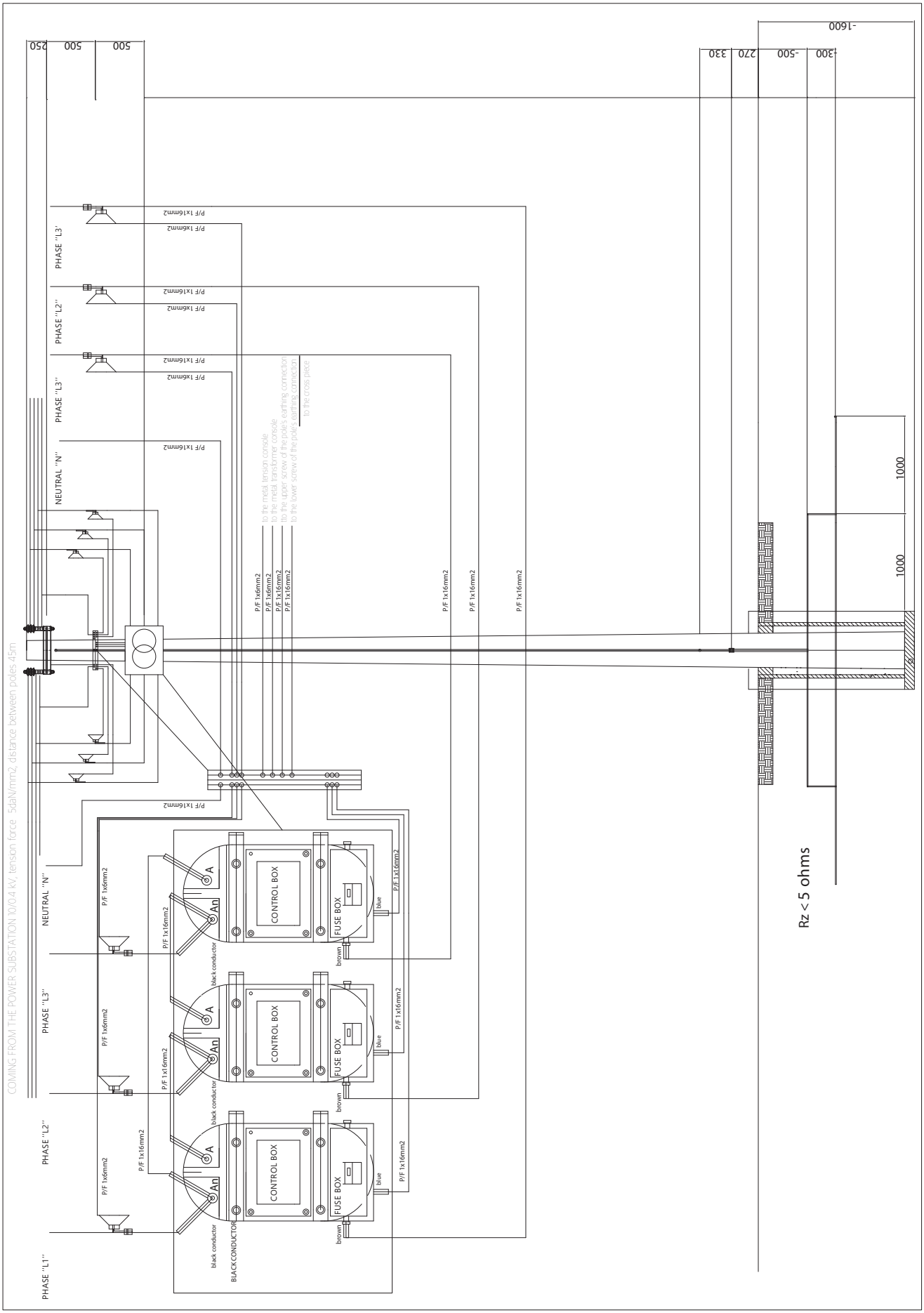


CONTENTS

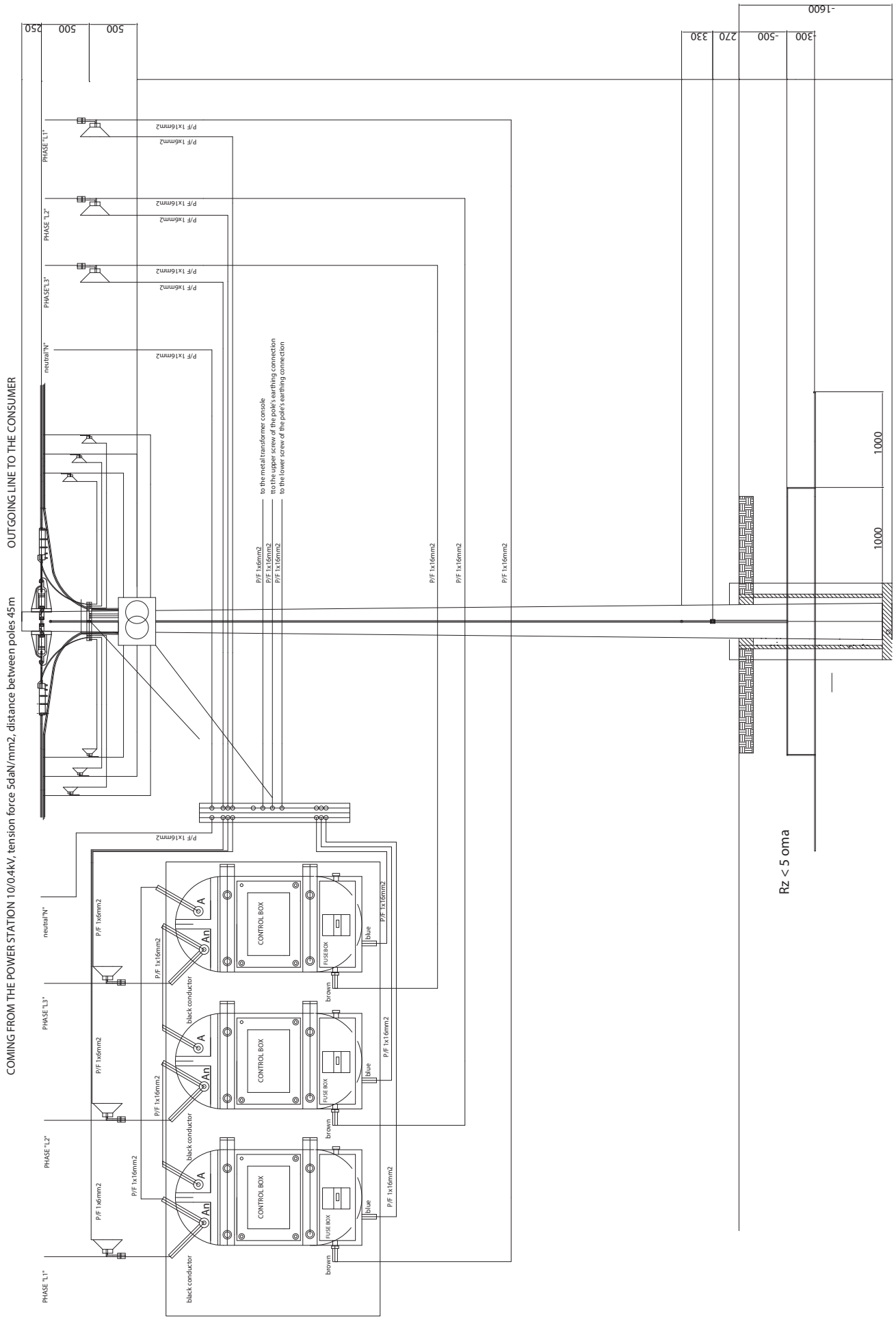
APPLICATION OF THE SINGLE-PHASE VROT-18 IN DISTRIBUTION NETWORKS



CONTENTS


COMING FROM THE POWER SUBSTATION 10/0.4 KV, tension force 5daN/mm2, distance between poles 45m
PHASE "L1"
PHASE "L2"
PHASE "L3"
NEUTRAL "N"
BLACK CONDUCTOR
black conductor
brown
blue
CONTROL BOX
FUSE BOX
P/F 1x16mm2
P/F 1x6mm2
to the metal tension console
to the metal transformer console
to the upper screw of the pole's earthing connection
to the lower screw of the pole's earthing connection
to the cross piece
1600
1000
1000
Rz < 5 ohms

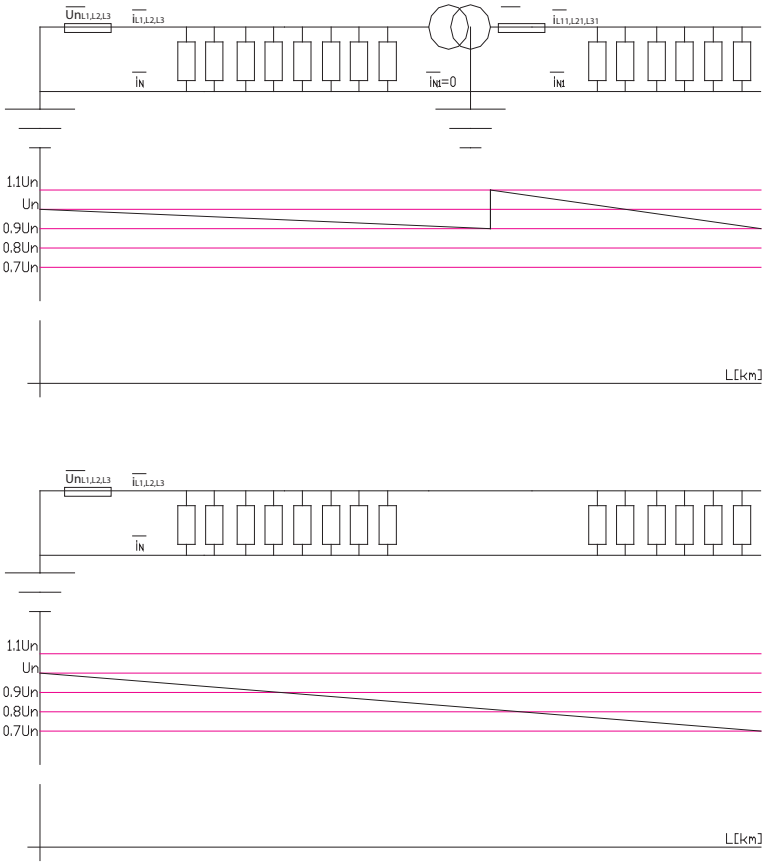
CONTENTS


COMING FROM THE POWER STATION 10/0.4kV, tension force 5daN/mm2, distance between poles 45m
OUTGOING LINE TO THE CONSUMER
PHASE "L1"
PHASE "L2"
PHASE "L3"
neutral "N"
P/F 1x16mm2
P/F 1x6mm2
P/F 1x16mm2
to the metal transformer console
to the upper screw of the pole's earthing connection
to the lower screw of the pole's earthing connection
CONTROL BOX
FUSE BOX
black conductor
brown
blue
A
An
250
500
500
330
270
500
300
1600
1000
1000
Rz < 5 oma

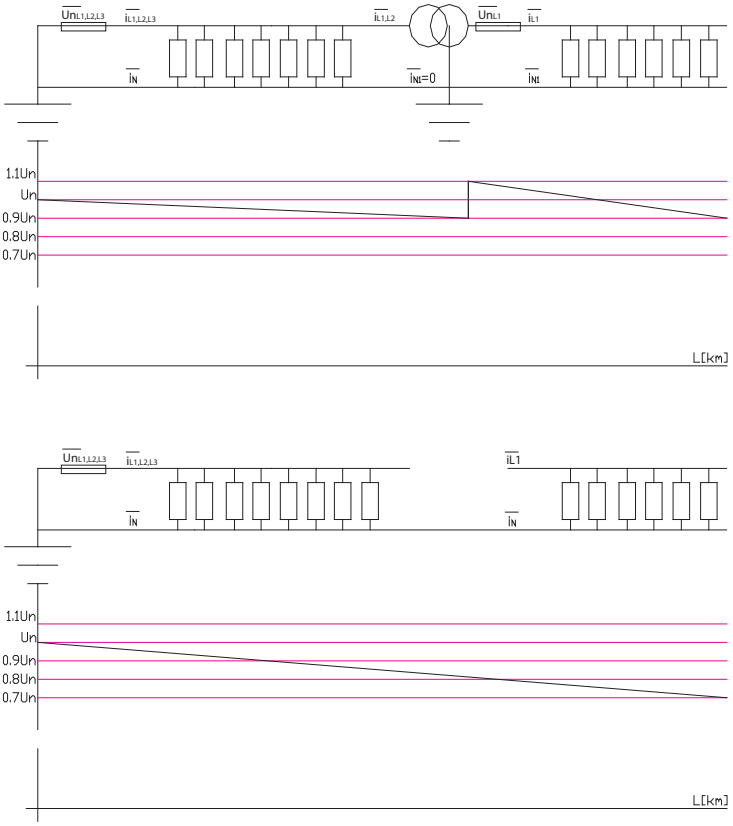
CONTENTS

Characteristics of voltage profiles along a low-voltage line

Application of the three-phase VROT for a three-phase consumer load at the end of the line

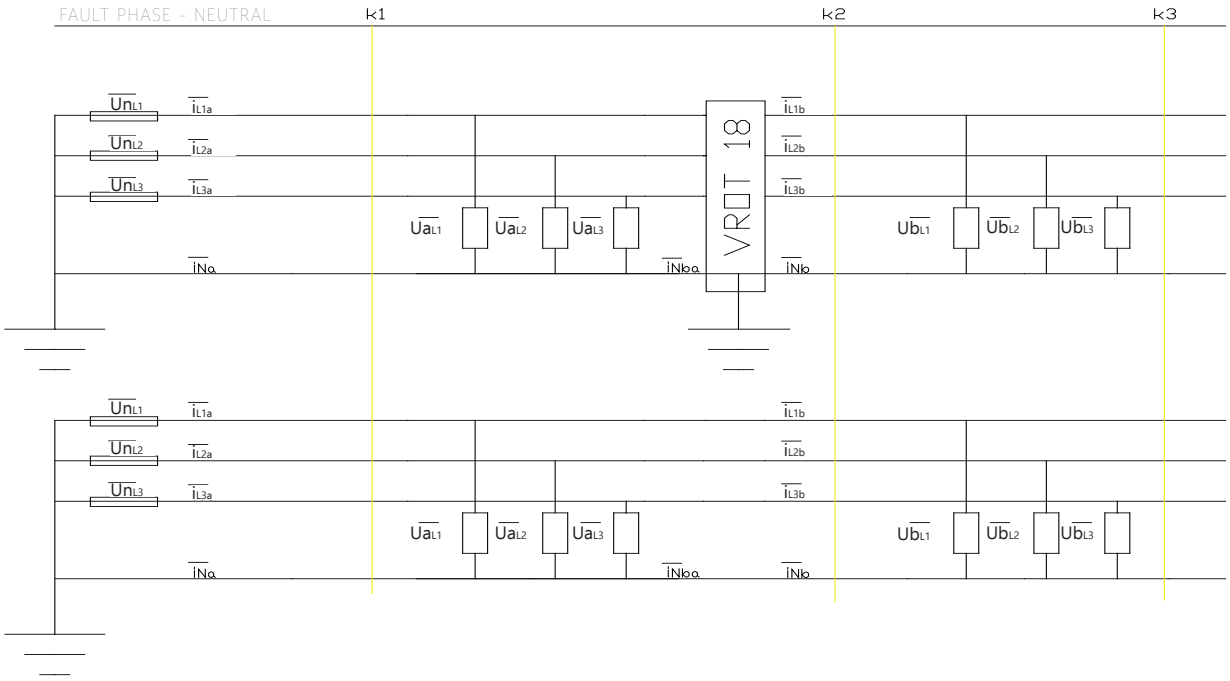


Application of the single-phase VROT for a single-phase consumer load at the end of the line



CONTENTS

Consumer protection against overvoltage in a low-voltage distribution network during faults caused by a phase-to-neutral short circuit.



Simulation of the short-circuit fault	WITH VROT 18			WITHOUT VROT 18		
	k_1	k_2	k_3	k_1	k_2	k_3
Conductor	X00- 3x70+71.5mm^2					
Distance from the power substation [m]	200	600	1000	200	600	1000
i_{Ra} [A] U_{RA} [V]	1224.04 12.18	709.81 117.30	757.60 117.98	1241.04 12.41	483.38 14.46	516.42 15.45
i_{Sa} [A] U_{SaA} [V]	39.18 297.36	710.18 117.15	758.00 117.80	61.40 293.42	58.45 279.35	58.70 280.51
i_{Ta} [A] $/U_{TA}$ [V]	67.71 293.54	57.07 212.74	57.35 213.91	67.40 292.63	63.90 277.41	64.19 278.69
i_{Na} [A]	1163.54	14.24	14.4	1145.04	393.64	426.24
i_{Nab} [A]	0	0	0	43.42	442.91	475.65
i_{Rb} [A] U_{RB} [V]	0 136.12	1176.73 16.90	1256.00 3.38	0 23.10	482.03 7.29	514.98 2.19
i_{Sb} [A] U_{SB} [V]	29.08 234.36	24.37 196.46	24.50 195.21	36.40 275.85	34.66 281.05	34.80 277.39
i_{Tb} [A] U_{TB} [V]	12.40 135.07	13.42 196.60	13.48 198.22	19.97 280.88	18.94 279.53	19.02 278.49
i_{Nb} [A]	23.26	1173.43	1252.49	43.42	442.91	475.65

CONTENTS

Appearance of the device installed in a single-phase low-voltage network:



The VROT 18 device supplies a single-phase consumer area located 1,500 m away from the associated substation (10(20)/0.4 kV, 250 kVA TS).

Prior to the installation of the VROT 18, the consumer area had a consumption of 750 kWh/month.

Following the installation of the VROT 18, the consumer area achieved a consumption of 3,048 kWh/month—with voltage quality in full compliance with the IEC 60038 / EN 50160 standards.



3VROT-18 installed in a three-phase network

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Installation photos





Additional accessories delivered with the device.
The device is delivered to the end user together with all the necessary mounting equipment so the mounting can be done directly without any adjustments.

CONTENTS

TYPE TEST CERTIFICATE FROM AN INDEPENDENT INTERNATIONAL LABORATORY

RESEARCH, DEVELOPMENT AND TESTING
NATIONAL INSTITUTE FOR
ELECTRICAL ENGINEERING
ICMET CRAIOVA

Address: Calea Bucuresti No.144, 200515 Craiova, ROMANIA
Matriculation certificate: J 16/312/1999; Fiscal code: RO3871599
Phone: 0351 – 404888, 0351 – 404889; Fax: 0251 – 415482, 0351 – 404890;
www.icmet.ro, e-mail: market@icmet.ro

HIGH VOLTAGE DIVISION - HVD
LOW VOLTAGE LABORATORY
Phone: 0351 – 402425; e-mail: ljt@icmet.ro

TEST REPORT
Nr. 20093 / 23.03.2010

1. CUSTOMER: Fabrika Mernih Transformatora Zajecar A.D.
Paracinski put bb, 19000 Zajecar, SERBIA

2. MANUFACTURER: Fabrika Mernih Transformatora Zajecar A.D.
Paracinski put bb, 19000 Zajecar, SERBIA

ENERGO-GROUP D.O.O
Petra Milosevica 7, 71123 I. Sarajevo, B&H

3. TESTED PRODUCT: Power low voltage transformer, type VROT 18, 400 V, 18 kVA, serial no. 2/10

4. REFERENCE STANDARD: IEC 60076-11:2004

5. TEST PERFORMED:
I. Separate-source AC withstand voltage test
II. Induced AC withstand voltage test
III. Lightning impulse test

6. TEST DATE: 23.03.2010

7. TEST RESULT: The product PASSED the test.

This report contains 7 pages and it is edited in 4 copies from which 3 copies for customer and one copy for laboratory.

HEAD OF HV DIVISION,
Eng. Ion PĂTRU

ICMET CRAIOVA DIVIZIA DE ÎNALTĂ TENSIUNE

HEAD OF LABORATORY,
Eng. Aurelia SCORNEA

Issue date: 25.03.2010

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d. All signatures from the present report are originals.
e. The product was presented to be tested by the customer.

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TOROIDAL TRANSFORMERS



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TTU-A, TTU-C 3
TTU-B 4
ZTZU 5

INTRODUCTION

APPLICATION

Small power transformers are used to transform voltages to the desired level or simply for galvanic isolation of the primary and secondary sides. Transformers of this type are standardly manufactured as single-phase, low-voltage units with primary voltage of 230 V or 400 V and secondary voltage from 12 V to 400 V. However, other voltages up to 1000 V are also available upon customer request. They are manufactured in accordance with the applicable EN/IEC 61558-1 standard series for transformers, chokes and power supply devices.

DESCRIPTION

The materials used in the construction of these transformers are at least in the thermal class B.
At the rated load, voltage and frequency, an ambient temperature below 40°C and altitude below 1000m, the maximum rise of the transformer temperature does not exceed 80°C.

ADVANTAGES

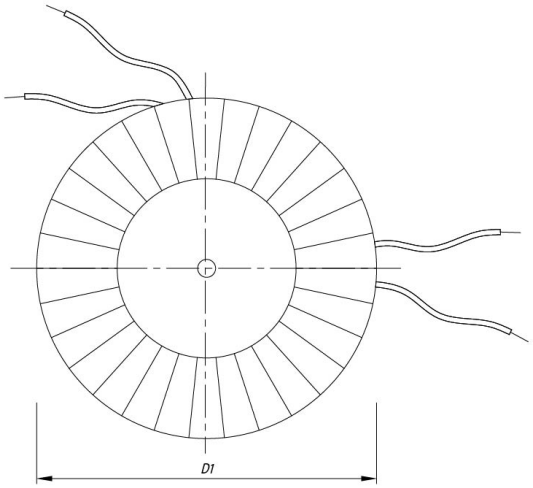
By using high-quality magnetic sheets for a core with no air gap and by choosing a suitable ratio of copper and iron in the transformer, the following advantages are achieved compared to transformers with a classic core:

- negligible magnetic losses
- low noise level
- small losses in windings
- high degree of efficiency
- light weight
- compactness
- easy installation

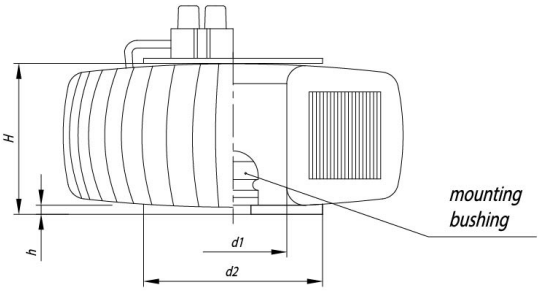
TTU-A and TTU-C



TTU type A



TTU type C



TOROIDAL TRANSFORMERS **TTU-A** AND **TTU-C**

TECHNICAL DATA	TTU-A, TTU-C
Highest voltage for equipment (kV)	0,72
Test voltage 50 Hz, 1 min (eff.) (kV)	3
Rated frequency (Hz)	50/60
Rated primary voltage (V)	230, 400 or as per request
Rated secondary voltage (V)	12, 24, 48, 110, 230 or as per request
Temperature class of insulation	B
Mounting	Indoor
Area of application	Every, including tropical
Valid standard	EN/IEC 61558-1

We make these transformers with following transformation ratios:
230/12V, 400/12V, 230/24V, 400/24V, 230/48V, 400/48V, 230/110V, 400/110V, 230/230V, 400/230V and 400/400V, and other ratios upon customer request.
Placement of connectors can also be in accordance with customer request.

Transformer type TTU-A and TTU-C	Rated power (VA)	Dimensions (mm)					Inlet thread	Mass (kg)
		D1	d1	d2	H	h		
TTU-15	15	60	22	41	37	2	M4	~0,38
TTU-20	20	72	30	53	44	2	M5	~0,82
TTU-30	30	90	30	53	36	2	M5	~1,22
TTU-50	50	100	28	75	40	3	M6	~1,37
TTU-80	80	104	36	75	56	3	M6	~1,90
TTU-100	100	104	36	75	56	3	M6	~2,10
TTU-160	160	106	34	83	59	3	M6	~2,40
TTU-200	200	118	36	102	59	3	M6	~3,86
TTU-250	250	120	36	102	59	3	M6	~3,92
TTU-320	320	115	40	83	71	3	M6	~4,80
TTU-400	400	120	40	102	71	3	M6	~5,20
TTU-500	500	128	38	115	72	3	M8	~5,60
TTU-630	630	142	44	115	85	3	M8	~6,80
TTU-800	800	156	44	135	85	3	M8	~7,00
TTU-1000	1000	166	48	145	96	4	M10	~9,70
TTU-1200	1200	168	50	145	108	4	M10	~10,90
TTU-1600	1600	174	45	145	108	4	M10	~11,90
TTU-2000	2000	204	62	160	108	4	M10	~18,50

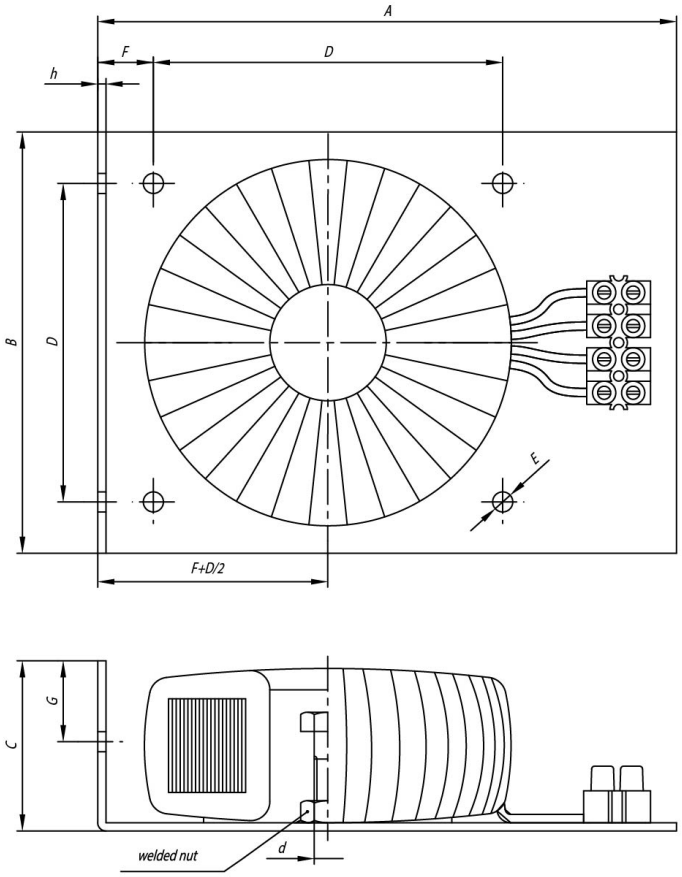
When ordering, please specify the transformation ratio, the primary rated power and rated power for each secondary (if there is more than one).

TTU-A – Toroidal transformer with free connectors.
TTU-C – Toroidal transformer on epoxy-resin base with connectors in terminal strips.

CONTENTS

TTU-B





TOROIDAL TRANSFORMERS **TTU-B**

TECHNICAL DATA	TTU-B
Highest voltage for equipment (kV)	0,72
Test voltage 50 Hz, 1 min (eff.) (kV)	3
Rated frequency (Hz)	50/60
Rated primary voltage (V)	230, 400 or per customer request
Rated secondary voltage (V)	12, 24, 48, 110, 230 or per customer request
Temperature class of insulation	B
Mounting	Indoor
Area of application	Every, including tropical
Valid standard	EN/IEC 61558-1

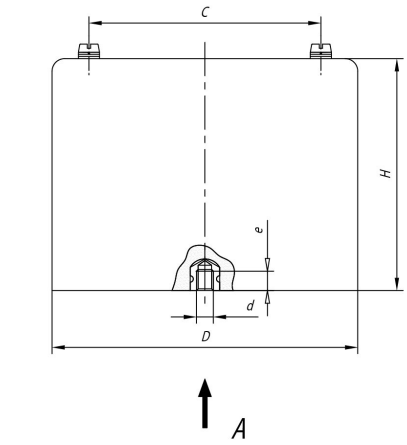
We make these transformers with following transformation ratios:
230/12V, 400/12V, 230/24V, 400/24V, 230/48V, 400/48V, 230/110V, 400/110V, 230/230V, 400/230V and 400/400V, as well as other ratios upon customer request.
When ordering, please specify the transformation ratio, the primary rated power and rated power for each secondary (if there is more than one).
TTU-B - Toroidal transformer with a metal mounting base.

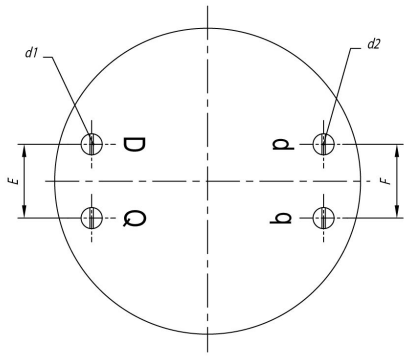
Transformer type TTU-B	Rated power (VA)	Dimensions (mm)							Mass (kg)
		A	B	C	D	E	F	G	
TTU-15	15	145	95	40	82	4,5	12	20	~0,60
TTU-20	20	145	95	40	82	4,5	12	20	~0,98
TTU-30	30	145	95	40	82	4,5	12	20	~1,44
TTU-50	50	145	95	40	82	4,5	12	20	~1,58
TTU-80	80	145	95	40	82	4,5	12	20	~2,10
TTU-100	100	160	115	60	95	4,5	13	30	~2,40
TTU-160	160	160	115	60	95	4,5	13	30	~2,60
TTU-200	200	185	135	70	112	5,5	15	35	~4,16
TTU-250	250	185	135	70	112	5,5	15	35	~4,21
TTU-320	320	185	135	70	112	5,5	15	35	~4,94
TTU-400	400	185	135	70	112	5,5	15	35	~5,32
TTU-500	500	185	135	70	112	5,5	15	35	~5,76
TTU-630	630	215	155	80	130	6,5	17	40	~7,52
TTU-800	800	215	155	80	130	6,5	17	40	~7,68
TTU-1000	1000	230	175	80	140	6,5	17	40	~10,47
TTU-1200	1200	230	175	80	140	6,5	17	40	~11,67
TTU-1600	1600	250	190	90	160	8,5	25	45	~12,93
TTU-2000	2000	250	190	90	160	8,5	25	45	~19,53

CONTENTS

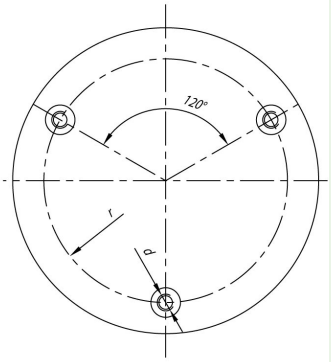
ZTZU







View "A" for 800-4000 VA



PROTECTIVE TRANSFORMERS **ZTZU**

TECHNICAL DATA	ZTZU-1	ZTZU-2	ZTZU-3
Highest voltage for equipment (kV)	0,72		
Test voltage 50 Hz, 1 min (eff.) (kV)	3		
Rated frequency (Hz)	50/60		
Rated primary voltage (V)	230, 400 or per customer request		
Rated secondary voltage (V)	12, 24, 48, 110, 230 or per customer request		
Temperature class of insulation	B		
Mounting	Indoor		
Isolation	Epoxy resin		
Area of application	Every, including tropical		
Valid standard	EN/IEC 61558-1		
Mass (kg)	~4,75	~6,5	~18-34

The mass of the transformer depends on the rated power and transformation ratio, and it can vary.

Type	Rated power (VA)	Dimensions (mm)									
		D	H	C	d	E	F	e	r	d_1	d_2
ZTZU-1	100; 160; 200; 250;300	Ø110 -Ø130	100 -112	62	M8	35	35	10	-	M6	M6
ZTZU-2	400; 500; 630	Ø130 - Ø155	110 - 134	96	M8	50	50	10	-	M6	M6
ZTZU-3	800; 1000; 1500; 2000; 2500; 30 00; 3500; 4000	Ø220	220	160	M8	40	50	10	85	M6	M10

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