

CONTENTS

About us	2
Certificates	4
I LOW VOLTAGE CURRENT TRANSFORMERS 0.72 kV.....	5
Low voltage current transformers 0.72 kV	7
Measuring current transformers STEM-081	8
Measuring current transformers STN-60/20, STN-60/30	9
Measuring current transformers STN-88/20, STN-88/30	10
Measuring current transformers STN-88/40, STN-88/50, STN-88/60	11
Measuring current transformers STEN-081 300-600 A	12
Measuring current transformers STEN-081A, STEN-081B	13
Measuring current transformers STEN-081 800-1000 A	14
Measuring current transformers STEN-081C	15
Measuring current transformers STEN-081D	16
Measuring current transformers STEN-081 1500-4000 A	17
Protective current transformers KT	18
Protective current transformers STD-90/50, STD-100/60, STD-120/80, STD-140/100	19
Protective current transformers STD-1	20
Protective current transformers ST-081A, ST-081B	21
Protective current transformers ST-081	22
Protective current transformers ST-3.6	23
Protective current transformers TSUM	24
Protective current transformers MTD-1, MTD-2	25
Protective current transformers MTD-11, MTD-15, MTD-55	28
II CURRENT TRANSFORMERS 12-36 kV	33
Current transformers 12-36 kV	35
Current transformers 12-36 kV, indoor mounting, type STEM-N*	38
Current transformers 12-36 kV, indoor mounting, type STEM-NS 24	39
Current transformers 12-36 kV, outdoor mounting, type ATM*	40
Current transformers 12-36 kV, outdoor mounting, type ATMS*	41
Current transformers 12-36 kV, outdoor mounting, type ATMSA*	42
Current transformers 12-36 kV, indoor mounting, type STPN-12	43
Current transformers 12-36 kV, indoor mounting, type STPM-36	44
III VOLTAGE TRANSFORMERS 12-36 kV	45
Voltage transformers 12-36 kV	47
Voltage transformers 12-36 kV, indoor mounting, type JNT*	49
Voltage transformers 12-36 kV, indoor mounting, type DNT*	50
Voltage transformers 12-36 kV, indoor mounting, type JNT SOV*	51
Voltage transformers 12-36 kV, indoor mounting, type DNT SOV*	52
Voltage transformers 12-36 kV, indoor mounting, type JNT SOH*	53
Voltage transformers 12-36 kV, indoor mounting, type DNT SOH*	54
Voltage transformers 12-36 kV, outdoor mounting, type JNT SM*	55
Voltage transformers 12-36 kV, outdoor mounting, type DNT SM*	56
Voltage transformers 12-36 kV, outdoor mounting, type VTOP I*	57
Voltage transformers 12-36 kV, outdoor mounting, type VTOP II*	58
Voltage transformers 12-36 kV, outdoor mounting, type NMT*	59
IV INSULATORS	61
Supporting and bushing type insulators 7.2-36 kV	63
Supporting type insulators 7.2-36 kV, indoor mounting, type IPA*	64
Supporting type insulators 7.2-36 kV, indoor mounting, type IPB* and IPC*	65
Supporting type insulators 12-36 kV, outdoor mounting, type C4*	66
Bushing type insulators 12-36 kV, indoor mounting, type IPU*	67
Bushing type insulators 12-36 kV, indoor-outdoor mounting, type IPSU*	68
Contact	70



MEASURING TRANSFORMERS FACTORY

Measuring Transformers Factory (FMT) was founded in 1969. Since its founding the company is being present on the market of electrical equipment. For more than 40 years of existing we are constantly improving the quality and widening the assortment of our products. The products of the Measuring Transformers Factory have proved themselves with their continuous quality performance in all kinds of conditions during exploitation. By combining theoretical knowledge, practical experience

and modern technology we succeed in solving many practical problems which occur in electrical systems and thus respond to our customers requests.

Since the founding of the company we have started with production of low voltage current measuring transformers and insulators for voltages up to 35 kV.

Conditions for production of current and voltage transformers up to 35 kV were fulfilled by buying plant for vacuum casting in 1972.

Production of ASK*, ABK* and VSK* transformer types started by the SIEMENS AG licence, as well as transformers of our own design.

By our own further development, in 1978. we offered to the market dry power transformers of TES* type, casted in epoxy resin, for powers up to 1600 kVA and rated voltages up to 10 kV (20 kV for some units).

After 1985. our factory developed air core inductive reactors, inductive reactors with metal core, separating

transformers up to 250 kVA impregnated by epoxy resin, toroidal transformers, transformers for ignition of oil and gas torches, transformers for beton heating, electromagnets, system earthing metal resistors for medium voltage networks etc.

We have also expanded our offering in the domain of insulators for all voltage levels up to 35 kV.

Development of production of mechanical equipment for environment protection

ABOUT US



tection was also under way and it contains dusters, fans, cyclones, elevator transport systems.

Following the latest technology applications we introduced the newest insulation material for all types of transformers.

At the end of 2005. Measuring Transformers Factory was privatized and since then we undertook the substantial investments with the goal to modernize the production.

Measuring Transformers Factory also invests in modernization of production by acquiring new machines and equipment and by implementing new technologies. We have continued to expand the assortment of our products with developing new kinds of voltage transformer called VTOP*, JNT*, DNT new low voltage current transformer called STN* and more types of our new products are in preparation.

Our products have found the way to come to the cu-

stomers in more than 15 states from all around the world. We have business collaboration with companies from former Yugoslavia (Slovenia, Bosnia and Herzegovina, FYR Macedonia, Montenegro) as well as with companies from Greece, Czech Republic, Estonia, Australia, Romania, Tanzania, United Arab Emirates, Yemen, Algeria, Nigeria and Thailand. On domestic market we supply almost all distributive companies with our products.

All products of the Measuring Transformers Factory

have type certificate and have to pass examination in our own laboratory which proves that they satisfy all current regulations concerning quality, technical characteristics, stability and assurance in their exploitation. Measuring Transformers Factory (FMT) possesses ISO-9001 certificate which also guarantees quality.

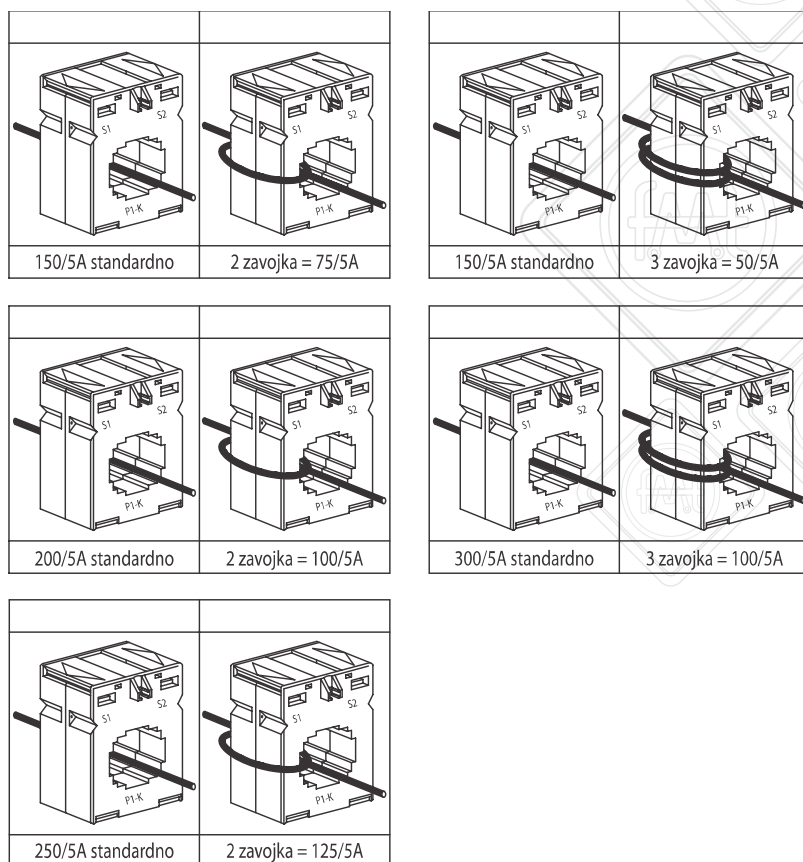
If you have any questions about our products please do not hesitate to contact our services and we will be honoured to help you.

LOW VOLTAGE CURRENT TRANSFORMERS 0.72 kV

- ◇ Measuring current transformers
- ◇ Protective current transformers



LOW VOLTAGE CURRENT TRANSFORMERS 0.72 kV



DESCRIPTION

Low voltage current transformers (for voltage levels up to 0.72 kV) are intended for current transformation to suitable greatness for measuring and protection. Their technical characteristics are in accordance with IEC 60044-1.

Active part of transformer consists of magnetic core made of cold rolled oriented steel and secondary winding, accept current transformer STEM-081 which has a primary winding as well as magnetic core and secondary winding (in other types of transformers primary winding is cable or track that passes through transformer).

Active part of transformer have been casted in epoxy resin or put in plastic or bakelite insulating enclosures which gives him good insulating characteristics and mechanical

protection even in the worst conditions of exploitation.

At almost all types of transformers secondary terminals have been covered with plastic cover that can be lead in.

APPLIANCE

Transformers are applicable for indoor mounting in cubicles and substations for rated voltages up to 0.72 kV. They are used for current circuits supplying in the measuring or protective devices

MOUNTING

Transformers can be mounted in all kinds of positions on the rectangular tracks or rounded conductors. Dimensions of primary conductors are chosen according to the transformers apertures that have been given in the drawing sketches. Tran-

sformers also can be mounted on the special base with two fixing straps.

SPECIAL CONSTRUCTIONS OF CURRENT TRANSFORMERS

There are some special constructions of current transformers like summation-type current transformers, current intertransformers for differential relay protection and disolvable cable transformers. All of them will be explained in details further in the catalogue.

HANDLING

During exploitation transformers must not be with open secondary circuit because it is dangerous for people who work with them as well as for the transformer itself.

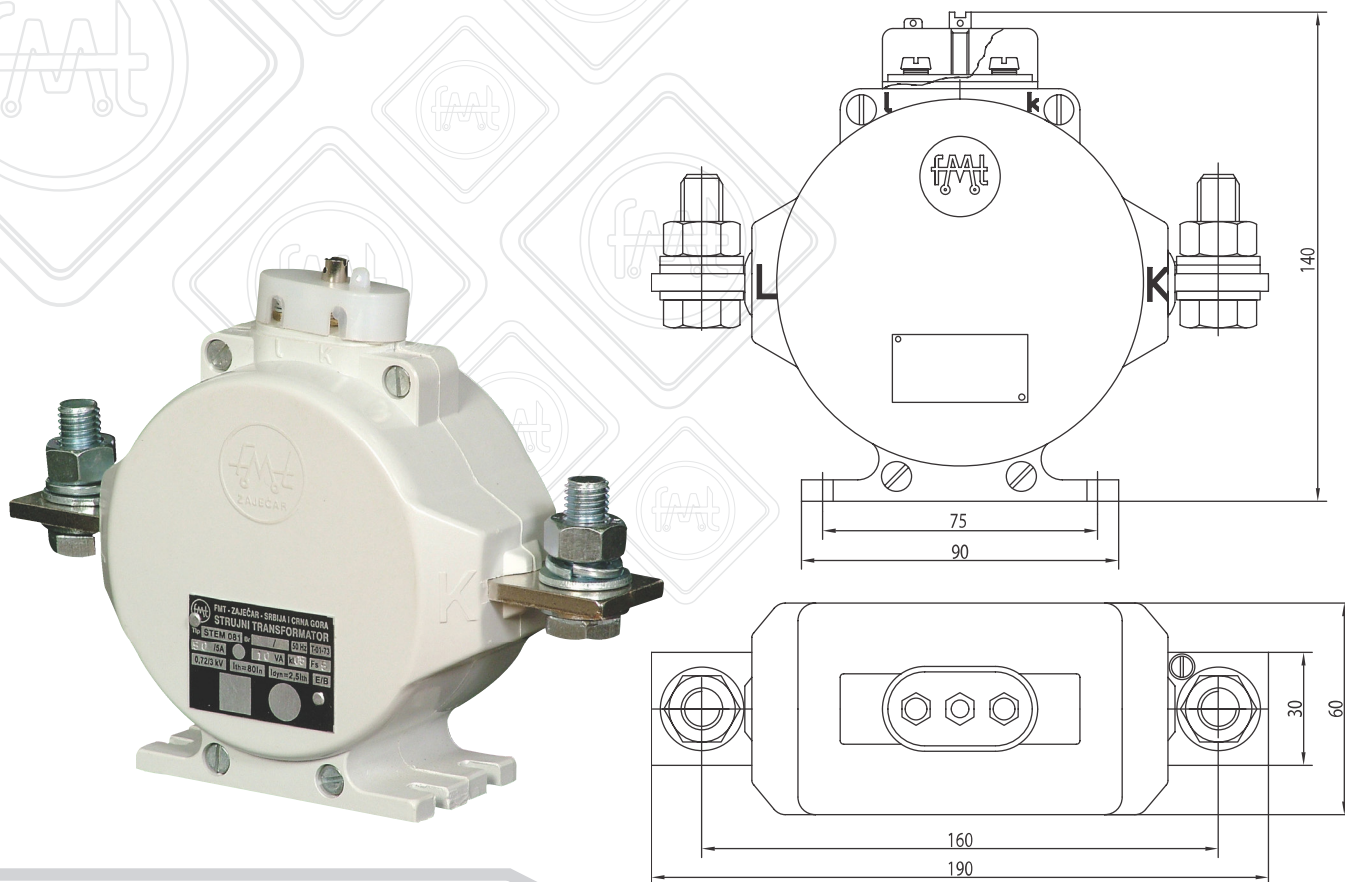
ACCURACY CLASS ENHANCEMENT AT WIRING CURRENT TRANSFORMERS 0.72 kV

If you want to achieve better accuracy class with wiring current transformers which is often a case when primary current is small, that can be done by wiring primary conductor through the transformers hole.

Example: Current transformer with transformation ratio 200/5 A/A can be used as current transformer with transformation ratio 100/5 A/A if we pull primary conductor two times through the transformer's hole. In that case technical characteristics of the transformer remains the same.

Current transformers that have that possibility have been specially marked.

Some examples of that have been given in the following sketches

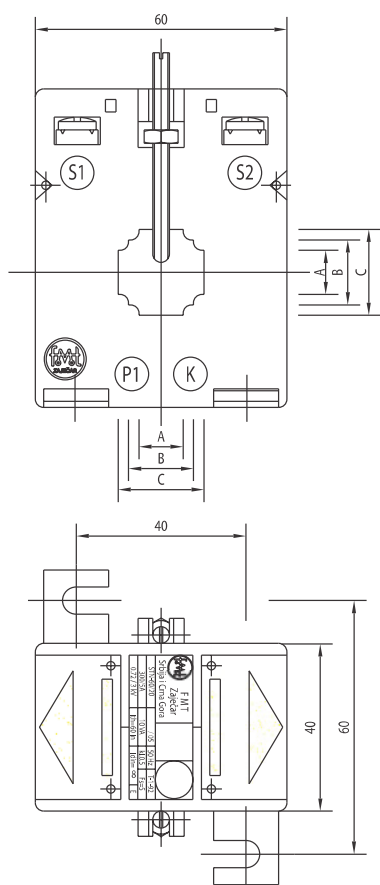


TECHNICAL DATA	STEM-081
Rated voltage (kV)	0.72
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3
Rated frequency (Hz)	50/60
Rated primary current (A)	10 to 250
Rated secondary current (A)	5 (or 1)
Rated short time thermal current	$I_{th}=80I_n$
Rated dynamic current	$I_{dyn}=2,5I_{th}$
Rated continuous thermal current	$I_{tth}=1,2I_n$
Instrument security factor	$F_s=5$
Insulation class	E/B
Type of basic insulation	epoxy resin or bakelite housing
Normative references	JUS IEC 60044-1, VDE 0414, BS 3938
Mass, approx	1.5 kg

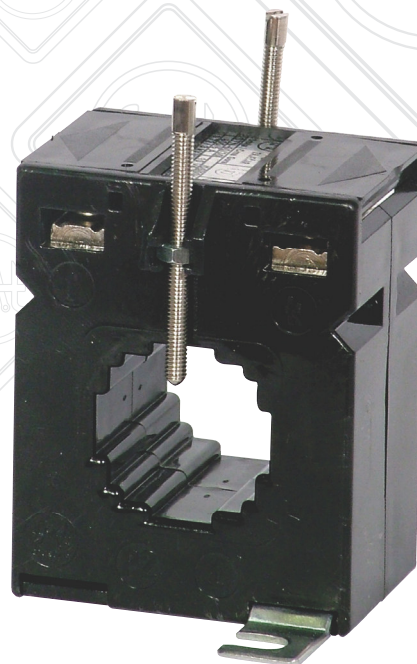
Accuracy class	Rated output (VA)
0.2	5
0.5	10
1	15

Measuring current transformers

STN 60-20, STN 60-30



Tip transformatora	Dimenzije (mm)		
	A	B	C
STN 60/20	10.5	15.5	20.5
STN 60/30	10.5	20.5	30.5



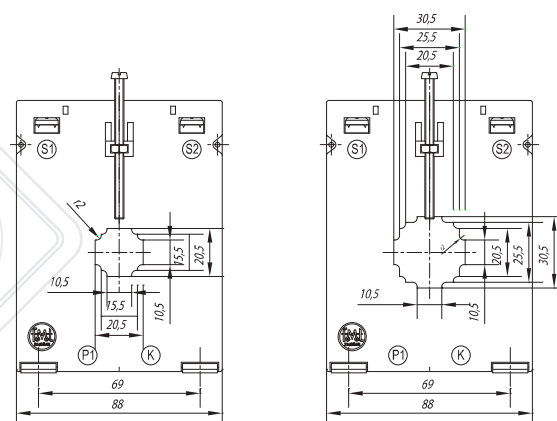
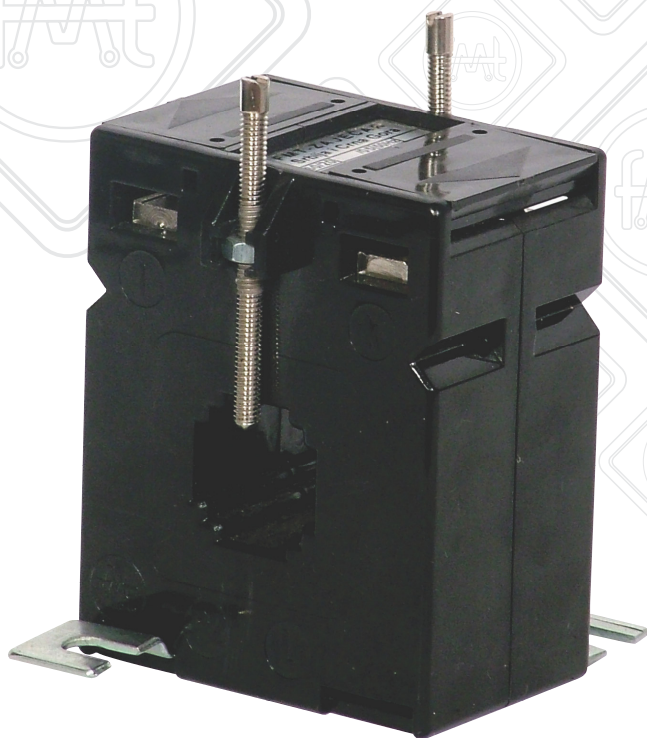
STN-60/20			
Transformation ratio (A/A)	Power (VA)	Accuracy class	Instrument security factor
50/5 or 50/1	2.5	3	5
75/5 or 75/1	2.5	1	5
100/5 or 100/1	2.5	1	5
150/5 or 150/1	2.5	0.5	5
200/5 or 200/1	5	0.5	5
250/5 or 250/1	10	0.5	5
300/5 or 300/1	10	0.5	5

STN-60/30			
Transformation ratio (A/A)	Power (VA)	Accuracy class	Instrument security factor
200/5 or 200/1	2.5	0.5	5
250/5 or 250/1	2.5	0.5	5
300/5 or 300/1	5	0.5	5
400/5 or 400/1	5	0.5	5
500/5 or 500/1	7.5	0.5	5
600/5 or 600/1	7.5	0.5	5

TECHNICAL DATA	STN-60/20	STN-60/30
Highest voltage for equipment (kV)	0.72	0.72
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3	3
Rated frequency (Hz)	50/60	50/60
Rated primary current (A)	50 - 300	200 - 600
Rated secondary current (A)	5 or 1	5 or 1
Rated short time thermal current	$I_{th}=60I_n$	$I_{th}=60I_n$
Rated dynamic current	$I_{dyn}=2.5 I_{th}$	$I_{dyn}=2.5 I_{th}$
Rated continuous thermal current	$I_{tth}=1.2I_n$	$I_{tth}=1.2I_n$
Insulation class	E/B	E/B
Type of basic insulation	polycarbonate	polycarbonate
Normative references	JUS IEC 60044-1	JUS IEC 60044-1
Mass	~0.48 kg	~0.35 kg

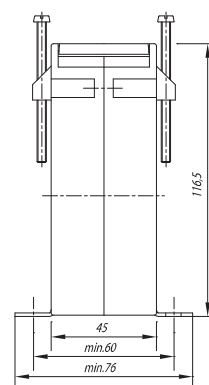
Characteristics can be different upon a customer's request.

STN 88-20, STN 88-30



STN-88/20

STN-88/30



STN – 88/20			
Transformation ratio (A/A)	Power (VA)	Accuracy class	Instrument security factor
50/5 and 50/1	2.5	3	5
75/5 and 75/1	2.5	0.5	5
100/5 and 100/1	2.5	0.5	5
150/5 and 150/1	5	0.5	5
200/5 and 200/1	10	0.5	5
250/5 and 250/1	10	0.5	5
300/5 and 300/1	10	0.5	5

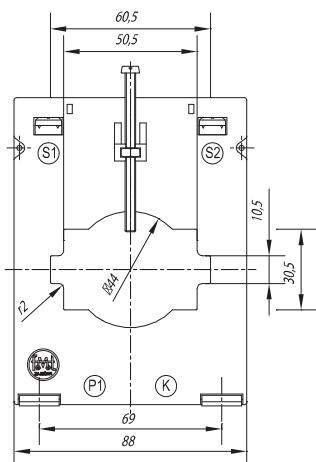
STN – 88/30			
Transformation ratio (A/A)	Power (VA)	Accuracy class	Instrument security factor
100/5 and 100/1	2.5	1	5
150/5 and 150/1	5	0.5	5
200/5 and 200/1	7.5	0.5	5
250/5 and 250/1	10	0.5	5
300/5 and 300/1	10	0.5	5
400/5 and 400/1	10	0.5	5
400/5 and 400/1	15	1	5
500/5 and 500/1	15	0.5	5
600/5 and 600/1	15	0.5	5

TECHNICAL DATA:	STN 88/20	STN 88/30
- Highest voltage for equipment (kV)	0.72 kV	0.72 kV
- Withstand voltage 50 Hz, 1 min. (kV)	3 kV	3 kV
- Frequency (Hz)	50/60 Hz	50/60 Hz
- Primary current (A)	50-300 A	100-600 A
- Secondary current (A)	5 A or 1 A	5 A or 1 A
- Short-time thermal current I _{th}	60 I _n	60 I _n
- Dynamic current	2.5 I _{th}	2.5 I _{th}
- Continuous thermal current	1.2 I _n	1.2 I _n
- Enclosures material	polycarbonate	polycarbonate
- Valid references	JUS IEC 60044-1	JUS IEC 60044-1
- Mass	~0.5 kg	~0.5 kg

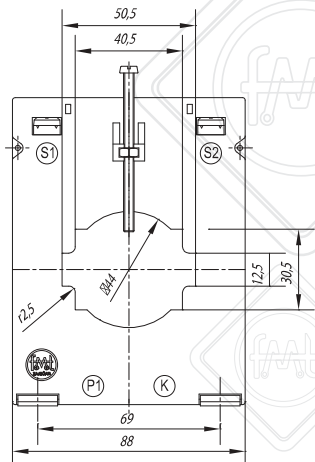
Transformer's mass depends of the transformation ratio and it is different for various transformation ratios.

Measuring current transformers

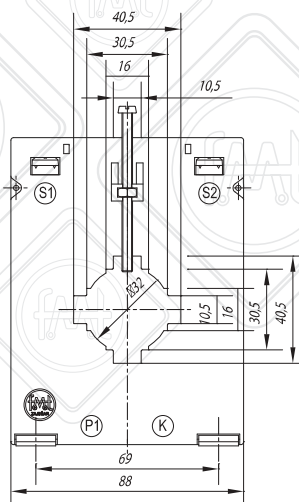
STN-88/40, STN-88/50, STN-88/60



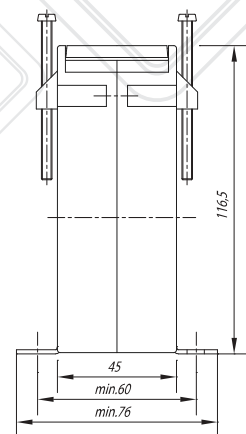
STN-88/60



STN-88/50



STN-88/40



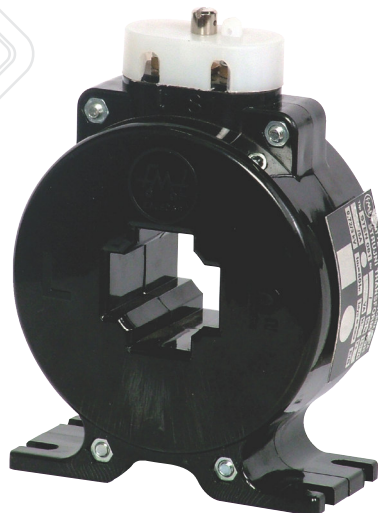
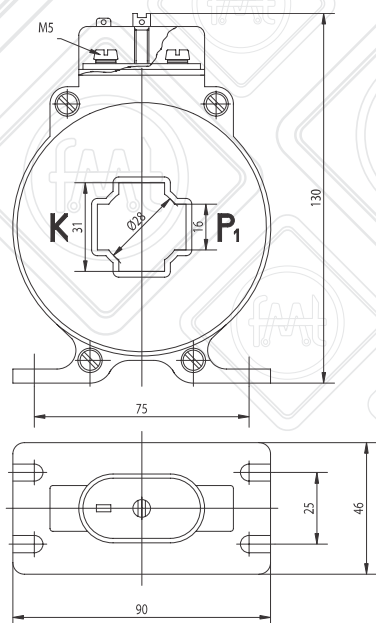
STN – 88/40			
Transformation ratio (A/A)	Power (VA)	Accuracy class	Instrument security factor
200/5	7.5	0.5	5
200/1	10	0.5	5
250/5 or 250/1	10	0.5	5
300/5 or 300/1	10	0.5	5
400/5 or 400/1	10	0.5	5
500/5 or 500/1	10	0.5	5
600/5 or 600/1	10	0.5	5

STN – 88/50			
Transformation ratio (A/A)	Power (VA)	Accuracy class	Instrument security factor
400/5 or 400/1	10	0.5	5
500/5 or 500/1	10	0.5	5
600/5 or 600/1	10	0.5	5
800/5 or 800/1	10	0.5	5
1000/5 or 1000/1	10	0.5	5

STN – 88/60			
Transformation ratio (A/A)	Power (VA)	Accuracy class	Instrument security factor
500/5 or 500/1	7.5	0.5	5
600/5 or 600/1	10	0.5	5
800/5 or 800/1	10	0.5	5
1000/5 or 1000/1	10	0.5	5
1250/5 or 1250/1	10	0.5	5

TECHNICAL DATA:	STN 88/40	STN 88/50	STN 88/60
- Highest voltage for equipment (kV)	0.72	0.72	0.72
- Withstand voltage 50 Hz, 1 min. (kV)	3	3	3
- Frequency (Hz)	50/60	50/60	50/60
- Primary current (A)	200-600	400-1000	500-1250
- Secondary current (A)	5 or 1	5 or 1	5 or 1
- Short-time thermal current I _{th}	60 I _n	60 I _n	60 I _n
- Dynamic current	2.5 I _{th}	2.5 I _{th}	2.5 I _n
- Continuous thermal current	1.2 I _n	1.2 I _n	1.2 I _n
- Enclosures material	polycarbonate	polycarbonate	polycarbonate
- Valid references	JUS IEC 60044-1	JUS IEC 60044-1	JUS IEC 60044-1
- Mass	~0.65 kg	~0.65 kg	~0.65 kg

Transformer's mass depends of the transformation ratio and it is different for various transformation ratios.



LOW VOLTAGE CURRENT TRANSFORMERS STEN 081 FOR PRIMARY CURRENT FROM 300 TO 600 A

TECHNICAL DATA	STEN-081
Rated voltage (kV)	0.72
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3
Rated frequency (Hz)	50/60
Rated primary current (A)	300; 400; 500; 600
Rated secondary current (A)	5 (or 1)
Rated short time thermal current	$I_{th}=80I_n$
Rated dynamic current	I_{dyn} =practically unlimited
Rated continuous thermal current	$I_{tth}=1,2I_n$
Instrument security factor	$F_s=5$
Insulation class	E/B
Type of basic insulation	epoxy resin or plastic housing
Normative references	JUS IEC 60044-1, VDE 0414, BS 3938
Weight, approx	0,7 kg

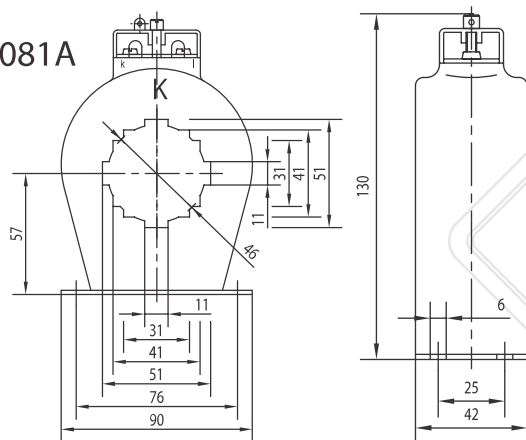
These transformers are serially produced with rated power 10 VA, accuracy class 0,5 and transformation ratio 75/5, 100/5, 150/5, 200/5, 300/5, 400/5 and 600/5 A/A.

Accuracy class	Rated output (VA)
0.2	5
0.5	10
1	15

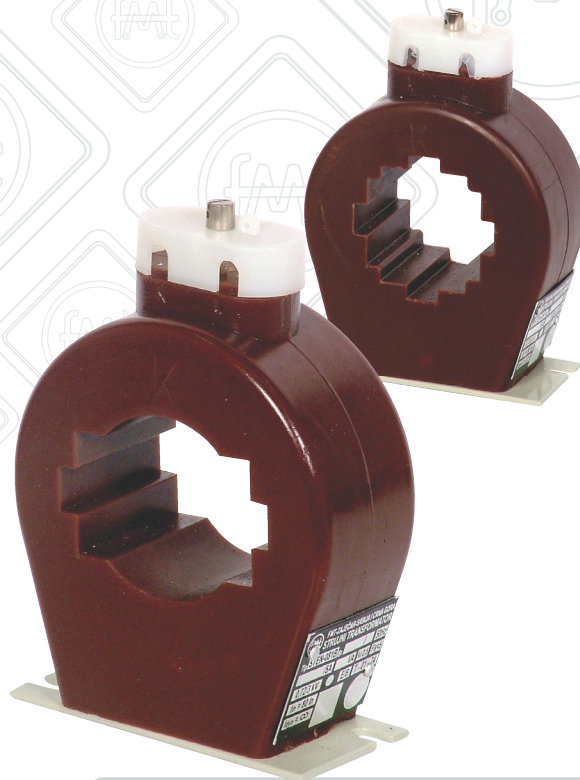
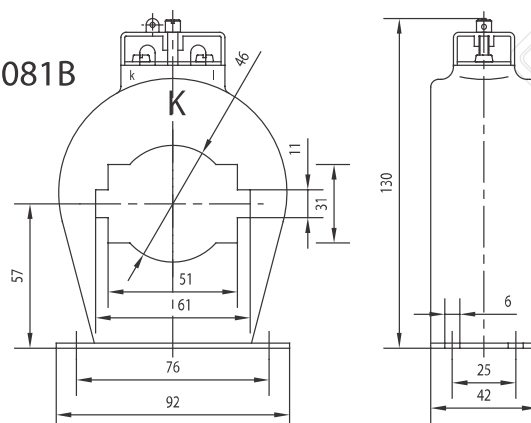
Measuring current transformers

STEN 081A I 081B

STEN 081A



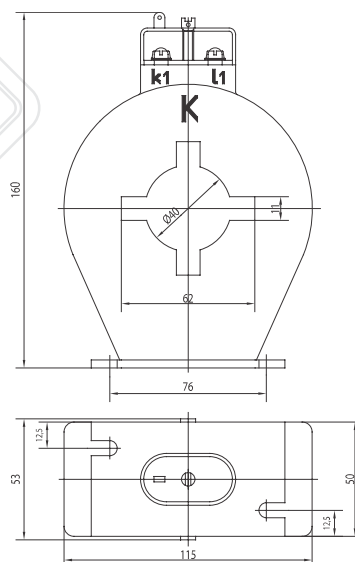
STEN 081B



LOW VOLTAGE CURRENT TRANSFORMERS STEN-081A AND STEN-081B

TECHNICAL DATA	STEN-081A	STEN-081B
Maximal operating voltage (kV)	1	1
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3	3
Rated frequency (Hz)	50/60	50/60
Rated primary current (A)	250 - 600	600 - 1000
Rated secondary current (A)	5 (or 1)	5 (or 1)
Rated short time thermal current	$I_{th}=80I_n$	$I_{th}=80I_n$
Rated dynamic current	$I_{dyn}=\text{practically unlimited}$	$I_{dyn}=\text{practically unlimited}$
Rated continuous thermal current	$I_{tth}=1.2I_n$	$I_{tth}=1.2I_n$
Insulation class	E/B	E/B
Type of basic insulation	epoxy resin	epoxy resin
Normative references	JUS IEC 60044-1	JUS IEC 60044-1
Mass	~0.7 kg	~0.7 kg

Transformation ratio (A/A)	250/5	300/5	400/5	500/5	600/5	800/5	1000/5
Accuracy class	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Rated output (VA)	5	5	5	5	10	10	10



LOW VOLTAGE CURRENT TRANSFORMERS STEN 081 FOR PRIMARY CURRENT FROM 800 TO 1000 A

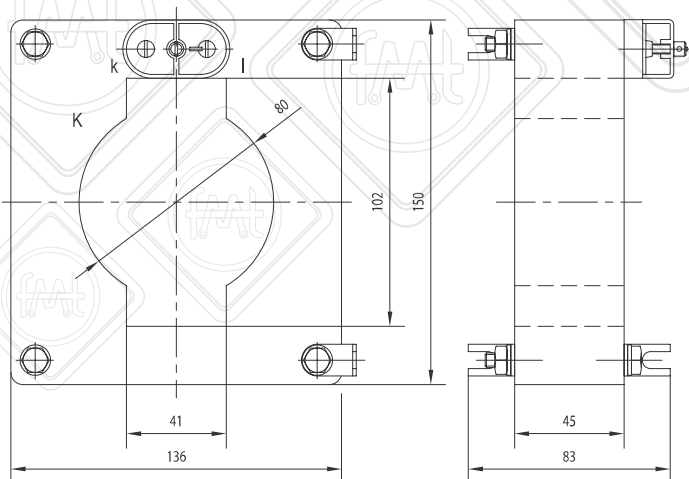
These transformers are serially produced with rated power 15 VA, accuracy class 0,5 and transformation ratio 1000/5 A/A.

Accuracy class	Rated output (VA)
0.2	10
0.5	15
1	30

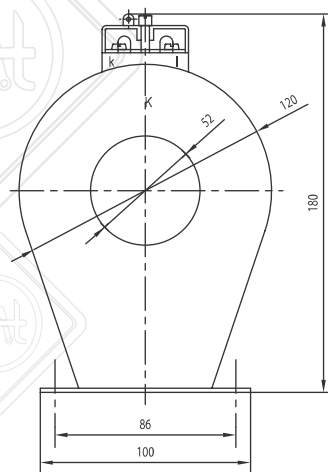
TECHNICAL DATA	STEN-081 800 to 1000 A
Rated voltage (kV)	0.72
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3
Rated frequency (Hz)	50/60
Rated primary current (A)	800; 1000
Rated secondary current (A)	5 (or 1)
Rated short time thermal current	$I_{th}=80I_n$
Rated dynamic current	$I_{dyn}=\text{practically unlimited}$
Rated continuous thermal current	$I_{tth}=1,2I_n$
Instrument security factor	$F_s=5$
Insulation class	E/B
Type of basic insulation	epoxy resin
Normative references	JUS IEC 60044-1, VDE 0414, BS 3938
Mass, approx	1.8 kg

Measuring current transformers

STEN 081C



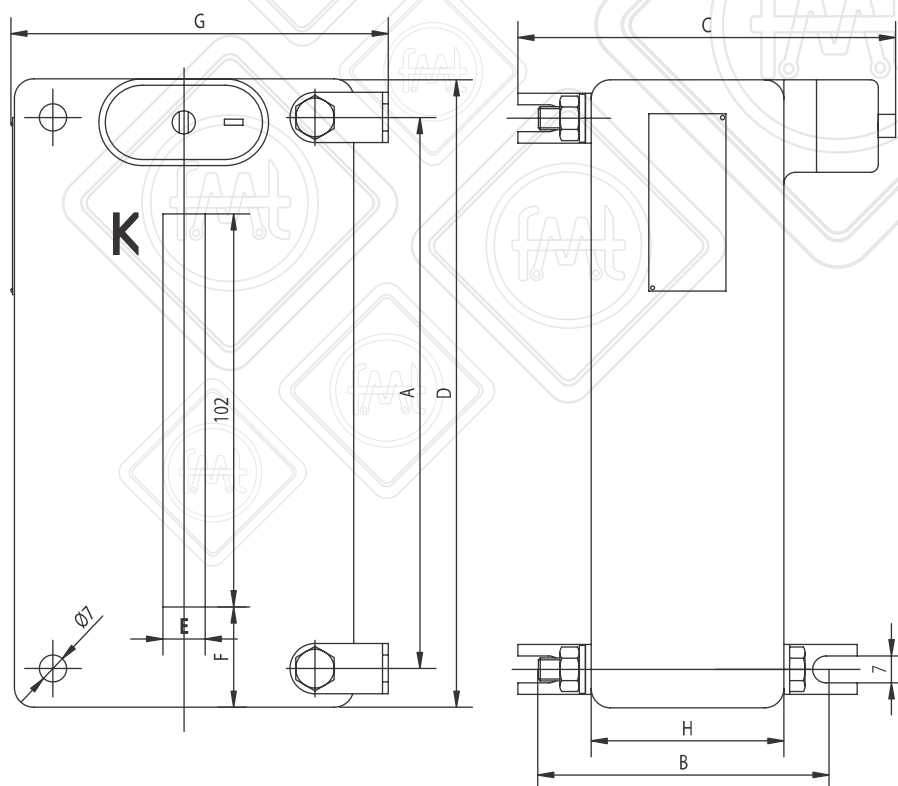
STEN-081C	
Maximal operating voltage (kV)	1
Withstand voltage, 50 Hz, 1 min (kV)	3
Rated frequency (Hz)	50 / 60
Rated primary current (A)	1000; 1500
Rated secondary current (A)	5 or 1
Rated power (VA)	15
Accuracy class	0.5
Short-time thermal current	$I_{th} = 80 I_n$
Rated dynamic current	$I_{dyn} = \infty$
Continuous thermal current	$I_{tth} = 1.2 I_n$
Thermal class of insulation	E / B
Basic insulation	epoxy resin
Valid references	JUS IEC 60044-1



STEN-081D	
Maximal operating voltage (kV)	1
Withstand voltage, 50 Hz, 1 min (kV)	3
Rated frequency (Hz)	50 / 60
Rated primary current (A)	200-1000
Rated secondary current (A)	5 or 1
Rated power (VA)	5; 10; 15
Accuracy class	0.5; 1; 3; 5P; 10P
Short-time thermal current	$I_{th} = 80 I_n$
Rated dynamic current	$I_{dyn} = \infty$
Continuous thermal current	$I_{tth} = 1.2 I_n$
Thermal class of insulation	E / B
Basic insulation	epoxy resin
Valid references	JUS IEC 60044-1

Measuring current transformers

STEN 081 1500-4000 A



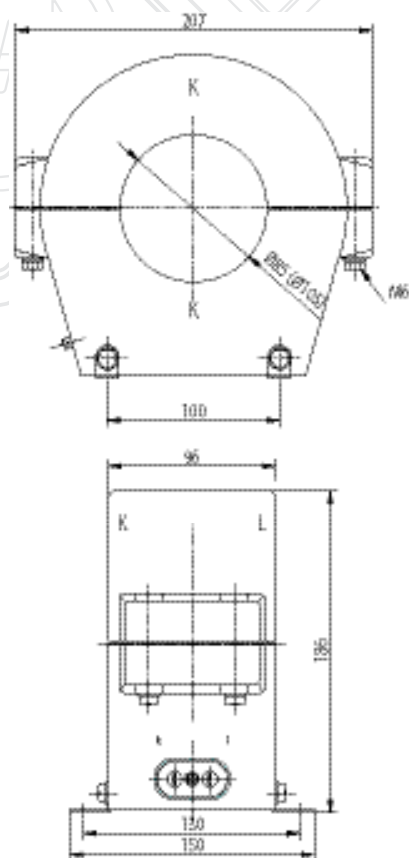
LOW VOLTAGE CURRENT TRANSFORMERS STEN 081 FOR PRIMARY CURRENT FROM 1500 TO 4000 A

TECHNICAL DATA	STEN-081 1500 to 4000 A
Rated voltage (kV)	0.72
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3
Rated frequency (Hz)	50/60
Rated primary current (A)	1500; 2000; 3000; 4000
Rated secondary current (A)	5 (or 1)
Rated short time thermal current	$I_{th}=80I_n$
Rated dynamic current	$I_{dyn}=\text{practically unlimited}$
Rated continuous thermal current	$I_{tth}=1.2I_n$
Instrument security factor	$F_s=5$
Insulation class	E/B
Type of basic insulation	epoxy resin
Normative references	JUS IEC 60044-1, VDE 0414, BS 3938
Mass, approx (kg)	2-3

These transformers are serially produced with rated power 30 VA, accuracy class 0.5 and transformation ratio 1500/5 and 2000/5 A/A.

Accuracy class	Rated output (VA)
0.2	10
0.5	30
1	45

Primary current(A)	Dimensions (mm)							
	A	B	C	D	E	F	G	H
1500	143	74	95	163	11	26	94	50
2000	143	74	95	163	11	26	94	50
3000	134	82	105	154	23	21	125	60
4000	134	82	105	154	23	21	125	60



CABLE TRANSFORMERS KT*

GENERAL PURPOSE:

Cable transformer type KT is used for connections of earth-fault protection relays. These transformers are applied in three-phase power cable networks, but they can be used in case when over ground network is ended by cable.

TECHNICAL DATA	KT
Rated transformation ratio (A/A)	250/5 (50/1)
Accuracy class	10P
Rated relay current (A)	5 (or 1)
Rated short time thermal current, 1 s	limited by cable
Rated dynamic current	practically unlimited
Rated primary voltage	defined by cable
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3
Mass, approx (kg)	10

DESIGN:

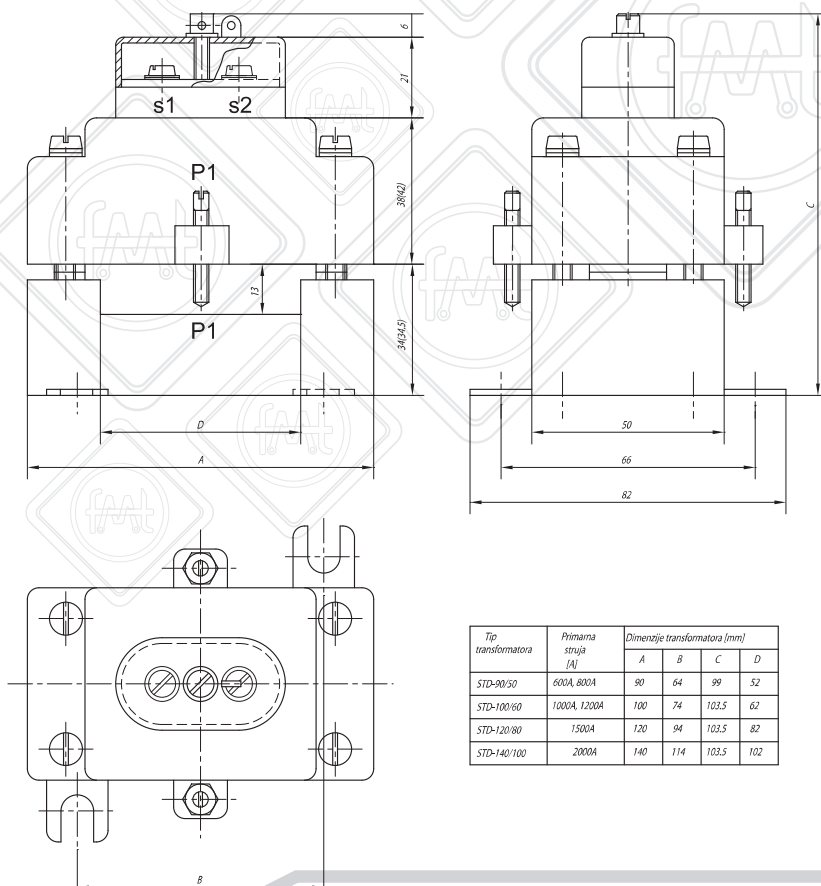
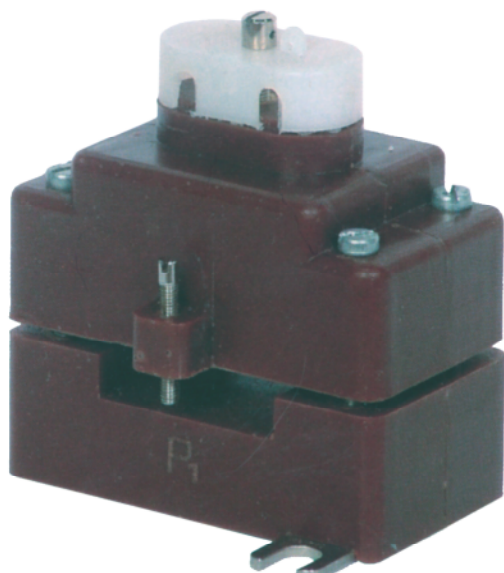
Cable transformer consists of two pieces, and therefore can be very easily mounted on power cable. Cable transformers can generally be used for all voltage levels, because primary insulation is determined by power cable insulation.

TRANSFORMER MOUNTING:

During assembling contact surfaces of magnetic core must be impeccably clean and fixing straps should be uniformly and well constricted, because even a negligible air gap have great influence on the relay's acting. During mounting, person who mounts should take care of terminal marks and endings polarity.

Protective current transformers

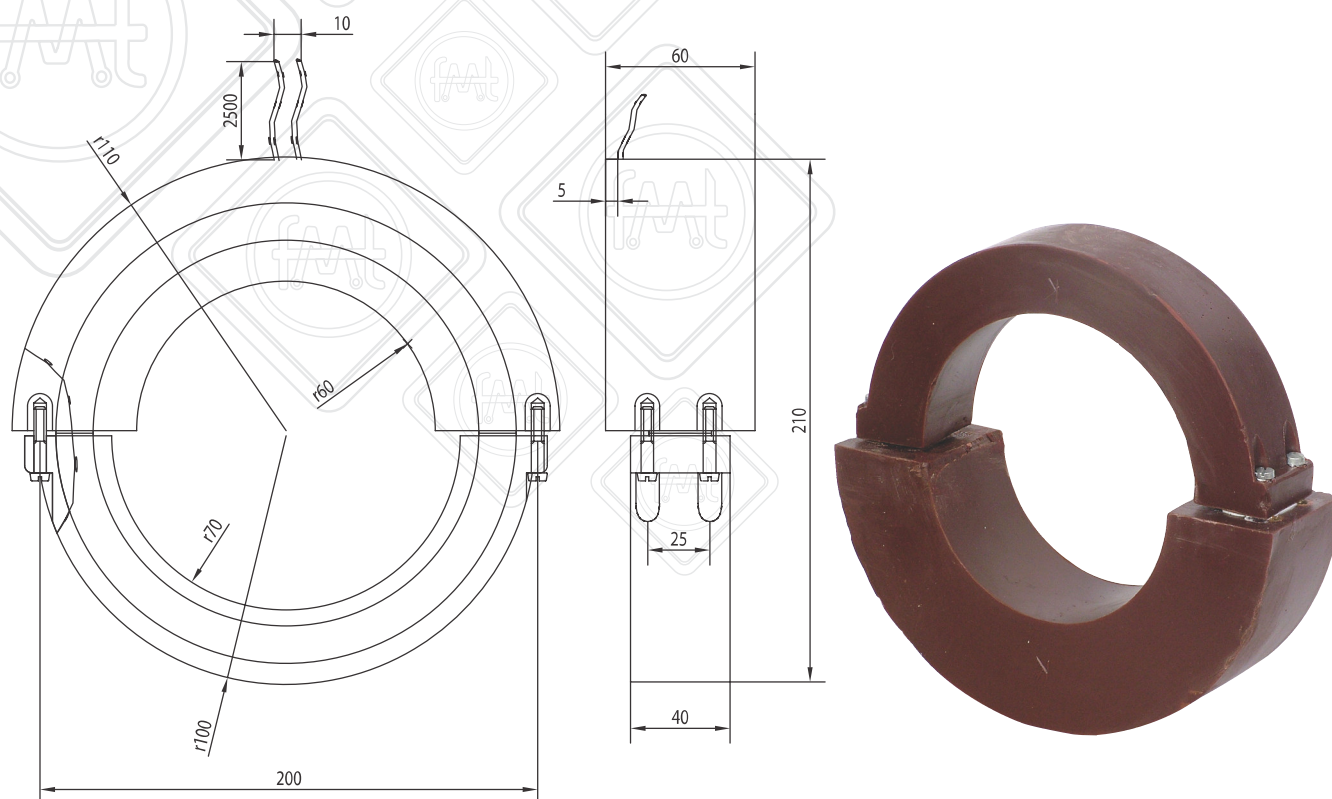
STD



Tip transformatora	Primarna struja [A]	Dimenzije transformatora [mm]			
		A	B	C	D
STD-90/50	600A, 800A	90	64	99	52
STD-100/60	1000A, 1200A	100	74	103.5	62
STD-120/80	1500A	120	94	103.5	82
STD-140/100	2000A	140	114	103.5	102

TECHNICAL DATA	STD
Maximal operating voltage (kV)	1
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3
Rated frequency (Hz)	50/60
Rated primary current (A)	400-2000
Rated secondary current (A)	5
Rated power (VA)	2.5; 5
Rated accuracy class	1
Rated short time thermal current	$I_{th}=80I_n$
Rated dynamic current	I_{dyn} =practically unlimited
Rated continuous thermal current	$I_{tth}=1.2I_n$
Insulation class	E/B
Type of basic insulation	epoxy resin
Normative references	JUS IEC 60044-1

Type of transformer	Dimensions (mm)			
	A	B	C	D
STD-90/50	90	64	99	52
STD-100/60	100	74	103.5	62
STD-120/80	120	94	103.5	82
STD-140/100	140	114	103.5	102

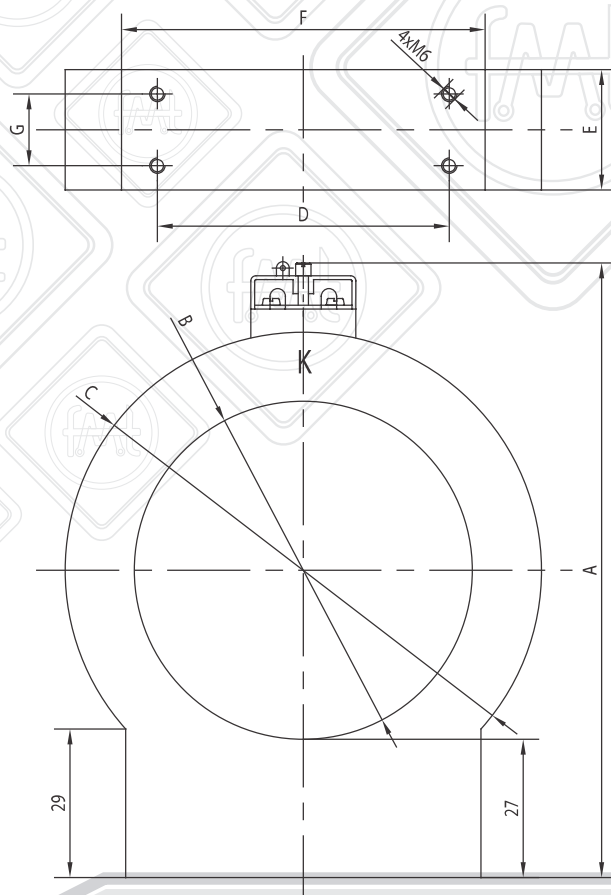


LOW VOLTAGE CURRENT TRANSFORMERS STD-1

TECHNICAL DATA	STD-1
Maximal operating voltage (kV)	1
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3
Rated frequency (Hz)	50/60
Rated primary current (A)	500 – 3000
Rated secondary current (A)	5; 1
Rated power (VA)	5; 10; 15
Rated accuracy class	0.5; 1; 3; 5P; 10P
Rated short time thermal current	$I_{th}=80I_n$
Rated dynamic current	I_{dyn} =practically unlimited
Rated continuous thermal current	$I_{tth}=1.2I_n$
Insulation class	E/B
Type of basic insulation	epoxy resin
Normative references	JUS IEC 60044-1

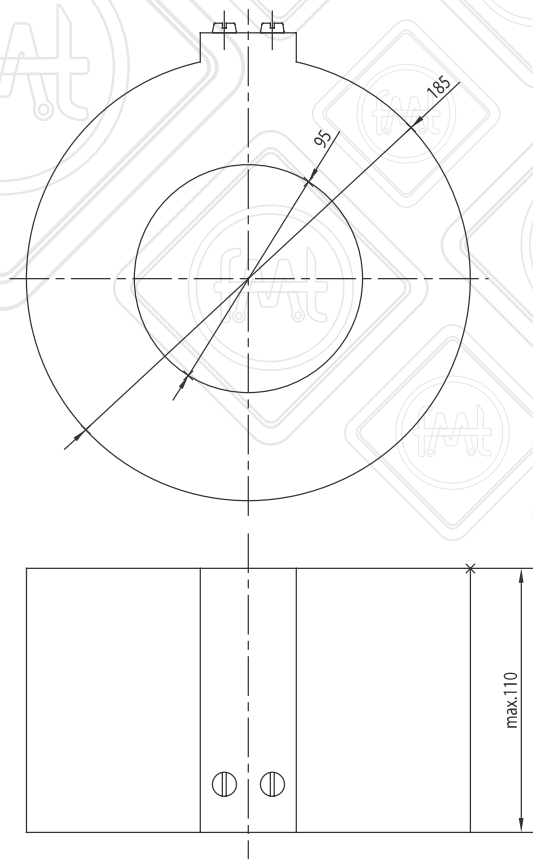
Protective current transformers

ST-081 A, ST-081 B



Type of transformer	Dimension (mm)						
	A	B	C	D	E	F	G
ST-081 A	240	132	186	114	47	142	28
ST-081 B	293	182	240	132	57	160	28

TECHNICAL DATA	ST-081 A; ST-081 B
Maximal operating voltage (kV)	1
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3
Rated frequency (Hz)	50/60
Rated primary current (A)	500 – 4000
Rated secondary current (A)	5; 1
Rated power (VA)	5; 10; 15
Rated accuracy class	0.5; 1; 3; 5P; 10P
Rated short time thermal current	$I_{th}=80I_n$
Rated dynamic current	I_{dyn} =practically unlimited
Rated continuous thermal current	$I_{tth}=1.2I_n$
Insulation class	E/B
Type of basic insulation	epoxy resin
Normative references	JUS IEC 60044-1

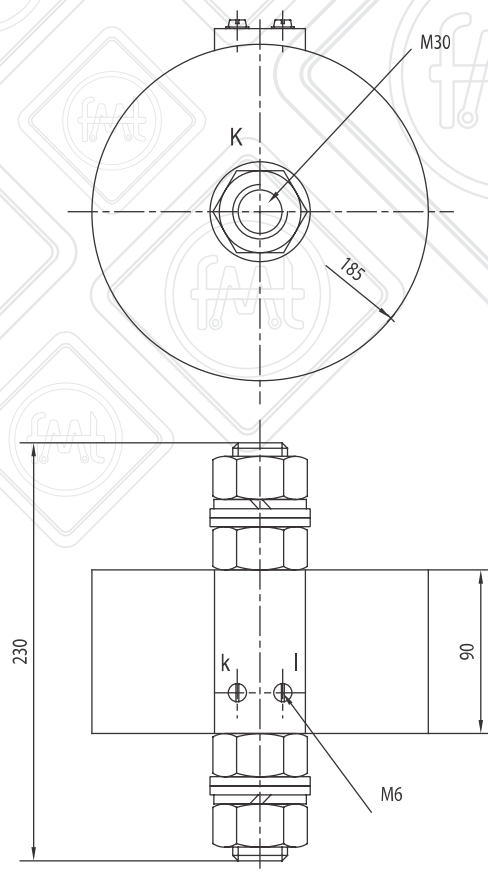


Technical data	ST-081
Maximal operating voltage	1 kV
Withstand voltage, 50 Hz, 1 min	3 kV
Rated frequency	50 / 60 Hz
Rated primary current	50 – 1000 A
Rated secondary current	5; 1 A
Rated power	2.5; 5; 10; 15; 30 VA
Accuracy class	0.5; 1; 3; 5P; 10P
Rated short-time current	$I_{th} = 80 I_n$
Rated dynamic current	$I_{dyn} = \infty$
Continuous thermal current	$I_{tth} = 1.2 I_n$
Thermal insulation class	E / B
Basic insulation	epoxy resin
Valid references	JUS IEC 60044-1

NOTE: Width of the transformer may vary (dimension in brackets), depending on the transformation ratio and rated power.

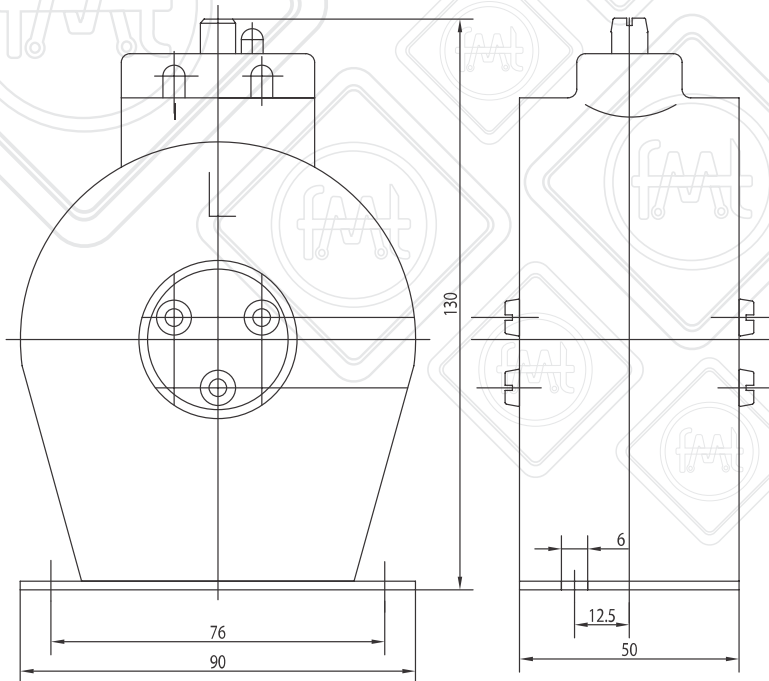
Protective current transformers

ST-3,6



LOW VOLTAGE CURRENT TRANSFORMERS ST-3.6

TECHNICAL DATA	ST-3.6
Maximal operating voltage (kV)	3.6
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	10
Rated frequency (Hz)	50/60
Rated primary current (A)	150; 200
Rated secondary current (A)	5; 1
Rated power (VA)	15
Rated accuracy class	5P; 10P
Rated short time thermal current	$I_{th}=80I_n$
Rated dynamic current	$I_{dyn}=\text{practically unlimited}$
Rated continuous thermal current	$I_{tth}=1.2I_n$
Insulation class	E/B
Type of basic insulation	epoxy resin
Normative references	JUS IEC 60044-1

**SUMMATION-TYPE CURRENT TRANSFORMERS TSUM-***

TECHNICAL DATA	TSUM
Rated voltage (kV)	0.72
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3
Rated frequency (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	$I_{tth}=1.2I_n$
Instrument security factor	$F_s=5$
Insulation class	E/B
Type of basic insulation	epoxy resin
Normative references	JUS IEC 60044-1, VDE 0414, BS 3938
Mass, approx (kg)	1.6

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

GENERAL PURPOSE:

Summation-type current transformer is intended for measuring instrument supply in cases when it performs measuring while is connected to several terminals (2, 3 or 4) at the same time. Primary windings of these transformers are connected to the adequate secondary windings of the main current transformers.

CHOOSING:

The important thing in choosing of the summation-type current transformers is that the number of turns in the primary windings are in proportion with the primary currents of the main current transformers (if the main current transformers doesn't have the same current transformation ratio). When mounting, primary windings of the summation-type current transformer must be connected to the adequate secondary windings of the main current transformers.

Example: If the main current transformers have transformation ratios 1000/5 A, 800/5 A, 500/5 A and 500/5 A, their primary current ratio is 10:8:5:5. Number of turns in the primary windings of the summation-type current transformer should have the same ratio. In this case summation-type current transformer is TSUM 4 with 4 primary windings and current transformation ratio $(5+5+5+5)/5$ A. This transformer is also useful, for example, when the main current transformers have transformation ratios 50/5 A, 40/5 A, 25/5 A and 25/5 A because their primary current ratio is 10:8:5:5.

The beginnings and the endings of the primary windings at the summation-type current transformer TSUM have the following markings K1, K2, K3, K4 or L1, L2, L3, L4.

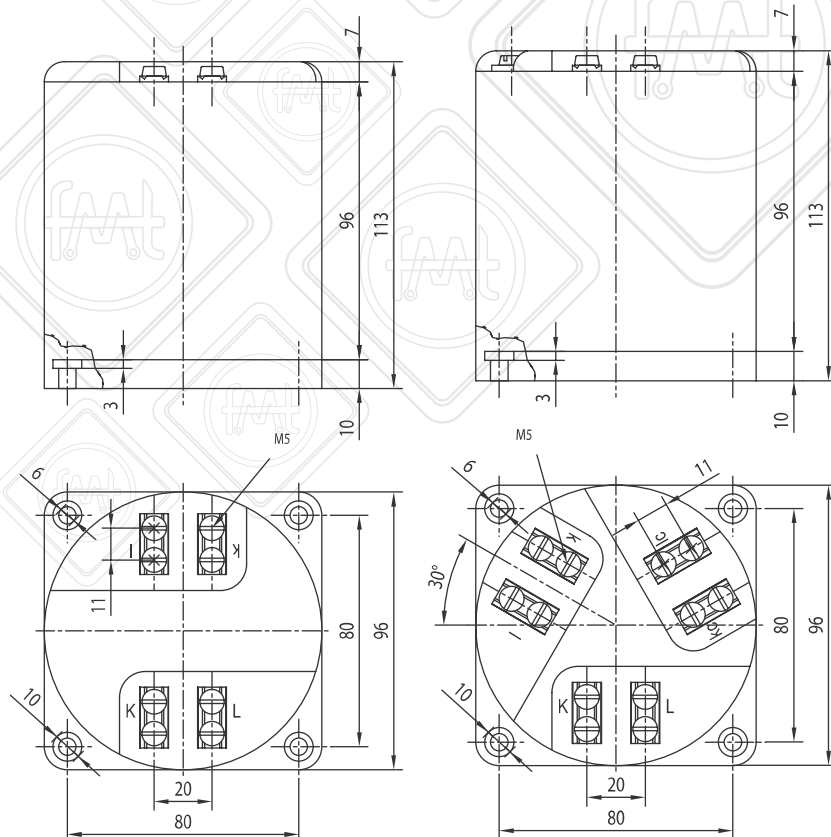
NOTE:

In case when some of main current transformers are not installed, unused primary winding of summation-type current transformer must remain open-circuited. In case when some of main current transformers are out of power supply, summation-type current transformer will still be supplied by other main current transformers.

In both cases, measuring instruments will indicate less values than in normal operating conditions.

Protective current transformers

MTD 1, MTD 2



DIFFERENTIAL RELAY PROTECTION CURRENT INTERTRANSFORMERS MTD 1 AND MTD 2

TECHNICAL DATA	MTD 1	MTD 2
Rated output (VA)	10	10
Accuracy class	5P10	5P10
Rated short time thermal current	$I_{th}=100I_n$	$I_{th}=100I_n$
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3	3
Rated frequency (Hz)	50/60	50/60
Insulation class	E/B	E/B
Mass, approx (kg)	3.1	3.5

CONNECTION:

Vector group connections of the current intertransformers depends on the vector group of the protected power transformers. Connections of the protection current intertransformers for two windings power transformers have been presented in the following tables. Current intertransformer connection to the differential relay (RD-20-2 for power transformers with two windings or RD-20-3 for power transformers with three windings) and to the current transformers for vector groups Yd, Yy, Yy0d5 and Yy6d5 have been presented in the additional description of the differential protection. Needless action of the relay when the fault (single pole earth fault) occur outside of the power transformer's protection area (when power transformer have solid earth connected neutral point), have been avoided by installing intertransformer who has one side connected in triangle. That intertransformer have to be installed between differential relay and the side of the protected power transformer which has solid earth connected neutral point. When power transformer has three windings, intertransformers are installed on one, two or three sides of the protected power transformer depending on the vector group, secondary currents and the earth neutral connection point. Choice of the current intertransformer and the differential protection relay for the three windings power transformer's protection depends on the number of sides from which power transformer gets his supply. For example, if power transformer gets his supply by one side, it is enough to add out normal differential relay (RD-20-2). Current intertransformers on the tertiary side of the protected power transformer are not necessary if current transformers on the tertiary side of the protected power transformer have been chosen so that their rated secondary current is 5 A (or 1 A) when primary winding of power transformer is loaded with rated burden and his secondary winding is unloaded. This is rarely a case because current transformers in the tertiary side of the protected power transformer usually have such rated transformation ratio so that they have rated current at 1/3 of the power transformer's rated burden.

CURRENT INTERTRANSFORMERS TRANSFORMATION RATIO:

Transformation ratio of intertransformers used for differential protection of two windings power transformer can be determined by equations given in the following table:

GENERAL PURPOSE:

Current intertransformers MTD 1 and MTD 2 are used for differential protection of power transformers. These intertransformers equalize secondary currents of measuring current transformers, which are installed on primary and secondary side (and tertiary) of protected power transformer, by their magnitude and phase angle.

DESIGN:

Current intertransformers MTD are designed as single-phase units, so differential relay protection needs three intertransformers connected in adequate connection, depending on the vector group of the protected power transformer. Current intertransformers MTD 1 have two windings (primary and secondary) and they are designed for differential protection of power transformers with vector groups Dd, Dy and Yd (they also can be used for power transformers with vector group Yy if their windings are connected in vector group Dd). Current intertransformers MTD 2 have three windings (primary, secondary and tertiary) and they are designed for differential protection of power transformers with vector groups Yy.

Vector group of current intertransformer	Dd	Yy	Dy	Yd
Transformation ratio of current intertransformer I1/I2	$\frac{P/3U_1p_1}{P/3U_2p_2}$	$\frac{P/\sqrt{3}U_1p_1}{P/\sqrt{3}U_2p_2}$	$\frac{P/3U_1p_1}{P/\sqrt{3}U_2p_2}$	$\frac{P/\sqrt{3}U_1p_1}{P/3U_2p_2}$

Transformation ratio of intertransformers used for differential protection of three windings power transformer can be determined by equations given in the following tables:

a) Intertransformers installed only in primary and secondary winding of power transformer

Vector group of current intertransformer	Yd (primary)	Yd (secondary)
Transformation ratio of current intertransformer	$\frac{I_1}{I_3} = \frac{P/\sqrt{3}U_1p_1}{P/3U_3p_3}$	$\frac{I_2}{I_3} = \frac{P/\sqrt{3}U_2p_2}{P/3U_3p_3}$

b) Intertransformers installed in primary, secondary and tertiary winding of power transformer

Vector group of current intertransformer	Yd (primary)	Yd (secondary)	Yy (tertiary)
Transformation ratio of current intertransformer	$\frac{I_1}{I_r} = \frac{P/\sqrt{3}U_1p_1}{I_n/\sqrt{3}}$	$\frac{I_2}{I_r} = \frac{P/\sqrt{3}U_2p_2}{I_n/\sqrt{3}}$	$\frac{I_3}{I_r} = \frac{P/\sqrt{3}U_3p_3}{I_n/\sqrt{3}}$

Where:

I1, I2, I3 – stands for intertransformer currents, on the side which is connected to the protected transformer primary, secondary and tertiary current transformers,

I_r – stands for intertransformer secondary current, i.e. current of differential relay,

I_n – stands for rated current of differential relay (5 A or 1 A),

P – stands for rated power of the protected power transformer,

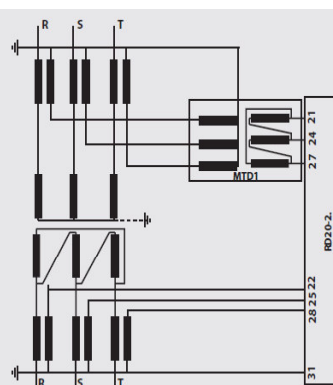
U1, U2, U3 – stands for rated phase-to-phase voltage (r.m.s.) on primary, secondary and tertiary side of power transformer, respectively and

p1, p2, p3 – stands for transformation ratios of main current transformers installed on primary, secondary and tertiary side of power transformer, respectively.

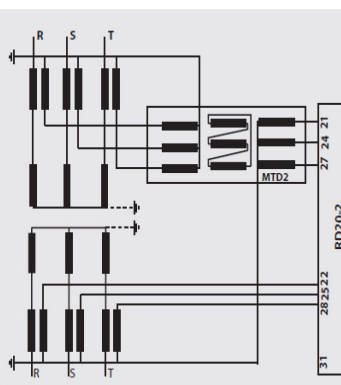
Protective current transformers

MTD 1, MTD 2

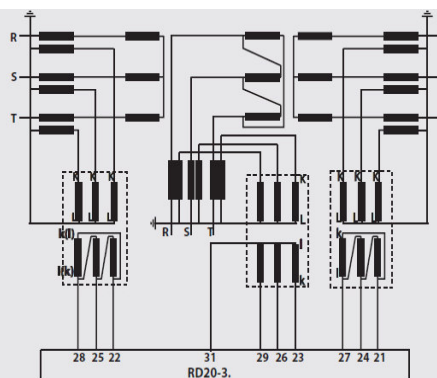
Vector group of protected power transformer							
Dd0	Yy0	Dy5	Yd5	Dd6	Yy6	Dy11	Yd11
Adequate connection scheme for current intertransformer MTD1 and MTD2							



Differential protection of the transformer with vector group Yd



Differential protection of the transformer with vector group Yy



Differential protection of the transformer with vector group Yy0d5 (marks in brackets are valid for vector group Yy6d5)



DIFFERENTIAL RELAY PROTECTION CURRENT INTERTRANSFORMERS MTD 11, MTD 15 AND MTD 55

TECHNICAL DATA	MTD 55	MTD 11	MTD 15
Rated primary current (A)	5	1	1
Rated secondary current (A)	5	1	5
Transformation ratio range I1/I2	from 0.246 to 4.066	from 0.246 to 4.066	from 0.129 to 0.567
Rated output (VA)	1	1	1
Accuracy class	10P15	10P15	10P15
Rated short time thermal current	I _{th} =100I _n	I _{th} =100I _n	I _{th} =100I _n
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	3	3	3
Rated frequency (Hz)	50/60	50/60	50/60
Insulation class	E/B	E/B	E/B
Mass, approx (kg)	2.55	2.55	2.55

GENERAL PURPOSE:

Current intertransformers MTD 55, MTD 11 and MTD 15 are used for differential protection of power transformer. These intertransformers equalize secondary currents of measuring current transformers, which are installed on primary and secondary side (and tertiary) of protected power transformer, by their magnitude and phase angle. These intertransformers are universal current transformers with six windings and with their appropriate connecting it is possible to get certain transformation ratio.

Regarding rated primary and secondary currents there are three types of current intertransformers:

MTD 55 for 5/5 A transformation ratio. This intertransformer is used in case when rated secondary currents of measuring current transformers, on both primary and secondary side of protected power transformer, are 5 A.

MTD 11 for 1/1 A transformation ratio. This intertransformer is used in

case when rated secondary currents of measuring current transformers, on both primary and secondary side of protected power transformer, are 1 A.

MTD 15 for 1/5 A transformation ratio. This intertransformer is used in case when rated secondary currents of measuring current transformers, on one side of protected power transformer is 1 A, and on the other side is 5 A.

DESIGN:

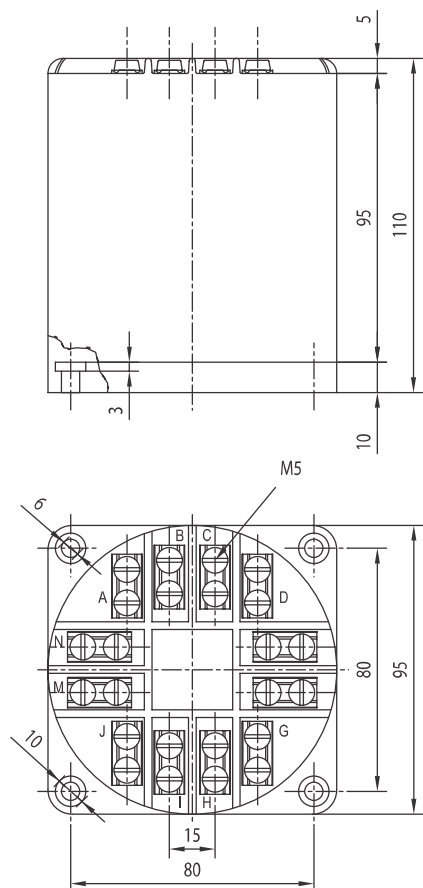
Current intertransformers MTD are designed as single-phase units, so differential relay protection needs three intertransformers connected in adequate connection, depending on the vector group of the protected power transformer. This type of MTD is six windings (sections) current intertransformer. By convenient connecting of these sections, according to combinations shown in the tables below, primary, secondary and tertiary windings can be formed for a great number of transformation ratios.

All three types of current intertransformers have tertiary winding formed by unconnected sections, i.e. remaining sections which are not used for forming primary and secondary windings of current intertransformer.

These intertransformers are used only for connection of the transistor differential relays RD 20. Relays RD 20 with old electromagnetic construction must not be used because of their great power consumption.

Protective current transformers

MTD 11, MTD 15, MTD 55



CONNECTION OF THE INTERTRANSFORMERS:

Vector group connections of the current intertransformers depends on the vector group of the protected power transformers. Connections of the protection current intertransformers for two windings power transformers have been presented in the following tables.

Current intertransformer connection to the differential relay (RD-20-2 for power transformers with two windings or RD-20-3 for power transformers with three windings) and to the current transformers for vector groups Yd, Yy, Yy0d5 and Yy6d5 have been presented in the additional description of the differential protection. Needless action of the relay when the fault (single pole earth fault) occur outside of the power transformer's protection area (when power transformer have solid earth connected neutral point), have been avoided by installing intertransformer who has one side connected in triangle. That intertransformer have to be installed between differential relay and the side of the protected power transformer which has solid earth connected neutral point. When power transformer has three windings, intertransformers are installed on one, two or three sides of the protected power transformer depending on the vector group, secondary currents and the earth neutral connection point. Choice of the current intertransformer and the differential protection relay for the three windings power transformer's protection depends on the number of sides from which power transformer gets his supply.

For example, if power transformer gets his supply by one side, it is enough to add out normal differential relay (RD-20-2). Connection of intertransformer used for protection of the three windings power transformer with vector group Yy0d5 (i.e. Yy6d5) has been given below in the additional representation of the differential protection.

Current intertransformers on the tertiary side of the protected power transformer are not necessary if current transformers on the tertiary side of the protected power transformer have been chosen so that their rated secondary current is 5 A (or 1 A) when primary winding of power transformer is loaded with rated burden and his secondary winding is unloaded. This is rarely a case because current transformers in the tertiary side of the protected power transformer usually have such rated transformation ratio so that they have rated current at 1/3 of the power transformer's rated burden.

Beside this, there are other connections of the current intertransformers that can be used for differential protection of the power transformers. Because differential relay RD 20 has small consumption (transistor relay), power of the intertransformers has been mostly spent on the line resistance between relay and intertransformer. Because of that, it is necessary to mount differential relay as close as possible to the intertransformer, and to accept greater cross section for the conduction lines (impedance of the secondary circuit must not exceed 0,02 ohms). It is also important that all connections must be accomplished impeccably, so that intermediate resistance will be less (line connections to the terminals must be carried out with two bolts).

CURRENT INTERTRANSFORMERS TRANSFORMATION RATIO:

Transformation ratio of intertransformers used for differential protection of two windings power transformer can be determined by equations given in the following table:

Vector group of current intertransformer	Dd	Yy	Dy	Yd
Transformation ratio of current intertransformer I1/I2	$\frac{P/3U_{1p1}}{P/3U_{2p2}}$	$\frac{P/\sqrt{3}U_{1p1}}{P/\sqrt{3}U_{2p2}}$	$\frac{P/3U_{1p1}}{P/\sqrt{3}U_{2p2}}$	$\frac{P/\sqrt{3}U_{1p1}}{P/3U_{2p2}}$

a) Intertransformers installed only in primary and secondary winding of power transformer

Vector group of current intertransformer	Yd (primary)	Yd (secondary)
Transformation ratio of current intertransformer	$\frac{I_1}{I_3} = \frac{P/\sqrt{3}U_{1p1}}{P/3U_{3p3}}$	$\frac{I_2}{I_3} = \frac{P/\sqrt{3}U_{2p2}}{P/3U_{3p3}}$

b) Intertransformers installed in primary, secondary and tertiary winding of power transformer

Vector group of current intertransformer	Yd (primary)	Yd (secondary)	Yy (tertiary)
Transformation ratio of current intertransformer	$\frac{I_1}{I_r} = \frac{P/\sqrt{3}U_{1p1}}{I_n/\sqrt{3}}$	$\frac{I_2}{I_r} = \frac{P/\sqrt{3}U_{2p2}}{I_n/\sqrt{3}}$	$\frac{I_3}{I_r} = \frac{P/\sqrt{3}U_{3p3}}{I_n/\sqrt{3}}$

Where:

I1, I2, I3 – stands for intertransformer currents, on the side which is connected to the protected transformer primary, secondary and tertiary current transformers,

I_r – stands for intertransformer differential current, i.e. current of differential relay,

I_n – stands for rated current of differential relay (5 A or 1 A),

P – stands for rated power of the protected power transformer,

U1, U2, U3 – stands for rated phase-to-phase voltage (r.m.s.) on primary, secondary and tertiary side of power transformer, respectively and

p1, p2, p3 – stands for transformation ratios of main current transformers installed on primary, secondary and tertiary side of power transformer, respectively.

Protective current transformers

MTD 11, MTD 15, MTD 55

Transformation ratio of current intertransformer can be adjusted to current ratio I_1/I_2 in wide range with sufficient precision. Connections for all combinations are chosen in such manner that deviation of demanded transformation ratio of current intertransformer and selected ratio of primary and secondary number of turns (n_1/n_2) does not exceed 1,5 %.

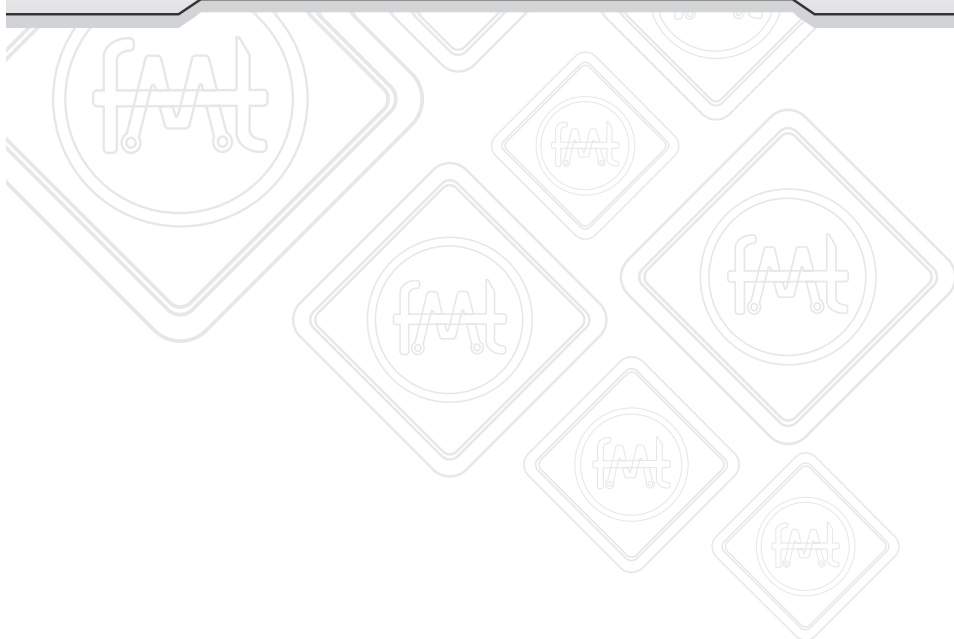
MTD 55 MTD 11							MTD 55 MTD 11							MTD 55 MTD 11							MTD 15							MTD 11						
Tran.rate	Tappings						Tran.rate	Tappings						Tran.rate	Tappings						Tran.rate	Tappings						Tran.rate	Tappings					
	Primary	Secondary	Tertiary	Connect				Primary	Secondary	Tertiary	Connect				Primary	Secondary	Tertiary	Connect				Primary	Secondary	Tertiary	Connect									
I1/I2	K	L	k	I	kc	Ic	I1/I2	K	L	k	I	kc	Ic	I1/I2	K	L	k	I	kc	Ic	I1/I2	K	L	k	I	kc	Ic	I1/I2	K	L	k	I	kc	Ic
0.246	G	N	E	F	C	D	1.700	A	N	G	F	C	D	0.600	G	H	A	N	C	D	0.1293	G	J	A	M	E	F	0.280	G	N	C	J	A	B
0.250	G	N	E	F	A	B	1.733	A	N	G	D	E	F	0.607	E	N	C	D	A	B	0.1333	G	N	E	F	C	D	0.287	G	M	E	J	A	B
0.258	G	J	E	F	C	D	1.759	C	N	G	F	A	B	0.621	C	N	A	B	E	F	0.1368	G	J	E	F	C	D	0.290	G	N	A	J	C	D
0.262	G	J	E	F	A	B	1.778	A	J	G	M	C	D	0.629	G	H	E	M	A	B	0.1404	G	M	E	F	C	D	0.299	G	M	C	J	A	B
0.270	G	N	C	D	A	B	1.815	A	J	G	M	E	F	0.636	C	F	A	N	G	H	0.1417	G	N	C	D	E	F	0.303	G	J	C	M	A	B
0.274	G	J	C	D	E	F	1.857	E	N	G	D	A	B	0.643	E	N	A	B	C	D	0.1441	G	N	C	D	A	B	0.310	G	M	A	J	C	D
0.281	G	N	A	B	E	F	1.893	E	N	G	B	C	D	0.658	G	N	E	J	A	B	0.1478	G	J	C	D	A	B	0.313	G	J	A	M	C	D
0.286	G	N	A	B	C	D	1.926	A	J	G	D	E	F	0.676	A	F	C	M	G	H	0.1513	G	N	A	B	E	F	0.322	G	H	C	N	A	B
0.291	G	N	E	F	A	B	1.962	C	J	G	F	A	B	0.684	G	N	C	J	A	B	0.1552	G	J	A	B	E	F	0.324	G	N	C	F	A	B
0.295	G	J	A	B	E	F	2.00	A	J	G	N	C	D	0.702	G	N	C	F	A	B	0.1593	G	M	A	B	E	F	0.333	G	J	C	F	A	B
0.300	G	J	A	B	C	D	2.038	C	J	G	B	E	F	0.727	A	J	G	M	E	F	0.1624	G	J	E	N	E	F	0.343	G	N	A	D	E	F
0.308	G	D	E	F	A	B	2.080	E	J	G	D	A	B	0.745	A	N	G	H	E	F	0.1651	G	N	A	B	C	D	0.354	G	J	A	D	E	F
0.315	G	N	C	D	A	B	2.120	E	J	G	B	C	D	0.761	A	N	G	H	C	D	0.1682	G	D	A	B	E	F	0.356	G	H	A	M	E	F
0.323	G	J	C	N	E	F	2.154	C	J	G	N	E	F	0.778	C	N	G	H	A	B	0.1717	G	J	C	D	A	B	0.364	G	J	C	N	A	B
0.327	G	N	A	B	E	F	2.200	E	J	G	N	A	B	0.795	A	J	G	H	E	F	0.1759	G	B	E	N	C	D	0.367	G	H	C	F	A	B
0.333	G	N	A	B	C	D	2.240	E	J	G	N	C	D	0.814	A	J	G	H	C	D	0.1776	G	D	E	N	A	B	0.374	G	J	A	N	C	D
0.340	G	M	C	D	E	F	2.304	C	M	G	B	E	F	0.833	C	J	G	H	A	B	0.1818	G	J	A	B	C	D	0.378	G	H	A	F	C	D
0.344	G	J	A	N	E	F	2.364	E	M	G	D	A	B	0.854	A	M	G	H	E	F	0.1852	G	B	C	N	E	F	0.384	G	J	A	N	E	F
0.350	G	J	A	N	C	D	2.409	E	M	G	B	C	D	0.875	A	M	G	H	C	D	0.1887	G	F	C	N	A	B	0.389	G	H	A	D	E	F
0.358	G	B	E	N	C	D	2.429	A	N	G	F	C	D	0.897	C	M	G	H	A	B	0.1936	G	N	A	B	C	D	0.391	G	M	A	F	C	D
0.365	G	D	E	N	A	B	2.476	A	N	G	D	E	F	0.921	A	N	G	H	E	F	0.1981	G	F	A	N	C	D	0.400	G	H	C	N	A	B
0.370	G	N	C	D	G	H	2.50	A	B	C	N	G	H	0.946	A	N	G	H	C	D	0.202	G	J	C	N	A	B	0.411	G	H	A	N	C	D
0.377	G	B	C	N	E	F	2.55	C	N	G	F	A	B	0.972	C	N	G	H	A	B	0.207	G	M	A	B	C	D	0.422	G	H	A	N	E	F
0.383	G	N	A	B	C	D	2.61	A	B	G	N	C	D	1.00	G	H	A	D	E	F	0.212	G	J	A	N	C	D	0.433	G	H	C	M	A	B
0.392	G	F	C	N	A	B	2.65	C	N	G	B	E	F	1.029	G	H	C	N	A	B	0.217	G	F	C	M	A	B	0.440	G	H	A	M	C	D
0.400	G	N	A	B	G	H	2.71	C	D	A	N	G	H	1.057	G	H	A	N	C	D	0.222	G	H	C	N	A	B	0.456	G	H	A	M	E	F
0.404	G	D	A	N	E	F	2.74	E	N	G	D	A	B	1.086	G	H	A	N	E	F	0.227	G	N	E	J	A	B	0.467	G	H	C	J	A	B
0.412	G	F	A	N	C	D	2.79	E	N	G	B	C	D	1.114	G	H	C	M	A	B	0.232	G	B	E	J	C	D	0.478	G	H	A	J	C	D
0.415	G	B	E	M	C	D	2.86	A	N	G	J	C	D	1.143	G	H	A	M	C	D	0.234	G	N	C	J	E	F	0.489	G	H	A	J	E	F
0.423	G	D	E	M	A	B	2.91	A	N	G	J	E	F	1.171	G	H	A	M	E	F	0.240	G	M	E	J	A	B	0.500	G	H	C	N	A	B
0.434	G	B	C	N	E	F	2.94	C	D	G	M	E	F	1.200	G	H	C	J	A	B	0.245	G	F	C	J	A	B	0.511	G	H	A	N	C	D
0.446	G	N	E	J	C	D	3.00	A	B	G	N	C	D	1.229	G	H	A	J	C	D	0.252	G	D	A	J	E	F	0.522	G	H	A	N	E	F
0.455	G	N	E	J	A	B	3.06	A	B	G	N	E	F	1.257	G	H	A	J	E	F	0.259	G	B	E	N	C	D	0.533	G	H	A	M		
0.464	G	N	C	J	E	F	3.10	C	N	G	J	E	F	1.286	G	H	C	N	A	B	0.262	G	M	A	J	C	D	0.548	G	N	A	F		
0.472	G	B	E	J	C	D	3.18	C	D	G	N	A	B	1.314	G	H	A	N	C	D	0.269	G	N	E	J	A	B	0.567	G	H	A	F		
0.481	G	D	E	J	A	B	3.25	E	F	G	D	A	B	1.343	G	H	A	N	E	F	0.274	G	F	C	N	A	B							
0.491	G	B	C	J	E	F	3.33	A	B	G	J	C	D	1.375	G	M	A	J	E	F														
0.500	G	N	A	J	C	D	3.39	A	B	G	J	E	F	1.424	C	F	G	N	A	B														
0.510	G	F	C	J	A	B	3.44	E	F	G	N	A	B	1.462	C	J	G	N	A	B														
0.519	G	D	A	J	E	F	3.50	A	B	G	N	C	D	1.478	C	M	A	F	G	H														
0.528	G	B	E	N	C	D	3.56	A	B	G	N	E	F	1.520	E	J	G	N	A	B														
0.538	G	D	E	N	A	B	3.65	C	D	G	J	E	F	1.556	A	B	E	N	C	D														
0.551	G	M	A	J	E	E	3.71	C	D	G	N	A	B	1.571	A	N	C	F	G	H														
0.563	G	M	A	J	C	F	3.81	E	F	G	J	A	B	1.591	E	M	G	H	A	B														
0.569	G	F	C	N	A	D	3.88	E	F	G	J	C	D	1.611	A	B	C	N	E	F														
0.577	G	D	A	N	E	B	4.00	E	F	G	N	A	B	1.647	C	D	E	N	A	B														
0.588	G	F	A	N	C	F	4.06	E	F	G	N	C	D	1.667	A	N	G	H	C	D														

NOTE:

Connection schemes for current intertransformers MTD 55, MTD 11 and MTD 15 fully correspond with those for types MTD 1 and MTD 2 depending of the protected power transformer vector group.

NOTE:

Connection schemes for current intertransformers MTD 55, MTD 11 and MTD 15 fully correspond with those for types MTD 1 and MTD 2 depending of the protected power transformer vector group.



CURRENT TRANSFORMERS 12-36 kV



CURRENT TRANSFORMERS 12-36 KV



DESCRIPTION

Basic insulation in these transformers is epoxy resin. Magnetic core consists of quality, cold rolled, oriented magnetic sheet. Secondary terminals have been covered with plastic cover that can be lead in. Transformers can be done with 1, 2 or 3 magnetic cores and as much separated secondary windings.

Primary winding can consist of two sections, so the transformer can be primary reconnectable. Marking 2x100 A means that transformer can be used for rated primary currents 100 A and 200 A.

APPLIANCE

These transformers are used for separating of measuring and protecting devices from high voltage and for transformation of measuring currents to the amount that is convenient for measuring and protecting

devices. They are appropriate for mounting in substations with rated voltages up to 36 kV. Supplying of ampermeters, current circuits of electricity meters, protecting and other devices is accomplished by these transformers. They can work continuously with 20% overrated burden and still maintain appointed accuracy class.

MOUNTING

Transformer can be mounted in all kinds of positions. He is attached to the background using bearing plate with adequate fastening screws. All connections on the primary and secondary side must be clean and well tightened, so they will not be overheated. One of the secondary winding connections should be earth connected (it is usually connection k i.e. S1). Whole burden of the connected measuring or protec-

ting devices together with cable losses must not exceed his rated value for more than 20 % because in that case accuracy class will not be satisfactory. If whole burden of the connected measuring or protecting devices together with cable losses is significantly less than his rated value, additional resistance should be added in secondary circuit. If some secondary winding is not charged his terminals must be shorted.

Primary reconnectable transformers have connection scheme. Bridging is done simply by moving connected plates on the high voltage terminals.

During mounting, take care that primary and secondary terminals don't change their places. Current input on the primary winding is marked with K or P1 and output is marked with L or P2. Current input on the secondary winding is marked with

k or S1 and output is marked with l or S2.

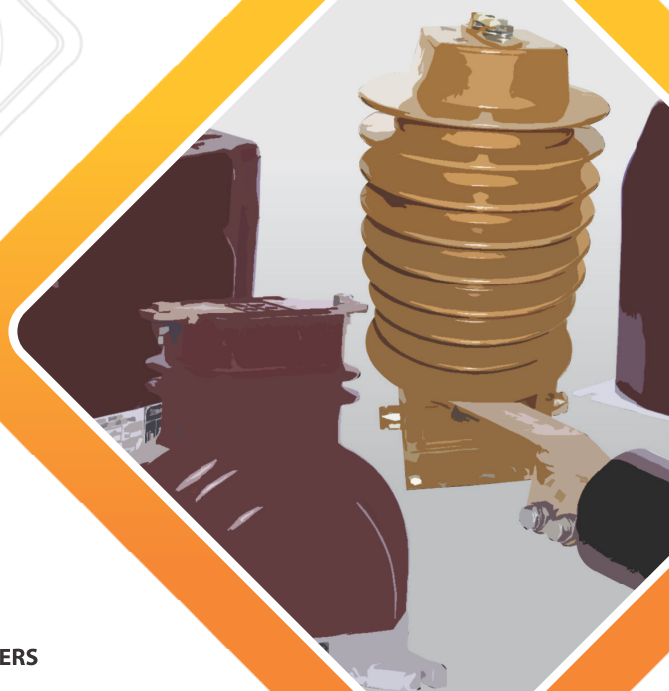
If exterior dynamic forces of the primary connections are great (greater than 3,75 kN) than supporting-type insulators should be mounted near the current transformer.

Transformers must be earth connected in the marked place.

HANDLING AND MAINTAINING

For these types of transformers regular maintaining is not necessary. It is enough, from time to time, to check if all connection are clean and well tightened and to clean the transformer if he is dirty. Take care that transformer must not work with open secondary circuit, because in that case high voltage appears on secondary side and insulation could be damaged. If some accident happens in the substation, transformers should be tested.

CURRENT TRANSFORMERS 12-36 KV



**APPROXIMATE DATA FOR MEASURING TRANSFORMERS
RATED POWER DEFINING**

Consumer	System power consum (VA)	
	Current circuit	Voltage circuit
Amperemeter with moving iron	0.75...1.2	-
Voltmeter with moving iron (100 V)	-	3...4.5
Nulvoltage meter	-	20
Wattmeter (Varmeter), electrodynamic (100 V)	3.5	1.5
Wattmeter (Varmeter), registration	3...12	4...9
Induction energy meter	0.4...1	2...5
Phasemeter, electrodynamic (cosφ)	2...6	3.5
Synchroscope	-	11
Frequency indicator with flaps (100 V)	-	3
Frequency indicator, electrodynamic	-	7
Voltage relay RU	-	1...4
Current limiting relay IR1	14	-
Current limiting relay IR2	5	-
Current limiting relay IR10	0.1	-
Differential relay RD	0.1...1	-
Distant relay	6...16	1
Distant relay at activation	-	2...60
Directed relays	10	8
Accessory relay PR	-	2...7.5
Cu conductor 1m 2,5mm ² at 5A	0.18	-
Cu conductor 1m 4mm ² at 5A	0.11	-
Cu conductor 1m 2,5mm ² at 1A	0.007	-
Cu conductor 1m 4mm ² at 1A	0.0044	-

CURRENT TRANSFORMERS 12-36 KV

BURDEN INFLUENCE TO THE INSTRUMENT SECURITY FACTOR AND ACCURACY LIMIT FACTOR FOR CURRENT MEASURING TRANSFORMERS

Standard values for the instrument security factor and accuracy limit factor which has been given by the manufacturer refer to the rated power of the current transformer's core.

If current measuring transformer is not charged with the rated burden his instrument security factor (or accuracy limit factor) will change by the following formula:

$$F_{st} = F_s \frac{P_n + P_i}{P_t + P_i}$$

F_s – instrument security factor with rated burden (P_n)

F_{st} – instrument security factor with operating burden (P_t)

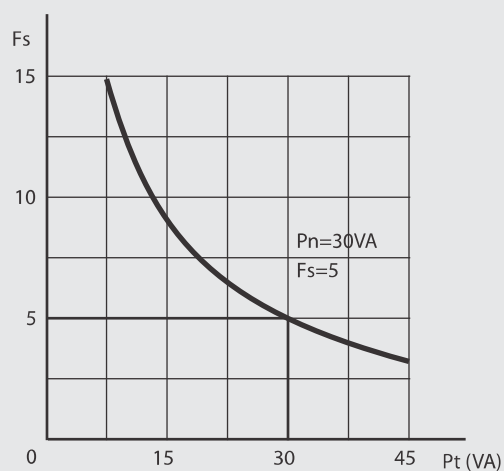
P_n – rated power of the core

P_t – power of the core with operating burden and rated current

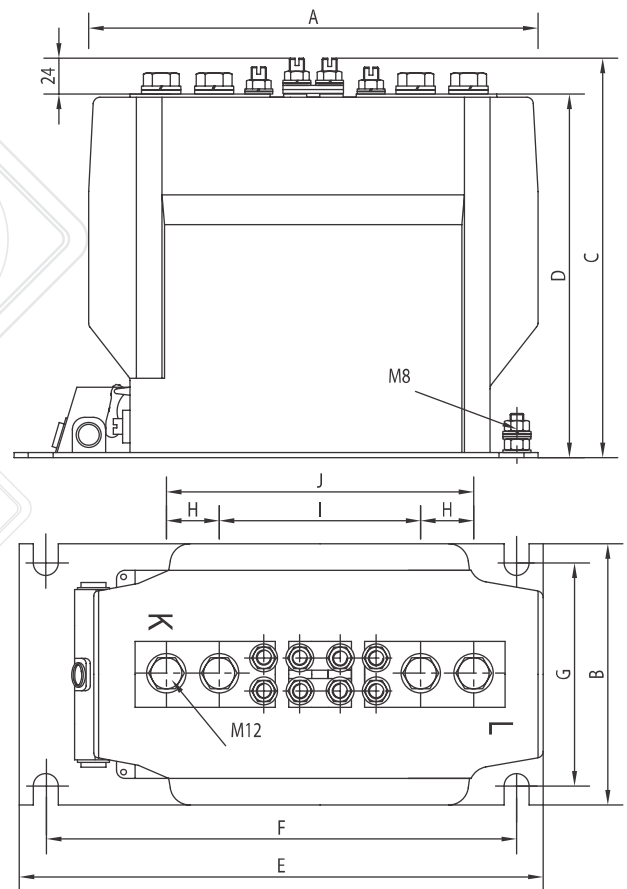
P_i – core's own consum (0,05 P_n to 0,2 P_n)

This formula is not relevant for so-called "linear" cores.

Graphic displays conditionality between instrument security factor and connected burden on the core whose power is 30 VA and instrument security factor is $F_s=5$. If connected burden is less than the core power instrument security factor is greater, so measuring instrument is in danger because of the enhanced secondary current. With accuracy limit factor situation is the same.



STEM-N 12, 24, 38



**INDOOR SUPPORTING TYPE CURRENT TRANSFORMERS STEM-N 12*;
STEM-N 24*; STEM-N 38***

TECHNICAL DATA	STEM-N-12*	STEM-N-24*	STEM-N-38*
Rated voltage (kV)	10	20	35
Maximal operating voltage (kV)	12	24	36
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	28	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	75	125	170
Rated frequency (Hz)	50/60		
Rated primary current (A)	5 to 2000 or 2x5 to 2x600		
Rated secondary current (A)	5 (or 1)		
Rated short time thermal current, 1s	$I_{th} = (100-500)I_n$, max 200 kA		
Rated dynamic current	$I_{dyn} = 2.5I_{th}$, max 200 kA		
Rated continuous thermal current	$I_{th} = 1.2I_n$		
Instrument security factor	$F_s = 5$		
Number of cores	1; 2 or 3		
Insulation class	E/B		
Type of basic insulation	epoxy resin		
Normative references	JUS IEC 60044-1, VDE 0414, BS 3938		

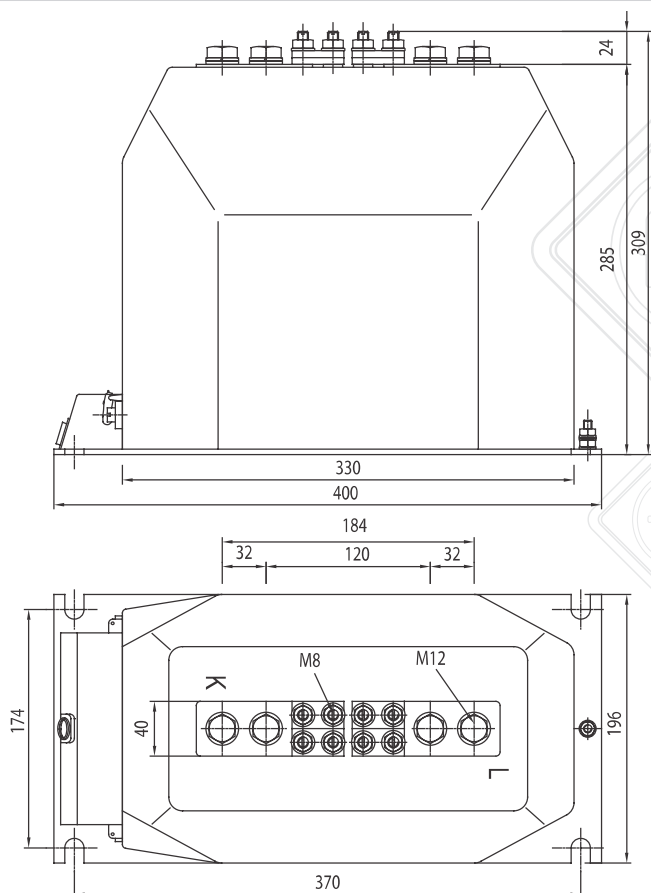
***Marks:**

- STEM-N-1211; STEM-N-2411; STEM-N-3811
- single-core transformer, connective on primary side.
 - STEM-N-1210; STEM-N-2410; STEM-N-3810
- single-core transformer, non-connective on primary side.
 - STEM-N-1221; STEM-N-2421; STEM-N-3821
- two-core transformer, connective on primary side.
 - STEM-N-1220; STEM-N-2420; STEM-N-3820
- two-core transformer, non-connective on primary side.
- When ordering, state: rated power, accuracy class and instrument security factor (or accuracy limit factor) for each core.

Type of transformer	Dimension (mm)										Mass (kg)
	A	B	C	D	E	F	G	H	I	J	
STEM-N-1211	162	158	244	220	196	125	135	/	108	/	11
STEM-N-1221	270	158	244	220	317	295	135	32	120	184	21
STEM-N-2411	176	180	294	270	190	160	154	/	108	/	15
STEM-N-2421	294	178	289	265	339	305	155	32	120	184	27
STEM-N-3811	198	184	414	390	200	144	160	/	108	/	18
STEM-N-3821	300	184	414	390	300	265	162	32	120	184	32

Current transformers 12-36 kV, indoor mounting

STEM-NS 24

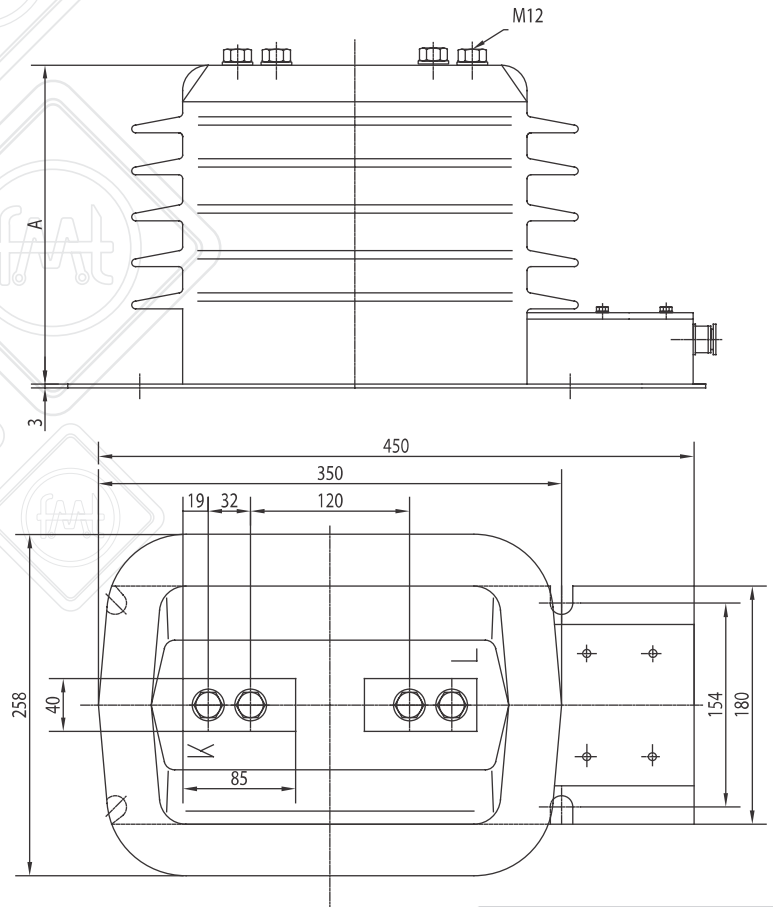


INDOOR SUPPORTING TYPE CURRENT TRANSFORMERS STEM-NS 24*

TECHNICAL DATA	STEM-NS-24*
Rated voltage (kV)	20
Maximal operating voltage (kV)	24
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	50
Rated lightning impulse withstand voltage 1.2/50ms (kV)	125
Rated frequency (Hz)	50/60
Rated primary current (A)	5 to 2000 or 2x5 to 2x600
Rated secondary current (A)	5 (or 1)
Rated short time thermal current, 1s	$I_{th} = (100-500)I_n$, max 200 kA
Rated dynamic current	$I_{dyn} = 2.5I_{th}$, max 200 kA
Rated continuous thermal current	$I_{tth} = 1.2I_n$
Instrument security factor	$F_s = 5$
Number of cores	1; 2 or 3
Insulation class	E/B
Type of basic insulation	epoxy resin
Normative references	JUS IEC 60044-1, VDE 0414, BS 3938



tip transformatora	A	broj rebara
ATM 24*	250	5
ATM 38*	370	8



OUTDOOR SUPPORTING TYPE CURRENT TRANSFORMERS ATM 24*; ATM 38*

TECHNICAL DATA	ATM 24*	ATM 38*
Rated voltage (kV)	20	35
Maximal operating voltage (kV)	24	36
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	125	170
Rated frequency (Hz)	50/60	
Rated primary current (A)	2x5 to 2x600	
Rated secondary current (A)	5 (or 1)	
Rated short time thermal current, 1s	$I_{th} = (100-500)I_n$, max 120 kA	
Rated dynamic current	$I_{dyn} = 2.5I_{th}$	
Rated continuous thermal current	$I_{th} = 1.2I_n$	
Number of cores	1; 2 or 3	
Insulation class	E/B	
Type of basic insulation	epoxy resin	
Mass, approx (kg)	34	38
Normative references	JUS IEC 60044-1, VDE 0414, BS 3938	

*Marks:

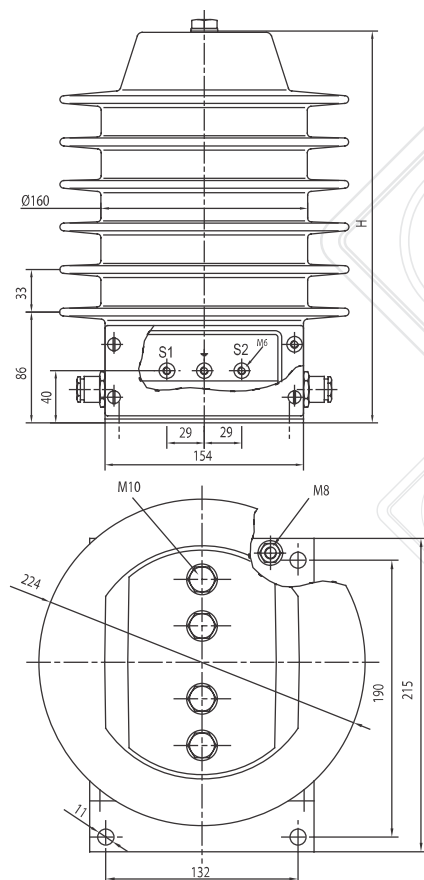
ATM 2411 - single-core transformer, connective on primary side
 ATM 2421 - two-core transformer, connective on primary side
 ATM 2431 - three-core transformer, connective on primary side
 ATM 2410 - single-core transformer, non-connective on primary side
 ATM 2420 - two-core transformer, non-connective on primary side
 ATM 2430 - three-core transformer, non-connective on primary side
 ATM 3811 - single-core transformer, connective on primary side
 ATM 3821 - two-core transformer, connective on primary side
 ATM 3831 - three-core transformer, connective on primary side
 ATM 3810 - single-core transformer, non-connective on primary side
 ATM 3820 - two-core transformer, non-connective on primary side
 ATM 3830 - three-core transformer, non-connective on primary side

These transformers are serially produced with accuracy class 0.5; 15 VA; $F_s=5$ for measuring core and 5P10; 30 VA for protection core. Rated secondary current is 5 A or 1 A.

When ordering state: rated power, accuracy class and instrument security factor (or accuracy limit factor) for each core.

Current transformers 12-36 kV, outdoor mounting

ATMS 24,38


OUTDOOR SUPPORTING TYPE CURRENT TRANSFORMERS
ATMS 24* AND ATMS 38*

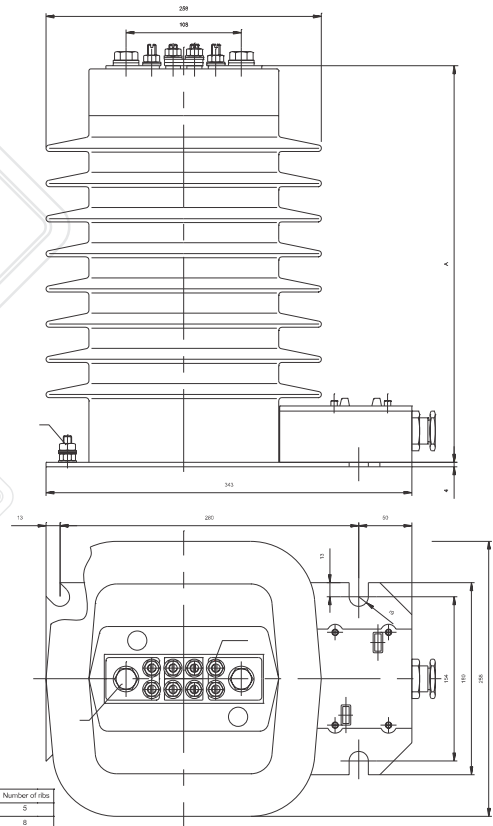
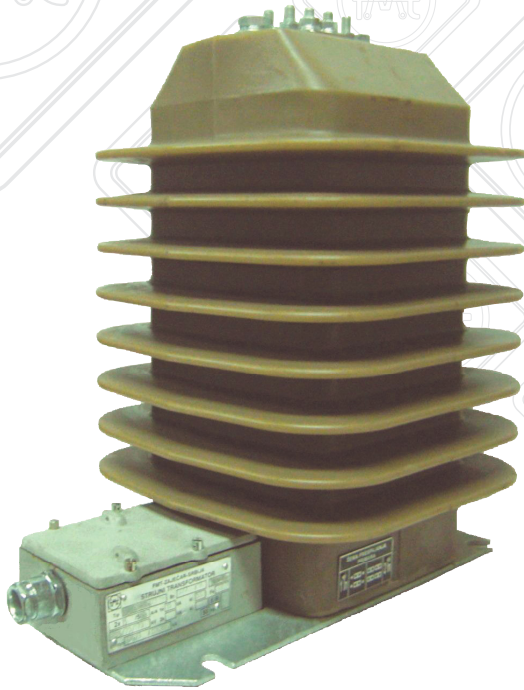
TECHNICAL DATA	ATMS 24*	ATMS 38*
Rated voltage (kV)	20	35
Maximal operating voltage (kV)	24	36
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	125	170
Rated frequency (Hz)	50/60	
Rated primary current (A)	5 to 500 or 2x5 to 2x75	
Rated secondary current (A)	5 (or 1)	
Rated short time thermal current, 1s	$I_{th}=100I_n$	
Rated dynamic current	$I_{dyn}=2.5I_{th}$	
Rated continuous thermal current	$I_{th}=1.2I_n$	
Instrument security factor	$F_s=5$	
Number of cores	1	
Insulation class	E/B	
Type of basic insulation	epoxy resin	
Normative references	JUS IEC 60044-1, VDE 0414, BS 3938	
Mass, approx. (kg)	16.5	19

*Marks:

ATMS 2411 - single-core transformer, connective on primary side

ATMS 3811 - single-core transformer, connective on primary side

These transformers are serially produced with rated short-time thermal current $I_{th}=100I_n$; accuracy class 0.5; 10 VA; $F_s=5$ for measuring core. When ordering state: rated power, accuracy class and instrument security factor.



Type of transformer	A	Number of ribs
ATMS-A 24*	250	5
ATMS-A 38*	372	8

OUTDOOR SUPPORTING TYPE CURRENT TRANSFORMERS ATMS-A 24*; ATMS-A 38*

TECHNICAL DATA	ATMS-A 24*	ATMS-A 38*
Rated voltage (kV)	20	35
Maximal operating voltage (kV)	24	36
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	125	170
Rated frequency (Hz)	50/60	
Rated primary current (A)	2x5 to 2x600	
Rated secondary current (A)	5 (or 1)	
Rated short time thermal current, 1s	$I_{th} = (100-500)I_n$, max 120 kA	
Rated dynamic current	$I_{dyn} = 2.5I_{th}$	
Rated continuous thermal current	$I_{tth} = 1.2I_n$	
Number of cores	1	
Insulation class	E/B	
Type of basic insulation	epoxy resin	
Normative references	JUS IEC 60044-1, VDE 0414, BS 3938	

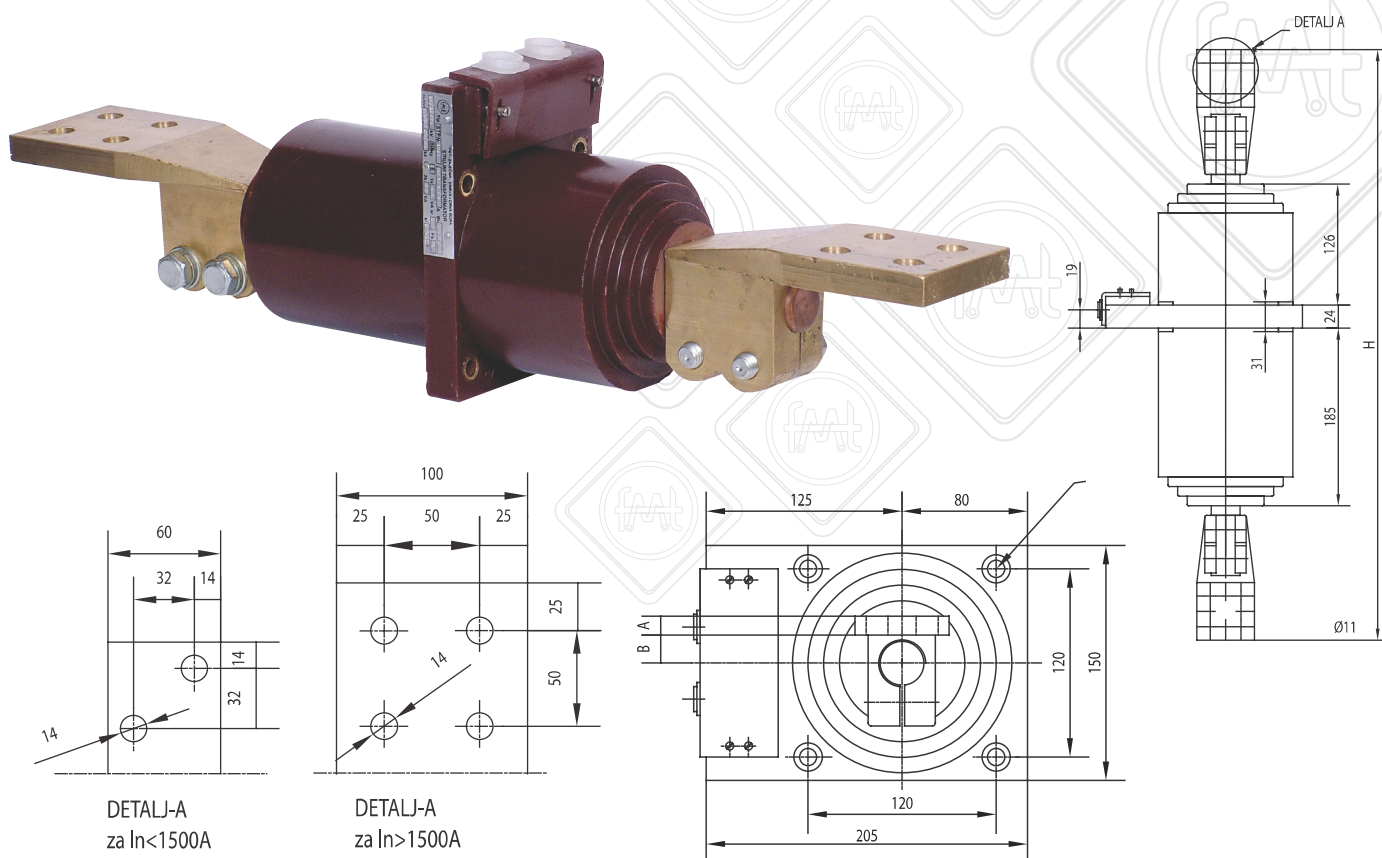
*Marks:

ATMS-A 2411 - single-core transformer, connective on primary side
 ATMS-A 2410 - single-core transformer, non-connective on primary side
 ATMS-A 3811 - single-core transformer, connective on primary side
 ATMS-A 3810 - single-core transformer, non-connective on primary side

We serially produce these transformers with accuracy class 0.5; 15 VA; $F_s=5$. Rated secondary current is 5 A or 1 A. When ordering state: rated power, accuracy class and instrument security factor.

Current transformers 12-36 kV, indoor mounting

STPN 12



INDOOR BUSHING TYPE CURRENT TRANSFORMERS STPN 12*

TECHNICAL DATA	STPN 12*
Rated voltage (kV)	10
Maximal operating voltage (kV)	12
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	28
Rated lightning impulse withstand voltage 1.2/50ms (kV)	70
Rated frequency (Hz)	50/60
Rated primary current (A)	400 to 4000
Rated secondary current (A)	5 (or 1)
Rated short time thermal current, 1s	$I_{th} = (100-200)I_n$
Rated dynamic current	$I_{dyn} = \text{practically unlimited}$
Rated continuous thermal current	$I_{th} = 1.2I_n$
Instrument security factor	$F_s = 5$
Number of cores	1; 2 or 3
Insulation class	E/B
Type of basic insulation	epoxy resin
Mass (kg)	24
Normative references	JUS IEC 60044-1, VDE 0414, BS 3938

Primary current(A)	Dimension (mm)		
	H	A	B
£ 1500	605	18	12
³ 1500	750	25	20

*Marks:

STPN 1210 - single-core transformer, unconnectable on primary side

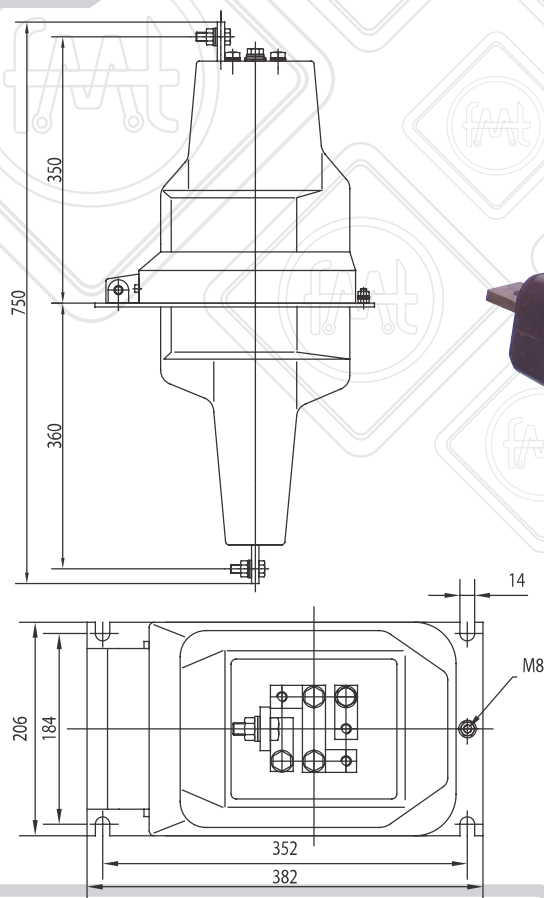
STPN 1220 - two-core transformer, unconnectable on primary side

STPN 1230 - three-core transformer, unconnectable on primary side

We serially produce these transformers with rated short-time thermal current $I_{th} = 100I_n$; accuracy class 0.5; 15 (30) VA; $F_s = 5$ for measuring core and 5P10, 30 VA for protection core.

When ordering state: rated power, accuracy class and instrument security factor (or accuracy limit factor) for each core.

NOTE: We keep the right for changes.



INDOOR BUSHING TYPE CURRENT TRANSFORMERS STPM 38*

TECHNICAL DATA	STPM 38*
Rated voltage (kV)	35
Maximal operating voltage (kV)	36
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	170
Rated frequency (Hz)	50/60
Rated primary current (A)	2x5 to 2x600
Rated secondary current (A)	5 (or 1)
Rated short time thermal current, 1s	$I_{th}=(100-500)I_n$
Rated dynamic current	$I_{dyn}=2.5I_{th}$
Rated continuous thermal current	$I_{th}=1.2I_n$
Instrument security factor	$F_s=5$
Number of cores	1; 2 or 3
Insulation class	E/B
Type of basic insulation	epoxy resin
Mass (kg)	24
Normative references	JUS IEC 60044-1, VDE 0414, BS 3938

*Marks:

STPM 3811 - single-core transformer, connective on primary side
 STPM 3821 - two-core transformer, connective on primary side
 STPM 3831 - three-core transformer, connective on primary side
 STPM 3810 - single-core transformer, non-connective on primary side
 STPM 3820 - two-core transformer, non-connective on primary side
 STPM 3830 - three-core transformer, non-connective on primary side

We serially produce these transformers with rated short-time thermal current $I_{th}=100I_n$; accuracy class 0.5; 15 (30) VA; $F_s=5$ for measuring core and 5P10, 30 VA for protection core.

When ordering state: rated power, accuracy class and instrument security factor (or accuracy limit factor) for each core.

NOTE: We keep the right for changes.



VOLTAGE TRANSFORMERS 12 - 36 kV



VOLTAGE TRANSFORMERS 12-36 KV

DESCRIPTION

Magnetic core consists of quality, cold rolled, oriented magnetic sheet. Primary and secondary windings are casted in epoxy resin which consists of quartz sand that gives electrical and mechanical strength to the windings. Impulse voltage is equally distributed over transformer surface by special design solution. That is why these transformers bear power-frequency withstand voltage test and impulse voltage test very well.

Because magnetic core consists of high quality magnetic sheet (with low specific losses) there is no dangerous overheating of magnetic core even in the cases of earth faults when magnetic induction becomes significantly higher. Single pole insulated voltage transformers have tertiary winding for open triangle vector group which is applied for earth-fault protection. When three single pole insulated voltage transformers are connected in star circuit connection in the network with isolated neutral point, their active resistance prevents ferrodynamic apparition in the network transients.

We make voltage transformers for all climate conditions.

APPLIANCE

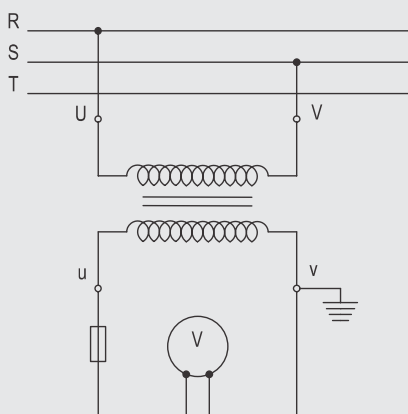
These transformers are used for separating measuring and protecting devices from high voltage and for voltage transformation to the amount that is convenient for measuring and protecting devices. We produce single pole insulated and two pole insulated voltage transformers for voltages up to 35 kV for indoor and outdoor mounting.

Accuracy class should be chosen according to transformers purpose.

- class 0.1: for the most accurate laboratory measuring;
- class 0.2: for laboratory measuring and testing stations, for the most accurate operative measuring and for electricity meters on the great consumers;
- class 0.5: for voltage and power operative measuring, electricity measuring and for accessory relays supplying;
- class 1: in cases when there is need for large rated power of the transformer and there is no need for more accurate measuring.

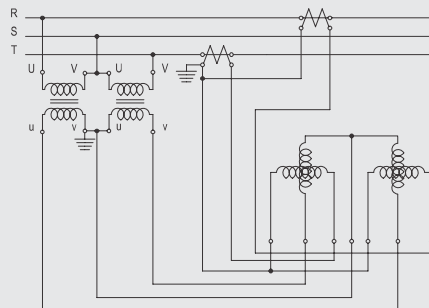
VOLTAGE TRANSFORMERS IN THREE PHASE SYSTEM

1. Two-pole insulated voltage transformer is used for supplying of voltmeters, frequency indicators, synchrosopes, some relays etc. He is applied in any case where voltage supplying is enough and doesn't matter what happens in the case of earth fault.



2. Two two-pole insulated voltage transformers in the "V" connection

With that connection we can supply three phase wattmeters and electricity meters. These devices consist of two systems connected in Aron's connection. In the case of earth-fault measuring is correct only if middle line (S) is earth-faulted. Otherwise the results will be either too big or too small.



Single-pole insulated voltage transformer can't be connected in "V" connection because one line in the high voltage network would be earth connected in that case.

3. Star connection of the three single-pole insulated voltage transformers for common purposes

This kind of connection is correctly transforming all voltages in three phase system. Neutral point on the high voltage side must be earth connected. With this connection it is possible to measure all three phase-to-phase voltages U_{rs} , U_{st} , U_{tr} as well as all three phase-to-earth voltages.

In normal operating conditions voltage transformer is working with magnetic induction 0,8-0,9 (T). If single-pole earth-fault happens, for example, in line S than primary winding of the middle voltage transformer is short-circuited, while voltages on the other two voltage transformers arise to the times higher value along with their magnetic induction.

Tertiary windings of three voltage transformers (100/3 V) have to be connected in open triangle. In normal operating conditions there is negligible voltage on the terminals. In case of earth fault that voltage arises to 100 V.

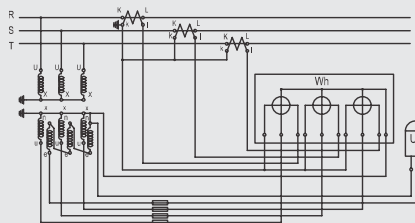
Measuring instruments that are built for phase-to-phase voltage (voltmeter, frequency meter, wattmeter, two-system electricity meters, relays etc.) have to be connected between secondary terminals (u and v).

Voltmeters, earth-fault signaling relays, three-system wattmeters, three-system electricity meters have to be connected between secondary ter-

VOLTAGE TRANSFORMERS 12-36 KV

APPROXIMATE DATA FOR MEASURING TRANSFORMERS RATED POWER DEFINING

Consumer	System power consum (VA)	
	Current circuit	Voltage circuit
Amperemeter with moving iron	0.75...1.2	-
Voltmeter with moving iron (100 V)	-	3...4.5
Nulvoltage meter	-	20
Wattmeter (Varmeter), electrodynamic (100 V)	3.5	1.5
Wattmeter (Varmeter), registration	3...12	4...9
Induction energy meter	0.4...1	2...5
Phasemeter, electrodynamic ($\cos\phi$)	2...6	3.5
Synchronoscope	-	11
Frequency indicator with flaps (100 V)	-	3
Frequency indicator, electrodynamic	-	7
Voltage relay RU	-	1...4
Current limiting relay IR1	14	-
Current limiting relay IR2	5	-
Current limiting relay IR10	0.1	-
Differential relay RD	0.1...1	-
Distant relay	6...16	1
Distant relay at activation	-	2...60
Directed relays	10	8
Accessory relay PR	-	2...7.5
Cu conductor 1m 2,5mm ² at 5A	0.18	-
Cu conductor 1m 4mm ² at 5A	0.11	-
Cu conductor 1m 2,5mm ² at 1A	0.007	-
Cu conductor 1m 4mm ² at 1A	0.0044	-



terminal (u) and earth connected neutral point (x). Three-system instruments are accurate even in the case of earth-fault in any phase line.

MOUNTING

Epoxy voltage transformers can be mounted in all kinds of positions.

Primary winding in the two pole insulated voltage transformers is connected between two phases while in the single pole insulated voltage transformer it is connected between phase and earth.

In the open triangle circuit at single pole voltage transformers, resistors 25 Ω or higher should be added. All metal parts of the transformer that are not normally under voltage should be earth-connected. There is fixing strap on the transformer that is marked with earth sign.

One secondary terminal also have to be earth-connected depending on the measuring circuit. At single pole insulated voltage transformers secondary terminal x connects to the earth as well as primary terminal X. At two pole insulated voltage transformer in the "V" connection usually secondary terminal v is earth-connected.

Secondary terminals at voltage transformer can stay open or charged with large resistance (voltmeters, voltage circuits of electricity meters and relays). Secondary terminals must not be short connected because there is possibility for damaging the transformer. Because of that secondary lines are usually assured with fuses. Earth-connected lines are not assured.

PRODUCTION

We produce this kind of transformers for indoor and outdoor mounting. At indoor mounting there is version with high voltage fuse bases, so the fuses can be built in transformer. There are also versions of the voltage transformer that can be used in 10 kV as well as in 20 kV networks by special reconnection of his primary windings.

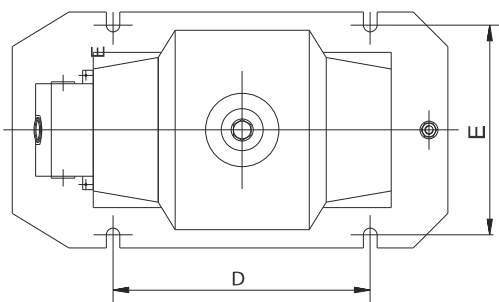
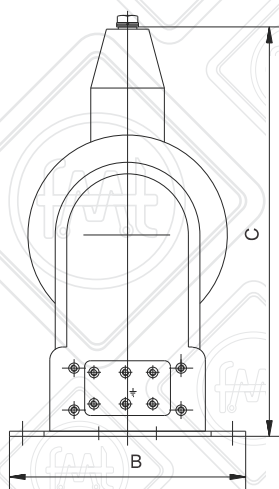
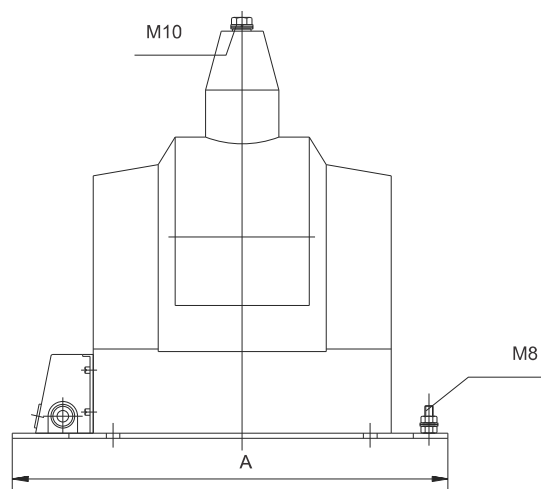
This catalogue is also presenting some special types of voltage transformers such as transformer for locomotives type NMT and voltage transformer for low voltage levels type NT.

HANDLING AND MAINTAINING

For these types of transformers regular maintaining is not necessary. It is enough, from time to time, to check if all connection are clean and well tightened and to clean the transformer if he is dirty. If some accident happens in the substation, transformers should be tested

Voltage transformers 12-36 kv, indoor mounting

JNT 12-38 kV



JNT	D imenzije (mm)				
	A	B	C	D	E
12kV	335	180	240	175	155
24kV	375	200	299	210	175
36kV	415	225	390	245	200



TECHNICAL DATA	JNT-12	JNT-24	JNT-24/12	JNT-36
Rated primary voltage (kV)	10/	20/	20/ //10/	35/
Highest voltage for equipment (r.m.s.) (kV)	12	24	24	36
Rated secondary voltage (V)	100/			
Rated tertiary voltage (V)	100/3			
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	28	50	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	75	125	125	170
Rated frequency (Hz)	50/60			
Accuracy class	0.2/3P			
	0.5/3P*			
	1/3P			
Rated power (VA)	25	25	-	30
	75*	75*	75/25*	100*
	150	150	150/50	200
Rated voltage factor Vf	1.9/8h			
Additional resistance in tertiary circuit (W)	25	25	25	**12.5
	** use two shunted resistors (25 W each)			
Limiting thermal secondary current (A)	10.4	10.4	10.4/5.2	13.8
Tertiary accuracy class	6P			
Tertiary rated power (VA)	25			
Type of basic insulation	epoxy resin			
Normative references	JUS IEC 60044-2			

INDOOR SINGLE POLE INSULATED VOLTAGE TRANSFORMERS JNT*

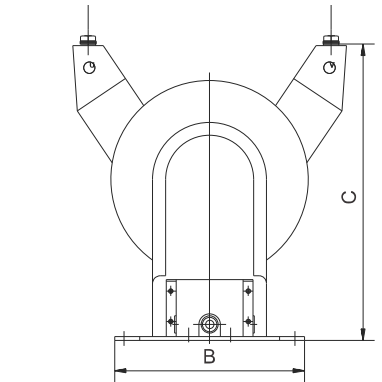
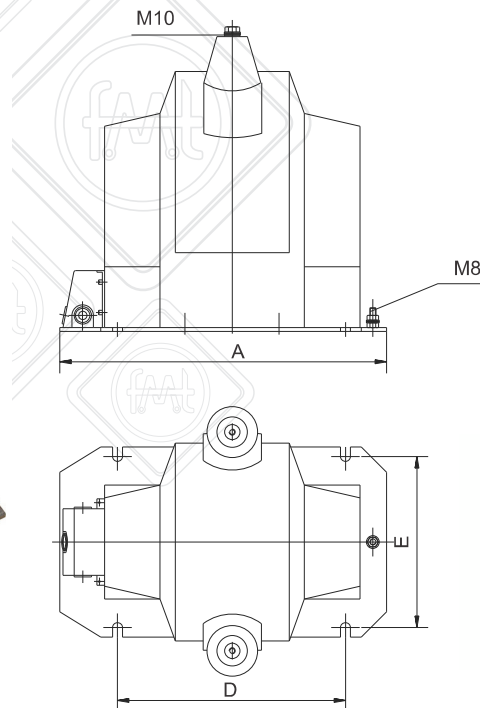
Type of transformer	Dimension (mm)							Mass (kg)
	A	B	C	D	E	F	G	
JNT-12	355	180	240	175	155	93	72	24.6
JNT-24	375	200	299	210	175	93	72	31.5
JNT-24/12	375	200	299	210	175	93	72	32.5
JNT-36	380	225	390	245	200	69.5	65.5	41.0

NOTE:

These transformers can also be produced for rated voltages: 3/ ; 5/ ; 6/ ; 15/ ; 17,5/ ; 25/ and 33/ kV. On customer's request we can produce other combinations of transformation ratio, rated output and accuracy class.

When ordering, state: rated primary, secondary and tertiary voltage, accuracy class and rated output.

*Characteristics of the transformers that we produce serially.



DNT	D imenzije (mm)					
	A	B	C	D	E	F
12kV	355	180	240	190	155	150
24kV	375	200	301	210	175	210
36kV	430	250	390	300	225	320

TECHNICAL DATA	DNT-12	DNT-24	DNT-24/12	DNT-36
Rated primary voltage (kV)	10	20	20/10	35
Highest voltage for equipment (r.m.s.) (kV)	12	24	24	36
Rated secondary voltage (V)	100			
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	28	50	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	75	125	125	170
Rated frequency (Hz)	50/60			
Accuracy class	0.2/3P			
	0.5/3P*			
	1/3P			
Rated power (VA)	25	25	-	30
	75*	75*	75/25*	100*
	150	150	150/50	200
Rated voltage factor Vf	1.2/continuously			
Limiting thermal secondary current (A)	10.4	10.4	10.4/5.2	13.8
Type of basic insulation	epoxy resin			
Normative references	JUS IEC 60044-2			

INDOOR TWO POLE INSULATED VOLTAGE TRANSFORMERS DNT*

Type of transformer	Dimension (mm)								Mass kg)
	A	B	C	D	E	F	G	H	
DNT-12	355	180	240	190	155	150	93	72	27.4
DNT-24	375	200	301	210	175	210	93	72	34.5
DNT-24/12	375	200	301	210	175	210	93	72	35.5
DNT-36	430	250	390	300	225	320	76	54	58.0

NOTE:

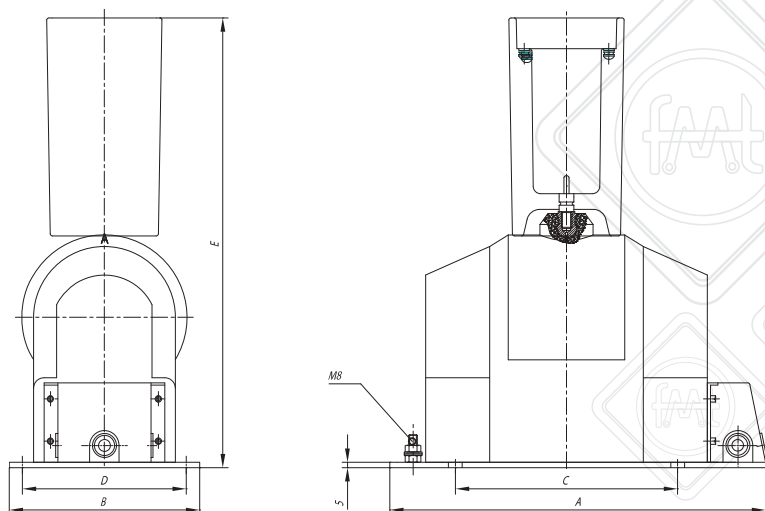
These transformers can also be produced for rated voltages: 3; 5; 6; 15; 17.5; 25 and 33 kV. On customer's request we can produce other combinations of transformation ratio, rated output and accuracy class.

*Characteristics of the transformers that we produce serially.

When ordering, state: rated primary and secondary voltage, accuracy class and rated output.

Voltage transformers 12-36 kv, indoor mounting

JNT-SOV 12-38 kV



Dimenzije (mm)	JNT SOV-12	JNT SOV-24	JNT SOV-36
A	355	375	390
B	180	200	225
C	190	210	245
D	155	175	200
E	425	586	774



TECHNICAL DATA	JNT SOV-12	JNT SOV-24	JNT SOV-24/12	JNT SOV-36
Rated primary voltage (kV)	10/	20/	20/ //10/	35/
Highest voltage for equipment (r.m.s.) (kV)	12	24	24	36
Rated secondary voltage (V)	100/			
Rated tertiary voltage (V)	100/3			
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	28	50	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	75	125	125	170
Rated frequency (Hz)	50/60			
Accuracy class	0.2/3P			
	0.5/3P*			
	1/3P			
Rated power (VA)	25	25	-	30
	75*	75*	75/25*	100*
	150	150	150/50	200
Rated voltage factor Vf	1.9/8h			
Additional resistance in tertiary circuit (W)	25	25	25	**12.5
	** use two shunted resistors (25 W each)			
Limiting thermal secondary current (A)	10.4	10.4	10.4/5.2	13.8
Tertiary accuracy class	6P			
Tertiary rated power (VA)	25			
Type of basic insulation	epoxy resin			
Normative references	JUS IEC 60044-2			

INDOOR SINGLE POLE INSULATED VOLTAGE TRANSFORMERS JNT SOV*

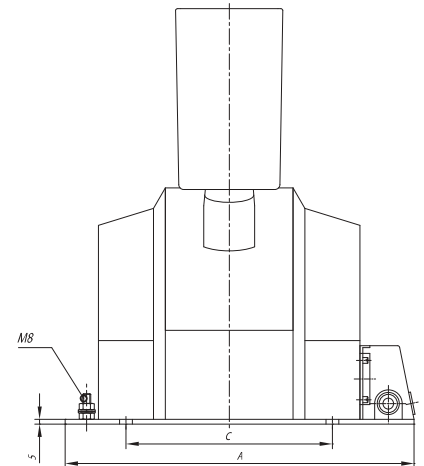
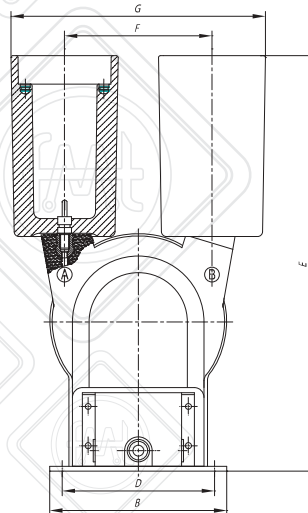
Type of transformer	Dimension (mm)							Mass (kg)
	A	B	C	D	E	F	G	
JNT SOV-12	355	180	416	190	155	93	72	25.4
JNT SOV-24	375	200	575	210	175	93	72	32.7
JNT SOV-24/12	375	200	575	210	175	93	72	33.7
JNT SOV-36	380	225	762	245	200	69.5	65.5	42.6

NOTE:

Transformers JNT SO* have been designed for indoor mounting in electrical power substations with voltage level up to 36 kV. They are provided with fuse boxes on high voltage side and on the customer's request we can also deliver adequate fuses whose mounting and dismounting is really simple. On customer's request we can produce other combinations of transformation ratio, rated output and accuracy class.

When ordering, state: rated primary, secondary and tertiary voltage, accuracy class and rated output.

*Characteristics of the transformers that we produce serially.



Dimenzije (mm)	DNT SOV-12	DNT SOV-24	DNT SOV-36
A	355	375	430
B	180	200	250
C	190	210	300
D	155	175	225
E	425	588	786
F	150	210	320
G	260	320	430

INDOOR TWO POLE INSULATED VOLTAGE TRANSFORMERS DNT SOV*

Type of transformer	Dimension (mm)									Mass (kg)
	A	B	C	D	E	F	G	H	I	
DNT SOV-12	355	180	417	190	155	150	93	72	260	29.0
DNT SOV-24	375	200	578	210	175	210	93	72	320	36.9
DNT SOV-24/12	375	200	578	210	175	210	93	72	320	37.9
DNT SOV-36	430	250	762	300	225	320	76	54	430	61.2

TECHNICAL DATA	DNT SOV-12	DNT SOV-24	DNT SOV-24/12	DNT SOV-36
Rated primary voltage (kV)	10	20	20/10	35
Highest voltage for equipment (r.m.s.) (kV)	12	24	24	36
Rated secondary voltage (V)	100			
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	28	50	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	75	125	125	170
Rated frequency (Hz)	50/60			
Accuracy class	0.2/3P			
	0.5/3P*			
	1/3P			
Rated power (VA)	25	25	-	30
	75*	75*	75/25*	100*
	150	150	150/50	200
Rated voltage factor Vf	1.2 continuously			
Limiting thermal secondary current (A)	10.4	10.4	10.4/5.2	13.8
Type of basic insulation	epoxy resin			
Normative references	JUS IEC 60044-2			

NOTE:

Transformers DNT SO* have been designed for indoor mounting in electrical power substations with voltage level up to 36 kV. They are provided with fuse boxes on high voltage side and on the customer's request we can also deliver adequate fuses whose mounting and dismounting is really simple.

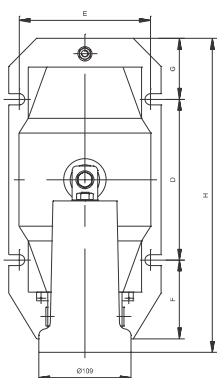
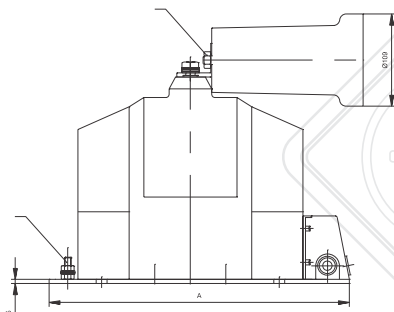
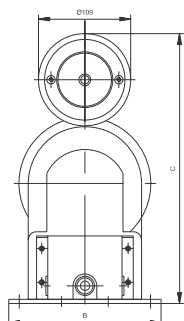
On customer's request we can produce other combinations of transformation ratio, rated output and accuracy class.

*Characteristics of the transformers that we produce serially.

When ordering, state: rated primary and secondary voltage, accuracy class and rated output.

Voltage transformers 12-36 kv, indoor mounting

JNT-SOH 12-38 kV



Type of transformer	Dimension (mm)								Mass (kg)
	A	B	C	D	E	F	G	H	
JNT SOH-12	355	180	319	190	155	93	72	371	25.4
JNT SOH-24	375	200	375	210	175	93	72	491	32.7
JNT SOH-24/12	375	200	375	210	175	93	72	491	33.7
JNT SOH-36	380	225	460	245	200	69.5	65.5	625	42.6



TECHNICAL DATA	JNT SOH-12	JNT SOH-24	JNT SOH-24/12	JNT SOH-36
Rated primary voltage (kV)	10/	20/	20/ //10/	35/
Highest voltage for equipment (r.m.s.) (kV)	12	24	24	36
Rated secondary voltage (V)	100/			
Rated tertiary voltage (V)	100/3			
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	28	50	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	75	125	125	170
Rated frequency (Hz)	50/60			
Accuracy class	0.2/3P			
	0.5/3P*			
	1/3P			
Rated power (VA)	25	25	-	30
	75*	75*	75/25*	100*
	150	150	150/50	200
Rated voltage factor Vf	1.9/8h			
Additional resistance in tertiary circuit (W)	25	25	25	**12.5
	** use two shunted resistors (25 W each)			
Limiting thermal secondary current (A)	10.4	10.4	10.4/5.2	13.8
Tertiary accuracy class	6P			
Tertiary rated power (VA)	25			
Type of basic insulation	epoxy resin			
Normative references	JUS IEC 60044-2			

INDOOR SINGLE POLE INSULATED VOLTAGE TRANSFORMERS JNT SOH*

Type of transformer	Dimension (mm)								Mass (kg)
	A	B	C	D	E	F	G	H	
JNT SOH-12	355	180	416	190	155	93	72	371	25.4
JNT SOH-24	375	200	575	210	175	93	72	491	32.7
JNT SOH-24/12	375	200	575	210	175	93	72	491	33.7
JNT SOH-36	380	225	762	245	200	69.5	65.5	625	42.6

NOTE:

Transformers JNT SOH* have been designed for indoor mounting in electrical power substations with voltage level up to 36 kV. They are provided with fuse boxes on high voltage side and on the customer's request we can also deliver adequate fuses whose mounting and dismounting is really simple.

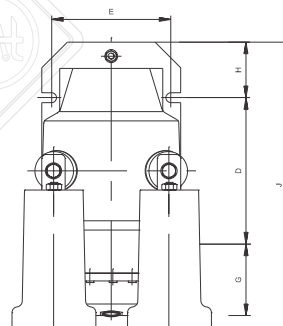
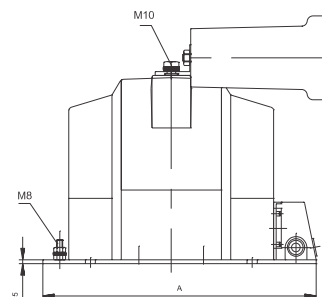
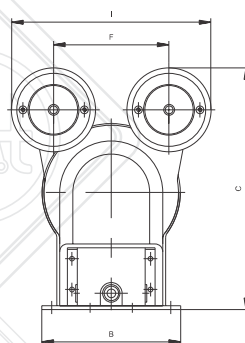
On customer's request we can produce other combinations of transformation ratio, rated output and accuracy class.

When ordering, state: rated primary, secondary and tertiary voltage, accuracy class and rated output.

*Characteristics of the transformers that we produce serially.

Voltage transformers 12-36 kv, indoor mounting

DNT-SOH 12-38 kV



Type of transformer	Dimension (mm)										Mass (kg)
	A	B	C	D	E	F	G	H	I	J	
DNT SOH-12	355	180	314	190	155	150	93	72	260	371	29.0
DNT SOH-24	375	200	374	210	175	210	93	72	320	484	36.9
DNT SOH-24/12	375	200	374	210	175	210	93	72	320	484	37.9
DNT SOH-36	430	250	466	300	225	320	76	54	430	632	61.2

INDOOR TWO POLE INSULATED VOLTAGE TRANSFORMERS DNT SOH*

Type of transformer	Dimension (mm)										Mass (kg)
	A	B	C	D	E	F	G	H	I	J	
DNT SOH-12	355	180	314	190	155	150	93	72	260	371	29.0
DNT SOH-24	375	200	374	210	175	210	93	72	320	484	36.9
DNT SOH-24/12	375	200	374	210	175	210	93	72	320	484	37.9
DNT SOH-36	430	250	466	300	225	320	76	54	430	632	61.2

TECHNICAL DATA	DNT SOH-12	DNT SOH-24	DNT SOH-24/12	DNT SOH-36
Rated primary voltage (kV)	10	20	20/10	35
Highest voltage for equipment (r.m.s.) (kV)	12	24	24	36
Rated secondary voltage (V)	100			
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	28	50	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	75	125	125	170
Rated frequency (Hz)	50/60			
Accuracy class	0.2/3P			
	0.5/3P*			
	1/3P			
Rated power (VA)	25	25	-	30
	75*	75*	75/25*	100*
	150	150	150/50	200
Rated voltage factor Vf	1.2 continuously			
Limiting thermal secondary current (A)	10.4	10.4	10.4/5.2	13.8
Type of basic insulation	epoxy resin			
Normative references	JUS IEC 60044-2			

NOTE:

Transformers DNT SO* have been designed for indoor mounting in electrical power substations with voltage level up to 36 kV. They are provided with fuse boxes on high voltage side and on the customer's request we can also deliver adequate fuses whose mounting and dismounting is really simple.

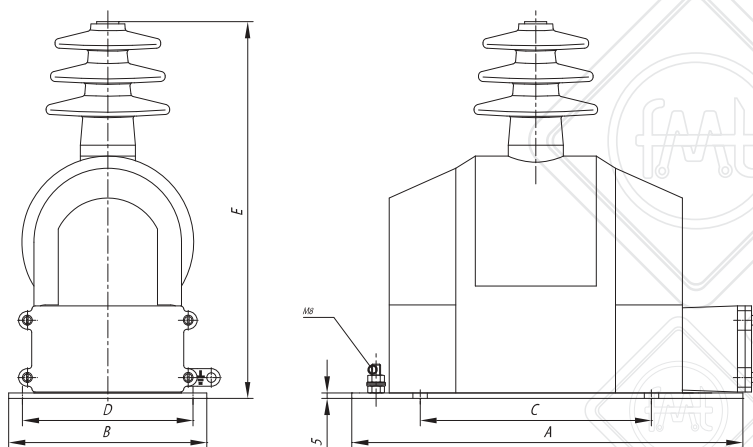
On customer's request we can produce other combinations of transformation ratio, rated output and accuracy class.

*Characteristics of the transformers that we produce serially.

When ordering, state: rated primary and secondary voltage, accuracy class and rated output.

Voltage transformers 12-36 kv, outdoor mounting

JNT-SM 12-38 kV



Dimenzije (mm)	JNT SM-12	JNT SM-24	JNT SM-36
A	355	375	390
B	180	200	225
C	190	210	245
D	155	175	200
E	345	425	525



OUTDOOR SINGLE POLE INSULATED VOLTAGE TRANSFORMERS JNT SM*

Type of transformer	Dimension (mm)							Number of ribs	Mass(kg)
	A	B	C	D	E	F	G		
JNT SM-12	349	190	210	165	360	101	38	3	25.9
JNT SM-24	338	210	220	185	440	91	27	4	33.0
JNT SM-24/12	338	210	220	185	440	91	27	4	34.0
JNT SM-36	346	235	229	210	540(570)	92	25	5(6)	42.8(43.0)

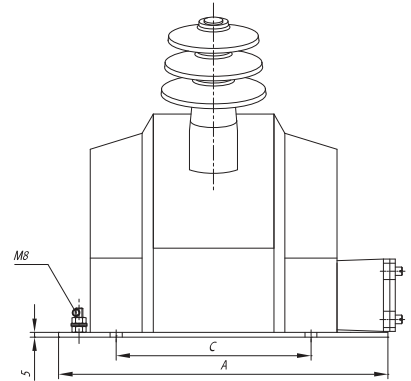
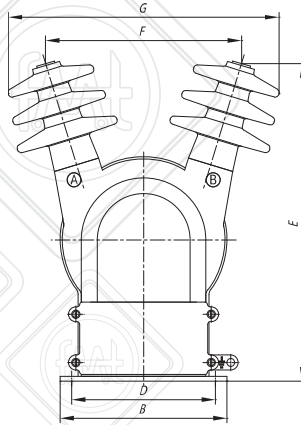
TECHNICAL DATA	JNT SM-12	JNT SM-24	JNT SM-24/12	JNT SM-36
Rated primary voltage (kV)	10/	20/	20/ //10/	35/
Highest voltage for equipment (r.m.s.) (kV)	12	24	24	36
Rated secondary voltage (V)	100/			
Rated tertiary voltage (V)	100/3			
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	28	50	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	75	125	125	170
Rated frequency (Hz)	50/60			
Accuracy class	0.2/3P			
	0.5/3P*			
	1/3P			
Rated power (VA)	25	25	-	30
	75*	75*	75/25*	100*
	150	150	150/50	200
Rated voltage factor Vf	1.9/8h			
Additional resistance in tertiary circuit (W)	25	25	25	**12.5
	** use two shunted resistors (25 W each)			
Limiting thermal secondary current (A)	10.4	10.4	10.4/5.2	13.8
Tertiary accuracy class	6P			
Tertiary rated power (VA)	25			
Type of basic insulation	epoxy resin			
Normative references	JUS IEC 60044-2			

NOTE:

These transformers can also be produced for rated voltages: 3/ ; 5/ ; 6/ ; 15/ ; 17.5/ ; 25/ and 33/ kV. On customer's request we can produce other combinations of transformation ratio, rated output and accuracy class.

When ordering, state: rated primary, secondary and tertiary voltage, accuracy class and rated output.

*Characteristics of the transformers that we produce serially.



Dimenzije (mm)	DNT SM-12	DNT SM-24	DNT SM-36
A	355	375	430
B	180	200	250
C	190	210	300
D	155	175	225
E	345	425	500
F	210	320	520
G	290	405	595

OUTDOOR TWO POLE INSULATED VOLTAGE TRANSFORMERS DNT SM*

Type of transformer	Dimension (mm)									Number of ribs	Mass (kg)
	A	B	C	D	E	F	G	H	I		
DNT SM-12	329	190	210	165	360	222	210	91	28	3	30.0
DNT SM-24	345	200	220	175	440	405	320	94	31	4	37.5
DNT SM-24/12	345	200	220	175	440	405	320	94	31	4	38.5
DNT SM-36	398	225	270	200	515	594	520	95	33	5	58.6

TECHNICAL DATA	DNT SM-12	DNT SM-24	DNT SM-24/12	DNT SM-36
Rated primary voltage (kV)	10	20	20/10	35
Highest voltage for equipment (r.m.s.) (kV)	12	24	24	36
Rated secondary voltage (V)	100			
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	28	50	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	75	125	125	170
Rated frequency (Hz)	50/60			
Accuracy class	0.2/3P			
	0.5/3P*			
	1/3P			
Rated power (VA)	25	25	-	30
	75*	75*	75/25*	100*
	150	150	150/50	200
Rated voltage factor Vf	1.2 continuously			
Limiting thermal secondary current (A)	10.4	10.4	10.4/5.2	13.8
Type of basic insulation	epoxy resin			
Normative references	JUS IEC 60044-2			

NOTE:

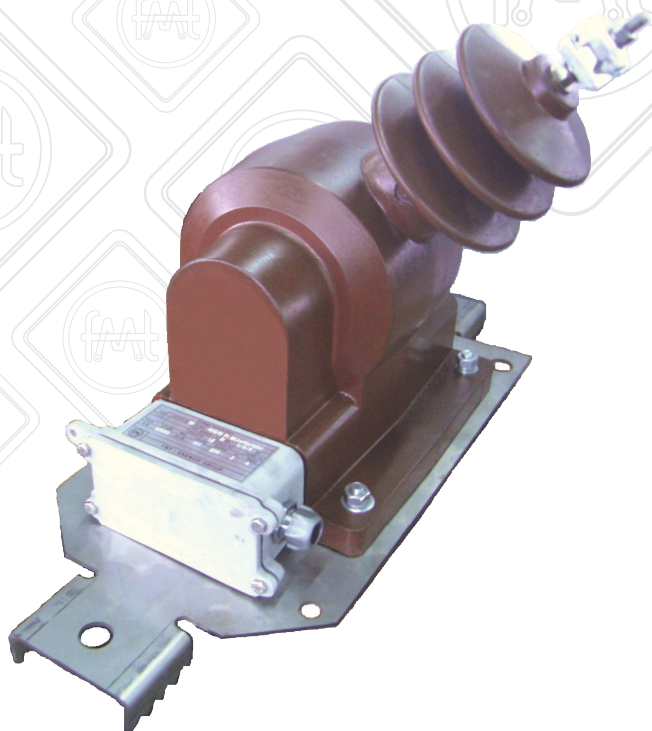
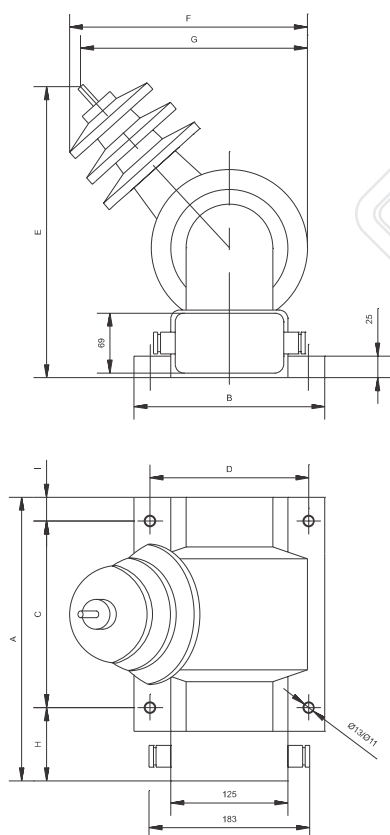
These transformers can also be produced for rated voltages: 3; 5; 6; 15; 17.5; 25 and 33 kV. On customer's request we can produce other combinations of transformation ratio, rated output and accuracy class.

When ordering, state: rated primary and secondary voltage, accuracy class and rated output.

*Characteristics of the transformers that we produce serially.

Voltage transformers 12-36 kv, outdoor mounting

VTOP I 12-38 kV



OUTDOOR SINGLE POLE INSULATED VOLTAGE TRANSFORMERS VTOP-I*

Type of transformer	Dimension (mm)									Mass (kg)
	A	B	C	D	E	F	G	H	I	
VTOP I-6.6	327	220	215	183	342	275	263	85	27	27.7
VTOP I-11	327	220	215	183	342	275	263	85	27	27.9
VTOP I-22	327	220	215	183	342	275	263	85	27	28.9
VTOP I-33	357	242	240	207	466	333	313	87	30	40.7

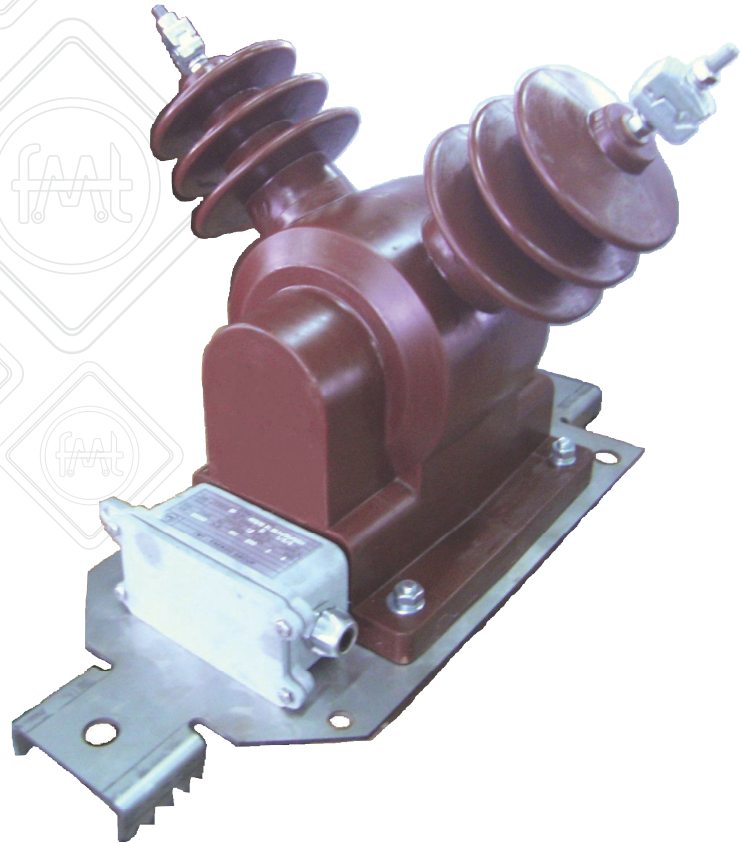
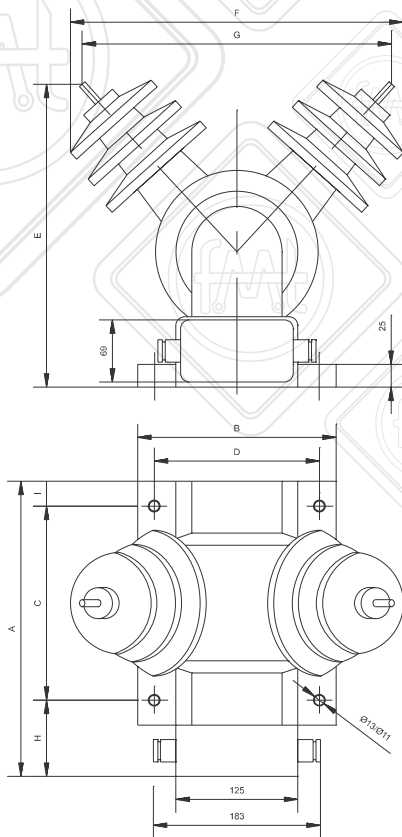
TECHNICAL DATA	VTOP I-6.6	VTOP I-11	VTOP I-22	VTOP I-33
Rated primary voltage (kV)	6/ ; 6.6/	10/ ; 11/	20/ ; 22/	33/ ; 35/
Highest voltage for equipment (r.m.s.) (kV)	6.6	12	24	36
Rated secondary voltage (V)	100/ ; 110/ ; 115/ ; 200/ ; 220/ ; 230/			
Rated tertiary voltage (V)	100/3; 110/3; 115/3; 200/3; 220/3; 230/3			
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	20	28	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	60	75	125	170
Rated frequency (Hz)	50/60			
Accuracy class	0.2/3P; 0.5/3P; 1/3P; 3*/3P			
Rated power (VA)	30 (kl.0.2)			
	50 (kl.0.5)			
	100 (kl.1)			
	200* (kl.3)			
Rated voltage factor Vf	1.9/8h			
Additional resistance in tertiary circuit (W)	25	25	25	**12.5
	** use two shunted resistors (25 W each)			
Limiting output power (VA)	400	400	400	600
Tertiary accuracy class	6P			
Tertiary rated power (VA)	25			
Type of basic insulation	epoxy resin			
Normative references	JUS IEC 60044-2			

NOTE:

These transformers can also be produced for rated voltages: 3/ ; 5/ ; 15/ ; 17.5/ and 25/ kV. On customer's request we can produce other combinations of transformation ratio, rated output and accuracy class.

When ordering, state: rated primary, secondary and tertiary voltage, accuracy class and rated output.

*Characteristics of the transformers that we produce serially.



OUTDOOR TWO POLE INSULATED VOLTAGE TRANSFORMERS VTOP-II*

Type of transformer	Dimension (mm)									Mass(kg)
	A	B	C	D	E	F	G	H	I	
VTOP II-6.6	327	220	215	183	342	370	346	85	27	29.0
VTOP II-11	327	220	215	183	342	370	346	85	27	29.2
VTOP II-22	327	220	215	183	342	370	346	85	27	30.2
VTOP II-33	357	242	240	207	466	450	411	87	30	42.0

TECHNICAL DATA	VTOP II-6.6	VTOP II-11	VTOP II-22	VTOP II-33
Rated primary voltage (kV)	6; 6.6	10; 11	20; 22	33; 35
Highest voltage for equipment (r.m.s.) (kV)	6.6	12	24	36
Rated secondary voltage (V)	100; 110; 115; 200; 220; 230			
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	20	28	50	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	60	75	125	170
Rated frequency (Hz)	50/60			
Accuracy class	0.2/3P; 0.5/3P; 1/3P; 3*/3P			
Rated power (VA)	30 (kl.0.2)			
	50 (kl.0.5)			
	100 (kl.1)			
	200* (kl.3)			
Rated voltage factor Vf	1.2 continuously			
Limiting output power (VA)	400	400	400	600
Type of basic insulation	epoxy resin			
Normative references	JUS IEC 60044-2			

NOTE:

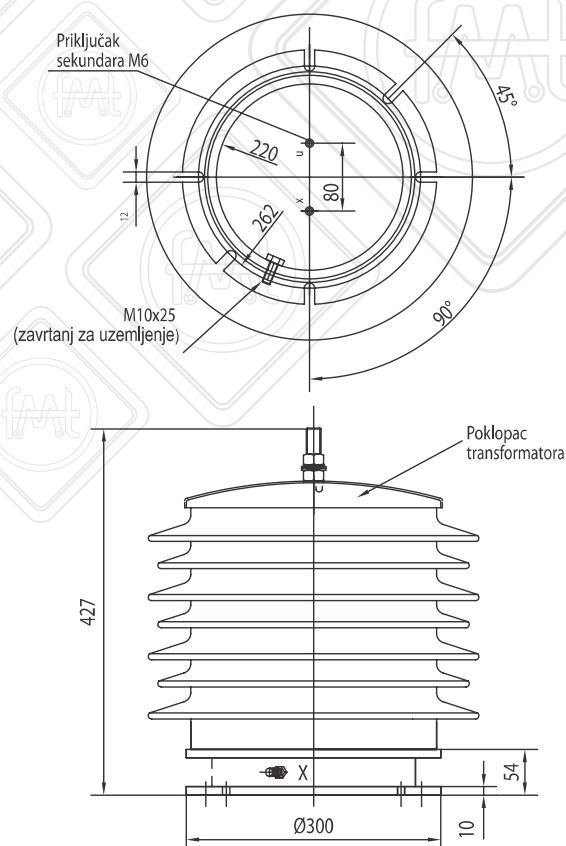
These transformers can also be produced for rated voltages: 3; 5; 15; 17.5 and 24 kV. On customer's request we can produce other combinations of transformation ratio, rated output and accuracy class.

When ordering, state: rated primary and secondary voltage, accuracy class and rated output.

*Characteristics of the transformers that we produce serially.

Voltage transformers 12-36 kv, outdoor mounting

NMT ZA UGRADNJU NA LOKOMOTIVE



OUTDOOR VOLTAGE TRANSFORMERS NMT

TECHNICAL DATA	NMT
Maximal operating voltage (kV)	36
Rated primary voltage (kV)	25
Rated secondary voltage (V)	403
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)	70
Rated lightning impulse withstand voltage 1.2/50ms (kV)	170
Rated frequency (Hz)	50
Rated power (VA)	20 (10)
Accuracy class	1 (0.5)
Thermal limiting power (VA)	600
Normative references	JUS IEC 60044-2

SUPPORTING AND BUSHING TYPE INSULATORS 7.2 - 36 kV



SUPPORTING AND BUSHING TYPE INSULATORS



GENERAL PURPOSE

Supporting-type insulators are used as carrying elements for busbars in various kind of substations especially in cubicles. Bushing-type insulators are used in various kind of substations, whenever is necessary to bring the conductor from one room to another or from room to outer space.

Because of epoxy resin characteristics, they are able to work in all exploitation conditions including tropical, especially in places where insulators must be resistant to humidity, chemical influences, impulse voltages and breaking forces. Because of those attributes they are suitable for appliance in mines, chemical industry and ships substations.

DESCRIPTION

Supporting and bushing type insulators are made of epoxy resin as basic insulation, whose temperature class is E/B (maximal temperature 130°C). Moulding parts are made of brass and they are resistant to chemical influences.

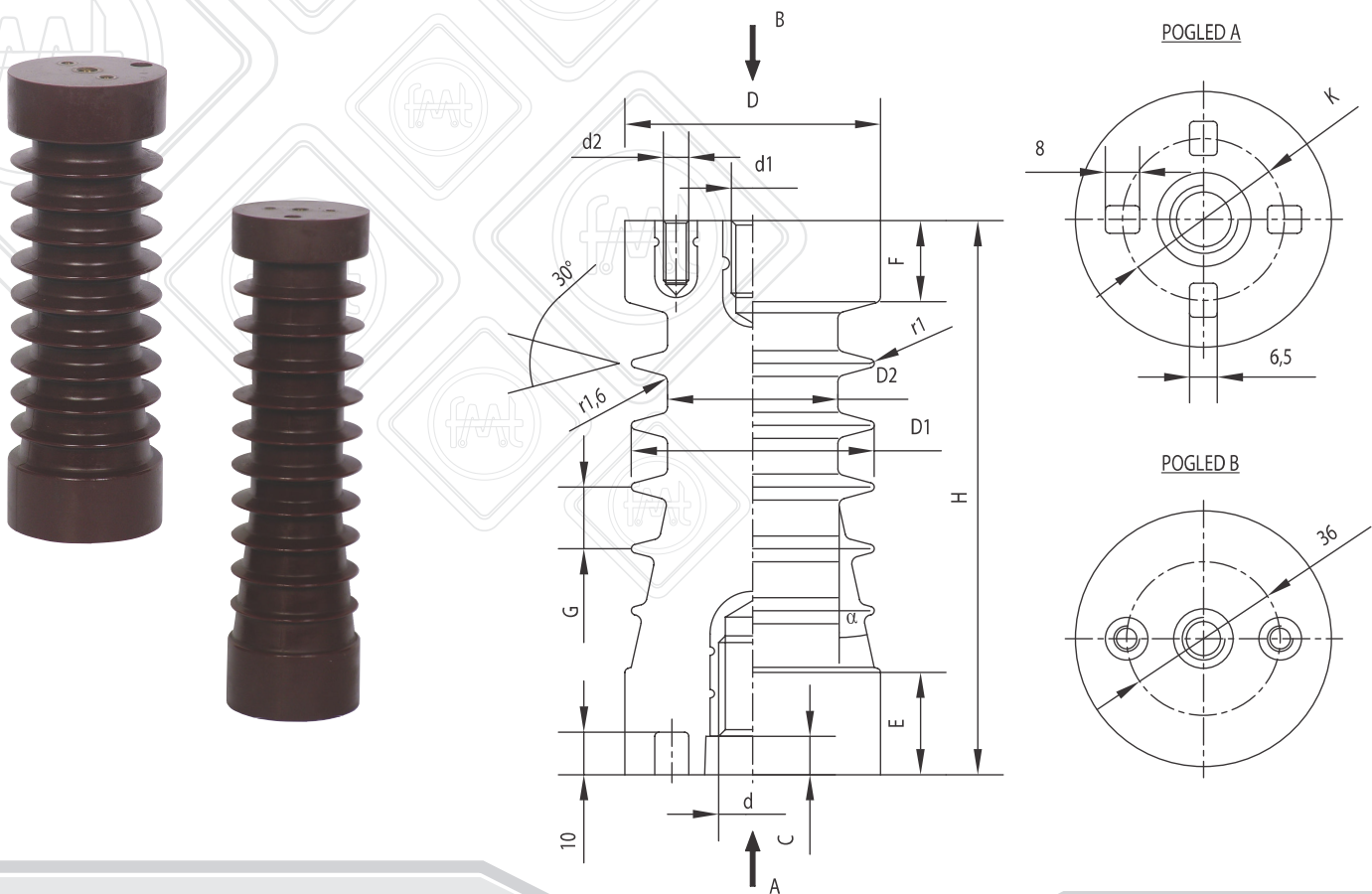
According to admissible breaking force, there are three types of supporting-type insulators: class A (3.75 kN), class B (7.5 kN) and class C (12.5 kN). Detailed technical characteristics for each type of insulator have been given separately beside each type of insulator.

MOUNTING

Insulators mounting is performed with moulded parts and fastening screws. During mounting, pay attention on the fasteners tightening, because if they have been tightened more than it is allowed fastening screw or insulator may break.

MAINTENANCE

For insulators special maintaining is not necessary during exploitation. It is enough, during regular annual maintenance, to check if all connection are clean and well tightened, to clean the insulator if it is dirty, and to tight fastening screws for mounting and connections, especially if insulator had been built-in in machines whose work is followed by great vibrations.



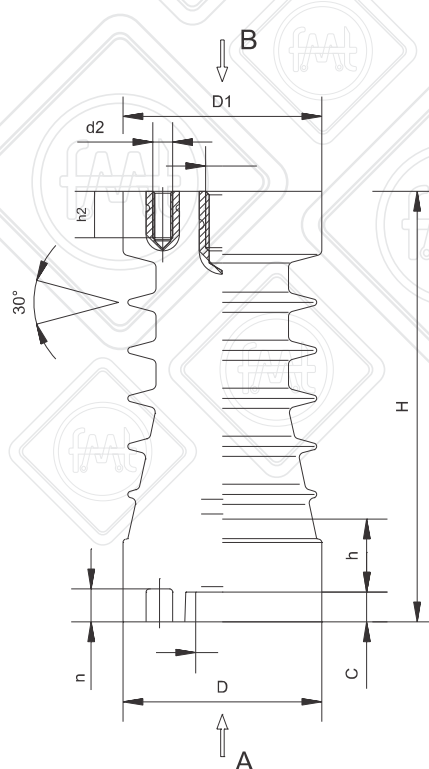
INDOOR SUPPORTING-TYPE INSULATORS FOR RATED VOLTAGES 7.2-36 kV IPA*;

Type of insulator	Dimension (mm)												m(kg)
	H	ØD	ØD1	ØD2	C	E	F	G	K	d	d1	d2	
IPA – 7.2	95	60	60	45	8	19.5	19.5	14	42	M16	M10	M6	0.42
IPA – 12	130	60	57	40	9	24	19	14.5	38	M16	M10	M6	0.53
IPA – 24	210	72	70	50	20	30	23	15.7	45	M16	M10	M6	1.12
IPA – 38	300	82	80	56	20	38	22	21.8	45	M16	M10	M6	1.95

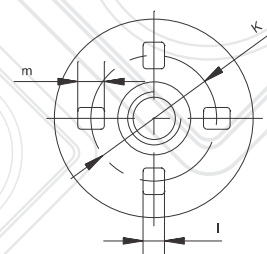
Technical data	IPA – 7.2	IPA – 12	IPA – 24	IPA – 38
Rated voltage (kV)	6	10	20	35
Maximal operating voltage (kV)	7.2	12	24	36
Rated withstand voltage 50 Hz, 1min. (kV)	20	28	50	70
Rated withstand voltage 1.2/50 µs (kV)	60	75	125	170
Breaking force (kN)	3.75			
Frequency (Hz)	50 / 60			
Ambient temperature range (oC)	- 40 to + 130			
Operating conditions	every, including tropical			
Type of insulation	epoxy resin			
Valid references	JUS N. B0.030			

Supporting type insulators 7,2 - 38 kV, indoor mounting

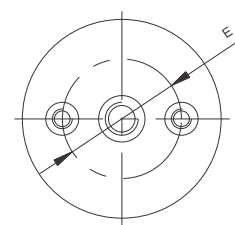
IPB



VIEW A



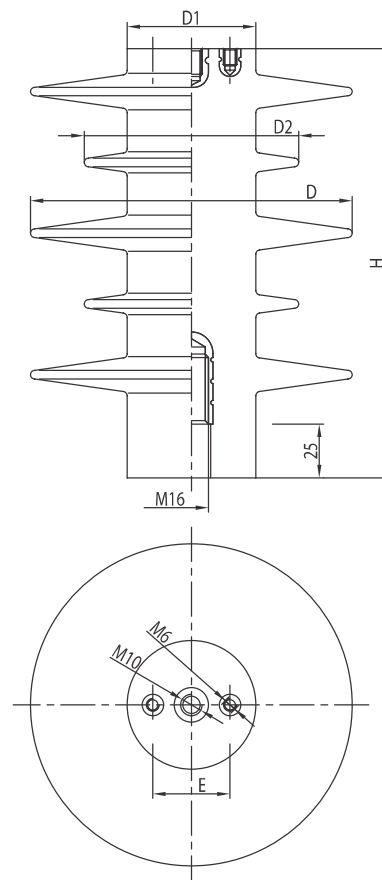
VIEW B



INDOOR SUPPORTING-TYPE INSULATORS FOR RATED VOLTAGES 7.2-38 kV IPB* AND IPC*;

Type of insulator	Dimension (mm)															m (kg)
	H	ØD	ØD1	C	n	K	m	l	E	h	h1	h2	d	d1	d2	
IPB-7.2	95	68	68	7	7	44	Ø7	-	46	22	18	10	M16	M12	M8	0.44
IPB-12	130	76	76	10	10	45	8	6	46	26	22	13	M20	M16	M10	0.55
IPB-24	210	100	85	-	-	50	Ø6	-	46	26	22	17	M20	M16	M10	1.15
IPB-38	300	95	85	20	10	60	10	8	46	35	22	17	M24	M16	M10	1.95
IPC-12	130	100	100	15	8	55	Ø5	-	66	26	22	13	M20	M16	M10	1.6

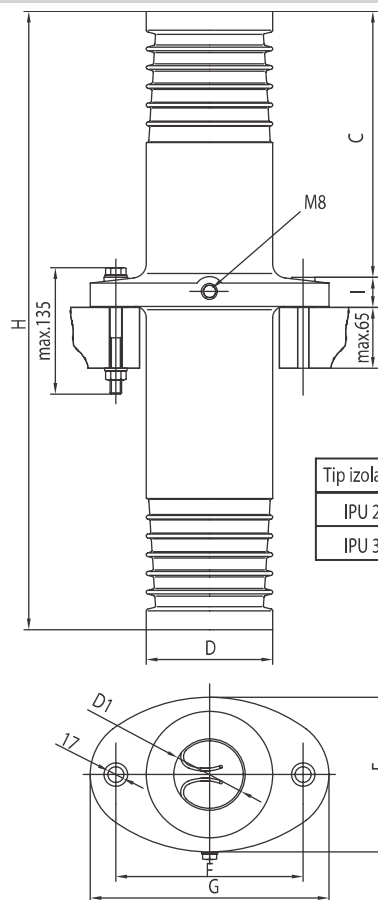
Technical data	IPB – 7.2	IPB – 12	IPB – 24	IPB – 38	IPC – 12
Rated voltage (kV)	6	10	20	35	10
Maximal operating voltage (kV)	7.2	12	24	36	12
Rated withstand voltage 50 Hz, 1min. (kV)	20	28	50	70	28
Rated withstand voltage 1.2/50 µs (kV)	60	75	125	170	75
Breaking force (kN)	7.5	7.5	7.5	7.5	12.5
Frequency (Hz)	50 / 60				
Ambient temperature range (°C)	- 40 to + 130				
Operating conditions	every, including tropical				
Type of insulation	epoxy resin				
Valid references	JUS N. B0.030				


OUTDOOR SUPPORTING-TYPE INSULATORS FOR RATED VOLTAGES 12-36 kV C4*;

TECHNICAL DATA		C4-75	C4-125	C4-170
Rated voltage (kV)		10	20	35
Maximal operating voltage (kV)		12	24	36
Rated power-frequency withstand voltage, 1 min (r.m.s.) (kV)		28	50	70
Rated impulse voltage, 1.2/50 μ s (kV)		75	125	170
Breaking force (kN)		4		
Dimension (mm)	$\varnothing D$	150	160	170
	$\varnothing d$	60	70	80
	H	200	300	400
	E	36	40	46
Mass (kg)		1.92	3.5	6.8

Bushing type insulators 12 - 38 kV, indoor mounting

IPU 24, IPU 38

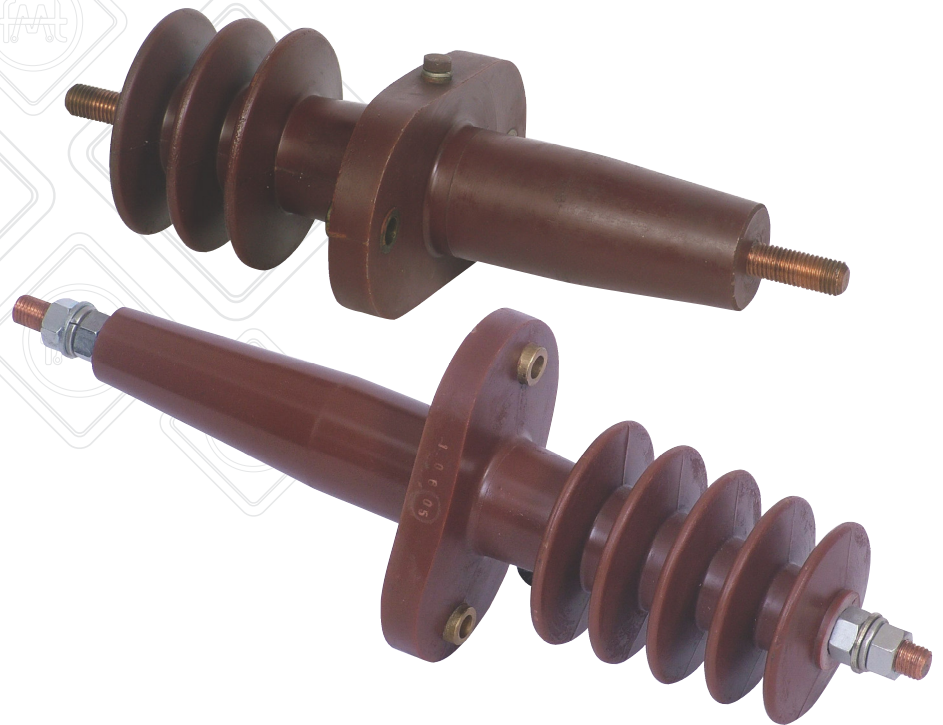
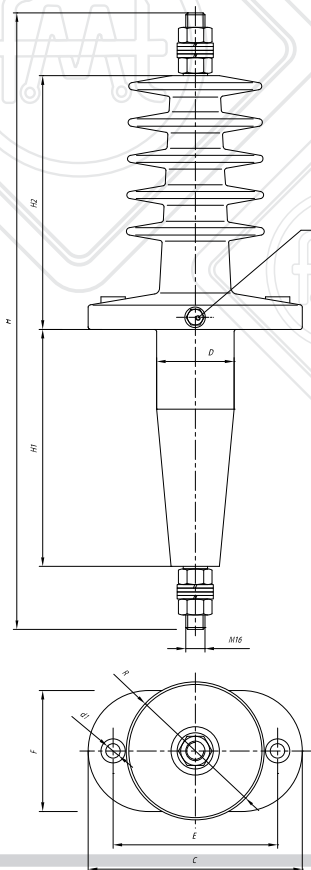


Tip izolatora	Dimenzije u mm							
	H	ØD	ØD1	C	E	F	G	I
IPU 24	525	120	70	212	150	180	225	32
IPU 38	660	135	70	284	165	200	255	32



Type of insulator	Dimension (mm)							
	H	ØD	ØD1	C	E	F	G	I
IPU-12	290	110	70	121	130	150	190	20
IPU-24	525	120	70	212	150	180	225	32
IPU-38	660	135	70	284	165	200	255	32

Technical data	IPU-12	IPU-24	IPU-38
Rated voltage (kV)	10	20	35
Maximal operating voltage (kV)	12	24	36
Rated withstand voltage 50 Hz, 1min. (kV)	28	50	70
Breaking force (kN)	3.75		
Frequency (Hz)	50 / 60		
Ambient temperature range (oC)	- 45 to + 130		
Operating conditions	every, including tropical		
Type of insulation	epoxy resin		
Valid references	JUS N. B0.030		
Number and dimensions of busbars	max. 2x(60x10) mm		
Mass (kg)	4.2	5.16	12.7



TECHNICAL DATA	IPSU-*/630
Rated current (A)	630
Rated thermal current (kA)	60
Ambient temperature range (oC)	from - 50 to +130
Operation conditions	every, including tropical
Type of basic insulation	epoxy resin
Normative references	JUS N.B0.030

Type of insulator	Un(kV)	Withstand voltage 50 Hz, 1 min.(kV)	Impulse voltage 1.2/50ms (kV)	Breaking force (kN)	Dimension (mm)											m(kg)
					H1	H2	H	C	E	F	H3	ØD	d1	d2	d3	
IPSU-12/630	10	28	75	3.75	70	147	380	177	136	100	60	64	M16	M10	M8	3.9
IPSU-20/630	20	50	125	7.5	220	292	680	196	156	120	65	84	M16	M12	M8	5.75
IPSU-35/630	35	70	170	7.5	300	440	907	230	165	140	60	94	M16	M12	M8	8.83



CONTACT

MEASURING TRANSFORMERS FACTORY ZAJECAR

Zajecar 19000, Strazilovska 57, Serbia

Central: +381 19 3413 122, +381 19 3413 613

Fax: +381 19 3413 266

General manager: +381 19 3155 551

Commercial manager: +381 19 3155 554

Sales department: +381 19 3455 556, +381 19 3155
555

Supply department: +381 19 3155 557

Development department: +381 19 3155 553

www.fmt.rs
office@fmt.rs