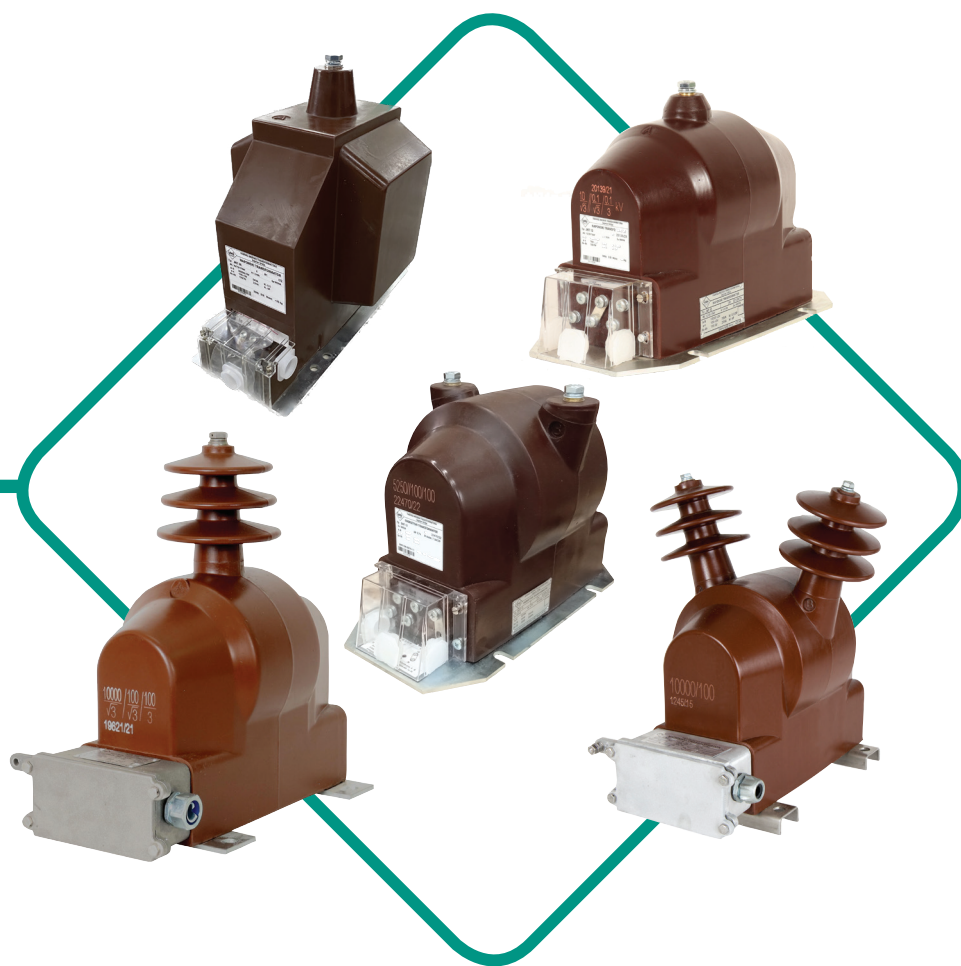


VOLTAGE TRANSFORMERS 12-38 kV







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INTRODUCTION

DESCRIPTION

Magnetic core consists of quality, cold rolled, oriented magnetic steel 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 become 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 together with the resistor type ORN-* that we can deliver on a special request, can prevent ferro-dynamic occurrence in the network transients.

We make voltage transformers for all climate conditions.

APPLIANCE

These transformers are used for separating of 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.

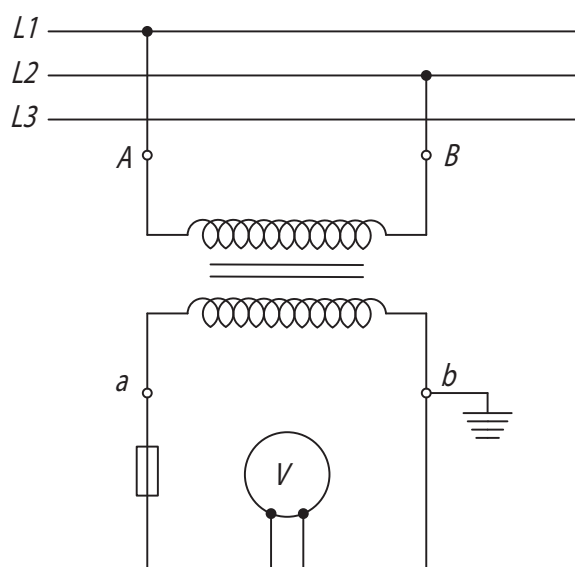
Accuracy class should be chosen according to transformers purpose.

- 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;

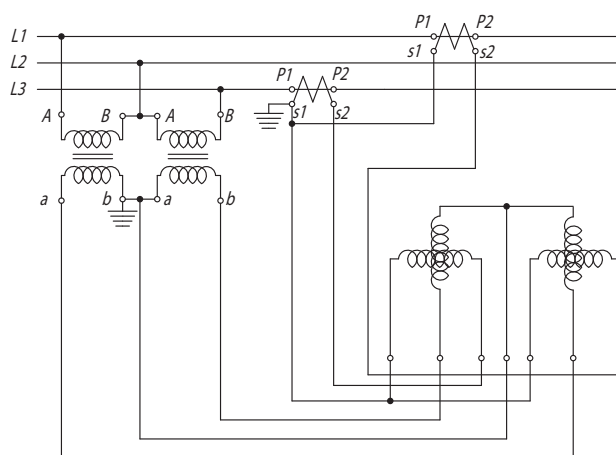
- class 1: in cases when there is need for large rated power of the transformer and there is no need for more accurate measuring.

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 consists of two systems connected in Aron's connection. In the case of earth-fault measuring is correct only if middle line (L2) is earth-faulted. If other two lines are earth-faulted 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-lines 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_{L1L2} , U_{L2L3} , U_{L1L3} 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 L2 than primary winding of the middle voltage transformer is short-circuited, while voltages on the other two voltage transformers arise to the $\sqrt{3}$ 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 which are intended for phase-to-phase voltage (voltmeter, frequency meter, power-meter, two-system electricity meters, relays etc.) have to be connected between secondary terminals (a and b).

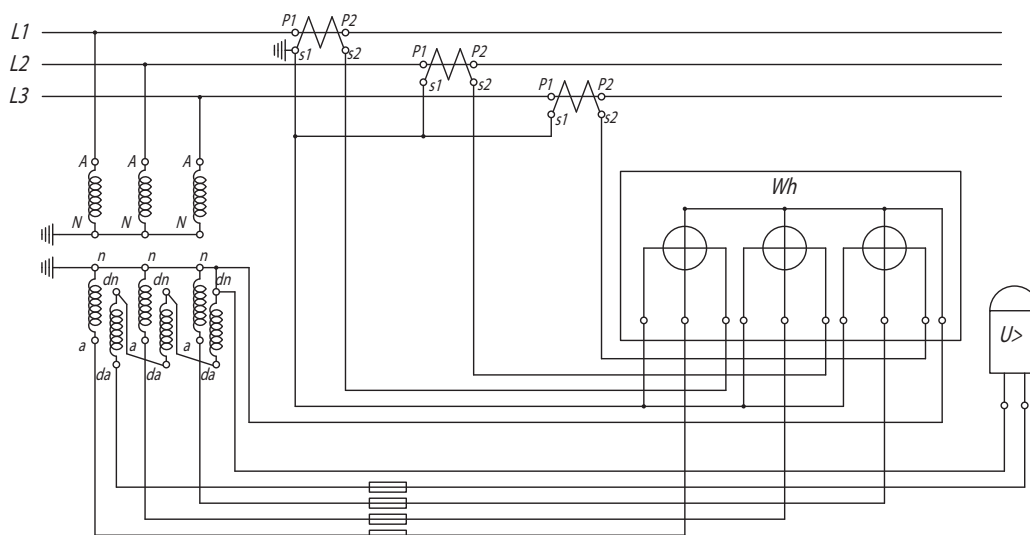
Voltmeters, earth-fault signaling relays, three-system power-meters, three-system electricity meters have to be connected between secondary terminal (a) and earth connected neutral point (x). Three-system instruments are accurate even in the case of earth-fault in any phase line.

MOUNTING

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

Primary winding in the two-pole insulated voltage transformers must be connected between two phases while in the single-pole insulated voltage transformer it has to be connected between phase and earth.

In the open triangle circuit at single-pole voltage transformers, resistors 25 Ω or higher should be added. Our resistor model ORN fulfill all requirements. All metal parts of the transformer that are not normally under volt-





age should be earth-connected. There is a 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 n connects to the earth as well as primary terminal N . At two-pole insulated voltage transformer in the "V" connection usually secondary terminal b 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 mounted directly in the 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 switching plate of his primary windings.

This catalog 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 again.

THE CONSUMPTION OF THE CONNECTING CABLES FOR MEASURING TRANSFORMERS RATED POWER DEFINING

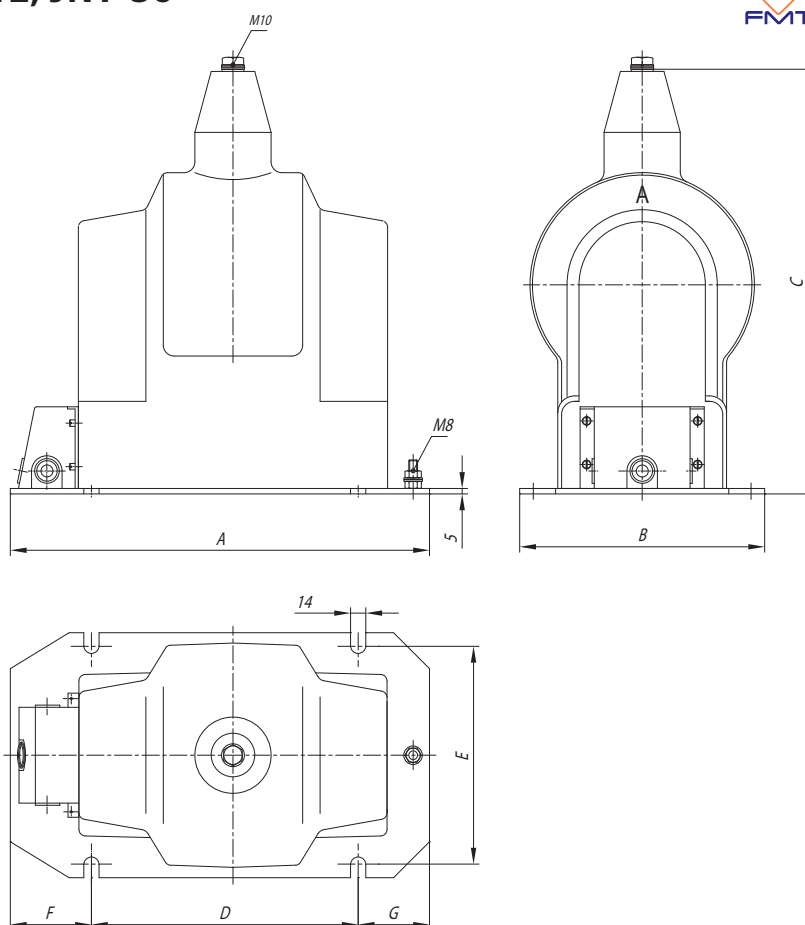
These data should be taken into account when choosing the rated power of measuring transformers in addition to consumption of the measuring or protective devices themselves.

Consumer	Power consumption (W/m)
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

JNT-12, JNT-24, JNT-24/12, JNT-36



JNT-12



SINGLE-POLE VOLTAGE TRANSFORMERS FOR INDOOR MOUNTING TYPE JNT *

Type of transformer	Dimensions (mm)						
	A	B	C	D	E	F	G
JNT-12	355	180	245	190	155	93	72
JNT-24	375	200	298	210	175	93	72
JNT-24/12	375	200	298	210	175	93	72
JNT-36	385	225	389	245	200	74.5	65.5

TECHNICAL DATA	JNT-12	JNT-24	JNT-24/12	JNT-36
Rated primary voltage (kV)	10/ $\sqrt{3}$	20/ $\sqrt{3}$	20/ $\sqrt{3}$ /10/ $\sqrt{3}$	35/ $\sqrt{3}$
Highest voltage for equipment (r.m.s.) (kV)	12	24	24	38(36)
Rated secondary voltage (V)	100/ $\sqrt{3}$ or 110/ $\sqrt{3}$			
Rated tertiary voltage (V)	100/3 or 110/3			
Rated power-frequency withstand voltage (kV)	28	50	50	70
Rated impulse voltage 1.2/50 μ s (kV)	75	125	125	170
Rated frequency (Hz)	50/60			
Maximal rated power for accuracy class 0.2 (VA)	25	30	30/10	30
Maximal rated power for accuracy class 0.5 (VA)	75	75	75/25	100
Maximal rated power for accuracy class 1 (VA)	150	150	150/50	200
Rated tertiary power (VA)	25; 50; 100			
Rated tertiary accuracy class	3P; 6P			
Rated voltage factor	1.9/8h			
Additional resistance in the tertiary circuit (W)	25	25	25	16.5
Limiting thermal power (VA)	600	600	600/300	800
Mass (kg)	24.6	31.5	32.5	41
Temperature insulation class	E/B			
Type of basic insulation	Epoxy resin			
Valid standards	IEC 61869-1; IEC 61869-3;			

NOTE:

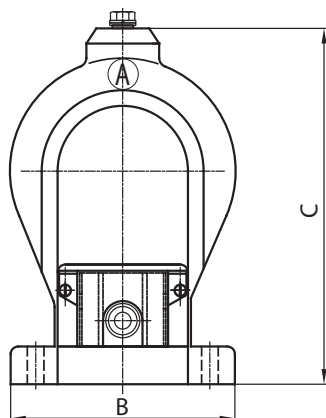
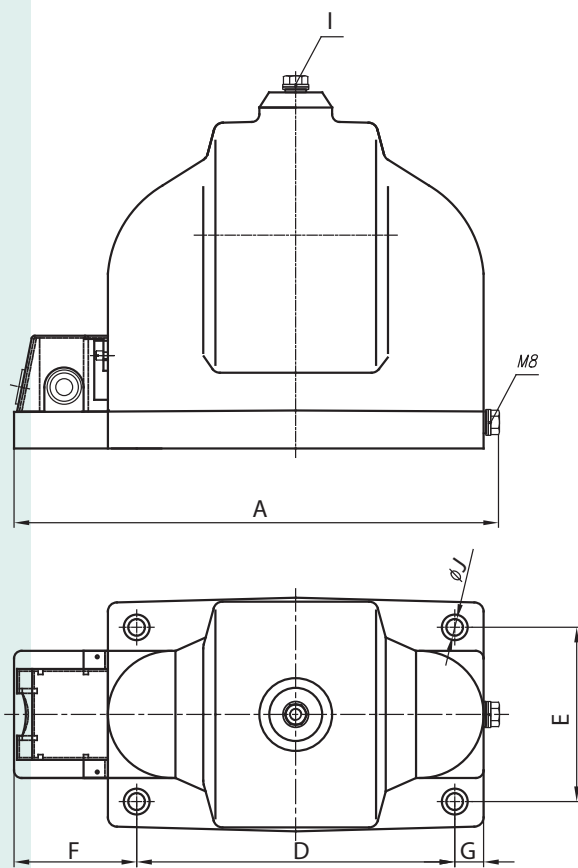
These transformers we can produce also for the following rated voltages: 3/ $\sqrt{3}$; 5/ $\sqrt{3}$; 6/ $\sqrt{3}$; 15/ $\sqrt{3}$; 17.5/ $\sqrt{3}$; 25/ $\sqrt{3}$ and 33/ $\sqrt{3}$ kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor.

Due to the prevention of ferro-resonant phenomenon, when 3 single-pole voltage transformers are used in networks with an isolated neutral point, it is necessary to put additional resistance in their open triangle tertiary circuit. The resistance value is given in the table. Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering.

We keep the right for a change.



JNT-10, JNT-10U, JNT-20U, JNT-30U



JNT 10

SINGLE-POLE VOLTAGE TRANSFORMERS WITH REDUCED RATED POWER FOR INDOOR MOUNTING
JNT-10, JNT-10U, JNT-20U, JNT-30U

TECHNICAL DATA	JNT-10	JNT-10U	JNT-20U	JNT-30U
Rated primary voltage (kV)	10/ $\sqrt{3}$	10/ $\sqrt{3}$	20/ $\sqrt{3}$	35/ $\sqrt{3}$
Highest voltage for equipment (r.m.s.) (kV)	12	12	24	36 (42)
Rated secondary voltage (V)	100/ $\sqrt{3}$ or 110/ $\sqrt{3}$			
Rated tertiary voltage (V)	100/3 or 110/3			
Rated power-frequency withstand voltage (kV)	28	28 (42)	50 (65)	70 (95)
Rated impulse voltage 1.2/50 μ s (kV)	75	75	125	170 (190)
Rated frequency (Hz)	50/60			
Maximal rated power for accuracy class 0.2 (VA)	15	30	30	30
Maximal rated power for accuracy class 0.5 (VA)	50	75	75	75
Maximal rated power for accuracy class 1 (VA)	100	150	150	150
Rated tertiary power (VA)	25; 50; 100	10-50	10-50	10-50
Rated tertiary accuracy class	3P; 6P	3P; 6P	3P; 6P	3P; 6P
Rated voltage factor	1.9/8h	1.9/8h	1.9/8h	1.9/8h
Additional resistance in the tertiary circuit (W)	25	25	25	25
Limiting thermal power (VA)	400	600	600	800
Mass (kg)	17	30	43	60
Temperature insulation class	E/B			
Type of basic insulation	Epoxy resin			
Valid standards	IEC 61869-1; IEC 61869-3		IEC 61869-1; IEC 61869-3; GOST 1983	

NOTE:

These transformers we can produce also for the following rated voltages: 3/ $\sqrt{3}$; 5/ $\sqrt{3}$; 6/ $\sqrt{3}$; 15/ $\sqrt{3}$; 17.5/ $\sqrt{3}$; 25/ $\sqrt{3}$ and 33/ $\sqrt{3}$ kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor.

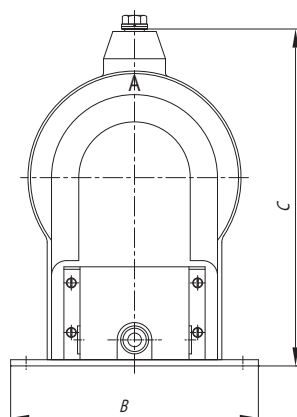
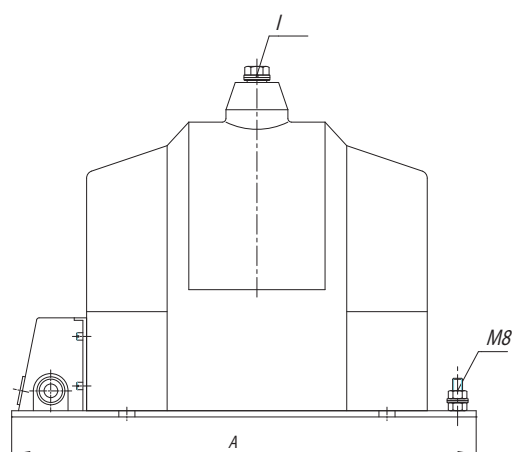
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Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering.

We keep the right for a change.

Type of transformer	Dimensions (mm)								
	A	B	C	D	E	F	G	I	J
JNT-10	320	148	237	210	115	81	19	M8	11
JNT-10U	275	220	251	215	180	30	30	M10	13
JNT-20U	315	242	290	240	207	37.5	37.5	M10	13
JNT-30U	415	250	390	300	225	90	25	M10	13

JNT-10d, JNTm2-24, JNTm2-24/12



JNTm2-24

SINGLE-POLE VOLTAGE TRANSFORMERS WITH REDUCED RATED POWER FOR INDOOR MOUNTING

JNTm2-24, JNTm2-24/12

Type of transformer	Dimensions (mm)								
	A	B	C	D	E	F	G	I	J
JNT-10d	340	148	220	270	125	53	17	M10	11
JNTm2-24	355	178	271	280	150	53	22	M10	14
JNTm2-24/12	355	178	271	280	150	53	22	M10	14

TECHNICAL DATA	JNT-10d	JNTm2-24	JNTm2-24/12
Rated primary voltage (kV)	10/ $\sqrt{3}$	20/ $\sqrt{3}$	20/ $\sqrt{3}$ /10/ $\sqrt{3}$
Highest voltage for equipment (r.m.s.) (kV)	12	24	24
Rated secondary voltage (V)	100/ $\sqrt{3}$ or 110/ $\sqrt{3}$		
Rated tertiary voltage (V)	100/3 or 110/3		
Rated power-frequency withstand voltage (kV)	28	50	50
Rated impulse voltage 1.2/50 μ s (kV)	75	125	125
Rated frequency (Hz)	50/60		
Maximal rated power for accuracy class 0.2 (VA)	15	15	-
Maximal rated power for accuracy class 0.5 (VA)	50	50	50/15
Maximal rated power for accuracy class 1 (VA)	100	100	75/25
Rated tertiary power (VA)	25; 50; 100		
Rated tertiary accuracy class	3P; 6P		
Rated voltage factor	1.9/8h		
Additional resistance in the tertiary circuit (W)	25	25	25
Limiting thermal power (VA)	400	400	400/200
Mass (kg)	21	27	27
Temperature insulation class	E/B		
Type of basic insulation	Epoxy resin		
Valid standards	IEC 61869-1; IEC 61869-3		

NOTE:

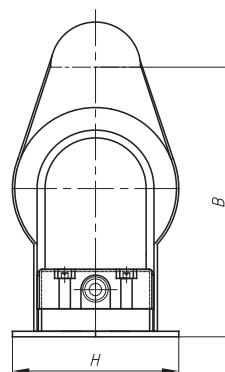
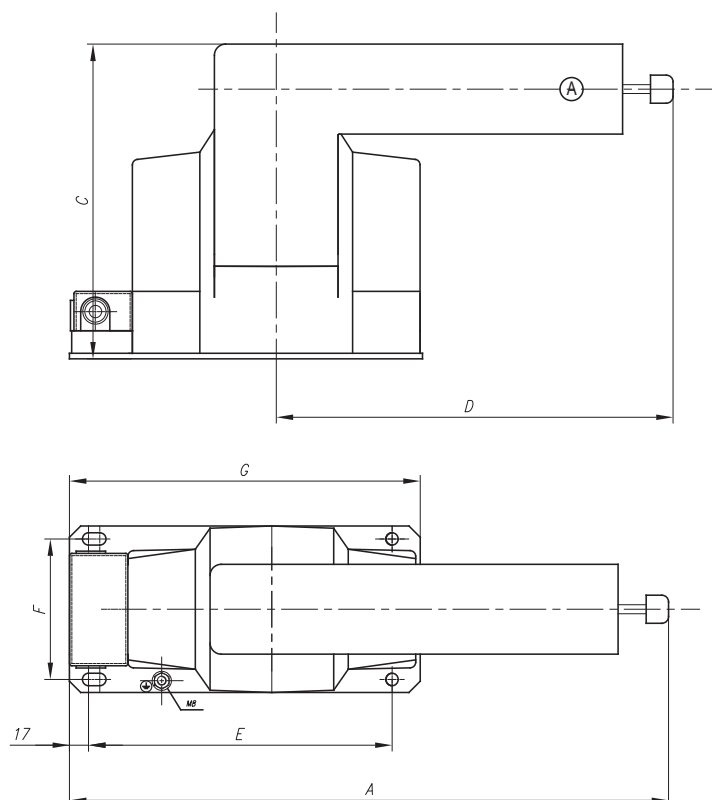
These transformers we can produce also for the following rated voltages: 3/ $\sqrt{3}$; 5/ $\sqrt{3}$; 6/ $\sqrt{3}$; 11/ $\sqrt{3}$; 15/ $\sqrt{3}$; 22/ $\sqrt{3}$ kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class and rated power.

Due to the prevention of ferroresonant phenomenon, when 3 single-pole voltage transformers are used in networks with an isolated neutral point, it is necessary to put additional resistance in their open triangle tertiary circuit. The resistance value is given in the table. Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering.

We keep the right for a change.



JNT SOP-12, JNT SOP-24, JNT SOP-24/12



JNT SOP-24

SINGLE-POLE VOLTAGE TRANSFORMERS FOR INDOOR MOUNTING WITH REDUCED POWER AND FUSES **JNT-SOP***

Type of transformer	Dimensions (mm)							
	A	B	C	D	E	F	G	H
JNT SOP-12	533	240	280	353	270	125	312	148
JNT SOP-24	606	300	340	416	275	130	325	164
JNT SOP-24/12	606	300	340	416	275	130	325	164

TECHNICAL DATA	JNT SOP-12	JNT SOP-24	JNT SOP-24/12
Rated primary voltage (kV)	10/ $\sqrt{3}$	20/ $\sqrt{3}$	20/ $\sqrt{3}$ /10/ $\sqrt{3}$
Highest voltage for equipment (r.m.s.) (kV)	12	24	24
Rated secondary voltage (V)	100/ $\sqrt{3}$ or 110/ $\sqrt{3}$		
Rated tertiary voltage (V)	100/3 or 110/3		
Rated power-frequency withstand voltage (kV)	28	50	50
Rated impulse voltage 1.2/50 μ s (kV)	75	125	125
Rated frequency (Hz)	50/60		
Maximal rated power for accuracy class 0.2 (VA)	25	30	30/10
Maximal rated power for accuracy class 0.5 (VA)	75	75	75/25
Maximal rated power for accuracy class 1 (VA)	150	150	150/50
Rated tertiary power (VA)	25; 50; 100		
Rated tertiary accuracy class	3P; 6P		
Rated voltage factor	1.9/8h		
Additional resistance in the tertiary circuit (W)	25	25	25
Limiting thermal power (VA)	600	600	600/300
Mass (kg)	23	29	30.5
Temperature insulation class	E/B		
Type of basic insulation	Epoxy resin		
Valid standards	IEC 61869-1; IEC 61869-3		

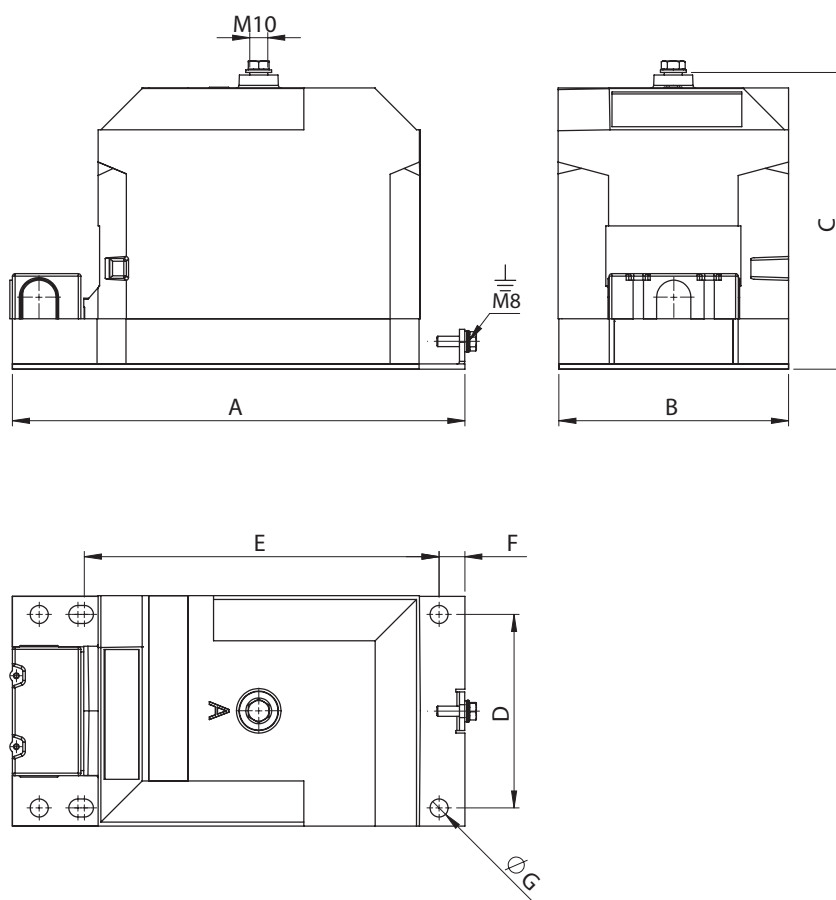
NOTE:

Transformers JNT-SOP with reduced power have been designed for indoor mounting for smaller cells for the voltage levels up to 24kV. They have fuse enclosures on high-voltage side and we deliver the fuses along with the transformer whose assembly and disassembly is extremely simple. These transformers we can produce also for the following rated voltages: 3/ $\sqrt{3}$; 5/ $\sqrt{3}$; 6/ $\sqrt{3}$; 11/ $\sqrt{3}$; 15/ $\sqrt{3}$; 22/ $\sqrt{3}$ kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor. Due to the prevention of ferroresonant phenomenon, when 3 single-pole voltage transformers are used in networks with an isolated neutral point, it is necessary to put additional resistance in their open triangle tertiary circuit. The resistance value is given in the table. Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering. We keep the right for a change.

REL 10, REL 20 i REL 20/10



REL-20



SINGLE-POLE VOLTAGE TRANSFORMERS FOR INDOOR MOUNTING REL* 12-24 kV

Type of transformer	Dimensions (mm)							Mass (kg)
	A	B	C	D	E	F	G	
REL 10	325	148	200	125	260	15	11	~18.5
REL 20	351	178	230	150	275	20	14	~25
REL 20/10	351	178	230	150	275	20	14	~25

NOTE:

These transformers we can produce also for the following rated voltages: $3/\sqrt{3}$; $5/\sqrt{3}$; $6/\sqrt{3}$; $11/\sqrt{3}$; $15/\sqrt{3}$; $22/\sqrt{3}$ kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor.

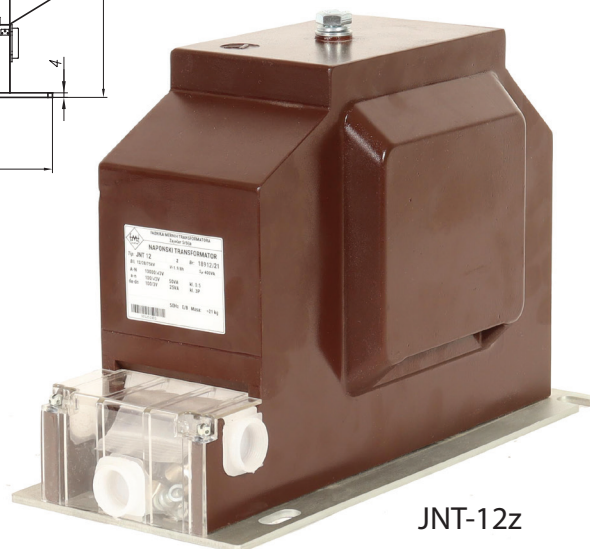
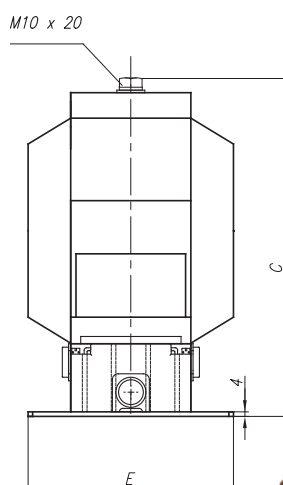
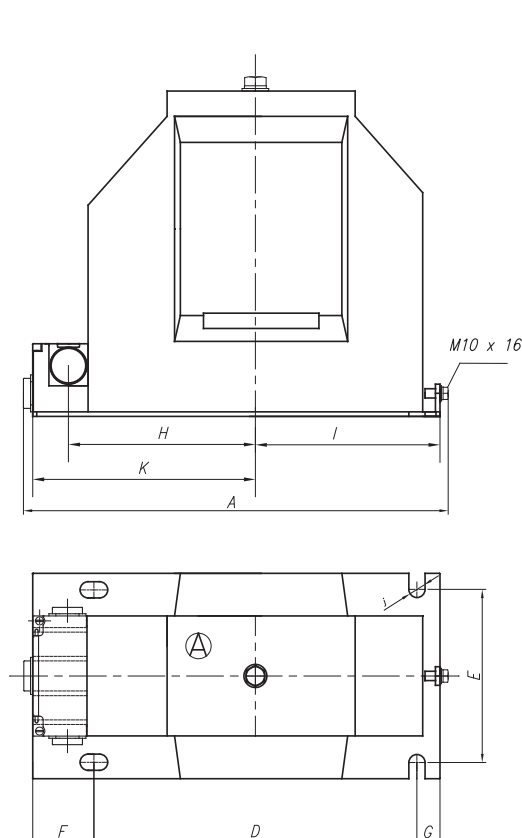
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Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering. We keep the right for a change.

TECHNICAL DATA	REL 10	REL 20	REL 20/10
Rated primary voltage (kV)	10/ $\sqrt{3}$	20/ $\sqrt{3}$	20/ $\sqrt{3}$ /10/ $\sqrt{3}$
Highest voltage for equipment (r.m.s.) (kV)	12	24	24
Rated secondary voltage (V)	100/ $\sqrt{3}$ or 110/ $\sqrt{3}$		
Rated tertiary voltage (V)	100/3 or 110/3		
Rated power-frequency withstand voltage (kV)	28 (42)	50 (65)	50 (65)
Rated impulse voltage 1.2/50 μ s (kV)	75	125	125
Rated frequency (Hz)	50/60		
Maximal rated power for accuracy class 0.2 (VA)	15	15	10(5)
Maximal rated power for accuracy class 0.5 (VA)	50	50	30(15)
Maximal rated power for accuracy class 1 (VA)	100	120	120(50)
Rated tertiary power (VA)	10-50		
Rated tertiary accuracy class	3P; 6P		
Rated voltage factor	1.9/8h		
Additional resistance in the tertiary circuit (W)	40	40	40
Limiting thermal power (VA)	400	400	400/200
Temperature insulation class	E		
Type of basic insulation	Epoxy resin		
Valid standards	IEC 61869-1; IEC 61869-3 (FOCT 1983)		



JNT-12z, JNT-12d, JNT-24z, JNT-24d, JNT-24/12z, JNT-24/12d



JNT-12z

SINGLE-POLE VOLTAGE TRANSFORMERS FOR INDOOR MOUNTING JNT*

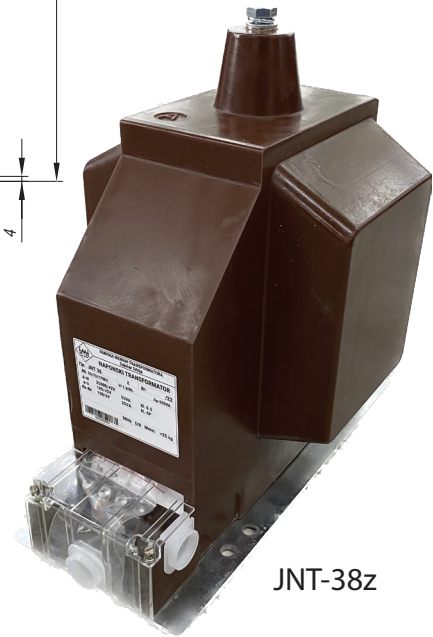
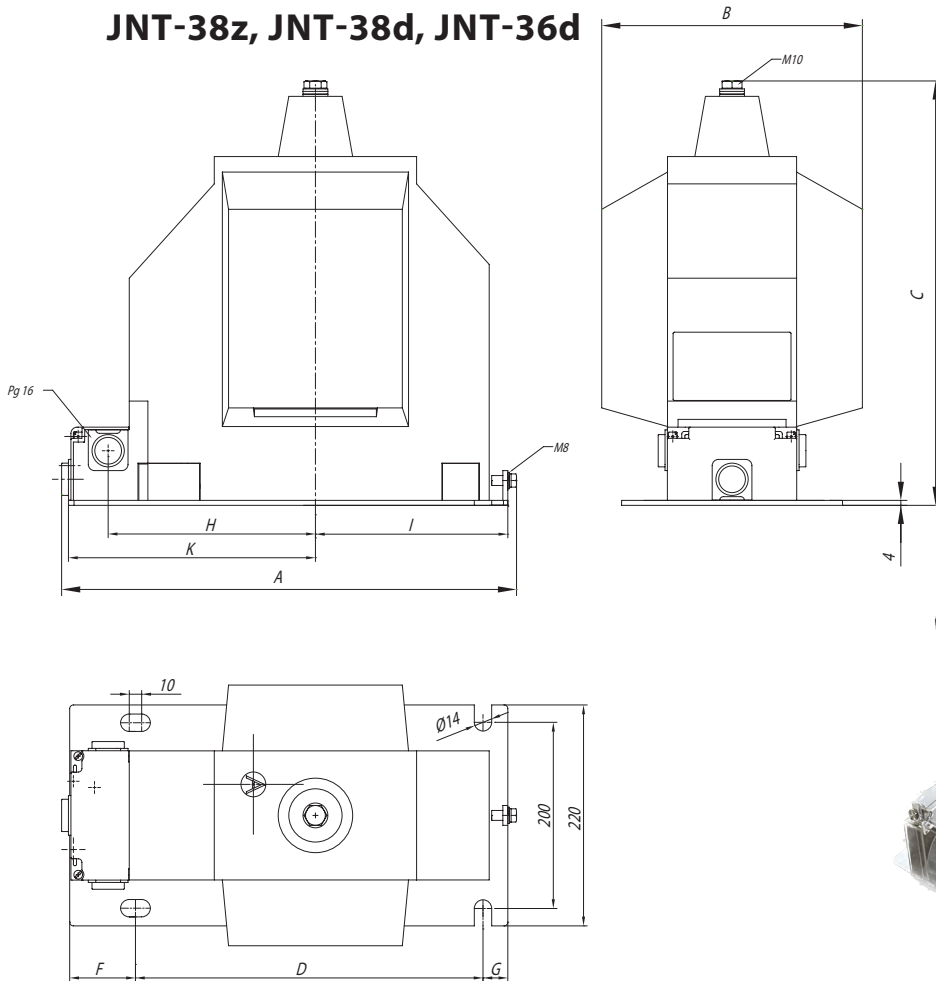
Type of transformer	Dimensions (mm)										
	A	B	C	D	B	F	G	H	I	K	j
JNT-12z	348	148	234	270	125	48	15	152	150	183	Ø12,Ø14
JNT-12d	358	148	234	275	125	55	15	162	150	195	Ø12,Ø14
JNT-24z	368	178	293	280	150	53	20	162	160	193	Ø12,Ø14
JNT-24d	392	178	293	275	150	70	32	174	172	205	Ø12,Ø14
JNT-24/12z	368	178	293	280	150	53	20	162	160	193	Ø12,Ø14
JNT-24/12d	392	178	293	275	150	70	32	174	172	205	Ø12,Ø14

TECHNICAL DATA	JNT-12z	JNT-12d	JNT-24z	JNT-24d	JNT-24/12z	JNT-24/12d
Rated primary voltage (kV)	10/√3	10/√3	20/√3	20/√3	20/√3/10/√3	20/√3/10/√3
Highest voltage for equipment (r.m.s.) (kV)	12	12	24	24	24	24
Rated secondary voltage (V)	100/√3 or 110/√3					
Rated tertiary voltage (V)	100/3 or 110/3					
Rated power-frequency withstand voltage (kV)	28	28	50	50	50	50
Rated impulse voltage 1.2/50 μs (kV)	75	75	125	125	125	125
Rated frequency (Hz)	50/60					
Maximal rated power for accuracy class 0.2 (VA)	25	25	30	30	30/10	30/10
Maximal rated power for accuracy class 0.5 (VA)	75	75	75	75	75/25	75/25
Maximal rated power for accuracy class 1 (VA)	150	150	150	150	150/50	150/50
Rated tertiary power (VA)	25; 50; 100					
Rated tertiary accuracy class	3P; 6P					
Rated voltage factor	1.9/8h					
Additional resistance in the tertiary circuit (W)	25	25	25	25	25	25
Limiting thermal power (VA)	500	600	600	700	600/300	700/350
Mass (kg)	24.6	24.6	31.5	33	32.5	34.5
Temperature insulation class	E/B					
Type of basic insulation	Epoxy resin					
Valid standards	IEC61869-1; IEC61869-3, DIN 42600-9					

NOTE:

These transformers we can produce also for the following rated voltages: 3/√3; 5/√3; 6/√3; 11/√3; 15/√3; 22/√3 kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor. Due to the prevention of ferroresonant phenomenon, when 3 single-pole voltage transformers are used in networks with an isolated neutral point, it is necessary to put additional resistance in their open triangle tertiary circuit. The resistance value is given in the table. Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering. We keep the right for a change.

JNT-38z, JNT-38d, JNT-36d



JNT-38z

SINGLE POLE VOLTAGE TRANSFORMERS, INDOOR MOUNTING BLOCK TYPE JNT-38z, JNT-38d, JNT-36d

Type of transformer	Dimensions (mm)								
	A	B	C	D	F	G	H	I	K
JNT-38z	368	210	342	245	70,5	37,5	162	160	193
JNT-38d	392	220	384	245	82,5	49,5	174	172	205
JNT-36d	443	240	376	300	88	40	207	190	238

NOTE:

These transformers we can produce also for the following rated voltages: $3/\sqrt{3}$; $5/\sqrt{3}$; $6/\sqrt{3}$; $11/\sqrt{3}$; $15/\sqrt{3}$; $22/\sqrt{3}$ and $30/\sqrt{3}$ kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor. Due to the prevention of ferro-resonant phenomenon, when 3 single-pole voltage transformers are used in networks with an isolated neutral point, it is necessary to put additional resistance in their open triangle tertiary circuit. The resistance value is given in the table. Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering. We keep the right for a change.

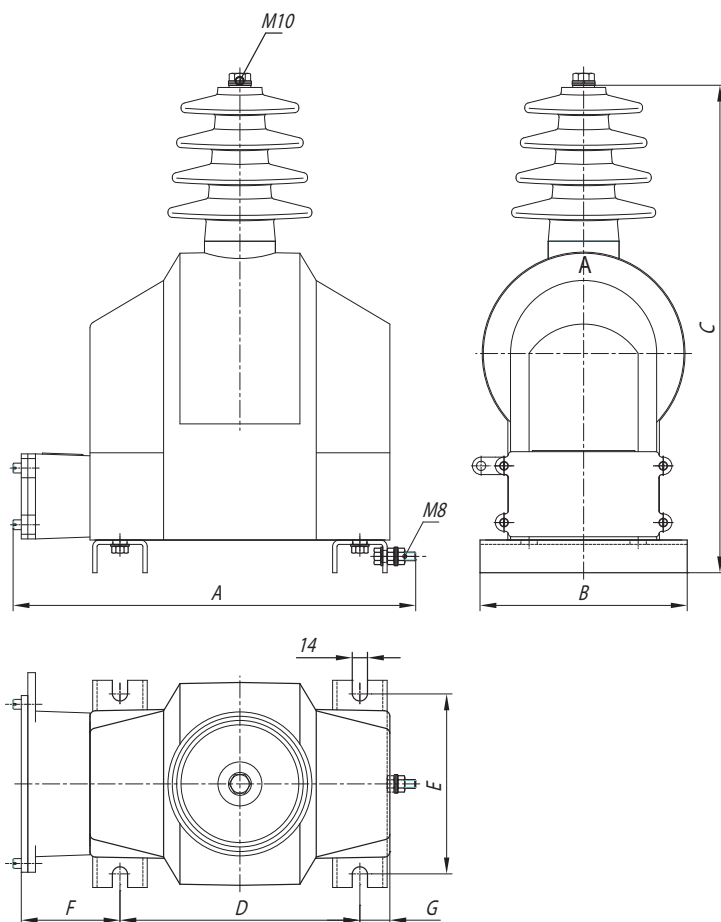
TECHNICAL DATA	JNT-38z	JNT-38d	JNT-36d
Rated primary voltage (kV)	$35/\sqrt{3}$	$35/\sqrt{3}$	$35/\sqrt{3}$
Highest voltage for equipment (r.m.s.) (kV)	38	38 (40.5)	36, 38 (40.5)
Rated secondary voltage(V)	$100/\sqrt{3}$ or $110/\sqrt{3}$		
Rated tertiary voltage (V)	$100/3$ or $110/3$		
Rated power-frequency withstand voltage (kV)	70	70 (80)	70 (80)
Rated impulse voltage $1.2/50 \mu s$ (kV)	170	170 (190)	170 (190)
Rated frequency(Hz)	50/60		
Maximal rated power for accuracy class 0.2 (VA)	25	30	50
Maximal rated power for accuracy class 0.5 (VA)	75	100	150
Maximal rated power for accuracy class 1 (VA)	150	200	300
Rated tertiary power (VA)	25; 50; 100		25; 50; 100; 150
Rated tertiary accuracy class	3P; 6P		
Rated voltage factor	1.9/8h		
Additional resistance in the tertiary circuit (W)	25	25(16.7)	16.7(12,5)
Limiting thermal power (VA)	600	800	1200
Mass (kg)	34	40	72
Temperature insulation class	E/B		
Type of basic insulation	Epoxy resin		
Valid standards	IEC61869-1; IEC61869-3		



JNT SM-12, JNT SM-24, JNT SM-24/12, JNT SM-36*



JNT SM-12



SINGLE-POLE VOLTAGE TRANSFORMERS FOR OUTDOOR MOUNTING JNT-SM*

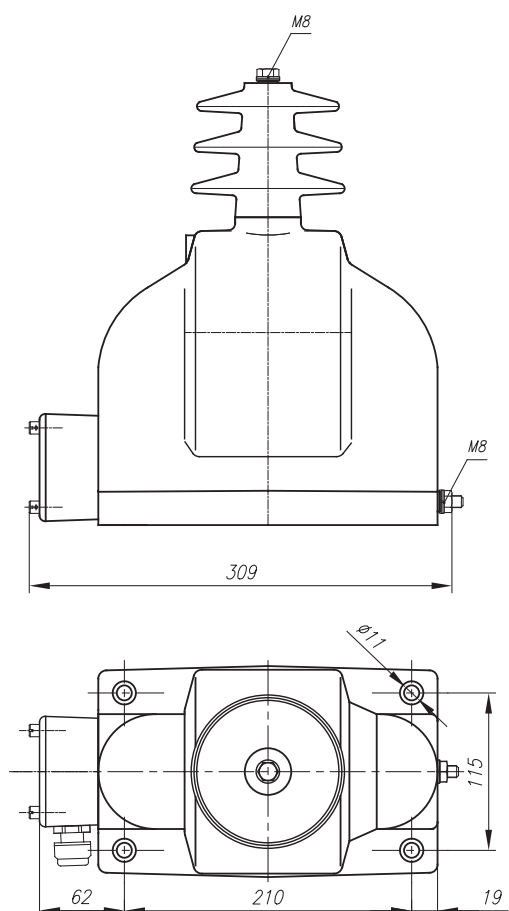
Type of transformer	Dimensions (mm)							Broj rebara	Creeping distance (mm)
	A	B	C	D	E	F	G		
JNT SM-12	366	190	367	209	165	98	21	3	500
JNT SM-24	370	190	447	220	165	90.5	27.5	4	630
JNT SM-24/12	370	190	447	220	165	90.5	27.5	4	630
JNT SM-36-5R	379	225	549	229	200	92	25	5	855
JNT SM-36-6R	379	225	579	229	200	92	25	6	920
JNT SM-36-8R	379	225	626	229	200	92	25	8	1125
JNT SM-36-10R	379	225	695	229	200	92	25	10	1280

TECHNICAL DATA	JNT SM-12	JNT SM-24	JNT SM-24/12	JNT SM-36*
Rated primary voltage (kV)	10/√3	20/√3	20/√3/10/√3	35/√3
Highest voltage for equipment (r.m.s.) (kV)	12	24	24	38(36)
Rated secondary voltage (V)	100/√3 or 110/√3			
Rated tertiary voltage (V)	100/3 or 110/3			
Rated power-frequency withstand voltage (kV)	28	50	50	70
Rated impulse voltage 1.2/50 μs (kV)	75	125	125	170
Rated frequency (Hz)	50/60			
Maximal rated power for accuracy class 0.2 (VA)	25	30	30/10	30
Maximal rated power for accuracy class 0.5 (VA)	75	75	75/25	100
Maximal rated power for accuracy class 1 (VA)	150	150	150/50	200
Rated tertiary power (VA)	25; 50; 100			
Rated tertiary accuracy class	3P; 6P			
Rated voltage factor	1.9/8h			
Additional resistance in the tertiary circuit (W)	25	25	25	16.5
Limiting thermal power (VA)	600	600	600/300	800
Mass (kg)	25.9	31.5	32.5	43
Temperature insulation class	E/B			
Type of basic insulation	Epoxy resin			
Valid standards	IEC 61869-1; IEC 61869-3			

NOTE:

These transformers we can produce also for the following rated voltages: 3/√3; 5/√3; 6/√3; 11/√3; 15/√3; 22/√3 and 30/√3 kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor. Due to the prevention of ferro-resonant phenomenon, when 3 single-pole voltage transformers are used in networks with an isolated neutral point, it is necessary to put additional resistance in their open triangle tertiary circuit. The resistance value is given in the table. Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering. We keep the right for a change. * - valid for all sub-types.

JNT SM-10



JNT SM-10

SINGLE-POLE VOLTAGE TRANSFORMERS WITH REDUCED RATED POWER FOR OUTDOOR MOUNTING JNT-SM 10

TECHNICAL DATA	JNT SM-10
Rated primary voltage (kV)	10/ $\sqrt{3}$
Highest voltage for equipment (r.m.s.) (kV)	12
Rated secondary voltage(V)	100/ $\sqrt{3}$ or 110/ $\sqrt{3}$
Rated tertiary voltage (V)	100/3 or 110/3
Rated power-frequency withstand voltage (kV)	28
Rated impulse voltage 1.2/50 μ s (kV)	75
Rated frequency(Hz)	50/60
Maximal rated power for accuracy class 0.2 (VA)	15
Maximal rated power for accuracy class 0.5 (VA)	50
Maximal rated power for accuracy class 1 (VA)	100
Rated tertiary power (VA)	25; 50; 100
Rated tertiary accuracy class	3P; 6P
Rated voltage factor	1.9/8h
Additional resistance in the tertiary circuit (W)	25
Limiting thermal power (VA)	400
Creeping distance (mm)	465
Mass (kg)	18.2
Temperature insulation class	E/B
Type of basic insulation	Epoxy resin
Valid standards	IEC 61869-1; IEC 61869-3

NOTE:

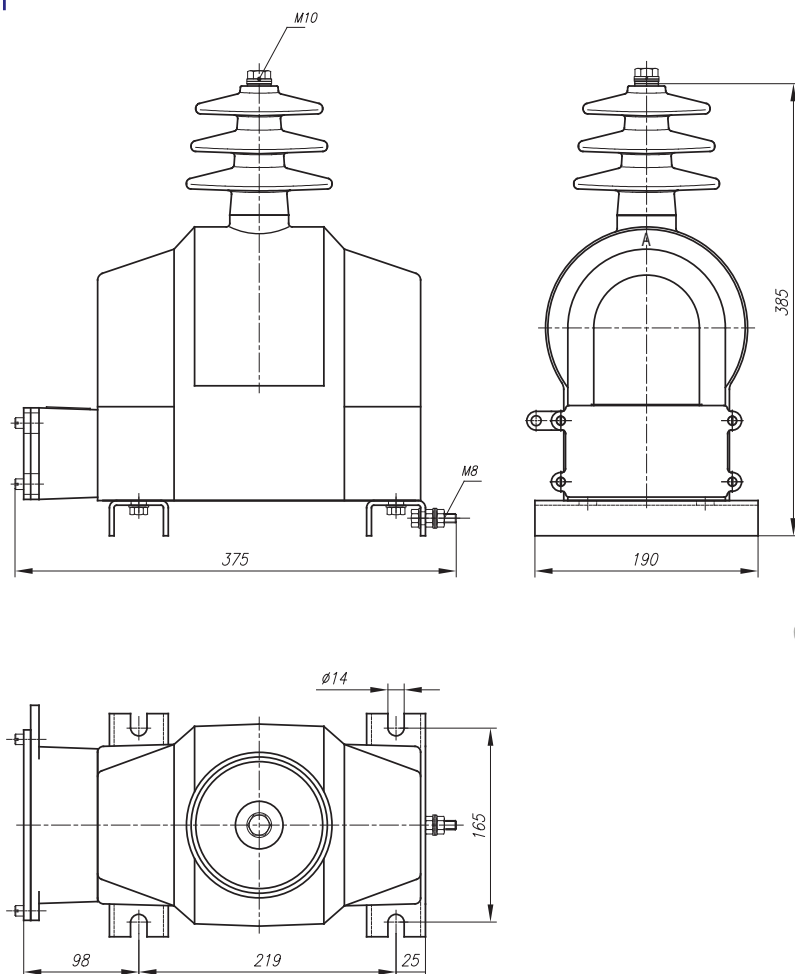
These transformers we can produce also for the following rated voltages: 3/ $\sqrt{3}$; 5/ $\sqrt{3}$; 6/ $\sqrt{3}$ and 11/ $\sqrt{3}$ kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor.

Due to the prevention of ferroresonant phenomenon, when 3 single-pole voltage transformers are used in networks with an isolated neutral point, it is necessary to put additional resistance in their open triangle tertiary circuit. The resistance value is given in the table. Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering.

We keep the right for a change.



JNTm2 SM-24, JNTm2 SM-24/12



JNTm2 SM-24

SINGLE-POLE VOLTAGE TRANSFORMER WITH REDUCED RATED POWER FOR OUTDOOR MOUNTING

JNTm2 SM-24, JNTm2 SM-24/12

TECHNICAL DATA	JNTm2 SM-24	JNTm2 SM-24/12
Rated primary voltage (kV)	20/ $\sqrt{3}$	20/ $\sqrt{3}$ /10/ $\sqrt{3}$
Highest voltage for equipment (r.m.s.) (kV)	24	
Rated secondary voltage (V)	100/ $\sqrt{3}$ or 110/ $\sqrt{3}$	
Rated tertiary voltage (V)	100/3 or 110/3	
Rated power-frequency withstand voltage (kV)	50	
Rated impulse voltage 1.2/50 μ s (kV)	125	
Rated frequency (Hz)	50/60	
Maximal rated power for accuracy class 0.2 (VA)	15	-
Maximal rated power for accuracy class 0.5 (VA)	50	50/15
Maximal rated power for accuracy class 1 (VA)	100	75/25
Rated tertiary power (VA)	25; 50; 100	
Rated tertiary accuracy class	3P; 6P	
Rated voltage factor	1.9/8h	
Additional resistance in the tertiary circuit (W)	25	
Limiting thermal power (VA)	400	400/200
Creeping distance (mm)	535	
Mass (kg)	27.5	28
Temperature insulation class	E/B	
Type of basic insulation	Epoxy resin	
Valid standards	IEC 61869-1; IEC 61869-3	

NOTE:

These transformers we can produce also for the following rated voltages: 3/ $\sqrt{3}$; 5/ $\sqrt{3}$; 6/ $\sqrt{3}$; 11/ $\sqrt{3}$; 15/ $\sqrt{3}$ and 22/ $\sqrt{3}$. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor.

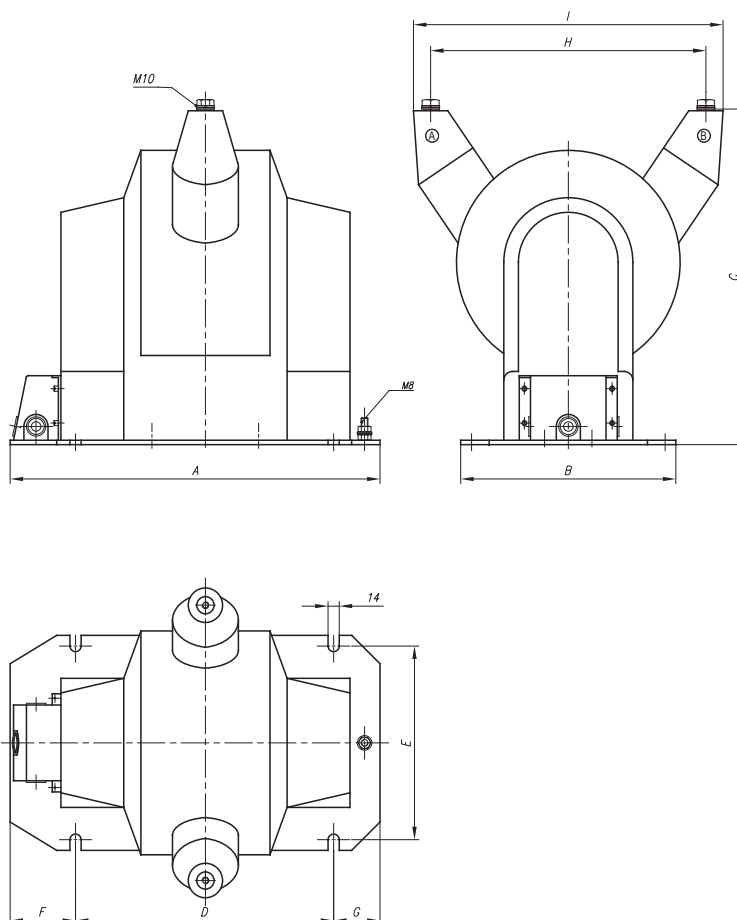
Due to the prevention of ferroresonant phenomenon, when 3 single-pole voltage transformers are used in networks with an isolated neutral point, it is necessary to put additional resistance in their open triangle tertiary circuit. The resistance value is given in the table.

Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering. We keep the right for a change.

DNT-12, DNTm1-24, DNT-24, DNT-24/12, DNT-36



DNT-12



TWO-POLE VOLTAGE TRANSFORMERS FOR INDOOR MOUNTING DNT-*

Type of transformer	Dimensions (mm)								
	A	B	C	D	E	F	G	H	I
DNT-12	355	180	246	190	155	93	72	150	198
DNTm1-24	355	180	300	190	155	93	72	210	246
DNT-24	375	200	300	210	175	93	72	210	246
DNT-24/12	375	200	300	210	175	93	72	210	246
DNT-36	430	250	397	300	225	76	54	320	364

TECHNICAL DATA	DNT-12	DNTm1-24	DNT-24	DNT-24/12	DNT-36
Rated primary voltage (kV)	10	20	20	20/10	35
Highest voltage for equipment (r.m.s.) (kV)	12	24	24	24	38(36)
Rated secondary voltage (V)	100 or 110				
Rated power-frequency withstand voltage (kV)	28	50	50	50	70
Rated impulse voltage 1.2/50 μ s (kV)	75	125	125	125	170
Rated frequency (Hz)	50/60				
Maximal rated power for accuracy class 0.2 (VA)	25	15	30	30/10	30
Maximal rated power for accuracy class 0.5 (VA)	75	50	75	75/25	100
Maximal rated power for accuracy class 1 (VA)	150	100	150	150/50	200
Rated voltage factor	1.2 permanently				
Limiting thermal power (VA)	600	400	600	600/300	800
Mass (kg)	27.4	28	34.5	35.5	58
Temperature insulation class	E/B				
Type of basic insulation	Epoxy resin				
Valid standards	IEC 61869-1; IEC 61869-3				

NOTE:

Voltage transformer DNTm1-24 is subtype with reduced rated power and smaller dimensions so it is convenient for smaller cells.

These transformers we can produce also for the following rated voltages: 3; 5; 6; 11; 15; 22 and 30 kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor.

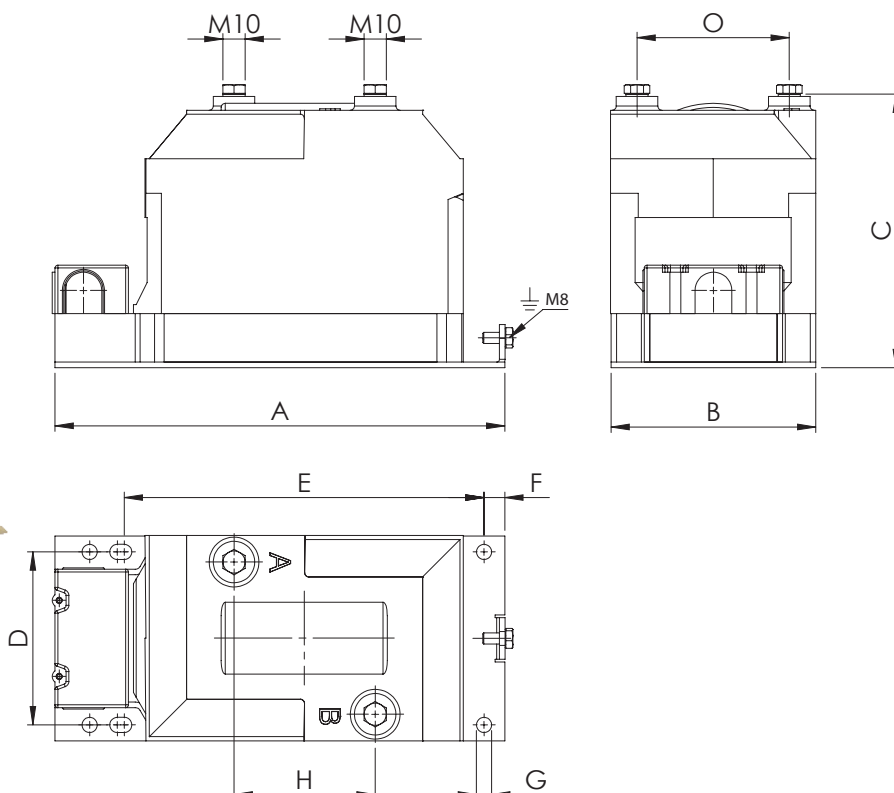
Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering.

We keep the right for a change.

RZL 10, RZL 20, RZL 20/10



RZL 10



TWO-POLE VOLTAGE TRANSFORMERS FOR INDOOR MOUNTING 12-24 kV

Type of transformer	Dimensions (mm)									Mass (kg)
	A	B	C	D	E	F	G	H	O	
RZL 10	325	148	200	125	260	15	11	102	110	~18.5
RZL 20	351	178	230	150	275	20	14	165	130	~25
RZL 20/10	351	178	230	150	275	20	14	165	130	~26

TECHNICAL DATA	RZL 10	RZL 20	RZL 20/10
Rated primary voltage (kV)	10	20	20/10
Highest voltage for equipment (r.m.s.) (kV)	12	24	
Rated secondary voltage (V)	100; 110 or 230		
Rated power-frequency withstand voltage (kV)	28 (42)	50 (65)	
Rated impulse voltage 1.2/50 μs (kV)	75	125	
Rated frequency (Hz)	50/60		
Maximal rated power for accuracy class 0.2 (VA)	10	15	10(5)
Maximal rated power for accuracy class 0.5 (VA)	30	50	30(15)
Maximal rated power for accuracy class 1 (VA)	100	120	120(50)
Rated voltage factor	1.2 x Un / permanently		
Limiting thermal power (VA)	400		
Temperature insulation class	E		
Type of basic insulation	Epoxy resin		
Valid standards	IEC 61869-1; IEC 61869-3 (ГОСТ 1983)		

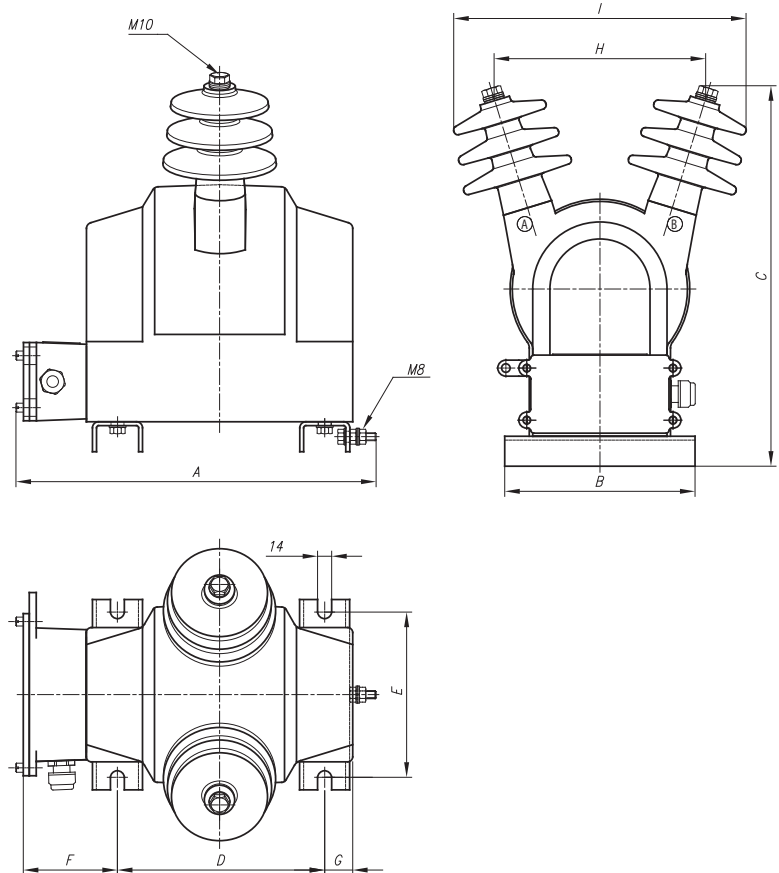
NOTE:

These transformers we can produce also for the following rated voltages: 3; 5; 6; 11; 15 and 22 kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor. Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering. We keep the right for a change.

**DNT SM-17.5, DNT SM-24, DNT SM-24/12, DNT SM-36,
DNT SM-36S, DNT SM-36-8R, DNT SM-36-10R**



DNT SM-12



TWO-POLE VOLTAGE TRANSFORMERS FOR OUTDOOR MOUNTING **DNT SM-***

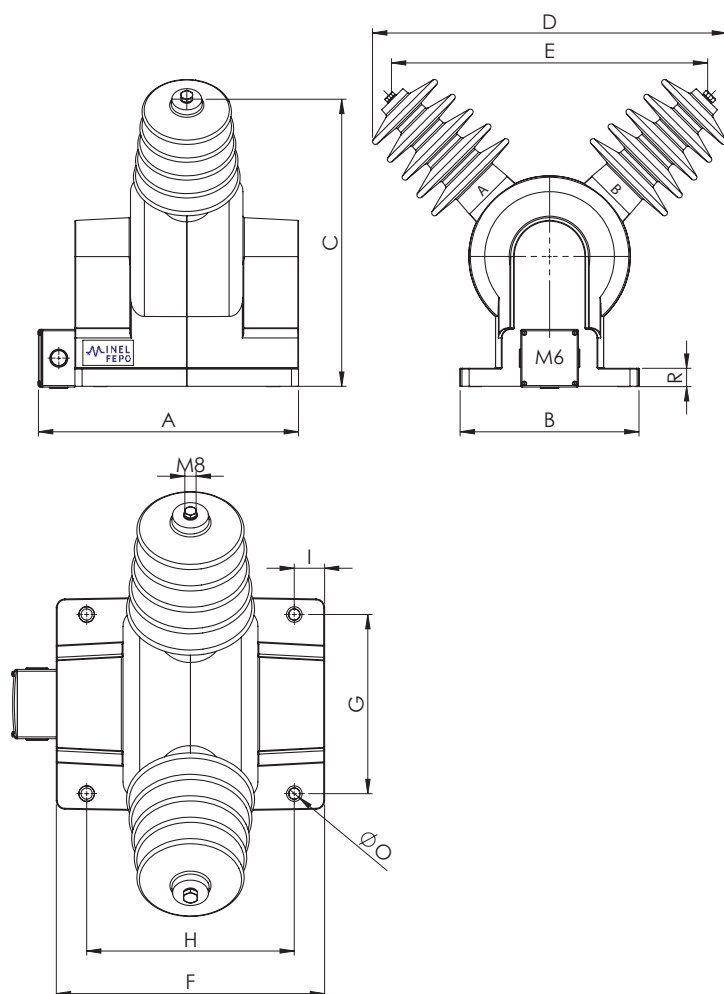
Type of transformer	Dimensions (mm)									Number of ribs	Creeping distance (mm)
	A	B	C	D	E	F	G	H	I		
DNT SM-17.5	360	190	367	207	165	94	28	210	292	3	500
DNT SM-24	373	190	449	220	165	94	31	320	406	4	650
DNT SM-24/12	373	190	449	220	165	94	31	320	406	4	650
DNT SM-36	425	225	551	270	200	96	33	430	520	5	900
DNT SM-36s	410	225	506	260	200	91	28	430	515	6	900
DNT SM-36-8R	425	225	613	270	200	96	33	490	573	8	1152
DNT SM-36-10R	425	225	676	270	200	96	33	536	613	10	1320

TECHNICAL DATA	DNT SM-17.5	DNT SM-24	DNT SM-24/12	DNT SM-36	DNT SM-36s	DNT SM-36-8R	DNT SM-36-10R
Rated primary voltage (kV)	15(10)	20	20/10	35	35	35	35
Highest voltage for equipment (r.m.s.) (kV)	17.5(12)	24	24	38	38	40.5	40.5
Rated secondary voltage (V)	100 or 110						
Rated power-frequency withstand voltage (kV)	38(28)	50	50	70	70	80	80
Rated impulse voltage 1.2/50 μ s (kV)	95(75)	125	125	170	170	190	190
Rated frequency (Hz)	50/60						
Maximal rated power for accuracy class 0.2 (VA)	25	30	30/10	30	30	30	30
Maximal rated power for accuracy class 0.5 (VA)	75	75	75/25	100	100	100	100
Maximal rated power for accuracy class 1(VA)	150	150	150/50	200	200	200	200
Rated voltage factor	1.2 permanently						
Limiting thermal power (VA)	600	600	600/300	800	800	800-1200	800-1200
Mass (kg)	27.6	36	37	60	53	63	66
Temperature insulation class	E/B						
Type of basic insulation	Epoxy resin						
Valid standards	IEC61869-1; IEC61869-3						

NOTE:

These transformers we can produce also for the following rated voltages: 3; 5; 6.3; 11; 15; 22 and 30 kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor. Please state rated voltages for primary and secondary winding, rated power and accuracy class for each winding when ordering. We keep the right for a change.
* - valid for all models of that type.

NTDSM-12, NTDSM-24, NTDSM-24/12



NTDSM 24

TWO-POLE VOLTAGE TRANSFORMERS FOR OUTDOOR MOUNTING 12-24 kV

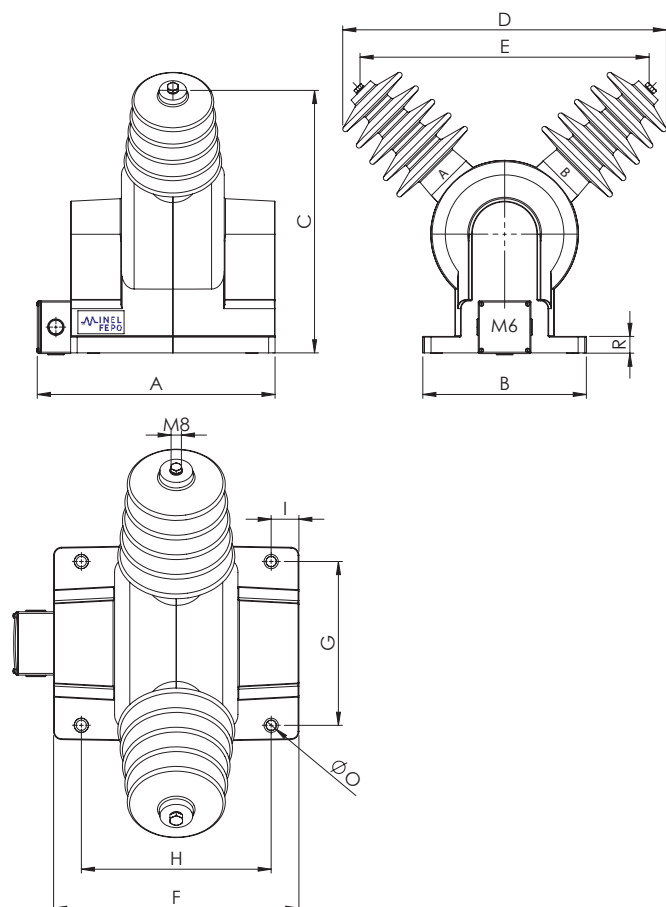
Type of transformer	Dimensions (mm)											Mass (kg)
	A	B	C	D	E	F	G	H	I	O	R	
NTDSM-12	320	220	315	370	303	270	183	215	27.5	13	25	~32
NTDSM-24	350	242	430	449	368	300	207	240	30	13	25	~48
NTDSM-24/12	350	242	430	449	368	300	207	240	30	13	25	~49

TECHNICAL DATA	NTDSM-12	NTDSM-24	NTDSM-24/12
Rated primary voltage (kV)	10	20	20/10
Highest voltage for equipment (r.m.s.) (kV)	12	24	
Rated secondary voltage (V)	100; 110 or 230		
Rated power-frequency withstand voltage (kV)	28 (42)	50 (65)	
Rated impulse voltage 1.2/50 μs (kV)	75	125	
Rated frequency (Hz)	50/60		
Maximal rated power for accuracy class 0.2 (VA)	15	15	10(5)
Maximal rated power for accuracy class 0.5 (VA)	75	75	30(15)
Maximal rated power for accuracy class 1 (VA)	150	150	120(50)
Rated voltage factor	1.2 permanently		
Limiting thermal power (VA)	600		
Temperature insulation class	F		
Type of basic insulation	Cycloaliphatic resin		
Valid standards	IEC 61869-1; IEC 61869-3 (ГОСТ 1983)		

NOTE:

These transformers we can produce also for the following rated voltages: 3; 5; 6; 11; 15 and 22 kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class, rated power and voltage factor. Please state rated voltages for primary and secondary winding, rated power and accuracy class when ordering. We keep the right for a change.

NTDSM-0,63-12, NTDSM-1,25-12 NTDSM-0,63-24, NTDSM-1,25-24



NTDSM 0,63-12

TWO-POLE VOLTAGE TRANSFORMERS FOR OUTDOOR MOUNTING 12-24 kV

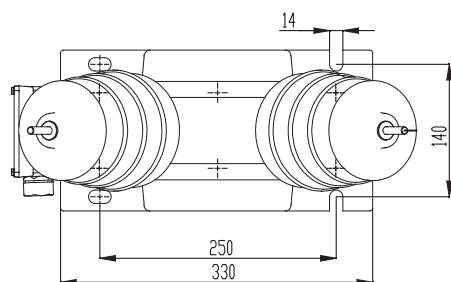
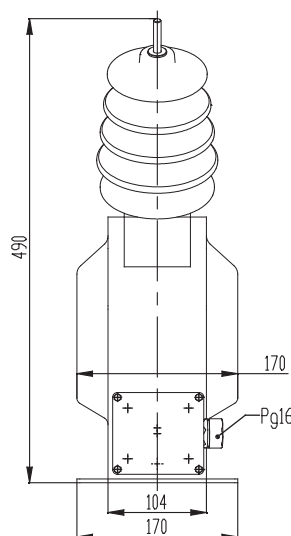
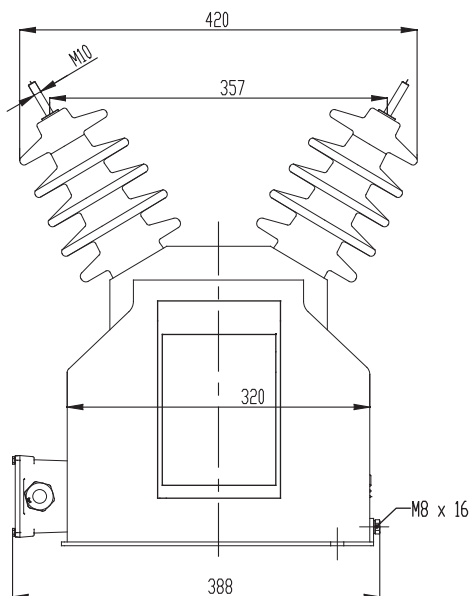
Type of transformer	Dimensions (mm)											Mass (kg)
	A	B	C	D	E	F	G	H	I	O	R	
NTDSM-0,63-12	320	220	315	370	303	270	183	215	27,5	13	25	~32
NTDSM-1,25-12	320	220	315	370	303	270	183	215	27,5	13	25	~34
NTDSM-0,63-24	350	242	430	449	368	300	207	240	30	13	25	~48
NTDSM-1,25-24	350	242	430	449	368	300	207	240	30	13	25	~50

TECHNICAL DATA	NTDSM-0,63-12	NTDSM-1,25-12	NTDSM-0,63-24	NTDSM-1,25-24
Rated primary voltage (kV)	3; 6; 10		10; 15; 20	
Highest voltage for equipment (r.m.s.) (kV)	12		24	
Rated secondary voltage (V)	218; 224; 230; 236; 242			
Rated power-frequency withstand voltage (kV)	28		50	
Rated impulse voltage 1.2/50 μs (kV)	75		125	
Rated frequency (Hz)	50/60			
Rated power (VA)	630		1250	
No load losses (W)	50		50	
Short-circuit voltage (%)	4,5		4,5±10	
Load losses (W)	55		50	
Rated voltage factor	1.2 x Un / permanently			
Temperature insulation class	E			
Type of basic insulation	Cycloaliphatic resin			
Valid standards	IEC 61869-1; IEC 61869-3 (ГОСТ 1983)			

NOTE:

These transformers we can produce also for the following rated voltages: 3; 5; 6; 11; 15 and 22 kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class and rated power. Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering. We keep the right for a change.

NTDSM-24h, NTDSM-24/12h



NTDSM-24h

TWO-POLE VOLTAGE TRANSFORMERS FOR OUTDOOR MOUNTING **NTDSM-***

TECHNICAL DATA	NTDSM-24h	NTDSM-24/12h
Rated primary voltage (kV)	20	20/10
Highest voltage for equipment (r.m.s.) (kV)	24	24
Rated secondary voltage (V)	100, 110 or 230	
Rated power-frequency withstand voltage (kV)	50	50
Rated impulse voltage 1.2/50 μ s (kV)	125	125
Rated frequency (Hz)	50/60	
Maximal rated power for accuracy class 0.2 (VA)	30	30/10
Maximal rated power for accuracy class 0.5 (VA)	75	75/25
Maximal rated power for accuracy class 1 (VA)	150	150/50
Rated voltage factor	1.2 permanently	
Limiting thermal power (VA)	600	600/300
Mass (kg)	36	37
Temperature insulation class	E/B	
Type of basic insulation	Epoxy resin	
Valid standards	IEC 61869-1; IEC 61869-3	

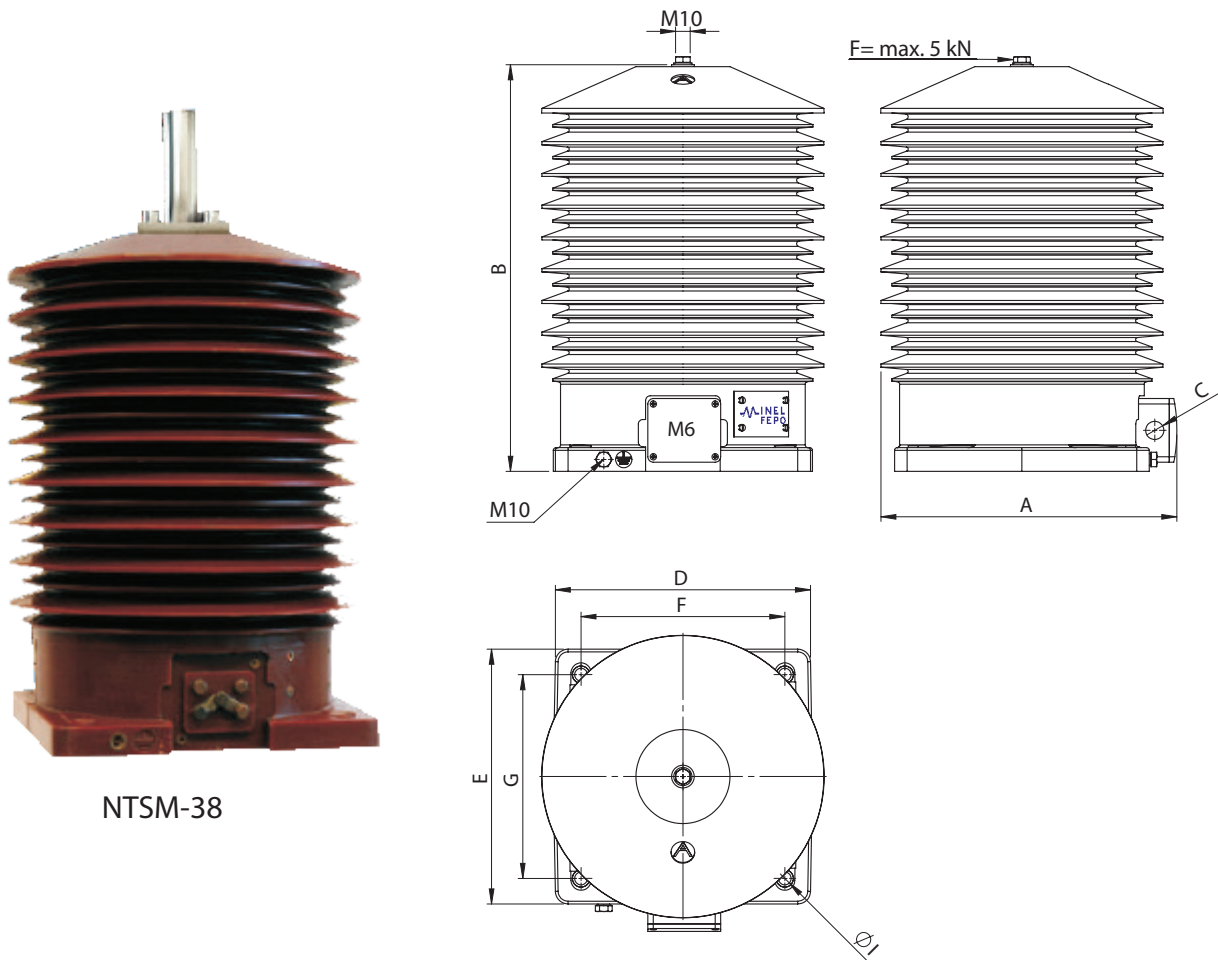
NOTE:

These transformers we can produce also for the following rated voltages: 3; 5; 6; 6.3; 10; 11; 15; 17.5; and 22 kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class and rated power.

Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering.

We keep the right for a change.

NTSM-12, NTSM-24, NTSM-38



NTSM-38

SINGLE POLE VOLTAGE TRANSFORMERS FOR OUTDOOR MOUNTING 12-42 kV

Type of transformer	Dimensions (mm)								Mass (kg)
	A	B	C	D	E	F	G	I	
NTSM-12	315	372	Pg16	280	276	224	224	14	~40
NTSM-24	315	450	Pg16	280	276	224	224	14	~58
NTSM-38	315	520	Pg16	280	276	224	224	14	~72

NOTE:

These transformers we can produce also for the following rated voltages: $3/\sqrt{3}$; $5/\sqrt{3}$; $6/\sqrt{3}$; $11/\sqrt{3}$; $15/\sqrt{3}$; $22/\sqrt{3}$ and $30/\sqrt{3}$ kV. On the customer's request we are able to produce these transformers with other combinations of transformation ratios, accuracy class and rated power.

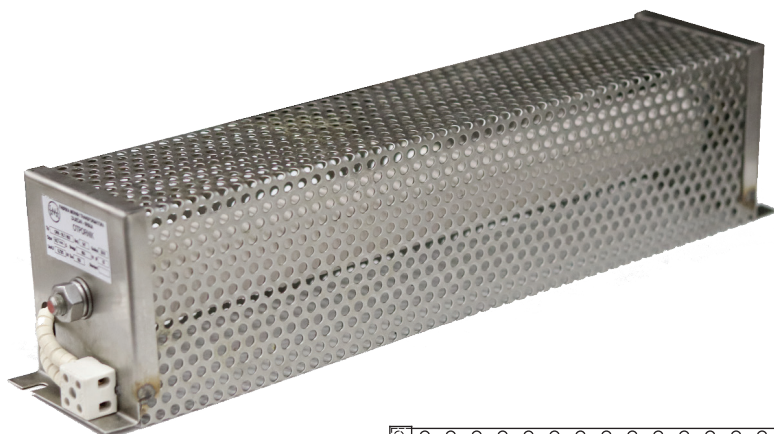
Please state rated voltages for primary, secondary and tertiary winding, rated power and accuracy class for each winding when ordering.

We keep the right for a change.

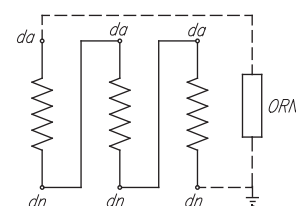
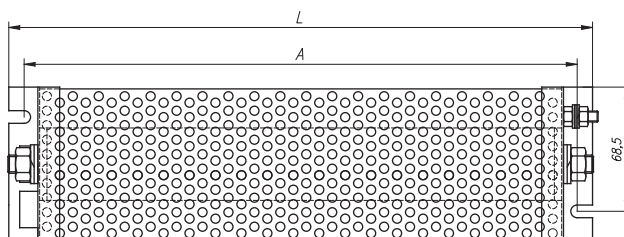
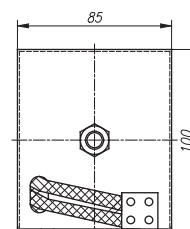
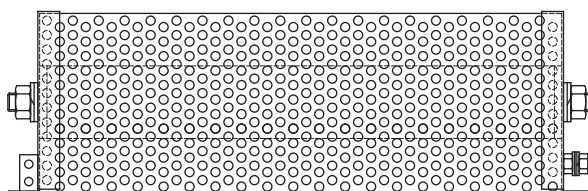
TECHNICAL DATA	NTSM-12	NTSM-24	NTSM-38
Rated primary voltage (kV)	10/ $\sqrt{3}$	20/ $\sqrt{3}$	35/ $\sqrt{3}$
Highest voltage for equipment (r.m.s.) (kV)	12	24	36 (42)
Rated secondary voltage (V)	100/ $\sqrt{3}$ or 110/ $\sqrt{3}$		
Rated tertiary voltage (V)	100/3 or 110/3		
Rated power-frequency withstand voltage (kV)	28 (42)	50 (65)	70 (95)
Rated impulse voltage 1.2/50 μ s (kV)	75	125	170 (190)
Rated frequency (Hz)	50/60		
Maximal rated power for accuracy class 0.2 (VA)	15	15	20
Maximal rated power for accuracy class 0.5 (VA)	50	50	75
Maximal rated power for accuracy class 1 (VA)	100	120	150
Rated tertiary power (VA)	10-50		
Rated tertiary accuracy class	3P; 6P		
Rated voltage factor	1.9 / 8h		
Additional resistance in the tertiary circuit (W)	25		
Limiting thermal power (VA)	600		
Temperature insulation class	F		
Type of basic insulation	Cycloaliphatic resin		
Valid standards	IEC 61869-1; IEC 61869-3 (ГОСТ 1983)		



ORN



ORN-25/400



Resistor to suppress ferroresonance
(Connection to open delta tertiary circuit)

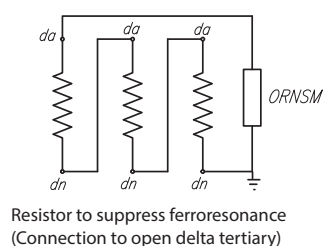
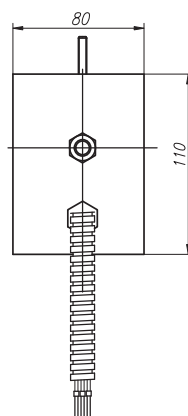
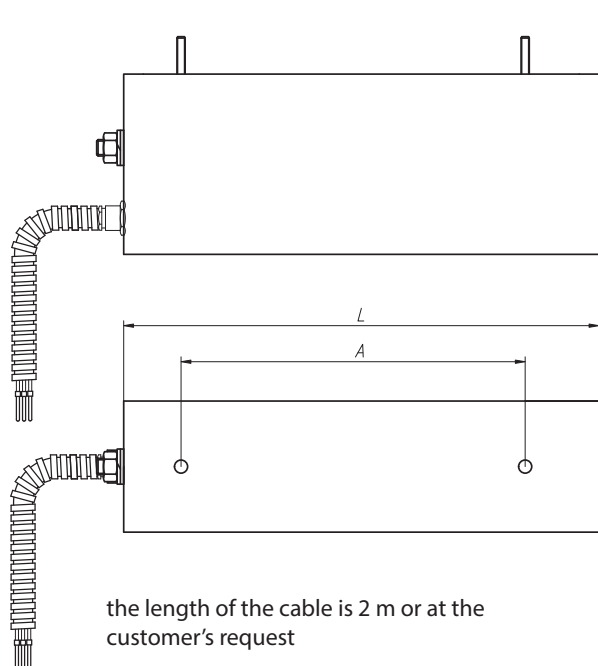
FERRORESONANCE PREVENTING RESISTOR - ORN

Type of the resistor	For voltage transformers FMT	Power (W)	Resistance (Ω)	L(mm)	A(mm)
ORN-25/400	10 i 20 kV	400W	25 Ω	322	305
ORN-16.7/600	35 kV	600W	16.7 Ω	432	415

NOTE:

Due to the prevention of ferroresonant phenomenon, when 3 single-pole voltage transformers are used in networks with an isolated neutral point, it is necessary to put additional resistance in their open triangle tertiary circuit. The resistance value is 25 Ω ; 400W for transformers at 10 and 20kV, and for 35 kV the resistor of (16- 20) Ω ; 600 W. That will reduce the risk of ferroresonance occurring.

ORN SM



FERRORESONANCE PREVENTING RESISTOR FOR OUTDOOR MOUNTING – ORN SM

Type of the resistor	For voltage transformers FMT	Power (W)	Resistance (Ω)	L(mm)	A(mm)
ORN SM-25/400	10 and 20 kV	400W	25Ω	290	210
ORN SM-16.7/600	35 kV	600W	16.7Ω	400	320

NOTE:

Due to the prevention of ferroresonant phenomenon, when 3 single-pole voltage transformers are used in networks with an isolated neutral point, it is necessary to put additional resistance in their open triangle tertiary circuit. The resistance value is 25Ω; 400W for transformers at 10 and 20kV, and for 35 kV the resistor of (16- 20) Ω; 600 W. That will reduce the risk of ferroresonance occurring.

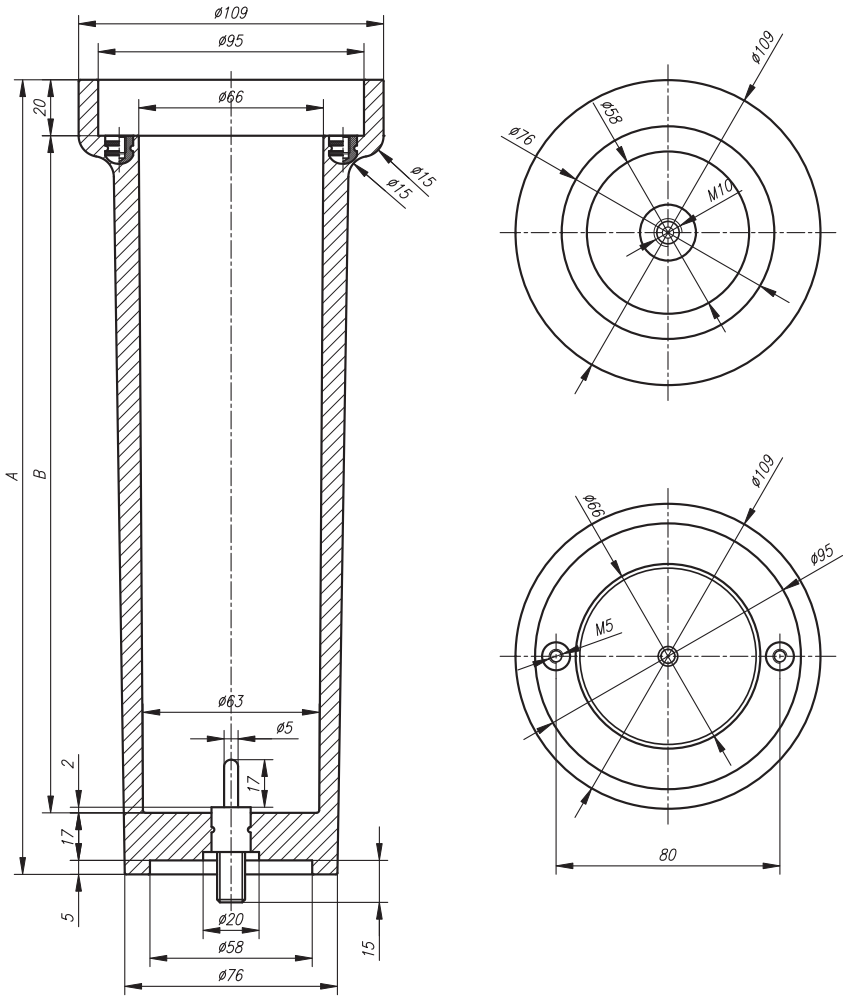
We always put these resistors in the three-pole power measuring assemblies without any special requests.



FT-*



FT-12

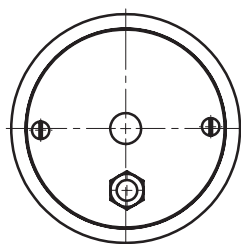
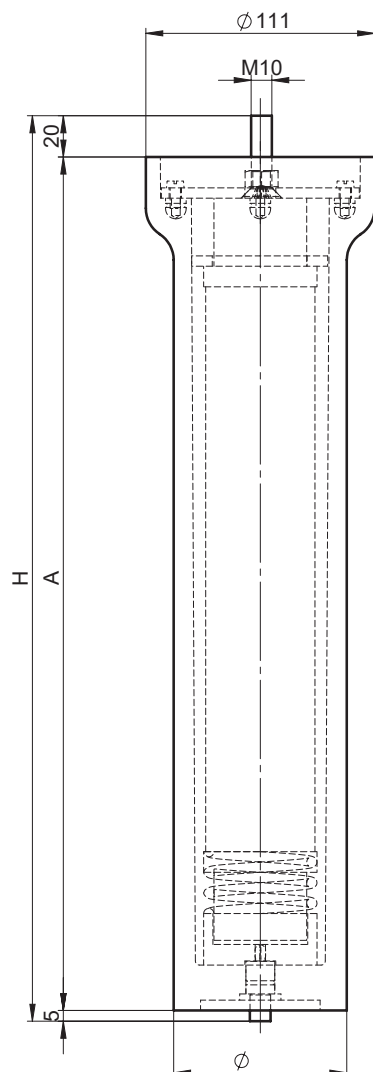


FUSE ENCLOSURES FT-*

Type of enclosure	Rated voltage (kV)	A (mm)	B (mm)	Fuse dimensions (mm)	Mass of the enclosure without the fuse (kg)
FT-12	10	179	137	Ø60x160	0.8
FT-24	20	284	242	Ø60x265	1.06
FT-36	35	380	338	Ø60x358	1.44

NOTE:
Fuse enclosure FT can be mounted on the voltage transformer in vertical or in horizontal position with the additional part which we deliver along with it. We deliver these enclosures upon the customer's request with or without the fuse.

VVC-*



KO VVC36kV

FUSE ENCLOSURES VVC-*

Type of enclosure	Rated voltage (kV)	A (mm)	H (mm)	Fuse dimensions (mm)	Mass of the enclosure without the fuse (kg)
KO VVC12kV	10	314	339	$\varnothing 53 \times 192$	1.93
KO VVC24kV	20	414	439	$\varnothing 53 \times 292$	2.33
KO VVC36kV	35	564	589	$\varnothing 53 \times 442$	2.88

NOTE:

Fuse enclosure VVC can be mounted on the voltage transformer only in vertical position. We deliver these enclosures upon the customer's request with or without the fuse.



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