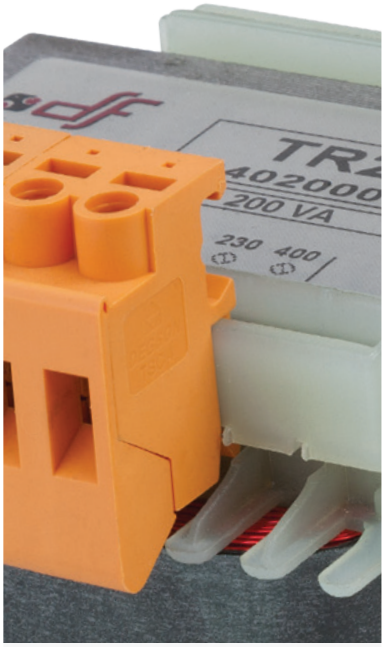
TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS



TRANSFORMERS

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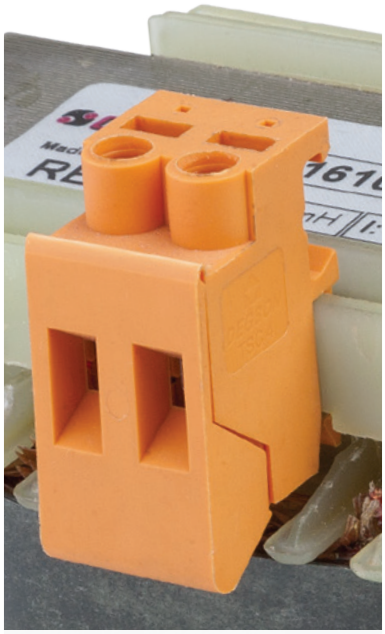
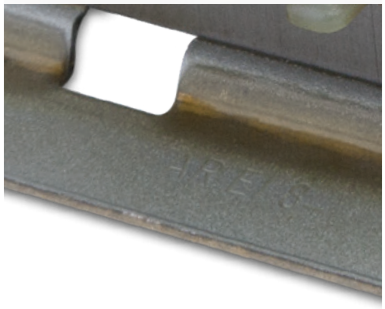




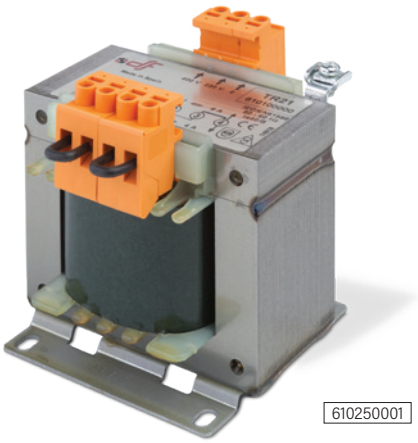
TR21 Control SINGLE-PHASE transformer

Control and safety or isolating single-phase transformers. They can supply high instantaneous power necessary for the correct operation of contactors and other switch and control gear. Great flexibility due to the double primary voltage and the serial-parallel connection. TIG welding in the core and the base-plates that prevent vibrations and noise. Fast and easy connection due to the clamp type terminal blocks.

TR21

PRI VOLTAGE	0-230-400V
SEC VOLTAGE	12-24V 24-48V 115-230V

POWER (VA)	INSTANT. POWER (VA)	REFERENCE 12 - 24V	24 - 48V	115 - 230V
40	75	**610040000**	**610040001**	**610040002**
63	140	**610063000**	**610063001**	**610063002**
100	220	**610100000**	**610100001**	**610100002**
160	380	**610160000**	**610160001**	**610160002**
200	450	**610200000**	**610200001**	**610200002**
250	650	**610250000**	**610250001**	**610250002**
320	850	**610320000**	**610320001**	**610320002**
400	1000	**610400000**	**610400001**	**610400002**
500	1400	**610500000**	**610500001**	**610500002**
630	1600	**610630000**	**610630001**	**610630002**
800	2400	**610800000**	**610800001**	**610800002**
1000	3300	**611000000**	**611000001**	**611000002**



610250001

STANDARDS

IEC 61558-1 EN 61558-1
IEC 61558-2-2 EN 61558-2-2
IEC 61558-2-4 EN 61558-2-4
IEC 61558-2-6 EN 61558-2-6

DIMENSIONS TECHNICAL DATA SECONDARY CONNECTION PAG 16

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TR22 Power SINGLE-PHASE transformer

Single-phase power isolating transformers dry type. Intended for change of voltages with galvanic isolation and/or attenuation of line disturbances. Manufactured with electrical steel with low losses and copper windings. On request we can manufacture transformers with other voltages, with taps, electrostatic screen, with thermal switch, etc.

TR22

PRI VOLTAGE	230V
SEC VOLTAGE	230V
OTHER CHARACTERISTICS ON REQUEST	

POWER (kVA)	REFERENCE TR22 IP00	TR22 IP23
1,3	62N0013000	62C0013000
1,6	62N0016000	62C0016000
2,0	62N0020000	62C0020000
2,5	62N0025000	62C0025000
3,0	62N0030000	62C0030000
3,5	62N0035000	62C0035000
4,0	62N0040000	62C0040000
5,0	62N0050000	62C0050000
6,3	62N0063000	62C0063000
8,0	62N0080000	62C0080000
10	62N0100000	62C0100000
12,5	62N0125000	62C0125000
16	62N0160000	62C0160000
20	62N0200000	62C0200000
25	62N0250000	62C0250000
31,5	62N0315000	62C0315000

62N0250000

ACCESSORIES

DESCRIPTION	REFERENCE
WHEELS KIT (max 200 kg/wheel)	690000005

STANDARDS	DIMENSIONS TECHNICAL DATA	PROTECTION GUIDE	IP PROTECTION INDEX
IEC 60076-11	PAG 17	PAG 31	PAG 33

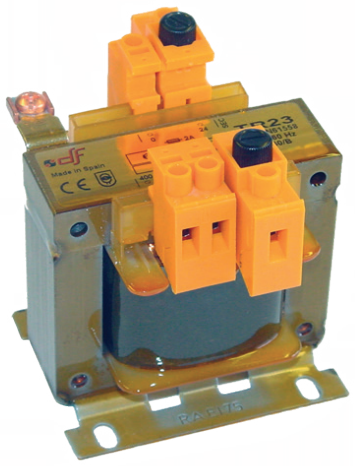
TR23 Customer design SINGLE-PHASE transformer

Single-phase special transformers manufactured on request (customer design). These transformers can be manufactured with fuse holders, thermal protectors, electrostatic screen. TIG welding in the core and the base-plates that prevent vibrations and noise. Fast and easy connection due to the clamp type terminal blocks that are delivered open.

TR23

PRI VOLTAGE	ON REQUEST
SEC VOLTAGE	ON REQUEST

POWER (VA)
10-12-16-20
25-30
40
50
63
100
160
200
250
320
400
500
630
800
1000



STANDARDS	DIMENSIONS TECHNICAL DATA	PROTECTION GUIDE	IP PROTECTION INDEX
IEC 61558 EN 61558	PAG 18	PAG 31	PAG 33

TR26 TR26H

Safety for swimming-pool SINGLE-PHASE transformer

Single-phase safety transformers intended to supply spotlights in swimming-pools, garden ponds, ornamental fountains and moist locations, where for safety reasons it is necessary to supply with safety extra low voltage (SELV). It has several taps in the primary winding in order to compensate for the voltage drop in the transformer-spotlight line conductors and thus gets an adequate brightness in every spotlight. On request we can manufacture transformers with other rated power or voltages, or with other line lengths between transformers and spotlights.

TR26

PRI VOLTAGE	230V
SEC VOLTAGE	12V

	POWER (VA)	REFERENCE	FOR SPOTLIGHT	DISTANCES TRANSFORMER SPOTLIGHT
TR26 IP20	130	**660130000**	1x12V 100W	10-18-25 m
	350	**660350000**	1x12V 300W	10-25-40 m
	700	**660700000**	2x12V 300W	10-25-40 m
TR26 IP00	130	**660130001**	1x12V 100W	10-18-25 m
	350	**660350001**	1x12V 300W	10-25-40 m
	700	**660700001**	2x12V 300W	10-25-40 m
TR26H IP20	350	**660350010**	1x12V 300W	8-18-25 m (6 mm² WIRE SIZE) 10-25-40 m (10 mm² WIRE SIZE)
TR26 for LED spotlights	30	**660030001**	18W	
	63	**660063001**	38W	
	100	**660100001**	60W	

660350000

660063001

660030001

STANDARDS
IEC 61558-1
IEC 61558-2-6
EN 61558-1
EN 61558-2-6

DIMENSIONS
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TECHNICAL DATA
PAG 19
PAG 20

PROTECTION GUIDE
PAG 31

IP PROTECTION INDEX
PAG 33

TR28 2.2 Control and safety or isolating SINGLE-PHASE transformer

Control and safety or isolating single-phase transformers. They can supply high instantaneous power necessary for the correct operation of contactors and other switch and control gear. IP20 protection index (finger safe). For mounting on DIN/EN rail up to 320 VA. Fast and easy connection due to the high capacity clamp type terminal blocks.

TR28 2.2

PRI VOLTAGE: **0-230-400V**

SEC VOLTAGE: **12-24V 24-48V 115-230V**

OTHER CHARACTERISTICS ON REQUEST

POWER (VA) t_a 40°C	POWER (VA) t_a 25°C	INSTANT. POWER (VA)	REFERENCE 12-24V	REFERENCE 24-48V	REFERENCE 115-230V
25	35	45	**680025043**	**680025044**	**680025045**
40	50	90	**680040043**	**680040044**	**680040045**
63	100	150	**680063043**	**680063044**	**680063045**
100	130	230	**680100043**	**680100044**	**680100045**
160	200	350	**680160043**	**680160044**	**680160045**
200	250	450	**680200043**	**680200044**	**680200045**
250	320	600	**680250043**	**680250044**	**680250045**
320	400	800	**680320043**	**680320044**	**680320045**
400	500	950	**680400043**	**680400044**	**680400045**
500	630	1275	**680500043**	**680500044**	**680500045**
630	800	1700	**680630043**	**680630044**	**680630045**
800	1000	2100	**680800043**	**680800044**	**680800045**
1000	1250	3300	**681000043**	**681000044**	**681000045**
1300	1600	4300	-	**681300044**	**681300045**
1600	2000	5200	-	**681600044**	**681600045**
2000	2500	6800	-	**682000044**	**682000045**
2500	3000	8250	-	**682500044**	**682500045**
3000	3500	9800	-	**683000044**	**683000045**


680040043


680100043


681300044

t_a maximum ambient temperature

STANDARDS

IEC 61558-1 EN 61558-1
IEC 61558-2-2 EN 61558-2-2
IEC 61558-2-4 EN 61558-2-4
IEC 61558-2-6 EN 61558-2-6

DIMENSIONS TECHNICAL DATA SECONDARY CONNECTION PAG 21

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PROTECTION GUIDE PAG 31

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TR28 5.2

Control and safety or isolating SINGLE-PHASE transformer

Control and safety or isolating single-phase transformers. They can supply high instantaneous power necessary for the correct operation of contactors and other switch and control gear. IP20 protection index (finger safe). For mounting on DIN/EN rail up to 320 VA. Great flexibility due to the several primary rated voltages with regulation taps ±15V and the serial-parallel secondary connection. Fast and easy connection due to the high capacity clamp type terminal blocks.

TR28
5.2

PRI VOLTAGE	0-230-400V -460V ±15V
SEC VOLTAGE	12-24V 24-48V 115-230V

POWER (VA) t_a 40°C	POWER (VA) t_a 25°C	INSTANT. POWER (VA)	REFERENCE 12-24V	REFERENCE 24-48V	REFERENCE 115-230V
25	40	75	**680025010**	**680025011**	**680025012**
40	63	120	**680040010**	**680040011**	**680040012**
63	100	150	**680063010**	**680063011**	**680063012**
100	130	230	**680100010**	**680100011**	**680100012**
160	200	350	**680160010**	**680160011**	**680160012**
200	250	450	**680200010**	**680200011**	**680200012**
250	320	600	**680250010**	**680250011**	**680250012**
320	400	800	**680320010**	**680320011**	**680320012**
400	500	950	**680400010**	**680400011**	**680400012**
500	630	1275	**680500010**	**680500011**	**680500012**
630	800	1700	**680630010**	**680630011**	**680630012**
800	1000	2100	**680800010**	**680800011**	**680800012**
1000	1250	3300	**681000010**	**681000011**	**681000012**

t_a maximum ambient temperature


680250012


680500010


681000011

STANDARDS

IEC 61558-1 EN 61558-1
IEC 61558-2-2 EN 61558-2-2
IEC 61558-2-4 EN 61558-2-4
IEC 61558-2-6 EN 61558-2-6

DIMENSIONS TECHNICAL DATA SECONDARY CONNECTION PAG 22

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IP PROTECTION INDEX PAG 33

TRT33 Power isolating THREE-PHASE transformer

Three-phase power isolating transformers dry type. Intended for change of voltages with galvanic isolation, attenuation of line disturbances and/or when it is necessary to change the neutral system. Connection with terminal blocks or with screws for flats terminals. Manufactured with electrical steel with low losses and copper windings. On request we can manufacture transformers with other voltages, with taps, electrostatic screen, with thermal switch, etc.

TRT33

PRI VOLTAGE	400V
SEC VOLTAGE	230V
OTHER CHARACTERISTICS ON REQUEST	

POWER (kVA)	REFERENCE TRT33 IP00	TRT33 IP23
0,5	73N0005000	73C0005000
1	73N0010000	73C0010000
1,6	73N0016000	73C0016000
2	73N0020000	73C0020000
3,5	73N0035000	73C0035000
4	73N0040000	73C0040000
5	73N0050000	73C0050000
6,3	73N0063000	73C0063000
8	73N0080000	73C0080000
10	73N0100000	73C0100000
12,5	73N0125000	73C0125000
16	73N0160000	73C0160000
20	73N0200000	73C0200000
25	73N0250000	73C0250000
31,5	73N0315000	73C0315000
40	73N0400000	73C0400000
50	73N0500000	73C0500000
63	73N0630000	73C0630000
80	73N0800000	73C0800000
100	73N1000000	73C1000000

73N0035000

73C0035000

ACCESSORIES

DESCRIPTION	REFERENCE
WHEELS KIT (max 200 kg/wheel)	690000005

STANDARDS
IEC 61558
IEC 60076-11
EN 61558

DIMENSIONS TECHNICAL DATA
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PROTECTION GUIDE
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VECTOR GROUPS
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TR24 Reversible SINGLE-PHASE autotransformer

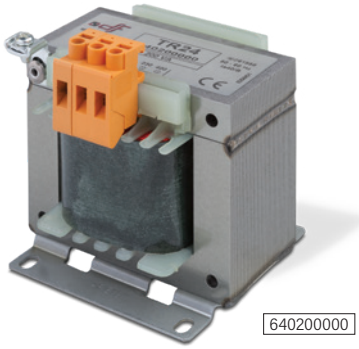
Single-phase reversible autotransformers, especially intended for use as a voltage adapter when an economical solution is required in applications where the galvanic isolation or attenuation of disturbances are not required. On request we can manufacture autotransformers with other voltages, with taps, with thermal switch, etc.

TR24

VOLTAGES **0-230-400V**

OTHER CHARACTERISTICS ON REQUEST

POWER (kVA)	REFERENCE
100	**640100000**
200	**640200000**
320	**640320000**
400	**640400000**
500	**640500000**
630	**640630000**
800	**640800000**
1000	**641000000**
1600	**641600000**
2000	**642000000**
2500	**642500000**
3000	**643000000**
4000	**644000000**
5000	**645000000**
6300	**646300000**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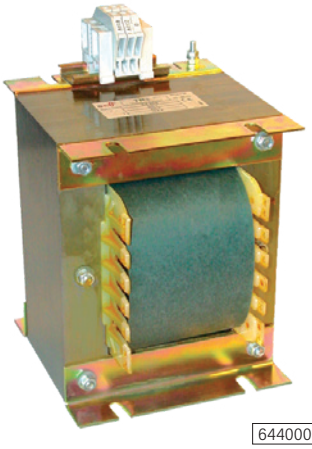
644000000

STANDARDS
IEC 61558
IEC 60076-11
EN 61558

DIMENSIONS TECHNICAL DATA
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PROTECTION GUIDE
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IP PROTECTION INDEX
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TRT30 Reversible dry type THREE-PHASE autotransformer

Three-phase reversible autotransformers, dry type, intended for use as voltage adapter when an economical solution is required in applications where the galvanic isolation or attenuation of disturbances are not required. The main applications include the voltage adaptation in motors, pumps, machines, air conditioning equipment. Connection with terminal blocks or with screws for flat terminals. Manufactured with electrical steel with low losses and copper windings. On request we can manufacture autotransformers with other voltages, with taps, with thermal switch, etc.

TRT30

VOLTAGES **230-400V**

OTHER CHARACTERISTICS ON REQUEST

POWER (kVA)	REFERENCE	
	TRT30 IP00	TRT30 IP23
0,5	70N0005000	70C0005000
1	70N0010000	70C0010000
2	70N0020000	70C0020000
3	70N0030000	70C0030000
5	70N0050000	70C0050000
8	70N0080000	70C0080000
10	70N0100000	70C0100000
12,5	70N0125000	70C0125000
16	70N0160000	70C0160000
20	70N0200000	70C0200000
25	70N0250000	70C0250000
31,5	70N0315000	70C0315000
40	70N0400000	70C0400000
50	70N0500000	70C0500000
63	70N0630000	70C0630000
80	70N0800000	70C0800000
100	70N1000000	70C1000000
125	70N1250000	70C1250000
160	70N1600000	70C1600000
200	70N2000000	70C2000000

70N0630000

70C0630000

ACCESSORIES

DESCRIPTION	REFERENCE
WHEELS KIT (max 200 kg/wheel)	690000005

STANDARDS
IEC 61558
IEC 60076-11
EN 61558

DIMENSIONS TECHNICAL DATA
PAG 25

SELECTION GUIDE
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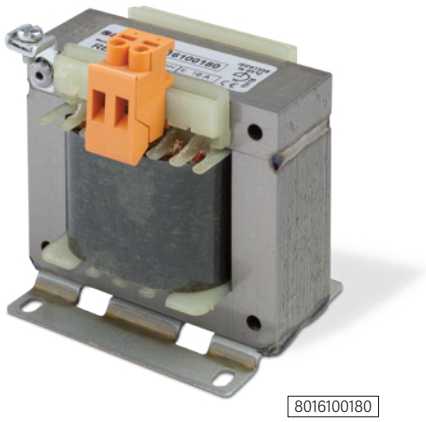
RE8 Line SINGLE-PHASE reactor

Single-phase line reactors (intended for the attenuation of notches and spikes, reduction of harmonics and limitation of inrush currents in power converters and motor drives), as well as DC link chokes for DC side of converters. Manufactured with magnetic steel with low losses and copper windings. On request we can manufacture reactors with other characteristics, for other applications or with thermal switch.

RE8

OTHER CHARACTERISTICS ON REQUEST

CURRENT (A)	L (mH)	REFERENCE
6	4,881	**8006100480**
10	2,928	**8010100290**
16	1,830	**8016100180**
25	1,171	**8025100110**
32	0,915	**8032291500**
40	0,732	**8040273200**
50	0,586	**8050258600**
63	0,465	**8063246500**



8016100180

STANDARDS

IEC 61558
IEC 60076-11
EN 61558

DIMENSIONS TECHNICAL DATA

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IP PROTECTION INDEX

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RET9 Line THREE-PHASE reactor

Three-phase line or motor reactors for power converters (intended for the attenuation of notches and spikes as well as reduction of harmonics and limitation of inrush currents in power converters and motor drives).. Manufactured with electrical steel with low losses and copper windings. On request we can manufacture reactors with other characteristics, with built-in thermal switch, etc.

RET9

OTHER CHARACTERISTICS ON REQUEST

CURRENT (A)	L (mH)	REFERENCE
10	2,928	**9010100290**
16	1,830	**9016100180**
20	1,464	**9020100140**
25	1,171	**9025100110**
32	0,915	**9032291500**
40	0,732	**9040273200**
50	0,586	**9050258600**
63	0,465	**9063246500**
80	0,366	**9080236600**
100	0,293	**9100229300**
125	0,234	**9125223400**
160	0,183	**9160218300**
200	0,146	**9200214600**

STANDARDS

IEC 61558
IEC 60289
EN 61558
EN 60289

DIMENSIONS TECHNICAL DATA

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IP PROTECTION INDEX

PAG 33

RET9 Harmonic circuit filter THREE-PHASE reactor

Three-phase reactors for the protection of capacitor banks in power factor correction equipment with presence of harmonics. Avoids resonance effects, minimizes harmonic currents through the capacitors and reduces the losses, increasing capacitor life. Manufactured ith electrical steel with low losses and copper windings. Built-in thermal switch. On request we can manufacture reactors with other characteristics.

RET9

OTHER CHARACTERISTICS ON REQUEST

POWER (kvar)*	L (mH)	CURRENT (A)		REFERENCE
		I_N 50 Hz	I_N rms	
5	7,67	7,65	8,44	**9008100760**
10	3,83	15,3	16,9	**9015100380**
12,5	3,07	19,1	21,1	**9019100310**
15	2,56	22,9	25,3	**9023100260**
20	1,92	30,6	33,7	**9031100190**
25	1,53	38,2	42,2	**9038100150**
30	1,28	45,9	50,6	**9046100120**
40	0,958	61,2	67,5	**9061295800**
50	0,767	76,5	84,4	**9076276700**
60	0,639	91,8	101,3	**9092263900**
70	0,548	107,1	118,2	**9107254800**
80	0,479	122,4	135,1	**9122247900**

* Effective filtered compensating reactive power

STANDARDS

IEC 61558
IEC 60289
EN 61558
EN 60289

DIMENSIONS TECHNICAL DATA

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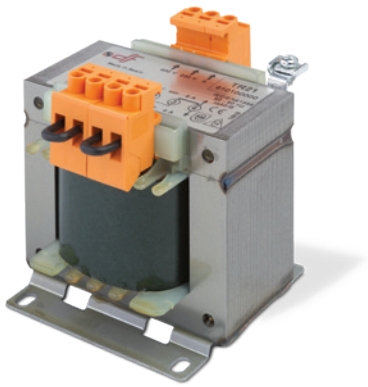
TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TR21

Control
SINGLE-PHASE
transformer



TECHNICAL DATA

PRI VOLTAGE
0-230-400V

SEC VOLTAGE
12-24V
24-48V
115-230V

SEC CONNECTION
SERIAL
PARALLEL

THERMAL CLASS
B

MAX AMBIENT TEMPERATURE
40°C

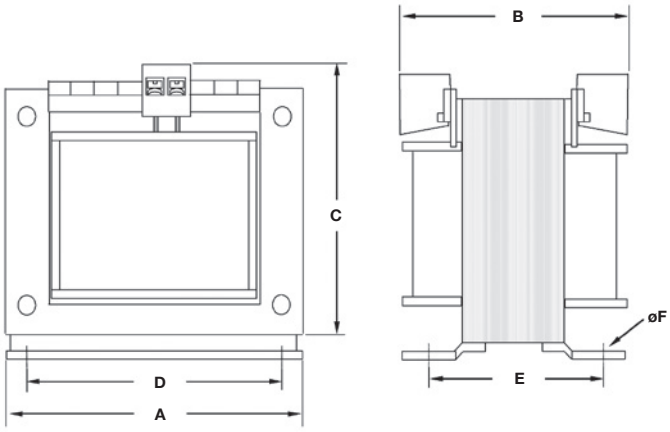
FREQUENCY
50/60Hz

CLASS
I

PROTECTION INDEX
IP00

DIELECTRIC STRENGTH PRI-SEC
> 4kV

DIMENSIONS

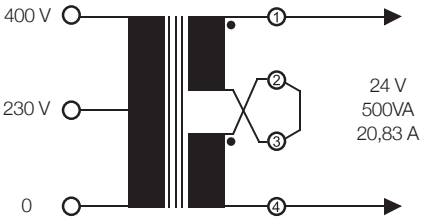


POWER (VA)	DIMENSIONS (mm)						WEIGHT (kg)
	A	B	C	D	E	F	
40	75	83	88	56	47	4,8	1,00
63	84	86	95	64	52	4,8	1,40
100	84	100	95	64	67	4,8	1,96
160	96	102	106	84	77	5,7	2,80
200	96	116	106	84	91	5,7	3,40
250	108	105	115	80,5	73	5,7	3,64
320	108	117	115	80,5	87	5,7	4,54
400	120	110(1)	124(2)	90	87	5,7	5,20
500	120	126(1)	124(2)	90	107	5,7	6,85
630	150	114(1)	146(2)	122	92	6,8	7,50
800	150	133(3)	146(4)	122	108	6,8	10,2
1000	150	156(3)	146 (4)	122	135	6,8	13,6

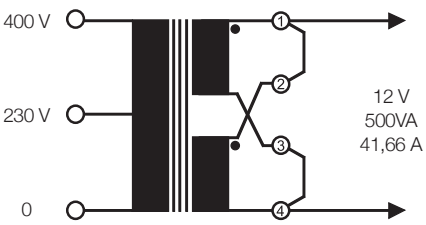
(1) SEC 12V - 24V → + 20mm
(2) SEC 12V - 24V → + 7,5mm
(3) SEC 12V - 24V / SEC 24V - 48V → + 20mm
(4) SEC 12V - 24V / SEC 24V - 48V → + 7,5mm

SECONDARY CONNECTION*

SERIAL CONNECTION



PARALLEL CONNECTION



* TRANSFORMER 230-400 // 12-24V 500VA
REF 610500000

TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TR22

Power
SINGLE-PHASE
transformer

TECHNICAL DATA

PRI VOLTAGE
230V

SEC VOLTAGE
230V

THERMAL CLASS
B – H

MAX AMBIENT TEMPERATURE
40°C

FREQUENCY
50/60Hz

CLASS
I

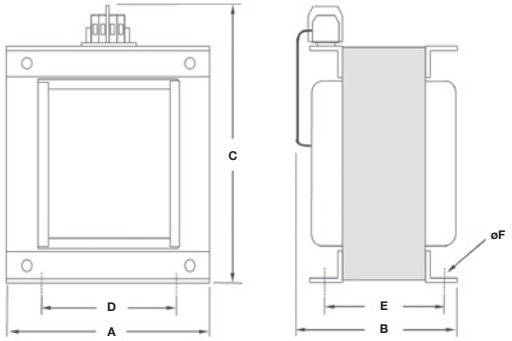
PROTECTION INDEX
IP00 – IP23

DIELECTRIC STRENGTH PRI-SEC
> 4kV

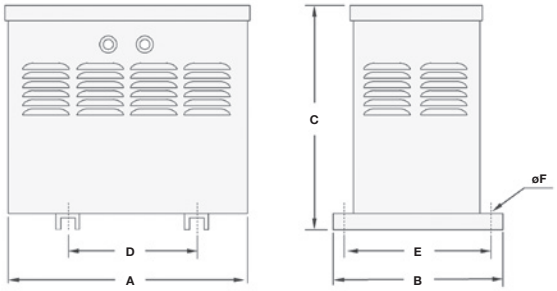
NATURAL AIR COOLING
OTHER CHARACTERISTICS ON REQUEST

DIMENSIONS

TR22 IP00



TR22 IP23



POWER (kVA)	DIMENSIONS (mm)												WEIGHT (kg)	
	A		B		C		D		E		F			
	IP00	IP23	IP00	IP23	IP00	IP23	IP00	IP23	IP00	IP23	IP00	IP23	IP00	IP23
1,3	163	285	160	290	245	335	98	200	115	265	8	12	17,0	21,0
1,6	163	285	165	290	245	335	98	200	120	265	8	12	19,0	23,0
2,0	163	285	175	290	245	335	98	200	130	265	8	12	21,5	25,5
2,5	163	285	195	290	245	335	98	200	150	265	8	12	25,5	29,5
3,0	200	375	200	300	290	435	120	200	140	270	10	12	34,0	41,5
3,5	200	375	210	300	290	435	120	200	150	270	10	12	38,0	45,5
4,0	200	375	220	300	290	435	120	200	160	270	10	12	42,0	49,5
5,0	200	375	240	300	290	435	120	200	180	270	10	12	48,0	55,5
6,3	250	450	250	400	350	480	150	300	180	370	12	12	67,0	75,0
8,0	250	450	270	400	361	480	150	300	200	370	12	12	79,0	87,0
10	250	450	300	400	361	480	150	300	230	370	12	12	95,0	103
12,5	300	540	300	500	421	610	180	400	220	470	12	12	108	116
16	300	540	320	500	421	610	180	400	240	470	12	12	126	134
20	300	540	340	500	421	610	180	400	260	470	12	12	150	158
25	350	540	360	500	493	610	210	400	270	470	12	12	180	190
31,5	350	540	370	500	493	610	210	400	280	470	12	12	210	220

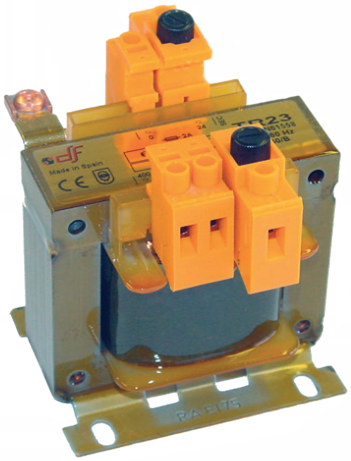
Dimensions may **slightly** vary according the voltages

TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TR23

Customer design
SINGLE-PHASE
transformer



TECHNICAL DATA

PRI VOLTAGE
ON REQUEST

SEC VOLTAGE
ON REQUEST

THERMAL CLASS
B

MAX AMBIENT TEMPERATURE
40ºC

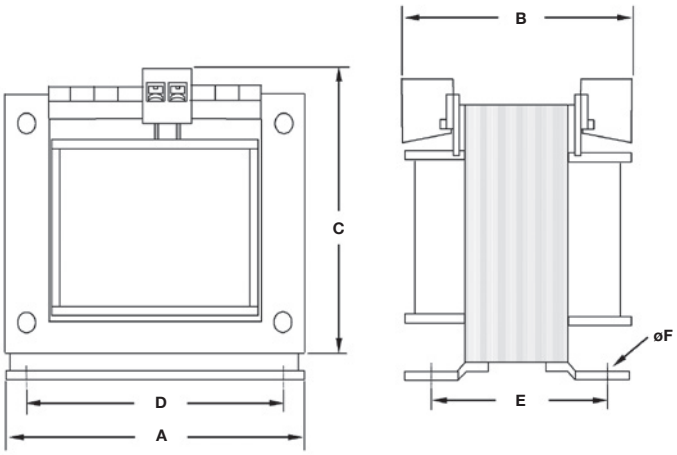
FREQUENCY
50/60Hz

CLASS
I

PROTECTION INDEX
IP00

DIELECTRIC STRENGTH PRI-SEC
> 4kV

DIMENSIONS



POWER (VA)	DIMENSIONS (mm)						WEIGHT (kg)
	A	B	C	D	E	F	
10-12-16-20	60	71	77	44	39	3,5	0,51
25-30	60	80	77	44	49	3,5	0,74
40	75	77	88	56	47	4,8	1,00
50	75	82	88	56	52	4,8	1,10
63	84	80	95	64	52	4,8	1,35
100	84	94	95	64	67	4,8	1,96
160	96	96	106	84	81	5,7	2,78
200	96	110	106	84	91	5,7	3,35
250	108	99	115	80,5	73	5,7	3,64
320	108	111	115	80,5	87	5,7	4,40
400	120	106	124	90	87	5,7	4,90
500	120	126	124	90	107	5,7	6,70
630	150	114	146	122	92	6,8	7,50
800	150	133	146	122	108	6,8	9,80
1000	150	156	146	122	135	6,8	13,2

Dimensions may slightly vary according the voltages.
In transformers with the following characteristics

- Rated power up to 250VA.
- Without electrostatic screen.
- One primary voltage up to 400V.
- One SEC voltage between 12V and 230V.

The dimensions and weight are those corresponding to the immediate smaller rated power.

Terminal block → +9 mm.
Terminal block with current >32 A → +15 mm.
Currents >80 A ((flat terminals or busbar) → +50 mm.

Terminal block with fuse → +10 mm.
Terminal block with currentd >32 A → +7,5 mm.

TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TR26

Safety for swimming-pool SINGLE-PHASE transformer

TECHNICAL DATA

PRI VOLTAGE
230V

SEC VOLTAGE
12V

THERMAL CLASS
B(130°C)
F(155°C)

MAX AMBIENT TEMPERATURE
40°C

FREQUENCY
50/60Hz

CLASS
I

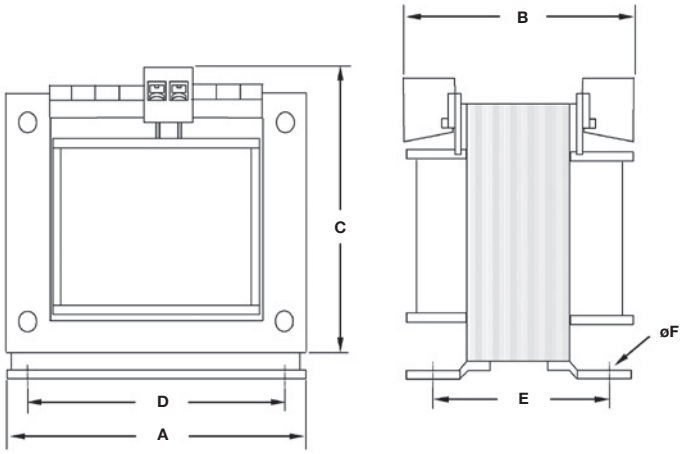
PROTECTION INDEX
IP00 – IP20

DIELECTRIC STRENGTH PRI-SEC
≥ 4,5kV

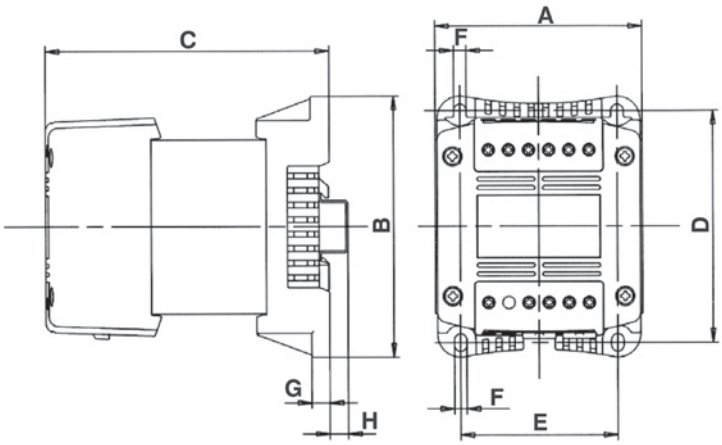
DIELECTRIC STRENGTH BETWEEN WINDINGS & METALLIC PARTS
≥ 2,5kV

DIMENSIONS

TR26 IP00



TR26 IP20



POWER (VA)	DIMENSIONS (mm)																WEIGHT (kg)	
	A		B		C		D		E		F		G		H			
	IP00	IP20	IP00	IP20	IP00	IP20	IP00	IP20	IP00	IP20	IP00	IP20	IP00	IP20	IP00	IP20	IP00	IP20
30		68,5		76		92,2		64,5		56,5		5		7,5				0,8
63		84		113		112		101		66		5		7,5				1,5
100		84		113		116		101		66		5		7,5				1,83
130	84	84	90	113	90	116	64	101	67	66	4,8	5	-	7,5	-	2	1,96	2,00
350	108	108	110	135	93	138	90	120	80	82	5,0	6,5	-	9,5	-	9,5	3,90	4,45
700	120	120	135	152	108	166	90	135	117	94	5,7	7	-	9,5	-	-	7,80	7,89

TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TR26H

Safety for swimming-pool SINGLE-PHASE transformer

TECHNICAL DATA

PRI VOLTAGE
230V

SEC VOLTAGE
12V

SEC CONNECTION
SERIAL or PARALLEL

THERMAL CLASS
F(155ºC)

MAX AMBIENT TEMPERATURE
40ºC

FREQUENCY
50/60Hz

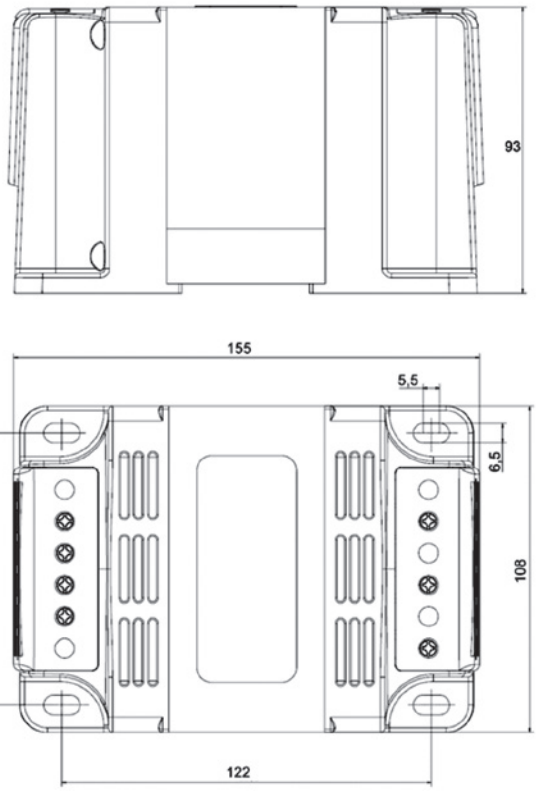
CLASS
I

PROTECTION INDEX
IP20

DIELECTRIC STRENGTH PRI-SEC
> 4kV

ELECTROSTATIC SCREEN BETWEEN WINDINGS

DIMENSIONS



TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TR28
2.2

Control and safety or isolating SINGLE-PHASE transformer

TECHNICAL DATA

PRI VOLTAGE
0-230-400V

SEC VOLTAGE
12-24V
24-48V
115-230V

THERMAL CLASS
B(130ºC)
F(155ºC)

MAX AMBIENT TEMPERATURE
40ºC

FREQUENCY
50/60Hz

CLASS
I

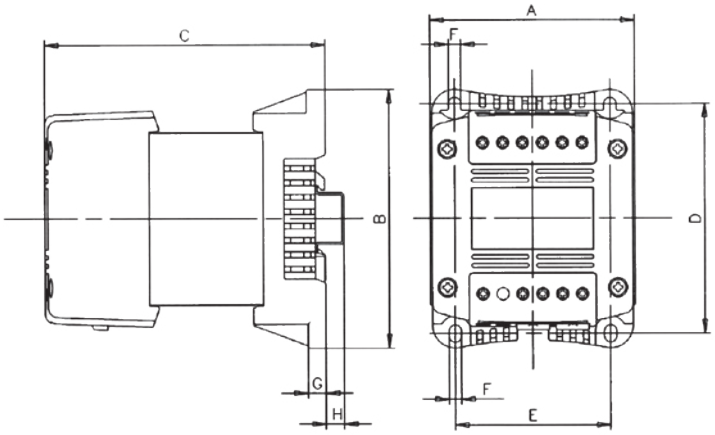
PROTECTION INDEX
IP20

DIELECTRIC STRENGTH PRI-SEC
≥ 4,5kV

DIELECTRIC STRENGTH BETWEEN WINDINGS & METALLIC PARTS
≥ 2,5kV

OTHER CHARACTERISTICS ON REQUEST

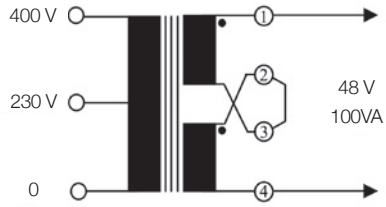
DIMENSIONS



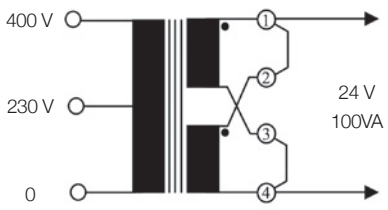
POWER (VA)	DIMENSIONS (mm)								WEIGHT (kg)
	A	B	C	D	E	F	G	H	
25	68,5	76	92,2	64,5	56,5	5	7,5	2	0,80
40	68,5	76	92,2	64,5	56,5	5	7,5	2	1,10
63	84	113	112	101	66	5	7,5	2	1,80
100	84	113	116	101	66	5	7,5	2	1,95
160	84	113	131	101	66	5	7,5	2	2,55
200	108	135	133	120	82	6,5	9,5	9,5	4,15
250	108	135	138	120	82	6,5	9,5	9,5	4,40
320	108	135	148	120	82	6,5	9,5	9,5	4,95
400	120	152	141	135	94	7	9,5	-	5,80
500	120	152	156	135	94	7	9,5	-	7,00
630	150	177	140	160	115	7	2	-	8,60
800	150	177	160	160	115	7	2	-	11,4
1000	150	177	182,60	160	115	7	2	-	14,3
1300	192	210	170	193	150	7	2	-	14,6
1600	192	210	185	193	150	7	2	-	17,8
2000	192	210	200	193	150	7	2	-	20,8
2500	192	210	220	193	150	7	2	-	25,7
3000	192	210	250	193	150	7	2	-	31,5

SECONDARY CONNECTION*

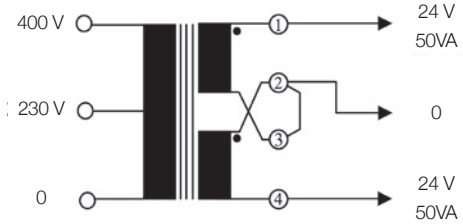
SERIAL CONNECTION



PARALLEL CONNECTION



WITH MIDDLE TAP



* TRANSFORMER 0-230-400 // 24-48V 100VA
REF 680100044

TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TR28
5.2

Control and safety or isolating SINGLE-PHASE transformer

TECHNICAL DATA

PRI VOLTAGE
0-230-400V-460±15V

SEC VOLTAGE
12-24V
24-48V
115-230V

THERMAL CLASS
B(130ºC)

MAX AMBIENT TEMPERATURE
40ºC

FREQUENCY
50/60Hz

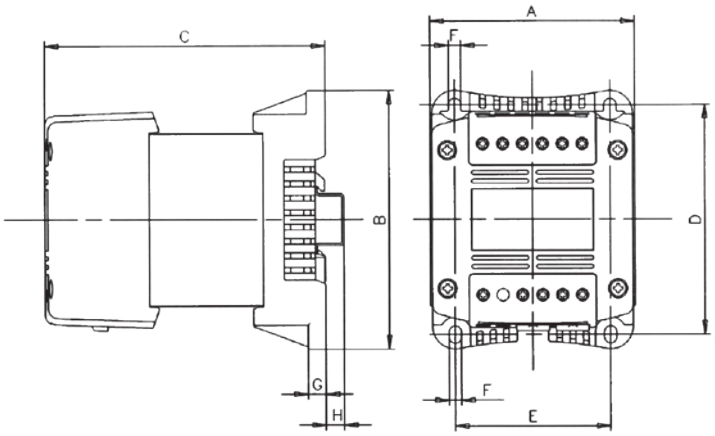
CLASS
I

PROTECTION INDEX
IP20

DIELECTRIC STRENGTH PRI-SEC
≥ 4,5kV

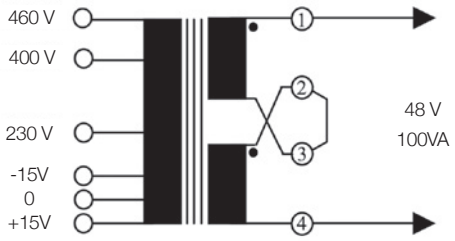
DIELECTRIC STRENGTH BETWEEN WINDINGS & METALLIC PARTS
≥ 2,5kV

DIMENSIONS

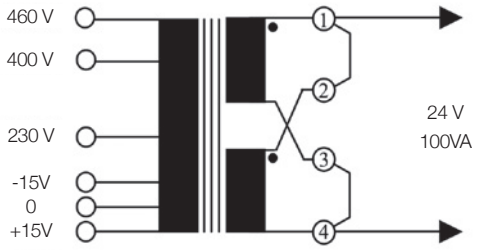


SECONDARY CONNECTION*

SERIAL CONNECTION



PARALLEL CONNECTION



POWER (VA)	DIMENSIONS (mm)								WEIGHT (kg)
	A	B	C	D	E	F	G	H	
25	84	113	96	101	66	5	7,5	2	1,17
40	84	113	105	101	66	5	7,5	2	1,48
63	84	113	112	101	66	5	7,5	2	1,83
100	84	113	116	101	66	5	7,5	2	2,00
160	84	113	131	101	66	5	7,5	2	2,65
200	108	135	133	120	82	6,5	9,5	9,5	4,20
250	108	135	138	120	82	6,5	9,5	9,5	4,45
320	108	135	148	120	82	6,5	9,5	9,5	5,00
400	120	152	136	135	94	7	9,5	-	5,30
500	120	152	156	135	94	7	9,5	-	7,08
630	150	177	140	160	115	7	2	-	8,68
800	150	177	160	160	115	7	2	-	11,5
1000	150	177	182,60	160	115	7	2	-	14,4

* TRANSFORMER 0-230-400 // 24-48V 100VA
REF 680100001

TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TRT33

Power isolating THREE-PHASE transformer

TECHNICAL DATA

PRI VOLTAGE
400V

SEC VOLTAGE
230V

THERMAL CLASS
B – H

MAX AMBIENT TEMPERATURE
40°C

FREQUENCY
50/60Hz

CLASS
I

PROTECTION INDEX
IP00 – IP23

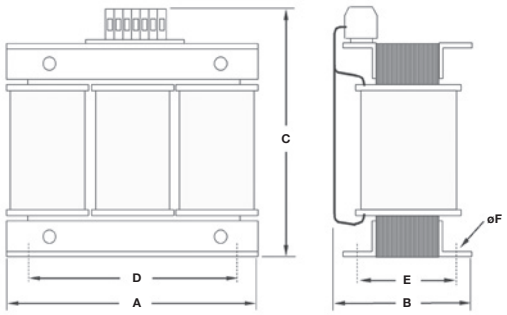
DIELECTRIC STRENGTH PRI-SEC
> 4kV

VECTOR GROUP
Dyn5

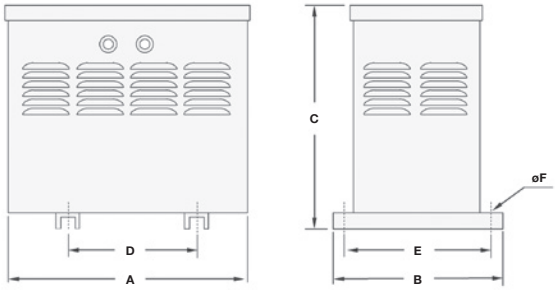
NATURAL AIR COOLING
OTHER CHARACTERISTICS ON REQUEST

DIMENSIONS

TRT33 IP00



TRT33 IP23



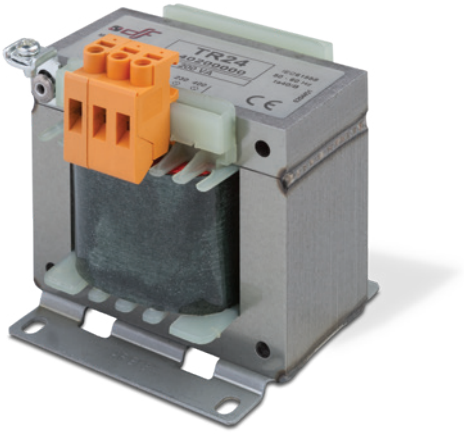
POWER (kVA)	DIMENSIONS (mm)												WEIGHT (kg)	
	A		B		C		D		E		F			
	IP00	IP23	IP00	IP23	IP00	IP23	IP00	IP23	IP00	IP23	IP00	IP23	IP00	IP23
0,5	180	235	85	240	200	285	140	140	55	215	6	12	6,5	9,5
1	240	285	110	290	250	335	200	200	75	265	6	12	16,0	20,0
1,6	240	285	120	290	250	335	200	200	85	265	6	12	18,5	22,5
2	240	285	130	290	250	335	200	200	95	265	6	12	23,0	27,0
3,5	300	375	135	300	340	435	200	200	105	270	6	12	33,5	40,5
4	300	375	145	300	340	435	200	200	115	270	6	12	40,0	47,0
5	300	375	175	300	340	435	200	200	135	270	6	12	50,0	57,0
6,3	360	450	170	400	361	480	300	300	115	370	8	12	56,0	66,0
8	360	450	180	400	361	480	300	300	125	370	8	12	58,0	68,0
10	360	450	190	400	361	480	300	300	135	370	8	12	66,7	76,5
12,5	420	510	195	400	411	540	300	300	135	370	8	12	78,0	89,0
16	420	510	215	400	411	540	300	300	155	370	8	12	102	113
20	480	540	220	500	473	610	400	400	155	470	10	12	118	137
25	480	540	240	500	473	610	400	400	175	470	10	12	154	172
31,5	480	540	265	500	473	610	400	400	195	470	10	12	165	184
40	480	540	300	500	461	610	400	400	215	470	10	12	195	215
50	660	880	310	530	600	830	500	500	225	500	12	12	255	285
63	660	880	330	530	600	830	500	500	245	500	12	12	320	350
80	660	880	350	730	600	830	500	500	270	700	12	12	420	460
100	720	880	380	730	720	830	500	500	250	700	12	12	450	490

Dimensions may **slightly** vary according the voltages

TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TR24 | Reversible SINGLE-PHASE autotransformer



TECHNICAL DATA

VOLTAGES
0-230-400V

CLASS
I

THERMAL CLASS
B

PROTECTION INDEX
IP00

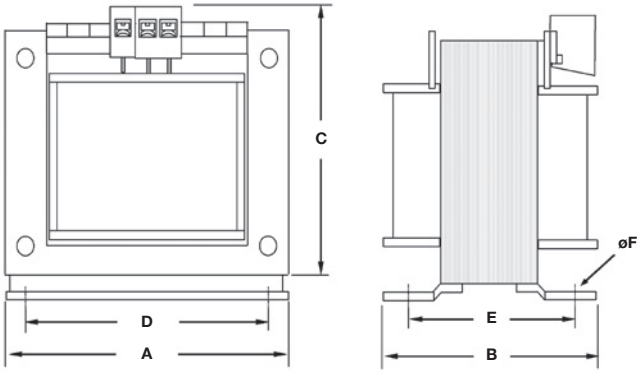
MAX AMBIENT TEMPERATURE
40°C

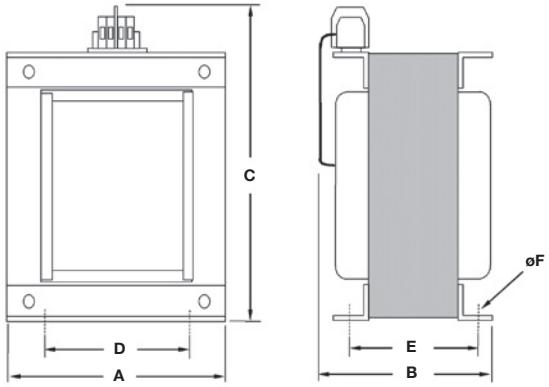
DIELECTRIC STRENGTH PRI-SEC
> 3kV

FREQUENCY
50/60Hz

REVERSIBLE
OTHER CHARACTERISTICS ON REQUEST

DIMENSIONS





POWER (kVA)	DIMENSIONS (mm)						WEIGHT (kg)
	A	B	C	D	E	F	
100	75	71	84	56	47	4,8	1,00
200	84	84	90	64	67	4,8	1,90
320	96	82	100	84	67	5,7	2,23
400	96	92	100	84	77	5,7	2,68
500	96	107	100	84	91	5,7	3,35
630	108	91	111	80,5	73	5,7	3,60
800	108	104	111	80,5	87	5,7	4,40
1000	120	106	118	90	87	5,7	4,90
1600	150	114	142	122	92	6,8	7,50
2000	150	130	142	122	108	6,8	9,80
2500	150	157	142	122	135	6,8	12,9
3000	150	157	142	122	135	6,8	13,2

POWER (kVA)	DIMENSIONS (mm)						WEIGHT (kg)
	A	B	C	D	E	F	
4000	163	165	256	98	120	8	19,0
5000	163	175	256	98	130	8	21,5
6300	163	195	256	98	150	8	23,5

Dimensions may **significantly** vary according the voltages

TRT30

Reversible dry type THREE-PHASE autotransformer

TECHNICAL DATA

VOLTAGES
230-400V

FREQUENCY
50/60Hz

DIELECTRIC STRENGTH PRI-SEC
> 3kV

THERMAL CLASS
B – H

CLASS
I

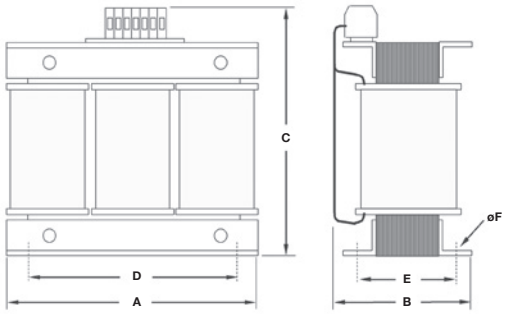
MAX AMBIENT TEMPERATURE
40°C

PROTECTION INDEX
IP00 – IP23

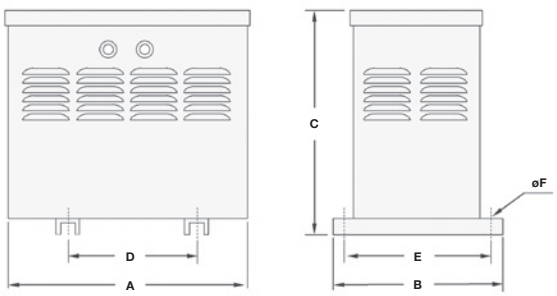
REVERSIBLE
COPPER WINDINGS
NATURAL AIR COOLING
OTHER CHARACTERISTICS ON REQUEST

DIMENSIONS

TRT30 IP00



TRT30 IP23



POWER (kVA)	DIMENSIONS (mm)												WEIGHT (kg)	
	A		B		C		D		E		F			
	IP00	IP23	IP00	IP23	IP00	IP23	IP00	IP23	IP00	IP23	IP00	IP23	IP00	IP23
0,5	180	235	85	240	185	285	140	140	55	215	6	12	5,5	9,0
1	180	235	85	240	200	285	140	140	55	215	6	12	6,5	9,5
2	180	235	95	240	200	285	140	140	65	215	6	12	9,1	12,0
3	240	285	110	290	250	335	200	200	75	265	6	12	16,0	20,0
5	240	285	120	290	250	335	200	200	85	265	6	12	18,5	22,5
8	240	285	145	290	261	335	200	200	110	265	6	12	27,0	31,0
10	300	375	135	300	311	435	200	200	95	270	6	12	31,0	38,0
12,5	300	375	155	300	311	435	200	200	115	270	6	12	40,0	47,0
16	300	375	165	300	311	435	200	200	125	270	6	12	44,0	51,0
20	360	450	170	400	361	480	300	300	115	370	8	12	56,0	66,0
25	360	450	180	400	361	480	300	300	125	370	8	12	58,0	68,0
31,5	420	510	195	400	423	540	300	300	135	370	8	12	78,0	89,0
40	420	510	205	400	435	540	300	300	145	370	8	12	90,0	101
50	420	510	215	400	435	540	300	300	155	370	8	12	102	113
63	480	540	240	500	500	610	400	400	175	470	10	12	154	172
80	480	540	265	500	500	610	400	400	195	470	10	12	165	184
100	480	540	300	500	500	610	400	400	215	470	10	12	195	215
125	660	880	310	530	600	830	500	500	225	500	12	12	245	275
160	660	880	330	530	600	830	500	500	245	500	12	12	305	335
200	660	880	350	730	600	830	500	500	270	700	12	12	400	440

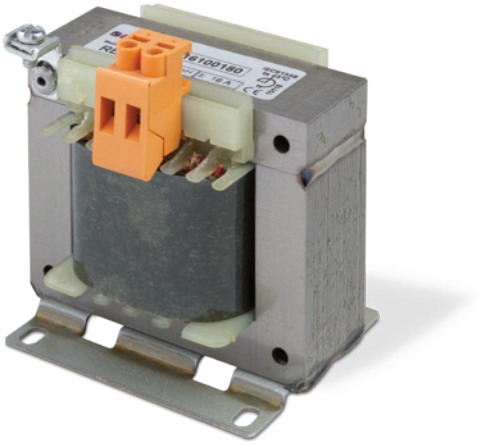
Dimensions may **significantly** vary according the voltages

TRANSFORMERS

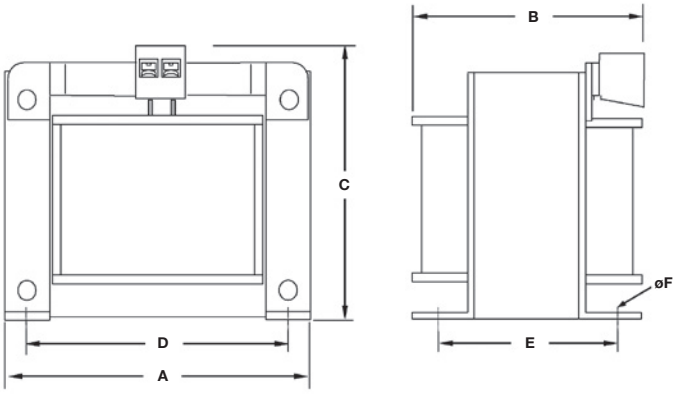
LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

RE8

Line
SINGLE-PHASE
reactor



DIMENSIONS



CURRENT (A)	DIMENSIONS (mm)						WEIGHT (kg)
	A	B	C	D	E	F	
6	60	70	68	50	48	4	0,73
10	75	66	81	62,5	45	4	0,98
16	84	85	86	70	66	4	1,98
25	96	90	96	80	70	5	2,65
32	108	112	106	90	75	5	3,56
40	108	126	116	90	89	5	4,37
50	120	123	128	100	84	6	5,00
63	120	143	128	100	104	6	6,75

TECHNICAL DATA

VOLTAGE DROP
4% at I_N (230V)

CLASS
I

THERMAL CLASS
B

PROTECTION INDEX
IP00

MAX AMBIENT TEMPERATURE
40°C

DIELECTRIC STRENGTH PRI-SEC
> 3kV

FREQUENCY
50Hz

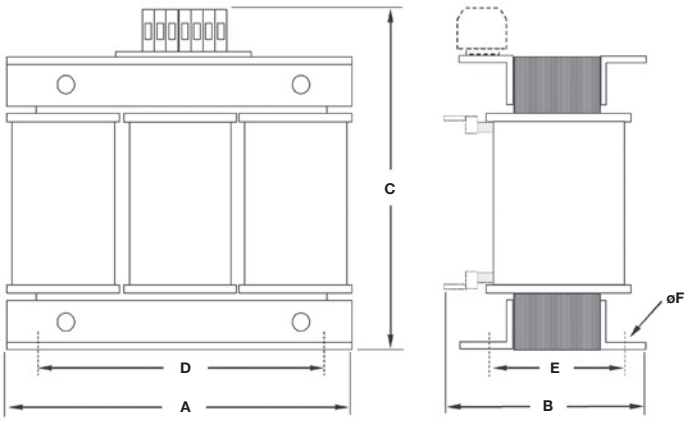
OTHER CHARACTERISTICS ON REQUEST

TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

RET9 | Line
THREE-PHASE
reactor

DIMENSIONS



CURRENT (A)	DIMENSIONS (mm)						WEIGHT (kg)
	A	B	C	D	E	F	
10	180	90	205	140	55	6	4,5
16	180	90	205	140	55	6	4,8
20	180	90	205	140	55	6	5,2
25	180	90	205	140	55	6	5,5
32	180	90	220	140	55	6	6,5
40	180	100	235	140	65	6	8,5
50	180	100	235	140	65	6	9,0
63	180	140	185	140	75	6	10,0
80	240	140	235	200	75	6	14,0
100	240	140	235	200	75	6	15,0
125	240	140	235	200	75	6	16,0
160	240	150	235	200	85	6	18,5
200	300	190	290	200	95	6	30,0

TECHNICAL DATA

VOLTAGE DROP
4% at I_N (400V)

CLASS
I

THERMAL CLASS
B – H

PROTECTION INDEX
IP00

MAX AMBIENT TEMPERATURE
40°C

DIELECTRIC STRENGTH PRI-SEC
> 4kV

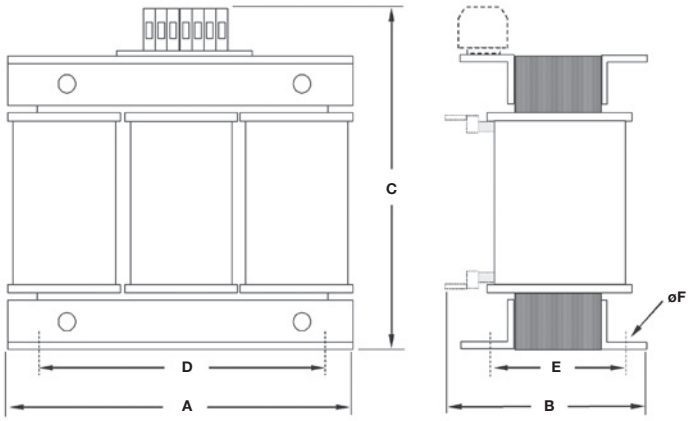
FREQUENCY
50Hz

NATURAL AIR COOLING
OTHER CHARACTERISTICS ON REQUEST

RET9

Harmonic circuit filter
THREE-PHASE reactor

DIMENSIONS



CURRENT (kvar)*	DIMENSIONS (mm)						WEIGHT (kg)
	A	B	C	D	E	F	
5	180	85	220	140	55	6	6,5
10	180	95	220	140	65	6	9,0
12,5	180	105	170	140	75	6	11,5
15	240	135	230	200	75	6	15,0
20	240	135	230	200	75	6	15,4
25	240	135	230	200	75	6	15,9
30	240	145	230	200	85	6	18,0
40	240	145	230	200	85	6	20,0
50	300	170	285	200	95	6	30,0
60	300	180	285	200	105	6	36,0
70	300	190	285	200	115	6	40,0
80	300	200	285	200	125	6	42,0

* Effective filtered compensating reactive power

TECHNICAL DATA

VOLTAGE DROP
400V

FILTERING FACTOR
P=0,07 (7%)

fr
189Hz

L TOLERANCE
3%

LINEARITY (95% I_N)
1,8 · I_N

MAX PERMANENT OVERLOAD
1,17 · I_N

THERMAL CLASS
B – H

MAX AMBIENT TEMPERATURE
40ºC

FREQUENCY
50Hz

CLASS
I

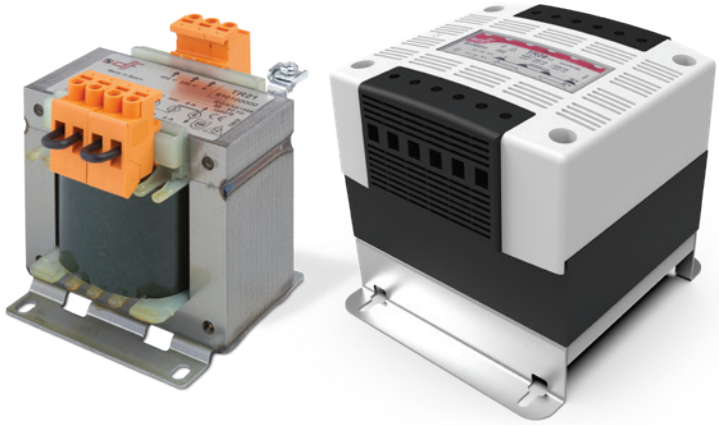
PROTECTION INDEX
IP00

DIELECTRIC STRENGTH PRI-SEC
> 4kV

THERMAL MICRO SWITCH
OTHER CHARACTERISTICS ON REQUEST

TR21 TR28

SINGLE-PHASE transformers



SELECTION GUIDE

Determination of rated power of the transformer in control applications

For the correct sizing of a control transformer we must consider the continuous power as well as the inrush power due to the high momentary inrush current caused when electromechanical devices such as contactors or relays are energized.

During the normal operation of control circuit the transformer must supply a high instantaneous power for a short time. From the thermal point of view this is not a problem due to the very short time, however, this situation could be problematic due to the reduction of output voltage in the transformer.

If the secondary voltage decreases in excess, some devices might not operate and the control circuit won't work properly.

Thus, in every control circuit we **will take into account several facts:**

- **The maximum power in a given moment (inrush power).**
- **Continuous power requirement.**
- **Power factor.**
- **Minimum admissible voltage.**

An exhaustive study in each situation could be very complex due to the particularities on every application, however there are simple rules to determine the correct size of a transformer.

We can suppose that the power factor is cosφ=0,5 during the operation of contactors.

The instantaneous power will be:

$$P_{inst} = \Sigma P_m + \Sigma P_s + P_a$$

ΣPm *sum of the sealed power of the contactors.*
ΣPs *sum of the power of the signalling lamps.*
Pa *inrush power of the biggest contactor.*

TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TRT30

Reversible dry type THREE-PHASE autotransformer

SELECTION GUIDE

Determination of autotransformers for motors

When it is necessary to select an autotransformer for supply a electric motor or an equipment where the main charge is a motor, it is important to take into account the type of mechanic charge of the motor as well as the type of start, in order to consider the time and the peak currents that the autotransformer must withstand. For another hand we must bear in mind the frequency of the starts of the motor (number of starts per hour).
Basically we can consider **three load types on the motor:**

NORMAL LOAD

Direct start on line, star-delta or start with resistors/reactances with fast start and low inertia load on the motor.

Examples

- **Air conditioned.**
- **Colds chambers or freezers.**
- **Compressors.**
- **Machine tools.**

HEAVY LOAD

Applications where the motor has a load with high inertia what causes a very slow start.

Examples

- **Belt conveyor.**
- **Fans.**
- **Shaping machine.**
- **Grinding machine.**
- **Pump.**
- **Rolling-mill train.**

SOFT STARTER OR VARIABLE SPEED DRIVE

The use of soft starters or variable speed drives can avoid the high starting current, however, the harmonics increase the losses in the autotransformers which cause elevation of temperature. This point must be taken into account for the correct choosing of the rated power because an excessive temperature rise can reduce drastically the duration of the autotransformer.

					RATED POWER OF AUTOTRANSFORMER					
					NON FREQUENT START (UP TO 4 STARTS / HOUR)			FREQUENT START (UP TO 15 STARTS / HOUR)		
MOTOR*					NORMAL LOAD	HEAVY LOAD	VARIABLE SPEED DRIVE	NORMAL LOAD	HEAVY LOAD	VARIABLE SPEED DRIVE
(CV)	(kW)	FP	η (%)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)
0,25	0,18	0,72	72	0,35	0,5	0,5	0,5	0,5	1	0,5
0,5	0,37	0,72	72	0,71	1	1	1	1	2	1
0,75	0,55	0,75	73	1,01	1	2	2	2	2	2
1	0,74	0,76	75	1,29	2	2	2	2	3	2
1,5	1,10	0,78	76	1,86	2	2	3	3	5	3
2	1,47	0,80	77	2,39	3	3	3	3	5	3
2,5	1,84	0,82	79	2,84	3	5	5	5	8	5
3	2,21	0,83	80	3,33	5	5	5	5	8	5
4	2,94	0,84	80	4,38	5	8	8	8	8	8
5	3,68	0,84	83	5,28	8	8	8	8	10	8
5,5	4,05	0,84	83	5,81	8	8	10	8	12,5	10
7,5	5,52	0,84	85	7,73	10	12,5	12,5	10	16	12,5
10	7,36	0,84	86	10,2	12,5	16	16	16	20	16
15	11,0	0,85	87	14,9	16	20	20	20	31,5	20
20	14,7	0,85	88	19,7	25	31,5	31,5	31,5	40	31,5
25	18,4	0,85	89	24,3	31,5	40	40	31,5	50	40
30	22,1	0,86	90	28,5	31,5	40	40	40	63	40
40	29,4	0,86	94	36,4	40	50	50	50	80	50
50	36,8	0,87	96	44,1	50	63	63	63	100	63
60	44,2	0,87	97	52,3	63	80	80	80	100	80
75	55,2	0,88	98	64,0	80	100	100	100	125	100
100	73,6	0,88	98	85,3	100	125	125	125	160	125
125	92,0	0,88	98	106,7	125	160	160	160	200	160
150	110,4	0,88	98	128,0	160	200	200	200	-	200
180	132,5	0,88	98	153,6	200	200	200	200	-	200
200	147,2	0,88	98	170,7	200	-	-	-	-	-

* Approximate values for three-phase squirrel cage motors, 4 poles, 50/60 Hz
(Could be different according the manufacturer)

TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TR21 TR22 TR23 TR26 TR28 TRT33

SINGLE-PHASE
THREE-PHASE
transformers

TR24 TRT30

SINGLE-PHASE
THREE-PHASE
autotransformers

PROTECTION GUIDE

The transformers and autotransformers (and their lines) must be protected against overloads and/or short-circuits that they can be submitted in use, and could causes dangerous situations for persons, animals or installations. This protection are also a requirement of the standards and the national regulations about electrical installations.

Due to the high inrush current (about $25 \cdot I_n$) it is very difficult to get an optimal protection in the primary side. If we select the rated current of fuses according to the primary rated current, the inrush current will melt the fuses. On the other hand, if the fuses are overrating for withstand the inrush, the transformer won't have a good protection against overloads.

For this reason we recommend to protect transformers and autotransformers on the secondary side (output).

The most adequate way to protect this devices (and their lines) is to include on the output side a device protection capable to interrupt overloads as well as short circuits. For the other hand the input line must be protected against short circuit.

CRITERIA TO SELECT THE RATINGS OF PROTECTION DEVICES

LOAD

PROTECTION ON THE OUTPUT SIDE

In this part can appear overloads (if the user try to obtain a power higher than the rated power) as well as short circuits.

In order to achieve a good protection, the device (fuse link, circuit breaker or similar) must be capable to interrupt all range of currents (overloads and short circuits) and must have a rated current equal or lower than the output rated current of the autotransformer.

SUPPLY LINE

PROTECTION ON THE INPUT SIDE

In this part there is no risk of overload because if the output protection has been correctly selected, it will operate if appear an overload at the output side and the load will be disconnected of the autotransformer. For this reason we only must protect the input line of autotransformer against short circuits in the line, in the autotransformer connections or inside the windings in a hypothetical failure of the insulations. When the transformer is energized, it can demand a high momentary current (can be about 25 times the rated current) with a duration of a few milliseconds, that decrease very quickly until reaching the rated value.

This factors should be taken into account to choose the protection in order to avoid the fusing of the fuses or the not desired operation of the circuit breakers:

- Miniature fuses 5x20 or 6x32 time-lag (slow) according IEC/EN60127

  I_n fuse link ≥ $3 \cdot I_n$ transformer

- Fuse links aM type according to IEC/EN60269

  I_n fuse link ≥ $1{,}8 \cdot I_n$ transformer

- Fuse links gG type according to IEC/EN60269

  I_n fuse link ≥ $3 \cdot I_n$ transformer

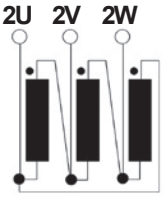
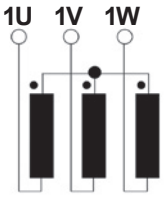
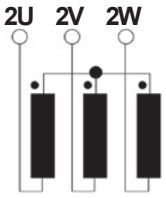
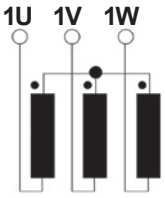
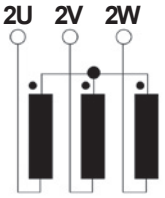
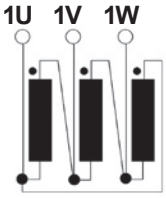
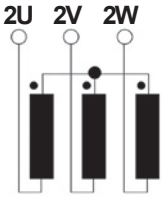
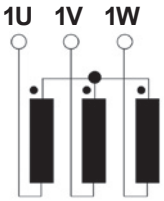
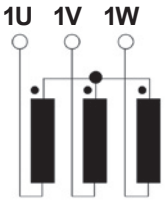
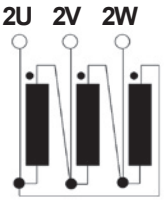
TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TRT33

Power isolating THREE-PHASE transformer

VECTOR GROUPS

VECTOR GROUP	PHASE ANGLE	GREATER VOLTAGE	SMALLER VOLTAGE	VECTOR GROUP	PHASE ANGLE	GREATER VOLTAGE	SMALLER VOLTAGE
Dd0	0 (0°)			**Dd6**	6 (180°)		
Yy0	0 (0°)			**Yy6**	6 (180°)		
Dy5	5 (150°)			**Dy11**	11 (330°)		
Yd5	5 (150°)			**Yd11**	11 (330°)		

D → DELTA CONNECTION
Y → STAR (WYE) CONNECTION

- Capital letters (D, Y, N) are associated to the winding with the greater voltage and small letters (d, and, n) with the smaller voltage.
- If the neutral point of star connection winding is accessible (can be connected) is indicated by the letter N: YN or yn.

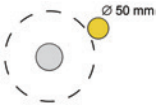
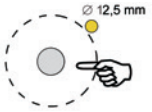
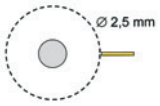
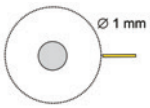
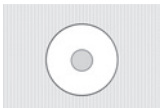
TRANSFORMERS

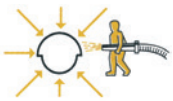
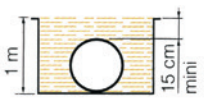
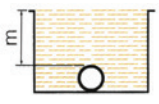
LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS

TR | transformers autotransformers

RE | reactors

IP PROTECTION INDEX

FIRST NUMBER PROTECTION AGAINST CONTACTS AND SOLID OBJECTS		
0		**NO SPECIAL PROTECTION**
1		**PROTECTED AGAINST SOLID OBJECTS GREATER THAN 50 mm** (SUCH AS A HAND)
2		**PROTECTED AGAINST SOLID OBJECTS GREATER THAN 12,5 mm** (SUCH AS A FINGER)
3		**PROTECTED AGAINST SOLID OBJECTS GREATER THAN 2,5 mm** (SUCH AS A TOOLS)
4		**PROTECTED AGAINST SOLID OBJECTS GREATER THAN 1 mm** (SUCH AS A SMALL TOOLS AND WIRES)
5		**PROTECTED AGAINS DUST** (LOW INGRESS OF DUST) (SATISFACTORY OPERATION OF THE EQUIPMENT)
6		**DUST-TIGHT** (NO INGRESS OF DUST)

SECOND NUMBER PROTECTION AGAINST HARMFUL INGRESS OF WATER		
0		**NO SPECIAL PROTECTION**
1		**PROTECTION AGAINST DRIPPING WATER** (VERTICALLY FALLING DROPS)
2		**PROTECTION AGAINST DRIPPING WATER AT AN ANGLE UP TO 15°**
3		**PROTECTION AGAINST DRIPPING WATER AT AN ANGLE UP TO 60°**
4		**PROTECTION AGAINST SPLASHING WATER FROM ANY DIRECTION**
5		**PROTECTION AGAINST WATER JETS**
6		**PROTECTION AGAINST POWERFUL WATER JET**
7		**PROTECTION AGAINST THE EFFECTS OF TEMPORARY IMMERSION IN WATER**
8		**PROTECTION AGAINST THE EFFECTS OF CONTINOUS IMMERSION IN WATER**

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