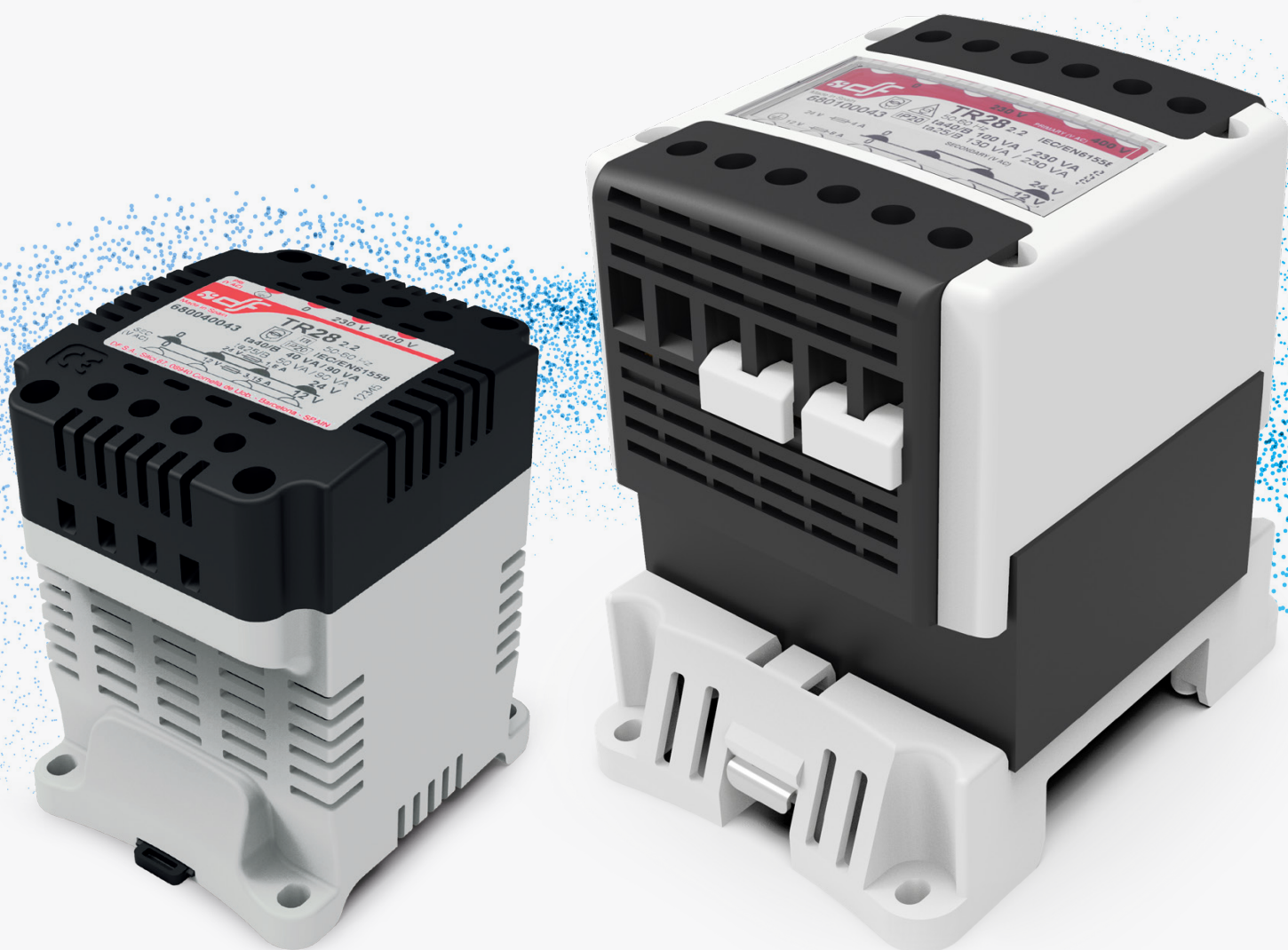




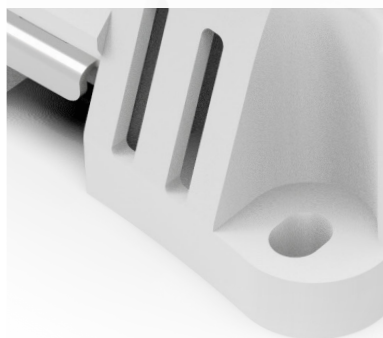
TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS



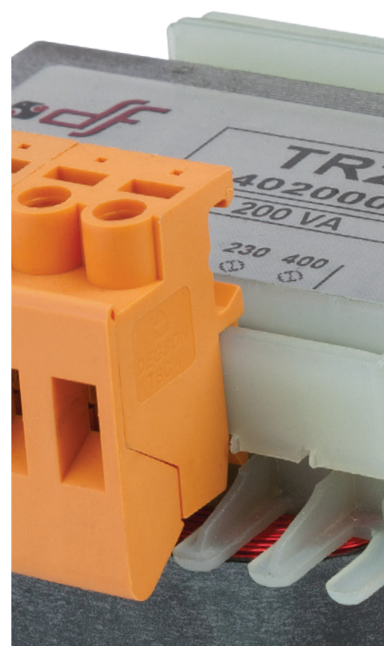
04

SINGLE-PHASE
transformers



10

THREE-PHASE
transformers



11

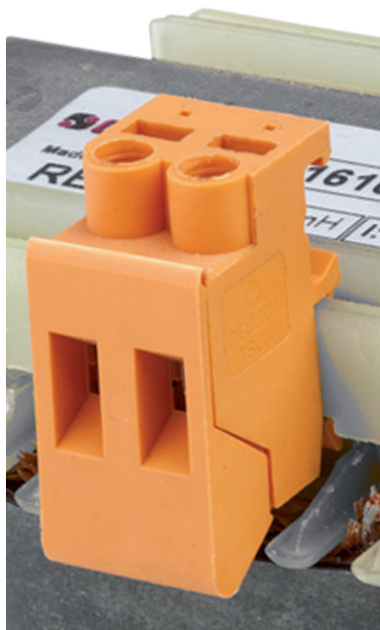
SINGLE-PHASE
autotransformers





12

THREE-PHASE
autotransformers



13

SINGLE-PHASE
reactors



14

THREE-PHASE
reactors



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

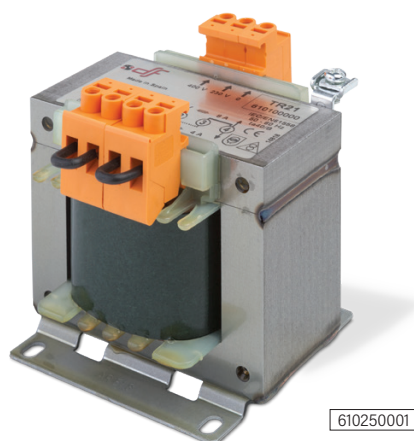
POWER
(VA)

INSTANT. POWER
(VA)

REFERENCE



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

SELECTION GUIDE

PAG 29

PROTECTION GUIDE

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IP PROTECTION INDEX

PAG 33

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

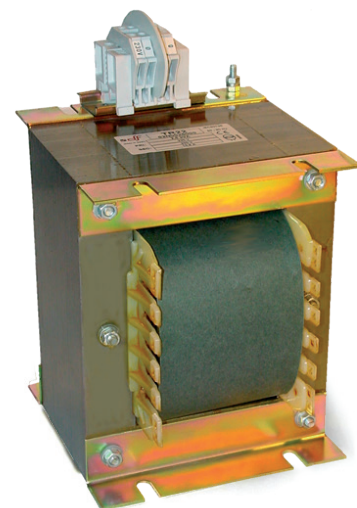
POWER (kVA)

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

IEC 60076-11

DIMENSIONS TECHNICAL DATA

PAG 17

PROTECTION GUIDE

PAG 31

IP PROTECTION INDEX

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

POWER
(VA)

10-12-16-20

PRI
VOLTAGE ON REQUEST

SEC.
VOLTAGE ON REQUEST

25-30

40

50

63

100

160

200

250

320

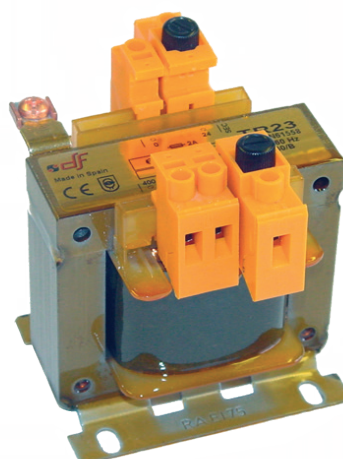
400

500

630

800

1000



STANDARDS

IEC 61558
EN 61558

DIMENSIONS TECHNICAL DATA

PAG 18

PROTECTION GUIDE

PAG 31

IP PROTECTION INDEX

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

130	660130000	1x12V 100W	10-18-25 m
350	660350000	1x12V 300W	10-25-40 m
700	660700000	2x12V 300W	10-25-40 m

130	660130001	1x12V 100W	10-18-25 m
350	660350001	1x12V 300W	10-25-40 m
700	660700001	2x12V 300W	10-25-40 m

350	660350010	1x12V 300W	8-18-25 m (6 mm ² WIRE SIZE) 10-25-40 m (10 mm ² WIRE SIZE)
-----	-----------	------------	--

30	660030001	18W
63	660063001	38W
100	660100001	60W

TR26
IP20

TR26
IP00

TR26H
IP20

TR26
for LED
spotlights



660350000



660063001



660030001

STANDARDS

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

DIMENSIONS

PAG 19

TECHNICAL DATA

PAG 19 
PAG 20 

PROTECTION GUIDE

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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)		INSTANT. POWER (VA)	REFERENCE		
t _a 40°C	t _a 25°C		12-24V 	24-48V 	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

t_a maximum ambient temperature



680040043



680100043



681300044

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

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SELECTION GUIDE

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PROTECTION GUIDE

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IP PROTECTION INDEX

PAG 33

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 $\pm 15V$ 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 $\pm 15V$

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

POWER (VA)		INSTANT. POWER (VA)	REFERENCE		
t_a 40°C	t_a 25°C		12-24V 	24-48V 	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

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SELECTION GUIDE

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PROTECTION GUIDE

PAG 31

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

PAG 31

IP PROTECTION INDEX

PAG 33

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

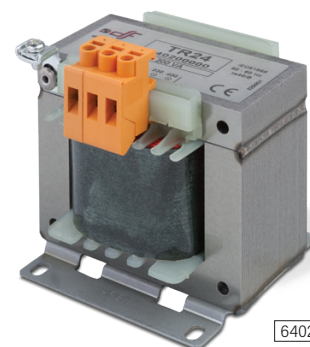
VOLTAGES 0-230-400V

OTHER CHARACTERISTICS
ON REQUEST

POWER (kVA)

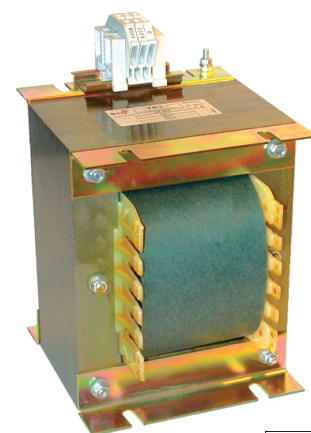
REFERENCE

100	640100000
200	640200000
320	640320000
400	640400000
500	640500000
630	640630000
800	640800000
1000	641000000
1600	641600000
2000	642000000
2500	642500000
3000	643000000



640200000

4000	644000000
5000	645000000
6300	646300000



644000000

STANDARDS

IEC 61558
IEC 60076-11
EN 61558

DIMENSIONS TECHNICAL DATA

PAG 24

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

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SELECTION GUIDE

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PROTECTION GUIDE

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IP PROTECTION INDEX

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RE8

Line SINGLE-PHASE reactor

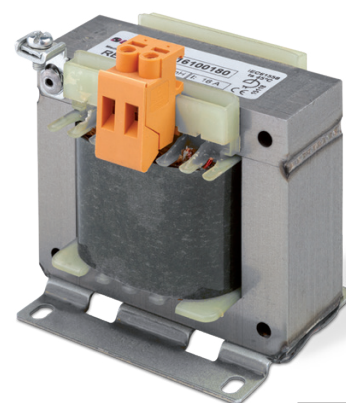


Single-phase line reactors (intended for the attenuation of notches and spikes, reduction of harmonics and limitation of inrush currents in power converters and motor drives), as well as DC link chokes for DC side of converters. Manufactured with magnetic steel with low losses and copper windings. On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

PAG 26

IP PROTECTION INDEX

PAG 33

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

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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 with 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

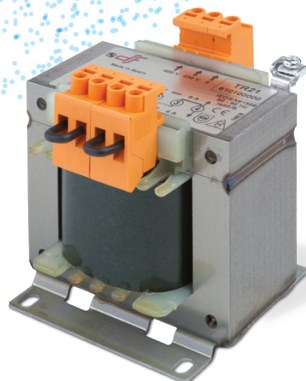
PAG 28

IP PROTECTION INDEX

PAG 33

TR21

Control SINGLE-PHASE transformer



TECHNICAL DATA

PRI VOLTAGE
0-230-400V

MAX AMBIENT TEMPERATURE
40°C

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

FREQUENCY
50/60Hz

CLASS
I

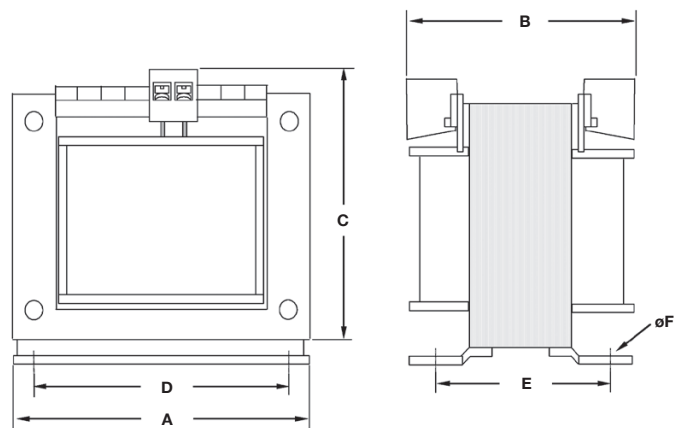
SEC CONNECTION
SERIAL
PARALLEL

PROTECTION INDEX
IP00

THERMAL CLASS
B

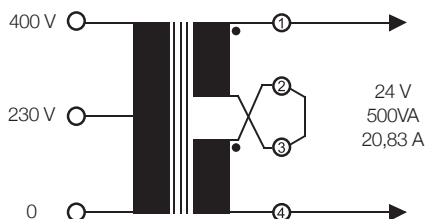
DIELECTRIC STRENGTH
PRI-SEC
> 4kV

DIMENSIONS

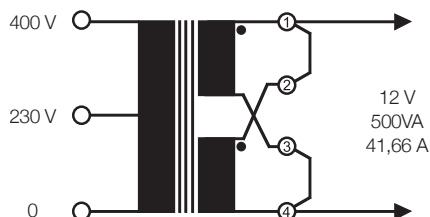


SECONDARY CONNECTION*

SERIAL CONNECTION



PARALLEL CONNECTION



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

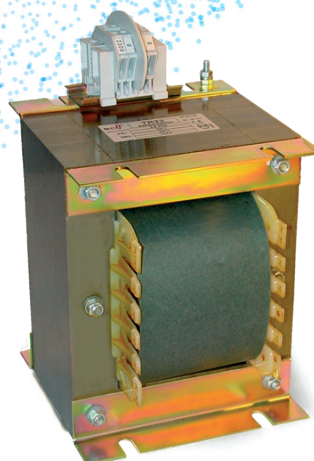
⁽³⁾ SEC 12V - 24V / SEC 24V - 48V → + 20mm

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

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

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

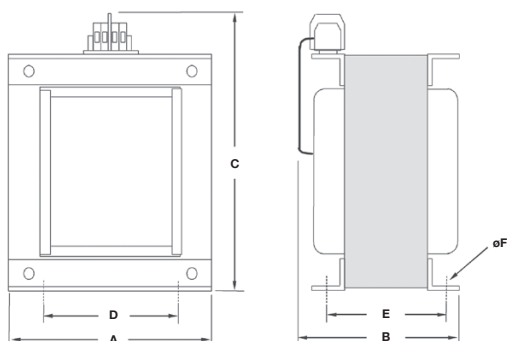
PROTECTION INDEX
IP00 – IP23

DIELECTRIC STRENGTH
PRI-SEC
> 4kV

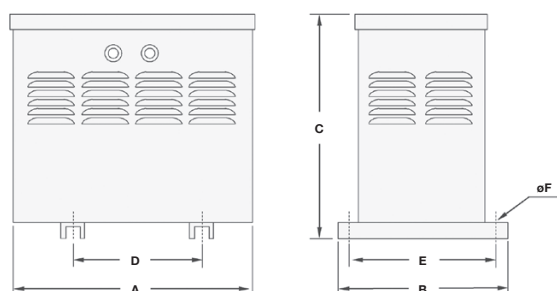
NATURAL AIR COOLING
OTHER CHARACTERISTICS ON REQUEST

DIMENSIONS

TR22 IP00



TR22 IP23



POWER
(kVA)

DIMENSIONS
(mm)

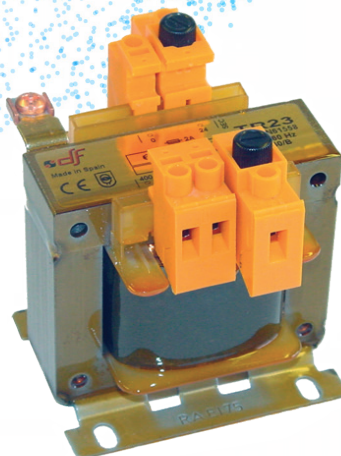
WEIGHT
(kg)

	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

TR23

Customer design SINGLE-PHASE transformer



TECHNICAL DATA

PRI VOLTAGE
ON REQUEST

SEC VOLTAGE
ON REQUEST

THERMAL CLASS
B

MAX AMBIENT TEMPERATURE
40°C

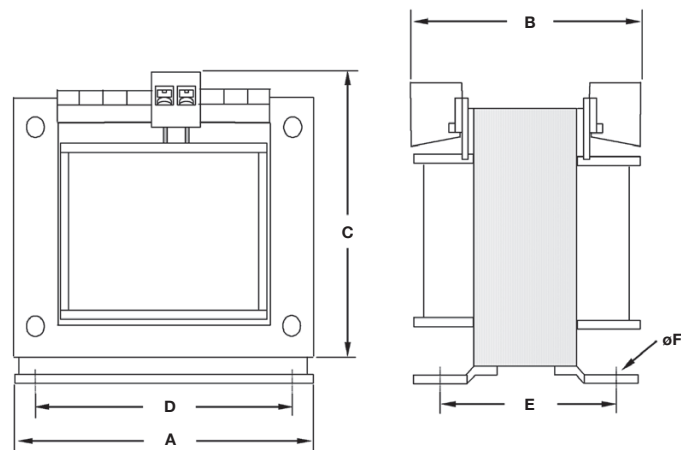
FREQUENCY
50/60Hz

CLASS
I

PROTECTION INDEX
IP00

DIELECTRIC STRENGTH
PRI-SEC
> 4kV

DIMENSIONS



POWER (VA)	DIMENSIONS (mm)						WEIGHT (kg)
	A	B	C	D	E	F	
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 current >32 A → +7,5 mm.

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

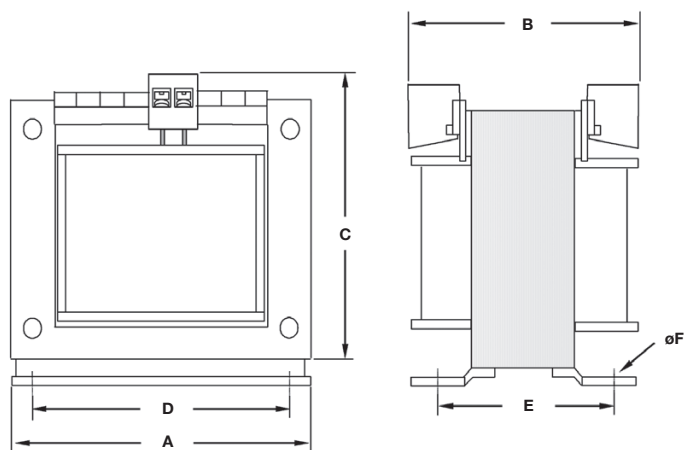
PROTECTION INDEX
IP00 – IP20

DIELECTRIC STRENGTH PRI-SEC
≥ 4,5kV

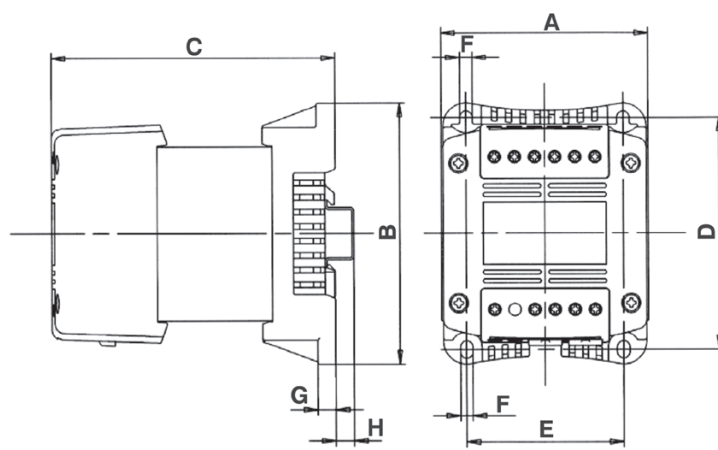
DIELECTRIC STRENGTH BETWEEN WINDINGS & METALLIC PARTS
≥ 2,5kV

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

TR26H

**Safety for
swimming-pool**
SINGLE-PHASE
transformer



TECHNICAL DATA

PRI VOLTAGE
230V

SEC VOLTAGE
12V

SEC CONNECTION
SERIAL or PARALLEL

THERMAL CLASS
F(155°C)

MAX AMBIENT TEMPERATURE
40°C

FREQUENCY
50/60Hz

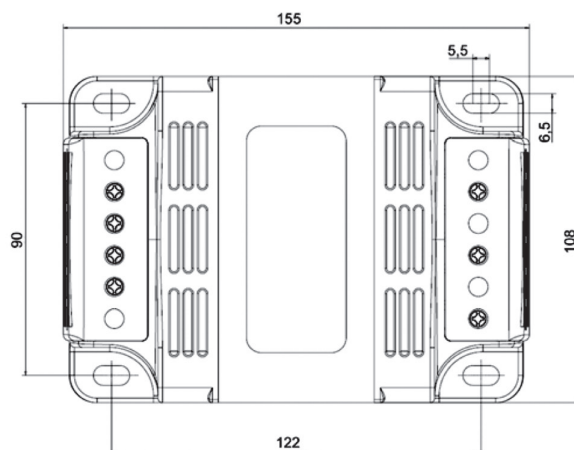
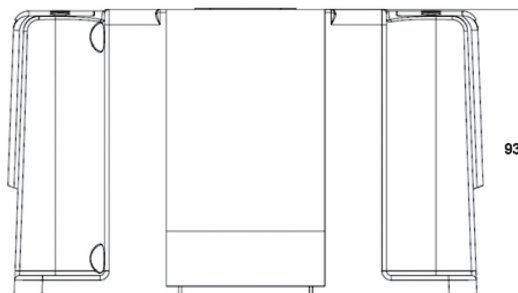
CLASS
I

PROTECTION INDEX
IP20

DIELECTRIC STRENGTH
PRI-SEC
> 4kV

ELECTROSTATIC SCREEN BETWEEN WINDINGS

DIMENSIONS



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(130°C)
F(155°C)

MAX AMBIENT TEMPERATURE
40°C

FREQUENCY
50/60Hz

CLASS
I

PROTECTION INDEX
IP20

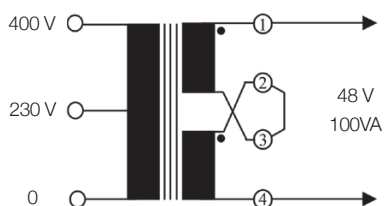
DIELECTRIC STRENGTH
PRI-SEC
≥ 4,5kV

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

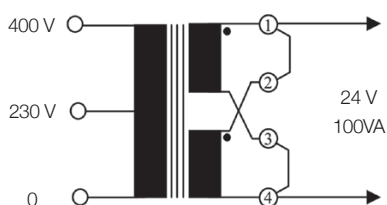
OTHER CHARACTERISTICS ON REQUEST

SECONDARY CONNECTION*

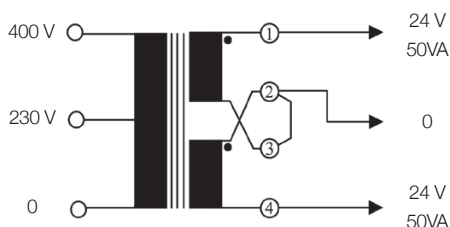
SERIAL CONNECTION



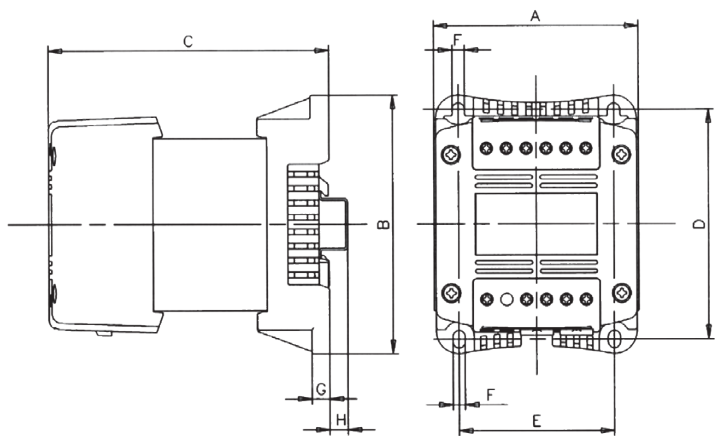
PARALLEL CONNECTION



WITH MIDDLE TAP



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

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

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(130°C)

MAX AMBIENT TEMPERATURE
40°C

FREQUENCY
50/60Hz

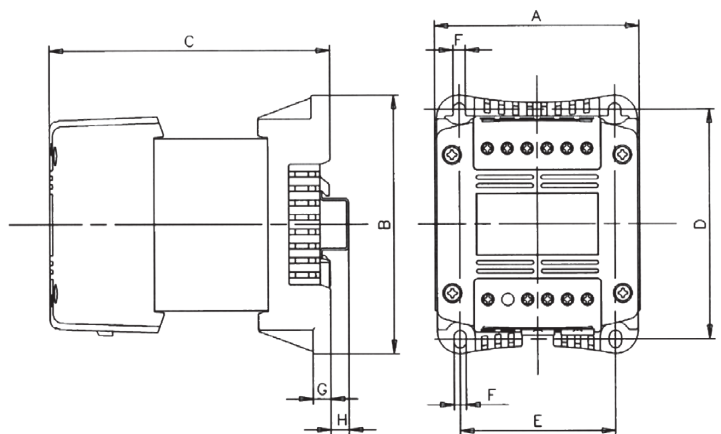
CLASS
I

PROTECTION INDEX
IP20

DIELECTRIC STRENGTH
PRI-SEC
≥ 4,5kV

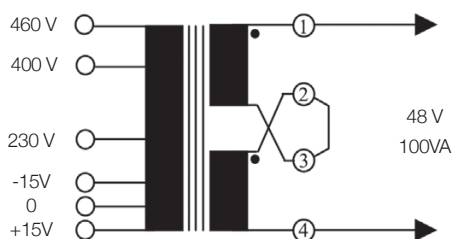
DIELECTRIC STRENGTH
BETWEEN WINDINGS & METALLIC PARTS
≥ 2,5kV

DIMENSIONS

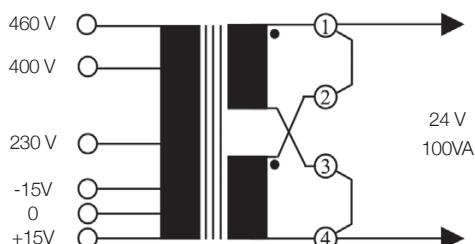


SECONDARY CONNECTION*

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

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

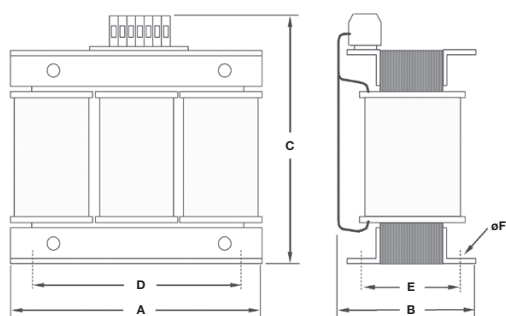
**DIELECTRIC STRENGTH
PRI-SEC**
> 4kV

VECTOR GROUP
Dyn5

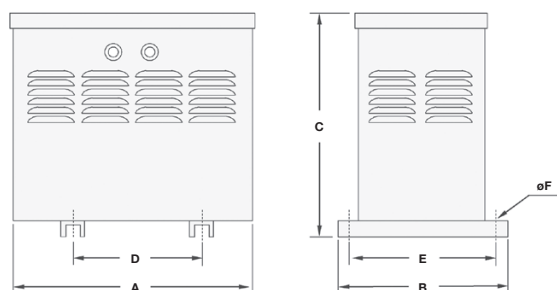
NATURAL AIR COOLING
OTHER CHARACTERISTICS ON REQUEST

DIMENSIONS

TRT33 IP00



TRT33 IP23



POWER
(kVA)

DIMENSIONS
(mm)

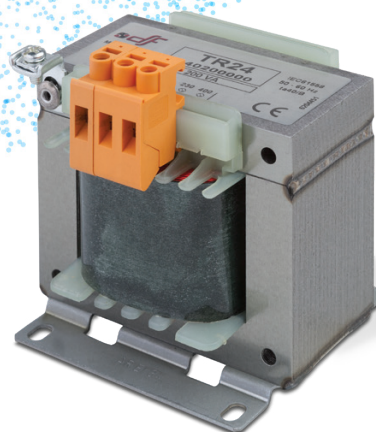
WEIGHT
(kg)

	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 to the voltages

TR24

Reversible SINGLE-PHASE autotransformer



TECHNICAL DATA

VOLTAGES
0-230-400V

THERMAL CLASS
B

MAX AMBIENT TEMPERATURE
40°C

FREQUENCY
50/60Hz

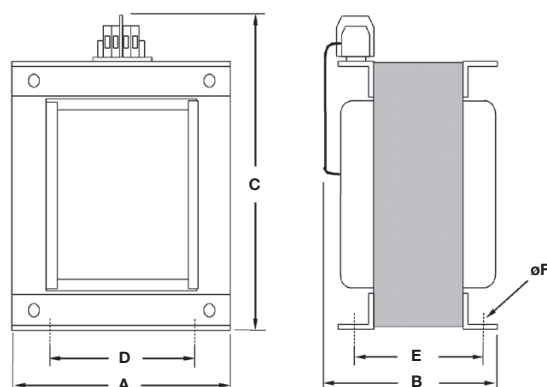
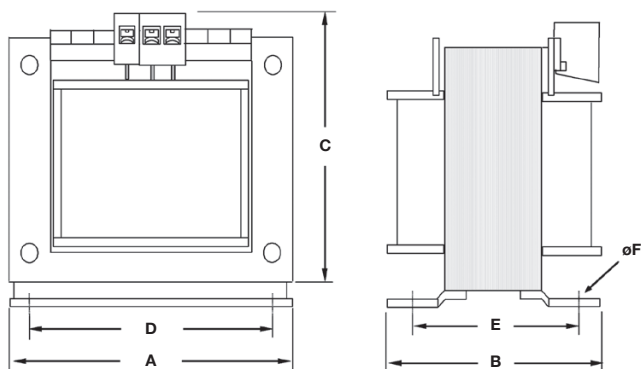
CLASS
I

PROTECTION INDEX
IP00

DIELECTRIC STRENGTH
PRI-SEC
> 3kV

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 to 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

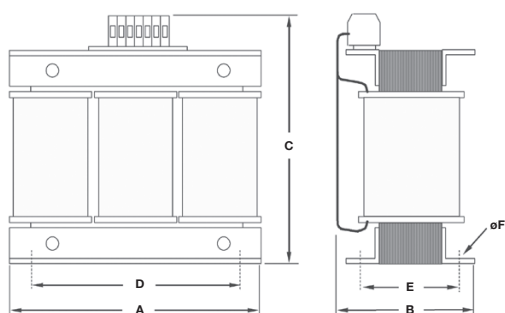
**MAX AMBIENT
TEMPERATURE**
40°C

PROTECTION INDEX
IP00 – IP23

REVERSIBLE
COPPER WINDINGS
NATURAL AIR COOLING
OTHER CHARACTERISTICS ON REQUEST

DIMENSIONS

TRT30 IP00



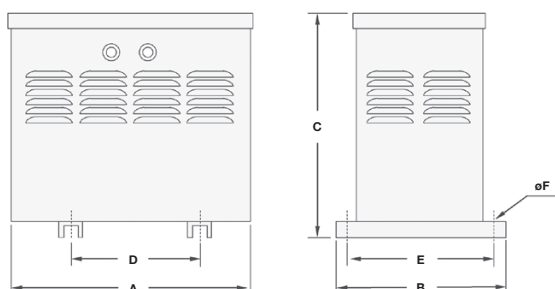
POWER
(kVA)

DIMENSIONS
(mm)

WEIGHT
(kg)

	A		B		C		D		E		F			
	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

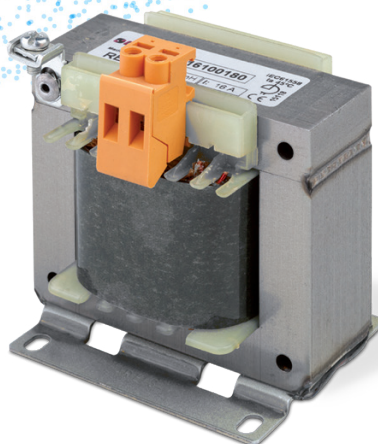
TRT30 IP23



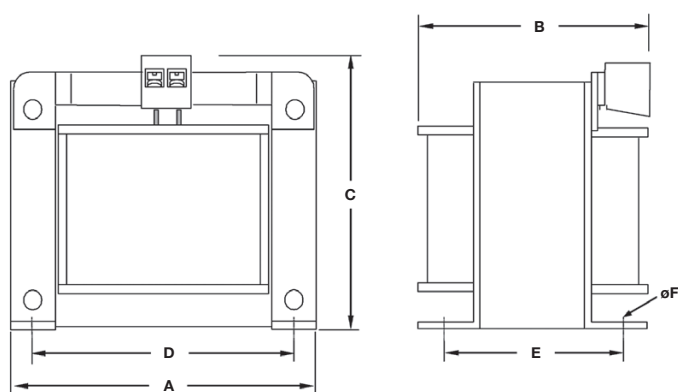
Dimensions may significantly vary according the voltages

RE8

Line
SINGLE-PHASE
reactor



DIMENSIONS



TECHNICAL DATA

VOLTAGE DROP
4% at I_N (230V)

THERMAL CLASS
B

MAX AMBIENT TEMPERATURE
40°C

FREQUENCY
50Hz

CLASS
I

PROTECTION INDEX
IP00

DIELECTRIC STRENGTH
PRI-SEC
> 3kV

OTHER CHARACTERISTICS ON REQUEST

CURRENT

(A)

DIMENSIONS

(mm)

WEIGHT

(kg)

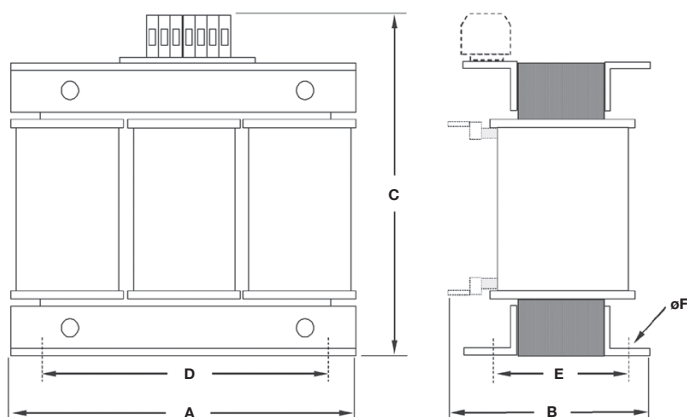
	A	B	C	D	E	F	
6	60	70	68	50	48	4	0,73
10	75	66	81	62,5	45	4	0,98
16	84	85	86	70	66	4	1,98
25	96	90	96	80	70	5	2,65
32	108	112	106	90	75	5	3,56
40	108	126	116	90	89	5	4,37
50	120	123	128	100	84	6	5,00
63	120	143	128	100	104	6	6,75

RET9

Line
THREE-PHASE
reactor



DIMENSIONS



TECHNICAL DATA

VOLTAGE DROP
4% at I_N (400V)

THERMAL CLASS
B – H

MAX AMBIENT TEMPERATURE
40°C

FREQUENCY
50Hz

NATURAL AIR COOLING
OTHER CHARACTERISTICS ON REQUEST

CLASS
I

PROTECTION INDEX
IP00

DIELECTRIC STRENGTH
PRI-SEC
> 4kV

CURRENT

(A)

DIMENSIONS

(mm)

WEIGHT

(kg)

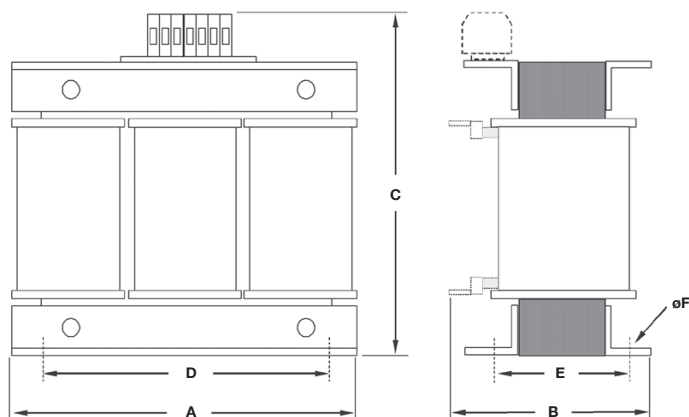
	A	B	C	D	E	F	
10	180	90	205	140	55	6	4,5
16	180	90	205	140	55	6	4,8
20	180	90	205	140	55	6	5,2
25	180	90	205	140	55	6	5,5
32	180	90	220	140	55	6	6,5
40	180	100	235	140	65	6	8,5
50	180	100	235	140	65	6	9,0
63	180	140	185	140	75	6	10,0
80	240	140	235	200	75	6	14,0
100	240	140	235	200	75	6	15,0
125	240	140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

RET9

Harmonic circuit filter THREE-PHASE reactor



DIMENSIONS



TECHNICAL DATA

VOLTAGE DROP
400V

FILTERING FACTOR
 $P=0,07$ (7%)

fr
189Hz

L TOLERANCE
3%

LINEARITY (95% I_N)
 $1,8 \cdot I_N$

MAX PERMANENT OVERLOAD
 $1,17 \cdot I_N$

THERMAL CLASS
B – H

MAX AMBIENT TEMPERATURE
40°C

FREQUENCY
50Hz

CLASS
I

PROTECTION INDEX
IP00

DIELECTRIC STRENGTH
PRI-SEC
> 4kV

THERMAL MICRO SWITCH
OTHER CHARACTERISTICS ON REQUEST

CURRENT
(kvar)*

DIMENSIONS
(mm)

WEIGHT
(kg)

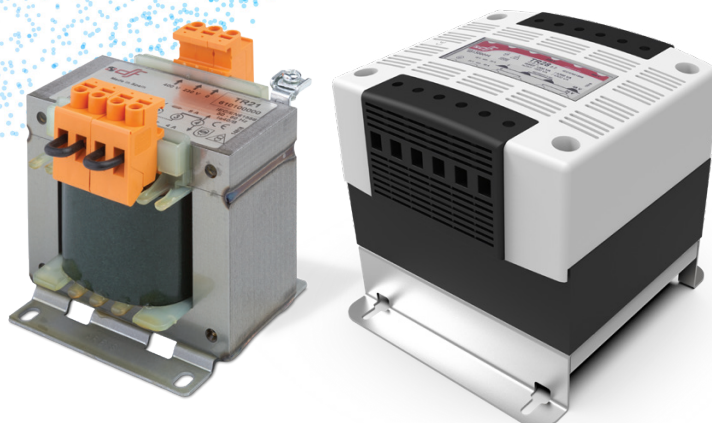
	A	B	C	D	E	F	
5	180	85	220	140	55	6	6,5
10	180	95	220	140	65	6	9,0
12,5	180	105	170	140	75	6	11,5
15	240	135	230	200	75	6	15,0
20	240	135	230	200	75	6	15,4
25	240	135	230	200	75	6	15,9
30	240	145	230	200	85	6	18,0
40	240	145	230	200	85	6	20,0
50	300	170	285	200	95	6	30,0
60	300	180	285	200	105	6	36,0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

* Effective filtered compensating reactive power

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 $\cos\varphi=0,5$ during the operation of contactors.

The instantaneous power will be:

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

ΣP_m sum of the sealed power of the contactors.

ΣP_s sum of the power of the signalling lamps.

P_a inrush power of the biggest contactor.

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			VARIABLE SPEED DRIVE			NORMAL LOAD			HEAVY LOAD			VARIABLE SPEED DRIVE		
(CV)	(kW)	FP	η (%)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)	(kVA)
0,25	0,18	0,72	72	0,35	0,5	0,5	0,5	0,5	0,5	0,5	0,5	1	0,5	0,5	0,5	0,5	0,5	0,5	0,5
0,5	0,37	0,72	72	0,71	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1
0,75	0,55	0,75	73	1,01	1	2	2	2	2	2	2	3	2	2	2	2	2	2	2
1	0,74	0,76	75	1,29	2	2	2	2	2	2	2	3	2	3	3	3	3	3	3
1,5	1,10	0,78	76	1,86	2	2	3	3	3	3	3	5	3	5	5	5	5	5	5
2	1,47	0,80	77	2,39	3	3	3	3	3	3	3	5	3	5	5	5	5	5	5
2,5	1,84	0,82	79	2,84	3	5	5	5	5	5	5	8	5	8	8	8	8	8	8
3	2,21	0,83	80	3,33	5	5	5	5	5	5	5	8	5	8	8	8	8	8	8
4	2,94	0,84	80	4,38	5	8	8	8	8	8	8	8	8	8	8	8	8	8	8
5	3,68	0,84	83	5,28	8	8	8	8	8	8	8	10	8	10	10	10	10	10	10
5,5	4,05	0,84	83	5,81	8	8	10	10	10	10	10	12,5	10	12,5	12,5	12,5	12,5	12,5	12,5
7,5	5,52	0,84	85	7,73	10	12,5	12,5	12,5	12,5	12,5	12,5	16	12,5	16	16	16	16	16	16
10	7,36	0,84	86	10,2	12,5	16	16	16	16	16	16	20	16	20	20	20	20	20	20
15	11,0	0,85	87	14,9	16	20	20	20	20	20	20	31,5	20	31,5	31,5	31,5	31,5	31,5	31,5
20	14,7	0,85	88	19,7	25	31,5	31,5	31,5	31,5	31,5	31,5	40	31,5	40	40	40	40	40	40
25	18,4	0,85	89	24,3	31,5	40	40	40	40	40	40	50	40	50	50	50	50	50	50
30	22,1	0,86	90	28,5	31,5	40	40	40	40	40	40	63	40	63	63	63	63	63	63
40	29,4	0,86	94	36,4	40	50	50	50	50	50	50	80	50	80	80	80	80	80	80
50	36,8	0,87	96	44,1	50	63	63	63	63	63	63	100	63	100	100	100	100	100	100
60	44,2	0,87	97	52,3	63	80	80	80	80	80	80	125	80	125	125	125	125	125	125
75	55,2	0,88	98	64,0	80	100	100	100	100	100	100	160	100	160	160	160	160	160	160
100	73,6	0,88	98	85,3	100	125	125	125	125	125	125	200	125	200	200	200	200	200	200
125	92,0	0,88	98	106,7	125	160	160	160	160	160	160	250	160	250	250	250	250	250	250
150	110,4	0,88	98	128,0	160	200	200	200	200	200	200	-	200	-	-	-	-	-	-
180	132,5	0,88	98	153,6	200	250	250	250	250	250	250	-	250	-	-	-	-	-	-
200	147,2	0,88	98	170,7	250	315	315	315	315	315	315	-	315	-	-	-	-	-	-

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

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 $\geq 3 \cdot I_n$ transformer

- Fuse links aM type according to IEC/EN60269

I_n fuse link $\geq 1,8 \cdot I_n$ transformer

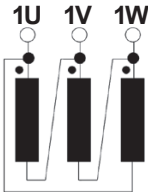
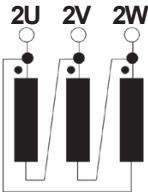
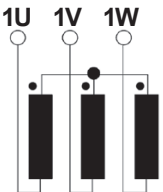
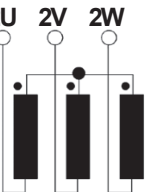
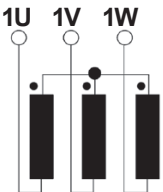
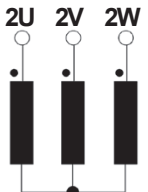
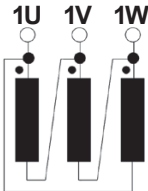
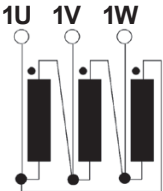
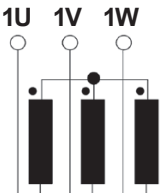
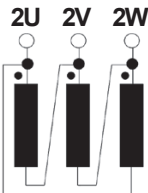
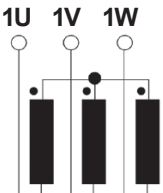
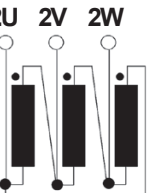
- Fuse links gG type according to IEC/EN60269

I_n fuse link $\geq 3 \cdot I_n$ transformer

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.

TR | transformers
autotransformers

RE | reactors

IP PROTECTION INDEX

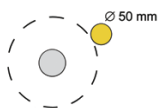
FIRST NUMBER

PROTECTION AGAINST CONTACTS AND SOLID OBJECTS

0

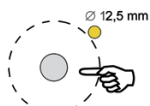
NO SPECIAL PROTECTION

1



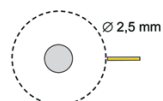
PROTECTED AGAINST SOLID OBJECTS GREATER THAN 50 mm
(SUCH AS A HAND)

2



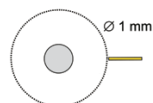
PROTECTED AGAINST SOLID OBJECTS GREATER THAN 12,5 mm
(SUCH AS A FINGER)

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 AGAINST 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



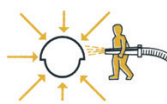
PROTECTION AGAINST DRIPPING WATER AT AN ANGLE UP TO 60°

4



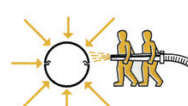
PROTECTION AGAINST SPLASHING WATER FROM ANY DIRECTION

5



PROTECTION AGAINST WATER JETS

6



PROTECTION AGAINST POWERFUL WATER JET

7

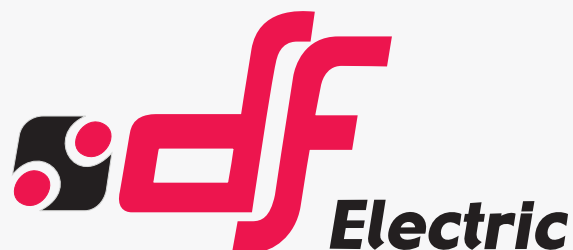


PROTECTION AGAINST THE EFFECTS OF TEMPORARY IMMERSION IN WATER

8



PROTECTION AGAINST THE EFFECTS OF CONTINUOUS IMMERSION IN WATER



PROTECTING THE WORLD

HEAD OFFICE AND FACTORY

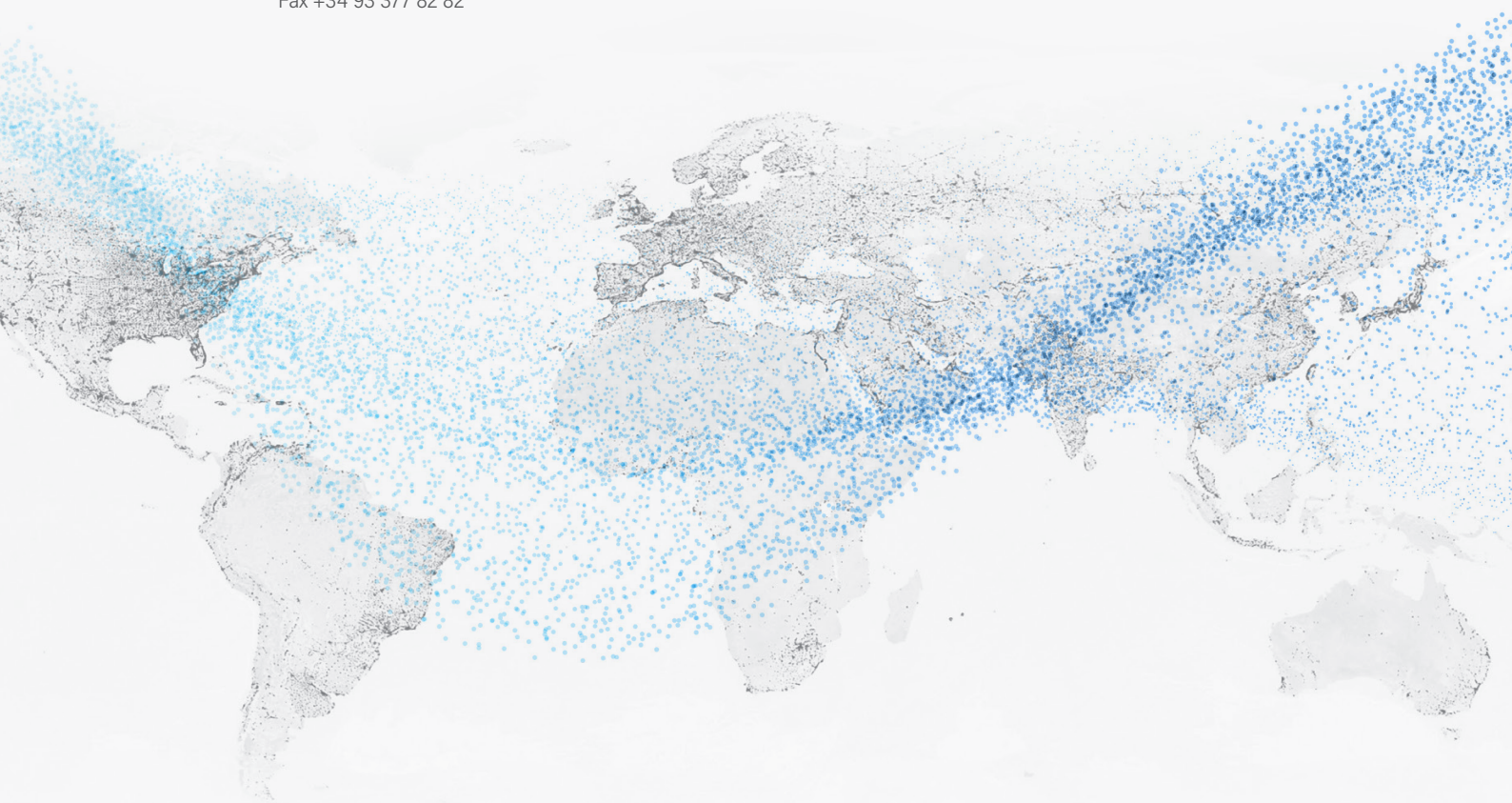
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The "electro technical expert" logo marked on the products included in this data sheet indicates that the installation of these products must be carried out by expert personnel with specialized knowledge.



To prevent electrical hazards, carry out the installation without voltage.



Safety notice
Please capture the following QR code and read our safety notice carefully before installing our products.



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