



TRT30 REVERSIBLE ALUMINIUM WINDINGS

three-phase autotransformers



**PROTECTING
THE WORLD**



TRT30
AL

POWER
1kVA...125kVA

RATED VOLTAGES
230-400V

STANDARDS
IEC/EN 61558-1
IEC/EN 61558-2-13
IEC60076-11



IP00



IP23

TRT30 REVERSIBLE

Three-phase autotransformers

TRT30 AL autotransformers are specially intended for use as voltage adapter when an economical solution is required. Their windings are made in aluminium.

Autotransformers have a small size (and small price) that a transformer with the same rated power. The main disadvantage is that the autotransformers do not have galvanic isolation. Neither can filter disturbances and interferences produced by harmonics or high frequency.

The main applications comprise the voltage adaptation in motors, electrical pumps, machinery, or air conditioned equipment. The TRT30 autotransformers are reversible, thus can be used as step up as well as step down autotransformers.

The range comprises rated power between 1kVA and 125kVA.

They are sized for continuous service at 100% of power in an ambient temperature up to 40°C. For ambient temperatures above 40°C it is necessary to apply a derating.

Rated voltages 230-400V according standard values in IEC60038. On request we can manufacture autotransformers with other voltages or with regulation taps. TRT30 autotransformers can withstand an input overvoltage of up to 10%.

The windings have star connection with accessible neutral. There are versions without case (IP00) and with metallic case (IP23).

Range

POWER (kVA)	REFERENCE	
	TRT30 IP00	TRT30 IP23
1	70N0010500	70C0010500
2	70N0020500	70C0020500
3	70N0030500	70C0030500
5	70N0050500	70C0050500
8	70N0080500	70C0080500
10	70N0100500	70C0100500
12,5	70N0125500	70C0125500
16	70N0160500	70C0160500
20	70N0200500	70C0200500
25	70N0250500	70C0250500
31,5	70N0315500	70C0315500
40	70N0400500	70C0400500
50	70N0500500	70C0500500
63	70N0630500	70C0630500
80	70N0800500	70C0800500
100	70N1000500	70C1000500
125	70N1250500	70C1250500

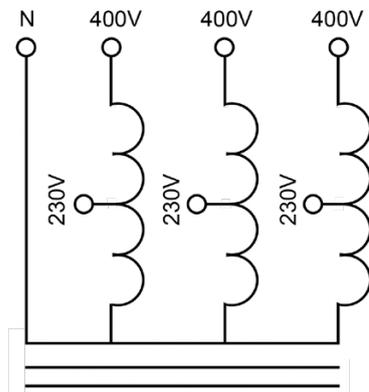
OTHER CHARACTERISTICS ON REQUEST SUBJECT TO AVAILABILITY AND POSSIBILITY



Technical data

Use	Reversible autotransformer. Indoor use. Dry type. For stationary installation. Continuous operation (ED100%)
Rated voltages	230-400V
Rated power range	1kVA to 125kVA 1kVA to 3kVA → IEC/EN61558-13 5kVA to 125kVA → IEC60076-11
Vector group	YN0 connection star with accessible neutral
Protection against electric shock	Class I
Thermal class	≤ 20kVA: F (155°C) ≥ 25kVA: H (180°C)
Rated ambient temperature	40°C
Protection index	IP00 IP23
Frequency	50/60Hz
Dielectric strength	> 3kV
Ambient temperature of service *	-20°C ... 70°C
Storage temperature	-40°C ... 85°C
Cooling	Natural air cooling If the transformer is placed into a cabinet, it must have adequate ventilation.

* For ambient temperatures higher than 40°C it is necessary to apply a derating.



Standards

IEC/EN 61558-1 Transformers, general specifications
IEC/EN 61558-2-13 Autotransformers for general use
IEC60076-11 Dry-type power transformers
RoHS Compliant



Constructive characteristics

Aluminium windings class HC (220°C)

Reinforced insulation

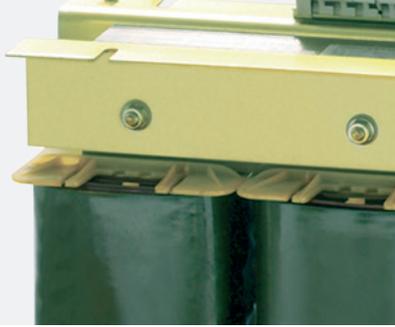
Flexible insulating materials Class F (155°C) or H (180°C)

Impregnation with epoxy resin class H (180°C)

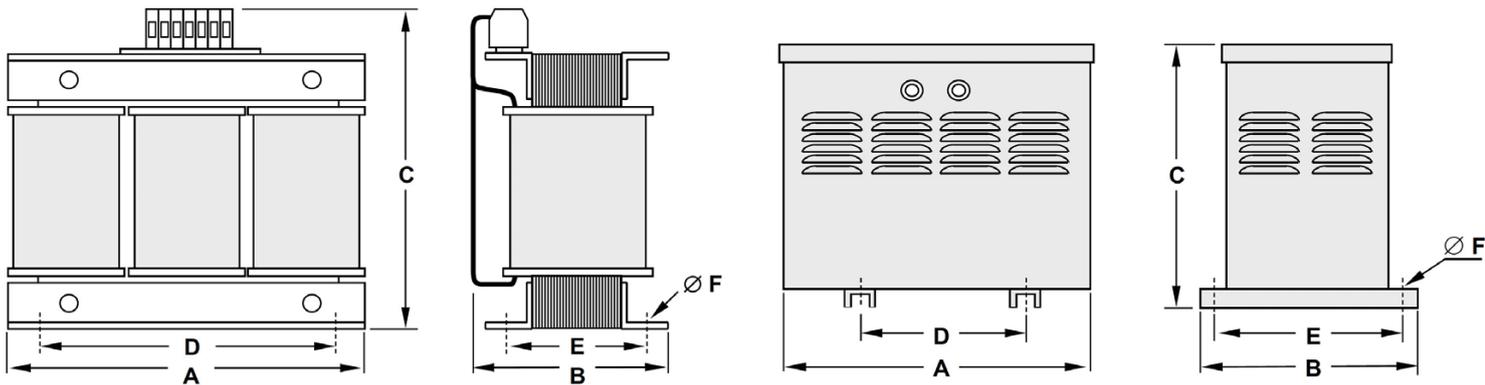
Connection with terminal blocks or screws to connect crimping terminals

With eyebolts for rated power from 20kVA

Metallic case with index protection IP23 painted with epoxy in RAL7032 colour



Dimensions



TRT30 IP00

TRT30 IP23

POWER (kVA)	DIMENSIONS (mm)						WEIGHT (kg)
	A	B	C	D	E	F	
1	180	90	210	140	55	7	5,6
2	180	95	210	140	65	7	7,2
3	240	120	260	200	75	7	12,6
5	240	130	260	200	95	6	18
8	240	145	261	200	110	6	17
10	300	165	324	200	115	6	31
12,5	300	180	324	200	135	6	37,6
16	300	180	365	300	125	8	45
20	360	170	366	300	125	8	55
25	360	180	366	300	125	8	71
31,5	420	200	425	300	140	8	78,4
40	420	255	440	300	170	9	95
50	480	260	500	400	175	10,5	115
63	480	290	510	400	195	10,5	135
80	480	300	510	400	195	10,5	152,5
100	600	320	605	500	180	16	187,5
125	600	340	605	500	200	16	220

POWER (kVA)	DIMENSIONS (mm)						WEIGHT (kg)
	A	B	C ¹	D	E	F	
1	235	240	285	140	215	12	9
2	235	240	285	140	215	12	10,5
3	285	290	335	200	265	12	17,4
5	285	290	335	200	265	12	21,5
8	285	290	335	200	265	12	31
10	375	300	435	200	270	12	38
12,5	375	300	435	200	270	12	44,5
16	375	300	435	200	270	12	55
20	450	400	480	300	370	12	65
25	450	400	480	300	370	12	81
31,5	510	400	540	300	370	12	89,5
40	510	400	540	300	370	12	110
50	540	500	610	400	470	12	135
63	540	500	610	400	470	12	155
80	540	500	610	400	470	12	173
100	880	530	830	500	500	12	220
125	880	530	830	500	500	12	245

These dimensions belongs to autotransformers with rated voltage of 230-400V.
For another voltages the dimmensions can be very different.

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For another voltages the dimmensions can be very different.

¹ Eyebolts \geq 16kVA +45mm



Typical values

RATED POWER t_a 40°C (kVA)	RATED CURRENT 230V (A)	RATED CURRENT 400V (A)	NO-LOAD CURRENT I_0 (% I_n)	NO-LOAD LOSSES P_{FE} (W)	CC LOSSES P_{Cu} (W)	U_{cc} (%)	EFFICIENCY (%)
1	2,5	1,4	4	14	33	3	95,5
2	5	2,9	2,9	18	66	3,2	95,9
3	7,5	4,3	2,4	22	70	2,4	97
5	12,6	7,22	3,5	30	125	2,5	96,9
8	20,1	11,5	2,8	53	205	2,5	96,8
10	25,1	14,4	3	57	170	1,9	97,5
12,5	31,4	18	3,5	70	190	1,8	97,5
16	40,2	23,1	2,3	95	240	1,8	97,7
20	50,2	28,9	2,4	118	232	1,6	98
25	62,8	36,1	2	106	325	1,6	98,1
31,5	79,1	35,5	2,9	143	670	2,3	97,5
40	100,4	57,7	2	175	710	1,6	97,8
50	125,5	72,2	1,6	199	750	1,8	98,1
63	158,1	90,9	1,9	250	1075	1,7	97,9
80	200,8	115,5	2	295	1295	1,6	98
100	251	144,3	1,8	380	1600	1,9	98
125	313,8	180,4	1,2	442	1896	1,7	98,2



Autotransformer protection

The autotransformers (and their lines) must be protected against overloads and/or shortcircuits that they can be submitted in use, and could causes dangerous situations for persons, animals or installations.

These protections are also a requirement of the standards and the national regulations about electrical installations.

The most adequate way to protect these autotransformers (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.

As a general rule the criteria to select the ratings of protection devices are the following:

Protection on the **output side** (load)

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

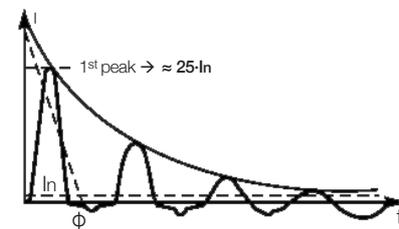
In order to achieve a good protection, the device (fuse link, circuit breaker or similar) must be capable to interrupt all range of currents (overloads and short circuits) and must has a rated current of the autotransformer (see the nameplate of the autotransformer).

Protection on the **input side** (supply line)

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 autotransformer 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 reach the rated value



The amplitude of this peak it depends of several factors (autotransformer design, instantaneous value of the voltage when the transformer is energized, ...)

These factors should be take into account to choose the protection in order to avoid the fusing of the fuses or the not desired operation of the circuit breakers.

For the protection of the line side of the TRT30 autotransformers we can use the following devices:

- aM fuses
I fuse $\geq 1,1 \cdot I$ autotransformer
- gG fuses
I fuse $\geq 2,2 \cdot I$ autotransformer
- Circuit breaker D type
I MCB $\geq 1,6 \cdot I$ autotransformer
- Circuit breaker C type
I MCB $\geq 3,3 \cdot I$ autotransformer

Obviously, there are several ways to ensure the correct protection of the TRT30 autotransformers because in the market we can find a wide range of protection devices.

We must take into account the main characteristics of this devices:

- Rated current.
- Rated voltage.
- Breaking range.
- Breaking capacity.



Autotransformer protection (cont.)

The following table defines the more common protection devices as gG or aM fuses according IEC/EN60269 or circuit breakers according IEC/EN60947.

Autotransformer working as **STEP-UP (230V → 400V)**

POWER (kVA)	MINIMUM RATED CURRENT OF PROTECTION					
	INPUT SIDE (230V)				OUTPUT SIDE (400V)	
	gG FUSE (A)	aM FUSE (A)	MCB charact. D (A)	MCB charact. C (A)	gG FUSE (A)	MCB ① (A)
1	6	4	6	10	-	1,6
2	12	6	10	16	-	3
3	16	10	16	25	4	4
5	32	16	25	40	8	8
8	50	25	40	80	10	10
10	63	32	50	80	12	16
12,5	80	40	63	100	16	16
16	100	50	80	125	20	20
20	125	63	100		25	25
25	160	80	125		32	32
31,5	200	100			40	40
40	224	125			50	50
50	315	160		③	63	63
63	355	200	③	③	80	80
80	400	250			100	100
100	500	315			125	125
125	630	400			160	②

- ① The characteristic will be selected according to the kind of the load
- ② Moulded case circuit breaker with the thermal trip adjusted at the rated current of the autotransformer
- ③ Moulded case circuit breaker with thermal trip adjusted at 1,05·In of the autotransformer



Autotransformer protection (cont.)

The following table defines the more common protection devices as gG or aM fuses according IEC/EN60269 or circuit breakers according IEC/EN60947.

Autotransformer working as **STEP-DOWN (400V → 230V)**

POWER (kVA)	MINIMUM RATED CURRENT OF PROTECTION					
	INPUT SIDE (400V)				OUTPUT SIDE (230V)	
	gG FUSE (A)	aM FUSE (A)	MCB charact. D (A)	MCB charact. C (A)	gG FUSE (A)	MCB ① (A)
1	4	2	3	6	2,5 AT ④	3
2	8	4	6	10	5 AT ④	6
3	10	6	10	16	8 AT ④	8
5	16	10	16	25	12	12
8	25	16	20	40	20	20
10	32	20	25	50	25	25
12,5	40	25	32	63	32	32
16	50	32	40	80	40	40
20	63	40	50	100	50	50
25	80	50	63	125	63	63
31,5	100	63	80		80	80
40	125	80	100		100	100
50	160	100	125		125	125
63	200	125		③	160	
80	250	160			200	②
100	315	200	③		250	
125	400	224			315	

- ① The characteristic will be selected according to the kind of the load
- ② Moulded case circuit breaker with the thermal trip adjusted at the rated current of the autotransformer
- ③ Moulded case circuit breaker with thermal trip adjusted at 1,05·In of the autotransformer
- ④ 5x20 or 6x32 fuse links according IEC/EN60127



Selection guide

Determination of rated power of the autotransformer for the supply 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

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)

(CV)	(kW)	MOTOR*		(kVA)	NON FREQUENT START (UP TO 4 STARTS / HOUR)			FREQUENT START (UP TO 15 STARTS / HOUR)		
		FP	η (%)		NORMAL LOAD (kVA)	HEAVY LOAD (kVA)	VARIABLE SPEED DRIVE (kVA)	NORMAL LOAD (kVA)	HEAVY LOAD (kVA)	VARIABLE SPEED DRIVE (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	0,85	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	80	100	100	100	125	100
100	73,6	0,88	98	85,3	100	125	125	125	160	125
125	92	0,88	98	106,7	125	-	-	-	-	-

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

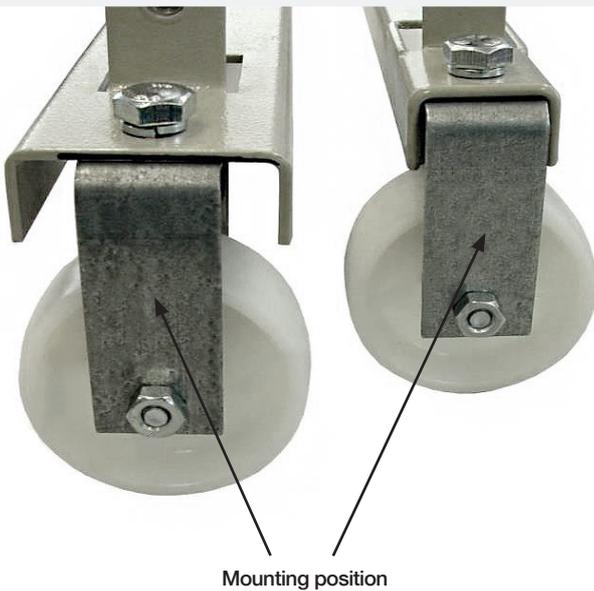


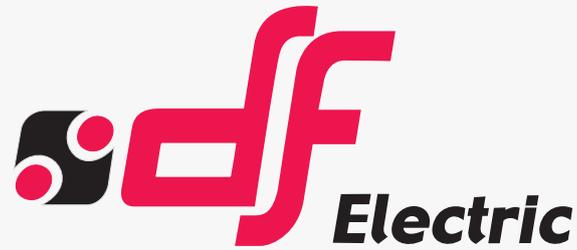
Accessories

Wheel set

Maximum load 200 kg/wheel
Fixation with M10 screws *(included)*

690000005 SET OF 4 WHEELS





PROTECTING THE WORLD

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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
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