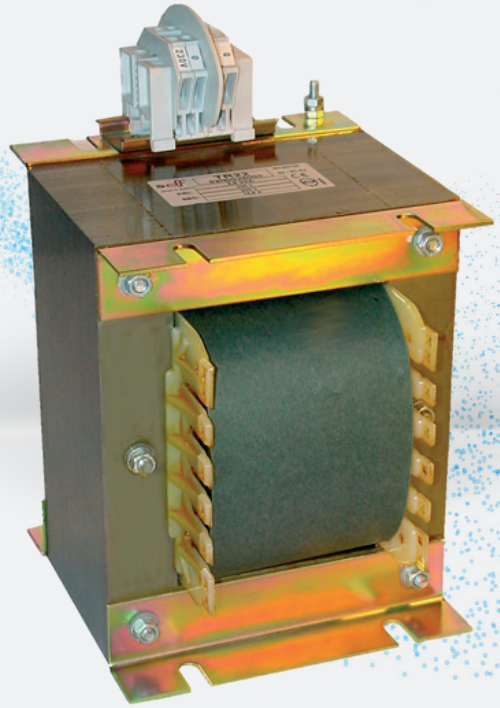
df Electric

TRANSFORMERS

LOW VOLTAGE TRANSFORMERS · AUTOTRANSFORMERS · REACTORS



TR22
POWER
single-phase transformers

TR22

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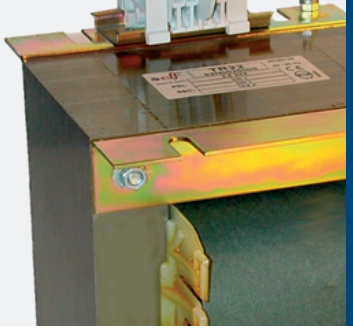


TR22
POWER
single-phase transformers

TRANSFORMERS

TR22

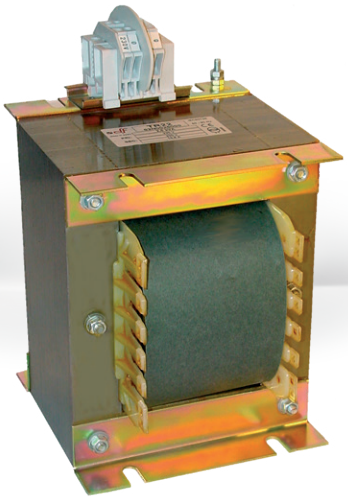
TR22

POWER
1,3KVA...31,5kVA

PRI VOLTAGE
ON REQUEST

SEC VOLTAGE
ON REQUEST

STANDARDS
IEC60076-11



IP00

IP23

TR22 POWER
Single-phase transformers

TR22 transformers are single-phase isolating transformers and are specially intended for use as voltage adapter and/or when a galvanic isolation is required.

The range comprises rated power between 1,3kVA and 31,5kVA.

Rated voltages on request (max. 750V).

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.

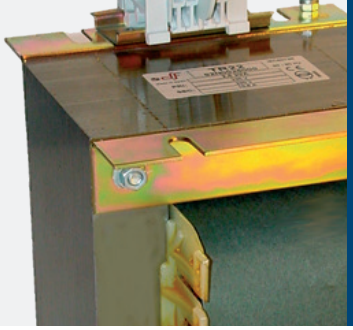
TR22 transformers can withstand an input overvoltage up to 10%.

There are versions without case (IP00) and with metallic case (IP23).

On request we can manufacture transformers with electrostatic screen, with taps for regulation. etc.

Range

POWER (kVA)
1,3
1,6
2,0
2,5
3,0
3,5
4,0
5,0
6,3
8,0
10
12,5
16
20
25
31,5



TR22 POWER
single-phase transformers

TR22

TRANSFORMERS

Technical data

Use	Indoor use. Dry type. For stationary installation. Continuous operation (ED100%)
Rated primary voltage	ON REQUEST
Rated secondary voltage	ON REQUEST
Rated power range	1,3kVA ... 31,5kVA
Protection against electric shock	Class I
Thermal class	F (155°C) ≤ 5kVA H (180°C) ≤ 6,3kVA
Rated ambient temperature	40ºC
Protection index	IP00 | IP23
Frequency	50/60Hz
Dielectric strength between primary and secondary	≥4kV
Dielectric strength between windings and metallic parts	≥2,5kV
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 40ºC it is necessary to apply a derating.

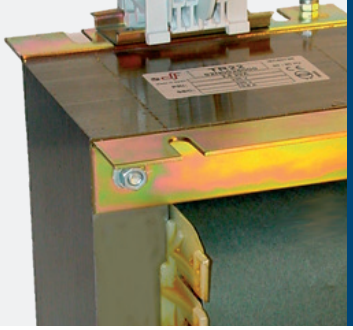
Standards

IEC60076-11 Dry-type power transformers
RoHS Compliant

RoHS COMPLIANT

Constructive characteristics

Copper windings Class F (155°C) or H (180°C)
Reinforced insulation
Flexible insulating materials Class F (155°C) or H (180°C)
Impregnation Class H (180°C)
Impregnation Class F (155°C)
Connection with terminal blocks protected against accidental contacts
Metallic case with index protection IP23 painted with epoxy in RAL7032 colour

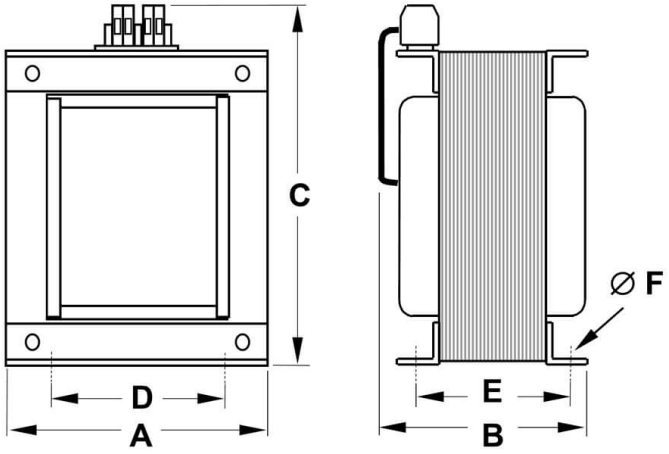


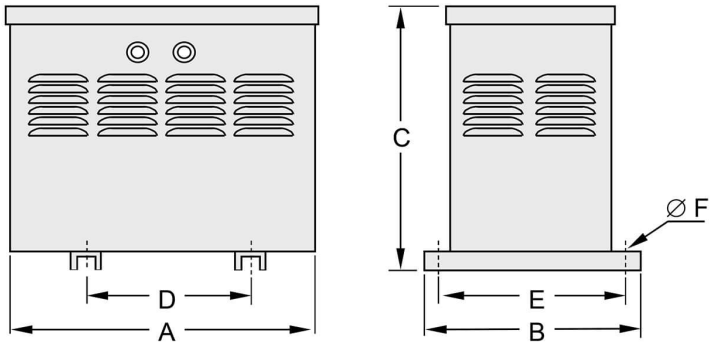
TR22 POWER
single-phase transformers

TRANSFORMERS

TR22

Dimensions





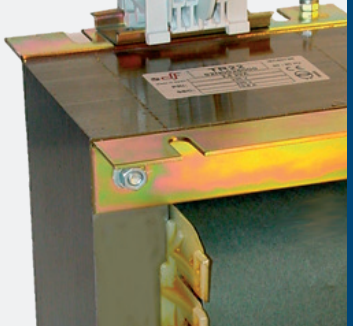
TR22 IP00

POWER	DIMENSIONS						WEIGHT
(kVA)	(mm)						(kg)
	A	B	C	D	E	F	
1,3	163	145	245	98	110	8	14,5
1,6	163	160	245	98	115	8	17,0
2,0	163	165	245	98	120	8	19,0
2,5	163	185	245	98	140	8	23,5
3,0	200	180	290	120	120	10	27,1
3,5	200	190	290	120	130	10	30,1
4,0	200	200	290	120	140	10	34,0
5,0	200	220	290	120	160	10	42,0
6,3	250	230	350	150	160	12	56,0
8,0	250	250	361	150	180	12	67,0
10	250	270	361	150	200	12	79,0
12,5	300	300	460	180	220	12	108
16	300	320	460	180	240	12	126
20	300	340	460	180	260	12	150
25	350	360	520	210	270	12	180
31,5	350	370	520	210	280	12	210

TR22 IP23

POWER	DIMENSIONS						WEIGHT
(kVA)	(mm)						(kg)
	A	B	C	D	E	F	
1,3	285	290	335	200	265	12	18,5
1,6	285	290	335	200	265	12	21,0
2,0	285	290	335	200	265	12	23,0
2,5	285	290	335	200	265	12	27,5
3,0	375	300	435	200	270	12	34,6
3,5	375	300	435	200	270	12	37,6
4,0	375	300	435	200	270	12	41,5
5,0	375	300	435	200	270	12	49,5
6,3	450	400	480	300	370	12	64,0
8,0	450	400	480	300	370	12	75,0
10	450	400	480	300	370	12	87,0
12,5	540	500	610	400	470	12	116
16	540	500	610	400	470	12	134
20	540	500	610	400	470	12	158
25	540	500	610	400	470	12	190
31,5	540	500	610	400	470	12	220

The dimensions may sligthtly vary according the different rated voltages



Transformer protection

The transformers (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 this transformers (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 equal or lower than the output rated current of the transformer (I_2).

$$I_2 = \frac{P}{U_2}$$

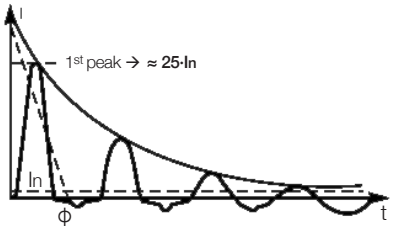
I_2 → rated current of the secondary of the transformer (A)
P → rated power of the transformer (VA)
U_2 → secondary rated voltage (V)

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 transformer.

For this reason we only must protect the input line of transformer against short circuits in the line, in the transformer 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 reach the rated value



The amplitude of this peak it depends of several factors (transformer 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 TR22 transformers we can use the following devices:

- aM fuses (I fuse ≥ 1,1 · I_1 transformer)
- gG fuses (I fuse ≥ 2,2 · I_1 transformer)
- Circuit breaker D type (I MCB ≥ 1,6 · I_1 transformer)

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

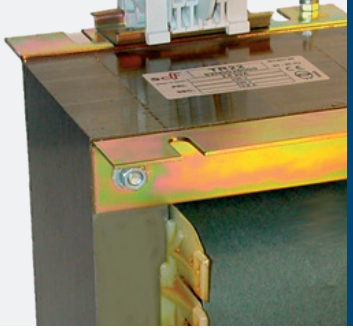
We must take into account the main characteristics of this devices:

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

The rated current of transformer (I_1) can be calculated with the formula:

$$I_1 = \frac{P}{U_1}$$

I_1 → rated current of the primary of the transformer (A)
P → rated power of the transformer (VA)
U_1 → primary rated voltage (V)



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 ϕ = 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

With the continuous power requirement and the instantaneous power required by the circuit, we are able to choose the adequate size of transformer (see the **maximum instantaneous power of TR21 transformers**).

Example

This example assumes the following:

- **4 contactors for motor**
  sealed power: 8 VA
- **2 contactors for motor**
  sealed power: 18 VA
- **1 contactors for motor**
  sealed power: 22 VA
  Inrush power: 22 VA
- **3 signalling lamps of 2 VA**

The total sealed power will be:

4 x 8 VA = 32 VA
2 x 18 VA = 36 VA
1 x 22 VA = 22 VA
ΣP_m = **90 VA**

Sum of the signalling lamps power:

ΣP_s = 3 x 2 VA = **6 VA**

Inrush Power of the biggest contactor:

P_a = **280 VA**

The instantaneous power will be:

$P_{inst.}$ = 90 VA + 6 VA + 280 VA = **376 VA**

Continuous power:

P = 90 VA + 6 VA = **96 VA**

With this information we can select the adequate size of transformer. In this example the **rated power will be 160 VA** (the 100 VA transformer does not have enough instantaneous power).

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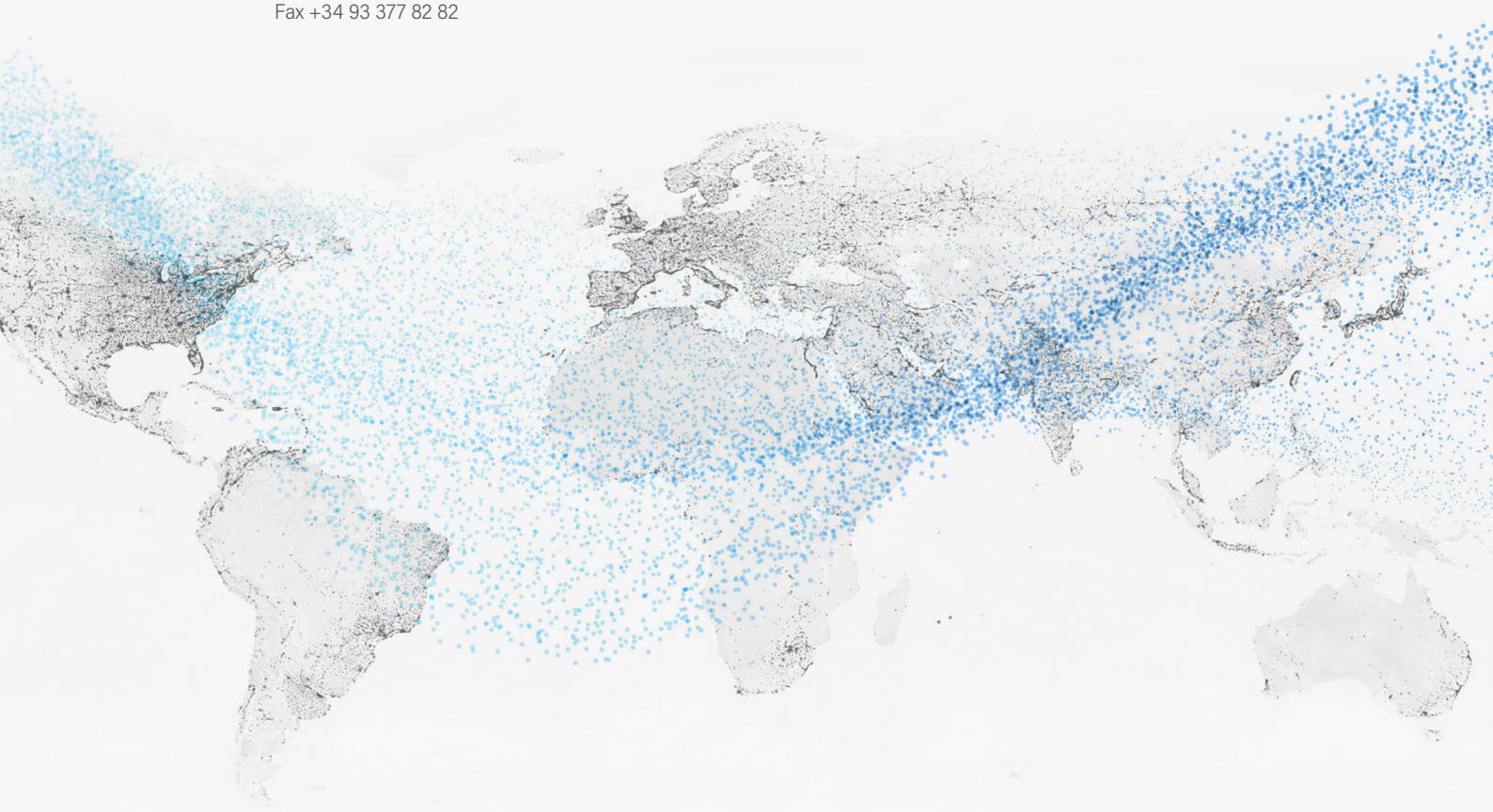

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