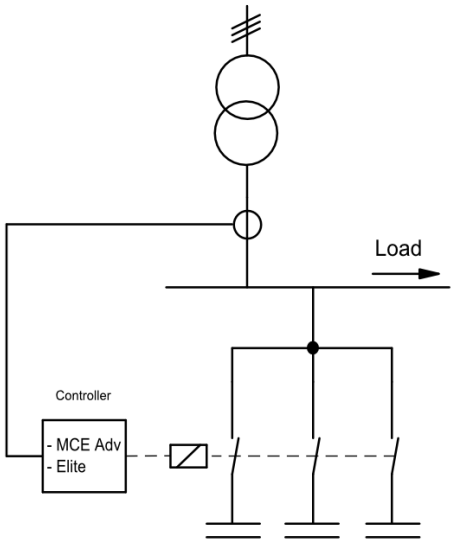
CURRENT TRANSFORMERS

For their correct operation, reactive power controllers that control the automatic capacitor banks, require to have a signal input to allow them to know at every moment the needs of reactive energy of the installation.
This signal is provided through a current transformer, located outside of the bank, in a point of the line through which circulates the totality of the load of the installation (capacitors included).
To select correctly a current transformer, first there have to be established the following characteristics of itself:

- Primary and secondary current
- Power
- Precision class



Current of the primary and secondary

Primary current of the transformer is calculated from the power of the feeding transformer or in lack of it, from the power of the installed load.

Example: Let's suppose that we have a transformer with a power S = 1000 kVA and a rated voltage U_N = 400 V 50 Hz

$$I\ (A) = \frac{S\ (\text{kVA})}{U_N(\text{V}) * \sqrt{3}} * 1000 = \frac{1000}{400 * \sqrt{3}} * 1000 = 1443\ A$$

It shall then be selected a transformer of 1500 A, which is the standard value immediately higher to the calculated one. Current of the secondary is standardized in a value of 5 A. Transformer will then be a **1500/5 A**. It is named constant of the transformer to the quotient resulting from the primary current/secondary current, represented by the letter k. In this case k = 1500/5 = 300.

Power

Transformer must have a higher power than the load which is feeding. This load is composed by the controller, by any other instrument (ammeter, etc.) connected in the same circuit, **and by the losses in the conductors of the line.**

Power of some of the most common loads are indicated in the table:

Measurement and control equipment	Power (VA)
Reactive controllers MCR and MR	0.5
Moving iron instruments	0.7 - 1.5
Digital instruments	0.5 - 1.0
Adding current transformers	2.5
Harmonic detector relay	1.5
Active and reactive energy meters	0.5 - 5.0
Impedance adapter transformer	2.5

Losses in the conductors of the line of the secondary can be evaluated through the following relations (for transformers .../5 A):

Section	Losses
1.5 mm^2	0.60 VA/m
2.5 mm^2	0.37 VA/m
4.0 mm^2	0.23 VA/m
6.0 mm^2	0.15 VA/m

Example: In the installation of the previous example, current transformer is connected to the capacitor bank through a line of 10 meters long with 2.5 mm^2 section cable. The bank is equipped with a **MCR** controller.

Losses in the line: 10 m · 0.37 VA/m =	3.7 VA
Power of the **MCR** controller:	0.5 VA

Total power	**4.3 VA**

A power of 5 VA, which is the normalized value immediately higher to the one obtained by the calculation will be chosen. Required transformer will then be :

1500/5 A 5 VA

Precision class

To work, there should be usually used transformers of class 1. Nevertheless, for transformers of small current, it can be necessary to work with transformers of class 3.

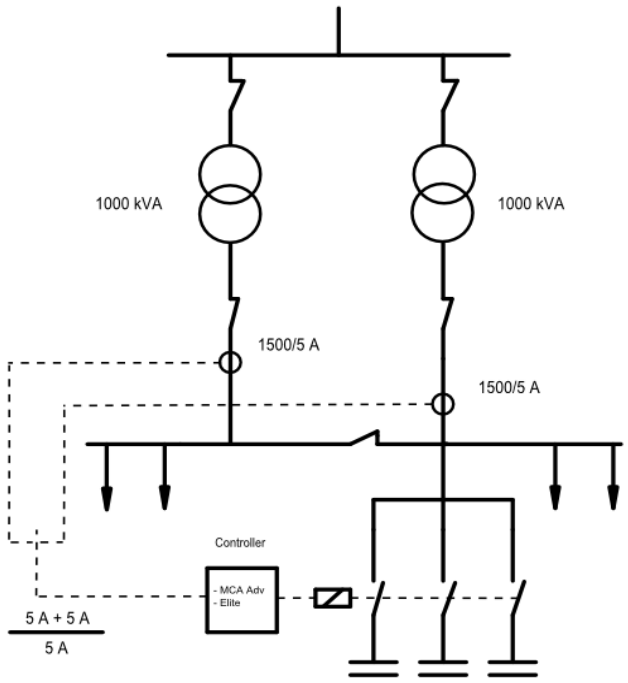
Note: If the distance between the transformer and the bank is very high and the losses in the line are higher than the power of the transformer, important measuring errors are originated. In this case, it shall be used an impedance adapter transformer, which reduces the value of the current to only 100 mA. One second adapter transformer gives back the current to its level of .../5 A before the controller of the bank.

Adding current transformers

When it is necessary to compensate two or more feeding transformers through only one capacitor bank, a current transformer has to be installed on each transformer, as well as to integrate its signals through an adding current transformer, which will be the one in charge to give the signal to the controller.

To allow summing the intensities of the transformers, these latter ones must have the same transformation relation. In the example of the figure, the final constant of the current transformer will be:

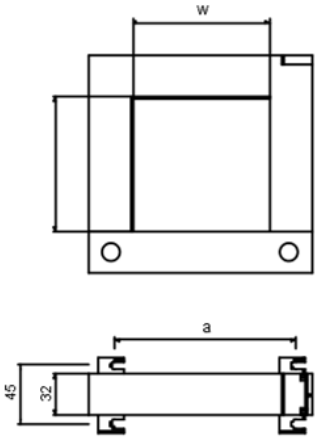
$$K = \frac{(1500+1500)}{5} = 600$$



CURRENT TRANSFORMERS WITH SPLIT-CORE
TCP SERIES

Current transformers **TCP** series are designed to facilitate their assembly in both, new installations and those that are already working.

In the conventional transformers it is imperative to interrupt the primary circuit to set up the cables or busbars through the interior of the core. The practicable core of **TCP** transformers allows its assembly without needing to interrupt the supply of electrical power, what represents a considerable installation saving cost.



TECHNICAL CHARACTERISTICS

Maximal voltage of the network	**0.6 kV 50 Hz**
Frequency	**50 ... 60 Hz**
Insulation level	**0.6 / 3 kV**
Max. transitory current	**20 I_N**
Working temperature	**- 10 / + 50 ºC**
Precision class	**0.5**
Intensity of the secondary	**... / 5 A**
Casing	**Self-extinguishing V0**
Standards	**IEC 185, VDE 414**
	UNE 21088

		POWER (VA)			Core opening			
Reference	**Type(A)**	**class: 0.5**	**1**	**3**	**w(mm)**	**l(mm)**	**a(mm)**	**Weight(kg)**
TCP02301005	100/5	-	-	1.5	20	30	51	0.75
TCP02301505	150/5	-	-	2	20	30	51	0.75
TCP02302005	200/5	-	1.5	2.5	20	30	51	0.75
TCP02302505	250/5	-	2	4	20	30	51	0.75
TCP02303005	300/5	1.5	4	6	20	30	51	0.75
TCP02304005	400/5	2.5	6	10	20	30	51	0.75
TCP05802505	250/5	1	2	4	50	80	78	0.90
TCP05803005	300/5	1.5	3	6	50	80	78	0.90
TCP05804005	400/5	1.5	3	10	50	80	78	0.90
TCP05805005	500/5	2.5	5	15	50	80	78	0.90
TCP05806005	600/5	2.5	5	17.5	50	80	78	0.90
TCP05807505	750/5	3	6	18	50	80	78	0.90
TCP05808005	800/5	3	7	18	50	80	78	0.90
TCP05810005	1000/5	5	10	20	50	80	78	0.90
TCP08802505	250/5	1	2	4	80	80	108	1.00
TCP08803005	300/5	1.5	3	6	80	80	108	1.00
TCP08804005	400/5	1.5	3	10	80	80	108	1.00
TCP08805005	500/5	2.5	5	15	80	80	108	1.00
TCP08806005	600/5	2.5	5	17.5	80	80	108	1.00
TCP08807505	750/5	3	6	18	80	80	108	1.00
TCP08808005	800/5	3	7	18	80	80	108	1.00
TCP08810005	1000/5	5	10	20	80	80	108	1.00
TCP81205005	500/5	-	4	12	80	120	108	1.20
TCP81206005	600/5	-	5	14	80	120	108	1.20
TCP81207505	750/5	2.5	6	17	80	120	108	1.20
TCP81208005	800/5	3	7	18	80	120	108	1.20
TCP81210005	1000/5	5	9	20	80	120	108	1.20
TCP81212005	1200/5	6	11	24	80	120	108	1.20
TCP81212505	1250/5	7	15	28	80	120	108	1.20
TCP81215005	1500/5	8	17	30	80	120	108	1.20