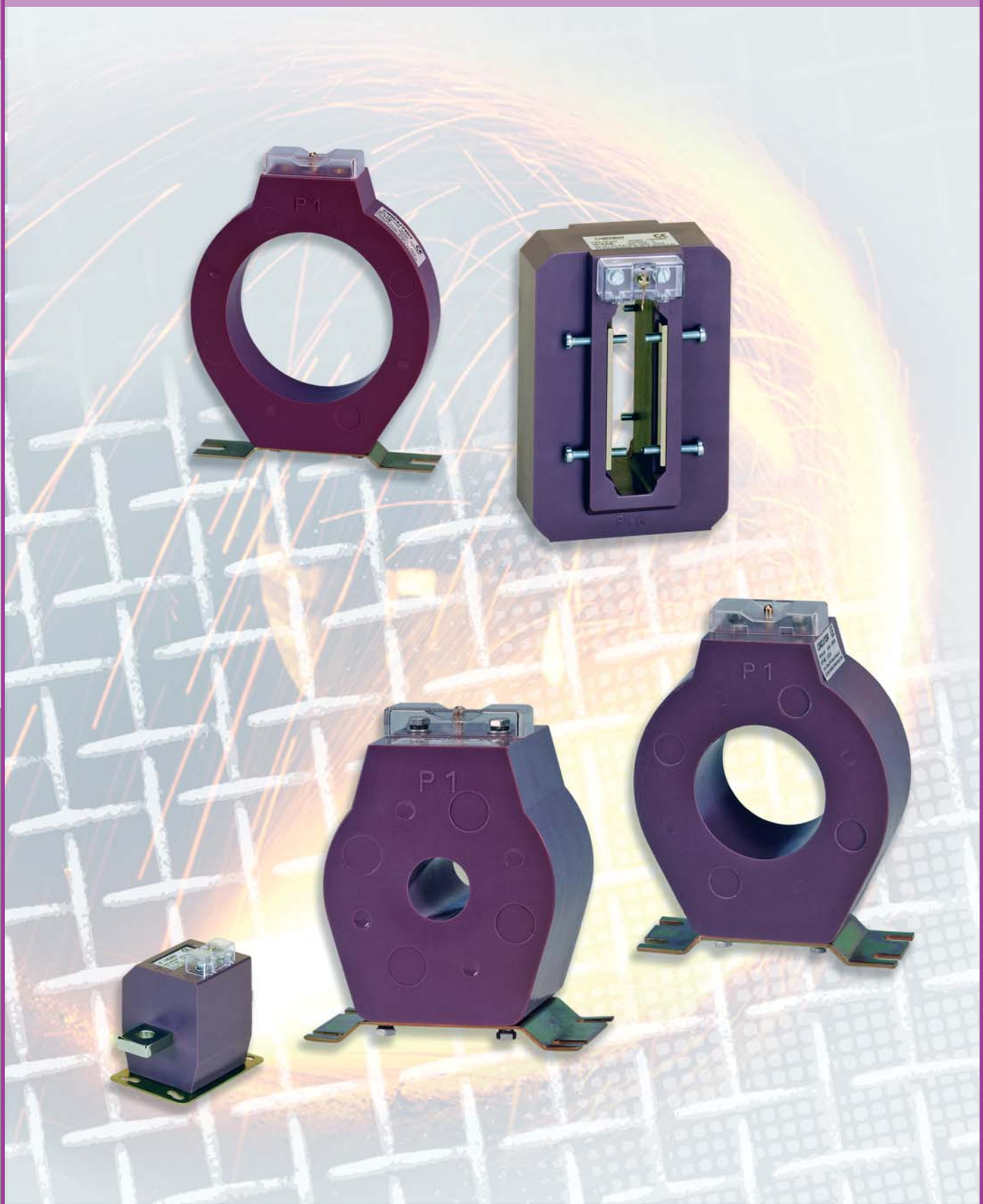




# PROTECTION TRANSFORMERS





## SELECTION

The following information must be known for the correct selection of current measurement transformer (measurement or protection):

- The application for which it is intended (measurement or protection)
- Features of the operating environment, or conditions of use (indoors or outdoors, maximum operating temperature, etc.)
- The features of the line where it is to be installed:
  - Size of cables or flat strip
  - Measurement margins for the measured current (maximum and minimum current)
  - Overload (range and time)
  - System voltage (low, medium or high voltage)
  - Short circuit current
  - System frequency
- Features of the associated instrument or relay (accuracy, rated current, consumption, etc.)
- Distance between the transformer and the instrument, plus the cable diameter used for connection

## THE POWER OF A TRANSFORMER

This is an important parameter. In the transformer, the primary current has to induce power required in the secondary to transmit the secondary current to the measurement equipment. Induced power has to be equal to or higher than losses in the line plus consumption of the measurement equipment itself.

### Losses in the line, $P_L$ :

This is the power lost through heating up due to the passage of current through the resistance  $R_L$  in the cables in the transformer's secondary circuit.

### Factors to be taken into account:

- **Secondary current**  $P_L = R_L \cdot I^2$
- Cable diameter.  $R_L$  is inversely proportional to the square of the diameter
- Cable length.  $R_L$  is proportional to the length of cabling (there and back)

### Accuracy power:

The rated apparent power (V·A), with a specific power factor which the current transformer supplies to the secondary current with the assigned current when it is connected to its rated load,  $S_c (V \cdot A) = Z_c \cdot (I_{sn})^2$

According to standards for apparent power higher than or equal to 5 V·A, the power factor is 0.8 inductive. For lower apparent powers the power factor is the same as the unit. For lower apparent powers the power factor is the same as the unit.

## ACCURACY OF A TRANSFORMER

The type of error produced in a transformer is established by IEC 44-1. In measurement transformers 25 % and 100% of rated power. In protection transformers only 100 % of rated power.

### FOR PROTECTION TRANSFORMERS

TYPE	± % Error for % $I_n$	Phase difference ± for % $I_n$		Composite error
		Minutes	Centiradians	
5P	± 1	± 60	± 1,8	5
10P	± 3	---	---	10

## THE TRANSFORMER WHEN SATURATED

A current transformer is saturated when its current primary or load are above its rated values. The linearity of the current transformation between primary and secondary decreases and error increases. As can be seen the saturation of the transformer is inversely proportional to the load. (Fig 1).

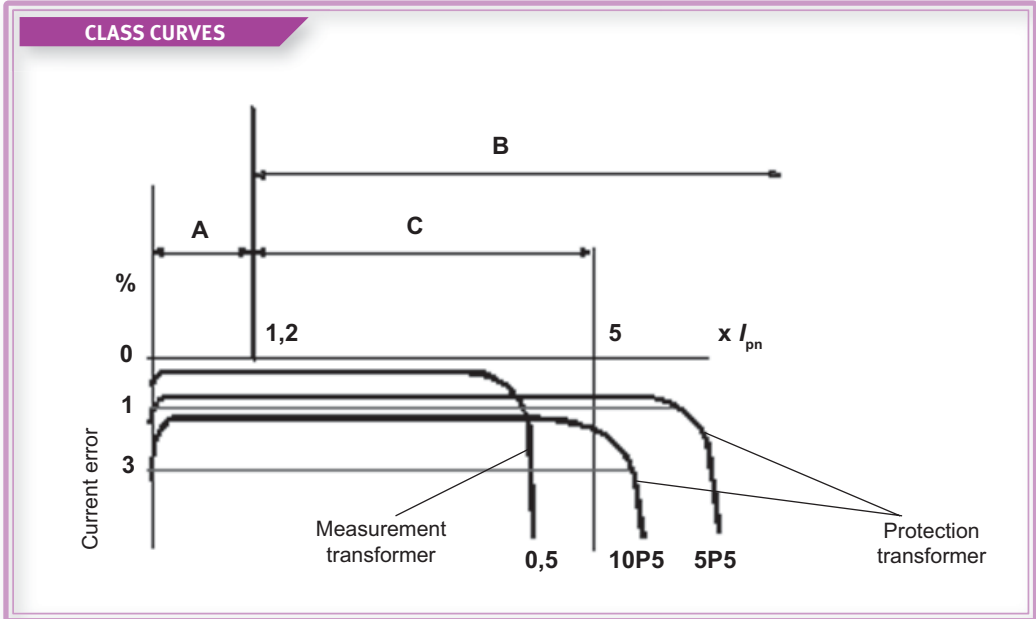
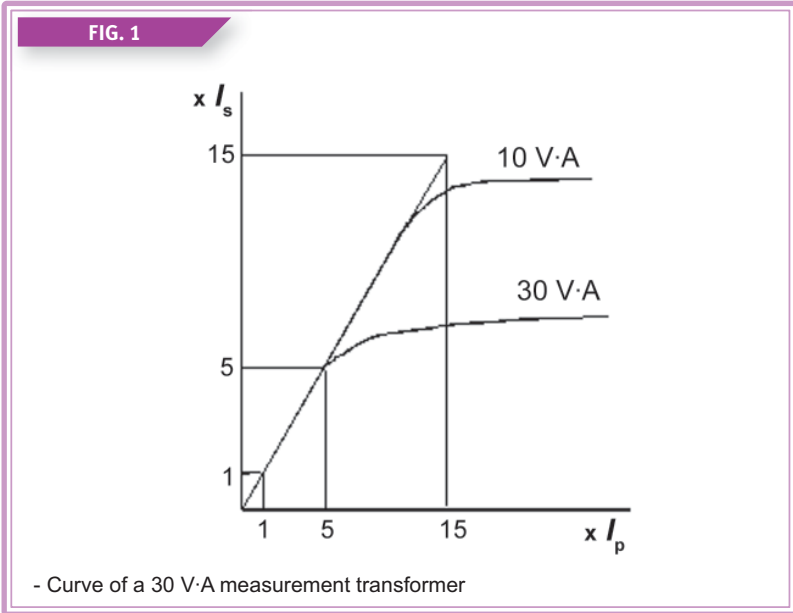
The difference between measurement or protection current transformers is its behaviour with the overload which occurs in the primary.

Those used for measurement are saturated when there is an overload in order not to damage the equipment in the secondary. Protection transformers are not saturated until there is a high current.

A class 5P15 protection transformer indicates that it does not become saturated until 15 times the rated current passes through the primary. (5 is the % of error in the measured current)

In measurement transformers, the **SAFETY FACTOR (FS)** parameter indicates how large the primary current can be which the transformer is capable of transferring to measuring equipment.

Protection transformers



- A: Rated current area
- B: Overload area for protection transformers
- C: Maximum overload area for FS < 5 measurement transformers



TRM

Measurement transformers



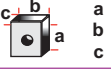
Type	TRM 30			TRM 40			TRM 60					
Ø Inner	30			40			60					
Flat strip	Busbar											
	147 110 50			168 135 38			178 135 36					
A	Power V·A		Code	Weight kg	Power V·A		Code	Weight kg	Power V·A		Code	Weight kg
	Class				Class				Class			
	0,5	1			0,5	0,5						
75/5	-	2	P50101	1,2	-	-	-	-	-	-	-	-
100/5	-	5	P50102	1,1	-	-	-	-	-	-	-	-
150/5	-	5	P50103	1,1	5	P50111	1,3	-	-	-	-	-
200/5	10	-	P50104	1,2	7,5	P50112	1,3	-	-	-	-	-
250/5	15	-	P50105	1,2	10	P50113	1,2	5	P50121	1,0	-	-
300/5	20	-	P50106	1,3	15	P50114	1,3	7,5	P50122	1,2	-	-
400/5	25	-	P50107	1,2	20	P50115	1,3	10	P50123	1,2	-	-
500/5	-	-	-	-	25	P50116	1,2	15	P50124	1,3	-	-
600/5	-	-	-	-	30	P50117	1,2	20	P50125	1,3	-	-
800/5	-	-	-	-	35	P50118	1,3	25	P50126	1,4	-	-
1 000/5	-	-	-	-	-	-	-	30	P50127	1,4	-	-
1 200/5	-	-	-	-	-	-	-	35	P50128	1,5	-	-



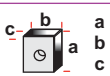
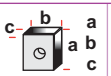
Code	TRM 80			TRM 100			TRM 140			TRM 180			
Ø Inner	80			100			140			180			
Flat strip	Busbar												
	178 135 36			228 175 38			271 223 40			308 223 40			
A	Power V·A		Code	Weight kg	Power V·A		Code	Weight kg	Power V·A		Code	Weight kg	
	Class				Class				Class				
	0,5	0,5			0,5	0,5							
500/5	5	-	P50131	0,9	-	-	-	-	-	-	-	-	
600/5	7,5	-	P50132	0,9	-	-	-	-	-	-	-	-	
750/5	10	-	P50133	0,9	15	P50141	1,6	-	-	-	-	-	
1 000/5	15	-	P50134	0,9	20	P50142	1,7	15	P50151	2,1	-	-	
1 250/5	-	-	-	-	20	P50143	1,7	20	P50152	2,2	15	P50161	1,7
1 500/5	20	-	P50135	1,0	20	P50144	1,6	25	P50153	2,2	20	P50162	1,8
2 000/5	25	-	P50136	1,0	20	P50145	1,7	30	P50154	2,3	20	P50163	1,9
2 500/5	30	-	P50137	1,2	20	P50146	1,8	35	P50155	2,3	20	P50164	2,0
3 000/5	-	-	-	-	25	P50147	1,9	35	P50156	2,5	20	P50165	2,5
4 000/5	-	-	-	-	-	-	-	35	P50157	3,0	20	P50166	3,0
5 000/5	-	-	-	-	-	-	-	-	-	-	20	P50167	4,0



TRP

Protection transformers

										
Type		TRP 40				TRP 60				
Ø Inner		40				60				
Flat strip		Busbar								
		205 160 93				229 190 110				
A	V-A	Code	Weight kg	Code	Weight kg	V-A	Code	Weight kg	Code	Weight kg
		5P10		5P20			5P10		5P20	
100/5	5	P50311	5,0	P50211	9,0	-	-	-	-	-
150/5	5	P50312	5,0	P50212	9,0	2,5	P50321	2,6	P50221	4,2
200/5	10	P50313	5,0	P50213	9,0	2,5	P50322	2,7	P50222	4,2
250/5	10	P50314	5,0	P50214	9,0	5	P50323	2,7	P50223	4,3
300/5	15	P50315	5,1	P50215	9,1	5	P50324	2,7	P50224	4,7
400/5	20	P50316	5,1	P50216	9,2	7,5	P50325	2,8	P50225	4,9
500/5	25	P50317	5,2	P50217	9,3	10	P50326	2,8	P50226	5,1
600/5	-	-	-	-	-	10	P50327	2,9	P50227	5,2
750/5	-	-	-	-	-	15	P50328	3,0	P50228	5,3
1 000/5	-	-	-	-	-	20	P50329	3,2	P50229	5,5

											
Type		TRP 80				Type		TRP 100			
Ø Inner		80				Ø Inner		100			
Flat strip		Busbar									
		205 160 93						238 190 96			
A	V-A	Code	Weight kg	Code	Weight kg	A	V-A	Code	Weight kg	Code	Weight kg
		5P10		5P20				5P10		5P20	
100/5	-	-	-	-	-	750/5	5	P50341	3,4	P50241	5,6
200/5	-	-	-	-	-	1 000/5	7,5	P50342	3,4	P50242	5,8
250/5	5	P50331	3,2	P50231	5,6	1 200/5	10	P50343	3,4	P50243	5,9
300/5	5	P50332	3,3	P50232	5,7	1 500/5	10	P50344	3,5	P50244	6,1
400/5	7,5	P50333	3,3	P50233	5,8	1 600/5	15	P50345	3,6	P50245	6,2
500/5	10	P50334	3,4	P50234	5,9	2 000/5	15	P50346	3,7	P50246	6,4
600/5	10	P50335	3,5	P50235	6,1	2 500/5	15	P50347	3,9	P50247	6,8
800/5	15	P50336	3,6	P50236	6,2	3 000/5	20	P50348	4,3	P50248	7,3
1 000/5	20	P50337	3,7	P50237	6,3	-	-	-	-	-	-
1 200/5	25	P50338	3,8	P50238	6,6	-	-	-	-	-	-
1 500/5	30	P50339	4,0	P50239	6,9	-	-	-	-	-	-
1 600/5	30	P5033A	4,1	P5023A	7,1	-	-	-	-	-	-
1 800/5	35	P5033B	4,2	P5023B	7,2	-	-	-	-	-	-

TRP

Protection transformers

Type		TRP 140				TRP 180				Type		TRP 400					
Ø Inner		140				180				Ø Inner		100 x 20					
Flat strip		Busbar								Flat strip		Busbar					
		 272 223 98										 154 108 65					
A	V·A	Code	Weight kg	Code	Weight kg	V·A	Code	Weight kg	Code	Weight kg	A	V·A	Code	Weight kg	V·A	Code	Weight kg
		5P10		5P20			5P10		5P20				10 P10			5 P10	
1 000/5	5	P50351	3,7	P50251	6,2	-	-	-	-	-	750/5	7,5	P50371	2,1	5	P50271	2,1
1 200/5	-	-	-	-	-	-	-	-	-	-	800/5	7,5	P50372	2,2	5	P50272	2,2
1 250/5	5	P50352	3,8	P50252	6,4	-	-	-	-	-	1 000/5	10	P50373	2,4	10	P50273	2,4
1 500/5	10	P50353	3,9	P50253	6,6	5	P50361	4,5	P50261	7,6	1 200/5	10	P50374	2,4	10	P50274	2,4
2 000/5	10	P50354	4,2	P50254	7,1	7,5	P50362	4,5	P50262	7,6	1 500/5	15	P50375	2,6	10	P50275	2,6
2 500/5	10	P50355	4,5	P50255	7,5	10	P50363	5,0	P50263	8,5	2 000/5	20	P50376	2,7	15	P50276	2,7
3 000/5	15	P50356	4,6	P50256	8,0	10	P50364	5,2	P50264	8,9							
4 000/5	15	P50357	5,2	P50257	8,9	15	P50365	5,7	P50265	9,7							
5 000/5	-	-	-	-	-	15	P50366	6,2	P50266	10,6							

TRMC-210 TRMC-400

Protection and measurement transformers

Type		TRMC 210				TRMC 400							
Ø Inner		-				100 x 20							
flat strip		Measurement, flat strip				Busbar							
		 145 111 48								 160 99 68			
A	Power V·A		Code	Weight kg	Pwer V·A		code	Weight kg					
	Class				Class								
	0,5S	0,5			0,5S	0,5							
100/5	10	15	Q30101	1,6	-	-	-	-					
150/5	10	15	Q30102	1,5	-	-	-	-					
200/5	10	15	Q30103	1,5	-	-	-	-					
300/5	10	15	Q30104	1,4	-	-	-	-					
400/5	10	15	Q30105	1,41	-	-	-	-					
500/5	10	15	Q30106	1,52	-	-	-	-					
600/5	10	15	Q30107	1,67	-	-	-	-					
750/5	-	-	-	-	10	15	Q30111	1,54					
1 000/5	-	-	-	-	10	15	Q30112	1,65					
1 500/5	-	-	-	-	10	15	Q30113	1,78					



**DIMENSIONS**

(mm)	a	b	c	d	e	f	g	h	i	j
<b>TRM 100</b>	100	181	204	175	144	104	100	38	30	10
<b>TRM 140</b>	140	223	245	223	190	123	122	40	32	12
<b>TRM 180</b>	180	260	282	223	190	142	140	40	32	12
<b>TRP 140</b>	140	223	246	223	190	123	123	98	90	12
<b>TRP 180</b>	180	260	282	223	190	142	140	98	90	12

(mm)	a	b	c	d	e	f	g	h	i	j	l	m
<b>TRM 30</b>	30	105	123	110	98	63	60	50	28	10	4	18
<b>TRM 40</b>	40	125	144	135	110	73	71	38	30	10	1,5	6,5
<b>TRM 60</b>	60	135	154	135	110	78	76	36	30	10	3	3
<b>TRP 80</b>	80	135	154	135	110	78	76	36	30	10	3	3

(mm)	a	b	c	d	e	f	g	h	i	j	k	l	m
<b>TRP 40</b>	40	160	181	160	135	91	90	93	86	10	60	5	2
<b>TRP 60</b>	60	190	205	190	159	105	100	110	95	10	70	7,5	7,5
<b>TRP 80</b>	80	160	181	160	135	91	90	93	86	10	60	5	2
<b>TRP 100</b>	100	181	204	190	159	104	100	96	95	12	70	0,5	0,5

**TRP 400**

**TRMC 400**

**TRMC 210**

Dimensions	a	b
Up to 300 A	43	5
325 ... 600 A	38	10



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