CURRENT TRANSFORMERS

Current Transformers

FAT - 30B

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FAT - 40

FAT - 40L

FAT - 60

FAT - 100

FAT - 100L

FAT - 130

FAT - 130L

CONTENTS

TS EN 60044-1
EN 60044-1
IEC 60044-1
CE

Assembly Position	**:** Free
Altitude	**:** 1000 m (max)
Relative Humidity	**:** 90% (max)
Ambiance Temperature	**:** Between -25°C and +40°C
Protection Class	**:** IP20

Low voltage current transformers; consist of three parts as primary winding, secondary winding and magnetic core which those windings are wound on. There is no primary winding in current transformers without busbar in primary. Instead, primary winding is formed by passing busbar or cable through toroidal core of the transformer. Federal current transformers are manufactured in accordance with CE. Federal current transformers can be sealed.

Measure current transformers:
Measure current transformers have been formed to feed measurement tools, counters, relays and other devices operating with similar techniques. These are the transformers which insulate such devices from high voltage networks and which reduce currents out of limits of measurement devices to measurable values.

Explanations of technical terms used in current transformers:
Primary winding (P1, P2): This is the winding passing the current to be transformed.

Secondary winding (S1, S2): This is the winding feeding current circuits of current transformer, measurement tools, counters, relays and similar devices.

Primary rated current (Ipn):
This is the current which is taken as the basis in manufacture of the current transformer and which determines normal operating conditions of the transformer.

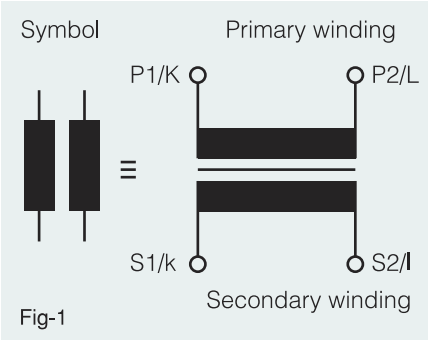


Fig-1

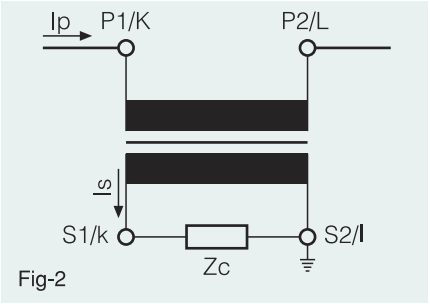


Fig-2

Secondary rated current (Isn):
This is the current which is taken as the basis in manufacture of the current transformer and which determines normal operating conditions of the transformer.

Rated transformation proportion (Kn):
This is the proportion between the primary rated current and the secondary rated current.

$$Kn = \frac{Ipn}{Isn}$$

Short-term thermal rated current (Ith):
This is the effective value of the primary current, which the secondary of the current transformer can resist for 1 second without any damage in short circuit condition.

Dynamic rated current (Idyn):
This is the peak value of the primary current, which the secondary of the current transformer can resist without any electrical or magnetic damage due to electromagnetic forces in short circuit condition.

Safety coefficient in measurement tools (Fs):
Safety is expressed as the proportion of the primary current to the primary rated current.

$$Fs = \frac{Ips}{Ipn}$$

Here;
Ips = Safety primary current
Ipn = Primary rated current

In case of a short circuit in the network to which the primary winding is connected, safety of the tools fed by the current transformer is higher as the Fs coefficient is lower.

Compound error (oc) :
Provided that assumptions in marking of positive ends of primary and secondary currents are complied with, this is the effective value of the difference between rated transformation proportion and multiplication of instant values of the primary current and instant values of the secondary current in continuous operations. The compound error is generally given as % of the effective value of the primary current with the formula below.

$$\varepsilon c = \frac{100}{Ib}\sqrt{\frac{1}{T}\int(Kn.Is-Ip)^2dt}$$

Here;
Kn= Rated transformation proportion
Ib= Effective value of the primary current
Ip= Instant value of the primary current
Is= Instant value of the secondary current
T= Duration of a period

Current error (Transformation proportion error) (o1) :
This is the error arising in measurement of the current due to inequality of the transformation proportion of the transformer to the rated transformation proportion. The current error is found with the following equality in percentage.

$$\varepsilon_1 = \frac{Kn \times Is - Ib}{Ib} \times 100\ (\%)$$

Here;
Kn= Rated transformation proportion
Ib= Primary current
Is= This is the equivalent secondary current when Ip passes through the primary winding during measurement.

Phase shift (o) :
Provided that direction of the current vector is selected to have zero phase difference in an ideal transformer (with zero loss), this is the phase difference between vectors of primary and secondary currents in any current transformer. If phase of the secondary current vector is in front of phase of the primary current vector, the phase difference is positive; if it is behind, the phase difference is negative.

Load (Zc):
Provided that power coefficient is stated, this is the impedance of the secondary current expressed in ohms (or in volt amperes in rated secondary current). Load is generally expressed with apparent power, which is taken at a particular power coefficient and secondary rated current and which is stated in volt ampere.

Rated output power:
This is the apparent power, given by the current transformer to the secondary current at a particular power coefficient, secondary rated current and rated load and expressed in volt amperes.

$Pc = Zc \times Isn^2\ (VA)$

Accuracy class (CL):
This is a term used to describe that the error in current transformers remains within particular limits. Accuracy class of measurement current transformer is given with a number called “class index” in percentage which is equal to top limit of the current error in primary rated current and rated load. Standard value is 0,1 - 0,2 - 0,5 - 1 - 3 - 5. Accuracy class of the protection current transformer is given with a number called “class index” and a following “P” letter expressing the top level of the compound error in rated current and rated load. Standard value is 5P and 10P.

Current error limits (for classes 3 and 5):

Accuracy class	±% current error for the current value expressed in percentage of the rated current	
	%50	%120
3	3	3
5	5	5

Highest network voltage (kV)	One-minute duration network resistance voltage (kV)	Impulse withstand voltage (kV)
0,6	3	-
1,2	6	-
2,4	11	-
3,6	16	45
7,2	22	60
12,0	28	75
17,5	38	95
24,0	50	125
36,0	70	170

Current error and phase shift limits (for classes 5P and 10P):

Accuracy class	Current error % in primary rated current	Phase shift in primary rated current		Compound error % in rated accuracy limit primary current
		Minutes	Centi-radians	
5P	±1	±60	±,18	5
10P	±3	—	—	10

Rated insulation level:
This is the effective value of the large voltage in KV at any time and any point of the network between phase conductors of the network (except temporary voltage changes in case of instant cut-out of significant loads and failures).

Impact voltage test :
This is the test carried out to determine impact voltage resistance of primary circuits of the current transformers employed in outside facilities.

Network frequency voltage test:
This is the application of network frequency voltage value, which is the equivalent of the rated insulation level, to the transformer for 1 minute by connecting the primary winding and all the parts belonging to it. This is the application of a particular voltage value at high frequency (100 Hz - 200 Hz) for a duration calculated according to the frequency.

Current error and phase shift limits (classes 0,1 - 0,2 - 0,5 - 1 according to IEC 385, IEC 60044-1):

Accuracy class	Current (proportion) error ± percentage for the rated currents given below				± phase shift for rated current percentages given below							
					Minutes				Centi-radians			
	% 5	% 20	% 100	% 120	% 5	% 20	% 100	% 120	% 5	% 20	% 100	% 120
0,1	0,4	0,2	0,1	0,1	15	8	5	5	0,45	0,24	0,15	0,15
0,2	0,75	0,35	0,2	0,2	30	15	10	10	0,9	0,45	0,3	0,3
0,5	1,5	0,75	0,5	0,5	90	45	30	30	2,7	1,35	0,9	0,9
1,0	3,0	1,5	1,0	1,0	180	90	60	60	5,4	2,7	1,8	1,8

When current fault and phase shift at rated frequency varies between 1/1 and 1/4 of the secondary load, rated load, the values in the table should not be exceeded.

Powers of devices connected to current transformers:

Devices	Power VA)
Ammeter (soft iron)	0,7 ... 1,5
Watt meters	0,2 ... 5,0
Cosφ meters	2,0 ... 6,0
Counters (active and reactive)	0,4 ... 1,0
Reactive power control relays	0,5 ... 1,0
Over current relays	0,2 ... 6,0
Reverse current relay	1,0 ... 2,0
Secondary thermal relay	7,2 ... 9,0

Additional loads arising from copper cables:
Power loss in cable with secondary current as 5 A (VA)

Cable (Cu)	2,5 mm²	4,0 mm²	6,0 mm²	10,0 mm²
1 m.	0,36	0,22	0,15	0,09
2 m.	0,71	0,45	0,30	0,18
3 m.	1,07	0,67	0,45	0,27
4 m.	1,43	0,89	0,60	0,36
5 m.	1,78	1,12	0,74	0,44
6 m.	2,14	1,34	0,89	0,54
7 m.	2,50	1,56	1,04	0,63
8 m.	2,86	1,79	1,19	0,71
9 m.	3,21	2,01	1,34	0,80
10 m.	3,57	2,24	1,49	0,89

Power loss calculation of cable:

$$P = \frac{I_{sn}^2 \times 2l}{Sx56} \text{ (VA)}$$

l = Length of the cable on secondary side (m)
Isn = Secondary rated current (A)
S = Section of copper cable (mm2)
P = Power loss (VA)

For example; The load coming to the current transformer for an active, a reactive counter and 4 m 2,5 mm2cable is 1+1+1,43 = 3,43 VA. Here, it would be suitable to use a current transformer of 5 VA.

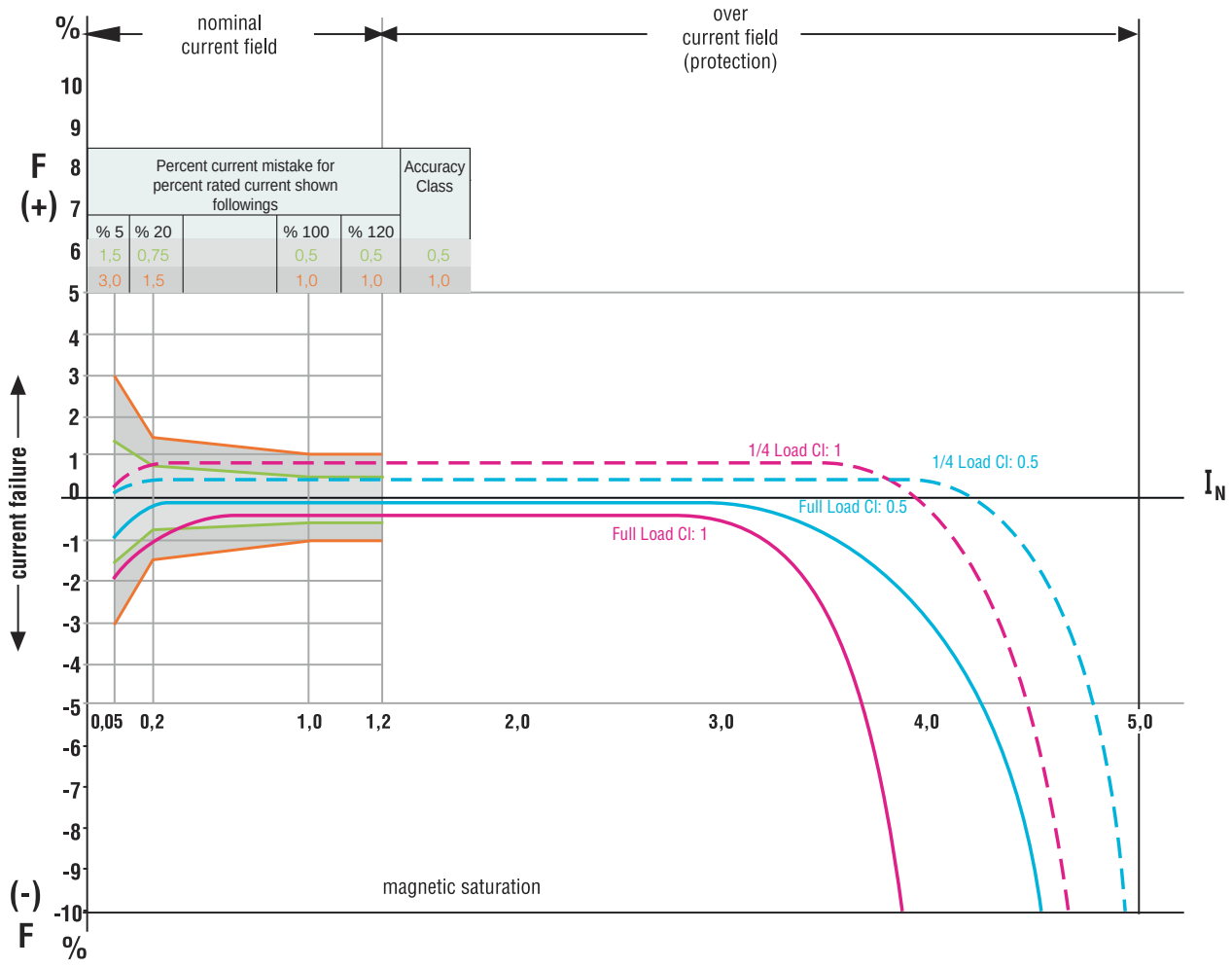
Technical features:

Highest network voltage	: 720 V
Place of use	: Inside building
Continuous operating voltage	: 1,2xIn
One-minute duration test voltage	: 3 kV
Safety coefficient	: <5
Nominal primary current	: 30A....4000A
Nominal secondary current	: 5 A
Operating frequency	: 50-60Hz
Operating temperature	: -25°C + 40°C
Thermal rated current	: Ith= 100xIn (Ith=60xIn for FAT-30B)
Dynamic rated current	: Idyn= 2,5xIth
Insulation Class	: e

Important considerations in assembly of current transformers:
- While current passes through the primary, the secondary circuit should not be opened.
- Primary ends of current transformers are shown with letters K-L, secondary ends are shown with letters k-l.
- Current transformers are made as one-phased.
- Current transformers are devices that usually operate in case of short circuit. (*)

(*) Current transformers must always be operated in case of short circuit. If the primary winding is under voltage, the secondary winding should be kept in short circuit. Otherwise, a fatal risk may occur for individuals carrying out measurement due to the excessive voltage to occur in the secondary winding.

Proportion error in current transformers (as stated in the standards) guaranteed only between 100% and 120% of the nominal current. Error class might be 2-3 times more especially in currents below half of the nominal current. Attention should be paid to keep the load currents in application between (1-1,2) x In.



FAT - 30B

With Busbar

Type	Rated current (A)	Rated Power (VA) Class:0,5	Rated Power (VA) Class:1	Weight (kg)	Order codes (□ For class 0.5 : A, For class 1 : B; Δ For 5VA : 2, For 10 VA : 4)
FAT-30B	30/5	5 , 10	5 , 10	0,60	9GA-□00Δ5-0030
FAT-30B	40/5	5 , 10	5 , 10	0,60	9GA-□00Δ5-0040
FAT-30B	50/5	5 , 10	5 , 10	0,60	9GA-□00Δ5-0050
FAT-30B	60/5	5 , 10	5 , 10	0,60	9GA-□00Δ5-0060
FAT-30B	75/5	5 , 10	5 , 10	0,60	9GA-□00Δ5-0075
FAT-30B	80/5	5 , 10	5 , 10	0,60	9GA-□00Δ5-0080
FAT-30B	100/5	5 , 10	5 , 10	0,60	9GA-□00Δ5-0100
FAT-30B	125/5	5 , 10	5 , 10	0,60	9GA-□00Δ5-0125
FAT-30B	150/5	5 , 10	5 , 10	0,60	9GA-□00Δ5-0150
FAT-30B	200/5	5 , 10	5 , 10	0,60	9GA-□00Δ5-0200
FAT-30B	250/5	5 , 10	5 , 10	0,60	9GA-□00Δ5-0250

FAT - 40 / FAT - 40L

Without Busbar

Busbar: 40 x 10 mm.

Type	Rated current (A)	Rated Power (VA) Class:0,5	Rated Power (VA) Class:1	Weight (kg)	Cable (max) mm.	Order codes (□ For Class 0.5 : A, For Class 1 : B; Δ For 5VA : 2, For 10 VA : 4)
FAT-40	300/5	5 , 10	5 , 10	0,38	Ø30	9GC-□00Δ5-0300
FAT-40	400/5	5 , 10	5 , 10	0,38	Ø30	9GC-□00Δ5-0400
FAT-40	500/5	5 , 10	5 , 10	0,38	Ø30	9GC-□00Δ5-0500
FAT-40	600/5	5 , 10	5 , 10	0,38	Ø30	9GC-□00Δ5-0600
FAT-40L	200/5	5 , 10	5 , 10	0,60	Ø35	9GK-□00Δ5-0200
FAT-40L	250/5	5 , 10	5 , 10	0,60	Ø35	9GK-□00Δ5-0250
FAT-40L	300/5	5 , 10	5 , 10	0,60	Ø35	9GK-□00Δ5-0300
FAT-40L	400/5	5 , 10	5 , 10	0,60	Ø35	9GK-□00Δ5-0400
FAT-40L	500/5	5 , 10	5 , 10	0,60	Ø35	9GK-□00Δ5-0500
FAT-40L	600/5	5 , 10	5 , 10	0,60	Ø35	9GK-□00Δ5-0600

FAT - 100 / FAT - 100L

Without Busbar

Busbar: For FAT100 80 x 30, 100 x 10 mm.
For FAT 100L 80 x 30, 100 x 20 mm.

Type	Rated current (A)	Rated Power (VA) Class:0,5	Rated Power (VA) Class:1	Weight (kg)	Cable (max) mm.	Order codes (□ For Class 0.5 : A, For Class 1 : B; Δ For 10 VA : 4, For 15 VA : 5)
FAT-100	1200/5	15	15	0,70	Ø60	9GE-□00Δ5-1200
FAT-100	1250/5	15	15	0,72	Ø60	9GE-□00Δ5-1250
FAT-100	1500/5	15	15	0,80	Ø60	9GE-□00Δ5-1500
FAT-100	1600/5	15	15	0,83	Ø60	9GE-□00Δ5-1600
FAT-100	2000/5	15	15	0,94	Ø60	9GE-□00Δ5-2000
FAT-100	2500/5	15	15	1,10	Ø60	9GE-□00Δ5-2500
FAT-100	3000/5	15	15	1,16	Ø60	9GE-□00Δ5-3000
FAT-100	3200/5	15	15	1,16	Ø60	9GE-□00Δ5-3200
FAT-100	4000/5	15	15	1,16	Ø60	9GE-□00Δ5-4000
FAT-100L	500/5	10	10	0,90	Ø80	9GL-□00Δ5-0500
FAT-100L	600/5	10	10	0,90	Ø80	9GL-□00Δ5-0600
FAT-100L	750/5	10	10	0,90	Ø80	9GL-□00Δ5-0750
FAT-100L	800/5	10	10	0,90	Ø80	9GL-□00Δ5-0800
FAT-100L	1000/5	10	10	1,00	Ø80	9GL-□00Δ5-1000
FAT-100L	1500/5	10	10	1,00	Ø80	9GL-□00Δ5-1500

FAT - 30

Without Busbar

Busbar: 30 x 10 mm.

Type	Rated current (A)	Rated Power (VA) Class:0,5	Rated Power (VA) Class:1	Weight (kg)	Cable (max) mm.	Order codes (□ For Class 0.5 : A, For Class 1 : B; Δ For 5VA : 2, For 10 VA : 4)
FAT-30	100/5	-	5	0,60	Ø12	9GB-□00Δ5-0100
FAT-30	150/5	-	10	0,60	Ø12	9GB-□00Δ5-0150
FAT-30	200/5	5 , 10	5 , 10	0,60	Ø12	9GB-□00Δ5-0200
FAT-30	250/5	5 , 10	5 , 10	0,60	Ø12	9GB-□00Δ5-0250

FAT - 60

Without Busbar

Busbar: 60 x 20 mm.

Type	Rated current (A)	Rated Power (VA) Class:0,5	Rated Power (VA) Class:1	Weight (kg)	Cable (max) mm.	Order codes (□ For Class 0.5 : A, For Class 1 : B; Δ For 10 VA : 4, For 15 VA : 5)
FAT-60	600/5	10 , 15	10 , 15	0,60	Ø40	9GD-□00Δ5-0600
FAT-60	750/5	10 , 15	10 , 15	0,60	Ø40	9GD-□00Δ5-0750
FAT-60	800/5	10 , 15	10 , 15	0,60	Ø40	9GD-□00Δ5-0800
FAT-60	1000/5	15	15	0,60	Ø40	9GD-□00Δ5-1000

FAT - 130 / FAT - 130L

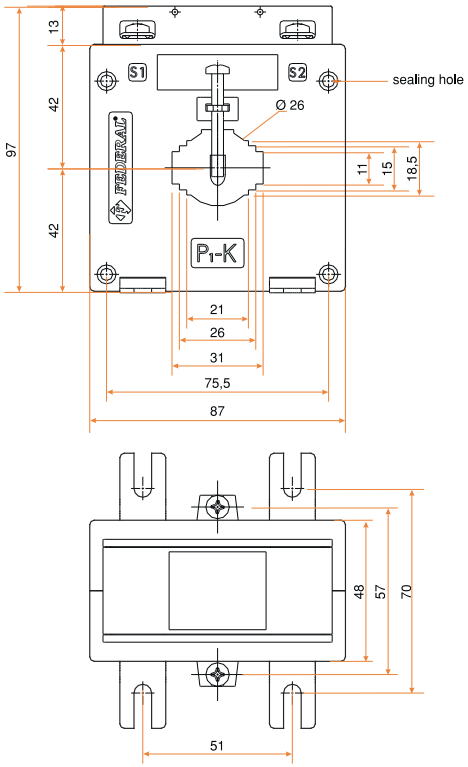
Without Busbar

Busbar: ForFAT130 110 x 60 ; 2(110 x 20) mm.
For FAT 130L 135 x 40 mm.

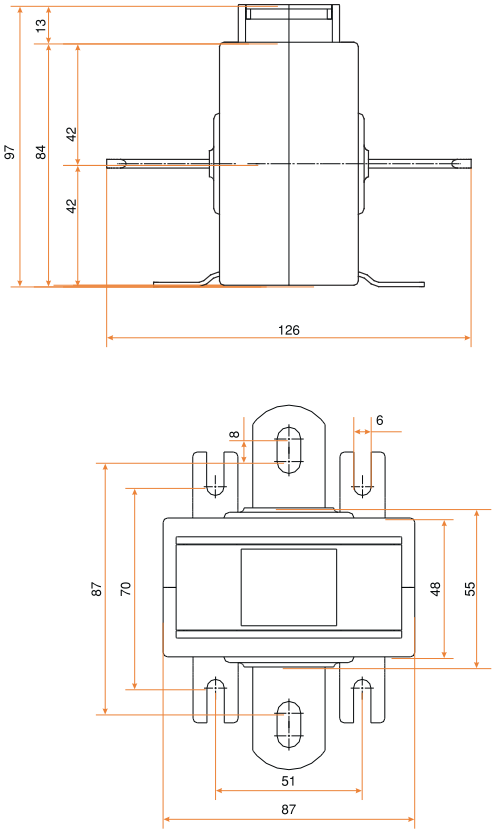
Type	Rated current (A)	Rated Power (VA) Class:0,5	Rated Power (VA) Class:1	Weight (kg)	Cable (max) mm.	Order codes (□ For Class 0.5 : A, For Class 1 : B; Δ For 10 VA : 4)
FAT-130	1500/5	10	10	1,50	Ø105	9GN-□00Δ5-1500
FAT-130	2000/5	10	10	1,50	Ø105	9GN-□00Δ5-2000
FAT-130	2500/5	10	10	1,50	Ø105	9GN-□00Δ5-2500
FAT-130	3000/5	10	10	1,50	Ø135	9GN-□00Δ5-3000
FAT-130	4000/5	10	10	1,50	Ø135	9GN-□00Δ5-4000
FAT-130L	1500/5	10	10	1,50	Ø135	9GM-□00Δ5-1500
FAT-130L	2000/5	10	10	1,50	Ø135	9GM-□00Δ5-2000
FAT-130L	2500/5	10	10	1,50	Ø135	9GM-□00Δ5-2500
FAT-130L	3000/5	10	10	1,50	Ø135	9GM-□00Δ5-3000
FAT-130L	4000/5	10	10	1,50	Ø135	9GM-□00Δ5-4000

Note: Federal L.V current transformers possess sealing feature. Plaese call our company for current requests which are absent in the list.

FAT - 30



FAT - 30B



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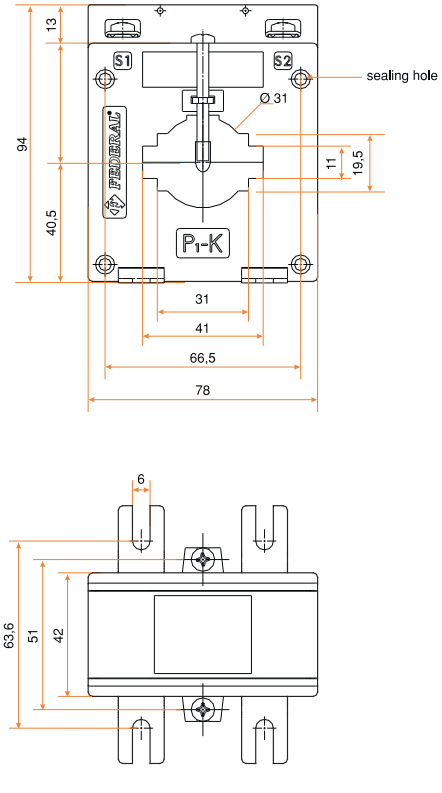
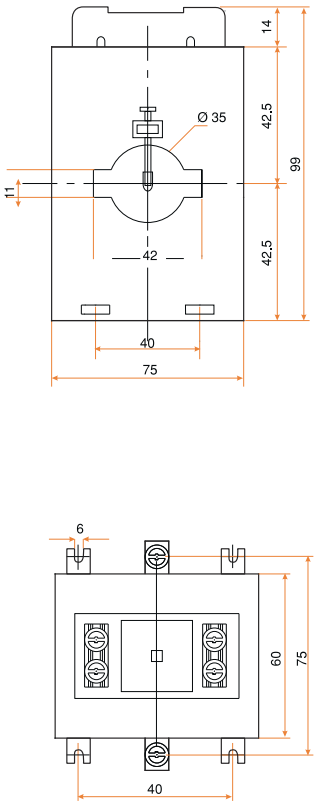


FAT - 40L



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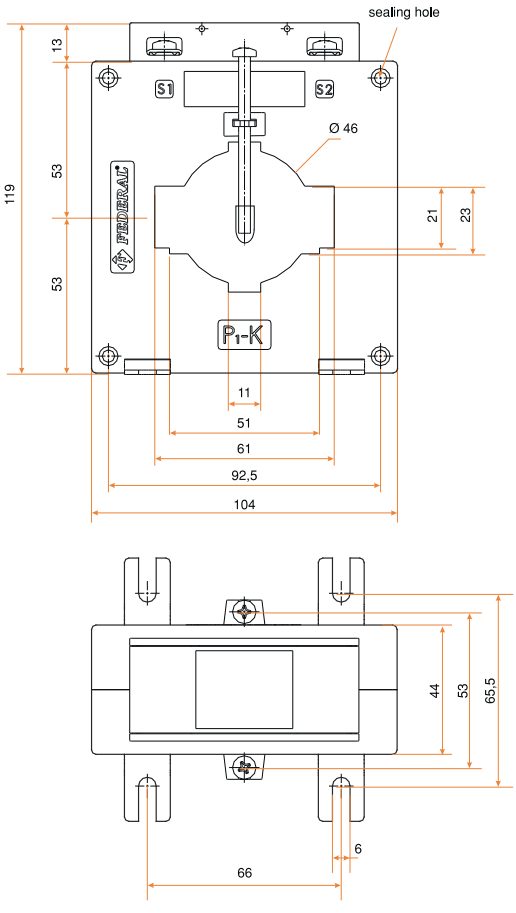

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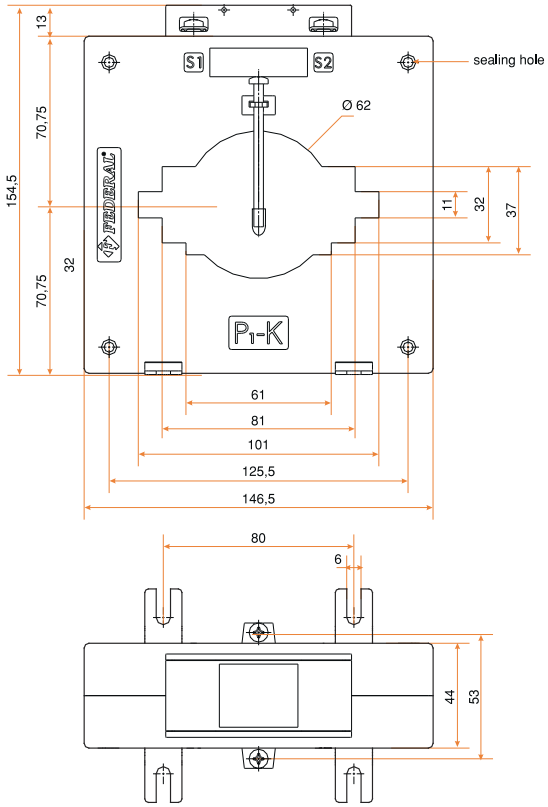
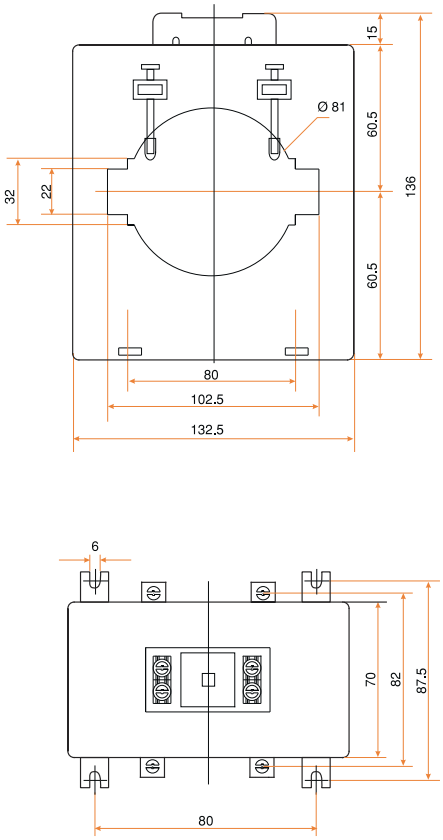
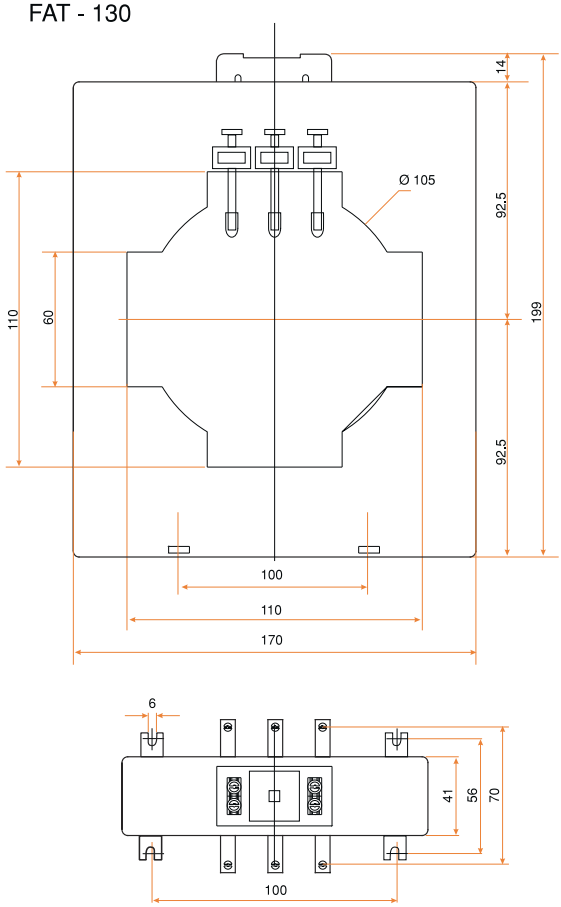


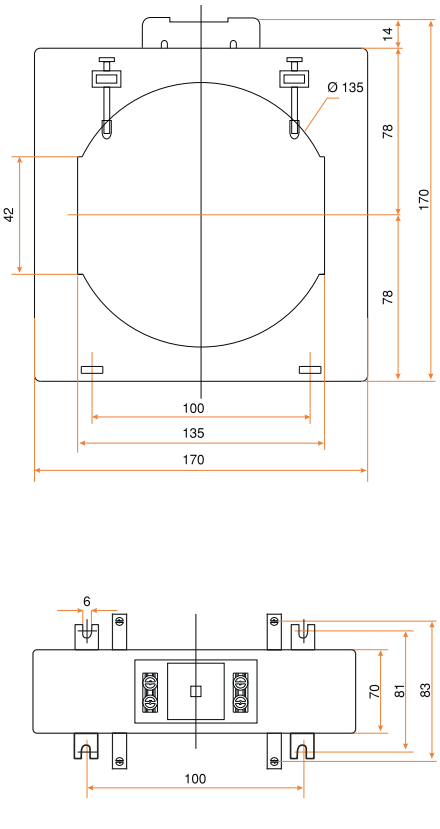
FAT - 100L



FAT - 130



FAT - 130L



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