Indoor current transformers KOFA

Rated frequency	50 Hz (60 Hz)
Rated secondary current	5 A (1 A, 2 A)
Rated burdens	2.5, 5, 7.5, 10, 15, 20, 25, 30 VA
Accuracy class	0.2, 0.5, 1, 5P10, 5P20
Mechanical strength of primary terminals:	5 kN
Standards	IEC, BS, ANSI, ...
Other data will be offered on request.	

Description

The primary winding, core and secondary winding of the transformer are encapsulated in cast-resin.

Secondary conductors

The fixing screws in the light alloy base are positioned within easy reach also from above. The conduit used for the secondary conductors can be fixed into a U-shape slot entry in the secondary terminal box. This design obviates the drawing of the secondary conductor through an entrance hole into the terminal box.
When specified on order the box can be provided with a threaded entry for cable termination accessories. One 2.5...10 sq. mm or two 2.5...6 sq. mm (in case of three core transformer one 2.5...6 sq. mm) conductors can be directly connected to the secondary terminals. The terminal cover is sealable. Degree of protection by enclosure is IP 30.

Primary terminals

M12 size screws are used in primary terminals. Primary connection can be changed to I_{pn} or 2 x I_{pn} current without removing the already fitted primary conductors.

Environment and altitudes

The KOFA transformers are made for indoor mounting. IEC recommandation gives requirement for ambient temperature between -5 ºC and +40 ºC. The transformers, however, may be used at a temperature as low as -40 ºC. The transformers must be protected against unusually heavy deposits of dust or similar pollution, as well as against direct sunshine.
In mountaineous areas the height above sea level may be higher than the height specified in the IEC standards as design criteria (= 1000 m). The thin air at high altitudes affects the cooling of the transformers as well as the required creepage & free air distance to earth and between phases. The manufacturer should be consulted in such cases.
The problem with creepage and free air distance can be solved by choosing a transformer type designed for higher voltages. The requirement for impulse test voltage (BIL-level) should preferably NOT be higher than normal for the service voltage used as this may have a negative effect on the available output from the secondaries.
The transformer specification can in such a case be for example:

Type	KOFA 24 D2
Service voltage	17.5 kV
Test voltages	38 kV 1 min./95 kV impulse

The normal transformer type KOFA 24 D2 would have been suitable if used below 1000 m.

Permissable torques for screw connections

M5	max /Nm/ ...3,5	min /Nm/...2,8
M8	max /Nm/ ...20	min /Nm/...16
M12	max /Nm/ ...70	min /Nm/...56

Isulation levels for KOFA models

12 / 28 / 75 kV
17,5 / 38 / 95 kV
24(25) / 50 / 125 kV

Technical data and ordering information
NOTE: Available for 50 Hz only

Description for preferred transformers

A limited selection of the KOFA-type current transformers are available as preferred types, which gives two advantages:

1. Having factory documentation and material ready for the most frequent ratingsthus offering short delivery times for urgent needs.
2. Simplifying the choise and ordering by giving each standard c.t. a specific order code.

On ordering transformers according to the table below please give only the order code, observing the voltage code.

Available preferred current transformers:

Type: KOFA 12 D 2 for 12 kV
KOFA 24 D 2 for 24 kV
Secondary current: 5 A
Number of cores: 2
Weight: 17 and 19 kg
Standards: International standard IEC 60044-1

Normally not labelled: R_{ct} (winding resistance at 75 ºC), U_k (knee-point voltage) and I_o (exciting current).

Example how to order:
Requirements: 6.6 kV, stand. IEC 60044-1
I_{th}/I_{dyn} = 10-20/25-50 kA
100-200/5/5 A
Core 1: 15 VA cl. 0.5, Fs = 5
Core 2: 15 VA cl. 10P10
Frequency: 50Hz
Gives the ordering code: KOFA 12 D2 - L01

PREFERRED CURRENT TRANSFORMERS, 50 Hz										Commercial code
Rated primary current A	Short-circuit strength		Core S1			Core S2				
	Short-time current, 1 s kA r.m.s	Surge current kA peak	Class 0.5	F_s	R_{ct} Ω	Class 5P10 VA	R_{ct} Ω	U_k V	I_o mA	12 kV 12 24 kV 24 ▼
50-100	11-22	30-60	15	5	0.16	15	0.07	25.0	145	**KOFA _ D2-H01**
50-100	20-40	50-100	5	15	0.04	5	0.03	12.0	290	**KOFA _ D2-H02**
75-150	11-22	30-60	15	5	0.18	15	0.19	34.0	100	**KOFA _ D2-J01**
75-150	20-40	50-100	15	10	0.14	10	0.05	17.0	195	**KOFA _ D2-J02**
100-200	11-22	30-60	15	5	0.16	15	0.07	25.0	145	**KOFA _ D2-L01**
100-200	20-40	50-100	15	5	0.16	15	0.07	25.0	145	**KOFA _ D2-L02**
150-300	16-32	40-80	15	5	0.18	15	0.28	34.0	100	**KOFA _ D2-N01**
150-300	27-54	68-136	15	5	0.18	15	0.19	34.0	100	**KOFA _ D2-N02**
200-400	20-40	50-100	15	5	0.16	15	0.07	25.0	145	**KOFA _ D2-R01**
200-400	27-54	68-136	15	5	0.16	15	0.07	25.0	145	**KOFA _ D2-R02**
300-600	27-54	68-136	15	5	0.18	15	0.28	34.0	100	**KOFA _ D2-S01**
400-800	27-54	68-136	15	5	0.24	15	0.31	34.0	75	**KOFA _ D2-T01**

Technical data and ordering information
50 Hz (60 Hz)

Highest system voltage

The transformer design is for 12 kV and 17.5 kV types KOFA 12_ and for 24 kV types KOFA 24_.

Short circuit strength, primary current, core selection symbol

The primary table on page 6 shows the available short circuit strengths and rated primary currents. The table also gives the core selection symbol. The larger the chosen core symbol, the smaller the cores and transformers become in size. In case of trans-formers with two primary connections the table is applicable for the lower rated current.
At the double rated current the thermal and dynamic strengths are also doubled.

The cores

The core selection tables on page 7 and 8 show how the core size is determined by the chosen core symbol, burden and accuracy. Only the most common accuracy classes and burdens are indicated in the table, the secondary current being 5 A. The core size obtained from the table, decides the size of transformer frame lenghtwise. For both 12 and 24 kV are three different transformer lenghts available: types KOFA _ 1, KOFA _ 2 and KOFA _ 3 which can accommondate number of cores as shown on page 6.

Cantilever strength: 5 kN

Frequency

The transformers can be manufactured for different frequencies. The tables herein are made for 50 Hz. The same tables may be used also for 60 Hz taking into account that the FS-value of measuring cores will be 20 % higher at 60 Hz.

Custom designed transformers
Primary and type selection tables
Selection tables

Primary table 12, 17.5 and 24 kV

1

I_{th}/kA 1 s I_{dyn}/kA peak	Connections for two primary currents 6.7-13.4 17-34	 11-22 30-60	 16-32 40-80	 20-40 50-100	 27-54 68-136	Single ratio 90 250	I_{th}/kA 1 s I_{dyn}/kA peak
Rated primary current I_{pn}/A	Core selection symbol						Rated primary current I_{pn}/A
						(1) 2500 (2) 2000 1500 1250	2500 (only 12 kV) 2000 1500 1250
400-800 300-600					800 600	1000 800 600	1000 800 600
250-500 200-400 150-300			800 600	800 600	500 800 600	500 400 300	500 400 300
125-250 100-200 75-150	2 800 750	750 800 600	750 600 450	500 400 300	500 400 300	250 200 150	250 200 150
60-120 50-100 40-80	720 800 640	480 400 320	360 300 240	240 200 160	240 200 160		
30-60 25-50 20-40	480 400 320	240 200 160	180 150 120	120 100			
15-30 10-20	240 160	120					

Max. continuous current
(1) at 12 kV 1.0 x 2500 A
(2) at 24 kV 1.2 x 2000 A

(1) and (2) only with 5 A secondary current

Example on page 9.

Type selection 12, 17.5 and 24 kV

4

	12, 17.5 kV				24 kV			
	Core size total	No. of cores	Type **KOFA**	Weight kg	Core size total	No. of cores	Type **KOFA**	Weight kg
Transformers for two primary current connections	30...71	1 2	**12 B 1** **12 D 1**	12	30...61	1 2	**24 B 1** **24 D 1**	14
	...122	1 2 3	**12 B 2** **12 D 2** **12 F 2**	17	...112	1 2 3	**24 B 2** **24 D 2** **24 F 2**	19
	...184	1 2 3	**12 B 3** **12 D 3** **12 F 3**	22	...174	1 2 3	**24 B 3** **24 D 3** **24 F 3**	25
Single ratio transformers	30...140 ...112 (1)	1 2 3	**12 A 3** **12 C 3** **12 E 3**	21	30...112	1 2 3	**24 A 3** **24 C 3** **24 E 3**	24

(1) for primary currents 2000 A and 2500 A

Custom designed transformers
Core selection table 12, 17.5 and 24 kV
Selection table

Rated burden ▶		2.5 VA		5 VA		7.5 VA		10 VA		3 15 VA		20 VA		25 VA		30 VA	
Selection	Class	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <
2500	0.2 0.5 1.0 5P10 5P20	30 30 30 30 30	10 10 30	30 30 30 30 46	10 10 25	30 30 30 30 46	10 10 25	30 30 30 30 46	10 10 20	30 30 30 30 46	10 10 15	30 30 30 30 56	10 10 15	30 30 30 46 56	10 10 15	30 30 30 46 61	10 10 10
2000	0.2 0.5 1.0 5P10 5P20	30 30 30 30 30	10 10 25	30 30 30 30 46	10 10 25	30 30 30 30 46	10 10 20	30 30 30 30 46	10 10 20	30 30 30 30 56	10 10 15	30 30 30 46 56	10 10 15	30 30 30 46 61	10 10 10	30 30 30 46 72	10 10 10
1500	0.2 0.5 1.0 5P10 5P20	30 30 30 30 46	10 10 20	30 30 30 30 46	10 10 20	30 30 30 30 46	10 10 15	30 30 30 30 56	10 10 15	30 30 30 46 61	10 10 10	30 30 30 46 72	10 10 10	30 30 30 46 82	10 10 10	30 30 30 56 102	10 10 10
1250	0.2 0.5 1.0 5P10 5P20	30 30 30 30 46	10 10 25	30 30 30 30 46	10 10 20	30 30 30 30 46	10 10 15	30 30 30 30 56	10 10 15	30 30 30 46 61	10 10 10	30 30 30 46 72	10 10 10	30 30 30 46 92	10 10 10	30 30 30 56 102	10 10 10
1000	0.2 0.5 1.0 5P10 5P20	30 30 30 30 46	10 10 20	30 30 30 30 46	10 10 15	30 30 30 46 56	10 10 15	30 30 30 46 61	10 10 10	30 30 30 46 72	10 10 10	30 30 30 56 97	10 10 10	30 30 30 56 107	10 10 10	30 30 30 61 117	5 5 5
800	0.2 0.5 1.0 5P10 5P20	30 30 30 30 46	15 10 20	30 30 30 30 56	10 10 15	30 30 30 46 61	10 10 15	30 30 30 46 72	10 10 10	30 30 30 46 97	10 10 10	30 30 30 56 117	10 10 10	46 30 30 72 122	10 5 5	46 30 30 72 154	10 5 5
750	0.2 0.5 1.0 5P10 5P20	30 30 30 30 46	10 10 20	30 30 30 30 56	10 10 15	30 30 30 46 61	10 10 10	30 30 30 46 72	10 10 10	30 30 30 56 72	10 10 10	30 30 30 56 102	10 5 5	46 30 30 72 117	10 5 5	46 30 30 72 133	10 5 5
720	0.2 0.5 1.0 5P10 5P20	30 30 30 30 46	10 10 20	30 30 30 30 56	10 10 15	30 30 30 46 61	10 10 10	30 30 30 46 72	10 10 10	46 30 30 56 82	10 10 10	46 30 30 61 107	10 5 5	46 30 30 72 122	10 5 5	46 30 30 82 143	10 5 5
640	0.2 0.5 1.0 5P10 5P20	30 30 30 30 46	10 10 15	30 30 30 46 56	10 10 15	30 30 30 46 56	10 10 10	30 30 30 46 72	10 10 10	46 30 30 56 82	10 10 10	46 30 30 61 107	10 5 5	46 30 30 72 128	10 5 5	56 30 30 82 143	10 5 5
600	0.2 0.5 1.0 5P10 5P20	30 30 30 30 46	10 10 15	30 30 30 46 56	10 10 15	30 30 30 46 72	10 10 10	30 30 30 46 82	10 10 10	46 30 30 56 107	10 10 10	46 30 30 72 122	10 5 5	46 30 30 72 154	10 5 5	56 30 30 92 179	10 5 5
500	0.2 0.5 1.0 5P10 5P20	30 30 30 30 56	15 10 15	30 30 30 46 72	10 10 10	46 30 30 46 72	10 10 10	46 30 30 56 82	10 10 10	46 30 30 61 112	10 5 5	56 30 30 72 143	10 5 5	61 46 30 82 169	10 10 5	72 46 30 102 184	10 5 5

Custom designed transformers
Core selection table 12, 17.5 and 24 kV
Selection table

Rated burden ▶		2.5 VA		5 VA		7.5 VA		10 VA		15 VA		20 VA		25 VA		30 VA	
Selectionn	Class	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <
480	0.2 0.5 1.0 5P10 5P20	30 30 30 30 46	15 10 15	30 30 30 46 56	10 10 10	46 30 30 46 72	10 10 10	46 30 30 56 82	10 10 10	56 30 30 61 107	10 5 5	56 30 30 72 133	10 5 5	72 46 30 82 163	10 10 5	82 46 30 102	10 5 5
450	0.2 0.5 1.0 5P10 5P20	46 30 30 30 46	15 10 15	30 30 30 46 56	10 10 10	46 30 30 46 72	10 10 10	46 30 30 56 82	10 10 10	61 30 30 61 112	10 5 5	72 46 30 72 143	10 10 5	82 46 30 92 169	10 10 5	97 46 30 102	10 5 5
400	0.2 0.5 1.0 5P10 5P20	46 30 30 30 46	20 10 15	46 30 30 46 56	15 10 10	46 30 30 46 72	10 10 10	61 30 30 56 82	10 10 10	97 46 30 72 117	10 10 5	112 46 30 82 154	10 10 5	154 46 30 97 184	10 5 5	179 56 30 112	10 10 5
360	0.2 0.5 1.0 5P10 5P20	72 30 30 30 46	20 10 15	46 30 30 46 61	15 10 10	56 30 30 46 72	15 10 10	72 30 30 56 97	15 5 5	92 46 30 72 128	15 10 5	102 46 30 92 163	15 10 5	128 56 30 107	15 10 5	143 56 46 122	15 5 5
320	0.2 0.5 1.0 5P10 5P20	61 30 30 30 56	25 10 15	46 30 30 46 61	15 10 10	72 30 30 56 82	15 10 10	92 46 30 56 102	15 10 5	143 46 30 82 143	15 10 5	143 56 30 97 184	15 10 5	163 61 46 117	20 10 5	72 46 133	10 5
300	0.2 0.5 1.0 5P10 5P20	72 30 30 30 46	25 10 15	61 30 30 46 61	15 10 10	82 46 30 56 82	15 10 10	112 46 30 61 107	15 10 5	143 56 30 82 143	20 10 5	154 61 46 102	20 10 5	184 72 46 122	20 10 5	82 46 143	10 5
250	0.2 0.5 1.0 5P10 5P20	107 30 30 46 56	35 10 15	72 46 30 46 82	20 10 10	102 46 30 56 107	20 10 5	133 56 30 72 128	20 10 5	72 46 97	10 5	82 46 122	10 5	102 46	10 5	112 56	10 5
240	0.2 0.5 1.0 5P10 5P20	72 30 30 46 56	40 10 15	82 46 30 46 72	25 10 10	107 46 30 56 102	25 10 5	154 56 30 72 128	25 10 5	82 46 97 179	10 5	97 46 122	10 5	112 56 143	10 5	143 56 174	10 5
200	0.2 0.5 1.0 5P10 5P20	107 30 30 46 56	50 10 15	112 56 30 56 82	35 10 10	72 46 61 112	10 10	102 46 82 143	10 10	56 112	10	72 143	10	82 174	10	102	10
180	0.2 0.5 1.0 5P10 5P20	133 56 30 46 56	60 10 10	154 82 30 56 92	35 10 10	82 46 72 122	15 10	107 46 82 154	15 10	72 117	10	92 154	10	112	10	133	10
160	0.2 0.5 1.0 5P10 5P20	46 30 46 56	15 10	82 46 56 97	15 10	112 46 72	15 10	61 97	10								
150	0.2 0.5 1.0 5P10 5P20	46 30 46 61	15 10	92 46 56 102	15 10	143 56 82	15 10	72 102	10								

Custom designed transformers
Example

Rated burden ▶		2.5 VA		5 VA		7.5 VA		10 VA		15 VA		20 VA		25 VA		30 VA	
Selectionn	Class	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <	Size	Fs <
	0.2																
	0.5	82	20	154	20	97	10	133	10								
	1.0	30	10	61	10	97											
120	5P10	46		72													
	5P20	72		122		92		117									
	10P10	46		72													
	10P20	72		117													
	0.2																
	0.5	107	35														
	1.0	72	15														
100	5P10	56		122		122											
	5P20	82															
	10P10	46		72		107											
	10P20	82															

Example

Requirements: 6.6 kV
100/5/5 A
I_{th} (1 sec) = 10 kA, I_{dyn} = 25 kA
Core 1: 15 VA, class 0.5
Core 2: 15 VA, class 10P10

1 The primary table shows that a transformer having I_{pn} = 100-200 A, I_{th} = 11-22 kA and I_{dyn} = 30-60 kA will meet the set requirements for I_{th} and I_{dyn}.

2 Hence the core selection symbol at 100-200 A rated current will be 800. The core sizes are obtained from the core selection table which for core symbol 800 are:

3

Core 1:	15 VA, class 0.5	30
Core 2:	15 VA, class 5P10	46
Total		76

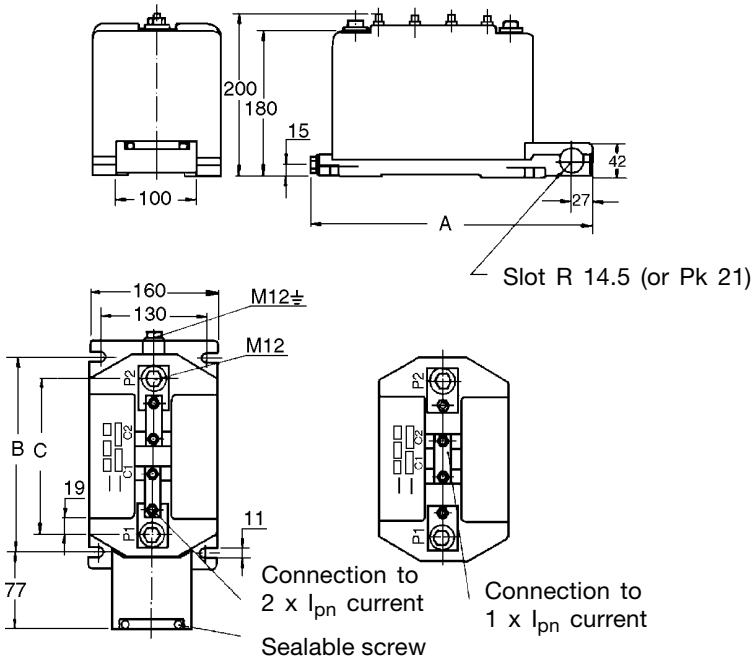
(5P10 acc. the table gives better accuracy than 10P10)

4 12 kV transformer, type KOFA 12__, will be used at 6.6 kV.

The type selection table gives type KOFA 12 D2 for the transformer size. If the transformer is later connected to a ratio 200/5/5 A the corresponding short circuit strengths are I_{th} = 22 kA and I_{dyn} = 60 kA. It is not advisable to choose unnecessarily high values for I_{th} (and I_{dyn}). The higher short circuit strength decreases the available burden and increases transformer price.

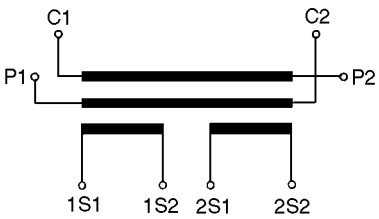
Dimensions 12 and 17.5 kV
Overall dimensions

Connections for two primary currents
Type KOFA 12 B1, D1, B2, D2, F2, B3, D3, F3



Creepage distance	160 mm
Arcing distance	150 mm

Terminal markings

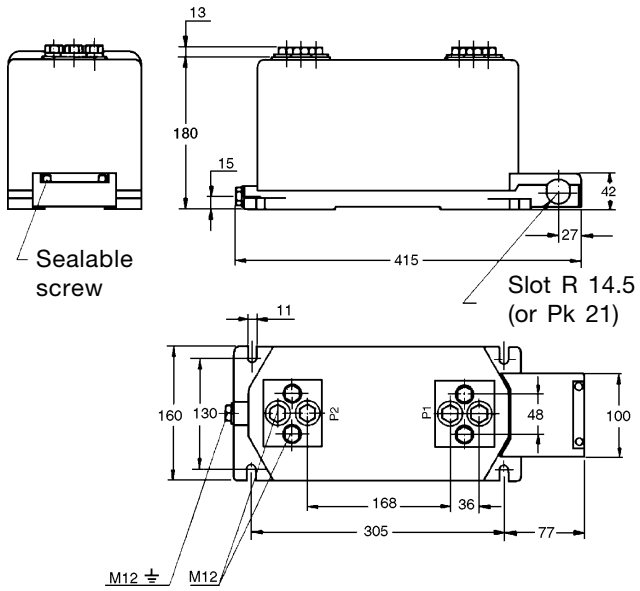


E.g. 2 cores

Type	A	B	C
KOFA 12 B 1, D 1	295	185	132
KOFA 12 B 2, D 2, F 2	355	245	192
KOFA 12 B 3, D 3, F 3	415	305	252

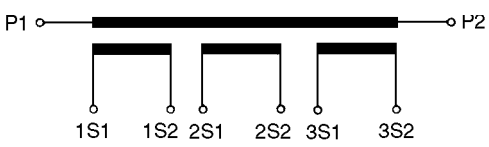
Dimensions 12 and 17.5 kV
Overall dimensions

Single ratio
Type KOFA 12 A3, C3, E3



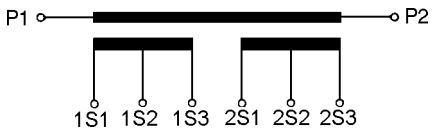
Creepage distance	165 mm
Arcing distance	150 mm

Terminal markings



E.g. 3 cores

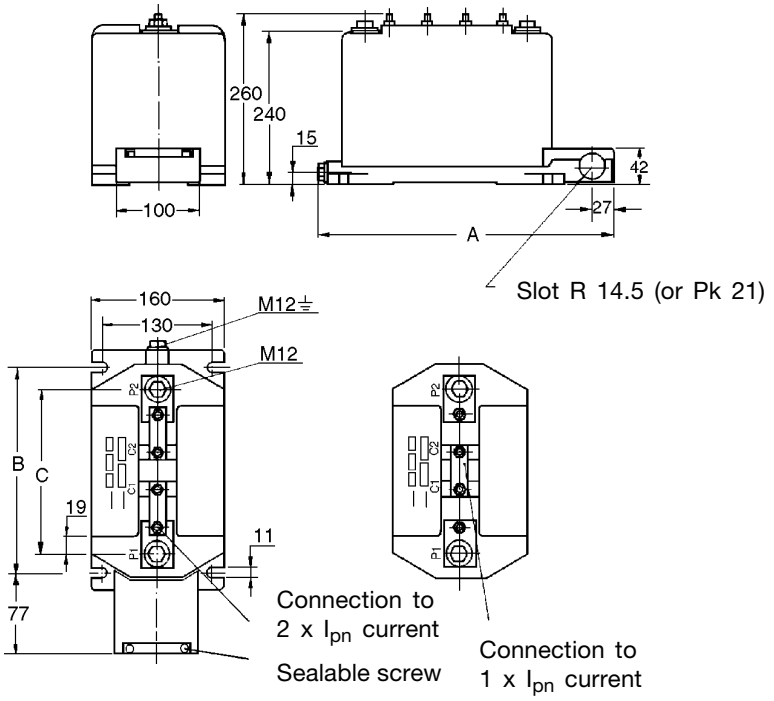
Terminal markings when secondary reconnectable for two primary currents:



Connect between S1 and S2 for the lower primary current.
Connect between S1 and S3 for the higher primary current.

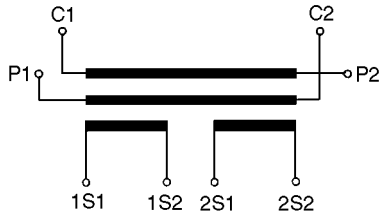
Dimensions 24 kV
Overall dimensions

Connections for two primary currents
Type KOFA 24 B1, D1, B2, D2, F2, B3, D3, F3



Creepage distance	220 mm
Arcing distance	210 mm

Terminal markings

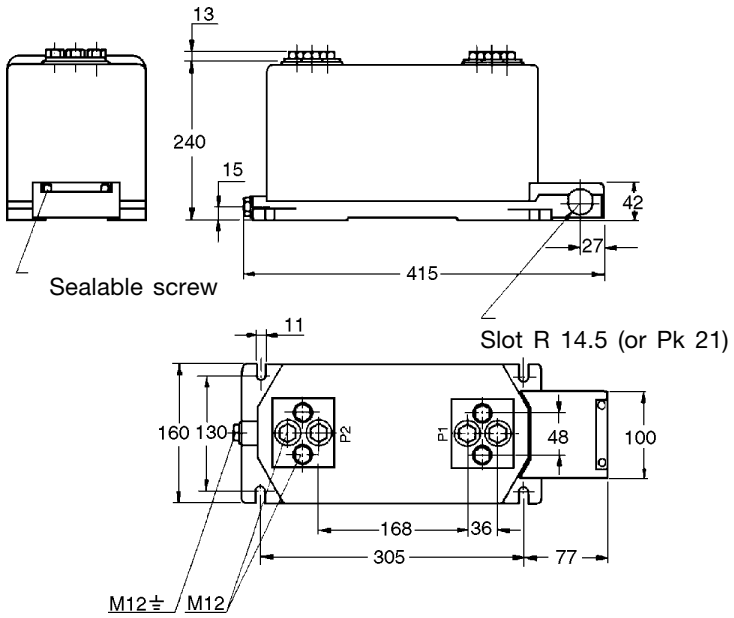


E.g. 2 cores

Type	A	B	C
KOFA 24 B 1, D 1	295	185	132
KOFA 24 B 2, D 2, F 2	355	245	192
KOFA 24 B 3, D 3, F 3	415	305	252

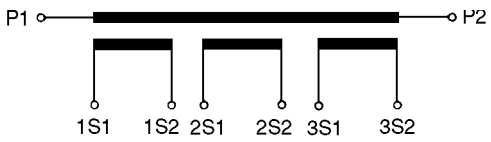
Dimensions 24 kV
Overall dimensions

Single ratio
Type KOFA 24 A3, C3, E3

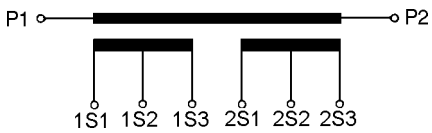


Creepage distance	225 mm
Arcing distance	210 mm

Terminal markings



Terminal markings when secondary reconnectable for two primary currents:



Connect between S1 and S2 for the lower primary current.
Connect between S1 and S3 for the higher primary current.

Order form KOFA

Customer		Date	
Address		Delivery required	
Country		Tel.	Fax.
Contact person		E-mail	

Current transformers

Project ref.:		Date		Inquiry No.:	
				Offer No.:	

Um:	kV		
Ith:	kA/1s	Insulation level (BIL):	kV/ kV/ kV
	kA/3s		
freq.:	Hz	Routine test certificates	
Idyn.:	kA	Additional name plate	
		Magnetisation curves	

Indoor ☐
Outdoor ☐

Remarks:

Pos.:		Pcs.:				
	ratio (A)	Class	Burden (VA)	ext 100% ○	add. Requirment	
core 1:				ext 120% ○		
core 2:				ext 150% ○		
core 3:				ext 200% ○		
core 4:				reconnectable	○ Yes	○ primary ○ secondary
					○ No	

Supplier's remarks

Type

Unit price

Total price

Comment

Pos.:		Pcs				
	ratio	Class	Burden	ext 100% ○	add. Requirment	
core 1:				ext 120% ○		
core 2:				ext 150% ○		
core 3:				ext 200% ○		
core 4:				reconnectable	○ Yes	○ primary ○ secondary
					○ No	

Supplier's remarks

Type

Unit price

Total price

Comment

A 3440-510-I/2001

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