



# OSKF

## Current Transformers 72.5 kV to 765 kV

For years, utility engineers have trusted OSKF current transformers and thousands are installed in substations around the world. Our customers recognize the high quality design results in long-term safety and reliability for system voltages up to 800 kV.

The enduring success of this series is the result of a well executed design entirely focused on addressing the goals of safety and long life.

- > Metering – Protection
- > Performance:
  - $V_{nom}$ : 69 to 765 kV
  - $I_n$ : up to 5000 A
  - $I_{th}$ : up to 50 kA.  $I_{dyn}$  75 KAp
  - Secondary cores: up to 8
- > Characteristics:
  - High quality paper-oil insulation
  - Head type design with aluminum housing
  - Oil expansion and hermetic seal by stainless steel diaphragm bellows
  - Oil level indicator
  - Secondary cores isolated in heavy walled grounded housing
  - Changing of primary ratio by secondary taps or primary connection
- > Available high and extended range accuracy design (ERCT).
- > Seismic withstand capability: the standard OSKF resists medium intensity seismic events. For highly active seismic regions, the design is adapted accordingly.
  - > Compliance with ANSI/IEEE, standards. Other standards on request.
  - > Seismic designs available.



### SERVICE LIFE AND MAINTENANCE

OSKF current transformers have been designed for a 30 year plus life-time. They are maintenance free: the oil is hermetically sealed from the air by a stainless steel diaphragm assembly and all external parts are of corrosion-resistant material.

### Customer Benefits

- Conservative and safe design
- Extensive field and extreme climate experience, including high seismic regions
- Burst (internal arc) protected
- Maintenance-free, hermetically sealed
- Stable accuracy over its lifetime
- Rugged, leak-proof design

## HEAD TYPE DESIGN AND PRIMARY WINDINGS

The 'inverted CT' design, with active part in the head, offers particular advantage for higher currents. The primary is normally a straight bar type conductor with low inductance. Therefore no primary surge protection is required. Ratio change can be accomplished either by primary series-parallel connection (single, double or quadruple ratio) or by secondary taps. Combinations of series-parallel connection and secondary taps are also possible. The head type design also has the advantage of spreading the primary flux in a uniform and symmetrical way through the cores, avoiding local saturation and reducing the leakage flux.

## CORES AND SECONDARY WINDINGS

Current transformers can have several toroidal laminated cores which are independent of each other. The cores with the secondary winding are accommodated in a thick-walled, aluminum housing.

The core housing is mounted on a heavy gauge metal tube inside the insulator which leads to the base plate. Cross sections and connections have been dimensioned to provide a fault current path to ground greatly reducing the opportunity for a secondary arc within the insulator. As a result of this design an open secondary winding flashover limited in time will not damage the high voltage insulation; and a high voltage insulation breakdown does not impair the function of the secondaries.

## HIGH QUALITY PAPER-OIL INSULATION

Insulating paper is applied to the core housing and its supporting tube by a special wrapping machine to ensure high density and uniform insulation.

Low impedance grading layers with well-rounded edges ensure a uniformly distributed field over the entire unit surge arrestors to protect the CT are not required.

Only a name brand mineral oil with excellent durability and gas-absorbing properties is used. The insulating oil contains no PCB.

Controlled vacuum and temperature treatments withdraw humidity and gas from the paper insulation and insulation oil; the impregnation process results in a robust dielectric system.

## HERMETICALLY SEALED FOR LONG LIFE

The OSKF maintains a completely sealed and pressure free system through the use of a stainless steel metallic diaphragm assembly. The diaphragm assembly provides oil expansion and pressure compensation, protects the interior from air and moisture and preserves the dielectric strength of the unit. The movements of the diaphragm assembly are translated to an indirect oil level indicator which is visible behind a window in the diaphragm cover. Effectively oil maintenance, change or inspection is eliminated and the CT operates pressure free.

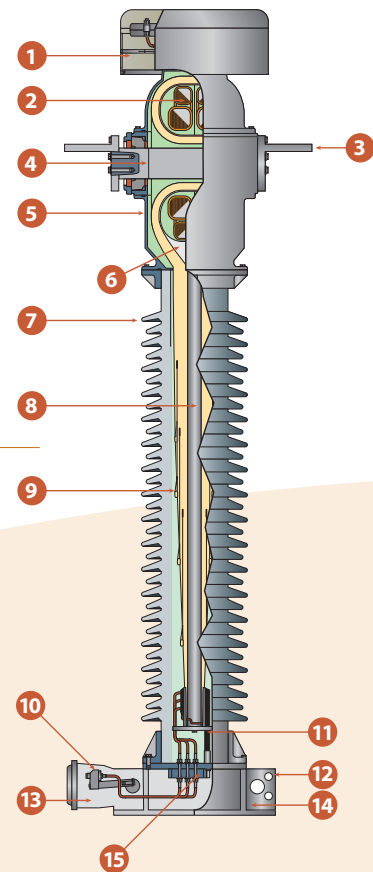
## LEAKPROOF DESIGN

The head housing is made of corrosion-proof aluminum alloy. Every housing is subjected to a vacuum leak test by helium leak detection. An overall leak test is performed on every assembled unit before oil filling. All seals are formed by single piece O-Rings in fully machined grooves.

## PRIMARY TERMINALS AND GROUNDING

The standard primary terminals consist of busbar aluminum flat terminal pads with 4, 6, 8, or more holes depending on current rating. Other terminal designs are available on request. Two grounding pads on opposite corners of the base are provided.

1. Diaphragm bellows
2. CT cores and secondary windings
3. Primary terminal
4. Primary conductor assembly
5. Head housing
6. Core housing
7. Porcelain or composite insulator
8. Bushing tube
9. Capacitive grading layers
10. Secondary terminal blocks
11. Fault current carrying connector to ground
12. Ground pad
13. Secondary terminal box
14. Pedestal
15. Oil/Air block





## SECONDARY TERMINAL BOX

The terminal box is very spacious and has a removable gland plate located at the bottom which allows for in-factory or on-site drilling of the conduit entrances for the insertion of conduit hubs as desired. The secondaries are brought out through an oil/air seal block assembly and terminated on separate terminal blocks with 8-32 screws. Other terminals on request.

## INSULATOR

The outer insulation consists of aluminum oxide porcelain in grey (ANSI 70) or brown (RAL 8016). Standard creepage distances are available according to the dimension tables. Larger creepage distances and composite insulators are available on request.

## PROTECTION AGAINST BURSTING

The optimized insulation structure and mechanical design ensure dielectric integrity for a very long time. The following additional measures are taken to prevent the insulator from failing in the event of an inner insulation breakdown. The capacitive grading in the high voltage insulation is designed to withstand transient overvoltages to be expected during service life.

- > The active part is above the porcelain in an aluminum head housing.
- > An internal fault current connection is provided between the core housing and the ground terminal on the base.
- > A pressure relief plate exists in the area of the expansion body on the head.
- > Upon request, a composite insulator consisting of fiberglass reinforced pipe and silicone rubber screens can be provided instead of the porcelain insulator.

The capacitive grading in the high voltage insulation is designed to withstand transient overvoltages to be expected during service life.



## SERVICE LIFE AND MAINTENANCE

OSKF current transformers have been designed for a 30 year plus life-time. They have no specific maintenance requirements and no painting is required:

- > All hardware is made of stainless steel.
- > Housing are made of marine grade aluminum alloy.
- > Porcelain fittings are made from cast iron hot dip galvanized.
- > Angle brackets are made form steel and hot dip galvanized.

Besides regular transformer surface cleaning, no routine maintenance is required. The hermetic seal alleviates the need for oil sampling or moisture checks unless unusual operating conditions occur.

## TESTING

Testing is performed in conformance with national, international and internal quality standards. Along with the power-frequency withstand test capacitance and dielectric loss factor, internal partial discharges are also measured as routine tests. Tests certificates are issued and supplied with the equipment.

## TRANSPORTATION AND INSTALLATION

OSKF can be transported and stored horizontally. Vertical transportation is possible for lower voltage units depending on the permitted transportation height. The OSKF is supplied ready for energizing. No special tools are required for connection.

## ADDITIONAL INFORMATION

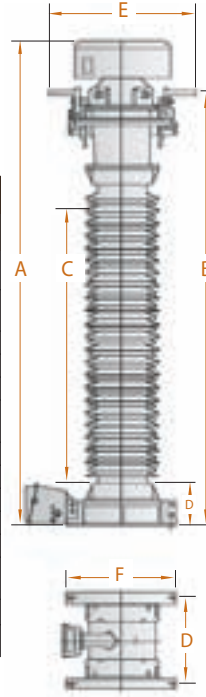
- > **Dielectric loss factor:**  $\tan \delta$  smaller than 0.5% up to the power-frequency test voltage
- > **Radio Influence Voltage (RIV):** Less than 2500 V at 1.1  $U_m$
- > **Internal partial discharge:** Less than 10 pC at 1.0  $U_m$
- > **Frequency:** 60 Hz. Other value on request.
- > **Ambient temperature:** -40°C... +40°C on a 24h average. Other designs can be provided upon request for temperatures ranges falling outside of the mentioned range, i.e. -50°C to +50°C
- > **Mechanical strength:** The service load (applied to the terminal in any direction continuously) is 650 lb., the short time load (impulse load like conductor whip) is 1595 lb. For SK1 units (metering units up to 145 kV) the loads are 500 lb. and 1000lb. respective. Other values on request.

## DIMENSIONS

Except the ERCT Line Current Transformers are for specific projects custom made products. The following dimensions refer to certain standard versions. Other requirements affect the dimensions. The head size can change, depending on the core data and the primary nominal current. With regard to the creepage distance and clearance, the insulator can be adapted to the customers' request.

DIMENSIONS						
Type		OSKF 72.5	OSKF 123		OSFK 145	
Head size		1	1	2/B	1	2/B
Maximum system voltage (V <sub>n</sub> )	kV	72.5	123	123	145	145
Power frequency withstand test	kV	140	230	230	275	275
Impulse test voltage (BIL)	kV	350	550	550	650	650
Standard creepage distance (*)	in	63.2	115.4	117.7	138.6	138.6
Dimensions in	A	64.6	79.0	87.6	87.2	92.3
	B	55.4	69.6	74.3	77.8	79.1
	C	22.3	36.7	39.0	44.8	43.7
	D	10.2	10.2	11.1	10.2	11.1
	E	30.4	28.4	33.1	30.4	33.1
	F	11.4	11.4	17.7	11.4	17.7
Total weight (approx.)	pound	533.6	648.3	886.4	692.4	921.7
Weight of oil (approx.)	pound	99.2	108.0	178.6	114.7	198.5
Weight of oil (approx.)	gal	13.5	14.7	24.3	15.6	26.9

Indicatives values only - All indicated dimensions must be confirmed with order.  
(\*) - Standard creepage distance (in) - Other values on request.



## INQUIRY CHECK LIST

- > Applicable standards
- > Rated frequency
- > Highest system voltage
- > Test voltages (power frequency, lightning impulse, switching impulse above 245 kV)
- > Primary/secondary rated currents
- > Dynamic short circuit current (mechanical current)
- > Short time current and duration
- > Continuous thermal rating factor
- > Core rating (burden, accuracy), on dual ratio the accuracy is assumed on both ratios, on multi ratio only on the full winding
- > Environmental conditions, creepage (altitude, temperatures, pollution, seismic conditions...)
- > Options:
  - Composite insulator
  - Surge arrester on secondary winding
  - Ground cable connector
  - Primary terminal, primary terminal connectors
  - Specific design for use in highly active seismic regions
- > Available accessories:
  - Capacitance tap
  - Lifting lugs
  - Oil sampling kit
  - Shock indicators during shipment

DIMENSIONS											
Type		OSKF 170		OSKF 245		OSFK 362		OSKF 550		OSKF 800	
Head Size		2/1	3A	2/1	3/A	3A	4	4	5	5	6
Maximum system voltage (U <sub>m</sub> )	kV	170	170	245	245	362	362	550	550	765	765
Power frequency withstand test	kV	325	325	395	395	575	575	830	830	975	975
Impulse test voltage (BIL)	kV	750	750	950	950	1300	1300	1800	1800	2100	2100
Standard creepage distance (*)	in	165.5	168.1	248.0	248.0	371.1	371.1	529.9	529.9	529.9	581.9
Dimensions in	A	101.7	106.6	128.7	139.2	186.7	193.6	247.6	253.5	329.1	341.7
	B	88.5	90.8	115.3	117.8	159.9	163.4	211.9	215.8	268.5	276.0
	C	53.1	53.1	79.5	79.5	118.1	118.1	167.3	167.8	218.9	218.9
	D	11.1	11.1	11.1	11.1	14.1	14.1	14.5	14.1	19.3	18.9
	E	33.1	36.6	33.1	36.6	36.6	38.0	38.0	43.5	42.4	49.8
	F	17.7	17.7	22.0	22.0	29.5	29.5	29.5	29.5	29.5	47.2
Total weight (approx.)	pound	957.0	1276.7	1389.2	1693.4	2582.1	3340.6	4004.3	4798.1	6665.7	9029.5
Weight of oil (approx.)	pound	189.6	324.1	335.2	502.7	743.1	855.5	996.7	1285.5	2132.2	2555.6
Weight of oil (approx.)	gal	25.8	44.1	45.7	68.4	101.2	116.5	135.8	174.9	290.4	348.0

Indicatives values only - All indicated dimensions must be confirmed with order.  
(\*) - Standard creepage distance (in) - Other values on request.

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