ALKARGO

MEDIUM POWER TRANSFORMER

MEDIUM POWER TRANSFORMER
FROM 3,15 TO 31,5 MVA
HIGHEST VOLTAGE FOR MATERIAL ≤72,5kV

GENERAL CHARACTERISTICS

Three phase oil-immersed naturally cooled type ONAN medium power transformers. These units are manufactured and tested according to IEC-76 , BS 171 , ANSI C 57 or other national standards.

RATED POWER

The ratings shown in the Schedule of Particulars and Guarantees are those which can be continously supplied in all tapping range.

Due to different ambient temperatures as well as different load cycles, the transformers are capable of sustaining loads greater than their rated power, provided that the guidelines in and IEC 354 **“Loading Guide for Power Transformers in oil” are followed.**

TAPPING RANGE

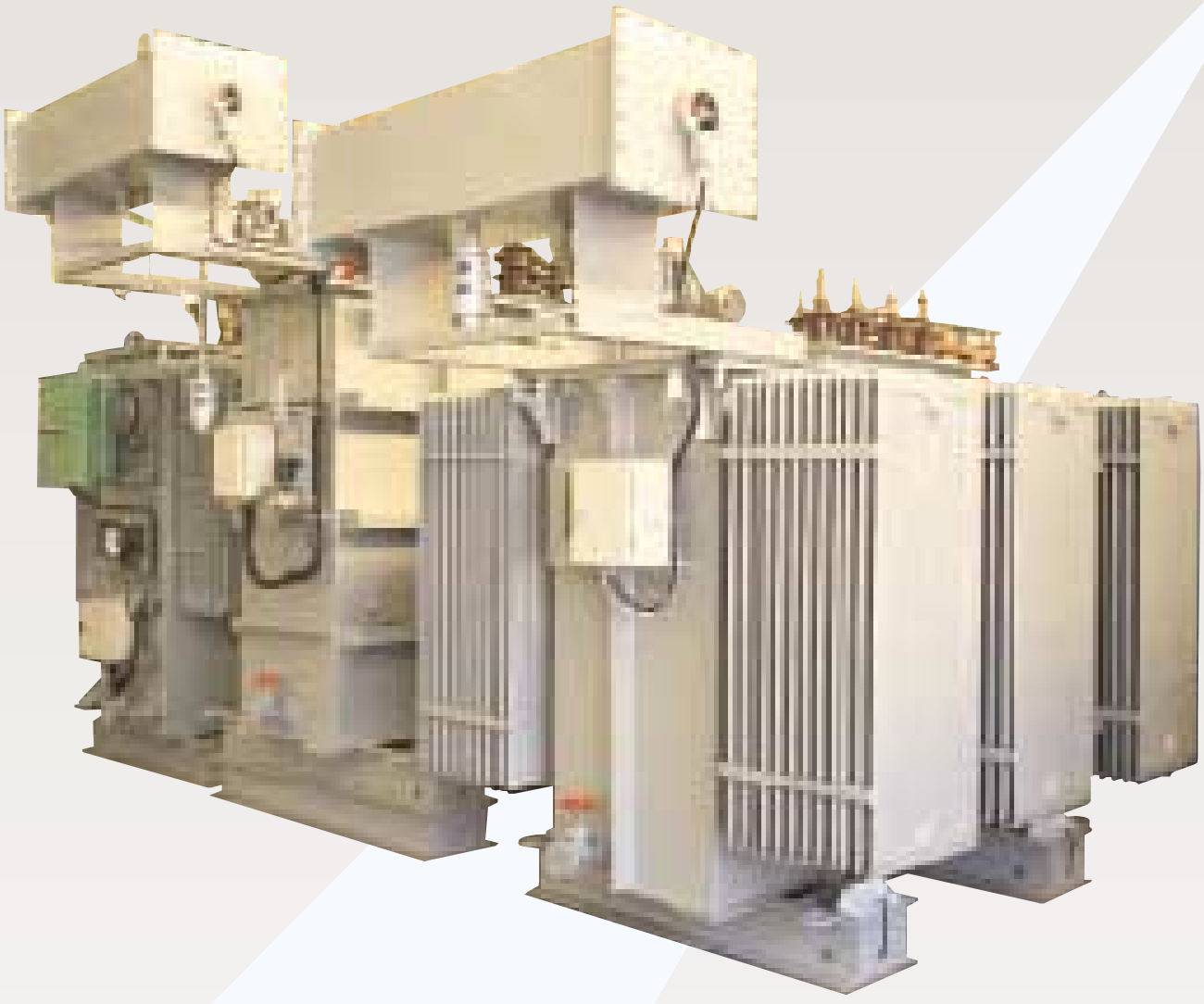
Fully rated tappings are provided either on high voltage winding , low voltage winding or both. In all cases they are implemented by means of an off-load tap-changer operated off-circuit and no voltage or an on-load tap changer for manual and automatic operation.

TAPPING METHODS

When one of the windings has to be changed for varying the effective transformation ratio , with or without tap changer , this shall be carried out by means of bushings located in the cover or by an off-load tap-changer with the operating handwheel on the cover. In this way partial or complete untanking is not necessary.

LOSSES

The guaranteed losses subject to tolerance specified in IEC-76 are stated in the schedule of Particulars and Guarantees. On request or following the capitalization of losses , transformers can be manufactured with different loss levels. These can be valued according to no load losses and load losses.



NOISE LEVEL

The average noise level of transformers according to UNE EN 60551 and IEC-60551 is below the requirements of those standards and those of NEMA TR1.

Transformers wiht lower noise can be manufactured on request.

TEMPERATURE RISE

During continous full load operation, the average temperature rise measured at any place of the winding, do not exceed 65 K. In identical conditions, the temperature rise of the oil under the tap-cover, do not exceed 60 K, measured with a thermometer.

In such conditions, the temperature rise in the hottest spot of the winding will not exceed 78 K.

COOLING

Standard transformers are provided with radiators attached directly to the tank for ONAN units. A cooling equipment is provided on request and the transformer will operate as an ONAF unit.

Transformers can also be designed for forced oil or air forced cooling (OFAF) or for forced oil and water (OFWF).

CONSTRUCTION DETAILS

I- CORE

The core is manufactured from grain oriented low losses steel sheets. Each lamination is insulated with a ceramic component on both sides to ensure a long trouble free lifetime to the core.

The magnetic circuit and winding structure is designed to withstand mechanical stresses from short-circuits .

Additionally yokes and legs are wrapped with a special tape to reduce vibration levels.

The core of higher rating units is provided with cooling ducts in order to facilitate oil circulation inside them.

II- WINDINGS

The windings are concentrically possitioned with the Low Voltage winding adjacent to the core and the High Voltage winding on the outside.

Windings may be layered , spiral or in disc form , depending on the voltage and currents involved. Windings for high currents are made of transposed cable or with several wires in parallel on which several transpositions are made. The inclusion of axial and/or radial ducts ensures a high level of oil circulation and good resistance to induced voltages and impulses.

The wires are made of high-purity electrolytic copper, insulated with several layers of paper or enamelled. Windings are mechanically stabilised before they are fitted on the core.

III- OFF-LOAD TAP-CHANGER

This is usually used with the high voltage winding , though it can operate with either.

It is robust and sized for 1.4 times the rated current . The control is on the cover , and acts directly on the switching mechanism by means of a rack and pinion system. On request the control can also be fitted on one side of the tank.

IV- ON LOAD TAP-CHANGER

On transformers where voltage is regulated under load , we use on load tap-changers by highest quality world-renowned manufacturers.

These may be controlled manually or automatically , with tap change times being short in all cases. Should the operating mechanism fail , the changer remains in its working position.

The careful simple construction of these changer makes for fast , easy servicing and numerous operations.

V- TANK.

The transformer tank is of hot-rolled steel plate construction , reinforced with sections. It is designed and tested to withstand a complete vacuum and an internal pressure of 1.5 times greater than the maximum oil height obtainable during operation.

The frame carrying the running wheels is welded under the base.

Lifting lugs , jacking pads , haulage lugs are provided for pulling , lifting and hoisting.

VI- CONSERVATOR

This is sized to absorb the expansion and contraction of oil under the lowest and highest operatins temperatures. It is built as a free standing unit on the cover of the transformer. At each end it has removable lids to access for maintenance.

VII- RADIATORS

These are made with drawn parts welded together and are sized to withstand the pressure tests , complete vacuum and an internal pressure of 1 kg/cm2

They are usually attached to the two largest sides of the tank to facilitate installation of cooling equipment at a later date if necessary.

VIII- BUSHINGS

For equipment with a highest voltage of 52 kv or less , porcelain bushings are used as per UNE EN 50180

For a rated voltage of 72.5 KV , sealed construction oil-filled condenser type bushings are used. In all cases they can be dismounted for maintenance and replacement.

On request , transformers can be supplied with bushings inside cable boxes in air or oil suitable for receiving one of more cables per phase.

MEDIUM POWER TRANSFORMER

Serie 36 kV

Rated Power (MVA)		3,15	4	5	6,3	8	10	12,5	16	20	25	31,5
No load losses(Wo) kW		3,8	4,1	4,8	5,6	6,2	7,4	9,3	10,5	13	16	20
No load current (%)		0,9	0,8	0,75	0,7	0,65	0,6	0,55	0,5	0,45	0,4	0,35
Load losses (Wc) kW		28	35	40	48	56	66	80	90	102	120	140
Short-circuit voltage (%)		6,25	7,15	7,15	7,15	8,35	8,35	8,35	10	10	10	12,5
Efficiency con cos φ=1	(%)a 4/4	99,00	99,03	99,11	99,15	99,23	99,27	99,29	99,37	99,42	99,45	99,49
	3/4	99,17	99,21	99,27	99,31	99,37	99,41	99,42	99,49	99,53	99,55	99,58
	2/4	99,31	99,36	99,41	99,44	99,49	99,52	99,53	99,58	99,61	99,63	99,65
	1/4	99,30	99,37	99,41	99,45	99,51	99,54	99,54	99,59	99,61	99,62	99,63
Efficiency con cos φ=0,8	(%)a 4/4	98,75	98,79	98,89	98,94	99,03	99,09	99,11	99,22	99,28	99,32	99,36
	3/4	98,97	99,01	99,09	99,14	99,21	99,26	99,28	99,36	99,41	99,44	99,48
	2/4	99,15	99,20	99,265	99,30	99,37	99,40	99,41	99,48	99,52	99,54	99,56
	1/4	99,12	99,22	99,27	99,32	99,39	99,42	99,43	99,49	99,51	99,53	99,54
Regulation voltage cos φ=1	(%)a 4/4	1,08	1,12	1,05	1,01	1,04	1,00	0,98	1,06	1,00	0,97	1,22
	3/4	0,81	0,85	0,79	0,76	0,78	0,75	0,74	0,80	0,76	0,73	0,92
	2/4	0,54	0,56	0,53	0,51	0,52	0,50	0,49	0,53	0,50	0,49	0,61
	1/4	0,27	0,28	0,26	0,25	0,26	0,25	0,25	0,27	0,25	0,24	0,31
Regulation voltage cos φ=0,8	(%)a 4/4	4,52	5,09	5,03	5,01	5,74	5,71	5,70	6,73	6,69	6,67	8,32
	3/4	3,39	3,82	3,78	3,76	4,31	4,29	4,28	5,05	5,02	5,01	6,24
	2/4	2,26	2,55	2,52	2,51	2,87	2,86	2,85	3,37	3,35	3,34	4,16
	1/4	1,13	1,27	1,26	1,25	1,44	1,43	1,43	1,68	1,67	1,67	2,08
Lenght	mm.	2400	2500	2600	2700	2850	2950	3150	3500	3750	4000	4250
Width	mm.	2050	2050	2100	2220	2680	2900	3000	3120	3240	3350	3450
Height	mm.	2560	2670	2710	2790	3050	3150	3400	3700	3850	4100	4360
Distance between wheel axis	mm.	1150	1150	1150	1150	1150	1150	1500	1500	1710	1710	1710
Insulation fwid weight	Kg.	1500	1600	1840	2100	2550	2970	3540	4320	5150	6150	7300
Untanking weight	Kg.	4550	4950	5760	6650	7900	9360	11400	14050	17160	21400	26200
Total weight	Kg.	7800	8700	9900	11300	13750	16500	19700	24200	29700	36150	43600

Serie 52 kV

Rated Power (MVA)		3,15	4	5	6,3	8	10	12,5	16	20	25	31,5
No load losses(Wo) kW		4	4,3	5,2	6	6,6	7,8	10	11,3	14	17,5	22
No load current (%)		0,95	0,85	0,8	0,75	0,7	0,65	0,6	0,55	0,5	0,4	0,35
Load losses (Wc) kW		28	38	42	48	58	66	82	92	105	123	144
Short-circuit voltage (%)		6,25	7,15	7,15	7,15	8,35	8,35	8,35	10	10	10	12,5
Efficiency con cos φ=1	(%)a 4/4	98,99	98,95	99,06	99,15	99,19	99,26	99,27	99,35	99,4	99,44	99,47
	3/4	99,17	99,15	99,23	99,30	99,35	99,40	99,4	99,47	99,51	99,54	99,56
	2/4	99,30	99,31	99,37	99,43	99,47	99,51	99,51	99,57	99,59	99,61	99,63
	1/4	99,27	99,33	99,37	99,43	99,49	99,52	99,51	99,57	99,59	99,59	99,6
Efficiency con cos φ=0,8	(%)a 4/4	98,74	98,69	98,83	98,94	99,00	99,08	99,09	99,20	99,26	99,30	99,34
	3/4	98,96	98,94	99,04	99,13	99,18	99,25	99,25	99,34	99,39	99,42	99,45
	2/4	99,13	99,14	99,22	99,29	99,34	99,39	99,39	99,46	99,49	99,52	99,54
	1/4	99,09	99,17	99,22	99,29	99,36	99,40	99,39	99,47	99,48	99,49	99,51
Regulation voltage cos φ=1	(%)a 4/4	1,08	1,20	1,09	1,01	1,07	1,00	1,00	1,07	1,02	0,99	1,23
	3/4	0,81	0,90	0,82	0,76	0,80	0,75	0,75	0,81	0,77	0,74	0,93
	2/4	0,54	0,60	0,55	0,51	0,54	0,50	0,50	0,54	0,51	0,50	0,62
	1/4	0,27	0,30	0,27	0,25	0,27	0,25	0,25	0,27	0,26	0,25	0,31
Regulation voltage cos φ=0,8	(%)a 4/4	4,52	5,14	5,06	5,01	5,76	5,71	5,71	6,74	6,7	6,68	8,33
	3/4	3,39	3,86	3,80	3,76	4,32	4,29	4,29	5,06	5,03	5,01	6,25
	2/4	2,26	2,57	2,53	2,51	2,88	2,86	2,86	3,37	3,35	3,34	4,17
	1/4	1,13	1,29	1,27	1,25	1,44	1,43	1,43	1,69	1,68	1,67	2,08
Lenght	mm.	2700	2800	2900	3050	3100	3200	3400	3750	4000	4250	4500
Width	mm.	2100	2100	2150	2370	2750	2900	3050	3200	3350	3550	3700
Height	mm.	2850	2920	2980	3180	3320	3400	3650	3900	4100	4350	4650
Distance between wheel axis	mm.	1150	1150	1150	1150	1150	1150	1500	1500	1710	1710	1710
Insulation fwid weight	Kg.	1800	2050	2200	2550	2750	3350	3950	4850	5750	6950	8500
Untanking weight	Kg.	4830	5150	6050	7300	8300	9800	12100	15100	18550	23300	28600
Total weight	Kg.	8900	10100	10950	12800	14800	17400	21100	26300	32400	39800	47800

MEDIUM POWER TRANSFORMER

Serie 72,5 kV

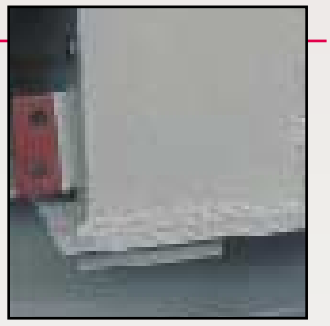
Rated Power (MVA)		3,15	4	5	6,3	8	10	12,5	16	20	25	31,5
No load losses(Wo) kW		4,6	5	6	7	7,5	8,8	11	13	16	20	25
No load current (%)		1	0,9	0,85	0,8	0,75	0,7	0,65	0,6	0,5	0,45	0,4
Load losses (Wc) kW		26	35	40	48	62	68	84	96	110	128	150
Short-circuit voltage (%)		6,25	7,15	7,15	7,15	8,35	8,35	8,35	10	10	10	12,5
Efficiency con cos φ=1	(%)a 4/4	99,03	99,01	99,08	99,13	99,13	99,23	99,24	99,32	99,37	99,41	99,44
	3/4	99,19	99,18	99,24	99,28	99,29	99,37	99,38	99,44	99,48	99,51	99,53
	2/4	99,30	99,31	99,36	99,40	99,42	99,48	99,49	99,54	99,56	99,58	99,6
	1/4	99,21	99,28	99,32	99,36	99,43	99,48	99,48	99,52	99,54	99,55	99,56
Efficiency con cos φ=0,8	(%)a 4/4	98,80	98,76	98,86	98,92	98,92	99,04	99,05	99,15	99,21	99,26	99,31
	3/4	98,99	98,98	99,05	99,10	99,12	99,22	99,22	99,30	99,35	99,39	99,42
	2/4	99,17	99,14	99,20	99,25	99,28	99,35	99,36	99,42	99,45	99,48	99,50
	1/4	99,02	99,11	99,15	99,21	99,29	99,35	99,35	99,41	99,43	99,44	99,45
Regulation voltage cos φ=1	(%)a 4/4	1,01	1,12	1,05	1,01	1,12	1,02	1,01	1,09	1,04	1,01	1,25
	3/4	0,76	0,85	0,79	0,76	0,84	0,77	0,76	0,82	0,79	0,76	0,94
	2/4	0,51	0,56	0,53	0,51	0,56	0,51	0,51	0,55	0,52	0,51	0,63
	1/4	0,25	0,28	0,26	0,25	0,28	0,26	0,25	0,27	0,26	0,25	0,31
Regulation voltage cos φ=0,8	(%)a 4/4	4,47	5,09	5,03	5,01	5,79	5,73	5,72	6,76	6,72	6,69	8,34
	3/4	3,36	3,82	3,78	3,76	4,35	4,30	4,30	5,07	5,04	5,02	6,26
	2/4	2,24	2,55	2,52	2,51	2,9	2,87	2,86	3,38	3,36	3,35	4,17
	1/4	1,12	1,27	1,26	1,25	1,45	1,43	1,43	1,69	1,68	1,37	2,09
Lenght	mm.	3300	3350	3350	3450	3550	3650	3800	4150	4250	4350	4600
Width	mm.	2300	2300	2360	2570	2750	2970	3150	3250	3400	3700	3800
Height	mm.	3180	3320	3380	3460	3590	3700	3900	4100	4350	4600	4900
Distance between wheel axis	mm.	1150	1150	1150	1150	1150	1150	1500	1500	1710	1710	1710
Insulation fwid weight	Kg.	2300	2700	2950	3100	3550	4100	4950	6100	7400	9100	11150
Untanking weight	Kg.	5600	6150	7250	8150	9100	10750	13350	16900	20950	26150	32100
Total weight	Kg.	9900	11400	12950	14500	16200	19100	23150	29200	35400	44400	53900

FITTINGS

I- WHEELS

These transformers are usually supplied with four two-way wheels (i.e. wheels which can be set in the direction of the two main axes). Unless the purchaser indicates otherwise , plain wheels are supplied. Flanged wheels for mounting on rails can be supplied on request.

II- EARTH CONNECTIONS



Near to the bottom right of each of the larger sides of the transformer tank there is a plate for earthing it. These connection plates are made of stainless steel , and have 14mm. diameter holes.

III- JACKING PADS

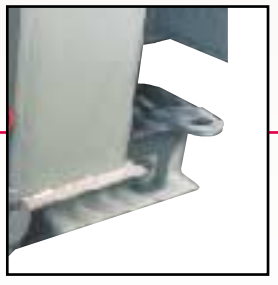
The transformer tank has four jacking pads at the bottom corners by which it can be raised with jacks so that the wheel direction can be changed.

IV-DRAIN VALVE

This is located on one of the smaller sides of the tank , under the expansion tank and as close to the base as possible to facilitate complete drainage.

V- FILTERING & SAMPLING VALVES

These two valves are at diagonally opposite points on the transformer tank. The former is below the expansion tank and the latter is lower down on the opposite side. This lower valve is fitted with a device for taking samples of insulating liquid.



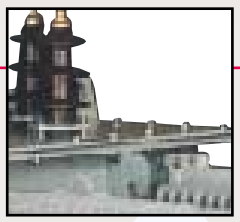
VI- HAULAGE LUGS

These lugs , fitted at all four corners of the frame on which the wheels are located can be used to haul the transformer in any direction.

VII - UNTANKING RINGS

These are on the transformer cover , on its longitudinal axis close to the edge of the cover.

VIII - LIFTING LUGS



There are two lugs on each of the larger side of the tank , supported on the frame

IX - THERMOMETER POCKET

Two sensor housings are usually fitted on the transformer cover , at the points where the oil gets hottest. They have 1” gas thread couplings.

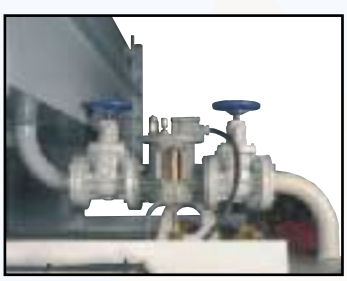
X - TWO CONTACT THERMOMETER

This thermometer is used to indicate the maximum oil temperature. It has a circular scale and two independent adjustable contacts: one for an alarm and the other for a trip mechanism. The maximum temperature reached is shown by a red needle. It is positioned on the transformer at eye level for direct reading.

XI - HOTTEST SPOT WINDING TEMPERATURE INDICATOR (“THERMAL IMAGE”)

If this is expressly requested by the customer , the transformer can be supplied with a winding temperature indicator showing the temperature at the hottest spot on the winding. This fitting has several independent adjustable contacts and a connector for remote temperature reading. It is positioned on the transformer at eye level so that the temperature can be read directly on the scale.

XII - BUCHHOLZ RELAY



The Buchholz gas relay is a fitting which protects the transformer from sudden flows of oil and gas emissions through the tube between the tank and the conservator. It has two different level ball valves which act on two independent contacts, one to an alarm and the other to a trip mechanism. The relay body has two graduated peep-windows indicating the volume of gas built up and a valve for bleeding or taking gas samples. A valve is fitted between the relay and the conservator for maintenance work.

XIII - GAS COLLECTOR

If this is espressly requested by the customer , a gas collector can be fitted , connected to the top of the buchholz relay body via a copper tube with stop-cocks to allow the gas built up in the buchholz relay through to the collector. The gas collector can be easily removed from the transformer so that gas can subsequently be analysed.

XIV - OVERPRESSURE DEVICE

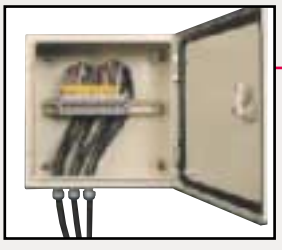
This protects the transformer against internal overpressure in the tank. It can be mounted on the cover or at one end of a tube. It has a mechanical device to indicate that it has cut in , and a switched , potential-free electrical contact.

XV - MAGNETIC LEVEL GAUGE

Located on a dismountable cover on the conservator , this device indicates the oil level in the tank at all times. The movement of the float on the liquid inside is transmitted to the dial by a magnetic coupling system. It has two normally open , potential-free contacts: one for minimum level and the other for maximum.

XVI - SILICA GEL AIR BREATHER

To prevent moist air getting into the conservator , the transformer has a silica gel dryer at the bottom of a vent tube running from inside the top of the conservator to the outside air.



XVII - AUXILIARY TERMINAL BOX

All protecion , signalling and ancillary service circuits are wired to an auxiliary terminal box. This is the only point which should be accessed from the outside to take signals. It is located on the transformer close to the rating plate under the conservator.

OTHER PRODUCTS IN OUR MANUFACTURING PROGRAMME

- Transformers in silicone (LNAN)
- Cast resin dry type transformers form 50 to 5000 KVA and equipment with highest voltage of ≤36 kV.
- Earthing transformers
- Impregnated dry type transformers
- Auto-transformers
- Transformers for rectifiers
- Special transformers
- Oil-immersed distribution transformers

Note: The data and descriptions in this catalogue are taken from our present desing and construction specifications , and do not constitute a commitment on our part unless further confirmation is given. We reserve the right to make modifications without prior notice in order to introduce any improvements which may be considered appropriate

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