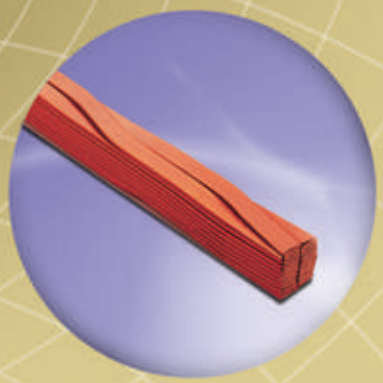
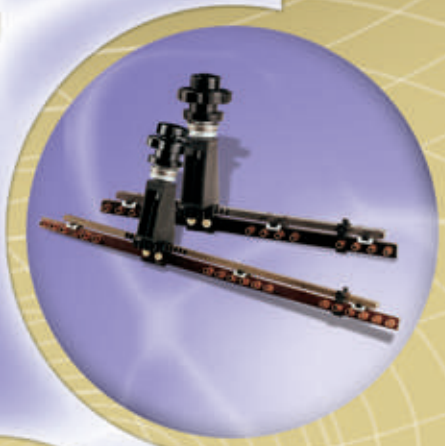
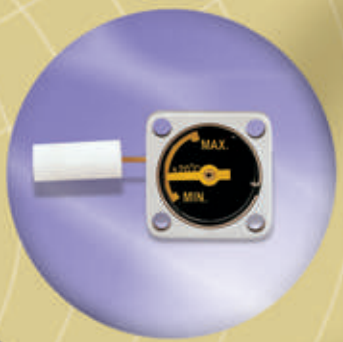
TRANSFORMER COMPONENTS AND ACCESSORIES

COUNTINUOUSLY TRANSPOSED CABLES
RADIATORS
OFF CIRCUIT TAP CHANGERS
DEHYDRATING BREATHERS
MAGNETIC OIL LEVEL INDICATORS (Oil gauges)
THERMOMETERS







I.T.S.D
Iran Transfo Substation Development Co.

WE EARN CUSTOMER SATISFACTION

www.iran-transfo.com
IRAN TRANSFO CORPORATION

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Table of Content:

WE EARN CUSTOMER SATISFACTION

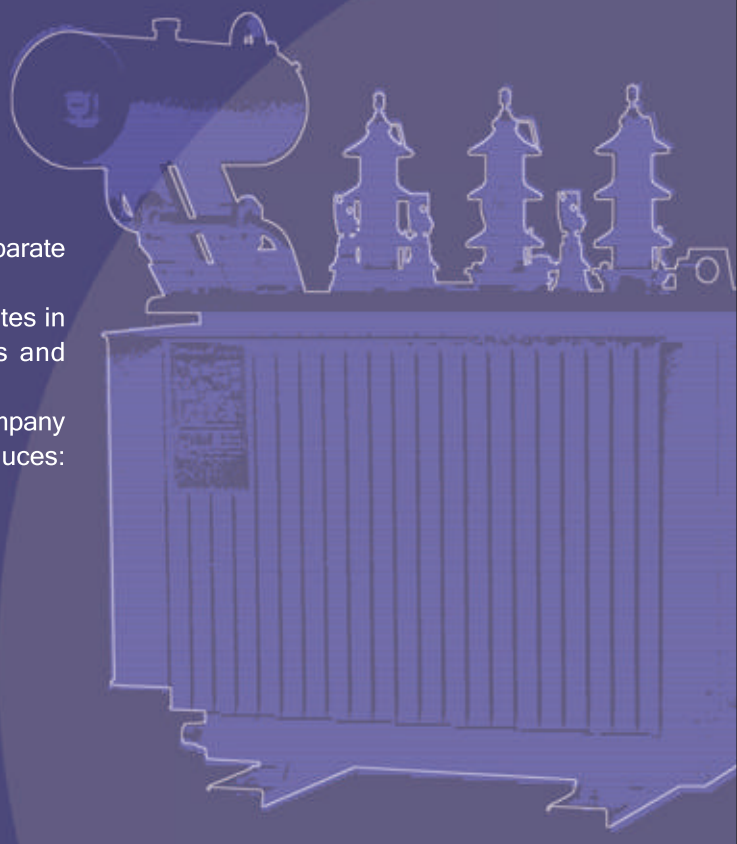
HIGH QUALITY
IS OUR POLICY

IRAN TRANSFO CORPORATION

MANUFACTURER OF TRANSFORMER COMPONENTS AND ACCESSORIES

Iran Transfo Corporation manufactures following items for power and distribution oil immersed transformers and reactors:

1- COUNTINUOUSLY TRANSPOSED CABLES
2- RADIATORS
3- OFF CIRCUIT TAP CHANGERS
4- DEHYDRATING BREATHERS
5- MAGNETIC OIL LEVEL INDICATORS (Oil gauges)
6- THERMOMETERS



These components and accessories are produced in two separate sites.
The first site is wire and accessories workshop which locates in Iran Transfo main plant and manufactures CTC cables and radiators.
The second site is Iran Transfo Substation Development company (ITSD) is placed in Zanjan No.1 Industrial zone which produces:

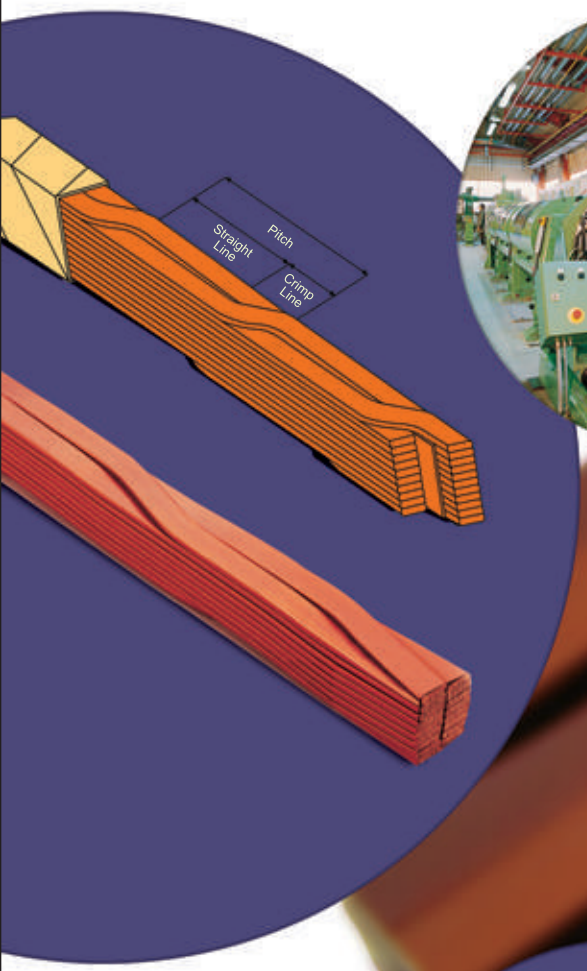
- OFF-CIRCUIT TAP CHANGERS
- DEHYDRATING BREATHERS
- MAGNETIC OIL LEVEL INDICATORS (Oil gauges)
- THERMOMETERS

SECTION ONE

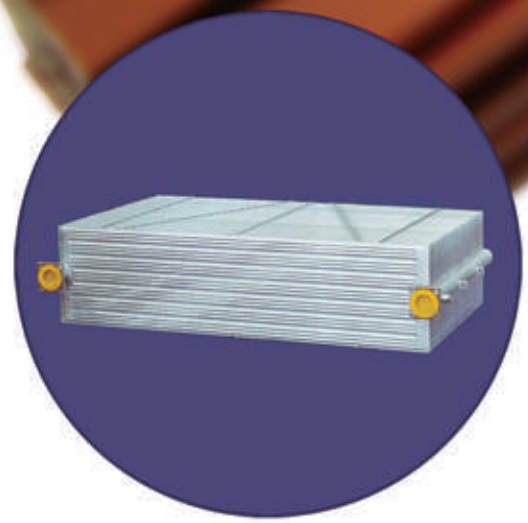
WIRE AND ACCESSORIES WORKSHOP

PRODUCES:

COUNTINUOUSLY TRANSPOSED CABLES



RADIATORS



COUNTINUOUSLY TRANSPOSED CABLES

Definition

Continuously transposed cables are an essential part for making high quality high-power transformers. Continuously transposed cables have been successfully employed for more than 40 years.
IRAN TRANSFO has the know-how and all necessary instruments for producing continuously transposed cables with up to 66 single conductors. The following technical information gives a general view about the standard used for production and possible diverse in construction of continuously transposed cables. It also gives an impression of the secured experience in the production of continuously transposed cables. In many cases the continuously transposed cables can be laid-out without check backs, immediately with the particulars from this pamphlet. Should any planned lay-out go beyond the limits given here, please contact us. We are certain that we can nearly always suggest an appropriate solution. The choice of single conductor dimensions should generally be made acc. to DIN 46451 part 1,so that a production without problems and easy workability of the continuously transposed cables is ensured. When choosing the dimensions,factors of special significance are:

- The number of single conductors
- The pitch in the continuously transposed cable
- The copper condition
- The suitable ratio of height/width
- What type of insulation has been utilized?

COPPER CONDITION OF THE SINGLE CONDUCTOR

The standard production is based on a copper conductor of E-Cu 58 F20 acc. to DIN 40500.
The tensile strength is for:

- Conductor thickness up to 1.50 mm Rp0.2≤130 N/mm²
- Conductor thickness over 1.50 mm Rp0.2≤100 N/mm²

Should transformer winding with higher strength be required then continuously transposed cable with strain hardened copper can be used.

SINGLE CONDUCTOR STANDARD PRODUCTION

Quantity: min. 5
max. 66
Dimension: min. 1.2 × 3.0
max. 2.5 × 12.0

INSULATED SINGLE CONDUCTORS

The considerable mechanical distortion and strain of the transposing and the subsequent winding and the pressing within the transformer winding, must leave the insulation of the single conductor undamaged. Occurance of short circuits between individual conductors are not favorable; under certain circumstances they diminish the efficiency. The best mechanical qualities have as yet enamel insulations based on polyvinyl acetate (PVA). Besides that, acetatenamelled single conductors show very favorable qualities in transformers as regards oil and hydrolysis resistance; the temperature index is 120°C (=248° Fahrenheit). On request we also deliver continuously transposed cables with single conductors that are insulated with heat resisting coating.
Increases through insulations: The standard single conductor has an insulation increase across thickness and width of 0.110 + 0.020 mm. The insulation increases are close to those through PVA coating.

PRODUCTION OF CONTINUOUSLY TRANSPOSED CABLES

The number of single conductors available at the present are:

- Uneven-numbered 5 to 65 conductors
- Even-numbered 6 to 66 conductors

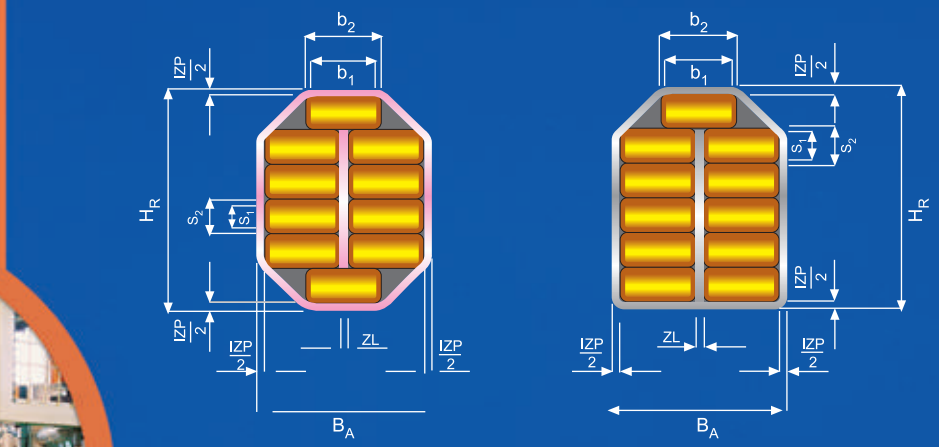
With the fixing of the number of single conductor, the dimensions of the single conductors and the required smallest winding diameter, the pitch Sr is also given. The pitch results from the winding circumference D × π (=length of lay-S) divide by the number of single conductors.

$$Sr = D * \pi / n$$

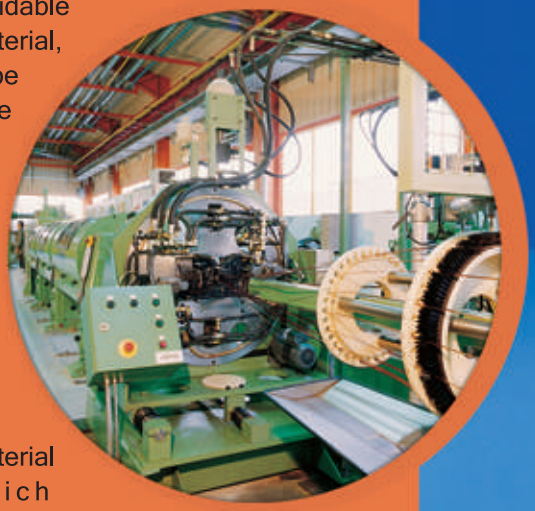
Where: D=core diameter of winding

EXTERNAL INSULATION

The transposed single conductors are normally with common exterior insulation but should the electric strength required by the customer imply it can be increased.
The user should define all parameters for the lay-out of the insulation ,and tune them with us if there are any special conditions.



As a regular practice, insulating papers are employed, but we can also use special kind insulation made of other braidable material, to be sure of



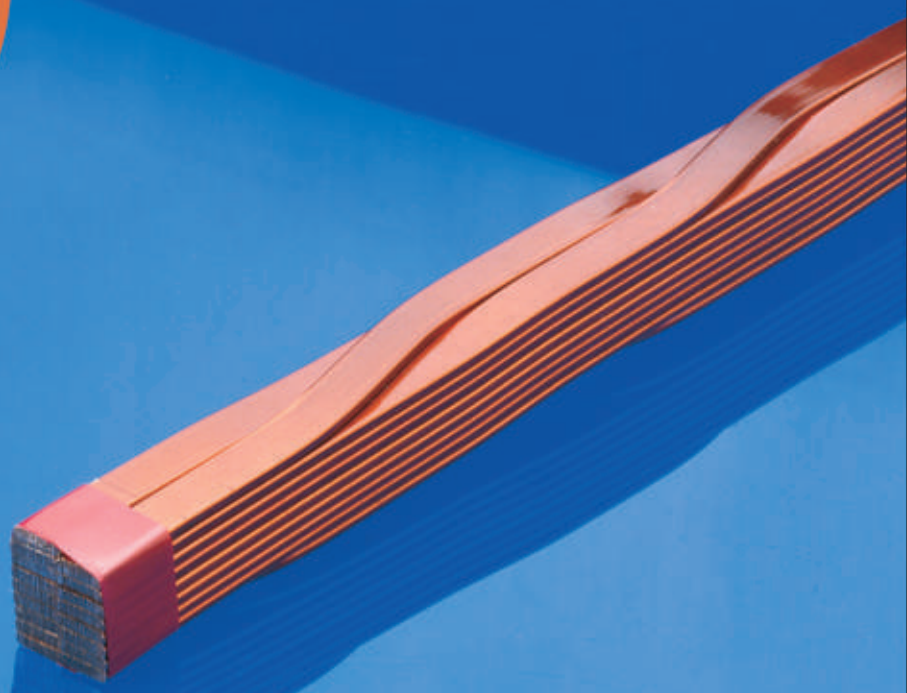
material which suits You. Please notify us in this respect.

STANDARD INSULATION

Thermally upgraded paper, consisting of sulphate cellulose according to DIN 6741 is used for all paper layers. All layers are buttlapped.Two cover layers are interleavedly wound.
Other types of paper wrapping are possible according to the order of our customers.

INTERCOLUMN SEPARATOR

To improve the axial pressure strength of the continuously transposed cables,an inter column separator is inserted between both stacks of conductors. This separator is made of transformer press-board and on the basis of DIN 7733/7734 with thickness either 0.10 mm or 0.20 mm as may be requested by the customer.Due to technical reasons, for continuous transposed cables with height less then 10 mm, there would be no need for inter column separator.



CALCULATION OF THE DIMENSIONS

The results ascertained through the calculating methods shown here are maximal dimensions that are usually remained under. If one takes them as basis for the winding space, it is sufficiently safe.

USED ABBREVIATIONS

B_A= Max. width of CTC (axial)
H_R= Max. height of CTC (radial)
IZP= Increase in paper-insulation
ZL= Thickness of inter column separator
b_1= Nominal thickness bare conductor
Δb_1=Tolerance nominal width bare conductor
s_1= Nominal thickness bare conductor
Δs_1= Tolerance nominal thickness bare conductor
IZL= Increase in film-coating
b_2= Max. width of insulated conductor
s_2= Max. thickness of insulated conductor
n= Number of conductors
S= Length of lay
S_R= Pitch (transposition distance)
D= Core diameter of winding

1- INSULATED SINGLE CONDUCTOR

Width: $b_2 = b_1 + \Delta b_1 + IZL\ max$

Thickness: $s_2 = s_1 + \Delta s_1 + IZL\ max$

2- INSULATED CONTINUOUSLY TRANSPOSED CABLES

Width (axial) $B_A = 2 \times b_2 + ZL + IZP$

Height (radial)

-uneven-numbered $H_R = \frac{n+1}{2} \times s_2 + IZP$

-even-numbered $H_R = \frac{n+2}{2} \times s_2 + IZP$

QUALITY CONTROL

Raw material

• Enameled rectangular wire

All specifications are controlled acc. to IEC 60317 and tests made acc. to IEC 60851. Iran Transfo laboratories has all necessary instruments to control mechanical, electrical, chemical qualities of enameled wires like proof stress, tensile test, hardness, breakdown voltage, resistance to refrigerant,...

• Insulation paper

We receive insulation papers from the first class companies like Weidmann, Ahlstrom, Monksio...and we also check some properties of paper like thickness, specific weight, ... in house.

During production

• The CTC machines are equiped with an instrument for finding short circuit between each two wires during transposition, if it finds a short circuit stops the machine and by CTC fault finder the operator detects that point, then repair the wires.

• When production of one reel is completed, by using above instrument, quality control team check existence of short circuit between each two layers, if there isn't a short circuit, then the related check list is completed and issue of QC OK report with green mark, is prepared.

Test certificate

A test certificate will be issued containing the following information:

• Dimensions of the copper conductor; specified value/actual value
• Increase value of the insulation; specified value/actual value
• Type of insulation
• Number of paper layers
• Dimensions of the insulated wire
• Yield point Rp 0.2.

PACKING

The transposed cable is delivered on a wooden reel, uniformly distributed and tightened.

RADIATORS

DEFINITION

Radiators are used for cooling of transformer oil.
Their cooling capacities are defined according to the number and dimensions of their radiating elements.
Radiators are manufactured in accordance with DIN 42559.
We don't use seem welding for radiator headers , that being the main advantage and specific feature of our radiators.
It cause a smooth surface without any leakage and extra works.

DIMENSIONS

- Length of elements 800 – 3500
- Width 520 mm
- No. of elements in each radiator 4-28
- Elements spacing 45 mm
- Flange or joint pipe. alternatively

MATERIALS FOR PRODUCTION OF

- SHELL

Cold rolled steel St 37-2 acc.to DIN 1541/1623 thickness 1.25 mm

- HEADER PIPE

Welded support roller pipe acc. to DIN 2394

- SEPARATING IRONS

Round steel St 37-2 acc.to DIN 1013, diameter 8 mm

- FLANGE

Flat steel 150×20, acc. to DIN 1017, St 37-2

SHELL PRODUCTION

DEGREASING STATION

Provided for cleaning and spraying radiator shells by means of heated stem in order to obtain degrease shells.The radiators are cleaned in a closed chamber.

DEGREASING STATION

PRODUCTION OF RADIATING ELEMENTS

SEMI-AUTOMATIC WELDING HEADS

SURFACE TREATEMENTS

PROTECTION AGAINST CORROSION

PRODUCTION OF RADIATOR ELEMENTS

SEMI-AUTOMATIC WELDING HEADS

This is a very special type by means of plasma welding machine,that causes a very smooth and clean sealed surface with no leakage and extra works.

WELDING MUNIPULATOR

To connect radiator elements with collector pipes and spacing bars.

RADIATOR LEAKAGE TEST

The welded radiators are tested under a pressure of approx. 2 bar.

SURFACE TREATEMENTS

Manual blast cleaning unit to prepare a good surface for painting.

PROTECTION AGAINST CORROSION

According to customer needs and environmental conditions following methods are used for protection against corrosion:

- Galvanizing

Hot dip galvanizing acc. to DIN 50976 or BS 729.

- Adhesive coat

Two pack paint on epoxy resin basis 35 micron

- Base coat

On alkyd resin basis 35 micron
Two pack paint on epoxy resin basis 35 micron

- Intermediate coat

On alkyd resin basis 35 micron
Two pack paint on epoxy resin basis 35 micron
Two pack paint on epoxy resin basis with mio 35 micron

- Top coat

On alkyd resin basis, shade as requested 35 micron
On alkyd resin basis with mio, shade as requested 35 micron
Two pack paint on epoxy resin basis, shade as requested 35 micron
Two pack paint on epoxy resin basis with mio, shade as requested 35 micron
Two pack paint on polyurethane basis, shade as requested 35 micron
Two pack paint on polyurethane basis with mio, shade as requested 35 micron

INTERNAL VARNISH

Celerol reaction primer

PACKING

All radiators packed on wooden pallets or boxes and fastened with steel strips.

QUALITY CONTROL

- All raw materials checked by IRAN TRANSFO laboratories.

In production line quality control team does following works:

- Visual tests
- Measure all necessary dimensions and welding thickness and control them with drawings and technical documents.
- Fill check lists for each order.
- N.D.T tests on finished surfaces like thickness, gloss and visual.
- D.T tests on sample surfaces like cross cut, scrap adhesion and hardness.

OTHER TESTS CAN BE DONE ACC. TO ORDER.

HOW TO ORDER

- Classification according to the types:

F ▸ Radiator with flanges
R ▸ Radiator without flanges
G ▸ Radiator with elements of the same lengths
Sl ▸ Radiator with the sloped elements on the left
Sr ▸ Radiator with the sloped elements on the right
Sb ▸ Radiator with the sloped elements on the both sides

- Dimensions:

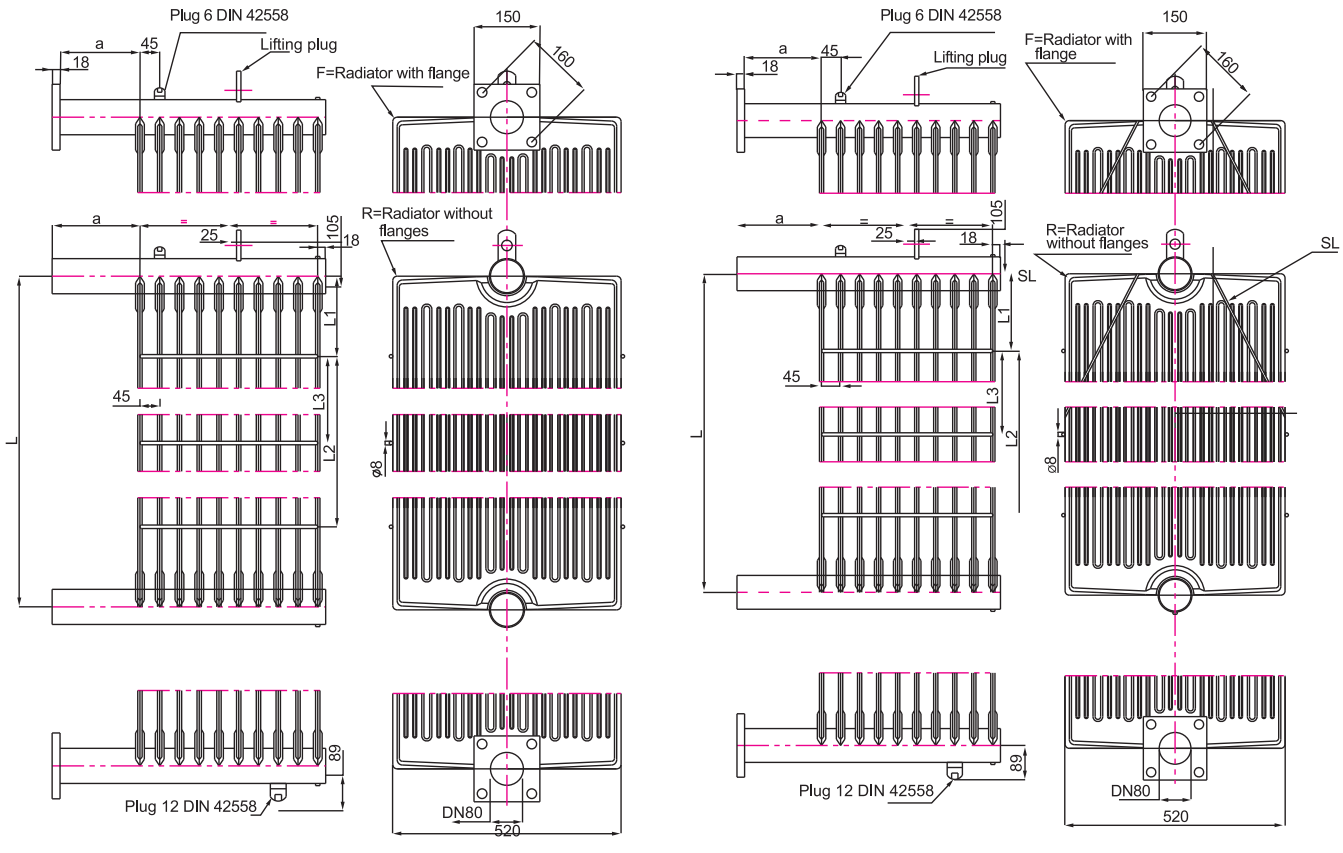
l ▸ Center distance
a ▸ Length of flanged socket

- Number of elements:

n ▸ Number of elements of the same length
n1 ▸ Number of sloped elements

- Protection against corrosion:

Hg ▸ Hot dip galvanizing
Ac ▸ Adhesive coating
Bc_A ▸ Base coating on alkyd resin basis



Bc_{EP} ▸Two pack base coating on epoxy resin basis
Ic_{A} ▸ Intermediate coating on alkyd resin basis
Ic_{AM} ▸Intermediate coating on alkyd resin basis with mio
Ic_{EP} ▸Two pack Intermediate coating on epoxy resin basis
$Ic_{EP/M}$ ▸Two pack Intermediate coating on epoxy resin basis with mio
Tc_{A} ▸Top coating on alkyd resin basis shade as requested
Tc_{AM} ▸Top coating on alkyd resin basis with mio shade as requested
Tc_{EP} ▸Two pack top coating on epoxy resin basis shade as requested
$Tc_{EP/M}$ ▸Two pack top coating on epoxy resin basis with mio shade as requested
Tc_{PU} ▸Top coating on polyurethane basis shade as requested
$Tc_{PU/M}$ ▸Top coating on polyurethane basis with mio, shade as requested
In ▸ Internal varnish

SAMPLE OF TYPES

FG ▸Radiator with flanges and elements of the same length
FGSb ▸Radiator with flanges and elements of the same length, sloped on both sides
RGSb ▸Radiator without flanges and elements of the same length, sloped on both sides

SAMPLE OF PURCHASE ORDER

Designation of a radiator with flanges and elements with the same length.

- Center distance L=2400 mm
- Length of flanged socket a=120 mm
- Number of elements n=10
- The protection against corrosion consists of:
- Hot dip galvanizing, adhesive coat, intermediate coat

On alkyd resin basis shade RAL 7033 and interior coat.

FG 2400×120×10-Hg-Ac-Ic_{A}-In

SECTION TWO

IRAN TRANSFO SUBSTATION DEVELOPMENT COMPANY

PRODUCES:
1- COMPACT SUBSTATIONS
2- MOBILE SUBSTATIONS
3- PACKAGE SUBSTATIONS
4- TRANSFORMERS EQUIPMENTS INCLUDING:

MAGNETIC OIL LEVEL INDICATORS

DEHYDRATING BREATHERS

THERMOMETERS

OFF CIRCUIT TAP CHANGERS

DEHYDRATING BREATHERS

Dehydrating breather is used to remove moisture from the air that enters the conservator. It helps the oil maintain its insulating properties.It is filled up with silicagel which can absorb moisture equivalent to 20% of its own weight . Dehydrating breathers should be checked to ensure that they are free from restriction and have not absorbed excessive moisture.When dry, the silicagel has a blue color and when it has become saturated with moisture the color changes to a pale pink.This indicates that, it is time to replace the silicagel with new one.

General specification

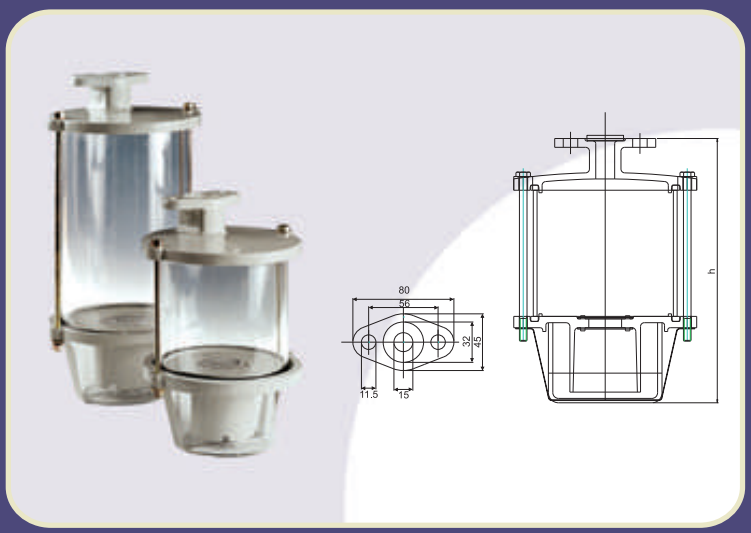
ITSD dehydrating breathers are produced according to DIN 42567.

•Material

-Top section •Casted aluminum
-Bottom section •Casted aluminum
-Standard painting •Electrostatic coating

Other painting method is possible acc. to order

-Container cylinder •Polycarbonate
-Oil bowl •Polycarbonate
-Oil bowl holder •St37
-Bolts,Nuts,Washers •Galvanized steel
-Rubber gaskets



TYPES

Product code	Silicagel capacity(Kg)	Transformer oil capacity(Kg)	Capacity Max.(cm^3)	h (mm)	Range of application	Conservator Pipe dia(mm)
TA18209	O.5	1800	900	209	UP TO 630 KVA	15
TA18289	1.0	3600	1600	289	800 TO 2000 KVA	15

MAGNETIC OIL LEVEL INDICATOR S

DEFINITION

Magnetic oil level indicator is used particularly to indicate oil level in transformers.
They are used in transformers with capacity less than 2000 KVA for the purpose of monitoring. All parts of indicators have no contact with oil.
The oil level indicator do not allow oil leakage in temperature of 110°C and 0.5 bar effective pressure and vacuum.

General specification

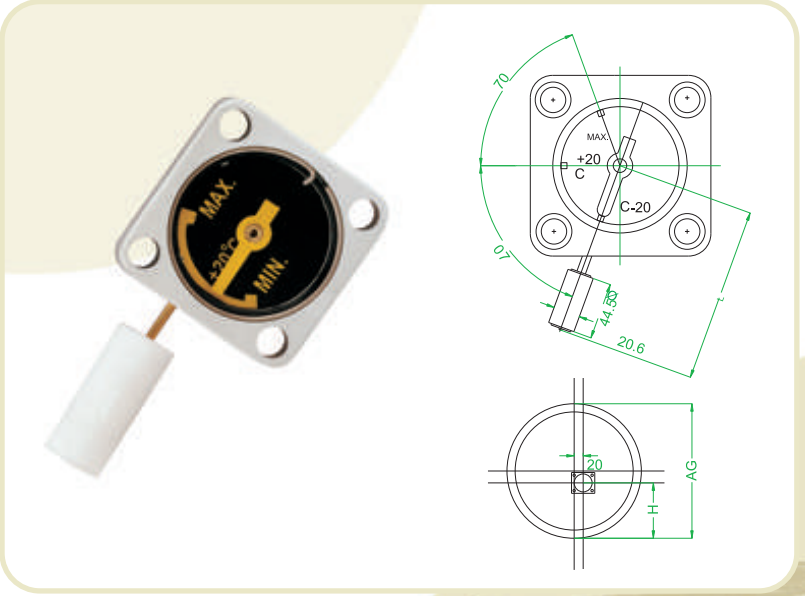
ITSD oil level indicators are produced according to DIN 42269.

•Material

- Case • Casted aluminum
- Case paint • Electrostatic (shaded acc. to order)
- Indicator dial • Aluminum
- Pointer • Brass paint indicator dial yellow and black indicated
- Pointer shade • Yellow or red
- Indicator glass • Polycarbonate
- Float • Nitrofil

TYPES

Order No.	Ø AG	L	H
TAL 160	160	68	75
TAL 200	200	80	88
TAL 250	250	102	107
TAL 315	315	124	130
TAL 400	400	156	160
TAL 500	500	195	200



THERMOMETERS

DEFINITION

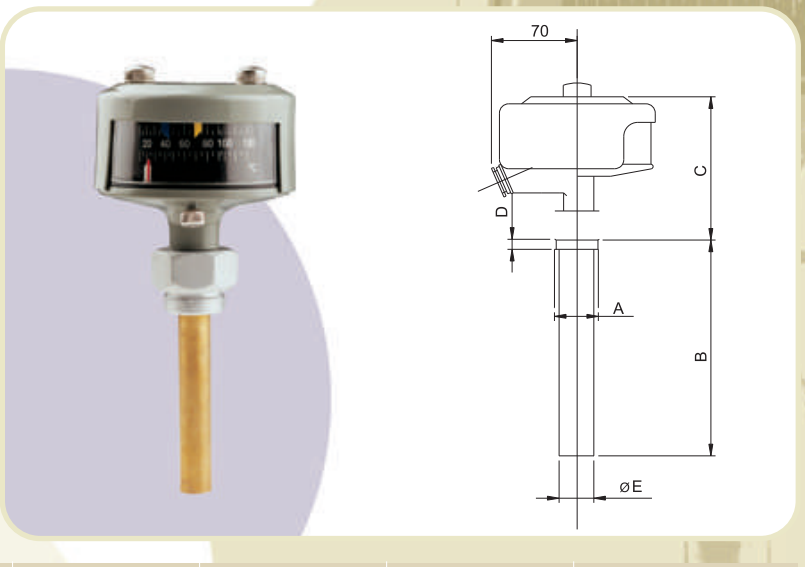
ITSD thermometers are used for indicating oil temperature in hermetic and expansion conservator type transformers.
They are equipped with two electric switches and a maximum indicating pointer.
The thermometers operate efficiently under very hot and cold weather conditions.

GENERAL SPECIFICATION

- Ambient temperature: -40°C to 80°C
- Pressure: -50 Kpa to 200 Kpa
- Insulation test: 2000 V 50 Hz to earth: 60 s
- Protection class: IP 54

MATERIAL

- Case: casted aluminum
- Paint: electrostatic powder coating
- Window: polycarbonate
- Thermowell: stainless steel
- Oring: nitrile



TYPES

Type	A	B	C	D	E	Contact
TA1015	R½	104	117	12	15	2
TA1517	R¾	106	117	12	17	2
TA2017	R1	106	117	12	17	2

OFF CIRCUIT TAP CHANGERS

DEFINITION

ITSD off circuit tap changer is a device fitted to transformers with capacity less than 1000 KVA for regulation of the output voltages to required levels.

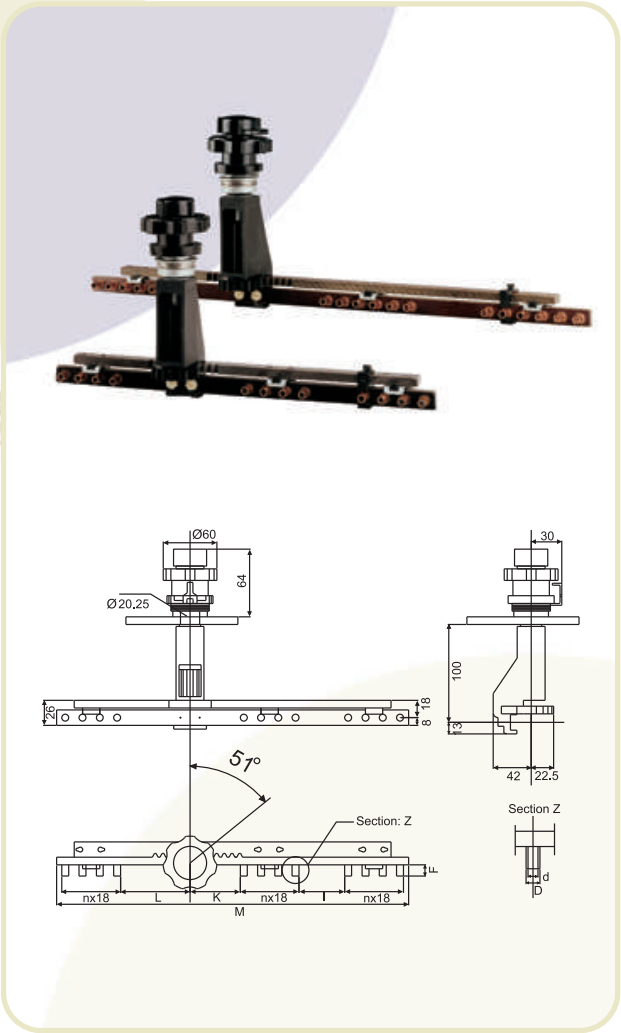
GENERAL SPECIFICATION

ITSD tap changers are produced according to IEC76 in three types: 3, 5, 7 taps

QUALITY CONTROL

These tests are carried out on our tap changers:

- Contact temperature rise test
- Mechanical life-time test
- Lightning impulse test
- Power frequency voltage test
- Temperature rise test
- Manual operation test



MATERIAL

- Shaft of the shafted pinion are made of galvanized FREE CUTTING STEEL.
- All other steel parts is made of galvanized steel.
- Lower part of the bearing, shaft pinion, control knob, lock nut head and body are made of polyamid
- Positioning ring and protective cover are made from aluminum.
- Fixed contacts are made from copper E-CU F25.
- Insulation parts are made of paper phenol-plastic resin based laminates.

TYPES

No	System Voltage (kv)	I(A)	Code No.	Number of position	D	d	F	H	I	K	L	M	n×18
1	36	30	TA55550	5	5	3.1	12	5	80	90	90	550	5×18=90
2	36	63	TA57550	5	7	5.1	12	5	80	90	90	550	5×18=90
3	24	63	TA37367	3	7	5.1	11.5	5.5	55	65	65	367	3×18=54
4	24	63	TA57455	5	7	5.1	11.5	5.5	55	65	65	475	5×18=90
5	24	63	TA77563	7	7	5.1	11.5	5.5	55	65	65	563	7×18=126

HIGH QUALITY
IS OUR POLICY

WE EARN CUSTOMER SATISFACTION

We look forward to serving the purchasers, nationwide and beyond, constantly through or dedication to quality, firm belief in advancement and our solemn pledge to manufacture the state-of-the art products.
Thus
we always endeavor to stay ahead and explore the best.

IRAN TRANSFO CORPORATION

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