

# 1 TECHNICAL INFORMATION

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Datum Date VIII 2005.	Izradio Designed ing. Taslak	Odobrio Approved mr. Piliš	Priloženo Revision
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2003-05

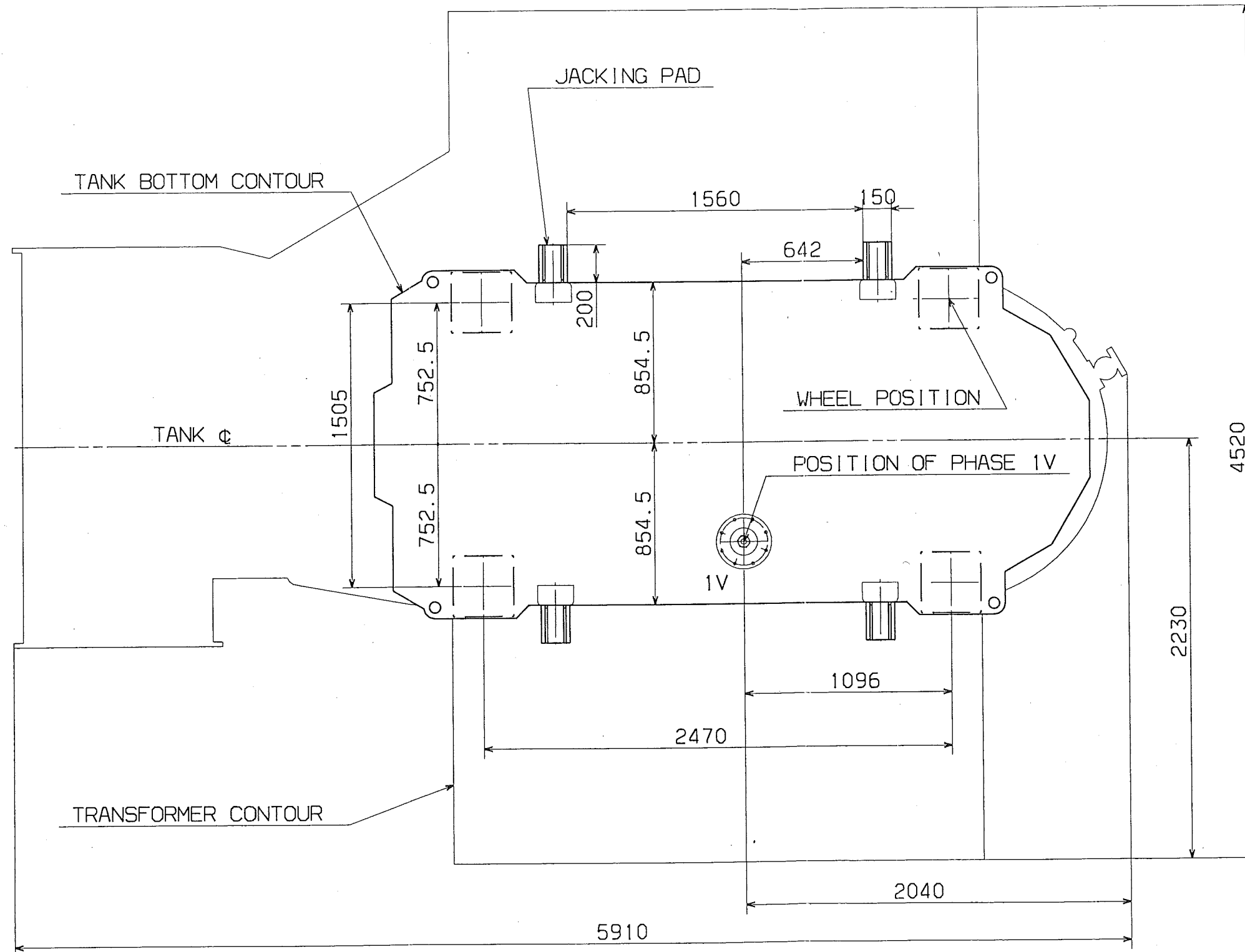


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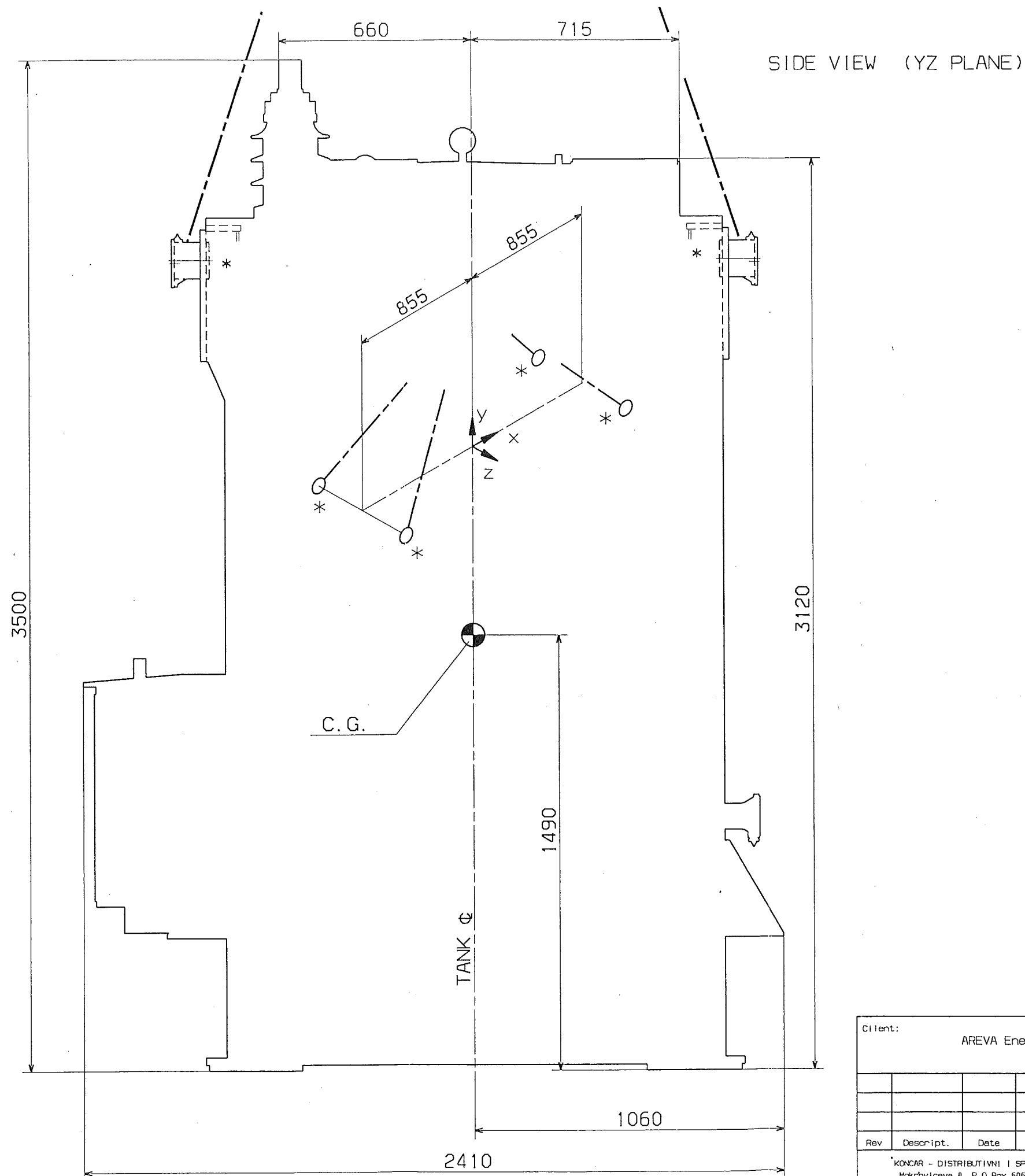
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# TOP VIEW



TOTAL LOAD ON FOUNDATION: 600 kN  
LOAD PER WHEEL: 150 kN

Client:				AREVA Energietechnik GmbH Germany			Project:			Power transformer 40/50 MVA, 110±2x2.5%/6.3 kV, ONAN/ONAF US Steel Kosice Extension 110 kV S/S		
				Designed		Checked		Approved		FOUNDATION DRAWING		
				S. Vojtich		G. Tesjak		M. J. Jos				
Rev				Date		Date		Date		TBP50000-123/A		
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				Scale: 1/25		Sheet: .		Sheets:		Rev		



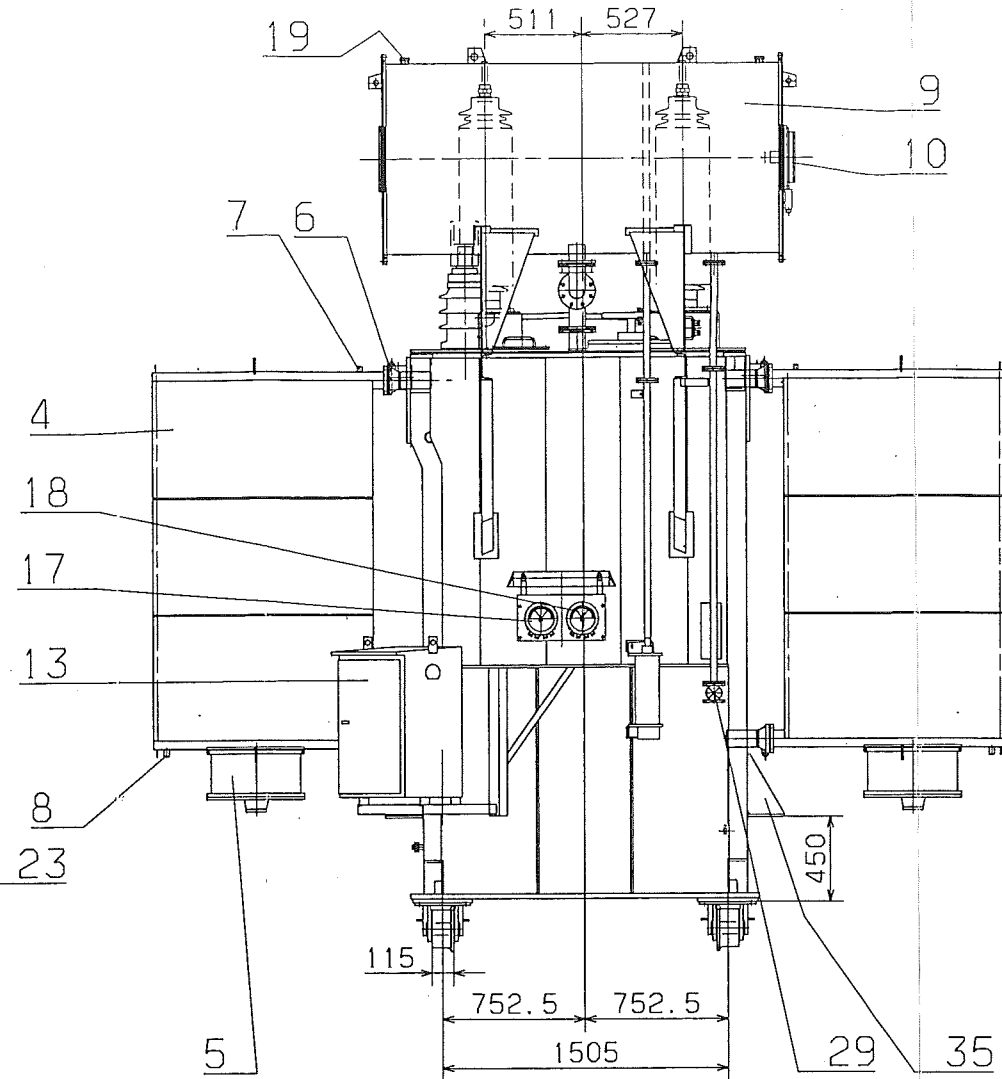
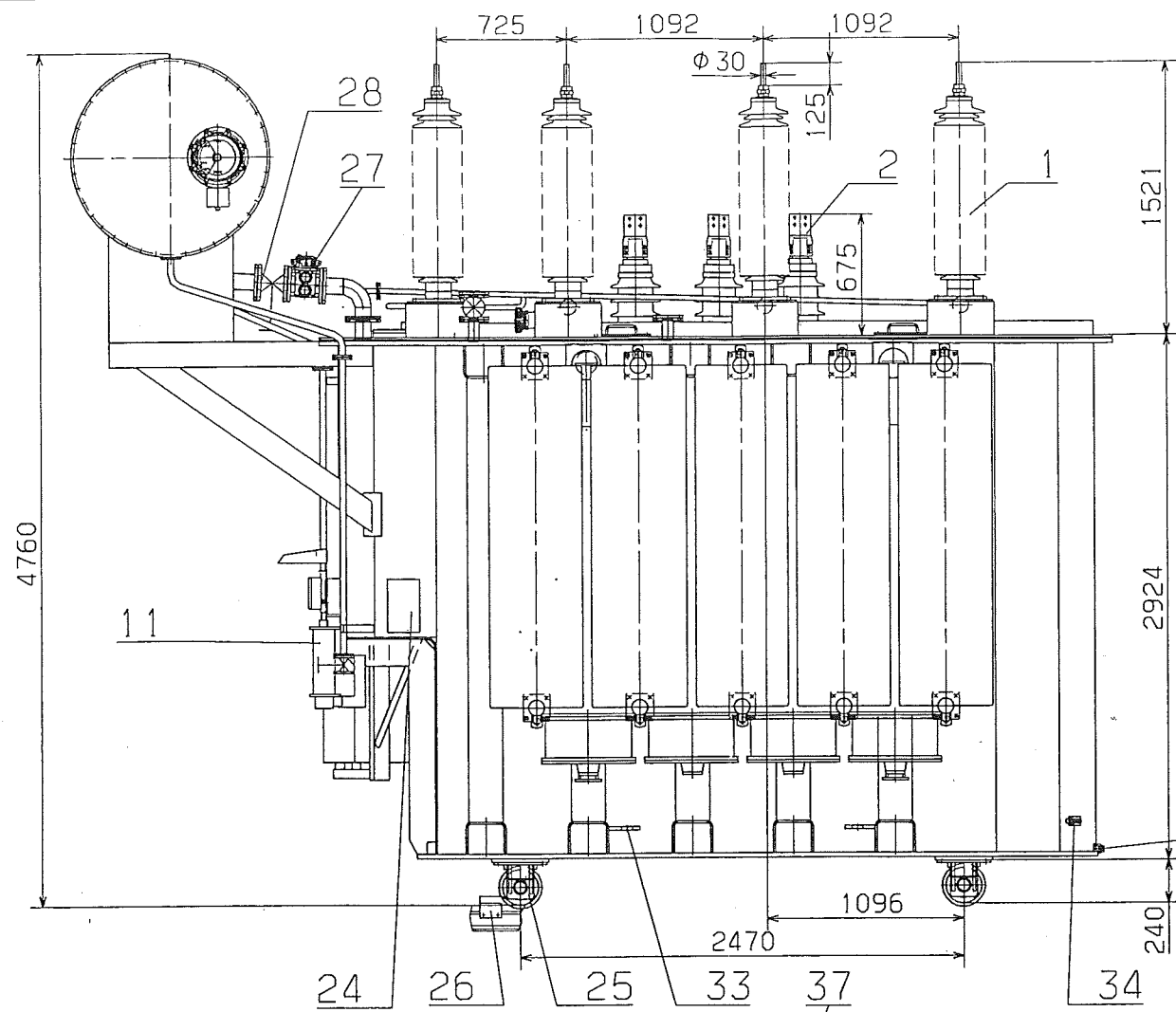
TRANSPORT MASS: 52000 kg  
TRANSPORT LENGTH: 5710 mm

\*- LIFTING PROVISION  
C.G. - CENTRE OF GRAVITY

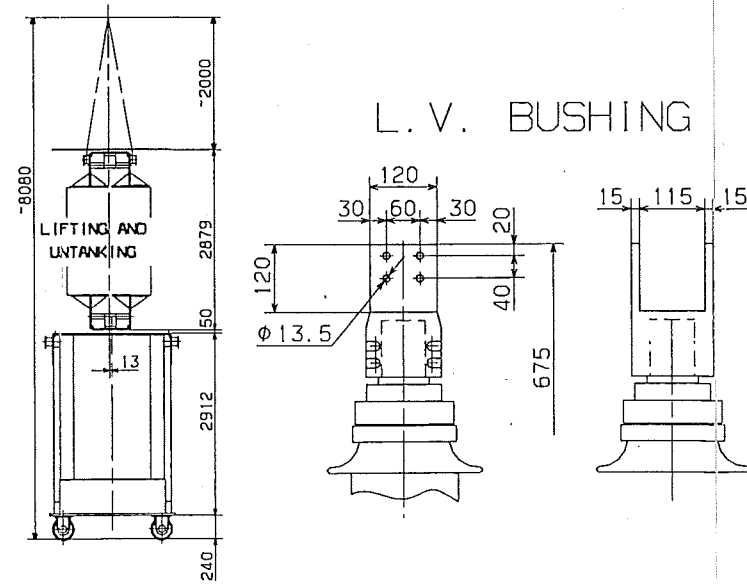
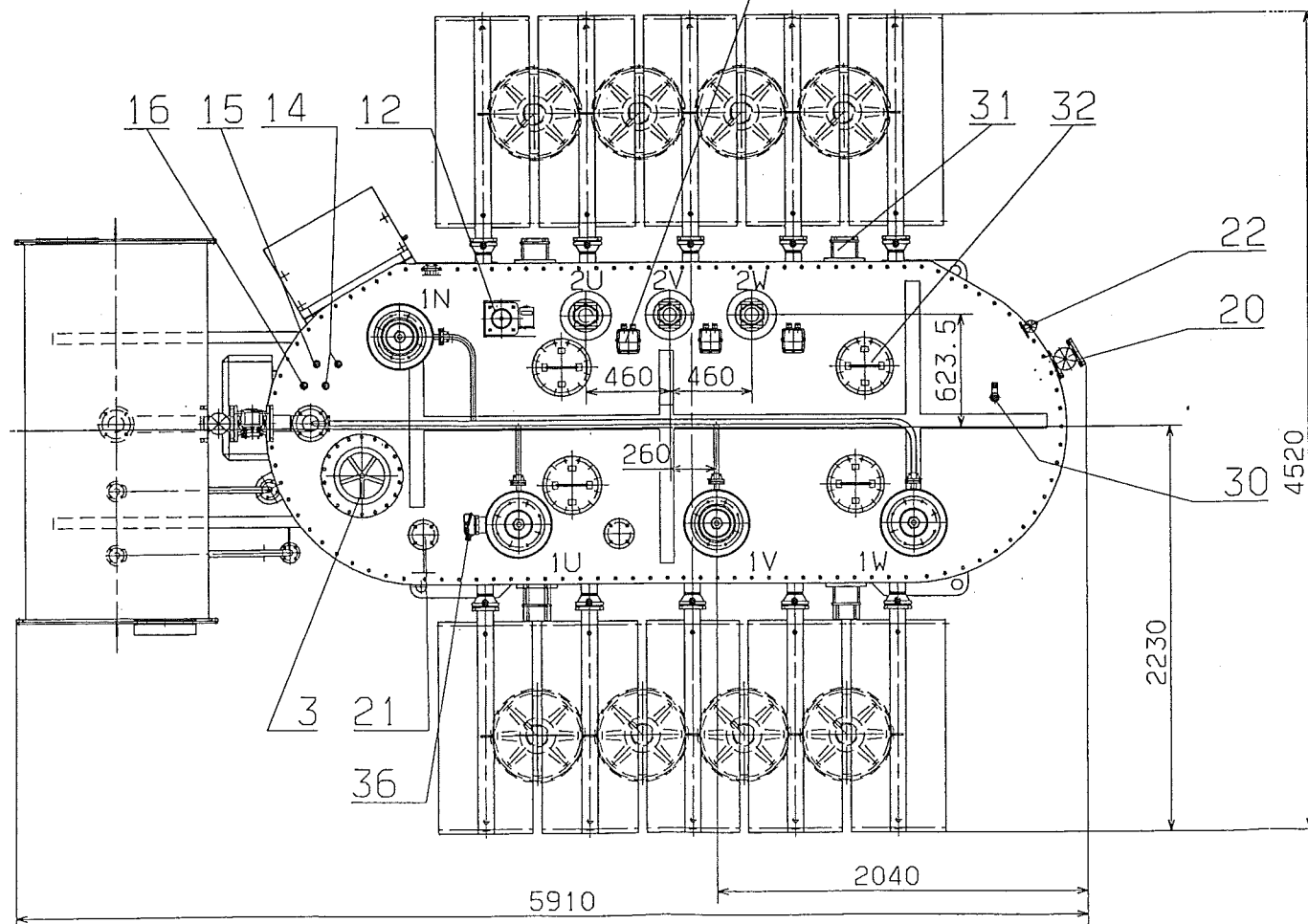
OUTLINE DRAWING No. 348670

Client:				Project:			
AREVA Energietechnik GmbH Germany				Power transformer 40/50 MVA, 110±2x2.5%/6.3 kV, ONAN/ONAF US Steel Kosice Extension 110 kV S/S			
				Designed	Checked	Approved	TRANSPORT DRAWING
				S. Vojtíc	G. Tasler	M. Blazek	
				<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	
Rev	Descript.	Date	Sign.	Date:	2005-04-08		TBP50000-123/A
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Končar d.o.o. Zagreb  
Kopiranje bez odobrenja ni je dozvoljeno  
Čuvanje bez odobrenja ni je dozvoljeno



- 1- H.V. BUSHING
- 2- L.V. BUSHING
- 3- OFF-CIRCUIT TAP CHANGER DRIVE
- 4- COOLING RADIATOR
- 5- COOLING FAN
- 6- SHUT-OFF VALVE FOR COOLING RADIATOR
- 7- COOLING RADIATOR DEAERATION PLUG
- 8- COOLING RADIATOR DRAIN PLUG
- 9- OIL CONSERVATOR
- 10- OIL LEVEL INDICATOR
- 11- SILICAGEL BREATHER
- 12- PRESSURE RELIEF DEVICE
- 13- COOLING AND SIGNALS CABINET
- 14- THERMOMETER POCKET (SPARE)- 1"
- 15- BULB FOR OIL TEMPERATURE INDICATOR
- 16- BULB FOR WINDING TEMPERATURE INDICATOR
- 17- OIL TEMPERATURE INDICATOR
- 18- WINDING TEMPERATURE INDICATOR
- 19- CONSERVATOR FILLING PLUG
- 20- LOWER FILTER/DRAIN VALVE- 50mm
- 21- UPPER FILTER VALVE- 50 mm
- 22- OIL SAMPLING VALVE- 15 mm
- 23- DRAIN PLUG- 1"
- 24- RATING PLATE
- 25- WHEEL Ø200 mm
- 26- BRAKE DEVICE
- 27- GAS & OIL ACTUATED RELAY
- 28- MAIN PIPEWORK VALVE- 80 mm
- 29- OIL DRAIN VALVE FOR CONSERVATOR- 25 mm
- 30- CORE EARTHING
- 31- TRANSFORMER LIFTING PROVISION
- 32- HANDHOLE FOR ACTIVE PART LIFTING
- 33- PULLING EYES
- 34- MAIN EARTHING TERMINAL (2 PCS.)
- 35- JACKING PAD
- 36- C.T.1 TERMINAL BOX
- 37- C.T.2 TERMINAL BOX



FOR TRANSPORT DISMOUNT:

- 1- COOLING RADIATORS WITH FANS
- 2- OIL CONSERVATOR WITH ADDITIONAL PARTS
- 3- H.V. BUSHINGS
- 4- L.V. BUSHINGS' FLAGS
- 5- WHEELS

TOTAL MASS: 60000 kg  
TRANSPORT MASS: 52000 kg  
UNTANKING MASS: 32500 kg  
MASS OF OIL: 12000 kg

TRANSPORT DRAWING No. 348671

Client: AREVA Energietechnik GmbH Germany				Project: Power transformer 40/50 MVA, 110±2x2.5%/6.3 kV, ONAN/ONAF US Steel Kosice Extension 110 kV S/S		
				Designed S. Vojtic	Checked G. Taslak	Approved M. B. Jos
A	HV bushings position	05-04-27	Vojtic	Wfz	Taslak	B
Rev	Descript.	Date	Sign.	Date: 2005-04-08		
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Scale: 1/40				Sheet:.		Sheets: A

Type: Three phase two windings oil immersed power transformer with off load tap-changer

Type designation: TBP 50000-123/A

Installation: Outdoor

Filling medium: Mineral transformer oil "Shell" Diala DX

Standard: IEC 60076

Rated power: 40/50 MVA

Type of cooling: ONAN/ONAF

Rated voltages:  $110 \pm 2 \times 2.5\%$  / 6,3 kV

Insulation level: LI550 AC230 / LI60 AC20 kV  
HV LV

Rated frequency: 50 Hz

Connection: YNd1

Temperature rises:  
average winding 65 K  
top oil 60 K

Ambient temperature: max. +40 °C;

No-load losses: 23,0 kW +IEC tol.

Load losses at 75°C  
and 40MVA: 154 kW +IEC tol.

Minimum short-circuit impedance at nominal  
Voltage and 40MVA: 10,7 %

HV condenser bushings:  
-manufacturer: "ABB"  
-type: GOB 550/800 acc. to IEC 60137  
-outer terminal: LF 170002-A

LV porcelain bushings:  
-type: 20NF5000 acc. to DIN 42541-83

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Off load tap-changer:

-manufacturer: "MR"  
-type: U III 300 -123 -0605 0ME  
-rated current: 300A  
-no. of positions: 5

Motor drive mechanism:

-manufacturer: "MR"  
-type: by handwheel

Transformer equipment:

-Buchholz relay:

-manufacturer: "EMB"  
-type: BF80/10; 09-26-211

-Oil temperature indicator:

-manufacturer: "MESSKO"  
-type: MT - ST160SK

-Winding temperature indicator:

-manufacturer: "MESSKO"  
-type: MT - ST160W

-Oil level indicator for main tank:

-manufacturer: "COMEM"  
-type: LA34 YON (two minimum contact)

-Pressure relief device:

-manufacturer: "ETI"  
-type: VS 100 NK

-Cooling fans:

-manufacturer: "SCHORMANN"  
-type: SK-470-6  
-supply voltage: 400/230 V

-Silicagel breather:

-manufacturer: "RUNEHAMP"  
-type: 4130-4

-Current transformer:

-manufacturer: "KONČAR"  
-type: CT 225  
225/2 A; 10VA; c1.3; Fs5 (for WTI)

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V 2005	ing. Taslak	mr. Biloš	Rev. A



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-type: CT 4000  
4000/1 A; 20VA; 5P20 (each LV bushings)

- Shut-off valve in the pipework conservator-main tank (1 pc.)
- Drain/filling valve, conservator main tank (1 pc.)
- Oil sampling valve tank bottom (1 pc.)
- Filter valve, tank cover (1 pc.)
- Filter/drain valve, tank bottom (1 pc.)
- Earthing terminals (2 pcs. bottom)
- Thermometer pockets (4 pcs.)
- Lifting lugs for complete transformer (4 pcs.)
- Lifting facility for active part (4 pcs.)
- Pulling lugs (4 pcs.)
- Jacking pads (4 pcs.)
- Bi-directional rollers

Masses:

total: 60000 kg  
oil: 12000 kg  
active part: 32500 kg  
transport: 52000 kg

Dimensions:

overall length: 5910 mm  
overall width: 4520 mm  
overall height: 4760 mm

Colour of final paint:

RAL 7032

Promjena Revisior	Rev. A
Odobrio Approved	mr. Biloš
Izradio Designed	ing. Tasiak
Datum Date	V 2005



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Transformer is manufactured in accordance with the following documents:

Contract No: ..... 31054

DRAWINGS FOR APPROVAL ..... from IV.2005

IEC standard

### 1.1 GENERAL

Transformer is designed for continuous operation under rated load without exceeding temperature rise of 60 K top oil (measured by thermometer).

Transformer cooling method is ONAN / ONAF.

For voltage adjustment, tapings are provided on HV side. Off-load tap changer with hand wheel provide voltage variation  $110 \pm 2 \times 2,5\%/6.3$  kV.

### 1.2 CORES:

Transformer core is three-limb type made from cold rolled grain oriented electrical steel sheets of low specific losses and nominal thickness 0,27mm.

The steel sheets are insulated on both sides with inorganic insulating material resistant to transformer oil and to temperature which can occur in transformer.

Complete cores are tightened by steel clamping boards which are insulated by pressboard towards the core.

### 1.3 WINDINGS:

Windings are made of paper insulated rectangular conductors of electrolytic copper.

The conductor insulation is made of high quality natron paper in several sheets.

Cooling channels in the windings are created by means of spacers made of transformer board.

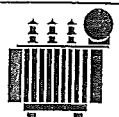
Before oil filling of the tank, vacuum drying process for the windings and insulation is applied.

### 1.4 WINDING CONNECTIONS:

Winding connections between phase windings and bushings and off-load tap changer are made of paper insulated copper cable conductor.

Connections are tightened by insulated frame in several points to prevent movement.

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VIII. 2005	ing. Taslak <i>Taslak</i>	mr. Šiloš <i>Šiloš</i>	



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## 1.5 TRANSFORMER TANK:

Transformer tank is made of steel plates and designed to withstand full vacuum in order to apply vacuum drying and oil filling process.

The tank is equipped with lifting devices, four attaching plates for jacks and pulling eyes for all four directions.

Transformer base is wheel type.

During the transformer moving by means of pulling eyes it is recommended to disconnect oil conservator and cooling radiators with fans.

On the transformer sides cooling radiators are attached. Each radiator is provided with flanged inlet and outlet (shut-off valves, butterfly type) for its connection to the main tank and also with a drain plug and air release plug.

On the upper tank flange there is the tank cover tightened with bolts and sealed by oil resistant gasket.

On the tank cover are placed:

Thermometer pockets, upper filter valve, vacuum pump connection, tap changer head,

Pressure relief device, current transformers terminal boxes.

HV phase bushings and neutral bushing and LV phase.

Oil conservator enables that tank shall be completely full with oil, as well as oil extension due to temperature changes. It is by pipe work and Buchholz relay connected to the transformer tank. There are drain valve, silicagel breather and oil level indicator with 2 contacts on minimum.

On the side of tap changer Signals cabinet is attached. All signaling cables are connected to the Signals cabinet by approved type of installation cables.

Oil temperature and winding temperature indicator is placed on the side of transformer tank and connected with cables to the Signals cabinet.

## 1.6 TRANSFORMER OIL:

Transformer oil serves as insulating and cooling agent, and its characteristics complies with IEC Recommendation 60296. During operation oil insulating characteristics should be checked.

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## 1.7 PROTECTION DEVICES:

Protection devices serve for protection against defects inside the transformer caused by gas production or overheating of oil and windings. This could be caused by damage on the insulation, short-circuit between turns or ground, overload and other.

Buchholz (gas) relay react upon appearance of gas and increased oil circulation due to defect in transformer. Gas relay is located in pipe work between conservator and main tank.

Oil temperature indicator indicates top oil temperature. Thermometer bulb is located in the thermometer pocket. Thermometer pocket should be filled with oil up to the height 30 mm from the upper edge. Oil temperature indicator is equipped with four adjustable contacts, two for alarm and two for trip.

Winding temperature indicator indicates a hottest spot temperature of the winding. It comprises thermometer bulb which indicates top oil temperature and bushing type current transformer with heating element which simulates transformer winding.. It is equipped with four adjustable contacts, two for alarm and two for trip.

Pressure relief device serves to prevent excessive pressure in the transformer tank.

Oil level indicators indicate oil level in transformer conservator. They are equipped with two contacts for minimum level of oil in conservator.

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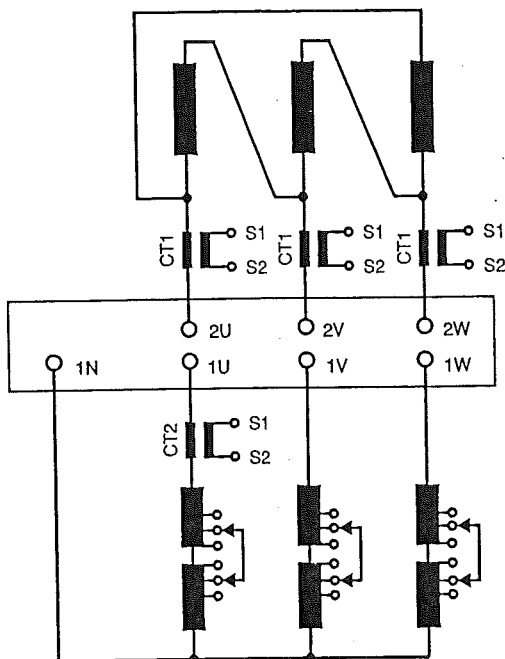


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# TRANSFORMER WITH OFF-CIRCUIT TAPPING

Type	TBP 50000-123/A		No.	CT1283-		Year of Manufact.	2005	
Rated Freq.	50 Hz		Number of Phases	3		Standard	IEC 60076	
	LI550 AC230 / LI60 AC20		Vector Group Symbol	YNd1				
Rated Power	50000 kVA		Type of Cooling	ONAN/ONAF				
	H.V.	L.V.	H.V.	L.V.	Imp. Voltage (40MVA)	%		
1	115500	6300 V	249.9	4582.1	Transp. mass	52 t		
2	112750		256.0		Untanking Mass	32.5 t		
3	110000		262.4		Mass of Oil	12 t		
4	107250		269.2		Total Mass	60 t		
5	104500		276.2					
ONAN Cooling up to 40 MVA								



Current transformers:  
CT1: 4000/1A; 20VA; 5P20  
CT2: 225/2A; 10VA cl.3; Fs5

MADE IN CROATIA

MATERIAL: ALUMINIUM 2mm

Client <b>AREVA Energietechnik GmbH Germany</b>				Project <b>US Steel Košice Extension 110kV S/S</b>			
Designed <i>ing. Taslak</i>				Approved <i>mr. Biloš</i>			
Date 2005.05.13.				Date 2005.04.11.			
Rev. A				Title <b>RATING PLATE</b>			
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