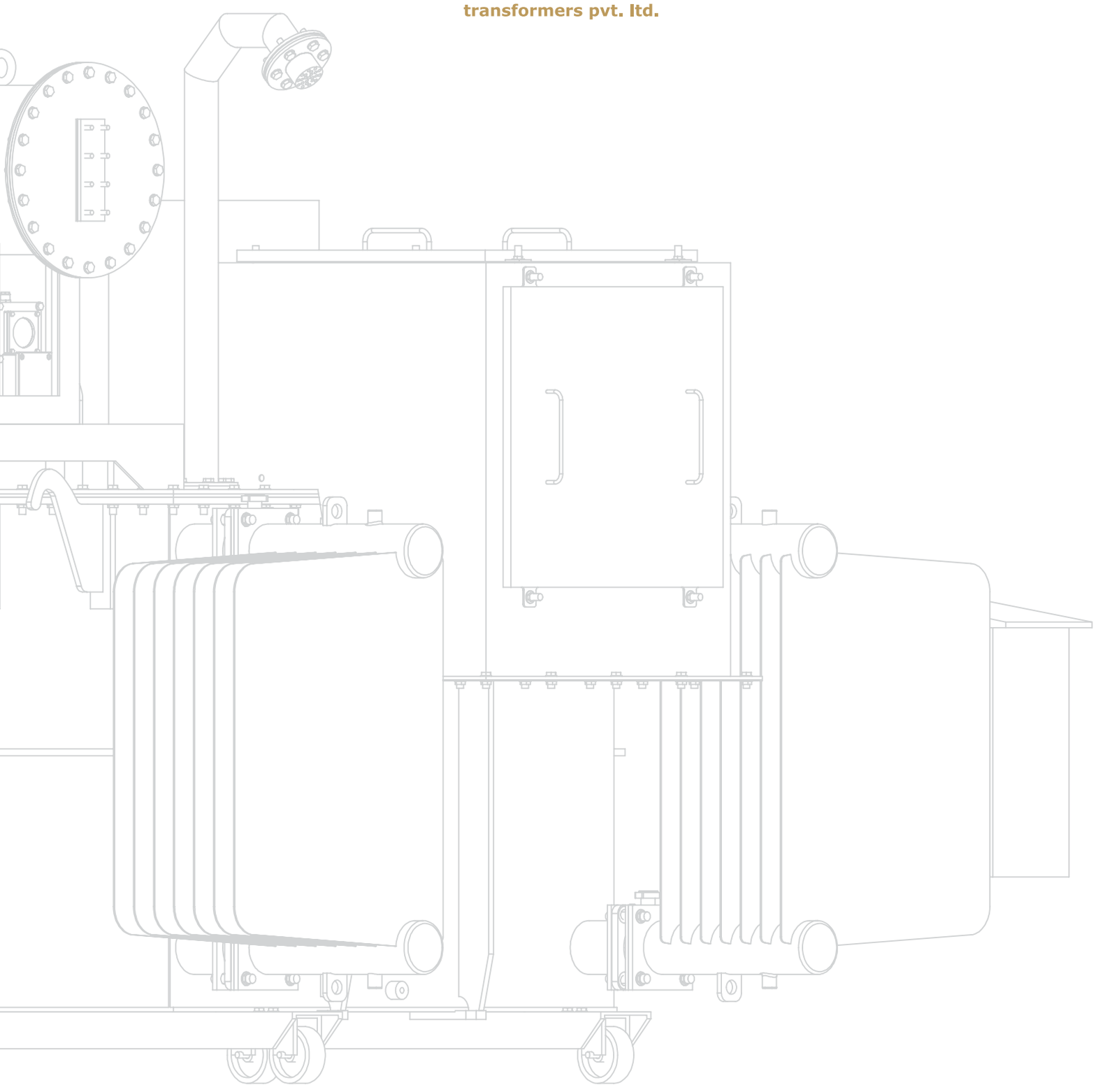
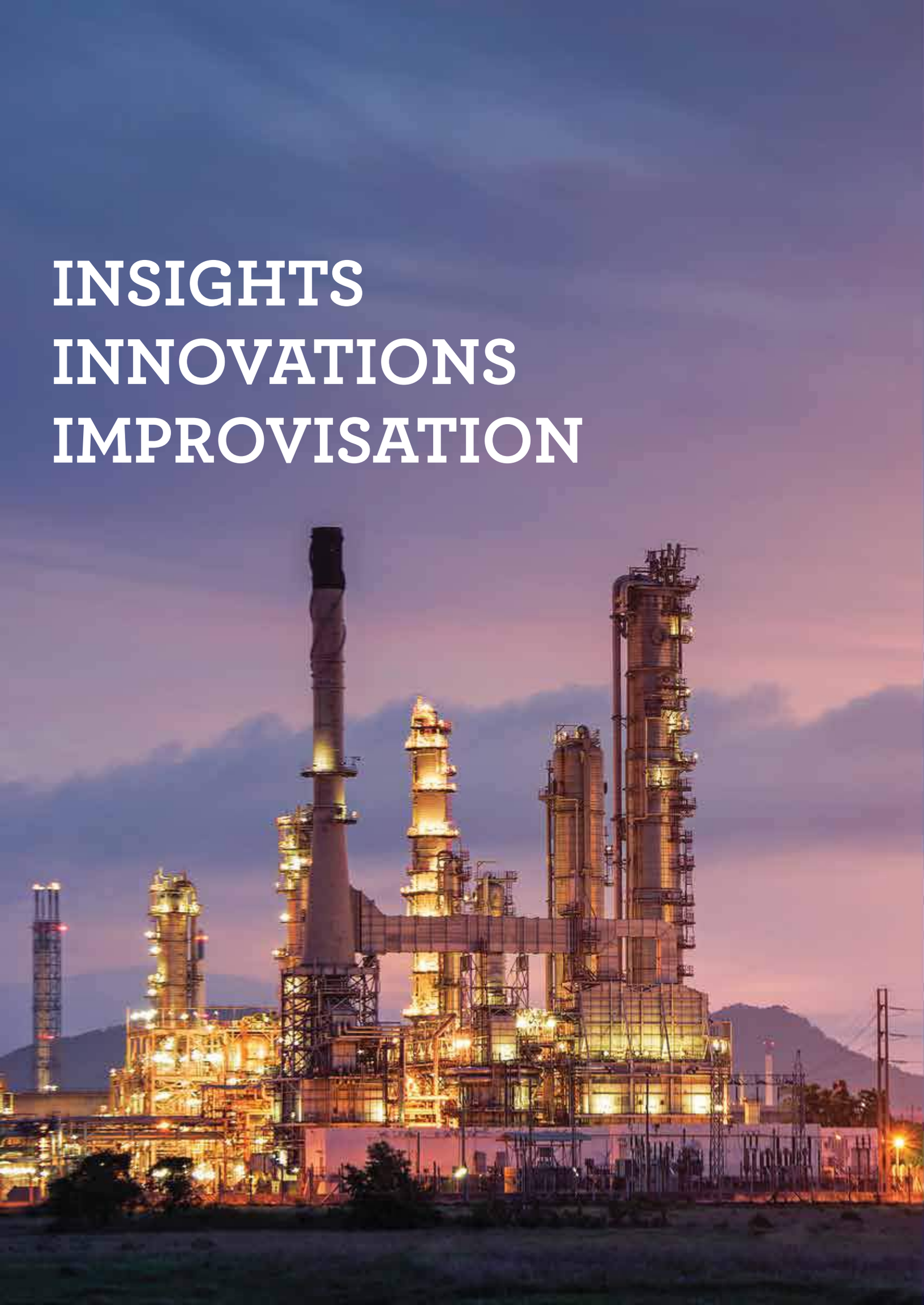
SYNERGY
transformers pvt. ltd.



# “SAVE ENERGY IT IS PRECIOUS”

# INSIGHTS
# INNOVATIONS
# IMPROVISATION



SYNERGY
transformers pvt. ltd.

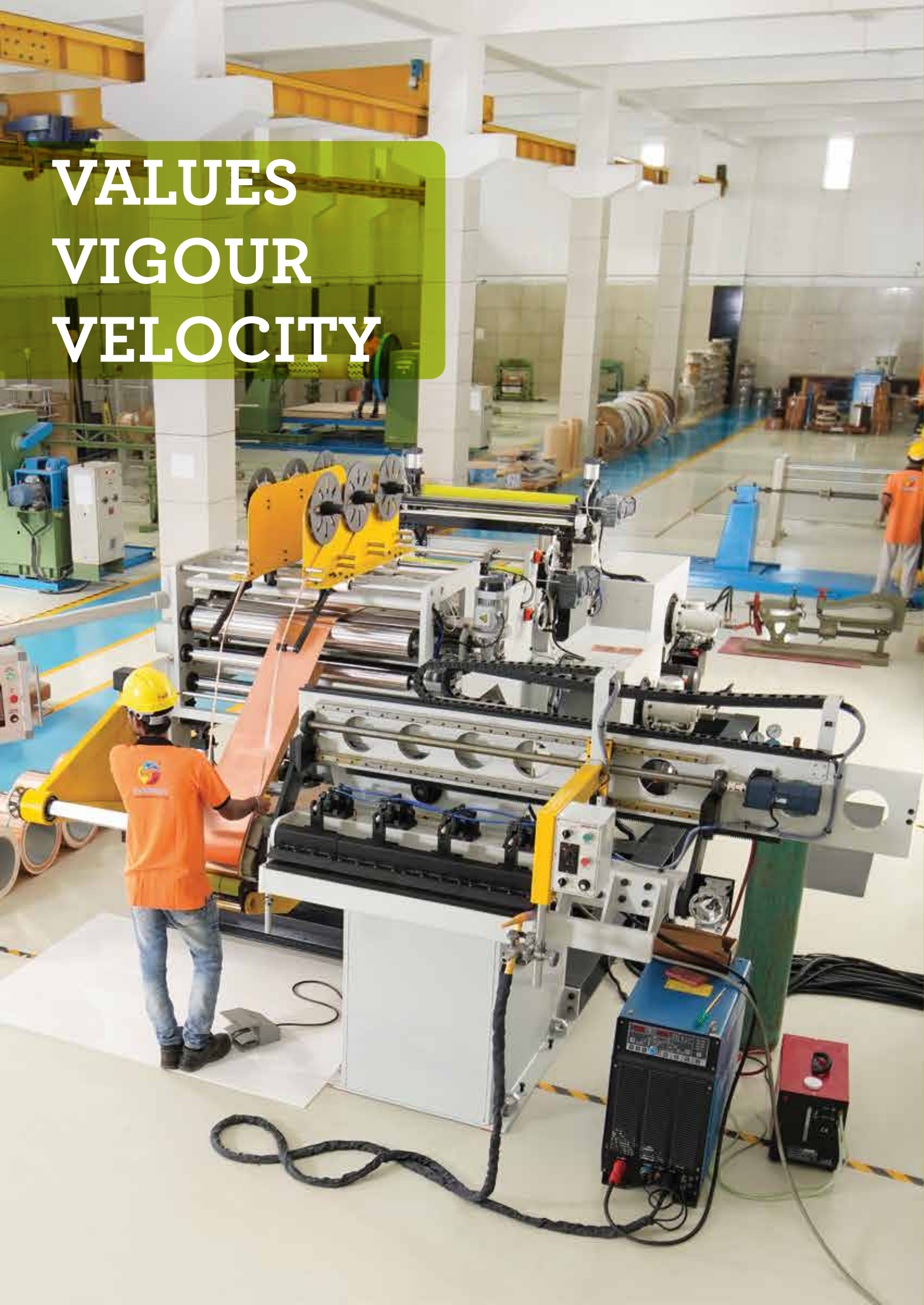

Our motto of "Value with Quality" has made Synergy grow as one of the largest, fastest and most trusted manufacturer of transformers with an ISO 9001:2015 certification.

# ENLIGHTENING PROGRESS

Every business survives for the betterment of society as well as not to it's unwell bringing. Keeping the ethics in our principles we are dedicated to protecting the environment into every way which is mandatory by the government Laws that may add to society's welfare.

We won't do any harm to society. We may group pollution control standards as well as treat people associated with us in the Law steadfast manner.

As India's most important transformer manufacture companies, as well as one which is apprehended in the high value even by the competitors, an enormous deal of significance is attached for living our image like value-based association. We are a morally responsible company, work with transparency, authenticate sincerity and commitment, both horizontally and vertically across the organization as well as instill the spirit of reliability. We also endeavor and extend the values of our business contacts, be it dealers or valued customers.


VALUES
VIGOUR
VELOCITY

SYNERGY
transformers pvt. ltd.

Every work in the world and under the sun requires dedication. When dedication is deep from the heart and done full heartedly, the nature cannot deny development to the one. When a company steps towards progress with dedication, the Face of the Nation is bound to be held high.

# ENLIGHTENING FORESIGHT

## ABOUT US

We at Synergy Transfomers are a team of engineers with expertise in electrical field. We are engaged in the manufacturing of distribution transformers and special purpose transformers under the brand name "synergy". We firmly believe in quality and that too backed up by after sales services to their installations throughout INDIA

Synergy Transfomers was established in the year 2004.
The company is based at Pipaliya 24 kms. North of Rajkot, one of the fastest growing industrial zone of the country.
The city is well connected by air, rail and road.

We are manufacturing ISI approved onload distribution transformer starting from 200 KVA to 2500 KVA under BIS-1180(Jan 2016) and above 2500 KVA up-to 5000 KVA under IS-2026 of all voltage class and covering all level of efficiency and Power transformer ranges from 3 MVA to 50 MVA of 132 kV voltage class. We design and manufacture a complete range of transformers in our class.

We at synergy transfomers see that our customers get the best of the products and an excellent after sales service support.

## VISION

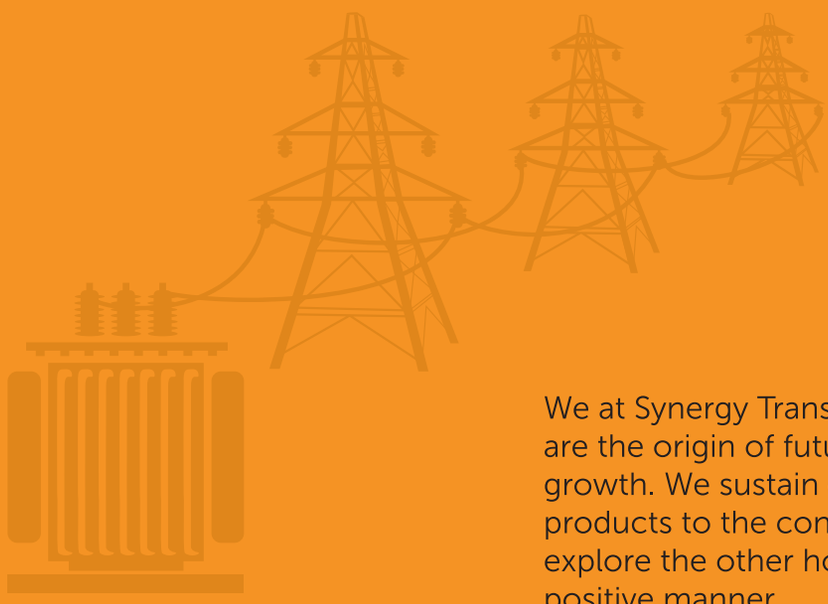
To be a leader in the Trasformer Industry by developing new product innovations that features with the best quality casting an International repute.

## MISSION

Synergy reflects its mission of delivering the best quality of Transformers, which justify the "Value for Money" for its customers.


ADHERENCE
ASSURANCE
ACHIEVEMENT

SYNERGY
transformers pvt. ltd.



We at Synergy Transformers believe the Quality and Services are the origin of future expansion and growth. We sustain our reputation for providing quality products to the consumer as well as frequently explore the other horizons through adopting changes with positive manner.

# ENLIGHTENING QUALITY

## QUALITY & ASSURANCE

Quality Assurance programs in Synergy, strives to achieve the best quality and aims to give best product and services in all the sectors and building a strong and reliable business relationship with customers and suppliers.

Tested as per IS:1180 by ERDA and Approved by BIS

**VOLTAGE CLASS - 11000/433 & 415**

| Sr.No | Kva rating | Voltage class | Efficiency level | Standard | Result |
|---|---|---|---|---|---|
| 1 | 200 | 11000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 2 | 315 | 11000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 3 | 400 | 11000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 4 | 500 | 11000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 5 | 630 | 11000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 6 | 800 | 11000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 7 | 1000 | 11000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 10 | 1250 | 11000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 12 | 1600 | 11000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 13 | 2000 | 11000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 14 | 2500 | 11000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |

Tested as per IS:1180 by ERDA and Approved by BIS

**VOLTAGE CLASS - 33000/433 & 415**

| Sr.No | Kva rating | Voltage class | Efficiency level | Standard | Result |
|---|---|---|---|---|---|
| 1 | 200 | 33000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 2 | 315 | 33000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 3 | 400 | 33000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 4 | 500 | 33000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 5 | 630 | 33000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 6 | 800 | 33000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 7 | 1000 | 33000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 10 | 1250 | 33000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 12 | 1600 | 33000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 13 | 2000 | 33000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |
| 14 | 2500 | 33000/433 & 415 | Level-1, Level-2, Level-3 | IS 1180 | ✓ |

Greatest possible customer satisfaction

Process quality combined with efficient processes results in the best cost position

Personnel Quality and test trained and motivated employees.

# ENLIGHTENING TESTING

SYNERGY
transformers pvt. ltd.

At Synergy we deeply value the role of our products in our life. But we intend to take it much beyond the conventional function. We see a cable as a means of connecting life to life. Thus only the company can expand highest to the sky and widest to the horizon.

Synergy firmly believes in maintaining a healthy customer-manufacturer relationship and has gained a personal touch among all of its clients, the on-time delivery system at Synergy makes sure that the product reaches client without making any delay in the delivery.

The strong National Distribution Network bonds the company with its clients in every market.

Synergy will be coming up soon with its expansion plans exploring the International market too.

The International Distribution Network would target new innovations and provide the best services across the globe, The Company's vision of touching the sky in the Transformer industry is not far as Synergy plans out for its further expansion soon in the industry.

We provide you all the possible reasons to deal with Synergy.

## CERTIFICATION







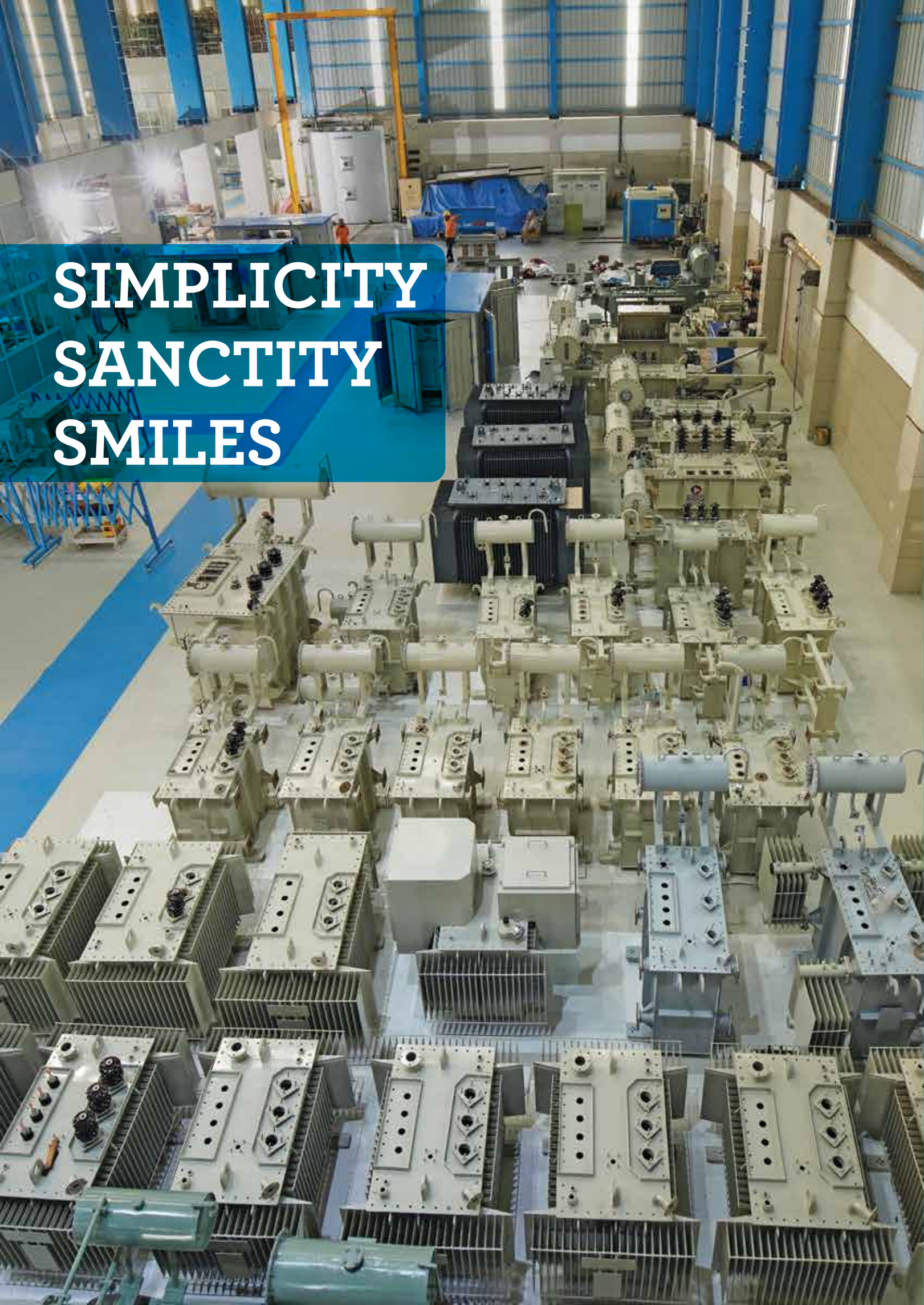




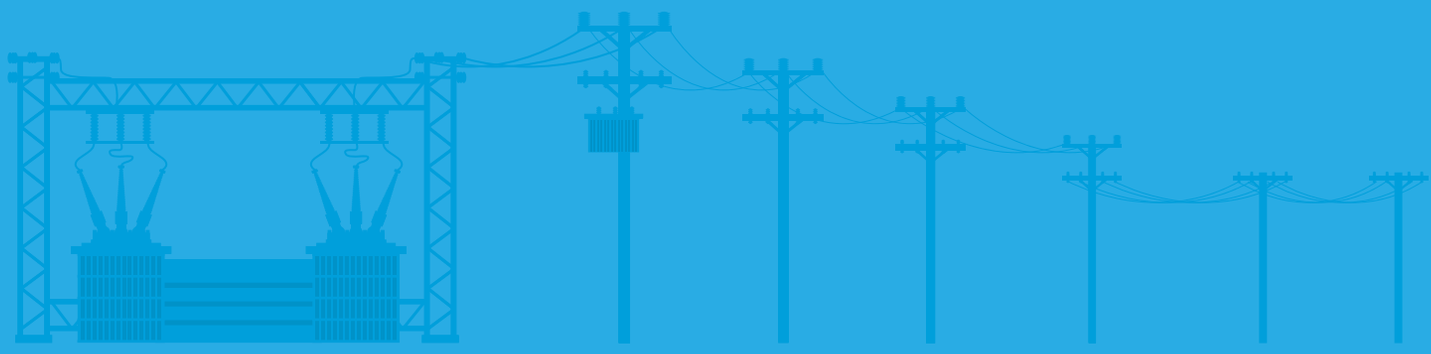








SIMPLICITY
SANCTITY
SMILES

SYNERGY
transformers pvt. ltd.



# ENLIGHTENING SERVICES

## THE MARKETING PRACTICES

The marketing team at Synergy takes up the challenge in scaling new heights in the national market.
The direct market approach has created a new scope for taping growth at Synergy. The on-time job delivery is one thing that has made Synergy a reliable name in the Transformer Industry.
Delivering the job within the specified time line is a stringent practice at Synergy.

Synergy spreads its strong distribution network across the country the marketing team with its sharp skills explores the market for the company.
In the next two - three years Synergy plans to serve the National & International market with the High Tension Transformer.
Synergy portrays a promising picture for the future that has immense potentials to be explored at the National as well as the International Market.

# PRECISION PERFECTION PROMINENCE

## ENLIGHTENING MANUFACTURING

The State-of-the-art Manufacturing
Quality at Synergy evolves from the state-of-the-art manufacturing plant, with a large infrastructure spread over 36,000 Sq.Feet located at Pipaliya Toll Plaza, near Rajkot in Gujarat. With the modern technology & independent testing facilities of excellence, products undergo quality tests as per national & international standards.

Synergy firmly believes in the Quality Management Policy. The continuous inspection in the quality deliverance has made Synergy inculcate the International Quality standards, striving for the Six Sigma quality levels. The research and development department at Synergy churns out new innovations that ultimately transforms to a new Product. The company has involved itself in developing new innovations with the help of the experts of the department.

Every length of Synergy Transformers is tested to ensure high reliability in performance. Continuous process monitoring and post manufacturing tests ensure the best quality to Indian as well as International standards.


SYNERGY
transformers pvt. ltd.

# ON LOAD DISTRIBUTION TRANSFORMER

IS 1180
PART 1
7600080312

We manufacture ISI approved onload distribution transformer starting from 200 KVA to 2500 KVA under BIS-1180(Jan 2016) and above 2500 KVA up-to 5000 KVA under IS-2026 of all voltage class and covering all level of efficiency.


On Load Distribution Transfrormer

## Features of Onload Transformer

| | | |
|---|---|---|
| 1. | Designing | Designed for minimum 25 years for 24 x 7 duty with negligible maintenance and silent operation. |
| 2. | Magnetic Circuit | Step-lap horizontal and vertical in 5,7,9 step design for lower losses and low magnetizing current of core by using high quality CRGO material with grades such as ZDKH, ZDMH, AMORPHOUS, MOH, etc. |
| 3. | Electric Circuit | Using electrolytic grade with 99.99% pure high quality copper from our regular and reputed vendor HINDALCO & STERLITE with Foil winding in L.V coil of transformer. |
| 4. | Dielectric Circuit | High dielectric insulation property to withstand lightening impulse and voltage surges. |
| 5. | Thermal Circuit | ONAN through natural convection for effective cooling through axial and radial ducts. |

## Technical Specification of onload distribution transformer

Onload Transformers are installed where voltage fluctuations from h.v side are continuous.
So onload transformer changes tap using AVR without any power-cut and give constant out-put voltage.
Thus over-all power consumption of industry gets optimized hence results in power savings.

| | |
|---|---|
| Type | Indoor/ Outdoor Floor Mounted |
| Voltage Class | 3.3,6.6, 11, 22, 33 Kv or special class by customer |
| Vector Group | Dyn11, Dyn5, Dyn1 or other specified by customer |
| No. of phase | 3 phases |
| Frequency | 50/60 Hz |
| Tap Range | ±10 %, +5% To -15% in 1.25% steps in 17 position or in ±10 % 2.5% steps in 9 Positions or as per requirement of customer. |
| Winding Material | HV Side EC Grade Enamal Rectangular Conductor<br>LV SIde EC Gade Coppe Foil |
| Applicable Standards | BIS-1180, IS-2026, IEC 60076 |
| Painting | Epoxy, Polyurethane or specified by customer |

SYNERGY
transformers pvt. ltd.

## Standard Fittings

1. Rating & Diagram Plate
2. Earthing terminals
3. Lifting Lugs
4. Thermometer Pocket
5. Air Release Plug
6. Conservator Tank
7. Cover Mounted Thermometer
8. Explosion Vent With Suitable Diaphragm
9. Oil Level Indicator
10. Drain Cum Oil Filter Valve
11. Top Oil Filter Valve
12. Bi-Directional Roller
13. Silica gel breather
14. Cooling Radiators
15. H.V & L.V Side cable box with copper bus-bar.
16. Neutral - earth bushing for earthing of neutral.
17. RTCC panel with AVR and TPI for onload distribution transformer.

## Protective Devices

1. Buchholz Relay with alarm and trip contact for transformers from 500 KVA to 5000 KVA
2. Oil Temperature Indicator with alarm and trip contact for transformers from 630 KVA to 5000 KVA
3. Winding Temperature Indicator with alarm and trip contact for transformers from 800 KVA to 5000 KVA
4. Magnetic Oil Level gauge with alarm contact for transformers from 1250 KVA to 5000 KVA

## Optional Accessories on request

1. Neutral C.T
2. Jacking Pads
3. Shut-off Valves
4. Annunciation/Inspection Window
5. Pressure Release Valve with contacts (PRV).

### Maximum Total Losses Upto 11 Kv Class Transformers As Per BIS-1180

| Sr. No. | KVA | Impedance % | Maximum Total Loss (W) @ 75 Degree Celsius | | | |
|---|---|---|---|---|---|---|
| | | | LEVEL 2 | | LEVEL 3 | |
| | | | 50% | 100% | 50% | 100% |
| 1 | 250 | 4.5 | 980 | 2930 | 920 | 2700 |
| 2 | 315 | 4.5 | 1025 | 3100 | 955 | 2750 |
| 3 | 400 | 4.5 | 1225 | 3450 | 1150 | 3330 |
| 4 | 500 | 4.5 | 1510 | 4300 | 1430 | 4100 |
| 5 | 630 | 4.5 | 1860 | 5300 | 1745 | 4850 |
| 6 | 800 | 5.0 | 2287 | 6402 | 2147 | 5837 |
| 7 | 1000 | 5.0 | 2790 | 7700 | 2620 | 7000 |
| 8 | 1250 | 5.0 | 3300 | 9200 | 3220 | 8400 |
| 9 | 1600 | 6.25 | 4200 | 11800 | 3970 | 11300 |
| 10 | 2000 | 6.25 | 5050 | 15000 | 4790 | 14100 |
| 11 | 2500 | 6.25 | 6150 | 18500 | 5900 | 17500 |

Note : For Transformer having voltage class 22 Kv then permissible total loss shall not exceed by 5% of total loss as per above table and for 33 Kv Class permissible total loss shall not exceed by 7.5% of total loss as per above table.

## Benefits of On Load Transformers

1. Due to on load transformer the voltage at LV side remains in limit against the voltage fluctuations from HV side.
2. For changing tap, shut down of factory is not reliable. But due to on load transformer you can change tap even when your factory is running.
3. As their is RTCC panel with AVR (Automatic Voltage Regulator) LV side voltage remains in desire range by changing tap automatically.
4. Due to on load transformer increase industrial machinery lifes, durability, low maintenance and low power conception.

# OFF LOAD DISTRIBUTION TRANSFORMER

IS 1180
PART 1
7600080312

We manufacture ISI approved offload distribution transformer starting from 100 KVA to 2500 KVA under BIS-1180(Jan 2016) and above 2500 KVA up-to 5000 KVA under IS-2026 of all voltage class and covering all level of efficiency.

Off Load Distribution Transfrormer

## Features of Off Load Transformer

| | | |
|---|---|---|
| 1. | Designing | Designed for minimum 25 years for 24 x 7 duty with negligible maintenance and silent operation. |
| 2. | Magnetic Circuit | Step-lap horizontal and vertical in 5,7,9 step design for lower losses and low magnetizing current of core by using high quality CRGO material with grades such as ZDKH, ZDMH, AMORPHOUS, MOH, etc. |
| 3. | Electric Circuit | Using electrolytic grade with 99.99% pure high quality copper from our regular and reputed vendor HINDALCO & STERLITE with Foil winding in L.V coil of transformer. |
| 4. | Dielectric Circuit | High dielectric insulation property to withstand lightening impulse and voltage surges. |
| 5. | Thermal Circuit | ONAN through natural convection for effective cooling through axial and radial ducts. |

## Technical Specification of offload distribution transformer

| | |
|---|---|
| Type | Indoor/ Outdoor Floor Mounted |
| Voltage Class | 3.3,6.6, 11, 22, 33 Kv or special class by customer |
| Vector Group | Dyn11, Dyn5, Dyn1 or other specified by customer |
| No. of phase | 3 phases |
| Frequency | 50/60 Hz |
| Tap Range | $\pm$7.5%,$\pm$5% in 2.5% step voltage @ 5,7,9 and 11 steps or as per customer requirement. |
| Winding Material | HV Side EC Grade Enamal Rectangular Conductor<br>LV SIde EC Gade Coppe Foil |
| Applicable Standards | BIS-1180, IS-2026, IEC 60076 |
| Painting | Epoxy, Polyurethane or specified by customer |

## Applications

Engineering Industries · Auto Industries · Ceramic Industries · Forging Industries · Plastic Industries · Hospital · Pharma · Food Processing · Hotels/ Resort · Mining Industries

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# Advantage of Foil Winding

1. Temperature rise is lower due to high face-area for current flow.
2. High Mechanical strength towards AXIAL and RADIAL forces in comparison to conventional layer winding.
3. Inter-turn Fault is vanished out due to foil winding as compare to layer winding
4. No need of transposition due to foil winding which gives exact results as compare to conventional winding.
5. Increased reliability.
6. Reduced size.
7. Higher ambient temperature operating capability.
8. Improved electrical stress resistance.
9. Better overall regulation.
10. Temprature control copper foil dissiplate heat more effectively than conventional layer winding.
11. Consistent Performance Controlled Copper Losses.
12. These processes enhance the transformer's short-circuit withstand capability.

# HERMETICALLY SEALED DISTRIBUTION TRANSFORMERS

We manufacture ISI approved offload distribution transformer starting from 200 KVA to 2500 KVA under BIS-1180(Jan 2016) and above 2500 KVA up-to 5000 KVA under IS-2026 of all voltage class and covering all level of efficiency.

IS 1180
PART 1
7600080312

## Features of On Load & Off Load Transformer

| | | |
|---|---|---|
| 1. | Designing | Designed for minimum 25 years for 24 x 7 duty with negligible maintenance and silent operation. |
| 2. | Magnetic Circuit | Step-lap horizontal and vertical in 5,7,9 step design for lower losses and low magnetizing current of core by using high quality CRGO material with grades such as ZDKH, ZDMH, AMORPHOUS, MOH, etc. |
| 3. | Electric Circuit | Using electrolytic grade with 99.99% pure high quality copper from our regular and reputed vendor HINDALCO & STERLITE with Foil winding in L.V coil of transformer. |
| 4. | Dielectric Circuit | High dielectric insulation property to withstand lightening impulse and voltage surges. |
| 5. | Thermal Circuit | ONAN through natural convection for effective cooling through axial and radial ducts. |

## Technical Specification

| | |
|---|---|
| Type | Indoor/ Outdoor Floor Mounted |
| Voltage Class | 3.3,6.6, 11, 22, 33 Kv or special class by customer |
| Vector Group | Dyn11, Dyn5, Dyn1 or other specified by customer |
| No. of phase | 3 phases |
| Frequency | 50/60 Hz |
| Tap Range | ±7.5%,±5% in 2.5% step voltage @ 5,7,9 and 11 steps or as per customer requirement.<br>±10 %, +5% To -15% in 1.25% steps in 17 position or as per customer requirement. |
| Winding Material | HV Side EC Grade Enamal Rectangular Conductor<br>LV SIde EC Gade Coppe Foil |
| Applicable Standards | BIS-1180, IS-2026, IEC 60076 |
| Painting | Epoxy, Polyurethane or specified by customer |

## Applications

Engineering Industries · Auto Industries · Ceramic Industries · Forging Industries · Plastic Industries · Hospital · Pharma · Food Processing · Hotels/ Resort · Mining Industries

SYNERGY
transformers pvt. ltd.

## Standard Fittings

1. Rating & Diagram Plate
2. Earthing terminals
3. Lifting Lugs
4. Thermometer Pocket
5. Air Release Plug
6. Cover Mounted Thermometer
7. Explosion Vent With Suitable Diaphragm
8. Oil Level Indicator
9. Drain Cum Oil Filter Valve
10. Top Oil Filter Valve
11. Bi-Directional Roller
12. H.V & L.V Side cable box with copper bus-bar.
13. Neutral - earth bushing for earthing of neutral.
14. RTCC panel with AVR and TPI for OLTC.

## Protective Devices

1. DGPT 2 Relay
2. Oil Temperature Indicator with alarm and trip contact for transformers from 630 KVA to 5000 KVA
3. Winding Temperature Indicator with alarm and trip contact for transformers from 800 KVA to 5000 KVA

## Optional Accessories on request

1. Neutral C.T
2. Jacking Pads
3. Annunciation
4. Pressure Release Valve with contacts (PRV).

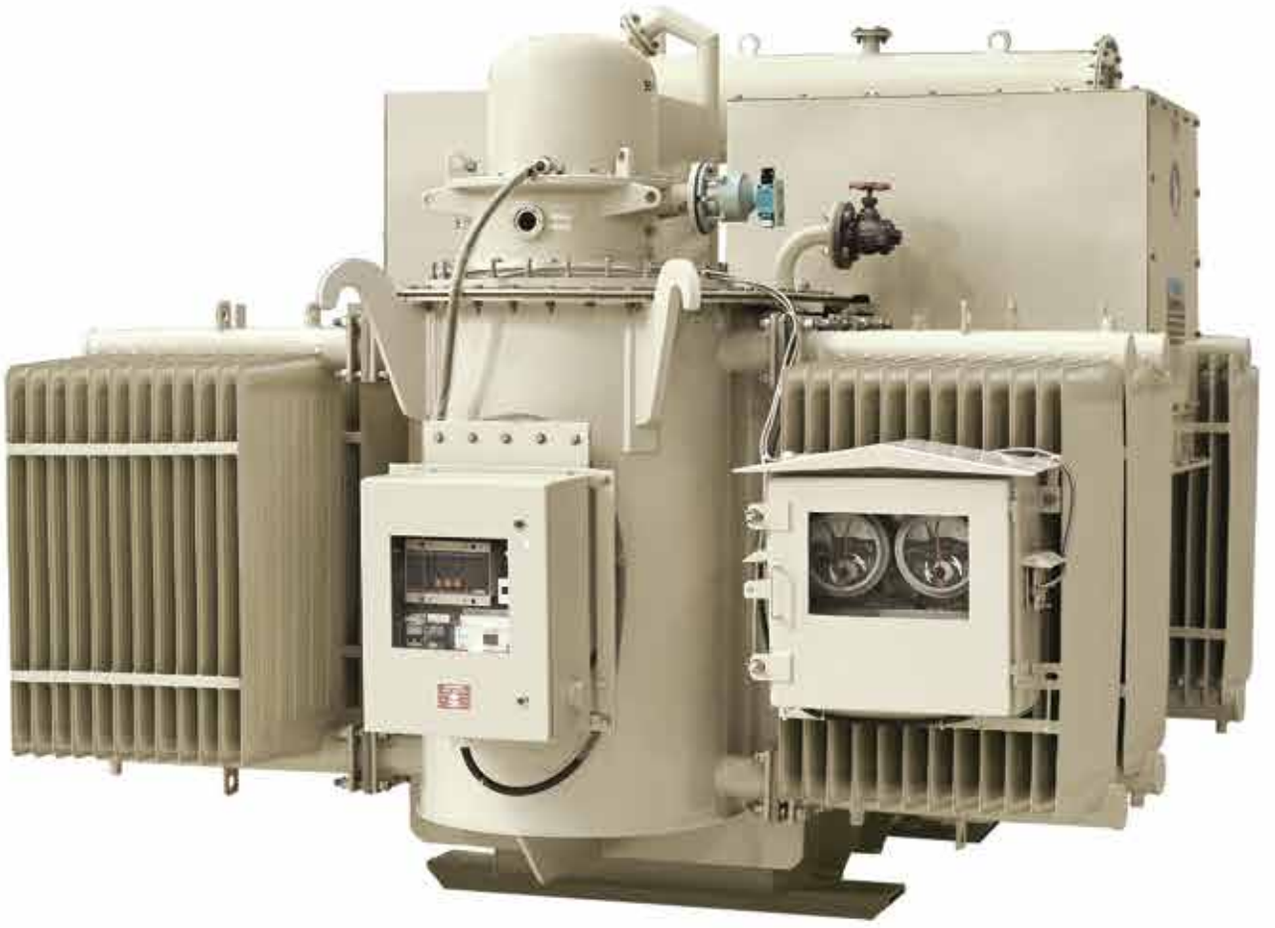
## Comparison Chart of Hermetically Sealed Transformers with Conventional Oil Filled Transformers

| Sr. No. | Parameter | Conventional Oil Filled | Hermetically Sealed-maintanance Free Oil Filed | Benefit |
|---|---|---|---|---|
| 1. | Construction | Fabricated tank with detachable (Bolted) radiators and equipped with breather & conservator | Welded tank design with corrugated Fins (insted of radiators) and without Breather & conservator | Compact & space saving |
| 2. | Cooling | Oil need to undergo flow process through radiators to achieve cooling | corrugated fins are welded to tank to increase surface area thereby enhancing cooling process | Higher surface area leads to better heat dissipation which in turn enhances efficiency. |
| 3. | Oil contamination with air | Yes, since transformers is equipped with breather which leads to oxidation and reduction in BDV of oil | Not possible since there is no breather and oil is filled inside tank in factory under vacuume and after which the tank is sealed | Oil BDV Maintained throught the life. Oil properties are unaffected & hence requires no maintenance |
| 4. | Oil filtration and top up | Oil filtration is required during pre-commissioning and top up is required during preventive maintenance | Not Required | Since no filtration & preventive maintenance required operation is trouble free, without interruption and does not require an shutdown |
| 5. | Oil leakage possibility | Yes, due to conventional design | Not possible since it is hermetically sealed and fabrication is welded (without joints) | No need for oil top up due to leakage |
| 6. | Size | Bulky due to conservator & radiator and other fittings | Relatively compact with space saving by almost 30% | Less footprint and hence requires less space at site |
| 7. | Losses | Losses increase with its operational life | Losses remains constant throughtout its operational life | This results in improve efficiency |
| 8. | Expected life | 15-20 Years | 25-30 years | Due to negligible maintenance it enhances product life |
| 9. | insulation | As oil comes in contact with air (moisture) which in turns comes in contact with insulation material deteriorates with the passage of time | Since oil is not in contact with external atmosphere, no such deterioration takes place | This helps in reduction of mechanical and voltage stress on insulation preventing failure |
| 10. | Total ownership cost (TOC) | High relatively low capital cost but high operating cost & losses over a period of time | Marginal high initial cost but less operating cost due to negligible maintenance & no deterioration of oil property (virtual maintenance free) | Initial high capital cost makes the transformer Toc economical and hence ROI (return on investment) are quickly realized |
| 11. | Failure chances | More since it requires oil filtration, top up and regular maintenance | Less as it highly reliable | High raliability as it is maintenance free |
| 12. | Protection | For protection & measurement separate devices such as OTI, WTI, PRV and buchholze relay are to be mounted | One single integrated device can provide protection against gas, pressure and temperature | Only one cut out for mounting is required instead of four(4) in conventional transformer |

# SOLAR/WIND TRANSFORMER

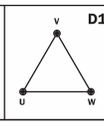
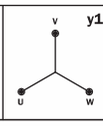
We manufacture wide range of Oil Cooled Distribution Transformers
The standard range is 100 KVA to 11000 KVA.

IS 1180
PART 1
7600080312



Two Winding Solar Transformer

**VECTOR GROUP**

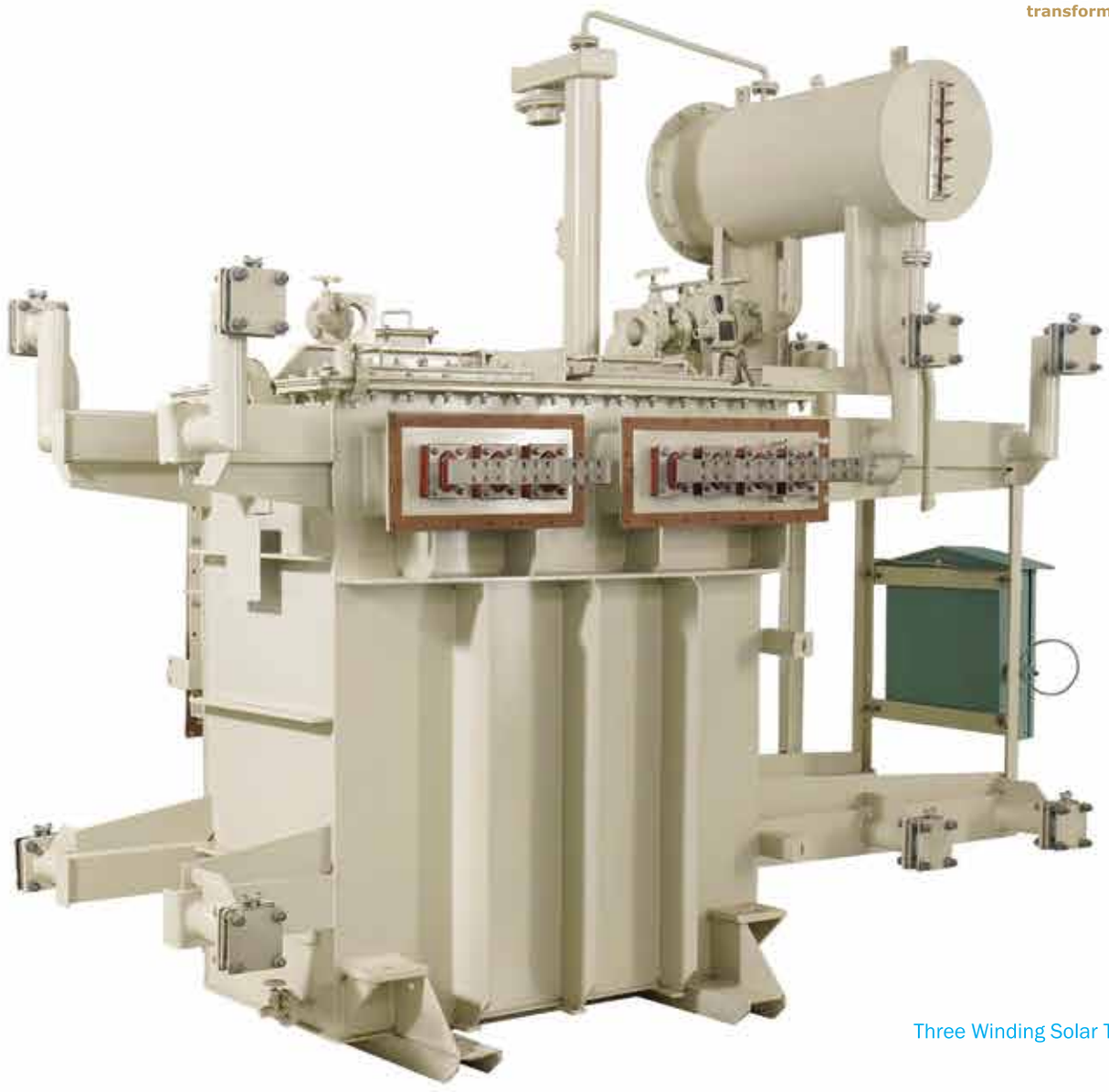
| | | |
|---|---|---|
| **Two winding** |   |   |

## Specification

This transformer is meant for converting the low voltage in to high voltage and fed into power grid. Thus this transformer is also known Convertor Duty or Inverter Duty transformer. The transformer is designed in such a way that it can resist towards Harmonic currents caused by rectifier/inverter. Also a Copper static shield is provided earthen separately to resist towards radio frequent disturbance. For such transformers, design is done with multiple winding for example three winding or five winding transformer. Maintaining proper mechanical and electrical properties is the crucial part in designing such transformer ensuring good performance with safety of all the electrical equipments.

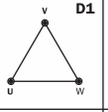
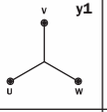
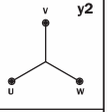
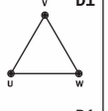
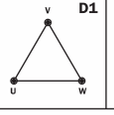
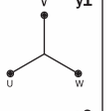
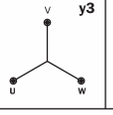
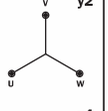
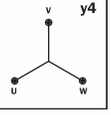
We manufacture both onload as well as offload solar/wind transformer ranges from 100 KVA to 11000 KVA with voltage class of 3.3, 6.6, 11, 22, & 33 on primary side and from 200 volts to 1000 volts on the secondary side.

SYNERGY
transformers pvt. ltd.



Three Winding Solar Transformer

**VECTOR GROUP**

| | | | |
|---|---|---|---|
| **Three winding** |   |   |   |
| **Five winding** |     |     |     |

## Features

1. Designed to give maintenance free long lasting operation for minimum 30 years.
2. Copper Static shield provided between primary and secondary to protect transformer against disturbance.
3. We take reduced current density to protect transformer from overheating due to harmonic current and thus limits the transformer loss.
4. We take flux density lower to decrease core loss due to harmonic interference from inverters and thyristors.

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# FURNACE TRANSFORMER

Rectifier Duty Transformer

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Furnace Transformer are design for induction melting and induction heating for ferrous and non-ferrous metal.

Induction Furnace has coil constructed from heavy copper tubing. it is designed and turned to the inverter circuit which applies a medium frequency (generally 500 Hz or 1000 Hz) voltage to the induction coil. The magnetic field produced by the induction coil induces eddy currents in the charge and heats it. Medium frequency is necessary to
enhance the rate of heat generation.

The inverter circuit requires for its operation a D.C. voltage which is obtained by converting available three phase A.C. voltage to required volage for converter circuit of the induction furnace are referred to as induction furnace transformers. Thus they are essentially Rectifier / Converter duty transformers.

Input voltage is derived from the rating of the rectifier transformer from standard three phase AC distribution voltage like 433 V, 3.3 kV, 6.6 kV, 11 kV, 33 kV, etc. These become the primary voltage of the transformer. Secondary voltage can be between 400 to 1000 V decided by the required D.C. output Voltage.

## Features

1. Electrostatic earth shield provided between primary and secondary side windings for protection of rectifier elements against voltage surges in primary side windings. (Ref. D-3)
2. Use reduced current densities to limit losses due to harmonic currents.
3. Use reduced flux density to limit core losses due to harmonic flux.
4. Designed to suit 6 Pulse / 12 Pulse or other rectifier circuits as required by furnace manufacturer. Two active parts in one tank can also be provided.
5. Confirming to I.S. 2026 and I.S. 4540 - specifications for power transformer and specifications for rectifiers.

## Why weight and dimensions of induction furnace transformers are higher than conventional transformer?

1. To achieve reduced current densities, more conductor cross section areas are required, Hence core weight increases.
2. To achieve reduced flux density, more core cross section are is required, hence core weight increases.
3. In a transformer, core weight and copper weight are inter dependent. Increase in conductor cross section requires that core window are be bigger resulting in increase of core weight also. Similarly increase in core cross section is achieved by increasing core dia. which increases mean dias of winding and the lengths of their mean turn. This increases copper weight also, increase in core and copper weights increase the overall dimensions, increasing oil quantity, structural steel etc.
4. When an electrostatic shield is provided between the windings, more radial gap is required between the windings. This further increase core weight, copper weight, oil quantity and structural steel.

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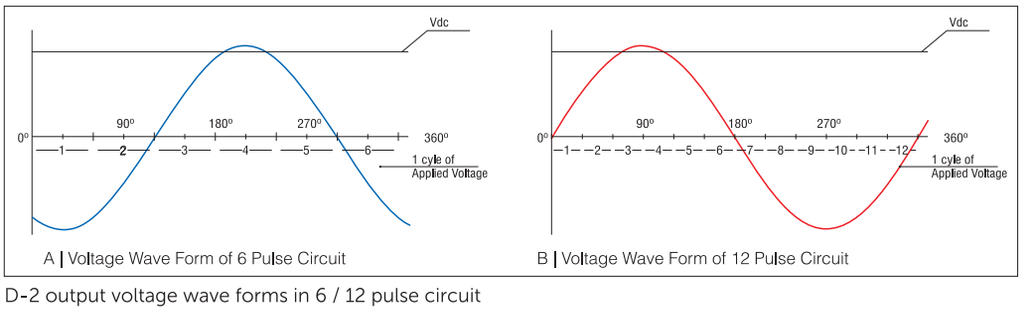
## Technical Specification

| | |
|---|---|
| Type | Indoor/ Outdoor Pad Mounted |
| Duty | On Load / Off Load |
| Voltage Class | 3.3,6.6, 11, 22, 33 Kv or special class by customer |
| Vector Group | Dyn11, Dyn5, Dyn1 or other specified by customer |
| No. of phase | 3 phases |
| Frequency | 50/60 Hz |
| Tap Range | ±10 % in on load and ±7.5% in off load or other specified by customer |
| Winding Material | Copper with multiple paper covering |
| Shielding | Copper Static shield between L.V. & H.V. heavily grounded |
| Applicable Standards | IS-2026, IEC 60076 |
| Painting | Epoxy, Polyurethane or specified by customer |

| No. | Primary | Secondary | Remarks |
|---|---|---|---|
| 1 | △ | Y | 1. Secondary winding.<br>2. 2 way, using Bridge circuit<br>3. 6 Pulse |
| 2 | △<br>△ | Y<br>▽ | 1. One delta and one star cell side windings<br>2. 2 way using Bridge circuit.<br>3. 12 Pulse |

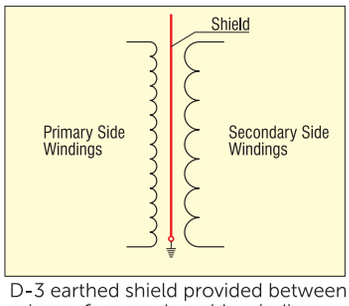
D-1 Typical rectifier transformer winding connections in common use




A | Voltage Wave Form of 6 Pulse Circuit

B | Voltage Wave Form of 12 Pulse Circuit

D-2 output voltage wave forms in 6 / 12 pulse circuit




D-3 earthed shield provided between primary & secondary side windings

# COMPACT SUBSTATION (CSS)

IS 1180
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We manufacture wide range of Compact Substation.
The standard range is 250 KVA to 5000 KVA.
3.3, 6.6, 11, 22 & 33 KV voltages class.


CSS consist of all the necessary equipment such as VCB, DRY TYPE TRANSFORMER, LBS, RMU, PROTECTIVE RELAYS etc. Thus CSS is all in one compact substation which has all the necessary devices. This CSS is easily transferable and can be taken into work within a limited period of time. All you have to do is to give H.V side and L.V side connections and your CSS is ready for use which is safe and reliable. CSS are ranges from 250 KVA to 5000 KVA of 3.3, 6.6, 11, 22 & 33 KV voltages class.
This transformer can be installed in various field of operation such as Casting industries, Textile industries, Residential areas, Solar farms, Wind farms, etc.

## Specification

1. Designed to give maintenance free long lasting operation for minimum 30 years.
2. Dry type epoxy cast or vacuum impregnated or transformer.
3. VCB or SF6 C.B whichever is suitable for protection from H.V side with all necessary protecting relays, CT'S, PT'S etc.
4. LBS switch for making or breaking contact from L.V side.
5. M.S cabinet for protection of all the internal devices from environmental strokes.
6. Epoxy or polyurethane dual coat with zinc rich primer on the cabinet for protection against rust for minimum 5 years

## Technical Details

| | |
|---|---|
| Transformer | Dry type or vacuum impregnated transformer. |
| Tapping | ±5% in 2.5% gap in 5 steps. |
| H.V Side protection | VCB with alarm and trip protections. |
| L.V Side protection | Micro processor base ACB or MCCB for making and breaking contact from L.V side. |
| Sensors | 4 Channels & 8 channels RTD with Fan, Alarm, Trip and Fault acknowledgement. |

## Key Features of CSS

1. Designed for indoor installation close to their point of use at the center of the major load consumers.
2. These transformers are combined with their primary and secondary switchgear and distribution boards into compact substations that are installed directly at their point of use.
3. This reduces construction requirements, cable costs, transmission losses and installation costs.
4. Transformer is fitted with three temperature sensors installed in the LV winding, and a solid-state tripping device with relay output.
5. It can be mounted on a roof top (for dry type transformer) where you want the power supply.


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# POWER TRASFORMER

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We manufacture wide range of Oil Cooled Power Transformers
The standard range is 3000 KVA to 50 MVA.
33, 66, 132 KV voltages class.

## Specification

1. 3 phase, 50 Hz in voltages of 11kV, 22kV, 33kV, 66 kV & 110 kV
2. Off-circuit tap changer to provide ± 5 %, ± 7.5% & +5% to -10% taps insteps of 2.5%
3. On load tap changer to provide +5% to -15% taps in steps of 1.25% as standard range & also custom built for any other ranges. OLTC will be internally/externally mounted as per the requirement
4. Class A, uniform/non-uniform insulated
5. Vector group Dyn 11, YNd 11, YNyn 0
6. Continuous duty, double copper wound
7. Painting as per IS/IEC standards
8. Both HV & LV side outdoor bushings or cable boxes
9. Cooling radiators/fans.
10. Standard fittings as per IS/IEC standards
11. Buchholz relay with alarm and trip contact with shut off valves
12. Oil temperature indicator with alarm and trip contact
13. Winding temperature indicator with alarm and trip contact
14. Magnetic oil level gauge with alarm contact
15. Marshaling box to house oil temperature inducator and winding temperature indicator
16. Cooler control unit
17. Neutral current transformer

## Features

1. Designed for 25 years of trouble-free performance
2. Design conforms to IS 2026, IEC 60076, ANSI and other relevant standards
3. Low power loss and low noise
4. Designed to withstand electrical impulses and thermal and dynamic stresses
5. Optimum utilization of active materials for compactness
6. Modern manufacturing techniques ensure cost effectiveness and reliability

## Optional Accessories

1. Winding temperature indicator and oil temperature indicator with remote indication
2. RTDs for winding temperature measurement
3. Oil preservation system through air cell/thermosphyon filter
4. Neutral earthing bar with epoxy supports

## Applications

Synergy manufactures power transformers from 3.0 MVA upt0 50 MVA, of 33 kV, 66 kV, 132 kV voltage class. All transformers can be supplied with the desired tappings for positive/negative voltage variation either with OFF circuit or ON load tap changers. We can also manufacture intermediate sizes with non standard voltage ranges as per customer requirements, Synergy power transformers are currently in operation in sevaral power utilities playing an important role in efficient transmission and distribution of electricity.

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