APAR

Tomorrow's solutions today

ADVANCED WINDING SOLUTIONS CTC/PICC CONDUCTORS

Engineered for Transformer Performance

Delivering high-performance conductor solutions designed for efficiency, reliability, and long-term durability in modern transformer applications.

www.apar.com

About APAR

APAR: A Legacy of Manufacturing and Engineering Excellence

With a rich legacy spanning over six decades, APAR Industries Limited has evolved from a modest power conductor manufacturer into a global powerhouse in the electrical and energy infrastructure, earning worldwide acclaim for its pioneering spirit and commitment to quality. Navigating the evolving tides of technological innovation and market growth, APAR's reach now extends to over 140 countries, supported by 10 state-of-the-art manufacturing facilities across India and 1 strategic facility in the UAE.

The company commands distinction among India's foremost enterprises, having attained the prestigious 155th rank on both the Fortune 500 India 2024 and Economic Times 500 India 2023 rankings, with a revenue of around USD 2.2 billion (FY24-25), underscoring its robust financial standing and sustained growth trajectory. It is one of the fastest-growing companies, with a revenue CAGR of more than 30% between FY20-21 and FY24-25, based on consolidated financial statements in INR.

Our Global Positioning

The world's largest
global aluminium and alloy conductor manufacturer.

India's largest exporter
and producer of speciality and renewable cables.

Top 10 players
in the lubricants industry in India.

Great Place To Work
certified with 2000+ Employees

World's 3rd largest
and India's largest transformer oils manufacturer.

Amongst the world's largest
Manufacturers of Continuously Transposed Conductors (CTC) and Paper Insulated Copper Conductors (PICC) products.

First and the only
Indian company to provide solution in copper & fiber hybrid cables.

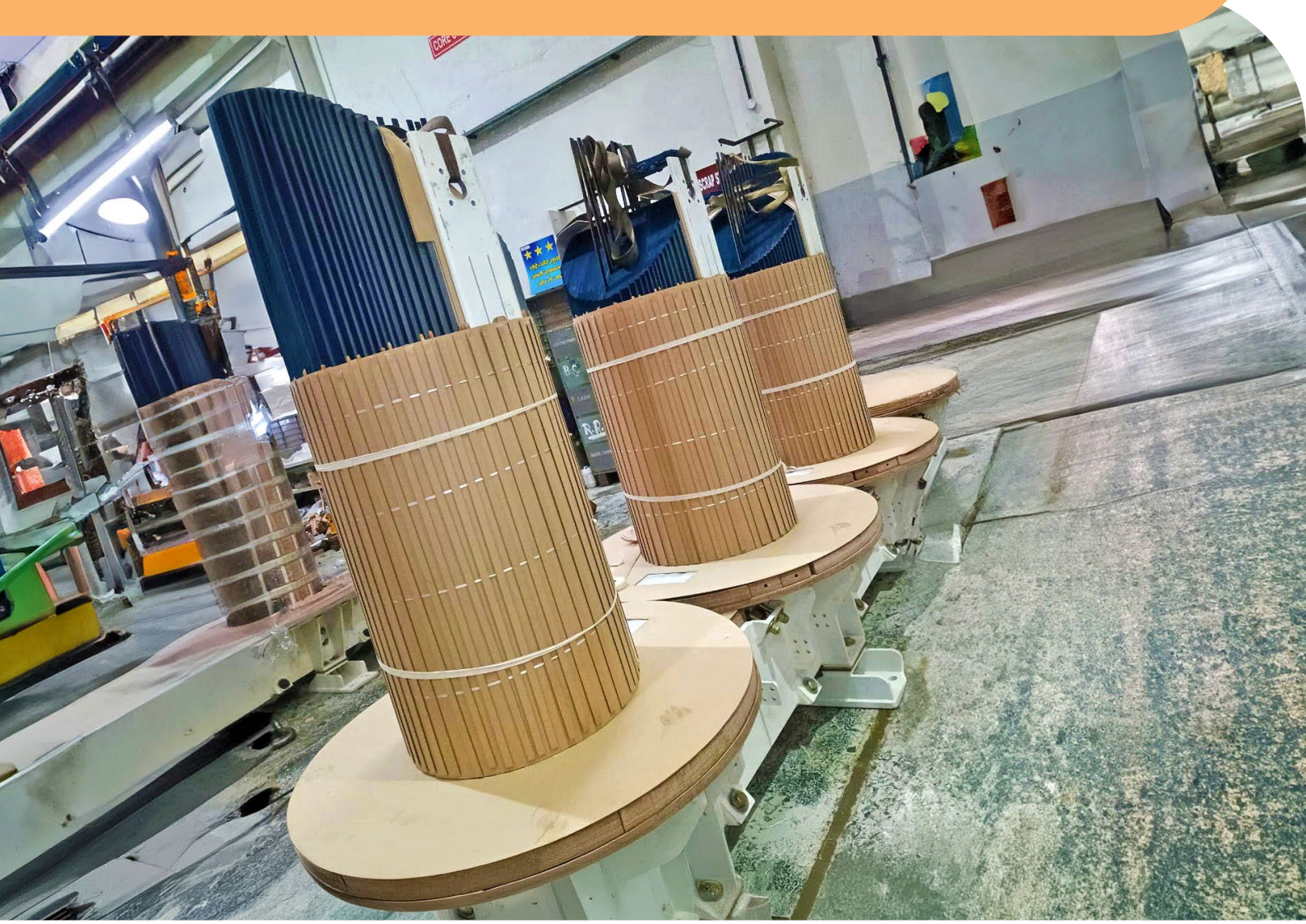
$2 Billion
Revenue

140+
Global footprint

66
Years of excellence

11
Manufacturing facilities

Advanced Conductors For Modern Transformers



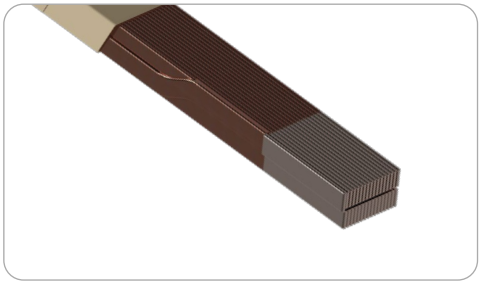
High-performance copper conductors are fundamental to transformer efficiency, reliability, and lifecycle performance.

At APAR, we bring our deep engineering expertise to deliver Continuously Transposed Conductors (CTC) and Paper Insulated Copper Conductors (PICC)—solutions designed to optimise electrical performance, enhance thermal stability, and enable compact, efficient transformer designs.

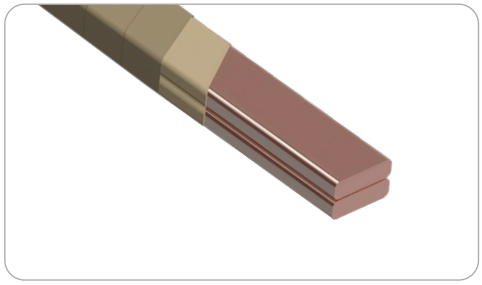
With a significant presence across the globe, APAR supports global power networks with advanced winding solutions built for evolving energy demands.

CTC/PICC Products

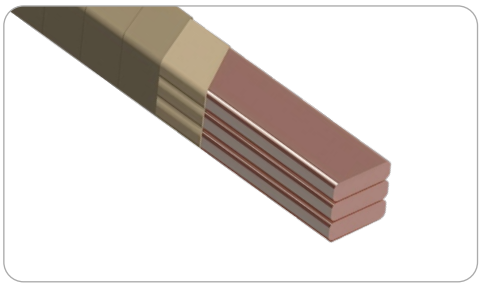
Our Offerings:



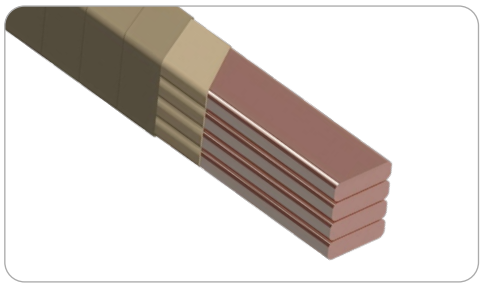
Copper CTCs
Continuously Transposed Conductors



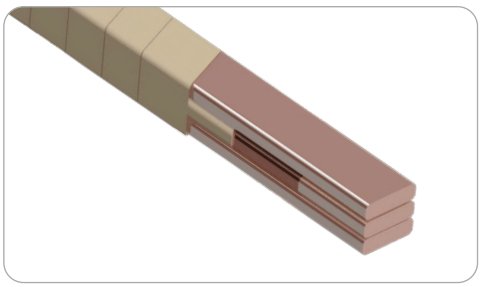
Double Bunched PICC
Paper Insulated Copper Conductors



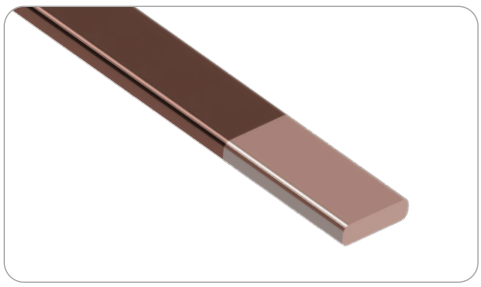
Triple Bunched PICC
Paper Insulated Copper Conductors



Quadruple Bunched PICC
Paper Insulated Copper Conductors



Enamel Bunched PICC
Paper Insulated Copper Conductors



Enamel Copper Strips
Paper Insulated Copper Conductors

LKC/Lead Wire

Applications

CTC

- Oil Filled Power Transformers
- HVDC Transformers
- Large Distribution Transformers
- EHV Transformers (765 & 1200kV) and Reactors
- Traction transformers

PICC

- Oil Filled Power & Distribution Transformers
- High Voltage Motors/Generators
- EHV Transformers (765 & 1200kV) and Reactors
- Traction Transformers
- Dry Type Transformers
- Resin Cast Transformers
- Wind Mill Generators

Continuously Transposed Conductors (Copper CTC)

Variants:

CTC | Special Protection Paper-Covered CTC | Netting tape CTC

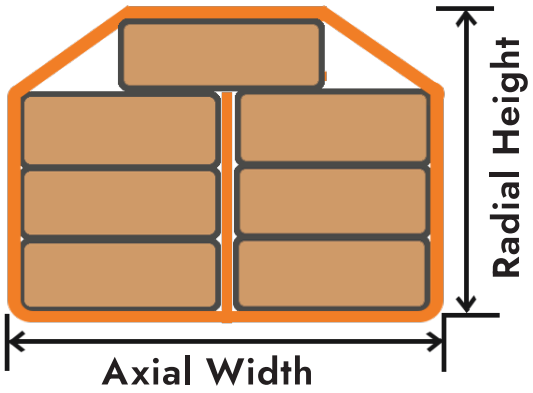
Key Benefits:

- Lower electrical losses
- High mechanical strength
- Uniform current distribution
- Faster winding process
- Superior thermal performance
- Enhanced reliability
- Compact winding design
- Design flexibility

CU-ETP, CU-AG0.1 & OFC ACCORDING TO ASTM B-49-17

Application:

These are typically used as winding material for Power, distribution, traction and furnace transformers.



Types of Enamel and Epoxy

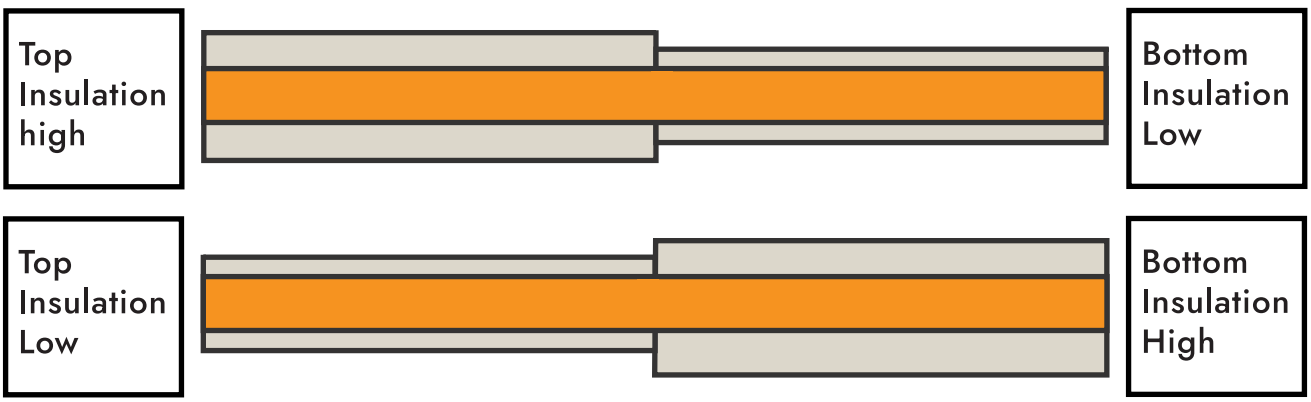
Enamel/Epoxy	Description of Enamel/Epoxy	Thermal Class
PVA	Poly-vinyl Acetal / Formal	120˚C
PEI	Poly-ester-imide	180˚C
PEI + PAI	Poly-ester-imide + Poly-amide-imide	200˚C
Epoxy	Standard B-Stage Epoxy	120˚C
Epoxy (HS)	High solid content B-Stage Epoxy	120˚C

NEW PRODUCT

MULTI INSULATION CTC IN ONE DRUM

Advantage over conventional CTC:

Eliminates joints during winding, improving productivity.



Paper Insulated Copper Conductors (PICC)

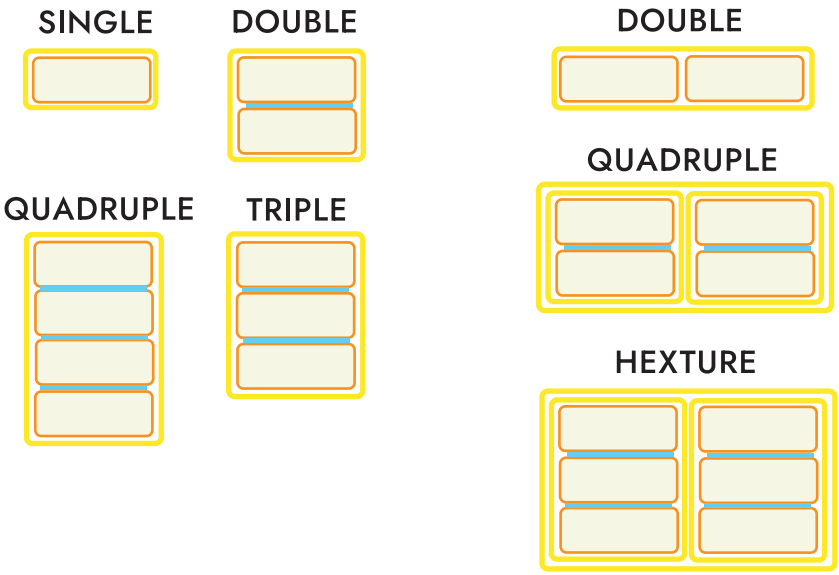
Double Bunched/Triple Bunched/Quadruple Bunched/Enameled Bunched

Strength in Insulation. Reliability in Performance.

Available in both enamel insulated and paper-insulated copper strips, manufactured with high-quality insulation as per customer specifications. Insulation thickness and layering are fully customisable to suit specific application needs.

Key Benefits:

- High insulation reliability
- Strong mechanical performance
- Flexible configurations

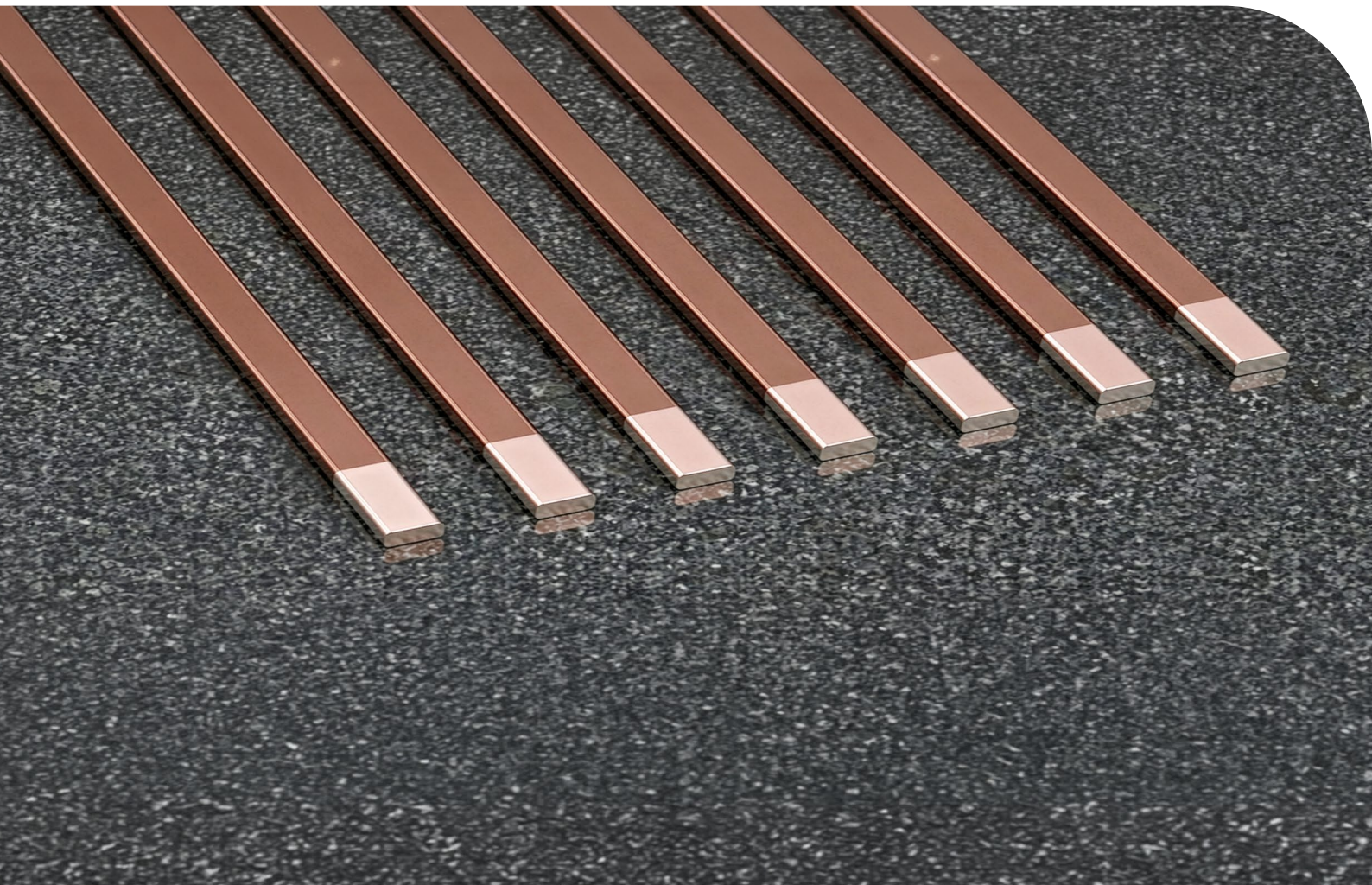


Enameled Copper Strips

Enameled copper rectangular strips feature a flat cross-section and are insulated with high-performance enamel for electrical insulation and thermal protection. Typical insulation systems include polyesterimide, polyamide-imide, and epoxy.

Types of Enamel	Description	Thermal Class
PVA	Poly-vinyl Acetal / Formal	120˚C
PEI	Poly-ester-imide	180˚C
PEI + PAI	Poly-ester-imide + Poly-amide-imide	200˚C

Width Single Strip	3.00 mm to 12.50 mm
Thickness Single Strip	0.90 mm to 3.25 mm



NEW
PRODUCT

LKC/Lead Connection Cable/MPCC

Lead connection cable for transformers are specialised conductors that connect internal windings of a transformer to external circuits or devices. They play a critical role in ensuring efficient, safe, and reliable power transfer.

Application:

Used for connection and lead cable for oil filled transmission & distribution transformers.
Our Manufacturing range: 6 to 500 Sq mm

Precision Engineered Performance & Technical Excellence

Mechanical Properties – Work Hardening (Proof Stress at Rp0.1% & Rp0.2%)

Proof Stress Code	Range (MPa)
CPR A	80 – 110
CPR B	90 – 120
CPR 1	140 – 200
CPR 2	170 – 220
CPR 3*	220 – 260

For proof stress above 240 MPa, Cu-Ag0.1 (silver-bearing copper) is recommended.

Insulating Paper Type & Capacity

Paper Type Used
Kraft Paper
Thermally Upgraded Kraft Paper
High density Crepe Paper (Dennison-22HCC/Cindus-42HCF/Cottrell-CK125)
Nomex®
Polyester netting tape

CTC

Parameter	Range
Number of strands	5 to 83
Width (Single Strip)	3.15 mm to 11.50 mm
Thickness (Single Strip)	0.90 mm to 2.80 mm
Number of layers	Maximum 24
Transposing factor (Ft)	7 to 15

Transposition Design & Engineering

In a complete transposition cycle, each strand occupies every possible position within one turn of the winding.

Pitch (P):

$P = D \times \pi / n$

Transposition Factor (Ft):

$Ft = (D \times \pi) / (b \times n)$

(Recommended Ft between 7 and 15)

Dimensional Calculations:

Axial Width (Ab):

$Ab = 2 \times (b + E) + I + R$

Radial Dimension (Rh):

For ODD strands: $Rh = (n + 1) / 2 \times (a + E) + R$

For EVEN strands: $Rh = (n + 2) / 2 \times (a + E) + R$

Where:

n = Number of strips

a = Thickness of bare wire

b = Width of bare wire

E = Increase due to enamel

I = Column separator

R = Paper insulation thickness

Note: Above dimension are nominal and additional tolerances shall apply. Some calculations include free space factor to calculate Nominal dimensions, which depends on number of strands, strip size and proof stress. Contact APAR technical team for detailed calculations.

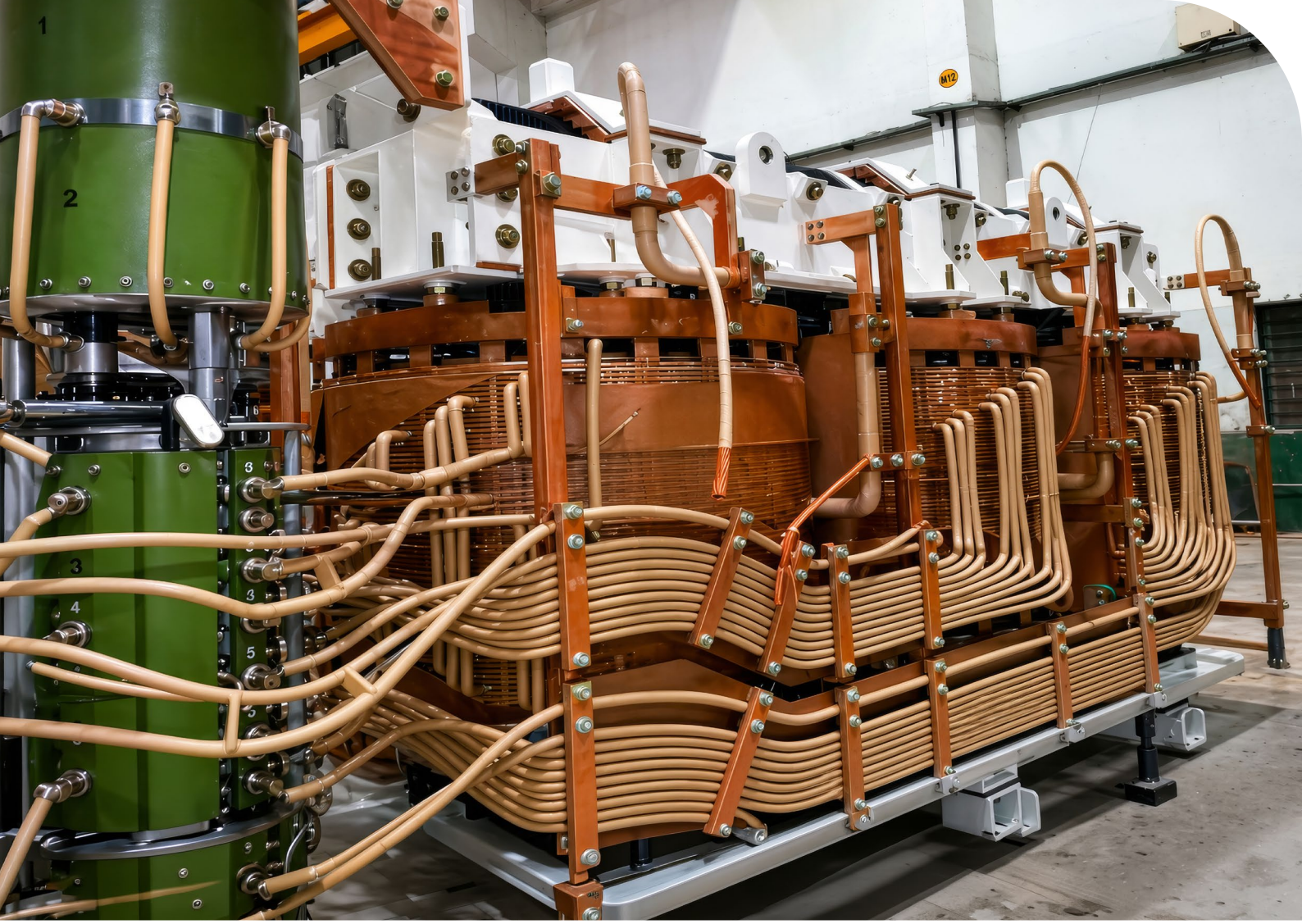
APAR Manufacturing Edge

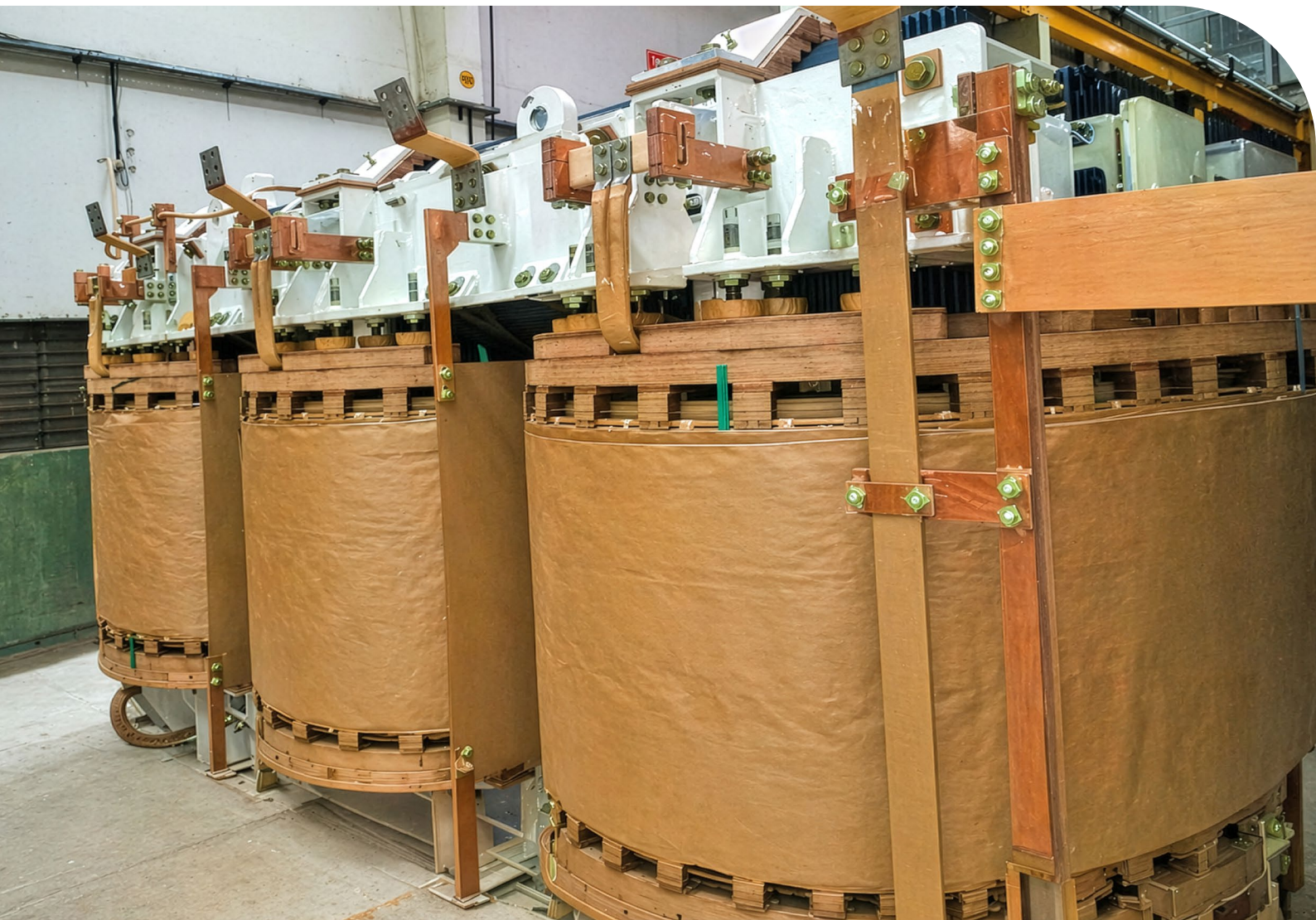
APAR operates ten advanced manufacturing plants strategically located across India and one plant in Sharjah, UAE. Its CTC/PICC facility at Silvassa has recently undergone a capacity expansion, increasing CTC production capacity by 30%—enhancing its ability to meet growing demand while improving operational efficiency and cost optimisation.

APAR's advanced CTC / PICC manufacturing processes deliver:

- High-precision transposition with tight dimensional tolerances
- Superaior flexibility with optimised pitch design
- Excellent windability and ease of handling
- Consistent quality for high-reliability transformer applications

Continuously Transposed Conductors are used in critical transformer applications where performance and reliability are paramount, necessitating stringent quality control throughout the manufacturing process.


1
2
3
3
4
5



APAR

Tomorrow's solutions today

Corporate Office

Mumbai, Maharashtra
APAR House, Bldg. no 4 & 5, Corporate Park,V.N. Purav Marg, Chembur, Mumbai- 400 071. Maharashtra, India

Phone: 022 - 25263400/67800400
FAX: 022 - 25246326

Registered Office

Vadodara, Gujarat
301, Panorama Complex, R.C.Dutt Road, Vadodara-390007. Gujarat, India
Phone: (0265) 6178700/709, 2339906
CIN: L91110GJ1989PLC012802

Send your enquiry to: **corporate@apar.com**