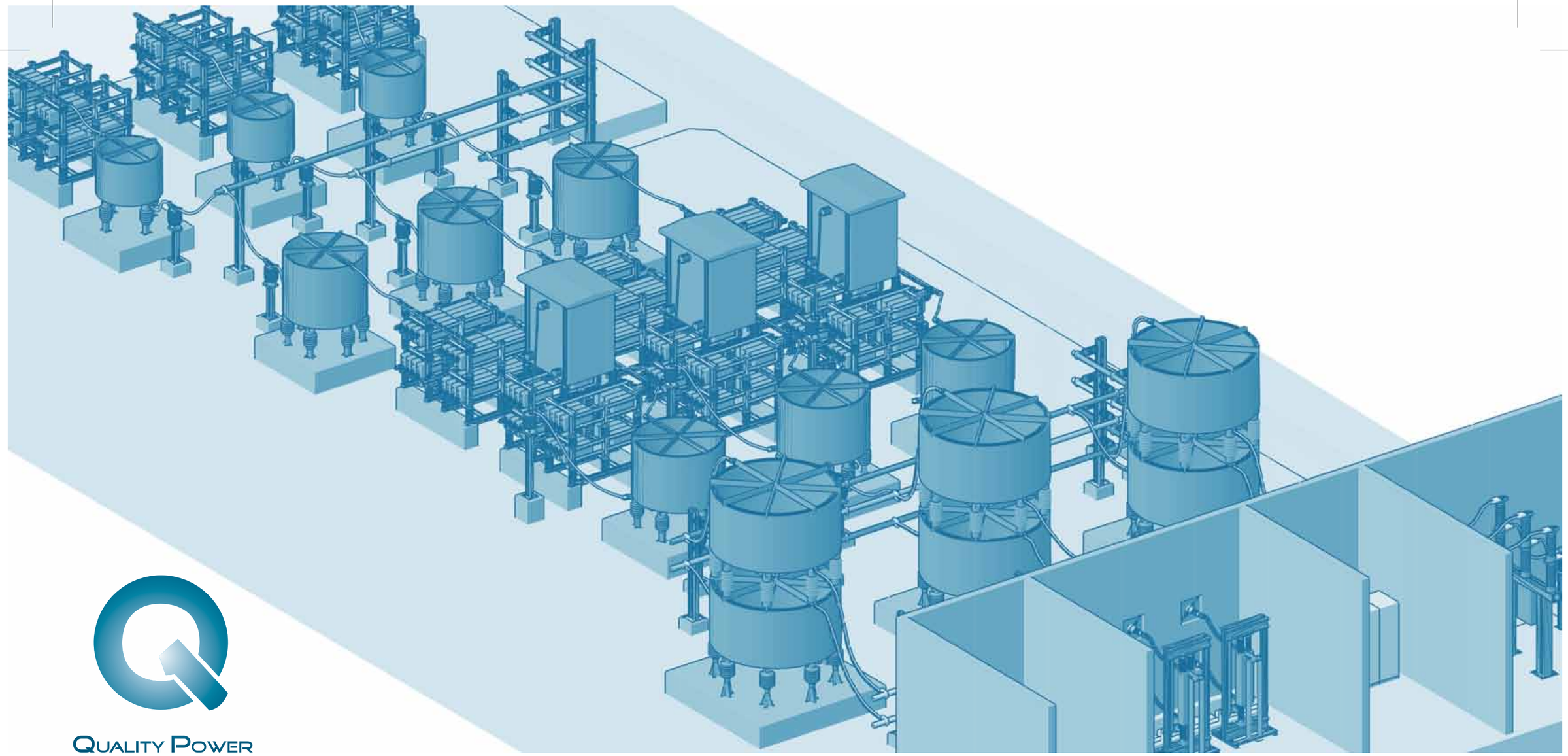


QUALITY POWER

QUALITY POWER ELECTRICAL EQUIPMENTS PVT. LTD.

L61,KUPWAD MIDC,
SANGLI 416436,
MAHARASHTRA, INDIA
CORPORATE@QUALITYPOWER.CO.IN
+91 233 2645432

QUALITY POWER ENGINEERING PROJECTS PVT. LTD.

ESTEEM PLAZA, 4TH MAIN ROAD,
UPPER PALACE ORCHARDS, SADASHIVANAGAR,
BENGALURU 560080, INDIA
PROJECTS@QUALITYPOWER.CO.IN
+91 80 2645432

ENDOKS ENERGY SYSTEMS LTD.

GERSAN SANAYI SITESI ERGAZI MH 2308,
06370, BATIKENT, YENIMAHALLE,
ANKARA, TURKEY
INFO@ENDOKS.COM.TR
+90 312 2560086

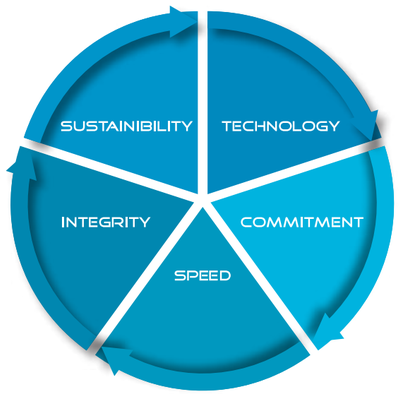
QUALITY POWER UK LTD.

2,PRESTWOOD PLACE, EAST PIMBO,
SKELMERSDALE, LANCASHIRE,
WN8 9QE, UNITED KINGDOM
SALES@QUALITYPOWERUK.COM
+44 1695 550677

QUALITY POWER

ABOUT US

Quality Power is a technology based provider of Power Products, Systems, Solutions and Services. Building on our core strengths of technology leadership, pioneering spirit and a sustainable approach to business, Quality Power helps its customers to become more profitable while lowering environmental impact. Founded in 2001, Quality Power operates multiple facilities in India, Turkey and United Kingdom employing over 250 skilled personnel in its activities. Quality power has been rated SE1A the highest in Financial and Market performance and also among top 50 SME companies Standard & Poor in India.



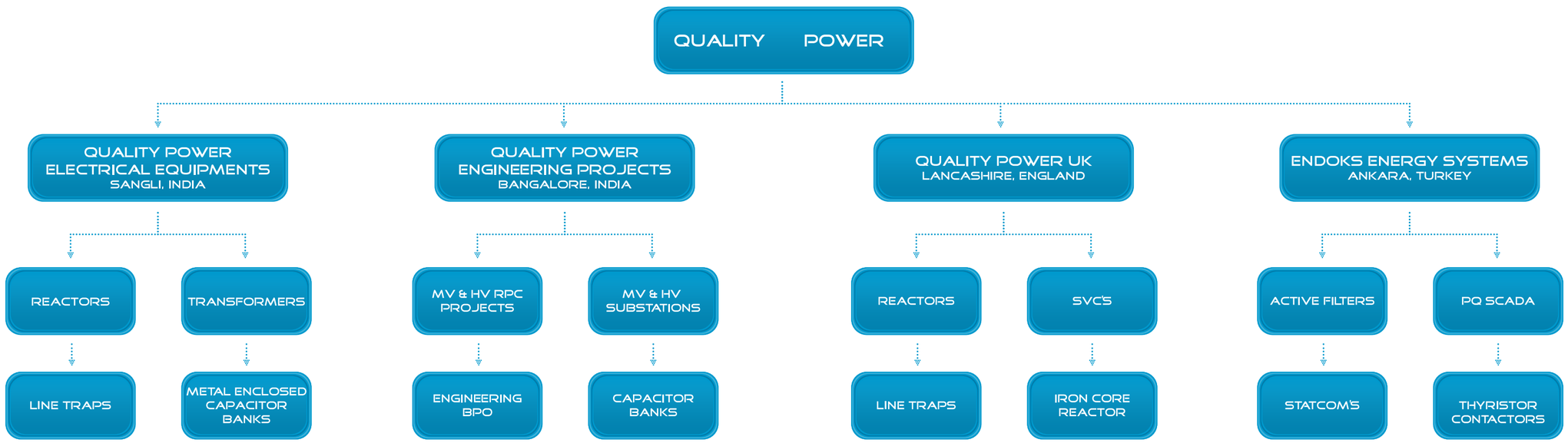
ABOUT US

Our international footprint assists in fueling the company's growth by allowing the business to draw on the multidisciplinary expertise available within the centers of competence we have established in the past 10 years through both organic growth and acquisition. The rich blend of cultures across the company enables us to develop strong and lasting relationships with our customers as part of our strategy of forming long term partnerships across the globe within our specialist field. We are seeking to build a strong and sustainable business for the long term founded upon a strong sense of ethics and with the company seeking to play our role as corporate citizens in order to find the right blend of profitable development within the context of fairness to suppliers staff and of course our clients.

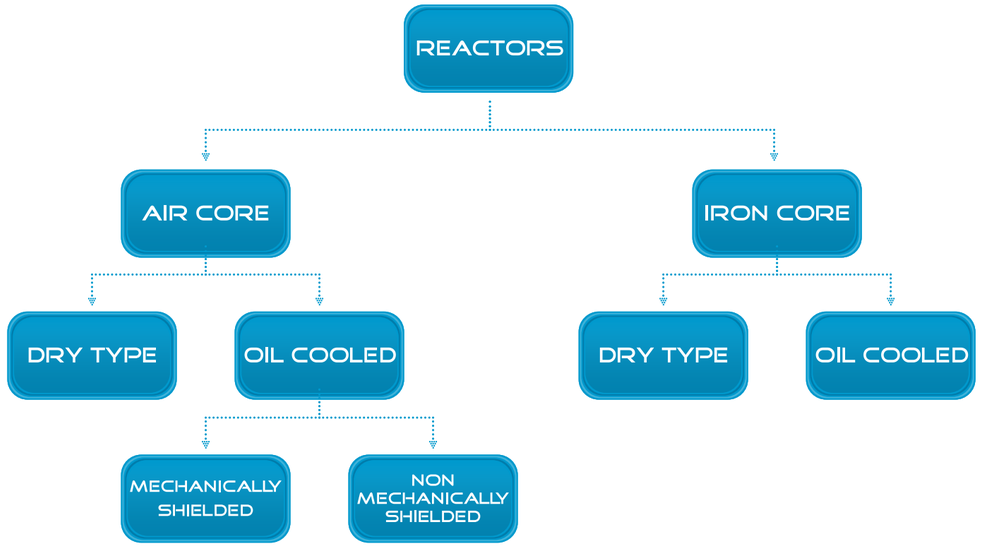
With our superior design technology & expertise we manufacture Reactors, Transformers, Line Traps, Capacitor Banks, Static VAR Compensators (SVC), Harmonic Filters, Active filters Thyristor contactors & SCADA systems in our various factories around the globe. The projects wing of the company undertakes turnkey Reactive Power Compensation Projects, Harmonic Filters and HV Substations. With a constant emphasis of R&D, Quality Power operates multiple factories & labs in India, Turkey and England for its 11 product categories.

Quality Power has a Global presence with a satisfied customer base in over 48 countries and a international spread of 28 Representative offices in Asia, Africa, Europe, North & South America.

For more details on the company and its other products please visit us
www.qualitypower.com, www.endoks.com.tr, www.qualitypoweruk.com



REACTORS



Properties	Iron Core Reactors	Air Core Reactors
V/I Linearity	Till the core saturates or 150% of rated current	Linear up to infinity current
Switching impulse & short circuit	Designed to meet the requirements	Can withstand higher level
Tolerance Limits	5% Tolerance Minimum	Can be designed to lower tolerance levels
Losses	Low	Slightly High
Weight	Compact	Large
Maintenance	Due to the presence of Air gap in the Core periodically inspection is required	Less Maintenance
Harmonics	Not Suitable	Suitable
Noise Level	High	Low
Transit Requirements	Air gaps may need to be tuned at sight	No tuning required

Properties	Oil Cooled Reactors Magnetically shielded / Non Magnetically shielded	Dry Type Reactors
V/I Linearity	Till the core saturates / Linear	Linear
Switching impulse and short circuit	Designed to meet the requirement	Use of Epoxy resin & fibreglass gives very high withstand ability
Fire retardant property	High Risk (because of oil & paper insulation)	Zero Risk (Fibreglass and epoxy resin is non-flammable)
Tolerance Limits	5% Tolerance Minimum	1% Tolerance Minimum
Losses	High due to MS Presence	Comparatively very less
Weight	Very Heavy	Light
Civil Work	Protective Wall & oil pump required apart from foundation	Only foundation required
Maintenance	Require Periodically	Nil
Harmonics	Not Suitable / Suitable but high	Most suitable / Reccomended
Transportation	Breakages & leakage possibilities due to enormous mass and mishandling	Small and light, it is compariitively very safe

REACTORS

DRY Q TECHNOLOGY

DESIGN & CONSTRUCTION

- Compliant with IEC60289 / IEC 60076 / IEEE C57 / IS 555-3 / Equivalent Standards
- 400V to 765kV
- Tolerance to specifications for better tuning of Harmonic Filters.
- Higher Efficiency up to 99%+
- Superior Insulation type tested up to 1050kVP system ratings with a long self life
- High resistance to short circuit forces due to Resin Impregnation Technology
- Type Tested up to 40kA/3 seconds short time currents
- 35MVAr per Phase.
- Proven Design & Technology with over 80 man years experience
- Precision Analysis Software
- High Q factor
- Low Noise
- Low Thermal Stress
- Rugged Construction

ENHANCED PROTECTION

- Enhanced Fire retardant Property
- Higher Creepage Insulators employed for All weather Protection
- Coated with special resins for UV protection.
- Coated with UV resistant high performance polyurethane paint.
- Silicone Protective RTV coat for protection against abrasion, corrosion and dust deposition.
- Fully Type Tested at Factory

REACTORS

HARMONIC FILTER, DAMPING AND DISCHARGE REACTORS ASSOCIATED WITH CAPACITORS

The typical applications include

• Filter reactors connected in series or in parallel with capacitors to reduce or block harmonics or control signals(ripple signals) with frequencies up to 10kHz

• Damping reactors connected in series with shunt capacitors to limit the inrush current when capacitor is energised, limit the outrush current during closing faults or adjacent capacitor switching and/or to detune capacitor banks in order to avoid resonance with the power system

• Discharge reactors used in the bypass/discharge circuit of high voltage power system series capacitor bank applications to limit the current under fault conditions.

The steady state voltage across these reactors is usually low compared to the system voltage; however switching will cause transient voltages at the resonant frequencies formed by the capacitors and reactors which may be considerably higher.

For filter and damping reactors under normal operation, the current flowing through the reactor is composed of a power frequency current and a superimposed harmonic current. For damping reactors, the power frequency current is usually much greater than the harmonic current whereas for filter reactors the specific application will determine the ratio of the two current components.

REACTORS

Harmonic filters, essentially consisting of reactors and capacitors are usually installed close to the source of harmonics in order to provide a low impedance path for connection of a filter reactor with a capacitor bank, which needs to be eliminated. If several harmonic frequencies need to be eliminated, a number of filters with different resonance frequencies will be connected to the bus system, for instance 3rd, 5th, 7th, 11th, 13th .. etc harmonic of the fundamental frequency (50Hz or 60Hz). If fine tuning of the filter is required, the filter reactor may be equipped with taps for inductance adjustment.

Discharge reactors do not carry a continuos current during normal service, but are normally specified with a continuos current to allow operation with the capacitor bypassed by the reactor.

Capacitor inrush current damping reactors are generally used in series with the capacitor bank either in the line or neutral side for limiting the switching inrush current. The rating varies from 0.2% to 13% for various applications. The short circuit withstand ability of the reactor is designed depending whether the reactor is placed on line or neutral side of the capacitor bank. They are extensively used with MV and HV capacitor banks.

Damping, discharge and some filter reactors are subject to high short time current during switching and fault conditions. Damping reactors may be switched very frequently often, several times a day and are therefore subject to routine transient over voltages. In some applications the fault currents arising from a short circuit across the capacitor need to be considered. Discharge reactors are usually installed with the associated series capacitor banks on an insulated platform. Therefore, the reactor insulation requirements are dictated by the insulation coordination for the series capacitor arrangement rather than by the system voltage. Quality Power manufactures highly efficient air core reactors for capacitor applications up to 800kV systems.

REACTORS

DIMINISHED 'Q' REACTORS

The 'Q' factor of a system is defined as

'Q' factor = REACTIVE POWER / ACTIVE POWER

For a dry type reactor, the Natural Q is well above 100. For special applications in high power consuming industries like Steel, for the stability of system frequency we provide "Diminished Q" rings atop the reactors which can be configured to the requisite Q levels. This provides an economic alternative to paralleling resistors to reactors.

THYRISTOR CONTROLLED REACTORS

A thyristor-controlled reactor (TCR) is connected in series with a bidirectional thyristor valve. The thyristor-controlled reactor is an important component of a Static VAr Compensator. The TCR reactor generates inductive reactive power of the SVC. TCR's are essentially shunt reactors, but the current is continuously regulated by the thyristor valves. The three phase reactors are delta connected and each phase is split into two coils and the thyristors are connected between the coils. The thyristor valve is phase-controlled. Equivalent reactance is varied continuously. In parallel with the circuit consisting of the series connection of the reactance and the thyristor valve, there may be an opposite reactance, usually consisting of a permanently connected, mechanically switched or thyristor switched capacitor.

REACTORS

By phase-controlled switching of the thyristor valve, the value of delivered reactive power can be set. Thyristor-controlled reactors can also be used for limiting voltage rises when circuits are open. The FC/TCR compensator consists of a fixed capacitor bank divided into several three-phase sections incorporating reactors, utilized also as high-order current harmonics filters, and parallel reactors whose fundamental current harmonic is controlled means of thyristor AC switches. The reactors' current can be controlled in a continuous manner from zero, if the switch is turned off, to its maximum value, when the reactor is directly connected to the source. Quality Power manufactures highly robust TCR's with Q factor > 175 up to 100MVAr ratings.

SERIES REACTORS FOR ELECTRIC ARC FURNACE

Series reactors are installed in the feeder system of an electric arc furnace (EAF) on the primary side of the furnace transformer in order to improve the efficiency of the furnace, especially during the melting process. By increasing the source impedance of the EAF power supply, the electric arc will be stabilized; the consumption of the graphite electrodes and the tap-to-tap time (melting cycle) will be reduced. The series reactors are commonly equipped with taps, typically in the range of 25% to 100% of the maximum inductance (usually in steps of 20 % or 25%), to optimize the power factor for a certain melting process / cycle.

NEUTRAL EARTHING REACTORS

The Neutral earthing reactor is connected between the neutral and the earth to limit to control the current. This kind of reactors include Single phase neutral earthing reactors for three phase power systems, reactors connected between the neutral of a power system and earth, reactors connected for limiting the line to earth current under system fault conditions. Neutral Earthing Reactors generally carry very little or no continuos current and the rated fault current and duration is normally always the deciding size of the coil. Neutral Earthing reactors are also used between the neutral of the shunt reactor and earth to suppress the arc during single pole switching of a transmission line.

Neutral grounding reactors are used for low-impedance grounding of the neutral point of three-phase networks in order to limit the fault current in the event of a phase to ground short circuit (fault current will be limited to the level of the phase to phase short-circuit current). One reactor terminal is connected to the neutral of the network and the other terminal is grounded.During normal operation of the power system the current flow through the reactor is almost zero, since it is only driven by the imbalance of the three-phase network. Dry type Air core reactors are normally preferred for this application due to its sturdy and rugged build which can easily withstand the mechanical forces during fault.

REACTORS

SHUNT REACTORS

This type of reactors are intended for connecting phase to earth, phase to neutral or between phases in a power system to compensate for capacitive current. The absorbed reactive power at rated voltage can be fixed or it may be adjusted by the use of additional means such as:

- Phase controlled switching by a power electronic device (like in SVC)
- DC Magnetisation of the iron core
- Winding taps for on load or off load setting

Under normal operation of a power system the current is essentially determined by the connected Ohmic and inductive loads. High voltage transmission lines and cables however have an inherent capacitance, causing a capacitive charging current. Thus capacitive VAr's are generated. In lightly loaded lines or cables this capacitive current will increase the voltage at the end of the line. By the use of shunt reactors the capacitive VAr's will be compensated and the voltage increase at the end of the line will be limited. The efficiency of the power system will be increased by allowing the transmission of more active energy. We manufacture Shunt reactors up to 33kV levels in both Air Core & Iron Core Types.

With regard to design and installation, the reactor can be identified as:

- Single Phase or Three Phase
- Dry Type of Liquid Immersed
- Air Core or Gapped Core
- With or without Magnetic Shield
- Indoor or Outdoor Installation
- Fixed or Variable Reactance
- Linear or Saturated

REACTORS

FAULT CURRENT LIMITING REACTORS

Current Limiting Reactors are connected in series with the power system essentially to damp the short circuit fault current. During normal operation, a continuos current flows through the reactor.
Current limiting reactors are now widely used to control fault currents in both utility and industrial power systems. The primary advantages of a current limiting reactor are:

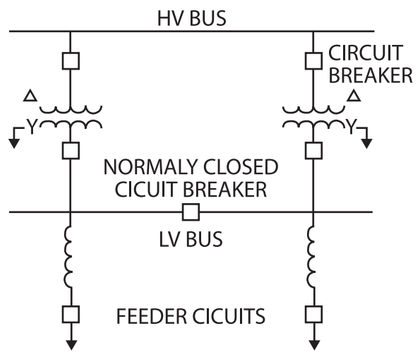
- Reduction of electromechanical loading and thermal stress of Transformers and switchgears
- Improvement of the stability of primary bus voltage during a fault on feederalizers and current limiting fuses
- Reduction of Line to line fault current to levels below those of line to ground faults or vice versa.
- Protection of distribution transformer and downstream power equipment and devices from the propagation of initial fast front voltage transients due to faults and circuit breaker operations.
- Allowance of complete control over steady state losses by meeting any specified Q Factor for any desired frequency. This feature helps for networks where high harmonic frequency currents are to be damped without increasing fundamental frequency loss.
- Increase in system reliability

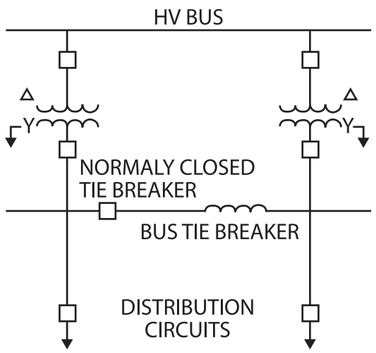
REACTORS

These type of reactors are briefly classifie as:

PHASE REACTORS

This type of reactor is connected in series with the transmission or distribution lines and is used to reduce fault level at the output of the reactor to the desirable level. They carry a continuos current during normal operation and hence Power loss is an important consideration. Dry Type air core reactors by design has a high Q factor and hence preferred for this application. A Low loss reactor can bring substantial benefit to the customer during course of life of the equipment.





BUS TIE REACTORS

These reactors are used to tie two or more feeders or power sources are connected to a single bus. It is desirable to sectionalize the bus due to high fault levels without losing operational flexibility. The advantage of a bus tie reactor is that if load is essentially balanced on both sides of the reactor under operating conditions, the reactor has negligible effect on voltage regulation or system losses. Quality Power can provide the customer a thorough solution which includes:

- Aluminum or Copper windings
- From 400V to 765kV
- System Study
- Power System ETAP Simulation
- PCC Foundation Engineering
- Turn Key Installation

The accessories of this type of reactors include:

- Silicone RTV Coat for Enhanced Abrasion protection
- Special Engineered Enclosures if installed indoors
- Connecting Structures, Busbars Flexible Links etc

REACTORS

LOAD FLOW REACTORS

The distribution of the load flow in complex interconnected power systems is determined by the voltage levels in the nodes of the electric power grid and the impedance of the transmission path. To optimize and to control the impedance of the transmission path, load flow reactors are connected in series to the high voltage transmission line. The use of load flow reactors in complex electric power grids is one the most costeffective solutions, to ensure the required load balancing within the grid system under normal continuous load conditions and/or under contingency overloads conditions.

OIL COOLED REACTORS

Quality Power manufactures a wide range of Oil cooled reactors for various applications. The details are as below:

IRON GAP CORE REACTORS

This type of reactors is used in HV transmission lines to compensate the Ferranti effect. Due to high impedance compared to the current, iron core reactors are more compact and thus are preferred by Utilities. These reactors are comparatively large and involve complex engineering to reduce losses and noise.

AIR CORE REACTORS

When space is a constraint and requirement of a on load tap changer from 0 to 100%, Air Core (Magnetically and Non Magnetically shielded) reactors deliver a economical and efficient solution. These reactors generally being in a series application, the short circuit currents are higher and hence face higher electro mechanical forces in the winding. Quality Power with its expertise can predict the forces involved and suitable mechanical assemblies are provided for the reactors.

The reactors are made with both Mineral and Biodegradable oil. Standard features of the Oil cooled reactors include temperature monitors and pressure relief devices.

TRANSFORMERS

DESCRIPTION

Quality Power has a transformer design experience for about a 135 Man Years. The production is based on the development and research carried out in the design department and at the Quality Power Research Team in close cooperation with our customers. This long experience combined with research and development, guarantees high quality, long life and reliability.

STANDARD FEATURES

The transformers are manufactured and tested in accordance with the International Standards IEC Publication 76 and Indian Standards IS 2026. The transformers can be overloaded in accordance with IEC Publications 354 (1972). The on-load tap- changer and bushings have been chosen so as not to limit the overload capability. The cooling methods are ONAN or ONAN/ONAF

CONSTRUCTION FEATURES

The transformers are of the breathing, conventional type provided with an oil conservator. Two types of transformer are manufactured :

1. Transformers with off-load tap changer
2. Transformers with on-load tap changer

CORE

The three legged bolt-less core is constructed of grain oriented steel laminations. The joints between the leg and yoke are mitred at 45° and interleaved. The cross section of the leg is circular.

WINDING

The material of the windings is either copper or aluminium. The windings are made of paper insulated rectangular wire in the form of multilayer, disc or helical windings. Transformers provided with on-load tapchanger usually have a separate tap winding.

EARTHING TRANSFORMERS

Earthing transformers are used to create a neutral point in a three-phase system, which provides possibility for neutral earthing. The earthing can be through an arc-suppression reactor, a neutral earthing reactor or resistor or directly.

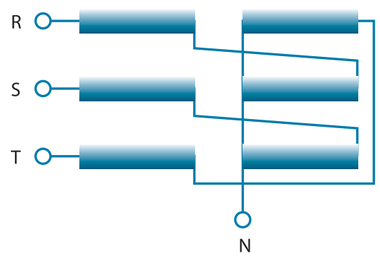
The design can be a transformer with just one winding, which is zigzag connected. The zero sequence impedance of such a winding is treated as 100% of the transformer impedance and is inversely proportional to the fault current rating. If the purpose is to limit the current through the transformer in case of an earth fault somewhere in the system. Figure shows the connection diagram.

During undisturbed system operation with balanced (symmetrical) voltages the current through the earthing transformer is small & of the same size as the magnetizing current. Unbalanced voltages will cause some higher currents flowing through the earthing transformer, which it must be capable to carry.

An alternative connection to the zigzag is star/delta connection where the delta connected winding will compensate the zero sequence magnetic fields so it will be confined to a leakage field between the star and the delta winding and make the zero sequence impedance of the transformer relatively small. However, if it is desired to increase the zero sequence impedance, this can be achieved by opening the delta connection and inserting a reactor or resistor. It is possible to provide the earthing transformer with a secondary winding for continuous auxiliary station supply.

If the earthing transformer is used for directly earthing or through a current limiting reactor, the neutral current through the transformer will be high but the duration is limited to a few seconds. Earthing transformer must be designed to withstand the thermal and mechanical effects of the rated neutral current. The characteristic of earthing transformer should be selected to match the property of the system. Quality Power Manufactures Earthing Transformers upto 66kV as per IEC60289, IEC60076 and various national standards.

ZIG ZAG CONNECTION:



TRANSFORMERS

CONVERTER DUTY TRANSFORMER

One of the main differences from other types of transformers is that the load currents contain higher harmonics due to the distorted waveform. The converter to the transformer causes the distorted current waveform. This has to be considered as distorted current leads to higher losses & temperatures in the transformer. At inquiry and order, the technical specification for the convertor transformer needs some additional information compared to power transformer specifications. Such information involves winding current waveform, i.e. The harmonic content.

The transformer is designed to feed the full load requirement in spite of the presence of harmonics in the circuit due to converter load. The harmonic content in a converter transformer is much higher than a convention power transformer. There are additional load losses due to the presence of harmonic currents in windings. High leakage flux is produced by these harmonics. The stray flux due to these harmonics causes additional stray and eddy losses not only in the winding conductors but also in transformer tank and steel structure. These losses cause local hot spots. To overcome such occurrence requires proper selection of winding conductor in critical field provision of suitable magnetic shunts, directed oil flow for effective cooling along with additional cooling equipment. There may also be special requirements regarding tolerances on the transformer short circuit impedance because this impedance influences the efficiency of the electrolysis process.

FURNACE TRANSFORMER

Transformers of this type are used in the steel melting & metallurgical industry. They are characterized by high secondary current & a wide secondary voltage range. The secondary voltage is normally regulated by an on-load tab changer (OLTC) located in the high voltage winding or in an intermediate circuit of a two-core design (booster regulation) within the transformer tank. Furnace transformers have secondary voltages up to 1500 v. Furnaces transformer needs to be engineered for the various types of furnaces like:

- AC Furnaces
- Arc furnaces
- Reduction furnaces
- Furnaces for special purposes
- DC Furnaces

DRY TYPE TRANSFORMERS

Dry type transformers, which cool by air ventilation, provide excellent, low-heat service in small enclosures and indoor situations where oil leakage could cause a fire or significant environmental hazard. Clearly, a system without these threats offers enhanced safety for indoor applications. A dry type transformer will typically incorporate a design with greater internal clearances to allow for better heat dissipation. The transformer can be close to the load, minimizing secondary line losses. The dry type transformer also reduces maintenance. The dry type transformers are used in Industries, Oil & Gas installations and commercial buildings where reliability and safety are mandatory. Quality Power manufacturers Vacuum Pressure Impregnated type transformers up to 33kV, 3 MVA for both distribution and also special applications.

There are various accessories for dry type transformers like:

- IPxx Enclosures
- Tap changers
- Digital Protection Monitoring & Protection equipments
- Switchgears & Lighting Protection
- Cooling Fans
- "SMART" SCADA compatibility

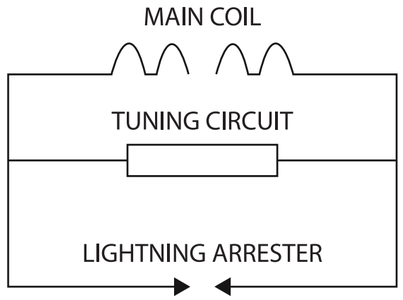
Quality Power is a global OEM of dry type transformer for various Multinationals for their Oil & Gas verticals.

SPECIAL PURPOSE TRANSFORMER

Quality Power exclusively designs and manufacturers custom build Power Transformers for various special applications like reffussion, STATCON, Traction, Single phase transformers for customers upto 66 kV and 20MVA.

LINE TRAPS

Line Traps are used in Power Line Carrier Communication (PLCC) Systems. It is a parallel resonant circuit which offers high impedance at the tuned frequency by connecting a tuning device in parallel with the main coil, the attenuation and high frequency impedance characteristics of the power line can be made. The line trap is an assembly of three main components:



MAIN COIL

- Rugged Construction as per IEC 60353
- Dry Q Coil technology
- Class F Insulation.
- Lowest losses. High Q factor
- Low Temperature stress
- Compact Dimensions & Adaptable Mounting Features
- Lower weights
- Silicone coated RTV resin coat.
- Coated with UV resistant special polyurethane paint.

TUNING CIRCUIT

- High Quality Tuning components
- High Frequency Performance
- Resin Encapsulated
- Dielectrically tested
- Narrow band / wide band
- Multiple Tuning in single pot

Compact and sturdy

PROTECTIVE DEVICE

- Transient Overvoltage Protection
- Polymeric Construction
- Light and compact

The line trap is connected in series with the transmission line. The main coil is designed to carry the rated power frequency current as well as to withstand the fault levels of sub-station equipment. It allows the

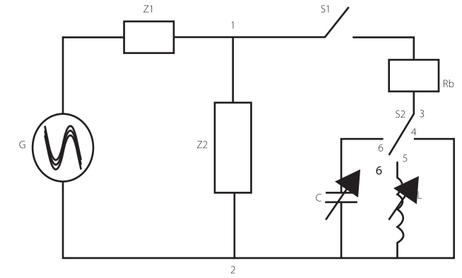
LINE TRAPS

passage to power frequency currents and blocks the high frequency currents with the help of tuning circuit. The tuning circuit in conjunction with the inductance of the mail coil forms a band stop filter. It ensures that the line trap offers high impedance to carrier currents under all conditions including resonance.

The tuning circuit can be single band tuned or programmable for multiple bands (usually two to three bands). The tuning circuit is housed in a weather proof enclosure filled with resin/foam to prevent it from the weather conditions.

The lightning arrester ensures protection against surge voltages. The lightning arrester can be gapless or gapped type.

The line traps conform to IEC standard 60353.



The measuring circuit for determining the tapping loss is shown above. The tapping losses are calculated by the following formula:

$$\text{Tapping loss based on the blocking resistance (A+R)} = 20 \log 10 \frac{U1}{U2} \text{ dB}$$

$$= 20 \log 10 \left(1 + \frac{Z1}{Rb}\right)$$

Where:

Z1 = Resistance equivalent to the characteristic impedance of the line
Rb = Blocking resistance
U1 = Voltage at terminals 1 and 2 when the switch S1 is open
U2 = Voltage at terminals 1 and 2 when switch S1 is closed and switch S2 is in position 3 – 5 when measuring tapping loss based on blocking resistance.

The line traps manufactured by Quality Power are of encapsulated design. This design does not require spacers between each turn of the main coil. Further, they are low loss type thereby reducing the transmission loss and saving for the customer. The low loss line trap produce less heat resulting into longer life for the insulation and the line trap.

LINE TRAPS

TYPE OF MOUNTING & OPTIONAL ACCESSORIES

	Suspension Type	CVT Mounted	Insulator Mounting
Voltage	66kV - 765kV	66kV - 220kV	66kV - 765kV
Insulators	✓		✓
Non Magnetic Mounting Pedestral		✓	
Bird Barrier	✓	✓	✓
Steel Structure			✓
Dual Band Tuning Pot	✓	✓	✓
Terminal Connecters	✓	✓	✓

LINE TRAPS

The standard ratings of the line trap are given as per the table below.

Type	Air Core, Dry Type, Resin Impregnated													
Winding Conductor of Main Coil	Aluminium													
Rated Maximum Voltage (kV)	132	132	220						400		765			
Rated Current (Amps)	630	630	800	800	1250	1250	1600	1600	2000	2000	3150	3150	4000	4000
Rated Frequency (Hz)	50 / 60													
Rated Inductance (mH)	0.2	0.5	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1
Blocking Bandwidth (kHz)	260 - 500	150 - 500	150 - 500	90 - 500	150 - 500	90 - 500	150 - 500	90 - 500	150 - 500	90 - 500	90 - 500	150 - 500	90 - 500	150 - 500
Type of Blocking Bandwidth	Narrow Band	Wide Band												
Minimum Resistive Value of Impedance (Ohms)	> = 570													
Natural Resonance Frequency (kHz)	> 500													
Max Temperature Rise at Rated Current (°C)	90													
Rated Short Time Current for 1 Second (kA) IEC Series 1	16	16	20	20	31.5	31.5	40	40	40	40	40		63	
Rated Short Time Current for 1 Second (kA) IEC Series 2	20	20	25	25	40	40	50	50	50	50	50		80	
Radio Interference Voltage (micro V)	> = 2500													

More ratings and details can be provided on specific request.