
COILINNOVATION
POWER INDUCTORS

WE ARE PREPARED TO SWIM AGAINST THE CURRENT!

This may sound strange for a firm specialising in power inductors for electrical power systems but in a world of constant change, standstill is tantamount to going backwards. Innovation is the key for a successful future. It is the basis for sustained competitiveness. We are therefore committed to product development, which is only limited by the provisions of physical laws.
Join us on our way!

COIL INNOVATION

Coil Innovation specialises in the design, manufacture and sales of power inductors for electrical power systems, especially of air-core dry-type reactors.

The company was founded in July 2004 as a private limited company by a team with a wealth of experience in this branch of business and a high degree of product knowledge. The founders form the core operational team of the company and hold the majority of the shares. They are supported by a young, motivated and highly-qualified team of employees. The rest of the shares are held by strategic partners, for example by the Haase Company, located in Graz, Austria, which is a key supplier, providing the aluminum conductor material for the manufacture of air-core dry-type reactor windings.

For the manufacture of power inductors, modern production facilities, were built in Eferding, in the heart of Upper-Austria, consisting of approximately 1.350 m^2 of production area and 600 m^2 of office area. As well as innovative production equipment, Coil Innovation disposes of a state of the art high voltage testing laboratory.

INNOVATION AND QUALITY

Innovation and quality are the key elements of the strategic alignment of Coil Innovation.

This is reflected in our newly-developed manufacturing equipment, cross-linking several production steps to an integrated process by means of an adaptive control system. By this quality-focussed innovation, manufacturing tolerances are respected and essentially eliminated.

Coil Innovation has a modern high voltage test laboratory, which is - among other things - equipped with the following testing facilities:

- Impulse voltage test system
- AC high voltage test system
- Test system to perform AC load tests, consisting of a transformer aggregate, a capacitor bank to generate reactive power and precision instrument transformers
- Test system to perform DC load tests, consisting of a transformer aggregate, a rectifier and precision current shunts (current viewing resistors)
- Fibre optic temperature measurement system for heat run tests on reactors
- Programmable AC power source, high precision watt meter and high precision micro-ohmmeter

AIR-CORE DRY-TYPE REACTORS IN GENERAL

Air-core dry-type reactors are mainly employed in electric power transmission and distribution systems as well as in electric power systems of electrical plants. They are installed to protect these systems and to increase their efficiency.

As a special application air-core dry-type reactors will also be used in electrical test laboratories and research institutions.

With the ongoing development of electrical power technology, especially through the increased use of semiconductors in electric power systems, the requirements of power inductors have changed during the last decades. The application spectrum for air-core dry-type reactors has been extended, caused by economic advantages of the air-core reactor technology in comparison with iron-core reactors and by the benefits of the linear characteristics of air-core reactors.

The utilization of new weatherproof insulation materials and advanced manufacturing technologies have facilitated the use of air-core dry-type reactors up to the highest voltage and power levels.

Air-core dry-type reactors do not utilize an oil insulation system. They are environmentally-friendly and there are no fire hazard concerns. Furthermore, air-core dry-type reactors are essentially maintenance-free.

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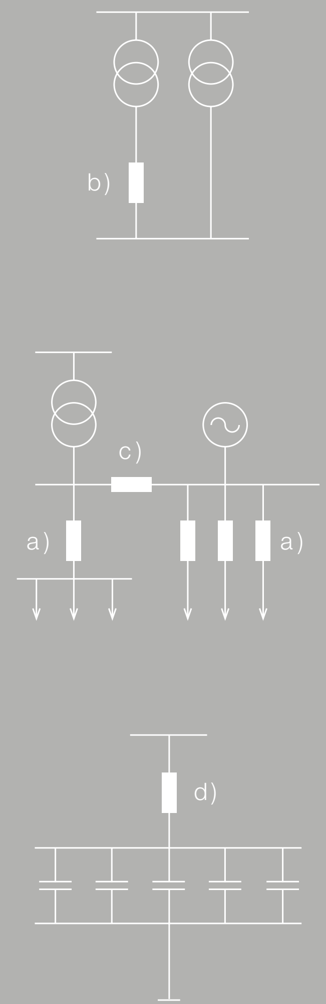
CURRENT LIMITING REACTORS

Current limiting reactors (a) are series connected to the transmission/distribution line or to the feeder in order to limit the short-circuit power on the load side of the reactor. The reactor limits the short-circuit current to a level which can be handled by the components installed in the electrical system, such as breakers, switches or fuses. This represents the classical application of air-core reactors. Due to the linear inductance-characteristics over the current range the full reactor impedance is also maintained during system fault conditions.

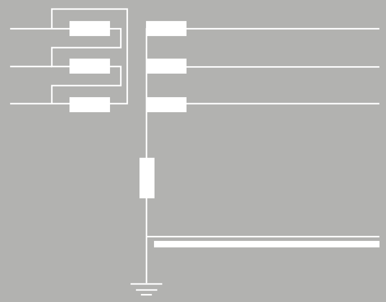
Other special applications of current limiting reactors are:

- Load balancing reactors (b) for load sharing in parallel circuits
- Bus tie reactors (c) installed between two different bus systems
- Capacitor inrush current limiting or damping reactors (d)



NEUTRAL GROUNDING REACTORS

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.



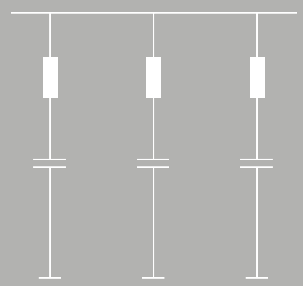
HARMONIC FILTER REACTORS

Harmonics are generated by non-linear components and loads in the power system. In electrical power engineering a number of such non-linear loads exist, in components and devices such as welding machines, electronic drive systems or fluorescent lighting.

Harmonic currents may have an adverse effect on different electrical components. These include transformers, switches, capacitors, fuses and relays. The detrimental effects are increased losses and heating and/or excessive dielectric stresses. Electric utilities very often impose high charges when certain maximum levels of harmonic distortion are exceeded.

Therefore harmonic currents have to be eliminated by filters. These 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 the harmonic currents. This is achieved by series connection of a filter reactor with a capacitor bank, forming a filter circuit tuned to the harmonic frequency 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 the 3rd, 5th and 7th 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.



SHUNT REACTORS

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 VArs 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 VArs 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.

Air-core dry-type shunt reactors are normally connected to the tertiary winding (e.g. at 20kV) of the high voltage transformer (e.g. 400kV/110kV transformers) (a). For system voltages up to 115kV, air-core dry-type shunt reactors can also be directly connected to the system (b).

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 optimise 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 of the most cost-effective solutions, to ensure the required load balancing within the grid system under normal continuous load conditions and/or under contingency overload conditions.

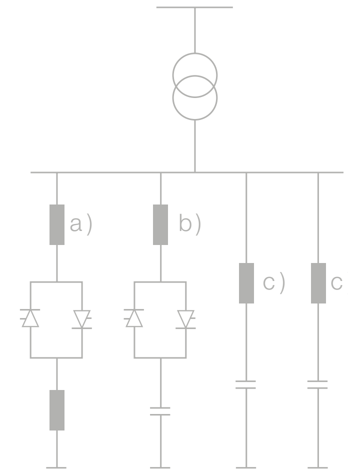
REACTORS FOR STATIC VAR COMPENSATION (SVC)

In order to improve power system transmission and distribution performance and stability Static Var Compensation (SVC-) Systems are installed by electric utilities.

Thyristor controlled reactors (a), called TCRs are major components of an SVC system. They are commonly used in combination with switched shunt capacitors to provide variable reactive power as required. To limit the inrush current of the capacitors, series connected damping reactors (b) are inserted ahead of the capacitor bank. The power semi-conductors used in an SVC scheme generate harmonics, which need to be eliminated by harmonic filters. Therefore in an SVC system harmonic filter reactors (c) are employed as well.

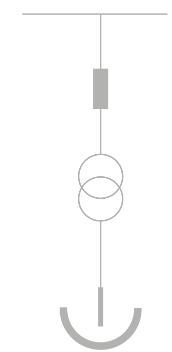
Demands for increased production and more stringent regulations regarding admissible network disturbances make reactive power compensation a profitable solution in industry as well.

A typical example for an industrial load that would cause inconvenience to consumers, is an electric arc furnace (EAF) in a steel works. The extreme load fluctuations during the scrap melting process require dynamic reactive power compensation in order to provide stable and steady voltage support for the electric arc furnace and to minimize network disturbances. SVC systems for electric arc furnaces therefore represent the key application for SVC reactors, in particular for thyristor controlled reactors.



SERIES REACTOR FOR ELECTRIC ARC FURNACES

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 stabilised, 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 40 to 100% of the maximum inductance (usually in steps of 15% or 20%), to optimize the power factor for a certain melting process/cycle.



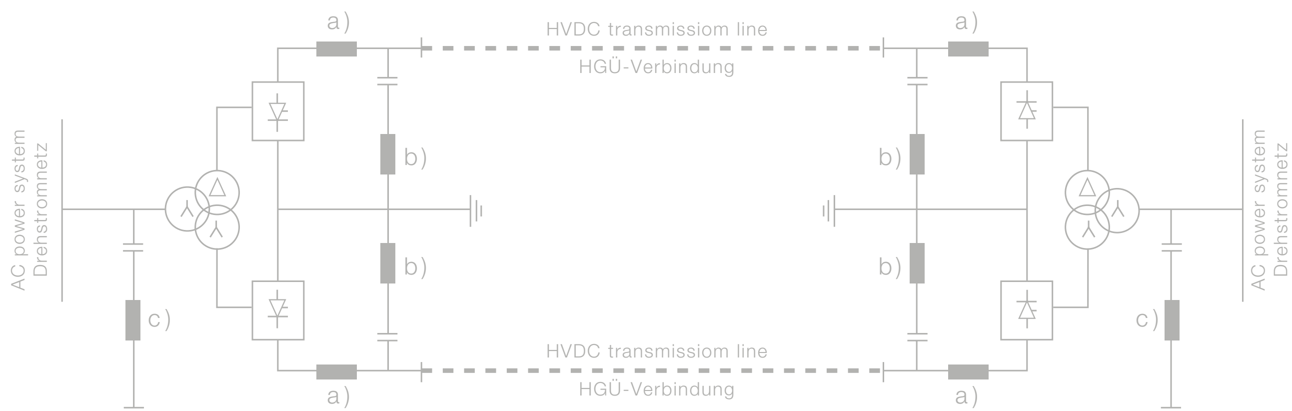
REACTORS FOR HIGH VOLTAGE DC TRANSMISSION (HVDC)

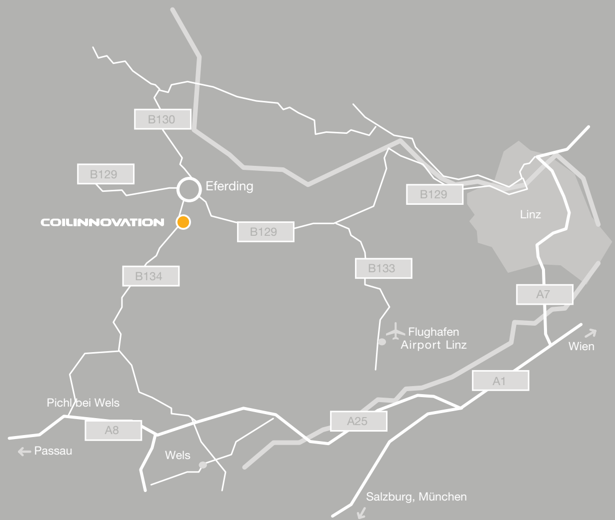
High-voltage direct current (HVDC-) technology is employed, if electrical bulk power has to be transmitted over long distances by overhead lines or submarine cables. It is also used to interconnect independent AC power sytems by so-called back-to-back interconnectors, when traditional alternating AC connections can't be used. This might be the case, if the AC power systems are operating asynchronously or when the traditional AC connection of the power systems would result in a too high short-circuit power level.

In an HVDC system air-core dry-type reactors are major components and are used for various purposes. As an example the one-line diagram below shows a typical HVDC system.

HVDC smoothing reactors (a) are connected in series with the HVDC transmission line or in the intermediate DC circuit of a back-to-back interconnector. They are installed for the purpose of reducing the harmonic currents in the DC system, reducing the rate of current increase during fault conditions and of improving the dynamic stability of the HVDC system.

HVDC filter reactors are installed on the AC side (c) as well as on the DC side (b) of the converter station. AC filters serve two purposes at the same time, providing reactive power and reducing harmonic currents.





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