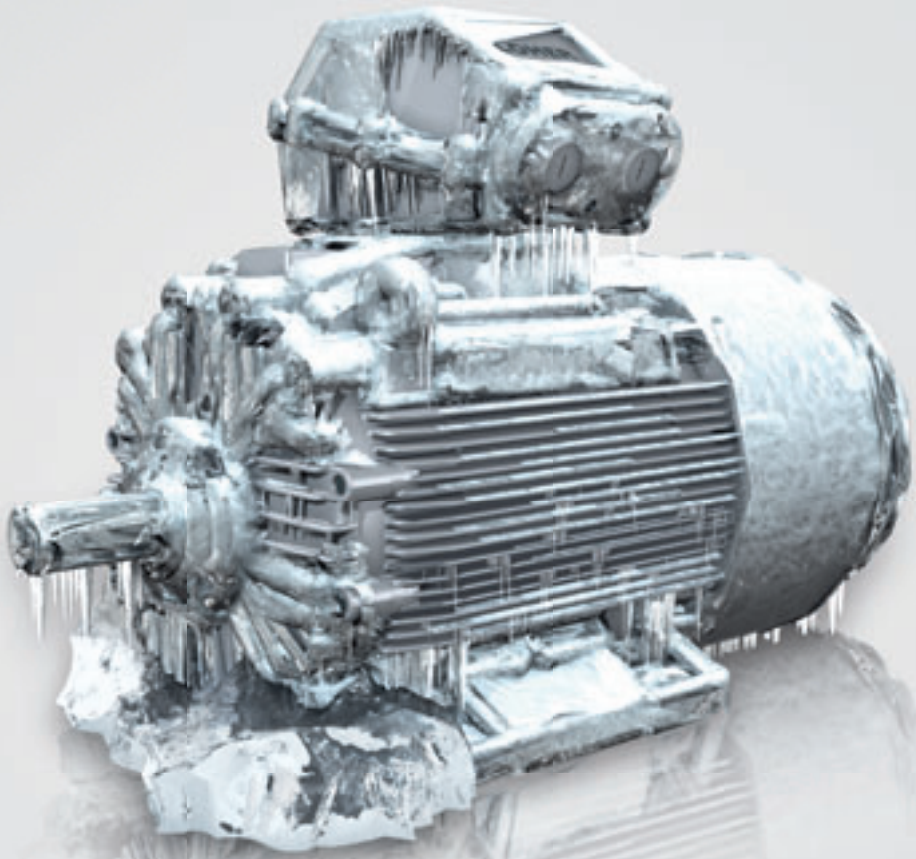
Inherently rugged: Tailor-made drive solutions for extreme applications



Drive Systems

LOHER

The No. 1 for customer- and sector-specific drive solutions in the process industry

Loher GmbH has been producing electric drive systems for over 110 years. The company, with its headquarters in Ruhstorf, close to Passau in Germany, specializes in drive solutions for hazardous zones as well as other extreme locations. As technology leader in this area, Loher has maintained its flexibility that is typical for a medium-sized company.

Precise fit for every requirement ...
Loher's hallmark stands for drive solutions that are precisely tailored to specific customer and sector requirements. This also applies to out-of-the-ordinary specifications and special demands. The specialists from Loher work closely with their customers in order to guarantee that this is achieved.

Based on its well-proven standard platforms, Loher adapts its motors and drive inverters to the specific project – with the highest degree of flexibility and precision. This includes the mechanical and electrical design as well as special monitoring devices and cooling types. This means that quite individual drive systems are created, tailored to the particular plant, application or customer specifications. Even the most complex drives can be implemented over the complete power range. The development and production of highly specialized motors from special components is routine for Loher – this is also true when it comes to addressing quite exceptional demands – such as 6-phase motors.

... and at home in extreme locations
Loher always precisely adapts its drive solutions to the specific requirements of the application – and it doesn't matter just how extreme the particular location is. The portfolio includes, among other things:

- Explosion-protected drives in all of the usual types of protection
- Winch drives that can be mounted unprotected on the deck of a ship
- Sub-sea components to pump mineral resources from the depths of the ocean
- Drilling drives to drill tunnels or to mine coal underground
- Smoke extraction motors that ensure disturbance-free operation even under extreme heat
- Vibration- and shock-resistant motors that can be used in earthquake zones
- Motors for desert regions – especially designed so that they can withstand the effects of heat, dust and sand storms
- Low-temperature drives for applications in frigid polar climates

The leading experts for all aspects of explosion-protected drives

Already back in 1960, Loher played a leading role when it came to explosion-protected drives. Since then, the company has enjoyed an excellent reputation, is clearly recognized as being an expert in this field and has been able to continuously expand its No. 1 position.

In all applicable types of explosion protection – from 0.1 kW ...
Loher supplies motors, depending on the classification, in all of the applicable types of protection – from 0.1 to 10,000 kW. Even in explosive atmospheres, these motors ensure reliable operation and the maximum degree of safety for man, machine and the environment. The seamless range from Loher encompasses dust-explosion protection in hazardous Zones 21 and 22 as well as type of protection Ex n (non-sparking) for Zone 2 – where sparks that could potentially cause an explosion are prevented from occurring. Loher motors also cover Zone 1 with the following types of protection: Pressurized enclosure Ex p (here, an inert gas is kept under pressure inside the motor to prevent explosive gases from entering it), Ex e (increased safety that prevents inadmissibly high temperatures from occurring at all of the motor parts) as well as flameproof motors Ex d. With this type of protection, the motor is designed so that an explosion inside the motor cannot be propagated outside the motor and at the same time the motor frame can withstand the pressure due to an explosion.

... up into the Megawatt range
Especially for flameproof motors, Loher has a range of motors that extends up into the Megawatt range; when it comes to scope and performance, this range is second to none – and this applies worldwide. This range addresses applications involving explosive gases in the chemical and petrochemical industries, oil & gas and also for Group I firedamp-proof motors in the mining sector.

Double protection for maximum safety
The Loher portfolio also includes drive solutions with double protection: On one hand, this is a combination of gas and dust explosion protection for hazardous locations where fine dusts and explosive gases can occur – whether in the process industry or in mining. The other possibility is Ex d and Ex e double protection. This type of double protection makes sense, for example, on board liquid gas tankers where electrical equipment must be absolutely ruled out as a possible source of ignition due to the hazardous load that the tankers are transporting.

To achieve this, Loher uses a "flameproof enclosure" mechanical design and at the same time ensures that the temperatures of the active parts correspond to type of protection "increased safety."

Explosion-proof motors are available in a rib-cooled version; for high power ratings, pipe-cooled motors are available or motors with mounted heat exchangers (air/air or air/water) – and then normally in a pressurized enclosure Ex p. Every type of Ex d motor is individually tested in the plant to ensure that it is pressure-tight. And it goes without saying that they are ATEX-certified – but they also have country-specific certificates – such as GOST (Russia) and NEPSI (China).

Drive inverter technology tailored to explosion protection
Loher also offers drive inverters that are precisely matched to their explosion-protected motors. The experience and competence of the motor manufacturer has been incorporated in quite a special way in the mechanical design of these drive inverters. In this case, the focus was on the special requirements of explosion-protected motors. When equipping the drive inverter with the optional ATEX-certified temperature monitoring function, the explosion-protected motor can be operated without having to use an external line contactor that is generally required. A certified thermistor relay is also not required. The PTC temperature sensors can be directly evaluated by the drive inverter.

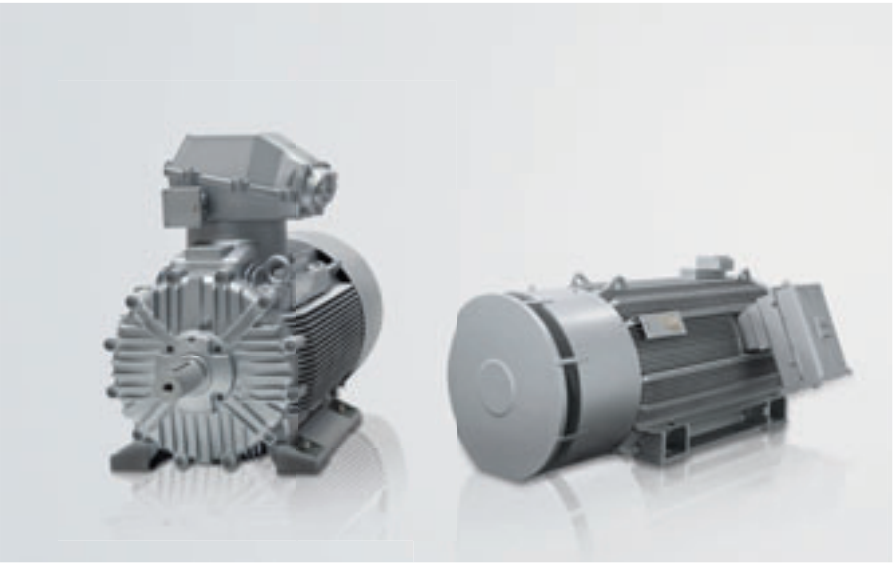
First-class industry sector solutions for sophisticated tasks

With its seamless range of explosion-protected motors, Loher is the ideal partner for the oil & gas, chemical and petrochemical industries as well as for the mining and marine sectors. In these sectors, especially pumps and compressors, but also fans, centrifuges, mixers and extruders are often located in hazardous zones. Extreme temperatures and aggressive atmospheres frequently compound the situation. Customized drive solutions from Loher are precisely predestined to cope with such extreme requirements.

Loher CHEMSTAR motor: The star for the chemical and petrochemical industries
On the motor side, for lower and average power ratings, Loher CHEMSTAR motors ensure maximum safety, the highest degree of availability and low operating costs. This series of motors covers a power range extending from 0.25 to 250 kW with all of the usual types of protection. For Loher CHEMSTAR motors, gas and dust explosion protection can be combined just the same as the double protection Ex d and Ex e. Versions in sector-specific designs open up a whole raft of application possibilities: For instance, a high-quality paint finish, which is especially resistant to chemicals, and a galvanized fan cowl provide protection against corrosion in aggressive atmospheres.

Frequently, it is not necessary to equip Loher CHEMSTAR motors with anti-condensation heating – even for extremely high air humidities. These motors operate reliably at temperatures extending from –55°C all the way up to +70°C – even in zones with dust and gas. This means that they are admirably suited for use in deserts and polar regions. When specified, motor versions are available with corrosion-resistant stainless steel screws and bolts. Shaft seals with degree of protection IP66 offer protection against water and dust and as a consequence, the motors can be mounted outdoors without any problem.

Loher CHEMSTAR motors have, as standard, IP55 degree of protection. However, the degree of protection extends up to IP67. Their frame is manufactured out of rugged cast iron. The following are optionally available – including reinforced bearings and integrated PTC thermistors. Loher CHEMSTAR motors are supplied with industry sector-specific documentation, including ATEX certification for the chemical and petrochemical industries.



VARIO: High-voltage motors for maximum safety and availability in the oil and gas industry
VARIO high-voltage motors are always the first choice where a higher power rating is required. The VARIO series extends the power ratings of Loher CHEMSTAR motors upwards into the Megawatt range. These motors are mainly used in the oil & gas sector where high rating pumps and compressors are required to pump and transport media: In all hazardous zones up to Gas Group II C in compliance with explosion protection Class II 2 GEx de II C T4.

Just like the Loher CHEMSTAR motors, the VARIO motors are also certified across the board in compliance with ATEX, NEPSI and GOST – even for low temperatures. This means that they are also admirably suited for applications in oil & gas fields in cold regions – for instance in Canada, Alaska and Siberia. VARIO rib-cooled high-voltage flameproof motors with shaft height 630 are now replacing the previous pipe-cooled motors of this type with shaft heights 630 and 710. This means that the range of rib-cooled Ex d motors extends up to approx. 2,800 kW.

These rib-cooled explosion-protected motors are lighter, have smaller dimensions, are quieter and have an excellent degree of power utilization. When equipped with roller bearings, they are predestined to address applications in Zone 1, including highly explosive environments containing hydrogen.

Special solutions for exceptional situations

Loher is also at home when it comes to very special motors. The company implements solutions that leave no demands open, even under the most extreme conditions – demands relating to performance and reliability.

Deep-sea components
Loher developed its sub-sea components specifically for use on the sea bed. These deep-sea motors have been symbolic for high reliability for many years. They operate perfectly even in depths down to 1,000 meters – in spite of the enormous pressure that prevails at this depth and although they are completely submerged in saltwater. These motors drive pumps, multi-phase pumps and compressors and therefore play their role in optimally exploiting oil and gas fields.

Platform drives
Drive systems used on drilling platforms must comply with extremely stringent standards. Loher platform motors are in complete compliance with these standards. Both in general terms, regarding reliability, monitoring equipment and the integration of the motors into monitoring systems used throughout the complete platform. However, they are also in full compliance with standards relating to the particular application, for instance, with regulations associated with protection against ice in polar regions.

All of the platform motors have a special offshore paint finish to protect them against salt-laden sea air. Bolts, screws and other exposed parts and components are manufactured out of stainless steel.

Integrated pump drives
Special Loher motors, which are integrated into pumps, are used in the chemical industry. They reliably operate under extreme pressure and temperature: Here, temperatures can extend from –50°C all the way up to +400°C and pressure levels of up to 1,200 bar are frequently encountered.

Ammonia-proof three-phase motors
Ammonia-proof three-phase motors are just another example for process-specific solutions from Loher. With these motors, all of the parts inside the motor that come into contact with the gas are resistant to ammonia. Their complete frame is pressure-tight.

Generator systems for wind turbines

We have a leading position in the global market for generator systems for wind turbines. We supply via Winergy AG as an exclusive distribution partner systems, generators and inverters extending up to over 5 MW – for both onshore and offshore applications. Our portfolio includes perfectly coordinated and harmonized systems to address the widest range of these environmentally-friendly power generators: Synchronous or induction generators, with air/air, air/water or water jacket cooling.

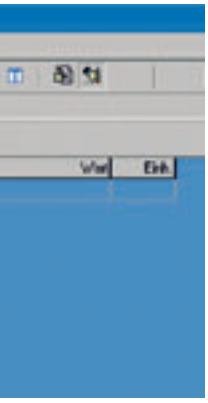
Emission-free power generation at the highest level
Our systems distinguish themselves as a result of their maximum yield and availability, are convincing thanks to their low operating costs and are perfectly adapted to the particular wind turbine type. Frequently, induction generators are designed as double-fed slip-ring rotor generators as these operate especially cost-effectively. The control characteristics of these generators allow a significantly lower rating inverter to be used than for conventional generator types where the frequency inverter must be dimensioned for the full power rating of the system.

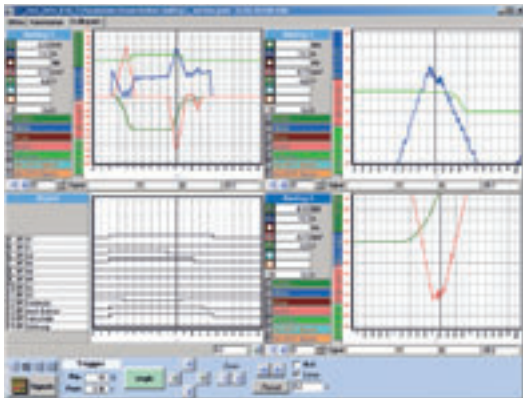
Optimized over the complete operating period
Another significant advantage of our generators: Their brush/slip ring combination that has been optimized for a long service lifetime. The mechanical design of the generators means that their bearings can be changed in the wind turbine gondola – and an efficiency characteristic for optimized output with increased power factor ensures a high energy yield. For salt-laden environments, our special paint systems guarantee optimum corrosion protection for both onshore and offshore applications.

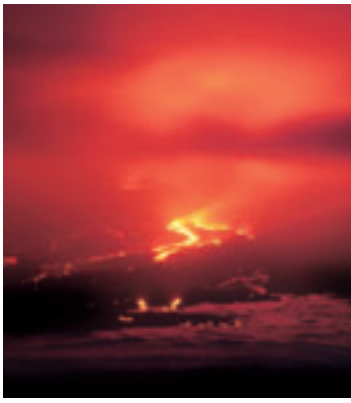
First choice for all specific control types
State-of-the-art wind turbines are equipped with frequency inverters for variable-speed operation. As a result of the variable speed, operation continuously adapts itself to the fluctuating wind velocities, therefore always achieving the optimum efficiency. The power generation of the wind turbine system is decoupled from the line frequency. This allows the wind turbine system to always operate at its optimum efficiency even at different speeds. Our special wind turbine inverters equipped with state-of-the-art IGBT technology handle all control types typical for wind turbines. This also applies to the very special characteristics of double-fed induction generators. They fully comply with the requirements regarding good electrical line supply compatibility – that are increasingly becoming more and more stringent – especially for wind turbine systems in the Megawatt class.

The drive inverter for the chemical and petrochemical industries: DYNAVERT T

With its DYNAVERT® T, Loher is offering drive inverters that have been precisely tailored to the high requirements of the chemical and petrochemical industries regarding availability, service-friendliness and long service lifetime. With a power range from 2.2 to 3,900 kW, they are available in all of the voltage classes typically encountered in the sectors – naturally also for 500 V and 690 V.







Optimally equipped as standard
From the word go, DYNAVERT was specifically designed for the chemical and petrochemical industries, power utility and supply industry and applications in general machinery construction. DYNAVERT can be flexibly integrated into each and every automation concept – whether conventionally controlled or via a bus system (PROFIBUS DP/ Modbus). Here, what is worth highlighting are features such as the control terminal strip according to NAMUR Recommendation NE37 and protective separation in compliance with PELV/VDE 0106/EN 50178. The all-in-one philosophy with standard integrated line filter, output filter and line reactor (or DC reactor) means that DYNAVERT inverters can be optimally adapted to the specific requirements of the motor and line supply.

Well-conceived option packages
Beyond these basic industry sector-specific features, DYNAVERT T drive inverters are admirably suited for controlling explosion-protected motors (applications in Zones 1, 2, 21, 22). They can be optionally equipped with an ATEX-certified PTC thermistor device without the dimensions having to be changed. When compared to the generally used three-phase disconnection from the line supply using a contactor in the drive inverter feeder cable, a motor located in a hazardous zone is safely shut down if the integrated PTC thermistor sensor responds. The drive is shut down via the power electronics (2 redundant shutdown paths, drive risk evaluation according to EN 1050, analysis of the safety-relevant off circuit according to EN 954-1 Category 3 or Category 3 according to EN ISO 13849-2). An external line contactor and ATEX-certified PTC relay can then be eliminated.

Additional accessories distinguish this series – for instance, a main switch that can be integrated, safe stop input and water cooling.

An extensive modular system allows the different versions to be adapted to create customized solutions. Various special control types such as line synchronization, process/voltage/current or torque control are available.

Using specifically developed faceplates and driver blocks, DYNAVERT T is fully integrated into SIMATIC PCS 7 – the process control system from Siemens. This means that it can be completely controlled from a central PCS 7 main control room via PROFIBUS. All of its operating modes can be visualized there in the control room.

Intelligent software
Another highlight of DYNAVERT T is the Windows-based, self-learning IMS software. This is used to parameterize, commission and troubleshoot these drives. With this software, all of the drive parameters can also be read in the offline mode. The special terminal strip display shows the parameterization/ assignment of each individual terminal. Absolute transparency is always guaranteed even when a lot of settings are involved. An oscilloscope function with eight analog and various digital signals is available in the online mode.

Admirably equipped for extreme locations

Although the oil, gas, chemical and petrochemical sectors – where there is an especially high danger of explosion – represent classic sectors for Loher, Loher drives can be found wherever extreme ambient conditions that can challenge drive technology prevail – onboard ships in rough seas for instance, or in hot and dusty shafts that extend far below the surface of the earth.

Motors onboard ships: On deck ...
Drive systems mounted on decks of ships must be equipped to handle the wind and weather. Winch drives are a perfect example. The motors must be able to cope with spray, flooding and icing. Special on-deck motors from Loher are precisely designed to handle these tough conditions: They simply continue to operate – even when completely flooded with water. In order to ensure this, for example, ship's winch motors from Loher have an absolutely watertight cast iron frame without fan – with ring-shaped cooling ribs that allow water to easily run off. A special offshore paint finish ensures additional corrosion protection. Even the brakes are protected against seawater.

Motors with extended fan cowls are available for areas on the deck that are not in an immediate danger of being directly flooded. These fan cowls prevent a surge of water from directly entering into the motor cooling system. The extensive Loher portfolio is rounded off with drive solutions that have an ice-proof design – for use onboard ships in polar regions.

... and below deck
Beyond the unique on-deck range, Loher supplies other motor types for marine applications. Motors for bow thrusters are just one example. These are used to improve the maneuverability of ships and have been adapted to withstand continuous vibration of the ship as it makes way. These motors can also be equipped with circulating air-water heat exchangers in a seawater-resistant double-pipe design.

Mining motors
Drive systems used in mining must comply with the highest demands. They must be able to cope with extremely heavy duty operation – in extremely rugged environments: Heat, dust, frequently extremely high air humidities, high load levels from the drilling units when drilling through different stone and rock structures and the ever-present hazard of explosion due to firedamp – that is so typical when mining in rock.

Loher offers special mining motors in type of protection EEx d I with firedamp-proof protection – in a complete system with special DYNAVERT I current-source DC link inverters for the mining sector.

These well-conceived systems comprising motor and drive inverter are optimally tailored to the conditions that prevail underground and have been tested and accepted in compliance with the stringent mining safety regulations. Loher mining motors are used to drive chain-type conveyors, loading arms, cutting heads and propulsion units of drilling machines. Loher motors for tunnel drilling machines master tasks similar to those of mining motors. In this case, four of these special motors are controlled from a DYNAVERT T.

In order to cope with the extreme vibrational load that is typical for drilling machines used in mining and tunnel construction, the motors have winding overhangs with special tapes that are sealed with resin. The short-circuit rings are supported on disks that are secured against rotation using keyways.

Special motors up to IP68 and for operation at temperatures of several hundred degrees Celsius
Other special drives from Loher include pump drives with degrees of protection IP67 and IP68 – such as are used in water treatment plants. These motors have a seal on the pump side with a sliding sealing ring – and when required, can also be equipped with a pressurized enclosure.

Loher also builds motors for heavy-duty starting. These must be able to cope with high radial forces and are correspondingly equipped with the appropriate bearings and shaft. They have a special welded copper rotor as well as a winding overhang cast in resin.

Low-temperature motors can operate under Siberian cold down to –55°C without any problems – even without anti-condensation heating. Smoke extraction motors, for example for tunnels, continue to run for up to one hour even at 400°C thanks to their special insulation system. When a fire occurs, these motors extract the hot smoke so that rescue and fire-fighting teams can do their job.

Drive solutions for specific operating conditions

The unique Loher portfolio is rounded off by a whole series of solutions for operating conditions that are out of the ordinary – for instance, elevator drives.

Gearless, safe and low noise: Elevator drives
Loher supplies elevator drives as complete packages, precisely tailored to the particular situation and requirements. In addition to the building architecture, the details of the specific elevator are also carefully taken into account. Mechanical design, working load, passenger cabin and cable weights, height, suspension, reversing roller arrangement etc.

Well-proven synchronous motors that have been specifically designed for this application are used. These motors are extremely quiet, are optimized for drive inverter operation and are also available in special application-specific designs. The redundant brakes are mounted on the motor and they have an integrated rotary pulse encoder. The elevator control is realized using a DYNAVERT L drive inverter that has been specifically developed for this type of application.

DYNAVERT L includes a motor contactor, braking resistor, EMC filter and motor reactor in a compact enclosure. This means that the elevator drive is completely decoupled from the elevator control. This guarantees safe and disturbance-free operation of the elevator system. An optimized pulse pattern ensures that the high whistling sounds emitted from the motor, typical for drive inverter operation, do not occur. An optional brake contactor prevents the drive from accelerating in an uncontrolled fashion after the drive unit brake is released – for example when people are being rescued from the elevator in an emergency situation.

This means that the passenger cabin moves with a constant velocity in the direction of the pulling load. Communications between the elevator control and the drive inverter can be established through a bus or conventional terminals. DCP (Drive Control and Positioning) or PCM (Positioning Control Mode) are available as bus protocols.

Application: Inclined lift to the ski jump at the Isel mountain, close to Innsbruck, with Loher DYNAVERT drive (inverter and motor) and SIMATIC S7 control

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