

# Fin-cooled motors for the oil, gas, chemical and petrochemical industries

Loher CHEMSTAR and Loher VARIO motors



Explosion-proof motors

**LOHER**



Danger of explosion, aggressive atmospheres, frequently extreme temperatures and the highest standards regarding safety are the main challenges for drive applications in the oil, gas, chemical and petrochemical industries.

In this environment, motors must optimally fulfill the various requirements and have maximum reliability in order to safely protect man, machine and the environment.

# Loher – the leading expert for explosion-proof motors

Even back in the sixties, Loher – based in Ruhstorf close to Passau, Germany – played a leading role in explosion-proof drives. In the meantime it is a recognized specialist in this domain worldwide and has always continued to expand its top position.

Both motor series – Loher CHEMSTAR and Loher VARIO – set standards in drive technology in the chemical and petrochemical industries as well as oil and gas sector. This is because they comply with all of the industries´ requirements and reflect the many years of experience that Loher has been engaged in this sector.

The decades of experience that Loher has in the development, design, engineering and production of explosion-proof motors guarantees an optimum of operational safety, availability and adaptation to the particular application conditions.



# Loher CHEMSTAR and Loher VARIO motor

Fin-cooled motors for extraordinary requirements



The sector-specific products and solutions of Loher GmbH perfectly fulfill the requirements – especially the fin-cooled Loher CHEMSTAR motor series – for low-voltage – and the Loher VARIO motor for low and high voltage applications

Not only are they extremely rugged and reliable, but they can also be supplied in all of the applicable types of protection Ex n, Ex e, Ex d, Ex p. And for exceptional requirements, they are also available in double protection types, gas/dust or Ex e and Ex d.

All of this is supplemented by additional features that protect the motors against aggressive atmospheres – such as a chemical-proof paint finish and galvanized fan cowls. They also have a wide range of permissible operating temperatures, which makes them ideal for applications in deserts and polar regions. The motors are also available with degrees of protection up to IP68 and naturally have sector-specific certificates such as ATEX, NEPSI (China), CCOE (India) and Rostekhnadzor (Russia).

## The economic and ecological drive solution

Loher CHEMSTAR and Loher VARIO motors are the economic and ecological drive solution for applications in the chemical and petrochemical industries as well as in the oil and gas sectors.

These motors are used in all of the associated production areas – from upstream through mid-stream to downstream. They form a complete,



seamless portfolio of explosion-proof three-phase motors from 0.12 kW up into the Megawatt range. The spectrum of Loher CHEMSTAR motors ranges from 0.12 up to 315 kW; the VARIO series continues the range in the low and high-voltage ranges all the way up to 2,800 kW.

Both of these series guarantee users high benefits: Low "Cost of Ownership" as well as high quality result in maximum cost-effectiveness.

When developing the Loher CHEMSTAR and Loher VARIO series of motors, we took into account all of the sector-specific requirements, especially regarding the following:

- Explosion protection
- Degree of protection
- Corrosion protection
- Noise level
- Service life
- Maintenance
- Repair
- Replaceability
- Availability
- Cost-effectiveness
- Environmental-friendliness

### **Explosion-proof motors also in high efficiency design**

The new international efficiency standard IEC 60034-30 now also includes explosion-proof motors – clearly reflecting the ever increasing significance of energy efficiency. Specifically for this reason, Loher has also developed a new series of flameproof motors (class of protection Ex d) in the high efficiency classification IE2. These high efficiency Ex d motors in IE2 cover a power range from 0.75 kW to 375 kW. They are available as 2, 4 and 6-pole motors for operation both at 50 and 60 Hz.

# Maximum safety – quality motors that withstand any pressure

The Loher CHEMSTAR and Loher VARIO series of motors are available in dust-explosion protection for hazardous Zones 21/22 and in gas explosion protection, types of protection Ex n (non-sparking) for Zone 2 where no arcing or sparking, which can potentially ignite an explosion, may occur. They are also available in Ex e (increased safety) for Zone 1, where inadmissibly high temperatures are prevented from occurring at any position on the motor, as well as flameproof encapsulated motors Ex d for Zone 1.

With the latter type of protection Ex d, the motor has been designed so that any explosion inside the motor cannot be propagated to the outside and, at the same time, the motor frame can withstand the pressure caused by the explosion.

Especially when it comes to flameproof encapsulated motors, Loher has a portfolio that is second to none when it comes to the scope and reputation in the world market. This is both regarding explosive gases in the process industry as well as firedamp-proof motors in the mining sector.

All of the flameproof explosion-proof motors in all of the various designs are individually tested in the factory to ensure that they can withstand the appropriate pressure levels.

## Double protection for exceptional requirements

The Loher CHEMSTAR and Loher VARIO motor series are also available with double protection to address exceptional requirements:

This is a combination of gas and dust explosion protection for locations where both fine dust and explosive gases can occur simultaneously.

The other option is double protection in Ex d and Ex e. Such a type of double protection is, for instance, practical for cargo pumps installed on liquid gas tankers. In this case, it must be absolutely ruled-out that the electrical equipment is a potential source of ignition due to the dangerous freight that is being transported.

In this case, Loher mechanically designs the explosion-proof motors with type of protection “flameproof encapsulation” – and at the same time, ensures that the temperatures of the active parts and components correspond to type of protection “increased safety”.



# An unbeatable total package

Lower costs, less efforts – higher performance

In addition to the application-specific advantages – such as reliability, operational safety, efficiency and explosion-protection – we also offer the two Loher CHEMSTAR and Loher VARIO series of motors as total package to optimize the complete supply chain: In this case, users profit from the low lifecycle costs as a result of the high quality, cost-effective operation, simple service and maintenance and long service life.

In the planning phase, the focus is on the technical specifications and the simplified documentation. A complete package of documentation is available for planning purposes.

The optimized ordering process to minimum purchasing costs is yet another advantage. This is complemented by shorter procurement times as a result short, flexible production times.



# Loher CHEMSTAR motors – ideal for the chemical and petrochemical industries

For low and medium power ratings, it is especially the Loher CHEMSTAR motor series that ensures a maximum degree of safety and reliability, highest availability and low operating costs. With a power range from 0.12 to 315 kW, Loher CHEMSTAR motors cover all conceivable types of protection.

A sector-specific design takes into account the application and installation location. For instance, a high-quality paint finish that is especially resistant to chemicals and the galvanized fan cowl protect against aggressive atmospheres.

Even when there is a high degree of humidity, anti-condensation heating is frequently not required. Loher CHEMSTAR motors operate perfectly from  $-55^{\circ}\text{C}$  ( $-67^{\circ}\text{F}$ ) to  $+70^{\circ}\text{C}$  ( $158^{\circ}\text{F}$ ) – also in zones with dust and gas.

These motors are even optimally equipped to cope with desert and polar climates.

When specified, the motors can be equipped with corrosion-resistant stainless steel screws and bolts. Shaft seals with an IP66 degree of protection protect against water and dust so that the motors can be mounted outdoors. Although the standard degree of protection is IP55; degrees of protection are available up to IP67.

The motor frame is manufactured out of rugged gray cast iron. This makes it extremely resistant to corrosion, it dampens vibration and has a high mechanical strength.

Reinforced bearings and integrated PTC thermistor are some of the options that can be ordered. The motor versions that can be adapted comply with almost all user requirements and specifications.

CHEMSTAR motors are supplied with sector-specific documentation including ATEX certificates for the chemical and petrochemical industries.

## General technical data

Motors in compliance with IEC and VIK in the following mounting arrangements	IMB3, B5, B35, V1, V3, V18, B14, 34
Power range	0.12 – 315 kW
Frame sizes	71 – 355 (IEC)
Speeds	1000, 1500, 3000 rpm – also in 60 Hz and pole-changing
Efficiency	$\geq 55$ kW Class IE2
Voltage	Volatge range 380...400...420 V / D, $\pm 5\%$ 655...690...725 V / S, $\pm 5\%$ 500 V $\pm 5\%$ Can be stamped for fixed voltages, e.g. 380 V Other voltages on request
$I_{\text{start}}/I_{\text{rated}}$	$<7x$ + IEC tolerance
Degree of protection	IP55, up to IP67 on request
Noise level	$\leq 77$ dBA + 3 dBA tolerance
Type of explosion protection	Without explosion protection II 3 G Ex n AII; II 2 G Ex e II, T3; II 2 G Ex de IIC, T4
Additional rating plate for converter operation with data for $T \sim n2$ ; $T \sim \text{const. } 1:3$ and $1:5$	
All of the Loher CHEMSTAR motors with type of protection Ex de and Ex n are accepted and certified for operation with Loher DYNAVERT T drive converters according to list UN04.	

# Loher CHEMSTAR motor – technical design

## Standard Option

Voltage range acc. IEC 38  
or fixed voltage

RAL colors

Labeled and certified for  
converter operation

SPM nipple from FS 132

Reinforced bearings

Vibration severity level A

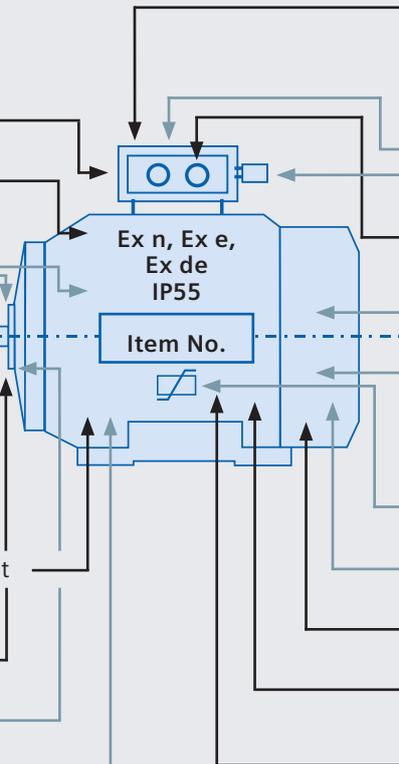
Shaft seal up to IP66

N14A paint finish that is especially resistant  
to chemicals

Permanent lubrication up to incl. FS 280

Regreasable bearings from FS 160

Ambient temperature from -55°C (-67°F)  
to +70°C (158°F)



Top-mounted terminal box,  
can be rotated through 4 x 90°

Larger terminals

Metric cable glands acc. to  
DIN 42925/Dec. 2004

Additional terminal box

Stainless steel screws and bolts

Anti-condensation heating

PTC thermistor

Various fan materials

Galvanized fan cowl

Thermally utilized F/B

Motor frame completely out of  
grey cast iron

## Standard version

- Voltage range acc. to IEC 38 or fixed voltage
- Vibration severity level A
- Shaft seal with up to IP66
- Permanent lubrication up to and incl. frame size 280
- Top-mounted terminal box, can be rotated through 4 x 90°
- Metric cable glands acc. to DIN 42925/Dec. 2004
- Galvanized fan cowl
- N14A paint finish that is especially resistant to chemicals
- Thermal utilization F/B
- Motor frame completely out of grey cast iron
- RAL colors

## Optional

- Labeled and certified for converter operation (with DYNAVERT T)
- SPM nipple from frame size 132
- Reinforced bearings
- Regreasable bearings from frame size 160
- Ambient temperature -55°C (-67°F) to +70°C (158°F)
- Larger terminals
- Additional terminal box
- Stainless steel screws and bolts
- Anti-condensation heating
- PTC thermistors
- Various fan materials

## Cable entry thread assignment for Loher CHEMSTAR motors

Frame size	Cable entry thread
71	1 x M 25 x 1,5
80	1 x M 25 x 1,5
90	1 x M 25 x 1,5
100	1 x M 32 x 1,5
112	2 x M 32 x 1,5
132	2 x M 32 x 1,5
160	2 x M 40 x 1,5
180	2 x M 40 x 1,5
200	2 x M 50 x 1,5
225	2 x M 50 x 1,5
250	2 x M 63 x 1,5
280	2 x M 63 x 1,5
315 S/M	2 x M 63 x 1,5
315 L	2 x M 63 x 1,5
355 LB	2 x M 63 x 1,5

## Cable gland assignment

Cable entry thread for PTC thermistor, anti-condensation heating: M 20 x 1.5 for cable D = 6 – 12

Cable entry threads are closed with plugs.

Cable glands are only supplied if specifically ordered.

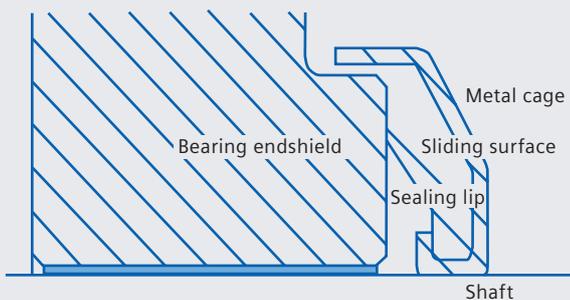
## Cable entry thread assignment for Loher CHEMSTAR motors

Frame size	Cable entry thread	Cable glands		Connection cross-section max. [mm <sup>2</sup> ]		Special version for larger cross-section max. [mm <sup>2</sup> ]	
		Motor type AM.A Type HSK-K clamping range [mm]	Motor type AM.K/EM../DN.. Type HSK-K-Ex clamping range [mm]	Motor type AM../EM..	Motor type DN..	Motor type AM../EM..	Motor type DN..
225	2 x M 50 x 1,5	32 – 38	32 – 38	16/50 <sup>3</sup>	6 – 70	70	120
250	2 x M 63 x 1,5	37 – 44	37 – 44	6 – 70	6 – 70	–	120
280	2 x M 63 x 1,5	37 – 44	37 – 44	6 – 70	10 – 95	95	240

## Paint N14A for Loher CHEMSTAR motors and Loher VARIO motors

Code	N04	N08	N14	N14A
Use	Standard paint finish Mounting indoors	Outdoors, tropical climate, moist environments	Tropical climate, moist environments	Standard VIK paint finish
	Standard motors and Ex e II	Standard paint finish Ex d I/II Indoors mounting and outdoors climate	Incl. J08 Increased level of chemicals, can be decontaminated, ships, onshore	Without J08, with rotor coating Increased level of chemicals, can be decontaminated, ships, onshore
Final paint finish	200 → 150 → 100 → 50 → 0 → 30 →	80	PUR 70 EP primer 70 KH primer 30	
Parts with primer (not for aluminum and galvanized fan cowls)	40 30	30		
Layer thickness > μm final paint finish	40	80	140	140
Durability list / climate groups EN 60721-3	Moderate		Worldwide	Worldwide

## Shaft seal IP66



- Axial sealing ring (Gamma ring 9RB)
- Sealing lip slides on a precision-machined metal surface
- As the speed increases the contact pressure decreases therefore minimum wear
- Together with the frame, the metal cage forms a labyrinth seal and protects the sealing lip against jets of water, dust and mechanical damage
- Suitable for horizontal and vertical motor frame sizes
- Mechanical design prevents water from collecting in the area around the sealing lip
- Especially suitable for mounting outdoors – especially V3
- Seal has degree of protection IP66/65 confirmed through EXAM
- In use for 25 years under extreme conditions

# Loher VARIO motors – maximum safety in the oil and gas sector

In a welded steel design from shaft height 355 and above, the Loher series of VARIO motors is either available as low-voltage or high-voltage motor depending on the particular application. Loher VARIO low-voltage and high-voltage motors are equipped as standard with the features that are required for applications in the oil and gas sector as well as the petrochemical and the chemical industries.

This series of motors fulfills the standards of the various operating companies to a high degree. With power ratings up to 2,800 kW, their main applications are in the oil and gas sector where high-rating pumps and compressors are required for pumping and transporting oil and gas. They can be used in any hazardous zone – up to gas group II C in compliance with Class II 2 G Ex de II C T4.

Equipped with roller bearings, VARIO motors are predestined for applications in hazardous Zone I and in highly explosive environments containing hydrogen. The complete range is certified according to ATEX, NEPSI, CCOE and Rostekhnadzor – also for extremely low temperatures. All of these features make these motors admirably suited for applications in oil and gas fields in cold regions such as Canada, Alaska and Siberia.

Loher VARIO motors are available in all of the usual voltages and frequencies up to 11 kV.

They distinguish themselves as a result of the extremely rugged design. Torsionally stiff steel frames – that at higher power ratings offer increased stiffness and lower vibration – ribbed bearing endshields in gray cast iron or steel with a high mechanical strength. Vertical motors can also be equipped with thrust bearings for high axial and radial loads.

The high efficiency is obtained by using magnetic slot wedges – resulting in significantly lower power costs. The terminal box can either be mounted on the side or at the top – other modifications are available on request. All of the terminal boxes can be rotated through 90°.

Loher high-voltage and low-voltage motors: Loher VARIO motors have enjoyed a great reputation in electric drive technology for many years and distinguish themselves as a result of a whole raft of features that allow them to fulfill the highest market demands:

- Short production times as a result of a well-conceived and fine-tuned modular system
- Engineered, based on international standards and customer specifications
- Spare parts are quickly available
- Optimum electrical and mechanical values
- High level of acceptance in the various sectors

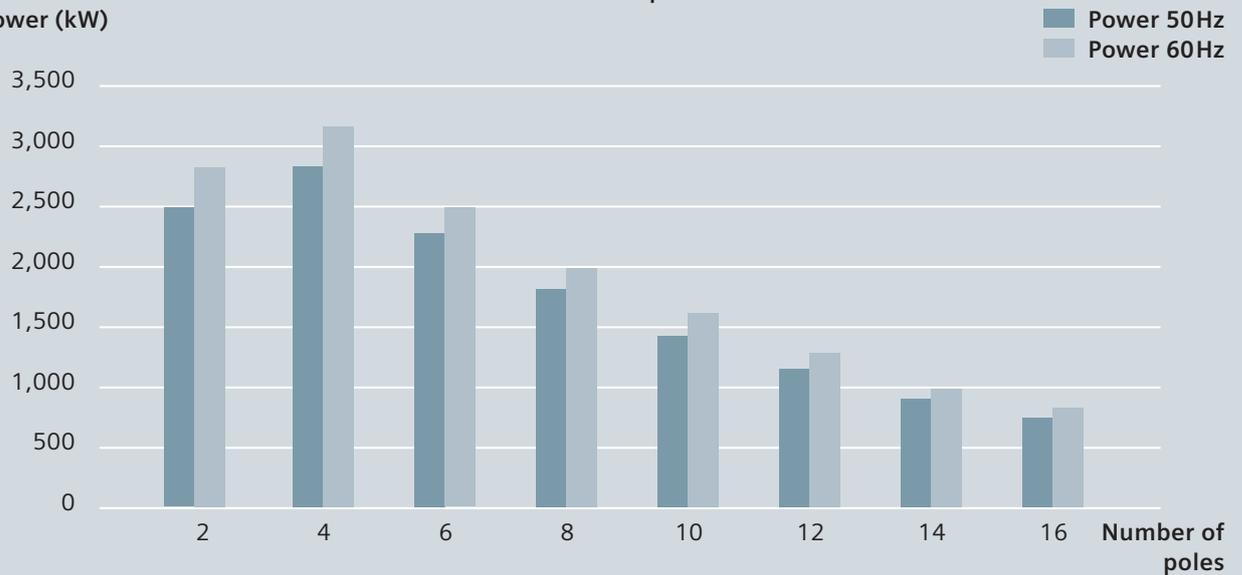
# Loher VARIO motors – Versatility at a glance

- 280 kW to 2,800 kW
- Voltages from 380 V to 11,000 V
- Shaft heights from 355 to 630
- Welded steel stator housing
- All types of explosion protection - including double protection
- Degrees of protection IP56, IP67, IP68
- Special paint finishes in all of the usual colors (RAL or Munsel)
- Suitable for the most extreme ambient conditions, e.g. offshore platforms

- Can be connected either directly to the line supply or drive converters
- Mounting arrangements IMB3, IMB35, IMV1
- Totally enclosed fan cooled (TEFC), cooling type IC411 or IC416 with forced ventilation
- In compliance with DIN ISO, EN and IEC
- Ex e high-voltage terminal boxes with new safety system
- Certified according to international regulations

**A wide range of additional options is available on request**

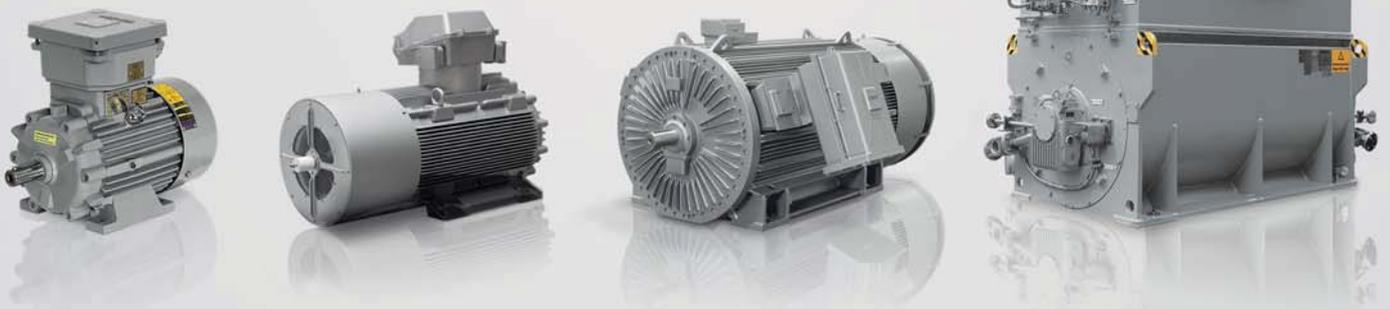
Power (kW)



# Loher CHEMSTAR and Loher VARIO motors – advantages through experience



- Adapted motor design (Manufacturer Standard) fulfills almost all user requirements and specifications in the marketplace
- Complete range of power ratings in the most important types of explosion protection to cover all applications
- Especially designed for applications such as: Process pumps, fans (also in V3), cooling system compressors, centrifuges, mixers, extruders and others
- Short delivery times as a result of the Manufacturer Standard
- Larger terminals for higher cable cross-sections avoid additional cabling costs
- State-of-the-art production technologies (e.g. UV impregnation) secure a high product quality
- Low operating costs ("Cost of Ownership") guaranteeing a high degree of cost effectiveness
- Short delivery times, standardized version and documentation permit low costs in the procurement process
- Complete project documentation guaranteeing minimum planning costs
- Loher CHEMSTAR and Loher VARIO motors come with standard documentation in the most important languages. Many other languages are available on request.



For high power ratings, additional motor series and cooling types round-off the portfolio for oil and gas sector and the petrochemical and chemical industries: Pipe-cooled motors, open-circuit ventilated motors, motors with mounted air-to-air or air-to-water heat exchangers.

Whether as explosion-proof motor or motor for safe environments – in shaft heights from 355 to 800, the range of applications that can be addressed up to 10,000 kW has almost no limits.



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