



> CHALLENGES

Leroy-Somer's high-efficiency motors in Europe, the United States, China, Brazil, etc

NEW RANGES

> ALTERNATORS

Low-voltage alternators
Unrivalled reliability and performance

> ATEX

IE2 high-efficiency ATEX motor ranges

Leroy-Somer's high-efficiency motors in Europe, the United States, China, Brazil, etc

The new-generation LS2 and LS3 high-efficiency motors offer real advantages for users and manufacturers of rotating electrical machines, in terms of performance as much as respect for the environment and energy savings. Nowadays, these high-efficiency motors are exported worldwide!



There are numerous countries throughout the world with mandatory regulations concerning the use of high-efficiency motors. These regulations change rapidly and new legislation is regularly published.

The ErP Directive in Europe

In Europe, the situation is now clear. The ErP (Energy-related Products) European directive imposes the use of class IE2 motors from 16 June 2011. Class IE3 motors (or IE2 equipped with a drive) will be mandatory from 1 January 2015 for power ratings from 7.5 to 375 kW. Finally, from 1 January 2017, the rated power range will be extended to lower power ratings down to 0.75 kW.

What does Leroy-Somer offer?

The new LS2 generation of IE2 and IE3 motors complies with these regulations and offers users significant advantages in terms of performance as much as respect for the environment and energy savings.

But how should a European manufacturer go about exporting his machines worldwide? Which type of high-efficiency motors should he fit on his machines? Are there any specific requirements in terms of regulation?

Globally, for these countries, the regulations are similar to those for the IE2 and IE3 efficiency classes but with different conditions.

EISA 2007 in the United States

In the United States, the Energy Independence and Security Act (EISA) was signed in 2007.

This regulation replaces EAct, the previous Energy Policy Act, and has also extended its scope to motors that were not affected under that act.

Affected products

The regulation applies to motors for general applications and defines two groups of motors.

All motors from 1 to 200 HP 230 or 460 V 60 Hz formerly affected by the EAct have seen their required efficiency level change from "High Efficiency" (equivalent to IE2) to "Premium Efficiency" (equivalent to IE3).

Some types of motor that were not covered by EAct (U-frame; Design C; for monobloc pumps; without feet; with vertical solid shaft and normal axial thrust; with 8 poles; for fire pumps from 1 to 200 HP) must now be at least High Efficiency level (equivalent to IE2) as defined in table 112-11 of the NEMA MG 1 standard.

There is also a list of products which are not affected by EISA such as design D motors with high slip or intermittent duty motors.

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Motors used for variable speed

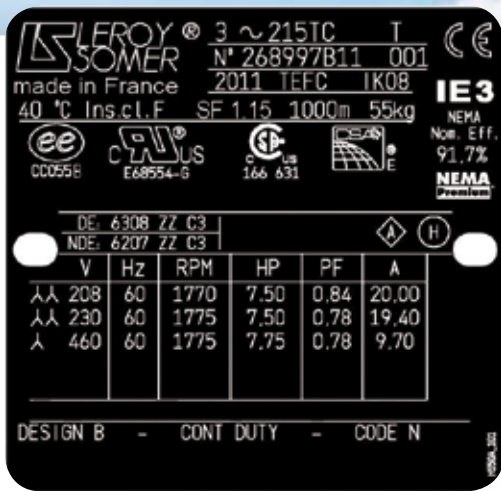
As concerns motors used for variable speed, there are two possible scenarios.

Motors specially designed for variable speed, such as those described in IEC 60034-25 with enhanced insulation, insulated bearings, etc, are considered to be «inverter duty» motors and are not therefore covered by EISA.

4 and 6 poles that comply with the EISA regulation.

Leroy-Somer's range of «inverter duty» motors (LSMV), designed to work at variable speed only, can be fitted on machines destined for the USA.

These motor ranges are certified UL/CSA Recognized.



Conversely, standard fixed-speed motors for general applications which can also be used at variable speed are covered by EISA.

Implementation timetable

The EISA regulation applies to motors placed on the United States market from 19 December 2010.

Restrictions concerning motor nameplates

To comply with the EISA regulation it is mandatory, in addition to the obligations associated with the NEMA standard, to state certain additional information, in particular the Compliance Certification (CC) number.

Leroy-Somer has been certified number 055 by the DoE (Department of Energy).

What does Leroy-Somer offer?

In the United States, Leroy-Somer sells high-efficiency motor ranges for power ratings between 1 HP and 200 HP with 2,

The GB standard in China

The regulation concerning motor efficiency bears the reference GB 18613-2006 and specifies three efficiency levels. Since 1 July 2011, grade 2 (=IE2) is mandatory from 0.55 kW upwards.

What does Leroy-Somer offer?

Leroy-Somer's IE2 LS2 motor ranges comply with this new regulation.

The winding should be adapted to the local mains voltage and the energy mark added.

NBR 17094 -1 and Inmetro in Brazil

Since 8 December 2009, motors imported into Brazilian territory must conform to Regulation 553 - standard NBR 17094-1. The efficiency level is equivalent to IE2 60 Hz. It is mandatory for high-efficiency motors to be registered and approved with the Instituto Nacional de Metrologia, Qualidade e Tecnologia (INMETRO, National Institute of Metrology, Standardization and Industrial Quality).

Note that without this approval, no motor can be placed on the Brazilian market, whether on its own or mounted on a machine.

What does Leroy-Somer offer?

Leroy-Somer, with its 2 and 4-pole IE2 LS2 range of motors, is registered with IN-



METRO. This range of motors is therefore authorised for import into Brazil.

Other countries

Numerous countries such as Canada, Australia, New Zealand, South Korea and India also have local regulations.

Don't hesitate to consult Leroy-Somer if you need detailed information.

Low-voltage alternators

Unrivalled reliability and performance

Leroy-Somer offers innovative new Pure Energy alternator ranges which are ideally suited to meeting the requirements of the generator market. Moreover, taking account of developments in the power of heat engines, Leroy-Somer has extended its industrial low-voltage range up to 3.6 MW.

Leroy-Somer, world leader in 10 kVA to 20 MVA alternators

Leroy-Somer is the world leader in low, medium and high-voltage alternators from 1 to 20 MW. Its Electric Power Generation (EPG) division has 10 factories worldwide with production sites in Europe, the United States, Mexico, China and India. Leroy-Somer's global presence provides support to the world's leading energy producers such as CATERPILLAR-FG Wilson, KOHLER-SDMO, GHADDAR MACHINERY on every continent.

In power generation, Leroy-Somer has a particularly strong presence on two main markets:

- That for low-voltage alternators (less than 3.6 MW) which is a highly competitive market and whose main application is the generator, such as those found in the cogeneration, marine, residential, commercial, construction and rental sectors.
- That for medium and high-voltage alternators (3.6 MW to 20 MW) which is a more complex market with specific applications (hydroelectric power stations, wind turbines, the oil, nuclear, and rail industries, etc).

A recent survey by the BVA opinion research institute confirms Leroy-Somer's reputation and the excellent customer satisfaction level it achieves. Being the exclusive supplier to world leaders is certain proof of quality and reliability!

The low-voltage range

Leroy-Somer's low-voltage range basically consists of 4-pole alternators intended to be driven by heat engines running at 1500 rpm or 1800 rpm, for 50 Hz or 60 Hz respectively. The range of power ratings is from 10 to 3600 kW. Leroy-Somer offers three different excitation systems (Shunt, PMG or AREP™) which can be used, depending on requirements, to adapt the alternator performance to the application. Leroy-Somer have patented the AREP (Polymorphic Excitation-Controlled Alternator) system. It is ideally suited to demanding applications in motor starting capacity and short-circuit current.



ESS Energie Systeme & Service GmbH is developing mini-CHP plants



Viessmann is dedicated to the task of generating abundant, cheap, green heat and making it available as and when needed. The group employs almost 9400 people. The company offers its customers a complete range of thermal power stations with power ratings from 1.5 kW to 116 MW.

ESS is a wholly-owned subsidiary of the Viessmann group. The company specialises in the development and manufacture of CHP plants which are unusual in that they produce

heat and electricity simultaneously. This technology can minimise energy losses. More specifically, ESS offers compact gas-operated solutions rated 5 kW to 401 kW for applications intended for town councils, industries, companies, hotels, hospitals, care homes and convalescent homes, etc.

The overall efficiency of an ESS CHP plant can be as high as 96%. For example, the Vitobloc 200 module EM-20/39 has thermal efficiency of more than 64% and electrical efficiency of more than 32%. Maintenance intervals, including oil changes, are approximately 6000 hours – the equivalent of servicing a car every 225,000 miles.

These systems constitute a first step towards mini-CHP plants, which will be able to satisfy the demands of decentralised low-power applications.

ESS has chosen Leroy-Somer to implement this strategic micro-CHP project. After 10 years' close collaboration, the quality, service, and performance of our products and our business relationship have established us as the ideal partner.



Vitobloc 200, EM-5,5

Leroy-Somer solutions, winning features

Unrivalled performance

- Higher specific output power (power-weight ratio) than the competition.
- High efficiency levels in perfect balance with the commercially-available heat engines with which they are associated.
- Excellent capacity for starting electric motors.
- Low reactance results in excellent performance during applications subject to distorting loads.

Quality recognised by customers

- Quality of products: Leroy-Somer EPG has received a certification mark from its main customer in recognition of the quality level.
- Quality of services: adherence to delivery times, performance of pre- and after-sales services.

Continuous innovation

Leroy-Somer innovates constantly, both with regard to the structure of its alternators and with regard to their regulation systems. The most recent innovation to date is the digital AVR, which beats the competition hands-down with its user-friendly parameter setting and outstanding performance.

A superbly versatile modular system

Thanks to the modular nature of the range, the alternators can easily be customised to suit the application requirements.



*Generator
CATERPILLAR/FG Wilson*



*Generator
KOHLER/SDMO*



*Generator
Ghaddar Machinery*

New ranges

To keep abreast of a market such as that for low-voltage alternators, we need to constantly reinvent ourselves! The EPG division has therefore launched two new products onto the market in the space of two years with the LSA 40 and LSA 42.3, and has extended its low-voltage range to 3.6 MW.

The new LSA 40, a 4-pole three-phase alternator, offers a range of power ratings from 10 to 23 kVA at 50 Hz 1500 rpm and from 10 to 23 kW at 60 Hz 1800 rpm. It is particularly compact and versatile and is characterised by high efficiency levels. Its size and weight make it one of the smallest and lightest in this range of power ratings.

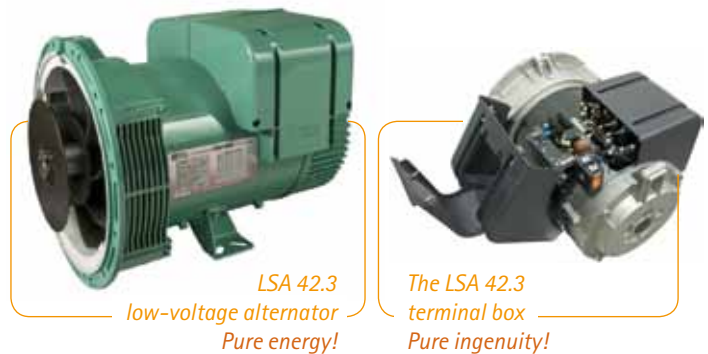
LSA 42.3 is a natural successor to the LSA 40 and offers a range of power ratings from 25 to 60 kVA at 50 Hz 1500 rpm and from 25 to 60 kW at 60 Hz 1800 rpm.

The Pure Energy generation of LSA 40 and LSA 42.3 alternators are very easy to install. The clever design of the LSA 40 terminal box has been remodelled and features a cover for even better direct access to the AVR.

Leroy-Somer EPG has developed a rugged, high-quality range that meets international standards

and is perfectly suited to the specific requirements of most complex and restrictive applications found in the telecoms, construction, residential, commercial, micro-CHP, agricultural and even marine sectors.

Finally, Leroy-Somer has expanded its low-voltage range, taking account of how the new-generation heat engines have evolved in terms of power. This expansion of the offer thus covers every possible customer need. New models we can mention by way of example include the LSA 54 M75, which delivers power of 3250 kVA at 50 Hz 1500 rpm with 400 V or even 3900 kVA at 60 Hz 1800 rpm with 480 V.



CTM - Guaranteed rapid delivery times!

Compagnia Tecnica Motori (CTM), founded in 1958, specialises in the design, manufacture and installation of generators and fire-fighting systems.

CTM offers a wide range of standard and customised generators from 9 kVA to 4235 kVA. Development, engineering and assembly take place in the Cesano Boscone factory (Italy). Their skill in managing the production process guarantees perfect integration of the various components. CTM works in close collaboration with Leroy-Somer and with different par-

tners and subcontractors in order to continually improve its products and services.

Always keen to rationalise their use of resources, CTM is particularly interested in Leroy-Somer's offer, which includes the most efficient low-voltage alternators on the market.

With Leroy-Somer, CTM has a reliable source of technical support whatever the circumstances and can count on guaranteed rapid delivery times!



Alternator from the expanded low-voltage range
LSA 53.1 M80/4P - 2300 kVA - 400 V



Backup diesel generator installed in a processing factory
located at M'Boundi in the Republic of Congo.

Leroy-Somer electric motors cut food processor's energy bills

Dyneo® permanent magnet electric motors from Leroy-Somer fitted to compressors are at the heart of an innovative new industrial refrigeration system – the first of its kind installed in Europe. A large food production plant in County Cork, Ireland, needed to update and expand its beef chilling, offal processing and dispatch areas to improve efficiency.

The factory handles approximately 112 tonnes of meat during a typical day but a substantial percentage is lost through evaporation. Industrial refrigeration specialists NH3, of Newmarket, Suffolk, were set the task to find a way of combating this.

NH3 managing director Johnathan Ball takes up the story: "Refrigeration systems by their nature dehumidify air and as a consequence you lose moisture from the product. This shrinkage of the meat combined with the substantial number of cattle being slaughtered for the chilling processes, meant these losses soon built up. At NH3 we have developed a refrigeration system which can guarantee a very low weight loss and in doing so improve the volume of the product leaving the factory gate. Our experience in installing the system around the world has shown it to be a success."

For the food producer, NH3 designed and installed a new industrial refrigeration system running on ammonia – with zero ozone depletion properties – and in doing so significantly reduced the plant's CO2 emissions.

Two new Mycom compressors fitted with Leroy-Somer energy saving inverter-based electric motors are at the heart of the 2400 kW system. NH3 say that the Leroy-Somer Dyneo® electric motors with their permanent magnet construction, combined with the Powerdrive inverter, are the best way of achieving the energy efficiencies needed at the plant.

The inverter with its variable speed control delivers considerable energy savings. The advanced floating control, installed by TCS, a sister company of NH3, ensures that the compressors are extremely efficient irrespective of the refrigeration required – reducing the refrigeration system's energy bills at the plant by as much as eight per cent.

Mr Ball added: "The Leroy-Somer variable speed drive electric motors give a dramatic efficiency improvement over and above standard electric motors. The frequency-based inverter decreases or increases the speed of the compressor when the system requires it. So far our improvements have delivered a substantial decrease in the volume of meat being lost – but with the amount processed at the plant on a daily basis this is having a significant impact on output."

Dyneo® electric motors with permanent magnet rotor technology are smaller and more efficient than conventional machines. They have:

- IP 55 construction in accordance with IEC 60034
- power rating from 0.75 to 400 kW
- torque from 1 to 1400 N.m
- speed from 1 to 5500 min⁻¹
- frame size from 90 to 315 mm.

NH3 contracts' manager Joe Kraemer is also happy with the contribution made by the Dyneo® electric motors: "It was a challenging project and a number of innovations were needed. It's the first time we have used the Leroy-Somer permanent magnetic motor with the variable speed drive on the Mycom compressor. It's working well. It's also the first time this system has been installed at a plant in Europe and we're very pleased with the outcome."



A compressor with its Leroy-Somer electric motor is winched into place at the food production plant.



Leroy-Somer electric motor control panels in the electrical supply room at the factory.

Varmeca variable speed motor installation at Thames Water leads to energy savings

Thames Water's raw sludge thickening plant at Swindon had been experiencing problems for some time. This was causing disruptions to the plant on a regular basis. There were high pump maintenance costs, issues with downtime and high noise levels in the building.

The system is designed to take thickened raw sludge from a mechanical drum and pump it underground to a sludge-blending tank but breakdowns had been leading to night call outs. The system – dealing with up to 16 cubic metres of raw sludge an hour – was becoming increasingly unreliable and inefficient. Thames Water recognised that action was needed. The plant was singled out as an ideal candidate for its efficiency programme.

German pump manufacturer Seepex was employed by Thames Water to find out what was causing the problems – and find a solution. Seepex, with its UK base in Yeovil, are the nominated consultant to Thames Water for its sludge pumping efficiency and optimisation programme. Seepex are also an established customer of Leroy-Somer and over the years they have been impressed with the quality of finish, reliability and efficiency to be found in Leroy-Somer products.

Seepex supplies pumps to the environmental industry and also to the food, paper and chemical industries. All Seepex

products are manufactured in Germany and sold worldwide – except for Seepex inc which supplies the American market.

Seepex has wide experience of dealing with mechanical problems associated with sludge pumping and sludge treatment processes in the UK. At Swindon, the first

There were a high number of starts and incidents involving high speeds. This was all having an impact on the machinery. The variator was using more belts and pulleys than would be considered normal and the bearings were near to failure."

The Seepex response was to specify a Varmeca 30 5.5 kW inverter-based variable speed motor – and a new gearbox – to replace the belts and pulleys which were breaking down. Seepex installed a pump drive conversion together with an automated ultrasonic control system – varying the pump speed and balancing it with thickener output. This removed the need for a manual mechanical speed variator and the operating and maintenance costs linked to this.

Seepex business development manager Martin Gillman said: "In simple terms the most effective way to achieve this, and to keep installation costs down, was to use the Varmeca 30 riding piggyback on the Seepex BN26-12 progressive cavity pump motor with a change of gearbox to suit this.

"The inverter-driven Varmeca controls the pump and is ideal for the job. No maintenance is now needed on the Vee belt drives and the life of the rotor and stator is increased by reducing the stop/start frequency and slowing the pump speed. So the Varmeca 30 helps to reduce running costs and delivers greater efficiency."



The new system with the Leroy-Somer Varmeca 30 inverter-based variable speed motor now operates without problems.

job for Seepex was to get to the root of the disruption. Trevor Hockley from Seepex's technical sales team explains: "There were serious issues. There were concerns over the pump drive system – a belt variator.

stator is increased by reducing the stop/start frequency and slowing the pump speed. So the Varmeca 30 helps to reduce running costs and delivers greater efficiency."



The old system containing a belt variator was liable to breakdowns.

Varmeca 30 variable speed motors and geared motors are suitable for damp and dusty environments. For more than 15 years, Varmeca customers have benefited from integrated variable speed, guaranteed performance in severe environments, energy savings, reductions in installation costs, ease of commissioning, flexibility and safety in use. The Varmeca 30 has:

- IP 65 protection
- aluminium housing for optimum cooling
- construction with no water retention areas
- electronics moulded in resin
- a paint system suitable for harsh environments
- is ATEX certified by INERIS, atmospheres containing explosive dust, Zones 21 and 22.

The Varmeca range, available from 0.25 kW to 11 kW, has an operating temperature varying from -20°C to +40°C, with no derating, and can be fitted to all Leroy-Somer and geared motors. It is designed for all single-phase and three-

phase voltages. The range is a versatile and convenient way for original equipment manufacturers and machine builders to use variable speed control in a wide range of applications involving pumps, fans and mixers.

Varmeca's speed control is able to handle simple and complex systems. The system controls cycle times, soft starts and stops – and can be operated locally or remotely by a computer. The range has all the functions of a variable speed drive without the drawbacks of a complex installation, is supplied with factory settings ready to use and is maintenance free.

The capital costs of installing EFF1 motors and inverters can be claimed back via the Government's Enhanced Capital Allowance Scheme to manage climate change.

In Swindon, other benefits to the Seepex system include:

- call-outs to belt drive problems and the maintenance costs of the belt variators eliminated

- plant downtime due to pump failure eliminated since changes were made
- speed control now automatic and balanced with the process which increases the service life of the pumps.

Trevor Hockley concluded: "The new system increases the efficiency of the pump by removing the poor mechanical efficiency while retaining the volumetric efficiency. We are confident that we will see an approximate ten per cent reduction in energy costs by the use of the new system year on year due to the removal of belt slippage and by slowing the motor down to operate only at the required speed to suit the required flow of thickened sludge.

"The Varmeca 30 is a neat product – easy to install and efficient too. We are impressed with the complete package."

IE2 high-efficiency ATEX motor ranges

Although safety motors for use in ATEX gas and dust zones have not been included in the EuP European directive lot 11 which imposes, from 16 June 2011, the exclusive use of motors with IE2 efficiency level in accordance with IEC 60034-30, Leroy-Somer has taken the decision to make the majority of its ATEX ranges also or exclusively available in an IE2 version.

In numerous installations, the ATEX zones are adjacent to safe zones where the installation of high-efficiency motors has now become a statutory obligation. It is therefore logical for the owner to wish to make the same electricity savings throughout his site, particularly since the return on investment is always very quick. In the field, an increasing number of users are therefore insisting that their equipment suppliers integrate IE2 motors on all the machines they supply.

ATEX Gas Zone 1 - A new range of flame-proof motors with IE2 efficiency level as standard



As a reminder, the majority of applications used in an explosive atmosphere, and therefore representing a potential danger (zone 1), use Ex d or Ex de flameproof motors. Leroy-Somer has taken the decision to develop a new range of FLSD flameproof motors with IE2 efficiency level as standard (from 11 kW) in order to anticipate what this market requires.

These motors benefit from the development of IE2 cast iron reference ranges in the LS2 FLSES series, which has led to a reduction in losses of at least 10%!

Optimised component design

Leroy-Somer has selected low-loss magnetic laminations. The end shields are ribbed to ensure maximum heat dissipation. The profile

of the housing cooling fins has been optimised, thus reducing the power absorbed by the cooling fans.

The considerable reduction in temperature rise increases the life of the windings (more than 10,000 hrs on average) and reinforces the capacity to accept brief overloads.

The new cover and fan design also reduce the noise level: - 5 dBA for example on a 30 kW motor running at 3000 rpm.

Options

Leroy-Somer offers a variety of complementary equipment (PTC or Pt100 sensors, heaters, cable gland, incremental encoder and/or forced ventilation unit, Corrobloc finish for harsh atmospheres, etc).

Maintenance

The greasing intervals have been significantly extended, resulting in a reduction in maintenance costs: a 30 kW motor running at 1500 rpm, operated at an ambient temperature of 25°C, can therefore run for more than 20,000 hrs without intervention.

Services

A «Guaranteed Availability» charter of delivery times allied with

a gearbox assembly centre allows the customer to procure several hundred part numbers on guaranteed short delivery (between 1 and 5 days ex. works depending on the optional equipment chosen).

Variable speed

In recent years, the use of safety motors for variable speed, which was still very limited in 2003 when the ATEX Directives were introduced, has been rolled out in the majority of sectors, even refineries and petrochemical industries.

All new LS2 FLSD motors have been tested and approved on frequency inverters. EC type-examination certificates awarded by the Ineris notified body include provisions certifying suitability for use on frequency inverters.

All motors kept in stock rated higher than 11 kW are fitted with PTC sensors and a second nameplate allowing variable speed between 10 and 50 Hz.

Release onto the market

The LS2 IE2 FLSD range of motors rated 11 to 90 kW is now available. Flameproof motors with higher power ratings will be available at the end of June 2012.

ATEX Gas Zone 2 – A new range of IE2 «non-sparking» motors

In zone 2 (minimal danger), the use of Ex n non-sparking motors is mandatory. All LS2 LSN/FLSN high-efficiency motor ranges are now available as an option.

ATEX Dust – Two IE2 motor ranges for use in zone 21 or 22

All motor ranges for potentially explosive dust atmospheres (LSPX/FLSPX and LSES/FLSES zone 22) can also be supplied in an IE2 version.



Evolution of ATEX markings

The standards governing motors for use in ATEX gas and dust zones are continually evolving.

Since 1 June 2012, standard EN 60079-0:2009 has definitively replaced references EN 60079-0:2006 and EN 61241-0:2006. A new 60079-31:2009 standard defining protection by an Ex t casing has also been introduced.

Users will notice modifications relating to how motors are marked:

1. Introduction of a new Group of potentially explosive atmospheres, Group III for identifying dust atmospheres, with the following subdivisions:
 - IIIA: Combustible particles in suspension
 - IIIB: Non-conductive dust
 - IIIC: Conductive dust

2. Introduction of the Equipment Protection Level (EPL), namely:
 - Ma or Mb for equipment used in gas-prone mines
 - Ga, Gb or Gc in gas atmospheres
 - Da, Db or Dc in dust atmospheres
3. When combustible dust is present, the protection method becomes:
 - Ex tb in zone 21
 - Ex tc in zone 22

Equivalence table between ATEX marking, EPL levels and zones

Directive 94/9/EC Classification of equipment					IEC 60079-0 Classification of equipment Equipment Protection Level				Zones	
Use	ATEX Ggroup	Category	Protection level	If ATEX present	Use	Equipment group	EPL level	Protection level	If ATEX present	60079-10
Gas-prone mines	I	M1 Max. mine gas content	Very high	Powered up	Gas-prone mines	I	Ma Max. mine gas content	Very high	Powered up	
		M2 Outside a certain value	High	Powered down			Mb Outside a certain value	High	Powered down	
Surface industries	II	1G	Very high	Powered up	Explosive gas atmospheres	A II B C	Ga	Very high	Powered up	0
		2G ⁽¹⁾	High				Gb ⁽¹⁾	Haut		1
		3G	Normal				Gc	Reinforced		2
		1D	Very high				Da	Very high		20 IP6X
		2D ⁽²⁾	High				Db ⁽²⁾	High		21 IP6X
3D	Normal	Dc	Reinforced	22 IP6X						
					Explosive dust atmospheres	A III B C				

⁽¹⁾ Can be installed in zone 1 and 2
⁽²⁾ Can be installed in zone 21 and 22

I : Methane IIA : Propane IIIB : Ethylene IIIC : Hydrogen, Acetylene
 IIIA : combustible particles in suspension
 IIIB : non-conductive dust
 IIIC : conductive dust

Electromagnetic disturbance and regenerative function

Of all the solutions for reducing harmonics, the drive with active synchronous rectifier, also called a Regen drive or AFE (Active Front End) drive, benefits from the dual function of eliminating harmonics and sending power back to the grid. This is a drive unlike any other!



Harmonic distortion

Unlike linear loads such as induction motors which draw a uniform sinusoidal current, variable speed drives consist of a diode bridge at their input which, in rectifying the D.C. to A.C., creates disturbance on the electrical mains supply.

These distortions can lead to a set of consequences on the installation upstream of the drive such as, for example, possible overheating in the transformers or noise disturbance.

What happens is that the rectifier in the frequency inverter creates harmonic distortion of the current. This distortion can be calculated precisely using a mathematical operation (known as the Fourier transform). The total harmonic distortion (THDI) can be used to measure the total harmonic level.

The effects are usually negligible as long as the power of the equipment in an installation does not exceed 20% of the power supply transformer power.

Since the use of non-linear loads is becoming increasingly frequent, legislation

has been developed to prevent the mains quality being affected by harmonics. These limits may apply directly to the product or more commonly to the highest power ratings at the connection point to the public grid (PCC). For example, for infrastructure investments (water treatment plants, tunnel renovation, etc) an increasing number of engineering companies refer to the IEEE 519 recommendations in order to specify the acceptable harmonic level for the PCC.

An extensive range of solutions is available that can reduce the harmonics present on an installation. The addition of line reactors or the use of a drive with active synchronous rectifier form part of the possible solutions.

Drive with active synchronous rectifier

A conventional drive has a diode rectifier bridge at its input which generates D.C. voltage. This D.C. voltage is then switched at high frequency by an IGBT inverter bridge which creates an A.C. voltage with variable amplitude and frequency. The latter varies the motor speed. Since the diode bridge is not reversible, the power can only travel in one direction.

At the drive output, the IGBT inverter generates a sinusoidal current in the electric motor which can either drive a machine, or brake it. Power passes from the D.C. voltage to the motor and vice versa from the motor to the D.C. voltage.

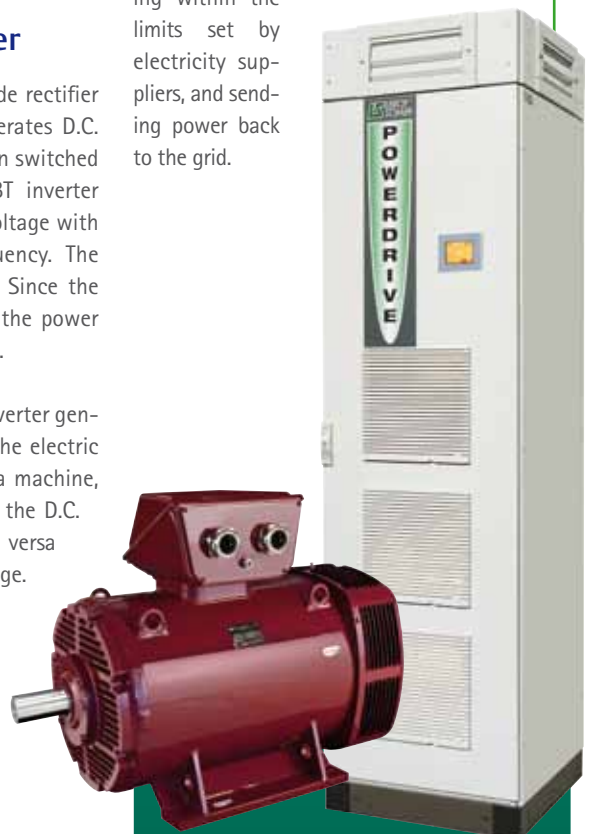
However, as this power cannot be sent back to the grid, during the braking phase the value of the D.C. bus will increase to a threshold where the drive locks in order to protect itself.

On the drive with active synchronous rectifier, whether "AFE" or "Regen", the

unidirectional diode bridge is replaced with a second IGBT inverter bridge which will transfer energy between the power supply line and the D.C. voltage. This energy transfer will take place with a sinusoidal current waveform.

This drive is also called a Regen drive because it was initially developed to send power back to the grid when braking loads, for example. This is one of the ways in which power is generated, on some wind turbines for example.

The drive with active synchronous rectifier can therefore be used to create a uniform sinusoidal current and has the dual function of eliminating harmonics, i.e. keeping within the limits set by electricity suppliers, and sending power back to the grid.



Powerdrive MDR from 45 kW to 2800 kW and PLSRPM from 300 to 600 kW

Dyneo® D.C. geared motor solutions serving the Norwegian army

Heating the buildings in a naval base using exceptionally cold sea water: this was the challenge that Star Refrigeration, a company that specialises in designing industrial heat pumps, had to meet with the support of Leroy-Somer.

Heat pumps and performance coefficient

Industrial heat pumps recover low-temperature heat from the ground, water or the air and transfer it at a higher temperature to a heating system via a compressor which increases the pressure of the coolant and hence its temperature. Its efficiency is expressed by the coefficient of performance (COP) which gives the ratio between the quantity of heat produced and the electricity consumption.

Neatpump pumps with zero impact on the ozone layer

To heat all the buildings on the Ramsund naval base, the Norwegian army installed Neatpump heat pumps made by Star Refrigeration, a company based in Scotland, and installed by its Norwegian partner Norsk Kulde.

The plant extracts sea water in the port of Ramsund, captures its heat, compresses it and supplies hot water and heating to the buildings on the base.

Unlike the first-generation systems, the Neatpump pump does not require any greenhouse gases (HFCs) but uses ammonia, a natural coolant which does not erode the ozone layer. The plant has a capacity of 600 kW, a COP of 2.7 and the hot water produced varies in temperature between 60 and 68°C.

Reliable, high-performance equipment

The Neatpump heat pump is equipped with a Vilter single screw compressor. This unique compressor design centres around axial and radial balancing of the screw combined with the Paralex™ slide valve system, ensuring a long-lasting, reliable and low-maintenance product.

mode of the magnet motor associated with the Powerdrive.

Star Refrigeration particularly appreciated Leroy-Somer's responsiveness and the technical support provided to the installer Norsk Kulde through its local service centre.

Neatpump heat pump, Vilter screw compressor, Leroy-Somer's Dyneo® D.C. geared motor – a winning combination for heating



To ensure high efficiency even at partial load, Star Refrigeration decided to use Leroy-Somer's Dyneo® permanent magnet motors which are fitted on the Neatpump range.

Dyneo® motors offer the unit exceptional performance in terms of efficiency and compactness, not to mention simplified commissioning thanks to the sensorless control

the Ramsund naval base in an eco-friendly way despite the extreme cold which can take hold in this region.



Industry Solutions tailored to your needs

Familiarity with your applications

For the best part of a century, Leroy-Somer has been present wherever people have needed to produce electricity and transmit movement. With this wealth of acquired experience, Leroy-Somer's engineers and technicians are able to offer you reliable, innovative solutions for a wide range of applications, in all types of industry. Its decentralised design offices allow Leroy-Somer to gain an understanding of your business from the initial product design stage.

Offering the best technology

Leroy-Somer adapts and customises its product ranges while incorporating the requirements of:

- the specification or the customer's process (control, self-diagnostics, communication, automation system, monitoring, etc)
- the working environment (damp, corrosion, high temperature, potentially explosive atmospheres, etc)
- the machine function (materials handling, pumping, compression, ventilation, etc)
- the type of industry (chemical, automotive, food processing, paper-making, marine, etc)

CHEMICAL INDUSTRY

Since they account for 65% of a production site's electricity consumption, whether in pumping, mixing, mechanical dehydration or ventilation applications, motors constitute an important source of potential savings.



early as possible, usually results in savings of more than 30% on the relevant drive system.

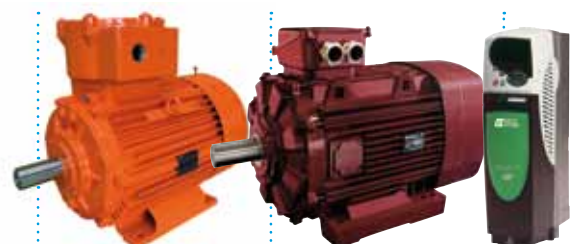
Solutions for potentially explosive atmospheres

The chemical industry also requires safety motors and geared motors to be used in potentially explosive atmospheres containing gas or dust. The ATEX ranges of motors and geared motors, designed and approved by European certification bodies, form part of the solutions offered by Leroy-Somer both in V.I.K. finish for operation in harsh environments and a standard construction for less severe environments.

Increased productivity and energy savings

Thanks to its expertise in the design and manufacture of electric motors, geared motors and variable speed drives, Leroy-Somer has developed an extensive range of solutions which can help owners reduce their production costs and satisfy environmental concerns.

The result is striking: improving the efficiency of fixed-speed motors has already led to a reduction of around 10% in a site's electricity consumption, whereas implementing variable speed, as





QUARRIES

Driving loads at precise speeds or high operating rates without compromising safety

Expertise

In partnership with the world leaders in the profession, Leroy-Somer develops geared brake motor solutions which are an ideal replacement for conventional backstop geared motors, to maximise the safety of installations.

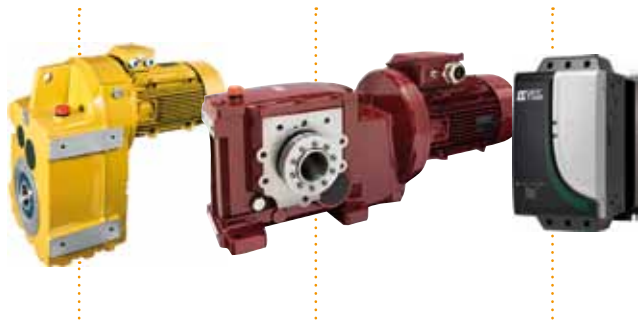
Save money on operating costs

Taking account of the specific application characteristics, such as balancing and tilting of the conveyor belt, Leroy-Somer offers easily interchangeable drive solutions which can withstand severe

operating conditions, such as humidity, shocks and vibrations: geared motors with or without a brake, gearboxes, induction motors, variable speed solutions. In addition, by combining a gearbox and a motor with the new permanent magnet technology, Leroy-Somer is committed to significantly reducing energy bills.

Rapid repairs

Rapid repairs are possible thanks to our unique guaranteed availability service from our factories, Assembly Centres and Distributors, providing technical advice, on-site support and repair or modernisation of existing drive mechanisms.



AGRI-FOODS

Meeting the specific requirements of processes in the food industry: hygiene, reliability, safety, energy savings, etc



Customised solutions

Using its in-depth knowledge of companies in the industrial supply chain plus equipment users and manufacturers, Leroy-Somer designs special products that can cope with the constraints of the following environments:

- Harsh and extremely harsh atmospheres: motors, geared motors and drives which can resist frequent washing, high-

pressure cleaning, constant humidity and contact with harsh liquids

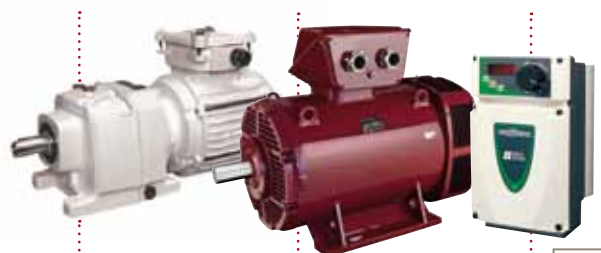
- Potentially explosive atmospheres: ATEX-certified drive systems for operation in zones containing dust (zone 21 and zone 22)

Energy savings

Motorised applications, which account for 70% of its electricity consumption, are an area where significant savings can be made in the food processing industry, with less energy-intensive solutions: high-efficiency motors, variable speed, new technologies.

Services

Leroy-Somer offers a complete range of services: eco-responsible maintenance and energy expertise, repair in the workshop and on-site repair, predictive and remedial maintenance, spare parts logistics and training.



GENERATING PURE ENERGY



> **NEW LSA 42.3**
ALTERNATOR



Leroy-Somer's EPG (Electric Power Generation) division, the world leader in Low and Medium Voltage alternators, has the most extensive range on the market, suitable for a wide variety of applications. Leroy-Somer EPG's expertise is recognized throughout the Power Generation business, as is its proven ability to meet customers' needs worldwide. Leroy-Somer EPG is proud to present the new LSA 42.3 alternator from 25 to 60 kVA, a significant advance in alternator design.

For more information on LSA 42.3 or the EPG Alternator range: www.lsa423.com



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