Dynecᵀ

Synchronous motors combining reluctance and permanent magnets

High efficiency motors
Interchangeable and compact versions

Variable speed

Frame sizes from 132 to 355

Power from 11 to 430 kW

Speeds from 1500 min^{-1} to 6000 min^{-1}

LEROY-SOMER™

Nidec
All for dreams

Dyneo+ Synchronous motors combining reluctance and permanent magnets

This catalogue presents the synchronous motors combining reluctance and permanent magnets of the Dyneo+ range, in all their efficiency classes and construction shapes.

Dyneo+ motors are designed to be only driven by a variable speed drive while allowing a very high efficiency level.

Nidec Leroy-Somer reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document is therefore liable to be changed without notice.

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General information

DYNEO+ RANGE

Nidec Leroy-somer has developed the Dyneo+ range of high performance synchronous motors combining reluctance and permanent magnets.

The technology used combines the proven performance of permanent magnets with the simplicity of use of induction motors.

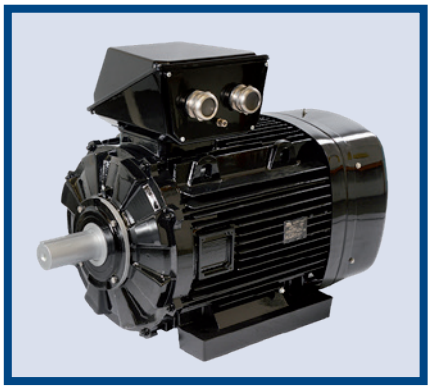
Dyneo+ motors based on IMfinity® platform, are designed to be controlled by a variable speed drive. They have been qualified and optimized with Nidec Leroy-Somer drives to guarantee optimum electrical and mechanical performance and easy commissioning.

Their high efficiency level (according to IEC 60034-30-2 standard) associated with the undeniable benefits of variable speed control, contributes considerably to reducing the energy bill.

Dyneo+ range is available in 2 versions:

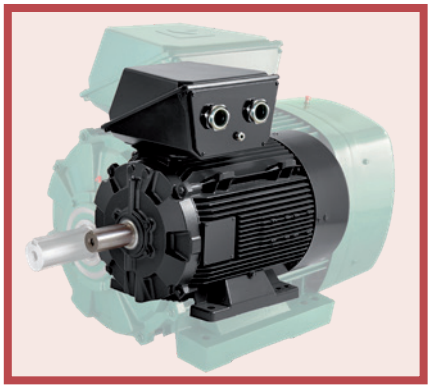
- INTERCHANGEABLE

- Aluminium or cast iron housing,
- 1500 and 3000 rpm speed ranges,
- IEC standard dimensions and power equivalent to standard induction motors.



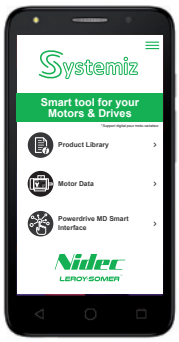
- COMPACT

- Aluminium or steel housing,
- 1500, 1800, 2600, 3000, 3600, 4500 and 6000 rpm speed ranges,
- Performances and dimensions optimized for a high power to weight ratio.



APPLICATION SYSTEMIZ

By simply reading the QR code on the nameplate, the Systemiz application displays all useful Dyneo+ information, such as motor characteristics, commissioning and maintenance manuals or certificates, which can be consulted on any device (computer , tablet, smartphone). The Systemiz app is available on all iOS, Android or Windows PC platforms.



General information

QUALITY COMMITMENT

Nidec Leroy-Somer's quality management system is based on:

- Control of procedures right from the initial sales offering until delivery to the customer, including design, manufacturing start-up and production
- A total quality policy based on making continuous progress in improving operational procedures, involving all departments in the company in order to give customer satisfaction as regards delivery times, conformity and cost
- Indicators used to monitor procedure performance
- Corrective actions and advancements

with tools such as FMECA, QFD, MAVP, MSP/MSQ and Hoshin type improvement workshops on flows, process re-engineering, plus Lean Manufacturing and Lean Office

- Annual surveys, opinion polls and regular visits to customers in order to ascertain and detect their expectations.

Personnel are trained and take part in analyses and actions for continuous improvement of our procedures.

Nidec Leroy-Somer has entrusted the certification of its expertise to various international organisations.

Certification is granted by independent professional auditors, and recognises the high standards of the company's quality assurance procedures. All activities resulting in the final version of the machine have therefore received official certification ISO 9001: 2015 from the DNV. Similarly, our environmental approach has enabled us to obtain certification ISO 14001: 2015.

Products for particular applications or those designed to operate in specific environments are also approved or certified by the following organisations: LCIE, DNV, INERIS, EFECTIS, UL, BSRIA, TUV, GOST, which check their technical performance against the various standards or recommendations.

General information

DIRECTIVE AND STANDARDS RELATING TO MOTOR EFFICIENCY

There have been a number of changes to the standards and new standards created in recent years. They mainly concern motor efficiency and their scope includes measurement methods and motor classification.

Regulations are gradually being implemented, both nationally and internationally, in many countries in order to promote the use of high efficiency motors (Europe, USA, Canada, Brazil, Australia, New Zealand, Korea, China, Israel, etc.).

The new generation of synchronous motors combining reluctance and permanent magnets responds to changes in the standards as well as the latest demands of system integrators and users.

IEC 60034-30-2 STANDARD

The IEC 60034-30-2 defines efficiency classes for rotating electrical machines not covered by the IEC 60034-30-1 standard.

This technical specification refers to the efficiency classification of AC motor designed for variable voltage / frequency use, i.e. induction motors and synchronous motors not covered by IEC 60034-30-1 (not designed to be powered by mains supply).

By extension and consistency, Nidec Leroy-Somer has chosen to respect this standard for PLSHRM motors although theoretically not covered.

Sphere of application:

- Nominal voltage U_n from 50 V to 1 kV
- Nominal power P_n from 0.12 kW to 1 000 kW
- Nominal speed N_n from 600 rpm to 6000 rpm whatever the number of magnetic poles
- Designed for cooling modes IC410, IC411, IC416, or IC418 according to IEC 60034-6
- Capable of continuous operation at its rated operating point (torque / power, speed) with a temperature increase in the specified insulation temperature class
- Dimensioned for any ambient temperature in the range –20°C to +60°C;

Motors not concerned
Motors designed to be powered by mains supply.

ErP DIRECTIVE (Energy Related Product) 2009/125/EC (21ST OCTOBER 2009)

It establishes a framework for setting the eco-design requirements to be applied to “energy-using products”. These products are grouped in lots. Motors come under lot 11 of the eco-design program, as do pumps, fans and circulating pumps.

DECREE IMPLEMENTING OF THE ErP EUROPEAN REGULATION (Energy Related Product) EC/640/2009 + AMENDEMENT EU/4/2014

This is based on standard IEC 60034-30-2 and will define the efficiency classes. It specifies the efficiency levels to be attained for machines sold in the European market and outlines the timetable for their implementation.

Efficiency classes	Efficiency level
IE1	Standard
IE2	High
IE3	Premium
IE4	Super Premium
IE5*	Ultra Premium

** Motor dedicated to variable speed only*

This standard only defines efficiency classes and their conditions. It is then up to each country to define the efficiency classes and the exact scope of application.

Motors concerned:
3-phase motors from 0.75 to 375 kW with 2, 4 and 6 poles.

Obligation to place High efficiency or Premium efficiency motors on the market:

- IE2 Class from 16 June 2011
- IE3 Class from 1st January 2015 for power ratings from 7.5 to 375 kW
- IE3 Class from 1st January 2017 for power from 0.75 to 375 kW

Motors not concerned:

- Motors designed to operate when fully submerged in liquid
- Motors which are fully integrated in another product (rotor/stator)
- Motors with duty other than continuous duty
- Motors designed to operate in the following conditions:
  - altitude > 4000 m
  - ambient air temperature > 60°C
  - maximum operating temperature > 400°C
  - ambient air temperature < -30°C or < 0°C for water-cooled motors
- safety motors conforming to directive ATEX 2014/34/UE
  - brake motors.

General information

The motors comply with the standards mentioned in this catalog

STANDARDS AND APPROVALS

Reference		International standards
IEC 60034-1	EN 60034-1	Electrical rotating machines: ratings and operating characteristics
IEC 60034-2-1 IEC 60034-2-3		Electrical rotating machines Party 2: methods for determining losses and efficiency from tests (excluding machines for traction vehicles)
IEC 60034-5	EN 60034-5	Electrical rotating machines: classification of degrees of protection provided by casings of rotating machines
IEC 60034-6	EN 60034-6	Electrical rotating machines (except traction): cooling methods
IEC 60034-7	EN 60034-7	Electrical rotating machines (except traction): symbols for mounting positions and assembly layouts
IEC 60034-8		Electrical rotating machines: terminal markings and direction of rotation
IEC 60034-9	EN 60034-9	Electrical rotating machines: noise limits
IEC 60034-14	EN 60034-14	Electrical rotating machines: mechanical vibration of certain machines with shaft heights 56 mm and higher. Measurement, evaluation and limits of vibrational intensity
IEC TS/60034-30-2		Electrical rotating machines Efficiency classes of variable speed AC motors (IE-code)
IEC 61800-9-2		Adjustable speed electrical power drive systems Part 9-2: Ecodesign for power drive systems, motor starters, power electronics and their driven applications - Energy efficiency indicators for power drive systems and motor starters
IEC 60038		IEC standard voltages
IEC 60072		Dimensions and power series for electrical rotating machines: designation of casings between 56 and 400 and flanges between 55 and 1080
IEC 60085		Evaluation and thermal classification of electrical insulation
IEC 60721-2-1		Classification of natural environment conditions. Temperature and humidity
IEC 60204-1		Safety of machinery - Electrical equipment of machines - Part 1: General requirements
IEC 60445		Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals, conductor terminations and conductors
IEC 61800-3		Electromagnetic compatibility (EMC) : environment
IEC 106 guide		Guidelines on the specification of environmental conditions for the determination of operating characteristics of equipment
ISO 281		Bearings - Basic dynamic loadings and nominal bearing life
ISO 1680	EN 21680	Acoustics - Test code for measuring airborne noise emitted by electrical rotating machines: a method for establishing an expert opinion for free field conditions over a reflective surface
ISO 8821		Mechanical vibration - Balancing. Conventions on shaft keys and related parts
	EN 50102	Degree of protection provided by electrical housings against extreme mechanical impacts
ISO 12944-2		Corrosion protection.

MAIN PRODUCT MARKINGS

Dyneo+ range is available with CE, cURus and EAC markings.

CE	This marking is mandatory throughout the European Economic Community. It means that the product conforms to all the relevant directives. If the product does not conform to a relevant directive, it cannot be CE rated and cannot therefore bear the **CE** mark.
c UL us	**The UL Recognized Component Mark**, which is optional, indicates conformance with Canadian requirements and those of the United States. UL encourages manufacturers distributing products bearing the UL Recognized Component Mark for both countries to use this combined mark.
EAC	The EAC mark replaces the GOST mark. It is the equivalent of the CE mark for the European Union market. This new mark covers regulations for Russia, Kazakhstan and Belarus. All products marketed in these three countries must bear this marking.

Environment

INDEXES OF PROTECTION OF ELECTRICAL EQUIPMENT ENCLOSURES

According to IEC 60034-5 - EN 60034-5 (IP) - IEC 62262 (IK)

1st digit: protection against solid materials			2nd digit protection against liquids			3rd digit mechanical protection		
IP	**Tests**	**Definition**	**IP**	**Tests**	**Definition**	**IK**	**Tests**	**Definition**
0		No protection	0		No protection	00		No protection
1	Ø 50 mm	Protected against solid objects larger than 50 mm (e.g. accidental contact with the hand)	1		Protected against water drops falling vertically (condensation)	01	150 g, 10 cm	Impact energy: 0.15 J
2	Ø 12 mm	Protected against solid objects larger than 12 mm (e.g. a finger)	2	15°	Protected against water drops falling at up to 15° from the vertical	02	200 g, 10 cm	Impact energy: 0.20 J
3	Ø 2.5 mm	Protected against solid objects larger than 2.5 mm (e.g. tools, wires)	3	60°	Protected against rain falling at up to 60° from the vertical	03	250 g, 15 cm	Impact energy: 0.37 J
4	Ø 1 mm	Protected against solid objects larger than 1 mm (e.g. thin tools, small wires)	4		Protected against projected water from all directions	04	250 g, 20 cm	Impact energy: 0.50 J
5		Protected against dust (no deposits of harmful material)	5		Protected against jets of water from all directions from a hose	05	350 g, 20 cm	Impact energy: 0.70 J
6		Protected against any dust penetration	6		Protected against projected water comparable to big waves	06	250 g, 40 cm	Impact energy: 1 J
			7	0.15 m, 1 m	Protected against the effects of immersion between 0.15 and 1 m	07	0.5 kg, 40 cm	Impact energy: 2 J
			8 . . m	..m	Protected against prolonged effects of immersion under pressure	08	1.25 kg, 40 cm	Impact energy: 5 J
						09	2.5 kg, 40 cm	Impact energy: 10 J
						10	5 kg, 40 cm	Impact energy: 20 J

Example :

: Example of an IP 55 machine

IP : Index of Protection

5. : Machine protected against dust and accidental contact.
Test result: no dust enters in harmful quantities, no risk of direct contact with rotating parts. The test will last for 2 hours.

.5 : Machine protected against jets of water from all directions from hoses at 3 m distance with a flow rate of 12.5 l/min at 0.3 bar.
The test will last for 3 minutes.
Test result: no damage from water projected onto the machine

LSHRM and FLSHRM motor types have a IP55 protection and PLSHRM a IP23 protection.

Environment

ENVIRONMENTAL LIMITATIONS

NORMAL OPERATING CONDITIONS

According to 60034-1, motors can operate in the following conditions:

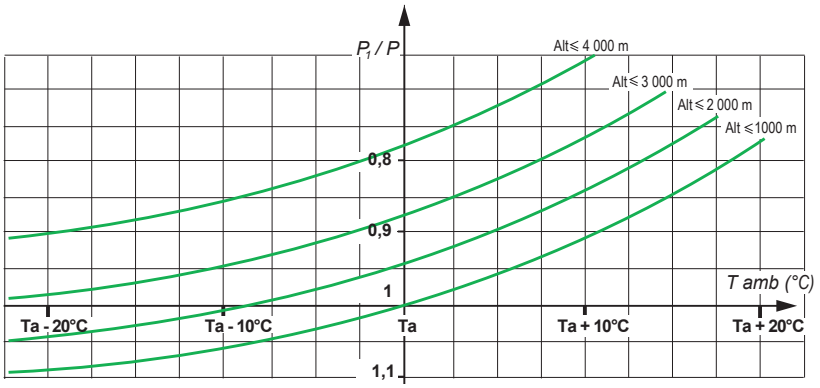
- ambient temperature within the range -20°C to +50°C (to +45°C for compact version),
- altitude less than 1000 m,
- atmospheric pressure: 1050 hPa (mbar) = (750 mm Hg)

Power correction factor

For operating conditions outside these limits, apply the power correction coefficient shown in the chart on the right while maintaining the thermal reserve, as a function of the altitude and ambient temperature.

Correction coefficient table

NB: The output power can only be corrected upwards once the ability of the motor to start the load has been checked.



***Plated ambient temperature (Ta)**: Interchangeable version: + 50°C or compact one: + 45°C*

In temperate climates, relative humidity is generally between 50 and 70%. For the relationship between relative humidity and motor impregnation, especially where humidity and temperature are high, see table on next page.

NORMAL STORAGE CONDITIONS

Machines should be stored at an ambient temperature between -16°C and +80°C for aluminium motors, between -40°C and +80°C for cast iron motors, and at a relative humidity of less than 90%.

For starting, see the commissioning and installation manual ref.5511

(www.leroy-somer.com).

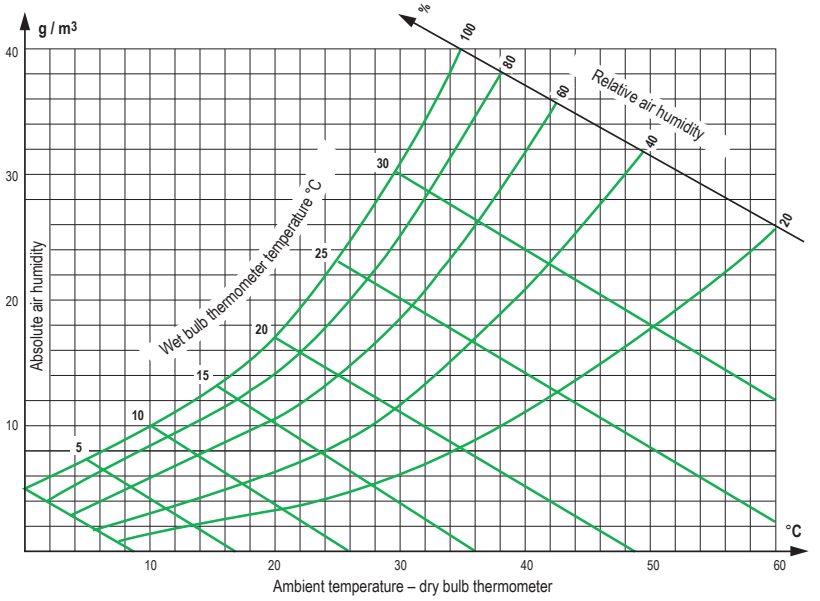
RELATIVE AND ABSOLUTE HUMIDITY

MEASURING THE HUMIDITY

Humidity is usually measured by the “wet and dry bulb thermometer” method. Absolute humidity, calculated from the readings taken on the two thermometers, can be determined using the chart on the right. The chart also provides relative humidity figures.

To determine the humidity correctly, a good air flow is required for stable readings, and accurate readings must be taken on the thermometers.

During the construction of aluminium motors, the materials of the various components which are in contact with one another are selected so as to minimize deterioration by galvanic effect. The voltages in the metal combinations used (cast iron-steel; cast iron-aluminium; steel-aluminium; steel-tin) are too low to cause deterioration.



DRAIN HOLES

Holes are provided at the lowest points of the enclosure, depending on the operating position (IM, etc.) to drain off any moisture that may have accumulated inside during cooling of the machine.

The holes may be sealed with plastic plugs in standard. On request, they can be sealed with screws, siphon or plastic ventilator.

Under certain special conditions, it is advisable to leave the drain holes permanently open (operation in environments with high levels of condensation). Opening the holes periodically should be part of the regular maintenance procedure.

DRIP COVERS

For machines operating outdoors, with the drive shaft downwards, drip covers are recommended.

This is an option and should be specified on the order if required.

Environment

IMPREGNATION AND ENHANCED PROTECTION

NORMAL ATMOSPHERIC PRESSURE (750 MM HG)

The table below shows the methods of manufacture suited to environments in which temperature and relative humidity show large degrees of variation (see relative and absolute humidity calculation method, on preceding page).

The protection of the winding is generally described by the term "tropicalization".

T : Tropicalization

TC: Complete Tropicalization

For high humidity environments, we recommend that the windings are pre-heated (see space heaters in section hereafter).

IINFLUENCE OF ATMOSPHERIC PRESSURE

As atmospheric pressure decreases, air particles rarefy and the environment becomes increasingly conductive.

- P > 550 mm Hg:
standard impregnation according to previous table - Possible derating or forced ventilation.

- P > 200 mm Hg:
Coating of bearings - Flying leads up to a zone at P ~ 750 mm Hg - Derating to take account of insufficient ventilation - Forced ventilation.

- P < 200 mm Hg: Special manufacture based on specification.

In all cases, these problems should be resolved by a special contract worked out on the basis of a specification.

SPACE HEATERS

Severe climatic conditions, e.g. T amb < - 40°C, RH > 95% etc, may require the use of space heaters (fitted to one or two winding end coils) which serve to maintain the average temperature of the motor, provide trouble-free starting, and/or eliminate problems caused by condensation (loss of insulation).

The heater supply wires are brought out to a terminal block in the motor terminal box.

The heaters must be switched off while the motor is running.

Space heater values are given in section *Optional equipments page 63*.

Tropicalization choice

Ambient temperature range \ Relative humidity	HR ≤ 95 %	HR > 95 % [1]
θ < - 40 °C	ask for estimate (quotation)	ask for estimate (quotation)
- 20 °C à + 50 °C	T Standard	TC Standard
Other ambient temperatures	ask for estimate (quotation)	ask for estimate (quotation)
Plate mark	T	TC

1. Atmosphere without high levels of condensation

Standard impregnation

Environment

PAINTING

Surface protection is defined in the ISO 12944 standard. This standard defines the planned lifetime of a paint system until the first major application of maintenance paint. Durability is not a guarantee.

The EN ISO 12944 standard comprises 8 sections. Part 2 covers the classification of the environments.

Nidec Leroy-Somer motors are protected with a range of surface finishes.

The surfaces receive appropriate special treatments, as shown below.

PREPARATION OF SURFACES

SURFACE	PARTS	TREATMENT
Cast iron	End shields	Shot blasting + Primer
Steel	Accessories	Phosphatization + Primer
	Terminal boxes - Fan covers	Electrostatic painting or Epoxy powder
Aluminium alloy	Housings - Terminal boxes	Shot blasting
Polymer	Fan covers- Terminal boxes Ventilation grilles	None, but must be free from grease, casting-mould coatings and dust which would affect paint adhesion

CLASSIFICATION OF THE ENVIRONMENTS

Nidec Leroy-Somer painting systems according to the categories.

ATMOSPHERIC CORROSIVE CATEGORIES	CORROSIVITY CATEGORY AS PER ISO 12944-2	Durability class	ISO 6270 Water condensation nb hours	ISO 9227 Salt mist nb hours	Nidec Leroy-Somer equivalent system	System description
Others	-	-	-	-	Unpainted	Without any coat except cast iron parts
		-	-	-	Primer	One primer coat / Ph-Zn Pu
AVERAGE	C3	Limited	48	120	C3L	One Polyurethane coat
		Medium	120	240	-	-
		High	240	480	-	-
		Very high	480	720	-	-
HIGH	C4	Limited	120	240	-	-
		Medium	240	480	C4M	One primer coat / Ph-Zn Pu One Polyurethane coat
					C4M-P*	One Primer coat / Ph-Zn Pu One Epoxy coat
		High	480	720	-	-
		Very high	720	1440	-	-
VERY HIGH	C5	Limited	240	480	-	-
		Medium	480	720	C5M	One primer coat / Ph-Zn Epoxy One middle coat Ph-Zn Pu One Polyester / Acrylic coat
		High	720	1440	-	-
		Very high	-	-	-	-

: Standard for Dyneo+ motors.

* For indoor only

Nidec Leroy-Somer standard paint color reference for Dyneo+ range:

RAL 9005

Paint brightness standard: Satin or gloss

Environment

INTERFERENCE SUPPRESSION AND PROTECTION OF PEOPLE

AIRBORNE INTERFERENCE

EMISSION

For standard motors, the housing acts as an electromagnetic screening, reducing electromagnetic emissions measured at 0.25 meters from the motor to approximately 5 gauss (5 x 10^{-4} T).

However, electromagnetic emissions may be noticeably reduced by a special construction of aluminium alloy end shields and a stainless steel shaft.

IMMUNITY

The construction of motor housings (especially finned aluminium alloy frames) isolates external electromagnetic sources to the extent that any field penetrating the casing and magnetic circuit will be too weak to interfere with the operation of the motor.

POWER SUPPLY INTERFERENCE

The use of electronic systems for starting, variable speed control or power supply can create harmonics on the supply lines which may interfere with the operation of machines. These phenomena are taken into account in determining the machine dimensions, which act as quenching chokes in this respect.

The CISPR 11 standard defines permissible rejection and immunity rates.

Three-phase squirrel cage machines do not in themselves produce interference of this type. Mains connection equipment (contactors) may, however, need interference protection.

APPLICATION OF DIRECTIVE 2014/30/EC CONCERNING ELECTROMAGNETIC COMPATIBILITY (EMC)

In the case the motor is supplied by a drive, the motor is only a sub-assembly of a device which the system builder must ensure conforms to the essential requirements of the EMC directives.

APPLICATION OF LOW VOLTAGE DIRECTIVE 2014/35/EU

All motors are subject to this directive. The main requirements concern the protection of people, animals and property against risks caused by operation of the motors (see the commissioning and maintenance manual for precautions to be taken).

APPLICATION OF MACHINERY DIRECTIVE 2006/42/EC

All motors are designed to be integrated in a device subject to the machinery directive.

CE PRODUCT MARKING

The fact that motors comply with the essential requirements of the Directives is shown by the CE mark on their nameplates and/or packaging and documentation.

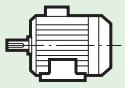
Construction

MOUNTINGS AND POSITIONS (according to IEC 60034-7 standard)

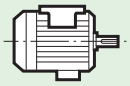
Foot mounted motors

• all frame sizes

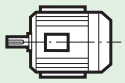
IM 1001 (IM B3)
- Horizontal shaft
- Feet on floor



IM 1071 (IM B8)
- Horizontal shaft
- Feet on top

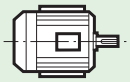


IM 1051 (IM B6)
- Horizontal shaft
- Wall mounted with feet on left when viewed from drive end

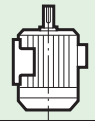


IM 1011 (IM V5)
- Vertical shaft facing down
- Feet on wall

IM 1061 (IM B7)
- Horizontal shaft
- Wall mounted with feet on right when viewed from drive end



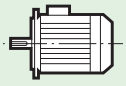
IM 1031 (IM V6)
- Vertical shaft facing up
- Feet on wall



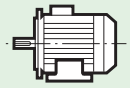
(FF) flange mounted motors

• all frame sizes
(except IM 3001, which is limited to frame size 225 mm)

IM 3001 (IM B5)
- Horizontal shaft

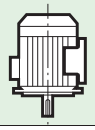


IM 2001 (IM B35)
- Horizontal shaft
- Feet on floor

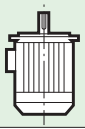


IM 3011 (IM V1)
- Vertical shaft facing down

IM 2011 (IM V15)
- Vertical shaft facing down
- Feet on wall



IM 3031 (IM V3)
- Vertical shaft facing up

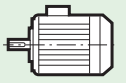


IM 2031 (IM V36)
- Vertical shaft facing up
- Feet on wall

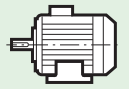
(FT) face mounted motors

• all frame sizes ≤ 160 mm

IM 3601 (IM B14)
- Horizontal shaft

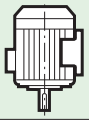


IM 2101 (IM B34)
- Horizontal shaft
- Feet on floor



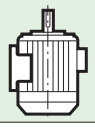
IM 3611 (IM V18)
- Vertical shaft facing down

IM 2111 (IM V58)
- Vertical shaft facing down
- Feet on wall



IM 3631 (IM V19)
- Vertical shaft facing up

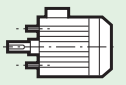
IM 2131 (IM V69)
- Vertical shaft facing up
- Feet on wall



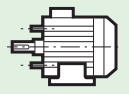
Motors without drive end shield

Warning: The protection (IP) specified on the IM B9 and IM B15 motor nameplates is provided by the customer when the motor is assembled.

IM 9101 (IM B9)
- Threaded tie rods
- Horizontal shaft



IM 1201 (IM B15)
- Foot mounted with threaded tie rods
- Horizontal shaft



Frame size (mm)	Mounting positions											
	IM 1001	IM 1051	IM 1061	IM 1071	IM 1011	IM 1031	IM 3001	IM 3011	IM 3031	IM 2001	IM 2011	IM 2031
≤ LSHRM 200	●	●	●	●	●	●	●	●	●	●	●	●
LSHRM 225 and 250	●	●	●	●	●	●	■	●	●	●	●	●
≥ (F)LSHRM 280	●	■	■	■	■	■	■	●	●	●	●	■
PLSHRM 315LD	●	■	■	■	■	■	■	■	■	●	■	■

● : possible positions
■ : please consult Nidec Leroy-Somer specifying the coupling method and the axial and radial loads if applicable

Construction

CONNECTION TO THE DRIVE - MOTOR CONNECTION

TERMINAL BOX

Placed as standard on the top of the motor near the drive end, it is IP 55 protection and fitted with threaded plugs or a removable undrilled support plate.

The standard position of the plug is on the right, seen from the drive end but, owing to the symmetrical construction of the box, it can usually be placed in any of the 4 directions, as shown in the table right.

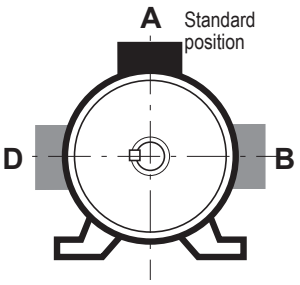
If required, the terminal box may be fitted in a different position (on the left or right as seen from the drive end, and at the DE or NDE of the motor housing).

FLYING LEADS

According to specification, motors can be supplied with flying leads using single-core cables (as an option, the cables can be protected by a sheath) or multicore cables.

Please state cable characteristics (length, number of conductors), connection method (flying leads or on a terminal block) and the drill hole position.

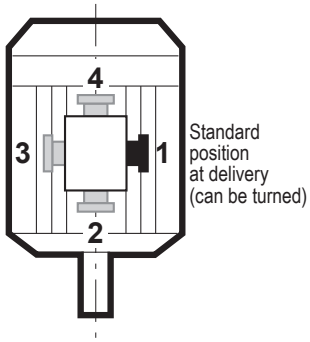
Positions of the terminal box
in relation to the drive end
(motor in IM 1001 position)



Terminal box position	A	B	D
LSHRM	●	■	■
FLSHRM	●	■	■
PLSHRM	●	■	■

● : standard
■ : please consult Nidec Leroy-Somer

Positions of the plug
in relation
to the drive end



Cable gland position	1	2*	3	4
LSHRM 160 to 315	●	▲	▲	▲
FLSHRM - PLSHRM	●	-	▲	-

** not recommended (impossible on (FF) flange mounted motors)*
● : standard
▲ : possible by simply turning round the terminal box
- : not available

WIRING DIAGRAMS AND GROUND CONNECTION

All standard motors are supplied with a wiring diagram in the terminal box.

Some terminal boxes are provided with multi-level power connection bars to facilitate wiring.

For more details about terminal boxes, refer to section *Description of terminal boxes page 60.*

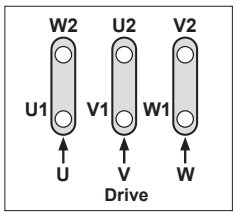
Ground braids are fitted as standard.

A dedicated connection to the ground wires of the power cables is present in the terminal box. It distributes the fault currents as well as the high frequency currents so that they do not circulate through the electrical equipment.

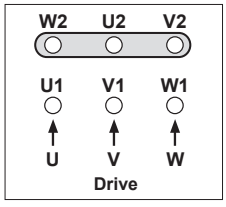
Under no circumstances the earth connections, intended to protect people by connecting the metal masses to the earth by a cable, can substitute for the ground connections.

Connection diagrams

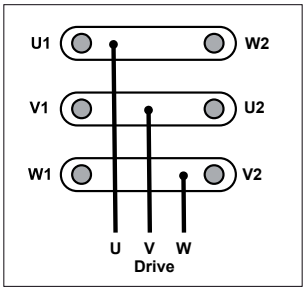
Standard terminal board, delta connection

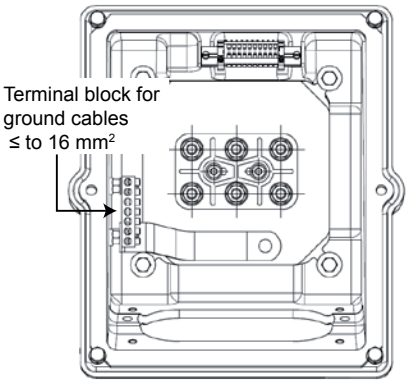


Standard terminal board, star connection



Multi-level terminal board, delta connection





Motor terminal block

Ground connection bar for cables > to 16 mm²

Construction

RADIAL LOADS

PERMISSIBLE RADIAL LOAD ON THE MAIN SHAFT EXTENSION

In pulley and belt couplings, the drive shaft carrying the pulley is subjected to a radial force Fpr applied at a distance X (mm) from the shoulder of the shaft extension (length E).

Radial force acting on the drive shaft: Fpr

The radial force Fpr expressed in daN applied to the drive shaft is found by the formula.

$$Fpr = 1.91\ 10^6 \frac{P_N \cdot k}{D \cdot N_N} \pm P_P$$

where:

P_N = nominal motor power (kW)

D = external diameter of the drive pulley (mm)

N_N = nominal motor speed (min^{-1})

k = factor depending on the type of transmission

P_P = weight of the pulley (daN)

The weight of the pulley is positive when it acts in the same direction as the tension force in the belt (and negative when it acts in the opposite direction).

Range of values for factor k(*)

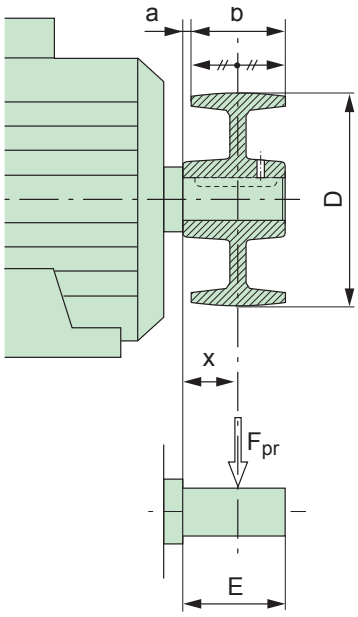
- toothed belts: k = 1 to 1.5
- V-belts: k = 2 to 2.5
- flat belts
  - with tensioner: k = 2.5 to 3
  - without tensioner: k = 3 to 4

(*) A more accurate figure for factor k can be obtained from the transmission suppliers.

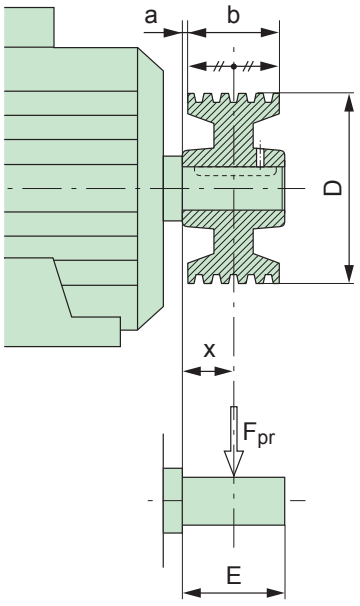
Change in bearing life depending on the radial load factor.

For a radial load Fpr (Fpr ≠ FR), applied at distance X, the bearing life L10h changes, as a rough estimate, in the ratio kR (kR = Fpr/FR) as shown in the chart below, for standard fitting arrangements.

If the load factor kR is greater than 1.05, you should consult our technical department, stating mounting position and direction of force before opting for a special fitting arrangement.

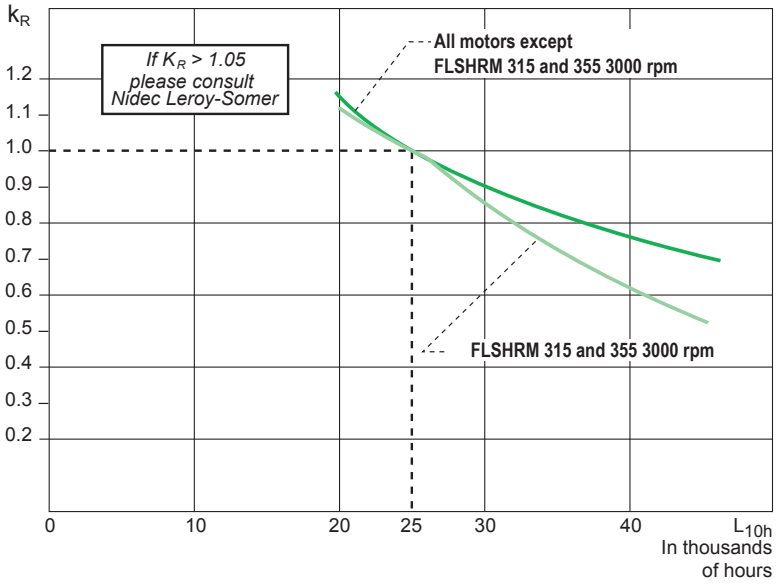


$$\begin{cases} x = a + \frac{b}{2} \\ \text{where} \\ x \le E \end{cases}$$



$$\begin{cases} x = a + \frac{b}{2} \\ \text{where} \\ x \le E \end{cases}$$

Change in bearing life L_{10h} depending on the radial load factor kR for standard fitting arrangements.

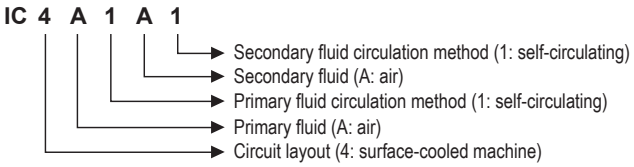


Construction

COOLING

Designation for the IC (International Cooling) coded cooling method in the IEC 60034-6 standard.

The standard allows for two designations (general formula and simplified formula) as shown in the example opposite.



NB: The letter A may be omitted if this will not lead to confusion. This contracted formula becomes the simplified formula. Simplified form: **IC 411**.

Circuit layout

Characteristic number	Abbreviated designation	Description
0(1)	Free circulation	The coolant enters and leaves the machine freely. It is taken from and returned to the fluid round the machine.
1(1)	Machine with one intake pipe	The coolant is taken up elsewhere than from the fluid round the machine, brought into the machine through an intake pipe and emptied into the fluid round the machine.
2(1)	Machine with one outlet pipe	The coolant is taken up from the fluid round the machine, brought away from the machine by an outlet pipe and does not go back into the fluid round the machine.
3(1)	Machine with two pipes (intake and outlet)	The coolant is taken up elsewhere than from the fluid round the machine, brought to the machine through an intake pipe, then taken away from the machine through an outlet pipe and does not go back into the fluid round the machine.
4	Surface cooled machine using the fluid round the machine	The primary coolant circulates in a closed circuit, transferring its heat to a secondary coolant (the one surrounding the machine) through the machine casing. The casing surface is either smooth or finned to improve heat transmission.
5(2)	Built-in heat exchanger (using the surrounding environment)	The primary coolant circulates in a closed circuit, transferring its heat to a secondary coolant (the one surrounding the machine) in an integral heat exchanger inside the machine.
6(2)	Machine-mounted heat exchanger (using the surrounding environment)	The primary coolant circulates in a closed circuit, transferring its heat to a secondary coolant (the one surrounding the machine) in a heat exchanger that forms an independent unit, mounted on the machine.
7(2)	Built-in heat exchanger (not using the surrounding environment)	The primary coolant circulates in a closed circuit, transferring its heat to a secondary coolant (which is not the one round the machine) in an integral heat exchanger inside the machine.
8(2)	Machine-mounted heat exchanger (not using the surrounding environment)	The primary coolant circulates in a closed circuit, transferring its heat to a secondary coolant (which is not the one round the machine) in a heat exchanger that forms an independent unit, mounted on the machine.
9(2)(3)	Separate heat exchanger (using the surrounding environment or not)	The primary coolant circulates in a closed circuit, transferring its heat to the secondary fluid in a heat exchanger that forms an independent unit, away from the machine.

Coolant

Characteristic letter	Type of fluid
A	Air
F	Freon
H	Hydrogen
N	Nitrogen
C	Carbon dioxide
W	Water
U	Oil
S	Any other fluid (must be identified separately)
Y	The fluid has not yet been selected (used temporarily)

Method of circulation

Characteristic number	Designation abbreviated	Description
0	Free circulation	The circulation of the coolant is due only to differences in temperature. Ventilation caused by the rotor is negligible.
1	Self-circulating	The circulation of the coolant depends on the rotational speed of the main machine, and is caused by the action of the rotor alone, or a device mounted directly on it.
2, 3, 4		Not yet defined.
5(4)	Built-in and independent device	The coolant is circulated by a built-in device which is powered independently of the rotational speed of the main machine.
6(4)	Independent device mounted on the machine	The coolant is circulated by a device mounted on the machine which is powered independently of the rotational speed of the main machine.
7(4)	Entirely separate independent device or using the pressure of the coolant circulation system	The coolant is circulated by a separate electrical or mechanical device, independent and not mounted on the machine, or by the pressure in the coolant circulation system.
8(4)	Relative displacement	The circulation of the coolant is produced by the relative movement between the machine and the coolant, either by displacement of the machine in relation to the coolant, or by the flow of the surrounding coolant.
9	All other devices	The coolant is circulated using a method other than those defined above: it must be described in full.

(1) Filters or labyrinth seals for dust removal or noise protection can be fitted inside the casing or in the ducting. The first characteristic numbers 0 to 3 also apply to machines in which the coolant is taken up at the outlet of a water-cooler designed to lower the temperature of the ambient air or recirculated through a water-cooler so as not to increase the ambient temperature.

(2) The nature of the heat exchanger elements is not specified (smooth or finned tubes, corrugated surfaces, etc).

(3) A separate heat exchanger can be installed near to or at a distance from the machine. A secondary gas coolant may be the surrounding environment or not.

(4) Use of such a device does not exclude the ventilating action of the rotor or the existence of an additional fan mounted directly on the rotor.

Construction

COOLING

MOTOR VENTILATION

In compliance with IEC 60034-6, the enclosed motors (F)LSHRM are cooled using method IC 411, ie. “surface-cooled machine using the ambient air circulating round the machine”.

Cooling is achieved by a fan mounted at the non-drive end of the motor, inside a fan cover which acts as a safety guard (check according to IEC 60034-5). The fan draws the air through the grille in the cover and blows it along the housing fins, giving an identical heat balance in either direction of rotation.

NB: Obstruction, even accidental, of the fan cover grille (grille clogged or placed against a wall) seriously impairs motor cooling.

We recommend a minimum distance of 1/4 of the frame size between the end of the cover and any possible obstacle (wall, machine, etc).

Drip-proof motors PLSHRM are cooled in accordance with method IC 01 (standard IEC 60034-6) i.e. “machine cooled by means of the ambient fluid (air) circulating inside the machine”.

A fan at the non-drive end cools the motor. Air is sucked in at the motor drive end and blown along the fan cover to ensure the thermal equilibrium of the motor in any direction of rotation.

COOLING OF DYNEO+ MOTORS

The speed control of Dyneo+ motors by a drive requires special precautions.

By operating in continuous duty at low speed, ventilation loses much of its efficiency. It is therefore advisable to consult the torque values according to the speed of the Dyneo+ motors, indicated in the tables in the section *Electrical and mechanical characteristics from page 33*.

If the torque required at low speed is greater than these values, it is advisable to fit a constant flow forced ventilation independent of the motor speed.

In continuous duty operation at high speed, since the noise emitted by the motor ventilation can become disturbing for the environment, the use of a forced ventilation can also be advised.

NON-VENTILATED APPLICATIONS IN CONTINUOUS OPERATION

Enclosed motord (F)LSHRM in version IC 410 are banned, only version IC 418 is authorized.

IC 418 COOLING SYSTEM

If they are placed in the air flow from a fan, these motors are capable of supplying their rated power if the speed of the air between the housing fins and the overall flow rate of the air between the fins comply with the data in the table below.

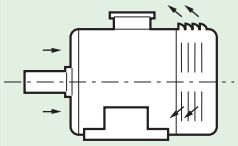
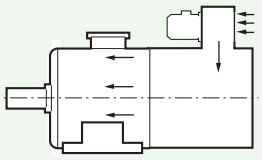
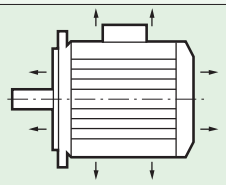
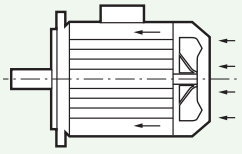
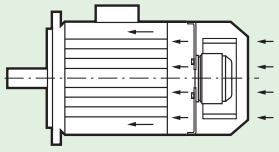
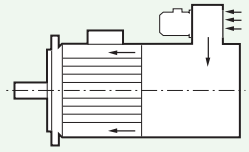
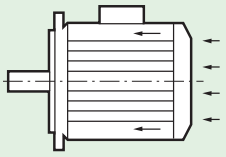
Type	< 3000 rpm		≥ 3000 rpm	
	flow rate m^3/h	speed m/s	flow rate m^3/h	speed m/s
(F)LSHRM 132	300	10.5	570	21
(F)LSHRM 160	600	12.5	1000	21
(F)LSHRM 180	900	16	1200	21
(F)LSHRM 200	1200	16	1800	23
(F)LSHRM 225	1500	18	2000	24
(F)LSHRM 250	2600	20	3000	25
(F)LSHRM 280	2600	20	3000	25
(F)LSHRM 315	2600	20	5000	25
(F)LSHRM 355	2800	20	5200	25

These air flows are valid for normal operating conditions as described in section Environmental limitations page 10.

Construction

COOLING

STANDARD CODES

IC 01	Drip-proof machine, cooled by means of the ambient fluid (air) circulating inside the machine.	
IC 06	Drip-proof machine. External motorized radial (R) fan supplied with the machine	
IC 410	Enclosed machine ,surface-cooled by natural convection and radiation. No external fan.	
IC 411	Enclosed machine. Smooth or finned ventilated casing. External shaft-mounted fan.	
IC 416 A*	Enclosed machine. Smooth or finned enclosed casing. External motorized axial (A) fan supplied with the machine.	
IC 416 R*	Enclosed machine. Smooth or finned enclosed casing. External motorized radial (R) fan supplied with the machine	
IC 418	Enclosed machine. Smooth or finned casing. No external fan. Ventilation provided by air flow coming from the driven system	

** Features not within manufacturer's standard range.*

Other cooling modes can be achievable like liquid cooling.

DYNEO+ RANGE COOLING MODES

Type	IC 410	IC 411	IC 416 A	IC 416 R	IC 418	Type	IC 01	IC 06
(F)LSHRM	-	●	■	-	■	PLSHRM	●	●

● : standard construction
● : standard construction in IM 2001 (B35); feasible on consultation for other positions
■ : feasible on consultation
- : not available

Construction

BEARINGS AND BEARING LIFE

DEFINITIONS

LOAD RATINGS

Static load rating Co:

This is the load for which permanent deformation at point of contact between a bearing race and the ball (or roller) with the heaviest load reaches 0.01% of the diameter of the ball (or roller).

Dynamic load rating C:

This is the load (constant in intensity and direction) for which the nominal lifetime of the bearing will reach 1 million revolutions.

The static load rating Co and dynamic load rating C are obtained for each bearing by following the method in ISO 281.

LIFETIME

The lifetime of a bearing is the number of revolutions (or number of operating hours at a constant speed) that the bearing can accomplish before the first signs of fatigue (spalling) begin to appear on a ring, ball or roller.

Nominal lifetime L10h

According to the ISO recommendations, the nominal lifetime is the length of time achieved or exceeded by 90% of apparently identical bearings operating under the conditions specified by the manufacturer.

Note: The majority of bearings last much longer than the nominal lifetime; the average lifetime achieved or exceeded by 50% of bearings is around 5 times longer than the nominal lifetime.

DETERMINATION OF NOMINAL LIFETIME

Constant load and speed of rotation

The nominal lifetime of a bearing expressed in operating hours L_{10h}, the dynamic load rating C expressed in daN and the applied loads (radial load Fr and axial load F_a) are related by the following equation:

$$L_{10h} = \frac{1000000}{60 \cdot N} \cdot \left(\frac{C}{P}\right)^p$$

where N = speed of rotation (rpm)

P ($P = X F_r + Y F_a$): equivalent dynamic load (F_r, F_a, P in daN)

p: exponent which is a function of the contact between the races and balls (or rollers)

p = 3 for ball bearings

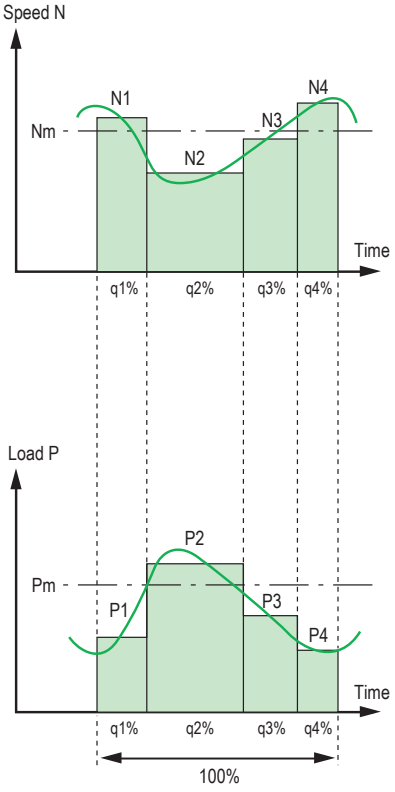
p = 10/3 for roller bearings

The formulae that give Equivalent Dynamic Load (values of factors X and Y) for different types of bearing may be obtained from the various manufacturers.

Variable load and speed of rotation

For bearings with periodically variable load and speed, the nominal lifetime is established using the equation:

$$L_{10h} = \frac{1000000}{60 \cdot N_m} \cdot \left(\frac{C}{P_m}\right)^p$$



N_m: average speed of rotation

$$N_m = N_1 \cdot \frac{q_1}{100} + N_2 \cdot \frac{q_2}{100} + \ldots (min^{-1})$$

P_m : average equivalent dynamic load

$$P_m = \sqrt[P]{P_1^P \cdot \left(\frac{N_1}{N_m}\right) \cdot \frac{q_1}{100} + P_2^P \cdot \left(\frac{N_2}{N_m}\right) \cdot \frac{q_2}{100} + \ldots (daN)}$$

with q1, q2, etc as a %

Nominal lifetime L_{10h} is applicable to bearings made of bearing steel and normal operating conditions (lubricating film present, no contamination, correctly fitted, etc).

Situations and data differing from these conditions will lead to either a reduction or an increase in lifetime compared to the nominal lifetime.

Corrected nominal lifetime

If the ISO recommendations (DIN ISO 281) are used, improvements to bearing steel, manufacturing processes and the effects of operating conditions may be integrated in the nominal lifetime calculation.

The theoretical pre-fatigue lifetime Lnah is thus calculated using the formula:

$$L_{nah} = a_1 a_2 a_3 L_{10h}$$

where:

a_1: failure probability factor.

a_2: factor for the characteristics and tempering of the steel.

a_3: factor for the operating conditions (lubricant quality, temperature, speed of rotation, etc).

Construction

BEARINGS AND BEARING LIFE

ROLE OF THE LUBRICANT

The principal role of the lubricant is to avoid direct contact between the metal parts in motion: balls or rollers, slip-rings, cages, etc. It also protects the bearing against wear and corrosion.

The quantity of lubricant needed by a bearing is normally quite small. There should be enough to provide good lubrication without undesirable overheating. As well as lubrication itself and the operating temperature, the amount of lubricant should be judged by considerations such as sealing and heat dissipation.

The lubricating power of a grease or an oil lessens with time owing to mechanical constraints and straight forward ageing. Used or contaminated lubricants should therefore be replaced or topped up with new lubricant at regular intervals.

Bearings can be lubricated with grease, oil or, in certain cases, with a solid lubricant.

GREASING

A lubricating grease can be defined as a product of semi-fluid consistency obtained by the dispersion of a thickening agent in a lubricating fluid and which may contain several additives to give it particular properties.

Composition of a grease
Base oil: 85 to 97%
Thickener: 3 to 15 %
Additives: 0 to 12 %

THE BASE OIL LUBRICATES

The oil making up the grease is of prime importance.

It is the oil that lubricates the moving parts by coating them with a protective film which prevents direct contact. The thickness of the lubricating film is directly linked to the viscosity of the oil, and the viscosity itself depends on temperature. The two main types used to make grease are mineral oils and synthetic oils. Mineral oils are suitable for normal applications in a range of temperatures from -30°C to +150°C.

Synthetic oils have the advantage of being effective in severe conditions (extreme variations of temperature, harsh chemical environments, etc).

THE THICKENER GIVES THE GREASE CONSISTENCY

The more thickener a grease contains, the “harder” it will be. Grease consistency varies with the temperature. In falling temperatures, the grease hardens progressively, and the opposite happens when temperatures rise.

The consistency of a grease can be quantified using the NLGI (National Lubricating Grease Institute) classification. There are 9 NLGI grades, from 000 for the softest greases up to 6 for the hardest. Consistency is expressed by the depth to which a cone may be driven into a grease maintained at 25°C.

If we only consider the chemical nature of the thickener, lubricating greases fall into three major categories:

• **Conventional greases with a metallic soap base** (calcium, sodium, aluminium, lithium). Lithium soaps have several advantages over other metallic soaps: a high melting point (180° to 200°), good mechanical stability and good water resistant properties.

• **Greases with a complex soap base.** The main advantage of this type of soap is a very high melting point (over 250°C).

• **Soapless greases.** The thickener is an inorganic compound, such as clay. Their main property is the absence of a melting point, which makes them practically non- liquefying.

ADDITIVES IMPROVE SOME GREASE PROPERTIES

Additives fall into two types, depending on whether or not they are soluble in the base oil.

The most common insoluble additives - graphite, molybdenum disulphide, talc, mica, etc, improve the friction characteristics between metal surfaces. They are therefore used in applications where heavy pressure occurs.

The soluble additives are the same as those used in lubricating oils: antioxidants, anti-rust agents, etc.

LUBRICATION TYPE

The bearings are lubricated with a polyurea soap-based grease.

Operation

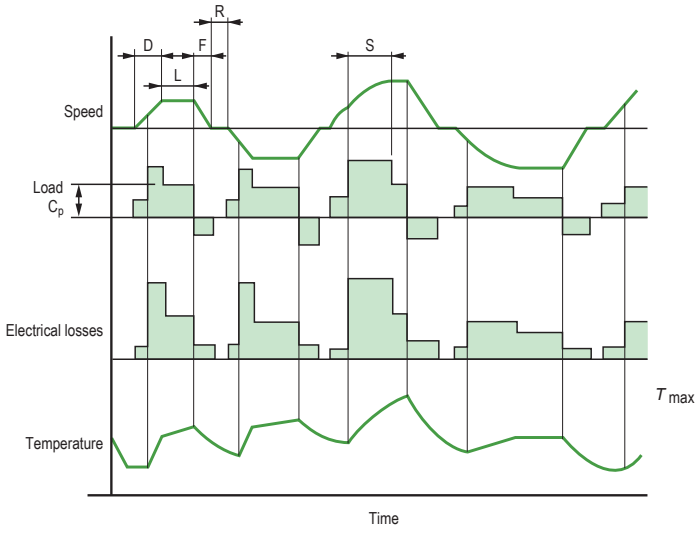
DUTY CYCLE
(CEI 60034-1)

Duty cycle of Dyneo+ motors is **Type S9**:

Duty with non-periodic variations in load and speed

This is a duty in which the load and speed generally vary non-periodically within the permissible operating range. This duty frequently includes applied overloads which may be much higher than the full load (or at full loads).

Note: for this type of duty, the appropriate full load values must be used as the basis for calculating overload.



D = starting

L = operation at variable loads

F = electrical braking

R = rest

S = operation at overload

C_p = full load

T_{max} = maximum temperature attained

Operation

INSULATION CLASS

The machines in this catalogue have been designed with a class F insulation system for the windings.

Class F allows for temperature rises (measured by the resistance variation method) of 95 K at 50°C ambient temperature (or 100 K at 45°C ambient temperature) and maximum temperatures at the hot spots in the machine of 155°C (Ref. IEC 60085 and IEC 60034-1).

Complete impregnation with tropicalized varnish of thermal class 180°C gives protection against attacks from the environment, such as: 90% relative humidity, interference, etc.

The insulation of the windings is monitored in two ways:

a - Dielectric inspection which involves checking the leakage current, at an applied voltage of (2U + 1000 V), in conditions complying with standard IEC 60034-1 (systematic test).

b - Monitoring the insulation resistance between the windings and between the windings and the earth (sampling test) at a D.C. voltage of 500 V or 1000 V.

TEMPERATURE RISE AND THERMAL RESERVE

Nidec Leroy-somer machines are built with a thermal reserve linked to the following factors:

- A difference of 25 K between the nominal temperature rise (Un, Fn, Pn) and the permissible temperature rise (95 K or 100K) for class F insulation.

- A difference of 10°C minimum at the voltage limits.

In IEC 60034-1 and 60034-2-1, temperature rise (Δθ), is calculated using the winding resistance variation method, with the formula:

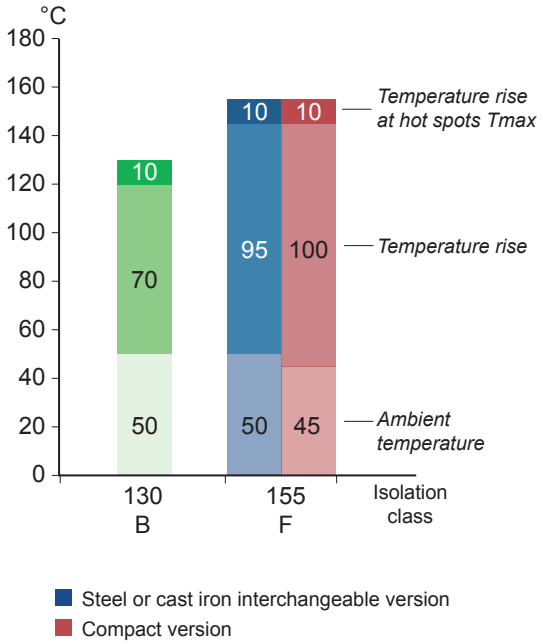
$$\Delta T = \frac{R_2 - R_1}{R_1} (235 + T_1) + (T_1 - T_2)$$

R_1: cold resistance measured at ambient temperature T_1

R_2: stabilized hot resistance measured at ambient temperature T_2

235: coefficient for a copper winding

Temperature rise (ΔT) and maximum temperatures at hot spots (Tmax) for insulation classes (IEC 60034-1).



Operation

DYNEO+ MOTOR SELECTION

APPLICATIONS AND CHOICE OF SOLUTIONS

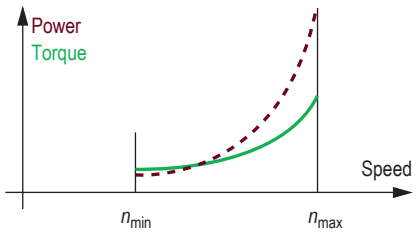
In principle, there are three typical types of load. It is essential to determine the speed range and the application torque (or power) in order to select the drive system:

CENTRIFUGAL OPERATION

The torque varies as the square of the speed (or cube of the power). The torque required for acceleration is low (about 20% of nominal torque). The starting torque is low.

- Sizing: depends on the power or torque at maximum speed
- Drive selected for normal duty

Typical applications: ventilation, pumping, ...

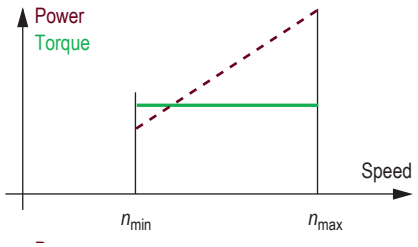


CONSTANT TORQUE OPERATION

The torque remains constant throughout the speed range. The torque required for acceleration may be high, depending on the machine (higher than the nominal torque).

- Sizing: depends on the torque required over the entire speed range
- Drive selected for heavy duty

Typical machines: extruders, crushers, gantries, presses, ...

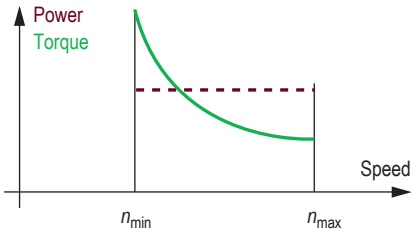


CONSTANT POWER OPERATION

The torque decreases as the speed increases. The torque required for acceleration is no more than the nominal torque. The starting torque is at its maximum.

- Sizing: depends on the torque required at minimum speed and the range of operating speeds.
- Drive selected for heavy duty
- An encoder feedback is advisable for improved regulation

Typical machines: winders, machine tool spindles, ...

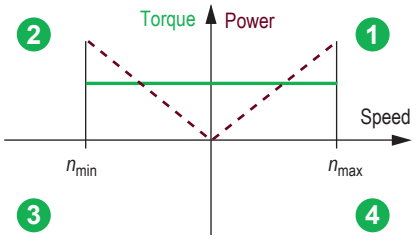


4 QUADRANTS OPERATION

With this operation type, the load becomes a driving load in certain stages of the cycle.

- Sizing: see above depending on the load.
- In the case of repetitive braking, install a reinforced insulation system (RIS). For more information, refer to the guide to best practises ref.5626.
- Drive selection: to dissipate the power from a driving load, it is possible to use a braking resistor, or to send power back to the grid. In the latter case, a regenerative or 4-quadrant drive should be used.

Typical machines: centrifuges, travelling cranes, presses, machine tool spindles, etc



It should be noted that Dyneo+ motors can be used as a generator controlled by a Regen drive only. In that case, no adjustment is needed and machine performances are identical to the ones described in this document.

Operation

DYNEO+ MOTOR SELECTION

MOTOR CONTROL MODE SELECTION

Dyneo+ motor associated with the Powerdrive MD Smart or Powerdrive F300 has different characteristics depending on the selected control mode. The control mode must be determined according to:

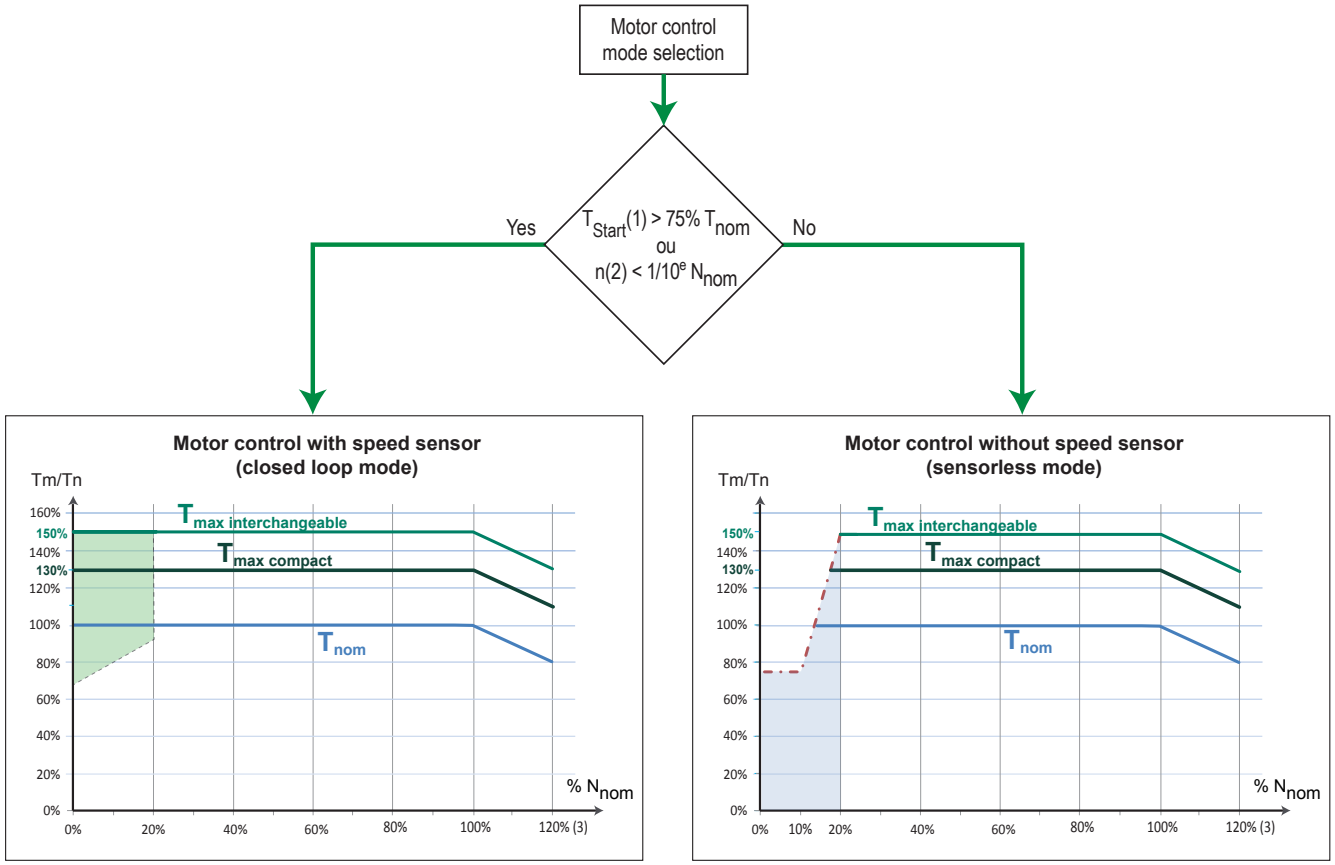
- the starting torque,
- the nominal speed of the machine (or its regulation range).

The Sensorless mode is particularly suitable for applications that do not require a high starting torque.

With sensor feedback (closed loop), the drives offer a high performance level for the most demanding applications.

For position sensor selection, refer to section *Position sensors page 63*.

TORQUE / SPEED CURVES DEPENDING ON CONTROL MODE



Key:

(1) Between 0 and 10% of nominal speed

(2) Minimum speed (continuous operation)

(3) Field weakening operation is guaranteed up to 120% of the nominal speed

Nominal torque at 400V (mains voltage which supplies the drive)

Maximum torque at 400V (mains voltage which supplies the drive), ambient temperature from 0°C to +50°C for interchangeable version and from 0°C to +45°C for compact version

Torque limitation at low speed in sensorless mode

In this area, a forced ventilation is mandatory for continuous operation

Starting phase

In the case of a mains supply voltage below 400V, the nominal motor power is reduced in the voltage ratio (eg 380V / 400V = 95%).

To get detailed characteristics of each Dyneo+ motor, refer to section *Electrical and mechanical characteristics from page 62*.

For low temperature operation (less than 0°C), refer to section *Maximum torque derating at low temperature page 26*.

Operation

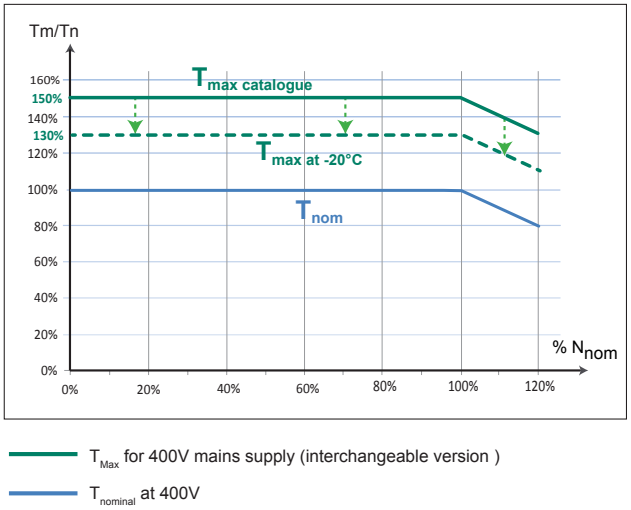
DYNEO+ MOTOR SELECTION

MAXIMUM TORQUE DERATING AT LOW TEMPERATURE

Maximum values shown in the mechanical and electrical characteristics of section *Electrical and mechanical characteristics from page 33* are set to protect the motor effectively. They are given for a temperature from 0°C to +50°C (or +45°C for compact version).

If the ambient temperature is below 0°C, the maximum torque must be derated: reduction by 1% for every degree below 0°C, ie. 20% derating for a temperature at -20°C.

Maximum torque derating example of an interchangeable motor in closed loop, used in an ambient temperature at -20°C



CONSTANT TORQUE OPERATION UP TO 87HZ OR 174HZ IN Δ CONNECTION

With a variable speed drive, 1500 or 3000 rpm motors with standard star connection (Y) can be used with delta connection (D). This increases the constant torque range :

- from 50 to 87 Hz for Dyneo+ motor 1500 range,
- from 100 to 174 Hz for Dyneo+ motor 3000 range,

which can increase the power by the same ratio (√3).

The drive will be sized with the current value at 400V / 87 Hz or 400V / 174 Hz indicated either on the Dyneo+ motor nameplate or in section *Electrical and mechanical characteristics from page 33*.

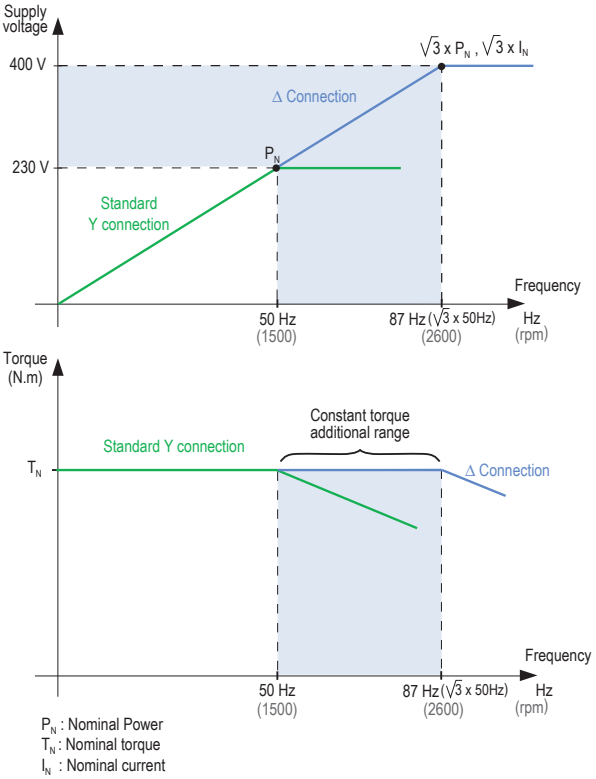
Selection example:

- for a constant torque of 189 N.m from 750 to 2600 rpm:

-> The selected motor is

1500 LSHRM 200 LQ1
30kW - 400 Y 57A / 52 kW - 400V Δ 99A

To select the correct drive, take the current value of 99A (at 87 Hz).



BEST PRACTISES OF MOTOR AND DRIVE SYSTEMS

Nidec Leroy-Somer has created a guide that describes best practises of motor and drive system installation and wiring for a low voltage mains supply. This document provides explanations and advices to ensure that the installation works properly and that equipment life is optimal.

This guide (ref.5626) is available on the website www.leroy-somer.com.

Operation

NOISE LEVEL

NOISE EMITTED BY ROTATING MACHINES

In a compressible medium, the mechanical vibrations of an elastic body create pressure waves which are characterized by their amplitude and frequency. The pressure waves constitute an audible noise if they have a frequency of between 16 Hz and 16,000 Hz.

Noise is measured by a microphone linked to a frequency analyser. Measurements are taken in an anechoic chamber on machines at no-load, and a sound pressure level Lp or a sound power level Lw can then be established. Measurement can also be carried out in situ on machines which may be on-load, using an acoustic intensity meter which can differentiate between sound sources and identify the sound emissions from the machine.

The concept of noise is linked to hearing. The auditory sensation is determined by integrating weighted frequency components with isosonic curves (giving a sensation of constant sound level) according to their intensity.

The weighting is carried out on sound meters using filters whose bandwidth takes into account, to a certain extent, the physiology of the human ear:

Filter A: used for low and medium noise levels. High attenuation, narrow bandwidth.

Filter B: used for very high noise levels Wide bandwidth.

Filter C: very low attenuation over the whole of the audible frequency range.

The filter A is most frequently used for the sound levels of rotating machines. The standardized characteristics are established with it.

A few basic definitions:

The unit of reference is the bel, and the sub-multiple decibel dB is used here.

Sound pressure level in dB

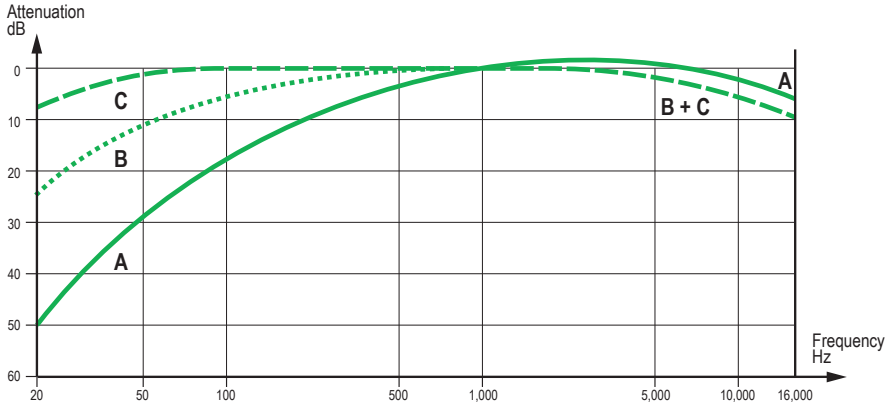
$L_p = 20\log_{10}\left(\frac{P}{P_0}\right)$ $p_0 = 2.10^{-5}$ Pa

Sound power level in dB

$L_W = 10\log_{10}\left(\frac{P}{P_0}\right)$ $p_0 = 10^{-12}$ W

Sound intensity level in dB

$L_W = 10\log_{10}\left(\frac{I}{I_0}\right)$ $I_0 = 10^{-12}$ W/m²



WEIGHTED SOUND LEVEL [DB(A)]

Under IEC 60034-9, the guaranteed values are given for a machine operating at no-load under normal supply conditions (IEC 60034-1), in the actual operating position, or sometimes in the direction of rotation as specified in the design.

This being the case, standardized sound power level limits are shown for the values obtained for the machines described in this catalogue.

(Measurements were taken in conformity with standard ISO 1680).

Expressed as sound power level (Lw) according to the standard, the level of sound is also shown as sound pressure level (Lp) in the selection data.

The maximum standard tolerance for all these values is + 3 dB(A).

Operation

Dyneo+ motors are in vibration class level A as standard

VIBRATION

VIBRATION LEVELS - BALANCING

Inaccuracies due to construction (magnetic, mechanical and air-flow) lead to sinusoidal (or pseudo sinusoidal) vibrations over a wide range of frequencies. Other sources of vibrations disturb operation: bad fastening of the frame, incorrect coupling, bushing misalignment, etc.

We shall first of all look at the vibrations emitted at the operating frequency, corresponding to an unbalanced load, whose amplitude swamps all other frequencies and on which the dynamic balancing of the mass in rotation has a decisive effect.

Under standard ISO 8821, rotating machines can be balanced with or without a key or with a half-key on the shaft extension.

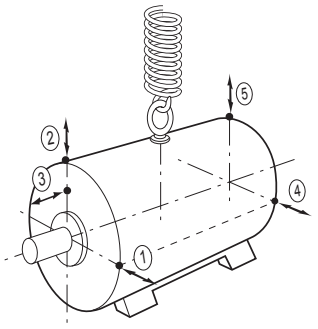
The balancing method is marked on the shaft extension as follows:

- Half-key balancing: letter H
- Full key balancing: letter F
- No-key balancing: letter N

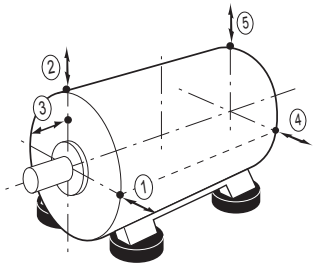
The measurement points quoted in the standards are indicated in the drawings above. At each point, the results should be lower than those given in the tables below for each balancing class and only the highest value is to be taken as the «vibration level».

Dyneo+ motors are half-key balanced as standard. Any coupling element (pulley, coupling sleeve, slip-ring, etc.) must therefore be balanced accordingly.

Check the motor nameplate for balancing information.



Measuring system for suspended machines



Measuring system for machines on flexible mountings

MEASURED MAGNITUDE

The vibration speed can be chosen as the variable to be measured. This is the speed at which the machine moves either side of its static position. It is measured in mm/s.

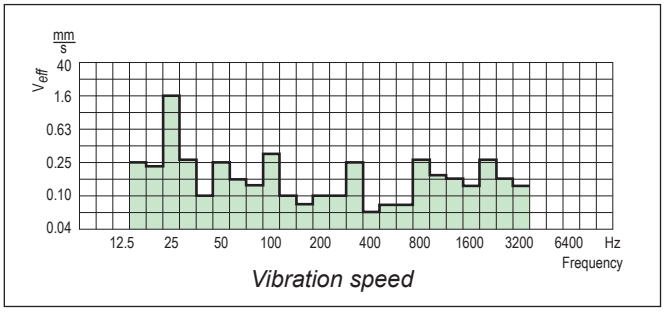
As the vibratory movements are complex and non-harmonic, it is the root mean square (rms) value of the speed of vibration which is used to express the vibration level.

Measured are the vibratory displacement amplitude (in µm) or vibratory acceleration (in m/s^2). If the vibratory displacement is measured against frequency, the measured value decreases with the frequency: highfrequency vibrations cannot be measured.

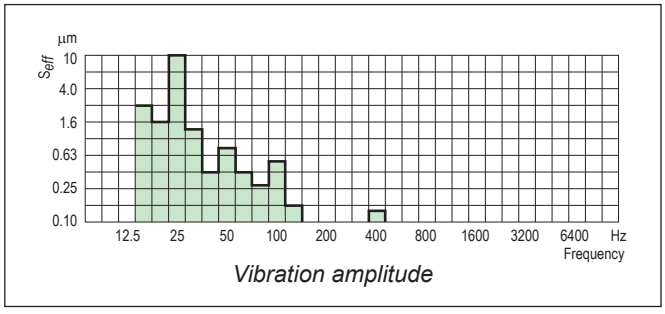
If the vibratory acceleration is measured, the measured value increases with the frequency: low-frequency vibrations (unbalanced loads) cannot be measured here.

The rms speed of vibration is the variable chosen by the standards.

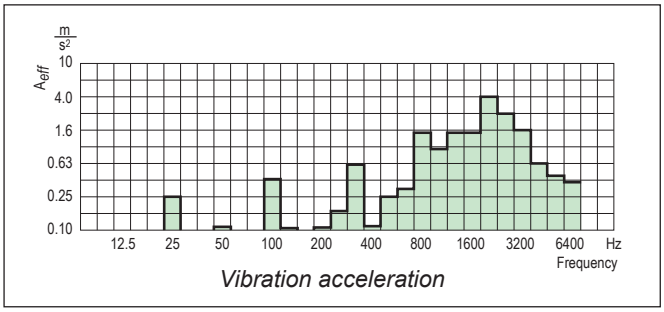
However, if preferred, the table of vibration amplitudes may still be used (for measuring sinusoidal and similar vibrations).



Vibration speed



Vibration amplitude



Vibration acceleration

Operation

VIBRATION

MAXIMUM VIBRATION MAGNITUDE LIMITS (RMS VALUES), IN TERMS OF DISPLACEMENT AND SPEED FOR A FRAME SIZE H (IEC 60034-14 : 2018)

Vibration level	*Frame size* ≤ 132		*Frame size* > 132	
	Displacement µm	Speed mm/s	Displacement µm	Speed mm/s
A	45	2.8	45	2.8
B	18	1.1	29	1.8

For large machines and special requirements with regard to vibration, balancing can be carried out *in situ* (finished assembly).
Prior consultation is essential, as the machine dimensions may be modified by the necessary addition of balancing disks mounted on the shaft extensions.

MAXIMUM MECHANICAL SPEED

Dyneo+ motors offer a wide speed range, particularly with the compact version. However, the chosen bearings and balancing class selected for the rotor do not enable exceeding a maximum mechanical speed without endangering the motor and its life span. Tables below indicates the maximum speeds supported by the motors under horizontal and vertical operation. These speed limit values are given for motors directly connected to the driven machinery (without radial or axial loads).

Type	Max. mechanical speed (rpm)
LSHRM 132MU1/MU3	6700
LSHRM 160MR1/LR1/LR3	6700
LSHRM 180M1/L1/L1M	6000
LSHRM 200LQ1	5000
LSHRM 200LR1	5000 (6000 for 6000 range)
LSHRM 225SG1	6000
LSHRM 225SZ1/MG/MG1M/MY1	4500
LSHRM 250SF1S	6000
LSHRM 250ME/SF1	4500
LSHRM 250MF1	3800
LSHRM 280SC/MC/MUS	4500
LSHRM 280SD / MD	3800
LSHRM 280MU	3600
LSHRM 315 MP	2800
LSHRM 315MN1	3800
LSHRM 315MRS	4500
LSHRM 315SN1	2800 (3800 for 3000 range)
LSHRM 315MR	2800 (3600 for 3000 range)

Type	Max. mechanical speed (rpm)
FLSHRM 280SB / MD	3800
FLSHRM 315STB / M	2800
FLSHRM 315LA / LB	2800
FLSHRM 280SA / MA	3800
FLSHRM 315STA / MT	
FLSHRM 315LTA / LTB	
FLSHRM 355LTA / LTB / LTC	

Type	Vitesse mécanique max (rpm)
PLSHRM 315LD	3600 (4500 for 4500 range)

Operation

The motors of this catalogue are equipped with PTC and PT1000 sensors as standard

THERMAL PROTECTIONS

Motors are protected by the variable speed drive, placed between the isolating switch and the motor. The drive provides total protection of the motor against overloads.

Dyneo+ motors are equipped with PTC sensors and a PT1000 sensor.

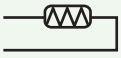
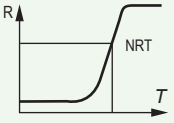
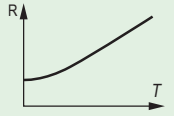
PTC sensors (fitted in the windings) are dedicated to the themal protection of the motor. PT1000 sensor (fitted in the windings) is dedicated to the motor temperature monitoring (alarm management).

It must be emphasized that under no circumstances can these sensors be used to carry out direct regulation of the motor operating cycles.

ALARM AND EARLY WARNING

All protective equipment can be backed up by another type of protection (with different NRTs): the first device will then act as an early warning (light or sound signals given without shutting down the power circuits), and the second device will be the alarm (shutting down the power circuits).

BUILT-IN INDIRECT THERMAL PROTECTIONS

Type	Operating principle	Operating curve	Breaking capacity (A)	Protection provided	Mounting Number of devices*
Positive temperature coefficient thermistor **PTC**	Non-linear variable resistor, indirectly heated 		0	General monitoring for transient overloads	Mounted with associated relay in control circuit 3 in series
Temperature sensor **PT 1000**	Resistance depending on the winding temperature		0	high accuracy continuous surveillance of key hot spots	Mounted in control boards with associated reading equipment (or recorder) 1 per hot spot

- NRT: nominal running temperature. The NRTs are chosen according to the position of the sensor in the motor and the temperature rise class.

** The number of devices relates to the winding protection.*

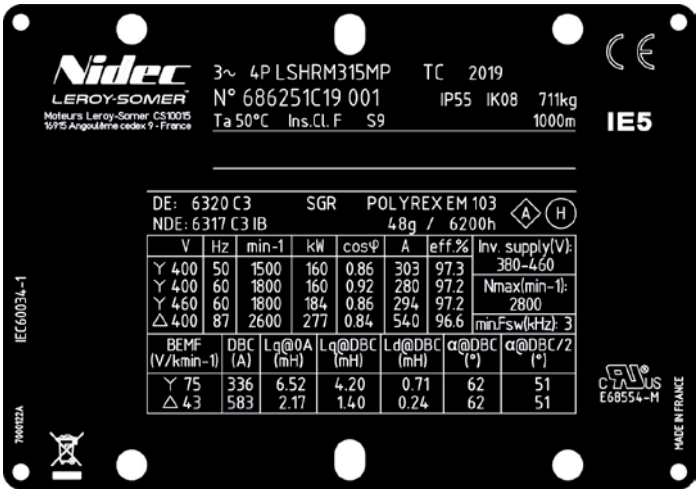
Nameplates

NAMEPLATE SYMBOL DEFINITION

The nameplate identifies the motors, indicate the main performance and show compatibility of the motor concerned with the main standards and concerning them.

All motors in this catalogue are fitted with two information plates: one indicating the motor's performance, and the other providing Systemiz information.

NAMEPLATE OF MOTOR PERFORMANCES



SYSTEMIZ PLATE

- Easy configuration via QR code
- Direct access to documentation

Legal mark of compliance of equipment with the requirements of European Directives

MOTOR

3 ~: three-phase A.C. motor
4P: number of poles
LSHRM: series
315: frame size
MP: housing symbol
TC: impregnation index
686251: motor batch number
C: month of production
19 & 2019: year of production
001: serial number
IP55 IK08: degree of protection
kg: weight

Ta 50°C: ambient operating temperature
Ins.Cl. F: insulation class F
S9: duty (operating) factor
1000m: maximum altitude without derating
IE5: efficiency class according to 60034-30-2
DE: Drive End bearing
NDE: Non Drive End bearing
IB: Insulated Bearing
SGR: Shaft Ground ring
RIS: Reinforced Insulation System
POLYREX EM103: type of grease
48 g: amount of grease at each regreasing (in g)

6200 h: regreasing interval (in hours) for the ambient temperature (Ta)
A : vibration level
H : balancing mode

CHARACTERISTICS

V: mains supply voltage that powers the drive
Δ: delta motor connection
Y: star motor connection
Hz: supply frequency
min-1: revolutions per minute (rpm)
kW: power rating
cosφ: power factor
A: current rating
eff.%: efficiency

Inv. supply(V): supply voltage range of the drive
Nmax (min-1): maximum speed
min.Fsw (kHz): minimum switching frequency
BEMF (V / kmin-1): back Electromotive Force
DBC (A): design Base current
Lq@0A (mH): unsaturated quadratic inductance at 0 amperes
Lq@DBC (mH): saturated quadratic inductance at design current

Ld@DBC (mH): saturated direct inductance at design current
α@DBC (°): load angle at design current
α@DBC/2 (°): load angle at 50% of design current

Commercial designation

The commercial designation of a Dyneo+ motor consists of electrical and mechanical components as described below.

To get a complete motor specification, use Nidec Leroy-somer Configurator:
www.configurateurls.leroy-somer.com

1500	LSHRM	315	MP	160 kW	B3	400VY/460VY/400VD	50 Hz
Range (Speed)	Series Designation LSHRM FLSHRM PLSHRM	Frame size IEC 60072	Housing designation and manufacturer code	Rated power	Mounting arrangement IEC 60034-7	Mains voltage and connection	Frequency

Electrical and mechanical characteristics

ALUMINIUM MOTOR DESCRIPTION (LSHRM)

Designation	Materials	Comments
Housing with cooling fins	Aluminium alloy	- with integral or screw-on feet, or without feet - 4 or 6 fixing holes for housings with feet - lifting rings - stainless steel earth terminal (with a stainless steel jumper screw for LSHRM 132 and LSHRM 160)
Stator	Insulated low-carbon magnetic steel laminations Electroplated copper	- low carbon content guarantees long-term lamination pack stability - semi-enclosed slots - class F insulation
Rotor	Insulated low-carbon magnetic steel laminations, Aluminium, ferrite magnet	- rotor with ferrite magnets (Nidec Leroy Somer patent) - shrink-fitted mass to shaft - rotor balanced dynamically, 1/2 key
Shaft	Steel	- for frame size ≤ 160 MR - LR : tapped hole, round-ended closed key - for frame size ≥ 180: tapped hole, open key
End shields	Cast iron Stainless steel screws for DE shield from frame sizes 180 to 315	- DE and NDE shields
Bearings and lubrication		- permanently greased bearings frame size or regreasable bearings (for more details, please see the tables of section *Bearings and greasing page 58* - bearings preloaded at non drive end
Labyrinth seal **Lipseals**	Plastic or steel Synthetic rubber	- lipseal or deflector at drive end for all flange mounted motors - lipseal, deflector or labyrinth seal for foot mounted motors
Fan	Composite material or aluminium alloy	- 2 directions of rotation: straight blades
Fan cover	pressed steel Stainless steel screws	- fitted, on request, with a drip cover for operation in vertical position, shaft end facing down (steel cover)
Terminal box	Aluminium alloy Fan cover screws in stainless steel	- IP 55 - can be turned at 90°, fitted with a terminal block with 6 steel terminals as standard (brass as an option) - terminal box fitted with threaded plugs, (cable glands as an option) - 1 earth terminal in each terminal box - fixing system consisting of a cover with captive screws

STEEL MOTOR DESCRIPTION (PLSHRM)

Designation	Materials	Comments
Housing	Steel	- lifting rings - Stainless steel earth terminal
Stator	Insulated low-carbon magnetic steel laminations Electroplated copper	low carbon content guarantees long-term lamination pack stability - welded laminations - semi-enclosed slots - class F insulation
Rotor	Insulated low-carbon magnetic steel laminations, Aluminium or copper, ferrite magnets	- shrink-fitted mass to shaft - rotor balanced dynamically, class A, 1/2 key
Shaft	Steel	
End shields	Cast iron or steel Stainless steel screws for DE shield	
Bearings and lubrication		- bearings preloaded at non drive end
Labyrinth seal **Lipseals**	Plastic or steel, Synthetic rubber	
Fan	Composite Aluminium or steel alloy	- bidirectional fan
Fan cover	Pressed steel Stainless steel screws	- fitted, on request, with a drip cover for operation in vertical position, shaft end facing down
Terminal box	Steel Fan cover screws in stainless steel	- can be turned in 4 directions, opposite the feet - fitted as standard with a terminal block with 6 steel terminals - terminal box comes complete with a removable undrilled cable gland support plate, without cable gland - 1 earth terminal in each terminal box

Electrical and mechanical characteristics

CAST IRON MOTOR DESCRIPTION (FLSHRM)

Designation	Materials	Comments
Housing with cooling fins	Cast iron	- lifting rings - earth terminal with an optional jumper screw
Stator	Insulated low-carbon magnetic steel laminations Electroplated copper	- low carbon content guarantees long-term lamination pack stability - welded laminations - semi-enclosed slots - class F insulation
Rotor	Insulated low-carbon magnetic steel laminations, aluminium, ferrite magnets	- rotor with ferrite magnets (Nidec Leroy Somer patent) - shrink-fitted mass to shaft - rotor balanced dynamically, 1/2 key
Shaft	Steel	- open key
End shields	Cast iron Stainless steel screws for DE shield	
Bearings and lubrication		- regreasable bearings frame sizes 280 to 355 - bearings preloaded at NDE
Labyrinth seal **Lipseals**	Plastic or steel, Synthetic rubber	- decompression grooves
Fan	Composite up to size 280 inclusive Metal from 315 ST upwards	- 2 directions of rotation : straight blades
Fan cover	Pressed steel Stainless steel screws	- fitted. on request, with a drip cover for operation in vertical position, shaft end facing down
Terminal box	Cast iron body and cover Fan cover screws in stainless steel	- IP 55 - fitted with a block with 6 terminals - undrilled cable gland mounting plate - 1 earth terminal in each terminal box

⚠ **When dismantling the motor only**

The rotor must not be assembled or maintained by people with pacemakers or any other implanted medical electronic device.

The motor rotor contains a magnetic field. If the rotor is separated from the motor, its field can affect pacemakers or disturb digital devices such as watches, mobile phones, etc. No magnetized dust must be present in the working environment, which must be kept clean.

Electrical and mechanical characteristics

KEY OF INTERCHANGEABLE AND COMPACT VERSION CHARACTERISTIC TABLES

LEFT PAGE

- Mains voltage which powers the drive (35V maximum voltage drop between mains and motor)
- Motor connection: Y star ; D delta

Motor speed range

Nominal speed (Nn) and nominal frequency (fn) of the motor

Thermal torque values of the motor given at nomnial speed (Nn) and at 50% Nn, 33% Nn, 20% Nn, 10% Nn

1500 range

Type	Nominal characteristics									
	Voltage connection	Power	Speed (Nn)	Frequency (fn)	Torque					Nominal current
					10% Nn	20% Nn	33% Nn	50% Nn	Nn	
	V	kW	rpm	Hz	N.m	N.m	N.m	N.m	N.m	A rms
LSHRM 160MR1	400Y	**11**	1500	50	46	70	70	70	70	21
	400Y	**11**	1800	60	46	70	70	70	58	20
	460Y	**12.7**	1800	60	46	70	70	70	67	21
	400D	**19.1**	2600	87	63	70	70	70	70	38

Motor characteristics for constant torque operation as described in section *Constant torque operation up to 87Hz or 174Hz in Δ connection page 26*

RIGHT PAGE

Motor speed, voltage and connection reminder of previous page (left page)

Motor speed range reminder

Motor power reminder of previous page (left page)

Motor weight of mounting arrangement IM 1001 (B3)

Pressure noise level

1500 range

Type	Speed/voltage Connection Y or D	Power	Efficiency				Max. characteristics		Noise level	Inertia	Motor weight
			Class	100% Nn / 50% Cn	100% Nn / 75% Cn	100% Nn / 100% Cn	Maximum torque	Maximum current			
		kW					N.m	A rms	dB(A)	kg.m²	kg
LSHRM 160MR1	1500 / 400 Y	**11**	IE4	93.7	94.1	94.1	105	33	61	0.0262	72
	1800 / 400 Y	**11**	IE5	93.7	94.4	94.2		33	64		
	1800 / 460 Y	**12.7**	IE5	93.6	94.2	94.2		33	64		
	2600 / 400 D	**19.1**	IE5	93.4	94.4	94.7		56	73		

Efficiency class according to IEC 60034-30-2 standard

Acceleration torque during speed-up phase as described in section *Motor control mode selection page 25*.
Maximum torque values are guaranteed for an ambient temperature range from 0°C to +50°C (+45°C for compact version).
Below 0°C, it is necessary to apply a derating. Refer to section *Maximum torque derating at low temperature page 26*

Electrical and mechanical characteristics

INTERCHANGEABLE VERSION - ALUMINIUM HOUSING : LSHRM

1500 range

Type	Nominal characteristics									
	Voltage connection	Power	Speed (Nn)	Frequency (fn)	Torque					Nominal current
					10% Nn	20% Nn	33% Nn	50% Nn	Nn	
	V	kW	rpm	Hz	N.m	N.m	N.m	N.m	N.m	A rms
LSHRM 160MR1	400Y	**11**	1500	50	46	70	70	70	70	21
	400Y	**11**	1800	60	46	70	70	70	58	20
	460Y	**12.7**	1800	60	46	70	70	70	67	21
	400D	**19.1**	2600	87	63	70	70	70	70	38
LSHRM 160LR1	400Y	**15**	1500	50	62	96	96	96	96	28
	400Y	**15**	1800	60	62	96	96	96	80	27
	460Y	**17.3**	1800	60	62	96	96	96	92	27
	400D	**26**	2600	87	86	96	96	96	95	49
LSHRM 180M1	400Y	**18.5**	1500	50	100	118	118	118	118	36
	400Y	**18.5**	1800	60	100	118	118	118	98	35
	460Y	**21.3**	1800	60	100	118	118	118	113	36
	400D	**32.1**	2600	87	112	118	118	118	117	63
LSHRM 180L1	400Y	**22**	1500	50	119	140	140	140	140	42
	400Y	**22**	1800	60	119	140	140	140	117	40
	460Y	**25**	1800	60	119	140	140	140	135	41
	400D	**38**	2600	87	132	140	140	140	139	74
LSHRM 200LQ1	400Y	**30**	1500	50	153	191	191	191	191	57
	400Y	**30**	1800	60	153	191	191	191	159	55
	460Y	**35**	1800	60	153	191	191	191	184	56
	400D	**52**	2600	87	181	191	191	191	190	99
LSHRM 225SZ1	400Y	**37**	1500	50	188	236	236	236	236	70
	400Y	**37**	1800	60	188	236	236	236	196	68
	460Y	**43**	1800	60	188	236	236	236	227	69
	400D	**64**	2600	87	223	236	236	236	235	122
LSHRM 225MG	400Y	**45**	1500	50	229	287	287	287	287	82
	400Y	**45**	1800	60	229	287	287	287	239	80
	460Y	**54**	1800	60	229	287	287	287	288	83
	400D	**79**	2600	87	275	287	287	287	290	142
LSHRM 250ME	400Y	**55**	1500	50	315	350	350	350	350	99
	400Y	**55**	1800	60	315	350	350	350	292	95
	460Y	**64**	1800	60	315	350	350	350	337	98
	400D	**95**	2600	87	349	350	350	350	349	176
LSHRM 280SD	400Y	**75**	1500	50	430	478	478	478	478	134
	400Y	**75**	1800	60	430	478	478	478	398	130
	460Y	**86**	1800	60	430	478	478	478	458	131
	400D	**131**	2600	87	478	478	478	478	478	231
LSHRM 280MD	400Y	**90**	1500	50	458	573	573	573	573	163
	400Y	**90**	1800	60	458	573	573	573	478	158
	460Y	**104**	1800	60	458	573	573	573	550	155
	400D	**156**	2600	87	542	573	573	573	570	279
LSHRM 315SN1	400Y	**110**	1500	50	595	700	700	700	700	199
	400Y	**110**	1800	60	595	700	700	700	584	195
	460Y	**132**	1800	60	595	700	700	700	698	202
	400D	**192**	2600	87	668	700	700	700	703	342
LSHRM 315MP	400Y	**132**	1500	50	714	840	840	840	840	235
	400Y	**132**	1800	60	714	840	840	840	700	234
	460Y	**152**	1800	60	714	840	840	840	807	233
	400D	**229**	2600	87	796	840	840	840	838	415
LSHRM 315MP	400Y	**160**	1500	50	866	1019	1019	1019	1019	304
	400Y	**160**	1800	60	866	1019	1019	1019	849	280
	460Y	**184**	1800	60	866	1019	1019	1019	976	294
	400D	**277**	2600	87	965	1019	1019	1019	1016	541
LSHRM 315MR	400D	**200**	1500	50	1146	1273	1273	1273	1273	377
	400D	**200**	1800	60	1146	1273	1273	1273	1061	349
	460D	**230**	1800	60	1146	1273	1273	1273	1221	366

Electrical and mechanical characteristics

INTERCHANGEABLE VERSION - ALUMINIUM HOUSING : LSHRM

1500 range

Type	Speed/voltage Connection Y or D	Power	Efficiency				Max. characteristics		Noise level	Inertia	Motor weight
			Class	100% Nn / 50% Cn	100% Nn / 75% Cn	100% Nn / 100% Cn	Maximum Torque	Maximum Current			
		kW							dB(A)	kg.m²	kg
LSHRM 160MR1	1500 / 400 Y	11	IE4	93.7	94.1	94.1	105	33	61	0.0262	72
	1800 / 400 Y	11	IE5	93.7	94.4	94.2		33	64		
	1800 / 460 Y	12.7	IE5	93.6	94.2	94.2		33	64		
	2600 / 400 D	19.1	IE5	93.4	94.4	94.7		56	73		
LSHRM 160LR1	1500 / 400 Y	15	IE4	94.3	94.4	93.9	143	43	61	0.0309	80
	1800 / 400 Y	15	IE5	94.6	95.1	94		43	64		
	1800 / 460 Y	17.3	IE5	94.6	94.7	94.5		43	64		
	2600 / 400 D	26	IE5	94.3	94.9	95		74	73		
LSHRM 180M1	1500 / 400 Y	18.5	IE5	93	93.4	93.2	177	61	63	0.0826	130
	1800 / 400 Y	18.5	IE5	92.4	93.6	92.9		61	66		
	1800 / 460 Y	21.3	IE5	92.6	93.4	93.4		61	66		
	2600 / 400 D	32.1	IE5	91	92.7	93.4		106	75		
LSHRM 180L1	1500 / 400 Y	22	IE5	94.5	94.9	94.7	210	63	63	0.0989	130
	1800 / 400 Y	22	IE5	94.6	95.4	94.9		63	66		
	1800 / 460 Y	25	IE5	94.5	95.1	95.1		63	66		
	2600 / 400 D	38	IE5	94	95	95.4		109	75		
LSHRM 200LQ1	1500 / 400 Y	30	IE5	94.9	95	94.7	287	88	64	0.1169	152
	1800 / 400 Y	30	IE5	95.1	95.6	95		88	67		
	1800 / 460 Y	35	IE5	95.1	95.4	95.2		88	67		
	2600 / 400 D	52	IE5	94.8	95.5	95.7		153	76		
LSHRM 225SZ1	1500 / 400 Y	37	IE4	95.1	95.1	94.7	353	109	66	0.1333	174
	1800 / 400 Y	37	IE5	95.4	95.9	94.9		109	69		
	1800 / 460 Y	43	IE5	95.3	95.5	95.2		109	69		
	2600 / 400 D	64	IE5	95.2	95.8	95.8		188	78		
LSHRM 225MG	1500 / 400 Y	45	IE5	95.1	95.7	95.9	430	126	67	0.4899	294
	1800 / 400 Y	45	IE5	94.5	95.6	95.7		126	70		
	1800 / 460 Y	54	IE5	94.7	95.6	95.9		126	70		
	2600 / 400 D	79	IE5	93.1	94.7	95.4		218	79		
LSHRM 250ME	1500 / 400 Y	55	IE5	95.5	98.2	96.2	525	152	68	0.5701	320
	1800 / 400 Y	55	IE5	95	96	96.1		152	73		
	1800 / 460 Y	64	IE5	95.1	95.9	96.2		152	73		
	2600 / 400 D	95	IE5	93.8	95.2	95.8		262	80		
LSHRM 280SD	1500 / 400 Y	75	IE5	96.1	96.6	96.5	716	198	69	0.7437	380
	1800 / 400 Y	75	IE5	95.7	96.6	95.9		198	74		
	1800 / 460 Y	86	IE5	95.8	96.5	96.6		198	74		
	2600 / 400 D	131	IE5	94.8	95.9	96.4		343	81		
LSHRM 280MD	1500 / 400 Y	90	IE5	96.4	96.8	96.6	860	224	70	0.8246	416
	1800 / 400 Y	90	IE5	96.1	96.7	96.1		224	75		
	1800 / 460 Y	104	IE5	96.1	96.6	96.8		224	75		
	2600 / 400 D	156	IE5	95.2	96.2	96.6		387	82		
LSHRM 315SN1	1500 / 400 Y	110	IE5	96.5	96.8	96.7	1051	280	71	0.7409	480
	1800 / 400 Y	110	IE5	96.3	96.9	96.2		280	76		
	1800 / 460 Y	132	IE5	96.3	96.8	96.8		280	76		
	2600 / 400 D	192	IE5	95.6	96.5	96.8		485	83		
LSHRM 315MP	1500 / 400 Y	132	IE5	96.4	97	97.2	1261	357	75	1.9838	657
	1800 / 400 Y	132	IE5	95.8	96.8	96.3		357	80		
	1800 / 460 Y	152	IE5	96	96.8	97.1		357	80		
	2600 / 400 D	229	IE5	94.5	95.9	96.5		618	87		
LSHRM 315MP	1500 / 400 Y	160	IE5	96.5	97.1	97.3	1528	461	76	2.205	712
	1800 / 400 Y	160	IE5	96.1	96.9	97.2		461	81		
	1800 / 460 Y	184	IE5	96.2	96.9	97.3		461	81		
	2600 / 400 D	278	IE5	94.8	96.1	96.7		798	88		
LSHRM 315MR	1500 / 400 D	200	IE5	96.8	97.3	97.5	1910	576	76	2.216	820
	1500 / 400 D	200	IE5	96.4	97.2	97.4		576	81		
	1800 / 460 D	230	IE5	96.5	97.2	97.5		576	81		

Electrical and mechanical characteristics

INTERCHANGEABLE VERSION - ALUMINIUM HOUSING : LSHRM

3000 range

Type	Nominal characteristics									
	Voltage connection	Power	Speed (Nn)	Frequency (fn)	Torque					Nominal current
					10% Nn	20% Nn	33% Nn	50% Nn	Nn	
	V	kW	rpm	Hz	N.m	N.m	N.m	N.m	N.m	A rms
LSHRM 160MR1	400Y	11	3000	100	35	35	35	35	35	20
	400Y	11	3600	120	35	35	35	35	29	20
	460Y	12.7	3600	120	35	35	35	35	34	20
	400D	19.1	5200	174	35	35	35	35	35	36
LSHRM 160MR1	400Y	15	3000	100	48	48	48	48	48	28
	400Y	15	3600	120	48	48	48	48	40	27
	460Y	17.3	3600	120	48	48	48	48	46	28
	400D	26	5200	174	48	48	48	48	48	51
LSHRM 160LR1	400Y	18.5	3000	100	59	59	59	59	59	34
	400Y	18.5	3600	120	59	59	59	59	49	33
	460Y	21.3	3600	120	59	59	59	59	56	33
	400D	32.1	5200	174	59	59	59	59	59	62
LSHRM 180M1	400Y	22	3000	100	70	70	70	70	70	42
	400Y	22	3600	120	70	70	70	70	58	40
	460Y	26	3600	120	70	70	70	70	68	41
	400D	38	5200	174	70	70	70	70	70	74
LSHRM 200LQ1	400Y	30	3000	100	96	96	96	96	96	57
	400Y	30	3600	120	96	96	96	96	80	57
	460Y	35	3600	120	96	96	96	96	92	57
LSHRM 200LQ1	400Y	37	3000	100	118	118	118	118	118	70
	400Y	37	3600	120	118	118	118	118	98	69
	460Y	43	3600	120	118	118	118	118	114	69
LSHRM 225MY1	400Y	45	3000	100	143	143	143	143	143	84
	400Y	45	3600	120	143	143	143	143	119	82
	460Y	52	3600	120	143	143	143	143	138	83
LSHRM 250ME	400Y	55	3000	100	175	175	175	175	175	100
	400Y	55	3600	120	175	175	175	175	146	101
	460Y	64	3600	120	175	175	175	175	169	100
LSHRM 280SC	400Y	75	3000	100	239	239	239	239	239	138
	400Y	75	3600	120	239	239	239	239	199	136
	460Y	86	3600	120	239	239	239	239	229	135
LSHRM 280MC	400Y	90	3000	100	287	287	287	287	287	167
	400Y	90	3600	120	287	287	287	287	239	160
	460Y	104	3600	120	287	287	287	287	275	168
LSHRM 315SN1	400Y	110	3000	100	350	350	350	350	350	201
	400Y	110	3600	120	350	350	350	350	292	195
	460Y	127	3600	120	350	350	350	350	336	197
LSHRM 315MN1	400Y	132	3000	100	420	420	420	420	420	237
	400Y	132	3600	120	420	420	420	420	350	234
	460Y	152	3600	120	420	420	420	420	403	232
LSHRM 315MN1	400Y	160	3000	100	509	509	509	509	509	289
	400Y	160	3600	120	509	509	509	509	424	273
	460Y	184	3600	120	509	509	509	509	489	283
LSHRM 315MN1	400Y	200	3000	100	637	637	637	637	637	366
	400Y	200	3600	120	637	637	637	637	531	365
	460Y	233	3600	120	637	637	637	637	619	359

Electrical and mechanical characteristics

INTERCHANGEABLE VERSION - ALUMINIUM HOUSING : LSHRM

3000 range

Type	Speed/voltage Connection Y or D	Power	Efficiency				Max. characteristics		Noise level	Inertia	Motor weight
			Class	100% Nn / 50% Cn	100% Nn / 75% Cn	100% Nn / 100% Cn	Maximum Torque	Maximum Current			
		kW							dB(A)	kg.m²	kg
LSHRM 160MR1	3000 / 400 Y	11	IE5	93.5	94.3	94.4	53	32	68	0.0293	46
	3600 / 400 Y	11	IE5	93.1	94.3	94.2		32	72		
	3600 / 460 Y	12.7	IE5	93.1	94.1	94.6		32	72		
	5200 / 400 D	19.1	IE5	91.7	93.3	94.2		55	80		
LSHRM 160MR1	3000 / 400 Y	15	IE5	93.6	94.6	95.1	72	42	68	0.0217	54
	3600 / 400 Y	15	IE5	92.6	94	94.6		42	72		
	3600 / 460 Y	17.3	IE5	92.8	94.2	94.7		42	72		
	5200 / 400 D	26	IE5	90.9	92.8	94		73	80		
LSHRM 160LR1	3000 / 400 Y	18.5	IE5	94.1	94.8	95.1	88	55	68	0.0217	54
	3600 / 400 Y	18.5	IE5	93.6	94.7	94.8		55	72		
	3600 / 460 Y	21.3	IE5	93.6	94.6	95.1		55	72		
	5200 / 400 D	32.1	IE5	92.1	93.7	94.5		96	80		
LSHRM 180M1	3000 / 400 Y	22	IE5	94.1	95	95.4	105	64	69	0.0643	115
	3600 / 400 Y	22	IE5	93.4	94.6	95		64	73		
	3600 / 460 Y	26	IE5	93.5	94.7	95.2		64	73		
	5200 / 400 D	38	IE5	91.7	93.5	94.5		111	81		
LSHRM 200LQ1	3000 / 400 Y	30	IE5	94.7	95	94.9	143	90	73	0.0659	115
	3600 / 400 Y	30	IE5	94.1	95.1	93.7		90	77		
	3600 / 460 Y	35	IE5	94.3	95	95		90	77		
LSHRM 200LQ1	3000 / 400 Y	37	IE5	95.1	95.6	95.9	177	107	73	0.0823	130
	3600 / 400 Y	37	IE5	94.8	95.6	95.7		107	77		
	3600 / 460 Y	43	IE5	94.8	95.7	95.9		107	77		
LSHRM 225MY1	3000 / 400 Y	45	IE5	95.5	96.1	96.2	215	130	75	0.1016	130
	3600 / 400 Y	45	IE5	95.3	96.1	96.1		130	79		
	3600 / 460 Y	52	IE5	95.3	96	96.3		130	79		
LSHRM 250ME	3000 / 400 Y	55	IE5	93.6	94.9	95.6	263	158	76	0.4057	245
	3600 / 400 Y	55	IE5	91.9	93.8	94.6		158	81		
	3600 / 460 Y	64	IE5	92.2	94	94.9		158	81		
LSHRM 280SC	3000 / 400 Y	75	IE5	94.4	95.4	95.9	358	214	76	0.4057	245
	3600 / 400 Y	75	IE5	93	94.7	94.2		214	81		
	3600 / 460 Y	86	IE5	93.3	94.7	95.4		214	81		
LSHRM 280MC	3000 / 400 Y	90	IE5	94.9	95.8	96.2	430	228	81	0.4905	294
	3600 / 400 Y	90	IE5	93.8	95.1	95.8		228	86		
	3600 / 460 Y	104	IE5	93.9	95.2	95.9		228	86		
LSHRM 315SN1	3000 / 400 Y	110	IE5	95.2	96.2	96.5	525	293	81	0.5759	320
	3600 / 400 Y	110	IE5	94.2	95.4	96.1		293	86		
	3600 / 460 Y	127	IE5	94.3	95.5	96.1		293	86		
LSHRM 315MN1	3000 / 400 D	132	IE5	95.6	96.5	96.8	630	339	81	0.6568	340
	3600 / 400 D	132	IE5	94.7	95.9	95.4		339	86		
	3600 / 460 D	152	IE5	94.9	95.9	96.4		339	86		
LSHRM 315MN1	3000 / 400 Y	160	IE5	95.9	96.6	97.1	764	400	81	0.8246	416
	3600 / 400 Y	160	IE5	95	96	96.6		400	86		
	3600 / 460 Y	184	IE5	95.1	96.1	96.6		400	86		
LSHRM 315MN1	3000 / 400 Y	200	IE5	96.1	96.8	97.1	955	503	81	0.7409	480
	3600 / 400 Y	200	IE5	95.4	96.4	95.8		503	86		
	3600 / 460 Y	233	IE5	95.5	96.3	96.8		503	86		

Electrical and mechanical characteristics

INTERCHANGEABLE VERSION - CAST IRON HOUSING : FLSHRM

1500 range

Type	Nominal characteristics									
	Voltage connection	Power	Speed (Nn)	Frequency (fn)	Torque					Nominal current
					10% Nn	20% Nn	33% Nn	50% Nn	Nn	
	V	kW	rpm	Hz	N.m	N.m	N.m	N.m	N.m	A rms
FLSHRM 280SB	400Y	**75**	1500	50	430	478	478	478	478	134
	400Y	**75**	1800	60	430	478	478	478	398	130
	460Y	**86**	1800	60	430	478	478	478	458	131
	400D	**131**	2600	87	478	478	478	478	478	231
FLSHRM 280MD	400Y	**90**	1500	50	458	573	573	573	573	163
	400Y	**90**	1800	60	458	573	573	573	478	158
	460Y	**104**	1800	60	458	573	573	573	550	155
	400D	**156**	2600	87	542	573	573	573	570	279
FLSHRM 315STB	400Y	**110**	1500	50	595	700	700	700	700	199
	400Y	**110**	1800	60	595	700	700	700	584	195
	460Y	**132**	1800	60	595	700	700	700	698	202
	400D	**192**	2600	87	668	700	700	700	703	342
FLSHRM 315M	400Y	**132**	1500	50	714	840	840	840	840	235
	400Y	**132**	1800	60	714	840	840	840	700	234
	460Y	**152**	1800	60	714	840	840	840	807	233
	400D	**229**	2600	87	796	840	840	840	838	415
FLSHRM 315LA	400Y	**160**	1500	50	866	1019	1019	1019	1019	304
	400Y	**160**	1800	60	866	1019	1019	1019	849	280
	460Y	**184**	1800	60	866	1019	1019	1019	976	294
	400D	**278**	2600	87	965	1019	1019	1019	1016	541
FLSHRM 315LB	400D	**200**	1500	50	1146	1273	1273	1273	1273	377
	400D	**200**	1800	60	1146	1273	1273	1273	1061	349
	460D	**230**	1800	60	1146	1273	1273	1273	1221	366

Electrical and mechanical characteristics

INTERCHANGEABLE VERSION - CAST IRON HOUSING : FLSHRM

1500 range

Type	Speed/voltage Connection Y or D	Power	Efficiency				Max. characteristics		Noise level	Inertia	Motor weight
			Class	100% Nn / 50% Cn	100% Nn / 75% Cn	100% Nn / 100% Cn	Maximum Torque	Maximum Current			
		kW							dB(A)	kg.m²	kg
FLSHRM 280SB	1500 / 400 Y	**75**	IE5	96.1	96.6	96.2	716	198	69	0.7691	605
	1800 / 400 Y	**75**	IE5	95.7	96.6	95.9		198	74		
	1800 / 460 Y	**86**	IE5	95.8	96.5	96.6		198	74		
	2600 / 400 D	**131**	IE5	94.8	95.9	96.4		343	81		
FLSHRM 280MD	1500 / 400 Y	**90**	IE5	96.4	96.8	96.5	860	224	70	0.8501	634
	1800 / 400 Y	**90**	IE5	96.1	96.7	96.1		224	75		
	1800 / 460 Y	**104**	IE5	96.1	96.6	96.8		224	75		
	2600 / 400 D	**156**	IE5	95.2	96.2	96.6		387	82		
FLSHRM 315STB	1500 / 400 Y	**110**	IE5	96.5	96.8	96.7	1051	280	71	0.987	728
	1800 / 400 Y	**110**	IE5	96.3	96.9	96.2		280	76		
	1800 / 460 Y	**132**	IE5	96.3	96.8	96.8		280	76		
	2600 / 400 D	**192**	IE5	95.6	96.5	96.8		485	83		
FLSHRM 315M	1500 / 400 Y	**132**	IE5	96.4	97	97.2	1261	357	75	2.16	1086
	1800 / 400 Y	**132**	IE5	95.8	96.8	96.3		357	80		
	1800 / 460 Y	**152**	IE5	96	96.8	97.1		357	80		
	2600 / 400 D	**229**	IE5	94.5	95.9	96.5		618	87		
FLSHRM 315LA	1500 / 400 Y	**160**	IE5	96.5	97.1	97.3	1528	461	76	2.38	1122
	1800 / 400 Y	**160**	IE5	96.1	96.9	97.2		461	81		
	1800 / 460 Y	**184**	IE5	96.2	96.9	97.3		461	81		
	2600 / 400 D	**278**	IE5	94.8	96.1	96.7		798	88		
FLSHRM 315LB	1500 / 400 D	**200**	IE5	96.8	97.3	97.5	1910	576	76	2.83	1218
	1800 / 400 D	**200**	IE5	96.4	97.2	97.4		576	81		
	1800 / 460 D	**230**	IE5	96.5	97.2	97.5		576	81		

Electrical and mechanical characteristics

INTERCHANGEABLE VERSION - CAST IRON HOUSING : FLSHRM

3000 range

Type	Nominal characteristics									
	Voltage connection	Power	Speed (Nn)	Frequency (fn)	Torque					Nominal current
					10% Nn	20% Nn	33% Nn	50% Nn	Nn	
	V	kW	rpm	Hz	N.m	N.m	N.m	N.m	N.m	A rms
FLSHRM 280SA	400Y	**75**	3000	100	239	239	239	239	239	138
	400Y	**75**	3600	120	239	239	239	239	199	136
	460Y	**86**	3600	120	239	239	239	239	229	135
FLSHRM 280MA	400Y	**90**	3000	100	287	287	287	287	287	167
	400Y	**90**	3600	120	287	287	287	287	239	160
	460Y	**108**	3600	120	287	287	287	287	286	168
FLSHRM 315STA	400Y	**110**	3000	100	350	350	350	350	350	201
	400Y	**110**	3600	120	350	350	350	350	292	195
	460Y	**127**	3600	120	350	350	350	350	336	197
FLSHRM 315MT	400Y	**132**	3000	100	420	420	420	420	420	237
	400Y	**132**	3600	120	420	420	420	420	350	234
	460Y	**152**	3600	120	420	420	420	420	403	232
FLSHRM 315LTA	400Y	**160**	3000	100	509	509	509	509	509	289
	400Y	**160**	3600	120	509	509	509	509	424	273
	460Y	**184**	3600	120	509	509	509	509	489	283
FLSHRM 315LTB	400Y	**200**	3000	100	637	637	637	637	637	366
	400Y	**200**	3600	120	637	637	637	637	531	365
	460Y	**233**	3600	120	637	637	637	637	619	359
FLSHRM 355LTA	400D	**250**	3000	100	796	796	796	796	796	452
	400D	**250**	3600	120	796	796	796	796	663	452
	460D	**288**	3600	120	796	796	796	796	763	448
FLSHRM 355LTC	400D	**315**	3000	100	1003	1003	1003	1003	1003	580
	400D	**315**	3600	120	1003	1003	1003	1003	836	848
	460D	**363**	3600	120	1003	1003	1003	1003	962	576
FLSHRM 355LTC	400D	**355**	3000	100	1130	1130	1130	1130	1130	650
	400D	**355**	3600	120	1130	1130	1130	1130	942	642
	460D	**408**	3600	120	1130	1130	1130	1130	1084	650

Electrical and mechanical characteristics

INTERCHANGEABLE VERSION - CAST IRON HOUSING : FLSHRM

3000 range

Type	Speed/voltage Connection Y or D	Power	Efficiency				Max. characteristics		Noise level	Inertia	Motor weight
			Class	100% Nn / 50% Cn	100% Nn / 75% Cn	100% Nn / 100% Cn	Maximum Torque	Maximum Current			
		kW							dB(A)	kg.m²	kg
FLSHRM 280SA	3000 / 400 Y	75	IE5	94.4	94.8	95.8	358	214	83	0.4413	495
	3600 / 400 Y	75	IE5	93	94.7	94.2		214	88		
	3600 / 460 Y	86	IE5	93.3	94.7	95.4		214	88		
FLSHRM 280MA	3000 / 400 Y	90	IE5	94.9	95.8	96.2	430	228	83	0.5223	522
	3600 / 400 Y	90	IE5	93.8	95.1	95.8		228	88		
	3600 / 460 Y	108	IE5	93.9	95.2	95.9		228	88		
FLSHRM 315STA	3000 / 400 Y	110	IE5	95.2	96.2	96.5	525	293	83	0.6149	606
	3600 / 400 Y	110	IE5	94.2	95.4	96.1		293	88		
	3600 / 460 Y	127	IE5	94.3	95.5	96.1		293	88		
FLSHRM 315MT	3000 / 400 Y	132	IE5	95.6	96.5	96.8	630	339	83	0.6958	633
	3600 / 400 Y	132	IE5	94.7	95.9	95.4		339	88		
	3600 / 460 Y	152	IE5	94.9	95.9	96.4		339	88		
FLSHRM 315LTA	3000 / 400 Y	160	IE5	95.9	96.7	96.8	764	400	83	0.858	690
	3600 / 400 Y	160	IE5	95	96	96.6		400	88		
	3600 / 460 Y	184	IE5	95.1	96.1	96.6		400	88		
FLSHRM 315LTB	3000 / 400 Y	200	IE5	96.1	96.8	97	955	503	83	0.939	717
	3600 / 400 Y	200	IE5	95.4	96.4	95.8		503	88		
	3600 / 460 Y	233	IE5	95.5	96.3	96.8		503	88		
FLSHRM 355LTA	3000 / 400 D	250	IE5	95.4	96.5	97	1194	687	83	2.28	1157
	3600 / 400 D	250	IE5	94.4	95.8	95.8		687	88		
	3600 / 460 D	288	IE5	94.6	95.9	96.7		687	88		
FLSHRM 355LTC	3000 / 400 D	315	IE5	96	96.4	97.1	1504	758	83	2.72	1254
	3600 / 400 D	315	IE5	95	95.5	96.2		758	88		
	3600 / 460 D	363	IE5	95	95.6	96.8		758	88		
FLSHRM 355LTC	3000 / 400 D	355	IE5	95.9	96.8	97.3	1695	992	83	2.94	1297
	3600 / 400 D	355	IE5	95.1	96.3	96.3		992	88		
	3600 / 460 D	408	IE5	95.3	96.4	97		992	88		

Electrical and mechanical characteristics

COMPACT VERSION - ALUMINIUM HOUSING : LSHRM

1500 range

Type	Nominal characteristics									
	Voltage connection	Power	Speed (Nn)	Frequency (fn)	Torque					Nominal current
					10% Nn	20% Nn	33% Nn	50% Nn	Nn	
	V	kW	rpm	Hz	N.m	N.m	N.m	N.m	N.m	A rms
LSHRM 132MU1	400Y	**15.5**	1500	50	49	94	99	99	99	30
	400Y	**15.5**	1800	60	49	94	99	99	82	28
	460Y	**17.9**	1800	60	49	94	99	99	95	28
	400D	**27**	2600	87	79	94	99	99	99	53
LSHRM 160LR1	400Y	**18.5**	1500	50	59	112	118	118	118	36
	400Y	**18.5**	1800	60	59	112	118	118	98	34
	460Y	**21.3**	1800	60	59	112	118	118	113	35
	400D	**32.1**	2600	87	94	112	118	118	117	63
LSHRM 180L1M	400Y	**35**	1500	50	134	223	223	223	223	69
	400Y	**35**	1800	60	134	223	223	223	186	66
	460Y	**40**	1800	60	134	223	223	223	214	67
	400D	**61**	2600	87	200	223	223	223	222	119
LSHRM 200LR1	400Y	**41**	1500	50	157	261	261	261	261	81
	400Y	**41**	1800	60	157	261	261	261	218	77
	460Y	**47**	1800	60	157	261	261	261	250	78
	400D	**71**	2600	87	234	261	261	261	260	139
LSHRM 225MG1M	400Y	**94**	1500	50	389	598	598	598	598	183
	400Y	**94**	1800	60	389	598	598	598	499	171
	460Y	**126**	1800	60	389	598	598	598	670	203
LSHRM 250MF1	400Y	**117**	1500	50	484	745	745	745	745	218
	400Y	**117**	1800	60	484	745	745	745	621	210
	460Y	**153**	1800	60	484	745	745	745	810	239
LSHRM 280MU	400Y	**220**	1500	50	980	1401	1401	1401	1401	400
	400Y	**220**	1800	60	980	1401	1401	1401	1167	393
	460Y	**253**	1800	60	980	1401	1401	1401	1343	393
LSHRM 315MR	400D	**240**	1500	50	1146	1528	1528	1528	1528	457
	400D	**240**	1800	60	1146	1528	1528	1528	1273	429
	460D	**276**	1800	60	1146	1528	1528	1528	1465	443

1800 range

Type	Nominal characteristics									
	Voltage connection	Power	Speed (Nn)	Frequency (fn)	Torque					Nominal current
					10% Nn	20% Nn	33% Nn	50% Nn	Nn	
	V	kW	rpm	Hz	N.m	N.m	N.m	N.m	N.m	A rms
LSHRM 132MU1	400D	**19**	1800	60	50	96	101	101	101	37
LSHRM 160LR3	400D	**22**	1800	60	58	111	117	117	117	42
LSHRM 180L1M	400Y	**42**	1800	60	134	223	223	223	223	83
LSHRM 200LR1	400Y	**50**	1800	60	159	265	265	265	265	98
LSHRM 225MG1M	400Y	**112**	1800	60	386	594	594	594	594	216
LSHRM 250MF1	400Y	**138**	1800	60	476	732	732	732	732	263
LSHRM 280MU	400D	**250**	1800	60	928	1326	1326	1326	1326	451
LSHRM 315MR	400D	**280**	1800	60	1114	1486	1486	1486	1486	513

Electrical and mechanical characteristics

COMPACT VERSION - ALUMINIUM HOUSING : LSHRM

1500 range

Type	Speed/voltage Connection Y or D	Power	Efficiency				Max. characteristics		Noise level	Inertia	Motor weight
			Class	100% Nn / 50% Cn	100% Nn / 75% Cn	100% Nn / 100% Cn	Maximum Torque	Maximum Current			
		kW							dB(A)	kg.m²	kg
LSHRM 132MU1	1500 / 400 Y	**15.5**	IE3	94	93.9	92.5	128	41	61	0.0262	63
	1800 / 400 Y	**15.5**	IE4	94.4	94.8	93.2		41	64		
	1800 / 460 Y	**17.9**	IE4	94.3	94.3	93.7		41	64		
	2600 / 400 D	**27**	IE5	94.3	94.7	94.4		70	73		
LSHRM 160LR1	1500 / 400 Y	**18.5**	IE3	94.2	93.2	92.7	153	49	63	0.0309	80
	1800 / 400 Y	**18.5**	IE4	94.6	94.8	92.6		49	66		
	1800 / 460 Y	**21.3**	IE4	94.6	94.1	93.1		49	66		
	2600 / 400 D	**32.1**	IE5	94.6	94.6	94.1		85	75		
LSHRM 180L1M	1500 / 400 Y	**35**	IE4	94.7	94.7	94.1	290	96	66	0.1142	152
	1800 / 400 Y	**35**	IE5	95.1	95.5	94.6		96	69		
	1800 / 460 Y	**40**	IE5	94.9	95.2	94.8		96	69		
	2600 / 400 D	**61**	IE5	94.9	95.5	95.5		165	78		
LSHRM 200LR1	1500 / 400 Y	**41**	IE4	94.9	95.1	94.4	339	112	66	0.1333	174
	1800 / 400 Y	**41**	IE5	95.4	95.7	94.9		112	69		
	1800 / 460 Y	**47**	IE5	95.2	95.4	95.1		112	69		
	2600 / 400 D	**71**	IE5	95.2	95.7	95.8		194	78		
LSHRM 225MG1M	1500 / 400 Y	**94**	IE5	96	96.4	96.5	778	267	68	0.7319	380
	1800 / 400 Y	**94**	IE5	95.8	96.5	96.5		267	71		
	1800 / 460 Y	**126**	IE5	96	96.5	96.5		267	71		
LSHRM 250MF1	1500 / 400 Y	**117**	IE5	96.3	96.7	96.8	968	344	69	0.7409	480
	1800 / 400 Y	**117**	IE5	96.2	96.8	96.8		344	74		
	1800 / 460 Y	**153**	IE5	96.5	96.9	96.8		344	74		
LSHRM 280MU	1500 / 400 Y	**220**	IE5	97	97.4	97.5	1821	548	76	2.4304	820
	1800 / 400 Y	**220**	IE5	96.6	97.3	96.9		548	81		
	1800 / 460 Y	**253**	IE5	96.7	97.3	97.5		548	81		
LSHRM 315MR	1500 / 400 D	**240**	IE5	97	97.5	97.6	1986	600	77	2.437	874
	1800 / 400 D	**240**	IE5	96.7	97.4	97		600	82		
	1800 / 460 D	**276**	IE5	96.8	97.4	97.6		600	82		

1800 range

Type	Speed/voltage Connection Y or D	Power	Efficiency				Max. characteristics		Noise level	Inertia	Motor weight
			Class	100% Nn / 50% Cn	100% Nn / 75% Cn	100% Nn / 100% Cn	Maximum Torque	Maximum Current			
		kW							dB(A)	kg.m²	kg
LSHRM 132MU1	1800 / 400 D	**19**	IE4	94.2	93.6	92.7	131	51	63	0.0262	63
LSHRM 160LR3	1800 / 400 D	**22**	IE4	94.5	94.2	93.5	152	57	65	0.0309	80
LSHRM 180L1M	1800 / 400 Y	**42**	IE4	95	95.1	94.6	290	113	68	0.1142	152
LSHRM 200LR1	1800 / 400 Y	**50**	IE4	95.2	95.3	95	345	136	68	0.1333	174
LSHRM 225MG1M	1800 / 400 Y	**112**	IE5	96.1	96.5	96.7	772	281	70	0.7319	380
LSHRM 250MF1	1800 / 400 Y	**138**	IE5	96.4	96.9	97	952	343	71	0.7409	480
LSHRM 280MU	1800 / 400 D	**250**	IE5	96.9	97.4	97.6	1724	618	78	2.4304	820
LSHRM 315MR	1800 / 400 D	**280**	IE5	97.1	97.6	97.7	1931	698	79	2.437	874

Electrical and mechanical characteristics

COMPACT VERSION - ALUMINIUM OR STEEL HOUSING : LSHRM / PLSHRM

2600 range

Type	Nominal characteristics									
	Voltage connection	Power	Speed (Nn)	Frequency (fn)	Torque					Nominal current
					10% Nn	20% Nn	33% Nn	50% Nn	Nn	
	V	kW	rpm	Hz	N.m	N.m	N.m	N.m	N.m	A rms
LSHRM 132MU3	400D	**27**	2600	86.6	83	98	98	98	98	52
LSHRM 160LR3	400D	**32**	2600	86.6	100	117	117	117	117	60
LSHRM 180L1M	400D	**60**	2600	86.6	165	209	220	220	220	118
LSHRM 200LR1	400D	**70**	2600	86.6	192	243	256	256	256	138
LSHRM 225MG1M	400D	**157**	2600	86.6	546	574	574	574	574	309
LSHRM 250MF1	400D	**192**	2600	86.6	667	703	703	703	703	365
LSHRM 280MU	400D	**305**	2600	86.6	949	1116	1116	1116	1116	580
LSHRM 315MR	400D	**330**	2600	86.6	1147	1207	1207	1207	1207	591
PLSHRM 315LD	400D	**380**	2600	86.6	1390	1390	1390	1390	1390	800

3000 range

Type	Nominal characteristics									
	Voltage connection	Power	Speed (Nn)	Frequency (fn)	Torque					Nominal current
					10% Nn	20% Nn	33% Nn	50% Nn	Nn	
	V	kW	rpm	Hz	N.m	N.m	N.m	N.m	N.m	A rms
LSHRM 132MU3	400Y	**32**	3000	100	92	102	102	102	102	61
	400Y	**32**	3600	120	92	102	102	102	85	70
	460Y	**37**	3600	120	92	102	102	102	98	60
	400D	**56**	5200	173	102	102	102	102	102	110
LSHRM 160LR3	400Y	**37**	3000	100	106	118	118	118	118	70
	400Y	**37**	3600	120	106	118	118	118	98	69
	460Y	**43**	3600	120	106	118	118	118	113	69
	400D	**65**	5200	173	119	118	118	118	119	123
LSHRM 180L1M	400Y	**64**	3000	100	173	204	204	204	204	126
	400Y	**64**	3600	120	173	204	204	204	170	121
	460Y	**74**	3600	120	173	204	204	204	195	123
LSHRM 200LR1	400Y	**75**	3000	100	203	239	239	239	239	148
	400Y	**75**	3600	120	203	239	239	239	199	141
	460Y	**86**	3600	120	203	239	239	239	229	145
LSHRM 225MG1M	400Y	**172**	3000	100	548	548	548	548	548	327
	400Y	**172**	3600	120	548	548	548	548	456	318
	460Y	**198**	3600	120	548	548	548	548	526	314
LSHRM 250MF1	400Y	**206**	3000	100	656	656	656	656	656	382
	400Y	**206**	3600	120	656	656	656	656	546	384
	460Y	**248**	3600	120	656	656	656	656	658	388
LSHRM 315MP	400D	**250**	3000	100	796	796	796	796	796	452
	400D	**250**	3600	120	796	796	796	796	663	452
	460D	**288**	3600	120	796	796	796	796	763	448
LSHRM 280MU	400D	**315**	3000	100	1003	1003	1003	1003	1003	643
	400D	**315**	3600	120	1003	1003	1003	1003	836	572
	460D	**363**	3600	120	1003	1003	1003	1003	962	629
LSHRM 315MR	400D	**315**	3000	100	1003	1003	1003	1003	1003	580
	400D	**315**	3600	120	1003	1003	1003	1003	836	848
	460D	**363**	3600	120	1003	1003	1003	1003	962	576
LSHRM 315MR	400D	**355**	3000	100	1130	1130	1130	1130	1130	650
	400D	**355**	3600	120	1130	1130	1130	1130	942	642
	460D	**408**	3600	120	1130	1130	1130	1130	1084	650
PLSHRM 315LD	400D	**430**	3000	100	1369	1369	1369	1369	1369	795
	400D	**430**	3600	120	1369	1369	1369	1369	1141	797
	460D	**495**	3600	120	1369	1369	1369	1369	1314	785

Electrical and mechanical characteristics

COMPACT VERSION - ALUMINIUM OR STEEL HOUSING : LSHRM / PLSHRM

2600 range

Type	Speed/voltage Connection Y or D	Power	Efficiency				Max. characteristics		Noise level	Inertia	Motor weight
			Class	100% Nn / 50% Cn	100% Nn / 75% Cn	100% Nn / 100% Cn	Maximum Torque	Maximum Current			
		kW							dB(A)	kg.m²	kg
LSHRM 132MU3	2600 / 400 D	27	IE5	94.9	95.1	94.9	127	70	67	0.0262	63
LSHRM 160LR3	2600 / 400 D	32	IE5	94.7	94.8	94.5	152	83	70	0.0309	80
LSHRM 180L1M	2600 / 400 D	60	IE5	95.5	95.9	95.9	285	160	74	0.1142	152
LSHRM 200LR1	2600 / 400 D	70	IE5	95.7	96.1	96.3	333	184	75	0.1333	174
LSHRM 225MG1M	2600 / 400 D	157	IE5	96.1	96.7	97	747	395	77	0.7319	380
LSHRM 250MF1	2600 / 400 D	192	IE5	96.4	97	97.2	913	475	78	0.7409	480
LSHRM 280MU	2600 / 400 D	305	IE5	96.7	97.4	97.7	1451	760	80	2.4304	820
LSHRM 315MR	2600 / 400 D	330	IE5	96.8	97.5	97.8	1570	805	80	2.437	874
PLSHRM 315LD	2600 / 400 D	380	IE5	96.8	97.4	97.6	1808	1019	80	3.45	935

3000 range

Type	Speed/voltage Connection Y or D	Power	Efficiency				Max. characteristics		Noise level	Inertia	Motor weight
			Class	100% Nn / 50% Cn	100% Nn / 75% Cn	100% Nn / 100% Cn	Maximum Torque	Maximum Current			
		kW							dB(A)	kg.m²	kg
LSHRM 132MU3	3000 / 400 Y	32	IE5	94.7	95	94.9	132	83	70	0.0262	63
	3600 / 400 Y	32	IE5	94.7	95.6	94		83	74		
	3600 / 460 Y	37	IE5	94.6	95.1	95.2		83	74		
	5200 / 400 D	56	IE5	93.6	94.6	95		143	82		
LSHRM 160LR3	3000 / 400 Y	37	IE5	95	95.3	94.9	153	96	73	0.0309	80
	3600 / 400 Y	37	IE5	94.8	95.5	93.7		96	77		
	3600 / 460 Y	43	IE5	94.9	95.6	95.2		96	77		
	5200 / 400 D	65	IE5	94.4	95.3	95.5		166	85		
LSHRM 180L1M	3000 / 400 Y	64	IE5	95.7	96.3	96.3	265	166	77	0.1142	152
	3600 / 400 Y	64	IE5	95.5	96.1	96.3		166	81		
	3600 / 460 Y	74	IE5	95.5	96.1	96.3		166	81		
LSHRM 200LR1	3000 / 400 Y	75	IE5	95.8	96.3	96.6	310	194	78	0.1333	174
	3600 / 400 Y	75	IE5	95.7	96.2	96.4		194	82		
	3600 / 460 Y	86	IE5	95.6	96.2	96.5		194	82		
LSHRM 225MG1M	3000 / 400 Y	172	IE5	95.7	96.5	96.9	712	428	80	0.7319	380
	3600 / 400 Y	172	IE5	94.9	96	96.5		428	84		
	3600 / 460 Y	198	IE5	95.4	96.3	96.8		428	84		
LSHRM 250MF1	3000 / 400 Y	206	IE5	96	96.6	97.1	852	493	81	0.7409	480
	3600 / 400 Y	206	IE5	95.3	96.3	95.7		493	86		
	3600 / 460 Y	248	IE5	95.6	96.4	96.9		493	86		
LSHRM 315MP	3000 / 400 D	250	IE5	95.4	96.5	97	1194	687	83	2.205	712
	3600 / 400 D	250	IE5	94.4	95.8	95.8		687	88		
	3600 / 460 D	288	IE5	94.6	95.9	96.7		687	88		
LSHRM 280MU	3000 / 400 D	315	IE5	95.5	96.6	97.1	1304	791	83	2.4304	820
	3600 / 400 D	315	IE5	94.6	96	96.7		791	88		
	3600 / 460 D	363	IE5	94.8	96.1	96.7		791	88		
LSHRM 315MR	3000 / 400 D	315	IE5	96	96.4	97.1	1504	758	83	2.4262	820
	3600 / 400 D	315	IE5	95	95.5	96.2		758	88		
	3600 / 460 D	363	IE5	95	95.6	96.8		758	88		
LSHRM 315MR	3000 / 400 D	355	IE5	95.9	96.8	97.3	1695	992	81	2.437	874
	3600 / 400 D	355	IE5	95.1	96.3	96.3		992	86		
	3600 / 460 D	408	IE5	95.3	96.4	97		992	86		
PLSHRM 315LD	3000 / 400 D	430	IE5	96.9	97.5	97.8	1779	1055	83	3.45	935
	3600 / 400 D	430	IE5	96.6	97.4	96.9		1055	88		
	3600 / 460 D	495	IE5	96.6	97.3	97.7		1055	88		

Electrical and mechanical characteristics

COMPACT VERSION - ALUMINIUM OR STEEL HOUSING : LSHRM / PLSHRM

3600 range

Type	Nominal characteristics									
	Voltage connection	Power	Speed (Nn)	Frequency (fn)	Torque					Nominal current
					10% Nn	20% Nn	33% Nn	50% Nn	Nn	
	V	kW	rpm	Hz	N.m	N.m	N.m	N.m	N.m	A rms
LSHRM 132MU3	400Y	**38**	3600	120	91	101	101	101	101	73
LSHRM 160LR3	400D	**40**	3600	120	96	106	106	106	106	76
LSHRM 180L1M	400Y	**75**	3600	120	169	199	199	199	199	146
LSHRM 200LR1	400Y	**87**	3600	120	196	231	231	231	231	167
LSHRM 225MG1M	400D	**181**	3600	120	480	480	480	480	480	337
LSHRM 250MF1	400D	**230**	3600	120	610	610	610	610	610	430
LSHRM 280MU	400D	**322**	3600	120	854	854	854	854	854	579
PLSHRM 315LD	400D	**430**	3600	120	1141	1141	1141	1141	1141	830

4500 range

Type	Nominal characteristics									
	Voltage connection	Power	Speed (Nn)	Frequency (fn)	Torque					Nominal current
					10% Nn	20% Nn	33% Nn	50% Nn	Nn	
	V	kW	rpm	Hz	N.m	N.m	N.m	N.m	N.m	A rms
LSHRM 132MU3	400D	**48**	4500	150	92	102	102	102	102	93
LSHRM 160LR3	400D	**50**	4500	150	96	106	106	106	106	96
LSHRM 180L1M	400Y	**88**	4500	150	187	187	187	187	187	170
LSHRM 200LQ1	400Y	**88**	4500	150	187	187	187	187	187	170
LSHRM 225MG1M	400D	**185**	4500	150	393	393	393	393	393	369
LSHRM 250SF1	400D	**240**	4500	150	509	509	509	509	509	441
LSHRM 280MUS	400D	**260**	4500	150	552	552	552	552	552	514
LSHRM 315MRS	400D	**300**	4500	150	637	637	637	637	637	551
PLSHRM 315LD	400D	**430**	4500	150	913	913	913	913	913	781

6000 range

Type	Nominal characteristics									
	Voltage connection	Power	Speed (Nn)	Frequency (fn)	Torque					Nominal current
					10% Nn	20% Nn	33% Nn	50% Nn	Nn	
	V	kW	rpm	Hz	N.m	N.m	N.m	N.m	N.m	A rms
LSHRM 132MU3	400D	**57**	6000	200	82	91	91	91	91	112
LSHRM 160LR3	400D	**65**	6000	200	93	103	103	103	103	126
LSHRM 180L1M	400Y	**80**	6000	200	127	127	127	127	127	146
LSHRM 200LR1	400Y	**90**	6000	200	143	143	143	143	143	167
LSHRM 225SG1	400Y	**185**	6000	200	294	294	294	294	294	341
LSHRM 250SF1S	400D	**220**	6000	200	350	350	350	350	350	409

Electrical and mechanical characteristics

COMPACT VERSION - ALUMINIUM OR STEEL HOUSING : LSHRM / PLSHRM

3600 range

Type	Speed/voltage Connection Y or D	Power	Efficiency				Max. characteristics		Noise level	Inertia	Motor weight
			Class	100% Nn / 50% Cn	100% Nn / 75% Cn	100% Nn / 100% Cn	Maximum Torque	Maximum Current			
		kW							dB(A)	kg.m²	kg
LSHRM 132MU3	3600 / 400 Y	38	IE5	95	95.5	95.5	131	101	74	0.0262	63
LSHRM 160LR3	3600 / 400 D	40	IE5	95	95.5	95.8	138	105	77	0.0309	80
LSHRM 180L1M	3600 / 400 Y	75	IE5	95.6	96.2	96.5	259	194	81	0.1142	152
LSHRM 200LR1	3600 /400 Y	87	IE5	95.9	96.6	96.6	300	231	82	0.1333	174
LSHRM 225MG1M	3600 / 400 D	181	IE5	95.4	96.2	96.7	624	439	85	0.7319	380
LSHRM 250MF1	3600 / 400 D	230	IE5	95.9	96.6	96.6	793	578	86	0.7409	480
LSHRM 280MU	3600 / 400 D	322	IE5	95.5	96.5	97.1	1110	763	88	2.4304	820
PLSHRM 315LD	3600 / 400 D	430	IE5	96.3	97.1	97.5	1483	1070	88	3.45	935

4500 range

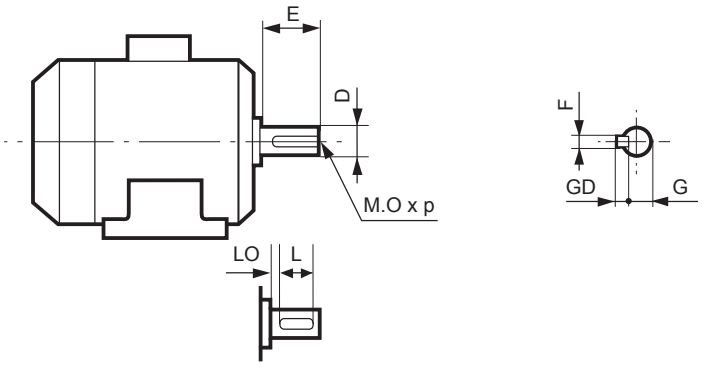
Type	Speed/voltage Connection Y or D	Power	Efficiency				Max. characteristics		Noise level	Inertia	Motor weight
			Class	100% Nn / 50% Cn	100% Nn / 75% Cn	100% Nn / 100% Cn	Maximum Torque	Maximum Current			
		kW							dB(A)	kg.m²	kg
LSHRM 132MU3	4500 / 400 D	48	IE5	95	95.4	95.6	132	125	85	0.0262	63
LSHRM 160LR3	4500 / 400 D	50	IE5	95	95.6	96.2	138	125	86	0.0309	80
LSHRM 180L1M	4500 / 400 Y	88	IE5	95.9	96.4	96.9	243	222	83	0.1142	152
LSHRM 200LQ1	4500 / 400 Y	88	IE5	95.9	96.4	96.9	243	222	83	0.1169	152
LSHRM 225MG1M	4500 / 400 D	185	IE5	93.3	94.6	95.6	510	462	83	0.7319	380
LSHRM 250SF1	4500 / 400 D	240	IE5	94.2	95.4	96.1	662	563	83	0.7409	480
LSHRM 280MUS	4500 / 400 D	260	IE4	93.6	94.9	95.9	717	654	86	2.4304	820
LSHRM 315MRS	4500 / 400 D	300	IE5	94.2	95.4	96.3	828	711	86	2.437	874
PLSHRM 315LD	4500 / 400 D	430	IE5	96	96.8	97.4	1186	1019	90	3.45	935

6000 range

Type	Speed/voltage Connection Y or D	Power	Efficiency				Max. characteristics		Noise level	Inertia	Motor weight
			Class	100% Nn / 50% Cn	100% Nn / 75% Cn	100% Nn / 100% Cn	Maximum Torque	Maximum Current			
		kW							dB(A)	kg.m²	kg
LSHRM 132MU3	6000 / 400 D	57	IE5	92.8	94.2	94.9	118	147	88	0.0262	63
LSHRM 160LR3	6000 / 400 D	65	IE5	93.2	94.5	95.3	134	168	89	0.0309	80
LSHRM 180L1M	6000 / 400 Y	80	IE5	93.9	95.3	96.1	166	207	86	0.1142	152
LSHRM 200LR1	6000 / 400 Y	90	IE5	94.1	95.4	96.2	186	223	86	0.1333	174
LSHRM 225SG1	6000 / 400 Y	185	IE4	93.6	94.8	95.5	383	442	89	0.7319	380
LSHRM 250SF1S	6000 / 400 D	220	IE4	93.8	95	95.6	455	531	89	0.7409	480

Electrical and mechanical characteristics

SHAFT EXTENSIONS



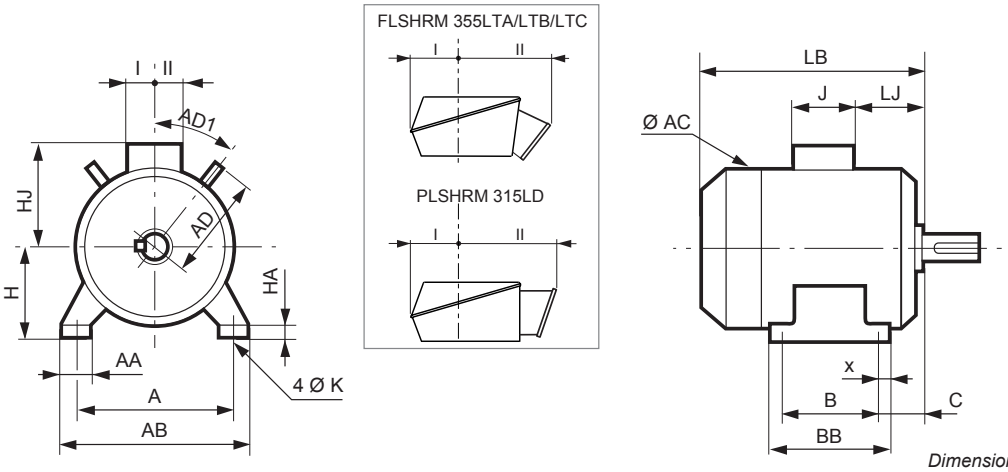
Dimensions in millimeters

Type	Main shaft extensions								
	F	GD	D	G	E	O	p	L	LO
Interchangeable alu	**1500 range**								
LSHRM 160MR1 / LR1	12	8	42k6	37	110	16	36	100	6
LSHRM 180M1 / L1	14	9	48k6	42.5	110	16	36	98	12
LSHRM 200LQ1	16	10	55m6	49	110	20	42	97	13
LSHRM 225SZ1 / MG	18	11	60m6	53	140	20	42	126	14
LSHRM 250ME	18	11	65m6	58	140	20	42	126	14
LSHRM 280SD / MD	20	12	75m6	67.5	140	20	42	125	15
LSHRM 315SN1	22	14	80m6	71	170	M20	42	140	15
LSHRM 315MP / MR	22	14	80m6	71	170	M20	42	140	15
Interchangeable alu	**3000 range**								
LSHRM 160MR1 / LR1	12	8	42k6	37	110	16	36	100	6
LSHRM 180M1	14	9	48k6	42.5	110	16	36	98	12
LSHRM 200LQ1	16	10	55m6	49	110	20	42	97	13
LSHRM 225MY1	16	10	55m6	49	110	20	42	97	13
LSHRM 250ME	18	11	60m6	53	140	20	42	126	14
LSHRM 280SC / MC	18	11	65m6	58	140	20	42	126	14
LSHRM 315SN1 / MN1	18	11	65m6	58	140	20	42	126	14
Interchangeable cast iron	**1500 range**								
FLSHRM 280SB / MD	20	12	75m6	67.5	140	20	42	125	15
FLSHRM 315STB / M	22	14	80m6	71	170	M20	42	140	15
FLSHRM 315LA / LB	25	14	90m6	81	170	24	50	140	30
Interchangeable cast iron	**3000 range**								
FLSHRM 280SA / MA	18	11	65m6	58	140	20	42	126	14
FLSHRM 315STA / MT	18	11	65m6	58	140	20	42	126	14
FLSHRM 315LTA / LTB	20	12	70m6	62.5	140	20	42	125	15
FLSHRM 355LTA / LTB / LTC	22	14	80m6	71	170	M20	42	140	15

Type	Main shaft extensions								
	F	GD	D	G	E	O	p	L	LO
Compact alu and steel	**1500, 1800, 2600, 3000, 3600, 4500 and 6000 ranges**								
LSHRM 132MU1 / MU3	12	8	42k6	37	110	16	36	100	6
LSHRM 160LR1 / LR3	12	8	42k6	37	110	16	36	100	6
LSHRM 180L1M	16	10	55m6	49	110	20	42	97	13
LSHRM 200LQ1 /LR1	16	10	55m6	49	110	20	42	97	13
LSHRM 225SG1	16	10	55m6	49	110	20	42	97	13
LSHRM 225MG1M	18	11	65m6	58	140	20	42	126	14
LSHRM 250SF1S	16	10	55m6	49	110	20	42	97	13
LSHRM 250SF1	18	11	65m6	58	140	20	42	126	14
LSHRM 250MF1	20	12	70m6	62.5	140	20	42	125	15
LSHRM 280MUS	18	11	65m6	58	140	20	42	126	14
LSHRM 280MU	22	14	80m6	71	170	M20	42	140	15
LSHRM 315MRS	18	11	65m6	58	140	20	42	126	14
LSHRM 315MP/MR	22	14	80m6	71	170	M20	42	140	15
PLSHRM 315LD	22	14	80m6	71	170	M20	42	140	15

Electrical and mechanical characteristics

FOOT MOUNTED DIMENSIONS IM 1001 (IM B3)



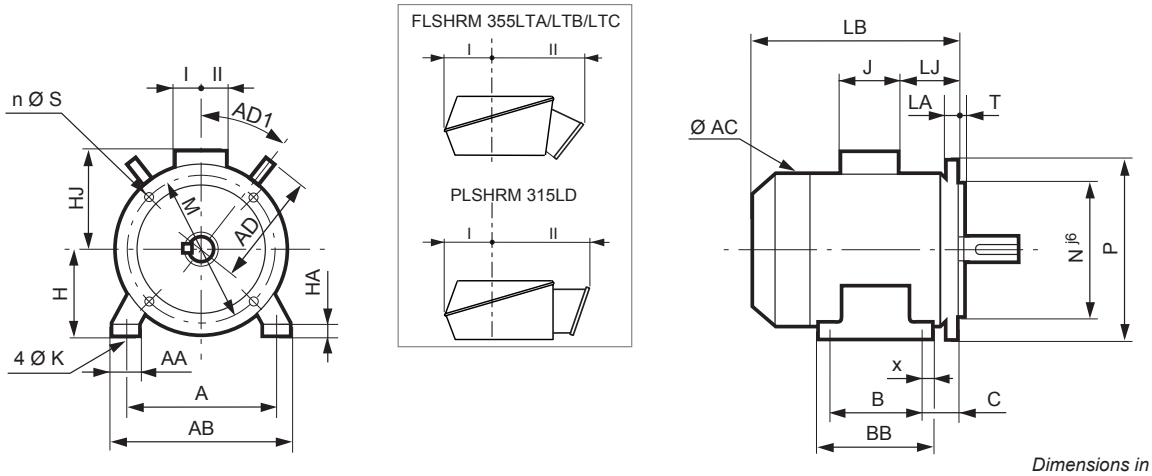
Dimensions in millimeters

Type	Main dimensions																		
	A	AB	B	BB	C	x	AA	K	HA	H	AC*	HJ	LB	LJ	J	I	II	AD	AD1
LSHRM 132MU1	216	250	178	208	129	15	50	12	15	132	272	209	452	63	194	79	79	140	45
LSHRM 132MU3	216	250	178	208	129	15	50	12	15	132	272	270	452	29.5	231	119	141	140	45
LSHRM 160MR1	254	294	210	294	108	20	64	14	25	160	272	223	495	64	194	79	79	156	45
LSHRM 160LR1	254	294	254	294	108	20	64	14	25	160	272	223	495	64	194	79	79	156	45
LSHRM 160LR3	254	294	254	294	108	20	64	14	25	160	272	270	495	30.5	231	119	141	156	45
LSHRM 180M1	279	339	241	291	121	25	86	14.5	25	180	350	290	552	41	231	119	141	225	45
LSHRM 180L1 / L1M	279	339	279	329	121	25	86	14.5	25	180	350	290	552	41	231	119	141	225	45
LSHRM 200LR1	318	378	305	365	133	30	108	18.5	30	200	350	290	620	47	231	119	141	225	45
LSHRM 200LQ1	318	378	305	365	133	30	108	18.5	30	200	350	290	558	47	231	119	141	225	45
LSHRM 225SZ1	356	431	286	386	149	50	127	18.5	36	225	350	290	651	77.5	231	119	141	225	45
LSHRM 225SG1	356	420	286	375	149	30	65	18.5	33	225	479	494	810	4	420	180	235	283	45
LSHRM 225MG	356	420	311	375	149	30	65	18.5	33	225	479	405	810	68	292	151	181	283	45
LSHRM 225MG1M	356	420	311	375	149	30	65	18.5	33	225	479	494	810	4	420	180	235	283	45
LSHRM 225MY1	356	431	311	386	149	50	127	18.5	36	225	350	290	615	77.5	231	119	141	225	45
LSHRM 250SF1 / SF1S	406	470	311	420	168	35	90	24	35	250	479	494	870	4	420	180	235	283	45
LSHRM 250ME	406	470	349	420	168	35	90	24	35	250	479	405	810	68	292	151	181	283	45
LSHRM 250MF1	406	470	349	420	168	35	90	24	35	250	479	494	870	4	420	180	235	283	45
LSHRM 280SC	457	520	368	478	190	35	90	24	35	280	479	405	810	68	292	151	181	283	45
LSHRM 280SD	457	520	368	478	190	35	90	24	35	280	479	405	870	68	292	151	181	283	45
LSHRM 280MC	457	520	419	478	190	35	90	24	35	280	479	405	810	68	292	151	181	283	45
LSHRM 280MD	457	520	419	478	190	35	90	24	35	280	479	405	870	68	292	151	181	283	45
LSHRM 280MU / MUS	457	533	419	495	190	40	85	24	35	280	586	555	991	34.5	420	180	235	340	45
LSHRM 315SN1	508	594	406	537	216	40	140	28	50	315	479	494	870	4	420	180	235	283	45
LSHRM 315MN1	508	594	457	537	216	40	140	28	50	315	479	494	870	4	420	180	235	283	45
LSHRM 315MP	508	594	457	537	216	40	114	28	70	315	586	555	947	60.5	420	180	235	340	45
LSHRM 315MR / MRS	508	594	457	537	216	40	114	28	70	315	586	555	1017	60.5	420	180	235	340	45
FLSHRM 280SA / SB	457	527	368	486	190	33	80	24	30	280	481	447	959	69	352	175	211	303	45
FLSHRM 280MA / MD	457	527	419	486	190	33	80	24	30	280	481	447	959	69	352	175	211	303	45
FLSHRM 315STA / STB	508	600	406	610	216	58	100	28	35	315	481	489	959	139	416	217	264	303	45
FLSHRM 315M	508	600	457	610	216	58	100	28	35	315	600	542	1177	119	416	217	264	343	45
FLSHRM 315MT	508	600	457	610	216	58	100	28	35	315	481	489	959	139	416	217	264	303	45
FLSHRM 315LA / LB	508	600	508	610	216	58	100	28	35	315	600	542	1177	119	416	217	264	343	45
FLSHRM 315LTA / LTB	508	600	508	610	216	58	100	28	35	315	481	489	959	139	416	217	264	303	45
FLSHRM 355LTA / LTB / LTC	610	710	630	756	254	76	100	28	35	355	600	542	1177	119	416	217	349	343	45
PLSHRM 315LD	508	608	508	588	216	40	100	28	26	315	680	550	1084	241	420	180	391	340	45

(*) *AC dimension: housing diameter without lifting rings*

Electrical and mechanical characteristics

FOOT AND FLANGE MOUNTED DIMENSIONS IM 2001 (IM B35)



Dimensions in millimeters

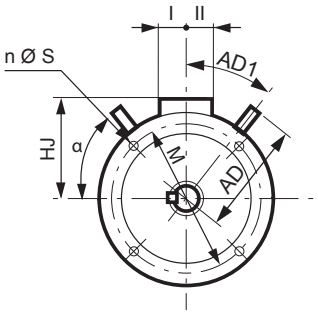
Type	Main dimensions																			
	A	AB	B	BB	C	x	AA	K	HA	H	AC*	HJ	LB	LJ	J	I	II	AD	AD1	Symb
LSHRM 132MU1	216	250	178	208	129	15	50	12	15	132	272	209	452	63	194	79	79	140	45	FF265
LSHRM 132MU3	216	250	178	208	129	15	50	12	15	132	272	270	452	29.5	231	119	141	140	45	FF265
LSHRM 160MR1	254	294	210	294	108	20	64	14	25	160	272	223	495	64	194	79	79	156	45	FF300
LSHRM 160LR1	254	294	254	294	108	20	64	14	25	160	272	223	495	64	194	79	79	156	45	FF300
LSHRM 160LR3	254	294	254	294	108	20	64	14	25	160	272	270	495	30.5	231	119	141	156	45	FF300
LSHRM 180M1	279	339	241	291	121	25	86	14.5	25	180	350	290	552	41	231	119	141	225	45	FF300
LSHRM 180L1 / L1M	279	339	279	329	121	25	86	14.5	25	180	350	290	552	41	231	119	141	225	45	FF300
LSHRM 200LR1	318	378	305	365	133	30	108	18.5	30	200	350	290	620	47	231	119	141	225	45	FF350
LSHRM 200LQ1	318	378	305	365	133	30	108	18.5	30	200	350	290	558	47	231	119	141	225	45	FF350
LSHRM 225SZ1	356	431	286	386	149	50	127	18.5	36	225	350	290	650.5	77.5	231	119	141	225	45	FF400
LSHRM 225SG1	356	420	286	375	149	30	65	18.5	33	225	479	494	810	4	420	180	235	283	45	FF400
LSHRM 225MG	356	420	311	375	149	30	65	18.5	33	225	479	405	810	68	292	151	181	283	45	FF400
LSHRM 225MG1M	356	420	311	375	149	30	65	18.5	33	225	479	494	810	4	420	180	235	283	45	FF400
LSHRM 225MY1	356	431	311	386	176	50	127	18.5	36	225	350	290	615	104	231	119	141	225	45	FF400
LSHRM 250SF1 / SF1S	406	470	311	420	168	35	90	24	35	250	479	494	870	4	420	180	235	283	45	FF500
LSHRM 250ME	406	470	349	420	168	35	90	24	35	250	479	405	810	68	292	151	181	283	45	FF500
LSHRM 250MF1	406	470	349	420	168	35	90	24	35	250	479	494	870	4	420	180	235	283	45	FF500
LSHRM 280SC	457	520	368	478	190	35	90	24	35	280	479	405	810	68	292	151	181	283	45	FF500
LSHRM 280SD	457	520	368	478	190	35	90	24	35	280	479	405	870	68	292	151	181	283	45	FF500
LSHRM 280MC	457	520	419	478	190	35	90	24	35	280	479	405	810	68	292	151	181	283	45	FF500
LSHRM 280MD	457	520	419	478	190	35	90	24	35	280	479	405	870	68	292	151	181	283	45	FF500
LSHRM 280MU / MUS	457	533	419	495	190	40	85	24	35	280	586	555	991	34.5	420	180	235	340	45	FF500
LSHRM 315SN1	508	594	406	537	216	40	140	28	50	315	479	494	870	4	420	180	235	283	45	FF600
LSHRM 315MN1	508	594	457	537	216	40	140	28	50	315	479	494	870	4	420	180	235	283	45	FF600
LSHRM 315MP	508	594	457	537	216	40	114	28	70	315	586	555	947	60.5	420	180	235	340	45	FF600
LSHRM 315MR / MRS	508	594	457	537	216	40	114	28	70	315	586	555	1017	60.5	420	180	235	340	45	FF600
FLSHRM 280SA / SB	457	527	368	486	190	33	80	24	30	280	481	447	959	69	352	175	211	303	45	FF500
FLSHRM 280MA / MD	457	527	419	486	190	33	80	24	30	280	481	447	959	69	352	175	211	303	45	FF500
FLSHRM 315STA / STB	508	600	406	610	216	58	100	28	35	315	481	489	959	139	416	217	264	303	45	FF600
FLSHRM 315M	508	600	457	610	216	58	100	28	35	315	600	542	1177	119	416	217	264	343	45	FF500
FLSHRM 315MT	508	600	457	610	216	58	100	28	35	315	481	489	959	139	416	217	264	303	45	FF600
FLSHRM 315LA / LB	508	600	508	610	216	58	100	28	35	315	600	542	1177	119	416	217	264	343	45	FF600
FLSHRM 315LTA / LTB	508	600	508	610	216	58	100	28	35	315	481	489	959	139	416	217	264	303	45	FF600
FLSHRM 355LTA / LTB / LTC	610	710	630	756	254	76	100	28	35	355	600	542	1177	119	416	217	349	343	45	FF740
PLSHRM 315LD**	508	608	508	588	216	40	100	28	26	315	680	550	1305	241	420	180	391	340	45	FF740

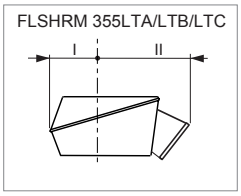
(*) AC dimension: housing diameter without lifting rings

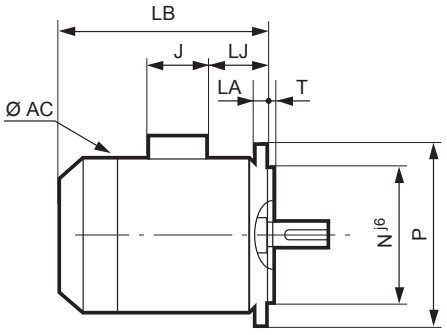
(**) with radial forced ventilation as standard. For dimensions, refer to section *Specific dimensions of PLSHRM 315LD in position IM 2001 (IM B35) page 54*

Electrical and mechanical characteristics

FLANGE MOUNTED DIMENSIONS IM 3001* - IM 3011 (IM B5* - IM V1)







Dimensions in millimeters

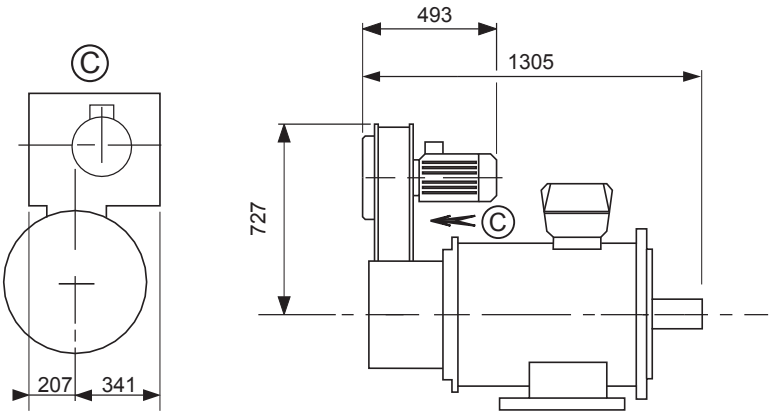
Type	Main dimensions									IEC Symbol	Flange dimensions							
	AC*	LB	HJ	LJ	J	I	II	AD	AD1		M	N	P	T	n	α°	S	LA
LSHRM 132MU1	272	452	209	63	194	79	79	140	45	**FF265**	265	230	300	4	4	45	14.5	14
LSHRM 132MU3	272	452	270	29.5	231	119	141	140	45	**FF265**	265	230	300	4	4	45	14.5	14
LSHRM 160MR1	272	495	223	64	194	79	79	156	45	**FF300**	300	250	350	5	4	45	18.5	15.5
LSHRM 160LR1	272	495	223	64	194	79	79	156	45	**FF300**	300	250	350	5	4	45	18.5	15.5
LSHRM 160LR3	272	495	270	30.5	231	119	141	156	45	**FF300**	300	250	350	5	4	45	18.5	15.5
LSHRM 180M1	350	552	290	41	231	119	141	225	45	**FF300**	300	250	350	5	4	45	18.5	15
LSHRM 180L1 / L1M	350	552	290	41	231	119	141	225	45	**FF300**	300	250	350	5	4	45	18.5	15
LSHRM 200LR1	350	620	290	47	231	119	141	225	45	**FF350**	350	300	400	5	4	45	18.5	15
LSHRM 200LQ1	350	558	290	47	231	119	141	225	45	**FF350**	350	300	400	5	4	45	18.5	15
LSHRM 225SZ1	350	650.5	290	77.5	231	119	141	225	45	**FF400**	400	350	450	5	8	22.5	18.5	22
LSHRM 225SG1	479	810	494	4	420	180	235	283	45	**FF400**	400	350	450	5	8	22.5	18.5	16
LSHRM 225MG	479	810	405	68	292	151	181	283	45	**FF400**	400	350	450	5	8	22.5	18.5	16
LSHRM 225MG1M	479	810	494	4	420	180	235	283	45	**FF400**	400	350	450	5	8	22.5	18.5	16
LSHRM 225MY1	350	615	290	104	231	119	141	225	45	**FF400**	400	350	450	5	8	22.5	18.5	22
LSHRM 250SF1 / SF1S	479	870	494	4	420	180	235	283	45	**FF500**	500	450	550	5	8	22.5	18.5	22
LSHRM 250ME	479	810	405	68	292	151	181	283	45	**FF500**	500	450	550	5	8	22.5	18.5	22
LSHRM 250MF1	479	870	494	4	420	180	235	283	45	**FF500**	500	450	550	5	8	22.5	18.5	22
LSHRM 280SC	479	810	405	68	292	151	181	283	45	**FF500**	500	450	550	5	8	22.5	18.5	22
LSHRM 280SD	479	870	405	68	292	151	181	283	45	**FF500**	500	450	550	5	8	22.5	18.5	22
LSHRM 280MC	479	810	405	68	292	151	181	283	45	**FF500**	500	450	550	5	8	22.5	18.5	22
LSHRM 280MD	479	870	405	68	292	151	181	283	45	**FF500**	500	450	550	5	8	22.5	18.5	22
LSHRM 280MU / MUS	586	991	555	34.5	420	180	235	340	45	**FF500**	500	450	550	5	8	22.5	18.5	18
LSHRM 315SN1	479	870	494	4	420	180	235	283	45	**FF600**	600	550	660	6	8	22.5	24	22
LSHRM 315MN1	479	870	494	4	420	180	235	283	45	**FF600**	600	550	660	6	8	22.5	24	22
LSHRM 315MP	586	947	555	60.5	420	180	235	340	45	**FF600**	600	550	660	6	8	22.5	24	22
LSHRM 315MR / MRS	586	1017	555	60.5	420	180	235	340	45	**FF600**	600	550	660	6	8	22.5	24	22
FLSHRM 280SA / SB	481	959	447	69	352	175	211	303	45	**FF500**	500	450	550	5	8	22.5	18.5	18
FLSHRM 280MA / MD	481	959	447	69	352	175	211	303	45	**FF500**	500	450	550	5	8	22.5	18.5	18
FLSHRM 315STA / STB	481	959	510	37	416	217	264	303	45	**FF600**	600	550	660	6	8	22.5	24	22
FLSHRM 315M	600	1177	542	119	416	217	264	343	45	**FF600**	600	550	660	6	8	22.5	24	22
FLSHRM 315MT	481	959	510	37	416	217	264	303	45	**FF600**	600	550	660	6	8	22.5	24	22
FLSHRM 315LA / LB	600	1177	542	119	416	217	264	343	45	**FF600**	600	550	660	6	8	22.5	24	22
FLSHRM 315LTA / LTB	481	959	510	37	416	217	264	303	45	**FF600**	600	550	660	6	8	22.5	24	22
FLSHRM 355LTA / LTB / LTC	600	1177	542	119	416	217	349	343	45	**FF740**	740	680	800	6	8	22.5	24	25

(*) For frame sizes ≥ 250mm in IM 3001 (IM B5) position, please consult.

Electrical and mechanical characteristics

SPECIFIC DIMENSIONS OF PLSHRM 315LD IN POSITION IM 2001 (IM B35)

PLSHRM 315LD with radial forced ventilation (with or without position sensor)



LIFTING RING POSITION

LIFTING THE MOTOR ONLY
(not coupled to the machine)

The regulations stipulate that over 25 kg, suitable handling equipment must be used.

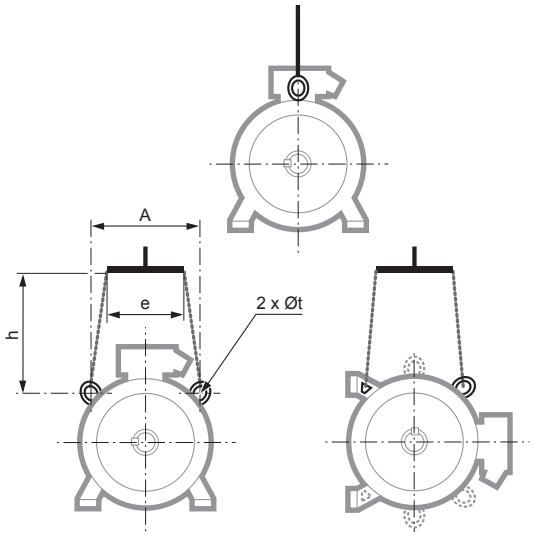
All our motors are fitted with grab handles, making them easier to handle without risk. A diagram of the sling hoisting method appears below with the required dimensions.

To prevent any damage to the motor during handling (for example: switching the motor from horizontal to vertical), it is essential to follow these instructions.

HORIZONTAL POSITION

Dimensions in millimeters

Type	Horizontal position (mm)			
	A	e mini	h mini	Øt
LSHRM 132 M1 / MU1 / MU3 / SM1	200	180	150	14
LSHRM 160 LR1 / LR3 / MR1	200	180	150	14
LSHRM 180 L1 / L1M / M1	200	260	150	14
LSHRM 200 LR1 / LQ1	200	260	150	14
LSHRM 225 MY1 / SZ1	200	260	150	14
LSHRM 225 MG / MG1M / SG1	360	380	200	30
LSHRM 250 ME / MF1 / SF1 / SF1S	360	380	200	30
LSHRM 280 MC / MD / SC / SD	360	380	200	30
LSHRM 280 MU / MUS	400	400	500	30
LSHRM 315 MN1 / SN1	360	380	200	30
LSHRM 315 MP / MR / MRS	400	400	500	30
FLSHRM 280 MA / MD / SA / SB	360	380	200	30
FLSHRM 315 LTA/ LTB / MT / STA / STB	360	380	200	30
FLSHRM 315 LA / LB / M	400	400	500	30
FLSHRM 355 LTA / LTB / LTC	400	400	500	30
PLSHRM 315 LD	400	400	500	30



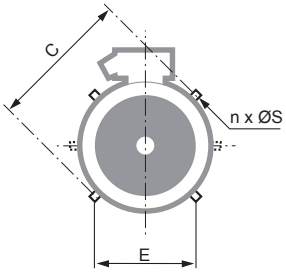
Electrical and mechanical characteristics

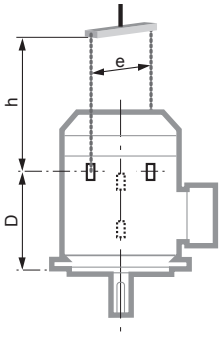
LIFTING RING POSITION

VERTICAL POSITION

Dimensions in millimeters

Type	Vertical position (mm)						
	C	E	D	n**	ØS	e mini *	h mini
LSHRM 132 M1 / MU1 / MU3 / SM1							
LSHRM 160 LR1 / LR3 / MR1							
LSHRM 180 L1 / L1M / M1	390	265	290	2	14	390	320
LSHRM 200 LR1 /LQ1	410	300	295	2	14	410	450
LSHRM 225 MY1 / SZ1	410	300	295	2	14	410	450
LSHRM 225 MG / MG1M / SG1	480	360	405	4	30	500	500
LSHRM 250 ME /MF1 / SF1 / SF1S	480	360	405	4	30	500	550
LSHRM 280 MC / MD / SC / SD	480	360	405	4	30	500	500
LSHRM 280 MU / MUS	630	-	570	2	30	630	550
LSHRM 315 MN1 / SN1	480	360	405	4	30	500	500
LSHRM 315 MP / MR / MRS	630	-	570	2	30	630	550
FLSHRM 280 MA / MD / SA / SB	480	360	405	4	30	500	500
FLSHRM 315 LTA/ LTB / MT / STA / STB	480	360	405	4	30	500	500
FLSHRM 315 LA / LB / M	630	-	570	2	30	630	550
FLSHRM 355 LTA / LTB / LTC	630	-	570	2	30	630	550
PLSHRM 315 LD	630	-	570	2	30	630	550





** if the motor is fitted with a drip cover, allow an additional 50 to 100 mm to avoid damaging it when the load is swung*
*** If n = 2, the lifting rings form a 90° angle with respect to the terminal box axis. If n = 4, this angle becomes 45°.*

Electrical and mechanical characteristics

RECOMMENDED BEARING PROTECTIONS

The bearing types of Dyneo+ motors follow the recommendations described in the guide to best practices of motor-drive systems ref. 5626. The tables below show in detail the standard protections for the range as well as the optional protections required depending on the mains voltage or the application.

: Integrated protection as standard

: Optional protections

Application B1 : All applications that do not meet the criteria listed in «Application B2». For example, the centrifugal pumps, the fans, the compressors, etc.

Application B2 : All applications that meet one or more of the following criteria:
- the drive has an active rectifier («Low harmonic», «Regen»),
- the drive has a braking transistor whose cumulative braking time is greater than 5% of the total operating time,
- the low rotational speed stop is less than 500 min^{-1} (example: extruders).

For example, materials handling, cranes, extrusion, power generation, etc.

INTERCHANGEABLE VERSION - ALUMINIUM HOUSING (LSHRM)

1500 range

Type	Rated Power kW	Mains voltage ≤ 510V, Application B1	Mains voltage > 510V or Application B2
LSHRM 160MR1	11	Standard bearings	Standard bearings
LSHRM 160LR1	15	Standard bearings	Standard bearings
LSHRM 180M1	18.5	Standard bearings	Standard bearings
LSHRM 180L1	22	Standard bearings	Standard bearings
LSHRM 200LQ1	30	Standard bearings	Standard bearings
LSHRM 225SZ1	37	Standard bearings	Standard bearings
LSHRM 225MG	45	Standard bearings	Insulated NDE bearing + grounding ring
LSHRM 250ME	55	Standard bearings	Insulated NDE bearing + grounding ring
LSHRM 280SD	75	Standard bearings	Insulated NDE bearing + grounding ring
LSHRM 280MD	90	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
LSHRM 315SN1	110	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
LSHRM 315MP	132	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
LSHRM 315MP	160	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
LSHRM 315MR	200	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring

3000 range

Type	Rated Power kW	Mains voltage ≤ 510V, Application B1	Mains voltage > 510V or Application B2
LSHRM 160MR1	11	Standard bearings	Standard bearings
LSHRM 160MR1	15	Standard bearings	Standard bearings
LSHRM 160LR1	18.5	Standard bearings	Standard bearings
LSHRM 180M1	22	Standard bearings	Standard bearings
LSHRM 200LQ1	30	Standard bearings	Standard bearings
LSHRM 200LQ1	37	Standard bearings	Standard bearings
LSHRM 225MY1	45	Standard bearings	Standard bearings
LSHRM 250ME	55	Standard bearings	Insulated NDE bearing + grounding ring
LSHRM 280SC	75	Standard bearings	Insulated NDE bearing + grounding ring
LSHRM 280MC	90	Standard bearings	Insulated NDE bearing + grounding ring
LSHRM 315SN1	110	Standard bearings	Insulated NDE bearing + grounding ring
LSHRM 315MN1	132	Standard bearings	Insulated NDE bearing + grounding ring
LSHRM 315MN1	160	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
LSHRM 315MN1	200	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring

Electrical and mechanical characteristics

RECOMMENDED BEARING PROTECTIONS

INTERCHANGEABLE VERSION - CAST IRON HOUSING (FLSHRM)

1500 range

Type	Rated Power kW	Mains voltage ≤ 510V, Application B1	Mains voltage > 510V or Application B2
FLSHRM 280SB	75	Standard bearings	Insulated NDE bearing + grounding ring
FLSHRM 280MD	90	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
FLSHRM 315STB	110	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
FLSHRM 315M	132	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
FLSHRM 315LA	160	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
FLSHRM 315LB	200	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring

3000 range

Type	Rated Power kW	Mains voltage ≤ 510V, Application B1	Mains voltage > 510V or Application B2
FLSHRM 280SA	75	Standard bearings	Insulated NDE bearing + grounding ring
FLSHRM 280MA	90	Standard bearings	Insulated NDE bearing + grounding ring
FLSHRM 315STA	110	Standard bearings	Insulated NDE bearing + grounding ring
FLSHRM 315MT	132	Standard bearings	Insulated NDE bearing + grounding ring
FLSHRM 315LTA	160	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
FLSHRM 315LTB	200	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
FLSHRM 355LTA	250	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
FLSHRM 355LTB	315	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
FLSHRM 355LTC	355	Insulated NDE bearing + grounding ring	Insulated DE & NDE bearing + grounding ring

COMPACT VERSION - ALUMINIUM OR STEEL HOUSING (LSHRM OR PLSHRM)

Gammes 1500, 1800, 2600, 3000, 3600, 4500 et 6000

Type	Mains voltage ≤ 510V, Application B1	Mains voltage > 510V or Application B2
LSHRM 132MU1 / MU3	Standard bearings	Standard bearings
LSHRM 160LR1 / LR3	Standard bearings	Standard bearings
LSHRM 180L1M	Standard bearings	Standard bearings
LSHRM 200LQ1/LR1	Standard bearings	Standard bearings
LSHRM 225SG1 / MG1M	Standard bearings	Standard bearings
LSHRM 250SF1 / SF1S / MF1	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
LSHRM 280MU / MUS	Insulated NDE bearing + grounding ring	Insulated NDE bearing + grounding ring
LSHRM 315MP / MR / MRS	Insulated NDE bearing + grounding ring	Insulated DE & NDE bearing + grounding ring
PLSHRM 315LD	Insulated DE & NDE bearing + grounding ring	Insulated DE & NDE bearing + grounding ring

Electrical and mechanical characteristics

BEARINGS AND GREASING

GREASING TYPE USED

The type of greasing depends on the frame size and the speed of rotation of the Dyneo+ motor as described in the table below. When the bearings are not greased for life, the type of grease and the greasing interval are indicated on the nameplate. Avoid any mixing, and respect the quantities.

For ranges 4500 and 6000, when the motor is commissioned or each time the bearings are replaced, the bearings must be run in to obtain optimum service life. Refer to the installation, commissioning and maintenance manual ref.5411.

Speed (rpm)	Motor frame size	Grease type	Standard grease
≤ 3600	≤ 225	Permanently greased bearings	ENS, WT or BQ 72-72
	> 225	Bearings with grease nipples	POLYREX EM 103 or BQ 72-72
> 3600	≤ 160	Permanently greased bearings	ENS, WT or BQ 72-72
	> 160	Bearings with grease nipples	BQ 72-72

PERMANENTLY GREASED BEARINGS

Under normal operating conditions, the service life (L10h) in hours of the bearing is indicated in the tables below for a machine horizontally installed and for ambient temperatures less than 25°C and than 45°C.

Type	Permanently greased bearings		Bearing life 1500 rpm	
	N.D.E.	D.E.	25°C	45°C
Interchangeable alu 1500 range				
LSHRM 160 MR1	6308 ZZ C3	6309 ZZ C3	> 40000	
LSHRM 160 LR1	6308 ZZ C3	6309 ZZ C3		
LSHRM 180 M1	6212 ZZ C3	6310 ZZ C3		
LSHRM 180 L1	6212 ZZ C3	6310 ZZ C3		
LSHRM 200 LQ1	6212 ZZ C3	6312 ZZ C3		
LSHRM 225 SZ1	6312 ZZ C3	6313 ZZ C3		
LSHRM 225 MG	6216 ZZ C3	6314 ZZ C3		

Type	Permanently greased bearings		Bearing life 3000 rpm	
	N.D.E.	D.E.	25°C	45°C
Interchangeable alu 3000 range				
LSHRM 160 MR1	6308 ZZ C3	6309 ZZ C3	> 40000	> 25000
LSHRM 160 LR1	6308 ZZ C3	6309 ZZ C3		
LSHRM 180 M1	6212 ZZ C3	6310 ZZ C3		
LSHRM 200 LQ1	6212 ZZ C3	6312 ZZ C3		21737
LSHRM 225 MY1	6312 ZZ C3	6313 ZZ C3		20332

Type	Permanently greased bearings		Bearing life 1500 rpm	
	N.D.E.	D.E.	25°C	45°C
Compact alu 1500 range				
LSHRM 132 MU1	6307 ZZ C3	6309 ZZ C3	> 40000	
LSHRM 160 LR1	6308 ZZ C3	6309 ZZ C3		
LSHRM 180 L1M	6212 ZZ C3	6212 ZZ C3		
LSHRM 200 LR1	6312 ZZ C3	6312 ZZ C3		
LSHRM 225 MG1M	6216 ZZ C3	6314 ZZ C3		

Type	Permanently greased bearings		Bearing life 1800 rpm	
	N.D.E.	D.E.	25°C	45°C
Compact alu 1800 range				
LSHRM 132 MU1	6307 ZZ C3	6309 ZZ C3	> 40000	
LSHRM 160 LR3	6308 ZZ C3	6309 ZZ C3		
LSHRM 180 L1M	6212 ZZ C3	6212 ZZ C3		
LSHRM 200 LR1	6312 ZZ C3	6312 ZZ C3		
LSHRM 225 MG1M	6216 ZZ C3	6314 ZZ C3		

Type	Permanently greased bearings		Bearing life 2600 rpm	
	N.D.E.	D.E.	25°C	45°C
Compact alu 2600 range				
LSHRM 132 MU3	6307 ZZ C3	6309 ZZ C3	> 40000	> 25000
LSHRM 160 LR3	6308 ZZ C3	6309 ZZ C3		
LSHRM 180 L1M	6212 ZZ C3	6212 ZZ C3		
LSHRM 200 LR1	6312 ZZ C3	6312 ZZ C3		
LSHRM 225 MG1M	6216 ZZ C3	6314 ZZ C3		

Type	Permanently greased bearings		Bearing life 3000 rpm	
	N.D.E.	D.E.	25°C	45°C
Compact alu 3000 range				
LSHRM 132 MU3	6307 ZZ C3	6309 ZZ C3	> 40000	> 25000
LSHRM 160 LR3	6308 ZZ C3	6309 ZZ C3		
LSHRM 180 L1M	6212 ZZ C3	6212 ZZ C3		
LSHRM 200 LR1	6312 ZZ C3	6312 ZZ C3		
LSHRM 225 MG1M	6216 ZZ C3	6314 ZZ C3		23896

Type	Permanently greased bearings		Bearing life 3600 rpm	
	N.D.E.	D.E.	25°C	45°C
Compact alu 3600 range				
LSHRM 132 MU3	6307 ZZ C3	6309 ZZ C3	> 40000	> 25000
LSHRM 160 LR3	6308 ZZ C3	6309 ZZ C3		
LSHRM 180 L1M	6212 ZZ C3	6212 ZZ C3		
LSHRM 200 LR1	6312 ZZ C3	6312 ZZ C3		20597
LSHRM 225 MG1M	6216 ZZ C3	6314 ZZ C3	35703	16482

Type	Permanently greased bearings		Bearing life 4500 rpm	
	N.D.E.	D.E.	25°C	45°C
Compact alu 4500 range				
LSHRM 132 MU3	6307 ZZ C3	6309 ZZ C3	> 40000	23567
LSHRM 160 LR3	6308 ZZ C3	6309 ZZ C3		

Type	Permanently greased bearings		Bearing life 6000 rpm	
	N.D.E.	D.E.	25°C	45°C
Compact alu 6000 range				
LSHRM 132 MU3	6307 ZZ C3	6309 ZZ C3	> 25000	12630
LSHRM 160 LR3	6308 ZZ C3	6309 ZZ C3		

Electrical and mechanical characteristics

BEARINGS AND GREASING

BEARINGS WITH GREASE NIPPLES

For standard bearing assemblies fitted with grease nipples, the tables below indicate the service life (L10h) in hours for a machine horizontally installed and for ambient temperatures less than 25°C and than 45°C.

Type	Bearings for greaser bearing bush		Quantity of grease	Greasing intervals 1500 rpm	
	N.D.E.	D.E.	g (1)	25°C	45°C
Interchangeable alu 1500 range					
LSHRM 250 ME	6216 C3	6314 C3	18	23700	9400
LSHRM 280 SD	6218 C3	6316 C3	24	20900	8300
LSHRM 280 MD	6218 C3	6316 C3	24	20900	8300
LSHRM 315 SN1	6218 C3	6320 C3	24	15900	6300
LSHRM 315 MP	6317 C3	6320 C3	37	15900	6300
LSHRM 315 MR	6317 C3	6320 C3	37	15900	6300

Type	Bearings for greaser bearing bush		Quantity of grease	Greasing intervals 3000 rpm	
	N.D.E.	D.E.	g (1)	25°C	45°C
Interchangeable alu 3000 range					
LSHRM 250 ME	6216 C3	6314 C3	18	29900	5900
LSHRM 280 SC	6216 C3	6314 C3	18	29900	5900
LSHRM 280 MC	6216 C3	6314 C3	18	29900	5900
LSHRM 315 SN1	6216 C3	6316 C3	18	26400	4600
LSHRM 315 MN1	6216 C3	6316 C3	18	26400	4600

Type	Bearings for greaser bearing bush		Quantity of grease	Greasing intervals 1500 rpm	
	N.D.E.	D.E.	g (1)	25°C	45°C
Interchangeable cast iron 1500 range					
FLSHRM 280 SB	6314 C3	6316 C3	29	21000	21000
FLSHRM 280 MD	6314 C3	6316 C3	29	21000	
FLSHRM 315 STB	6316 C3	6320 C3	44	16000	
FLSHRM 315 M	6316 C3	6320 C3	44	16000	
FLSHRM 315 LA	6316 C3	6320 C3	44	16000	
FLSHRM 315 LB	6316 C3	6320 C3	44	16000	

Type	Bearings for greaser bearing bush		Quantity of grease	Greasing intervals 3000 rpm	
	N.D.E.	D.E.	g (1)	25°C	45°C
Interchangeable cast iron 3000 range					
FLSHRM 280 SA	6314 C3	6316 C3	29	9600	7000
FLSHRM 280 MA	6314 C3	6316 C3	29	9600	7000
FLSHRM 315 STA	6316 C3	6316 C3	29	7000	7000
FLSHRM 315 MT	6316 C3	6316 C3	29	7000	7000
FLSHRM 315 LTA	6316 C3	6316 C3	29	7000	7000
FLSHRM 315 LTB	6316 C3	6316 C3	29	7000	7000
FLSHRM 355 LTA	6316 C3	6218 C3	29	7000	7000
FLSHRM 355 LTB	6316 C3	6218 C3	29	7000	7000
FLSHRM 355 LTC	6316 C3	6218 C3	29	7000	7000

Type	Bearings for greaser bearing bush		Quantity of grease	Greasing intervals 1500 rpm	
	N.D.E.	D.E.	g (1)	25°C	45°C
Compact alu 1500 range					
LSHRM 250 MF1	6216 C3	6316 C3	18	20900	8300
LSHRM 280 MU	6317 C3	6317 C3	37	19600	7800
LSHRM 315 MR	6317 C3	6320 C3	37	15900	6300

Type	Bearings for greaser bearing bush		Quantity of grease	Greasing intervals 1800 rpm	
	N.D.E.	D.E.	g (1)	25°C	45°C
Compact alu 1800 range					
LSHRM 250 MF1	6216 C3	6316 C3	18	26400	6100
LSHRM 280 MU	6317 C3	6317 C3	37	24700	5500
LSHRM 315 MR	6317 C3	6320 C3	37	24700	3800

Type	Bearings for greaser bearing bush		Quantity of grease	Greasing intervals 2600 rpm	
	N.D.E.	D.E.	g (1)	25°C	45°C
Compact alu and steel 2600 range					
LSHRM 250 MF1	6216 C3	6316 C3	18	26400	6100
LSHRM 280 MU	6317 C3	6317 C3	37	24700	5500
LSHRM 315 MR	6317 C3	6320 C3	37	20000	3800
PLSHRM 315 LD	6316 C3	6219 C3	33	24700	5500

Type	Bearings for greaser bearing bush		Quantity of grease	Greasing intervals 3000 rpm	
	N.D.E.	D.E.	g (1)	25°C	45°C
Compact alu and steel 3000 range					
LSHRM 250 MF1	6216 C3	6316 C3	18	26400	4600
LSHRM 280 MU	6317 C3	6317 C3	37	24700	4000
LSHRM 315 MP/MR	6317 C3	6317 C3	37	24700	4000
PLSHRM 315 LD	6316 C3	6219 C3	33	24700	4000

Type	Bearings for greaser bearing bush		Quantity of grease	Greasing intervals 3600 rpm	
	N.D.E.	D.E.	g (1)	25°C	45°C
Compact alu and steel 3600 range					
LSHRM 250 MF1	6216 C3	6316 C3	18	26400	3000
LSHRM 280 MU	6317 C3	6317 C3	37	24700	2600
PLSHRM 315 LD	6316 C3	6219 C3	33	24700	2600

Type	Bearings for greaser bearing bush		Quantity of grease	Greasing intervals 4500 rpm	
	N.D.E.	D.E.	g (2)	25°C	45°C
Compact alu and steel 4500 range					
LSHRM 180 L1M	6212 C3	6212 C3	12	30000	7000
LSHRM 200 LQ1	6212 C3	6312 C3	12		5400
LSHRM 225 MG1M	6216 C3	6314 C3	18		3700
LSHRM 250 SF1	6216 C3	6314 C3	18		3700
LSHRM 280 MUS	6314 C3	6314 C3	26		3700
LSHRM 315 MRS	6314 C3	6314 C3	26		3700
PLSHRM 315 LD	6314 C3	6216 C3	26		3700

Type	Bearings for greaser bearing bush		Quantity of grease	Greasing intervals 6000 rpm	
	N.D.E.	D.E.	g (2)	25°C	45°C
Compact alu 6000 range					
LSHRM 180 L1M	6212 C3	6212 C3	12	30000	3400
LSHRM 200 LR1	6212 C3	6212 C3	12		3400
LSHRM 225 SG1	6212 C3	6212 C3	12		3400
LSHRM 250 SF1S	6212 C3	6212 C3	12		3400

(1) Required quantity with Polyrex EM103
(2) Required quantity with Kluberquiet BQ 72-72

Electrical and mechanical characteristics

DESCRIPTION OF TERMINAL BOXES

DRILLING FOR CABLE GLANDS

Motors are supplied as standard with terminal boxes pre-drilled and threaded without cable glands or removable undrilled mounting plate. The tables below indicate the number of holes and their diameter for standard range. They are defined for a 400V voltage.

A cable gland option, anchored for an armoured cable, is available for pre-drilled terminal boxes (plastic cable glands must not be used to guarantee the protection of the installation in accordance with EMC directive 2014/30/EC).

As standard, an inclined extension feed is fitted to the motor terminal boxes of FLSHRM 355LTA/LTB/LTC and PLSHRM 315LD with a removable undrilled mounting plate (a straight extension feed is available as an option for the PLSHRM 315LD).

Type	Number of holes / drilling diameter
Interchangeable alu 1500 range	
LSHRM 160MR1 / LR1	1xM25 + 1xM16
LSHRM 180M1 / L1	1xM32 + 1xM16
LSHRM 200LQ1	1xM40 + 1xM16
LSHRM 225SZ1	1xM40 + 1xM16
LSHRM 225MG	1xM50 + 1xM16
LSHRM 250ME	1xM50 + 1xM16
LSHRM 280SD / MD	2xM50 + 1xM16
LSHRM 315 SN1 / MP / MR	Undrilled plate
Interchangeable alu 3000 range	
LSHRM 160MR1	1xM25 + 1xM16
LSHRM 160LR1	1xM32 + 1xM16
LSHRM 180M1	1xM32 + 1xM16
LSHRM 200LQ1	1xM40 + 1xM16
LSHRM 225MY1	1xM50 + 1xM16
LSHRM 250ME	1xM50 + 1xM16
LSHRM 280SC / MC	2xM50 + 1xM16
LSHRM 315SN1 / MN1	Undrilled plate
Interchangeable cast iron 1500 range	
FLSHRM 280SB / MD	Undrilled plate
FLSHRM 315STB / M	
FLSHRM 315LA / LB	
Interchangeable cast iron 3000 range	
FLSHRM 280SA / MA	Undrilled plate
FLSHRM 315STA / MT	
FLSHRM 315LTA / LTB	
FLSHRM 355LTA / LTB / LTC	

Type	Number of holes / drilling diameter
Compact alu 1500 range	
LSHRM 132MU1	1xM25 + 1xM16
LSHRM 160LR1	1xM32 + 1xM16
LSHRM 180L1M	1xM40 + 1xM16
LSHRM 200LR1	1xM50 + 1xM16
LSHRM 225MG1M	Undrilled plate
LSHRM 250MF1	
LSHRM 280MU	
LSHRM 315MR	
Compact alu 1800 range	
LSHRM 132MU1	1xM32 + 1xM16
LSHRM 160LR3	1xM32 + 1xM16
LSHRM 180L1M	1xM50 + 1xM16
LSHRM 200LR1	1xM50 + 1xM16
LSHRM 225MG1M	Undrilled plate
LSHRM 250MF1	
LSHRM 280MU	
LSHRM 315MR	
Compact alu and steel 2600 range	
LSHRM 132MU3	1xM40 + 1xM16
LSHRM 160LR3	1xM40+ 1xM16
LSHRM 180L1M	2xM50 + 1xM16
LSHRM 200LR1	2xM50 + 1xM16
LSHRM 225MG1M	Undrilled plate
LSHRM 250MF1	
LSHRM 280MU	
LSHRM 315MR	
PLSHRM 315LD	

Type	Number of holes / drilling diameter
Compact alu and steel 3000 range	
LSHRM 132MU3	1xM40 + 1xM16
LSHRM 160LR3	1xM40 + 1xM16
LSHRM 180L1M	2xM50 + 1xM16
LSHRM 200LR1	2xM50 + 1xM16
LSHRM 225MG1M	Undrilled plate
LSHRM 250MF1	
LSHRM 280MU	
LSHRM 315MP / MR	
PLSHRM 315LD	
Compact alu and steel 3600 range	
LSHRM 132MU3	1xM40 + 1xM16
LSHRM 160LR3	1xM40 + 1xM16
LSHRM 180L1M	2xM50 + 1xM16
LSHRM 200LR1	2xM50 + 1xM16
LSHRM 225MG1M	Undrilled plate
LSHRM 250MF1	
LSHRM 280MU	
PLSHRM 315LD	
Compact alu and steel 4500 range	
LSHRM 132MU3	1xM50 + 1xM16
LSHRM 160LR3	1xM50+ 1xM16
LSHRM 180L1M	2xM50 + 1xM16
LSHRM 200LQ1	2xM50 + 1xM16
LSHRM 225MG1M	Undrilled plate
LSHRM 250SF1	
LSHRM 280MUS	
LSHRM 315MRS	
PLSHRM 315LD	
Compact alu 6000 range	
LSHRM 132MU3	1xM50 + 1xM16
LSHRM 160LR3	2xM50+ 1xM16
LSHRM 180L1M	2xM50 + 1xM16
LSHRM 200LR1	2xM50 + 1xM16
LSHRM 225SG1	Undrilled plate
LSHRM 250SF1S	

Electrical and mechanical characteristics

DESCRIPTION OF TERMINAL BOXES

ZONES USED FOR DRILLING THE CABLE GLAND SUPPORT PLATES

TERMINAL BOXES WITHOUT EXTENSION FEED

Dimensions in millimeters

Motor Type	Diagram	Dimensions without extension feed
LSHRM 225 Compact version	3	H = 170; L = 333
LSHRM 250 Compact version		
LSHRM 280 Compact version		
LSHRM 315		
FLSHRM 280	2	H = 80; L = 190
FLSHRM 315	1	H = 115; L = 125
FLSHRM 355		
PLSHRM 315	3	H = 170; L = 333

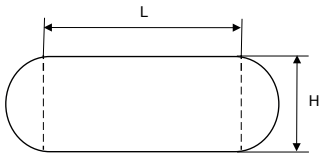


Diagram 1

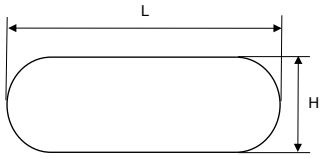


Diagram 2

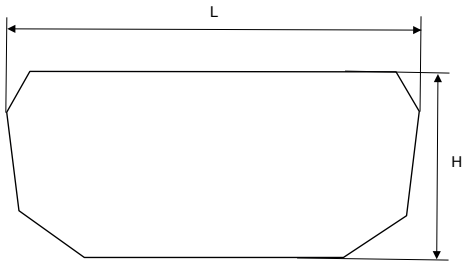
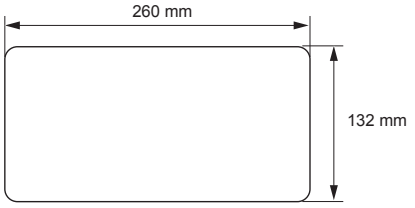
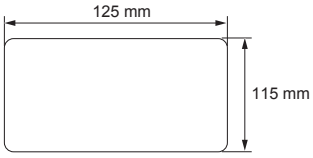


Diagram 3

TERMINAL BOXES WITH EXTENSION FEED



Area dimensions of the PLSHRM 315LD support plate with an extension feed



Area dimensions of the FLSHRM 355LTA/ LTB/LTC support plate with an extension feed

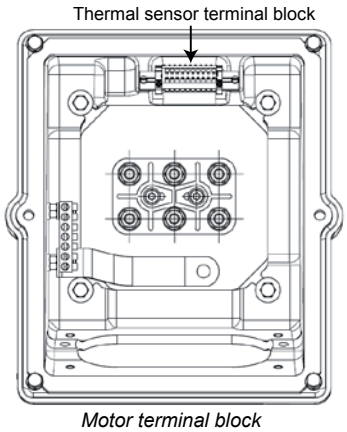
Electrical and mechanical characteristics

DESCRIPTION OF TERMINAL BOXES

TERMINAL BOARDS CONNECTION TERMINAL DIMENSIONS

Standard motors are fitted with a block of 6 terminals with the terminal markings complying with IEC 60034-8.

Motor thermal protections are connected on screw dominos with labelled wires.



Motor terminal block

Terminal boxes are also fitted with Ground braids between motor housing / terminal box housing / terminal box cover / cable gland support plate (if present).

Tightening torque for the nuts on the terminal blocks

Terminal	M6	M8	M10	M12	M16
Torque N.m	4	10	20	35	65

Type	Terminal / terminal board
Interchangeable alu 1500 range	
LSHRM 160MR1 / LR1	M6
LSHRM 180M1	M6
LSHRM 180L1	M8
LSHRM 200LQ1	M8
LSHRM 225SZ1	M8
LSHRM 225MG	M8
LSHRM 250ME	M10
LSHRM 280SD / MD	M10
LSHRM 315 SN1 / MP / MR	M12
Interchangeable alu 3000 range	
LSHRM 160MR1	M6
LSHRM 160LR1	M6
LSHRM 180M1	M6
LSHRM 200LQ1	M8
LSHRM 225MY1	M8
LSHRM 250ME	M10
LSHRM 280SC / MC	M10
LSHRM 315SN1	M12
LSHRM 315SMN1	M16
Interchangeable cast iron 1500 range	
FLSHRM 280SB / MD	M10
FLSHRM 315STB / M	M12
FLSHRM 315LA / LB	M12
Interchangeable cast iron 3000 range	
FLSHRM 280SA / MA	M10
FLSHRM 315STA / MT	M12
FLSHRM 315LTA / LTB	M12
FLSHRM 355LTA / LTB / LTC	Multi-level
Compact alu 1500 range	
LSHRM 132MU1	M6
LSHRM 160LR1	M6
LSHRM 180L1M	M8
LSHRM 200LR1	M8
LSHRM 225MG1M	M10
LSHRM 250MF1	M12
LSHRM 280MU	M16
LSHRM 315MR	M12
Compact alu 1800 range	
LSHRM 132MU1	M6
LSHRM 160LR3	M6
LSHRM 180L1M	M8
LSHRM 200LR1	M10
LSHRM 225MG1M	M12
LSHRM 250MF1	M12
LSHRM 280MU	Multi-level
LSHRM 315MR	

Type	Terminal / terminal board
Compact alu and steel 2600 range	
LSHRM 132MU3	M6
LSHRM 160LR3	M6
LSHRM 180L1M	M8
LSHRM 200LR1	M8
LSHRM 225MG1M	M10
LSHRM 250MF1	M12
LSHRM 280MU	Multi-level
LSHRM 315MR	
PLSHRM 315LD	
Compact alu and steel 3000 range	
LSHRM 132MU3	M8
LSHRM 160LR3	M8
LSHRM 180L1M	M10
LSHRM 200LR1	M10
LSHRM 225MG1M	M16
LSHRM 250MF1	M16
LSHRM 280MU	Multi-level
LSHRM 315MP /MR	
PLSHRM 315LD	
Compact alu and steel 3600 range	
LSHRM 132MU3	M8
LSHRM 160LR3	M8
LSHRM 180L1M	M10
LSHRM 200LR1	M10
LSHRM 225MG1M	M12
LSHRM 250MF1	M12
LSHRM 280MU	Multi-level
PLSHRM 315LD	
Compact alu and steel 4500 range	
LSHRM 132MU3	M8
LSHRM 160LR3	M8
LSHRM 180L1M	M10
LSHRM 200LQ1	M10
LSHRM 225MG1M	M12
LSHRM 250SF1	M12
LSHRM 280MUS	Multi-level
LSHRM 315MRS	
PLSHRM 315LD	
Compact alu 6000 range	
LSHRM 132MU3	M8
LSHRM 160LR3	M8
LSHRM 180L1M	M10
LSHRM 200LR1	M10
LSHRM 225SG1	M16
LSHRM 250SF1S	M12

MULTI-LEVEL TERMINAL BOARD

The motors with multi-level terminal boards are indicated in the tables above. The multi-level power connection bars are drilled (smooth holes) and are supplied without screws or nuts to allow the user to adapt the connection to the connector cross-section.

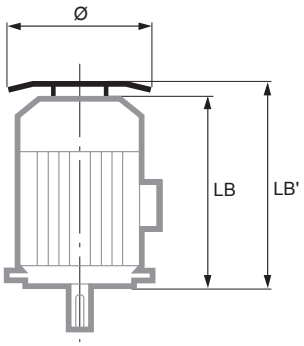
Optional equipments

DRIP COVER

OPERATION IN VERTICAL POSITION, SHAFT END FACING DOWN

Dimensions in millimetres

Motor type	LB'	Ø
LSHRM 132MU	LB + 30	240
LSHRM 160MR / LR	LB + 30	240
LSHRM 180M	LB + 36,5	265
LSHRM 180L	LB + 36,5	305
LSHRM 200	LB + 36,5	305
LSHRM 225SZ1 / MY1	LB + 36,5	350
LSHRM 225SG / MG	LB + 55	420
LSHRM 250	LB + 55	420
LSHRM 280 SC / SD / MC / MD	LB + 55	420
LSHRM 280 MU / MUS	LB + 76,5	505
LSHRM 315 SN / MN	LB + 55	420
LSHRM 315	LB + 76,5	505
FLSHRM 280	LB + 130	420
FLSHRM 315	LB + 118	620
FLSHRM 355	LB + 118	620



To get «LB» dimensions, refer to section *Flange mounted dimensions IM 3001* - IM 3011 (IM B5* - IM V1) page 53.*

POSITION SENSORS

Nidec Leroy-Somer drive ranges allow to operate in sensorless mode, i.e. without speed or position sensor in most applications. In this operating mode, the rotor position is calculated from drive electrical measurements (software sensor).

However, a speed / position sensor may be necessary:

- to reach rated toque at low speed,

- to allow continuous operation at low speed (N < Nn/10).

In Dyneo+ range, sensor types are:

- the **resolver** which allows speed regulation, positioning and position detection of the rotor.

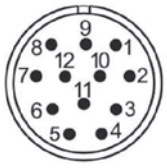
- the **absolute encoder** which allows positioning and position detection of the rotor without homing after power off.

To know the various absolute encoder types that are available, refer to Nidec Leroy-Somer configurator

http://configurateurls.Nidec Leroy-somer.com.

Standard resolver	Characteristics
Excitation	10 V, 10 kHz Sine wave signal
Polarity	2 poles
Transformation ratio	2:1
Resolution	16 bits
Connection	12 pins M23 connector

Resolver connection	
Pin N°	Connections
1	Ref H
2	Ref L
3	Cos H
4	Cos L
5	Sin H
6	Sin L
7 to 12	Not connected

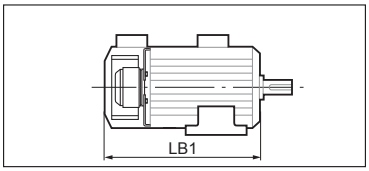


Resolver side connector : male M23 plug

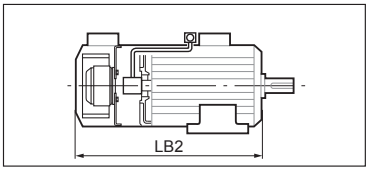
Optional equipments

FORCED VENTILATION

To maintain the nominal torque over all speed range, forced ventilation may be necessary. Refer to the torque values provided in the tables of the section *Electrical and mechanical characteristics à partir de la page 33* .



Motors with axial forced ventilation



Motors with axial forced ventilation and encoder/resolver

For the dimensions with forced ventilation and/or encoder/resolver as well as the characteristics of forced ventilation, refer to the Nidec Leroy-Somer Configurator *http://configurateurls.Nidec Leroy-somer.com.*

Units of measurement and standard formulae

ELECTRICITY AND ELECTROMAGNETISM

Parameters				Units		Units and expressions not recommended
French name	English name	Symbol	Definition	SI	Non SI but accepted	Conversions
Fréquence Période	Frequency	*f*		Hz (hertz)		
Courant électrique (intensité de)	Electric current	*I*		A (ampere)		
Potentiel électrique Tension Force électromotrice	Electric potential Voltage Electromotive force	*V* *U* *E*		V (volt)		
Déphasage	Phase angle	φ		rad	° degré	
Facteur de puissance	Power factor	cos φ				
Réactance Résistance Impédance	Reactance Resistance Impedance	*X* *R* *Z*		Ω (ohm)		*j* is defined as $j^2 = -1$ ω pulsat rotational frequency ion = 2 π . *f*
Inductance propre (self)	Self inductance	*L*		H (henry)		
Capacité	Capacitance	*C*		F (farad)		
Charge électrique, Quantité d'électricité	Quantity of electricity	*Q*		C (coulomb)	A.h 1 A.h = 3 600 C	
Résistivité	Resistivity	ρ		Ω.m		Ω/m
Conductance	Conductance	*G*		S (siemens)		1/ Ω = 1 S
Nombre de tours, (spires) de l'enroulement Nombre de phases Nombre de paires de pôles	N° of turns (coil) N° of phases N° of pairs of poles	*N* *m* *p*				
Champ magnétique	Magnetic field	*H*		A/m		
Différence de potentiel magnétique Force magnétomotrice Solénation, courant totalisé	Magnetic potential difference Magnetomotive force	*Um* *F, Fm* *H*		A		The unit AT (ampere-turns) is incorrect because it treats "turn" as a physical unit
Induction magnétique, Densité de flux magnétique	Magnetic induction Magnetic flux density	*B*		T (tesla) = Wb/m^2		(gauss) 1 G = 10^{-4} T
Flux magnétique, Flux d'induction magnétique	Magnetic flux	Φ		Wb (weber)		(maxwell) 1 max = 10^{-8} Wb
Potentiel vecteur magnétique	Magnetic vector potential	*A*		Wb/m		
Perméabilité d'un milieu Perméabilité du vide	Permeability Permeability of vacuum	$\mu = \mu_o \mu_r$ μ_o		H/m		
Permittivité	Permittivity	$\varepsilon = \varepsilon_o \varepsilon_r$		F/m		

Units of measurement and standard formulae

THERMODYNAMICS

Parameters				Units		Units and expressions not recommended
French name	English name	Symbol	Definition	SI	Non SI but accepted	Conversions
Température Thermodynamique	Temperature Thermodynamic	T		K (kelvin)	température Celsius, t, °C $T = t + 273,15$	°C : Degree Celsius t_C : temp. in °C t_F : temp. in °F f temperature Fahrenheit °F
Écart de température	Temperature rise	ΔT		K	°C	1 °C = 1 K
Densité de flux thermique	Heat flux density	q, ϕ		W/m²		
Conductivité thermique	Thermal conductivity	λ		W/m.K		
Coefficient de transmission thermique global	Total heat transmission coefficient	K		W/m².K		
Capacité thermique	Heat capacity	C		J/K		
Capacité thermique massique	Specific heat capacity	c		J/kg.K		
Energie interne	Internal energy	U		J		

NOISE AND VIBRATION

Parameters				Units		Units and expressions not recommended
French name	English name	Symbol	Definition	SI	Non SI but accepted	Conversions
Niveau de puissance acoustique	Sound power level	L_W	$L_W = 10 \lg(P/P_o)$ $(P_o = 10^{-12}\ W)$	dB (décibel)		lg logarithm to base 10 lg10 = 1
Niveau de pression acoustique	Sound pressure level	L_P	$L_P = 20 \lg(P/P_o)$ $(P_o = 2x10^{-5}\ Pa)$	dB		

DIMENSIONS

Parameters				Units		Units and expressions not recommended
French name	English name	Symbol	Definition	SI	Non SI but accepted	Conversions
Angle (angle plan)	Angle (plane angle)	α, β, T, ϕ		rad	degree : ° minute : ' second : "	180° = π rad = 3,14 rad
Longueur Largeur Hauteur Rayon Longueur curviligne	Length Breadth Height Radius	l b h r s		m (metre)	micrometre	cm, dm, dam, hm 1 inch = 1" = 25,4 mm 1 foot = 1' = 304,8 mm µm micron µ angström : A = 0,10 nm
Aire, superficie	Area	A, S		m²		1 square inch = 6,45 10^{-4} m²
Volume	Volume	V		m³	litre : l liter : L	UK gallon = 4,546 10^{-3} m³ US gallon = 3,785 10^{-3} m³

Units of measurement and standard formulae

MECHANICS

Parameters				Units		Units and expressions not recommended
English name	French name	Symbol	Definition	SI	Non SI but accepted	Conversions
Temps Intervalle de temps, durée Période (durée d'un cycle)	Time Period (periodic time)	t T		s (seconde)	minute: min hour: h day: d	Symbols ' and " are reserved for angles minute not written as mn
Vitesse angulaire Pulsation	Angular velocity Circular frequency	ω	$\omega = \frac{d\varphi}{dt}$	rad/s		
Accélération angulaire	Angular acceleration	α	$\alpha = \frac{d\omega}{dt}$	rad/s^2		
Vitesse Célérité	Speed Velocity	$u, v, w,$ c	$v = \frac{ds}{dt}$	m/s	1 km/h = 0,277 778 m/s 1 m/min = 0,016 6 m/s	
Accélération Accélération de la pesanteur	Acceleration Acceleration of free fall	a g=9,81m/s^2	$a = \frac{dv}{dt}$ à Paris	m/s^2		
Vitesse de rotation	Revolution per minute	N		s^{-1}	min^{-1}	tr/mn, RPM, TM...
Masse	Mass	m		kg (kilogramme)	tonne : t 1 t = 1 000 kg	kilo, kgs, KG... 1 pound : 1 lb = 0,453 6 kg
Masse volumique	Mass density	ρ	$\frac{dm}{dV}$	kg/m^3		
Masse linéique	Linear density	ρ_e	$\frac{dm}{dL}$	kg/m		
Masse surfacique	Surface mass	ρ_A	$\frac{dm}{dS}$	kg/m^2		
Quantité de mouvement	Momentum	P	$p = m.v$	kg. m/s		
Moment d'inertie	Moment of inertia	J, I	$I = \Sigma\, m.r^2$	kg.m^2		pound per square feet = 1 lb.ft^2 = 42.1 x 10^{-3} kg.m^2
Force Poids	Force Weight	F G	$G = m.g$	N (Newton)		kgf = kgp = 9.81 N pound force = lbF = 4.448 N
Moment d'une force	Moment of force, Torque	M T	$M = F.r$	N.m		mdaN, mkg, m.N 1 mkg = 9.81 N.m 1 ft.lbF = 1.356 N.m 1 in.lbF = 0.113 N.m
Pression	Pressure	p	$p = \frac{F}{S} = \frac{F}{A}$	Pa (Pascal)	bar 1 bar = 10^5 Pa	1 kgf/cm^2 = 0.981 bar 1 psi = 6 894 N/m^2 = 6 894 Pa 1 psi = 0.068 94 bar 1 atm = 1.013 x 10^5 Pa
Contrainte normale Contrainte tangentielle, Cission	Normal stress Shear stress	σ τ		Pa we use MPa = 10^6 Pa		kg/mm^2, 1 daN/mm^2 = 10 MPa psi = pound per square inch 1 psi = 6 894 Pa
Facteur de frottement	Friction coefficient	μ				incorrectly = coefficient friction f
Travail Énergie Énergie potentielle Énergie cinétique Quantité de chaleur	Work Energy Potential energy Kinetic energy Quantity of heat	W E Ep Ek Q	$W = F.l$	J (joule)	Wh = 3 600 J (wattheure)	1 N.m = 1 W.s = 1 J 1 kgm = 9.81 J (calorie) 1 cal = 4.18 J 1 kgm = 1.055 J (British thermal unit)
Puissance	Power	P	$P = \frac{W}{t}$	W (watt)		1 ch = 736 W; 1 HP = 746 W
Débit volumique	Volumetric flow	q_v	$q_v = \frac{dV}{dt}$	m^3/s		
Rendement	Efficiency	η		< 1		%
Viscosité dynamique	Dynamic viscosity	η, μ		Pa.s		poise, 1 P = 0.1 Pa.s
Viscosité cinématique	Kinematic viscosity	ν	$\nu = \frac{\eta}{\rho}$	m^2/s		stokes, 1 St = 10^{-4} m^2/s

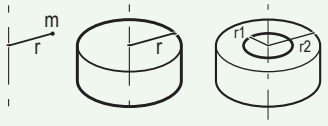
Unit conversions

Unit	MKSA (International System)	AGMA (US system)
Length	1 m = 3,280 8 ft 1 mm = 0,0393 7 in	1 ft = 0,304 8 m 1 in = 25,4 mm
Weight	1 kg = 2,204 6 lb	1 lb = 0,453 6 kg
Torque	1 Nm = 0,737 6 lb.ft 1 N.m = 141,6 oz.in	1 lb.ft = 1,356 N.m 1 oz.in = 0,007 06 N.m
Force	1 N = 0,224 8 lb	1 lb = 4,448 N
Moment of inertia	1 kg.m^2 = 23,73 lb.ft^2	1 lb.ft^2 = 0,042 14 kg.m^2
Power	1 kW = 1,341 HP	1 HP = 0,746 kW
Pressure	1 kPa = 0,145 05 psi	1 psi = 6,894 kPa
Magnetic flux	1 T = 1 Wb / m^2 = 6,452 10^4 line / in^2	1 line / in^2 = 1,550 10^{-5} Wb / m^2
Magnetic losses	1 W / kg = 0,453 6 W / lb	1 W / lb = 2,204 W / kg

Multiples and sub-multiples		
Factor by which the unit is multiplied	**Prefix to be placed before the unit name**	**Symbol to be placed before that of the unit**
10^{18} or 1 000 000 000 000 000 000	exa	E
10^{15} or 1 000 000 000 000 000	peta	P
10^{12} or 1 000 000 000 000	téra	T
10^{9} or 1 000 000 000	giga	G
10^{6} or 1 000 000	méga	M
10^{3} or 1 000	kilo	k
10^{2} or 100	hecto	h
10^{1} or 10	déca	da
10^{-1} or 0,1	déci	d
10^{-2} or 0,01	centi	c
10^{-3} or 0,001	milli	m
10^{-6} or 0,000 001	micro	µ
10^{-9} or 0,000 000 001	nano	n
10^{-12} or 0,000 000 000 001	pico	p
10^{-15} or 0,000 000 000 000 001	femto	f
10^{-18} or 0,000 000 000 000 000 001	atto	a

Standard formulae used in electrical engineering

MECHANICAL FORMULAE

Title	Formula	Unit	Definitions / Notes
Force	$F = m \cdot \gamma$	F in N m in kg γ in m/s^2	A force F is the product of a mass m by an acceleration γ
Weight	$G = m \cdot g$	G in N m in kg g = 9,81 m/s^2	
Torque	$M = F \cdot r$	M in N.m F in N r in m	The torque M of a force in relation to an axis is the product of that force multiplied by the distance r of the point of application of F in relation to the axis.
Power - rotating	$P = M \cdot \omega$	P in W M en N.m ω in rad/s	Power P is the quantity of work yielded per unit of time ω= 2π N/60 where N is the speed of rotation in min^{-1}
- linear	$P = F \cdot V$	P in W F in N V in m/s	V = linear velocity
Acceleration time	$t = J \cdot \frac{\omega}{M_a}$	t in s J in kg.m^2 ω in rad/s M_a in Nm	J is the moment of inertia of the system M_a is the moment of acceleration Note: All the calculations refer to a single rotational speed ω. where the inertias at speed ω'' are corrected to speed ω by the following calculation: $J_\omega = J_{\omega'} \cdot \left(\frac{\omega'}{\omega}\right)^2$
Moment of inertia Centre of gravity	$J = m \cdot r^2$	J in kg.m^2 m in kg r in m	
Solid cylinder around its axis	$J = m \cdot \frac{r^2}{2}$		
Hollow cylinder around its axis	$J = m \cdot \frac{r_1^2 + r_2^2}{2}$		
Inertia of a mass in linear motion	$J = m \cdot \left(\frac{v}{\omega}\right)^2$	J in kg.m^2 m in kg v in m/s ω in rad/s	The moment of inertia of a mass in linear motion transformed to a rotating motion.

Standard formulae used in electrical engineering

ELECTRICAL FORMULAE

Title	Formula	Unit	Definitions / Notes
Accelerating torque	$M_a = \frac{M_d + 2M_a + 2M_m + M_n}{6} - M_r$ *General formula:* $M_a = \frac{1}{N_n}\int_0^{N_n}(M_{mot} - M_r)\,dN$	*Nm*	Moment of acceleration M_a is the difference between the motor torque M_{mot} (estimated), and the resistive torque M_r. (M_d, M_a, M_m, M_n, see curve below) N = instantaneous speed N_n = rated speed
Power required by the machine	$P = \frac{M \cdot \omega}{\eta_a}$	*P* in W *M* in N.m ω in rad/s η_A without unit	η_a expresses the efficiency of the driven machine. M is the torque required by the driven machine.
Power drawn by the 3-phase motor	$P = \sqrt{3} \cdot U \cdot I \cdot \cos\varphi$	*P* in W *U* in V *I* in A	ϕ phase angle by which the current lags or leads the voltage. U armature voltage. I line current.
Reactive power drawn by the motor	$Q = \sqrt{3} \cdot U \cdot I \cdot \sin\varphi$	Q in VAR	
Reactive power supplied by a bank of capacitors	$Q = \sqrt{3} \cdot U^2 \cdot C \cdot \omega$	*U* in V *C* in µ F ω in rad/s	*U* = voltage at the capacitor terminals *C* = capacitor capacitance ω = rotational frequency of supply phases (ω = 2πf)
Apparent power	$S = \sqrt{3} \cdot U \cdot I$ $S = \sqrt{P^2 + Q^2}$	S in VA	
Power supplied by the 3-phase motor	$P = \sqrt{3} \cdot U \cdot I \cdot \cos\varphi \cdot \eta$		η expresses motor efficiency at the point of operation under consideration.
Slip	$g = \frac{N_S - N}{N_S}$		Slip is the difference between the actual motor speed N and the synchronous speed N_s
Synchronous speed	$N_S = \frac{120 \cdot f}{p}$	N_S in min^{-1} *f* in Hz	p = number of poles f = frequency of the power supply

Tolerance on main performance parameters

TOLERANCES OF ELECTROMECHANICAL CHARACTERISTICS

IEC 60034-1 specifies standard tolerances for electromechanical characteristics.

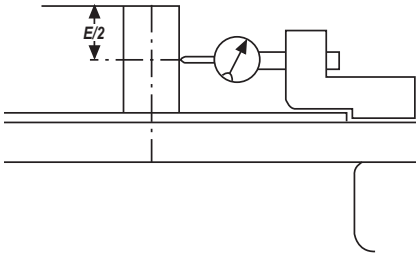
Parameters		Tolerances
Efficiency	machines P ≤ 150 kW machines P > 150 kW	– 15 % of (1 – η) – 10 % of (1 – η)
Cos φ		– 1/6 (1 – cos ϕ) (min 0.02 - max 0.07)
Slip	machines P < 1 kW machines P ≥ 1 kW	± 30 % ± 20 %
Locked rotor torque		– 15 %, + 25 % of rated torque
Starting current		+ 20 %
Run-up torque		– 15 % of rated torque
Maximum torque		– 10 % of rated torque > 1.5 M_N
Moment of inertia		±10 %
Noise		+ 3 dB (A)
Vibration		+ 10 % of the guaranteed class

Note: IEC 60034-1 - does not specify tolerances for current
- the tolerance is ± 10% in NEMA-MG1

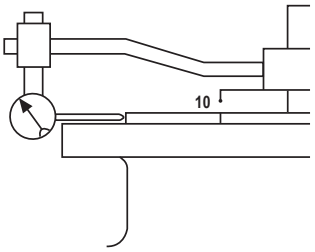
TOLERANCES AND ADJUSTMENTS

The standard tolerances shown below are applicable to the drawing dimensions given in our catalogues. They comply fully with the requirements of IEC standard 60072-1.

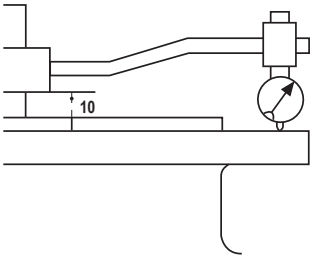
Characteristics	Tolerances
Frame size H ≤ 250 ≥ 280	0. — 0.5 mm 0. — 1 mm
Diameter Ø of the shaft extension: - 11 to 28 mm - 32 to 48 mm - 55 mm and over	 j6 k6 m6
Diameter N of flange spigots	j6 up to FF 500, js6 for FF 600 and more
Key width	h9
Width of drive shaft keyway (normal keying)	N9
Key depth: - square section - rectangular section	 h9 h11
1. Eccentricity of shaft in flanged motors (standard class) - diameter > 10 up to 18 mm - diameter > 18 up to 30 mm - diameter > 30 up to 50 mm - diameter > 50 up to 80 mm - diameter > 80 up to 120 mm	 0.035 mm 0.040 mm 0.050 mm 0.060 mm 0.070 mm
2. Concentricity of spigot diameter and 3. Perpendicularity of mating surface of flange in relation to shaft (standard class) Flange (FF) or Faceplate (FT): - F 55 to F 115 - F 130 to F 265 - F 300 to F 500 - F 600 to F 740 - F 940 to F 1080	 0.08 mm 0.10 mm 0.125 mm 0.16 mm 0.20 mm



1. Eccentricity of shaft in flanged motors

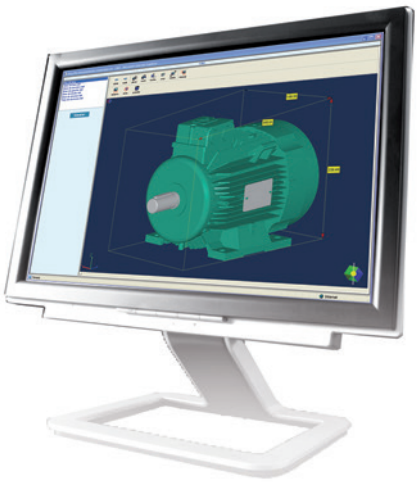


2. Concentricity of spigot diameter



3. Perpendicularity of mating surface of flange in relation to shaft

Configurator

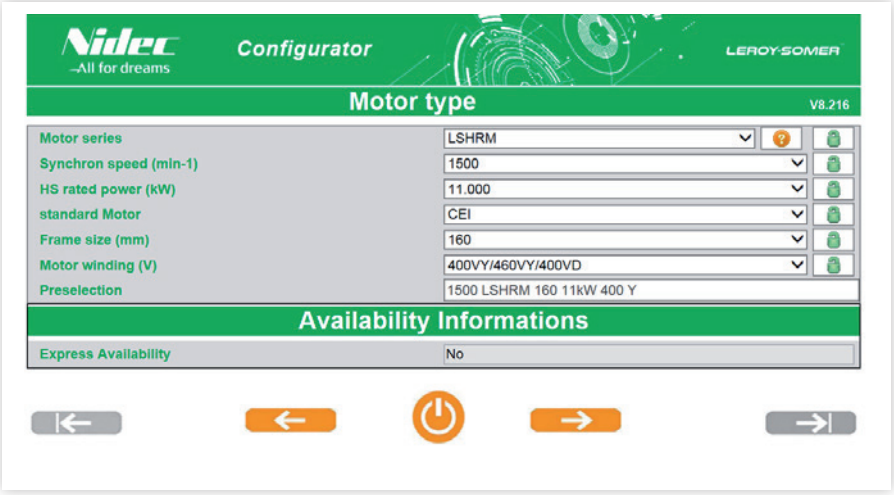


The Nidec Leroy-Somer configurator can be used to choose the most suitable motor and provides the technical specifications and corresponding drawings.

Register online at:

http://configurateurls.leroy-somer.com

- Help with product selection
- Print-outs of technical specifications
- Print-outs of 2D and 3D CAD files
- The equivalent of 300 catalogues in 15 languages



Declaration of conformity and incorporation

Nidec	PS4 : INSPECTION, MEASURING & TEST EQUIPMENT MANAGEMENT		Classement/*File*: S4T035
QUALITY MANAGEMENT	**EU DECLARATION OF CONFORMITY AND INCORPORATION**	Révision: D Date: 28/ 06/ 2019	Page : 2 / 2
	Doc type : S6T002 Rev D du/from 16/03/2017 — M☐ R☑ I☐ GP, Mansle & IMI	Annule et remplace/*Cancels and replaces:* S4T035 Révision C du/*from* 17/ 12/ 2018	

We, **MOTEURS LEROY SOMER,** boulevard Marcellin Leroy CS10015, 16915 ANGOULEME cedex 9, France, and we,

Constructions Electriques de Beaucourt (CEB) 14, Rue de Dampierre, 90500 BEAUCOURT, France (company of **Nidec Leroy-Somer Holding SA** , boulevard Marcellin Leroy, CS 10015, 16915 ANGOULEME cedex 9, France).

declare, under our own responsibility that the following products:

LSHRM, FLSHRM, PLSHRM, GLSHRM synchronous motor range

comply with:

- European Directives :
  - Low Voltage Directive — **2014/35/EU**
  - ROHS 2 Directive — **2011/65/EU**
  - Electromagnetic Compatibility Directive — **2014/30/EU**
  - ErP Directive — **2009/125/EC** and regulation (EC) application : **640/2009** and corrections (only for concerned products)
- European standards : **EN 50581:2012**
  EN 60034-1:2010; 60034-7:1993/A1:2001; 60034-9:2005/A1:2007; 60034-14:2018; 62262 :2002; 60034-30-2:2016

This conformity permits the use of these ranges of products in machines subject to the application of the Machinery Directive 2006/42/EC, provided that they are integrated or incorporated and/or assembled in accordance with, amongst others, the regulations of standard EN 60204(all parts) "Electrical Equipment for Machinery".

The products defined above may not be put into service until the machines in which they are incorporated have been declared as complying with the applicable Directive.

Installation of these materials shall be done by a professional who is responsible to comply with the regulations, decrees, laws, orders, directives, application circulars, standards, rules or any other document relating to the installation site. He will be also responsible for the respect of values stamped on rating plate(s), instruction manual, installation instructions, maintenance manuals and/or any other document supplied by the manufacturer. MOTEURS LEROY-SOMER and CEB accepts no liability in the event of failure to comply with these rules and regulations.

Date and Signature of technical director:

Eric VASSENT

2019/ July/ 04

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