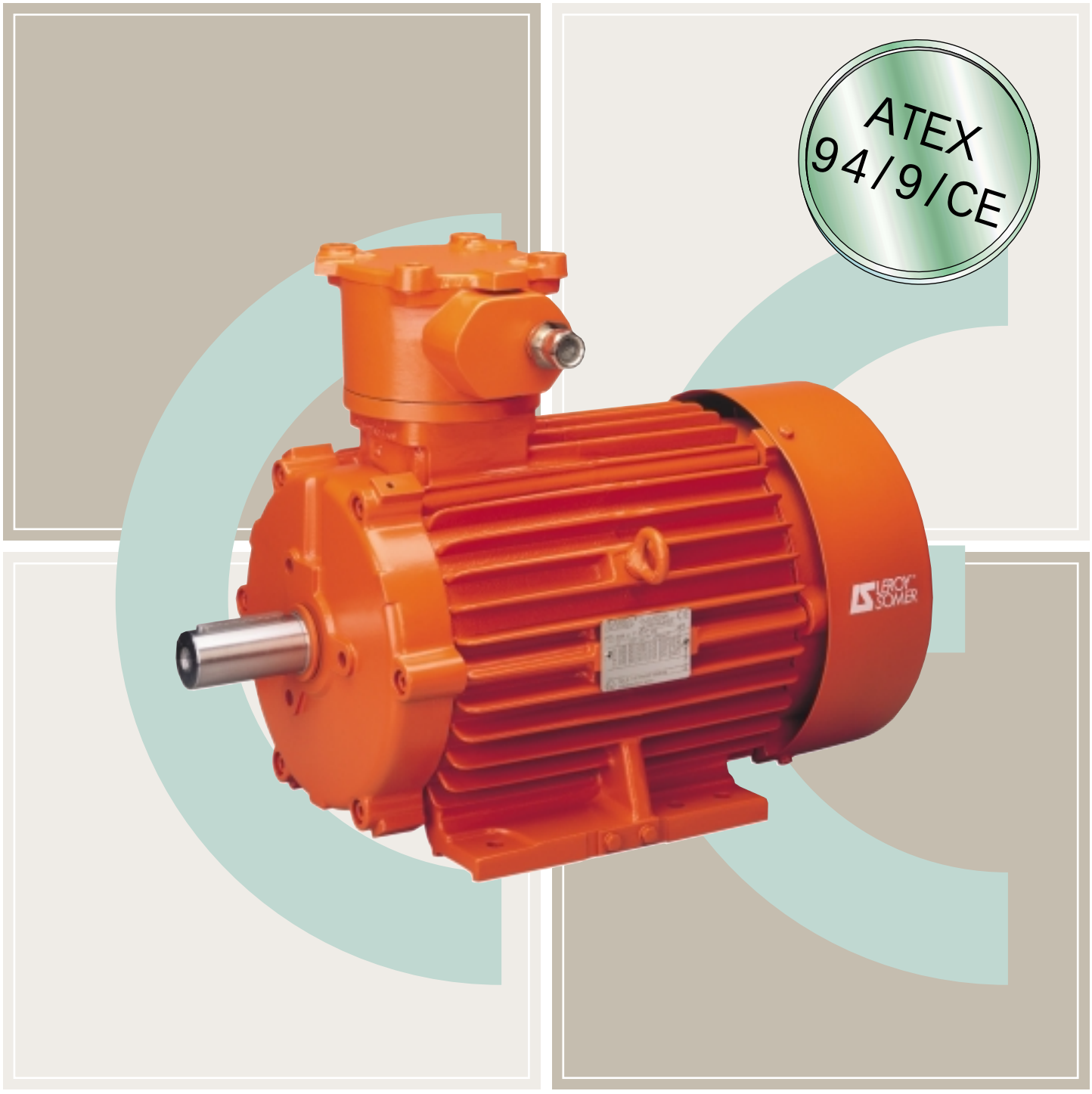
LEROY SOMER®

3574 en - 02.2004 / e

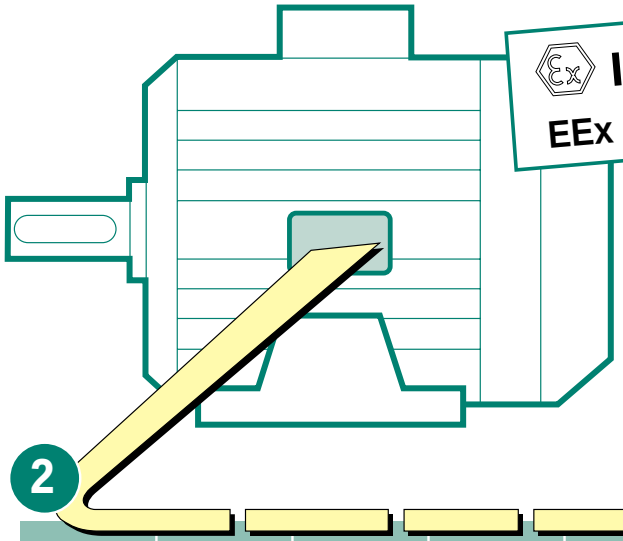


FLSD

Flameproof 3-phase TEFV cage induction motors

Technical catalogue

FLSD flameproof
TEFV induction motors



Use the **complete motor designation** as shown below when placing your **order**.

Simply go through the complete designation step by step.

4P 1500 min^{-1}	FLSD	100	L	3 kW	IM 1001 IM B3	230 / 400 V	50 Hz	IP 55

- No. of pole(s) Speed(s)
- Range identification
- Frame size IEC 60072-1
- Frame type — Section F P. 60 to 65
- Rated power — Section E P. 48 to 57
- Mounting arrangements IEC 60034-7 — Section C1 P. 21
- Supply voltage
- Mains frequency
- Degree of protection IEC 60034-5 — Section A5 P. 13

For **direct selection,** see section : E Page 47

3

- Number and type of cable gland — Section C4 P. 36
- Definition of cables — Section C4 P. 36

This document has been translated from the French version (Ref. 3574F) which should be used for reference.
Leroy-Somer reserves the right to modify the design, technical specifications and dimensions of the product shown in this catalogue.
The descriptions cannot in any way be considered contractual.

FLSD flameproof TEFV induction motors

This catalogue describes LEROY-SOMER **FLSD flameproof induction motor** from 0.18 to 400 kW used in group II (surface industries)

The range used by way of example is type :

Ex	II	2	G		
	EEx d	II	B	T4	INERIS 01 ATEX 0001 X

Other versions also described are :

EEx d II B T5

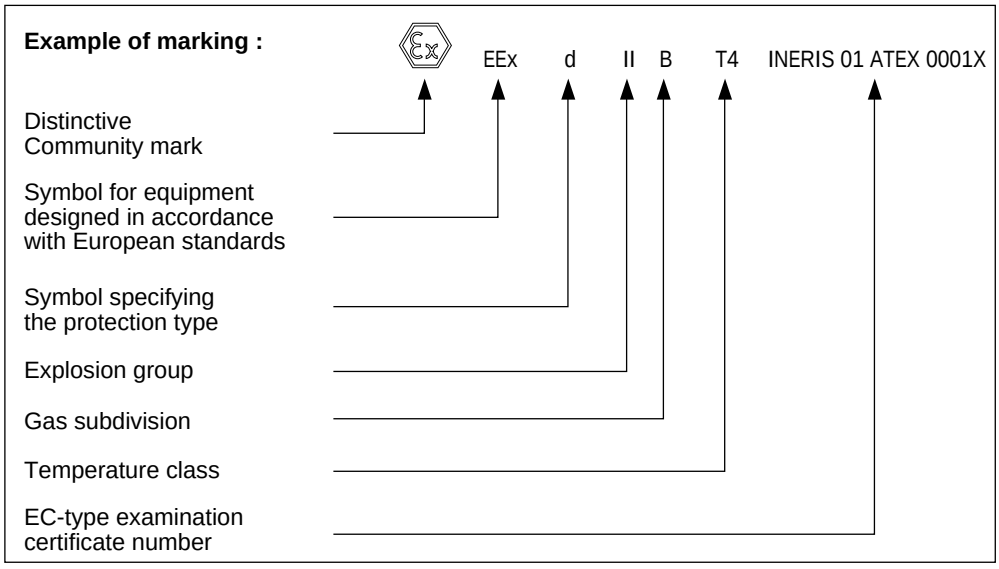
EEx d II C T5

EEx de II B T4

EEx de II B T5

EEx de II C T5

Example of marking :



LEROY-SOMER offers various ranges of **induction motors** designed around a common electrical base. These motors conform to the latest European standards, and satisfy the majority of demanding applications in industrial and safety environments.

	References for LEROY-SOMER 3-phase induction motor ranges :
LS	from 0.09 to 160 kW aluminium alloy frame.....Catalogue ref. : 3676
F LS (C)	from 0.18 to 750 kW cast iron frame.....Catalogue ref. : 3653
F LS D	from 0.18 to 400 kW cast iron frame, flameproof version.....Catalogue ref. : 3574
(F) LS N	from 0.18 to 400 kW aluminium alloy or cast iron frame, non-sparking version.....Catalogue ref. : 3708
(F) LS E	from 0.75 to 55 kW aluminium alloy or cast iron frame, increased safety version.....Catalogue ref. : 3642
(F) LS PX	from 0.18 to 400 kW aluminium alloy or cast iron frame, for dusty explosive atmospheres.....Catalogue ref. : 3215

FLSD flameproof TEFV induction motors

Contents

FLSD flameproof
TEFV induction motors

Contents

FLSD flameproof TEFV induction motors

Index

Index

A1 - Quality assurance

A

Industrial concerns are having to cope with an ever more competitive environment. Productivity depends to a considerable degree on the right investment at the right time.
LEROY-SOMER has the answer, building motors to precise standards of quality.

When carrying out quality checks on a machine's performance, the first step is to **measure the level of customer satisfaction.**

Careful study of this information tells us which points need looking at, improving and monitoring.

From the moment you place your order with our administrative staff until the motor is up and running (after design studies, launch and production activities) we keep you informed and involved.

Our own procedures are constantly under review. All our staff are involved in both operational process analysis and continuous training programmes. These initiatives help them serve you better, and increased skills bring increased motivation.

At LEROY-SOMER, we think it vital for our customers to know the importance we attach to quality.

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 **ISO 9000** accreditation, **Edition 2000**. Products are also approved by official bodies who inspect their technical performance with regard to the various standards.
This is a fundamental requirement for a company of international standing.

Our order tracking and manufacturing processes have been assessed for conformity by the notified body INERIS.

FLSD flameproof TEFV induction motors General information

A2 - Product approval

The FLSD flameproof motors presented in this catalogue conform to the national and/or international standards which govern the construction of this type of equipment.

EC-type examination certificates are drawn up by notified bodies, **in accordance with the European Community Council Directive 94/9/EC known as ATEX.**

Approval is obtained when descriptive documents have been examined and validated, and tests performed. These include tests involving heating and explosion of the equipment.

EC-type examination certificates granted by the bodies listed opposite are recognized by all EC countries.

Approved equipment is authorized to carry the CE mark or the distinctive community mark Ex .

List of official accreditation laboratories

• Germany:	**PTB - DMT/BVS**
• Belgium:	**ISSeP**
• Denmark:	**DEMKO**
• Spain:	**LOM**
• France:	**INERIS - L.C.I.E.**
• Great Britain:	**EECS - SCS**
• Italy:	**CESI**
• Netherlands:	**KEMA**

Type of motor	EC-type examination certificate acc. to ATEX	
	IIA and IIB	IIC
FLSD 80	INERIS 01 ATEX 0001 X	LCIE 94C6100*
FLSD 90 - 100	INERIS 01 ATEX 0001 X	ISSeP 93C.103.1063*
FLSD 112	INERIS 01 ATEX 0001 X	ISSeP 92C.103.1047*
FLSD 132	INERIS 01 ATEX 0001 X	ISSeP 93C.103.1062*
FLSD 160 -180	INERIS 01 ATEX 0001 X	ISSeP 92C.103.1049*
FLSD 200 - 225	INERIS 01 ATEX 0001 X	ISSeP 92C.103.1043*
FLSD 250	INERIS 01 ATEX 0001 X	INERIS 94.C 5009 X*
FLSD 280	INERIS 01 ATEX 0001 X	INERIS 93.C 5100 X*
FLSD 315 ST	INERIS 01 ATEX 0001 X	INERIS 93.C 5070 X*
FLSD 315 M/L	INERIS 01 ATEX 0001 X	INERIS 94.C 5004 X*
FLSD 355	INERIS 01 ATEX 0001 X	INERIS 94.C 5028 X*

* Certificate of conformity applicable until 1 July 2003

Products certified under "the old approach" (Directives prior to ATEX) can be used provided that they work correctly after 1st July 2003.

A3 - General standardization

A

ORGANIZATION OF STANDARDS AUTHORITIES

International bodies

<table>
<tr>
<td>Worldwide
  </td>
<td>General standardization
ISO
International Standards Organization
TC Technical Committees | SC Sub-committees | WG Working groups</td>
<td>Electronics and Electrotechnical Certification
IEC
International Electrotechnical Commission
TC Technical Committees | SC Sub-committees | WG Working groups</td>
</tr>
<tr>
<td>Europe
  </td>
<td>CEN
European Committee for Standardization
ECISS
European Committee for Iron and Steel Standards
TC Technical Committees</td>
<td>CENELEC
European Committee for Electrotechnical Standardization
TC Technical Committees | SC Sub-committees | AHG Ad hoc groups</td>
</tr>
</table>

Country	Initials	Name
AUSTRALIA	**SAA**	**S**tandards **A**ssociation of **A**ustralia
BELGIUM	**IBN**	**I**nstitut **B**elge de **N**ormalisation
CIS (ex-USSR)	**GOST**	**Go**sudarstvenne Komitet **St**andartov
DENMARK	**DS**	**D**ansk **S**tandardisieringsraad
FINLAND	**SFS**	**S**uomen **S**tandardisoimisliitto
FRANCE	**AFNOR including UTE**	**A**ssociation **F**rançaise de **N**ormalisation including: **U**nion **T**echnique de l'**É**lectricité
GERMANY	**DIN/VDE**	**V**erband **D**eutscher **E**lektrotechniker
ITALY	**CEI**	**C**omitato **E**lecttrotechnico **I**taliano
JAPAN	**JIS**	**J**apanese **I**ndustrial **S**tandard
NETHERLANDS	**NNI**	**N**ederlands **N**ormalisatie - **I**nstituut
NORWAY	**NFS**	**N**orges **S**tandardisieringsforbund
SAUDI ARABIA	**SASO**	**S**audi **A**rabian **S**tandards **O**rganization
SPAIN	**UNE**	**U**na **N**orma **E**spañola
SWEDEN	**SIS**	**S**tandardisieringskommissionen **I** **S**verige
SWITZERLAND	**SEV or ASE**	**S**chweizerischer **E**lektrotechnischer **V**erein
UNITED KINGDOM	**BSI**	**B**ritish **S**tandards **I**nstitution
USA	**ANSI including NEMA**	**A**merican **N**ational **S**tandards **I**nstitute including: **N**ational **E**lectrical **Ma**nufacturers

A3 - General standardization

List of standards quoted in this document

FLSD motors conform to all standards mentioned in this catalogue

Reference		International standards
IEC 60034-1	EN 60034-1	Electrical rotating machines: ratings and operating characteristics
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 60034-12	EN 60034-12	Starting characteristics for single-speed 3-phase cage induction motors for supply voltages less than or equal to 660V.
IEC 60034-14	EN 60034-14	Electrical rotating machines: mechanical vibrations of certain machines with a frame size above or equal to 56 mm. Measurement, evaluation and limits of vibrational intensity.
IEC 60038		IEC standard voltages
IEC 60072-1		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 60529	EN 60529	Degrees of protection provided by enclosures.
IEC 60721-2-1		Classification of natural environment conditions. Temperature and humidity.
IEC 60892		Effects of an imbalance in the voltage system on the characteristics of three-phase squirrel-cage induction motors.
IEC 61000-2-2	EN 61000-2-2	Electromagnetic compatibility (EMC): environment
IEC guide 106		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 ISO 1680	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 the electrical housing against extreme mechanical impacts.
CEI 60079-0	EN 50014	Electrical equipment for explosive atmospheres: General regulations
CEI 60079-1	EN 50018	Electrical equipment for explosive atmospheres: flameproof casings "d"
CEI 60079-7	EN 50019	Electrical equipment for explosive atmospheres: increased safety "e"
	EN 50281-1-1	Electrical apparatus for use in the presence of combustible dust

A4 - Tolerances on main performance parameters

A

Tolerances on electromechanical characteristics

IEC 60034-1 specifies standard tolerances for electromechanical characteristics.

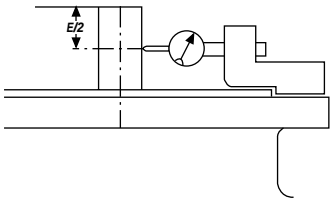
Parameters	Tolerances
Efficiency { machines P ≤ 50 kW machines P > 50 kW	**– 15% (1 – η)** **– 10% (1 – η)**
Cos φ	**– 1/6 (1 – cos φ)** **(min 0.02 - max 0.07)**
Slip { machines P < 1 kW machines P ≥ 1 kW	**± 30%** **± 20%**
Locked rotor torque	**– 15%, + 25% of rated torque**
Starting current	**+ 20%**
Run-up torque	**-15% of rated torque**
Breakdown torque	**-10% of rated torque** **> 1.6 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

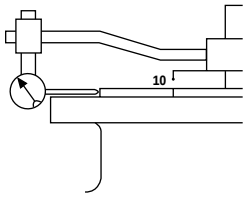
Tolerances and adjustments

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

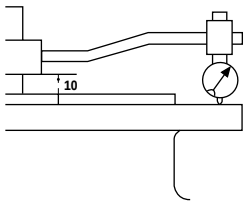
Characteristics	Tolerances
Frame size H ≤ 250 > 280	**0, — 0.5 mm** **0, — 1 mm**
Diameter ∅ of shaft extension: - 11 to 28 mm - 32 to 48 mm - 55 mm and over	 **j6** **k6** **m6**
Diameter N of flange spigot	**j6 up to FF 500,** **js6 for FF 600 and over**
Key width	**h9**
Width of drive shaft keyway (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 - FF 300 to FF 500 - FF 600 to FF 740 - FF 940 to FF 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***

A5 - Definition of "Index of Protection" (IP/IK)

Indices of protection of electrical equipment enclosures

FLSD motors are IP 55/ IK 08 as standard

First number : protection against solid objects			Second number : protection against liquids			mechanical protection		
IP	**Tests**	**Definition**	**IP**	**Tests**	**Definition**	**IK**	**Tests**	**Definition**
0		No protection	0		No protection	00		No protection
1	∅ 50 mm	Protected against solid objects of over 50 mm (eg : accidental hand contact)	1		Protected against vertically dripping water (condensation)	01	150 g, 10 cm	Impact energy : 0.15 J
2	∅ 12 mm	Protected against solid objects of over 12 mm (eg : finger)	2	15°	Protected against water dripping up to 15° from the vertical	02	200 g, 10 cm	Impact energy : 0.20 J
3	∅ 2.5 mm	Protected against solid objects of over 2.5 mm (eg : tools, wire)	3	60°	Protected against rain falling at up to 60° from the vertical	03	250 g, 15 cm	Impact energy : 0.37 J
4	∅ 1 mm	Protected against solid objects of over 1 mm (eg : small tools, thin wire)	4		Protected against water splashes 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	05	350 g, 20 cm	Impact energy : 0.70 J
6		Totally protected against any dust penetration	6		Protected against jets of water comparable to heavy seas	06	250 g, 40 cm	Impact energy : 1 J
			7	0.15 m, 1 m	Protégé contre les effets de l'immersion entre 0,15 et 1 m	07	0.5 kg, 40 cm	Impact energy : 2 J
			8 . . m	..m	Protected against the effects of immersion to depths of between 0.15 and 1 m	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:

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.

B1 - Definition of atmospheres and zones

B1.1 - ATMOSPHERES AT RISK OF EXPLOSION

This includes all explosive and explosible conditions, the explosion character being permanent or potential.

Explosive atmospheres:

An explosive atmosphere is an atmosphere where a mixture of air and inflammable substances is to be found (in gas form, vapours, fog or mist) in such proportions that excessive temperature, arcs or sparks cause it to explode. **The danger is permanent.**

Explosible atmospheres:

An explosible atmosphere is an atmosphere which may become explosive due to the particular local conditions. **The danger is potential.**

B1.2 - DEFINITION OF ZONES AT RISK OF EXPLOSION

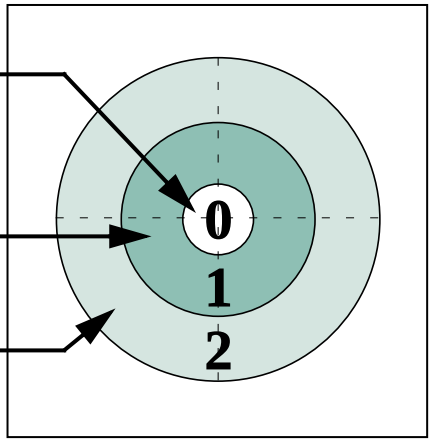
The international standard EN 60079-10 defines the danger zones according to the risk of encountering an explosive atmosphere as shown in the diagram opposite:

Note: Each country has similar and complementary publications giving instructions on the classification of dangerous locations.

Zone 0: location where an explosive gaseous atmosphere is permanently present for long periods.

Zone 1: location where an explosive gaseous atmosphere is likely to develop during normal operation.

Zone 2: location where an explosive gaseous atmosphere is not likely to form during normal operation, and where such a development, should it occur, only lasts for a short period of time.



Note: The zone is classified under the responsibility of the manager of the company where the equipment is installed.

B1.3 - EXPLOSION GROUP CLASSIFICATION

B1.3.1 - Area levels

The areas presenting explosion risks are divided into 2 groups:

- Group I: Gas-prone mines.

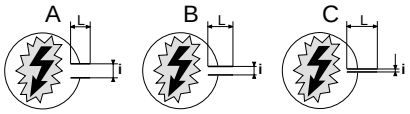
- Group II: Areas other than gas-prone mines **(surface industries)**.

This catalogue only concerns equipment in group II.

B1.3.2 - Gas levels

- Group I: only applies to mine gas (methane in mines).

- Group II: The gases present are classified in **3 subdivisions A, B and C**.



The A, B, C classification is according to the MESG (Maximum Experimental Safe Gap) which characterises the ability of a gas not to propagate ignition through a standard joint. **The risks following an explosion increase from subdivision A to subdivision C.**

Therefore, equipment certified for use in the presence of a type C gas can also be used in the presence of a type A or B gas.

B1.4 - TEMPERATURE CLASSES

The temperature class is based on the maximum temperature rise in the equipment and on the ambient operating temperature.

The maximum surface temperature of an electric device must always be lower than the ignition temperature of the mix of gases or vapour in which it will be used.

In order to be able to select various devices according to their surface temperature, **six temperature classes** have been created.

Temperature class	T1	T2	T3	T4	T5	T6
Ignition temperature	> 450 °C	> 300 °C	> 200 °C	> 135 °C	> 100 °C	> 85 °C
Max. surface temperature permitted on the equipment	450 °C	300 °C	200 °C	135 °C	100 °C	85 °C

B2 - Classification of common gases (indicative values)

Gas	Ignition temperature °C	Temperature class of equipment	Explosion group
Acetic acid	464	T1	IIA
Acetic anhydride	316	T2	IIA
Acetone	465	T1	IIA
Acetylene	305	T2	IIC
Ammonia solution	630	T1	IIA
Amyl acetate	380	T2	IIA
Benzene (pure)	498	T1	IIA
Butane n	365	T2	IIA
Butanol n	343	T2	IIA
Carbon disulphide	95	T6	IIC
Carbon monoxide	605	T1	IIB
Cyclohexanon	420	T2	IIA
Dichlorethylene	460	T1	IIA
Diesel oil DIN 51601/04.78	220 to 300	T3	IIA
Ethanal	140	T4	IIA
Ethane	472	T2 - T1	IIA
Ethyl acetate	427	T2	IIA
Ethyl alcohol	425	T2	IIA - IIB
Ethyl chloride	510	T1	IIA
Ethylene	425	T2	IIB
Ethylene glycol	235	T3	IIB
Ethylene oxide	440	T2	IIB
Ethylic ether	180	T4	IIB
Fuel EL DIN 51 603 section 1/12.81	220 to 300	T3	IIA
Fuel L DIN 51 603 section 2/10.76	220 to 300	T3	IIA
Fuels M and S DIN 51 603 section 2/10.76	220 to 300	T3	IIA
Hexane n	225	T3	IIA
Hydrogen	560	T1	IIC
Hydrosulphuric acid	270	T3	IIB
Kerosene (or gas oil n°1)	220 to 300	T3	IIA
Methane	537	T1	IIA
Methanol	385	T2	IIA
Methylene chloride	625	T1	IIA
Naphtalene	520	T1	IIA
Oils for motors with boiling point < 135 °C	220 to 300	T3	IIA
Oleic acid	360	T2	IIB
Phenol	595	T1	IIA
Propane	450	T2	IIA
Propylene alcohol	405	T2	IIB
Special oils for motors with boiling point > 135 °C	220 to 300	T3	IIA
Tetraline (tetrahydronaphtalene)	425	T2	IIB
Toluene	482	T1	IIA
Town gas	560	T1	IIB

B3 - Definition of equipment

B3.1 - TYPES OF PROTECTION

European standards define, according to the selected type of protection, construction rules for electrical equipment which can be used in explosible conditions.

These protection methods each form a specific standard in addition to the EN 50014 standard (general rules) and are indicated by a lower case letter.

These are:

- d: Flameproof enclosure
- e: Increased safety
- p: Pressurized enclosure
- q: Powder filling
- o: Oil immersion
- i: Fail safe
- m: Encapsulating

B3.1.1 - Electric motors protected by "d" flameproof enclosure (EN 50014 & EN 50018)

They must satisfy, among others, the following requirements:

- Resist an internal explosion of the air/gas mixture without damage to or permanent distortion of the enclosure.

- Ensure that the ignition inside the enclosure cannot be transmitted to the ambient explosive atmosphere.

- Present a surface temperature lower than the ignition temperature of the gas.

These three conditions require:

- Very robust construction of the enclosure.

- Minimum joint lengths and reduced gaps so that explosion of the air/gas mixture that is present inside the enclosure is not transmitted to the ambient explosible atmosphere (end shield/housing recesses, shaft bodies, etc).

- Limited temperature rise, taking into account unfavourable operating conditions (voltage limits) ensuring, depending on the ambient temperature, a surface temperature that is lower than the temperature class required by the type of gas present.

B3.1.2 - Electric motors protected by "e" increased safety enclosure (EN 50014 & EN 50019)

The type "e" protection method concerns equipment which does not produce arcs, sparks or hot spots during normal operation. This excludes in particular all rotating machines with a commutator.

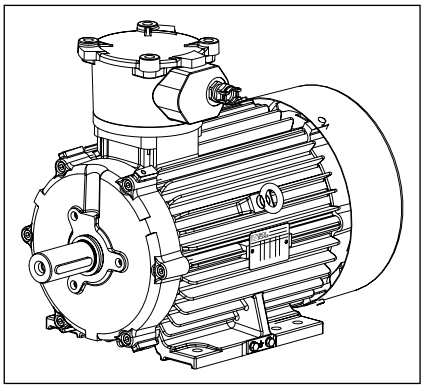
This requires, amongst others, the following design features:

- Special precautions to avoid the production of arcs and sparks: air distances, and minimum creepage distances between items which are powered up and, with regard to earths, absence of mechanical friction, insulation, minimum distances in ventilation systems, special materials for ventilation fans, etc.

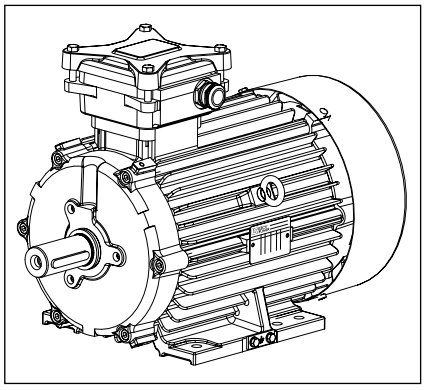
- Temperature **at all points in the motor** lower than the ignition temperature of the gas. This temperature must include a period with the rotor locked as defined in standard EN 50019.

B3.1.3 - "n" non-sparking electric motors (EN 50014 & EN 50021)

The type "n" protection method concerns equipment which generates no sparks, arcs, or hot spots, which operates in an exceptionally explosible atmosphere.



▲ ***Flameproof motor - "d" terminal box***



▲ ***Flameproof motor - "e" terminal box***

B3 - Definition of equipment

B3.2 - CONSTRUCTION STANDARDS

The European standards (EN) drawn up by the various member countries of CENELEC, are applicable in those countries as national standards.

Their contents are identical in all countries.

They have been published as national standards as shown in the table below:

Country	General rules	Protection type "d"	Protection type "e"
Germany	DIN EN 50014 VDE 0170/0171 T.1	DIN EN 50018 VDE 0170/0171 T.5	DIN EN 50019 VDE 0170/0171 T.6
Austria	EN 50014	EN 50018	EN 50019
France	NF EN 50014	NF EN 50018	NF EN 50019
Great Britain	BS 5501: Part 1	BS 5501: Part 5	BS 5501: Part 6
Internat. (CENELEC)	EN 50014	EN 50018	EN 50019

B3.2.1 - Comparison of USA/European standards

The installation regulations which apply in the USA are those specified in the NEC (National Electrical Code).

There is no mutual recognition between NEC and EN standards.

However, American firms in Europe or the Middle East often refer to the NEC, and it is therefore important to be able to translate:

NEC		CENELEC
Class I	Gas	Group/Category II
Class II	Dust	Group/Category II
Class III	Fibre	No specific standard
Division (DIV) I		Zone 0, 1 or 21
Division (DIV) II		Zone 2 or 22
Group A	Acetylene	II C
Group B	Hydrogen	II C
Group C		II B
Group D		II A

Motors which have been granted ATEX certification by INERIS cannot be used in the USA and Canada (please consult us for a design study).

B4 - Installation rules for surface industries

B4.1 - REGULATION RELATING TO ZONES AT RISK OF EXPLOSION CAUSED BY GAS AND VAPOURS

In zones at risk of explosion, electrical installations must be reduced to what is essential to the operating needs. Equipment, motors, ducting, necessary communication devices must, as far as possible, be placed outside the danger zones.

European Directive ATEX 94/9/EC, concerning electrical installations of plant classified as being likely to present risks of explosion, **requires in particular that the worker in an establishment:**

- Defines the zones where explosive atmospheres may appear.

- Selects electrical equipment suitable for the previously defined zones.

- Checks the conditions of installation, operation and maintenance of this equipment.

The standard EN 60079-10 can be used to determine dangerous regions.

B4.2 - CHOICE OF EQUIPMENT DEPENDING ON THE ZONE

Although coordinated construction codes exist, there is no coordinated regulation for the choice of equipment according to the zone (0, 1, 2) where it is installed, even though there is an EN 60079-14 recommendation.

Nevertheless it can be said that:

Zone 0:

The entire installation must be built with fail safe category “ia”. Only control or measurement equipment can be installed there.

Zone 1:

All electrical equipment used in zone 1 must be “safe”, in other words it must conform to standard NFC 23.514 (equivalent to EN 50014).

This equipment should be installed in accordance with the current rules and regulations. If "d" flameproof equipment is authorized for all countries, "e" increased safety equipment may be either totally or partially accepted.

In particular:

- France, Germany, Holland = totally accepted
- Belgium: partially (mains box but not motors)

Zone 2:

The equipment which can be used in zone 2 must be equipment that satisfies one of the two following conditions:

- Meets the rules for zone 1 equipment

- Conforms with the construction rules of a recognized standard for industrial electrical equipment which, during normal operation, does not generate arcs, sparks or hot surfaces which may cause ignition or an explosion. It can for instance conform to the English standard BS 5000 part 16 or to IEC 79.15. In this case, the equipment can be accompanied by a document issued by an official laboratory, or by a declaration of conformity from the manufacturer.

In all cases it is necessary to take account of the particular specifications and the internal safety rules for each industry in each country.

B4.3 - INSTALLATION TECHNOLOGIES

For installing electrical motors protected by "d" flameproof enclosures in zones at risk of explosion, there are three types of connection.

1. Direct entry of cables into the "d" flameproof enclosure via cable inlets of an approved type.

2. Indirect entry of cables via an "e" increased safety box.

3. Direct entry of cables into the "d" flameproof enclosure via tubes of an approved type ("conduit" system mainly used in the United States).

B4.4 - THE CABLES AND THEIR METHOD OF INSTALLATION

When selecting a type of cable to be used in explosible zones the following must be taken into account:

- Its area of use and environment (heat, humidity, corrosive environment, mechanical shocks).

- Its type of use.

- Its method of installation.

The passage of an electric current in a cable causes temperature rise due to the Joule effect. This phenomenon must be taken into account in explosible zones: in normal operation the maximum permissible current must be limited to 85% of the acceptable intensity in the zones where there is no danger of explosion (according to European harmonization document HD 384).

In all cases there must be constant monitoring that the maximum temperature of the cable remains below the ignition temperature of the gas.

The behaviour of burning cables is defined by the two following parameters (according to European harmonization document HD 405):

*** Reaction to fire:**

Ability to form a fuel for the fire and thus to contribute to the development of the fire.

There are 3 classes

- C1 = cable which does not cause fire to spread
- C2 = cable which does not cause flames to spread
- C3 = ordinary cable

*** Resistance to fire:**

Ability to continue operation in spite of the fire, for a certain period.

There are 2 classes:

- CR1 = cable performing its function in a fire for at least a certain time (if a cable is CR1 type, it is also at least C2 type)
- CR2 = ordinary cable

In some countries, the use of cables type C2 is required for explosible zones. The most common are discussed in standards:

- NFC 32-321 = unshielded rigid cable (wire manufacturer reference U 1000 RO2V)
- NFC 32-111 = shielded rigid cable (wire manufacturer reference U1000RGPFV)

B5 - Operating conditions

B5.1 - NORMAL OPERATING CONDITIONS

a/According to IEC 60034-1, motors can operate in the following normal conditions:

- ambient temperature within the range - 16 and + 40 °C

altitude less than 1000 m

- atmospheric pressure: 1050 hPa (mbar)

Standard EN 50014 § 4.2 concerning electrical equipment in an explosible atmosphere extends the range of ambient temperatures from - 20 to +40 °C as standard. In this case, no additional marking is necessary on the certified equipment.

Temperatures outside this range may be considered when the equipment is certified. An additional mark must therefore be added. These extensions involve special consultation.

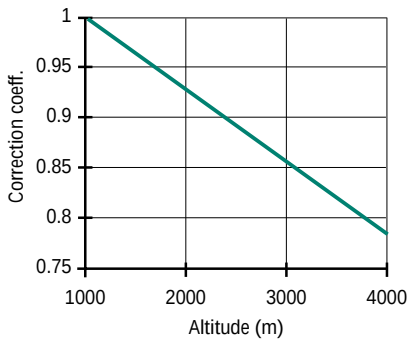
b/ FLSD motors are designed to operate in atmospheres where the relative humidity can reach 95% at 40 °C.

B5.2 - POWER CORRECTION

The power of our motors is given for continuous duty (S1) at nominal voltage and frequency, at up to 1000 m altitude and at a maximum ambient temperature of 40 °C as standard.

• Correction as a function of the altitude

For the different altitude values, apply a correction coefficient to the rated power as shown in the graph below.



• Motor used with FREQUENCY INVERTER

The certification of FLSD motors makes them suitable for use with frequency inverters, as long as the maximum permissible surface temperature of the motor (temperature class indicated on the motor) is not exceeded.

For this reason, the motors must be fitted with thermal winding probes for frame sizes 80 to 355 and a DE end shield probe for frame sizes 160 to 355.

Inverters of a type not designed for operation in an explosible zone must be placed in a non-explosible zone.

In all cases, a preliminary consultation is desirable. In fact, control of the motor by a frequency inverter generally requires, in view of the special applications, derating of the motor power. This in particular compensates for the additional losses caused by the voltage or current harmonics at the inverter output, and the problems of cooling at low speeds (sometimes requiring the addition of a flameproof forced ventilation unit whose operation is governed by the general power supply). The speed detection system must be certified for operation in explosible zones.

B5.3 - SEVERE ENVIRONMENT

Some operating conditions require special finishes for the environment: very dusty, humid, or harsh atmospheres.

The essential criteria for anti-corrosion protection apply to stainless steel components meeting the requirements of the ATEX Directive (screws and bolts, plates, cover), metal cable glands, protection of working parts (stator and rotor), special finishes.

B5.4 - HEATING WHEN STATIONARY

Machines which are subject to prolonged stops in particularly humid conditions are affected by high levels of internal condensation.

Heating the motor internally during standstill periods prevents condensation. This is achieved by supplying single-phase power (220 - 240V) to space heaters (fitted on request) which are switched on when the motor is stopped and cold (characteristics p. 67) and switched off when the motor is running.

FLSD flameproof
TEFV induction motors
Special information

B6 - External finish

LEROY-SOMER motors are protected with a range of surface finishes.
The surfaces receive appropriate special treatments, as shown below.

Standard FLSD motors conform to System IIa

B

Preparation of surfaces

SURFACE	PARTS	TREATMENT
Cast iron	All cast iron elements: housing for all the range, end shields and terminal boxes up to frame size 280	- SA 2.5 shot blasting - Application of primer (25 to 30 µ) or a coat of polyvinyl 20 µ[1]
Steel	Terminal box accessories end shields and terminal boxes from frame size 315	Phosphatization + Primer
	Covers	Electrostatic painting or Epoxy powder

Painting systems

PRODUCTS	ATMOSPHERE	SYSTEM	DESCRIPTION OF SYSTEMS
LEROY-SOMER motors	Moderately corrosive[2]: humid and outdoors (temperate climate)	**IIa**	1 base coat Epoxy 35/40 µm 1 coat polyurethane finish 25/30 µm
	Corrosive[2]: coastal, very humid (tropical climate)	**IIIa**	1 base coat Epoxy before assembly on internal and external surfaces of cast iron parts 35/40 µm 1 intermediate coat Epoxy 35/40 µm 1 coat polyurethane finish 25/30 µm
	Special conditions	System **IVb** and special (consult us)	1 base coat 35/40 µ 2 intermediate coats Epoxy 35/40 µ 1 coat Epoxy finish 35/40 µ

1. The polyvinyl butyral undercoat acts as a primer and base coat from frame size 160.

2. An atmosphere is said to be CORROSIVE when components are attacked by oxygen. It is said to be HARSH when components are attacked by bases, acids or salts.

The painting systems have been tested on steel plate in saline mist according to standard NFX 41 002 (5% Na Cl at 6<pH<7.5 at 35 °C, at 1 bar)

System IIa	250 hours
System IIIa	350 hours
System IV	500 hours

The standard paint colour for the FLSD range is:

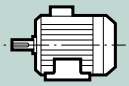
RAL 2004

C1 - Mounting arrangements

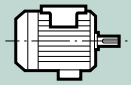
Mountings and positions (IEC standard 60034-7)

Foot mounted motors

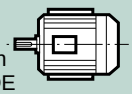
IM 1001 (IM B3)
- Horizontal shaft
- Feet on floor



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

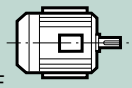


IM 1051 (IM B6)
- Horizontal shaft
- Wall mounted with feet on LHS when viewed from DE

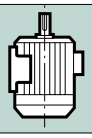


IM 1011 (IM V5)*
- Vertical shaft facing down
- Feet on wall

IM 1061 (IM B7)
- Horizontal shaft
- Wall mounted with feet on RHS when viewed from DE



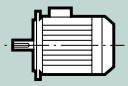
IM 1031 (IM V6)
- Vertical shaft facing up
- Feet on wall



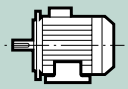
(FF) flange mounted motors

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

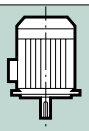
IM 3001 (IM B5)
- Horizontal shaft



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

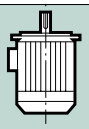


IM 3011 (IM V1)*
- Vertical shaft facing down

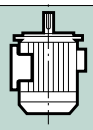


IM 2011 (IM V15)*
- Vertical shaft facing down
- Feet on wall

IM 3031 (IM V3)
- Vertical shaft facing up



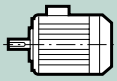
IM 2031 (IM V36)
- Vertical shaft facing up
- Feet on wall



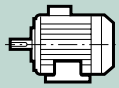
(FT) face mounted motors

• all frame sizes ≤ 132 mm
All positions are allowed

IM 3601 (IM B14)
- Horizontal shaft



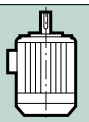
IM 2101 (IM B34)
- Horizontal shaft
- Feet on floor



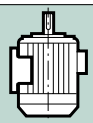
IM 3611 (IM V18)*
- Vertical shaft facing down

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



* All positions with shaft end facing down require the addition of a drip cover up to frame size 225 (for larger motors, on request).

Frame size	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
80 to 200	●	●	●	●	●	●	●	●	●	●	●	●
225 and 250	●	●	●	●	●	●	❍	●	●	●	●	●
280 and 315	●	❍	❍	❍	❍	❍	❍	●	●	●	●	❍
355	●	❍	❍	❍	❍	❍	❑	●	❍	●	●	❍

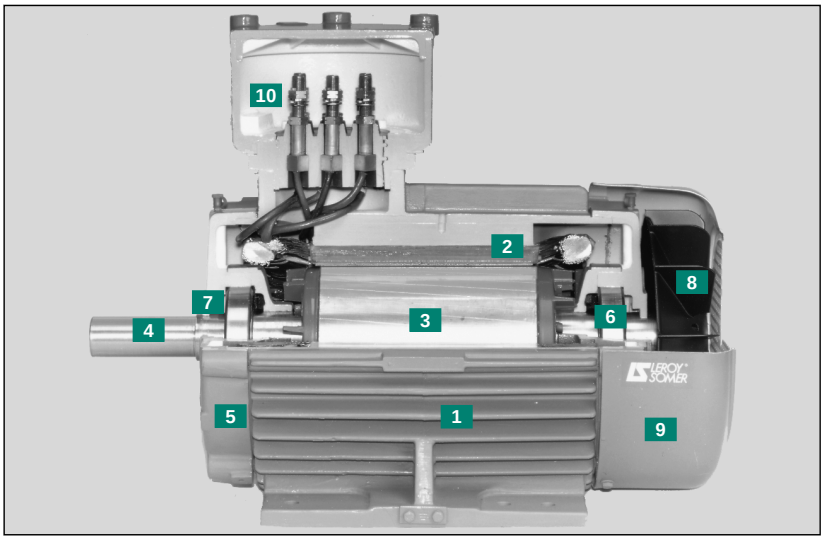
● : possible positions ❑: positions not available
❍ : please consult Leroy-Somer specifying the coupling method and the axial and radial loads if applicable

FLSD flameproof TEFV induction motors Construction

C2 - Components

C2.1 - DESCRIPTION OF STANDARD FLSD EEx d IIB T4 CAST IRON MOTORS

Component	Materials	Remarks
1 Finned housing	Cast iron	- with integral feet (except frame size 80), or without feet • 4, 6 or 8 fixing holes for foot mounting • lifting rings - external earth terminal
2 Stator	Insulated low-carbon magnetic steel laminations Insulated electroplated copper	- low carbon content guarantees long-term lamination pack stability - semi-enclosed slots - class F insulation
3 Rotor	Insulated low-carbon magnetic steel laminations Aluminium or copper	- squirrel cage with inclined cage bars - rotor cage pressure die-cast in aluminium (or alloy for special applications) or soldered in copper - heat shrink fit to shaft or keyed to shaft - rotor dynamically balanced to class N - half key
4 Shaft	Steel	- for frame size ≤ 132: • tapped shaft end • closed keyway - for frame size ≥ 160: • tapped shaft end • open keyway
5 End shields	Cast iron or steel	- Cast iron for frame sizes ≤ 280 - Steel for frame sizes ≥ 315
6 Bearings and lubrication		- type ZZ "greased for life" up to frame size 132 - regreasable types from 160 upwards - DE bearing locked on frame size 80 - NDE bearing preloaded from 90 to 280 preloaded at DE from size 315 upwards
7 Labyrinth seal Lipseals	Plastic or steel Synthetic rubber	- lipseal at drive end and non drive end for frame sizes up to 225 inclusive and 280 - labyrinth seal at drive end and non drive end for frame sizes ≥ 250 (except 280)
8 Fan	Composite material up to frame size 225 inclusive,	- 2 directions of rotation: straight blades
9 Fan cover	Pressed steel	- fitted with a drip cover for operation in vertical position, shaft end facing down for frame sizes 80 to 225. On request for larger sizes.
10 Terminal box	Cast iron for frame sizes ≤ 280 Steel for frame sizes ≥ 315	- type d in standard version - fitted with a flameproof cable gland (cable Ø must be specified at time of ordering, p. 36) - can be placed in any of 4 positions - internal earth terminal - terminal block or current bushing



C2 - Components

C2.2 - OTHER VERSIONS : FLSDE EEx de IIB CAST IRON MOTORS

These motors have a type "d" flameproof casing and a type "e" increased safety terminal box.

Terminal box	Cast iron	- type "e" increased safety - type "d" separation between motor casing and type "e" terminal box - type "e" safety terminal block for frame sizes ≤ 132 and type "e" current bushing for larger sizes

C2.3 - OTHER VERSIONS : FLSD EEx d IIC and FLSDE EEx de IIC CAST IRON MOTORS (for FRAME SIZE ≤ 280)

Terminal box	Cast iron	- special machining in order to comply with the Maximal Experimental Safe Gap (MESG) for group IIC (see p. 14)

These motors require special consultation.

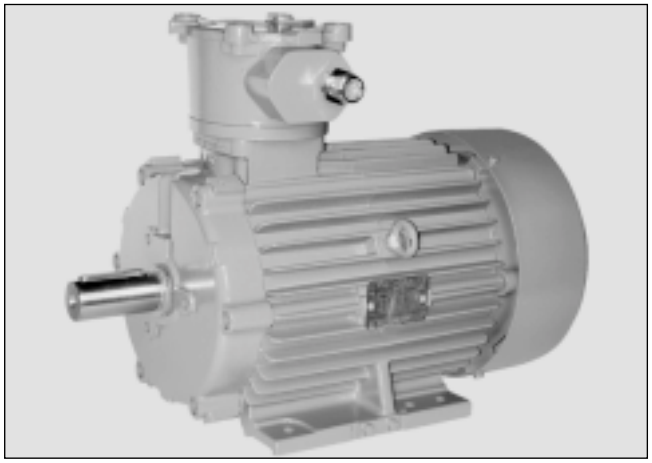
C2.4 - SPECIAL FINISHES

Certain application conditions require special finishes suitable for the environment (on request)

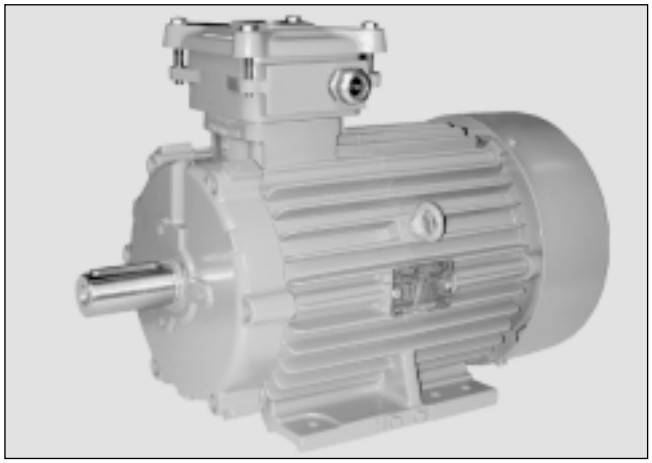
- **IP 6.: very dusty conditions:**
  dust protection identical to that on LSPX, FLSPX motors and LSPX FAP motors (motors for dusty explosive atmospheres) according to standard EN 50281-1-1.

- **IP .6: jets of water (excluding heavy seas):**
  waterproof protection available for frame sizes 90 to 355. Prior consultation with Leroy-Somer is necessary.

- **extremely harsh environments:**
  special painting systems according to individual specification
  stainless steels screws (tensile strength ≥ 78 daN/mm²)
  special cable glands



▲ ***Flameproof motor - Type "d" terminal box***



▲ ***Flameproof motor - Type "e" terminal box***

C3 - Bearings and lubrication

C3.1 - BEARINGS AND BEARING LIFE

Definitions

Load ratings

- Basic static load C_o:

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).

- Basic dynamic load 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 C_o 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 completed 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 length of time 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 basic dynamic load C expressed in daN and the applied loads (radial load F_r 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 (min-1)

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

p: an index which depends on the type of contact between the races and balls (or rollers)

p = 3 for ball bearings

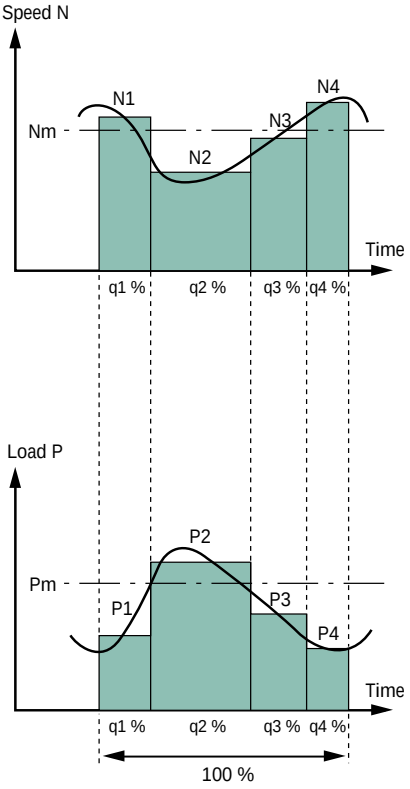
p = 10/3 for roller bearings

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

Variable load and speed of rotation

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

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



Nm: average speed of rotation

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

N_m: average equivalent dynamic load

$$P_m = \sqrt[1/p]{P_1^{1/p} \cdot \left(\frac{N_1}{N_m}\right) \cdot \frac{q_1}{100} + P_2^{1/p} \cdot \left(\frac{N_2}{N_m}\right) \cdot \frac{q_2}{100} + \ldots (daN)}$$

with q_1, q_2, etc as a %

Nominal lifetime L_{10h} is applicable to bearings made of bearing steel and normal operating conditions (lubricating film present, no pollution, 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:

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

with:

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).

Under normal operating conditions for FLSD motors, the corrected nominal lifetime, calculated with a failure probability factor a1 = 1 (L_{10ah}), is longer than the nominal lifetime L_{10h}.

C3 - Bearings and lubrication

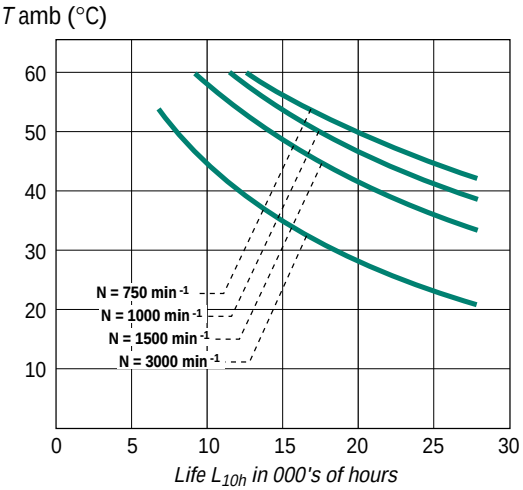
C3.2 - LUBRICATION OF BEARINGS

C3.2.1 - Permanently greased bearings

For **motors frame size** ≤ **132**, the type and size of the bearings make for long grease life and therefore lubrication for the lifetime of the machine.

The grease life L_{10h} according to speed of rotation and ambient temperature is shown on the chart opposite.

▼ ***Grease life L_{10h} in 000's of hours, for frames sizes < 132.***



C3.2.2 - Bearings with grease nipples

Motors of frame size ≥ 160 have grease nipples. The following table indicates the type of ball bearing, the quantity of grease and the regreasing intervals according to the type of motor, in an ambient temperature of 25 °C.

For vertical shaft machines used in an ambient temperature of 25 °C, the regreasing intervals will be approximately 80% of the values stated.

Motors operating in an ambient temperature of 40 °C need more frequent lubrication. The regreasing intervals will be around 50% of the values stated (in all cases, comply with the requirements on the motor nameplates).

Grease references: see instructions on nameplate.

Type of motor	Bearings		Quantity of grease	Regreasing intervals in hours			
	N.D.E.	D.E.	cm³	3000 min⁻¹	1500 min⁻¹	1000 min⁻¹	750 min⁻¹
FLSD 160 -180	6310	6310	15	4 600	11 000	18 000	24 000
FLSD 200	6312	6312	20	3 600	9 700	16 000	22 000
FLSD 225*	(6312)	6313	23	3 200	5 000	15 000	21 000
FLSD 250	6314	6314	26	2 800	8 300	14 000	20 000
FLSD 280	6317	6317	37	1 700	-	-	-
FLSD 280	6318	6318	40	-	6 200	11 000	16 000
FLSD 315 S/M/L	6317	6317	37	1 700	-	-	-
FLSD 315 S/M/L	6320	6320	50	-	5 400	10 000	14 500
FLSD 355	6317	6317	37	1 700	-	-	-
FLSD 355	6322	6322	60	-	4 500	9 000	13 500

* For 6313

C3.3 - GREASE LIFE

The lifetime of a lubricating grease depends on:

- the characteristics of the grease (type of soap and base oil, etc)

- service stress (type and size of bearing, speed of rotation, operating temperature, etc)

- contamination

C3 - Bearings and lubrication

C3.4 - TYPES OF BEARING AND STANDARD BEARING ASSEMBLIES

		Horizontal shaft	Vertical shaft	
			Shaft facing down	Shaft facing up
Flange mounted and/or foot mounted motors	standard mounting	The DE bearing is: - locked at DE for frame 90 to 112 - locked for 80 and from 132 to 315 ST The NDE bearing is locked for frames 315 M to 355.	The DE bearing is: - locked at DE for frame 90 to 112 - locked for 80 and from 132 to 315 ST The NDE bearing is locked for frames 315 M to 355.	The DE bearing is: - locked at DE for frame 90 to 112 - locked for 80 and from 132 to 315 ST The NDE bearing is locked for frames 315 M to 355.
	on request	DE bearing locked for frames ≤ 112	DE bearing locked for frames ≤ 112	DE bearing locked for frames ≤ 112

Important: When ordering, state correct mounting type and position (see section C1).

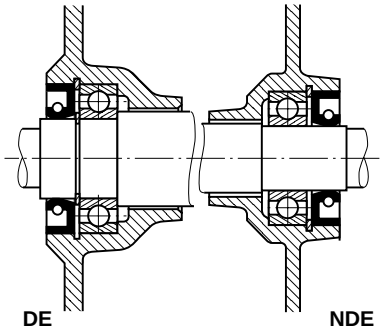
Motor		No. of poles	Standard mounting			
					Assembly diagram reference	
Frame/Type	LEROY-SOMER designation		Non drive end bearing (N.D.E.)	Drive end bearing (D.E.)	Foot mounted motors	Flange mounted (or foot and flange) motors
80 L	FLSD 80 L	2 ; 4 ; 6 ; 8	6004 ZZ	6005 ZZ	1	1
90 S/L	FLSD 90 S/L	2 ; 4 ; 6 ; 8	6205 ZZ C3	6305 ZZ C3	2	2
100 L	FLSD 100 L	2 ; 4 ; 6 ; 8	6305 ZZ C3	6306 ZZ C3	2	2
112 M	FLSD 112 M	2 ; 4 ; 6 ; 8	6306 ZZ C3	6306 ZZ C3	2	2
132 S/M	FLSD 132 S/M	2 ; 4 ; 6 ; 8	6308 ZZ C3	6308 ZZ C3	3	3
160 M/L	FLSD 160 M/L	2 ; 4 ; 6 ; 8	6310 C3	6310 C3	4	4
180 M/L	FLSD 180 M/L	2 ; 4 ; 6 ; 8	6310 C3	6310 C3	4	4
200 L	FLSD 200 L	2 ; 4 ; 6 ; 8	6312 C3	6312 C3	4	4
225 S/M	FLSD 225 S/M	2 ; 4 ; 6 ; 8	6312 C3	6313 C3	5	5
250 M	FLSD 250 M	2 ; 4 ; 6 ; 8	6314 C3	6314 C3	6	6
280 S	FLSD 280 S	2	6317 C3	6317 C3	7	7
280 S	FLSD 280 S	4 ; 6 ; 8	6318 C3	6318 C3	7	7
280 M	FLSD 280 M	2	6317 C3	6317 C3	7	7
280 M	FLSD 280 M	4 ; 6 ; 8	6318 C3	6318 C3	7	7
315 S/M	FLSD 315 S/M	2	6317 C3	6317 C3	8	8
315 S/M	FLSD 315 S/M	4 ; 6 ; 8	6320 C3	6320 C3	8	8
315 L	FLSD 315 L (A,B)	2	6317 C3	6317 C3	8	8
315 L	FLSD 315 L (A,B)	4 ; 6 ; 8	6320 C3	6320 C3	8	8
355 L	FLSD 355 L (A,B,C,D)	2	6317 C3	6317 C3	8	8
355 L	FLSD 355 L (A,B,C,D)	4 ; 6 ; 8	6322 C3	6322 C3	8	8

Bearing assemblies with roller bearings are available from frame sizes 132 to 355.

C3 - Bearings and lubrication

C3.4.1 - Bearing assembly diagrams

1



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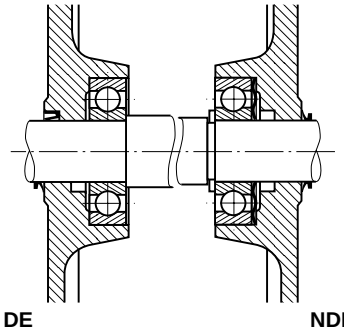

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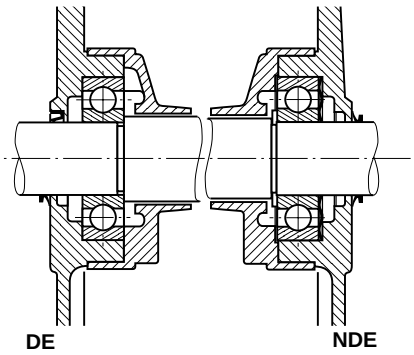

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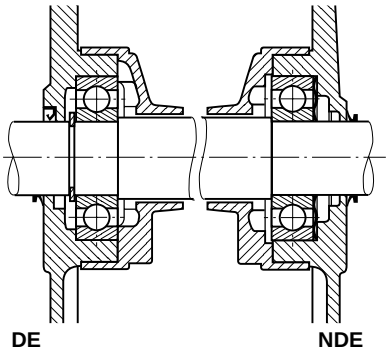

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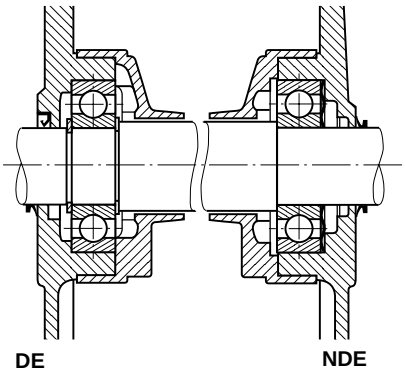

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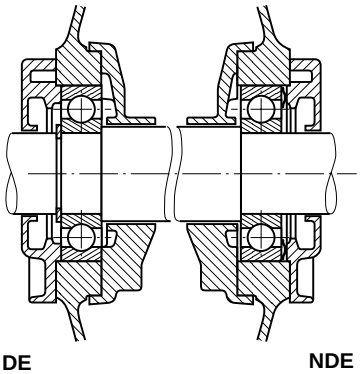

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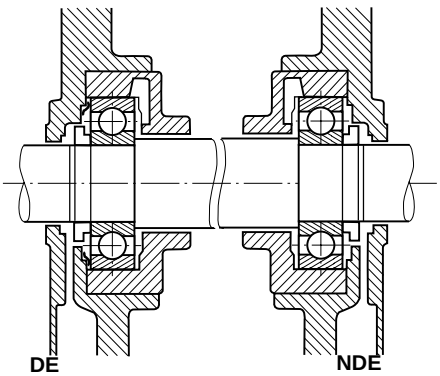

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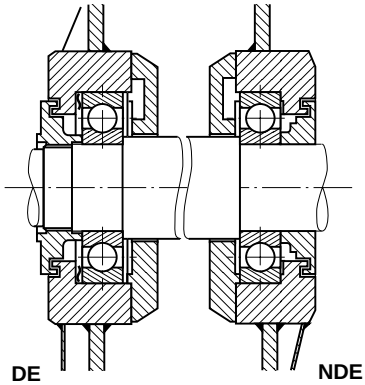
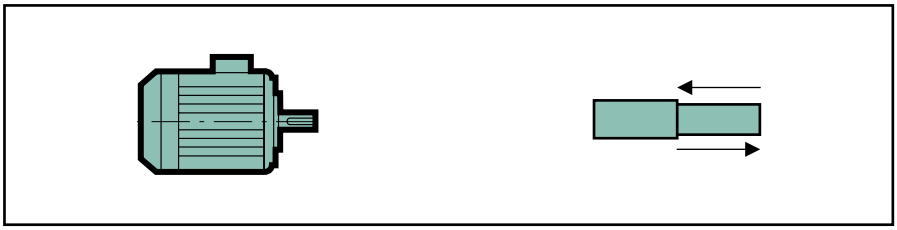


C3 - Bearings and lubrication

C3.4.2 - Permissible axial load (in daN) on main shaft extension for standard bearing assembly



Horizontal motor

Nominal bearing life L_{10h} : 25,000 hours

Motor		2 poles N = 3000 min^{-1}		4 poles N = 1500 min^{-1}		6 poles N = 1000 min^{-1}		8 poles N = 750 min^{-1}	
Frame size	Type	→	←	→	←	→	←	→	←
		IM B3 / B6 IM B7 / B8 IM B5 / B35 IM B14 / B34	IM B3 / B6 IM B7 / B8 IM B5 / B35 IM B14 / B34	IM B3 / B6 IM B7 / B8 IM B5 / B35 IM B14 / B34	IM B3 / B6 IM B7 / B8 IM B5 / B35 IM B14 / B34	IM B3 / B6 IM B7 / B8 IM B5 / B35 IM B14 / B34	IM B3 / B6 IM B7 / B8 IM B5 / B35 IM B14 / B34	IM B3 / B6 IM B7 / B8 IM B5 / B35 IM B14 / B34	IM B3 / B6 IM B7 / B8 IM B5 / B35 IM B14 / B34
80	FLSD 80 L	41	41	53	53	63	63	65	65
90	FLSD 90 S	52	(81)*	69	(99)*	82	(110)*	91	(120)*
90	FLSD 90 L	52	(81)*	69	(99)*	82	(110)*	91	(120)*
100	FLSD 100 L	66	(101)*	87	(122)*	103	(138)*	114	(150)*
112	FLSD 112 M	64	(103)*	85	(124)*	101	(140)*	112	(150)*
132	FLSD 132 S	118	167	154	203	181	230	201	250
132	FLSD 132 M	-	-	155	203	181	230	201	250
160	FLSD 160 M	160	268	216	324	256	364	286	395
160	FLSD 160 L	160	268	216	324	256	364	286	395
180	FLSD 180 M	160	268	216	324	-	-	-	-
180	FLSD 180 L	-	-	216	324	256	364	286	395
200	FLSD 200 L	230	338	303	411	357	465	396	504
225	FLSD 225 S	-	-	353	461	-	-	458	566
225	FLSD 225 M	269	377	353	461	413	521	458	566
250	FLSD 250 M	334	414	460	540	559	639	638	718
280	FLSD 280 S	358	518	526	686	642	802	713	873
280	FLSD 280 M	505	345	494	654	595	755	685	805
315	FLSD 315 S/M	486	326	746	546	905	705	963	763
315	FLSD 315 LA	504	344	728	528	886	686	940	740
315	FLSD 315 LB	487	327	733	533	847	647	890	690
355	FLSD 355 LA	453	293	788	587	934	694	1006	770
355	FLSD 355 LB	448	288	771	531	892	652	945	705
355	FLSD 355 LC	443	285	751	512	-	-	-	-
355	FLSD 355 LD	440	280	736	496	805	565	871	631

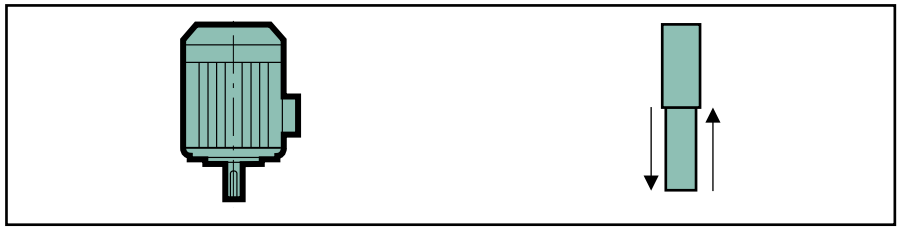
( )* The axial loads in brackets are the permissible axial loads for locked DE bearings (non-standard assembly, special order).

C3 - Bearings and lubrication

C3.4.2 - Permissible axial load (in daN) on main shaft extension for standard bearing assembly

Vertical motor
Shaft facing down

Nominal bearing life L_{10h} :
25,000 hours



Motor		2 poles N = 3000 min^{-1}		4 poles N = 1500 min^{-1}		6 poles N = 1000 min^{-1}		8 poles N = 750 min^{-1}	
Frame size	Type	↓ IM V5 IM V1 / V15 IM V18 / V58..	↑ IM V5 IM V1 / V15 IM V18 / V69..	↓ IM V5 IM V1 / V15 IM V18 / V69..	↑ IM V5 IM V1 / V15 IM V18 / V69..	↓ IM V5 IM V1 / V15 IM V18 / V69..	↑ IM V5 IM V1 / V15 IM V18 / V69..	↓ IM V5 IM V1 / V15 IM V18 / V69..	↑ IM V5 IM V1 / V15 IM V18 / V69..
80	FLSD 80 L	38	44	50	57	59	68	60	69
90	FLSD 90 S	48	(85)*	64	(104)*	76	(117)*	85	(126)*
90	FLSD 90 L	48	(86)*	63	(105)*	75	(117)*	84	(126)*
100	FLSD 100 L	60	(106)*	80	(130)*	95	(146)*	106	(157)*
112	FLSD 112 M	53	(113)*	73	(136)*	89	(152)*	100	(163)*
132	FLSD 132 S	101	183	133	224	156	255	184	267
132	FLSD 132 M	-	-	131	227	156	255	180	271
160	FLSD 160 M	133	295	184	355	222	400	251	428
160	FLSD 160 L	128	300	177	363	214	406	247	433
180	FLSD 180 M	121	307	171	368	-	-	-	-
180	FLSD 180 L	-	-	166	373	203	417	236	443
200	FLSD 200 L	168	400	238	477	281	540	311	590
225	FLSD 225 S	-	-	275	538	-	-	369	655
225	FLSD 225 M	195	450	265	548	319	615	357	667
250	FLSD 250 M	268	481	376	627	460	740	538	620
280	FLSD 280 S	424	493	552	727	676	831	726	941
280	FLSD 280 M	400	500	504	734	616	824	639	926
315	FLSD 315 S/M	361	545	582	861	764	976	800	1084
315	FLSD 315 LA	344	572	546	876	726	988	756	1090
315	FLSD 315 LB	306	596	514	909	644	1018	680	1100
355	FLSD 355 LA	244	648	512	1050	684	1175	720	1340
355	FLSD 355 LB	222	667	475	1067	605	1199	618	1367
355	FLSD 355 LC	195	692	425	1081	-	-	-	-
355	FLSD 355 LD	175	707	391	1107	432	1259	494	1397

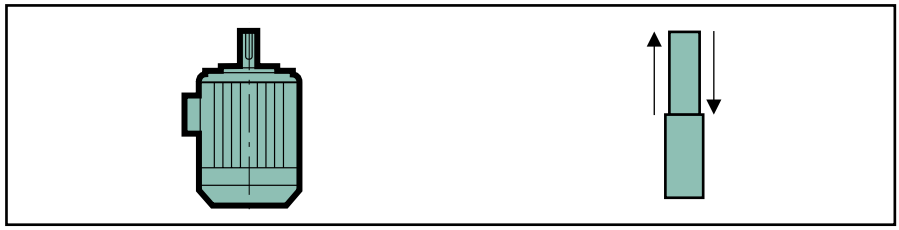
( )* The axial loads in brackets are the permissible axial loads for locked DE bearings (non-standard assembly, special order).

C3 - Bearings and lubrication

C3.4.2 - Permissible axial load (in daN) on main shaft extension for standard bearing assembly

Vertical motor
Shaft facing up

Nominal bearing life L_{10h} :
25,000 hours



Motor		2 poles N = 3000 min^{-1}		4 poles N = 1500 min^{-1}		6 poles N = 1000 min^{-1}		8 poles N = 750 min^{-1}	
Frame size	Type	↓ IM V6 IM V3 / V36 IM V19 / V69..	↑ IM V6 IM V3 / V36 IM V19 / V69..	↓ IM V6 IM V3 / V36 IM V19 / V69..	↑ IM V6 IM V3 / V36 IM V19 / V69..	↓ IM V6 IM V3 / V36 IM V19 / V69..	↑ IM V6 IM V3 / V36 IM V19 / V69..	↓ IM V6 IM V3 / V36 IM V19 / V69..	↑ IM V6 IM V3 / V36 IM V19 / V69..
80	FLSD 80 L	38	44	50	57	59	68	60	69
90	FLSD 90 S	(77)*	56	(93)*	75	(105)*	87	(115)*	97
90	FLSD 90 L	(77)*	56	(93)*	75	(105)*	88	(114)*	97
100	FLSD 100 L	(95)*	71	(115)*	94	(130)*	110	(142)*	122
112	FLSD 112 M	(92)*	74	(112)*	97	(128)*	112	(140)*	123
132	FLSD 132 S	150	134	183	175	205	206	233	218
132	FLSD 132 M	-	-	180	177	205	206	230	222
160	FLSD 160 M	240	187	292	247	330	290	360	320
160	FLSD 160 L	236	192	285	255	322	300	355	325
180	FLSD 180 M	229	200	280	260	-	-	-	-
180	FLSD 180 L	-	-	275	265	310	310	344	335
200	FLSD 200 L	277	286	346	370	390	432	420	481
225	FLSD 225 S	-	-	383	430	-	-	477	547
225	FLSD 225 M	303	343	373	440	427	507	466	560
250	FLSD 250 M	348	400	456	547	540	660	618	740
280	FLSD 280 S	424	493	552	727	676	831	726	941
280	FLSD 280 M	401	502	504	735	616	824	639	926
315	FLSD 315 S/M	361	545	582	861	764	976	800	1084
315	FLSD 315 LA	344	572	546	876	726	988	756	1091
315	FLSD 315 LB	306	596	514	909	644	1018	681	1098

355 : prior consultation

( )* The axial loads in brackets are the permissible axial loads for locked DE bearings (non-standard assembly, special order).

C3 - Bearings and lubrication

C3.4.3 - Permissible radial load on 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 applied to drive shaft extension: Fpr

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

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

with:

P_N = rated motor power (kW)

D = external diameter of the drive pulley (mm)

N_N = rated speed of the motor (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.

● Permission radial force on the drive shaft extension

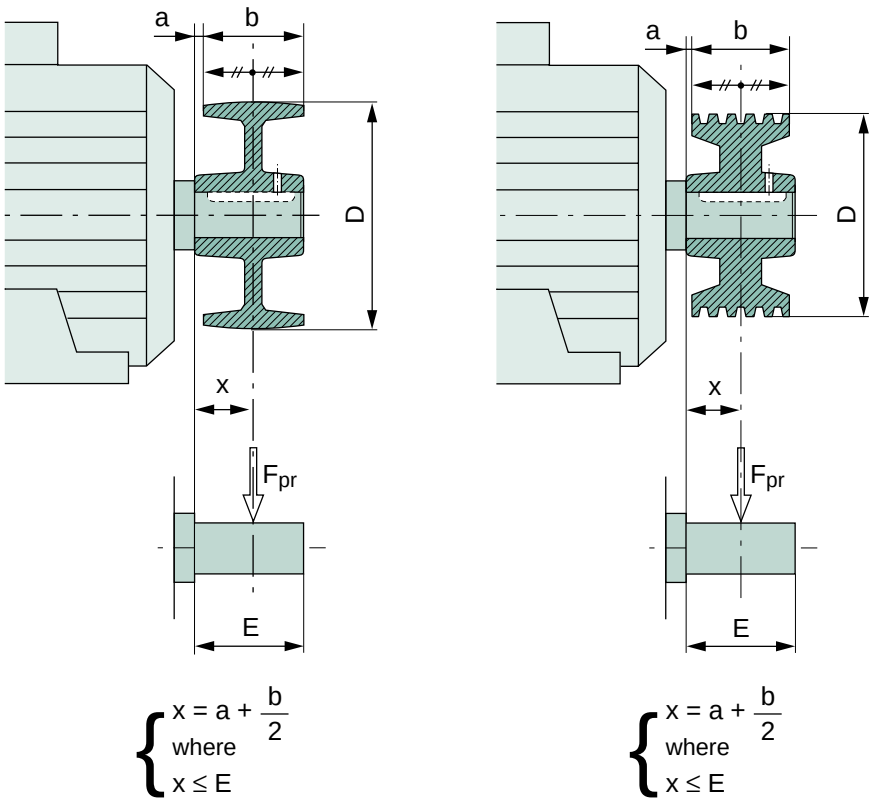
The charts on the following pages indicate, for each type of motor, the radial force FR at a distance X permissible on the drive end shaft extension, for a bearing life L_{10h} of 25,000 hours.

Note: For frame sizes ≥ 315 M, the selection charts are applicable for a motor installed with the shaft horizontal.

● Change in bearing life depending on the radial load factor

For a radial load Fpr (Fpr ≠ F_R), applied at distance X, the bearing life L_{10h} changes, at a first approximation, in the ratio k_R, (k_R = Fpr / F_R) as shown in the chart opposite, for standard assemblies.

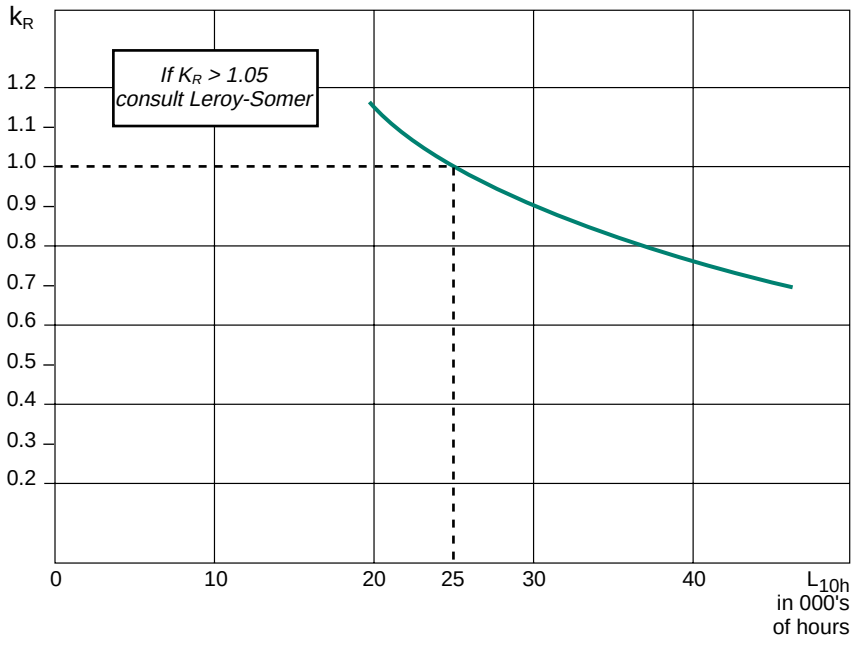
If the load factor k_R is greater than 1.05, you should consulter our technical department, stating mounting position and direction of force before opting for a special assembly.



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

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

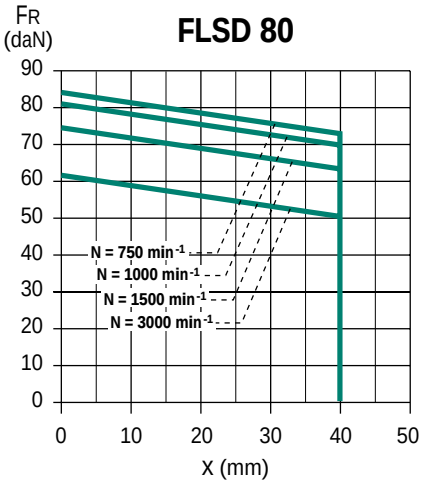
▼ ***Change in bearing life L_{10h} depending on the radial load factor k_R for standard assemblies.***

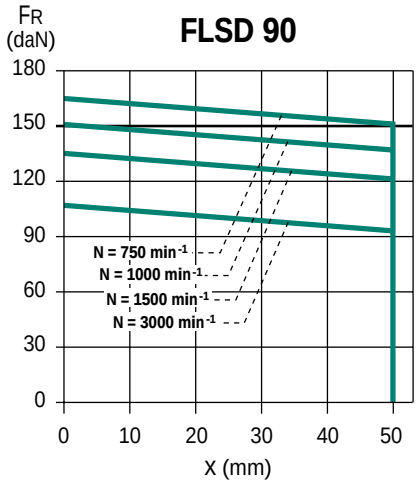


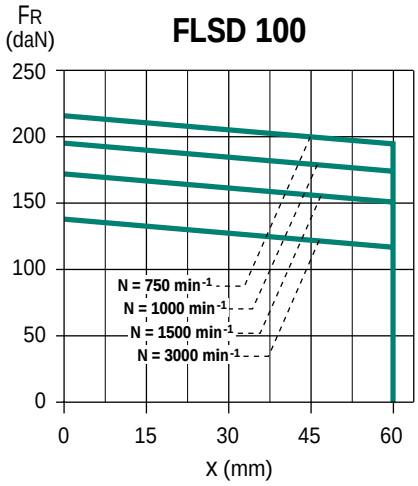
C3 - Bearings and lubrication

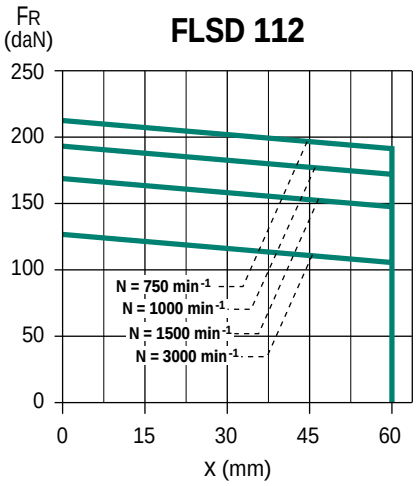
C3.4.4 - Standard assembly

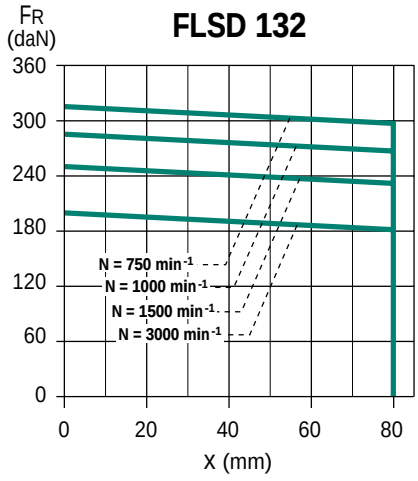
Permissible radial load on main shaft extension with a bearing life L_{10h} of 25,000 hours.

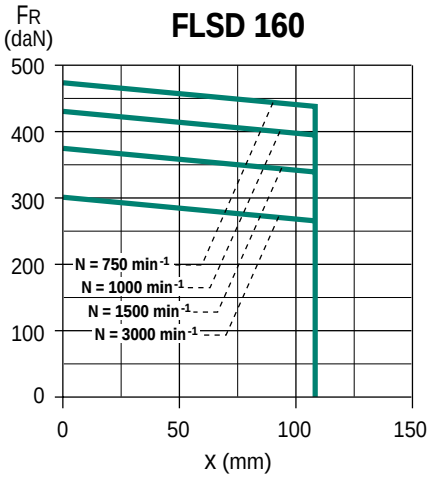


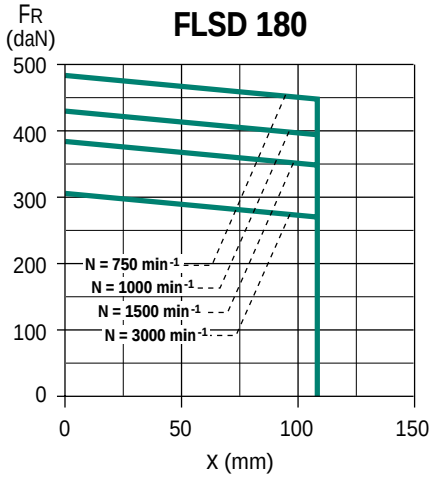








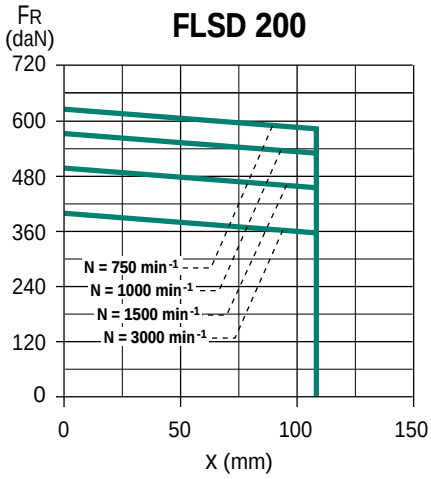


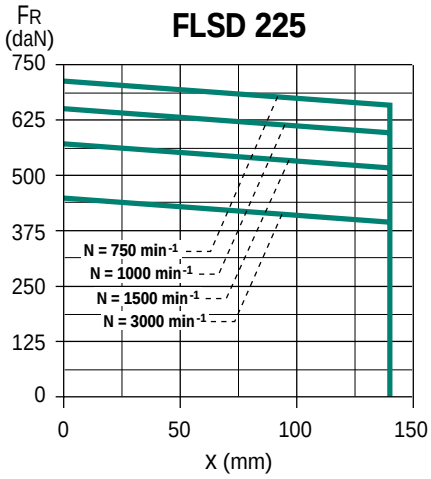


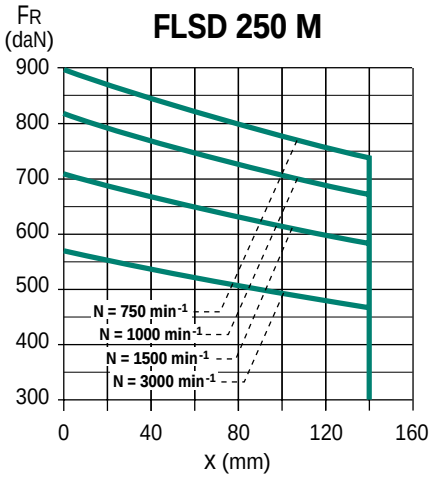
C3 - Bearings and lubrication

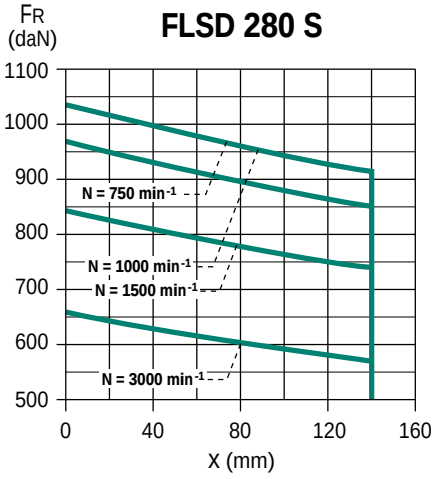
C3.4.4 - Standard assembly

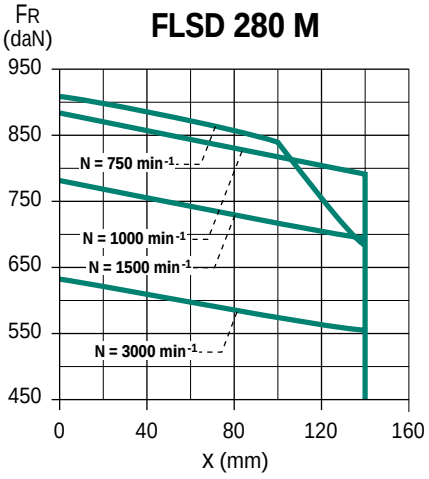
Permissible radial load on main shaft extension with a bearing life L_{10h} of 25,000 hours.

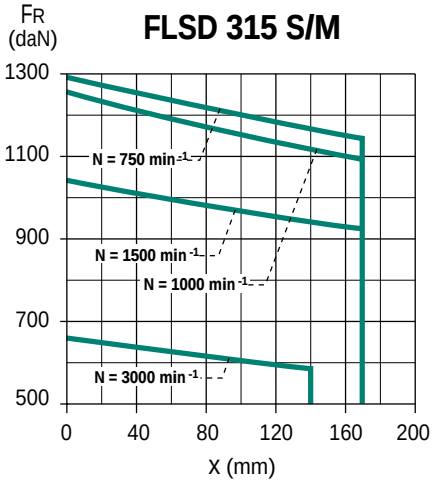








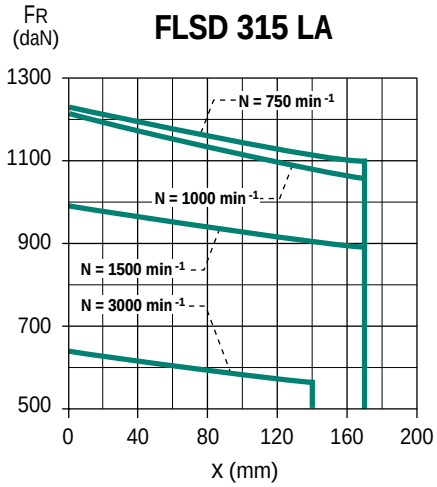


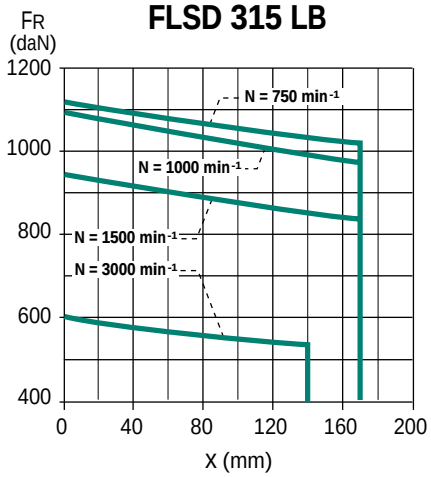


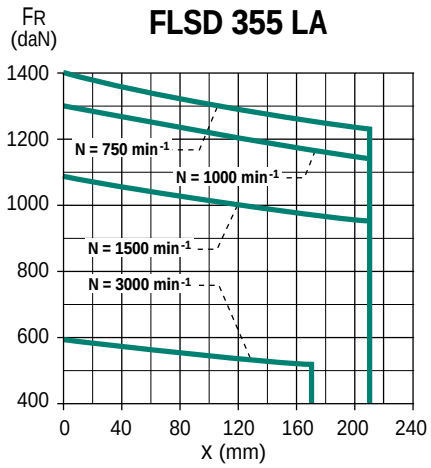
C3 - Bearings and lubrication

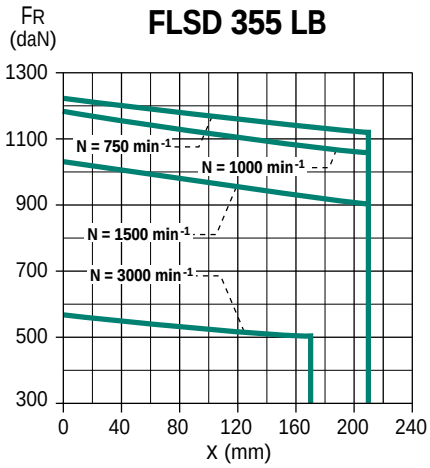
C3.4.4 - Standard assembly

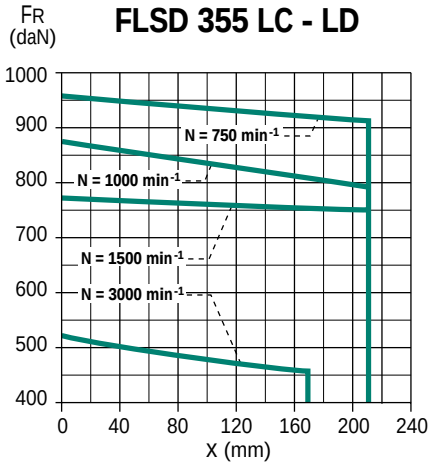
Permissible radial load on main shaft extension with a bearing life L_{10h} of 25,000 hours.











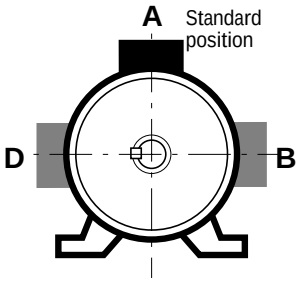
C4 - Mains connection

C4.1 - TERMINAL BOX AND CABLE GLAND POSITIONS

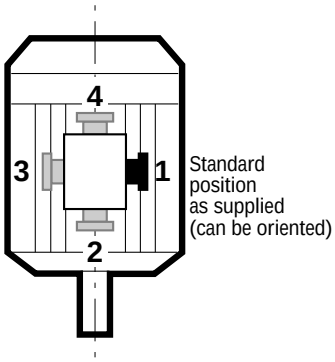
Placed as standard on the top of the motor, the terminal box has IP 55 protection and is fitted with a cable gland (see table in C4.3).

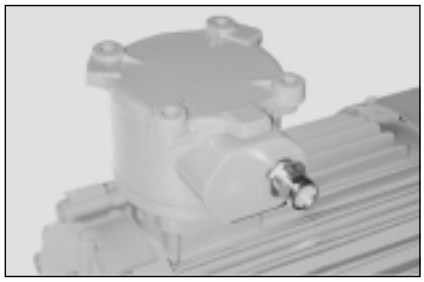
The standard position of the cable gland is on the right, seen from the drive end (position A1) but , owing to the symmetrical construction of the box, it can usually be placed in any of the 4 directions (see table below).

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



▼ ***Positions of the cable gland in relation to the drive end***

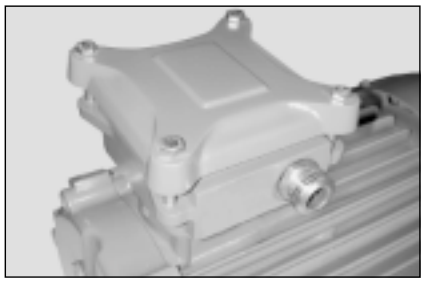




▲ ***Type "d" terminal box***

Terminal box position	A	B	D
FLSD 80 to 315 ST	●	-	-
FLSD 315 M to 355	●	❍	❍

●: standard ❍: ask for quotation - : not available



▲ ***Type "e" terminal box***

Cable gland position	1	2	3	4
Foot mounted motor				
FLSD 80 to 355	●	●	●	●
FT face mounted motor				
FLSD 80 to 112	●	❍	●	●
FF flange mounted motor				
FLSD 80 to 250	●	❍	●	●
FLSD 280 to 355	●	-	●	●

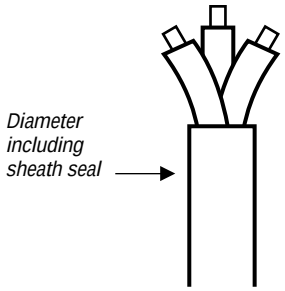
● : standard ● : possible by simply turning round the terminal box*
❍ : ask for quotation - : not available

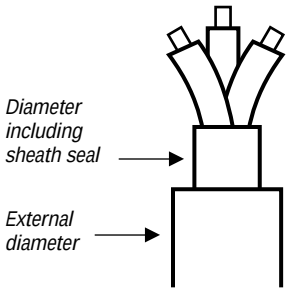
* **Important:** Take the necessary precautions when dismantling and re-assembling the terminal box, in order to maintain the flameproof properties of the equipment. **This is the responsibility of the person carrying out the operation.**

C4 - Mains connection

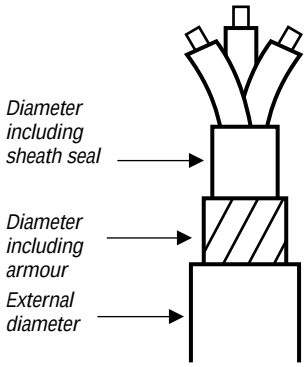
C4.2 - POWER SUPPLY CABLES (DIAMETERS TO BE SUPPLIED FOR SELECTION OF THE CABLE GLAND)

Non-armoured cable
(used in conjunction with cable gland type ADE 1 F)





Armoured cable
(used in conjunction with cable gland type ADE 3 F)



The sheath seal diameter of the power supply cable is compressed by an approved cable gland ring, thus creating the flameproof seal. Anchoring generally affects the external diameter of the cable.

The sheath seal diameter must correspond to a permissible diameter for the cable gland.
THIS CONDITION IS ESSENTIAL FOR MAINTAINING THE FLAMEPROOF PROPERTIES OF THE MOTOR.

Standard FLSD motors are supplied with an anchored cable gland

C4.3 - CABLE GLAND FOR "d" FLAMEPROOF TERMINAL BOXES

C4.3.1 - Standard cable gland table (non-armoured cables):

Frame size	Single speed motor		Cable gland for accessories: PTC - PTO / PTF / etc	
	Cable gland type	For cable diameter (mm) including sheath seal (flameproof seal)	Cable gland type	For cable diameter (mm) including sheath seal (flameproof seal)
80	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
90	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
100	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
112	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
132	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
160	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
180	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
200	ADE 1F ISO M40 x 1.5 no. 9	21 to 34	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
225	ADE 1F ISO M40 x 1.5 no. 9	21 to 34	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
250	ADE 1F ISO M40 x 1.5 no. 9	21 to 34	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
280	ADE 1F ISO M50 x 1.5 no. 10	27 to 41	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
315 S/M	ADE 1F ISO M63 x 1.5 no. 11	33 to 48	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
315 L	ADE 1F ISO M75 x 1.5 no. 13	47 to 65	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16
355*	ADE 1F ISO M63 x 1.5 no. 11 or ADE 1F ISO M75 x 1.5 no. 13	33 to 48 or 47 to 65	ADE 1F ISO M20 x 1.5 no. 6	8.5 to 16

* Supplied with 2 cable glands.
ADE type cable glands are nickel-plated brass.

CAUTION: - cable gland for IIB motors = ADE 1F
- cable gland for IIC motors = ADL 1F } **same sizes**

C4 - Mains connection

C4.3.2 - Number and type of adaptable cable glands on type "d" terminal box

The following table indicates for standard terminal boxes:

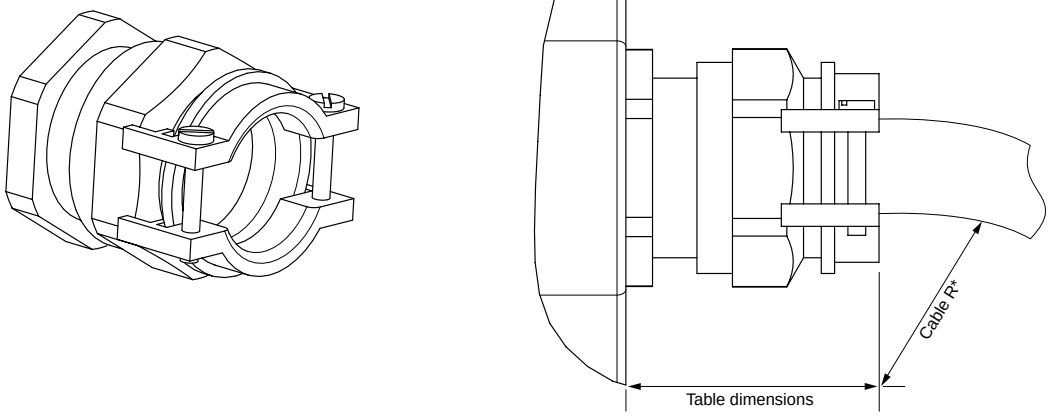
- the cable gland normally supplied
- the largest size of cable gland which can be supplied for connecting a single cable
- the largest size of cable glands which can be supplied for connecting two cables

Terminal box for frame size	Standard cable gland		Largest size for 1 cable gland		Largest size for 2 cable glands	
	Type	Permissible cable Ø (mm)	Type	Permissible cable Ø (mm)	Type	Permissible cable Ø (mm)
80	ADE1F ISO M20 x 1.5 no. 6	8.5 to 16	ADE1F ISO M25 x 1.5 no. 7	12 to 20.5	ADE1F ISO M25 x 1.5no.7**	12 to 20.5
90 - 112	ADE1F ISO M20 x 1.5 no. 6	8.5 to 16	ADE1F ISO M25 x 1.5 no. 7	12 to 20.5	ADE1F ISO M25 x 1.5 no. 7	12 to 20.5
132	ADE1F ISO M20 x 1.5 no. 6	8.5 to 16	ADE1F ISO M25 x 1.5 no. 7	12 to 20.5	ADE1F ISO M25 x 1.5 no. 7	12 to 20.5
160 - 180	ADE1F ISO M20 x 1.5 no. 6	8.5 to 16	ADE1F ISO M50 x 1.5 no.10	27 to 41	ADE1F ISO M50 x 1.5no.10	27 to 41
200 - 225	ADE1F ISO M40 x 1.5 no. 9	21 to 34	ADE1F ISO M50 x 1.5 no.10	27 to 41	ADE1F ISO M50 x 1.5no.10	27 to 41
250	ADE1F ISO M40 x 1.5 no. 9	21 to 34	ADE1F ISO M75 x 1.5 no.13	47 to 65	ADE1F ISO M75 x 1.5 no.13	47 to 65
280	ADE1F ISO M50 x 1.5 no.10	27 to 41	ADE1F ISO M75 x 1.5 no.13	47 to 65	ADE1F ISO M75 x 1.5 no.13	47 to 65
315 S/M	ADE1F ISO M63 x 1.5 no.11	33 to 48	ADE1F ISO M75 x 1.5 no.13	47 to 65	ADE1F ISO M75 x 1.5 no.13	47 to 65
315 L	ADE1F ISO M75 x 1.5 no.13	47 to 65	ADE1F ISO M75 x 1.5 no.13	47 to 65	ADE1F ISO M75 x 1.5 no.13	47 to 65
355*	ADE1F ISO M63 x 1.5 no. 11 or ADE1F ISO M75 x 1.5 no. 13	33 to 48 or 47 to 65	ADE1F ISO M75 x 1.5 no.13	47 to 65	ADE1F ISO M75 x 1.5 no.13	47 to 65

* Supplied with 2 cable glands.
** 1 cable gland on each side.

C4.3.3 - Dimensions of standard cable glands on type "d" terminal box

Type of cable gland	ISO M20 x 1.5 no. 6	ISO M25 x 1.5 no. 7	ISO M40 x 1.5 no. 9	ISO M50 x 1.5 no. 10	ISO M63 x 1.5 no. 11	ISO M75 x 1.5 no. 13
ADE 1F	30	32	41	44	46	54
ADE 3F	32	35	46	48	54	61



**Bending radius according to cable supplier catalogue.*

IMPORTANT: The installer is responsible for the seal and the flameproof qualities of the cable gland following connection on site.

C4 - Mains connection

C4.3.4 - Table of optional "e" increased safety terminal boxes

Table of approved "e" type cable glands:

Terminal box for frame size	Standard cable gland		Largest size for 1 cable gland		Largest size for 2 cable glands	
	Type	Permissible cable Ø (mm)	Type	Permissible cable Ø (mm)	Type	Permissible cable Ø (mm)
80 - 112	CMDEL M20x1.5 no.6	7.5 to 13	CMDEL M25x1.5 no.7	12.5 to 18	CMDEL M20x1.5 no.6	7.5 to 13
132	CMDEL M25x1.5 no.7	12.5 to 18	CMDEL M25x1.5 no.7	12.5 to 18	CMDEL M25x1.5 no.7	12.5 to 18
160	CMDEL M25x1.5 no.7	12.5 to 18				
180 - 200	CMDEL M32x1.5 no.8	17.5 to 25				
225	CMDEL M40x1.5 no.9	24.5 to 33.5	ON REQUEST		ON REQUEST	
250 - 315	CMDEL M50x1.5 no.10	33 to 43				
355	CMA 3" GC	40 to 62				
Auxiliaries	CMDEL M16 x 1.5 no. 5 CMDEL M20 x 1.5 no. 6	6 to 11 7.5 to 13				

C4.4 - POWER SUPPLY TERMINALS - DIRECTION OF ROTATION

The motors are fitted with a block of 6 terminals up to frame size 132, and with terminal posts above this size.

The terminal markings comply with IEC 60034-8 (or NFC51 118).

When the motor is running in U1, V1, W1 or 1U, 1V, 1W from a direct mains supply L1,L2, L3, it turns clockwise when seen from the drive shaft end.

If any two of the phases are changed over, the motor will run in an anti-clockwise direction (make sure that the motor has been designed to run in both directions).

If the motor is fitted with thermal protection or space heaters, these are connected in the main terminal box to auxiliary terminal blocks compatible with the box protection type.

Motor type	Box d terminals	Box e terminals
FLSD 80	M5	M7
FLSD 90 to 112	M5	M7
FLSD 132	M6	M8
FLSD 160 to 225	M8	M8
FLSD 250 to 280	M10	M10
FLSD 315 to 355	M12	M12

Tightening torque for the nuts on the terminal blocks and the terminal posts ▼

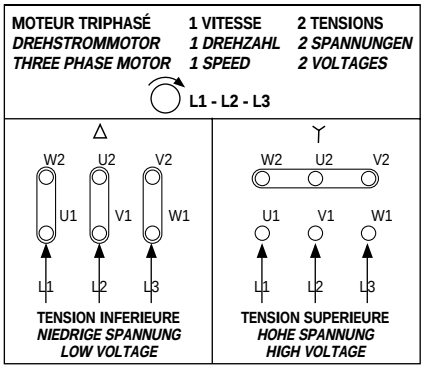
Terminal	M5	M6	M7	M8	M10	M12	S14
Torque N.m	2	3	4	7	15	15	22

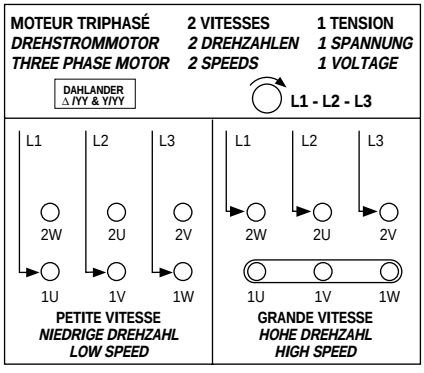
The motor power terminals must be tightened using a dynamometer key.

C4.5 - WIRING DIAGRAMS

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

The diagrams normally used are shown opposite.





C4.6 - EARTH TERMINALS

In accordance with general safety standards for machines, the motors are fitted with one earth terminal inside the terminal box and another on the outside, on one of the motor feet, flange or casing.

They are marked: ⏚

D1 - Duty cycle - Definitions

Typical duty cycles (according to IEC 60034-1)

The typical duty cycles are described below:

1 - Continuous duty - Type S1

Operation at constant load of sufficient duration for thermal equilibrium to be reached (see figure 1).

2 - Short-time duty - Type S2

Operation at constant load during a given time, less than that required for thermal equilibrium to be reached, followed by a rest and de-energized period of sufficient duration to re-establish machine temperatures within 2 K of the coolant (see figure 2).

3 - Intermittent periodic duty - Type S3

A sequence of identical duty cycles, each consisting of a period of operation at constant load and a rest and de-energized period (see figure 3). Here, the cycle is such that the starting current does not significantly affect the temperature rise (see figure 3).

4 - Intermittent periodic duty with starting - Type S4

A sequence of identical duty cycles, each consisting of a significant starting period, a period of operation at constant load and a rest and de-energized period (see figure 4).

5 - Intermittent periodic duty with electrical braking - Type S5

A sequence of periodic duty cycles, each consisting of a starting period, a period of operation at constant load, a period of rapid electrical braking and a rest and de-energized period (see figure 5).

6 - Periodic continuous duty with intermittent load - Type S6

A sequence of identical duty cycles, each consisting of a period of operation at constant load and a period of operation at no load. There is no rest and de-energized period (see figure 6).

7 - Periodic continuous duty with electrical braking - Type S7

A sequence of identical duty cycles, each consisting of a starting period, a period of operation at constant load and a period of electrical braking. There is no rest and de-energized period (see figure 7).

8 - Periodic continuous duty with related changes of load and speed - Type S8

A sequence of identical duty cycles, each consisting of a period of operation at constant load corresponding to a predetermined rotation speed, followed by one or more periods of operation at other constant loads corresponding to different rotation speeds (in induction motors, this can be done by changing the number of poles). There is no rest and de-energized period (see figure 8).

9 - Duty with non-periodic variations in load and speed - Type S9

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 loads (see figure 9).

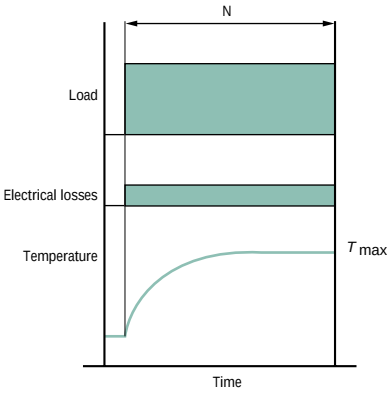
Note - For this type of duty, the appropriate full load values must be used as the basis for calculating overload.

10 - Operation at discrete constant loads - Type S10

This duty consists of a maximum of 4 discrete load values (or equivalent loads), each value being applied for sufficient time for the machine to reach thermal equilibrium. The minimum load during a load cycle may be zero (no-load operation or rest and de-energized period) (see figure 10).

D

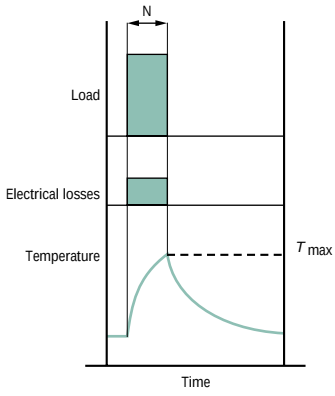
▼ ***Fig. 1. - Continuous duty, Type S1.***



N = operation at constant load

T_{max} = maximum temperature attained

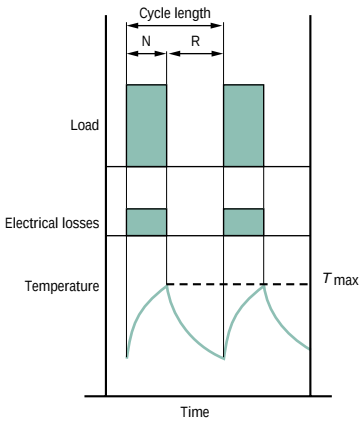
▼ ***Fig. 2. - Short-time duty, Type S2.***



N = operation at constant load

T_{max} = maximum temperature attained

▼ ***Fig. 3. - Intermittent periodic duty, Type S3.***



N = operation at constant load

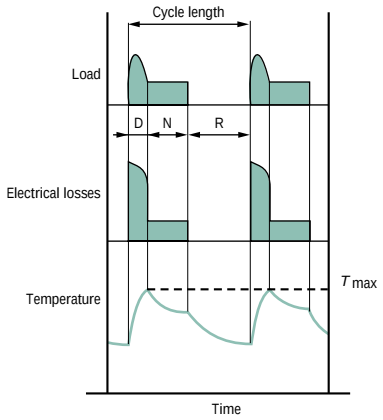
R = rest

T_{max} = maximum temperature attained

$$\text{Operating factor (\%)} = \frac{N}{N+R} \bullet 100$$

D1 - Duty cycle - Definitions

▼ ***Fig. 4. - Intermittent periodic duty with starting, Type S4.***



D = starting

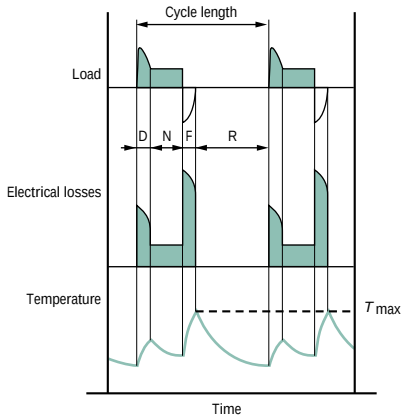
N = operation at constant load

R = rest

T_{max} = maximum temperature attained during cycle

Operating factor (%) = $\frac{D + N}{N + R + D} \bullet 100$

▼ ***Fig. 5. - Intermittent periodic duty with electrical braking, Type S5.***



D = starting

N = operation at constant load

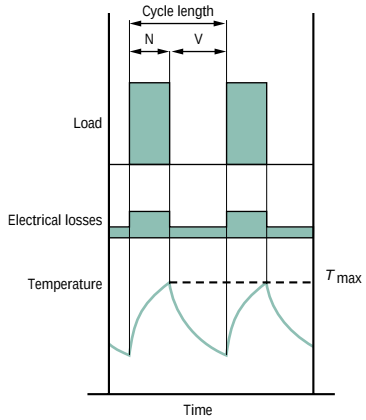
F = electrical braking

R = rest

T_{max} = maximum temperature attained during cycle

Operating factor (%) = $\frac{D + N + F}{D + N + F + R} \bullet 100$

▼ ***Fig. 6. - Periodic continuous duty with intermittent load, Type S6.***



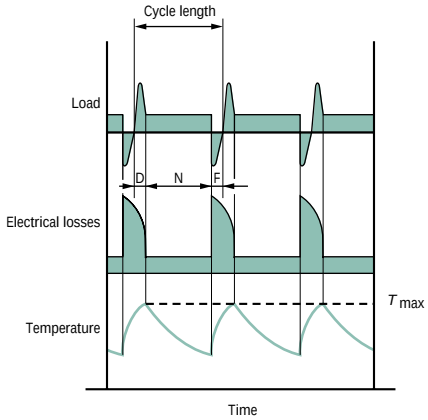
N = operation at constant load

V = no-load operation

T_{max} = maximum temperature attained during cycle

Operating factor (%) = $\frac{N}{N + V} \bullet 100$

▼ ***Fig. 7. - Periodic continuous duty with electrical braking, Type S7.***



D = starting

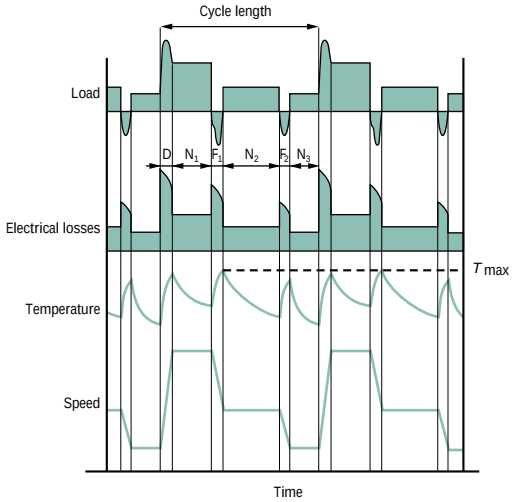
N = operation at constant load

F = electrical braking

T_{max} = maximum temperature attained during cycle

Operating factor = 1

▼ ***Fig. 8. - Periodic continuous duty with related changes of load and speed, Type S8.***



F_1F_2 = electrical braking

D = starting

$N_1N_2N_3$ = operation at constant loads.

T_{max} = maximum temperature attained during cycle

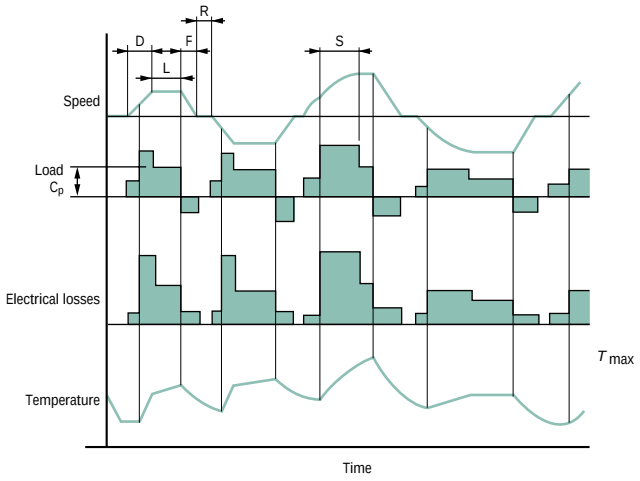
Operating factor = $\frac{D + N_1}{D + N_1 + F_1 + N_2 + F_2 + N_3}$ 100 %

$\frac{F_1 + N_2}{D + N_1 + F_1 + N_2 + F_2 + N_3}$ 100 %

$\frac{F_2 + N_3}{D + N_1 + F_1 + N_2 + F_2 + N_3}$ 100 %

D1 - Duty cycle - Definitions

▼ ***Fig. 9. - Duty with non-periodic variations in load and speed, Type S9.***



D = starting

L = operation at variable loads

F = electrical braking

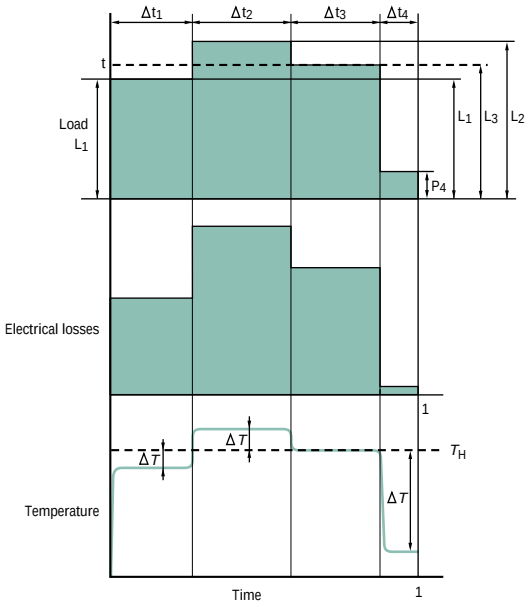
R = rest

S = operation at overload

C_p = full load

T_{max} = maximum temperature attained.

▼ ***Fig. 10 - Duty at discrete constant loads, Type S10.***



L = load

N = power rating for duty S1

p = p / $\frac{L}{N}$ = reduced load

t = time

T_p = total cycle time

t_i = discrete period within a cycle

Δt_i = t_i / T_p = relative duration of period within a cycle

Pu = electrical losses

H_N = temperature at power rating for duty type S1

ΔH_i = increase or decrease in temperature rise at the ith period of a cycle

D

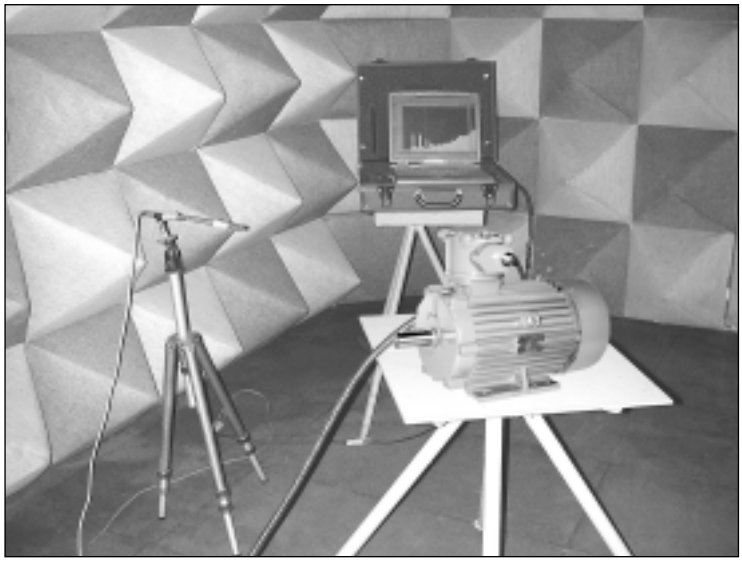
D2 - Weighted sound level [dB(A)]

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 are shown for the values obtained for the machines described in this catalogue. (Measurements were taken in conformity with standards 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 table below:

Motor type	2 poles			4 poles			6 poles			8 poles		
	IEC 60034-9	FLSD	FLSD	IEC 60034-9	FLSD	FLSD	IEC 60034-9	FLSD	FLSD	IEC 60034-9	FLSD	FLSD
	Power LwA		Pressure LpA	Power LwA		Pressure LpA	Power LwA		Pressure LpA	Power LwA		Pressure LpA
FLSD 80 L	84	76	67	-	57	48	-	56	40	-	56	40
FLSD 90 S	88	77	68	78	66	57	-	56	48	-	56	48
FLSD 90 L	88	77	68	82	66	57	76	56	48	-	56	48
FLSD 100 L	93	76	67	86	63	54	78	61	46	73	61	46
FLSD 112 M	93	85	76	86	69	60	78	62	52	74	62	52
FLSD 132 S	97	(81)	83 (72)	86	73	64	82	67	56	74	68	56
FLSD 132 M	97	(81)	83 (72)	90	73	64	82	67	56	78	68	56
FLSD 160 M	100	(86)	84 (75)	90	75	66	85	75	58	78	76	58
FLSD 160 L	100	(86)	84 (75)	94	75	66	85	75	58	82	76	58
FLSD 180 M	100	(89)	85 (77)	94	79	68	-	-	-	-	-	-
FLSD 180 L	-	(89)	85 (77)	94	79	68	88	76	60	82	76	60
FLSD 200 L	102	(90)	85 (78)	98	90	74	88	82	66	86	81	66
FLSD 225 S	-	(89)	83 (77)	98	90	73	-	-	-	86	81	65
FLSD 225 M	104	(89)	83 (77)	100	90	73	91	82	65	86	81	65
FLSD 250 M	104	94	82	100	92	80	91	82	71	90	82	71
FLSD 280 S	106	87	76	103	81	70	94	83	72	90	83	72
FLSD 280 M	106	87	76	103	81	70	94	83	72	93	83	72
FLSD 315 S	106	96	84	103	85	73	98	88	76	93	90	78
FLSD 315 M/LA	109	96	84	106	85	73	98	88	76	96	90	78
FLSD 315 LB	109	96	84	106	85	73	102	88	76	96	90	78
FLSD 355 LA/LB/LC	111	96	84	108	92	80	102	90	78	99	90	78
FLSD 355 LD	111	96	84	108	92	80	105	90	78	99	90	78

The maximum standard tolerance for all these values is + 3 dB(A).
The values in brackets are for ventilation which is designed for a lower sound level (for class T1 to T4).



D3 - Calculation of accelerating torque and starting time

Acceleration time can be calculated using a simplified formula:

$$t_d = \frac{\pi}{30} \cdot \frac{N \cdot J_N}{M_a} ,$$

t_d : is the acceleration time in seconds
J_N = moment of inertia in kg.m² of the motor plus the load corrected, if necessary, to the speed of the shaft that develops the torque M_a
N: speed to be achieved in min^{-1}

M_a or M_{acc} = the average accelerating torque in N.m (average torque developed by the motor during starting, reduced by the average resistive torque during the same period). In general, for centrifugal machines, a very good approximation can be written as follows:

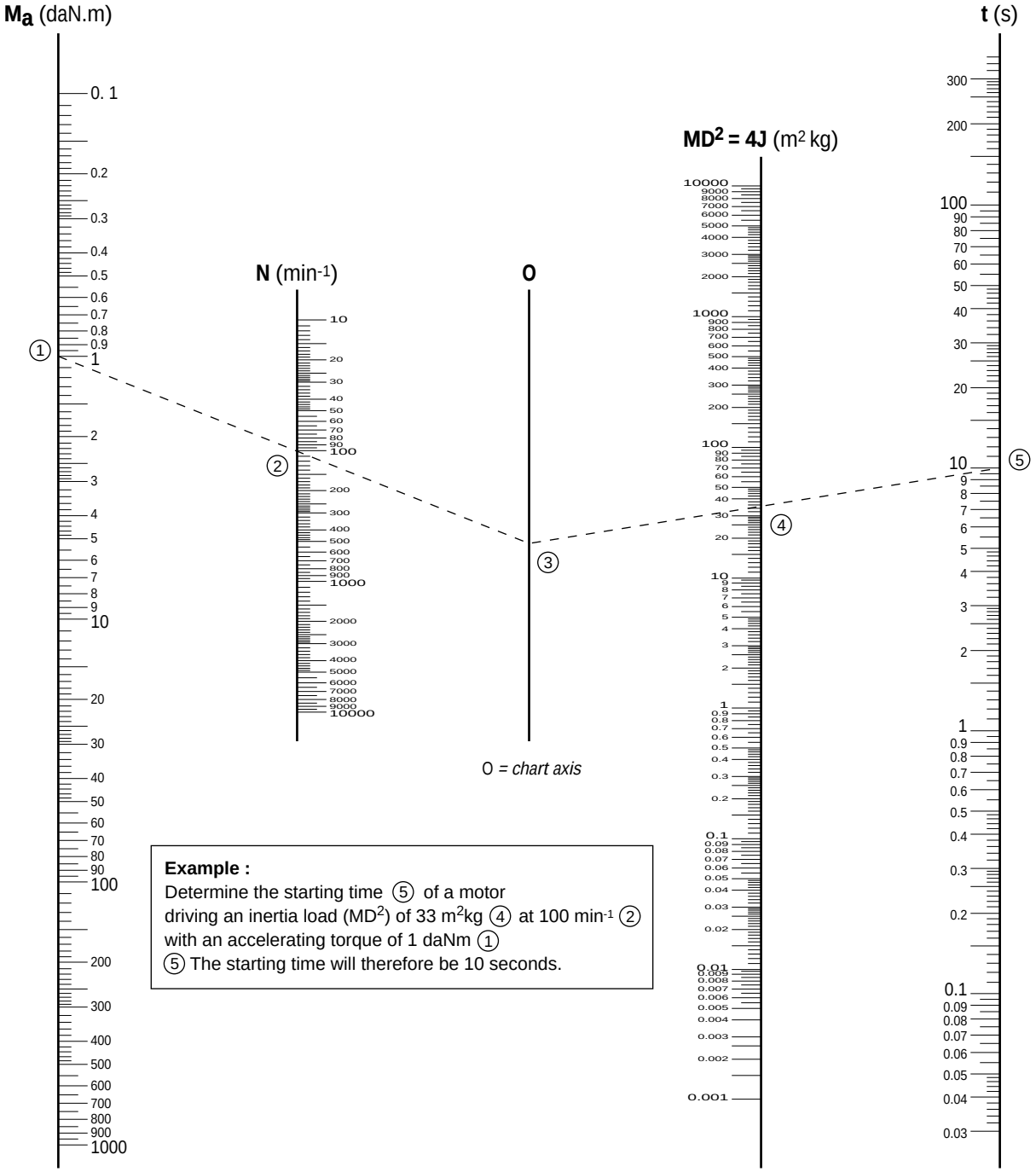
$$M_a = \frac{M_D + 2M_A + 2M_M + M_N}{6} - M_r$$

The chart below may also be used:

Here again is the formula by which the moment of inertia of the driven machine turning at speed N' is equalized with the speed N of the motor.

$$J_N = J_{N'} \cdot \left(\frac{N'}{N}\right)^2$$

▼ ***Starting time calculation chart***



Example :
Determine the starting time ⑤ of a motor driving an inertia load (MD^2) of 33 m^2kg ④ at 100 min^{-1} ② with an accelerating torque of 1 daNm ①
⑤ The starting time will therefore be 10 seconds.

D4 - 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 vibration can also affect motor operation: such as poor mounting, incorrect drive coupling, end shield misalignment, etc.

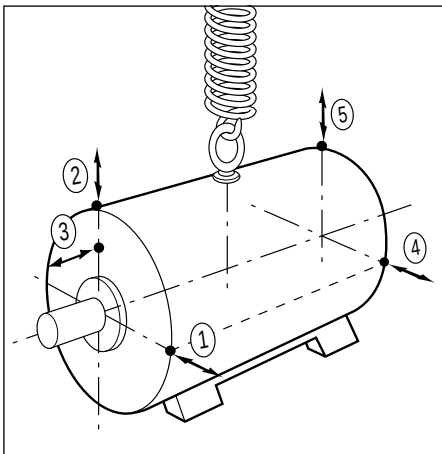
We shall first of all look at the vibrations emitted at the operating frequency, corresponding to an unbalanced load whose amplitude swamps all other frequencies and on which the dynamic balancing of the mass in rotation has a decisive effect.

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

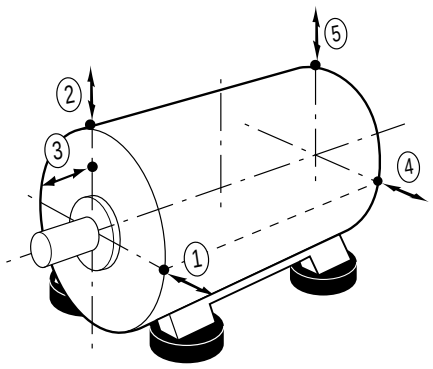
Standard ISO 8821 requires the balancing method to be marked on the shaft extension as follows:

- half-key balancing: letter H
- full key balancing: letter F
- no-key balancing: letter N

The machines in this catalogue are classed N - Classes R and S are available on request.



▲ ***Measuring system for suspended machines***



▲ ***Measuring system for machines on flexible mountings***

The measurement points quoted in the standards are the ones 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".

Measured parameters

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 quadratic average (rms value) of the speed of vibration which is used to express the vibration level.

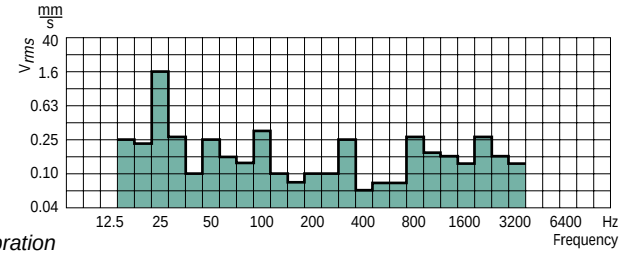
Other variables that could also be measured are the vibratory displacement amplitude (in µm) or vibratory acceleration (in m/s^2).

If the vibratory displacement is measured against frequency, the measured value decreases with the frequency: high-frequency vibrations are not taken into account.

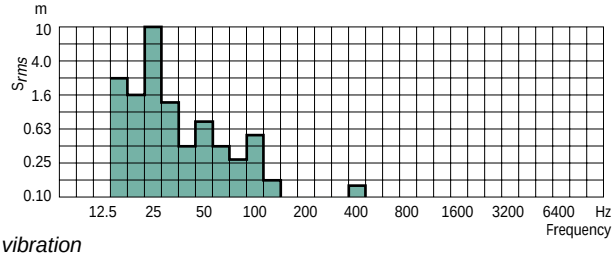
If the vibratory acceleration is measured, the measured value increases with the frequency: low-frequency vibrations (unbalanced loads) cannot be measured.

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

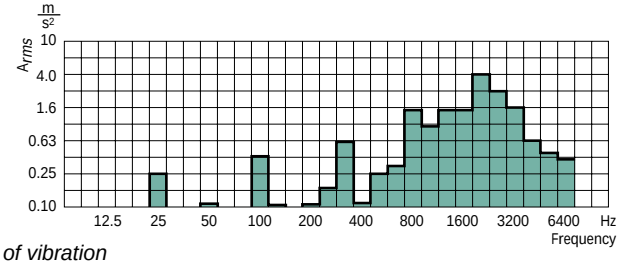
However, if preferred, the table of vibration amplitudes may still be used (for measuring sinusoidal and similar vibrations).



Speed of vibration



Amplitude of vibration



Acceleration of vibration

D4 - Vibration levels - Balancing

Standard FLSD machines in this catalogue are classed N

Maxim value of rms speed of vibration expressed in mm/s (IEC 60034-14)

Class	Speed N (min^{-1})	Frame size H (mm)		
		80 ≤ H ≤ 132	132 < H ≤ 225	225 < H ≤ 315 M
N (normal)	600 < N ≤ 3 600	1.8	2.8	3.5
R (reduced)	600 < N ≤ 1 800 1 800 < N ≤ 3 600	0.71 1.12	1.12 1.8	1.8 2.8
S (special)	600 < N ≤ 1 800 1 800 < N ≤ 3 600	0.45 0.71	0.71 1.12	1.12 1.8

Maximum value of the simple displacement amplitude expressed in μm (for sinusoidal vibrations only)

Class	Speed N (min^{-1})	Frame size H (mm)		
		80 ≤ H ≤ 132	132 < H ≤ 225	225 < H ≤ 315 M
N (normal)	1 000 1 500 3 000	24 16 8	38 25 12.5	48 32 16
R (reduced)	1 000 1 500 3 000	9 6.3 5	16 10 8	24 16 12.5
S (special)	1 000 1 500 3 000	6.3 4 3.15	9 6.3 5	16 10 8

For motors with a frame size larger than 315, look up the values given for class N of the 315.
For lower values, please consult us.

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 addition to the drive ends of the balancing disks required in this situation.

FLSD flameproof
TEFV induction motors

D

FLSD flameproof TEFV induction motors Selection tables

PAGES

E1 - Selection data: SINGLE-SPEED

E2 - Selection data: TWO-SPEED

For dimensions, see section F

page 59

FLSD flameproof TEFV induction motors Selection tables

E1 - Selection data: Single-speed

2 Poles 3000 min^{-1}

EEx d(e) II B T4

MAINS SUPPLY Δ 220 / Y 380 V or Δ 380 V **50 Hz**

Type	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated torque N.m	Rated current I_N (380 V) A	Power factor Cos φ	Efficiency η	Starting current / Rated current I_D / I_N	Starting torque / Rated torque M_D / M_N	Maximum torque / Rated torque M_M / M_N
FLSD 80 L	0.75	2840	2.5	1.9	0.85	67	5.2	2.6	2.4
FLSD 80 L	1.1	2845	3.7	2.6	0.84	77	5.6	3.1	2.9
FLSD 90 S	1.5	2841	5.3	3.2	0.90	83.1	7	2.8	2.7
FLSD 90 L	2.2	2822	7.8	4.6	0.92	83.9	6.3	2.9	2.5
FLSD 100 L	3	2833	10.2	6.1	0.93	81.6	7.5	3.9	3.4
FLSD 112 M	4	2911	13.5	8	0.96	82.3	7.2	2.4	2.9
FLSD 132 S	5.5	2901	18.1	11.3	0.91	81.7	7.5	2.1	3.1
FLSD 132 S	7.5	2918	24.6	14.7	0.91	85	7.5	2	3.3
FLSD 132 M	9	2918	29.4	17.1	0.92	87	7.7	2.5	3.1
FLSD 160 M	11	2935	35.8	22	0.88	86	7.6	3.3	3.2
FLSD 160 M	15	2925	49	29	0.89	88	7.2	3.1	3
FLSD 160 L	18.5	2925	60	36	0.89	88.5	7.6	3.1	3.1
FLSD 180 M	22	2930	72	42	0.89	89	8	3.7	3.4
FLSD 200 L	30	2955	97	55	0.91	91	8	2.7	3.2
FLSD 200 L	37	2955	120	67	0.91	91.5	7.9	2.6	3.1
FLSD 225 M	45	2944	145	79	0.88	92.5	7.9	2.7	3.1
FLSD 250 M	55	2947	177	102	0.86	94.5	7.1	2.35	2.4
FLSD 280 S	75	2960	242	133	0.91	94	6.3	2	2.2
FLSD 280 M	90	2960	290	160	0.91	94	7.5	2.1	2.25
FLSD 315 S	110	2960	356	200	0.91	95	7.2	1.9	2.25
FLSD 315 M	132	2960	427	238	0.89	94.5	7.2	1.6	2.25
FLSD 315 LA	160	2960	517	292	0.88	94.5	7	1.7	2.25
FLSD 315 LB	200	2962	647	359	0.89	94.7	7.4	1.8	2.25
FLSD 355 LA	250	2964	808	439	0.91	95	7.2	1.55	2.25
FLSD 355 LB ●	315	2970	1016	554	0.91	95	6.8	1.45	2.25
FLSD 355 LC	355	2981	1137	631	0.89	96	7.4	1.7	2.35
FLSD 355 LD ●	400	2980	1284	704	0.90	96	7.3	1.8	2.4

● Class F temperature rise

FLSD flameproof TEFV induction motors Selection tables

E1 - Selection data: Single-speed

2 poles 3000 min^{-1}

MAINS SUPPLY Δ 230 / Y 400 V or Δ 400 V **50 Hz**

Type	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated torque N.m	Rated current I_N (400 V) A	Power factor Cos φ	Efficiency η	Starting current / Rated current I_D / I_N	Starting torque / Rated torque M_D / M_N	Max. torque / Rated torque M_M / M_N	Moment of inertia J kg.m^2	Weight IM B3 kg
FLSD 80 L	0.75	2845	2.5	1.8	0.85	71	5.4	2.9	2.6	0.0009	18
FLSD 80 L	1.1	2860	3.7	2.5	0.83	76	5.9	3.4	3.1	0.0011	20.5
FLSD 90 S	1.5	2875	4.9	3	0.90	79.4	7.4	3.6	3.4	0.0017	36
FLSD 90 L	2.2	2863	7.6	4.3	0.92	83	8	3.8	2.8	0.0023	40
FLSD 100 L	3	2861	10	5.8	0.92	80.8	8.1	4.3	4.8	0.0029	45
FLSD 112 M	4	2897	13.2	7.7	0.93	81.1	7.3	2.3	3.9	0.0076	56
FLSD 132 S	5.5	2916	18	10.7	0.90	82.1	8.2	2.3	3.4	0.0160	82
FLSD 132 S	7.5	2930	24.4	14	0.90	85.7	8	2.2	3.6	0.0160	82
FLSD 132 M	9	2937	29.3	16.3	0.91	87.4	8.5	2.9	3.5	0.0190	88
FLSD 160 M	11	2940	35.7	21	0.87	86	8.4	3.6	3.5	0.0440	125
FLSD 160 M	15	2930	49	28	0.88	88	7.9	3.4	3.3	0.0515	137
FLSD 160 L	18.5	2930	60	34	0.88	88.5	8.3	3.4	3.4	0.0590	170
FLSD 180 M	22	2935	72	40	0.88	89	9.1	4.1	3.8	0.0750	180
FLSD 200 L	30	2960	97	53	0.90	91	8.8	3	3.5	0.1420	295
FLSD 200 L	37	2960	119	65	0.90	91.5	8.7	2.9	3.3	0.1630	325
FLSD 225 M	45	2949	145	77	0.91	92.5	8.8	2.9	3.4	0.2040	365
FLSD 250 M	55	2951	177	99	0.85	94.6	7.7	2.6	2.7	0.223	490
FLSD 280 S	75	2970	241	127	0.9	94.5	6.8	2.2	2.4	0.75	760
FLSD 280 M	90	2975	289	153	0.9	94.5	8.7	2.3	2.5	0.85	800
FLSD 315 S	110	2970	353	191	0.90	95.5	8	2.1	2.6	1.5	1070
FLSD 315 M	132	2955	427	226	0.89	94.7	7.8	1.8	2.5	1.5	1070
FLSD 315 LA	160	2955	517	281	0.87	94.7	7.5	1.9	2.5	1.8	1120
FLSD 315 LB	200	2960	645	345	0.88	95	8	2	2.5	2.1	1220
FLSD 355 LA	250	2957	807	421	0.90	95.2	7.8	1.7	2.5	3.3	1470
FLSD 355 LB ●	315	2960	1016	530	0.90	95.2	7.2	1.6	2.5	3.85	1570
FLSD 355 LC	355	2982	1137	605	0.88	96.3	7.9	1.9	2.6	4.2	1985
FLSD 355 LD ●	400	2980	1282	676	0.89	96.0	7.8	2.0	2.7	4.2	1995

● Class F temperature rise

● The values described in this catalogue also apply to special finishes: EEx d IIB T5, EEx d IIC T4 and EEx d IIC T5 for frame size ≤ 250.

However, for these special finishes, the supply **voltage and frequency** must be specified when ordering.

Voltage V	Frequency Hz	Voltage V	Frequency Hz
380	50	440	60
400	50	460	60
415	50	480	60
500	50		

FLSD flameproof TEFV induction motors Selection tables

E1 - Selection data: Single-speed

4 Poles 1500 min^{-1}

EEx d(e) II B T4

MAINS SUPPLY Δ 220 / Y 380 V or Δ 380 V **50 Hz**

Type	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated torque $N.m$	Rated current I_N (380 V) A	Power factor $Cos\ \varphi$	Efficiency η	Starting current / Rated current I_D / I_N	Starting torque / Rated torque M_D / M_N	Maximum torque / Rated torque M_M / M_N
FLSD 80 L	0.55	1405	3.7	1.6	0.80	66	3.8	1.9	2
FLSD 80 L	0.75	1420	5	2.2	0.75	69	4.2	2.4	2.5
FLSD 90 S	1.1	1435	7.3	2.5	0.87	76.5	5.6	1.9	2.4
FLSD 90 L	1.5	1447	9.9	3.5	0.85	76.7	5.5	2.1	2.7
FLSD 100 L	2.2	1429	14.7	4.9	0.87	78.8	5.5	2.2	2.7
FLSD 100 L	3	1420	20.1	6.9	0.84	79	5.8	2.5	2.5
FLSD 112 M	4	1439	26.5	8.5	0.88	81.7	7.5	2.3	3.2
FLSD 132 S	5.5	1446	36.3	10.7	0.91	85.2	6.5	1.9	2.9
FLSD 132 M	7.5	1452	49.3	14.7	0.89	87.1	7.5	2.2	3.7
FLSD 160 M	11	1445	72.7	22	0.86	87.5	5.6	2.2	2.3
FLSD 160 L	15	1445	99	30	0.86	88.5	6	2.1	2.2
FLSD 180 M	18.5	1445	122	36	0.86	89.5	6.5	2.7	2.8
FLSD 180 L	22	1450	145	43	0.86	89.5	6.9	2.7	2.7
FLSD 200 L	30	1470	195	58	0.86	91.5	6.8	2.5	2.6
FLSD 225 S	37	1465	241	71	0.86	92	7	2.7	2.6
FLSD 225 M	45	1465	293	86	0.86	92.5	7.1	2.8	2.6
FLSD 250 M	55	1475	356	106	0.85	92.5	7.2	2.3	2.35
FLSD 280 S	75	1485	485	145	0.83	95.5	7.6	3	2.35
FLSD 280 M	90	1485	582	176	0.82	95	9	3.4	2.35
FLSD 315 S	110	1482	711	207	0.85	95	7	2.4	2.35
FLSD 315 M	132	1480	852	248	0.85	95.1	6.8	2.35	2.3
FLSD 315 LA	160	1476	1035	298	0.86	95	7.4	1.8	2.2
FLSD 315 LB ●	200	1479	1291	371	0.86	95.2	7.4	1.8	2.3
FLSD 355 LA	250	1480	1613	444	0.90	95.5	7.2	1.8	2.2
FLSD 355 LB	300	1485	1929	541	0.88	95.7	6.3	1.45	2.2
FLSD 355 LC	355	1485	2283	635	0.88	96.5	6.4	1.65	2.2
FLSD 355 LD	400	1485	2572	716	0.88	96.5	6.9	1.9	2.2

● Class F temperature rise

FLSD flameproof TEFV induction motors Selection tables

E1 - Selection data: Single-speed

4 poles 1500 min^{-1}

MAINS SUPPLY Δ 230 / Y 400 V or Δ 400 V **50 Hz**

Type	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated torque N.m	Rated current I_N (400 V) A	Power factor Cos φ	Efficiency η	Starting current / Rated current I_D / I_N	Starting torque / Rated torque M_D / M_N	Max. torque / Rated torque M_M / M_N	Moment of inertia J kg.m^2	Weight IM B3 kg
FLSD 80 L	0.55	1415	3.7	1.5	0.79	67	4	2.1	2.2	0.0018	18
FLSD 80 L	0.75	1420	5	2.1	0.74	69	4.5	2.6	2.7	0.0024	20
FLSD 90 S	1.1	1440	7.3	2.4	0.86	77.3	6	2.2	2.6	0.0036	36
FLSD 90 L	1.5	1442	9.9	3.3	0.84	77.3	6	2.3	3	0.0041	40
FLSD 100 L	2.2	1434	14.7	4.8	0.85	78.6	5.9	2.4	3	0.0048	43
FLSD 100 L	3	1429	20	6.8	0.80	79.8	6.2	2.8	2.8	0.0061	47
FLSD 112 M	4	1443	26.5	8.3	0.85	81.6	7	2.4	3.3	0.0118	56
FLSD 132 S	5.5	1452	36.2	10.2	0.91	85.7	7.3	2.1	3.1	0.025	89
FLSD 132 M	7.5	1459	49.1	14.2	0.87	87.4	7.7	2.4	3.9	0.028	96
FLSD 160 M	11	1450	72.7	21	0.85	87.5	6.2	2.4	2.5	0.0666	130
FLSD 160 L	15	1450	99	29	0.85	88.5	6.9	2.3	2.4	0.0913	155
FLSD 180 M	18.5	1450	122	35	0.85	89.5	7.2	3	3.1	0.1053	175
FLSD 180 L	22	1455	145	42	0.85	89.5	7.6	3	3.1	0.1205	195
FLSD 200 L	30	1470	195	56	0.84	91.5	7.5	2.8	2.9	0.2147	305
FLSD 225 S	37	1470	241	69	0.84	92	7.7	2.9	2.8	0.2613	330
FLSD 225 M	45	1470	293	84	0.84	92.5	7.8	3	2.8	0.3136	365
FLSD 250 M	55	1480	355	101	0.85	92.5	7.8	2.5	2.6	0.399	540
FLSD 280 S	75	1487	484	142	0.80	95.5	8.2	3.3	2.6	1.45	780
FLSD 280 M	90	1488	581	172	0.80	95	10	3.8	2.6	1.75	830
FLSD 315 S	110	1482	710	199	0.84	95	7.7	2.7	2.6	2.7	1070
FLSD 315 M	132	1483	850	238	0.84	95.4	7.4	2.6	2.5	2.7	1070
FLSD 315 LA	160	1483	1032	286	0.85	95	8	2	2.4	3.2	1120
FLSD 315 LB ●	200	1485	1291	357	0.85	95.2	8	2	2.5	4.1	1220
FLSD 355 LA	250	1483	1611	420	0.90	95.5	7.8	2	2.4	6.9	1580
FLSD 355 LB	300	1489	1930	520	0.87	95.7	6.7	1.6	2.4	8	1630
FLSD 355 LC	355	1489	2279	610	0.87	96.5	6.8	1.8	2.4	8.4	1870
FLSD 355 LD	400	1489	2564	688	0.87	96.5	7.4	2.1	2.4	8.7	1990

● Class F temperature rise

● The values described in this catalogue also apply to special finishes: EEx d IIB T5, EEx d IIC T4 and EEx d IIC T5 for frame size ≤ 250.

However, for these special finishes, the supply **voltage and frequency** must be specified when ordering.

Voltage V	Frequency Hz	Voltage V	Frequency Hz
380	50	440	60
400	50	460	60
415	50	480	60
500	50		

FLSD flameproof
TEFV induction motors
Selection tables

E1 - Selection data: Single-speed

6 Poles 1000 min^{-1}

EEx d(e) II B T4

MAINS SUPPLY Δ 220 / Y 380 V or **Δ 380 V** **50 Hz**

Type	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated torque N.m	Rated current I_N (380 V) A	Power factor Cos φ	Efficiency η	Starting current / Rated current I_D / I_N	Starting torque / Rated torque M_D / M_N	Maximum torque / Rated torque M_M / M_N
FLSD 80 L	0.25	945	2.5	0.9	0.70	63.8	3	1.4	1.6
FLSD 80 L	0.37	960	3.7	1.2	0.68	69	3.5	1.7	2
FLSD 80 L	0.55	955	5.5	1.8	0.69	69	3.2	1.8	2.3
FLSD 90 S	0.75	935	8.6	2	0.79	71.8	4.5	2.2	2.9
FLSD 90 L	1.1	917	11.4	3	0.79	70	4.8	2.7	2.5
FLSD 100 L	1.5	917	15.2	3.8	0.81	74.1	5.1	2.6	2.6
FLSD 112 M	2.2	947	22	5.2	0.82	78.1	5.5	1.7	2.4
FLSD 132 S	3	950	29.7	7.1	0.79	81.5	5.3	1.9	2.5
FLSD 132 M	4	953	40	9.4	0.78	83.1	5.4	2.2	2.6
FLSD 132 M	5.5	952	54.7	13.5	0.74	83.7	5.1	2.3	2.5
FLSD 160 M	7.5	960	74.6	17	0.78	86	5	1.8	2.4
FLSD 160 L	11	965	109	24	0.79	87	5.6	1.9	2.6
FLSD 180 L	15*	965	148	34	0.77	87	6.1	1.8	2.2
FLSD 200 L	18.5	970	182	38	0.82	90	6.8	1.7	2.5
FLSD 200 L	22	970	217	45	0.81	90.5	6.8	2	2.9
FLSD 225 M	30	970	295	61	0.82	90.5	6.9	2.1	2.9
FLSD 250 M	37	978	361	76.4	0.80	92	6.9	1.9	2
FLSD 280 S	45	986	441	82	0.89	93.7	5.7	1.7	2.1
FLSD 280 M	55	986	538	103	0.86	94.8	6	1.9	2.2
FLSD 315 S	75	985	732	137	0.88	95.1	6.5	1.5	2.1
FLSD 315 M	90	980	877	168	0.87	93.6	6.7	1.35	2.3
FLSD 315 LA	110	983	1069	205	0.87	94.3	6.3	1.45	2.3
FLSD 315 LB	132	985	1280	244	0.87	94.7	7	1.55	2.3
FLSD 315 LB	150	984	1456	277	0.87	94.7	6.3	1.45	2.2
FLSD 355 LA	185	990	1785	344	0.87	94	7	1.55	2.45
FLSD 355 LB	220	985	2133	401	0.88	94.8	7	2.4	2.45
FLSD 355 LD	300	992	2888	575	0.83	95.3	7.1	2.35	2.35

* Characteristics only valid for T4 temperature class

FLSD flameproof TEFV induction motors Selection tables

E1 - Selection data: Single-speed

6 Poles 1000 min^{-1}

MAINS SUPPLY Δ 230 / Y 400 V or **Δ 400 V** **50 Hz**

Type	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated torque N.m	Rated current I_N (400 V) A	Power factor Cos φ	Efficiency η	Starting current / Rated current I_D / I_N	Starting torque / Rated torque M_D / M_N	Max. torque / Rated torque M_M / M_N	Moment of inertia J kg.m^2	Weight IM B3 kg
FLSD 80 L	0.25	950	2.5	0.9	0.67	63.4	3.1	1.6	1.8	0.0024	17
FLSD 80 L	0.37	960	3.7	1.2	0.64	69	3.7	1.9	2.1	0.0032	18
FLSD 80 L	0.55	960	5.5	1.8	0.62	69	3.3	2	2.5	0.0042	20.5
FLSD 90 S	0.75	940	8.7	2	0.76	71.5	4.5	2.4	3.2	0.0051	36
FLSD 90 L	1.1	932	10.9	3	0.75	69.6	5.2	3.1	2.8	0.0062	40
FLSD 100 L	1.5	928	15.2	3.8	0.78	74.1	5.4	2.8	2.8	0.01	47
FLSD 112 M	2.2	952	22	5.1	0.80	78.3	5.9	1.9	2.6	0.016	56
FLSD 132 S	3	957	29.7	7	0.76	81	5.6	2.1	2.7	0.019	84
FLSD 132 M	4	961	40	9.3	0.75	83.6	5.9	2.5	2.9	0.027	89
FLSD 132 M	5.5	959	54.7	13.3	0.71	84	5.5	2.5	2.8	0.034	93
FLSD 160 M	7.5	965	74.6	17	0.76	86	5.5	2	2.6	0.0871	125
FLSD 160 L	11	970	109	24	0.77	87	6.1	2.1	2.8	0.1180	145
FLSD 180 L	15*	970	148	34	0.74	87	6.8	2	2.4	0.1580	180
FLSD 200 L	18.5	975	182	37	0.80	90	7.5	1.9	2.7	0.3050	305
FLSD 200 L	22	970	217	45	0.79	90	7.5	2.2	3.2	0.3050	305
FLSD 225 M	30	970	295	60	0.80	90	7.7	2.3	3.1	0.3940	350
FLSD 250 M	37	982	360	74.5	0.78	92	7.2	2.4	2.2	0.56	530
FLSD 280 S	45	987	440	83	0.87	93.9	6.1	1.9	2.3	1.1	780
FLSD 280 M	55	987	536	100	0.84	95	6.4	2.1	2.4	1.25	830
FLSD 315 S	75	987	731	130	0.87	95	7.2	1.7	2.3	3.1	1080
FLSD 315 M	90	983	875	161	0.86	94	7.1	1.45	2.5	3.1	1080
FLSD 315 LA	110	985	1067	197	0.86	94.3	6.8	1.6	2.5	4	1130
FLSD 315 LB	132	986	1280	234	0.86	94.9	7.5	1.7	2.5	4.4	1195
FLSD 315 LB	150	985	1454	265	0.86	94.7	6.8	1.5	2.4	4.4	1215
FLSD 355 LA	185	991	1783	329	0.86	94.2	7.5	1.7	2.7	5	1485
FLSD 355 LB	220	987	2129	384	0.87	95	7.5	1.75	2.7	6	1610
FLSD 355 LD	300	993	2885	553	0.82	95.5	7.6	1.65	2.6	8	1995

● Class F temperature rise

* Characteristics only valid for T4 temperature class

● The values described in this catalogue also apply to special finishes: EEx d IIB T5, EEx d IIC T4 and EEx d IIC T5 for frame size ≤ 250.

However, for these special finishes, the supply **voltage and frequency** must be specified when ordering.

Voltage V	Frequency Hz	Voltage V	Frequency Hz
380	50	440	60
400	50	460	60
415	50	480	60
500	50		

FLSD flameproof TEFV induction motors Selection tables

E1 - Selection data: Single-speed

8 poles 750 min^{-1}

EEx d(e) II B T4

MAINS SUPPLY Δ 220 / Y 380 V or Δ 380 V **50 Hz**

Type	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated torque N.m	Rated current I_N (380 V) A	Power factor Cos φ	Efficiency η	Starting current / Rated current I_D / I_N	Starting torque / Rated torque M_D / M_N	Maximum torque / Rated torque M_M / M_N
FLSD 80 L	0.18	710	2.5	1	0.53	54	3.2	2.6	2.6
FLSD 80 L	0.25	700	3.5	1.1	0.63	57	2.8	1.9	1.9
FLSD 90 S	0.37	665	5	1.2	0.75	61.5	3.1	1.7	2
FLSD 90 L	0.55	660	7.4	1.8	0.76	61.5	3.3	1.8	1.9
FLSD 100 L	0.75	675	10.1	2.3	0.72	68	3.7	2	2
FLSD 100 L	1.1	665	14.9	3.6	0.72	65	3.4	2	2.2
FLSD 112 M	1.5	710	20	4.6	0.71	69.4	4.1	1.8	2.2
FLSD 132 S	2.2	710	30	6	0.73	77	3.8	1.7	2.3
FLSD 132 M	3	705	40.9	9	0.69	75	3.7	1.6	1.7
FLSD 160 M	4	721	53.8	11	0.67	81.5	3.4	1.9	1.8
FLSD 160 M	5.5	705	74.5	15	0.67	82	3.3	1.8	1.7
FLSD 160 L	7.5	705	102	21	0.66	82	3.5	2	1.9
FLSD 180 L	11*	700	150	31	0.66	82	3.6	1.7	1.8
FLSD 200 L	15	725	198	34	0.75	89	5	1.7	2.2
FLSD 225 S	18.5	725	244	43	0.74	89	5.1	1.8	2.3
FLSD 225 M	22	725	290	51	0.74	89	4.9	1.7	2.2
FLSD 250 M	30	730	392	63	0.80	91	6.1	1.5	1.8
FLSD 280 S	37	737	481	75	0.82	93.6	6.4	1.6	2.1
FLSD 280 M	45	739	585	90	0.81	94	7.1	1.9	2.1
FLSD 315 S	55	742	717	109	0.81	94.8	6.8	1.8	2.25
FLSD 315 M	75	735	974	146	0.84	93.1	6.9	1.8	2.35
FLSD 315 LA	90	733	1173	174	0.84	94	6.8	1.8	2.25
FLSD 315 LB	110	735	1429	213	0.83	94.2	6.7	1.45	2.1
FLSD 355 LA	132	738	1708	254	0.84	94	6.25	1.5	2.45
FLSD 355 LB	160	738	2070	309	0.83	95	6.4	1.6	2.45
FLSD 355 LD	200	738	2588	376	0.85	95.2	6.25	1.45	2.35

* Characteristics only valid for T4 temperature class

FLSD flameproof TEFV induction motors Selection tables

E1 - Selection data: Single-speed

8 poles 750 min^{-1}

MAINS SUPPLY Δ 230 / Y 400 V or Δ 400 V **50 Hz**

Type	Rated power at 50 Hz P_N kW	Rated speed N_N min^{-1}	Rated torque N.m	Rated current I_N (400 V) A	Power factor Cos φ	Efficiency η	Starting current / Rated current I_D / I_N	Starting torque / Rated torque M_D / M_N	Max. torque / Rated torque M_M / M_N	Moment of inertia J kg.m^2	Weight IM B3 kg
FLSD 80 L	0.18	705	2.5	1	0.50	54	3	2.4	2.3	0.0023	19
FLSD 80 L	0.25	690	3.5	1.1	0.60	57	2.6	1.7	1.8	0.0029	20
FLSD 90 S	0.37	685	5	1.2	0.72	62	3.3	1.8	2.2	0.0041	34
FLSD 90 L	0.55	670	7.4	1.7	0.73	63.5	3.6	2	2.1	0.0051	36
FLSD 100 L	0.75	680	10.1	2.4	0.67	67.5	3.8	2.2	2.2	0.01	47
FLSD 100 L	1.1	675	14.9	3.7	0.67	64	3.6	2.2	2.4	0.01	47
FLSD 112 M	1.5	715	20	4.9	0.65	68.4	4	2	2.4	0.016	56
FLSD 132 S	2.2	715	30	6	0.69	77	4.4	1.9	2.5	0.019	80
FLSD 132 M	3	715	40.9	8.2	0.69	76	4.3	1.9	2	0.025	89
FLSD 160 M	4	724	53.8	11	0.65	82	3.7	2.1	2	0.0761	140
FLSD 160 M	5.5	710	74.5	15	0.65	82	3.6	2	1.9	0.0761	140
FLSD 160 L	7.5	710	102	21	0.63	82	3.8	2.2	2.1	0.0913	155
FLSD 180 L	11*	710	148	31	0.63	82	3.9	1.9	2	0.1205	195
FLSD 200 L	15	725	198	34	0.72	89	5.4	1.9	2.4	0.3900	305
FLSD 225 S	18.5	725	244	43	0.7	88.5	5.5	2	2.5	0.3930	320
FLSD 225 M	22	725	290	50	0.71	88.5	5.3	1.9	2.4	0.4660	350
FLSD 250 M	30	733	391	61	0.78	91.3	5.5	1.65	2	0.57	530
FLSD 280 S	37	740	480	72	0.80	93.9	7	1.8	2.3	1.6	780
FLSD 280 M	45	741	585	90	0.77	94	7.5	2	2.3	1.75	810
FLSD 315 S	55	743	715	108	0.78	94.8	7.3	2	2.5	3.1	1070
FLSD 315 M	75	737	972	140	0.83	93.5	7.4	2	2.6	3.1	1070
FLSD 315 LA	90	735	1169	167	0.83	94	7.3	2	2.5	4.2	1100
FLSD 315 LB	110	740	1420	204	0.82	94.2	7.2	1.6	2.2	5.1	1195
FLSD 355 LA	132	740	1704	244	0.83	94.2	6.7	1.65	2.7	5.5	1485
FLSD 355 LB	160	740	2065	296	0.82	95.2	6.9	1.75	2.7	6	1605
FLSD 355 LD	200	740	2581	360	0.84	95.4	6.7	1.6	2.6	6.5	1995

* Characteristics only valid for T4 temperature class

● The values described in this catalogue also apply to special finishes: EEx d IIB T5, EEx d IIC T4 and EEx d IIC T5 for frame size ≤ 250.

However, for these special finishes, the supply **voltage and frequency** must be specified when ordering.

Voltage V	Frequency Hz	Voltage V	Frequency Hz
380	50	440	60
400	50	460	60
415	50	480	60
500	50		

FLSD flameproof
TEFV induction motors
Selection tables

E2 - Selection data: Two-speed

EEx d II B T4
Centrifugal applications

Type	MAINS SUPPLY 400 V 50 Hz		
	2/4 Poles Dahlander	4/8 Poles Dahlander	4/6 Poles 2 windings
	P_N kW	P_N kW	P_N kW
FLSD 80 L	1.1 / 0.28	1.1 / 0.18	0.75 / 0.25
FLSD 90 S	1.5 / 0.37	1.1 / 0.185	1.1 / 0.37
FLSD 90 L	2.2 / 0.55	1.5 / 0.25	1.4 / 0.45
FLSD 100 L	2.8 / 0.70	1.8 / 0.3	2 / 0.6
FLSD 100 L	-	2.2 / 0.37	-
FLSD 112 M	4 / 1	3.3 / 0.6	3 / 1
FLSD 132 S	6.4 / 1.6	5 / 1.1	4 / 1.3
FLSD 132 M	7.5 / 1.85	6 / 1.3	5.3 / 1.7
FLSD 160 M	13.5 / 3.3	10 / 2.2	7.3 / 2.4
FLSD 160 L	19 / 4.5	15 / 3.2	12.5 / 4
FLSD 180 M	22 / 5.5	17 / 3.6	14.4 / 4.6
FLSD 180 L	24 / 6	19 / 4	16 / 5.1
FLSD 200 L	28 / 7	24 / 6	20 / 6.5
FLSD 225 S	34 / 8.5	30 / 8	25 / 8.2
FLSD 225 M	42 / 10.5	36 / 9	30 / 10

For larger frame sizes and higher power ratings: consult us

The specific electrical characteristics for these motors are available on request.

E2 - Selection data: Two-speed

EEx d II B T4
General

Type	MAINS SUPPLY 400 V 50 Hz		
	2/4 Poles Dahlander	4/8 Poles Dahlander	4/6 Poles 2 windings
	P_N kW	P_N kW	P_N kW
FLSD 80 L	0.75 / 0.55	0.55 / 0.22	0.45 / 0.3
FLSD 90 S	1.3 / 0.9	0.75 / 0.4	0.7 / 0.4
FLSD 90 L	1.85 / 1.2	1.2 / 0.6	1.1 / 0.75
FLSD 100 L	2.5 / 1.6	1.7 / 0.9	1.6 / 1.1
FLSD 112 M	4 / 3	2.4 / 1.3	2.3 / 1.5
FLSD 132 S	6.2 / 4.5	5 / 2.8	3.6 / 2.4
FLSD 132 M	7.5 / 5.5	6 / 3.4	4.8 / 3.2
FLSD 160 M	13.5 / 10.3	8.1 / 4.5	6 / 4
FLSD 160 L	18.5 / 14	11 / 6	9.5 / 6.3
FLSD 180 M	21 / 16	12.7 / 7	11 / 7.3
FLSD 180 L	23 / 17.5	14 / 7.6	12 / 8
FLSD 200 L	28 / 21	18.5 / 10	17 / 11.3
FLSD 225 S	33 / 25	23 / 12.5	21 / 14
FLSD 225 M	38 / 28	28 / 16	26 / 17

For larger frame sizes and higher power ratings: consult us

FLSD flameproof
TEFV induction motors

FLSD flameproof
TEFV induction motors
Dimensions

PAGES

F

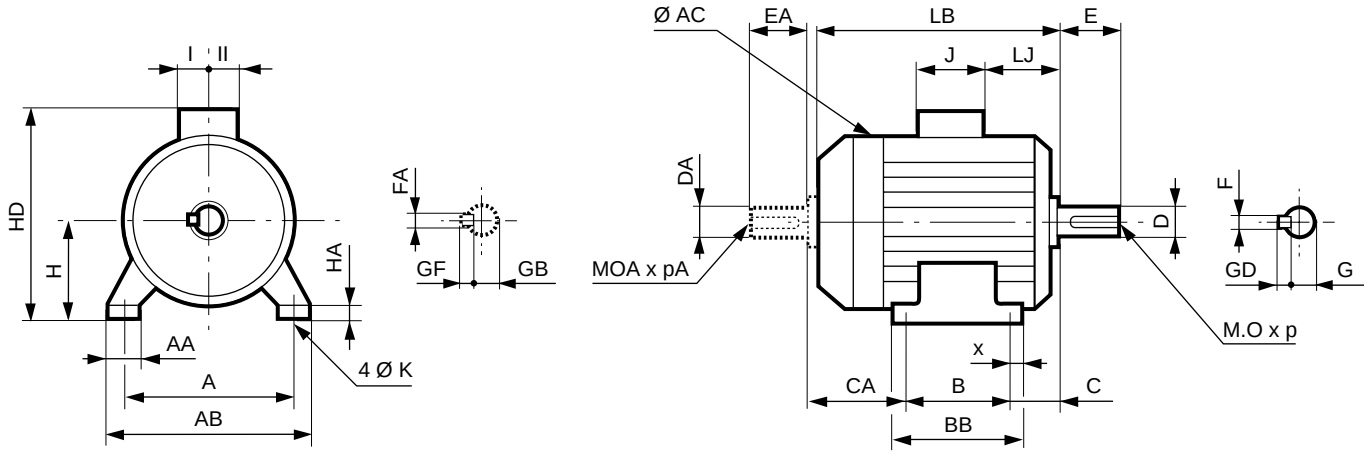
FLSD flameproof TEFV induction motors Dimensions

F1 - Foot mounted

Dimensions in millimetres

Dimensions of FLSD 3-phase TEFV flameproof induction motors - IP 55
Cage rotor

- foot mounted



Type	Main shaft extensions													
	4, 6 and 8 poles							2 poles						
	F	GD	D	G	E	O	p	F	GD	D	G	E	O	p
FLSD 80 L	6	6	19j6	15.5	40	6	16	6	6	19j6	15.5	40	6	16
FLSD 90 S/L	8	7	24j6	20	50	8	19	8	7	24j6	20	50	8	19
FLSD 100 L	8	7	28j6	24	60	10	22	8	7	28j6	24	60	10	22
FLSD 112 M	8	7	28j6	24	60	10	22	8	7	28j6	24	60	10	22
FLSD 132 S/M	10	8	38k6	33	80	12	28	10	8	38k6	33	80	12	28
FLSD 160 M/L	12	8	42k6	37	110	16	36	12	8	42k6	37	110	16	36
FLSD 180 M/L	14	9	48k6	42.5	110	16	36	14	9	48k6	42.5	110	16	36
FLSD 200 L	16	10	55m6	49	110	20	42	16	10	55m6	49	110	20	42
FLSD 225 S/M	18	11	60m6	53	140	20	42	16	10	55m6	49	110	20	42
FLSD 250 M	18	11	65m6	58	140	20	42	18	11	60m6	53	140	20	42
FLSD 280 S/M	20	12	75m6	67.5	140	20	53	18	11	65m6	58	140	20	53
FLSD 315 S/M	22	14	80m6	71	170	20	53	18	11	65m6	58	140	20	53
FLSD 315 L	25	14	90m6	81	170	24	53	20	12	70m6	62.5	140	20	53
FLSD 355 L	28	16	100m6	90	210	24	53	22	14	80m6	71	170	20	53

Type	Secondary shaft extensions													
	4, 6 and 8 poles							2 poles						
	FA	GF	DA	GB	EA	OA	pA	FA	GF	DA	GB	EA	OA	pA
FLSD 80 L	5	5	16j6	13	40	5	12	5	5	16j6	13	40	5	12
FLSD 90 S/L	8	7	24j6	20	50	8	19	8	7	24j6	20	50	8	19
FLSD 100 L	8	7	24j6	20	50	8	19	8	7	24j6	20	50	8	19
FLSD 112 M	8	7	28j6	24	60	10	22	8	7	28j6	24	60	10	22
FLSD 132 S/M	10	8	38k6	33	80	12	28	10	8	38k6	33	80	12	28
FLSD 160 M/L	12	8	42k6	37	110	16	36	12	8	42k6	37	110	16	36
FLSD 180 M/L	14	9	48k6	42.5	110	16	36	14	9	48k6	42.5	110	16	36
FLSD 200 L	16	10	55m6	49	110	20	42	16	10	55m6	49	110	20	42
FLSD 225 S/M	16	10	55m6	49	110	20	42	16	10	55m6	49	110	20	42
FLSD 250 M	18	11	60m6	58	140	20	42	18	11	60m6	53	140	20	42
FLSD 280 S/M	20	12	60m6	67.5	140	20	53	18	11	65m6	58	140	20	53
FLSD 315 S/M	22	14	80m6	71	170	20	53	18	11	65m6	58	140	20	53
FLSD 315 L	25	14	90m6	81	170	24	53	20	12	70m6	62.5	140	20	53
FLSD 355 L	28	16	100m6	90	210	24	53	22	14	80m6	71	170	20	53

FLSD flameproof TEFV induction motors Dimensions

F1 - Foot mounted

Dimensions in millimetres

Dimensions of FLSD 3-phase TEFV flameproof induction motors - IP 55
Cage rotor

- foot mounted

Type	Main dimensions																	
	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	LJ	J	I	II*	CA
FLSD 80 L	125	155	100	126	50	13	35	9	9	80	158	253	295	140	110	55	55	125
FLSD 90 S	140	170	100	155	56	15	42	12	10	90	184	317	298	6	174	87	95	148
FLSD 90 L	140	170	125	155	56	15	42	12	10	90	184	317	298	6	174	87	95	123
FLSD 100 L	160	205	140	170	63	15	50	12	13	100	195	327	340	4	174	87	95	142
FLSD 112 M	190	224	140	170	70	15	55	12	13	112	220	351	348	4	174	87	95	144
FLSD 132 S	216	256	140	228	89	25	60	12	15	132	264	386	440	24	174	87	95	217
FLSD 132 M	216	256	178	228	89	25	60	12	15	132	264	386	440	24	174	87	95	179
FLSD 160 M	254	310	210	322	108	30	75	15	18	160	310	490	549	19	250	125	145	237
FLSD 160 L	254	310	254	322	108	30	75	15	18	160	310	490	549	19	250	125	145	193
FLSD 180 M	279	340	241	364	121	30	80	15	20	180	310	510	617	19	250	125	145	261
FLSD 180 L	279	340	279	364	121	30	80	15	20	180	310	510	617	19	250	125	145	223
FLSD 200 L	318	380	305	385	133	40	90	19	24	200	385	565	648	33	250	125	145	216
FLSD 225 S	356	445	286	400	149	44	90	19	30	225	385	590	718	33	250	125	145	289
FLSD 225 M	356	445	311	400	149	44	90	19	30	225	385	590	718	33	250	125	145	264
FLSD 250 M	406	510	349	455	168	43	105	22	40	250	465	720	827	173	360	208	208	315
FLSD 280 S	457	537	368	499	190	40	100	22	40	280	520	857	1100	96	340	190	333	548
FLSD 280 M	457	537	419	499	190	40	100	22	40	280	520	857	1100	96	340	190	333	497
FLSD 315 M	508	600	457	598	216	45	100	27	38	315	624	952	1203	96	400	195	340	536
FLSD 315 LA/LB	508	600	508	598	216	45	100	27	38	315	624	952	1203	96	400	195	340	485
FLSD 315 S	508	600	406	598	216	45	100	27	38	315	624	952	1203	96	400	195	340	587
FLSD 355 LA/LB	610	710	630	710	254	40	110	27	38	355	700	1027	1302	88	400	195	340	427
FLSD 355 LC/LD	610	710	630	710	254	40	110	27	38	355	700	1027	1426	88	400	195	340	552

*** Dimension not including cable gland - For dimensions for the various types of cable gland, refer to section C4.3.3.**

F

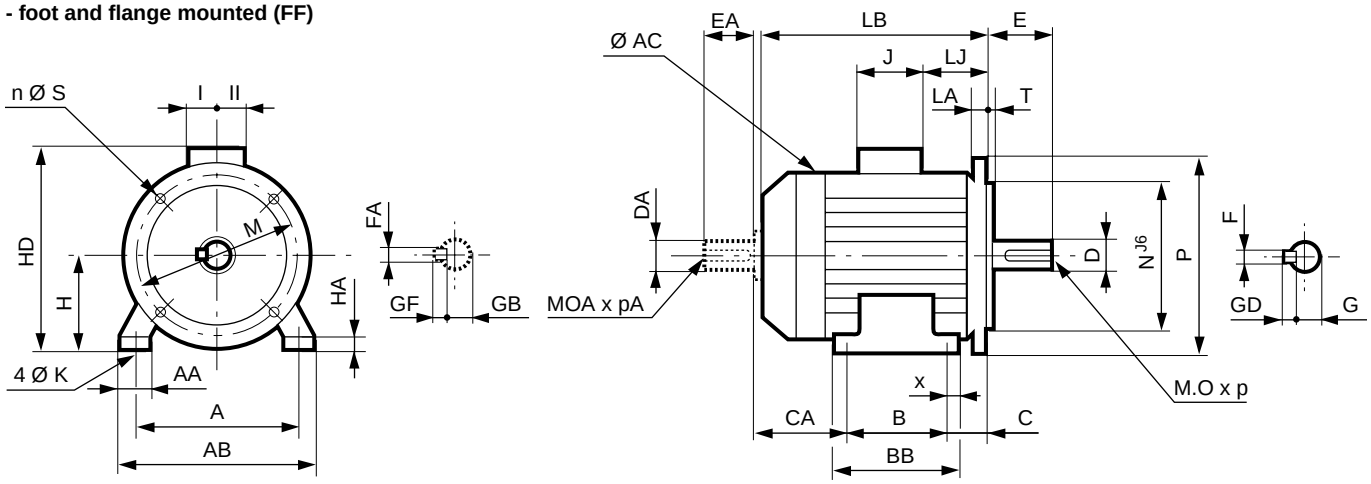
FLSD flameproof TEFV induction motors Dimensions

F2 - Foot and flange mounted

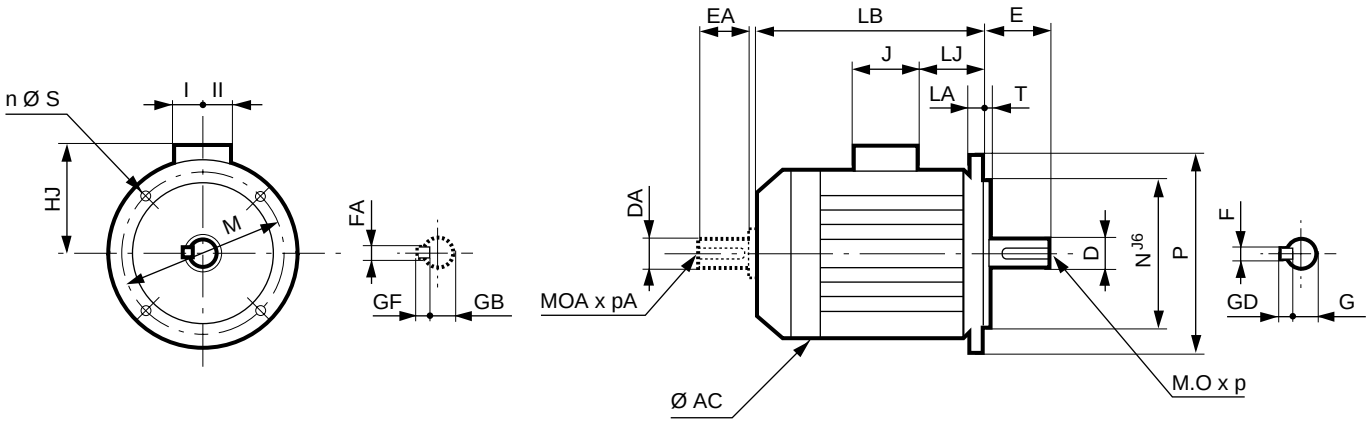
Dimensions in millimetres

Dimensions of FLSD 3-phase TEFV flameproof induction motors - IP 55
Cage rotor

- foot and flange mounted (FF)



- flange mounted (FF)



Dimension CA and shaft extensions are identical to those for foot mounted motors

FLSD flameproof TEFV induction motors Dimensions

F2 - Foot and flange mounted

Dimensions in millimetres

Dimensions of FLSD 3-phase TEFV flameproof induction motors - IP 55
Cage rotor

- foot and flange mounted (FF) **- flange mounted (FF)**

Type	Main dimensions																		
	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	HJ	LJ	J	I	II*	Sym.
FLSD 80 L	125	155	100	126	70	13	35	9	9	80	158	253	295	173	160	110	55	55	FF 165
FLSD 90 S	140	170	100	155	76	15	42	12	10	90	184	317	318	227	26	174	87	95	FF 165
FLSD 90 L	140	170	125	155	76	15	42	12	10	90	184	317	318	227	26	174	87	95	FF 165
FLSD 100 L	160	205	140	170	63	15	50	12	13	100	195	327	340	227	4	174	87	95	FF 215
FLSD 112 M	190	224	140	170	70	15	55	12	13	112	220	351	348	239	4	174	87	95	FF 215
FLSD 132 S	216	256	140	228	89	25	60	12	15	132	264	386	440	254	24	174	87	95	FF 265
FLSD 132 M	216	256	178	228	89	25	60	12	15	132	264	386	440	254	24	174	87	95	FF 265
FLSD 160 M	254	310	210	322	108	30	75	15	18	160	310	490	549	330	19	250	125	145	FF 300
FLSD 160 L	254	310	254	322	108	30	75	15	18	160	310	490	549	330	19	250	125	145	FF 300
FLSD 180 M	279	340	241	364	121	30	80	15	20	180	310	510	617	330	19	250	125	145	FF 300
FLSD 180 L	279	340	279	364	121	30	80	15	20	180	310	510	617	330	19	250	125	145	FF 300
FLSD 200 L	318	380	305	385	133	40	90	19	24	200	385	565	648	365	33	250	125	145	FF 350
FLSD 225 S	356	445	286	400	149	44	90	19	30	225	385	590	718	365	33	250	125	145	FF 400
FLSD 225 M	356	445	311	400	149	44	90	19	30	225	385	590	718	365	33	250	125	145	FF 400
FLSD 250 M	406	510	349	455	168	43	105	22	40	250	465	720	827	470	173	360	208	208	FF 500
FLSD 280 S	457	537	368	499	190	40	80	22	40	280	556	827	1065	547	79	340	190	333	FF 500
FLSD 280 M	457	537	419	499	190	40	80	22	40	280	556	827	1065	547	79	340	190	333	FF 500
FLSD 315 S	508	600	406	598	216	45	100	27	38	315	624	952	1203	637	96	400	195	340	FF 600
FLSD 315 M	508	600	457	598	216	45	100	27	38	315	624	952	1203	637	96	400	195	340	FF 600
FLSD 315 LA/LB	508	600	508	598	216	45	100	27	38	315	624	952	1203	637	96	400	195	340	FF 600
FLSD 355 LA/LB	610	710	630	710	254	40	110	27	38	355	700	1027	1302	672	88	400	195	340	FF 740
FLSD 355 LC/LD	610	710	630	710	254	40	110	27	38	355	700	1027	1426	672	88	400	195	340	FF 740

*** Dimension not including cable gland - For dimensions for the various types of cable gland, refer to section C4.3.3.**

IEC symbol	Flange dimensions						
	M	N	P	T	n	S	LA
FF 165	165	130	200	3.5	4	12	10
FF 215	215	180	250	4	4	15	11
FF 265	265	230	300	4	4	15	13
FF 300	300	250	350	5	4	19	13
FF 350	350	300	400	5	4	19	15
FF 400	400	350	450	5	8**	19	16
FF 500	500	450	550	5	8**	18	18*
FF 600	600	550	660	6	8**	22	25
FF 740	740	680	800	6	8**	22	25

Flange mounted motors FF in position IM 3001 are only available up to frame size 225.

See section C1 for mounting arrangements.

(*) LA = 22 from frame size 280 upwards

(**) = holes at an angle of 22°30 with respect to the vertical

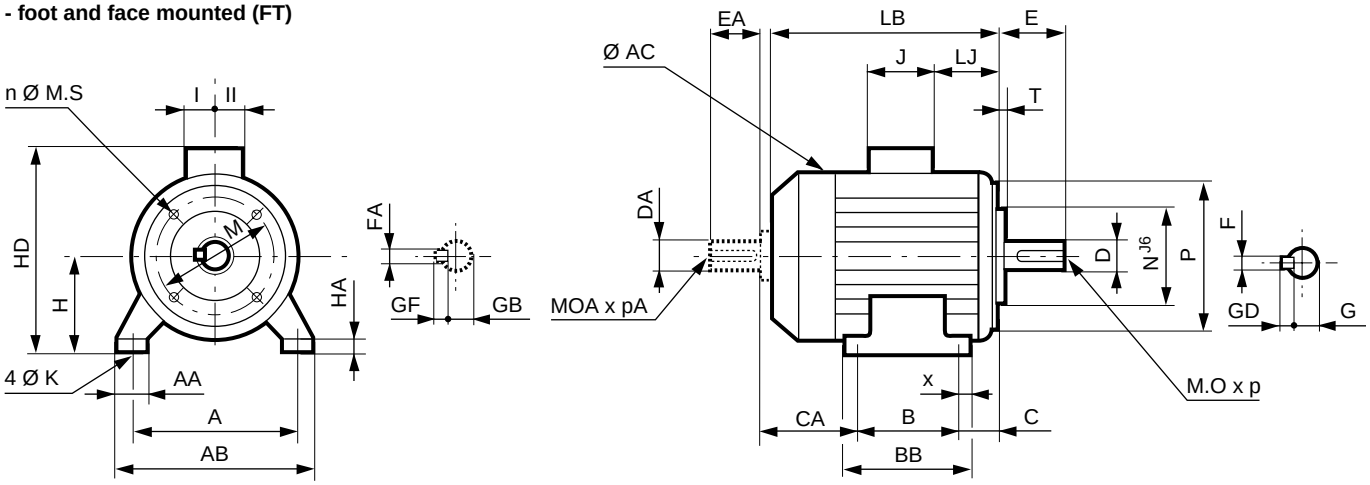
FLSD flameproof TEFV induction motors Dimensions

F3 - Foot and face mounted

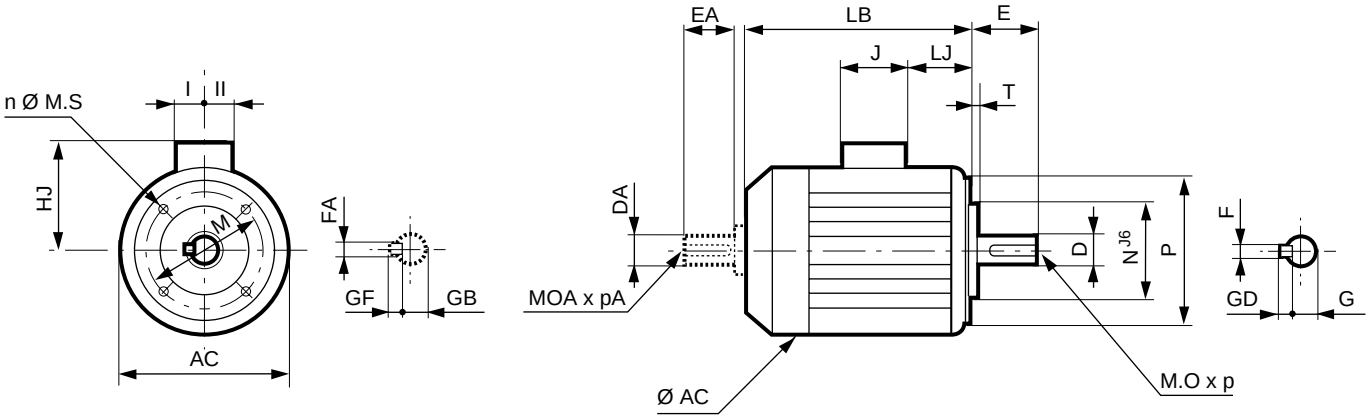
Dimensions in millimetres

Dimensions of FLSD 3-phase TEFV flameproof induction motors - IP 55
Cage rotor

- foot and face mounted (FT)



- face mounted (FT)



Dimension CA and shaft extensions are identical to those for foot mounted motors

FLSD flameproof TEFV induction motors Dimensions

F3 - Foot and face mounted

Dimensions in millimetres

Dimensions of FLSD 3-phase TEFV flameproof induction motors - IP 55
Cage rotor

- foot and face mounted (FT) **- Face mounted (FT)**

Type	Main dimensions																		
	A	AB	B	BB	C	X	AA	K	HA	H	AC	HD	LB	HJ	LJ	J	I	II*	Sym.
FLSD 80 L	125	155	100	126	50	13	35	9	9	80	158	253	273	173	140	110	55	55	FT 100
FLSD 90 S	140	170	100	155	56	15	42	12	10	90	184	317	298	227	6	174	87	95	FT 115
FLSD 90 L	140	170	125	155	56	15	42	12	10	90	184	317	298	227	6	174	87	95	FT 115
FLSD 100 L	160	205	140	170	63	15	50	12	13	100	195	327	340	227	4	174	87	95	FT 130
FLSD 112 M	190	224	140	170	70	15	55	12	13	112	220	351	348	239	4	174	87	95	FT 130
FLSD 132 S	216	256	140	228	89	25	60	12	15	132	264	386	440	254	24	174	87	95	FT 215
FLSD 132 M	216	256	178	228	89	25	60	12	15	132	264	386	440	254	24	174	87	95	FT 215

*** Dimension not including cable gland - For dimensions for the various types of cable gland, refer to section C4.3.3.**

IEC symbol	Faceplate dimensions					
	M	**N**	**P**	**T**	**n**	**Thread**
FT 100	100	80	120	3	4	M6
FT 115	115	95	140	3	4	M8
FT 130	130	110	160	3.5	4	M8
FT 215	215	180	250	4	4	M12

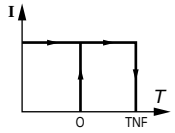
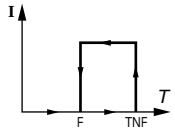
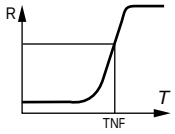
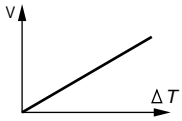
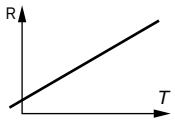
F

G1 - Electrical options

G1.1 - THERMAL PROTECTION

These protection devices provide total protection of the motor against non-transient overloads. If a shorter reaction time is required, or if you want to detect transient overloads, or if you wish to monitor temperature rises at "hot spots" in the motor or at strategic points in the installation for maintenance purposes, it would be advisable to install heat sensors. The various types are shown in the table below, with a description of each. It must be emphasized that sensors cannot be used to carry out direct adjustments to the motor operating cycles.

Indirect thermal protection, built-in

Type	Symbol	Operating principle	Operating curve	Cut-off	Protection provided
Normally closed thermostat (closed when de-energized)	PTO	Bimetallic strip, indirectly heated, operates on opening		2.5 A at 250V with Cos φ 0.4	General surveillance for non-transient overloads
Normally open thermostat (open when de-energized)	PTF	Bimetallic strip, indirectly heated, operates on closing		2.5 A at 250V with Cos φ 0.4	General surveillance for non-transient overloads
Positive temperature cœfficient thermistor	PTC	Variable non-linear resistor, indirectly heated		0	General surveillance for transient overloads
Thermocouples	*T* (*T*<150°C) copper constantan K (*T*<1000°C) copper, copper-nickel	Peltier effect		0	Continuous surveillance at hot spots
Platinum resistance thermometer	PT 100	Variable linear resistor, indirectly heated		0	High accuracy continuous surveillance at key hot spots

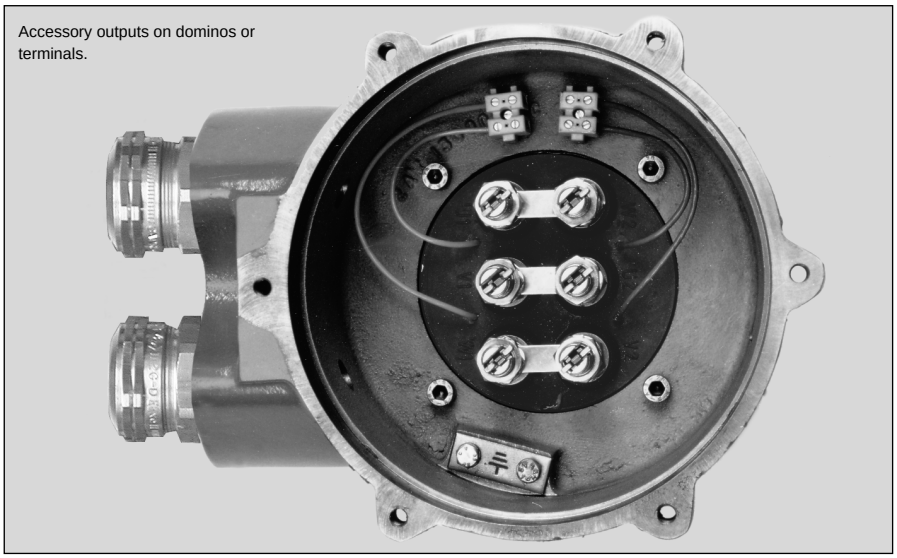
- NRT: nominal running temperature
- The NRTs are chosen according to the position of the sensor in the motor and the temperature class.

Fitting thermal protection

- PTO or PTF, in the control circuits
- PTC, with relay, in the control circuits
- PT 100 or Thermocouples, with reading equipment or recorder, in the control board of the installation for continuous surveillance.

Alarm and Safety

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


Accessory outputs on dominos or terminals.

G1 - Electrical options

G1.2 - SPACE HEATERS

Severe climatic conditions may require the use of space heaters (fitted to the motor windings) which serve to maintain the average temperature of the motor, provide trouble-free starting, and 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. They must only be switched on when the motor is cold and stationary.

Motor type	No. of poles	Power: P(W)
FLSD 80 to FLSD 132	2 - 4 - 6 - 8	25
FLSD 160 and FLSD 200	2 - 4 - 6 - 8	50
FLSD 225 and FLSD 250	2 - 4 - 6 - 8	100
FLSD 280 to FLSD 315	2 - 4 - 6 - 8	100
FLSD 355	2 - 4 - 6 - 8	150

The space heaters use 220/240V, single phase, 50 or 60 Hz.

G1.3 - A.C. INJECTION

Heating by A.C. injection is also possible.
Please consult Leroy-Somer.

FLSD flameproof TEFV induction motors Optional features

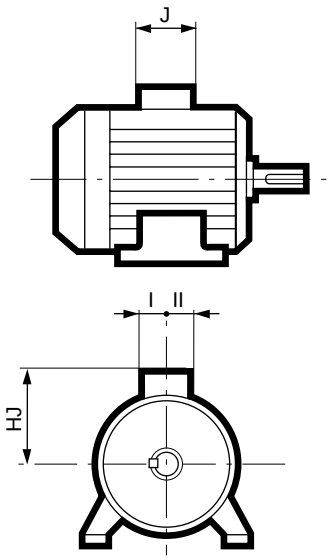
G2 - Mechanical options

G2.1 - VIBRATION SENSOR ADAPTATIONS

On request, our motors may be fitted with different types of approved vibration sensors compatible with the operating zone (sensor not supplied).

The characteristics of the components to be installed must be specified in order to define the sensor location.

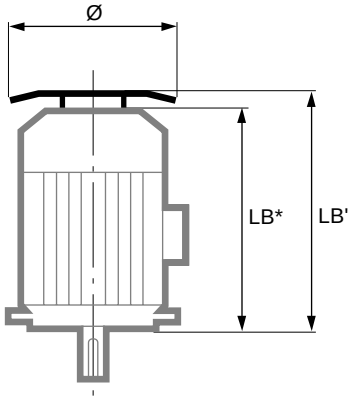
G2.2 - OPTIONAL "e" INCREASED SAFETY TERMINAL BOXES - DIMENSIONS



Type	J	HJ	I	II
FLSD 80	126 (158)	180 (196)	63 (79)	63 (79)
FLSD 90 and 100	126 (158)	190 (206)	63 (79)	63 (79)
FLSD 112	126 (158)	202 (218)	63 (79)	63 (79)
FLSD 132	158	230	79	79
FLSD 160 and 180	223	311	114	156
FLSD 200 and 225	223	346	135	135
FLSD 250	360	470	208	208
FLSD 280	340	577	190	333
FLSD 315 S/M/L	425	628	220	270
FLSD 355	425	663	220	270

( ) motors fitted with sensors

G2.3 - DRIP COVERS



* see pages 61 - 63 - 65

Drip cover for operation in vertical position, shaft end facing down, compulsory for frame sizes 80 to 225.

Type	LB'	Ø
FLSD 80	LB + 22	145
FLSD 90 and 100	LB + 25	185
FLSD 112	LB + 25	208
FLSD 132	LB + 35	238
FLSD 160 and 180	LB + 65	298
FLSD 200 and 225	LB + 70	298
FLSD 250 - 280 and 315	LB + 130	420
FLSD 355	LB + 135	500

G2 - Mechanical options

G2.4 - DRAIN VALVES

For frame sizes larger than or equal to 250, drain valves of an approved type for group IIC can be provided.

This system allows continuous draining of condensation water without operator intervention. However, in very dusty atmospheres, it is advisable to remove the moving part of the valve manually in order to empty out the condensation water.

G2.5 - FORCED VENTILATION

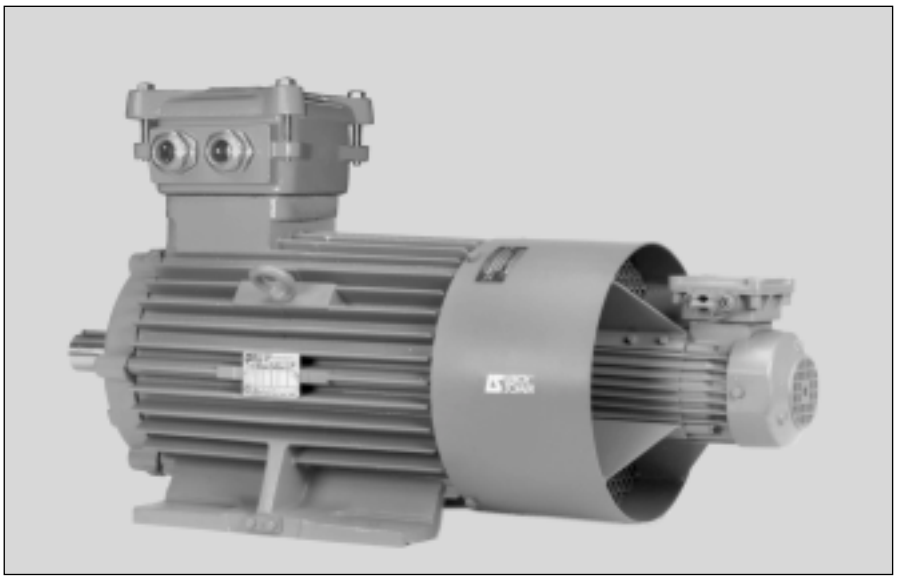
The FLSD motors described in this catalogue are approved to be supplied with frequency inverters.

This type of application sometimes requires the mounting of a forced ventilation unit for use at low speed (temperature rise) or at high speed (noise), in addition to the thermal protection (winding and DE shield).

Safety conditions: the forced ventilation unit is controlled by the power supply and should have the same degree of flameproof protection as the FLSD motor.

The mounting of an axial forced ventilation unit is possible for motors larger than frame size 132.

To adapt the motor to the application, it is necessary to inform the manufacturer of the operating characteristics (speed range, voltage, frequency, etc).



G2.6 - ROLLER BEARINGS

For high radial forces, it is possible to adapt roller bearings to the motor DE shield from frame size 132 upwards.

Please consult Leroy-Somer.

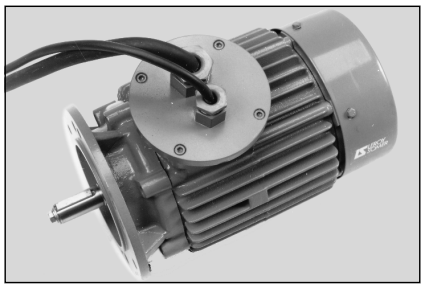
G2.7 - FLYING LEADS (on request)

Motors can be fitted with flying leads consisting of multicore or single-core cables for high currents.

The earthing is included in the sheathed cable output.

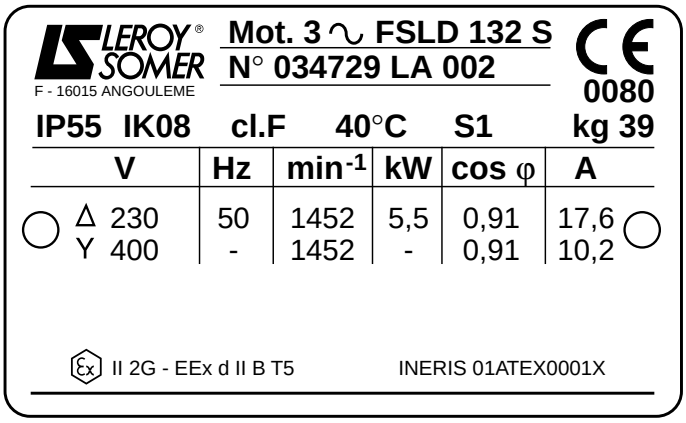
Accessories (thermal protection, space heaters, etc.) are usually connected using another multicore cable.

Caution: Motors with flying leads must be connected in an area with a protection type compatible with the installation zone.



H1 - Identification

H1.1 - IDENTIFICATION PLATES AND LEGEND - FRAME SIZE 80 to 132



▼ ***Definition of symbols used on nameplates***

Legal mark indicating that the equipment conforms to the requirements of the european directives.

MOT 3 ~ : Three-phase A.C. motor
FLSD : FLSD range
132 : Frame size
S : Housing symbol

Motor no.

N° : Motor batch number
L* : Year of production (2001)
A** : Month of production (January)
002 : Serial number

kg : Weight
IP55 : Index of protection
I cl. F : Insulation class F
40°C : Maximum ambient temperature for operation
S1 : Duty
V : Supply voltage
Hz : Supply frequency
min-1 : Revolutions per minute (rpm)
kW : Rated output power
cos φ : Power factor
A : Rated current
Δ - Y : Connection symbol

Legend

: Special mark denoting protection against risk of explosion
0080 : INERIS identification number
EEx : Symbol denoting switchgear designed for potentially explosive atmospheres
d : Protection type
II : Explosion group
B : Gas subdivision
T5 : Temperature class
INERIS : Notified Body
01ATEX0001X : EC-type examination certificate number

* L = 2001
M = 2002
.....

**A = January
B = February
.....

H1 - Identification

H1.2 - IDENTIFICATION PLATES AND LEGEND - FRAME SIZE 160 to 355

LEROY SOMER F - 90500 BEAUCOURT	MOT. 3 ~ FLSD 225 M4					CE 0080
	N° 703 481 00 MA 002 kg : 388					
IP 55 IK 08	I cl. F	40°C	S 1	%	d/h	
V	Hz	min^{-1}	kW	cos φ	A	
△380	50	1465	45	0,86	86	
△400	-	1470	-	0,84	84	
⅄ 690	-	-	-	-	48	
Ex II 2G - EEx d IIB T4 - T amb : -25°C à 40°C						
GRAISSE ESSO UNIREX N3	INERIS 01ATEX0001 X					
DE	6313 C3	23 cm³	8300 / 6500	H 50/60 Hz		
NDE	6312 C3	20 cm³	8300 / 6500	H 50/60 Hz		

▼ ***Definition of symbols used on nameplates***

CE **Legal mark indicating that the equipment conforms to the requirements of the european directives.**

MOT 3 ~ : Three-phase A.C. motor
FLSD : FLSD range
225 : Frame size
M : Housing symbol

Motor no.

N° : Motor batch number
M* : Year of production (2002)
A** : Month of production (January)
002 : Serial number

kg : Weight
IP55 : Index of protection
I cl. F : Insulation class F
40°C : Maximum ambient temperature for operation
S1..%: Duty - Duty (operating) factor
...d/h : No. of cycles per hour
V : Supply voltage
Hz : Supply frequency
min^{-1} : Revolutions per minute (rpm)
kW : Rated output power
cos φ: Power factor
A : Rated current
Δ - Y : Connection symbol

Legend

Ex : Special mark denoting protection against risk of explosion
0080 : INERIS identification number
EEx : Symbol denoting switchgear designed for potentially explosive atmospheres
d : Protection type
II : Explosion group
B : Gas subdivision
T4 : Temperature class
INERIS : Notified Body
01ATEX0001X : EC-type examination certificate number

Bearings

DE : Drive end bearing
NDE : Non drive end bearing
23 cm³: Amount of grease at each regreasing (in cm³)
8300 h : Regreasing interval
UNIREX N3: Type of grease

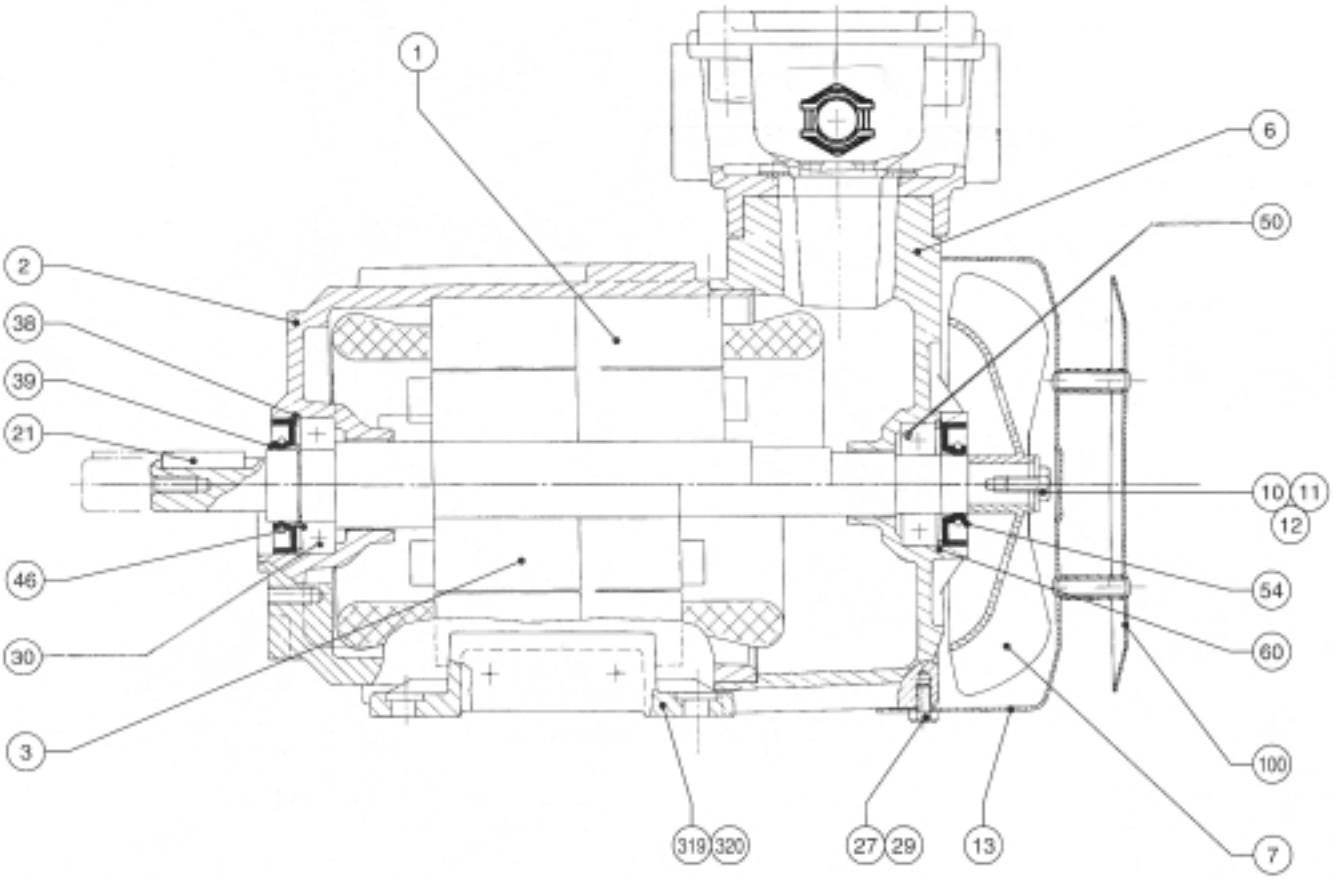
* L = 2001
M = 2002
.....

**A = January
B = February
.....

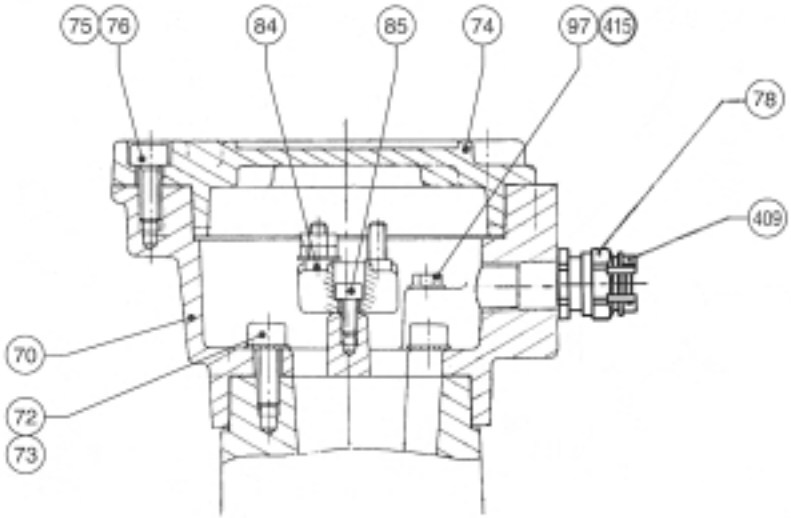
H2 - Cross-sectional views and parts list

H2.1 - FLSD 80

EEx d



EEx d terminal box



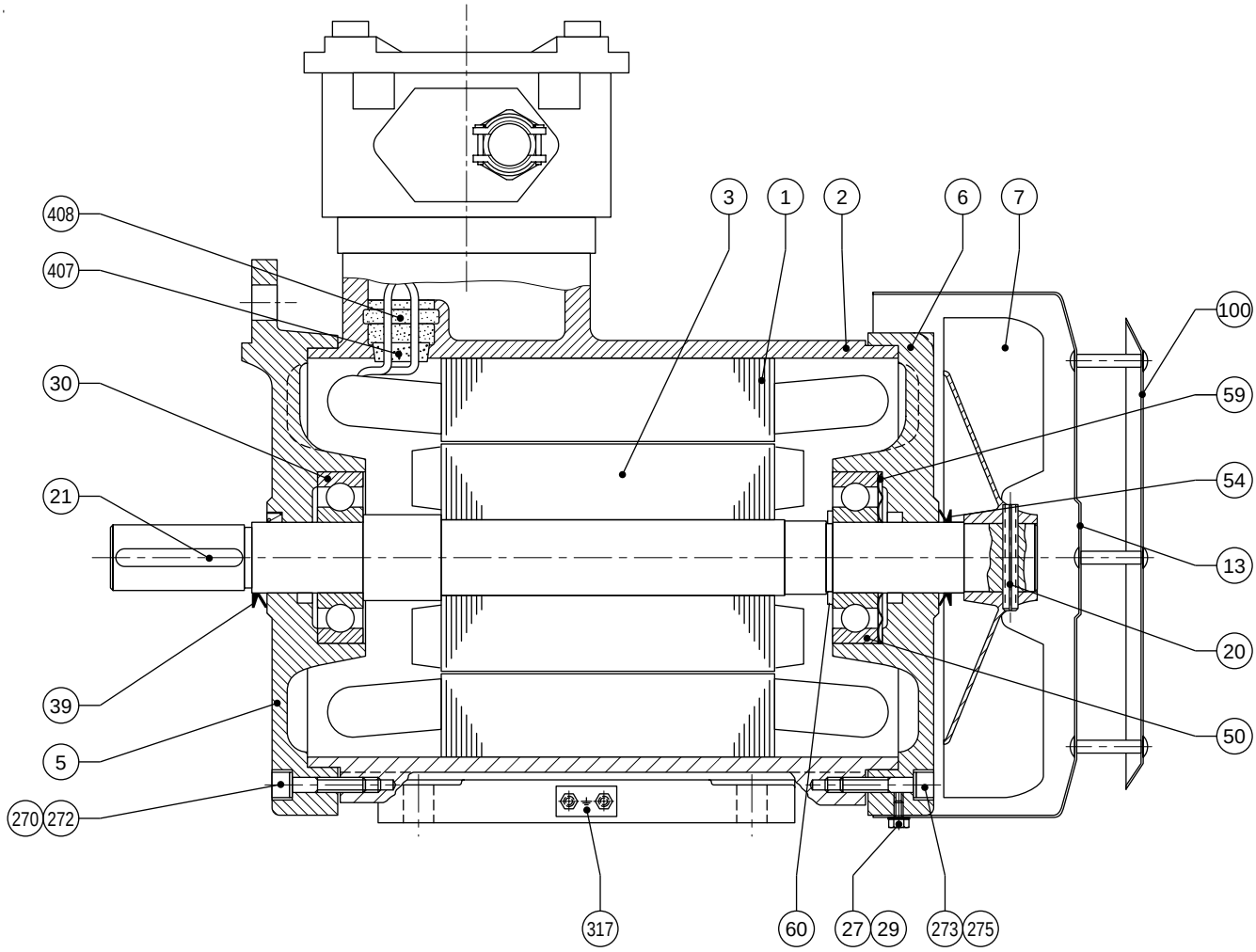
H2 - Cross-sectional views and parts list

Frame size: 80					
No.	**Description**	**No.**	**Description**	**No.**	**Description**
1	Wound stator	**30**	Drive end bearing	**76**	Cover washer
2	Housing	**38**	Bearing circlips	**78**	Cable gland
3	Rotor	**39**	DE seal	**84**	“d” terminal box
6	NDE shield	**46**	DE bearing circlips	**85**	“d” baseplate screw
7	Fan	**50**	NDE bearing	**97**	Earth terminal
10	Turbine or fan screw	**54**	NDE seal	**100**	Drip cover
11	Washer	**60**	NDE thrust bearing seal	**319**	Removable feet on right (DE view)
12	Lock washer	**70**	“d” terminal box casing	**320**	Removable feet on left (DE view)
13	Fan cover	**72**	Terminal box screw	**409**	Cable anchor
21	Key	**73**	Terminal box washers	**415**	Washer
27	Fan cover screw	**74**	“d” terminal box cover		
29	Washer	**75**	“d” cover screw		

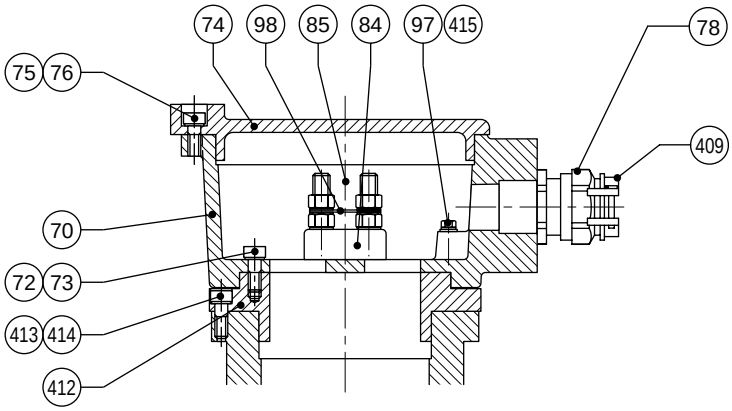
H2 - Cross-sectional views and parts list

H2.2 - FLSD 90 - 100 - 112

EEx d



EEx d terminal box



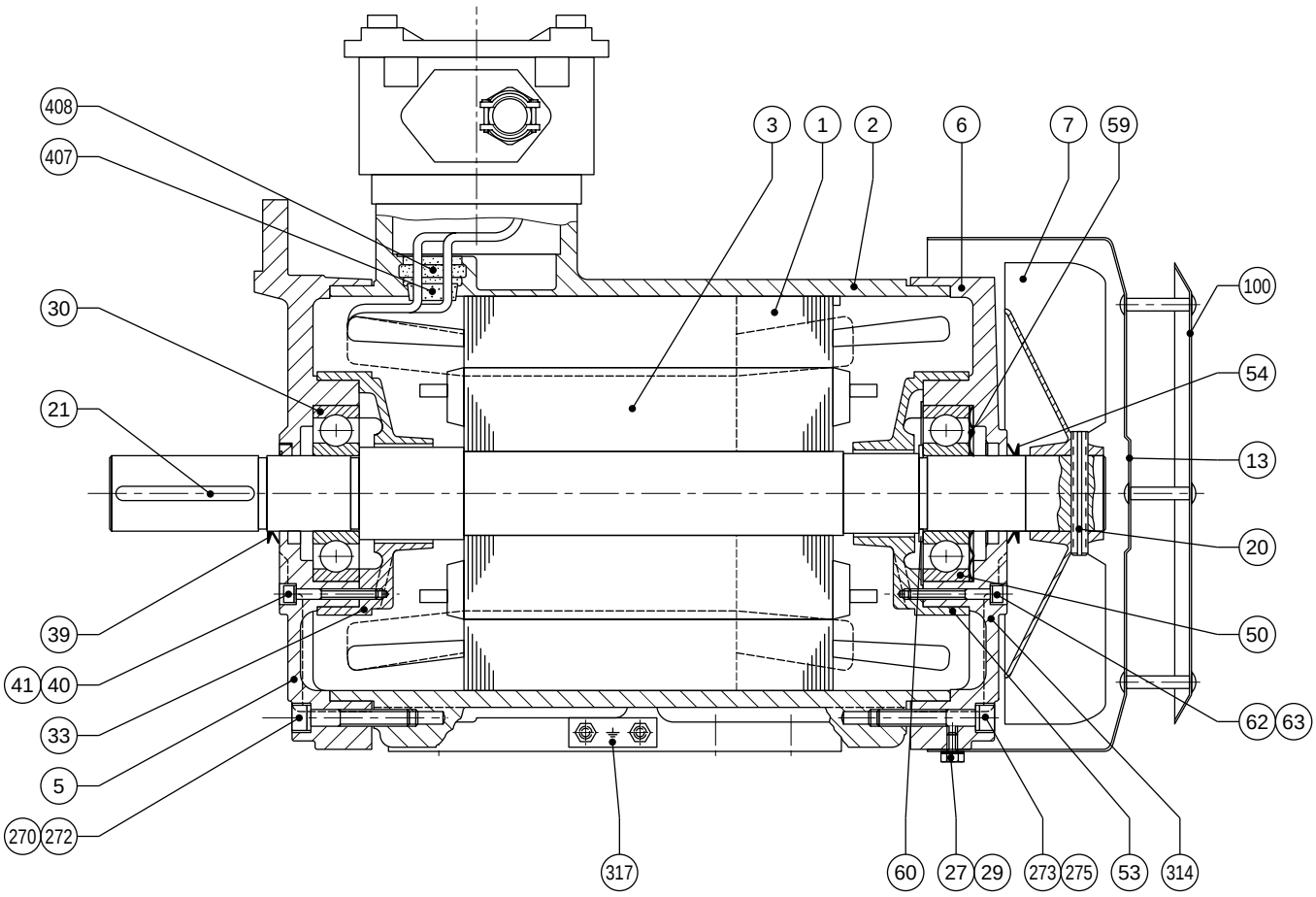
H2 - Cross-sectional views and parts list

Frame size: 90 - 100 - 112					
No.	**Description**	**No.**	**Description**	**No.**	**Description**
1	Wound stator	**54**	NDE seal	**100**	Drip cover
2	Housing	**59**	Preloading (wavy) washer	**270**	DE shield fixing screw
3	Rotor	**60**	NDE thrust bearing seal	**272**	Lock washer
5	DE shield	**70**	“d” terminal box casing	**273**	NDE shield fixing screw
6	NDE shield	**72**	Terminal box screw	**275**	Lock washer
7	Fan	**73**	Terminal box washers	**317**	Housing earth terminal
13	Fan cover	**74**	“d” terminal box cover	**407**	Rubber plug
20	Fan fixing pin	**75**	“d” cover screw	**408**	Flameproof screening
21	Key	**76**	Cover washer	**409**	Cable anchor
27	Fan cover screw	**78**	Cable gland	**412**	“d” terminal box support
29	Washer	**84**	“d” terminal block	**413**	Support plate screw
30	Drive end bearing	**85**	“d” baseplate screw	**414**	Support plate washer
39	DE seal	**97**	Earth terminal	**415**	Washer
50	NDE bearing	**98**	Connector links		

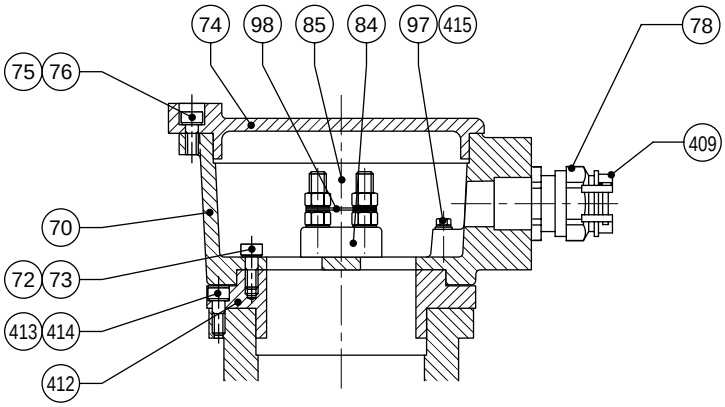
H2 - Cross-sectional views and parts list

H2.3 - FLSD 132

EEx d



EEx d terminal box



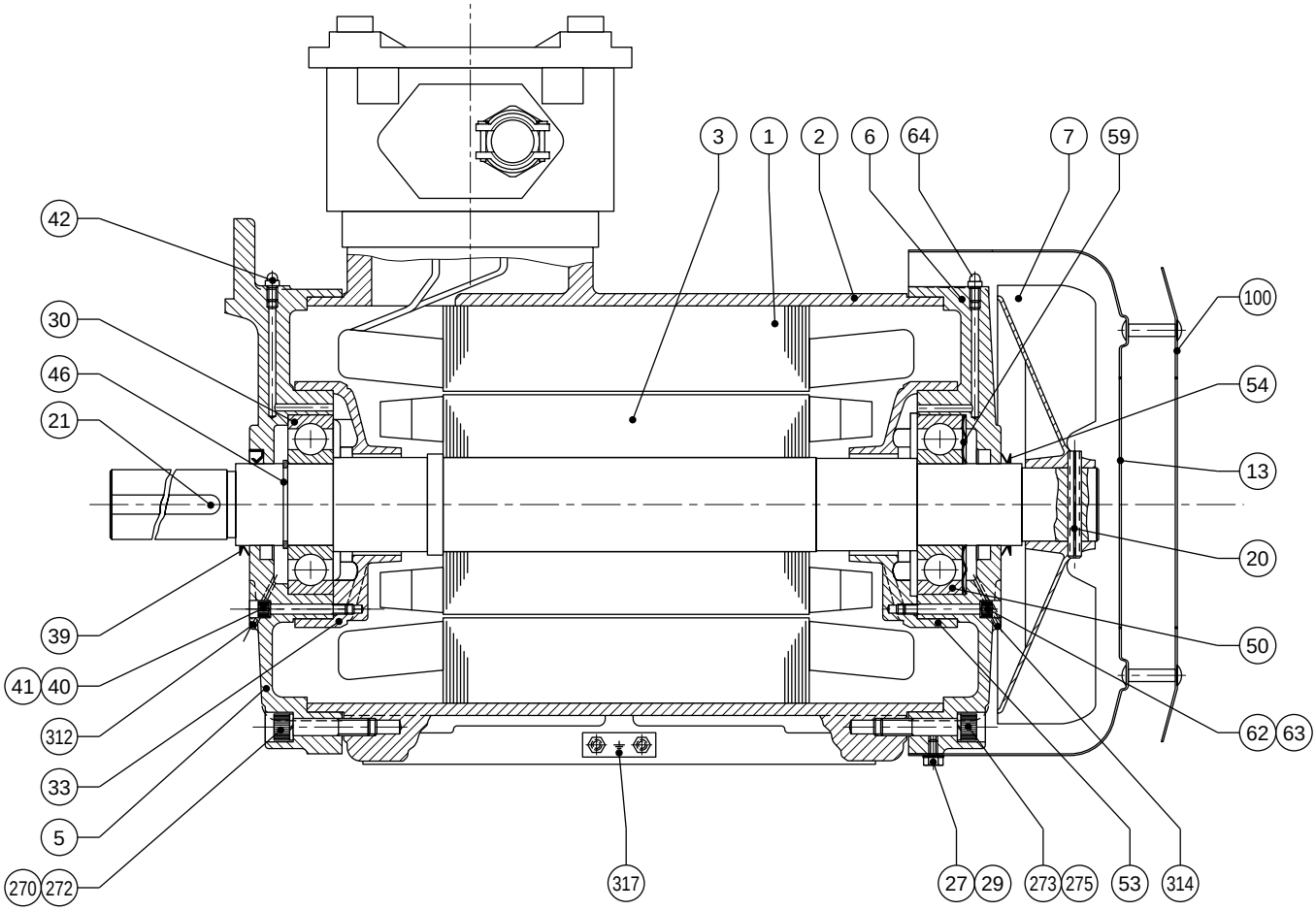
H2 - Cross-sectional views and parts list

Frame size: 132					
No.	**Description**	**No.**	**Description**	**No.**	**Description**
1	Wound stator	**53**	NDE internal cover	**100**	Drip cover
2	Housing	**54**	NDE seal	**270**	DE shield fixing screw
3	Rotor	**59**	Preloading (wavy) washer	**272**	Lock washer
5	DE shield	**60**	NDE thrust bearing seal	**273**	NDE shield fixing screw
6	NDE shield	**62**	NDE bearing cover screw	**275**	Lock washer
7	Fan	**63**	NDE bearing cover	**312**	DE grease drain screw
13	Fan cover	**70**	“d” terminal box casing	**314**	NDE grease drain screw
20	Fan fixing pin	**72**	Terminal box screw	**317**	Housing earth terminal
21	Key	**73**	Terminal box washers	**407**	Rubber plug
27	Fan cover screw	**74**	“d” terminal box cover	**408**	Flameproof screening
29	Washer	**75**	“d” cover screw	**409**	Cable anchor
30	Drive end bearing	**76**	Cover washer	**412**	“d” terminal box support
33	DE internal cover	**78**	Cable gland	**413**	Support plate screw
39	DE seal	**84**	“d” terminal block	**414**	Support plate washer
40	DE bearing cover screw	**85**	“d” baseplate screw	**415**	Washer
41	Lock washer	**97**	Earth terminal		
50	NDE bearing	**98**	Connector links		

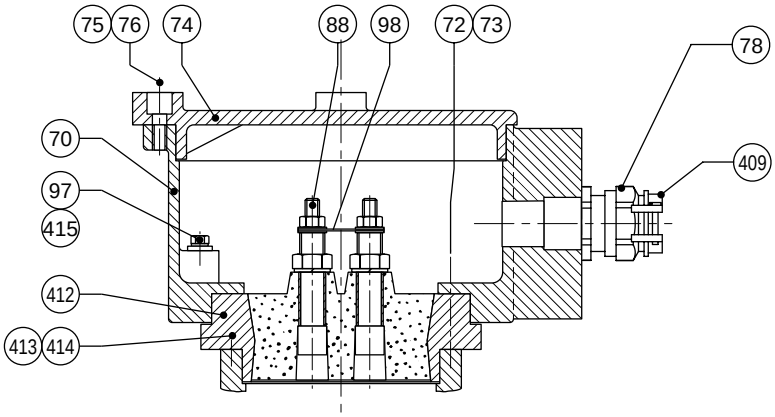
H2 - Cross-sectional views and parts list

H2.4 - FLSD 160 - 180 - 200

EEx d



EEx d terminal box



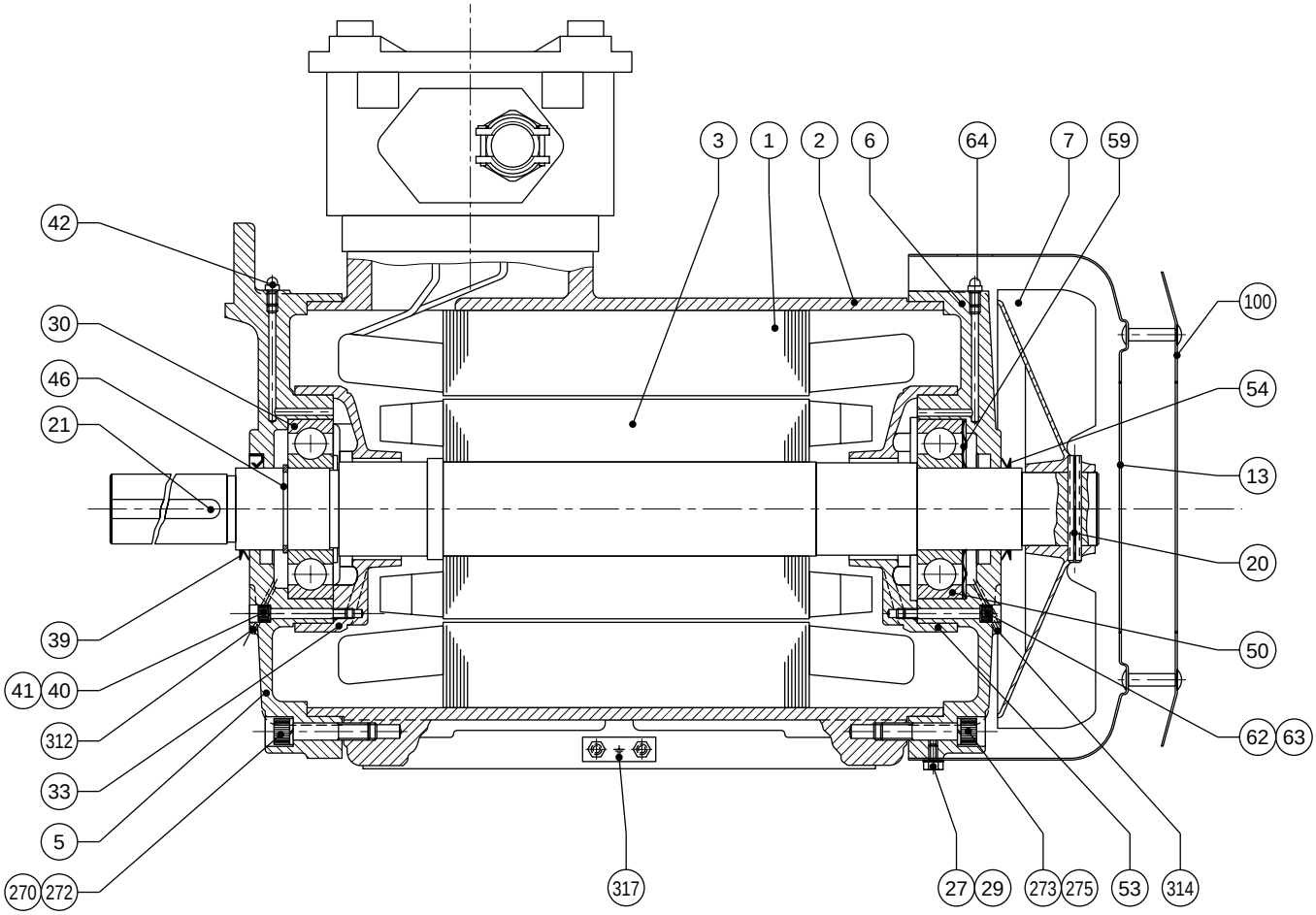
H2 - Cross-sectional views and parts list

Frame size: 160 - 180 - 200					
No.	**Description**	**No.**	**Description**	**No.**	**Description**
1	Wound stator	**42**	DE grease nipple	**88**	Terminal post
2	Housing	**46**	DE bearing circlips	**97**	Earth terminal
3	Rotor	**50**	NDE bearing	**98**	Connector links
5	DE shield	**53**	NDE internal cover	**100**	Drip cover
6	NDE shield	**54**	NDE seal	**270**	DE shield fixing screw
7	Fan	**59**	NDE preloading (wavy) washer	**272**	Lock washer
13	Fan cover	**62**	NDE bearing cover screw	**273**	NDE shield fixing screw
20	Fan fixing pin	**63**	NDE bearing cover	**275**	Lock washer
21	Key	**64**	NDE grease nipple	**312**	DE grease drain screw
27	Fan cover screw	**70**	“d” terminal box casing	**314**	NDE grease drain screw
29	Washer	**72**	Terminal box screw	**317**	Housing earth terminal
30	Drive end bearing	**73**	Terminal box washers	**409**	Cable anchor
33	DE internal cover	**74**	“d” terminal box cover	**412**	“d” terminal box support
39	DE seal	**75**	“d” cover screw	**413**	Support plate screw
40	DE bearing cover screw	**76**	Cover washer	**414**	Support plate washer
41	Lock washer	**78**	Cable gland	**415**	Washer

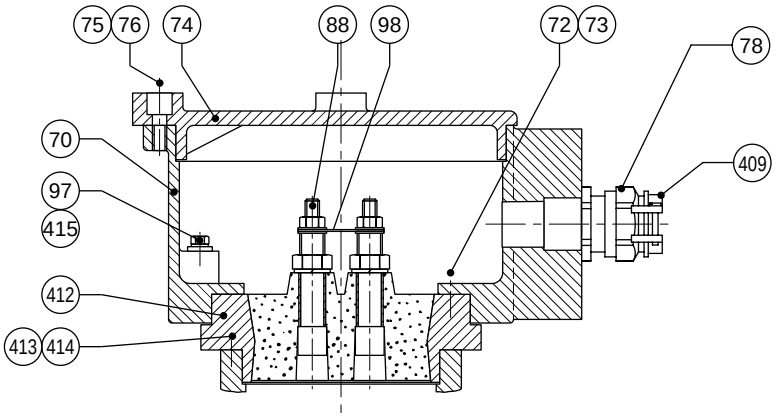
H2 - Cross-sectional views and parts list

H2.5 - FLSD 225

EEx d



EEx d terminal box



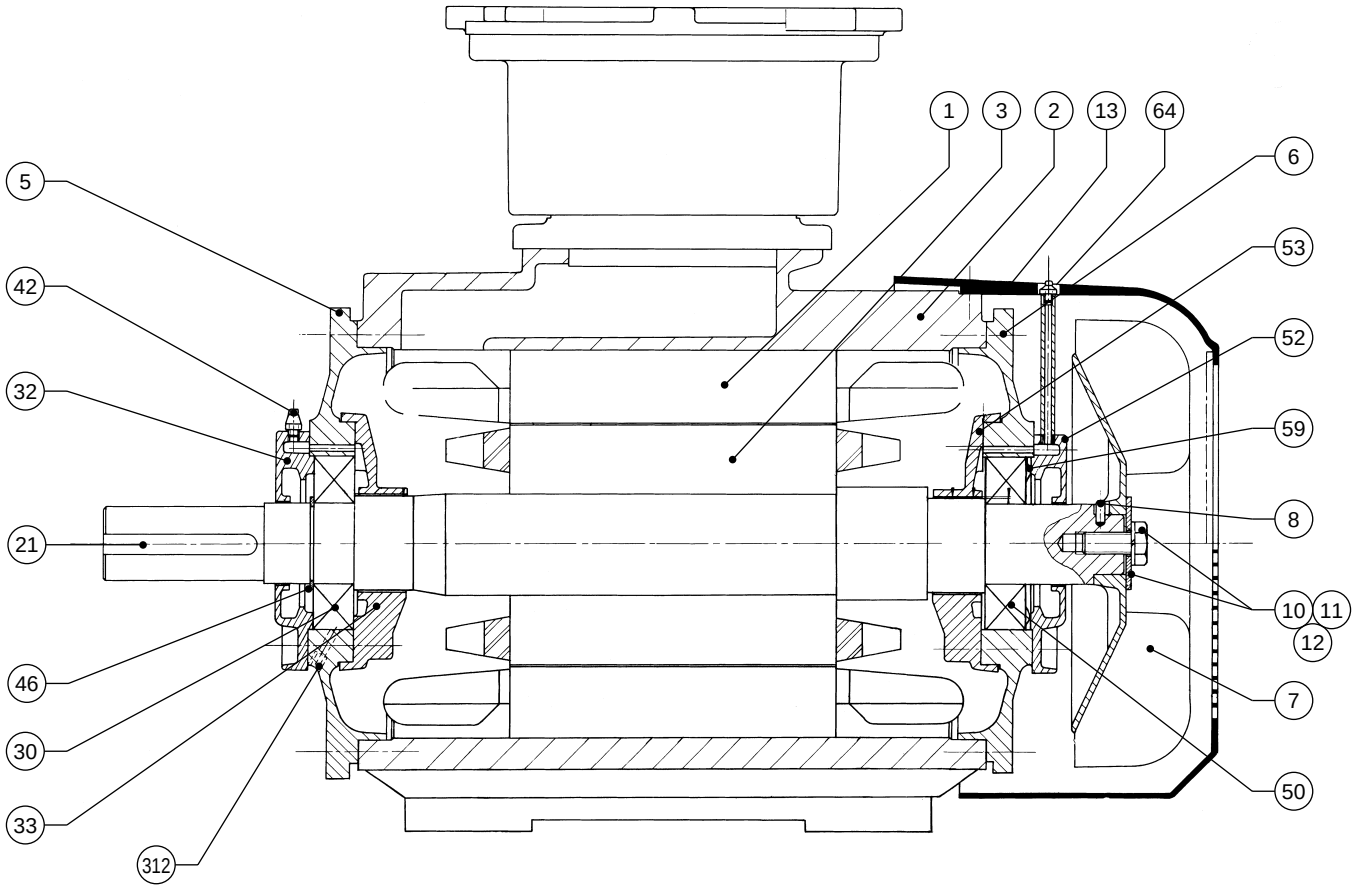
H2 - Cross-sectional views and parts list

Frame size: 225					
No.	**Description**	**No.**	**Description**	**No.**	**Description**
1	Wound stator	**42**	DE grease nipple	**88**	Terminal post
2	Housing	**46**	DE bearing circlips	**97**	Earth terminal
3	Rotor	**50**	NDE bearing	**98**	Connector links
5	DE shield	**53**	NDE internal cover	**100**	Drip cover
6	NDE shield	**54**	NDE seal	**270**	DE shield fixing screw
7	Fan	**59**	NDE preloading (wavy) washer	**272**	Lock washer
13	Fan cover	**62**	NDE bearing cover screw	**273**	NDE shield fixing screw
20	Fan fixing pin	**63**	NDE bearing cover	**275**	Lock washer
21	Key	**64**	NDE grease nipple	**312**	DE grease drain screw
27	Fan cover screw	**70**	“d” terminal box casing	**314**	NDE grease drain screw
29	Washer	**72**	Terminal box screw	**317**	Housing earth terminal
30	Drive end bearing	**73**	Terminal box washers	**409**	Cable anchor
33	DE internal cover	**74**	“d” terminal box cover	**412**	“d” terminal box support
39	DE seal	**75**	“d” cover screw	**413**	Support plate screw
40	DE bearing cover screw	**76**	Cover washer	**414**	Support plate washer
41	Lock washer	**78**	Cable gland	**415**	Washer

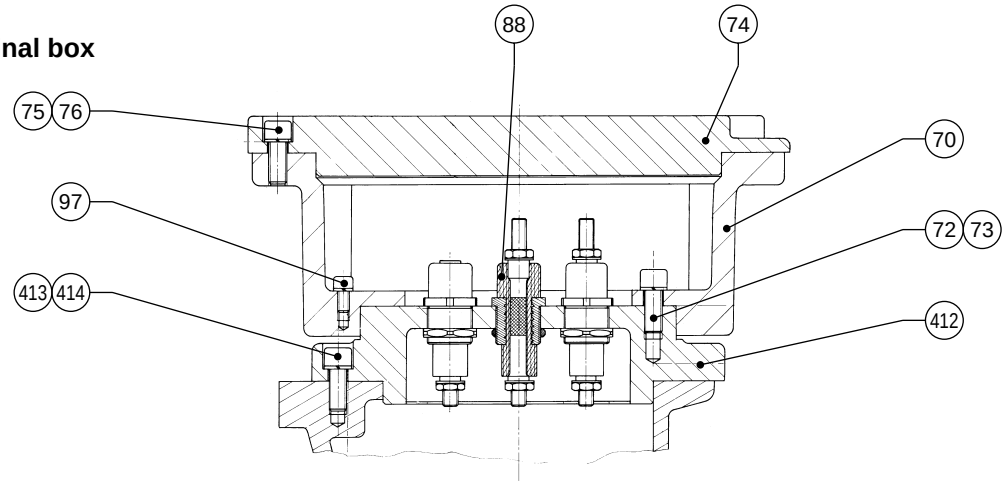
H2 - Cross-sectional views and parts list

H2.6 - FLSD 250

EEx d



EEx d terminal box



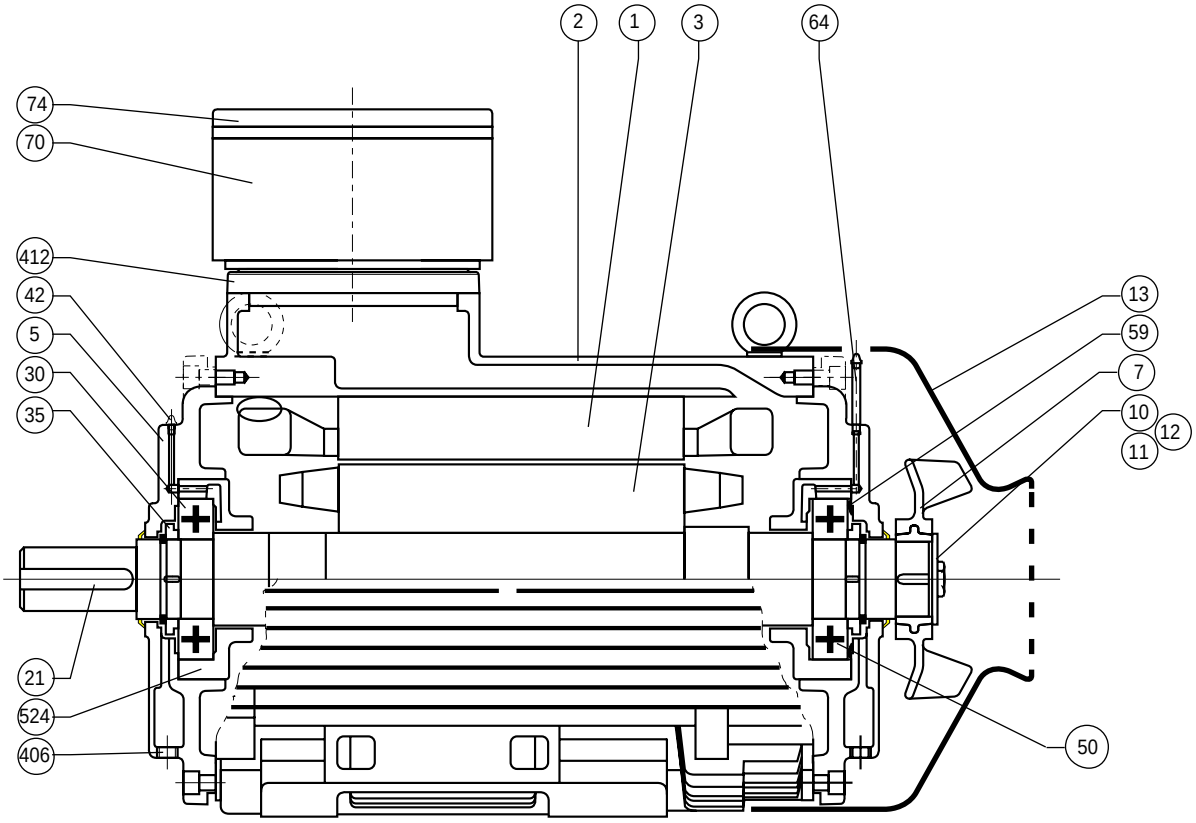
H2 - Cross-sectional views and parts list

Frame size: 250					
No.	**Description**	**No.**	**Description**	**No.**	**Description**
1	Wound stator	**21**	Key	**72**	Terminal box screw
2	Housing	**30**	Drive end bearing	**73**	Terminal box washers
3	Rotor	**32**	DE external cover	**74**	“d” terminal box cover
5	DE shield	**33**	DE internal cover	**75**	“d” cover screw
6	NDE shield	**42**	DE grease nipple	**76**	Cover washer
7	Fan	**46**	DE bearing circlips	**88**	Terminal post
8	Fan key	**50**	NDE bearing	**97**	Earth terminal
10	Turbine or fan screw	**52**	NDE external cover	**312**	DE grease drain screw
11	Washer	**53**	NDE internal cover	**412**	“d” terminal box support
12	Lock washer	**59**	NDE preloading (wavy) washer	**413**	Support plate screw
13	Fan cover	**64**	NDE grease nipple	**414**	Support plate washer
20	Fan fixing pin	**70**	“d” terminal box casing		

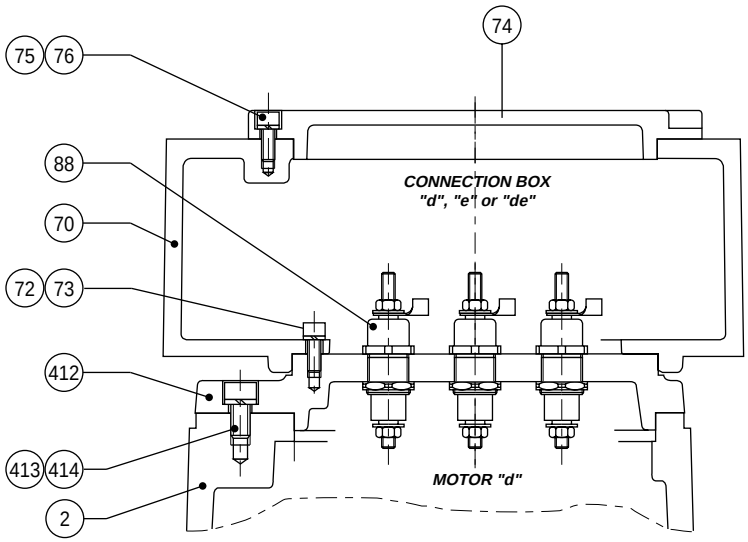
H2 - Cross-sectional views and parts list

H2.7 - FLSD 280

EEx d



EEx d terminal box



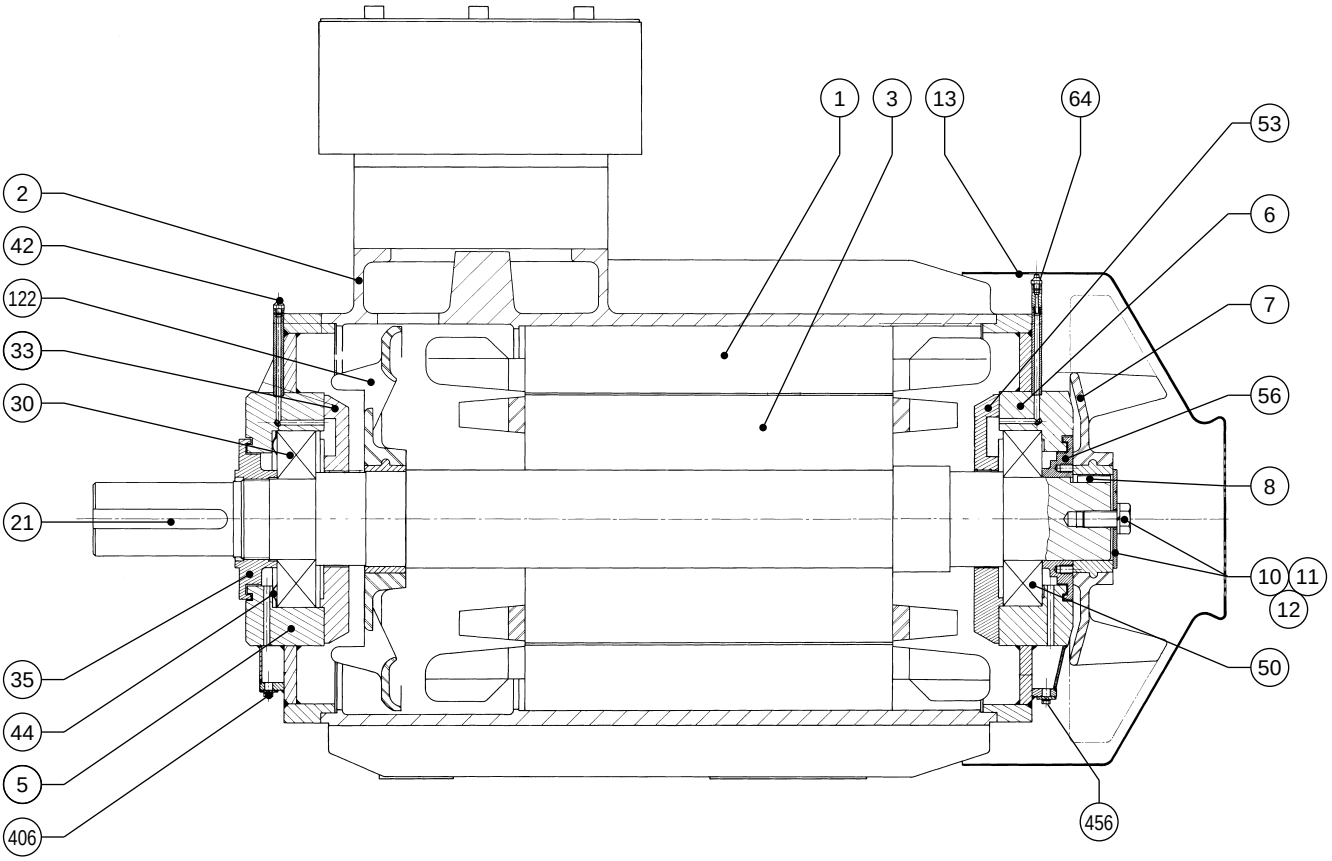
H2 - Cross-sectional views and parts list

Frame size: 280					
No.	**Description**	**No.**	**Description**	**No.**	**Description**
1	Wound stator	**30**	Drive end bearing	**75**	“d” cover screw
2	Housing	**35**	Moving part of DE grease valve	**76**	Cover washer
3	Rotor	**42**	DE grease nipple	**88**	Terminal post
5	DE shield	**50**	NDE bearing	**406**	Grease valve cover plate
7	Fan	**59**	NDE preloading (wavy) washer	**412**	“d” terminal box support
10	Turbine or fan screw	**64**	NDE grease nipple	**413**	Support plate screw
11	Washer	**70**	“d” terminal box casing	**414**	Support plate washer
12	Lock washer	**72**	Terminal box screw	**524**	DE bearing housing
13	Fan cover	**73**	Terminal box washers		
21	Key	**74**	“d” terminal box cover		

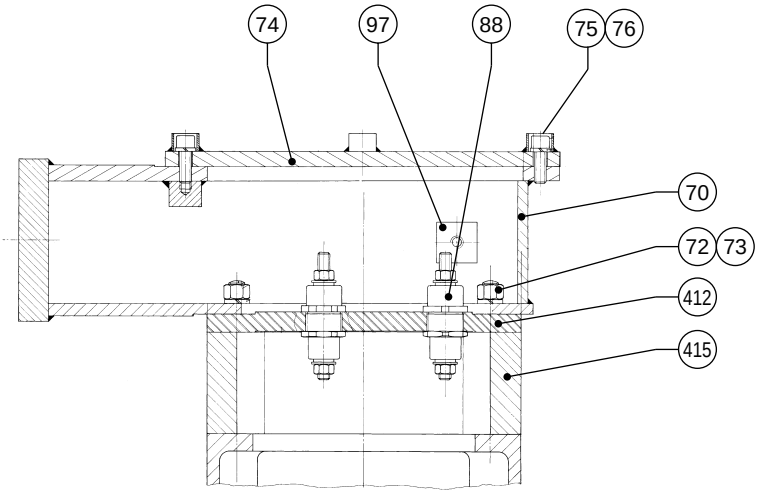
H2 - Cross-sectional views and parts list

H2.8 - FLSD 315 to 355

EEx d



EEx d terminal box



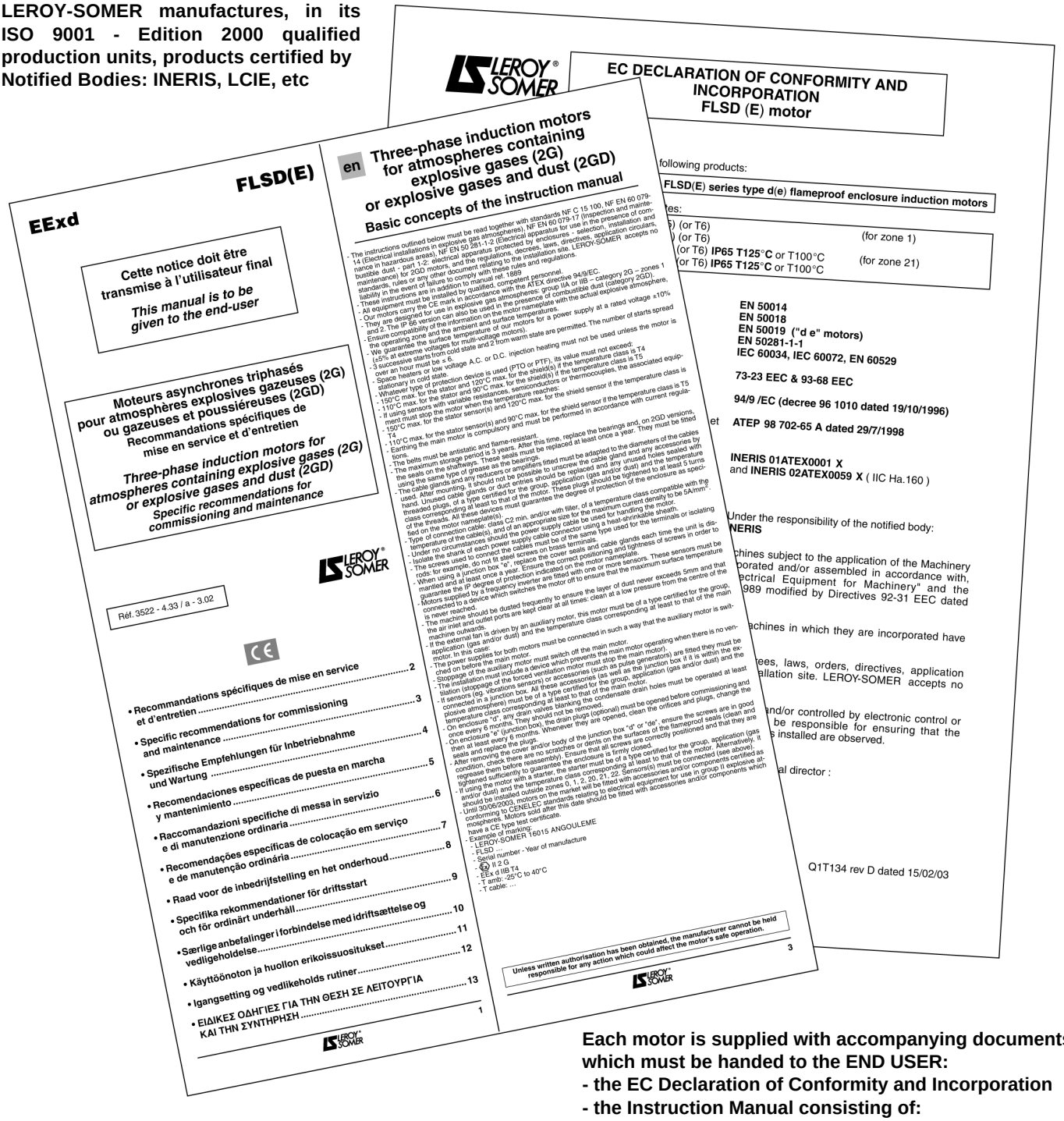
H2 - Cross-sectional views and parts list

Frame size: 315 to 355					
No.	**Description**	**No.**	**Description**	**No.**	**Description**
1	Wound stator	**30**	Drive end bearing	**74**	“d” terminal box cover
2	Housing	**33**	DE internal cover	**75**	“d” cover screw
3	Rotor	**35**	Moving part of DE grease valve	**76**	Cover washer
5	DE shield	**42**	DE grease nipple	**88**	Terminal post
6	NDE shield	**44**	DE preloading (wavy) washer	**97**	Earth terminal
7	Fan	**50**	NDE bearing	**122**	Air circulator
8	Fan key	**53**	NDE internal cover	**406**	Grease valve cover plate
10	Turbine or fan screw	**56**	Moving part of NDE grease valve	**412**	“d” terminal box support
11	Washer	**64**	NDE grease nipple	**415**	Flameproof terminal box height spacer
12	Lock washer	**70**	“d” terminal box casing	**456**	Grease valve cover plate
13	Fan cover	**72**	Terminal box screw		
21	Key	**73**	Terminal box washers		

FLSD flameproof TEFV induction motors Maintenance/Installation

H3 - Documentation - Manuals

LEROY-SOMER manufactures, in its ISO 9001 - Edition 2000 qualified production units, products certified by Notified Bodies: INERIS, LCIE, etc



If lost, these documents will be supplied on request.

Each motor is supplied with accompanying documents which must be handed to the END USER:
- **the EC Declaration of Conformity and Incorporation**
- **the Instruction Manual consisting of:**
  - **Recommendations for storing and installing induction motors.**
  - **Special manual for 3-phase induction motors for atmospheres containing explosive gases (2G) or explosive gases and dust (2GD).**

***Warning:* unless the manufacturer's agreement has been obtained in writing, any intervention which might affect the motor protection type is the responsibility of the person carrying out the work.**

Notes

I - APPLICATION AREA

Acceptance of our tenders or the placing of any order with us implies acceptance of the following conditions without exception or reservation. These conditions of sale shall prevail over all stipulations appearing on the customer's purchase order, his general conditions of purchase or any other document emanating from him and / or a third party.

A dispensation from these General Conditions of Sale applies to sales concerning foundry parts, which are subject to the European Foundries General Conditions of Sale, latest edition.

II - ORDERS

All orders, including those taken by our agents and representatives, by whatever mode of transmission, become valid only after we have accepted them in writing.

We reserve the right to modify the characteristics of our goods without prior warning. However, the customer reserves the possibility to specify technical specifications in the order. Unless such requirements have been notified in writing, the customer will not be able to refuse delivery of new modified goods.

Our company will not accept responsibility for an incorrect choice of goods if this incorrect choice results from incomplete and / or erroneous conditions of use, or conditions that have not been conveyed to the vendor by the customer.

Unless otherwise specified, our tenders and estimates are only valid for thirty days from the date of issue.

When the goods have to satisfy standards, particular regulations and / or be inspected by standards or control organisations, the price request must be accompanied by full specifications with which we must comply with. This is mentioned in the estimate. All test and inspection fees are the customer's responsibility.

III - PRICE

Our prices and price lists are shown exclusive of tax and may be revised without prior notice.

Our prices are either firm for the duration specified on the estimate, or subject to revision according to a formula accompanying the tender which, depending on the regulations, covers a change in the cost of raw materials, products, various services and salaries, an index of which is published in the B.O.C.C.R.F. ("Bulletin Officiel de la Concurrence, de la Consommation et de la Répression des Fraudes").

For any order of goods not found in our catalogue, requiring special manufacture, the invoice will include a minimum fixed sum of 600 FRF (six hundred French Francs) exclusive of tax, to cover start - up costs. Any tax due will be charged to the customer.

All related costs, such as customs clearance and special inspections, will be added on.

Customers should remember that the French Franc (or other currency) is being replaced by the Single European Currency (EURO) according to a European Community ruling. In accordance with the general principles of monetary law, references to the French Franc will then as of right be considered to refer to the Euro. This substitution will be enforced on the date and in accordance with the conditions defined by the European Community ruling.

IV - DELIVERY

Our export sales are governed by the INCOTERMS published by the International Chamber of Commerce ("I.C.C. INCOTERMS"), latest edition.

Goods are despatched in accordance with the conditions indicated on our order acknowledgement, sent out in response to any order for goods and / or services.

Unless otherwise specified, our prices refer to goods put at customer's disposal in our factories, and include standard packaging.

Unless otherwise specified, goods are always transported at the consignee's risk. Without exception, it is up to the purchaser to raise with the transporter, in the legal form and time limits, any claim concerning the condition or the number of packages received and also to send us at the same time a copy of this declaration. Failure to respect this procedure will relieve us of all responsibility.

In the case of CIF (Cost, Insurance & Freight) or CIP (Carriage & Insurance Paid to) sales, etc…, in the event of damage, our responsibility will only be engaged if any reservations and required declarations have been notified in the required time period, and will not in any case exceed the indemnity sum received from our insurers.

If the arrangements for despatch are modified, we reserve the right to invoice any additional costs arising from such changes. Packages cannot be returned.

Should the delivery of goods be delayed for a reason not attributable to the vendor, goods will be stored on the vendor's premises, at the own risk of the customer, at a charge for storage of 1% (one per cent) of the total order sum per week, beginning, without a grace period, on the day after the scheduled date of delivery indicated in the contract. After thirty days from this date, the vendor has the right to dispose of these goods as he wishes and arrange a new delivery date for the said goods with the customer. In all instances, all down payments received remain the property of the vendor as indemnity, without prejudice to other claims for damages that the vendor may wish to bring.

V - DELIVERY DATES

Delivery times are stated for information only, and do not include the month of August.

Delivery dates are counted from the issue date of the order acknowledgement from the vendor and are subject to compliance with the provisions indicated on the order acknowledgement, notably receipt of the down payment for the order, notification of the issuance of an irrevocable letter of credit conforming to all vendor requirements (especially as regards the amount, currency, validity, licence, etc.) and acceptance of the terms of payment with any guarantees which may be required, etc…

In no case does late delivery automatically entitle the customer to damages and / or penalties.

Unless otherwise specified, we reserve the right to make partial deliveries.

Delivery dates are automatically suspended without formal notice, and the vendor shall have no responsibility in cases of Force Majeure, or events beyond the control of the vendor or his suppliers such as delays, saturation, or unavailability of the planned transport methods, energy, raw materials etc., serious accidents such as fires, explosions, strikes, lock out, or emergency measures taken by the Authorities occurring after the conclusion of the order and preventing its normal execution. Similarly, delivery dates are automatically suspended without formal notice in all cases of failure to perform or late payment by the customer.

VI - TESTS

All goods manufactured by the vendor are tested before leaving the factory in accordance with vendor's ISO 9001 certifications. Customers may attend these tests : they simply have to convey the wish to do so in writing when the order is placed.

Specific tests and acceptance tests requested by the customer, whether conducted on the customer's premises, in our factories, on-site, or by inspection organisations, must be noted on the order and are to be paid for by the customer.

Goods specially developed for a customer will have to be approved by the latter before any delivery of mass - produced goods, notified by signing and returning to us the Product Approval Schedule reference Q1. T. 034.

In the event of the customer's insistence on delivery without having signed this form beforehand, the goods will then still be considered as prototypes and the customer will assume sole responsibility for using it or supplying it to his own customers.

VII -TERMS OF PAYMENT

All our sales are considered as carried out and payable at the registered office of the vendor, without exception, whatever the method of payment, the place of conclusion of the sale and delivery.

When the customer is based in France, our invoices are payable on receipt in cash, by banker's draft, or by L.C.R. ("Lettre de Change - Relevé"), within thirty days from the end of the month following the invoice date, net and without discount.

When the customer is based outside France, our invoices are payable in cash against delivery of the dispatching documents or by irrevocable documentary credit confirmed by a first class French bank with all bank charges payable by the customer.

Payments must be made in the currency of the invoice.

In accordance with French Law N° 92.1442 dated December 31,1992, non-payment of an invoice by its due date will give rise, after formal notice, to a penalty equal to one and a half times (1.5) the official rate of interest, and to late payment interest at the bank base rate plus five per cent. If the invoice carries V.A.T. (Value Added Tax), this is calculated on the amount, inclusive of tax, of the remaining sum due and comes into force from the due date.

Should steps have to be taken to recover the said amount, a surcharge of 15% (fifteen per cent) of the sum demanded will be payable.

Moreover, as a consequence of non - payment of an invoice or any term of payment, whatever the method of payment envisaged, the customer shall pay immediately for the whole of the outstanding amount owed to the vendor (including his subsidiaries, sister or parent companies, whether in France or overseas) for all deliveries or services, whatever their initial due date.

Notwithstanding any particular terms of payment arranged between the parties concerned, the vendor reserves the right to demand :

– payment in cash, before the goods leave the factory, for all orders in the process of manufacture, in the event of a problem with payment, or if the customer's financial situation justifies it,
– a down payment for the order.

Unless we are at fault, all down payments are non - returnable, without prejudice to our right to claim damages.

Any payment made in advance of the fixed payment date will lead to a discount of 0.2 % (zero point two per cent) per month of the amount concerned.

VIII - COMPENSATION CLAUSE

Unless prohibited by law, the vendor and the customer expressly agree between one another to compensate their respective debts arising from their commercial relationship, even if the conditions defined by law for legal compensation are not all satisfied.

In applying this clause, by vendor we mean any company in the LEROY SOMER group.

IX - TRANSFER OF RISKS - TRANSFERT OF TITLE

Transfer of risks occurs upon the handing over of the goods, according to the delivery conditions agreed at the time of ordering.

THE TRANSFER OF TITLE OF THE GOODS SOLD TO THE CUSTOMER OCCURS UPON PAYMENT OF THE WHOLE PRINCIPAL SUM AND INTEREST.

The provision of a document creating an obligation to pay (bank draft or similar) does not constitute payment.

So long as the price has not been paid in full, the customer is obliged to inform the vendor, within twenty - four hours, of the seizure, requisition or confiscation of goods to the benefit of a third party, and to take all safety measures to acquaint others with and respect our right of title in the event of intervention by creditors.

Failure to pay the amount due, whether total or partial, on the due date, for whatever reason and on whatever grounds, authorises the vendor to demand as of right and without formal notice, the return of the goods, wherever they may be, at the customer's expense and risk.

Return of the goods does not imply to cancellation of the sale .However, we reserve the option to apply the cancellation clause contained in these General Conditions of Sale.

X - CONFIDENTIALITY

The vendor and the customer undertake to maintain confidentiality of information of a technical, commercial or other nature, obtained during negotiations and / or the execution of any order.

XI - INDUSTRIAL AND INTELLECTUAL PROPERTY RIGHTS

The results, data, studies and information (whether patentable or not), or software developed by the vendor during execution of any order, and delivered to the customer, are the sole property of the vendor.

Apart from the instructions for use, servicing and maintenance, reports and documents of any type that we deliver to our customers remain our property and must be returned to us on request, even when design fees have been charged for them, and they shall not be communicated to third parties or used without the prior written agreement of the vendor.

XII - CANCELLATION CLAUSE

We reserve the right to cancel immediately, as of right and without formal notice, the sale of our goods in case of non-payment of any part of the price by the due date, or in case of any breach in the contractual obligations of the customer. In this case, the goods will have to be returned to us immediately, at the customer's own risk and expense, subject to a penalty of 10% (ten per cent) of its value per week of delay. All payments already received shall remain our property as indemnity, without prejudice to our rights to claim damages.

XIII -WARRANTY

The vendor warrants the goods against any defect, arising from a default in material or in workmanship, for twelve months starting from the date on which they are made available, according to the conditions defined below.

The warranty for goods with special applications, or goods used 24 hours a day, is automatically reduced by half.

On the other hand, parts or accessories of other origin, which bear their own brand name, are included in our warranty only to the extent of the warranty conditions granted by the suppliers of these parts.

The vendor's warranty will only apply insofar as the goods have been stored, used and maintained in accordance with the vendor's instructions and documentation. It cannot be invoked when the default results from :

– failure to monitor, maintain or store the goods correctly,

– normal wear and tear of goods,

– intervention on or modification to the goods without the vendor's prior authorisation in writing,

– abnormal use, or use not conforming to the intended purpose,

– defective installation at the customer's and / or the final user's premises,

– non-communication, by the customer, of the intended purpose or the conditions of use of the goods,

– failure to use original manufacturer's spare parts,

– Force Majeure or any event beyond the control of the vendor,

– etc …

In all cases, the warranty is limited to the replacement or the repair of parts or goods recognised as defective by our technical departments. If the repair is entrusted to a third party, it should only be carried out after acceptance by the vendor of the estimate for repair.

No goods should be returned without the vendor's prior authorisation in writing .

Goods to be repaired should be sent prepaid, to the address indicated by the vendor. If the goods have not been repaired under warranty, the cost of dispatching it back will be invoiced to the customer or to the end purchaser.

This warranty applies to our goods in accessible form and therefore does not cover the cost of dismantling and reinstallation of the said goods in the equipment in which they are integrated .

Repair, modification, or replacement of spare parts or goods during the warranty period will not extend the duration of the warranty.

The provisions of this article constitute the only obligation on the part of the vendor concerning the warranty for the goods supplied.

XIV -LIABILITY

The vendor will be liable for bodily injury caused by his goods or personnel.

The repair of property damages attributable to the vendor is expressly limited to a sum which may not exceed the amount of the goods found as defective.

It is expressly agreed that the vendor and the customer each waive any right to claim for indirect, consequential and / or punitive damages of any kind, such as loss of production, loss of profit, costs of withdrawal from the market or costs of recall, costs of dismantling and reinstallation of goods, loss of contracts, etc.

XV - SPARE PARTS AND ACCESSORIES

Spare parts and accessories are provided on request insofar as they are available. Related costs (carriage and any other costs) are always added to the invoice.

We reserve the right to demand a minimum quantity or invoice a minimum per order.

XVI - PARTIAL INVALIDITY

If any provision of these General Conditions of Sale is held to be unenforceable for any reason, it shall be adjusted rather than voided, if possible, in order to achieve the intent of the parties to the extent possible. In any event, all other provisions shall be deemed valid and enforceable to the full extent possible.

XVII -DISPUTES

THESE GENERAL CONDITIONS OF SALE ARE GOVERNED BY FRENCH LAW.

ANY DISPUTE RELATING TO OUR SALES, EVEN IN THE CASE OF MULTIPLE DEFENDANTS, SHALL BE, IN THE ABSENCE OF AMICABLE SETTLEMENT AND NOTWITHSTANDING ANY CLAUSE TO THE CONTRARY, SUBJECT TO THE JURISDICTION OF THE COURTS OF ANGOULEME (France).

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