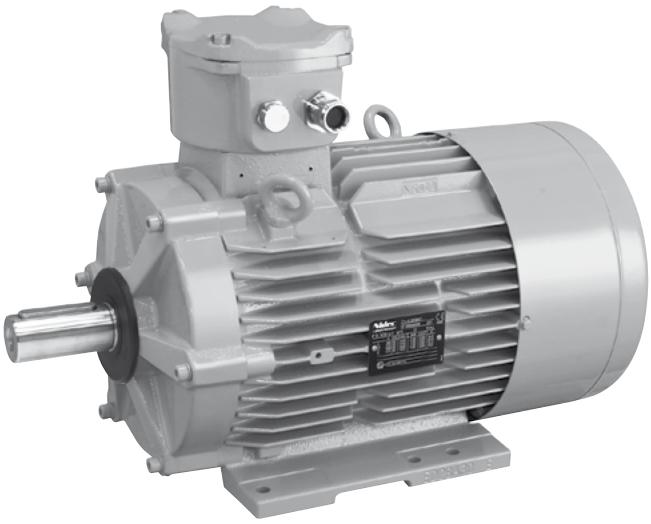
Nidec

All for dreams



Commissioning and maintenance guide

FLSD - Ex db & Ex db (eb)

Three-phase asynchronous motors for explosive gas and dust atmospheres

Reference: 5699 en - 2020.02 / c

LEROY-SOMER™

GENERAL WARNING

These symbols ⚠ ⚠ appear in this document whenever it is important to take special precautions during installation, operation, maintenance or servicing of the motors.

It is essential that electric motors are installed by experienced, qualified and authorized personnel.

In accordance with the main requirements of EC Directives, the safety of people, animals and property should be ensured when fitting the motors into machines.

Particular attention should be given to equipotential ground or earthing connections.

The noise levels of the machines, measured under standard conditions, complies with the requirements of the standard and does not exceed the maximum value of 85 dB(A) pressure at 1 metre.

⚠ **The following precautions must be taken before working on any stationary device:**

- **AC voltage disconnected and no residual voltage present**
- **Careful examination of the causes of the stoppage (jammed transmission - loss of phase - cut-out due to thermal protection - lack of lubrication, etc.)**

⚠ ⚠ **Electric motors are industrial products. They must therefore be installed by qualified, experienced and authorized personnel. The safety of people, animals and property must be ensured when fitting the motors into machines (please refer to current standards).**

Personnel likely to intervene on electrical installations and equipment in explosion risk areas shall be trained and authorized specifically for this type of equipment.
Indeed, knowledge is required about the risks specific to electricity, but also those due to chemical properties and physical characteristics of the products used in the installation (gas, vapours, dusts), as well as the environment in which the equipment operates. These elements condition the risks of fire and explosion.

More particularly, he/she must be informed and aware of the reasons for particular safety instructions in order to observe them. For example:
- never open when live,
- do not open when live in the presence of an explosive gas or dust atmosphere,
- do not repair in live conditions,
- do not manoeuvre under load,
- once energised wait 30 minutes before opening,
- refit the gaskets to guarantee sealing.

⚠ **Before commissioning, check that the information shown on the nameplate is compatible with the explosive atmosphere that is present and with the zone where used.**

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

Dear Customer,

*You have just acquired a **NIDEC LEROY-SOMER safety motor.***

This motor benefits from the experience of one of the largest manufacturers in the world, using state-of-the-art technologies – automation, specially selected materials and rigorous quality control. As a result, the regulatory authorities have awarded our motor factories ISO 9001, Edition 2015 international certification.

We thank you for making this choice, and would ask you to read the contents of this manual.

By observing a few essential rules, you will ensure problem-free operation for many years.

NIDEC LEROY-SOMER

EU DECLARATION OF CONFORMITY OF USE AND OF INTEGRATION

(Document subject to changes)

	PS6 : DOCUMENT MANAGEMENT		Classement/*File*: S4T004
TECHNICAL MANAGEMENT	**EU DECLARATION OF CONFORMITY AND INCORPORATION**	Révision: F Date: 2019/09/25	Page : 1 / 1
	Doc type : S6T002 Rev D du/from 16/03/2017	M☐ RØ I☐ GP, Mansle & IMI	Annule et remplace/*Cancels and replaces:* Révision E du/*from* 2019/07/01

We, **MOTEURS LEROY SOMER,** Bd Marcellin LEROY 16915 Angouleme cedex 9 France,

declare, under our own responsibility, that the following products :

FLSD series type **Ex db** (or Ex db eb) **flameproof enclosure induction motors**

Bearing the following markings on their nameplates:

CE 0080 ☒**I M2** **Ex db I Mb**
or **CE 0080** ☒**II 2G** **Ex db** (or db eb) **IIB T4** (or T3 or T5 or T6) **Gb**
or **CE 0080** ☒**II 2G** **Ex db** (or db eb) **IIC T4** (or T3 or T5 or T6) **Gb**
or **CE 0080** ☒**II 2GD Ex db** (or db eb) **IIB T4** (or T3 or T5 or T6) **Gb Ex tb IIIC T125°C** or T100 °C or T 85°C **Db**
or **CE 0080** ☒**II 2GD Ex db** (or db eb) **IIC T4** (or T3 or T5 or T6) **Gb Ex tb IIIC T125°C** or T100 °C or T 85°C **Db**
T3 motors can be marked T1 or T2 for commercial reasons.

comply with :

European Directives:	
• Low Voltage Directive	**2014/35/EU**
• ROHS 2 Directive	**2011/65/UE**
• Electromagnetic Compatibility Directive	**2014/30/EU**
• ATEX Directives:	**2014/34/EU**
European and international standards:	**EN 50581 :2012; 60034-1:2010; 60034-7:1993/A1:2001; EN 60034-9:2005/A1:2007; 60034-14:2018; 60034-30-2:2016; EN 62262 :2002; IEC 60079-0:2011; EN 60079-0:2012/A11:2013; IEC 60079-1:2014; EN 60079-1:2015; IEC 60079-7:2015; EN60079-7:2015** (Ex db eb)**; IEC 60079-31:2013; EN 60079-31:2014** (Ex tb)
The type awarded an EU type-examination certificate,	**INERIS 10ATEX0025X; IECEx INE10.0012X** (80 ≤ frame ≤ 132)
by the notified body:	INERIS (0080) – BP 2 – Parc technologique ALATA 60550 – VERNEUIL EN HALATTE

The design and manufacturing requirements are covered under the responsibility of the notified body by the PRODUCT QUALITY ASSURANCE notification : **INERIS (0080)**

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

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

Installation of these motors must comply with the regulations, decrees, laws, orders, directives, application circulars, standards, rules or any other document relating to the installation site. LEROY-SOMER accepts no liability in the event of failure to comply with these rules and regulations.

Note: When the motors are supplied via appropriate separate electronic inverters and/or controlled by electronic control or monitoring devices, they must be installed by a professional who will be responsible for ensuring that the electromagnetic compatibility regulations of the country in which the product is installed are observed.

Site Quality Manager's visa :
G.GARDAIS date: 2019/09/25

Site Technical Manager's visa:
B.VINCENT date: 2019/09/25

LEROY-SOMER *Consulter le système de gestion documentaire afin de vérifier la dernière version de ce document. For the latest version of this document, please access the document management system.*

	Process: POC2 New product development control	No. Q 0 1 T 4 9 9
Beaucourt plant	**EU DECLARATION OF CONFORMITY AND INCORPORATION**	Rev.: A of: 19/06/2019 Page: I / I
		Cancels and replaces: /
		Doc type : QOA1 Rev F of 19/06/2019

We, **Constructions Electriques de Beaucourt (CEB)**, 14, rue de Dampierre, 90500 BEAUCOURT, France, (a company of the **Nidec / Leroy-Somer Holding SA** group, boulevard Marcellin Leroy, CS 10015, 16915 ANGOULEME cedex 9, France) declare, under our sole responsibility that the following products:

Induction motors type FLSD protected by "db" explosion-proof enclosure, with our without " db" or "eb" junction boxes, frame size 160 to 315 mm

bearing one (or more) of the following markings on their nameplate:

CE 0080	☒**I M2**	**Ex db (eb) I Mb**	
or **CE 0080**	☒**II 2 G**	**Ex db (eb) IIB T4 Gb** or (T3 Gb or T5 Gb or T6 Gb)	(for zone 1)
or **CE 0080**	☒**II 2 G**	**Ex db (eb) IIC T4 Gb** or (T3 Gb or T5 Gb or T6 Gb)	(for zone 1)
or **CE 0080**	☒**II 2 G** + **II 2 D**	**Ex db (eb) IIB T4 Gb** or (T3 Gb or T5 Gb or T6 Gb) and **Ex tb IIIC T125 °C Db IP 65** or (T up to T200 °C)	(for zones 1 and 21)
or **CE 0080**	☒**II 2 G** + **II 2 D**	**Ex db (eb) IIC T4 Gb** or (T3 Gb or T5 Gb or T6 Gb) and **Ex tb IIIC T125 °C Db IP 65** or (T up to 200 °C)	(for zones 1 and 21)
or **CE 0080**	☒**II 2 D**	**Ex tb IIIC T125 °C Db IP 65** or (T up to 200 °C)	(for zone 21)

comply with the following European Directives:

▪ Low voltage:	**2014/35/EU**
▪ RoHS 2:	**2011/65/EU**
▪ Electromagnetic Compatibility:	**2014/30/EU**
▪ ErP:	**2009/125/EC and its (EC) implementation regulation: 640/2009 and amendments (for the products concerned)**
▪ Atex:	**2014/34/EU**
▪ European standards:	**EN 50581:2012 EN 60034-1:2010; 60034-7:1993/A1:2001; 60034-9:2005/A1:2007; 60034-14:2004/A1:2007; 60072-1:1991; 62262:2004 EN 60079-0:2012/A11:2013; 60079-1:2015;60079-7:2015 (if "eb" junction box); 60079-31:2014 (if motor II 2 G and II 2 D or II 2 D); 60529:2014**
▪ International standards:	**IEC 50581:2013 IEC 60034-1:2017; 60034-7:1993/A1:2001; 60034-9:2005/A1: 2007; 60034-14:2018; 60072-1:1991; 62262:2002 IEC 60079-0:2011/A1:2013; 60079-1:2014;60079-7:2015 (if "eb" junction box);60079-31:2013 (if motor II 2 G and II 2 D or II 2 D); 60529:2015**
▪ Types covered by:	
- EU-type examination certificate:	**INERIS 19ATEX0031 X**
- certificate of conformity:	**IECEx INE 19.0055X**
issued by the Notified Body:	**INERIS (0080) – BP2 – Parc technologique ALATA 60550 VERNEUIL-EN-HALATTE**
• the design and manufacturing requirements are covered by the PRODUCT QUALITY ASSURANCE notification	**Under the responsibility of the Notified Body INERIS (0080)**

This compliance permits the use of these ranges of products in a machine subject to the application of the machinery directive 2006/42/EC, provided that they are integrated or incorporated and/or assembled in accordance with, amongst others, the rules of standard EN 60204 (all sections) "Electrical Equipment of Machines".

This equipment must be installed by a professional, liable for ensuring compliance with all installation rules, decrees, orders, laws, directives, application memos, standards (IEC-EN 60079-14, etc.), regulations, good trade practices and any other document on the installation site. The professional is also liable for ensuring compliance with the values indicated on the motor information plate(s), instruction manuals, installation and maintenance manuals and any other document provided by the manufacturer.
Constructions Electriques de Beaucourt (CEB) cannot be held liable for non-compliance with all or part of the above.

Date and signature of the Technical Department
T. PERA
03/02/2020

LEROY-SOMER *Consulter le système de gestion documentaire afin de vérifier la dernière version de ce document. For the latest version of this document, please access the document management system.*

CONTENTS

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1 - RECEIPT

This manual or its condensed version is to be given to the end user. In the event of this notice not being translated into the language of the country in which the motor is used, the distributor is responsible for its translation and for distributing it to end users.

Products to which this manual applies may not be commissioned before the machinery in which they are installed has been declared to conform to the Directives that apply to it.

This equipment and its accessories or associated equipment must be installed by a professional, who is liable for ensuring compliance with all installation rules, decrees, orders, laws, directives, application memos, standards (where explosive atmospheres are involved, standard IEC-EN 60079-14 as a minimum), regulations, good trade practices and any other documents relating to the installation site. The professional is also liable for ensuring compliance with the values indicated on the motor information plate(s), instruction manuals, installation and maintenance manuals and any other document provided by the manufacturer.

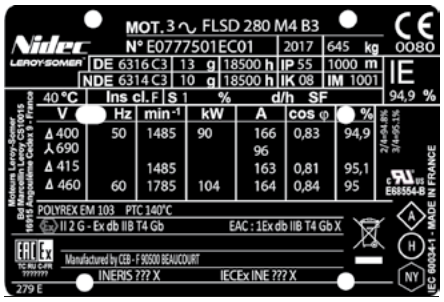
Constructions Electriques de Beaucourt (CEB) and NIDEC LEROY-SOMER cannot be held liable for non-compliance with all or part of the above or with any part of this manual.

On receipt of your motor, check that it has not suffered any damage in transit.
If there are obvious signs of damage, contact the carrier (you may able to claim on their insurance) and after a visual check, turn the motor by hand to detect any malfunction.

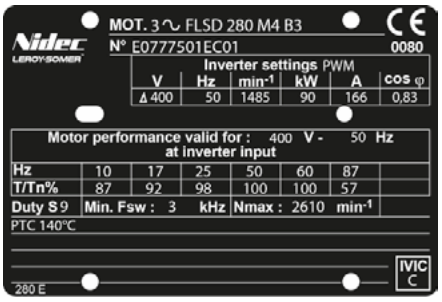
1.1 - Identification and marking

Check that the information shown on the nameplate is compatible with the explosive atmosphere that is present, the utilisation zone and the ambient and surface temperatures.

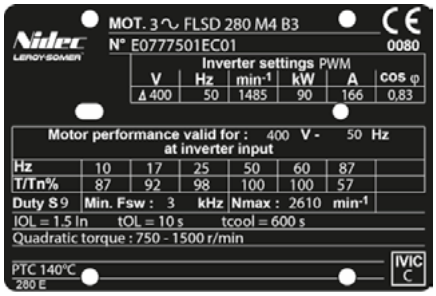
Mains supply nameplate



Variable speed nameplate



Quadratic torque variable speed nameplate



Definition of symbols used on nameplates:

Legal mark of conformity of product to the requirements of European Directives.

Special ATEX marking IECEx

:

II 2G or II 2G and II 2D: ATEX/IECEx marking
Ex db or db(eb): Protection mode “Anti-explosion envelope”
II B or II C : Equipment group “gas”
T4 : Temperature class “gas”
Gb : EPL level "gas"
Ex tb : Protection mode “dust” (option)
IIIC : Equipment group "dust" (if tb)
T125°C : Maximum surface temperature (if tb)
Db : “dust” EPL level
0080 : Notified organisation INERIS
INERIS ... X : ATEX attestation number
IECEx INE… : IECEx certificate no.

Zone	ATEX/IECEx marking	Marking of gas protection mode	Marking of dust protection mode (if tb)	Index of protection min
/	I M2	Ex db I Mb		IP55
1 & 2	II 2 G	Ex db IIB T4 Gb (1) Ex db IIC T4 Gb (1) Ex db IIB T5 Gb (1) Ex db IIC T5 Gb (1) Ex db IIB T6 Gb (1) Ex db IIC T6 Gb (1)		IP55
1 & 21 2 & 22	II 2D	Ex db IIB T4 Gb (1) Ex db IIC T4 Gb (1) Ex db IIB T5 Gb (1) Ex db IIC T5 Gb (1) Ex db IIB T6 Gb (1) Ex db IIC T6 Gb (1)	Ex tb IIIC T125°C Db Ex tb IIIC T125°C Db Ex tb IIIC T100°C Db Ex tb IIIC T100°C Db Ex tb IIIC T85°C Db Ex tb IIIC T85°C Db	IP65

(1): or Ex db eb

Motor symbols:
MOT 3 ~ : Three-phase A.C. motor
FLSD : Motor type
280 : Frame size
M : Housing symbol
4 : 4 poles
B3 : Operating position

No. : Serial number
2017 : Year of manufacture
IM : Operating position symbol
°C : Maximum ambient temperature
Ins. cl. : Winding insulation class
S : Standard operating duty
% : Operating duty
d/h : Number of starts per hour
SF : Duty factor

kg : Weight
DE : Drive end bearing
NDE : Non drive end bearing
g : Quantity of grease to be added per bearing at each re-lubrication (in g)
h : Interval in hours between re-lubrication
IP : Index of protection

IK : Impact resistance index
m : Maximum operating altitude
V : Supply voltage
Hz : Supply frequency
min-1 : Speed of rotation
kW : Rated power
A : Rated current
cos φ : Power factor
% : Efficiency at 4/4 load
Δ : Delta coupling
人 : Star coupling

POLYREX EM 103: Grease part number for bearings
Insulated bearing: NDE: Insulated bearing NDE side
Manufactured by CEB : Equipment manufacturer

EAC Ex : Equipment for explosive atmospheres certified for Eurasia
cURus : Class F insulation
E068554 for USA and Canada

A : Vibration level code

H : Balancing mode code

NY : Starting requirements code

279 E : Plate reference

IE % : Efficiency level and efficiency, at rated load and voltage
2/4 : Efficiency at 2/4 load
3/4 : Efficiency at 3/4 load

Inverter settings PWM: Characteristics for setting the PWM drive to allow temperature class of motor to be met
Motor performance valid for 400V - 50Hz at inverter input: Motor performance for a voltage of 400V - 50 Hz at the drive input

Duty S9 : Performances given for S9 duty
Min.Fsw : Minimum switching frequency of the drive in kHz
Nmax : Admissible maximum motor speed in rpm
PTC 140°C : PTC sensor type - temperature limit = 140°C
IOL : Admissible over-current = 1.5 x rated current
tOL : Maximum period during which over-current can occur (in secs)
tcool : Minimum duration during which the motor must be at the max of its rated current between 2 over-current events (in secs)
Quadratic torque : Type of torque: quadratic
IVIC : Pulse voltage insulation class code

2 - STORAGE

Prior to commissioning, motors should be stored:
- in a dry location, in their original packaging and protected from moisture: for relative humidities in excess of 90% the insulation may fall off very rapidly and around 100% may be practically zero. Monitor the condition of the rust prevention protection of unpainted parts. Storage conditions can be between -40°C and +80°C. For storage in an environment at between -40°C and -20°C: avoid impacts with the motor (damage due to the impact resistance of the equipment at these temperatures).

For very long period storage the motor may be packaged in a sealed envelope (e.g. thermo-welded plastic) with desiccator packs inside.
- protected from large and frequent temperature variations in order to prevent condensation. During the storage periods only drain plugs should be removed to eliminate condensation water.
- if the area is subject to vibration, try to reduce the effect of this vibration by placing the motor on a damping support (rubber plate or similar).
- turn the rotor a fraction of a turn once a fortnight to prevent the bearing rings from becoming marked.
- do not remove the rotor locking device **(if there are roller bearings).**

Even if the motor has been stored in the correct conditions, certain checks must be carried out before it is started up:

Greasing

- **Motors equipped with permanently greased bearings:** maximum storage period: 2 years. After this time, replace the bearings.

- **Motors equipped with bearings that can be re-greased:**

Storage period	Less than 2 years	The motor may be commissioned if the recommendations indicated in § 3 are followed to the letter.
	More than 2 years	Bearings must be replaced and bearing housings (or flanges) must be cleaned and degreased in order to renew the grease entirely, in accordance with the information shown on the nameplate (quantity and type of grease). Replace shaft passage seals and for IP66 motors recess seals before starting. The motor must then be commissioned by applying the recommendations indicated in § 3.

Greases used:
See nameplates.

⚠ Warning! Do not carry out the high voltage test on auxiliaries.

⚠ In the event of the machine being re-painted, the thickness of the coat must not exceed 2 mm and 0.2 mm for IIC group equipment. Otherwise it must be anti-static irrespective of its thickness if the motor is II 2G and II 2D.

3 - COMMISSIONING

Before starting users are responsible for checking that the equipment, the gas (and if relevant dust) group and conditions of use are compatible.

In all cases, compatibility of the motor and its environment must be guaranteed before its installation and also throughout its life.

⚠ ⚠ Electric motors are industrial products. They must therefore be installed by qualified, experienced and authorized personnel. The safety of people, animals and property must be ensured when fitting the motors into machines (please refer to current standards).

3.1 - Protocol for lubrication during commissioning

Given the “pot” storage life stated by oil companies and the transport and storage conditions, the rotation systems of all motors must be subject to enhanced monitoring during the first week of operation.
The aim of this monitoring is to ensure that an oil film is formed on the bearing tracks, thus ensuring optimum operation of the rotation system. Finally, this means that on the one hand personnel can become familiar with the operation of the equipment and on the other hand allows any teething troubles associated with the installation to be identified.

The amount of grease indicated for re-greasing on the nameplate must be added when topping-up with grease.
Greases must not be mixed. Grease used for top-ups must be that stated on the nameplate.

If mixed accidentally, bearing housings (or flanges) must be removed and fully cleaned and degreased, and the bearings must be changed.

In specific terms, the operations to be carried out during installation are as follows:
- Before installing the motor, top-up with grease and rotate the motor by hand for ten or so turns.
- After starting the motor (10 min), top up with grease.
- After 24 hours continuous operation, top up with grease.
- After an operating period of 100 to 200 hours, top up with grease.
- During this starting period (up to 50 hours operation after the last top up) there must be intensive monitoring. The bearing housing temperatures and vibration must be measured frequently.

This data is to be retained by operators. It represents a database and history which will be useful for future maintenance.

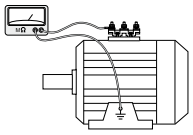
3.2 - Checking the insulation

Throughout the period required for checking insulation, ensure that there is no explosive atmosphere present.

Before starting the motor, it is advisable to check the insulation between the phases and earth, and between phases.

Motors are factory-fitted with preventative advice labels which must kept legible.
Before commissioning remove condensation (see §10.3 - Routine Maintenance)

This check is essential if the motor has been stored for longer than 6 months or if it has been kept in a damp atmosphere.
This measurement must be carried out using a megohmmeter at 500 volts DC (do not use a magneto-electric system).
It is better to carry out an initial test at 30 or 50 volts and if the insulation is greater than 1 megohm, carry out a second test at 500 volts DC for 60 seconds. The insulation value must be at least 10 megohms in cold state.
If this value cannot be achieved, or routinely if the motor might have been splashed with water or salt spray, or kept for a long period in a very humid place, or if it is covered with condensation, it is recommended that the stator be dried for 24 hours in an oven at a temperature of 110°C to 120°C.
If it is not possible to dry the motor in an oven:
- supply the motor, with the rotor immobilised, with a three-phase AC voltage which is 10% below the rated voltage, for 12 hours (use an induction regulator or a step-down transformer with adjustable points).
- or supply it with DC supply with the 3 phases in series, with a voltage value of 1 to 2% of the rated voltage (use a separate excitation DC generator or batteries for motors of less than 22kW).
- NB: The AC current must be monitored using a clamp-on ammeter, DC using a shunt ammeter. This current must not exceed 60 % of the rated current.
It is recommended that a thermometer be fitted to the motor frame: if the temperature exceeds 70°C, reduce the indicated voltage or current by 5 % of the original value for every 10°C difference.
While it is drying, all the motor orifices must be open (terminal box, drain holes). Before starting replace all plugs so that the motor degree of protection is IP 55 or 65. Clean or replace the plugs in ventilators and orifices before refitting.



Caution: If the high voltage test, carried out at the factory before dispatch, needs to be repeated, this should be performed at half the standard voltage, i.e.: 1/2 (2 U + 1000 V). Check that the capacitive effect resulting from the high voltage test is eliminated before connecting the terminals to ground.

For all motors before commissioning:
- remove the dust from the entire machine;
- rotate the motor at no load (no mechanical load) for 2 to 5 minutes, checking that there is no abnormal noise. If there is any abnormal noise, see section 10.

4 - INSTALLATION

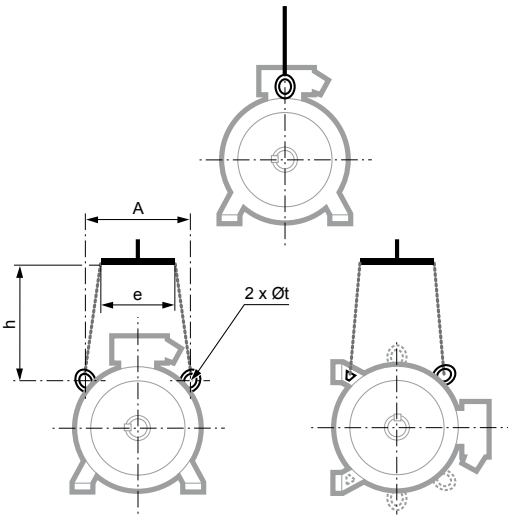
4.1 - Position of the lifting rings

Position of the lifting rings for lifting the motor only (not connected to the machine).

Labour regulations stipulate that all loads over 25 kg must be fitted with lifting devices to facilitate handling.
The overall mass of motors varies according to their power, their mounting position and whether they are fitted with optional equipment.
The actual weight of each Nidec Leroy-Somer motor is indicated on its nameplate.
The positions of the lifting rings and the minimum dimensions of the lifting bars are given below in order to help with preparation for handling the motors. If these precautions are not followed, there is a risk of warping or crushing some equipment such as the terminal box, protective cover or drip cover.

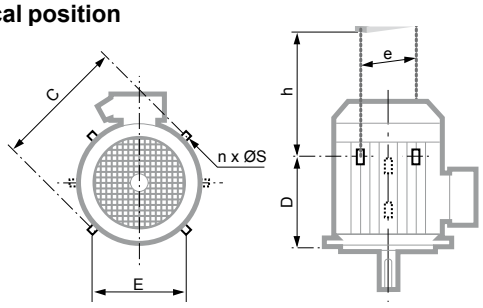
Motors intended for use in the vertical position are sometimes delivered in the horizontal position on a pallet. When the motor is pivoted, the shaft must under no circumstances be allowed to touch the ground, as the bearings could be irreparably damaged. Moreover, additional special precautions must be taken, as the integral motor lifting rings are not designed for pivoting the motor.

• Horizontal position



Type	Horizontal position			
	A	e min	h min	Ø t
90	152	150	190	22
100	152	150	190	22
110LG	146	200	190	22
112	146	200	190	22
132	176	180	190	22
160M/L	292	250	300	30
160LK	324	250	300	30
180M/L	324	250	300	30
200L	350	300	300	35
225MR	350	300	300	35
225SK/MK	415	400	400	35
250M	415	400	400	35
280S/M	430	400	400	40
315S/M/L	445	400	500	35
355L	600	600	500	60

• Vertical position



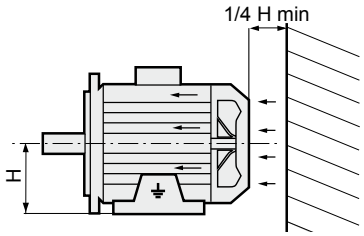
View from above Side view

Type	Vertical position						
	C	E	D	n	Ø S	e min*	h min
160M/L	/	292	270	3	30	360	400
160LK	/	324	300	3	30	410	450
180M/L	/	324	300	3	30	410	450
200L	/	350	360	3	35	445	500
225MR	/	350	360	3	35	445	500
225SK/MK	/	415	380	3	35	560	600
250M	/	415	380	3	35	560	600
280S/M	/	430	430	3	40	560	650
315S/M/L	630	445	817	2	35	650	550
355L	700	600	860	4	60	700	550

** If the motor is fitted with a drip cover, allow an additional 50 to 100 mm to avoid damaging it when the load is swung.*

4.2 - Location - ventilation

Our motors are cooled in accordance with method IC 411 (standard IEC 60034-6) i.e. “machine cooled by its surface, using the ambient fluid (air) flowing along the machine”.
The fan at the non-drive end cools the motor. Air is sucked in through the grille of a fan cover (which provides protection against the risk of direct contact with the fan in accordance with standard IEC 60034-5) and blown along the housing fins to ensure thermal equilibrium of the motor whatever the direction of rotation.



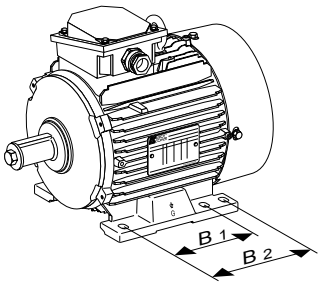
The motor is to be installed in an adequately ventilated area, where the air inlets and exits are free by a value of at least a quarter of the frame height.
Check that the fan cover bears no impact marks.
Blocking (clogging) the cover grille and the housing fins, even accidentally, will adversely affect the operation of the motor and its safety.
With vertical operation with shaft extension downwards, it is recommended that the motor be equipped with a drip cover to prevent the entry of any foreign matter.
It is necessary to check that the hot air is not being recycled. If it is, pipes must be provided for the intake of cold air and expulsion of hot air, in order to prevent abnormal motor temperature rise.
In this case, if the air is not circulated by an auxiliary fan, the dimensions of the pipes must be such that the pressure losses are negligible compared to those of the motor.

Possibility of additional external heat

The motor temperature class does not take additional external heat into account (e.g. pump circulating a hot fluid).

Installation

The motor must be mounted in the position specified on the order, on a base which is rigid enough to prevent distortion and vibration.
Where the motor feet have six fixing holes, it is preferable to use those which correspond to the standard dimensions for the motor power rating (refer to the asynchronous motors technical catalogue) or failing this to those shown at B2.



Provide easy access to the terminal box, the condensation drain plugs and, if appropriate, to the grease nipples.
Use lifting equipment which is compatible with the weight of the motor (indicated on the nameplate).

⚠ When the motor is fitted with lifting rings, they are solely for lifting the motor and must not be used to lift the whole machine after the motor has been fitted to it.
Note 1: When installing a suspended motor, it is essential to provide protection in case the fixing breaks.
Note 2: Never stand on the motor.

4.3 - Important information to be taken into consideration during installation

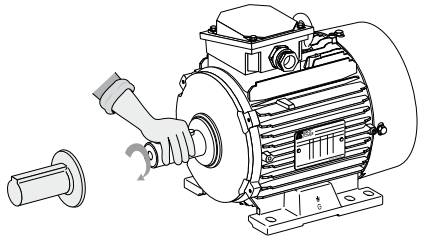
- Equipment to which this manual applies may not be commissioned before the machinery in which it is installed has been declared to conform to the Directives that apply to it.
- When motors are supplied by suitable electronic converters and/or controlled by electronic command and control devices, they must be installed by a professional who will be responsible for ensuring compliance with the electromagnetic compatibility regulations for the country in which the product is installed.
- As standard the motors’ impact resistance corresponds to “low” mechanical risk, therefore they must be installed in a low mechanical risk environment.
- All unused orifices must be blocked off using Ex threaded plugs.
- All accessories (cable glands, plugs etc.) cited in this notice must be of a type that is attested or certified for the group, the application (gas and/or dust) and the temperature class which correspond as a minimum to those for the location of the equipment (see the information on the nameplate.). They are correctly tightened onto their support. A ‘’KLINGERSIL C-4400’’ fibre seal, for example, is placed between the cable glands, the plugs and their support. Cable glands must be appropriate for the supply cable and any auxiliary cables. The cables are correctly gripped in the cable glands. Fitting must comply with the requirements of their instructions for use.
- The assembly of all these components must ensure the mode of protection (Ex) and the protection indices (IP, IK) specified on the nameplates.
- All threaded components must be fully tightened and have at least 5 threads assembled and a minimum screwed depth of 8 mm.

4.4 - Coupling

Preparation

Rotate the shaft by hand to detect any possible fault due to handling.

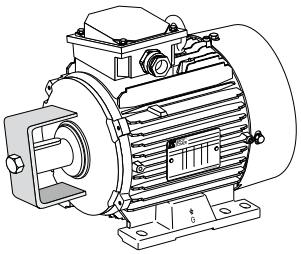
Remove any protection from the shaft extension. Drain off any condensation water that has formed inside the motor (see §3).



Rotor locking device

For made-to-order motors with roller bearings, remove the rotor locking device.

In exceptional circumstances when the motor has to be moved after the coupling device has been fitted, the rotor must be re-immobilized.



Balancing

Rotating machines are balanced in accordance with standard IEC 60034-14:

- half-key when the shaft extension is marked H.

When specifically requested, balancing may be carried out:

- no key when the shaft extension is marked N,
- full key when the shaft extension is marked F,

any coupling element (pulley, coupling sleeve, slip-ring, etc.) must therefore be balanced accordingly.

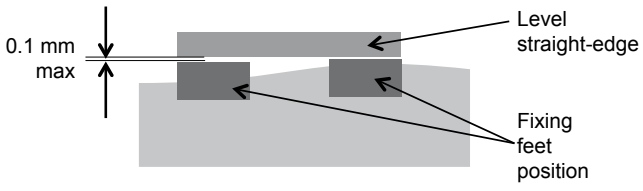
Motor with 2 shaft extensions:
Motor operation with a 2nd unused shaft extension is not permitted.

4.5 - Preparation of the fixing support

Installers must pay particular attention to ensuring good preparation of the motor fixing support.

Specific points to be observed:

- All metal supports must have undergone anti-corrosion treatment.
- The design and the dimensions of the support must prevent any vibration being transmitted to the motor, as well as any vibration caused by resonance.
- The support must be level and sufficiently rigid to enclose any short-circuit effects.
- The maximum level difference between the motor fixing feet must not exceed +/- 0.1 mm.



5 - LIMITING VALUES OF ELECTRICAL PARAMETERS

5.1 - Limitation of disturbances caused by starting of motors

To ensure preservation of the installation, any significant overheating of pipework must be avoided whilst ensuring that the protective devices do not intervene during starting.

Disturbances occurring in the operation of other equipment connected to the same source are due to the voltage drop caused by the current demand on starting.

Even though networks are increasingly capable of allowing direct starting, current demand must be reduced for certain installations.

Jerk-free operation and smooth starting mean that the driven machinery will be easier to use and have a longer operating life.

The two essential parameters for starting squirrel cage synchronous motors are:

- starting torque,
- starting current.

The starting torque and the resistive torque determine the starting time.

Depending on the driven load, the torque and current can be altered to match the starting options of the machine and to match the supply options.

The five essential modes are:

- D.O.L. starting,
- star/delta starting,
- soft starting with autotransformer,
- soft starting with resistors,
- electronic starting.

Electronic starting modes control the voltage at the motor terminals throughout the entire starting phase, giving very gradual smooth starting.

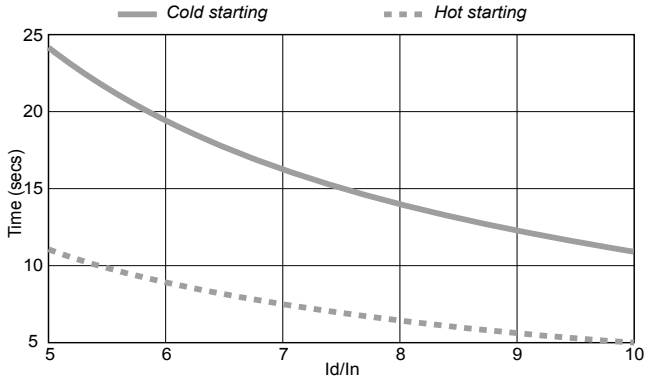
Starting systems are located outside the explosive zone or are of a type authorised for the zone.

5.2 - Supply voltage

The rated voltage is indicated on the nameplate.

5.3 - Permissible starting times and locked rotor times

Starting times must remain within the limits indicated below on condition that there are 6 or less starts during one hour.
Three successive cold starts and two consecutive hot starts are allowed.



Permissible motor starting time as a function of the ratio I_D / I_N.

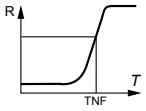
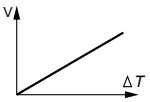
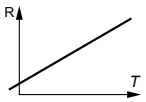
In the event of frequent or difficult startup conditions, equip motors with thermal protection devices (see § 6 - USE).

5.4 - Supply with frequency inverter

(See § 7.1).

6 - USE

Thermal protection devices (see § 9) and heaters.

Type	Operating principle	Operating curve	Breaking capacity (A)	Protection provided	Mounting Number of devices*
Positive temperature coefficient thermistor **PTC**	Non-linear variable resistor (indirectly heated) 		0	General surveillance for transient overloads	Mounted with associated relay in control circuit 3 in series
Thermocouples ***T*** (*T*<150°C) Constantan Copper **K** (*T*<1000°C) Copper Copper-Nickel	Peltier effect		0	Continuous monitoring of hot spots at regular intervals	Mounted in control boards with associated reading equipment (or recorder) 1 per hot spot
Platinum temperature sensor **PT 100**	Linear variable resistor (indirectly heated)		0	High precision monitoring continuous surveillance of key hot spots	Mounted in control boards with associated reading equipment (or recorder) 1 per hot spot

- NRT: nominal running temperature
- The NRTs are chosen according to the position of the sensor in the motor and the temperature rise class.
* The number of devices relates to the winding protection.

Alarm and early warning

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

Protection against condensation: space heaters

Marking: 1 label

A glass fibre flexible resistor is fixed on 1 or 2 coil end turns. This resistor heats the machines when stopped and thus prevents condensation inside the machines. Heaters must be de-energised when the machinery is being used.

Power supply: 230 V single-phase unless otherwise specified by the customer.

Recommended for use when ambient temperatures ≤ 20°C. In all cases the power dissipated must ensure that the temperature classification of the motor is observed.

Heaters or heating using the introduction of ac voltage must only be used when the motor is de-energised and cold.

Thermo-magnetic protection

Motors are protected by a magneto-thermal device placed between the isolating switch and the motor. These protection devices provide total protection of the motor against non-transient overloads.

This device may be accompanied by fused circuit breakers.

The thermal protection must be set to the value of the current shown on the motor nameplate for the voltage and frequency of the supply to which the motor is connected.

Built-in indirect thermal protection

Motors may be equipped with thermal sensors as an option. These sensors follow the temperature changes at “hot spots”:
- overload detection,
- cooling check,
- monitoring strategic points for maintenance of the installation, guarantee of hot spot temperatures.

⚠ In order to ensure that the maximum temperature is never reached, thermal sensors inside the equipment, when these are mandatory, must be connected to a device (functionally independent and additional to any system which might be necessary for operation under normal conditions) which causes de-energisation of the motor when the thermal protection values below are reached.

⚠ Under no circumstances can these sensors be used to carry out direct regulation of the motor operating cycles.

⚠ Control and shut-off devices must be installed in panels located outside the hazardous zone or be of a recognised type.

Temperature sensor operating thresholds:

Temperature classes	Maximum value of the winding sensor and of adjustment of associated equipment		Maximum value of the bearing housing sensor and of adjustment of associated equipment	
Frame size	*FLSD 80 to 132*	*FLSD 160 to 355*	*FLSD 80 to 132*	*FLSD 160 to 355*
T6	100°C	100°C	80°C	70°C
T5	110°C	100°C	90°C	70°C
T4	150°C	130°C	120°C	80°C
T3	150°C	140°C	120°C	90°C
Maximum temperature of dust motor surface	**Maximum value of the winding sensor and of adjustment of associated equipment**		**Maximum value of the bearing sensor and of adjustment of associated equipment**	
Frame size	*FLSD 80 to 132*	*FLSD 160 to 355*	*FLSD 80 to 132*	*FLSD 160 to 355*
85°C	100°C	100°C	70°C	70°C
100°C	110°C	110°C	90°C	90°C
125°C	130°C	140°C	110°C	110°C
135°C	150°C	140°C	110°C	110°C
145°C	150°C	140°C	110°C	110°C

Electrical characteristics of sensors and thermocouples:

* I max = 5A.
* U max:
  * for PT100 at 0°C = 2.5 V
  * for PTC = 2.5 V
  * for PTO/PTF = 7.5 V
  * for thermocouple = 7.5 V

7 - SPECIAL OPERATING CONDITIONS

- Thermal protection (see § 6 & 9)

- Heaters (see § 6)

- Temperatures: storage and ambient
Note: T_a = ambient temperatures

If the motor has been stored at a temperature below -10°C, heat the motor (see § 3) and turn the shaft by hand before operating the machine.

If using at a temperature below -20°C, heaters are recommended.

As standard construction, our motors are designed to operation at temperatures between -20°C and 40°C.

For FLSD 80 to 132 if T_a < -20°C, and for FLSD 160 to 355 if T_a < -25°C, shaft passage seals must be made of silicone and the fan must be metal.

- Surface temperature
As standard, the maximum surface temperature of our motors is 135°C as T4 with a maximum ambient temperature ≤ 40°C (marking G).
If the motors are also used in dusty explosive surroundings, the maximum surface temperature is 125°C (marking GD).

- Installation zones
The motors are designed for use in zones 1 and 2.
In explosive gas atmospheres the degree of protection is IP 55.

- Connection
Particular attention must be paid to the information on the nameplate in order to choose the correct type of connection for the supply voltage.
Similarly the protection system and the supply cables (the voltage drop during the starting phase must be less than 3%) are to be selected according to the characteristics marked on the nameplate.

- Earthing
The motor must be earthed in accordance with the applicable regulations (protection of workers).
An external terminal on the frame is used for effective earth connection of equipotential links. This terminal must be prevented from working itself loose.

- Leak tightness
Monitor the condition of all seals and periodically replace them if necessary. At the shaft passages, take care not to damage the seals in contact with the keys and shoulders.
After removing drain plugs or ventilators where these are present, refit them in place in order to ensure the IP 55 or IP 65 degree of protection of the motor. Replace the seals that are removed using new seals with the same characteristics. Clean the orifices and plugs before refitting them.

Whenever removed and during maintenance, replace seals (shaft passages, bearing housing recesses, terminal box cover etc.) using new seals with the same characteristics after cleaning the components. Shaft passage seals must be fitted using the same type of grease as the bearings.

- Employee safety
Protect all rotating devices before power-up.
If a motor is started up without a coupling device having been fitted, carefully immobilize the key in its housing.
All measures must be taken to provide protection against risks associated with rotation components (sleeve, pulley, belts etc.).

Beware of backdriving when the motor is switched off. Appropriate precautions must be taken:
- pumps, install a non-return valve, for example.

- NIDEC LEROY- SOMER "Digistart" electronic starter
This is micro-controlled multi-function electronic system, which is used with all squirrel-cage asynchronous three-phase motors.

It ensures smooth starting of the motor with:
- reduced starting current,
- smooth jerk-free acceleration achieved by controlling the current in the motor.

After starting, the DIGISTART carries out additional motor management functions in its other operating phases: steady state and slowing.
- Models from 18 to 1600 A
- Power supply: 220 to 700 V - 50/60 Hz

The DIGISTART is low-cost to install, and only an additional switch and fuses are required.

The "Digistart" electronic starter associated with the motor must be installed outside the hazardous zone.

- Contactors - Main switches
In all cases contactors, main switches etc. must be installed and connected in a panel outside the hazardous zone or be of a type that is authorised for the zone.

- Shock resistance
The motor can withstand a low mechanical impact (IK 08 according to EN 50102). The user must provide additional protection if there is a risk of significant mechanical shock.

- Fitting sensors or accessories
In the event that sensors (vibration sensors for example) or accessories (pulse generators for example) are fitted, these must be connected in a panel. All these accessories (as well as the panel if it not located outside the explosive atmosphere) must be of a type that is certified or attested for the group, the application (Gas or Gas and dust) and the temperature class which corresponds at least to that of the motor. Fitting must comply with the requirements of their instructions for use.

- Noise level
Most FLSD motors have an acoustic pressure level of less than 80 dB(A) (+/- 3dB) at 50Hz.
The values for each motor are given in our technical catalogue.
When the motors operate using a drive, please contact us for the noise levels.

7.1 - Variable speed use

7.1.1 - General

Drive control by a frequency inverter can in fact result in an increase in the machine temperature rise, due to a significantly lower supply voltage than on the mains, additional losses related to the wave form produced by the drive (PWM) and the reduction in speed of the cooling fan.
Standard IEC 60034-17 describes numerous good practices for all types of electric motor, however since this is Nidec Leroy-Somers' area of specialist expertise, we describe the best ways to deal with variable speed in the section below.
The homologation conditions of our safety motors allow them to operate on frequency drives on condition that the required precautions are taken to ensure that under all circumstances there is compliance with the temperature class marked on the nameplate.
Drive control using a frequency inverter results in an increase in the machine temperature rise, primarily as the result of a reduction in cooling fan speed and a supply voltage which is significantly lower than that of the network.
Consequently a reduction must generally be made in the rated power of the motor. Derating tables have been produced by our design bureau based on under-load tests on platforms, and on the requirements of IEC 60034-17. Depending on the application, on the desired speed range and the torque profile of the driven machine, Nidec Leroy-Somer will select the most suitable safety motor. The drive, if of a type not designed for operation in an explosive zone, must be located in a non-explosive zone.
In certain cases, the use of forced ventilation (where the fan is driven by an auxiliary motor whose type has been certified) may prove necessary. For small motors (frame height less than 160), the standard self-ventilated cooling mode (IC411) is nevertheless to be preferred.
A device for measuring the actual speed of the motor using an incremental or absolute encoder which is ATEX certified, may also be installed at the rear of most of our safety motors.

ATEX motors supplied through a frequency inverter are equipped with thermal protective devices in the winding. These must operate independently of measuring and control devices required for operation. Our derating tables are based on a drive supply whose switching frequency is equal to or greater than 3 kHz.

ADAPTATION OF MOTORS
A motor is always characterised by the following parameters, which depend on the design:
- temperature class
- voltage range
- frequency range
- thermal reserve

CHANGES IN MOTOR PERFORMANCE
When power is supplied by a drive, changes are observed in the above parameters due to certain phenomena:
- voltage drops in the drive components
- current increase in proportion with the decrease in voltage
- difference in motor power supply according to the type of control (flux vector or U/F)

The main consequence is an increase in the motor current resulting in increased copper losses and therefore a higher temperature rise in the winding (even at 50 Hz).
Reducing the speed leads to a reduction in air flow and hence a reduction in cooling efficiency, and as a result the motor temperature rise will increase again.
Conversely, in prolonged operation at high speed, the fan may make excessive noise, and it is advisable to install a forced ventilation system.
Above the synchronous speed, the iron losses increase and hence cause further temperature rise in the motor.
The type of control mode influences temperature rise in the motor:
- A U/F ratio gives the fundamental voltage maximum at 50 Hz but requires more current at low speed to obtain a high starting torque and therefore generates a temperature rise at low speed when the motor is poorly ventilated.
- Flux vector control requires less current at low speed while providing significant torque but regulates the voltage at 50 Hz and causes a voltage drop at the motor terminals, therefore requiring more current at the same power.

The temperature classification was realised with an IGBT drive supply and PWM waveform, min switching frequency = 3kHz, U/f constant open loop.

CONSEQUENCES OF POWER SUPPLIED BY DRIVES
When power is supplied to the motor by a variable speed drive with diode rectifier, this causes a voltage drop (~5%).
Some PWM techniques can be used to limit this voltage drop (~2%), to the detriment of the machine temperature rise (injection of harmonics of orders 5 and 7).
The non-sinusoidal signal (PWM) provided by the drive generates voltage peaks at the winding terminals due to the significant voltage variations relating to switching of the IGBTs (also called dV/dt). Repeated overvoltages can eventually damage the windings depending on their value and/or the motor design.
The value of the voltage peaks is proportional to the supply voltage.
This value can exceed the limit voltage for the windings which is related to the wire grade, the impregnation type and the insulation that may or may not be present in the slot bottoms or between phases.
Another reason for attaining high voltage values is when regeneration phenomena occur in the case of a driving load, hence the need to prioritise freewheel stops or stops that follow the longest permissible ramp.

7.1.2 - Special conditions for safe use

- The motor must be equipped with 3 thermal sensors (1 per phase) placed in or on the stator connection side winding heads (all frame sizes) and on the front bearing housing (from frame size 355) in the following cases:
  - motor supplied by frequency inverter
  - motor in a sufficient, non self-ventilated airflow (IC418
  - motor adapted to no longer be self-ventilated (IC410)
  - motor equipped with a backstop
- The thermal protection devices must be connected to a device which de-energises the motor when the setting value is reached and before the maximum surface temperature T° of the motor reaches the classification temperature shown on the nameplate. This device must act in normal conditions and must be additional and functionally independent of any system which may be necessary for operation under normal conditions.
- When the motor is equipped with auxiliary or forced ventilation (IC416), a device must prevent the main motor from operating in the absence of ventilation. Stopping the auxiliary motor must cause the main motor to stop.
- Heaters must only be supplied when there is no supply to the motor and the latter is cold. Their use is recommended for ambient temperatures of less than -20°C.
- Supply voltages and frequencies must comply with those stated on the motor nameplate.
- The frequency range stated on the motor nameplate must be strictly observed.
- In the event of several motors being supplied by the same drive, for safety reasons individual protection must be provided on each motor outlet (e.g. thermal relay).

7.1.3 - Minimum recommendations

The specific instructions given in the specific instruction manuals must be followed if a drive is used. In particular the following minimum requirements must be observed:
- Check that the drive switching frequency is 3 kHz minimum.
- Check that the motor has a second nameplate which gives the maximum characteristics of the motor during its use at variable speed.
- The reference voltage, usually 400V 50 Hz, is given on the motor nameplate. The drive must deliver a constant voltage/ frequency ratio.
- Programme the maximum current value as well as the min and max frequency values shown on the second nameplate of the motor into the drive.
- Connect all the temperature sensors present on the motor (windings and, if relevant, bearing housings) to safety devices which are independent of those used for operation under normal conditions.

⚠ **Drives and sensor connection components must be located outside hazardous zones (zones 0, 1, 2, 20, 21 and 22).**

- Cable glands and components must be compatible with the protection mode used for the connection portion. Alternatively, with integral cables, the motor connection must be made outside the explosive atmosphere or in a housing protected by a recognised protection method which is suitable for this use.
- The degree of protection of the motor, of its main connection housing and of any auxiliary connection box(es) is: IP55 - IK08. The user must provide additional protection if there is a high risk.
- The tensile strength of the fastening screws for the various parts of the non-explosive Ex db envelope must be at least equal to class 8.8.

- For temperatures below -40°C, the fastenings must be at least class 12.9 on FLSD 90 and FLSD 100.

- For FLSD motors 315 IIC below T°amb < -25°C, fastenings must be at least class 12-9.

- For motors with temperature class T5 or T6, please contact your local agent.

7.1.4 - Extreme operating conditions and specific features

MOTOR CONNECTIONS
Nidec Leroy-Somer do not recommend any specific connections for applications operating with a single motor on a single drive.

TRANSIENT OVERLOADS
Drives are designed to withstand transient overload.
When the overload values are too high, the system will automatically shut down. Nidec Leroy-Somer motors are designed to withstand these overloads, however in the event of very repetitive operation we still recommend use of a temperature sensor in the winding of the motor.

STARTING TORQUE AND CURRENT
Thanks to advances in control electronics, the torque available when the motor is switched on can be adjusted to a value between the rated torque and the variable speed drive breakdown torque.
The starting current will be directly related to the torque (120 or 180%).

ADJUSTING THE SWITCHING FREQUENCY
The variable speed drive switching frequency has an impact on losses in the motor and the drive, on the acoustic noise and the torque ripple.
A low switching frequency has an adverse effect on temperature rise in motors.
Nidec Leroy-Somer recommends a drive switching frequency of 3 kHz minimum.
In addition, a high switching frequency optimises the acoustic noise and torque ripple level.

OPERATION AT SPEEDS HIGHER THAN THOSE ASSIGNED BY THE MAINS FREQUENCIES

There are risks associated with the use of asynchronous motors at high speed (speed higher than 3600 rpm):
• the cage may be damaged,
• bearing life may be impaired,
• there may be increased vibration,
• etc.

Motors are designed to operate at the speeds shown on the nameplate (do not exceed the maximum speeds stated in our technical catalogues).
When high-speed motors are used, they often need to be adapted, and an in-depth mechanical and electrical design exercise is needed.

CHOICE OF MOTOR

There are two possibilities:
a - The frequency inverter is not supplied by Nidec Leroy-Somer
All the motors in this catalogue can be used with a frequency inverter.
Depending on the application, motors will need to be derated by around 10% compared to the motor operating curves in order to guarantee that motors will not be damaged.
b - The frequency inverter is supplied by Nidec Leroy-Somer
As these motor-drive assemblies have been specifically designed for use in combination, excellent performance is guaranteed.

7.1.5 - Winding insulation and recommendations relating to the mechanism of rotation

The insulation systems used for Nidec Leroy-Somer motors and recommendations for protection systems on the mechanisms of rotation are indicated in our good practice guide ref. 5626.

7.1.6 - Nameplates on motors operating with variable speed drives

The performance levels of motors operating using variable speed drives, shown on the VV nameplate, are values obtained with PWM supplies, with 360V at the motor terminals, in continuous operation.

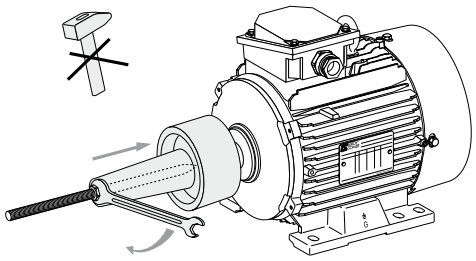
That is, for the following two cases:
• 400V rated voltage before drive + drive voltage drop of 40V.
• A – 10% + drive with no voltage drop.
Please contact us for other cases.

Some applications require special construction specifications:
- Do not use a motor for lifting that is not rated S3 or S4.
- Do not use the motor with a different duty type from that on the nameplate and in particular not in lifting applications.

8 - MECHANICAL ADJUSTMENTS

Tolerances and adjustments

Standard tolerances are applicable to the mechanical characteristic values given in our catalogues. They comply fully with the requirements of standard IEC 60072-1.
- Adhere strictly to the instructions provided by the transmission device supplier.
- Avoid impacts which could damage the bearings.
Use a screw device and grease the tapped hole of the shaft extension with a special lubricant (e.g. molykote grease) to make it easier to fit the coupling.



The hub of the transmission device must be:
- fully in contact with the shoulder of the shaft or, if this is missing, hard up against the metal stop ring forming a labyrinth seal and thus locking the bearing of motors FLSD 160 to 355 (do not crush the seal);
- longer than the shaft extension (by 2 to 3 mm) so that it can be tightened using a screw and washer. If it is not, a spacer ring must be inserted without cutting the key (if this ring is large, it must be balanced).

⚠ The 2nd shaft extension may also be smaller than the main shaft extension and may under no circumstances supply torques greater than half the rated torque.

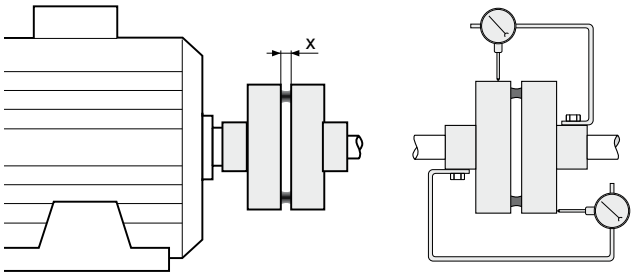
Inertia flywheels must not be mounted directly onto the shaft extension, but installed between bearing housings and connected by a coupling sleeve.

Direct connection to the machine

When the rotating device (pump or fan turbine) is mounted directly on the motor shaft end, check that this device is perfectly balanced and that the radial force and the axial thrust are within the limits indicated in the catalogue.

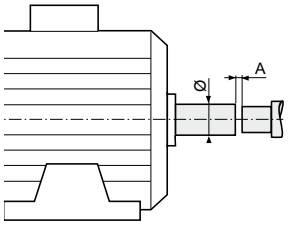
Direct connection using a coupling sleeve

Selection of the coupling sleeve should take account of the rated torque to be transmitted and the safety factor dependent on the starting conditions for the electric motor.
The machines must be carefully aligned, so that any lack of concentricity and parallelism in the two coupling halves is compatible with the coupling sleeve manufacturer's recommendations.
The two parts of the coupling sleeve should be temporarily assembled to make it easier to alter their relative position.
Adjust the parallel plane of both shafts using a gauge. Measure the distance between the two coupling surfaces at one point on the circumference. Rotate them 90°, 180° and 270° in relation to this initial position, and measure each time. The difference between the two extreme values of dimension "x" must not exceed 0.05 mm for standard couplings.



To perfect this adjustment and at the same time check the concentricity of the two shafts, fit 2 gauges as shown in the diagram and slowly turn both shafts.
The deviations registered by either shaft will indicate the need for an axial or radial adjustment if the deviation exceeds 0.05 mm.

Direct connection using a rigid coupling
The two shafts must be aligned so as to adhere to the coupling sleeve manufacturer's tolerances.
Maintain the minimum distance between the shaft extensions to allow for expansion of the motor shaft and the load shaft.



Ø (mm)	A (mm) min
9 to 55	1
60	1.5
65	1.5
75	2
80	2

Transmission via belt pulleys

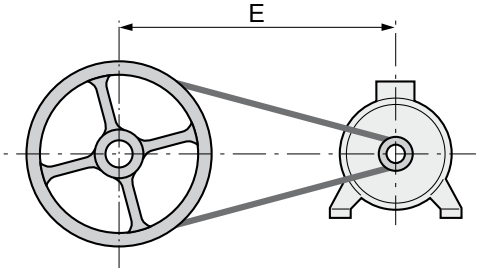
⚠ **When fitting a pulley/belt, check that the motor withstands the radial loads.**

The user chooses the diameter of the pulleys.
Cast iron pulleys with a diameter over 315 are not recommended for rotation speeds of 3,000 rpm.
Flat belts cannot be used for rotation speeds of 3,000 rpm or more.

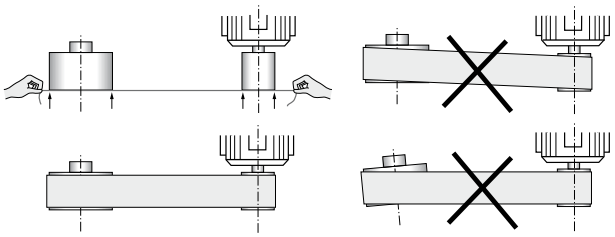
Positioning the belts

⚠ **Belts must be anti-static and must not propagate flames.**

So that the belts can be correctly positioned, allow for possible adjustment of approximately 3 % with respect to the calculated distance E.
Force must never be used when fitting the belts.
For notched belts, position the notches in the pulley grooves.



Aligning the pulleys
Check that the motor shaft is completely parallel with that of the receiving pulley.



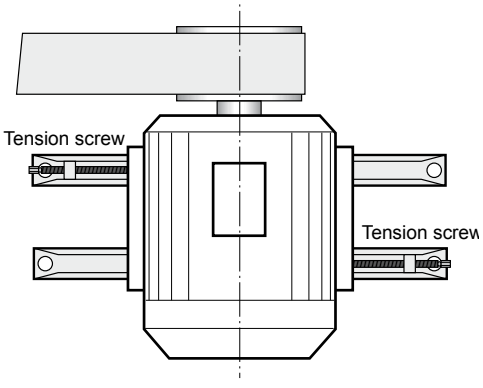
⚠ **Protect all rotating devices before power-up.**

⚠ **Adjusting the belt tension**
The tension of the belts must be adjusted very carefully in accordance with the recommendations of the belt supplier and the calculations made when the product was specified.

Reminder:
- tension too great = unnecessary force on the bearing housings which could lead to abnormal temperatures and premature wear of the mechanism of rotation (bearing housings-bearings) and eventually break the shaft;
- too little tension = vibration (wearing of the bearing unit).

Fixed distance between centres:
Place a belt tensioning pulley on the slack side of the belts:
- smooth pulley on the outside of the belt;
- grooved pulley on the inside of the belts when using V-belts.

Adjustable distance between centres:
The motor is usually mounted on slide rails, which enables optimum adjustment of the pulley alignment and the belt tension.
Place the slide rails on a perfectly horizontal baseplate.
The lengthways position of the slide rails is determined by the length of the belt, and the crossways position by the pulley of the machine being driven.
Mount the slide rails firmly with the tension screws in the direction shown in the diagram (the slide rail screw on the belt side between the motor and the machine being driven).
Fix the slide rails to the baseplate and adjust the belt tension as before.



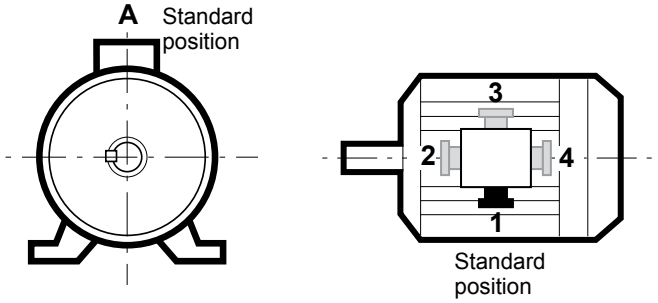
9 - MAINS CONNECTION

9.1 - Terminal box

It is placed as standard on top and at the front of the motor. It offers a degree of protection of IP 55 (G) or IP 65 (GD) and is equipped with a cable gland in accordance with the table in § 9.7.

Caution: the position of the terminal box cannot easily be changed, even with flanged motors, as the condensation drain holes (if present) must be at the bottom.

Terminal box positions **Cable gland positions**



⚠ Note: FLSD 160 to 355 motors are equipped as standard with cable passage blanking plugs

Cable gland

The standard position of the cable gland is on the right when viewed from the drive end (1).
If the special position of the cable gland has not been correctly specified on the order, or is no longer suitable, the symmetrical construction of the terminal box enables it to be turned in 4 directions except for position (2) for motors with smooth holed flanges (B5).
A cable gland must never open upwards.
Check that the incoming cable bend radius prevents water entering via the cable gland.

⚠ Installers are responsible for ensuring that the (IP) leak-tightness of cable passages is achieved (see the motor nameplate and the cable gland fitting instructions).

All accessories must be of a type that is attested or certified for the group, the application (gas and/or dust) and the temperature class which correspond as a minimum to those for the location of the equipment.

9.1.1 - "db" terminal box

The type and dimension of each threaded hole is marked on the terminal box.

9.1.2 - "eb" terminal box

If the threaded hole(s) of the orifice(s) intended to receive cable gland(s) or conduit(s) have/has metric threads, there is no specific marking present on the motor. If the type of thread is different or mixed, the type(s) are marked on the equipment.

Cable size

⚠ Match the cable gland and any associated expander or reducer to the diameter of the cable used, in accordance with the specific instructions for the cable gland.
In order to maintain the motor's original IP protection, it is essential to ensure leak-tightness between the rubber ring and the cable by tightening the cable gland correctly (so that it cannot be unscrewed by hand).
All unused holes must be blanked off using Ex certified plugs. It is essential to ensure that the fitting of cable glands or blanking devices is carried out with a seal, silicone or polyurethane sealant, between the cable glands, the plugs, the reducers and (or) expanders, the support or the box body.
Where connection is achieved using screwed pipe glands, it is mandatory for motors with Ex db boxes to have at least 5 threads assembled (with a minimum screwed depth of 8 mm).
Thread leak tightness may be enhanced using grease.

9.2 - Connection to the electrical supply

The cable entry system must be in accordance with one of the options described in standard IEC/EN 60079-14 §10.4.2; in particular ''incorporating plugging compounds'' for Ex db IIC equipment.

Connection to external power circuits must be in accordance with requirements of the standard IEC/EN 60079-14 and the regulations that are in force.

Alternatively, with integral cables the motor connection must either be made outside the explosive atmosphere, or protected by a protection method that is suitable for the application (gas and/or dust) and the temperature class which corresponds at least to that of the location of the equipment (see the information on the nameplate). Cables must be class C2 minimum and/or with gland packing.

If the motor is supplied with a cable gland support plate or un-drilled conduits:
- the drilling diameter of the smooth holes for cable glands or conduits must not be greater than the diameter of the thread of the cable gland or conduit + 2 mm and must be de-burred (broken angles about 0.5 mm x 45°) on each side of the thin plate.
- the installation of cable glands or conduit entry glands by the installer must ensure that the degree of safety (preservation of the explosion-proof character and/or of the IP) required by the application (gas and/or dust) and the motor temperature class is preserved.

If the motor is supplied with drillings but without cable or conduit glands:
- the installation of cable glands or conduit entry glands by the installer must ensure that the degree of safety (preservation of the explosion-proof character and/or of the IP) required by the application (gas and/or dust) and the motor temperature class is preserved.

If the motor is supplied with holes for cable glands blocked using non-certified plugs, replace them using components which are certified for the group, the application (gas and/or dust) and the temperature class which correspond at least to those of the motor: cable glands if connection, or plugs if unused orifices.

Adaptors (expanders or reducers) underneath plugs are prohibited. 1 adaptor only is allowed per cable gland.

If the connection box is type “eb” and comprises one or more threaded holes intended to receive cable glands, then unless stated otherwise these threaded holes are of the “ISO” type.

Supply voltages and frequencies must comply with those stated on the motor nameplate. Please contact us for all other conditions relating to the power supply.

Make connections as per the coupling instructions on the nameplate and the wiring diagram contained in the terminal box. Check the direction of rotation of the motor (§9.4).

The choice of connection cables is determined by the current, the voltage, the length and the temperature “T.cable” (if shown on the motor nameplate).
The connection must meet the requirements of the installation rules set by the standards and application of the regulations that are in force. A qualified person must be responsible for the connection, who will ensure:
* conformity of the connection box (protection mode Ex, IP, IK etc...).
* conformity of the connection to the terminal block and tightening torques.
* that the air gaps required by standards are observed. In the case of an Ex eb (GA 160 to 355) connection box, from each terminal, place the cables fitted with their connectors parallel to one another in order to achieve the maximum insulation distances.

The fastenings used for connecting cables must be of the same nature as the terminals (do not fit steel fastenings on brass terminals, for example).

When the motor is equipped with an auxiliary fan, this must be of a type that is certified for the group, the application (Gas and/or dust) and the temperature class that corresponds at least to that of the main motor. The supplies to both motors must be connected such that energisation of the main motor must be dependent on energisation of the auxiliary motor.

Stopping the auxiliary motor must cause de-energisation the main motor. The installation must include a device which prevents the main motor from operating if there is no ventilation.

Do not connect the motor if you are unsure how to interpret the connection circuit diagram or if the latter is missing: please contact us.

Installers are responsible for ensuring that the rules for electrical compatibility in the country in which the products are used are followed.

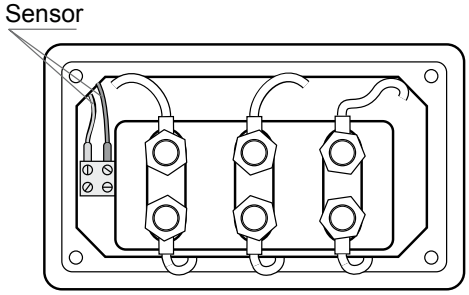
9.3 - Terminal block or isolator connection wiring diagram

All motors are supplied with a wiring diagram in the terminal box. If necessary this wiring diagram should be requested from the supplier, stating the type and number of the motor shown on the motor nameplate.
The connector links required for coupling can be found inside the terminal box.
Single speed motors are fitted with a block of 6 terminals, with the terminal markings complying with IEC 60034-8 (or NFC 51-118).

9.4 - Direction of rotation

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 main 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 accessories (thermal protection or space heater), these must be connected on strip terminals.

Motor equipped with a terminal block



AVERTISSEMENT

NE PAS OUVRIR SOUS TENSION
NE PAS OUVRIR SI UNE ATMOSPHERE EXPLOSIVE PEUT ETRE PRESENTE

DO NOT OPEN WHEN ENERGIZED
DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENTE

WARNING

ref. HS51A 31
PSI070EA050

⚠ **Motors are factory fitted with warning labels which must be kept legible.**

⚠ **Under no circumstances must the cable be used for handling the motor.**

9.5 - Earth terminal and earthing

⚠ The motor must be earthed in accordance with the applicable regulations (protection of workers).

An earth terminal is located inside the terminal box and another outside the on the cover. They are indicated by the symbol: ⏚
Jumper screws, lock washers, screws or lock-nuts or thread locking compound must be used to ensure that they do not become loose.
Cable sizing must be in accordance with the requirements of standard 60079-0.

Earth cable cross-sections as a function of motor supply cable cross-sections:

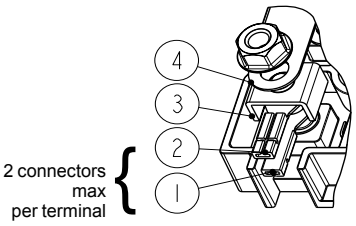
Phase conductor cross-section mm²	Min cross-section of earth or protection conductor mm²
4	4
6	6
10	10
16	16
25	25
35	25
50	25
70	35
95	50
120	70
150	75
185	95
240	120
300	150
400	200

9.6 - Connecting the power supply cables to the terminal block

The cables must be fitted with connectors suitable for the cable cross-section and the terminal diameter (see wiring diagram below).
They must be crimped in accordance with the connector supplier's instructions.

9.6.1 - Terminal block Ex eb M5 and M6 (FLSD 80-132)

LSE terminal blocks allow standard round connectors to be used. They are fitted to the housing and held by 2 locked screws.



The following are positioned, in order, on each terminal:
- 1: the motor cable connector, barrel immobilised,
- 2: the power supply cable connector, barrel immobilised,
- 3: the anti-rotation jumper screw,
- 4: Y or Δ connector links.

Tightening torque (N.m) on the slotted terminal block nuts

Terminal	M4	M5	M6
Steel	2	3.2	5
Brass	1	2	3

9.6.2 - LS block (FLSD 160-355)

Tightening torque (N.m) on the terminal block nuts

Terminal	M5	M6	M8	M10	M12	M14	M16
Steel	3.2	5	10	20	35	50	65
Brass	2	3	7	15	-	-	-

The fastenings used for connecting cables are supplied with the terminal blocks. Homologation status of the connection system will be lost if there is any modification of this equipment.
Fixing screws for terminal blocks of motors FLSD 160 to 225 supplied with a voltage greater than 630 V must be recessed by 3 mm into the terminal block.
WHEN closing the box, ensure that the cover seal is correctly positioned.

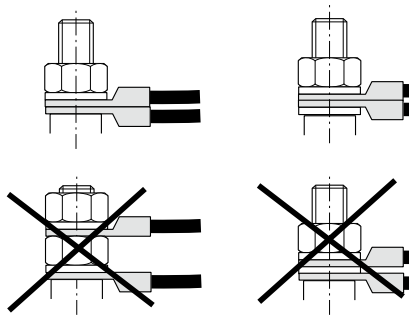
⚠ As a general rule, check that no nut, washer or other foreign body has fallen into the terminal box and/or come into contact with the winding.

- Earth terminal and earthing:
This is situated on a pad inside the terminal box. In some cases, the earth terminal can be situated on one of the feet, one of the cooling fins or the flange (round motors). It is indicated by the symbol: ⏚

⚠ The motor must be earthed in accordance with the applicable regulations (protection of workers).

*If necessary this wiring diagram should be requested from the supplier, stating the type and number of the motor shown on the motor nameplate.

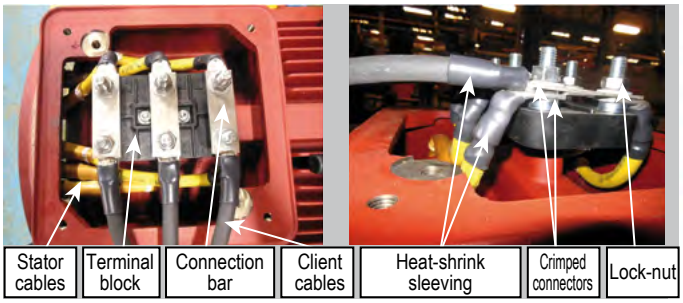
- Connecting the power supply cables to the terminal block:
The cables must be fitted with connectors suitable for the cable cross-section and the terminal diameter.
They must be crimped in accordance with the connector supplier's instructions.
They must be connected with connector resting on connector (see diagrams below):

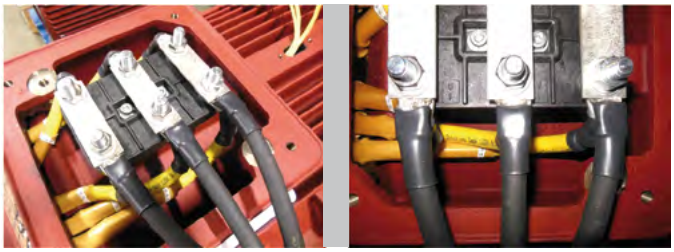


9.6.3 - "eb" terminal box

- Connection of auxiliaries on the three-pole Bartec terminal strips ref. 07-9702-0320/1 (AECE: PTB99 ATEX 3117 U - IECEx PTB 07.0007U) provided for auxiliaries (sensors, heaters etc.):
* max tightening torque: 0.4 N.m
* max total cross-section per connection: 2.5 mm²
* Umax = 440V - Imax = 23A for example
* Min air gaps = 8

- Positioning of power connection connectors (in "eb" box)





Cables must be parallel with each other in order to ensure that the 14 mm air-gap distances between phase and between phase and earth are achieved.

Creepage distances and air gap requirements must be observed and must comply with the requirements of standard IEC/EN 60079-7 for the assigned voltage.

9.7 - Size and type of cable glands for 400V rated supply voltage

Series	Type	Number and type of standard drilled holes	Max size of the power cable gland(s)		
			1 main entry + 1 auxiliary drilled hole ISO M20 x 1.5	1 main entry + 2 auxiliary drilled holes ISO M20 x 1.5	2 main entries + 2 auxiliary drilled holes ISO M20 x 1.5
FLSD	80	2 ISO M20 x 1.5	1 ISO 32 x 1.5	1 ISO 25* x 1.5	NA
	90				
	100				
	112	1 ISO M25 x 1.5 + 1 ISO M20 x 1.5			
	132				
	160	1 ISO M40 x 1.5 + 1 ISO M20 x 1.5	1 ISO M50 x 1.5	1 ISO M50 x 1.5	2 ISO M40 x 1.5
	180				
	200	1 ISO M50 x 1.5 + 1 ISO M20 x 1.5			
	225				
	250		1 ISO M63 x 1.5	1 ISO M63 x 1.5	2 ISO M63 x 1.5
	280	1 ISO M63 x 1.5 + 1 ISO M20 x 1.5			
	315	1 ISO M75 x 1.5 + 1 ISO M20 x 1.5	1 ISO M80 x 1.5	1 ISO M80 x 1.5	2 ISO M75 x 1.5
	355	2 ISO M75 x 1.5 + 1 ISO M20 x 1.5			

** In terminal box "d", the 2nd auxiliary gland must be installed in position 3.*

9.8 - Admissible number and maximum size of holes for cable glands per "eb" terminal block:

- FLSD 80 to 132: 1 ISO40 or 2 ISO32 or 3 ISO25 or 3 ISO20 or 5 ISO16
- FLSD 160 to 225: 4 ISO20 or 2 ISO40 + 2 ISO20.
- FLSD 250 & 280: 8 ISO20 or 2 ISO75 + 2 ISO20.
- FLSD 315 & 355: 10 ISO20 or 2 ISO83 + 2 ISO20.
- FLSD 315 & 355 with enlarged box: 14 ISO40 or 4 ISO90 + 4 ISO20.

9.9 - Cable temperatures (Tcable)

9.9.1 - FLSD 160 to 355

* For T°amb ≤ 40°C: no T° cable.

* For 40°C < T°amb ≤ 50°C: T° cables 80°C.

* For 50°C < T°amb ≤ 60°C: T° cables 90°C.

9.9.2 - FLSD 80 to 132

* For T°amb > 40°C: T° cables 100°C

10 - MAINTENANCE

10.1 - General

10.1.1 - Frequent monitoring

The frequency of inspections depends on specific climatic and operating conditions, and will be established in accordance with experience acquired.

The purpose of this monitoring, which is in general carried out by operating personnel is:

- to monitor, for preventative purposes, the condition of equipment (cables, cable glands etc.) taking the environment (temperature, humidity etc.) into consideration,
- to detect any anomalies as soon as possible; these are sometimes dangerous, such as abrasion damage to cable ducting,
- to provide a practical addition to the training of personnel on risks and means of preventing them.

⚠ **Dust accumulating between the fins or/and against fan cover grille leads to an increased surface temperature, so the motor must be cleaned regularly.**

⚠ **Cleaning must be carried out at reduced pressure from the centre and towards the ends of the machine**

10.1.2 - Repairs

The repair and/or rewinding of an electric motor which can be used in an explosive zone must only be made to the as-built specification, by qualified personnel and in accordance with the requirements of standard IEC/EN 60079-19. Failure to comply with this requirement may affect equipment safety (for example, protection index which is not IP 55 or IP 65 compliant) or the surface temperature (e.g. rewinding of the motor). Service centres ('Centres de Service' - CDS) are "Saqr - ATEX" trained and approved in order to ensure safe maintenance and repair of these motors.

CAUTION:

All modifications made without written permission of the manufacturer are strictly prohibited.

Service Centres are "Saqr - ATEX" trained and approved to ensure that these motors are safely maintained and repaired.

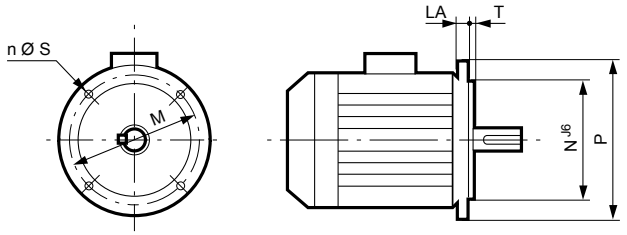
10.1.3 - Spare parts

When ordering spare parts, you must indicate the complete motor type, its serial number and the information given on the nameplate (see § 1).
Part references can be read from the exploded view diagrams and descriptions obtained from the parts list (§ 11).

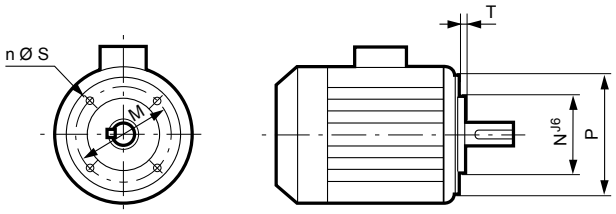
Routine maintenance kits can be obtained from our After-Sales services.

In the case of flange mounted motors, indicate the type of flange and its dimensions (see below).

Motor with smooth-holed flange



Motor with threaded-holed flange



Original manufacturer replacement parts must be used to ensure that our motors operate safely and correctly.

In the event of failure to comply with this advice, the manufacturer cannot be held responsible for any damage.

10.2 - Safety rules

⚠ Before any intervention is undertaken on the motor or the panel, check that there is not an explosive atmosphere present and that all equipment components are switched off. Also ensure that the motor is sufficiently cool to prevent any risk of burns.

⚠ Before any intervention is undertaken on the motor or the panel, check that cosine compensation capacitors φ are isolated and/or discharged (read the voltage at the terminals).

⚠ Before any intervention is undertaken in the terminal box or in the panel, check that there is no supply to the heaters.

⚠ The motor may remain powered-up, depending on the type of protection. Ensure that the AC supply is disconnected before any work is carried out in the terminal box or in the cabinet.

10.3 - Routine maintenance

Inspection after commissioning
After about 50 hours of operation check the tightness of the motor fixing bolts and of the coupling device. In the case of chain or belt drives, check that the tension is correctly adjusted.

Cleaning
To ensure the motor operates correctly, remove any dust or foreign bodies which might clog the air inlet and the housing fins.
Necessary precaution: check that the motor is totally sealed (terminal box, drain holes, etc.) before carrying out any cleaning operation.
Dry cleaning (vacuuming) is always preferable to wet cleaning.
Under no circumstances should cleaning of the motor generate an electrostatic charge.

⚠ Always clean at a pressure of less than 10 bars from the centre of the motor towards the extremities to avoid introducing dust and particles under the seals.

Draining off condensation (if there are drain plugs present)
Temperature differences cause condensation to be produced inside the motor. Condensation must be removed before it adversely affects motor operation.
Condensation removal holes located at the low points of the motors, depending on operating position, are blocked off using explosion proof plugs.
If the motor is equipped with condensation removal holes, these holes must be blocked using Ex d certified threaded plugs which, when fitted, guarantee the anti-explosion character of the motor. It is recommended that condensation be removed at least every 6 months. Refit and fully tighten the plugs after this operation.

⚠ Condensation drain holes must only be open during maintenance operations.

⚠ Refit drain holes blanking plugs in place in order to ensure the explosion-proof character of the motor. Clean the orifices and plugs before refitting them.

⚠ Contact Nidec Leroy-Somer regarding any intervention on anti-explosion seals.

Type	Frame size	Polarity	Permanently greased bearings	
			N.D.E.	D.E.
FLSD	80	2 ; 4 ; 6 ; 8	6204 ZZ C3	6204 ZZ C3
	90	2 ; 4 ; 6 ; 8	6205 ZZ C3	6205 ZZ C3
	100L	2 ; 4 ; 6 ; 8	6205 ZZ C3	6206 ZZ C3
	100LG - 112MG/MU	2 ; 4 ; 6 ; 8	6206 ZZ C3	6206 ZZ C3
	132M	2 ; 4 ; 6 ; 8	6308 ZZ C3	6308 ZZ C3

10.3.1 - Greasing

10.3.1.1 - Service life of grease

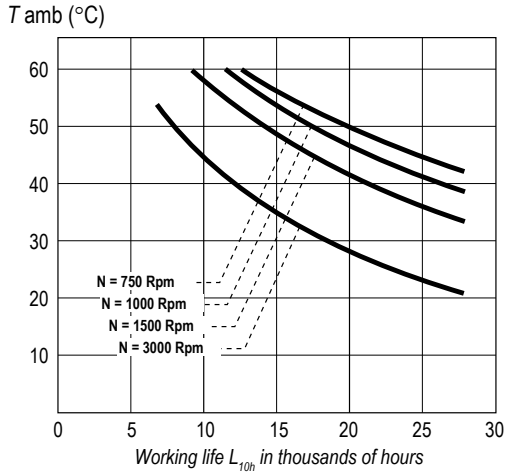
The service life of lubricating grease depends on:
- the characteristics of the grease (nature of the soap, of the base oil etc.),
- of the constraints in use (type and size of bearing, speed of rotation, operating temperature etc.),
- contamination factors.

10.3.1.2 - Permanently greased roller bearing housings

For motors of 80 ≤ HA < 132, the type and size of the bearings allow a long service life to be achieved for the grease, and therefore machines can be permanently greased.

The service life L_{10h} of the grease as a function of the speeds of rotation and of the ambient temperature is indicated in the following chart.

Service life L_{10h} of the grease in thousands of hours, for frame sizes < 132



10.3.1.3 - Roller bearings housings with grease nipples

For standard bearing assemblies with frame sizes ≥ 160 equipped with grease nipples, the table below shows, for the type of motor, the re-lubrication intervals to be used at an ambient temperature of 40°C for a machine installed with a horizontal shaft.

Note: The quality and quantity of the grease, as well as the re-lubrication intervals are indicated on the nameplate of the machine.
Warning: too much grease in a bearing is just as damaging as a lack of lubricant.

The table below is valid for FLSD motors placed in a horizontal position and lubricated using MOBIL POLYREX EM 103 grease used as standard.

Series	Type	Polarity	Type of bearings for bearing housings with grease nipples		25°C				40°C				55°C			
					N.D.E.		D.E.		N.D.E.		D.E.		N.D.E.		D.E.	
			N.D.E.	D.E.	Quantity of grease in grams	Lubrication intervals in hours	Quantity of grease in grams	Lubrication intervals in hours	Quantity of grease in grams	Lubrication intervals in hours	Quantity of grease in grams	Lubrication intervals in hours	Quantity of grease in grams	Lubrication intervals in hours	Quantity of grease in grams	Lubrication intervals in hours
FLSD	160MA/MB/L	2	6210 C3	6309 C3	8	19300	11	18500	8	19300	11	18500	8	19300	11	18500
	180M		6212 C3	6310 C3	11	14900	13	16200	11	14900	13	16200	11	14900	13	16200
	200LA/LB, 225MR		6313 C3	6313 C3	20	11000	20	11000	20	11000	20	11000	20	11000	20	11000
	250M, 280S/M		6314 C3	6316 C3	23	9700	29	7500	23	9700	29	7500	23	9700	29	7500
	315S/M (IIB/IIC)		6316 C3	6218 C3	29	7500	21	7500	29	7500	21	7500	29	7500	21	7500
	315LA/LB (IIB/IIC)		6316 C3	6218 C3	29	7500	21	7500	29	7500	21	7500	29	7500	21	4700
	160M/L	4	6210 C3	6309 C3	8	25000	11	25000	8	25000	11	25000	8	25000	11	25000
	180M/L		6212 C3	6310 C3	11	25000	13	25000	11	25000	13	25000	11	25000	13	25000
	200L		6313 C3	6313 C3	20	25000	20	25000	20	25000	20	25000	20	25000	20	25000
	225SK/MK, 250M		6314 C3	6316 C3	23	25000	29	21900	23	25000	29	21900	23	25000	29	21900
	280S/M		6314 C3	6316 C3	23	25000	29	21900	23	25000	29	21900	23	25000	29	13800
	315S (IIB/IIC)		6316 C3	6320 C3	29	21900	44	16600	29	21900	44	16600	29	21900	44	16600
	315M (IIB/IIC)		6316 C3	6320 C3	29	21900	44	16600	29	21900	44	16600	29	21900	44	13100
	315LA/LB (IIB/IIC)		6316 C3	6320 C3	29	21900	44	16600	29	21900	44	16600	29	21900	44	8200
	160M	6	6210 C3	6309 C3	8	25000	11	25000	8	25000	11	25000	8	25000	11	25000
	160LK, 180L		6212 C3	6310 C3	11	25000	13	25000	11	25000	13	25000	11	25000	13	25000
	200LA/LB		6313 C3	6313 C3	20	25000	20	25000	20	25000	20	25000	20	25000	20	25000
	225MK, 250M, 280S/M		6314 C3	6316 C3	23	25000	29	25000	23	25000	29	25000	23	25000	29	25000
	315S/M/LA/LB		6316 C3	6320 C3	29	25000	44	25000	29	25000	44	25000	29	25000	44	25000

10.3.1.4 - Special construction

In cases of special construction (motors equipped with roller bearings at the front or other assemblies), machines with frame sizes ≥ 160 are equipped with bearing housings with grease nipples.

The instructions required for bearing housing maintenance are shown on the machine nameplate.

Bearing housing fixing screws for FLSD 180 IIC motors operating at an ambient temperature of -45°C are to be class 10.9.

Warning: do not mix different types of grease (even if the soap bases are the same). Non-miscible lubricants can damage the bearings.

10.4 - Terminal box rotation

Terminal boxes can be pivoted through 90° or 180°.

- Remove the cover (2) by unscrewing the fixing screws (7).

- Release the terminal block from its support (3) by unscrewing both screws without disconnecting the connection cables from the winding.

- Displace the terminal block so as to gain access to all screws located beneath it.

- Unscrew the screw holding the block support plate (3).

- Unscrew the 3 terminal box screws (5) at the housing.

- Turn the terminal box (90° or 180°) into the desired position taking care not to damage the wires. It is essential not to damage the anti-explosion seals.

- Immobilise the terminal box in its new position by refitting the fixing screws (4) in place and tightening them to the torque specified in the appendix.

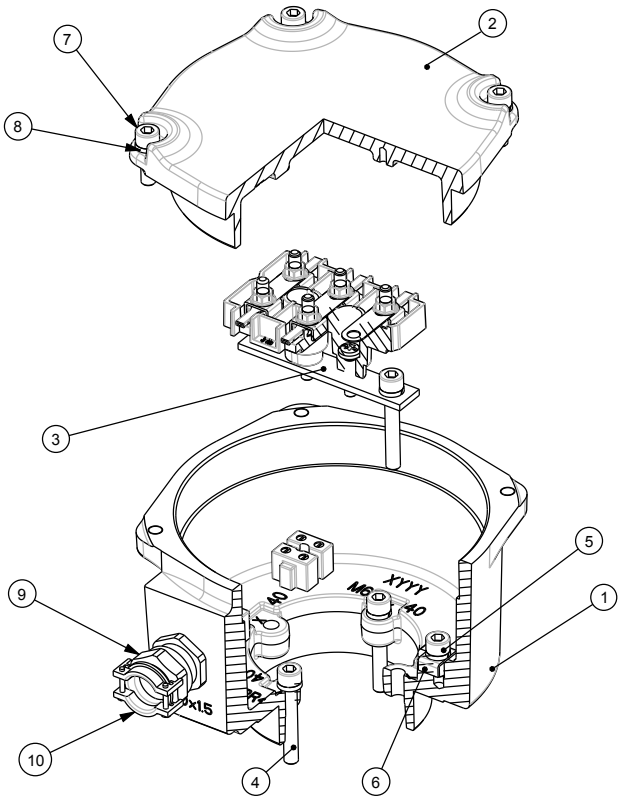
- Refit the block support plate (3) in place in its original position in relation to the housing. Ensure that the part opposite the plate is fully located in the anti-rotation recess then tighten the fixing screw to the recommended torque.

- Place the block opposite the fixing holes, refit the screws in place and tighten them to the specified torque.

- Refit the cover (2) in position taking care not to damage the anti-explosion seals and tighten the screws to the specified torque.

In the case of an "eb" type connection box:
In the case of a "eb" type box, if the threaded hole(s) of the orifice(s) intended to receive cable gland(s) or conduit(s) have/ has metric threads, there is no specific marking present on the motor. If the type of thread is different or mixed, the type(s) are marked on the equipment.

- When closing "eb" connection boxes, check that all seals are correctly positioned (bond them onto one of the components) and that the screws are correctly tightened in order to guarantee the IP degree of protection that is marked on the nameplate.



Example FLSD 80 to 132

Ref.	Description	Tightening torque
10	Tie-down module	
9	Ex Cable gland	
7-8	Screw class 12-9 and washers	10 Nm
6	Jumper screw	
5	Screw class 12-9	10 Nm
4	Screw class 8-8 and washers	10 Nm
3	Block support	
2	Cover	
1	Terminal box body	

10.5 - Groups IIC (> 200 µm) and group III paints: electrostatic risk

IEC EN 60079-0 §7.4 reminder:
Preventing electrostatic charge development on an item of equipment:

Maximum thickness of non-metallic layer (paint):
Group IIB = 2 mm ; Group IIC = 0.2 mm ; Group III = no limit.

The instructions must provide users with recommendations for reducing the risk of electrostatic discharges to as great an extent as possible.

Physical effects:
• Paint gives rise to electrostatic risks due to friction: during cleaning for example.
• Charges suspended in the air may be attracted by the paint and thus give it an electrostatic charge: charge by influence.

Nidec Leroy-Somer recommendations:
• Earth continuity between the various metallic parts must be ensured: frame, bearing housings, fan cover etc.
• The equipment must be permanently connected to earth.
• The motor must be cleaned using a damp cloth or using means which do not cause friction on the paint: using an ionised air-gun, for example.
• Users must prevent the paint gaining an electrostatic charge. For example: by making motor operation dependent on the level of humidity in the place it is located or by ionising the surrounding air.

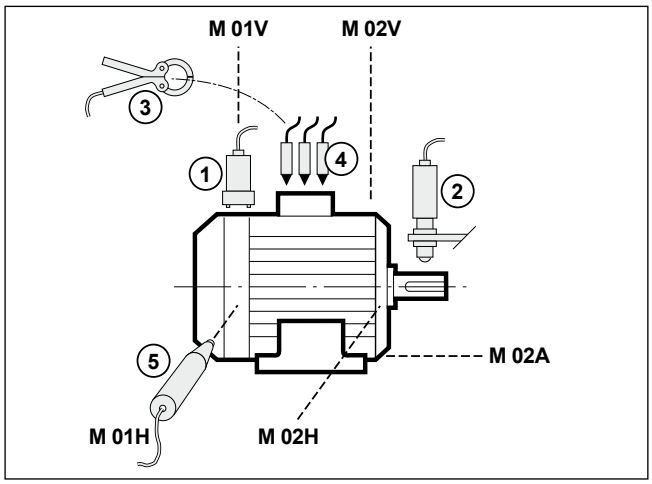
Users must carry out an assessment of the electrostatic risks in order to meet the requirements of guide IEC/TS 60079-32-1

10.6 - Troubleshooting guide (to supplement standard IEC 79-17)

Incident	Possible cause	Remedy
Abnormal noise	Originating in motor or machine being driven?	Uncouple the motor from the equipment being driven and test the motor on its own
Noisy motor	**Mechanical cause:** if the noise persists after cutting off the electrical supply	
	- Vibration	- Check that the key conforms to the type of balancing (see section 10.3)
	- Damaged bearings	- Change the bearings
	- Mechanical friction: fan, coupling	- Check
	Electrical cause: if the noise ceases after shutting off the electrical supply	- Check the power supply at the motor terminals
	- Normal voltage and 3 phases balanced	- Check the connection of the terminal block and the tightening of the connectors
	- Abnormal voltage	- Check the power supply line
	- Phase imbalance (current)	- Check the winding resistance and the balancing of the network (voltage)
Motor heats abnormally	- Faulty ventilation	- Check the environment - Clean the fan cover and the cooling fins - Check that the fan is correctly mounted on the shaft
	- Faulty supply voltage	- Check
	- Terminal connection fault	- Check
	- Overload	- Check the current consumption in relation to that indicated on the motor nameplate
	- Partial short-circuit	- Check the electrical continuity of the windings and/or of the installation
	- Phase imbalance	- Check the winding resistance
Motor does not start	**No load** - Mechanical obstruction - Broken power supply line	When switched off: - turn the shaft by hand to check that it rotates freely - check fuses, electrical protection, starting device, electrical continuity
	Under load - Phase imbalance	When switched off: - Check the direction of rotation (phase order) - Check the resistance and continuity of the windings - Check the electrical protection

10.7 - Preventive maintenance

Consult NIDEC LEROY-SOMER, who offer a preventive maintenance system through its **M**aintenance **I**ndustrie **S**ervices network.
This system enables data to be obtained on site of the parameters at different points as indicated in the table below.
A computer analysis is then performed using these measurements to produce a report on the behaviour of the installation.
This report highlights problems such as eccentricity, misalignment, the condition of the bearings as well as structural problems, electrical problems, etc.



Detector	Measurement	Measurement points position								
		M 01V	M 01H	M 02V	M 02H	M 02A	Shaft	E01	E02	E03
(1) Accelerometer	Vibration	●	●	●	●	●				
(2) Photo-electric cell	Speed and phase measurement (balancing)						●			
(3) Clamp-on ammeters	Current (DC or 3-phase AC) measurement							●	●	●
(4) Voltage probe	Voltage							●	●	●
(5) Infra-red probe	Temperature	●		●						

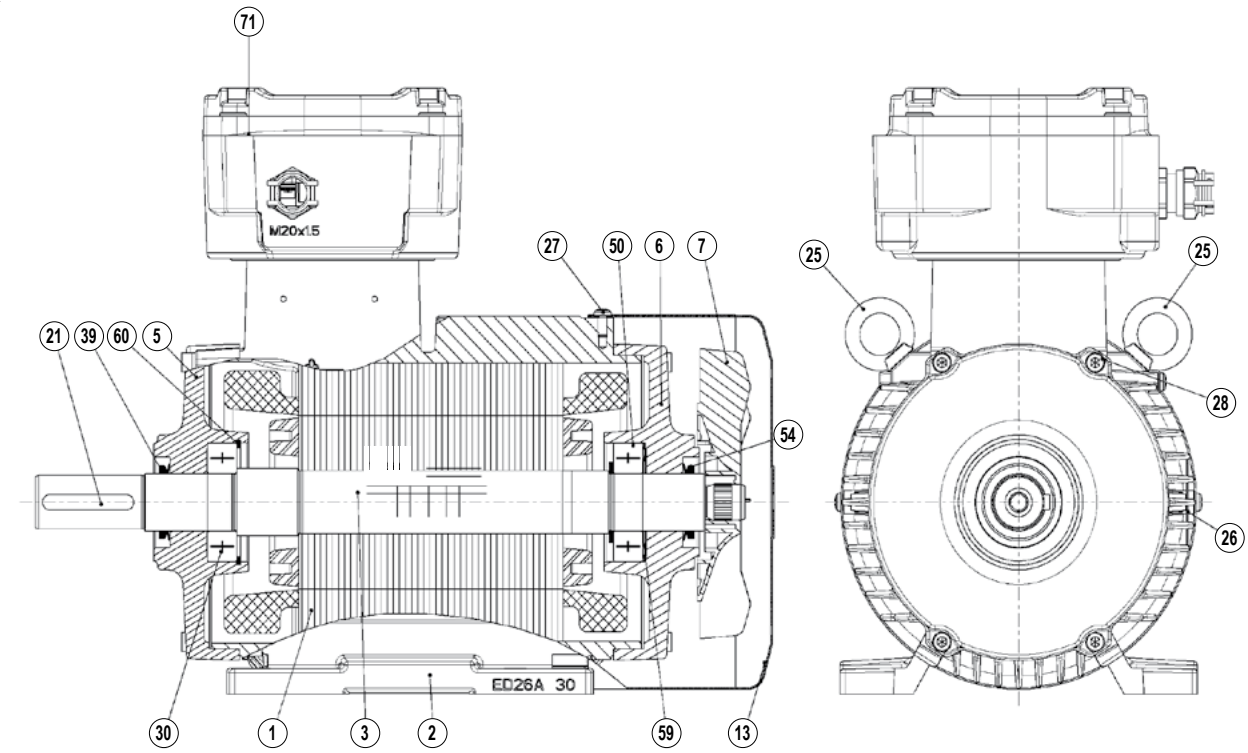
10.8 - Recycling

- It is recommended that at the end of a motor's working life a material recovery organisation is approached to recycle the various components of the motor.

11 - SECTION VIEWS, PARTS LIST

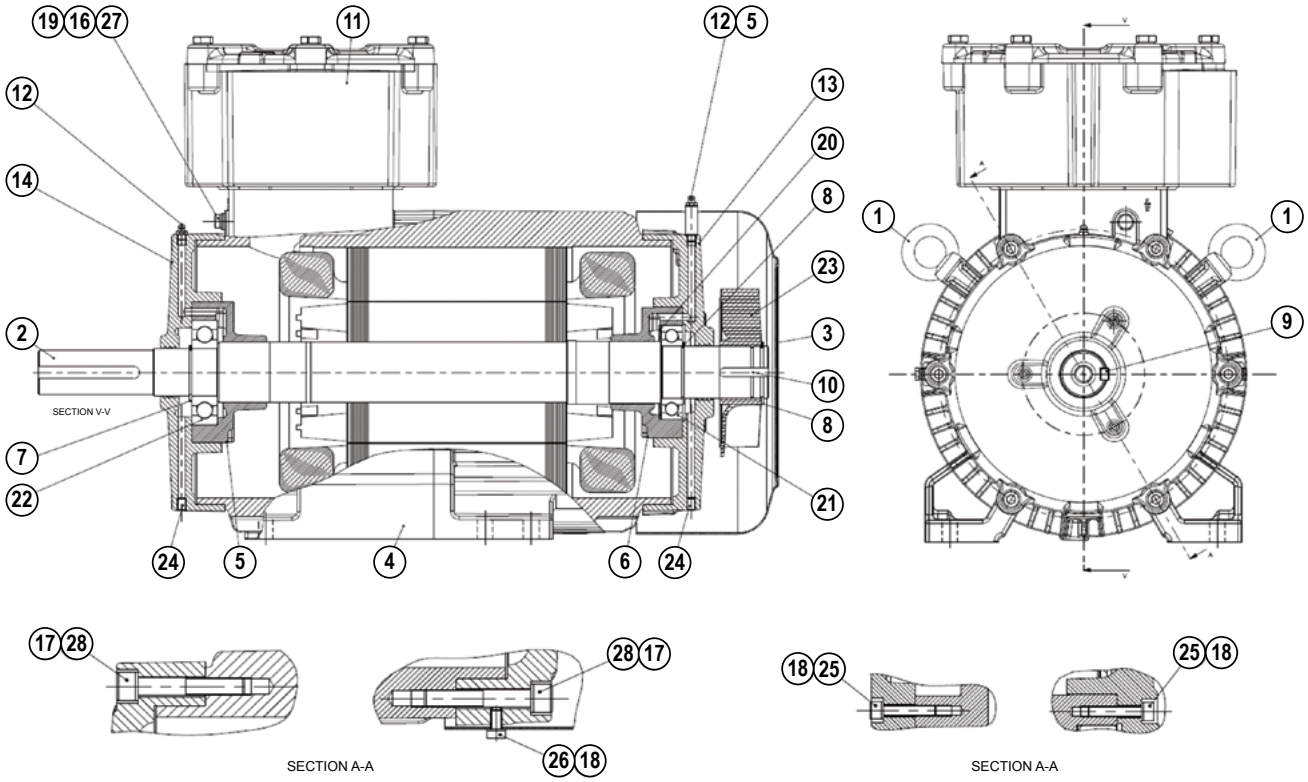
(Drawings do not foresee the manufacturer's details)

11.1 - FLSD 80 to 132



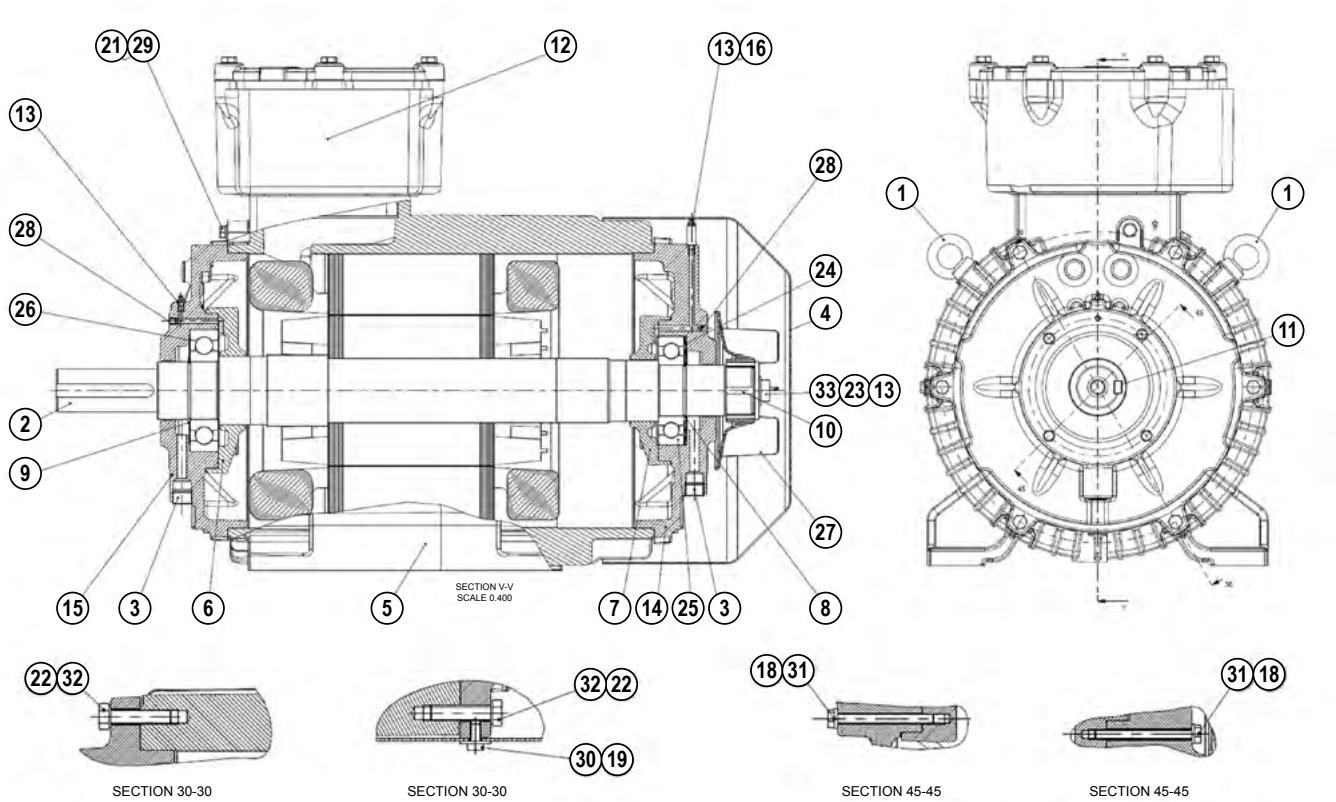
Item	Designation	Item	Designation	Item	Designation
1	Wound stator	**21**	Shaft end key	**50**	Rear bearing
2	Housing	**25**	Lifting ring	**54**	Rear seal
3	Rotor	**26**	Nameplate	**59**	Preload washer
5	Coupling-side flange	**27**	Cover fixing screw	**60**	Retaining ring (circlip)
6	Rear flange	**28**	Screw	**71**	Terminal box
7	Fan	**30**	Coupling-side bearing		
13	Fan cover	**39**	Coupling-side seal		

11.2 - FLSD 160 to 225, example IIB and IIC "db" box



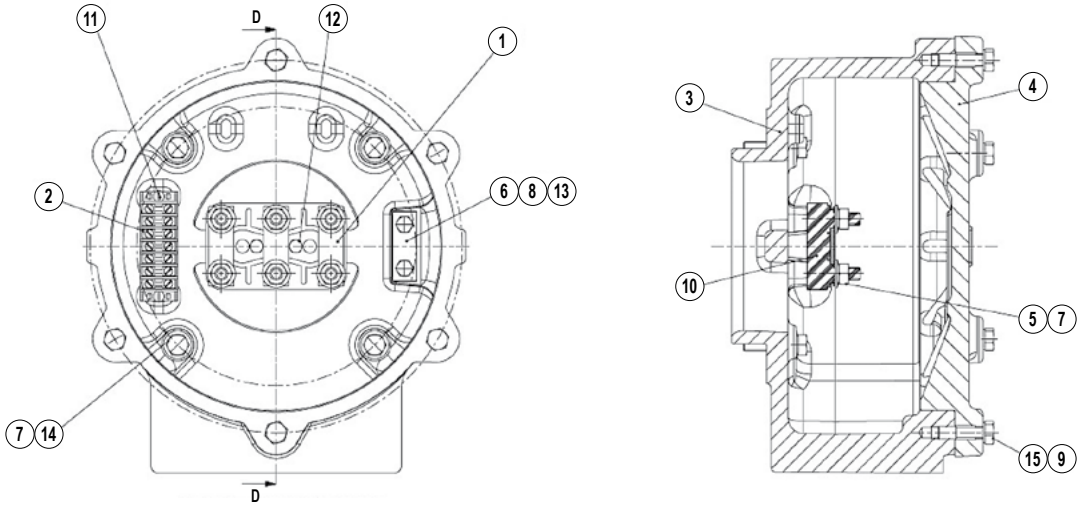
Item	Designation	Item	Designation	Item	Designation
1	Lifting ring	**11**	Terminal box assembly	**21**	Bearing
2	Shaft	**12**	Grease nipple	**22**	Bearing
3	Fan cover	**13**	Rear bearing housing	**23**	Fan
4	Frame	**14**	Front bearing housing	**24**	Screw
5	Bearing cap	**15**	Grease nipple extension	**25**	Screw
6	Bearing cap	**16**	Washer	**26**	Screw
7	Circlips	**17**	Washer	**27**	Screw
8	Circlips	**18**	Washer	**28**	Screw
9	Key	**19**	Washer		
10	Key	**20**	Preload or wavy washer		

11.3 - FLSD 250 and 280, example IIB "db" box



Item	Designation	Item	Designation	Item	Designation
1	Lifting ring	**12**	Terminal box assembly	**23**	Shaft end washer
2	Shaft	**13**	Grease nipple	**24**	Preload or wavy washer
3	Plug	**14**	Rear bearing housing	**25**	Bearing
4	Fan cover	**15**	Front bearing housing	**26**	Bearing
5	Frame	**16**	Grease nipple extension	**27**	Fan
6	Bearing cap	**17**	Washer	**28**	Screw
7	Bearing cap	**18**	Washer	**29**	Screw
8	Circlips	**19**	Washer	**30**	Screw
9	Circlips	**20**	Washer	**31**	Screw
10	Key	**21**	Washer	**32**	Screw
11	Key	**22**	Washer	**33**	Screw

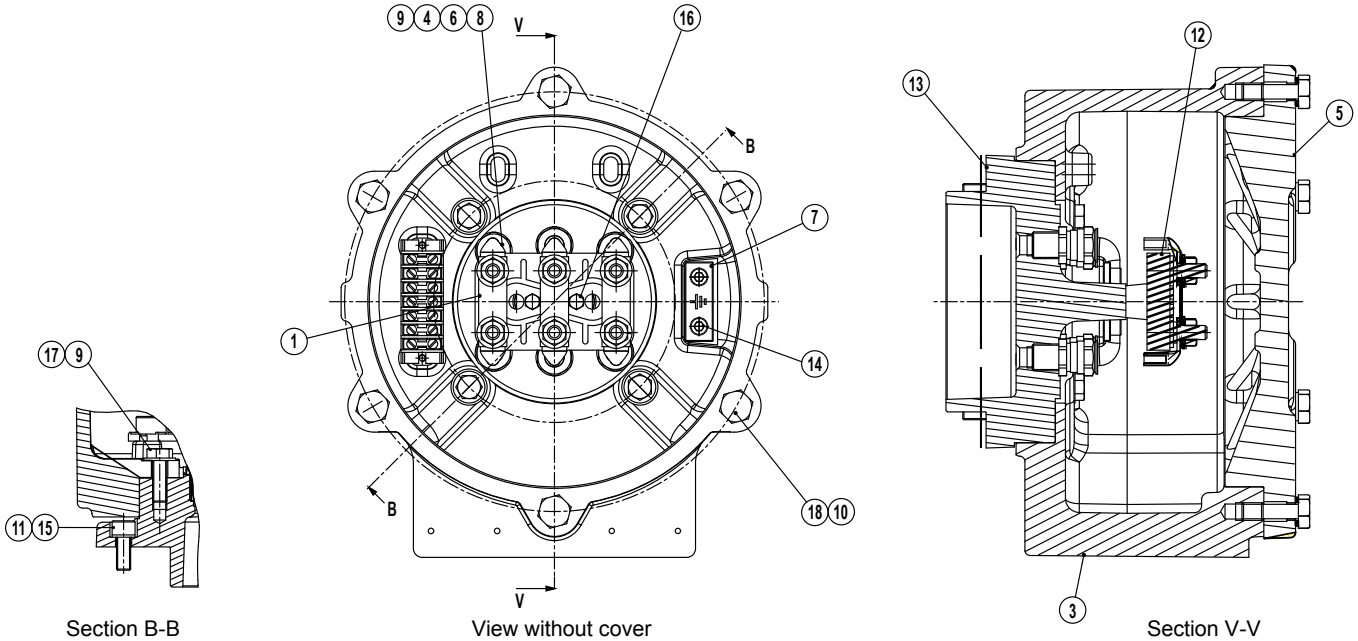
Terminal box Ex db, example FLSD 160 to 280 - IIB



View without cover

Item	Designation	Item	Designation	Item	Designation
1	Coupling link	**6**	Earth plate	**11**	Screw
2	Auxiliary terminal block	**7**	Contact washer	**12**	Screw
3	Terminal box body	**8**	Lock washer	**13**	Screw
4	Terminal box cover	**9**	Lock washer	**14**	Screw
5	Nut	**10**	Terminal base	**15**	Captive screw

Example FLSD 160 to 280 - IIC



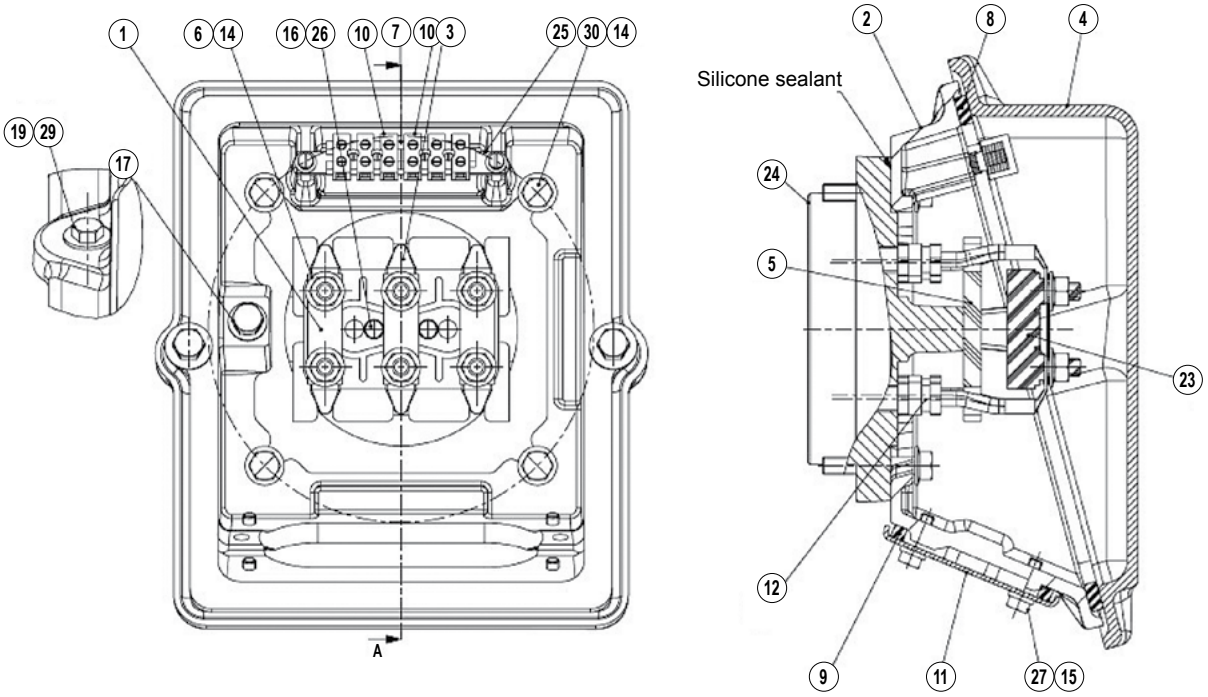
Section B-B

View without cover

Section V-V

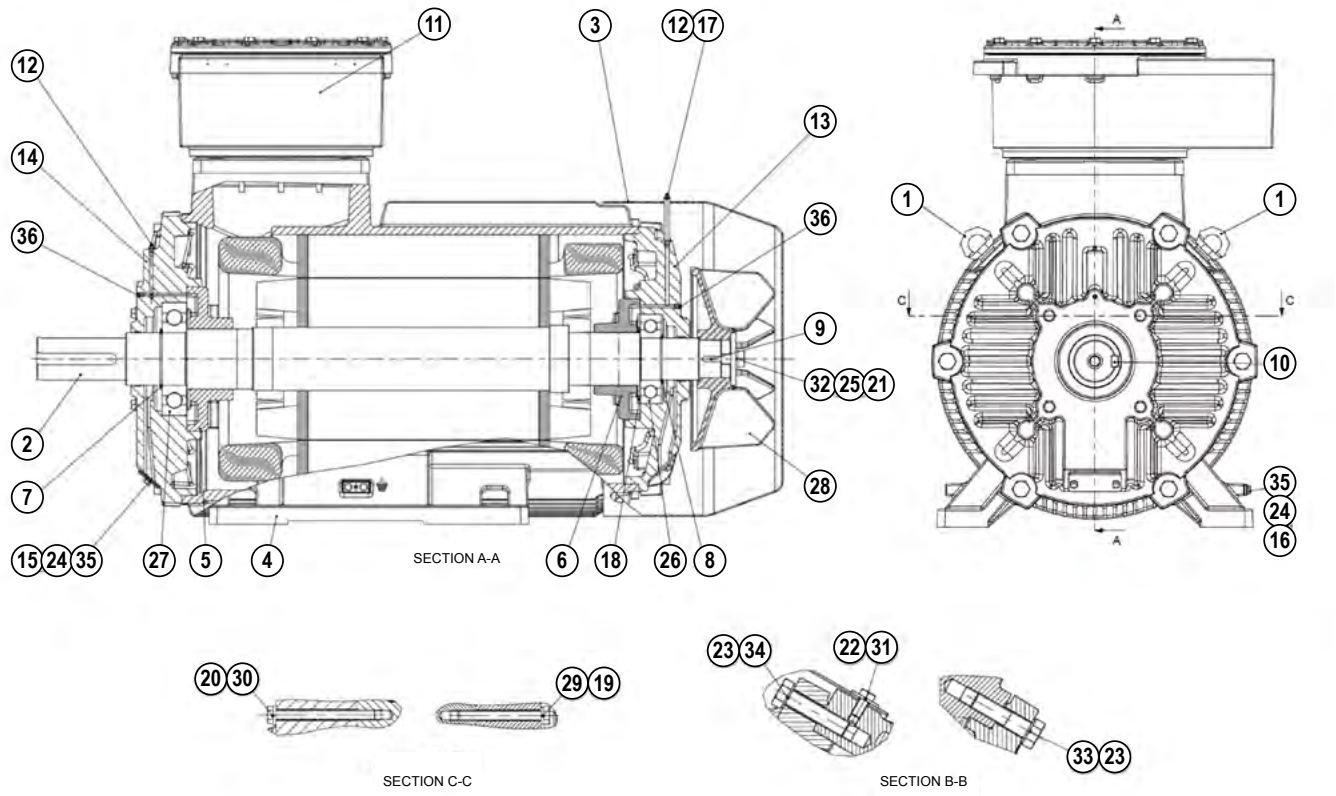
Item	Designation	Item	Designation	Item	Designation
9	Contact washer	**3**	Lower body	**15**	Screw
8	Cable gland	**2**	Auxiliary terminal block	**14**	Screw
7	Earth plate	**1**	Coupling link	**13**	Lower support 0
6	Nut	**18**	Captive screw	**12**	Terminal base
5	Lower cover	**17**	Screw	**11**	Lock washer
4	Elbow connector	**16**	Screw	**10**	Lock washer

Terminal box Ex eb, example FLSD 160 to 315 IIB/IIC and FLSD 355 IIB

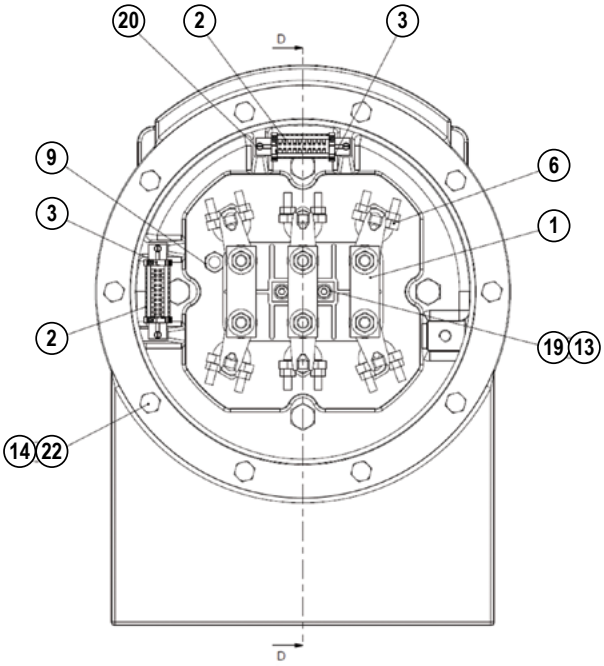


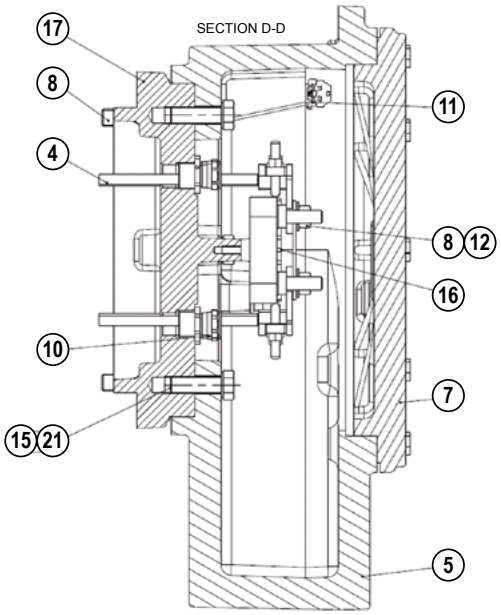
Item	Designation	Item	Designation	Item	Designation
1	Coupling link	**8**	Terminal box cover seal	**15**	Seal washer
2	Terminal box body	**9**	Cable gland plate seal	**16**	Lock washer
3	Elbow connector	**10**	BARTEC 3P connection strip	**17**	Lock washer
4	Terminal box cover	**11**	Cable gland support plate	**18**	Lock washer
5	Screen	**12**	Cable gland	**19**	Flat washer
6	Nut	**13**	Contact washer	**20**	Flat washer
7	BARTEC assembly	**14**	Contact washer		

11.4 - FLSD 315 (motor + "db" terminal box) IIB/IIC



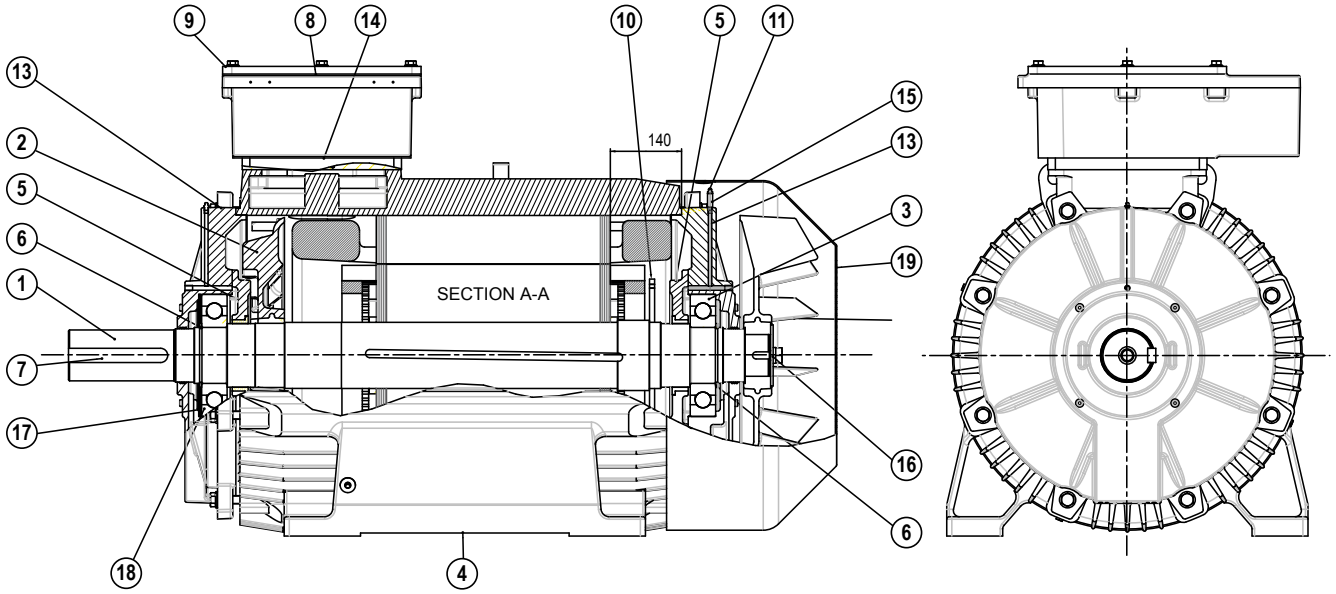
Item	Designation	Item	Designation	Item	Designation
1	Lifting ring	**13**	Rear bearing housing	**25**	Shaft end washer
2	Shaft	**14**	Front bearing housing	**26**	Bearing
3	Fan cover	**15**	Closure plate	**27**	Bearing
4	Frame	**16**	Earth plate	**28**	Fan
5	Bearing cap	**17**	Grease nipple extension	**29**	Screw
6	Bearing cap	**18**	Spring	**30**	Mixer
7	Circlips	**19**	Washer	**31**	Screw
8	Circlips	**20**	Washer	**32**	Screw
9	Key	**21**	Washer	**33**	Screw
10	Key	**22**	Washer	**34**	Screw
11	Terminal box assembly	**23**	Washer	**35**	Screw
12	Grease nipple	**24**	Washer	**36**	Screw



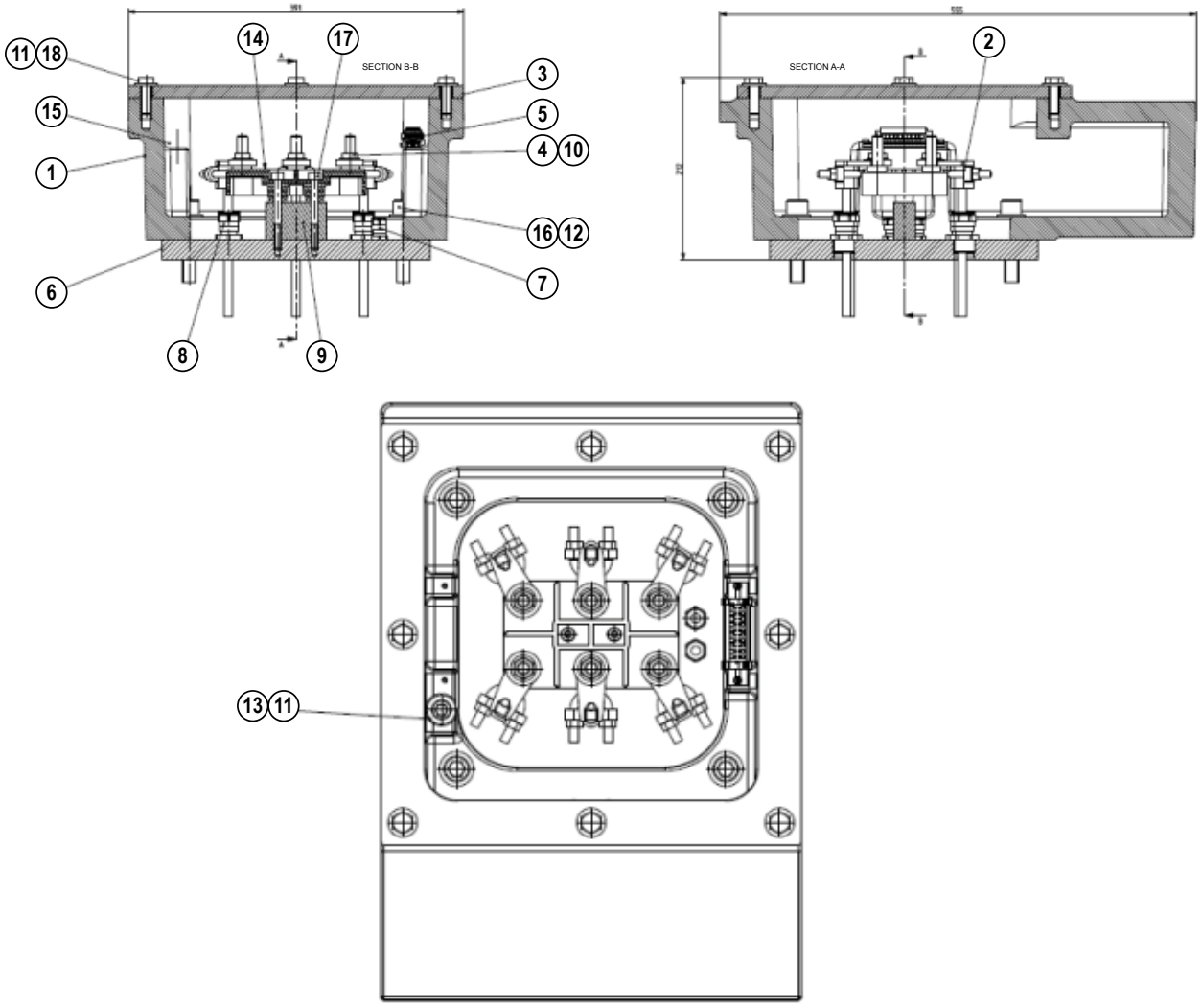


Item	Designation	Item	Designation
1	Coupling link	**12**	Washer
2	10P Wago terminal block	**13**	Washer
3	Plastic end stop	**14**	Washer
4	Cable	**15**	Washer
5	Terminal box body	**16**	Terminal base
6	Connector	**17**	Terminal box support type D
7	Terminal box cover	**18**	Screw
8	Nut	**19**	Screw
9	Cable gland	**20**	Screw
10	Cable gland	**21**	Screw
11	Al rail	**22**	Captive screw

11.5 - FLSD 355 (motor + "db" terminal box)



Item	Designation	Item	Designation
1	Shaft	**11**	Grease nipple
2	Internal mixer	**12**	Rear bearing mounting
3	Fan cover	**13**	Front bearing mounting
4	Frame	**14**	Terminal block support plate
5	Bearing cap	**15**	Grease nipple extension
6	Circlips	**16**	Shaft end washer
7	Parallel key	**17**	Preload or wavy washer
8	Terminal box body “D”	**18**	Bearing
9	Terminal box cover	**19**	Fan
10	Balancing disc		



Item	Designation	Item	Designation
1	Terminal box body “D”	**10**	Washer
2	Connector	**11**	Washer
3	Terminal box cover	**12**	Washer
4	Nut	**13**	Washer
5	WAGO terminal block assembly	**14**	Terminal base
6	Terminal block support plate	**15**	Screw
7	Cable gland	**16**	Screw
8	Cable gland	**17**	Screw
9	Terminal block riser	**18**	Screw

NOTES

Nidec

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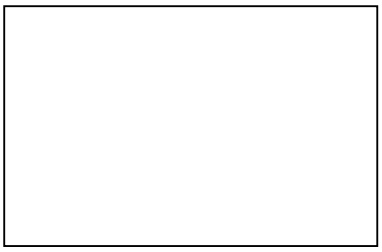

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