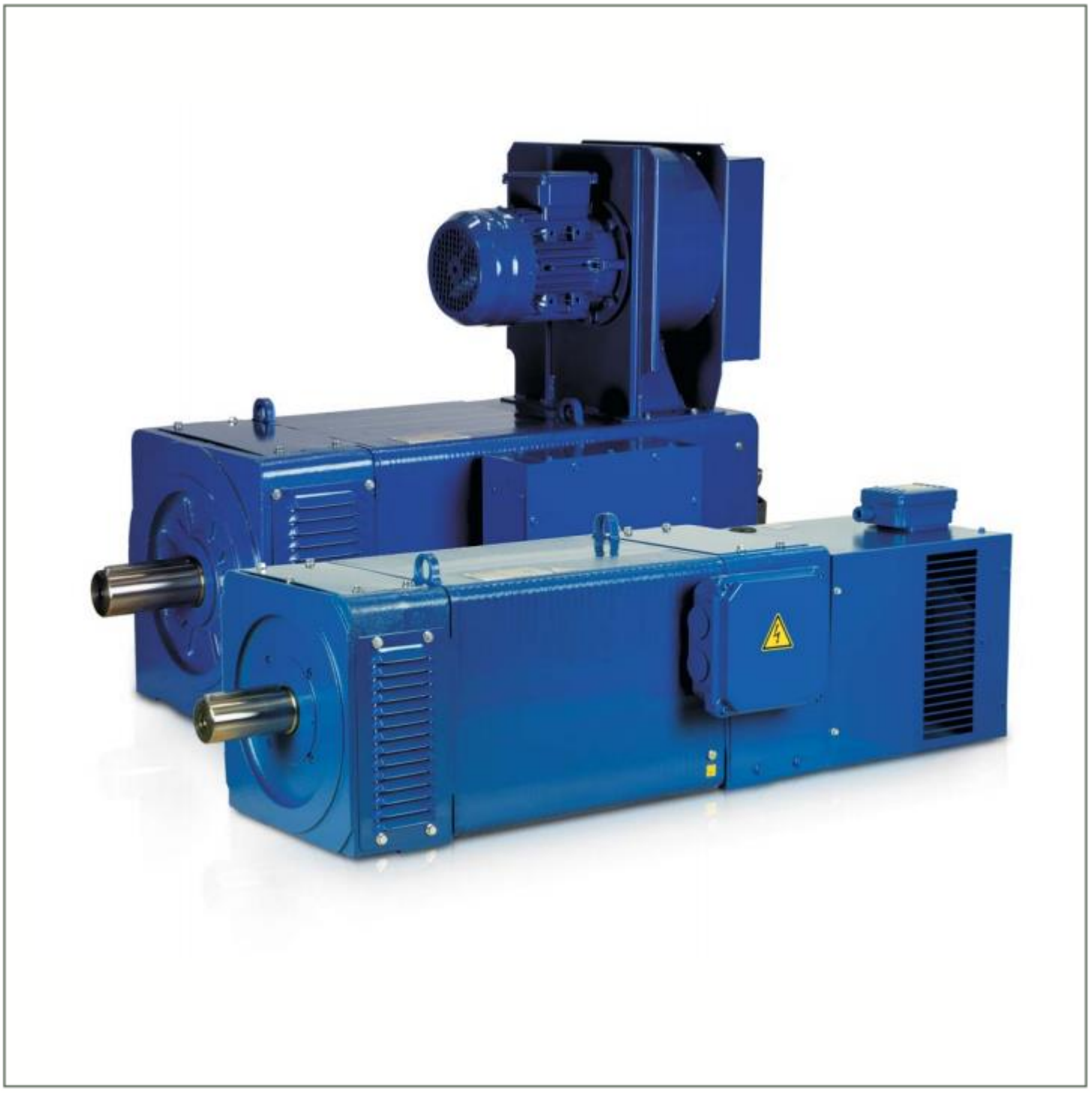
OPERATION AND MAINTENANCE MANUAL

ID MOTORS



VASCAT

www.vascat.com

CONTENTS

1. LEGAL NOTES AND SAFETY INSTRUCTIONS

1.1 Justification

VASCAT motors contain low-voltage parts and rotating elements that make them hazardous; they also contain hot surfaces. Users must take notice of all the hazard warning signs described in this manual (see section 1.3).

All the work related to the transport, connection, start-up and maintenance must be performed by responsible, qualified personnel (in accordance with the EN 50110-1 (VDE 0105-100) and IEC 60034 standards). Incorrect procedures may cause serious personal injury and material damages.

VASCAT motors may only be used for the purposes specified in section 0.

Furthermore, the conditions in the place where they are used must meet all the requirements given on the specifications plate and in this document.

1.2 Users and purpose

The purpose of the operation manual is to provide all the information required for the appropriate mounting, commissioning and maintenance of the ID motors and avoid hazards that may cause serious injury. This manual is for any person or individual working with the motors to which it refers or who assume responsibility for their operation.

All individuals working with ID series C.C. motors must have this manual at their disposal and they must follow the relevant instructions and indications.

The service instructions must be read carefully before using the machine. This will guarantee correct operation free from hazards and complications and will extend the service life of the machine.

These service instructions give a description of the machine and information on its correct operation from delivery to the end of its service life.

This manual must always be complete and perfectly legible.

1.3 Hazards and warning signs

This manual contains the information required for personal safety and the prevention of material damages. All the information that refers to personal safety is highlighted in general with a warning triangle; however, the informative notes (to avoid only material damages) are not. Depending on the hazard level, the signs indicate hazards from major to minor as follows:

DANGER

This means that if the appropriate preventive measures are not adopted, the result will be death or serious injury.

WARNING

This means that if the appropriate preventive measures are not adopted, the result will be death or serious injury.

PRECAUTION

This means that if the appropriate preventive measures are not adopted, the result may be serious injury.

PRECAUTION

This means that if the appropriate preventive measures are not adopted, the result may be material damages.

NB

This means that the result may be an unwanted status or situation if the corresponding safety instruction is not observed.

In the case of various hazard levels at the same time, the strictest security instruction will prevail in all circumstances. If a safety instruction with a warning triangle warns of personal injury, the same instruction may also contain a warning of possible material damages.

The signs that indicate the type of hazard (warning or precaution in this manual), which may be used in conjunction with the above pictograms, are as follows:

VOLTAGE

Indicates the existence of voltage on connection terminals or live parts.

HOT SURFACE

Indicates the possibility of the contact surface having a very high temperature with the consequent risk of burns.

MOVING ROTATING PARTS

Indicates the possibility of injury and properties caused by contact with shafts and other rotating parts.

1.4 Intended use

WARNING

VASCAT motors are to be used in industrial installations. They comply with the requirements of the harmonised standards of the EN 60034 series.

Said units are parts designed to be mounted on machines in accordance with the current machines directive. Start-up is not allowed until the end product is checked and found to be compliant with said directive (please see, among others, the EN 60204-1 standard).

VASCAT ID motors must be used only for the applications provided in the catalogues and the related technical documentation.

If third-party products and parts are used, they must be previously approved by VASCAT.

The correct and safe operation of the products requires their correct transport, storage, installation, assembly, operation and maintenance.

The allowed ambient conditions must be observed. The use of ID motors in hazardous areas is strictly prohibited unless they have been designed specifically for said circumstance, in which case the indications and warnings given in the related documentation must be observed.

1.5 Qualified personnel

WARNING

VASCAT motors must be installed and operated in accordance with the specifications given in this document. Only qualified personnel are authorised to intervene when, in accordance with the manual, they have all the technical know-how and skills required to handle, start up and connect the motors in accordance with safety standards.

Qualified personnel refers to the individuals who are capable of recognising the risks associated with their field of activity and avoid associated hazards.

1.6 Disclaimer

The indications given in this manual describe the product specifications but do not guarantee them.

VASCAT declines all liability for damages and operating faults caused by the following:

- Failure to follow the operating instructions.
- Damages caused by incorrect operation of the motor.
- Changes made to motors without prior authorisation.
- Operating errors.
- Carrying out inappropriate work on and with the motors.

The indications that refer to procedures and the connection details included in this manual must be considered only as proposals and whether or not they are applicable must be studied for each case in particular. VASCAT does not guarantee their appropriateness in any case.

The data given in this manual is reviewed regularly and subsequent editions are published when corrections are necessary.

1.7 Scope of the documentation and external references

The manual contains all the information required for the correct handling, installation (electrical and mechanical), commissioning and subsequent maintenance of ID series motors, together with the accessories required for proper operation.

It also describes the safety instructions to guarantee that no personal injuries or material damages will be caused during the entire process.

If the motor involves any type of special work (considered as non-standard), additional documentation may be necessary. In said case, the customer must check with VASCAT to make sure that he has all the relevant information.

This document provides no information about the technical data sheets or the specific technical data of the various MAC ID models or their characteristic curve.

To obtain said information, please log on to the VASCAT website at http://www.vascat.com.

2. DECLARATIONS OF CONFORMITY

VASCAT	**EU CONFORMITY DECLARATION** **ID MOTORS**

EU CONFORMITY DECLARATION

CE

The company VASCAT S.A., with registered offices in C/ Esquirol s/n - 08570 Torelló-SPAIN

DECLARES

The motors **ID 100** to **ID 200, IDX 132** to **IDX 200, IDM 160** to **IDM 200** series comply with the basic requirements set forth in the following Directives:

2014/35/UE – Low Voltage Directive
2006/42/CE – Machinery Directive (*)
2014/30/UE – Electromagnetic Compatibility Directive (**)
93/68/CEE – CE Marking Directive

(*) Although they are not in the scope of Machinery Directive. ID series fulfill the health and safety requirements as machinery components.

(**) ID motor series are not considered as devices in the sense of the EMC directive

These motors have been manufactured in compliance with the following standards:

- UNE-EN 60034-1
- UNE-EN 60034-5
- UNE-EN 60034-6
- UNE-EN 60034-8
- UNE-EN 60034-9
- TS 60034-25
- UNE-EN 60034-14
- UNE-EN 60204-1

In consequence to the above-mentioned standards, this declaration will no longer be valid when changes are made without our prior consent.

The product traceability is made through the serial number marked in the motor nameplate.

The specified product shall be installed as a part of a machine only. Commissioning of the product is not allowed until it has not been checked that the end-product complies with above mentioned operation standards.

Torelló, October 5, 2023.

Jordi Trullén - CTO

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VASCAT S.A.

VASCAT *Departament de R+D*	DECLARACIÓN DE CONFORMIDAD CON LAS DIRECTIVAS 2015/863/UE RoHS, 2012/19/UE WEEE Y REGLAMENTOS 1907/2006/UE Y 2019/1148/UE REACH *DECLARATION OF COMPLIANCE WITH THE EUROPEAN DIRECTIVES 2015/863/EU, 2012/19/EU WEEE AND REGULATIONS 1907/2006/CE AND 2019/1148/EU REACH*	Página 1/1 Fecha 01/09/20

Torelló, 01 de Septiembre de 2020

La firma VASCAT, S.A. con domicilio en C/ Esquirol s/n - 08570 Torelló

DECLARA

Que los productos fabricados por VASCAT,S.A. –Motores eléctricos de CC o CA para aplicaciones de velocidad variable - así como sus accesorios standard –Electroventiladores, Dinamos tacométricas, encóderes y frenos- , son conformes a la **Directiva Europea 2015/863/UE sobre restricciones a la utilización de determinadas sustancias peligrosas en aparatos eléctricos y electrónicos,** la **Directiva Europea 2012/19/UE sobre residuos de aparatos eléctricos y electrónicos** en lo concerniente al contenido en Plomo(Pb), Mercurio(Hg), Cadmio(Cd), Cromo Hexavalente (Cr 6+), Polibromobifenilos (PBB) y Polibromodifeniléteres (PBDE) y a los **Reglamentos Europeos 1907/2006/CE 2019/1148/UE relativo al uso de sustancias SVHC en cantidades no superiores al 0.1% (REACH) en todo su proceso de fabricación aun siendo usuarios intermedios y no estando sujetos al registro**.

Torelló, September 1st 2020

VASCAT, S.A. with address in C/ Esquirol s/n - 08570 Torelló

DECLARE

That the products manufactured by VASCAT,S.A. –Electric DC and AC motors for variable speed operation- and their standard accessories – Electric blowers, tachodinamos, encoders and brakes -, are in compliance with ***European Directives 2015/863/EU about Restrictions of hazardous substances in waste from electrical and electronic equipment – RoHS,*** *the* ***European Directives 2012/19/EU about waste of electrical and electronic equipment – WEEE –*** *as related to the content of Lead(Pb), Mercury(Hg), Cadmium(Cd), Hexavalent Chromium (Cr 6+), Polybrominated biphenyls(PBB) and Polybrominated Diphenilethers (PBDE) and the* ***European Regulations 1907/2006/CE and 2019/1148/EU about SVHC substances in quantity not higher 0.1% (REACH) throughout its manufacturer process although being downstream user which are not summited to registration activity***.

Josep Torras Homs

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Gerente / *General Manager*
VASCAT, S.A.

3. PRODUCT DESCRIPTION

VASCAT ID motors are direct current separately excited electrical machines with square laminated steel frame and forced cooling. They have been specially designed to work in high-dynamics applications that require speed variation. They must be powered exclusively by AC/DC or DC/DC converters.

3.1 General information

The following table shows the standard technical specifications of the ID series:

Technical specifications	Description
Motor type	***Separately excited DC motor***
Frame sizes (Shaft heights)	***ID series: 100, 112, 132, 160, 180 and 200 mm*** ***IDM series: 160, 180 and 200 mm*** ***IDX series: 132, 160, 180 and 200 mm*** ***IDMX series: 160, 180 and 200 mm***
No. of poles	***4 poles***
Protection rating **(According to the IEC/EN 60034-5 standard)**	***IP23***
Cooling Method **(According to the IEC/EN 60034-6 standard)**	***IC06***
Excitation/armature voltage	***Up to 460 VDC (other voltages on request)***
Insulation class **(According to the IEC/EN 60034-1 standard)**	***Materials Class H - Operating temperature Class F***
Assembly type **(According to the IEC/EN 60034-7 standard)**	***IM B3 or B35 (other types of assembly optional)***
Thermal protection **(According to the IEC/EN 60034-11 standard)**	***2 PTC140 sensors connected in series, one on the excitation coil and the other on the auxiliary (other optional sensors)***
Installation altitude **(According to the IEC/EN 60034-1 standard)**	***<1000 m above sea level***
Operating temperature **(According to the IEC/EN 60034-1 standard)**	***0 to +40ºC***
Vibration level **(According to the IEC/EN 60034-14 standard)**	***Class A (Class B optional)***
Shaft and flange types **(According to the IEC/EN 60072-1 standard)**	***Solid shaft with keyway and B5 flange (other setups optional)***
Brushes	***Electro-graphite EG321/EG332***
Bearings	***Rigid ball bearings (other types optional)***
Paint	***Synthetic enamel RAL 5010 colour (other types optional)***
Feedback sensors **(optional)**	***60V/1000rpm tachometer dynamo*** ***(Other types of sensors available on request)***
Brake *(optional)*	***Electromagnetic parking brake for absence of 24 VDC supply*** ***(Other types of brake available on request)***
Rotating direction	***Clockwise looking from the side closest to the cable outlet***

Table 1: General specifications of ID motors

On many occasions, VASCAT, S.A. adapts its motors to the specific requirements of each customer/application. Therefore, the above table must be understood as a general reference only. The exact specifications of each motor can be found on the corresponding technical data sheet and the additional documentation provided to the customer (where applicable).

3.2 Reference standards

The ID motors are designed and manufactured according to the Low Voltage Directive 2006/95/CE and they have been designed for their use in industrial applications as an incomplete machine or as a machine component as provided for in the 2006/46/CE Machinery Directive.

The following table summarises the main reference technical standards that have been taken into account for the design of these motors:

Standard	Description
IEC/EN 60034-1	*Dimensioning and behaviour in operation*
IEC/EN 60034-2	*Method for determining losses*
IEC/EN 60034-5	*Protection rating*
IEC/EN 60034-6	*Cooling*
IEC/EN 60034-7	*Mounting*
IEC/EN 60034-8	*Marking on terminals and direction of rotation*
IEC/EN 60034-9	*Noise emissions*
IEC/EN 60034-11	*Thermal protection*
IEC/EN 60034-14	*Mechanical vibration levels*
IEC/EN 60034-18	*Insulation evaluation*
IEC/EN 60072-1	*Power series and dimensions of rotating electrical machines*

Table 2: Reference standards

In accordance with the current Machinery Directive, the commissioning of these motors is prohibited in the European Union until conformity of the installation has been confirmed in which the machine is to be installed (see EN 60204-1). If the electrical machine is to be used outside the European Union, the specific laws of the country in which it is located will apply. Furthermore, safety standards, local installation and sector-specific standards must be applied.

The data given in all the documentation provided by VASCAT includes tolerances regarding the most relevant parameters shown on the table 3:

Power	Efficiency	Inertia	Noise level	Speed	Power	Maximum Torque
Pn < 150 kW	*-15% (1-η)*	*+/-10%*	*+3dB*	*+/-5%*	*-2%*	*-7%*
Pn > 150 kW	*-10% (1-η)*	*+/-10%*	*+3dB*	*+/- 5%*	*-1%*	*-6%*

Table 3: Tolerances

3.3 Definitions

3.3.1 Duty

Three-phase induction motors are usually designed to develop their rated power in continuous service with no overheating problems. However, most motors operate under a non-continuous type of service. Some motors are switched on for a few moments only, others work all day, but they only charge up briefly, etc. The EN 60034-1 standard defines 10 main service types and those summarised in the table below apply to ID motors:

Duty	Description	Definition
S1	*Continuous service*	*Operation in constant charging status with sufficient duration to reach thermal balance.*
S2	*Temporary service*	*Operation in constant charging status during a shorter period than necessary to reach thermal balance, followed by a standby period that is sufficient to cool down to ambient temperature.*
S3	*Intermittent regular service*	*Chain of identical services made up of a constant charging period followed by a standby period.*
S5	*Intermittent regular service with electrical braking*	*Chain of identical services made up of a start-up period, a constant charging period and an electrical braking period followed by a standby period.*
S6	*Regular uninterrupted service with intermittent charging*	*Chain of identical services made up of a constant charging period followed by a period of load-free operation.*
S7	*Regular uninterrupted service with intermittent charging and electrical braking.*	*Chain of identical services made up of a start-up period, a period of constant charging, a period of load-free operation and a period of electrical braking.*

Table 4: Duty

3.3.2 Mounting

The following are some of the mounting types applicable to the ID motors, labelled in accordance with the IEC/EN 60034/7 standard.

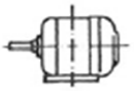
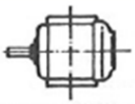
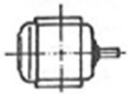
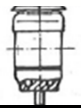
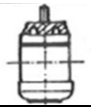
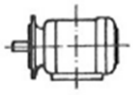
Mounting	Diagram	Assembly	Mounting	Diagram	Assembly
IM B3 IM1001		*Foot-mounting on lower horizontal plane*	IM V1 IM3011		*With flange shaft down (through-holes)*
IM B5 IM3001		*With horizontal flange (through-holes)*	IM V3 IM3031		*With flange shaft up (through-holes)*
IM B6 IM1051		*Foot-mounting on vertical plane shaft left*	IM V5 IM1011		*Foot-mounting on vertical plane shaft down*
IM B7 IM1061		*Foot-mounting on vertical plane (shaft right)*	IM V6 IM1031		*Foot-mounting on vertical plane shaft up*
IM B8 IM1071		*Foot-mounting on upper horizontal plane*	IM V18 IM3611		*With flange shaft down (threaded holes)*
IM B14 IM3601		*With flange (threaded holes)*	IM V19 IM3631		*With flange shaft up (threaded holes)*
IM B35 IM2001		*Flange-mounting (through-holes) and feet*	IM V15 IM2011		*Flange-mounting (through-holes), shaft down and feet*
			IM V36 IM2031		*Flange-mounting (through-holes), shaft up and feet*

Table 5: Mounting

3.3.3 IP protection rating

The protection rating of electrical machines is defined in accordance with IEC/EN 60034-5. Said standard specifies the protection rating of each machine using an 'IP' code, which comprises two digits:

- First digit: Indicates the protection rating for contact and solid bodies.
- Second digit: Indicates the protection rating for water.

The following table shows the meaning of each digit:

First digit	Protection offered	Second digit	Protection offered
0	*No special protection against contacts. No protection against the penetration of solid foreign bodies.*	0	*No special protection against water.*
1	*Protection against casual contacts of large surfaces, e.g. a hand. Protection against the penetration of solid foreign bodies with a diameter of more than 50 mm.*	1	*Protection against drops of water that fall vertically.*
2	*Protection against contact with fingers. Protection against the penetration of solid foreign bodies with a diameter of more than 12mm.*	2	*Protection against drops of water falling at an angle of up to 15º from the vertical axis.*
3	*Protection against contacts with tools, wires, etc. with a diameter of more than 2.5 mm. Protection against the penetration of solid foreign bodies with a diameter of more than 2.5mm.*	3	*Protection against water sprayed at an angle of more than 60º from the vertical axis.*
4	*Protection against contacts with tools, wires, etc. with a diameter of more than 1 mm. Protection against the penetration of solid foreign bodies with a diameter of more than 1mm.*	4	*Protection against water sprayed in any direction*
5	*Full protection against contacts. Protection against damaging dust deposits.*	5	*Protection against jets of water in any direction.*
6	*Full protection against contacts. Full protection against the penetration of dust.*	6	*Protection against the beating of the sea.*
		7	*Protection against temporary immersion under a specified pressure and for a specified time.*
		8	*Protection against prolonged immersion.*

Table 6: IP code

For example, a machine defined as IP54 indicates full protection against contacts and water sprayed in any direction.

3.3.4 IC Cooling Method

The type of cooling used in electrical machines is regulated by the IEC/EN 60034-6 standard. In order to identify the type of cooling used in each motor, it is also given a code similar to the IP protection rating. There are two types of code: full indication (e.g. IC9A7W7) and simplified indication (e.g. IC97W). Both begin with the initials IC (International Cooling).

The table below shows the most common cooling methods for ID motors:

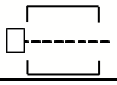
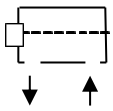
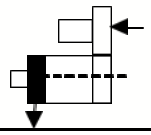
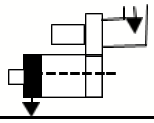
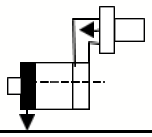
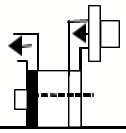
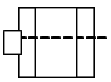
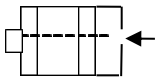
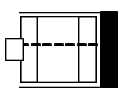
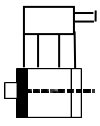
SIMPLIFIED INDICATION	FULL INDICATION	EN60034-6	DESCRIPTION
IC00	IC0A0		*Free circulation, using the surrounding medium, by means of free convection*
IC01	IC0A1		*Free circulation, using the surrounding medium, by own circulation*
IC06	IC0A6		*Free circulation, using the surrounding medium, by an independent part fitted on the machine*
IC16	IC1A6		*Circulation via inlet pipe or conduit, using remote fluid, by an independent part fitted on the machine*
IC17	IC1A7		*Circulation via inlet pipe or conduit, using remote fluid, by an independent, separate part or cooling system pressure*
IC37	IC3A7		*Circulation via inlet and outlet pipe or conduit, using remote fluid, by an independent, separate part or cooling system pressure*
IC410	IC4A1A0		*Cooling of the housing surface, using the surrounding medium, by means of free convection*
IC411	IC4A1A1		*Cooling of the housing surface, using the surrounding medium, by means of own circulation*
IC416	IC4A1A6		*Cooling of the housing surface, using the surrounding medium, by means of an independent part fitted on the machine*
IC97W	IC9A7W7		*Cooling using an independent heat exchanger by means of liquid coolant or remote fluid*

Table 7: Cooling types

3.3.5 Balancing and vibration level

The EN 60034-14 standard specifies the test procedures for the acceptance of vibration at factory and the vibration limits for certain electrical machines in specific conditions when they are disconnected from a power machine or charge

The standard defines two possible vibration levels for the shaft: type 'A' (machines with no special vibration requirements); and type 'B' (machines with special vibration requirements).

The following table shows the maximum admissible limits for displacement, speed and acceleration (in effective value) for a specific shaft height (H):

Vibration grade	Shaft height (mm)	56 ≤ H ≤ 132		H > 132	
	Mounting	Displac. µm	Vel. mm/s	Displac. µm	Vel. mm/s
A	*Free suspension*	*45*	*1.6*	*45*	*2.8*
	Rigid mounting	-	-	*37*	*2.3* *2.8**
B	*Free suspension*	*18*	*1.1*	*29*	*1.8*
	Rigid mounting			*24*	*1.5* *1.8**

Table 8: Vibration levels

If the machine does not specify the type to which it belongs, it must be considered as type 'A'.

3.3.6 Insulation class

The insulation rating of an electrical machine is identified on the motor specifications plate by means of a letter in accordance with the IEC/EN 60034-18 standard.
The following table summarises the maximum allowed temperature in the installation of a winding in accordance with its insulation rating:

Class	Maximum temperature
A	*105ºC*
E	*120ºC*
B	*130ºC*
F	*155ºC*
H	*180ºC*

Table 9: Insulation classes

3.3.7 Heating limits

The IEC60034-1 standard defines the maximum admissible heating (increase in temperature) for the windings as specified in the following table:

Thermal Class	Coolant temperature	Heating (per element)	Operating temperature
B (130ºC)	< 40ºC	< 80ºC	< 120ºC
F (155ºC)	< 40ºC	< 105ºC	< 145ºC
H (180ºC)	< 40ºC	< 125ºC	< 165ºC

Table 10: Heating limits

Accordingly, the rated working conditions of the motor must be such that the operating temperature on the windings is always below the temperature specified by the insulation class of the part materials. Therefore, the working thermal class of a motor can correspond to the following:

a) **The same thermal insulation class**. This would be the case of a motor built with **Class F** insulation (155°C) with a maximum working temperature of 140°C, corresponding to a **Class F**.

b) **A thermal class lower than the insulation class**. This would be the case of a motor built with **Class H** insulation (180°C) with a maximum working temperature of 140°C, corresponding to a **Class F**.

3.4 Nameplate

All ID motors are provided with the following nameplate:

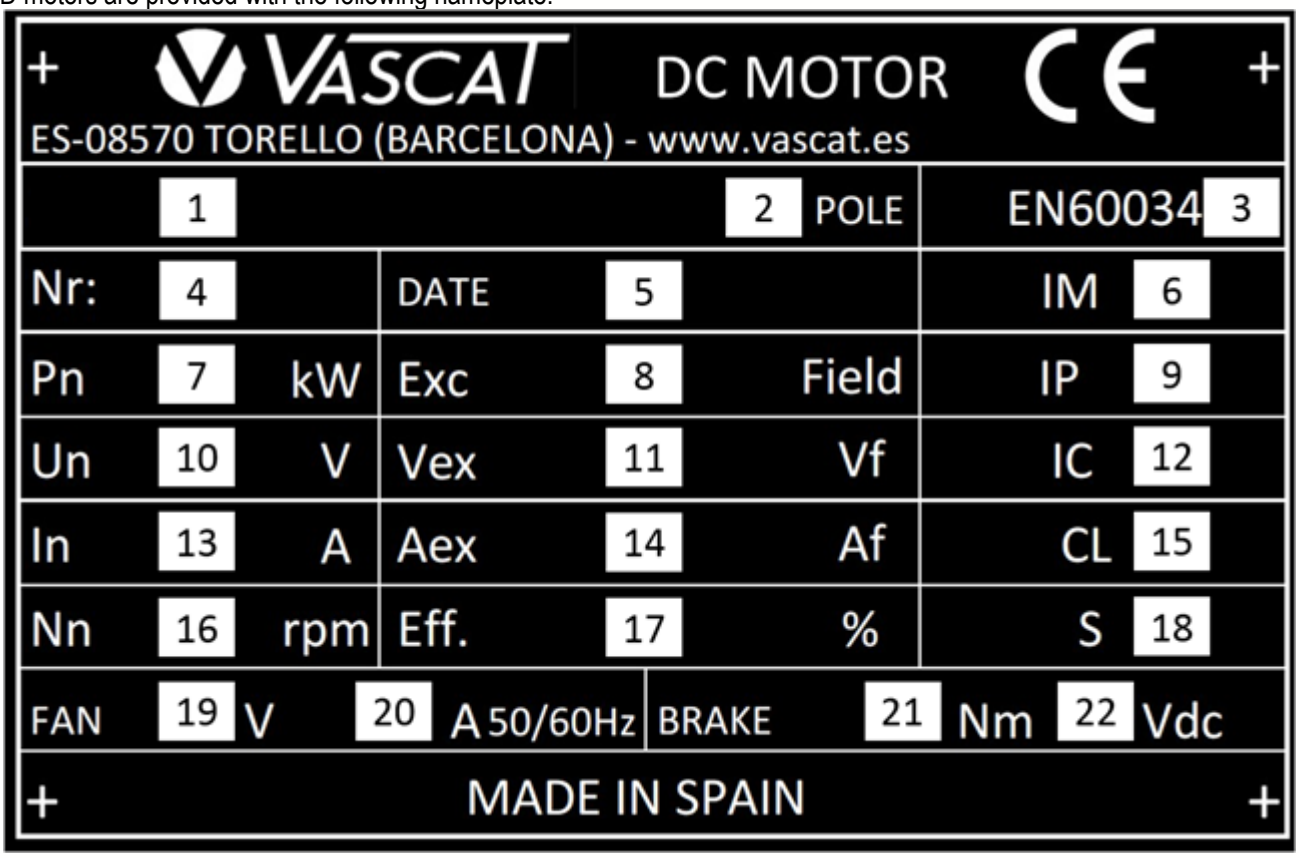


Figure 1: ID motor nameplate

The following table contains a description of the different fields of the plate:

Pos.	Description	Pos.	Description
1	*Motor type*	2	*Serial No.*
3	*EN60034 family of reference standards*	4	*Pole No.*
5	*Year of manufacture*	6	*Mounting type Code IM (EN60034-7)*
7	*Rated power PN in kW*	8	*Field*
9	*Protection rating IP code (EN60034-5)*	10	*Rated armature voltage UN in V*
11	*Field voltage in V*	12	*Winding working temperature CL code (EN60034-1)*
13	*Rated armature current IN in A*	14	*Field current in A*
15	*Cooling method IC code (EN60034-6)*	16	*Rated speed n_N in rpm*
17	*Motor efficiency*	18	*Duty S code (EN60034-1)*
19	*Voltage [V] of the axial fan (*)*	20	*Current [A] of the axial fan (*)*
21	*Torque [Nm] of the brake (**)*	22	*Voltage [V] of the brake (**)*

Table 11

(*) Positions ***19 / 20*** are checked only if there is an axial fan.
(**) Positions ***21 / 22*** are checked only if there is a parking brake.

3.5 General specifications

3.5.1 Motor code

ID series motors are coded as follows:

ID		*M*	*200*	*M*	*38*	*3*
Motor type		***Series***	***Size***	***Length***	***Armature winding***	***Field winding***
ID Separately excited DC motor		IP23 – IC06 Radial fan	***100*** ***112*** ***132*** ***160*** ***180*** ***200*** Shaft height (mm)	***S*** ***M*** ***L*** ***P***	Defines the rated motor speed	Defines the field winding voltage
	M	IP 23 – IC06 Radial fan With compensated winding				
	X	IP54 – IC416 Axial fan				
	MX	IP23 – IC06 Axial fan With compensated winding				

Table 12: ID motor codes

3.5.2 Ambient conditions

In their standard version, ID motors are not suitable for working in saline or corrosive atmospheres or for installation outdoors.

3.5.3 Duty

In all the series, unless specified otherwise, the powers assigned for continuous service (S1) apply, with an ambient temperature of between -20º and +40ºC and at a maximum height of 1000 m above sea level.

If the working conditions differ from those above, a declassing factor must be applied to the torque and power, called K1, with regard to the values given on the specifications plate, as shown in the following table:

Altitude	Temperature			
	30ºC	40ºC	50ºC	55ºC
1000 [m]	*1*	*1*	*0.92*	*0.86*
2000 [m]	*1*	*0.93*	*0.85*	*0.77*
3000 [m]	*0.93*	*0.85*	*0.76*	*0.69*
4000 [m]	*0.86*	*0.78*	*0.67*	*0.6*

Table 13: Derating factors

If the motor does not work in continuous duty service (S1), but rather in an S2-type discontinuous service, a multiplication factor must be applied (K2) to the torque and power specified on the plate (S1 Service) to determine the torque available for the service. The K2 factor is determined by the duration of the service according to the following graph.

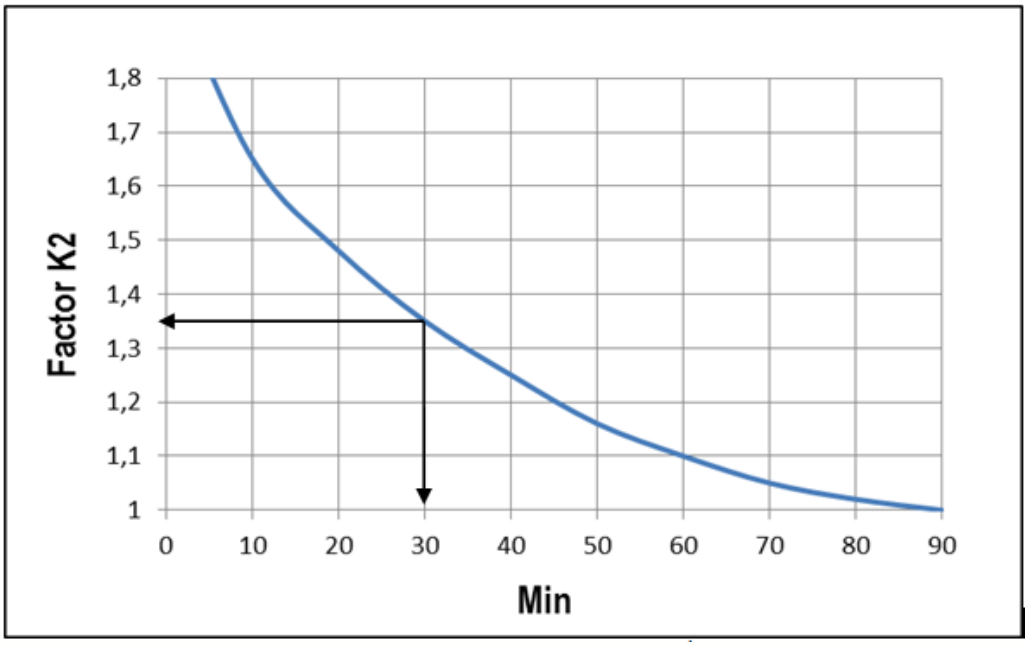


Figure 2: Derating factor for an S2-duty service

3.6 Mechanical specifications

3.6.1 Types of construction

Available construction types for ID motors are detailed in the table below:

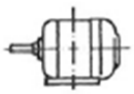
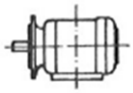
EN 60034-7		Frame size					
		100	112	132	160	180	200
	IM B3 IM 1001	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*
	IM V5 IM 1011	*OK*	*OK*	*OK*	*C*	*C*	*C*
	IM V6 IM 1031	*OK*	*OK*	*OK*	*C*	*C*	*C*
	IM B5 IM 3001	*OK*	*OK*	*C*	*C*	*C*	*C*
	IM V1 IM 3011	*OK*	*OK*	*OK*	*C*	*C*	*C*
	IM V3 IM 3031	*OK*	*OK*	*OK*	*C*	*C*	*C*
	IM B3/B5 IM 2001	*OK*	*OK*	*OK*	*OK*	*OK*	*OK*
	IM V1/V5 IM 2011	*OK*	*OK*	*OK*	*C*	*C*	*C*
	IM V3/V6 IM 2031	*OK*	*OK*	*OK*	*C*	*C*	*C*

Table14: Available construction types for ID motors

OK: Construction possible **X: Construction not possible** **C: Consult**

3.6.2 Degree of protection IP

ID motors are defined with the following IP degrees:

Motor	Standard version	Optional ratings
ID	*IP23*	*IP44 / 54*

Table 15: Degree of protection of ID motors

For motors that comply with the IP23 protection rating, due precautions must be taken if they are installed in environments that are dusty, damp or subject to adverse weather.

Motors that comply with the IP54 protection rating or higher can be installed in damp and dusty industrial environments

3.6.3 Cooling Method

The table below summarises the available cooling methods for the ID motors:

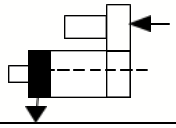
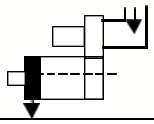
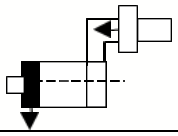
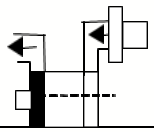
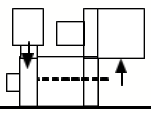
COOLING	EN60034-6	PROTECTION
IC06		IP65
IC16		IP65
IC17		IP65
IC37		IP65
IC06		IP44

Tabla16: Available cooling methods for ID motors

3.6.4 Balancing and vibration level

VASCAT motors from ID series are defined as A-grade vibration level machines (according to EN 60034-14). Balances for class B can also be supplied to order.

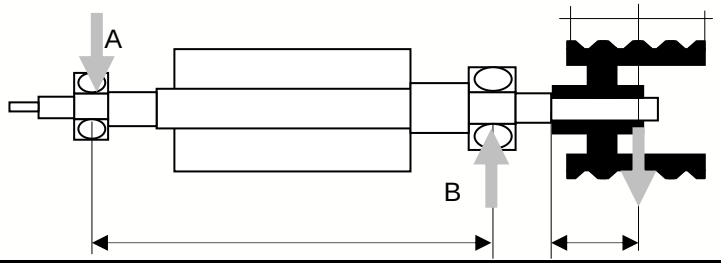
3.6.5 Bearings

ID motors include different bearings types depending on their frame size (shaft height). The following table summarises the bearings that are considered standard for each model:

Motor Type	*Bearing*		max n rpm	n rpm	L10h h	C N	max P N	A mm	B mm	max X mm	max Fr N (**)
ID 100	*D.E.*	*6307 ZZ C3*	*8500*	1500	20000	*33200*	2729	24	317.5	80	1600
	N.D.E.	*6207 ZZ C3*	*9000*	1500	20000	*25500*	2096	24	317.5	80	5100
ID 112	*D.E.*	*6308 ZZ C3*	*7500*	1500	20000	*41000*	3370	26	371	80	2100
	N.D.E.	*6208 ZZ C3*	*9000*	1500	20000	*30700*	2524	26	371	80	7100
ID 132	*D.E.*	*6310 ZZ C3*	*6300*	1500	20000	*61800*	5080	35.5	448.5	110	3100
		N310 (*)	*5000*	1500	20000	*110000*	11609				7000
	N.D.E.	*6208 ZZ C3*	*8500*	1500	20000	*30700*	2524	35.5	448.5	110	6200
ID 160	*D.E.*	*6312 ZZ C3*	*5000*	1500	20000	*81900*	6733	38.5	538	110	4200
		N312 (*)	*4300*	1500	20000	*151000*	15937				10000
	N.D.E.	*6308 ZZ C3*	*7500*	1500	20000	*41000*	3370	38.5	538	110	9800
ID 180	*D.E.*	*6313 ZZ C3*	*4800*	1500	20000	*92300*	7588	50	679	140	4700
		N313 (*)	*4000*	1500	20000	*183000*	19314				12100
	N.D.E.	*6311 ZZ C3*	*5600*	1500	20000	*71500*	5878	50	679	140	16800
ID 200	*D.E.*	*6315 ZZ C3*	*4300*	1500	20000	*114000*	9372	55	757	140	6000
		N315 (*)	*3400*	1500	20000	*242000*	25541				16200
	N.D.E.	*6313 ZZ C3*	*4800*	1500	20000	*92300*	7588	55	757	140	23600

Table 17: Technical specifications of ID motor bearings

N.D.E. = Rear / Non Drive End DE = Front / *Drive End*



TERMINOLOGY:

max n = Maximum speed
n = Working speed
L10h = Bearing service life, in h
C = Rated dynamic load of bearing
max P = Radial load admissible on bearing for L10h and n
max Fr = Maximum radial force on pulley

(*) Supply to order
(**) The maximum radial force on the pulley is lower than the values of the selected set of bearings
Ball bearings with ZZ blanking plates are greased for their entire service life.
Roller and ball bearings without blanking plates must be greased regularly with KP2N-40 lithium soap-based grease according to DIN51825.

PRECAUTION
If the admissible loads are exceeded for the forces on the end of the shaft, damages may occur to the mounting and the machine. Damages may also occur to the cylindrical roller bearings when the transversal forces are lower than the established minimum. Observe the admissible loads according to the data given in the catalogue.

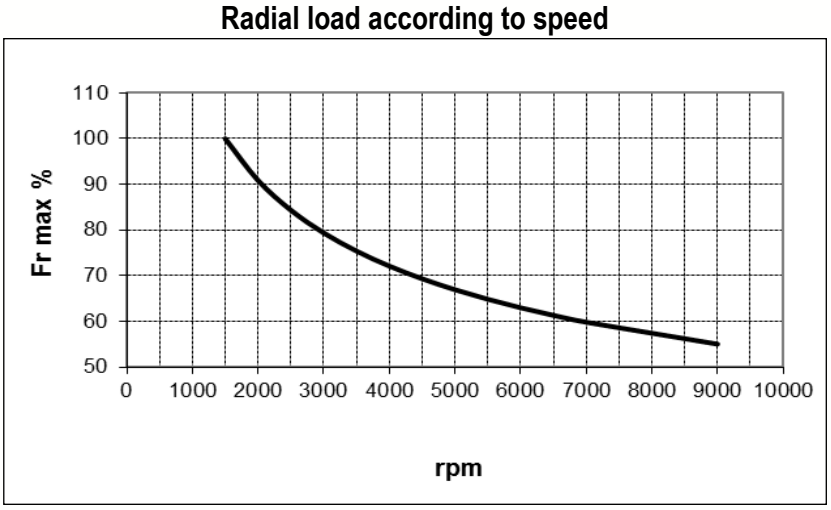


Figure 3: Admissible radial loads

A motor may need some type of special work (considered as non-standard) that includes a bearing different to those specified above. In said case, the customer must check with VASCAT to make sure that he has all the relevant information.

3.7 Electrical specifications

3.7.1 Windings and insulation

ID motor coil windings are made up of copper wires and plates with two coats of polyamide varnish > 220°C and/or THEIC-Polyesterimide with Amide-Imide > 200°C, rated with H-type insulation class.

They are impregnated using single-component epoxy resins that polymerise on the basis of temperature, also class H.

The coils are insulated from the magnetic circuit of the armature and the stator by means of NMN (Nomex-Mylar-Nomex) sandwich-type paper. The outer parts of the sandwich (Nomex) are fibres, whereas the core (Mylar) is a plastic film of polyethylene terephthalate. Special care is also taken with the insulation between each coil.

This insulation system ensures adequate dielectric resistance for motor operation during the most critical applications.

3.7.2 Connections

The connections between the windings and the terminal box are made using a flexible cable coated with FEP capable of withstanding up to 200°C. The connections are welded using a FUSBAT650 rod. The welds of the contacts are also protected by a double layer of fibreglass insulation pipe with class-H acrylic impregnation.

The armature coils are wave-soldered to the manifold.

3.7.3 Power-supply conditions

ID motors are designed to work with a power supply via AC/DC or DC/DC converters with full-bridge thyristors or high-frequency choppers and they can withstand voltages of up to 700 VDC (500 VAC).

3.7.4 Standard thermal protection

ID motors include a set of 2 PTC140-type thermistors on their main and auxiliary stator windings. It is a solid-state device of the variable resistive type that provides a *Contact Open (OFF) / Contact Closed (ON)* type logical signal depending on whether or not the temperature of the motor windings exceeds the reference temperature of the sensor, in this case 140°C.

Its operation curve is as follows:

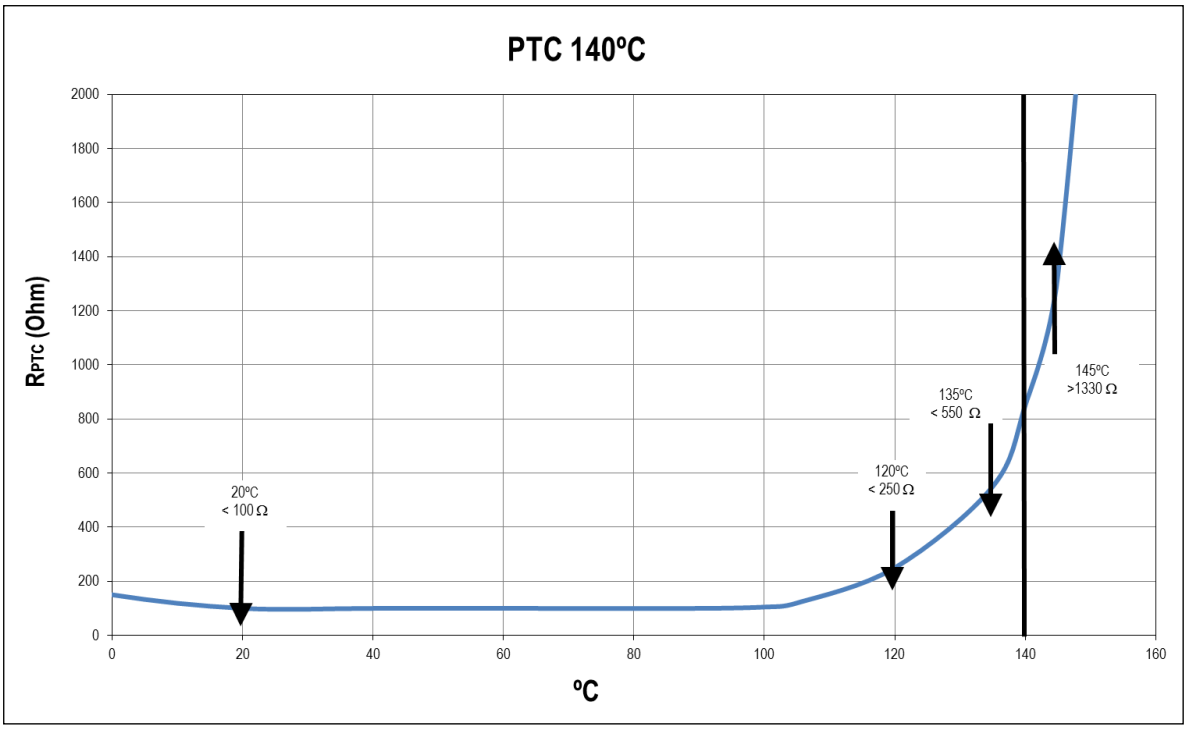


Figure 4 : Characteristic curve of a PTC140

Said ON/OFF logical signal can be used by an external control circuit to process an alarm system to prevent the motor from overheating.

3.7.5 Optional thermal sensors

The installation of other types of linear temperature probes is also possible on request. For example, KTY84-130 type sensors can be installed on the windings, as well as PT100 sensors on the windings and/or bearings, which would monitor the operating temperature at all times. The following graphs correspond to said sensors.

Please check with VASCAT for each specific case.

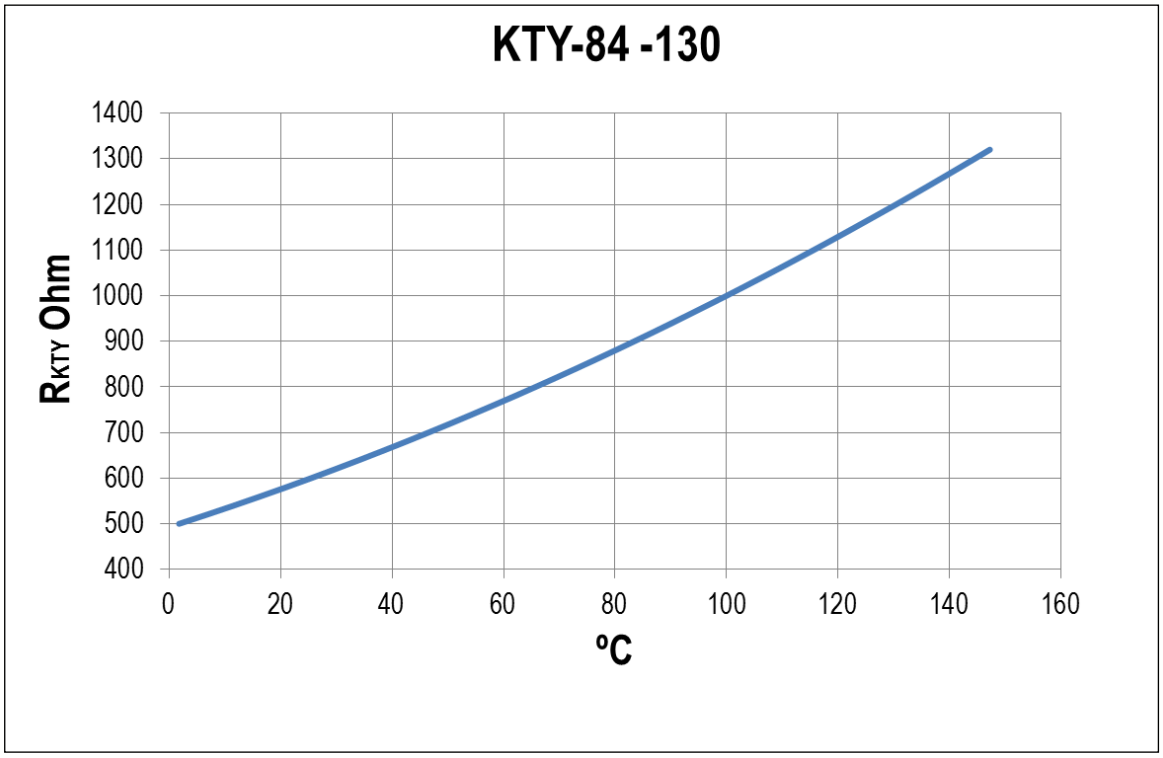


Figure 5: Characteristic curve of a KTY-84-130

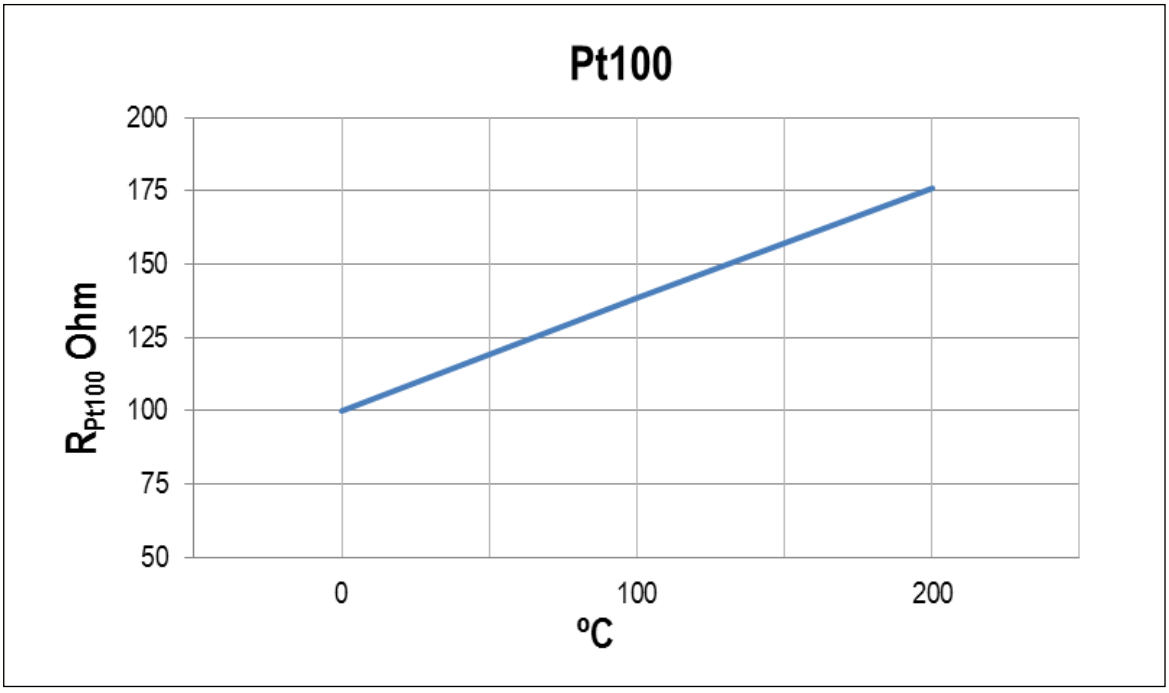


Figure 6: Characteristic curve of a Pt100

3.7.6 Anti-condensation heaters

As an option (on request), one or two heating elements can be installed on the main and/or auxiliary coils to prevent condensation on the motor windings when the motor is to be installed at a site with high relative humidity (> 85%).

The standard VASCAT model is 50 W 230 VAC.

3.7.7 Fan and pressure gauge

ID series motors are air-cooled using a forced ventilation system that includes an electric fan powered independently from the motor.

The fan on the ID series motors can be installed in the following positions:

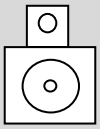
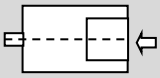
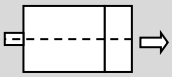
Motor	Circulation direction	Standard position	Optional positions
ID	*Impulsive*	*Top rear* 	*Side rear* 
IDX	*Suction*	*Axial* 	--

Table 18: Fan position

Other setups are possible on request.

The standard versions of these units are powered with single-phase or three-phase alternating current (see motor technical data sheet for more information). Other ventilation methods can be studied on request.

Radial electric fans incorporate a washable filter to prevent incoming particles from damaging the motor. This filter requires regular maintenance (see subsequent sections). This type of fan can include, (as an option on request) an anemostatic relay (pressure gauge) with a set of NC/NA contacts that open/close when the airflow is insufficient.

3.8 Accessories

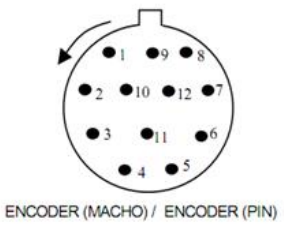
3.8.1 Feedback sensors

ID series motors can be fitted with different types of feedback sensors. As standard models, VASCAT offers the following incremental optical encoders:

Specifications	Type A	Type B	Type C
Number of pulses per revolution	*1024 / 2048*	*1024 / 2048*	*1024 / 2048*
VDC power supply voltage	*5*	*10 ÷ 30*	*5*
Output logic	*RS422 TTL Line driver*	*Push-Pull HTL*	*Sin/Cos 1Vpp*
Output voltage High level	*> 2.5 V*	*> VDC- 3 V*	*-*
Low level	*< 0.5 V*	*< 2.8 V*	*-*
Max. output frequency	*300 kHz*	*300 kHz*	*450 kHz*
Load capacity	*120 mA*	*150 mA*	*120 mA*
Maximum cable length	*100 m*	*100m*	*150m*
Short-circuit protection	*No*	*Yes*	*Yes*
Operating temperature	*-10 / 100ºC*		
Protection degree	*IP64*		
Hollow shaft diameter	*12mm*		
Male connector (encoder side)	*CONIN M23 12 poles with anticlockwise numbering*		

PINS

PIN No.	Signal
1	B'
2	VDC sensor
3	N
4	N'
5	A
6	A'
7	N.C.
8	B
9	N.C. (*)
10	0V supply
11	0V sensor
12	VDC supply



ENCODER (MACHO) / ENCODER (PIN)

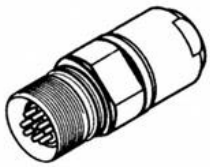


Table 19: Standard encoders on ID motors

*Cable screen on cable + connector versions.

ID motors can also include a tachometer dynamo. The standard VASCAT model has the following specifications:

Parameter	Values
Output voltage	60V/1000rpm
Maximum load resistance	90KOhm a 3000rpm
Temperature compensation	SI
Linearity error	0.15%
Maximum RMS ripple rating	0.25%
Protection	IP55
Maximum speed	6100rpm
Shaft diameter	11mm

Table 20: Standard tacho on ID motors

When specifically requested by the customer, other types of encoders and/or servo sensors can be fitted. Please check with VASCAT for each specific case.

3.8.2 Parking brake

ID series motors can be fitted, as an option, with an electromagnetic parking brake to immobilise the motor load safely and in a way that is 100% external to the operation of the motor itself.

On certain occasions, this is necessary for safety reasons, e.g. when it is necessary to block the movement of the machine to work on the interior safely or when there is a fault in the converter power supply or other mechanical devices of the installation.

PRECAUTION

The use of the parking brake as a dynamic working brake, e.g. to slow down a load, is not allowed, since it speeds up the premature wear and tear of the lining.

In general, the brakes are powered at 24 VDC (please check the technical datasheet of each motor), working via the activation of coils on springs. This type of brake works according to the lack of voltage operating principle, i.e. when there is no voltage applied, the brake blocks the rotation and when voltage is applied, it is unblocked.

PRECAUTION

If the appropriate voltage is not applied to the brake, it will not work correctly. In the case of insufficient voltage, it will overheat due to friction, causing rapid wear and tear of the lining. If the voltage is too high, the windings may be damaged by surge currents.

PRECAUTION

The brake power circuit must be completely independent.

Make sure that the brake is not activated before the motor rotates and that it remains connected to voltage when the motor is rotating. If, for any reason, the power supply to the brake continues when the motor is stopped, the brake will not work and, as the shaft would be free, undesired movements may occur.

The correct use of the brake is the user's responsibility and that of the manufacturer of the electrical control cabinet.

The specifications of the standard brake for each type of motor are specified on the corresponding technical data sheet, which can be consulted on VASCAT's website: http://www.vascat.es.

NB

The friction surfaces must always be kept free from oil and grease, since minimum quantities of such substances can largely reduce the brake torque.

3.8.3 Noise level

The technical data sheets VASCAT provides for each motor show the noise level in dB issued by each model.

Optionally, motors can be fitted with a kit to reduce the level of noise emissions. Please check with VASCAT for more details.

The machines directive specifies a noise level of 80 dB at work posts. The user is responsible for guaranteeing said level using the installation of external absorption devices if necessary.

4. SHIPMENT, RECEPTION, TRANSPORT AND STORAGE

4.1 Shipment

ID motors are shipped in completely closed packaging, including a wooden pallet that has been given phytosanitary treatment. The specific type of packaging may vary according to the destination and the type of transport used.

In general, for road transport, the packaging consists of a corrosion protection bag I2 type and a box of dual-layer corrugated cardboard, clipped and tied with a heat-sealed strap on the palate; for transport by sea or air, it consists of a corrosion protection bag I2 type and a wooden box that has been given phytosanitary treatment fastened to the pallet using nails or screws.

By request, other types of packaging may be considered according to the customer's specifications.

Please check with VASCAT for more details of each shipment.

4.2 Reception

When the goods have been received, the customer is responsible for checking that the packaging has not been damaged and is in perfect condition. If that is not the case, the circumstance must be recorded on the haulier's delivery documentation and a claim must be filed immediately with the haulage company for the damages that have been caused.

When it has been removed from the packaging, the material must be checked to ensure that it has been delivered in accordance with the details on the documents sent with the shipment, together with the fact that it is in a correct state of repair. Otherwise, a claim must be filed immediately with VASCAT for the faults that have been seen or for an incomplete shipment.

VASCAT declines all responsibility for damages claimed thereafter.

NB
Do not start up a machine that has been damaged under any circumstances.

4.3 Transport

The machine must be transported always in accordance with the following instructions:

WARNING

Transport and lifting of the machine by the eyebolts only

For the correct handling of the motor, several eyebolts have been fitted on the top of the housing exclusively for said purpose. Therefore, do not lift the motor using the shaft or the fan casing under any circumstances.

To lift the machine, use guide devices (cables, chains or slings) with safety hooks on the ends. See diagram:

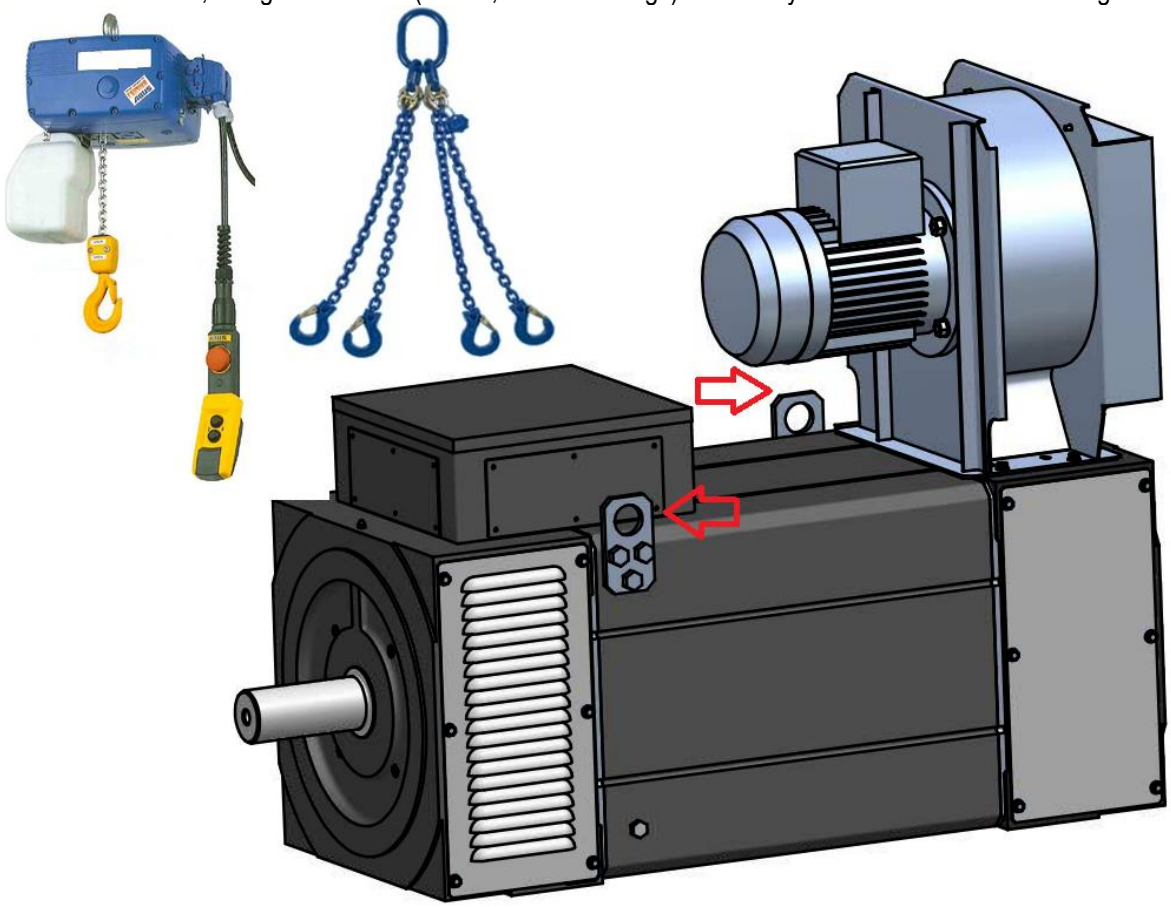


Figure 7: Transport and lifting of the motor

The lifting apparatus and guide devices must have sufficient load capacity to lift the machine. Please see that technical data sheet for the motor to know how much each model weighs.

Sudden movements and knocks must be avoided during transport.

4.4 Storage

ID motors can be stored for long periods (up to 2 years) without their specifications being affected. They must be stored in a dry, dust-free place with no aggressive atmosphere or vibrations and no sudden temperature changes.

PRECAUTION
Damages caused by outdoor storage The machine may be damaged if it is stored outdoors.

The machine must be stored only in indoor areas that meet the following conditions:

- They must be dry, dust-free, icing proof and have no vibrations. The relative humidity of the air must be below 60%; in accordance with EN 60034-1, the temperature must not be below -15ºC.
- It must be well ventilated.
- It must provide protection against extreme bad weather.
- The ambient air must not contain aggressive gases.

The machine must be protected against knocks and humidity and its entire surface must be appropriately covered.

If the machine cannot be stored in a dry place, the following measures must be adopted:

- Cover the machine using a plastic film or similar with a drying material (silica gel) inside.
- Package the unit in a sealed box.
- Place several bags of drying agents in the sealed box. Check the drying product regularly and replace it as necessary.
- Control the humidity level in the sealed packaging by placing indicators that show the air humidity level in the packaging at different levels.

If the machine is to be stored for a relatively long period (more than 6 months), it must be checked regularly (every 3 months) to ensure that it is in a perfect state of repair and that there are no faults. The required maintenance work must be carried out and the storage enclosure must be climate-controlled.

PRECAUTION
Damage caused by condensation water Condensation water may gather in the machine owing to important variations in ambient temperature, direct sunlight or high air humidity levels during storage. If the stator winding is damp, its insulation resistance is reduced. This leads to disruptive discharges that can destroy the winding. Furthermore, condensation water may form oxide or mould inside the machine. This is why it is important to follow VASCAT's storage recommendations to the letter.

5. INSTALLATION AND START-UP

PRECAUTION
Damage caused to bearings as a result of long storage periods If the machine has been stored for more than 3 years in good conditions (dry, dust-free place, etc.), the grease on the bearings must be changed, if they need re-greasing, or the bearing should be changed if it is a bearing with lubrication for its entire service life. If the machine has been stored in poor conditions, the change or re-greasing of the bearings may be necessary before the aforementioned period.

The following describes the conditions that are necessary for the installation and start-up of the machine.

5.1 Motor installation

5.1.1 Site

A correct site is essential for guaranteeing a long motor service life. The use of the motor in an incorrect site could shorten its service life considerably. The following are some points to bear in mind when choosing the correct site for the motor:

a) The chosen site must comply with the ambient temperature range and altitude for which the motor was selected (for more details, see section 3.5.3).

 HOT SURFACE
The exterior surface of the motors can reach temperatures of more than 60°C and, therefore, the appropriate precautions must be taken to avoid accidental contact (the motor bears a plate indicating said circumstance).

b) The site must have a humidity level of less than 85% to prevent condensation appearing on the surface. If the humidity levels at the site exceed 85%, the motor must be fitted with anti-condensation heaters (see section 3.7.6).

c) The air inlet and outlet must not be blocked. There must be no recirculation of hot air from the outlet to the inlet.

PRECAUTION
Damages caused to the motor by blocking the airflow at the motorised fan inlet Damages may be caused to the motor if there is an insufficient airflow at the motorised fan inlet due to the selection of an incorrect site for the machine. If the machine does not have sufficient cooling airflow, the windings may overheat and the corresponding consequences may arise.

5.1.2 Mounting

Correct mounting is essential to guarantee a long service life for the motor. The following are essential issues that need to be taken into account when anchoring the motor correctly:

IM B3 Foot-mounting:

a) Ensure that the support base is correctly levelled: the motors must be mounted on a solid, flat base that is perfectly level. If the base is not made up of one single compact surface, the motor feet support services must be on the same level. To level the machine correctly, the feet may have to be gauged using steel plates to avoid the appearance of mechanical tension.

PRECAUTION
Damages caused to the motor by the incorrect levelling of the support base The incorrect levelling of the motor reduces the service life of the bearings and other parts of the transmission.

b) Use an appropriate base for the assembly work: Make sure that the base on which the motor is to be located meets the following specifications:

- The dimensions of the base correspond to those of the motor feet. Make sure that the entire area of each of the 4 motor feet rests perfectly on a solid base.
- Make sure that the base is capable of supporting the weight of the motor without problem. If the base were to go out of shape over time, the motor may not be level, which would reduce the service life of the motor substantially, especially the bearings.
- Make sure that the base is sufficiently heavy-duty to counter the torque provided by the motor without noticeable deformation.
- Make sure that the base is sufficiently rigid for there to be no resonances in the motor operation speed range.

c) Make sure that there are no additional loads on the motor: Consideration must be given to the weight of the couplings and pulleys and the resulting axial and radial loads to ensure that the motor bearings are dimensioned correctly (the maximum admissible radial loads for each motor are specified in the Table 17).

d) Fastening the feet: When the motor has been installed on a base that meets all the aforementioned, the motor must be firmly fastened in position using the 4 holes machined on the feet (for said purpose) and bolts of the appropriate size for said holes. The diameter of the holes machined on the motor feet comply with the motor shaft height according to the EN 60072 standard. The leg bolts must be selected according to the loads applied to the motor and in compliance with the ISO 898-1 standard, which defines the mechanical properties of the bolts according to their quality.

Fastening using IM B5 or IM B14 flanges:

a) Remove the anti-rust varnish: First of all, clean the surface of the flange before fastening.

b) Connect and fastened the counter-flange: For correct fastening, use bolts with an appropriate diameter in accordance with the dimensions of the flange as per the EN 60072 standard.

c) Make sure of the perpendicularity of the machine shaft and the counter-flange plane: Perpendicularity errors must be below 0.05 mm.

d) Make sure that the counter-flange is appropriate: In accordance with section b) of the IM B3 assembly.

NB
Application of additional loads on the flange The motor flange is dimensioned only to support its own weight. If there are additional loads, the flange may not be sufficiently heavy duty and, therefore, faults may occur that affect the motor and the machine to which it is coupled.

5.1.3 Machine coupling

The motor must be coupled to the machine very carefully since it is fundamental in order to ensure the correct service life of the motor.

Before mounting the coupling, remove the protective lacquer and clean the surface well.

PRECAUTION
Damages to the motor bearings Prevent solvent from entering the interior of the bearings since they could be damaged.

If the motor works with a direct drive (coupled directly to the load), the appropriate coupling must be used to compensate the alignment errors and radial forces that are applied. Please check with VASCAT in case of doubt.

In any case, make sure that the alignment between the motor shaft and that of the machine corresponds to the coupling between both parts.

PRECAUTION
Damages to the shaft and bearings Excessive misalignment can cause overloads on the bearings and break the shaft or cause the bearings to seize up through fatigue. The customer is responsible for ensuring the correct alignment of both shafts.

VASCAT motors and rotors are dynamically balanced using a half-key on the end of the shaft (in accordance with the 60034-14 standard). To ensure the correct balance of the entire transmission unit, all the parts of the transmission system must also be balanced (pulley, coupling, etc.).

The installation of the coupling or the transmission element must be made gently without knocking, previously heating the pulley or using an appropriate tool (please see Figure 8).

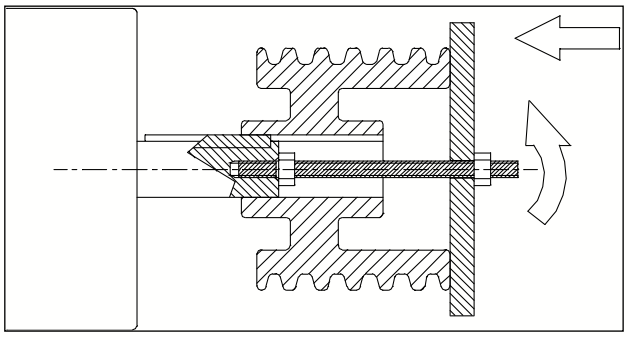


Figure 8: Fitting the coupling

PRECAUTION
Damages to the motor bearings If the motor shaft is knocked, the bearings may be damaged.

If belts are used for the transmission of the torque or a gear with radial load, make sure that the admissible radial load is not exceeded on the motor shaft. The specific data for the admissible radial loads for each size of motor can be found in the Table 17.

PRECAUTION
Damages to the motor bearings If the maximum value of the admissible radial load is exceeded, the shaft may break and the bearings may seize up due to fatigue. The customer is responsible for making sure that the tension of the transmission belts does not exceed the established limits.

5.2 Electrical connections

WARNING

All the work must be carried out by qualified personnel and when the motors are completely stopped and isolated from the mains. Always check that there is no voltage!

PRECAUTION

Damage to the windings

Before the connection, check the status of the insulation elements of the windings with regard to earth, since long or inappropriate storage or transport may have caused the motor to absorb humidity, which affects the capacity for insulation.

The insulation reference values considered safe by VASCAT are as follows:

Parameters	Reference values
Recommended measurement voltage	***500 V***
Minimum insulation resistance with new or repaired windings	***60 MΩ***

Table 21: Insulation reference values for ID motors

If the humidity or dirt returns a value below the specified figure, the windings must be cleaned or dried until measurements in the safe range are obtained.

WARNING

Dangerous voltage

When measuring the resistance of the winding insulation and just after the measurement, the terminals are live. Contact with any live part may cause serious injury or even death.

Do not touch the terminals during the measurement process or immediately afterwards. Before any contact, discharge the terminals to earth using an insulated cable.

5.2.1 Terminal boxes and connector strips

The motor has a terminal box with the corresponding electrical connection strip and connection bolts for the current of each motor.

The table below summarises the different types of terminal boxes, strips and terminals that correspond to the standard execution of each shaft height of the ID motors.

MOTOR	TERMINAL STRIP	TIGHTENING TORQUE	TERMINAL BOX
ID 100	M6	4Nm	135x105x76
ID 112	M6	4Nm	135x105x76
ID/IDX 132	M8	8Nm	185x185x91
ID/IDX 160	M8	8Nm	185x185x91
ID/IDX 180	M12	20Nm	300x300x120
ID/IDX 200	M12	20Nm	300x300x120

Table 22: Standard terminals and boxes on ID motors

By request, modifications can be made to the values specified in the table.

The motor power connections must be made with a cable section that corresponds to the rated current of the motor and in accordance with the schematic provided on the interior of the terminal box cover of each motor.

5.2.2 Connection diagrams

The connection schematics of the terminals in the terminal box for standard versions of the ID motors are as follows:

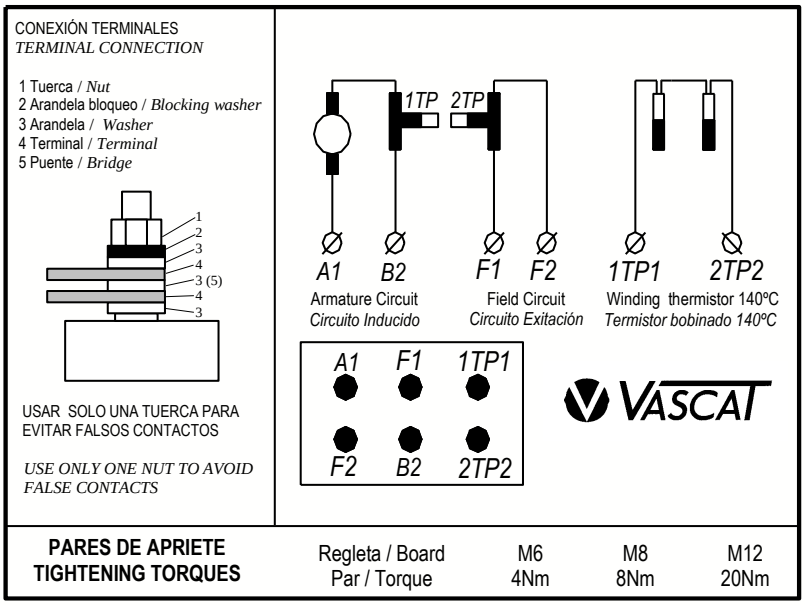


Figure 9: ID100 to ID160 motor connection schematics

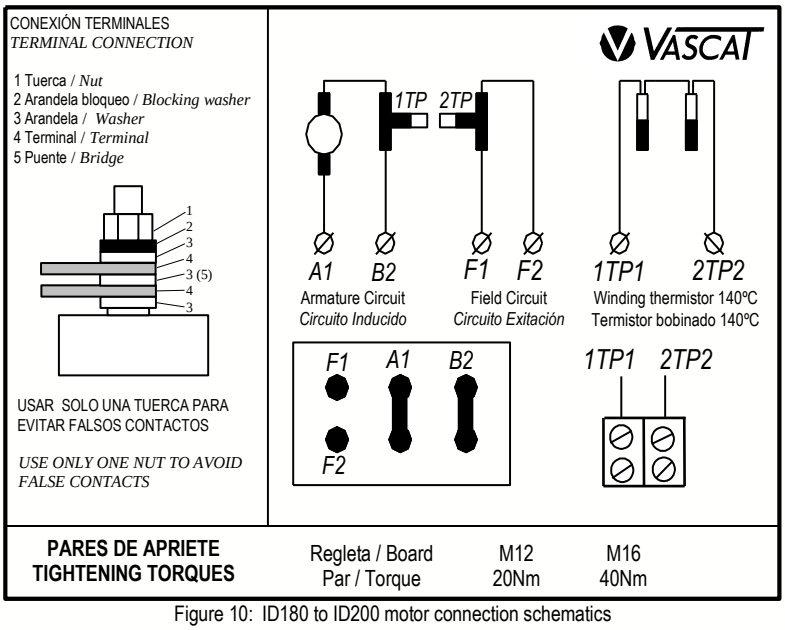


Figure 10: ID180 to ID200 motor connection schematics

When other optional components are incorporated (e.g. additional sensors, anti-condensation heaters, etc.), these schematics may vary slightly.

5.2.3 Power cables

The inputs of the power cables that are to be connected on the motor terminal box strip and the converter terminals must comply with current regulations. For the protection rating, type of cable-laying, allowed cable diameter, connection, etc., VASCAT recommends the use of symmetrical structure screened cables in accordance with technical specification IEC TS 60034-25.

The cable screen must be made up of the maximum possible number of individual conductors and it must have good conductivity. Twisted copper or aluminium screens are particularly suitable.

The screen connections must be made bearing in mind that they must cover a wide surface of the screen to create a 360° contact using gland boxes for low impedance through a wide range of power levels. Make sure that the screen is HF (for high frequencies). All the foregoing effectively reduces the voltages of the shaft and the housing, creating good derivation of the high frequency currents. This will reduce the currents that will pass through the bearings. Consideration must be given to the fact that the ends of the unscreened cable must be kept as short as possible.

The following two figures show the recommended terminations for screened cables:

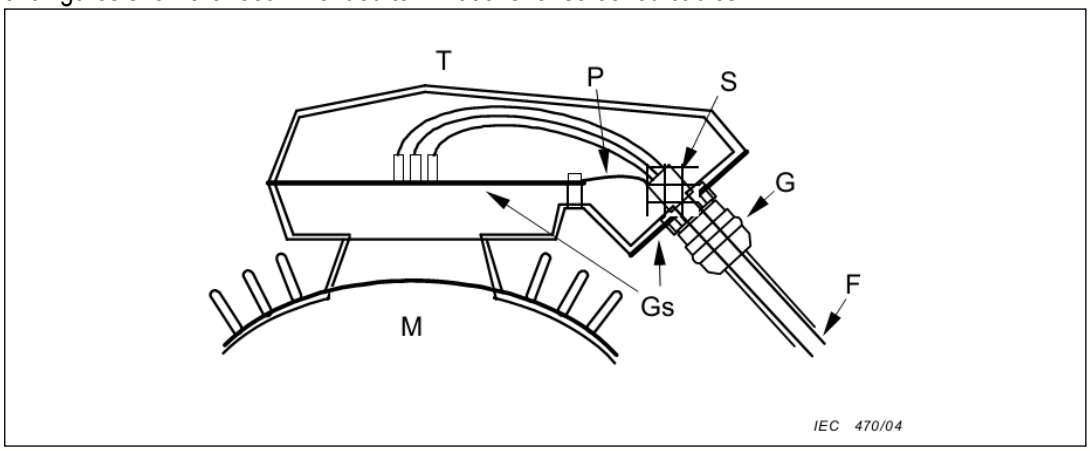


Figure 11: Recommended terminations

T – Conductor material terminal box S – Cable screen P – Earth cable M – Motor body
Gs – Conductor seals G – EMC gland seal F – Continuous Faraday box

The connection between the power cable screen and the motor terminal box must be made using either of the two methods shown in the following figures (on the left with an EMC gland seal and, on the right, with the screen connected to the terminal box using a flange):

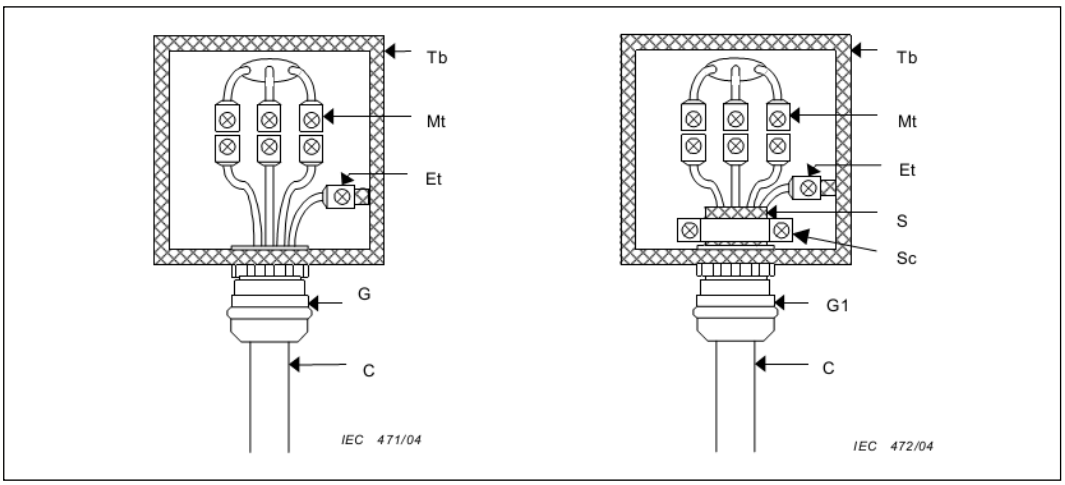


Figure 12: Recommended connections in the terminal box

Tb – Terminal box Mt – Motor terminals Et – Earth terminal S – Cable screen
Sc – Screen bracket G – EMC gland seal G1 – NON-EMC GLAND SEAL C - Cable

The earth protection conductor must be connected to the terminal indicated for said function.

DANGER
A poor earth connection involves a severe risk of electrocution through accidental contact with the motor surface.

5.2.4 Connections for the fan, thermal sensors and accessories

The fan motor cables must be connected in accordance with the specified voltage or that given on the fan motor nameplate (ID motors) or the main motor nameplate (on the IDX motors).

To connect the thermal sensors, use terminals of 1.5 mm^2on the tip and connect them to the corresponding nylon strip.

Where possible, connect the encoder or dynamo as shown in the schematic on the interior of the terminal box.

Where necessary, connect the brake cables in accordance with the voltage specified on the motor specifications plate. The connection on the ID motors is made using a nylon strip attached to the brake body; on the IDX, there is a connector on the top of the fan housing.

5.2.5 Final checks

Before closing the terminal box, check that:

- The electric connections in the terminal box are fastened tight in accordance with the above and the fastening torques given in Table 22.
- There are no protruding wire ends.
- The power cable screens are correctly connected.
- The interior of the terminal box is clean and free from leftover cables.
- All the seals and blanking surfaces are intact.
- The connection cables are positioned in such a way that they leave a certain amount of room for movement and that none of the cables are tight or connected in a 'forced' way.
- The connections between the terminals and the cables are correct.
- The inputs that are not used are fully closed.

After closing the terminal box cover:

- Make sure that the closing elements are fastened tight.

5.3 Start-up

5.3.1 Preliminary checks

Before starting the motor, check the following:

- The motor is correctly aligned, fastened and coupled (the belt tension is correct in the case of belt transmission or the radial profile and tooth flank profile is adequate in the case of gear transmission).
- All the necessary measures are in place to prevent direct contact with moving or live parts.
- Service conditions correspond to the information provided on the motor specifications plate.
- The earth and equipotential connections have been made correctly.
- The electrical connections are tightly bolted.
- All the power cables and their respective shields are correctly connected.
- The other cables (cables from the encoder/dynamo, fan, etc.) are also correctly connected.
- The drive configuration guarantees that the maximum rotation speed shown on the motor specifications plate will not be exceeded.
- The machine cooling system operates correctly (rotation direction, rpm, etc.). Also check that the air inlet and outlet are unblocked.
- If there is a brake, check that it works correctly.
- The motor is connected to operate in the correct rotation direction.
- There is a correct reading of the motor safety devices (thermal sensors).
- The converter is configured correctly: Check the drive configuration data with the specifications plate and the technical datasheet.
- The brushes are in contact with the manifold and the corresponding spring has the correct pressure.

5.3.2 Start-up

WARNING

Qualified personnel

All the preliminary work must be carried out by qualified personnel and when the motors are completely stopped and isolated from the mains. Always check that there is no voltage!

If the mains power cables are connected make sure there is no voltage and that no power voltage can be applied in any way.

PRECAUTION

Damage to the motor

Before starting up the motor, check that there are no elements blocking the rotation of the motor.

MOVING ROTATING PARTS

During start-up and while the motor is in operation, the customer is responsible for taking precaution to avoid accidental contact with the rotating parts.

Proceed as follows to start up the motor:

1- Start-up the drive auto-tuning procedure so that it can recognise the motor (see drive documentation for more details).

2- If the auto-tuning procedure is completed successfully, start the motor rotating at low speed. Check that the motor works satisfactorily, the excitation current is as specified and there are no strange noises or vibrations.

3- Gradually increase speed to rated values.

4- Check that the manifold switches cleanly and evenly

5- After several hours in operation, check that the thermal behaviour of the motor corresponds to the motor service type. If in doubt, please contact VASCAT.

6. MAINTENANCE

This chapter describes the preventive maintenance operations for ID motors. VASCAT declines all responsibility for faulty maintenance performed by the end user.

6.1 Safety instructions

WARNING

Qualified personnel

All the cleaning and maintenance work must be carried out by qualified personnel in observance of the safety regulations that apply to the machine coupled to the motor and when the motors are completely stopped and isolated from the mains.

Always check that there is no voltage! If the mains power cables are switched-on, make sure there is no power voltage and that no voltage can be applied in any way.

6.2 Maintenance operations and frequency

Activities	Service intervals and terms
Basic inspection	***Every 500 service hours or at least every 6 months***
Cleaning of the fan and air filter	***Depending on the level of local and environmental dirt***
Re-greasing of the bearings (Only on motors where it is necessary)	***See regular lubrication label and re-greasing equation (section 6.2.3 of this manual)***
Replacement of bearings	***Replacement after 20,000 service hours***
Blowing the brushes and checking their status	***Every 500 service hours or at least every 6 months***

Table 23: Maintenance activities

NB

Damages to motor and fan

If the fan air filter is not cleaned correctly or sufficiently regularly, the motor may not be cooled correctly, which will lead to the corresponding breakdowns.

Furthermore, the fan wheel must be in a good state of repair and perfectly clean; otherwise, it could be in permanent imbalance when it rotates, leading to a breakdown.

NB

Damages to the motor bearings

If the motor bearings are not re-greased adequately or as regularly as required, the bearings may be damaged irreparably.

The bearings have a specific service life. When they have reached the end of their service life, they must be replaced by new bearings that are equivalent to the originals. Otherwise, the motor may be seriously damaged.

6.2.1 Basic inspection

After assembling the motor or after repairing a breakdown, the motor must be inspected approximately every 500 operating hours or at least every six months. This inspection must consist of basically the following:

With the machine on:

- Check that the motor works according to its rated mechanical and electrical values and that there are no strange noises, vibrations or irregular rotation.

With the machine off:

- Check that no cracks appear in the motor fastening elements.
- Check that the connection terminals in the terminal box maintain an adequate fastening torque as specified in the Table 22.
- Check the condition of the manifold runner. An uneven or faulty runner wears down the brushes more quickly and indicates that the working conditions (e.g. load) or environmental conditions (e.g. chemical agents) require changes to the quality or number of brushes.
- Check that the eccentricity of the manifold does not exceed 0.03 mm and that it has no protruding segments or holes.
- Check the wear and tear of the brushes and their condition.
- Check that the brushes slide across the manifold evenly.
- Check that the insulation is greater than 60MOhm in the excitation and 10MOhm in the armature, especially in environments with high humidity levels.
- If faults are found during the inspection, they must be corrected immediately.

Besides this basic inspection, a number of maintenance tasks must be carried out to ensure that the motor has a long service life. The maintenance operations recommended by VASCAT are as follows:

6.2.2 Cleaning of the fan and air filter

It is important to keep the fan wheel as clean as possible. To do so, apply compressed air to its surface on a regular basis to ensure that there are no unwanted particles deposited on it.

The frequency of the cleaning process will depend on the local and environmental conditions that affect the motor, as well as the frequency with which the motor is used.

MOVING ROTATING PARTS

During the motor fan wheel cleaning operation, the customer is responsible for taking the necessary precautions to avoid accidental contact with the rotating parts.

The air inlets of ID series motors are fitted with NGB 290/4-type particle filters, which require regular cleaning. The frequency of this operation will depend on the environment in which the motor is located and the frequency with which it is used.

To wash the filter, it must be removed from the fan and cleaned using compressed air or washed with water and detergent, depending on the type of dirt in the environment. The filter must be replaced after 4 or 5 washes by one that is the same as or equivalent to the original.

6.2.3 Re-greasing of the bearings

Motors of the sizes from 100 to 200 include deep groove ball bearings with blanking plates as standard, greased for their entire service life. Accordingly, re-greasing operations are not required.

As an option, electrically insulated ball or roller bearings can be installed and they must be re-greased regularly.

The grease that is to be used on insulated bearings with no blanking plates and roller bearings must be KPHC2N-30L type according to DIN51825 or equivalent.

To determine the amount of grease that is to be inserted during the re-greasing operation, VASCAT provides the customer with the following equation as a guide for determining the grams of grease necessary:

$$m = D \cdot B \cdot 0.005$$

Where:

m : Amount of grease to add in the re-greasing operation [gr]
D : Bearing external diameter [mm]
B : Bearing axial thickness [mm]

VASCAT reccomends a re-greasing period according to the following diagram, depending on the average service speed factor **n·dm·bf** where **n** is the speed in rpm and **dm** is the middle diameter of the bearing - **dm=(D+d)/2** - in mm. **bf=1** for deep groove ball bearings, and **bf=1.5** for roller bearings.

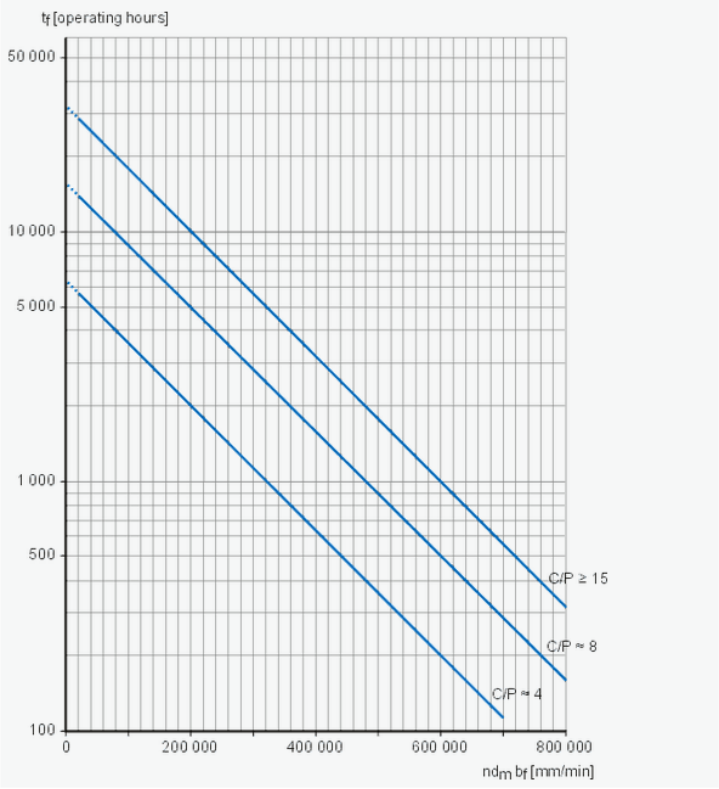


Figure 13: re- greasing periods

The greasing nipples VASCAT fits to its motors comply with the DIN 71412 standard and are zinc-coated. The types used in standard procedures are as follows:

Figure 14: Standard greasing nipples on ID motors

NB
Damages to the motor bearings If greasers containing different thickeners and basic oils are mixed together, the lubricant properties of the resulting grease may be inferior. The same type of grease must be used to lubricate the bearings at all times. Otherwise, the bearings may be damaged.

MOVING ROTATING PARTS
During the re-greasing operation, the customer is responsible for taking the necessary precautions to avoid accidental contact with the rotating parts.

6.2.4 Replacement of bearings

Both the bearings that have been greased for all their service life and those that need to be greased regularly, as well as hermetic parts that are subjected to wear and tear (seals and joints, etc.), where applicable, must be replaced after 20,000 operating hours.

Bearings of the same type as the originals must be installed. Standard bearings for each motor type can be consulted at Table 17.

The procedure for replacing bearings must be carried out as follows:

1. Disassemble the motor from its location and place it in a safe and clean place.

2. Remove the accessories (brake and/or encoder, where applicable) from the motor very carefully so as not to damage them and then remove the terminal box and fan. See following sections for more details.

3. Unscrew the motor seals and covers and remove them.

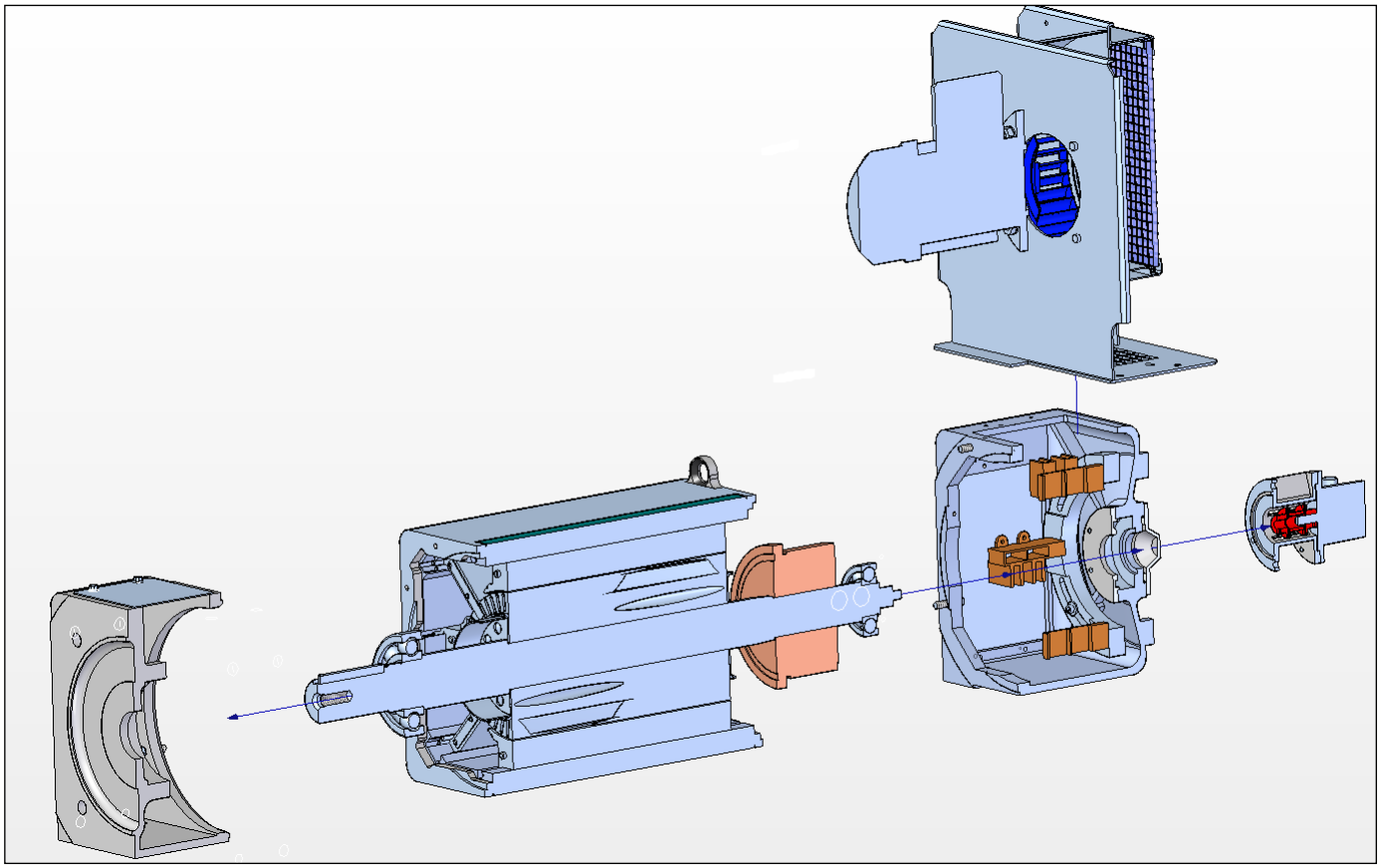


Figure 15: Replacing bearings on ID motors (step 3)

4. Remove the rotor from the interior of the stator, taking care not to damage the windings.

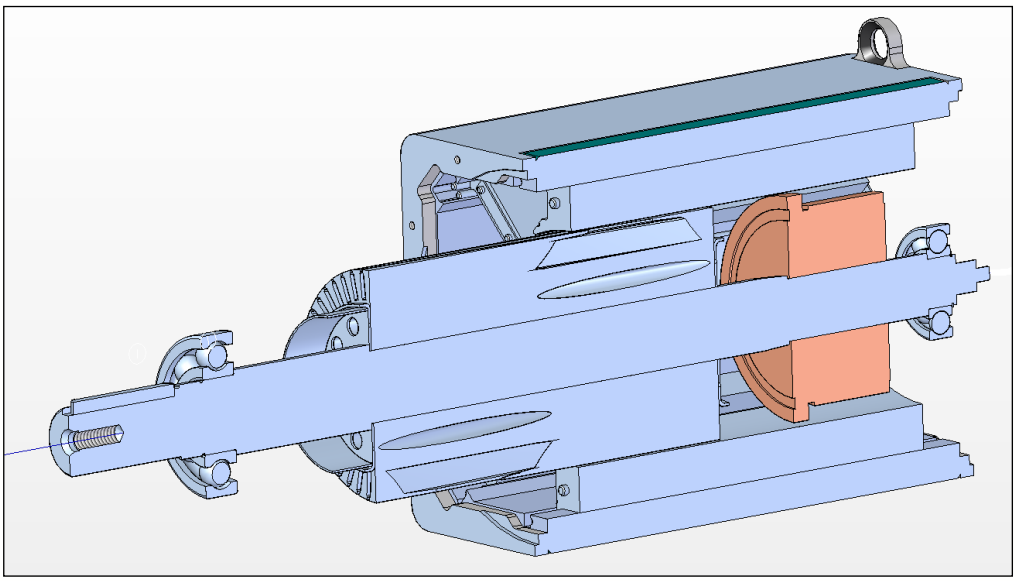


Figure 16: Replacing bearings on ID motors (step 4)

5. Put the rotor in a stable place so that it does not turnover.

6. Remove the bearing shim washers.

7. Remove the bearing from the shaft using a thrust extractor and taking care not to damage the shaft.

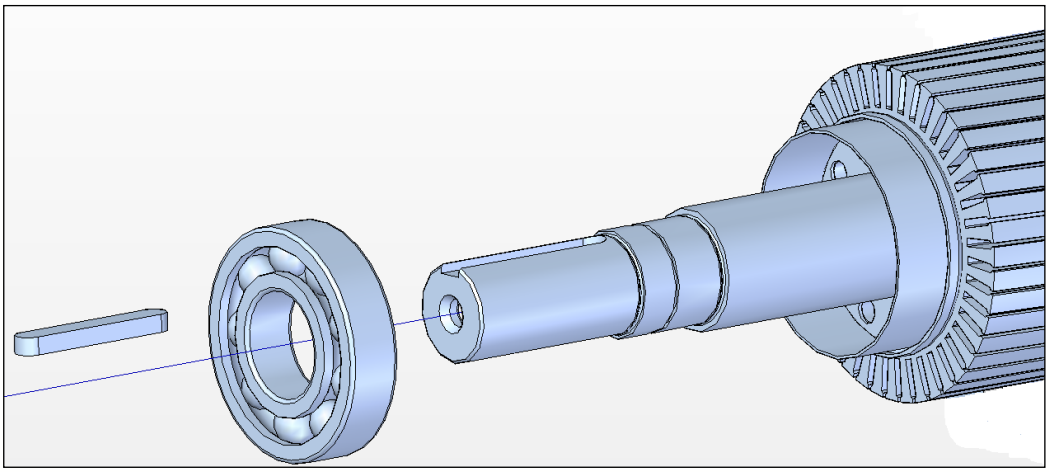


Figure 17: Replacing bearings on ID motors (steps 6 and 7)

8. Heat the new bearing to 70°C to make it dilate and easier to insert in the shaft.

9. Insert the new bearing in the shaft. The hot bearing must be inserted fully without the need for hitting it. This operation must be performed as quickly as possible. Do not let the bearing cool down.

10. Reassembled the *Seeger* shim washers.

11. Re-insert the rotor in the stator, taking care not to damage the windings.

12. Fit and screw up the covers and seals.

13. Refit the motor accessories.

6.2.5 Replacement of motor brushes

The brush-holders are only accessible through the inspection windows, as shown by the following figures:

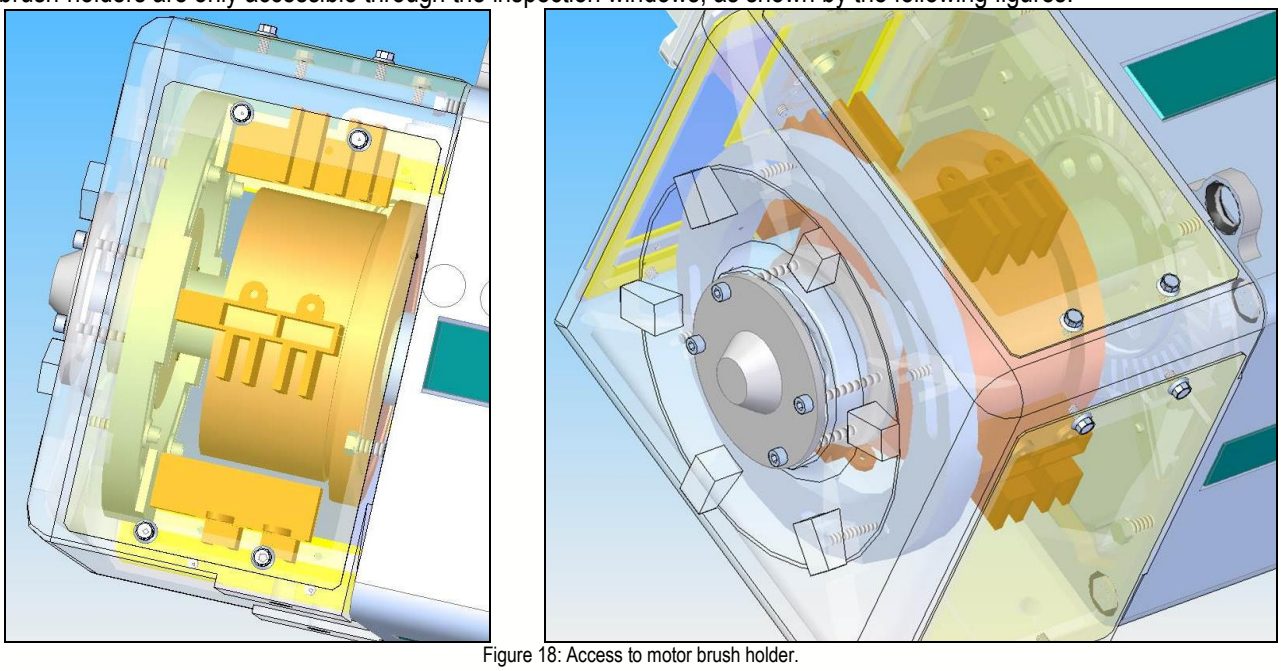


Figure 18: Access to motor brush holder.

In order to access the brushes on the lower position, it will be necessary to rotate the brush-holders ring, as there is not enough space below to access and remove these brushes:

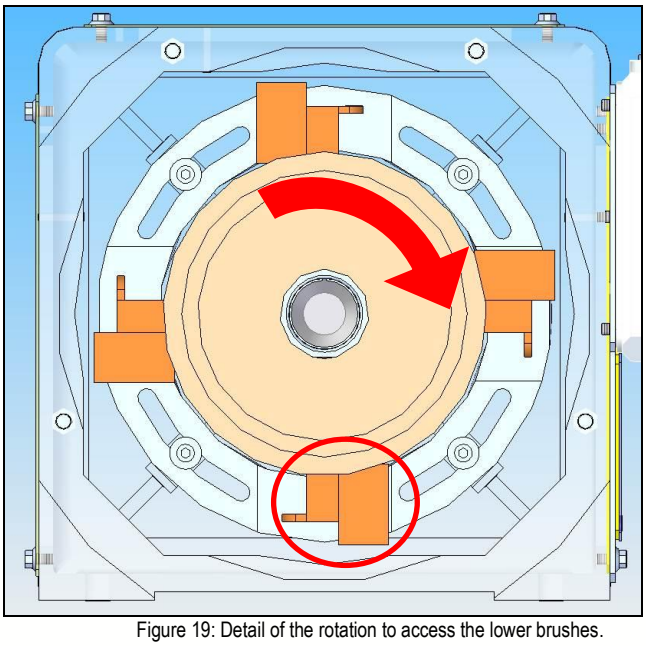


Figure 19: Detail of the rotation to access the lower brushes.

The brushes shall be changed in case their length is 14mm or less. To that end, follow the procedure as follows:

1. Unscrew the 4 screws of the guards from the inspection window.
2. In order to access the lower brushes, loosen or remove the 4 screws securing the brush-holders ring.
3. Remove the pressure spring from each brush.

4. Loosen the screw of each wire.

5. Insert the new brush, fasten the screws, reposition the spring, place the brush-holders back in its original position and tighten and adapt the brushes to the collector using a polishing stone.

Be aware that the position of the brush-holders ring will be altered during the changing procedure of the lower brushes. In order to always leave the brush-holders ring in its original position use the existing paint mark for this purpose. In case the mark had disappeared follow the instructions below for correct positioning of the brush-holders ring:

1. Disconnect all external connectors.

2. Energize the excitation terminals F1 and F2 with 220VAC.

3. Connect AC voltmeter to terminals A1 and A2 (a minimum scale of 2 Volts is required).

4. Check the voltmeter measure and turn the brush-holders ring clockwise or counter-clockwise until it reads 0 Volts. When that happens, the brush-holders ring will be in the right position.

Brush dimensions and quality are described in the technical data sheet of each motor.

6.2.6 Cleaning the collector area

Blow with compressed air in the collector area to prevent the accumulation of dust produced by the wear of the brushes; for this it is necessary to remove the side protections of the rear shield.

It is recommended to carry out this action twice a year for the motors equipped with IP23 and every 500 hours for the motors superior to IP44.

6.3 Replacing the encoder/tacho

1. Remove the protection
2. Loosen the elastic coupling that connects the shafts
3. Remove the stator flange
4. Remove the encoder from the flange

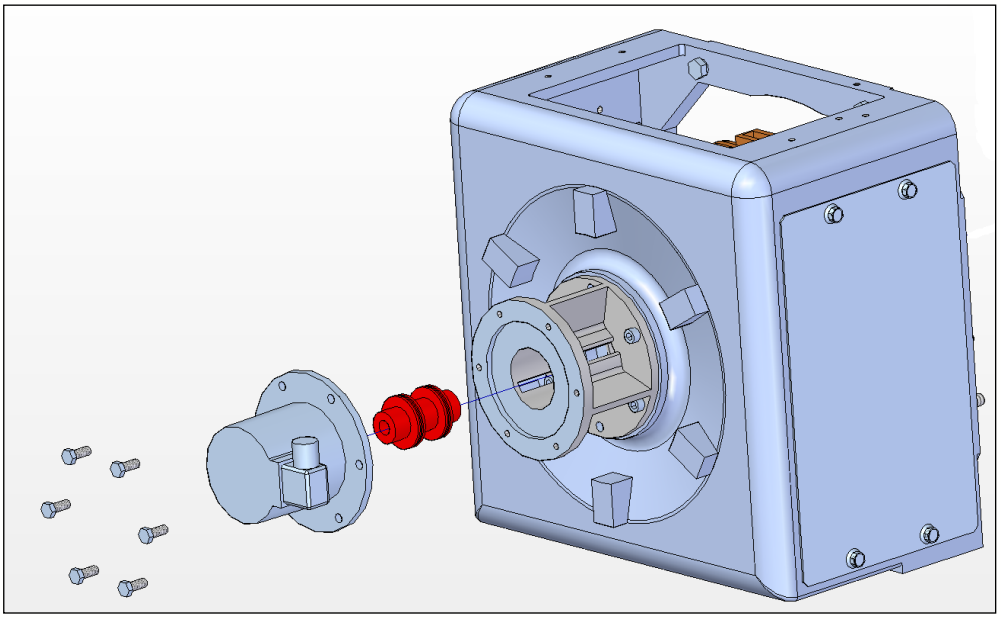


Figure 20: Replacing the encoder/tacho on ID motors (solid shaft type)

6.4 Replacing the brake and/or lining

The procedure for replacing the brake must be carried out as follows:

1. Remove the entire stator from the brake (a)
2. Then remove the protection ring (c)
3. Remove the rotor (b) by sliding it through the bushing that remains coupled to the shaft by a *Seeger* ring.
4. If the rotor lining is worn, replace it with a new one.

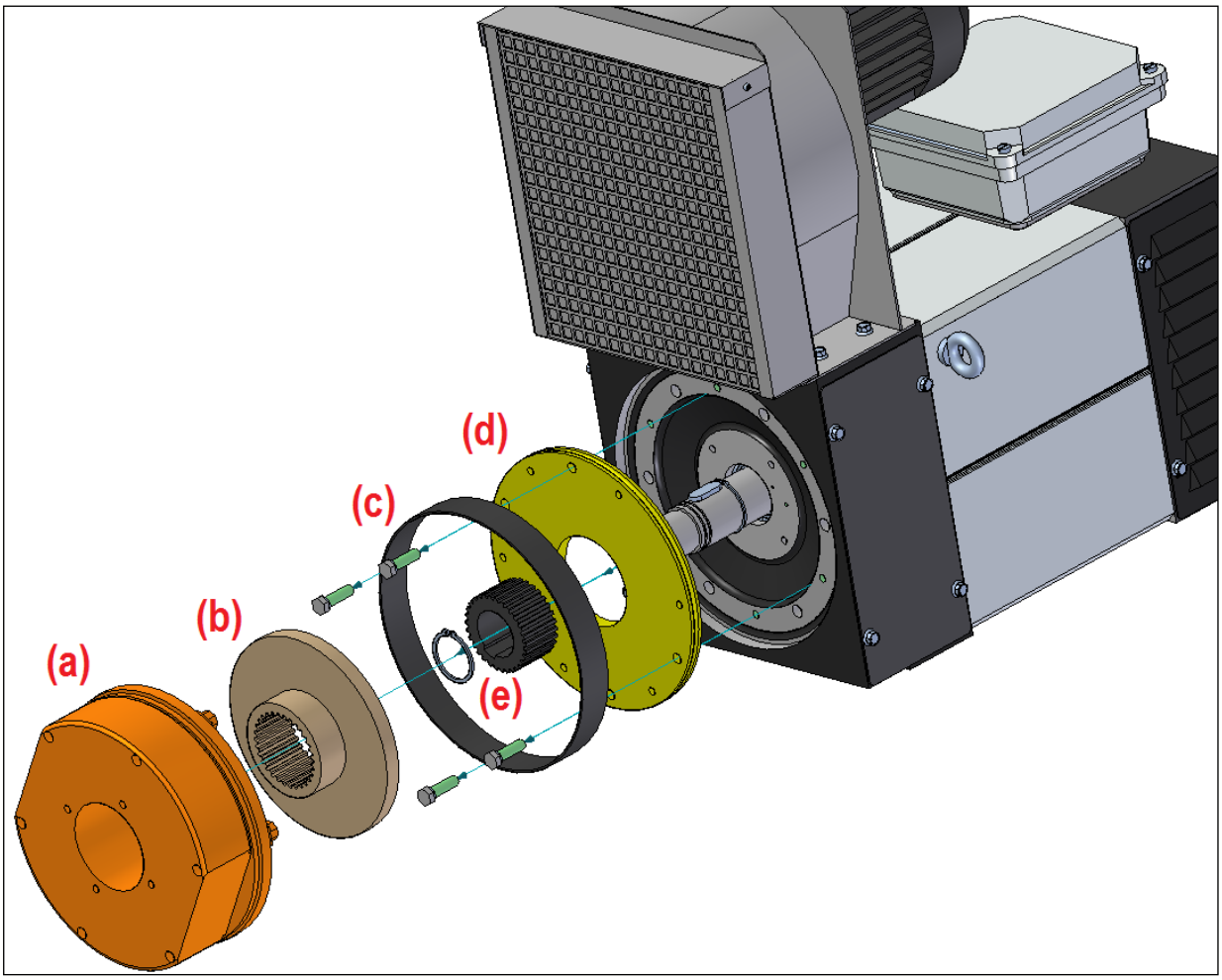


Figure 21: Replacing the brake on ID motors

6.5 Original spares

VASCAT supplies subunits of the complete motor as original spares for ID motors.

The spare subunits that are available are listed in the following table:

Spares	Subunits
1	*Stator subunit*
2	*Armature subunit*
3	*DE End-shield*
4	*NDE End-shield*
5	*Terminal box*
6	*Fan*
7	*Protections kit*
8	*Tacho*
-	*Brushes*

Table 24: Spare subunits

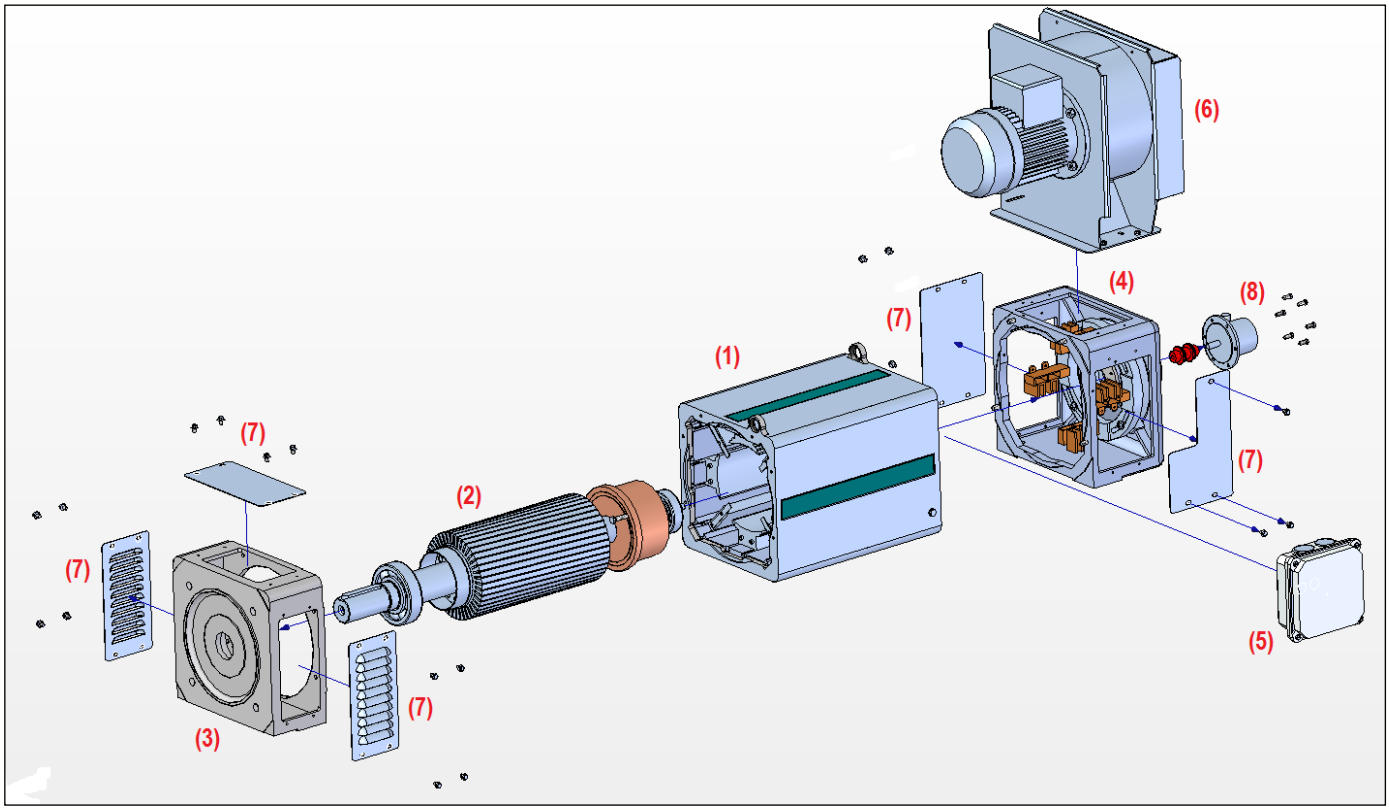


Figure 22: Spare subunits

When a specific original spare is required for an ID or IDX series motor, the following information must be provided:

1. Motor type (by default, ID).
2. Series (ID or IDX).
3. Size (in reference to shaft height).
4. Length (K, S, M, L, P or X).

These initial 4 points refer to the name of the motor and are summarised in the following table:

MCC	*ID*	*200*	*M*
Motor type	***Series***	***Size***	***Length***

Table 25: ID motor codes

Besides the initial 4 points, the following must also be specified:

5. Motor serial number.
6. Year of manufacturing.

All the information can be found on the motor specifications plate.

6.6 Operating faults

If faults appear during the operation of the motor, first of all check the possibility of the errors given in the following tables. If the fault cannot be eliminated with any of the following measures, please contact the technical service at VASCAT.

VOLTAGE

All the work must be carried out with no voltage connected.

HOT SURFACE

Hot motor surfaces. Therefore, cooling times must be observed.

6.6.1 Electrical faults

Fault	Probable cause	Corrective action
Motor doesn't start	Excessive load	Reduce load
	Power connection problems	Check the frequency converter and power cables.
	Problems with encoder connections	Check encoder cables and converter alarms
	Converter disabled	Check message on converter
Motor starts up with difficulty	Excessive load	Reduce load
	Power connection problems	Check the frequency converter and power cables.
	Short-circuit between turns or phase short-circuit on stator winding.	Check the winding resistances (milliohmmeter) and the insulation resistances. Repair the winding after consulting VASCAT.
Incorrect motor rotation direction.	Change of motor power cable polarity	Switch the motor connection
Buzzing noise on start-up	Interruption of a phase in the power cable after connection	Check the drive and power cables
	Short-circuit between turns or phase short-circuit on stator winding.	Check the winding resistances (milliohmmeter) and the insulation resistances. Repair the winding after consulting VASCAT.
Buzzing noise during operation	Overload	Reduce load
	Interruption of a phase in the power cable after connection	Check the drive and power cables
	Short-circuit between turns or phase short-circuit on stator winding.	Check the winding resistances (milliohmmeter) and the insulation resistances. Repair the winding after consulting VASCAT.

Table 26: Electrical faults (1)

Fault	Probable cause	Corrective action
Overheating during load-free operation	Converter output voltage too high, frequency too low	Check adjustments on drive and perform auto-tuning
	Fans stopped or turning in opposite direction	Connect fan. Invert phase sequence in case of inverse rotation.
	Fan broken down or airflow insufficient due to blocked channels	Repair fan or clean filter
	Cooling air is preheated	Ensure the entry of fresh air
Overheating with load	Excessive load	Reduce load
	Converter output voltage too high, frequency too low	Check adjustments on drive and perform auto-tuning
	Power connection problems	Check the drive and power cables
	Fan stopped	Connect fan
	Fan broken down or airflow insufficient due to blocked channels	Repair fan or clean filter
	Cooling air is preheated	Ensure the entry of fresh air
Overheating on certain winding sections	Short-circuit between turns or phase short-circuit on stator winding.	Determine the winding elements and insulation elements. Repair them after checking with manufacturer

Table 27: Electrical faults (2)

NB: Because the machine is powered from a frequency converter, please also check the drive converter service instructions in the event of electrical faults.

6.6.2 Mechanical faults

Fault	Probable cause	Corrective action
Rubbing noise	Rotating parts are rubbing together	Determine the cause and readjust the parts
	Foreign bodies in the motor	If so, repair by manufacturer
	Damage to bearings	Change bearings
Excessive radial vibrations	Rotor imbalance	Uncouple rotor and rebalance it
	Non-concentric rotor, shaft bent	Contact factory
	Non-concurrent shaft alignment	Align motor-machine system.
	Imbalance on coupled machine	Rebalance coupled machine
	Vibrations transmitted by gear	Correct gear
	Resonance with foundations	Reinforce foundations after checking with factory
	Changes to foundations	Determine cause and eliminate it. Realign machine
Excessive axial vibrations	Faulty angular alignment	Align group of machines and check alignment
	Blows transmitted by coupled machine	Examine coupled machine
	Vibrations transmitted by gear	Correct gear
	Resonance with foundations	Reinforce foundations after checking with factory
	Changes to foundations	Determine cause and eliminate it. Realign machine

Table 28 : Mechanical faults

6.7 Technical support and service

For more information or specific technical support, please contact:

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