HIGH SPEED MOTORS

MGV Series

Technical Manual

PVD 3627_GB

EU DECLARATION OF CONFORMITY

We ,

Parker Hannifin Manufacturing France SAS
Electromechanical & Drives Division Europe
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manufacturer, with brand name **Parker**, declare under our sole responsibility that the products

BRUSHLESS SERVOMOTORS TYPE MGV

satisfy the arrangements of the directives :

Directive 2014/35/EU : “Low Voltage Directive”, LVD
Directive 2011/65/EU : “Restriction of Hazardous Substances”, RoHS
Directive 2014/30/EU : “Electromagnetic Compatibility”, EMC

and meet standards or normative document according to :

EN 60034-1:2010/AC:2010 : Rotating electrical machines - Part 1 : Rating and performance.
EN 60034-5:2001/A1:2007 : Rotating electrical machines - Part 5 : Degrees of protection provided by the integral design of rotating electrical machines (IP code) - Classification.
EN 60204-1:2006/AC:2010 : Safety of machinery – Electrical equipment of machines – Part 1 : General requirements.

The product itself is not impacted by the modifications made on the latest directives.

The undersigned hereby certify that the above mentioned model is procured in accordance with the above directives and standards.

Further information :

SERVOMOTORS shall be mounted on a mechanical support providing good heat conduction and not exceeding 40° C in the vicinity of the motor flange.

The product must be installed in accordance with the instructions and recommendations contained in the operating instructions supplied with the product.

C.E. Marking : April 2006

Longvic, October 06th 2016

In the name of Parker
A. ANDRIOT
Quality Manager

Ref : DCE-MGV-001rev0

Table of Content

1. INTRODUCTION

1.1. Purpose and intended audience

This manual contains information that must be observed to select, install, operate and maintain PARKER MGV high speed motors.

Installation, operation and maintenance of the equipment should be carried out by qualified personnel. A qualified person is someone who is technically competent and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

Reading and understanding the information described in this document is mandatory before carrying out any operation on the motors. If any malfunction or technical problem occurs, that has not been dealt with in this manual, please contact PARKER for technical assistance. In case of missing information or doubts regarding the installation procedures, safety instructions or any other issue tackled in this manual, please contact PARKER as well.

PARKER's responsibility is limited to its torque motors and does not encompass the whole user's system. Data provided in this manual are for product description only and may not be guaranteed, unless expressly mentioned in a contract.

	DANGER: PARKER declines responsibility for any accident or material damage that may arise, if the procedures and safety instructions described in this manual are not scrupulously followed.
	Warning: Due to the **VERY HIGH SPEED**, the user of this motor has to **respect all the recommendations** in this manual.

1.2. Safety

1.2.1. Principle

To operate safely, this equipment must be transported, stored, handled, installed and serviced correctly. Following the safety instructions described in each section of this document is mandatory. Torque Motors usage must also comply with all applicable standards, national directives and factory instructions in force.

	DANGER: Non-compliance with safety instructions, legal and technical regulations in force may lead to physical injuries or death, as well as damages to the property and the environment.

1.2.2. General Safety Rules

Generality

DANGER: The installation, commission and operation must be performed by qualified personnel, in conjunction with this documentation.

The qualified personnel must know the safety (C18510 authorization, standard VDE 0105 or IEC 0364) and local regulations.

They must be authorized to install, commission and operate in accordance with established practices and standards.

Electrical hazard

Servo drives may contain non-insulated live AC or DC components. Respect the drives commissioning manual. Users are advised to guard against access to live parts before installing the equipment.

Some parts of the motor or installation elements can be subjected to dangerous voltages, when the motor is driven by the inverter , when the motor rotor is manually rotated, when the motor is driven by its load, when the motor is at standstill or stopped.

For measurements use only a meter to IEC 61010 (CAT III or higher). Always begin using the highest range. CAT I and CAT II meters must not be used on this product.

Allow at least 5 minutes for the drive's capacitors to discharge to safe voltage levels (<50V). Use the specified meter capable of measuring up to 1000V dc & ac rms to confirm that less than 50V is present between all power terminals and between power terminals and earth.

The motor must be permanently connected to an appropriate safety earth. The continuity of the grounding circuit has to be checked on the complete circuit : the resistance between any conductive point and the grounding conductor shall not exeed than100mΩ.
To prevent any accidental contact with live components, it is necessary to check that cables are not damaged, stripped or not in contact with a rotating part of the machine. The work place must be clean and dry.

General recommendations :

- Check the wiring circuit
- Lock the electrical cabinets
- Use standardized equipment

Mechanical hazard

Servomotors can accelerate in milliseconds. Running the motor can lead to other sections of the machine moving dangerously. Moving parts must be screened off to prevent operators coming into contact with them. The working procedure must allow the operator to keep out of the danger area.

Burning Hazard

Always bear in mind that some parts of the surface of the motor can reach temperatures exceeding 100°C.

2. PRODUCT DESCRIPTION

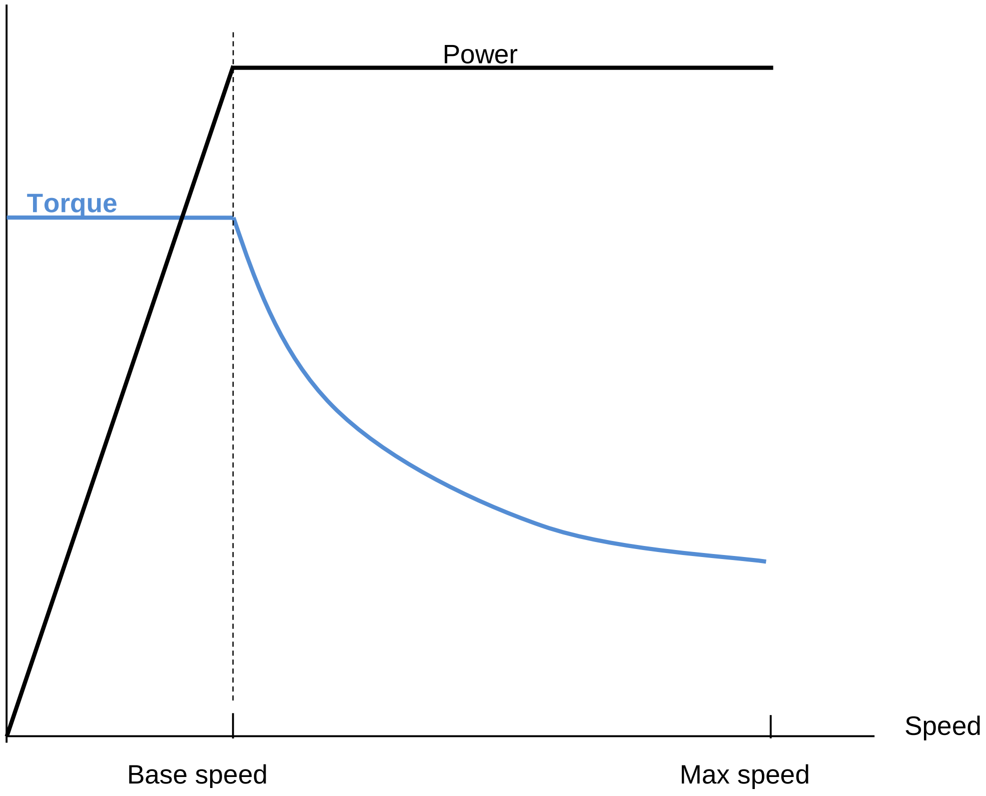
2.1. Overview

The MGV high-speed motors from Parker are innovating solutions through direct drive, specifically designed for industrial applications where high speed is needed.

The MGV motors are brushless synchronous servomotors, with permanent magnets, based on HKW active parts and fully integrated with a water-cooled housing, high speed ball bearings, encoder …
The water cooling increases the torque density and allows a silent operation.
These motors are taking advantage from the flux weakening principle that allows, at the same time, a high torque at low speed and a constant power after a given speed (called base speed).
As there is no current in the rotor, the losses in the rotor are very low

There are two areas :
- A constant torque area from the null speed to the base speed, where the motor is performing as an axis motor.
- A constant power area that allows to perform at higher speed.

MGV motor typical curve



2.2. Motor description and Applications

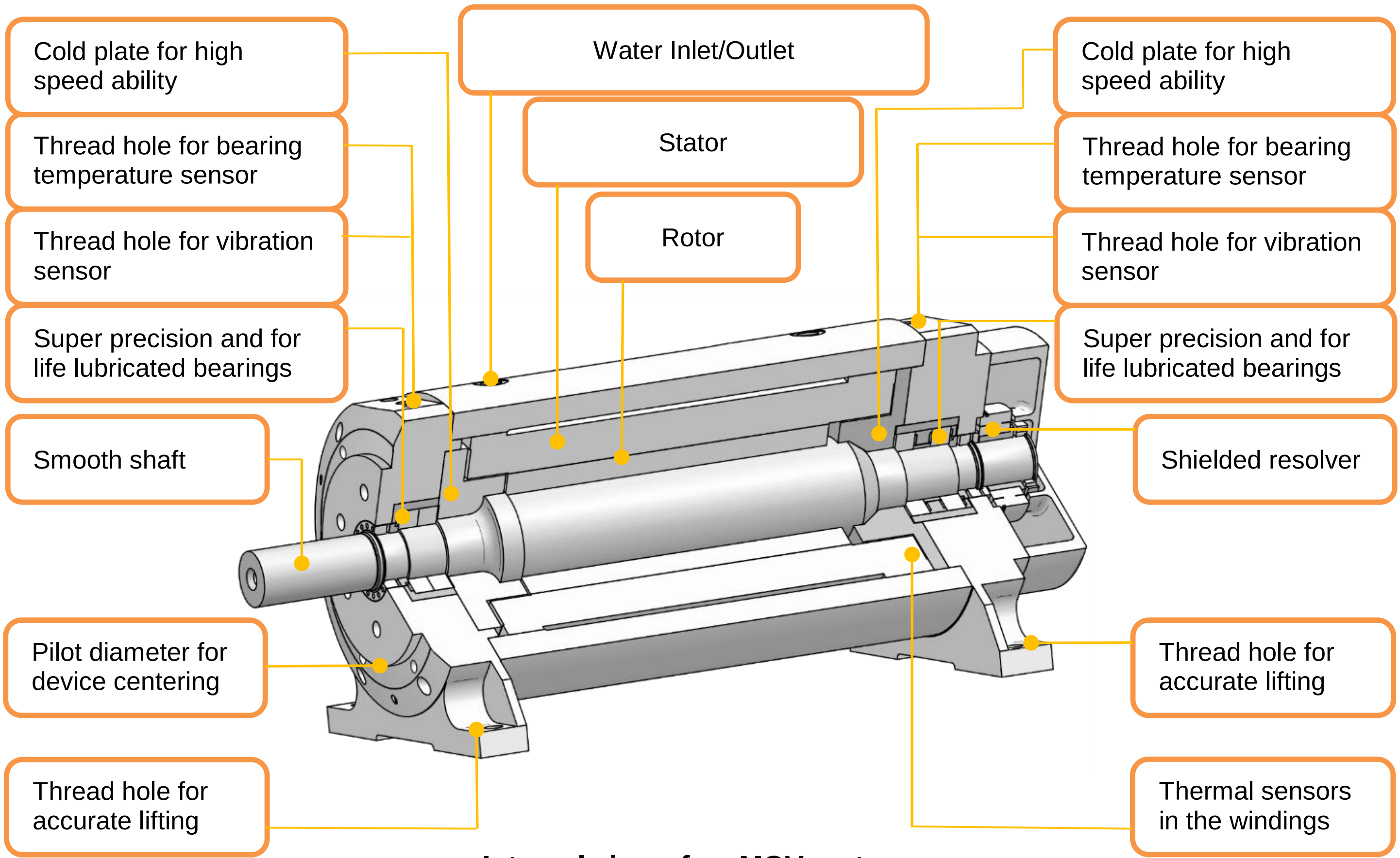
These motors are characterized by a low inertia, a high acceleration capability and a high speed up ability.

Driving is insured through a 2 poles resolver giving an absolute position on one turn.

Many winding are available to get the wished torque and speed characteristics for power up to 80KW with the DIGIVEX drives.

Higher power is available with the universal PARKER AC890 drives.

The MGV motors are supplied integrated and ready to be used.



Internal view of an MGV motor

2.2.1. Test benches

MGV motors are successfully used on test benches for characterization, control, burn-in tests of automotive or aeronautical components (starters, pumps, alternators, pulleys, freewheels, belts, gearboxes …).

2.2.2. Simulation benches

Thanks to the possibility to generate running cycles with fast answers, the MGV motors can be used for simulation (speed simulation in urban cycle or automobile race, non-cyclic speed simulation for engine …).

2.3. General technical data

Motor type Permanent-magnet synchronous motor

Magnet material Nd-Fe-B

Number of poles

Size:	MGV4	MGV6	MGV8	MGV9	MGVA	MGVB
Nbr of poles:	4	6	6	6	8	16

Mechanical interface Feet IM B3
or feet and flange IM B34 (IEC60034-7)

Sizes 4, 6, 8, 9, A, B

Degree of Protection IP40 as standard

Cooling Water cooled

Cooling water temperature 5°C to 25°C (IEC 60034-1) – to avoid condensation see §3.6

Altitude Up to 1000m (IEC 60034-1)
(for higher altitude see "Altitude derating")

Rated voltage 400 VAC or 480 VAC

Connections Terminal box and encoder signal connector.

Insulation of the stator winding Class F according to IEC 60034-1 with potting

Thermal protection 1 PTC probes and 1 KTY84-130 sensor

Operating temperature 0°C…+40°C (IEC 60034-1) – to avoid condensation see §3.6

Storage temperature -20… +60°C

Rotor balancing G1 class

Shaft end Smooth shaft as standard

Bearings Steel or ceramic, depending on speed and load

Sensor Resolver

Paint finish Black RAL9005

Marking CE

2.4. Product Code

Code	M	G	V	8	4	0	C	A	D	A	B	3	L	R	6	0	0	0

Product Series

Motor size (in connection with diameter)

4, 6, 8, 9, A or B

Active Part Length

Torque / Speed characteristics

See motor datas

Feedback Sensor

A : Resolver
K : sin/cos encoder (on request)

Mounting arrangement

B3 : by feet

Bearing design

L : Low speed (common bearing)
H : high speed (hybrid bearings)
X : very high speed (X-Life bearings)

Unused character

Mechanical Option

1 : Flying wires
6 : Terminal box

000 : Standard motor

3. TECHNICAL DATA

3.1. Motor selection

3.1.1. Altitude derating

From 0 to1000 m : no derating
From 1000 to 4000 m : torque derating of 5% for each step of 1000 m

3.1.2. Temperature derating

Water cooled motor

Typical values are given with a water inlet temperature of 25°C and a temperature gradient Inlet-Outlet of 10°C. These references lead to a winding overheating of **90°C** corresponding to a winding temperature of **115°C**. Recommendations regarding condensation issues are given at § 3.6.

It is possible to increase a little bit the Inlet temperature up to 40°C, but the torque must be reduced. The following formula gives an indicative about the torque derating at low speed. But in any case refer to Parker technical department to know the exact values

<u>At low speed</u> the torque derating is given by the following formula for an water Inlet temperature > 25°C.

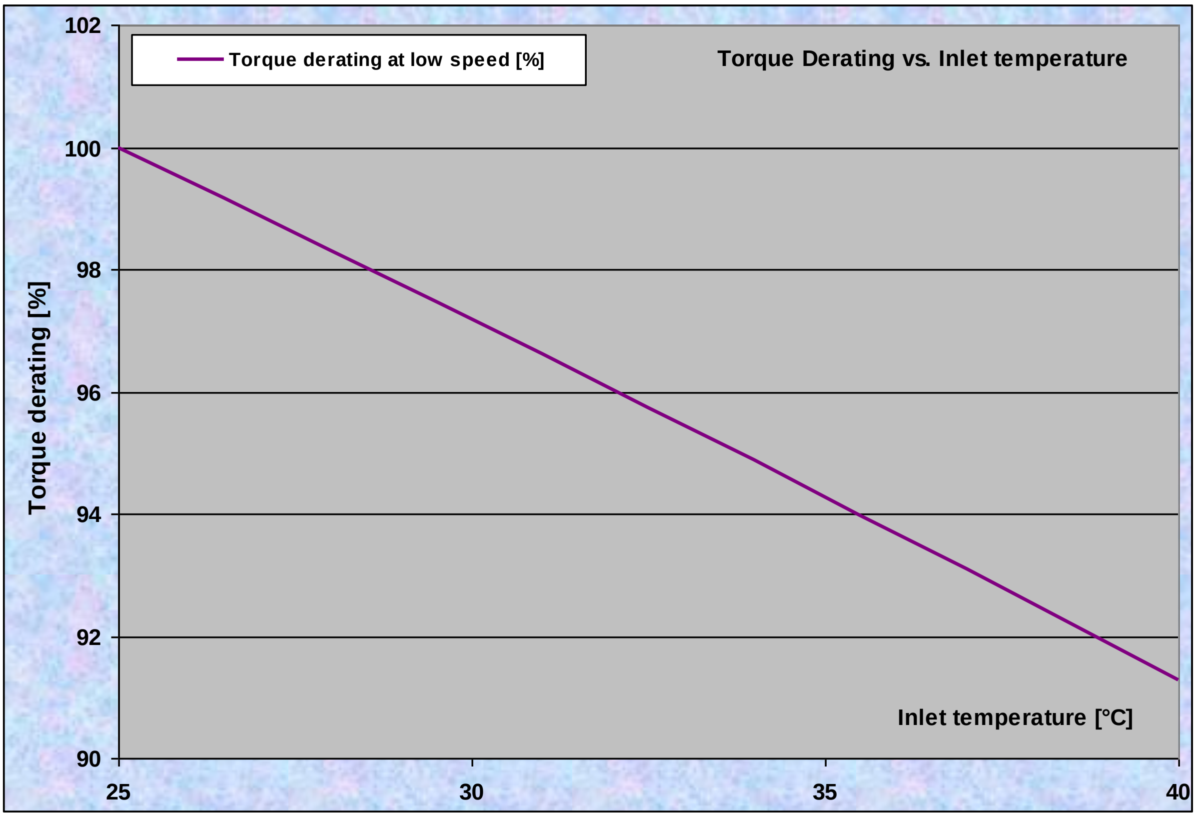
$$Torque\_derating[\%] = 100 * \sqrt{\frac{(115°C - Inlet\_temperature°C)}{90°C}}$$

	At high speed, the calculation is more complex, and the derating is much more important. Please refer to PARKER to know the precise data of Torque derating according to water inlet temperature at high speed for a specific motor.

N.B. No general rules can be applied concerning the torque derating of MGV motors **at high speed**. Please refer to Parker for each case.
In fact, the torque derating at high speed also depends on :

- the flux weakening ratio which leads to a short circuit current inherent in the motor (no action can reduce its value),
- the maximal speed of the motor which determines the iron losses and mechanical losses due to the rotation.

Illustration of the torque derating vs. temperature at low speed for a MGV motor:



3.1.3. Thermal equivalent torque (rms torque)

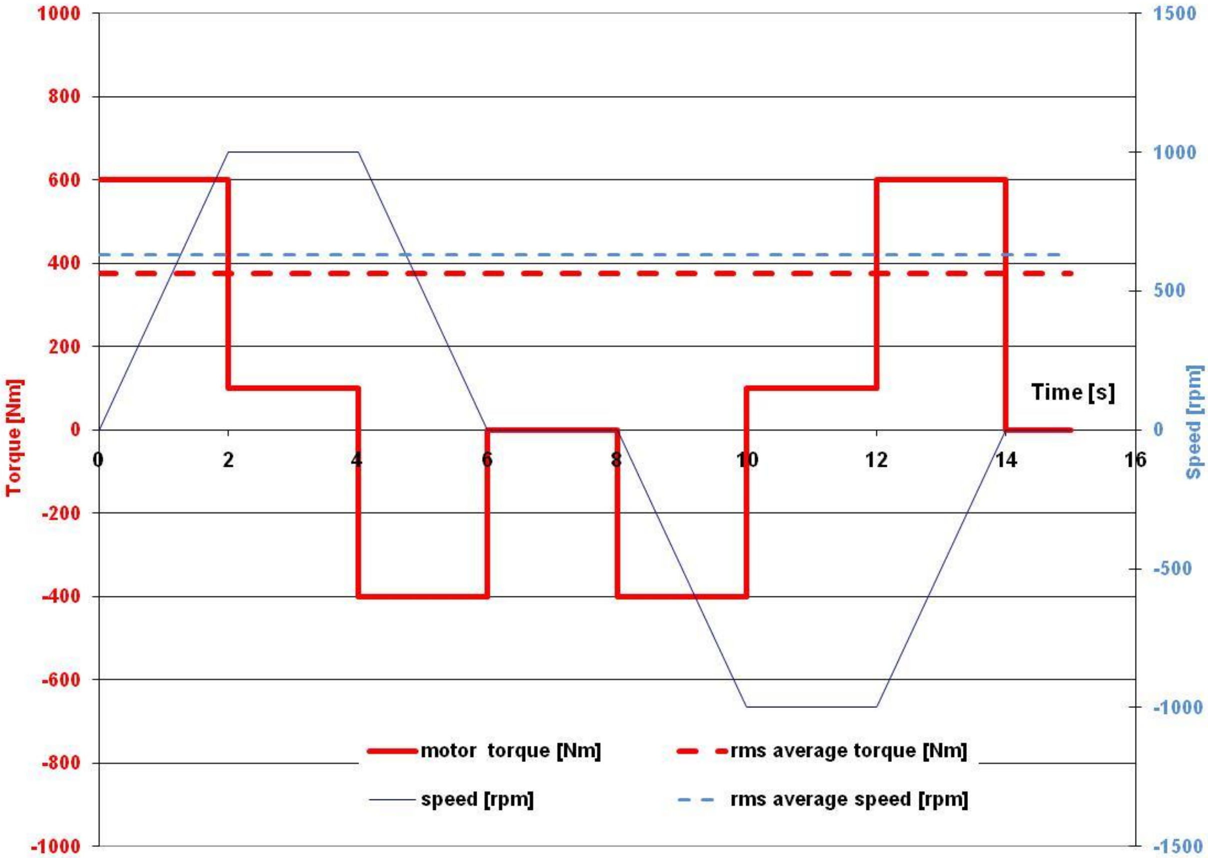
The selection of the right motor can be made through the calculation of the rms torque M_{rms} (i.e. root mean squared torque) (sometimes called equivalent torque).
This calculation does not take into account the thermal time constant. It can be used only if the overload time is much shorter than the copper thermal time constant.
The rms torque M_{rms} reflects the heating of the motor during its duty cycle.
Let us consider:
- the period of the cycle ***T*** *[s],*
- the successively samples of movements ***i*** characterized each ones by the maximal torque M_i *[Nm]* reached during the duration Δt_i *[s]*.
So, the rms torque M_{rms} can be calculated through the following basic formula:

$$M_{rms} = \sqrt{\frac{1}{T} * \sum_{i=1}^{n} M_i^2 \Delta t_i}$$

Example:
For a cycle of 2s at 0 Nm and 2s at 100Nm, the rms torque is

$$M_{rms} = \sqrt{\frac{1}{4} * 100^2 * 2} = 70{,}7Nm$$

Illustration :



The maximal torque M_i delivered by the motor at each segment ***i*** of movement is obtained by the algebric sum of the acceleration-deceleration torque and the resistant torque.
Therefore, M_{max} corresponds to the maximal value of M_i.

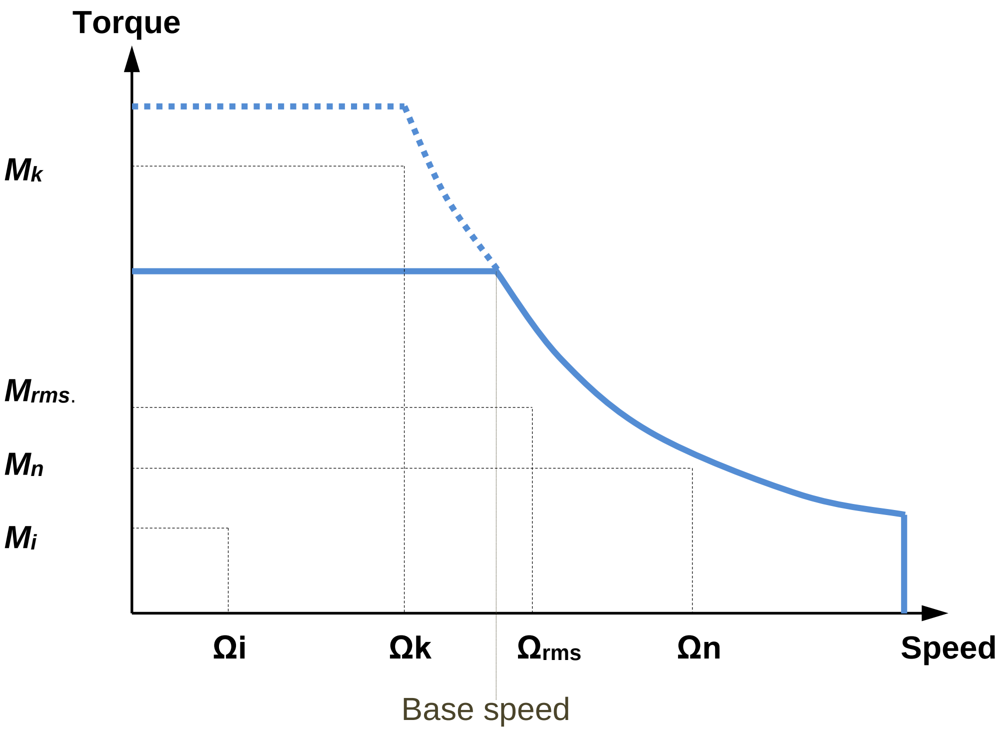
Selection of the motor :

The motor adapted to the duty cycle has to provide the rms torque M_{rms} at the rms speed(*) without extra heating. This means that the permanent torque M_n available at the average speed presents a sufficient margin regarding the rms torque M_{rms}.

$$\Omega_{rms} = \sqrt{\frac{1}{T} * \sum_{i=1}^{n} \Omega_i^2 \Delta t_i}$$

(*) rms speed is calculated thanks to the same formula as that used for the rms torque. The mean speed cannot be used (in general mean speed is equal to zero).
Only use the rms speed

Furthermore, each Mi and speed associated Ωi of the duty cycle has to be located in the operational area of the torque vs speed curve



3.1.4. Acceleration – Deceleration time with MGV motors

A MGV motor shows two phases during its acceleration (resp. deceleration) time:
- from 0 to the *Base speed* during its acceleration (or inversely from the *Base speed* to 0 during its deceleration), the phase is called "at constant Torque".
- from the *Base speed* to the *Maximal speed* during its acceleration (or inversely from the *Maximal speed* to the *Base speed* during its deceleration), the phase is called "at constant Power" or "Spindle mode".

We assume that the resistant torque is maintained constant and that the motor is able to provide it during the whole acceleration (resp. deceleration) phase. So the calculation of the total acceleration (resp. deceleration) time can be separated in two parts as explained below. When the resistant torque is not constant, the calculation becomes more complex and can be made through iterative means.

Notations:

N_{base}	*Base speed* of the motor [rpm]
Ω_{base}	Base angular speed of the motor [rad/s]
ΣJ	Total inertia {motor rotor inertia + load inertia reflected to the motor} [kgm²]
M_{motor}	equal to M_{S6} (peak torque) for a short acceleration (deceleration) time, otherwise M_{S1} (constant torque) [Nm]
$M_{resistant}$	Resistant torque, considered as constant during the whole acceleration (resp. deceleration) phase [Nm]
M	Torque available for the acceleration (respectively deceleration) [Nm]
N_{max}	*Maximal speed* of the application [rpm]
Ω_{max}	Maximal angular speed of the application [rad/s]
P_{motor}	equal to P_{S6} (peak power) for a short acceleration (deceleration) time, otherwise P_{S1} (constant power) [W]
P	Power available for the acceleration (respectively deceleration) [W]
t_1	Acceleration (respectively deceleration) time "at constant Torque" [s]
t_2	Acceleration (respectively deceleration) time "at constant Power" [s]
Δt	Global acceleration (respectively deceleration) time [s]

Angular speeds:

$$\Omega_{base} = \frac{2*\pi*N_{base}}{60} \qquad \Omega_{\max} = \frac{2*\pi*N_{\max}}{60}$$

3.1.4.1. Constant Torque Phase – t_1 calculation

Acceleration time t_1 "at constant Torque" from 0 to the *Base speed* :

$$M = M_{motor} - M_{resistant}$$

$$t_1 = \frac{\Omega_{base} * \Sigma J}{M}$$

Deceleration time t_1 "at constant Torque" from *Base speed* to 0:

$$M = M_{motor} + M_{resistant}$$

$$t_1 = \frac{\Omega_{base} * \Sigma J}{M}$$

3.1.4.2. Constant Torque Phase – t_2 calculation

Method #1:

This method is simple and provides an estimation of t_2 sufficient in most situations:

- when the resistant torque $M_{resistant}$ is small compared to M_{motor}
- when the resistant torque $M_{resistant}$ is equal to 0.

Procedure to follow:

We calculate firstly an estimation of the resistant power $P_{resistant}$ as follows:

$$P_{resistant} \approx M_{resistant} * \frac{(\Omega_{max} + \Omega_{base})}{2}$$

Acceleration time t_2 "at constant Power" from *Base speed* to *Maximal speed*:

The power available for the acceleration is equal to:

$$P = P_{mot} - P_{resistant}$$

So the estimated duration t_2 is given by the formula:

$$t_2 = \frac{\frac{1}{2} \Sigma J * (\Omega_{max}{}^2 - \Omega_{base}{}^2)}{P}$$

Deceleration time t_2 "at constant Power" from *Maximal speed* to *Base speed*:

The power available for the deceleration is equal to:

$$P = P_{mot} + P_{resistant}$$

So the estimated duration t_2 is given by the formula:

$$t_2 = \frac{\frac{1}{2} \Sigma J * (\Omega_{max}{}^2 - \Omega_{base}{}^2)}{P}$$

Total acceleration (resp. deceleration) time Δt will be given by the sum of t_1 and t_2:

$$\Lambda t = t_1 + t_2$$

Method #2:

This method is more complex but provides the exact solution for ***t_2***. It is sometimes used where justified by the required accuracy or by a resistant torque ***$M_{resistant}$*** non-negligible compared to ***M_{motor}***. This method is only valid if ***$M_{resistant}$*** $\neq 0$.

t_2 is solution of a nonlinear first order differential equation.

$M_{resistant} \neq 0$

Procedure to follow:

Acceleration time t_2 "at constant Power" from *Base speed* to *Maximal speed*:

$$a = \Sigma J$$

$$b = P_{motor}$$

$$c = M_{resistant}$$

$$d = M_{motor} - M_{resistant}$$

$$y_0 = \Omega_{base}$$

$$y_1 = \Omega_{max}$$

$$\lambda = y_0 - \frac{b}{c}$$

$$\mu = \frac{a * \lambda}{c}$$

$$t_x = -\frac{1}{c} * Ln\left|\frac{1}{\lambda} * (y_1 - \frac{b}{c})\right|$$

$$t_1 = \frac{y_0 * a}{d} \qquad acceleration\_time \quad in\_axis\ mode$$

$$t_2 = \mu + \frac{a}{c}(b * t_x - \lambda * e^{-c * t_x}) \qquad acceleration\_time \quad in\_spindle\ mode$$

Total acceleration time ***Δt*** from 0 to *Maximal speed* is given by the sum of t_1 and t_2:

$$\Lambda t = t_1 + t_2$$

Deceleration time t_2 "at constant Power" from *Maximal speed* to *Base speed*:

$$a = \Sigma J$$

$$b = -P_{motor} \quad \text{negative value} \Leftrightarrow braking$$

$$c = M_{resistant}$$

$$d = -M_{motor} - M_{resistant}$$

$$y_0 = \Omega_{\max}$$

$$y_1 = \Omega_{base}$$

$$\lambda = y_0 - \frac{b}{c}$$

$$\mu = \frac{a * \lambda}{c}$$

$$t_x = -\frac{1}{c} * Ln\left|\frac{1}{\lambda} * (y_1 - \frac{b}{c})\right|$$

$$t_1 = -\frac{y_1 * a}{d} \qquad deceleration\_time \quad in\_axis\,mode$$

$$t_2 = \mu + \frac{a}{c}(b * t_x - \lambda * e^{-c*t_x}) \qquad deceleration\_time \quad in\_spindle\,mode$$

Total deceleration time ***Δt*** from *Max speed* to 0 will be given by the sum of t_1 and t_2:

$$\Delta t = t_1 + t_2$$

3.1.4.3. Numerical example:

The MGV motor taken to illustrate the calculations is the type ***MGV840CAD***
Corresponding data are as follows:

$P_{S1} = P_{S6} =$ 63 kW
$N_{base} =$ 10300 rpm
$N_{max} =$ 24000 rpm
$M_{S1} =$ 58.4 Nm
$M_{S6} =$ 93.5 Nm
$J_{motor} =$ 0.01455 kgm²

We will consider:
$M_{resistant} =$ 6 Nm
$J_{load} = J_{motor}$ 0.01455 kgm²

Method #1

$$\Omega_{base} = \frac{2*\pi*N_{base}}{60} \qquad \frac{2*\pi*10300}{60} = 1079 \quad \text{rad/s}$$

$$\Omega_{\max} = \frac{2*\pi*N_{\max}}{60} \qquad \frac{2*\pi*24000}{60} = 2513 \quad \text{rad/s}$$

$$\Sigma J = J_{motor} + J_{load} \qquad 0.01455 + 0.001455 = 0.02910 \quad \text{kgm}^2$$

$$P_{resistant} \approx M_{resistant} * \frac{(\Omega_{\max} + \Omega_{base})}{2} \qquad = 6 * \frac{(2513+1079)}{2} = 10776 \quad \text{W}$$

Acceleration duration t_1 "at constant Torque" from 0 to the *Base speed* :

$$M = M_{motor} - M_{resistant} \qquad = 58.4 - 6 = 52.4 \quad \text{Nm}$$

$$t_1 = \frac{\Omega_{base} * \Sigma J}{M} \qquad = \frac{1079 * 0.02910}{52.4} = 0.599 \quad \text{s}$$

Deceleration time t_1 "at constant Torque" from the *Base speed* to 0:

$$M = M_{motor} + M_{resistant} \qquad = 58.4 + 6 = 64.4 \quad \text{Nm}$$

$$t_1 = \frac{\Omega_{base} * \Sigma J}{M} \qquad = \frac{1079 * 0.02910}{64.4} = 0.487 \quad \text{s}$$

Acceleration time t_2 "at constant Power" from *Base speed* to *Maximal speed*:
The power available for the acceleration is equal to:

$$P = P_{mot} - P_{resistant} \qquad = 63000 - 10776 = 52224 \quad \text{W}$$

So the estimated duration t_2 is given by the formula:

$$t_2 = \frac{\frac{1}{2}\Sigma J(\Omega_{\max}{}^2 - \Omega_{base}{}^2)}{P} \qquad = \frac{0.5*0.02910*(2513^2 - 1079^2)}{52224} = 1.436 \quad \text{s}$$

Total acceleration time Δt from 0 to *Maximal speed* is given by the sum of t_1 and t_2:

$$\Delta t = t_1 + t_2 \qquad 0.599 + 1.436 = 2.035 \quad s$$

Deceleration time t_2 "at constant Power" from *Maximal speed* to *Base speed*:
The power available for the deceleration is equal to:

$$P = P_{mot} + P_{resistant} \quad = 63000 + 10776 = 73776 \quad W$$

So the estimated duration t_2 is given by the formula:

$$t_2 = \frac{\frac{1}{2}\Sigma J(\Omega_{max}{}^2 - \Omega_{base}{}^2)}{P} \quad = \frac{0.5 * 0.02910 * (2513^2 - 1079^2)}{73776} = 1.016 \quad s$$

Total deceleration time Δt from *Max speed* to 0 will be given by the sum of t_1 and t_2:

$$\Delta t = t_1 + t_2 \quad = 0.487 + 1.016 = 1.503 \quad s$$

Method #2

t_2 is solution of a nonlinear first order differential equation.

$M_{resistant} \neq 0$

Acceleration time t_2 "at constant Power" from *Base speed* to *Maximal speed*:

$$a = \Sigma J = J_{motor} + J_{load} \quad = 0.02910 \quad kgm^2$$

$$b = P_{mot} \quad = 63000 \quad W$$

$$c = M_{resistant} \quad = 6 \quad Nm$$

$$d = M_{mot} - M_{resistant} = M \quad = 58.4 - 6 = 52.4 \quad Nm$$

$$y_0 = \Omega_{base} \quad = 1079 \quad rad/s$$

$$y_1 = \Omega_{max} \quad = 2513 \quad rad/s$$

$$\lambda = y_0 - \frac{b}{c} \quad = 1079 - \frac{63000}{6} = \text{-}9421$$

$$\mu = \frac{a * \lambda}{c} \quad = \frac{0.02910 * (-9421)}{6} = \text{-}45.69$$

$$t_x = -\frac{1}{c} * Ln\left|\frac{1}{\lambda} * (y_1 - \frac{b}{c})\right| \quad = -\frac{1}{6} * Ln\left|\frac{1}{-9421} * (2513 - \frac{63000}{6})\right| = 0.0275$$

$$t_1 = \frac{y_0 * a}{d} \quad = \frac{1079 * 0.02910}{52.4} = 0.599\,s \qquad acceleration\_axis\ mode$$

$$t_2 = \mu + \frac{a}{c}(b * t_x - \lambda * e^{-c*t_x}) \qquad acceleration\_spindle\ mode$$

$$t_2 = -45.69 + \frac{0.02910}{6}(63000 * 0.0275 - (-9421) * e^{-6*0.0275}) = 1.455\,s$$

Total acceleration time Δt from 0 to *Maximal speed* is given by the sum of t_1 and t_2:

$$\Delta t = t_1 + t_2 \quad = 0.599 + 1.455 = 2.054\,s$$

Deceleration time t_2 "at constant Power" from *Maximal speed* to *Base speed*:

$$a = \Sigma J = J_{motor} + J_{load} \quad = 0.02910 \quad \text{kgm}^2$$

$$b = -P_{mot} = -63000 \quad W \quad \text{negative value} \Leftrightarrow braking$$

$$c = M_{resistant} \quad = 6 \quad Nm$$

$$d = -M_{mot} - M_{resistant} = M = -58.4 - 6 = -64.4 \quad \text{Nm} \quad \text{negative value} \Leftrightarrow braking$$

$$y_0 = \Omega_{max} \quad = 2513 \quad rad/s$$

$$y_1 = \Omega_{base} \quad = 1079 \quad rad/s$$

$$\lambda = y_0 - \frac{b}{c} \quad = 2513 - \frac{-63000}{6} = 13013$$

$$\mu = \frac{a*\lambda}{c} \quad = \frac{0.02910*13013}{6} = 63.114$$

$$t_x = -\frac{1}{c}*Ln\left|\frac{1}{\lambda}*(y_1 - \frac{b}{c})\right| = \quad -\frac{1}{6}*Ln\left|\frac{1}{13013}*(1079 - \frac{-63000}{6})\right| = 0.01947$$

$$t_1 = -\frac{y_1*a}{d} \quad = -\frac{1079*0.02910}{-64.4} = 0.487\,s \quad deceleration\_time \quad in\_axis\,mode$$

$$t_2 = \mu + \frac{a}{c}(b*t_x - \lambda*e^{-c*t_x}) \quad deceleration\_time \quad in\_spindle\,mode$$

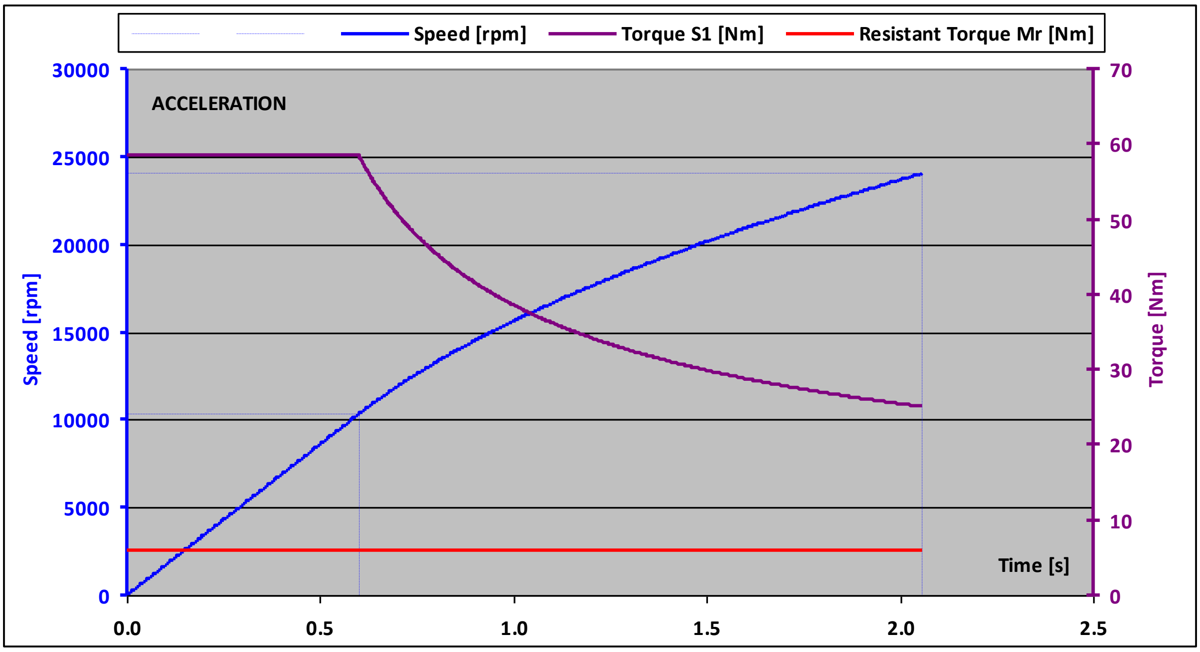
$$t_2 = 63.114 + \frac{0.02910}{6}(-63000*0.01947 - 13013*e^{-6*0.01947}) = 1.0095 \quad s$$

Total deceleration time ***Δt*** from *Max speed* to 0 will be given by the sum of t_1 and t_2:

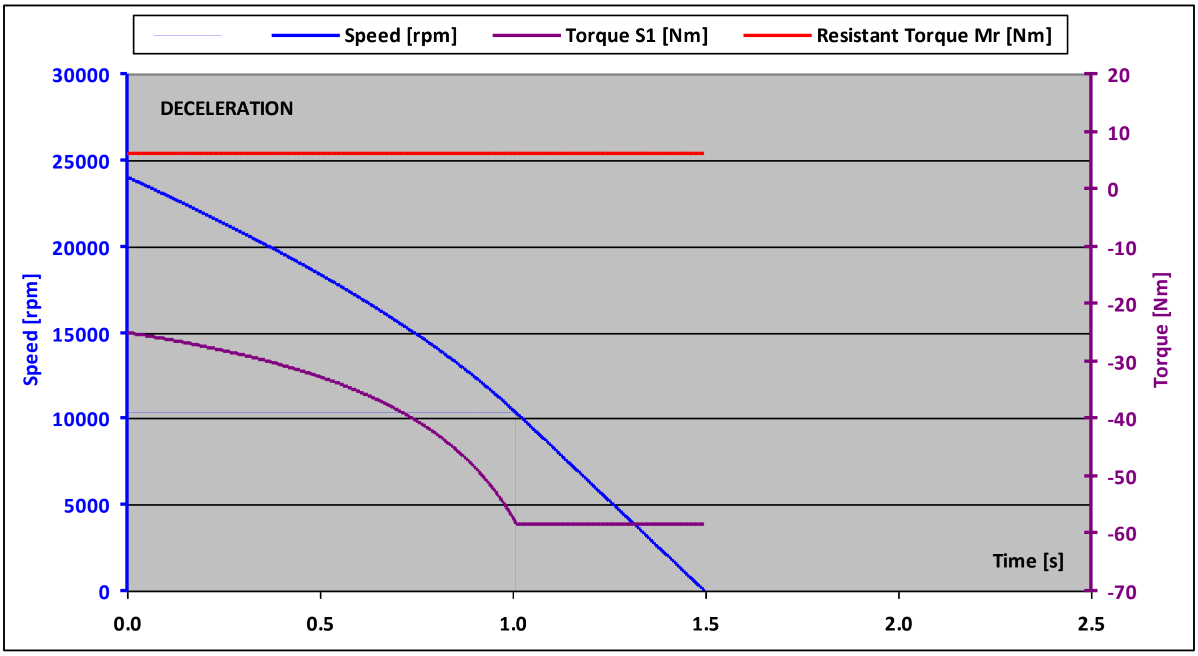
$$\Delta t = t_1 + t_2 \quad = 0.487 + 1.0095 = 1.497 \quad \text{s}$$

Illustrations:

Acceleration phase



Deceleration phase



3.1.5. Drive selection

The drive selection depends on its rated power, nominal current and maximal electrical frequency able to be managed by the drive and by the flux weakening ratio.

Please refer to the drive technical documentation for any further information and to select the best motor and drive association.

Short circuit current of the motor must be lower than the permanent current of the drive

$$I_{cc\_motor} < I_{S1\_drive}$$

Please refer to the drive technical documentation

Short circuit current of the motor must be lower than 0.8 times the peak current of the drive

$$I_{cc\_motor} < 0.8 \times I_{peak\_drive}$$

Please refer to the drive technical documentation

Max back emf of the motor must be lower than the max voltage (from the motor) supported by the drive
Please refer to the drive technical documentation

The drive must be able to manage the flux weakening and must avoid voltage higher than the nominal motor voltage at the motor terminals.
Please, check field weakening ratio supported by the drive.
Field weakening ratio = Max speed divided by the basis speed

Due to the maximum electrical frequency able to be managed by the drive, the motor has a speed limitation given as follows:

$$\text{Speed limitation}(rpm) = \frac{2 * \text{Max\_drive\_frequency}(Hz) * 60}{\text{Number\_of\_poles}}$$

Other limitations can come from the bearing type
(steel straight, hybrid or Xlife)
Cf: §3.4 Bearing

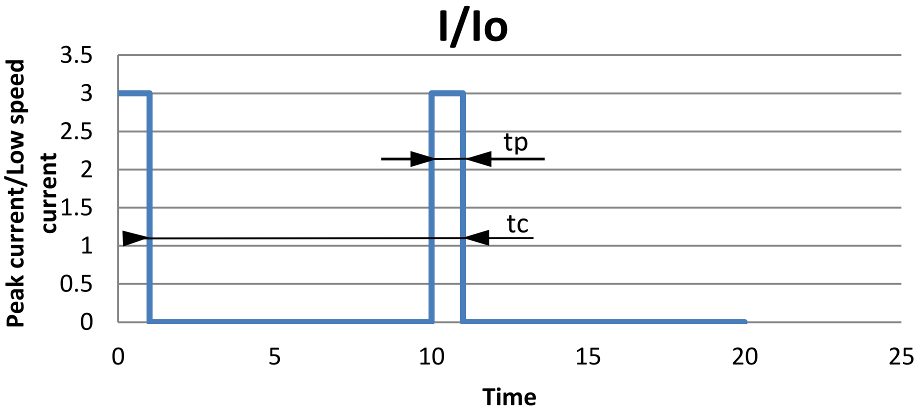
3.1.6. Current limitation at stall conditions (i.e. speed < 3 rpm)

Recommended reduced current at speed < 3 rpm:

Warning: The current must be limited to the prescribed values. If the nominal torque has to be maintained at stop or low speed (< 3 rpm), imperatively limit the current to 80% of I_0 (permanent current at low speed), in order to avoid an excessive overheating of the motor.

Please refer to the drive technical documentation for any further information and to choose functions to program the drive.

3.1.7. Peak current limitations



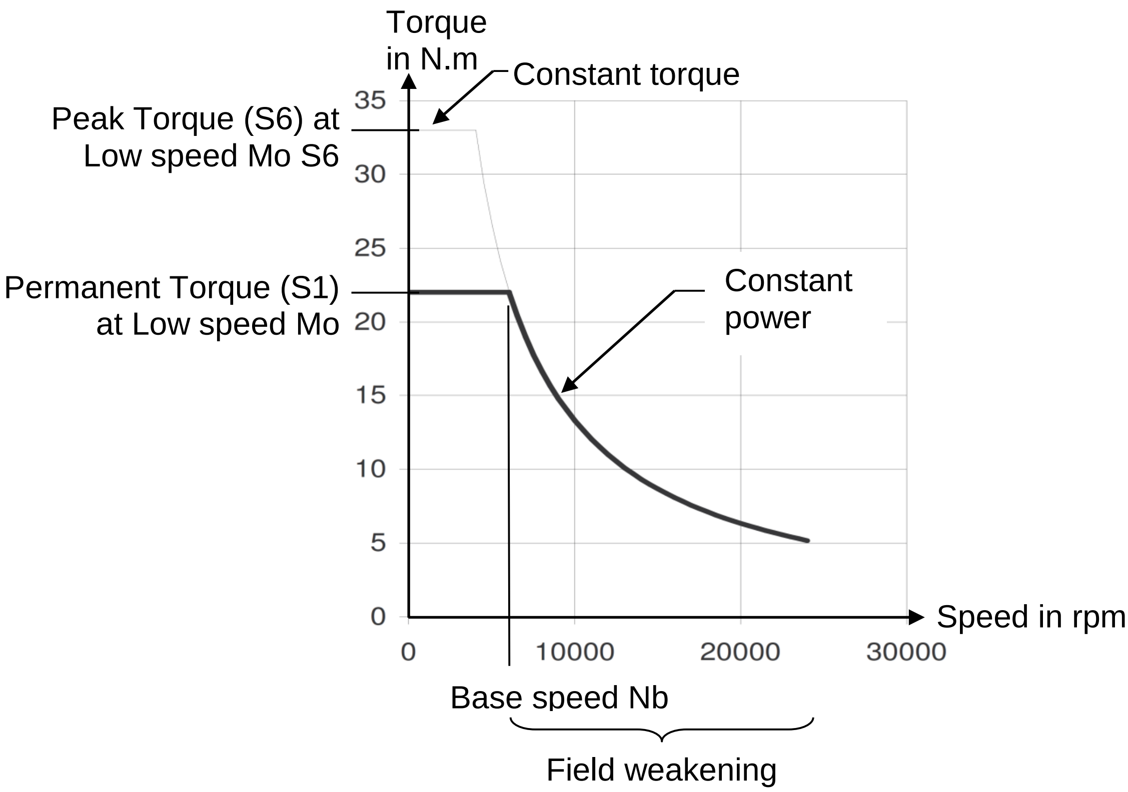
It is possible to use the MGV motors with a current higher than the permanent current. But, to avoid any overheating, the following rules must be respected.

1) The peak currents and peak torques given in the data sheet must never be exceeded
2) The thermal equivalent torque must be respected (§3.1.3)
3) If 1) and 2) are respected (it can limit the peak current value or duration), the peak current duration (tp) must be limited, in addition, accordingly to the following table (Io is the permanent current at low speed):

	Tp (second)							
Ipeak/In	1,2	1,4	1,6	1,8	2	2,2	2,4	**>2.4**
MGV4	2,8	1,3	0,8	0,6	0,4	0,3	0,3	not allowed
MGV6	2,5	1,1	0,7	0,5	0,4	0,3	0,2	
MGV8	2,5	1,1	0,7	0,5	0,4	0,3	0,2	
MGV9	5,1	2,4	1,4	1,0	0,8	0,6	0,5	
MGVA	5,1	2,4	1,4	1,0	0,8	0,6	0,5	
MGVB	4,9	2,3	1,4	1,0	0,7	0,6	0,5	

The peak current duration is calculated for a temperature rise of 3°C
Consult us for more demanding applications.

3.2. MGV Characteristics: Torque, speed, current, power…



3.2.1. Intrinsic characteristics

Motor	S1 Power PS1	Max. Speed with Steel Bearings Nmax	Max. Speed with Ceramic bearings Nmax	Max. Speed with X-life Bearings Nmax	Frequency at max speed with X-life fmax	Low speed Torque Mo	Low speed Current Io	Peak Torque Mpeak	Peak Current I peak	Base speed Nb	Inertia J	Polarity p
	[kW]	[rpm]	[rpm]	[rpm]	[Hz]	[Nm]	[Arms]	[Nm]	[Arms]	[rpm]	[kgm²]	[-]
MGV430BAI	15,7	26 000	33 000	45 000	1500	6,8	35	11	78,1	22000	0,00089	4
MGV635CAD	25	18 500	25 000	30 000	1500	20	49,4	30	74,3	11900	0,00352	6
MGV840CAD	63	14 300	18 000	24 000	1200	58	123	100	227	10400	0,0186	6
MGV860CBD	94	14 300	18 000	24 000	1200	120	136	170	202	7500	0,0264	6
MGV950CAX	175	11 700	16 000	20 000	1000	200	454	300	821	8350	0,063	6
MGV966DAX	250	-	-	8 000	533	520	505	900	982	4600	0,076	8
MGVA50DAX	260	9 200	12 000	-	800	440	558	600	798	5600	0,292	8
MGVA50DBY	290	9 200	12 000	-	800	570	560	800	870	4820	0,292	8
MGVB40HAA	350	5 000	8 000	-	1067	1000	722	1800	1410	3350	0,84	16
MGVB50HBS	500	5 000	8 000	-	1067	1500	1010	2700	1900	3200	1,04	16

3.2.2. AC890 Drive Association

Motor	AC890 drive	S1 Power PS1	Max. Speed with Steel Bearings Nmax	Max. Speed with Ceramic bearings Nmax	Max. Speed with X-life Bearings Nmax	Low speed Torque Mo	Peak Torque Mpeak
		[kW]	[rpm]	[rpm]	[rpm]	[Nm]	[Nm]
MGV430BAI	890SD-522450D	15,7	26 000	30 000	-	6,8	7,2
MGV635CAD	890SD-432730E	25	18 500	20 000	-	20	29,5
MGV840CAD	890SD-433105F	63	14 300	18 000	20 000	58	59,5
MGV860CBD	890PXSA-43215M	94	11 600	-	-	120	161
MGV860CBD	890PXSA-43215M + VPM	94	14 300	18 000	20 000	120	161
MGV950CAX	890PXSA-43480M	170	11 700	16 000	20 000	193	193
MGV966DAX	890PXSA-43580M	250	-	-	8 000	520	535
MGVA50DAX	890PXSA-43580M	240	9 200	11 800	-	412	412
MGVA50DBY	890PXSA-43580M	270	9 200	-	-	535	535
MGVB40HAA	2 x 890PXSA-43420M	350	5 000	7 000	-	1000	1080
MGVB50HBS	3 x 890PXSA-43580M	500	5 000	6 200	-	1500	2000

3.2.3. MGV430BAI Detailed Intrinsic Data

High speed brushless motor

MGV430BAI

ELECTRONIC DRIVE

DRIVE 36/79 - 400

*S1 power **/****	15.7 / 12.8	*kW*	*Ps1*
*S6 power **/****	18 / 14.7	*kW*	*Ps6*
*Low speed torque ** / ****	6.8 / 5.55	*N.m*	M_o
*Low speed S6 torque **/****	11 / 8.97	*N.m*	M_oS6
Base speed (S1)	22000	*rpm*	*Nb*
*Max speed *****	45000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	$\hat{U}$
Permanent current at low speed	35	*Arms*	I_o
S6 current at low speed	78.1	*Arms*	I_oS6
*Winding resistance(25°C) **	0.205	*Ω*	*Rb*
Rotor inertia	0.00089	$kg.m^2$	*J*
Thermal time constant	1	*min*	*Tth*
Motor mass	35	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	3.3	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** **Tolerances ± 7.5% and rotor at 25°C**

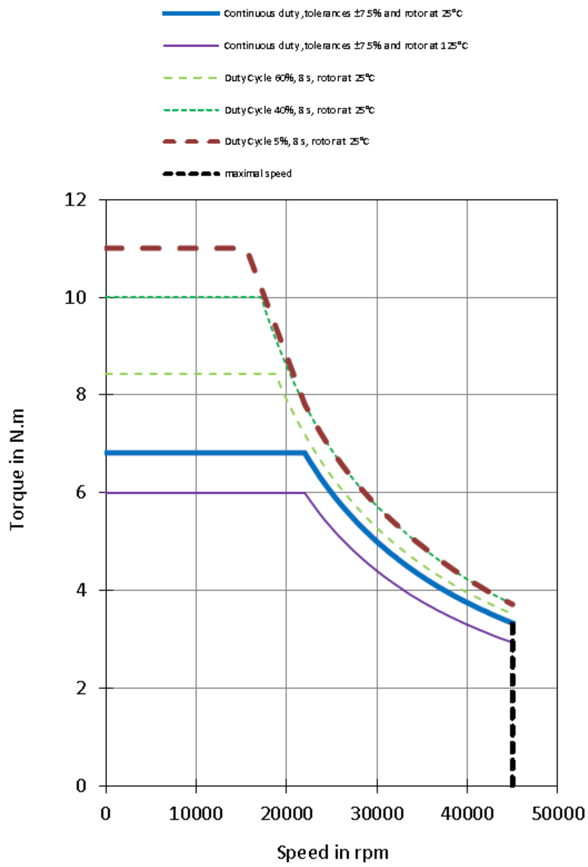
*** minimum value with rotor at 125°C

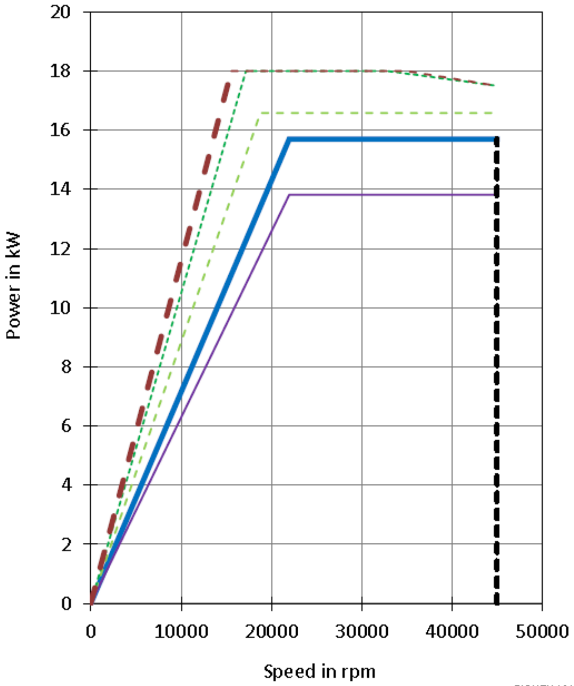
**** Speed limit due to the bearings:

Steel bearings limited to = 26000 rpm

Hybrid bearings limited to = 33000 rpm

X LIFE bearings limited to = 45000 rpm





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High speed brushless motor

MGV430BAI

ELECTRONIC DRIVE

DRIVE 36/79 - 400

Main characteristics

*S1 power **/****	15.7 / 12.8	*kW*	*Ps1*
*S6 power **/****	18 / 14.7	*kW*	*Ps6*
*Low speed torque ** / ****	6.8 / 5.55	*N.m*	M_0
*Low speed S6 torque **/****	11 / 8.97	*N.m*	$M_0 S6$
Base speed (S1)	22000	*rpm*	*Nb*
*Max speed *****	45000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	35	*Arms*	I_0
S6 current at low speed	78.1	*Arms*	$I_0 S6$

Mechanical parameters

Rotor inertia	0.00089	*kg.m²*	*J*
Motor mass	35	*kg*	*M*
Maximum speed with steel bearings	26000	*rpm*	N_1
Maximum speed with hybrid bearings	33000	*rpm*	N_2
Maximum speed with X LIFE bearings	45000	*rpm*	N_3
Maximum speed with Drive	45000	*rpm*	*Nmax*
Maximum mechanical speed	50000	*rpm*	*Nmec*

Electrical parameters

Number of poles	4		
*Winding resistance (25°C) **	0.205	*Ω*	*Rb*
Back EMF voltage phase to phase / 1000 rpm	11.7	*Vrms / 1000 rpm*	*ke*
Back EMF voltage phase to phase / (rad/s)	0.112	*Vrms / (rad/s)*	*ku*
Torque constant	0.194	*N.m / Arms*	*Kt*
Short circuit current	31.6	*Arms*	*Icc*
*Inductance Lq phase to phase (Back EMF voltage axis) **	2.35	*mH*	*Lq*
*Inductance Ld phase to phase **	2.05	*mH*	*Ld*
Optimal phasing at permanent current	20	*electrical degree*	ψo
Optimal phasing at S6 current	30	*electrical degree*	ψm

Thermal parameters

Motor thermal resistance	0.0818	*K/W*	*Rth*
Motor thermal time constant	1	*min*	*Tth*
Winding thermal time constant	0.38	*min*	Tth_w
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	3.3	*l/min*	*Wf*
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

**** Tolerances ± 7.5% and rotor at 25°C**

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

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Creation : 5 / 4 / 2016 Edition : 12 / 1 / 2017 MGV430BAI Indice g

3.2.4. MGV430BAI Detailed Data with AC890

High speed brushless motor

MGV430BAI

ELECTRONIC DRIVE

890SD-522450D

Parker

*S1 power **/****	15.7 / 12.8	*kW*	*Ps1*
*S6 power **/****	16 / 13.1	*kW*	*Ps6*
*Low speed torque ** / ****	6.8 / 5.55	*N.m*	M_0
*Low speed S6 torque **/****	7.2 / 5.87	*N.m*	M_0S6
Base speed (S1)	22000	*rpm*	*Nb*
*Max speed *****	30000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	35	*Arms*	I_0
S6 current at low speed	37.7	*Arms*	I_0S6
*Winding resistance(25°C) **	0.205	*Ω*	*Rb*
Rotor inertia	0.00089	*kg.m²*	*J*
Thermal time constant	1	*min*	*Tth*
Motor mass	35	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	3.3	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

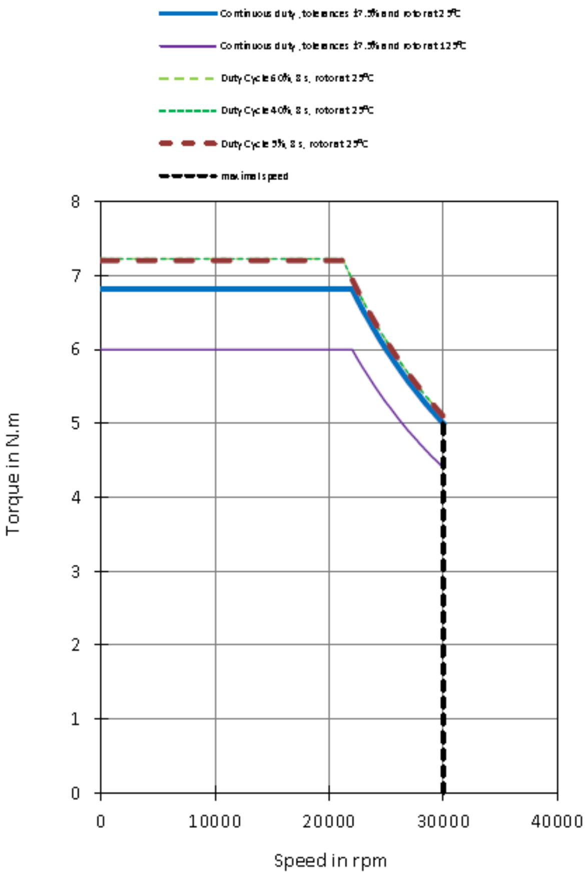
*** minimum value with rotor at 125°C

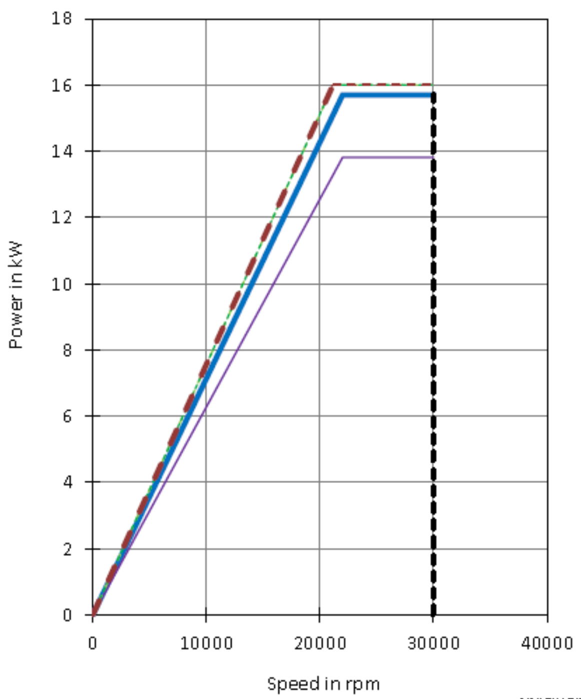
**** Speed limit due to the bearings:

Steel bearings limited to = 26000 rpm

Hybrid bearings limited to = 33000 rpm

X LIFE bearings limited to = 45000 rpm





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Creation : 5 / 4 / 2016	**Edition : 12 / 1 / 2017**	**Indice g**

High speed brushless motor

MGV430BAI

ELECTRONIC DRIVE

890SD-522450D

Main characteristics

S1 power **/***	15.7 / 12.8	kW	Ps1
S6 power **/***	16 / 13.1	kW	Ps6
Low speed torque ** / ***	6.8 / 5.55	N.m	M_0
Low speed S6 torque **/***	7.2 / 5.87	N.m	M_0S6
Base speed (S1)	22000	rpm	Nb
Max speed ****	30000	rpm	Nmax
DC voltage supply when motor is loaded	540	Vdc	Û
Permanent current at low speed	35	Arms	I_0
S6 current at low speed	37.7	Arms	I_0S6

Mechanical parameters

Rotor inertia	0.00089	kg.m²	J
Motor mass	35	kg	M
Maximum speed with steel bearings	26000	rpm	N_1
Maximum speed with hybrid bearings	33000	rpm	N_2
Maximum speed with X LIFE bearings	45000	rpm	N_3
Maximum speed with Drive	30000	rpm	Nmax
Maximum mechanical speed	50000	rpm	Nmec

Electrical parameters

Number of poles	4		
Winding resistance (25°C) *	0.205	Ω	Rb
Back EMF voltage phase to phase / 1000 rpm	11.7	Vrms / 1000 rpm	ke
Back EMF voltage phase to phase / (rad/s)	0.112	Vrms / (rad/s)	ku
Torque constant	0.194	N.m / Arms	Kt
Short circuit current	31.6	Arms	Icc
Inductance Lq phase to phase (Back EMF voltage axis) *	2.35	mH	Lq
Inductance Ld phase to phase *	2.05	mH	Ld
Optimal phasing at permanent current	20	electrical degree	ψo
Optimal phasing at S6 current	22	electrical degree	ψm

Thermal parameters

Motor thermal resistance	0.0818	K/W	Rth
Motor thermal time constant	1	min	Tth
Winding thermal time constant	0.38	min	Tth w
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	3.3	l/min	Wf
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

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3.2.5. MGV635CAD Detailed Intrinsic Data

High speed brushless motor

MGV635CAD

ELECTRONIC DRIVE

DRIVE 50/75 - 400

/ Need protection module

*S1 power **/****	25 / 20.9	*kW*	*Ps1*
*S6 power **/****	30 / 25.1	*kW*	*Ps6*
*Low speed torque ** / ****	20 / 16.7	*N.m*	M_0
*Low speed S6 torque **/****	30 / 25.1	*N.m*	M_0S6
Base speed (S1)	11900	*rpm*	*Nb*
*Max speed *****	30000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	49.4	*Arms*	I_0
S6 current at low speed	74.3	*Arms*	I_0S6
*Winding resistance(25°C) **	0.189	*Ω*	*Rb*
Rotor inertia	0.00352	*kg.m²*	*J*
Thermal time constant	1.5	*min*	*Tth*
Motor mass	55	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	5.6	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

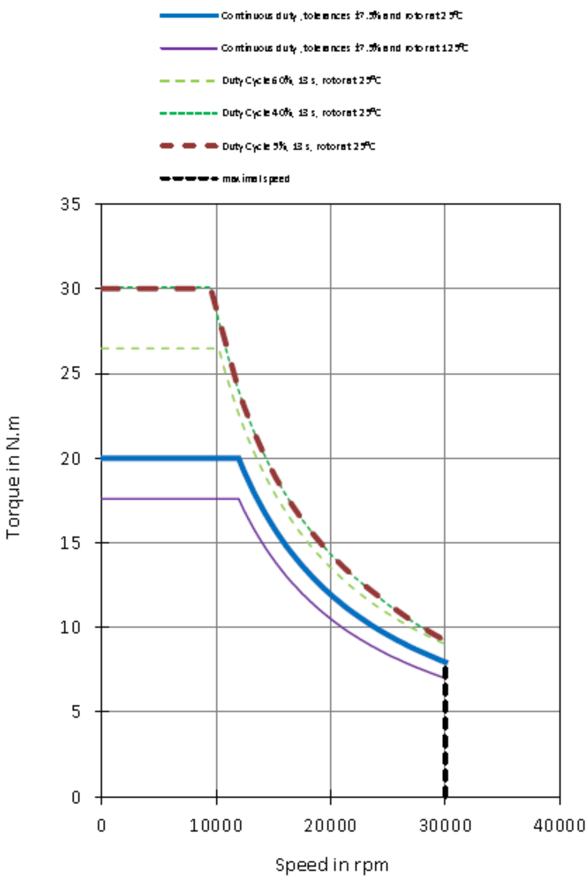
*** minimum value with rotor at 125°C

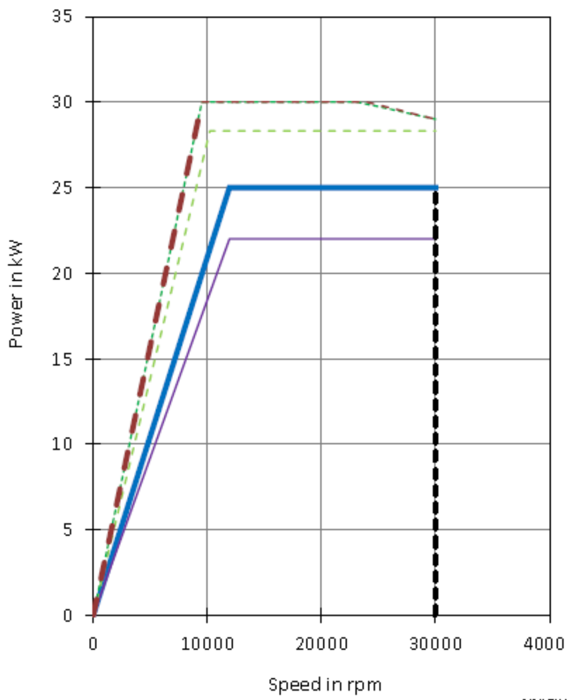
**** Speed limit due to the bearings:

Steel bearings limited to = 18500 rpm

Hybrid bearings limited to = 25000 rpm

X LIFE bearings limited to = 30000 rpm





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Creation : 5 / 4 / 2016 **Edition : 12 / 1 / 2017** **Indice g**

High speed brushless motor

MGV635CAD

ELECTRONIC DRIVE

DRIVE 50/75 - 400

Main characteristics

S1 power **/***	25 / 20.9	kW	Ps1
S6 power **/***	30 / 25.1	kW	Ps6
Low speed torque ** / ***	20 / 16.7	N.m	M_0
Low speed S6 torque **/***	30 / 25.1	N.m	M_0 S6
Base speed (S1)	11900	rpm	Nb
Max speed ****	30000	rpm	Nmax
DC voltage supply when motor is loaded	540	Vdc	Û
Permanent current at low speed	49.4	Arms	I_0
S6 current at low speed	74.3	Arms	I_0 S6

Mechanical parameters

Rotor inertia	0.00352	kg.m²	J
Motor mass	55	kg	M
Maximum speed with steel bearings	18500	rpm	N_1
Maximum speed with hybrid bearings	25000	rpm	N_2
Maximum speed with X LIFE bearings	30000	rpm	N_3
Maximum speed with Drive	30000	rpm	Nmax
Maximum mechanical speed	30000	rpm	Nmec

Electrical parameters

Number of poles	6		
Winding resistance (25°C) *	0.189	Ω	Rb
Back EMF voltage phase to phase / 1000 rpm	24.5	Vrms / 1000 rpm	ke
Back EMF voltage phase to phase / (rad/s)	0.234	Vrms / (rad/s)	ku
Torque constant	0.405	N.m / Arms	Kt
Short circuit current	53	Arms	Icc
Inductance Lq phase to phase (Back EMF voltage axis) *	1.93	mH	Lq
Inductance Ld phase to phase *	1.7	mH	Ld
Optimal phasing at permanent current	15	electrical degree	ψo
Optimal phasing at S6 current	20	electrical degree	ψm

Thermal parameters

Motor thermal resistance	0.0753	K/W	Rth
Motor thermal time constant	1.5	min	Tth
Winding thermal time constant	0.57	min	Tth w
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	5.6	l/min	Wf
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016 **Edition : 12 / 1 / 2017** MGV635CAD **Indice g**

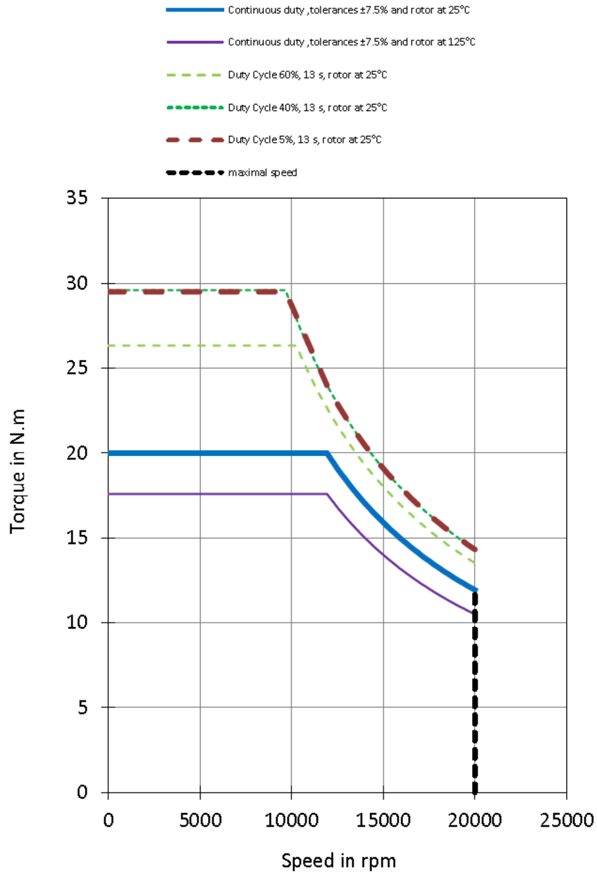
3.2.6. MGV635CAD Detailed Data with AC890

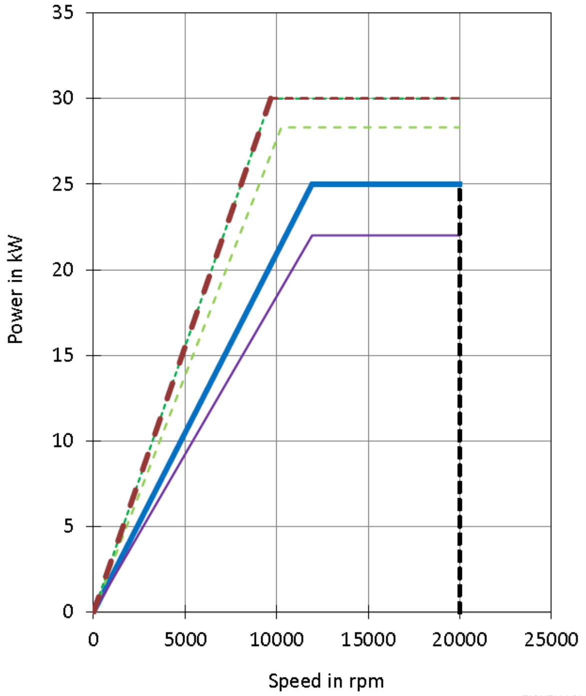
High speed brushless motor
MGV635CAD
ELECTRONIC DRIVE
890SD-432730E

*S1 power **/****	25 / 20.9	*kW*	*Ps1*
*S6 power **/****	30 / 25.1	*kW*	*Ps6*
*Low speed torque ** / ****	20 / 16.7	*N.m*	M_0
*Low speed S6 torque **/****	29.5 / 24.7	*N.m*	M_0S6
Base speed (S1)	11900	*rpm*	*Nb*
*Max speed *****	20000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	49.4	*Arms*	I_0
S6 current at low speed	73.1	*Arms*	I_0S6
*Winding resistance(25°C) **	0.189	*Ω*	*Rb*
Rotor inertia	0.00352	*kg.m²*	*J*
Thermal time constant	1.5	*min*	*Tth*
Motor mass	55	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	5.6	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase
** Tolerances ± 7.5% and rotor at 25°C
*** minimum value with rotor at 125°C
**** Speed limit due to the bearings:
Steel bearings limited to = 18500 rpm
Hybrid bearings limited to = 25000 rpm
X LIFE bearings limited to = 30000 rpm





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High speed brushless motor

MGV635CAD

ELECTRONIC DRIVE

890SD-432730E

Main characteristics

*S1 power **/****	25 / 20.9	*kW*	*Ps1*
*S6 power **/****	30 / 25.1	*kW*	*Ps6*
*Low speed torque ** / ****	20 / 16.7	*N.m*	M_0
*Low speed S6 torque **/****	29.5 / 24.7	*N.m*	$M_0 S6$
Base speed (S1)	11900	*rpm*	*Nb*
*Max speed *****	20000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	Û
Permanent current at low speed	49.4	*Arms*	I_0
S6 current at low speed	73.1	*Arms*	$I_0 S6$

Mechanical parameters

Rotor inertia	0.00352	$kg.m^2$	*J*
Motor mass	55	*kg*	*M*
Maximum speed with steel bearings	18500	*rpm*	N_1
Maximum speed with hybrid bearings	25000	*rpm*	N_2
Maximum speed with X LIFE bearings	30000	*rpm*	N_3
Maximum speed with Drive	20000	*rpm*	*Nmax*
Maximum mechanical speed	30000	*rpm*	*Nmec*

Electrical parameters

Number of poles	6		
*Winding resistance (25°C) **	0.189	*Ω*	*Rb*
Back EMF voltage phase to phase / 1000 rpm	24.5	*Vrms / 1000 rpm*	*ke*
Back EMF voltage phase to phase / (rad/s)	0.234	*Vrms / (rad/s)*	*ku*
Torque constant	0.405	*N.m / Arms*	*Kt*
Short circuit current	53	*Arms*	*Icc*
*Inductance Lq phase to phase (Back EMF voltage axis) **	1.93	*mH*	*Lq*
*Inductance Ld phase to phase **	1.7	*mH*	*Ld*
Optimal phasing at permanent current	15	*electrical degree*	ψo
Optimal phasing at S6 current	20	*electrical degree*	ψm

Thermal parameters

Motor thermal resistance	0.0753	*K/W*	*Rth*
Motor thermal time constant	1.5	*min*	*Tth*
Winding thermal time constant	0.57	*min*	*Tthw*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	5.6	*l/min*	*Wf*
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016 **Edition : 12 / 1 / 2017** **MGV635CAD** **Indice g**

3.2.7. MGV840CAD Detailed Intrinsic Data

High speed brushless motor

MGV840CAD

ELECTRONIC DRIVE

DRIVE 124/228 - 400

/ Need protection module

*S1 power **/****	63 / 52.8	*kW*	*Ps1*
*S6 power **/****	80 / 67	*kW*	*Ps6*
*Low speed torque ** / ****	58 / 48.6	*N.m*	M_0
*Low speed S6 torque **/****	100 / 83.8	*N.m*	M_0S6
Base speed (S1)	10400	*rpm*	*Nb*
*Max speed *****	24000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	$\hat{U}$
Permanent current at low speed	123	*Arms*	I_0
S6 current at low speed	227	*Arms*	I_0S6
*Winding resistance(25°C) **	0.0522	*Ω*	*Rb*
Rotor inertia	0.0186	*kg.m²*	*J*
Thermal time constant	2.4	*min*	*Tth*
Motor mass	115	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	11	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

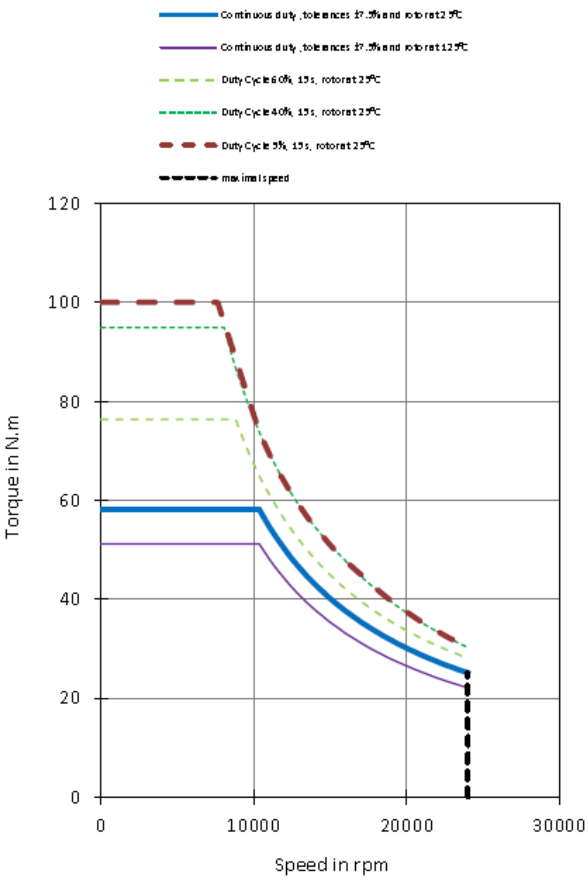
*** minimum value with rotor at 125°C

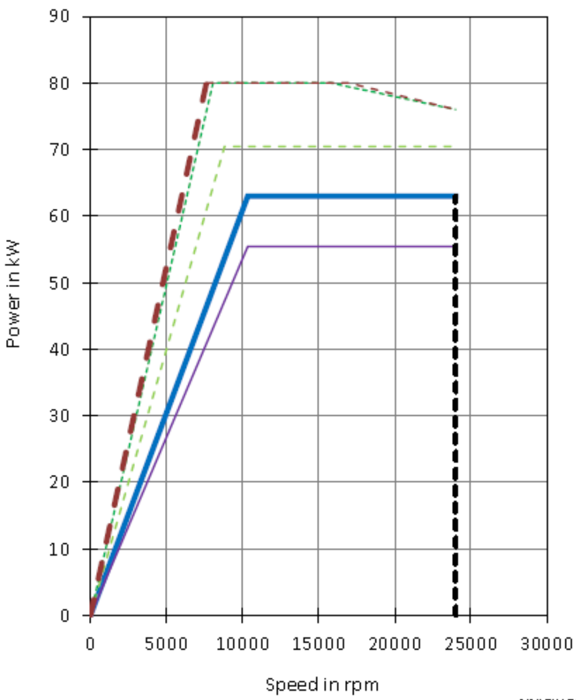
**** Speed limit due to the bearings:

Steel bearings limited to = 14300 rpm

Hybrid bearings limited to = 18000 rpm

X LIFE bearings limited to = 24000 rpm





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High speed brushless motor

MGV840CAD

ELECTRONIC DRIVE

DRIVE 124/228 - 400

Main characteristics

S1 power **/***	63 / 52.8	kW	Ps1
S6 power **/***	80 / 67	kW	Ps6
Low speed torque ** / ***	58 / 48.6	N.m	M_0
Low speed S6 torque **/***	100 / 83.8	N.m	M_0 S6
Base speed (S1)	10400	rpm	Nb
Max speed ****	24000	rpm	Nmax
DC voltage supply when motor is loaded	540	Vdc	Û
Permanent current at low speed	123	Arms	I_0
S6 current at low speed	227	Arms	I_0 S6

Mechanical parameters

Rotor inertia	0.0186	kg.m²	J
Motor mass	115	kg	M
Maximum speed with steel bearings	14300	rpm	N_1
Maximum speed with hybrid bearings	18000	rpm	N_2
Maximum speed with X LIFE bearings	24000	rpm	N_3
Maximum speed with Drive	24000	rpm	Nmax
Maximum mechanical speed	24000	rpm	Nmec

Electrical parameters

Number of poles	6		
Winding resistance (25°C) *	0.0522	Ω	Rb
Back EMF voltage phase to phase / 1000 rpm	28.3	Vrms / 1000 rpm	ke
Back EMF voltage phase to phase / (rad/s)	0.27	Vrms / (rad/s)	ku
Torque constant	0.472	N.m / Arms	Kt
Short circuit current	130	Arms	Icc
Inductance Lq phase to phase (Back EMF voltage axis) *	0.96	mH	Lq
Inductance Ld phase to phase *	0.8	mH	Ld
Optimal phasing at permanent current	20	electrical degree	ψo
Optimal phasing at S6 current	20	electrical degree	ψm

Thermal parameters

Motor thermal resistance	0.0391	K/W	Rth
Motor thermal time constant	2.4	min	Tth
Winding thermal time constant	0.64	min	Tth w
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	11	l/min	Wf
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

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3.2.8. MGV840CAD Detailed Data with AC890

High speed brushless motor

MGV840CAD

ELECTRONIC DRIVE

890SD-433105F

*S1 power **/****	63 / 52.8	*kW*	*Ps1*
*S6 power **/****	64 / 53.6	*kW*	*Ps6*
*Low speed torque ** / ****	58 / 48.6	*N.m*	M_0
*Low speed S6 torque **/****	59.5 / 49.9	*N.m*	M_0S6
Base speed (S1)	10400	*rpm*	*Nb*
*Max speed *****	20000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	123	*Arms*	I_0
S6 current at low speed	126	*Arms*	I_0S6
*Winding resistance(25°C) **	0.0522	*Ω*	*Rb*
Rotor inertia	0.0186	*kg.m²*	*J*
Thermal time constant	2.4	*min*	*Tth*
Motor mass	115	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	11	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

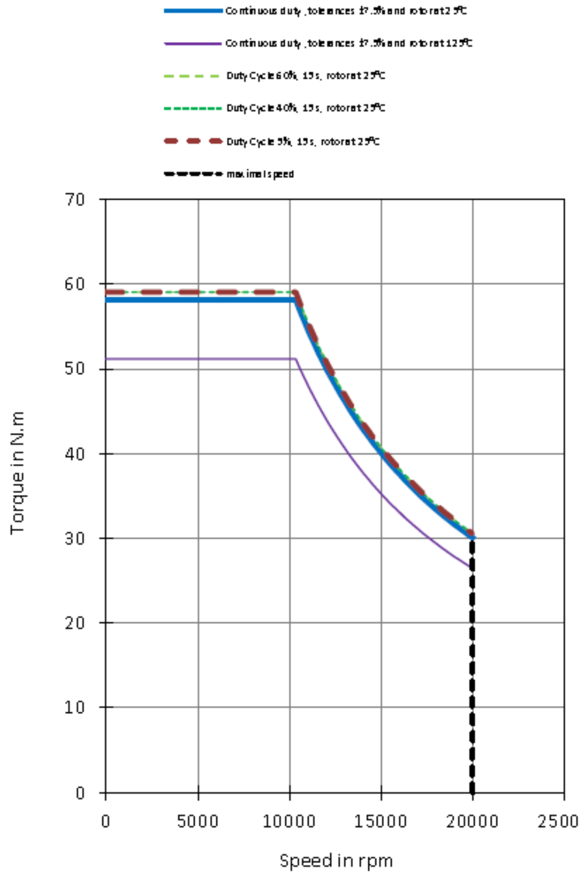
*** minimum value with rotor at 125°C

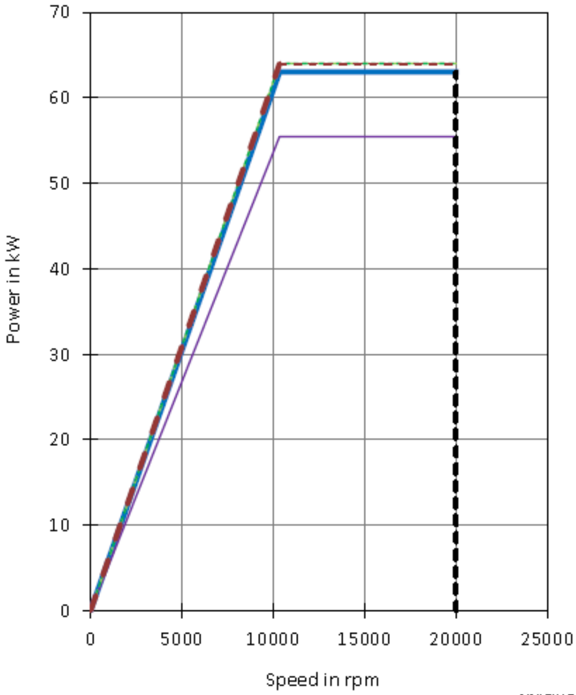
**** Speed limit due to the bearings:

Steel bearings limited to = 14300 rpm

Hybrid bearings limited to = 18000 rpm

X LIFE bearings limited to = 24000 rpm





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High speed brushless motor

MGV840CAD

ELECTRONIC DRIVE

890SD-433105F

Main characteristics

S1 power **/***	63 / 52.8	kW	Ps1
S6 power **/***	64 / 53.6	kW	Ps6
Low speed torque ** / ***	58 / 48.6	N.m	M_0
Low speed S6 torque **/***	59.5 / 49.9	N.m	$M_0 S6$
Base speed (S1)	10400	rpm	Nb
Max speed ****	20000	rpm	Nmax
DC voltage supply when motor is loaded	540	Vdc	Û
Permanent current at low speed	123	Arms	I_0
S6 current at low speed	126	Arms	$I_0 S6$

Mechanical parameters

Rotor inertia	0.0186	$kg.m^2$	J
Motor mass	115	kg	M
Maximum speed with steel bearings	14300	rpm	N_1
Maximum speed with hybrid bearings	18000	rpm	N_2
Maximum speed with X LIFE bearings	24000	rpm	N_3
Maximum speed with Drive	20000	rpm	Nmax
Maximum mechanical speed	24000	rpm	Nmec

Electrical parameters

Number of poles	6		
Winding resistance (25°C) *	0.0522	Ω	Rb
Back EMF voltage phase to phase / 1000 rpm	28.3	Vrms / 1000 rpm	ke
Back EMF voltage phase to phase / (rad/s)	0.27	Vrms / (rad/s)	ku
Torque constant	0.472	N.m / Arms	Kt
Short circuit current	130	Arms	Icc
Inductance Lq phase to phase (Back EMF voltage axis) *	0.96	mH	Lq
Inductance Ld phase to phase *	0.8	mH	Ld
Optimal phasing at permanent current	20	electrical degree	ψo
Optimal phasing at S6 current	20	electrical degree	ψm

Thermal parameters

Motor thermal resistance	0.0391	K/W	Rth
Motor thermal time constant	2.4	min	Tth
Winding thermal time constant	0.64	min	Tth w
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	11	l/min	Wf
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

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3.2.9. MGV860CBD Detailed Intrinsic Data

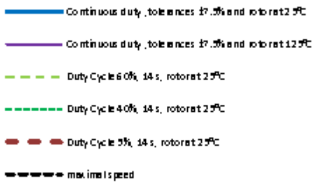
High speed brushless motor
MGV860CBD
ELECTRONIC DRIVE
DRIVE 231/405 - 400

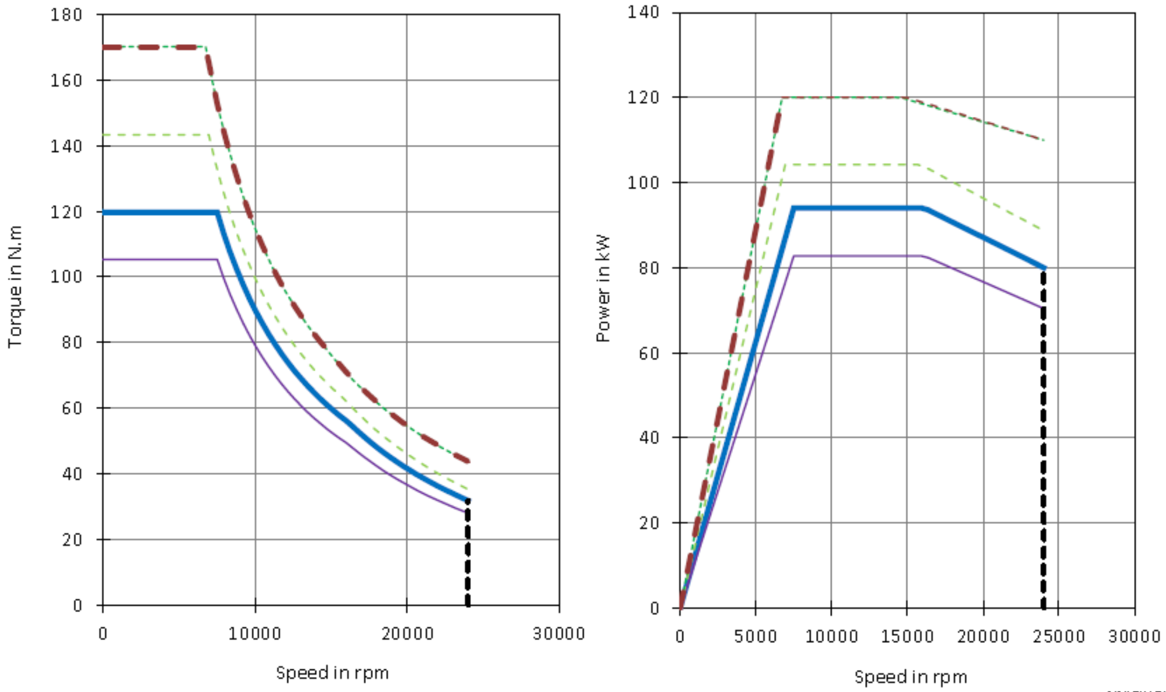
/ Need protection module

*S1 power **/****	94 / 76.3	kW	Ps1
*S6 power **/****	120 / 97.4	kW	Ps6
*Low speed torque ** / ****	120 / 97.4	N.m	M_0
*Low speed S6 torque **/****	170 / 138	N.m	M_0S6
Base speed (S1)	7500	rpm	Nb
*Max speed *****	24000	rpm	Nmax
DC voltage supply when motor is loaded	540	Vdc	Û
Permanent current at low speed	136	Arms	I_0
S6 current at low speed	202	Arms	I_0S6
*Winding resistance(25°C) **	0.0717	Ω	Rb
Rotor inertia	0.0264	$kg.m^2$	J
Thermal time constant	2.4	min	Tth
Motor mass	135	kg	M
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	17	l/min	Wf

All data are given in typical values under standard conditions

* Phase to phase
** Tolerances ± 7.5% and rotor at 25°C
*** minimum value with rotor at 125°C
**** Speed limit due to the bearings:
Steel bearings limited to = 14300 rpm
Hybrid bearings limited to = 18000 rpm
X LIFE bearings limited to = 24000 rpm





FICH ELV-012

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High speed brushless motor

MGV860CBD

ELECTRONIC DRIVE

DRIVE 231/405 - 400

Main characteristics

*S1 power **/****	94 / 76.3	*kW*	*Ps1*
*S6 power **/****	120 / 97.4	*kW*	*Ps6*
*Low speed torque ** / ****	120 / 97.4	*N.m*	M_0
*Low speed S6 torque **/****	170 / 138	*N.m*	$M_0 S6$
Base speed (S1)	7500	*rpm*	*Nb*
*Max speed *****	24000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	136	*Arms*	I_0
S6 current at low speed	202	*Arms*	$I_0 S6$

Mechanical parameters

Rotor inertia	0.0264	*kg.m²*	*J*
Motor mass	135	*kg*	*M*
Maximum speed with steel bearings	14300	*rpm*	N_1
Maximum speed with hybrid bearings	18000	*rpm*	N_2
Maximum speed with X LIFE bearings	24000	*rpm*	N_3
Maximum speed with Drive	24000	*rpm*	*Nmax*
Maximum mechanical speed	24000	*rpm*	*Nmec*

Electrical parameters

Number of poles	6		
*Winding resistance (25°C) **	0.0717	*Ω*	*Rb*
Back EMF voltage phase to phase / 1000 rpm	54.3	*Vrms / 1000 rpm*	*ke*
Back EMF voltage phase to phase / (rad/s)	0.519	*Vrms / (rad/s)*	*ku*
Torque constant	0.882	*N.m / Arms*	*Kt*
Short circuit current	177	*Arms*	*Icc*
*Inductance Lq phase to phase (Back EMF voltage axis) **	1.31	*mH*	*Lq*
*Inductance Ld phase to phase **	1.13	*mH*	*Ld*
Optimal phasing at permanent current	20	*electrical degree*	ψo
Optimal phasing at S6 current	20	*electrical degree*	ψm

Thermal parameters

Motor thermal resistance	0.0261	*K/W*	*Rth*
Motor thermal time constant	2.4	*min*	*Tth*
Winding thermal time constant	0.59	*min*	*Tth w*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	17	*l/min*	*Wf*
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

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3.2.10. MGV860CBD Detailed Data with AC890

High speed brushless motor

MGV860CBD

ELECTRONIC DRIVE

890PXSA-43215M

/ Need protection module

*S1 power **/****	94 / 76.3	*kW*	*Ps1*
*S6 power **/****	100 / 81.2	*kW*	*Ps6*
*Low speed torque ** / ****	120 / 97.4	*N.m*	M_0
*Low speed S6 torque **/****	161 / 131	*N.m*	M_0S6
Base speed (S1)	7500	*rpm*	*Nb*
*Max speed *****	20000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	$\hat{U}$
Permanent current at low speed	136	*Arms*	I_0
S6 current at low speed	189	*Arms*	I_0S6
*Winding resistance(25°C) **	0.0717	*Ω*	*Rb*
Rotor inertia	0.0264	$kg.m^2$	*J*
Thermal time constant	2.4	*min*	*Tth*
Motor mass	135	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	17	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

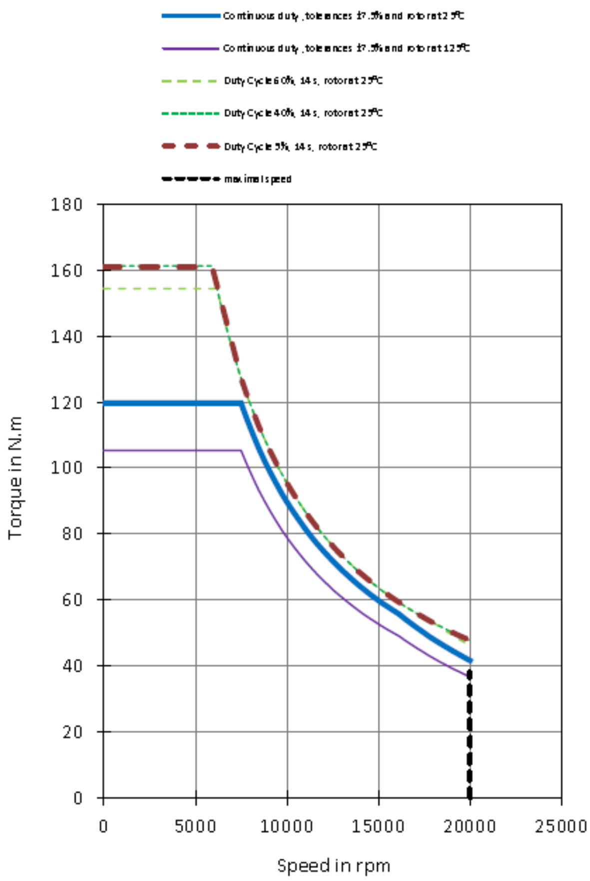
*** minimum value with rotor at 125°C

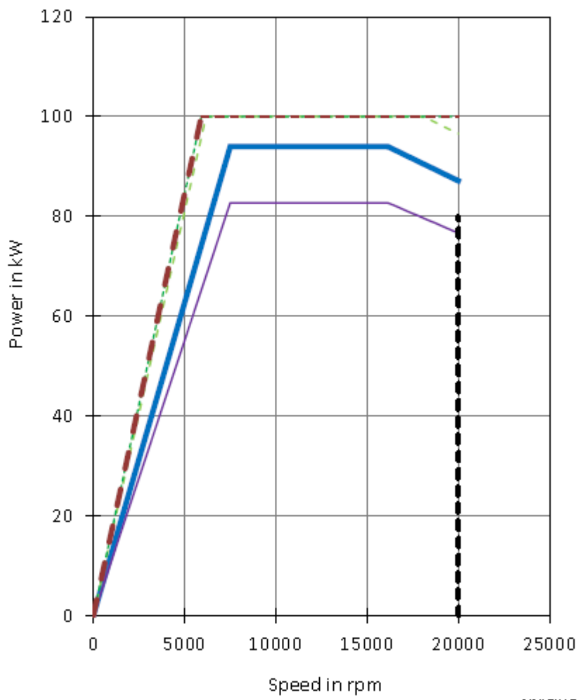
**** Speed limit due to the bearings:

Steel bearings limited to = 14300 rpm

Hybrid bearings limited to = 18000 rpm

X LIFE bearings limited to = 24000 rpm





FICH ELV-012

Creation : 5 / 4 / 2016 **Edition : 12 / 1 / 2017** **Indice a**

High speed brushless motor

MGV860CBD

ELECTRONIC DRIVE

890PXSA-43215M

Main characteristics

S1 power **/***	94 / 76.3	kW	Ps1
S6 power **/***	100 / 81.2	kW	Ps6
Low speed torque ** / ***	120 / 97.4	N.m	M_0
Low speed S6 torque **/***	161 / 131	N.m	M_0S6
Base speed (S1)	7500	rpm	Nb
Max speed ****	20000	rpm	Nmax
DC voltage supply when motor is loaded	540	Vdc	Û
Permanent current at low speed	136	Arms	I_0
S6 current at low speed	189	Arms	I_0S6

Mechanical parameters

Rotor inertia	0.0264	kg.m²	J
Motor mass	135	kg	M
Maximum speed with steel bearings	14300	rpm	N_1
Maximum speed with hybrid bearings	18000	rpm	N_2
Maximum speed with X LIFE bearings	24000	rpm	N_3
Maximum speed with Drive	20000	rpm	Nmax
Maximum mechanical speed	24000	rpm	Nmec

Electrical parameters

Number of poles	6		
Winding resistance (25°C) *	0.0717	Ω	Rb
Back EMF voltage phase to phase / 1000 rpm	54.3	Vrms / 1000 rpm	ke
Back EMF voltage phase to phase / (rad/s)	0.519	Vrms / (rad/s)	ku
Torque constant	0.882	N.m / Arms	Kt
Short circuit current	177	Arms	Icc
Inductance Lq phase to phase (Back EMF voltage axis) *	1.31	mH	Lq
Inductance Ld phase to phase *	1.13	mH	Ld
Optimal phasing at permanent current	20	electrical degree	ψo
Optimal phasing at S6 current	20	electrical degree	ψm

Thermal parameters

Motor thermal resistance	0.0261	K/W	Rth
Motor thermal time constant	2.4	min	Tth
Winding thermal time constant	0.59	min	Tthw
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	17	l/min	Wf
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016 **Edition : 12 / 1 / 2017** **MGV860CBD** **Indice a**

3.2.11. MGV950CAX Detailed Intrinsic Data

High speed brushless motor

MGV950CAX

ELECTRONIC DRIVE

DRIVE 455/822 - 400

*S1 power **/****	175 / 143	*kW*	*Ps1*
*S6 power **/****	225 / 183	*kW*	*Ps6*
*Low speed torque ** / ****	200 / 163	*N.m*	M_0
*Low speed S6 torque **/****	300 / 244	*N.m*	$M_0 S6$
Base speed (S1)	8350	*rpm*	*Nb*
*Max speed *****	20000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	$\hat{U}$
Permanent current at low speed	454	*Arms*	I_0
S6 current at low speed	821	*Arms*	$I_0 S6$
*Winding resistance(25°C) **	0.00747	*Ω*	*Rb*
Rotor inertia	0.063	$kg.m^2$	*J*
Thermal time constant	3.2	*min*	*Tth*
Motor mass	270	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	18	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

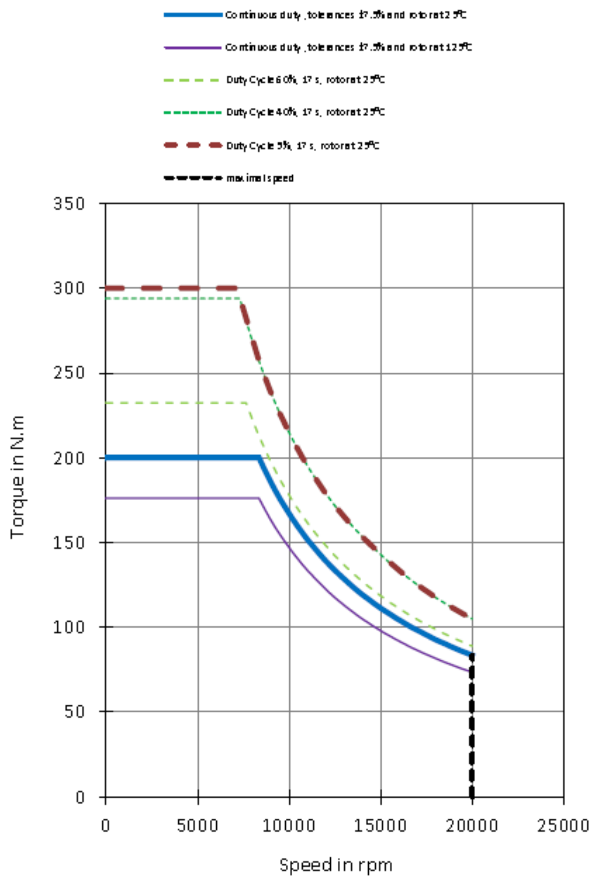
*** minimum value with rotor at 125°C

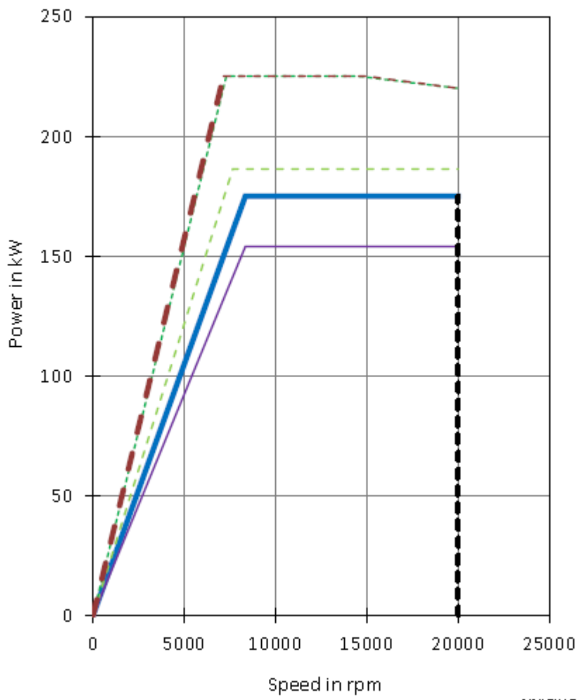
**** Speed limit due to the bearings:

Steel bearings limited to = 11700 rpm

Hybrid bearings limited to = 16000 rpm

X LIFE bearings limited to = 20000 rpm





FICH ELV-012

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High speed brushless motor

MGV950CAX

ELECTRONIC DRIVE

DRIVE 455/822 - 400

Main characteristics

S1 power **/***	175 / 143	kW	Ps1
S6 power **/***	225 / 183	kW	Ps6
Low speed torque ** / ***	200 / 163	N.m	M_0
Low speed S6 torque **/***	300 / 244	N.m	M_0 S6
Base speed (S1)	8350	rpm	Nb
Max speed ****	20000	rpm	Nmax
DC voltage supply when motor is loaded	540	Vdc	Û
Permanent current at low speed	454	Arms	I_0
S6 current at low speed	821	Arms	I_0 S6

Mechanical parameters

Rotor inertia	0.063	kg.m²	J
Motor mass	270	kg	M
Maximum speed with steel bearings	11700	rpm	N_1
Maximum speed with hybrid bearings	16000	rpm	N_2
Maximum speed with X LIFE bearings	20000	rpm	N_3
Maximum speed with Drive	20000	rpm	Nmax
Maximum mechanical speed	20000	rpm	Nmec

Electrical parameters

Number of poles	6		
Winding resistance (25°C) *	0.00747	Ω	Rb
Back EMF voltage phase to phase / 1000 rpm	27.8	Vrms / 1000 rpm	ke
Back EMF voltage phase to phase / (rad/s)	0.265	Vrms / (rad/s)	ku
Torque constant	0.441	N.m / Arms	Kt
Short circuit current	368	Arms	Icc
Inductance Lq phase to phase (Back EMF voltage axis) *	0.294	mH	Lq
Inductance Ld phase to phase *	0.278	mH	Ld
Optimal phasing at permanent current	20	electrical degree	ψo
Optimal phasing at S6 current	30	electrical degree	ψm

Thermal parameters

Motor thermal resistance	0.0137	K/W	Rth
Motor thermal time constant	3.2	min	Tth
Winding thermal time constant	0.74	min	Tth w
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	18	l/min	Wf
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

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3.2.12. MGV950CAX Detailed Data with AC890

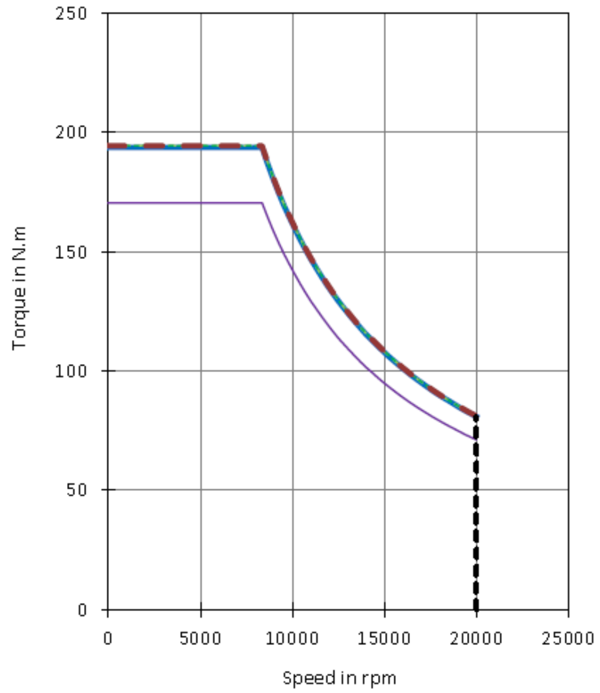
High speed brushless motor
MGV950CAX
ELECTRONIC DRIVE
890PXSA-43480M

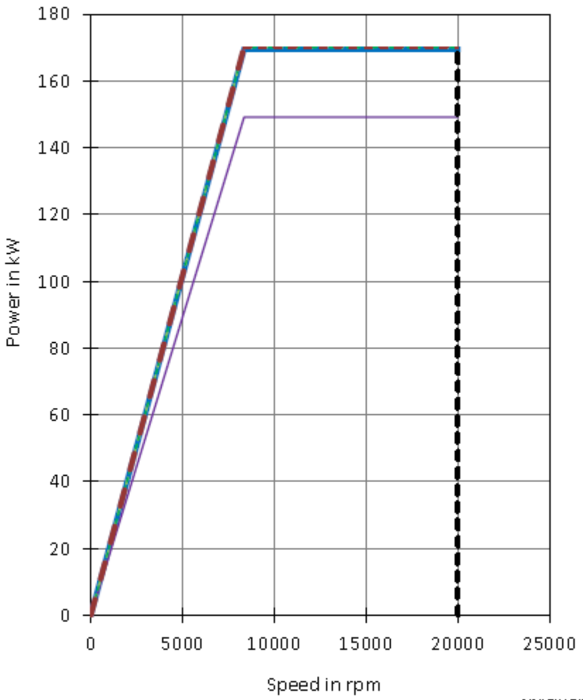
*S1 power **/****	169 / 138	*kW*	*Ps1*
*S6 power **/****	170 / 139	*kW*	*Ps6*
*Low speed torque ** / ****	193 / 158	*N.m*	M_0
*Low speed S6 torque **/****	195 / 159	*N.m*	$M_0 S6$
Base speed (S1)	8350	*rpm*	*Nb*
*Max speed *****	20000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	435	*Arms*	I_0
S6 current at low speed	440	*Arms*	$I_0 S6$
*Winding resistance(25°C) **	0.00747	*Ω*	*Rb*
Rotor inertia	0.063	*kg.m²*	*J*
Thermal time constant	3.2	*min*	*Tth*
Motor mass	270	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	18	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase
** Tolerances ± 7.5% and rotor at 25°C
*** minimum value with rotor at 125°C
**** Speed limit due to the bearings:
Steel bearings limited to = 11700 rpm
Hybrid bearings limited to = 16000 rpm
X LIFE bearings limited to = 20000 rpm

Continuous duty, tolerances ±7.5% and rotor at 25°C
Continuous duty, tolerances ±7.5% and rotor at 125°C
Duty Cycle 60%, 17 s, rotor at 25°C
Duty Cycle 40%, 17 s, rotor at 25°C
Duty Cycle 5%, 17 s, rotor at 25°C
maximal speed





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High speed brushless motor

MGV950CAX

ELECTRONIC DRIVE

890PXSA-43480M

Main characteristics

*S1 power **/****	169 / 138	*kW*	*Ps1*
*S6 power **/****	170 / 139	*kW*	*Ps6*
*Low speed torque ** / ****	193 / 158	*N.m*	M_0
*Low speed S6 torque **/****	195 / 159	*N.m*	$M_0 S6$
Base speed (S1)	8350	*rpm*	*Nb*
*Max speed *****	20000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	435	*Arms*	I_0
S6 current at low speed	440	*Arms*	$I_0 S6$

Mechanical parameters

Rotor inertia	0.063	$kg.m^2$	*J*
Motor mass	270	*kg*	*M*
Maximum speed with steel bearings	11700	*rpm*	N_1
Maximum speed with hybrid bearings	16000	*rpm*	N_2
Maximum speed with X LIFE bearings	20000	*rpm*	N_3
Maximum speed with Drive	20000	*rpm*	*Nmax*
Maximum mechanical speed	20000	*rpm*	*Nmec*

Electrical parameters

Number of poles	6		
*Winding resistance (25°C) **	0.00747	*Ω*	*Rb*
Back EMF voltage phase to phase / 1000 rpm	27.8	*Vrms / 1000 rpm*	*ke*
Back EMF voltage phase to phase / (rad/s)	0.265	*Vrms / (rad/s)*	*ku*
Torque constant	0.444	*N.m / Arms*	*Kt*
Short circuit current	368	*Arms*	*Icc*
*Inductance Lq phase to phase (Back EMF voltage axis) **	0.294	*mH*	*Lq*
*Inductance Ld phase to phase **	0.278	*mH*	*Ld*
Optimal phasing at permanent current	20	*electrical degree*	ψo
Optimal phasing at S6 current	20	*electrical degree*	ψm

Thermal parameters

Motor thermal resistance	0.0137	*K/W*	*Rth*
Motor thermal time constant	3.2	*min*	*Tth*
Winding thermal time constant	0.74	*min*	*Tthw*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	18	*l/min*	*Wf*
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016 **Edition : 12 / 1 / 2017** **MGV950CAX** **Indice e**

3.2.13. MGV966DAX Detailed Intrinsic Data

High speed brushless motor

MGV966DAX

ELECTRONIC DRIVE

Drive 506/983 - 400

*S1 power **/****	250 / 203	*kW*	*Ps1*
*S6 power **/****	380 / 309	*kW*	*Ps6*
*Low speed torque ** / ****	520 / 422	*N.m*	M_0
*Low speed S6 torque **/****	900 / 731	*N.m*	M_0S6
Base speed (S1)	4600	*rpm*	*Nb*
*Max speed *****	8000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	505	*Arms*	I_0
S6 current at low speed	982	*Arms*	I_0S6
*Winding resistance(25°C) **	0.0135	*Ω*	*Rb*
Rotor inertia	0.076	$kg.m^2$	*J*
Thermal time constant	3	*min*	*Tth*
Motor mass	300	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	28	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

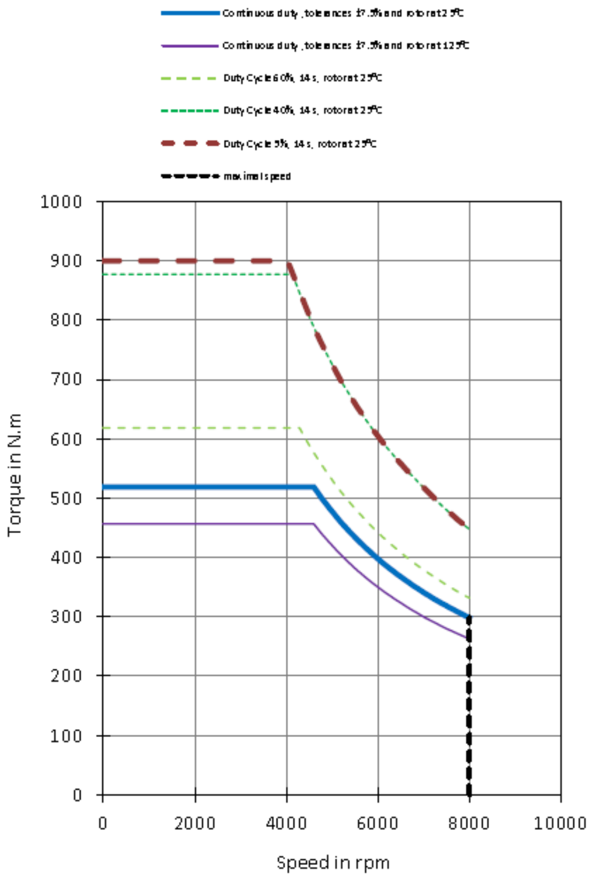
*** minimum value with rotor at 125°C

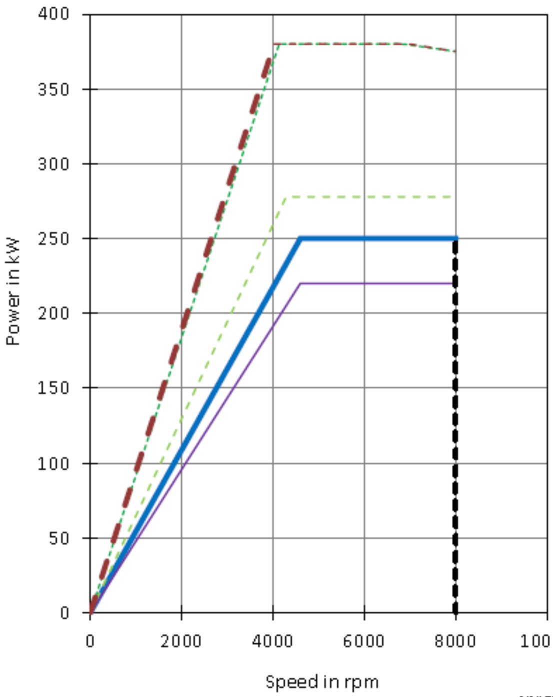
**** Speed limit due to the bearings:

Steel bearings limited to = 7000 rpm

Hybrid bearings limited to = ./. rpm

X LIFE bearings limited to = 8000 rpm





FICH ELV-012

Creation : 5 / 4 / 2016	**Edition : 12 / 1 / 2017**	**Indice d**

High speed brushless motor

MGV966DAX

ELECTRONIC DRIVE

Drive 506/983 - 400

Main characteristics

S1 power **/***	250 / 203	kW	Ps1
S6 power **/***	380 / 309	kW	Ps6
Low speed torque ** / ***	520 / 422	N.m	M_0
Low speed S6 torque **/***	900 / 731	N.m	M_0 S6
Base speed (S1)	4600	rpm	Nb
Max speed ****	8000	rpm	Nmax
DC voltage supply when motor is loaded	540	Vdc	Û
Permanent current at low speed	505	Arms	I_0
S6 current at low speed	982	Arms	I_0 S6

Mechanical parameters

Rotor inertia	0.076	kg.m²	J
Motor mass	300	kg	M
Maximum speed with steel bearings	7000	rpm	N_1
Maximum speed with hybrid bearings	-	rpm	N_2
Maximum speed with X LIFE bearings	8000	rpm	N_3
Maximum speed with Drive	8000	rpm	Nmax
Maximum mechanical speed	8000	rpm	Nmec

Electrical parameters

Number of poles	8		
Winding resistance (25°C) *	0.0135	Ω	Rb
Back EMF voltage phase to phase / 1000 rpm	64.1	Vrms / 1000 rpm	ke
Back EMF voltage phase to phase / (rad/s)	0.612	Vrms / (rad/s)	ku
Torque constant	1.03	N.m / Arms	Kt
Short circuit current	665	Arms	Icc
Inductance Lq phase to phase (Back EMF voltage axis) *	0.299	mH	Lq
Inductance Ld phase to phase *	0.266	mH	Ld
Optimal phasing at permanent current	15	electrical degree	ψo
Optimal phasing at S6 current	20	electrical degree	ψm

Thermal parameters

Motor thermal resistance	0.0099	K/W	Rth
Motor thermal time constant	3	min	Tth
Winding thermal time constant	0.62	min	Tth w
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	28	l/min	Wf
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016	Edition : 12 / 1 / 2017	MGV966DAX	Indice d

3.2.14. MGV966DAX Detailed Data with AC890

High speed brushless motor

MGV966DAX

ELECTRONIC DRIVE

890PXSA-43580M

Parker

*S1 power **/****	250 / 193	*kW*	*Ps1*
*S6 power **/****	270 / 208	*kW*	*Ps6*
*Low speed torque ** / ****	520 / 400	*N.m*	M_0
*Low speed S6 torque **/****	535 / 412	*N.m*	M_0S6
Base speed (S1)	4600	*rpm*	*Nb*
*Max speed *****	8000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	505	*Arms*	I_0
S6 current at low speed	520	*Arms*	I_0S6
*Winding resistance(25°C) **	0.0135	*Ω*	*Rb*
Rotor inertia	0.076	$kg.m^2$	*J*
Thermal time constant	3	*min*	*Tth*
Motor mass	300	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	28	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

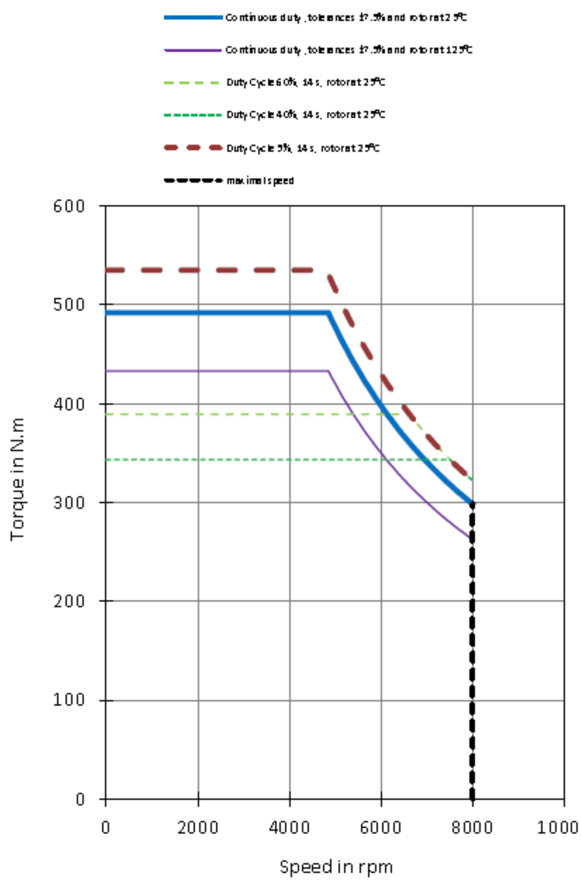
*** minimum value with rotor at 125°C

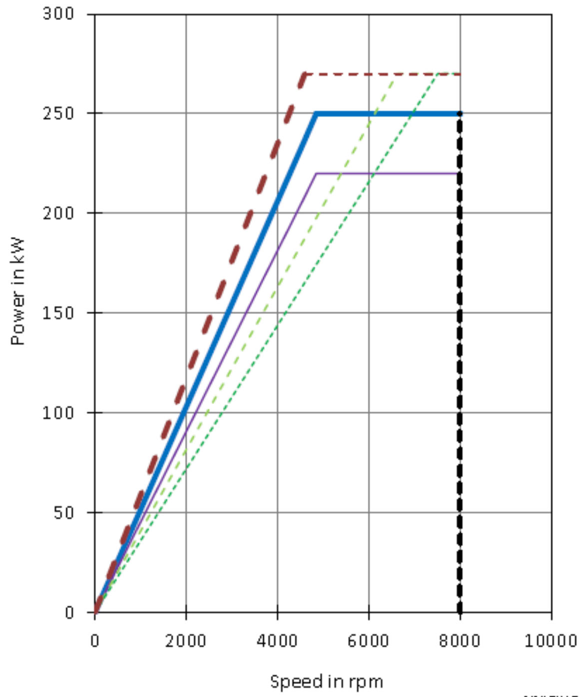
**** Speed limit due to the bearings:

Steel bearings limited to = 7000 rpm

Hybrid bearings limited to = ./. rpm

X LIFE bearings limited to = 8000 rpm





FICH ELV-012

Creation : 5 / 4 / 2016 **Edition : 12 / 1 / 2017** **Indice d**

High speed brushless motor

MGV966DAX

ELECTRONIC DRIVE

890PXSA-43580M

Main characteristics

*S1 power **/****	250 / 193	*kW*	*Ps1*
*S6 power **/****	270 / 208	*kW*	*Ps6*
*Low speed torque ** / ****	520 / 400	*N.m*	M_0
*Low speed S6 torque **/****	535 / 412	*N.m*	M_0 *S6*
Base speed (S1)	4600	*rpm*	*Nb*
*Max speed *****	8000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	505	*Arms*	I_0
S6 current at low speed	520	*Arms*	I_0 *S6*

Mechanical parameters

Rotor inertia	0.076	$kg.m^2$	*J*
Motor mass	300	*kg*	*M*
Maximum speed with steel bearings	7000	*rpm*	N_1
Maximum speed with hybrid bearings	-	*rpm*	N_2
Maximum speed with X LIFE bearings	8000	*rpm*	N_3
Maximum speed with Drive	8000	*rpm*	*Nmax*
Maximum mechanical speed	8000	*rpm*	*Nmec*

Electrical parameters

Number of poles	8		
*Winding resistance (25°C) **	0.0135	*Ω*	*Rb*
Back EMF voltage phase to phase / 1000 rpm	64.1	*Vrms / 1000 rpm*	*ke*
Back EMF voltage phase to phase / (rad/s)	0.612	*Vrms / (rad/s)*	*ku*
Torque constant	1.03	*N.m / Arms*	*Kt*
Short circuit current	665	*Arms*	*Icc*
*Inductance Lq phase to phase (Back EMF voltage axis) **	0.299	*mH*	*Lq*
*Inductance Ld phase to phase **	0.266	*mH*	*Ld*
Optimal phasing at permanent current	15	*electrical degree*	ψo
Optimal phasing at S6 current	15	*electrical degree*	ψm

Thermal parameters

Motor thermal resistance	0.0099	*K/W*	*Rth*
Motor thermal time constant	3	*min*	*Tth*
Winding thermal time constant	0.62	*min*	*Tth w*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	28	*l/min*	*Wf*
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016	Edition : 12 / 1 / 2017	MGV966DAX	Indice d

3.2.15. MGVA50DAX Detailed Intrinsic Data

High speed brushless motor

MGVA50DAX

ELECTRONIC DRIVE

DRIVE 559/799 - 400

*S1 power **/****	259 / 217	*kW*	*Ps1*
*S6 power **/****	310 / 260	*kW*	*Ps6*
*Low speed torque ** / ****	440 / 369	*N.m*	M_0
*Low speed S6 torque **/****	600 / 503	*N.m*	M_0S6
Base speed (S1)	5600	*rpm*	*Nb*
*Max speed *****	12000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	$\hat{U}$
Permanent current at low speed	558	*Arms*	I_0
S6 current at low speed	798	*Arms*	I_0S6
*Winding resistance(25°C) **	0.00884	*Ω*	*Rb*
Rotor inertia	0.292	$kg.m^2$	*J*
Thermal time constant	4	*min*	*Tth*
Motor mass	395	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	28	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

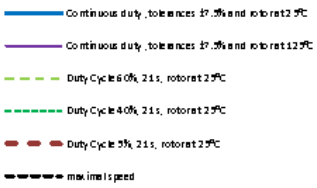
*** minimum value with rotor at 125°C

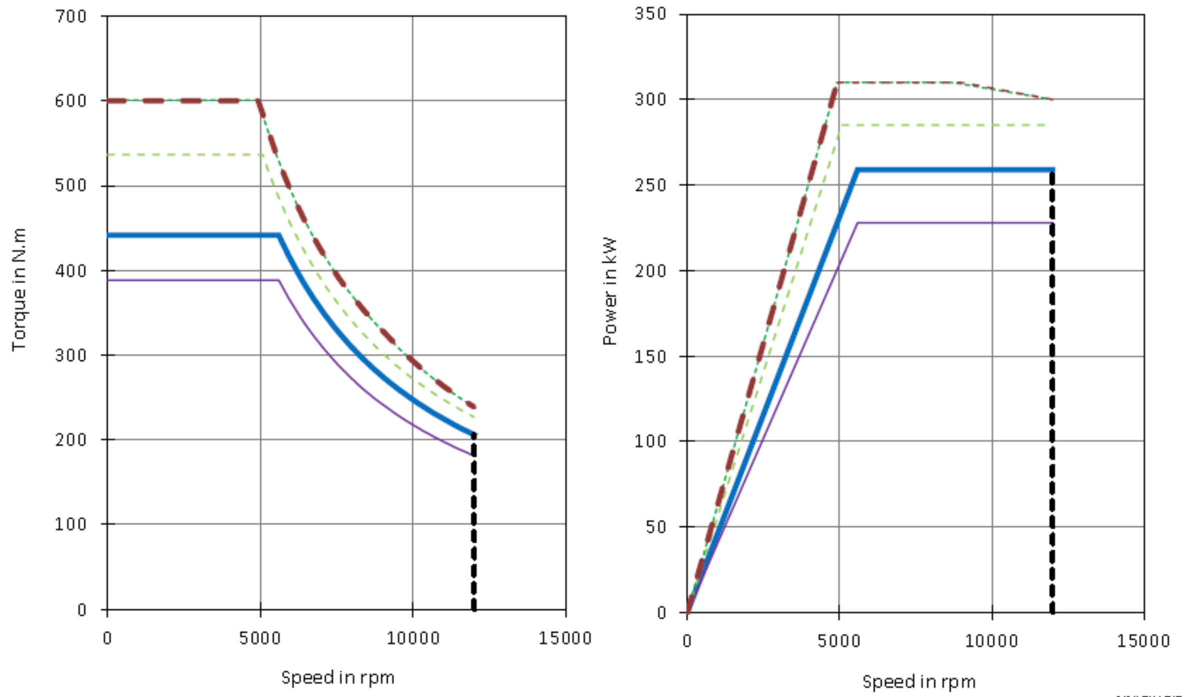
**** Speed limit due to the bearings:

Steel bearings limited to = 9200 rpm

Hybrid bearings limited to = 12000 rpm

X LIFE bearings limited to = ./. rpm





FICH ELV-012

Creation : 5 / 4 / 2016	Edition : 12 / 1 / 2017	Indice a

High speed brushless motor

MGVA50DAX

ELECTRONIC DRIVE

DRIVE 559/799 - 400

Main characteristics

*S1 power **/****	259 / 217	*kW*	*Ps1*
*S6 power **/****	310 / 260	*kW*	*Ps6*
*Low speed torque ** / ****	440 / 369	*N.m*	M_o
*Low speed S6 torque **/****	600 / 503	*N.m*	$M_o S6$
Base speed (S1)	5600	*rpm*	*Nb*
*Max speed *****	12000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	558	*Arms*	I_o
S6 current at low speed	798	*Arms*	$I_o S6$

Mechanical parameters

Rotor inertia	0.292	*kg.m²*	*J*
Motor mass	395	*kg*	*M*
Maximum speed with steel bearings	9200	*rpm*	N_1
Maximum speed with hybrid bearings	12000	*rpm*	N_2
Maximum speed with X LIFE bearings	-	*rpm*	N_3
Maximum speed with Drive	12000	*rpm*	*Nmax*
Maximum mechanical speed	13000	*rpm*	*Nmec*

Electrical parameters

Number of poles	8		
*Winding resistance (25°C) **	0.00884	*Ω*	*Rb*
Back EMF voltage phase to phase / 1000 rpm	50.9	*Vrms / 1000 rpm*	*ke*
Back EMF voltage phase to phase / (rad/s)	0.486	*Vrms / (rad/s)*	*ku*
Torque constant	0.789	*N.m / Arms*	*Kt*
Short circuit current	520	*Arms*	*Icc*
*Inductance Lq phase to phase (Back EMF voltage axis) **	0.272	*mH*	*Lq*
*Inductance Ld phase to phase **	0.27	*mH*	*Ld*
Optimal phasing at permanent current	20	*electrical degree*	ψo
Optimal phasing at S6 current	20	*electrical degree*	ψm

Thermal parameters

Motor thermal resistance	0.01055	*K/W*	*Rth*
Motor thermal time constant	4	*min*	*Tth*
Winding thermal time constant	0.92	*min*	*Tthw*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	28	*l/min*	*Wf*
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016 **Edition : 12 / 1 / 2017** **MGVA50DAX** **Indice a**

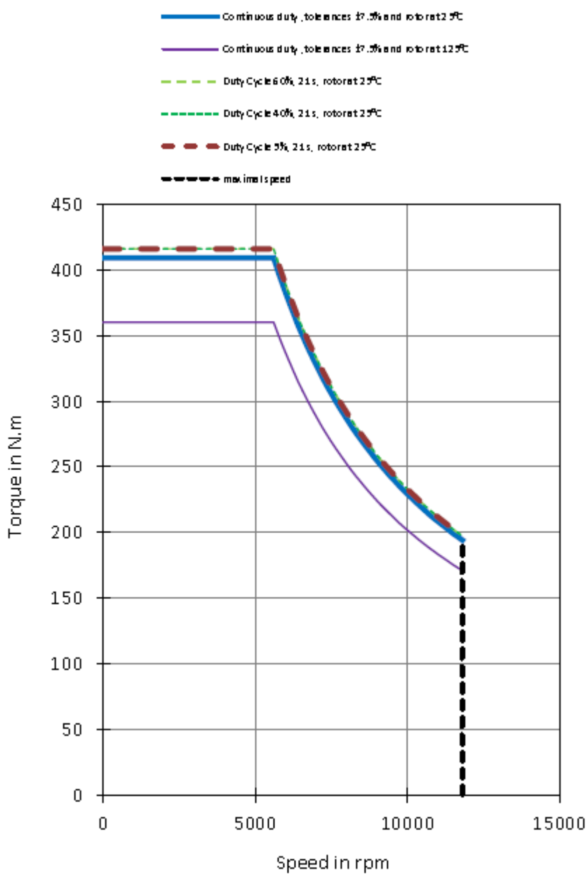
3.2.16. MGVA50DAX Detailed Data with AC890

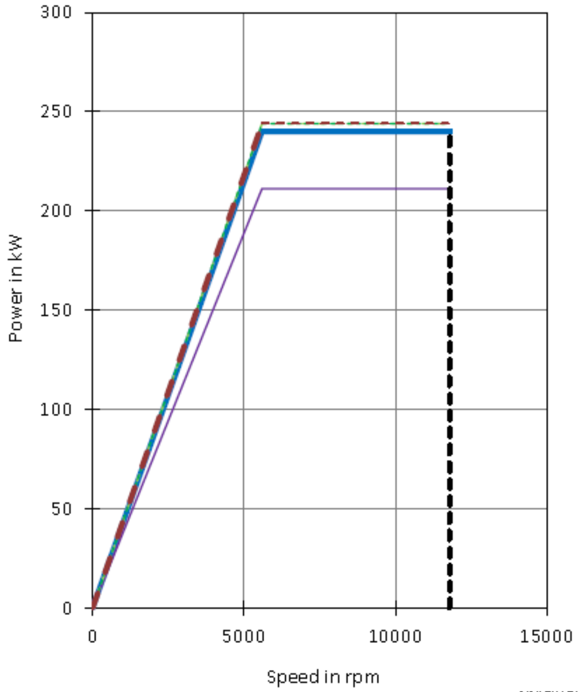
High speed brushless motor
MGVA50DAX
ELECTRONIC DRIVE
890PXSA-43580M

*S1 power **/****	240 / 199	*kW*	*Ps1*
*S6 power **/****	244 / 203	*kW*	*Ps6*
*Low speed torque ** / ****	412 / 342	*N.m*	M_0
*Low speed S6 torque **/****	416 / 345	*N.m*	M_0*S6*
Base speed (S1)	5600	*rpm*	*Nb*
*Max speed *****	11800	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	519	*Arms*	I_0
S6 current at low speed	525	*Arms*	I_0*S6*
*Winding resistance(25°C) **	0.00884	*Ω*	*Rb*
Rotor inertia	0.292	$kg.m^2$	*J*
Thermal time constant	4	*min*	*Tth*
Motor mass	395	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	28	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase
** Tolerances ± 7.5% and rotor at 25°C
*** minimum value with rotor at 125°C
**** Speed limit due to the bearings:
Steel bearings limited to = 9200 rpm
Hybrid bearings limited to = 12000 rpm
X LIFE bearings limited to = ./. rpm





FICH ELV-012

High speed brushless motor

MGVA50DAX

ELECTRONIC DRIVE

890PXSA-43580M

Main characteristics

*S1 power **/****	240 / 199	*kW*	*Ps1*
*S6 power **/****	244 / 203	*kW*	*Ps6*
*Low speed torque ** / ****	412 / 342	*N.m*	M_0
*Low speed S6 torque **/****	416 / 345	*N.m*	M_0 *S6*
Base speed (S1)	5600	*rpm*	*Nb*
*Max speed *****	11800	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	519	*Arms*	I_0
S6 current at low speed	525	*Arms*	I_0 *S6*

Mechanical parameters

Rotor inertia	0.292	*kg.m²*	*J*
Motor mass	395	*kg*	*M*
Maximum speed with steel bearings	9200	*rpm*	N_1
Maximum speed with hybrid bearings	12000	*rpm*	N_2
Maximum speed with X LIFE bearings	-	*rpm*	N_3
Maximum speed with Drive	11800	*rpm*	*Nmax*
Maximum mechanical speed	13000	*rpm*	*Nmec*

Electrical parameters

Number of poles	8		
*Winding resistance (25°C) **	0.00884	*Ω*	*Rb*
Back EMF voltage phase to phase / 1000 rpm	50.9	*Vrms / 1000 rpm*	*ke*
Back EMF voltage phase to phase / (rad/s)	0.486	*Vrms / (rad/s)*	*ku*
Torque constant	0.794	*N.m / Arms*	*Kt*
Short circuit current	520	*Arms*	*Icc*
*Inductance Lq phase to phase (Back EMF voltage axis) **	0.272	*mH*	*Lq*
*Inductance Ld phase to phase **	0.27	*mH*	*Ld*
Optimal phasing at permanent current	20	*electrical degree*	ψo
Optimal phasing at S6 current	20	*electrical degree*	ψm

Thermal parameters

Motor thermal resistance	0.01055	*K/W*	*Rth*
Motor thermal time constant	4	*min*	*Tth*
Winding thermal time constant	0.92	*min*	*Tth w*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	28	*l/min*	*Wf*
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016 **Edition : 12 / 1 / 2017** **MGVA50DAX** **Indice a**

3.2.17. MGVA50DBY Detailed Intrinsic Data

High speed brushless motor

MGVA50DBY

ELECTRONIC DRIVE

DRIVE 560/870 - 400

/ Need protection module

*S1 power **/****	290 / 237	*kW*	*Ps1*
*S6 power **/****	350 / 287	*kW*	*Ps6*
*Low speed torque ** / ****	570 / 467	*N.m*	M_0
*Low speed S6 torque **/****	800 / 656	*N.m*	$M_0 S6$
Base speed (S1)	4820	*rpm*	*Nb*
*Max speed *****	12000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	560	*Arms*	I_0
S6 current at low speed	870	*Arms*	$I_0 S6$
*Winding resistance(25°C) **	0.00931	*Ω*	*Rb*
Rotor inertia	0.292	*kg.m²*	*J*
Thermal time constant	4	*min*	*Tth*
Motor mass	395	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	28	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

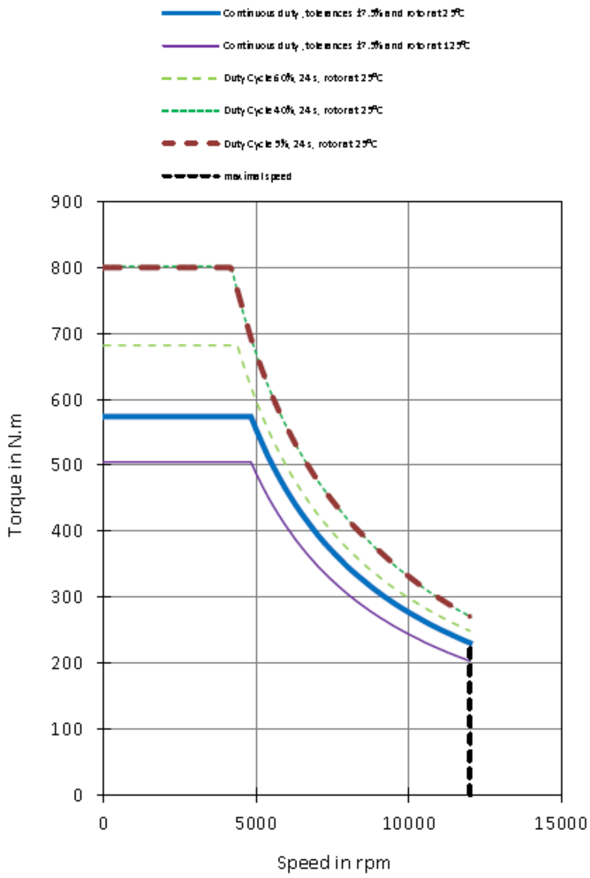
*** minimum value with rotor at 125°C

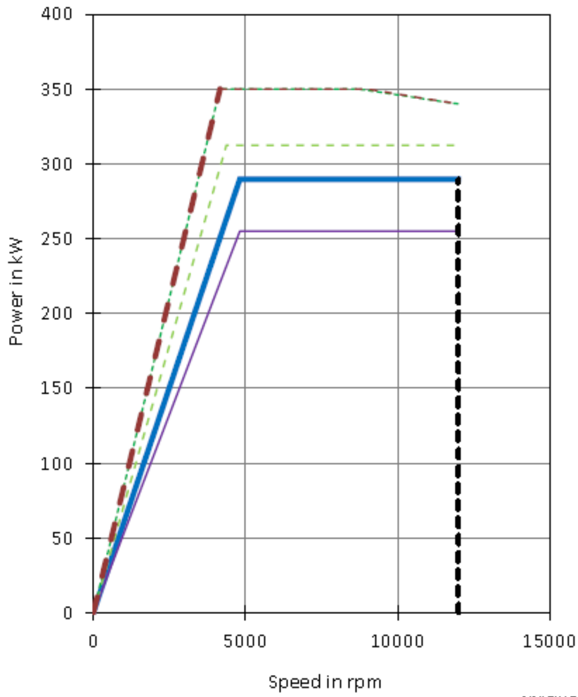
**** Speed limit due to the bearings:

Steel bearings limited to = 9200 rpm

Hybrid bearings limited to = 12000 rpm

X LIFE bearings limited to = ./. rpm





FICH ELV-012

Creation : 5 / 4 / 2016	**Edition : 12 / 1 / 2017**	**Indice a**

High speed brushless motor

MGVA50DBY

ELECTRONIC DRIVE

DRIVE 560/870 - 400

Main characteristics

*S1 power **/****	290 / 237	*kW*	*Ps1*
*S6 power **/****	350 / 287	*kW*	*Ps6*
*Low speed torque ** / ****	570 / 467	*N.m*	M_0
*Low speed S6 torque **/****	800 / 656	*N.m*	$M_0 S6$
Base speed (S1)	4820	*rpm*	*Nb*
*Max speed *****	12000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	560	*Arms*	I_0
S6 current at low speed	870	*Arms*	$I_0 S6$

Mechanical parameters

Rotor inertia	0.292	*kg.m²*	*J*
Motor mass	395	*kg*	*M*
Maximum speed with steel bearings	9200	*rpm*	N_1
Maximum speed with hybrid bearings	12000	*rpm*	N_2
Maximum speed with X LIFE bearings	-	*rpm*	N_3
Maximum speed with Drive	12000	*rpm*	*Nmax*
Maximum mechanical speed	13000	*rpm*	*Nmec*

Electrical parameters

Number of poles	8		
*Winding resistance (25°C) **	0.00931	*Ω*	*Rb*
Back EMF voltage phase to phase / 1000 rpm	66.1	*Vrms / 1000 rpm*	*ke*
Back EMF voltage phase to phase / (rad/s)	0.631	*Vrms / (rad/s)*	*ku*
Torque constant	1.02	*N.m / Arms*	*Kt*
Short circuit current	589	*Arms*	*Icc*
*Inductance Lq phase to phase (Back EMF voltage axis) **	0.308	*mH*	*Lq*
*Inductance Ld phase to phase **	0.31	*mH*	*Ld*
Optimal phasing at permanent current	20	*electrical degree*	ψo
Optimal phasing at S6 current	20	*electrical degree*	ψm

Thermal parameters

Motor thermal resistance	0.011	*K/W*	*Rth*
Motor thermal time constant	4	*min*	*Tth*
Winding thermal time constant	1	*min*	*Tthw*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	28	*l/min*	*Wf*
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016 **Edition : 12 / 1 / 2017** **MGVA50DBY** **Indice a**

3.2.18. MGVA50DBY Detailed Data with AC890

High speed brushless motor

MGVA50DBY

ELECTRONIC DRIVE

890PXSA-43580M

*S1 power **/****	270 / 220	*kW*	*Ps1*
*S6 power **/****	273 / 222	*kW*	*Ps6*
*Low speed torque ** / ****	535 / 435	*N.m*	M_0
*Low speed S6 torque **/****	540 / 439	*N.m*	M_0S6
Base speed (S1)	4820	*rpm*	*Nb*
*Max speed *****	9180	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	$\hat{U}$
Permanent current at low speed	520	*Arms*	I_0
S6 current at low speed	526	*Arms*	I_0S6
*Winding resistance(25°C) **	0.00931	*Ω*	*Rb*
Rotor inertia	0.292	$kg.m^2$	*J*
Thermal time constant	4	*min*	*Tth*
Motor mass	395	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	28	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

Steel bearings limited to = 9200 rpm

Hybrid bearings limited to = 12000 rpm

X LIFE bearings limited to = ./. rpm

Continuous duty, tolerances ±7.5% and rotor at 25°C

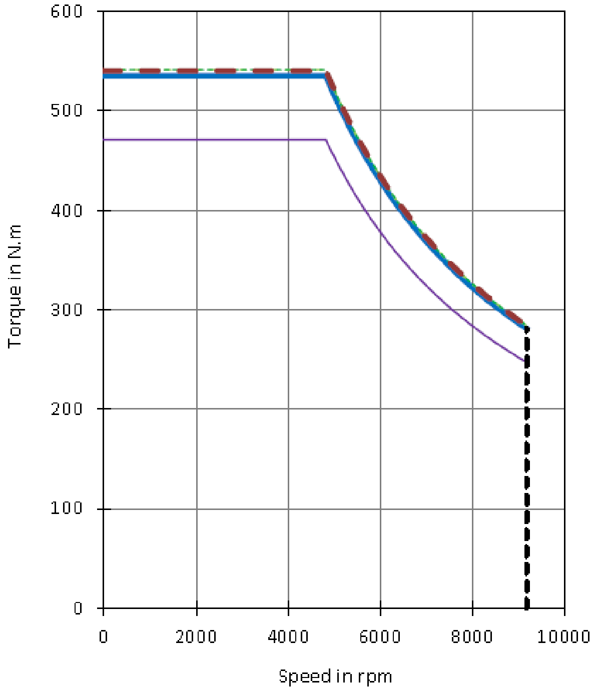
Continuous duty, tolerances ±7.5% and rotor at 125°C

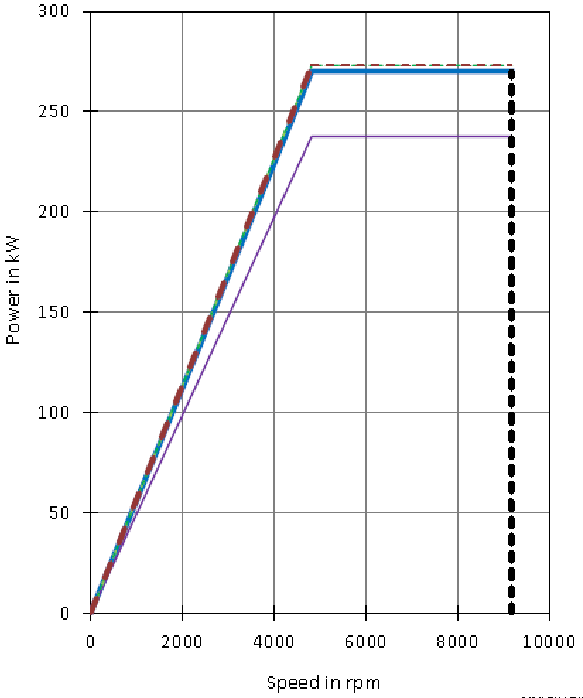
Duty Cycle 60%, 24 s, rotor at 25°C

Duty Cycle 40%, 24 s, rotor at 25°C

Duty Cycle 5%, 24 s, rotor at 25°C

maximal speed





FICH ELV-012

Creation : 5 / 4 / 2016	Edition : 12 / 1 / 2017	Indice a

High speed brushless motor

MGVA50DBY

ELECTRONIC DRIVE

890PXSA-43580M

Main characteristics

*S1 power **/****	270 / 220	*kW*	*Ps1*
*S6 power **/****	273 / 222	*kW*	*Ps6*
*Low speed torque ** / ****	535 / 435	*N.m*	M_0
*Low speed S6 torque **/****	540 / 439	*N.m*	M_0 S6
Base speed (S1)	4820	*rpm*	*Nb*
*Max speed *****	9180	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	520	*Arms*	I_0
S6 current at low speed	526	*Arms*	I_0 S6

Mechanical parameters

Rotor inertia	0.292	*kg.m²*	*J*
Motor mass	395	*kg*	*M*
Maximum speed with steel bearings	9200	*rpm*	N_1
Maximum speed with hybrid bearings	12000	*rpm*	N_2
Maximum speed with X LIFE bearings	-	*rpm*	N_3
Maximum speed with Drive	9180	*rpm*	*Nmax*
Maximum mechanical speed	13000	*rpm*	*Nmec*

Electrical parameters

Number of poles	8		
*Winding resistance (25°C) **	0.00931	*Ω*	*Rb*
Back EMF voltage phase to phase / 1000 rpm	66.1	*Vrms / 1000 rpm*	*ke*
Back EMF voltage phase to phase / (rad/s)	0.631	*Vrms / (rad/s)*	*ku*
Torque constant	1.03	*N.m / Arms*	*Kt*
Short circuit current	589	*Arms*	*Icc*
*Inductance Lq phase to phase (Back EMF voltage axis) **	0.308	*mH*	*Lq*
*Inductance Ld phase to phase **	0.31	*mH*	*Ld*
Optimal phasing at permanent current	20	*electrical degree*	ψo
Optimal phasing at S6 current	20	*electrical degree*	ψm

Thermal parameters

Motor thermal resistance	0.011	*K/W*	*Rth*
Motor thermal time constant	4	*min*	*Tth*
Winding thermal time constant	1	*min*	*Tthw*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	28	*l/min*	*Wf*
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016	**Edition : 12 / 1 / 2017 MGVA50DBY**	**Indice a**

3.2.19. MVB40HAA Detailed Intrinsic Data

High speed brushless motor

MGVB40HAA

ELECTRONIC DRIVE

DRIVE 722/1410 - 400

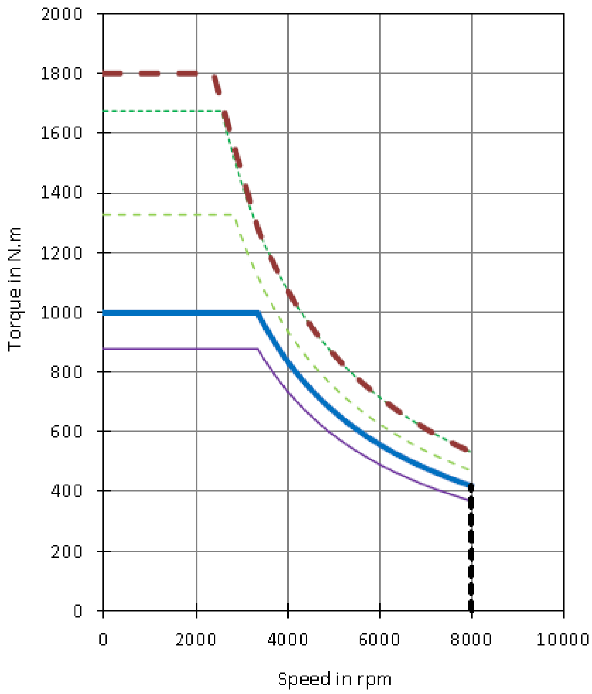
/ Need protection module

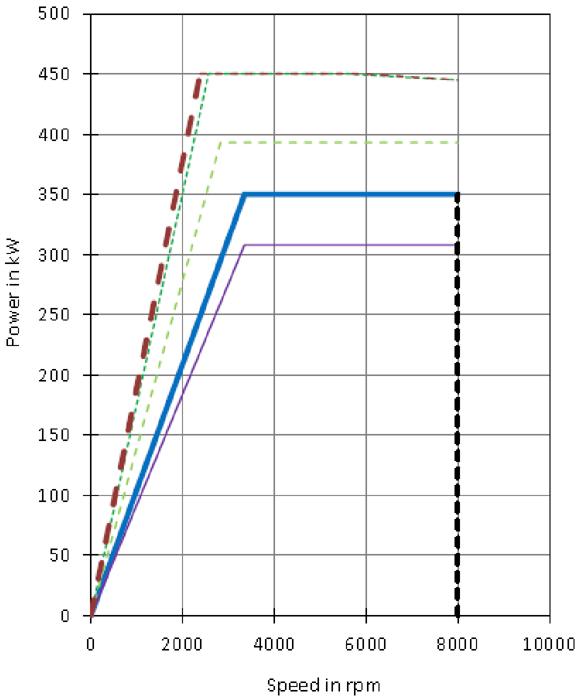
*S1 power **/****	350 / 284	*kW*	*Ps1*
*S6 power **/****	450 / 365	*kW*	*Ps6*
*Low speed torque ** / ****	1000 / 812	*N.m*	M_0
*Low speed S6 torque **/****	1800 / 1460	*N.m*	M_0S6
Base speed (S1)	3350	*rpm*	*Nb*
*Max speed *****	8000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	722	*Arms*	I_0
S6 current at low speed	1410	*Arms*	I_0S6
*Winding resistance(25°C) **	0.00617	*Ω*	*Rb*
Rotor inertia	0.84	$kg.m^2$	*J*
Thermal time constant	5	*min*	*Tth*
Motor mass	650	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	40	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase
** Tolerances ± 7.5% and rotor at 25°C
*** minimum value with rotor at 125°C
**** Speed limit due to the bearings:
Steel bearings limited to = ./. rpm
Hybrid bearings limited to = ./. rpm
X LIFE bearings limited to = 8000 rpm

Continuous duty, tolerances ±7.5% and rotor at 25°C
Continuous duty, tolerances ±7.5% and rotor at 125°C
Duty Cycle 60%, 26 s, rotor at 25°C
Duty Cycle 40%, 26 s, rotor at 25°C
Duty Cycle 5%, 26 s, rotor at 25°C
maximal speed





FICH ELV-012

Creation : 5 / 4 / 2016	**Edition : 12 / 1 / 2017**	**Indice b**

High speed brushless motor

MGVB40HAA

ELECTRONIC DRIVE

DRIVE 722/1410 - 400

Main characteristics

S1 power **/***	350 / 284	kW	Ps1
S6 power **/***	450 / 365	kW	Ps6
Low speed torque ** / ***	1000 / 812	N.m	M_0
Low speed S6 torque **/***	1800 / 1460	N.m	M_0 S6
Base speed (S1)	3350	rpm	Nb
Max speed ****	8000	rpm	Nmax
DC voltage supply when motor is loaded	540	Vdc	Û
Permanent current at low speed	722	Arms	I_0
S6 current at low speed	1410	Arms	I_0 S6

Mechanical parameters

Rotor inertia	0.84	kg.m²	J
Motor mass	650	kg	M
Maximum speed with steel bearings	-	rpm	N_1
Maximum speed with hybrid bearings	-	rpm	N_2
Maximum speed with X LIFE bearings	8000	rpm	N_3
Maximum speed with Drive	8000	rpm	Nmax
Maximum mechanical speed	8000	rpm	Nmec

Electrical parameters

Number of poles	16		
Winding resistance (25°C) *	0.00617	Ω	Rb
Back EMF voltage phase to phase / 1000 rpm	86.1	Vrms / 1000 rpm	ke
Back EMF voltage phase to phase / (rad/s)	0.822	Vrms / (rad/s)	ku
Torque constant	1.39	N.m / Arms	Kt
Short circuit current	764	Arms	Icc
Inductance Lq phase to phase (Back EMF voltage axis) *	0.185	mH	Lq
Inductance Ld phase to phase *	0.156	mH	Ld
Optimal phasing at permanent current	10	electrical degree	ψo
Optimal phasing at S6 current	20	electrical degree	ψm

Thermal parameters

Motor thermal resistance	0.0078	K/W	Rth
Motor thermal time constant	5	min	Tth
Winding thermal time constant	1.1	min	Tth w
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	40	l/min	Wf
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016 | Edition : 12 / 1 / 2017 | MGVB40HAA | Indice b

3.2.20. MGVB40HAA Detailed Data with AC890

High speed brushless motor

MGVB40HAA

ELECTRONIC DRIVE

2X890PXSA-43420M

*S1 power **/****	350 / 283	*kW*	*Ps1*
*S6 power **/****	380 / 308	*kW*	*Ps6*
*Low speed torque ** / ****	1000 / 810	*N.m*	M_0
*Low speed S6 torque **/****	1080 / 874	*N.m*	M_0S6
Base speed (S1)	3350	*rpm*	*Nb*
*Max speed *****	6990	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	722	*Arms*	I_0
S6 current at low speed	780	*Arms*	I_0S6
*Winding resistance(25°C) **	0.00617	*Ω*	*Rb*
Rotor inertia	0.84	$kg.m^2$	*J*
Thermal time constant	5	*min*	*Tth*
Motor mass	650	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	40	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

Steel bearings limited to = ./. rpm

Hybrid bearings limited to = ./. rpm

X LIFE bearings limited to = 8000 rpm

Continuous duty, tolerances ±7.5% and rotor at 25°C

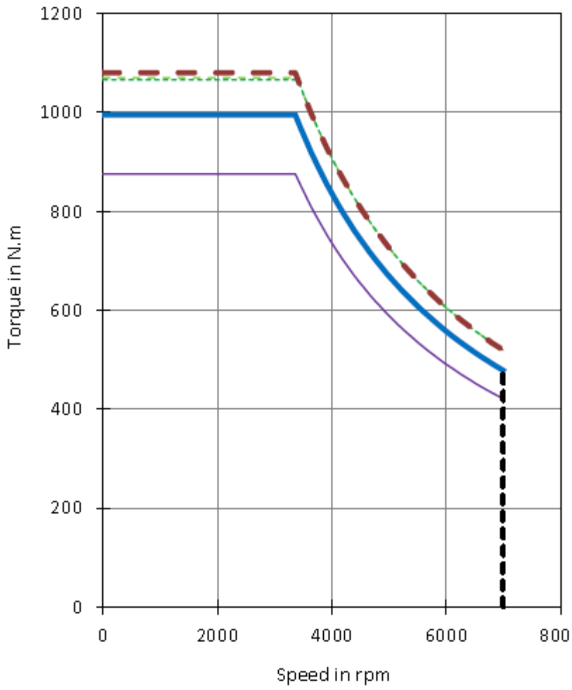
Continuous duty, tolerances ±7.5% and rotor at 125°C

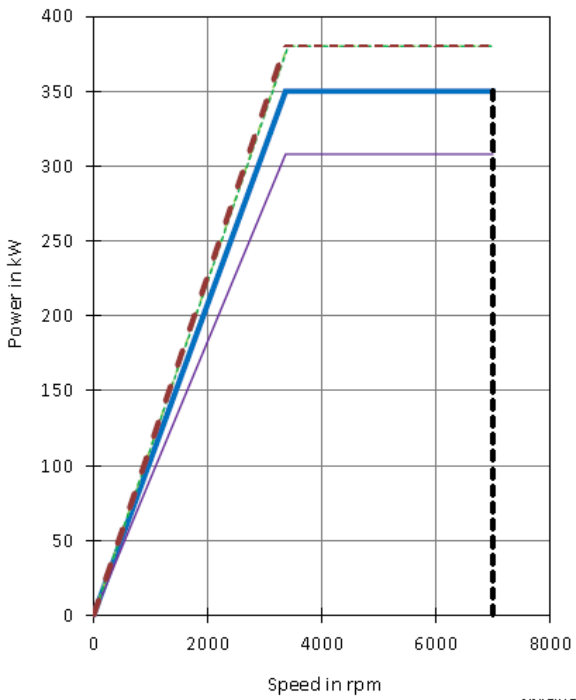
Duty Cycle 60%, 26 s, rotor at 25°C

Duty Cycle 40%, 26 s, rotor at 25°C

Duty Cycle 5%, 26 s, rotor at 25°C

maximal speed





FICH ELV-012

Creation : 5 / 4 / 2016	**Edition : 12 / 1 / 2017**	**Indice a**

High speed brushless motor

MGVB40HAA

ELECTRONIC DRIVE

2X890PXSA-43420M

Main characteristics

S1 power **/***	350 / 283	kW	Ps1
S6 power **/***	380 / 308	kW	Ps6
Low speed torque ** / ***	1000 / 810	N.m	M_0
Low speed S6 torque **/***	1080 / 874	N.m	$M_0 S6$
Base speed (S1)	3350	rpm	Nb
Max speed ****	6990	rpm	Nmax
DC voltage supply when motor is loaded	540	Vdc	Û
Permanent current at low speed	722	Arms	I_0
S6 current at low speed	780	Arms	$I_0 S6$

Mechanical parameters

Rotor inertia	0.84	kg.m²	J
Motor mass	650	kg	M
Maximum speed with steel bearings	-	rpm	N_1
Maximum speed with hybrid bearings	-	rpm	N_2
Maximum speed with X LIFE bearings	8000	rpm	N_3
Maximum speed with Drive	6990	rpm	Nmax
Maximum mechanical speed	8000	rpm	Nmec

Electrical parameters

Number of poles	16		
Winding resistance (25°C) *	0.00617	Ω	Rb
Back EMF voltage phase to phase / 1000 rpm	86.1	Vrms / 1000 rpm	ke
Back EMF voltage phase to phase / (rad/s)	0.822	Vrms / (rad/s)	ku
Torque constant	1.39	N.m / Arms	Kt
Short circuit current	764	Arms	Icc
Inductance Lq phase to phase (Back EMF voltage axis) *	0.185	mH	Lq
Inductance Ld phase to phase *	0.156	mH	Ld
Optimal phasing at permanent current	10	electrical degree	ψo
Optimal phasing at S6 current	11	electrical degree	ψm

Thermal parameters

Motor thermal resistance	0.0078	K/W	Rth
Motor thermal time constant	5	min	Tth
Winding thermal time constant	1.1	min	Tth w
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	40	l/min	Wf
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016 Edition : 12 / 1 / 2017 MGVB40HAA Indice a

3.2.21. MGVB50HBS Detailed Intrinsic Data

High speed brushless motor

MGVB50HBS

ELECTRONIC DRIVE

DRIVE 1160/2460 - 400

/ Need protection module

*S1 power **/****	500 / 405	*kW*	*Ps1*
*S6 power **/****	750 / 607	*kW*	*Ps6*
*Low speed torque ** / ****	1500 / 1210	*N.m*	M_0
*Low speed S6 torque **/****	2700 / 2190	*N.m*	M_0S6
Base speed (S1)	3200	*rpm*	*Nb*
*Max speed *****	8000	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	*Û*
Permanent current at low speed	1010	*Arms*	I_0
S6 current at low speed	1900	*Arms*	I_0S6
*Winding resistance(25°C) **	0.00417	*Ω*	*Rb*
Rotor inertia	1.04	*kg.m²*	*J*
Thermal time constant	5	*min*	*Tth*
Motor mass	740	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	50	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

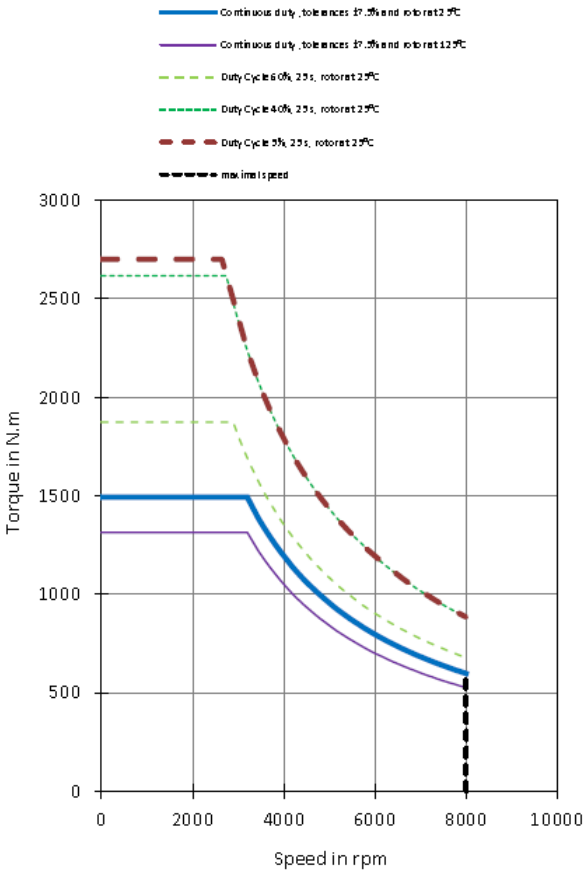
*** minimum value with rotor at 125°C

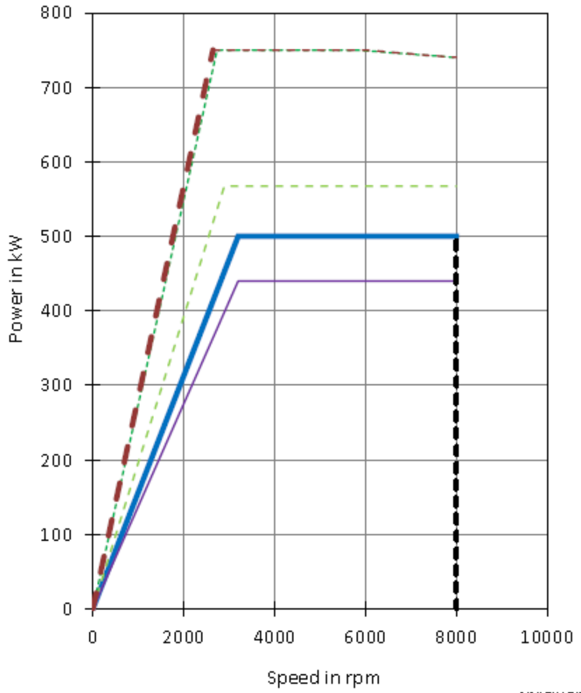
**** Speed limit due to the bearings:

Steel bearings limited to = ./. rpm

Hybrid bearings limited to = ./. rpm

X LIFE bearings limited to = 8000 rpm





FICH ELV-012

High speed brushless motor

MGVB50HBS

ELECTRONIC DRIVE

DRIVE 1160/2460 - 400

Main characteristics

S1 power **/***	500 / 405	kW	Ps1
S6 power **/***	750 / 607	kW	Ps6
Low speed torque ** / ***	1500 / 1210	N.m	M_o
Low speed S6 torque **/***	2700 / 2190	N.m	M_o S6
Base speed (S1)	3200	rpm	Nb
Max speed ****	8000	rpm	Nmax
DC voltage supply when motor is loaded	540	Vdc	Û
Permanent current at low speed	1010	Arms	I_o
S6 current at low speed	1900	Arms	I_o S6

Mechanical parameters

Rotor inertia	1.04	kg.m²	J
Motor mass	740	kg	M
Maximum speed with steel bearings	-	rpm	N_1
Maximum speed with hybrid bearings	-	rpm	N_2
Maximum speed with X LIFE bearings	8000	rpm	N_3
Maximum speed with Drive	8000	rpm	Nmax
Maximum mechanical speed	8000	rpm	Nmec

Electrical parameters

Number of poles	16		
Winding resistance (25°C) *	0.00417	Ω	Rb
Back EMF voltage phase to phase / 1000 rpm	97.2	Vrms / 1000 rpm	ke
Back EMF voltage phase to phase / (rad/s)	0.928	Vrms / (rad/s)	ku
Torque constant	1.49	N.m / Arms	Kt
Short circuit current	1290	Arms	Icc
Inductance Lq phase to phase (Back EMF voltage axis) *	0.125	mH	Lq
Inductance Ld phase to phase *	0.104	mH	Ld
Optimal phasing at permanent current	10	electrical degree	ψo
Optimal phasing at S6 current	19	electrical degree	ψm

Thermal parameters

Motor thermal resistance	0.00624	K/W	Rth
Motor thermal time constant	5	min	Tth
Winding thermal time constant	1.1	min	Tthw
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	50	l/min	Wf
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016	**Edition : 12 / 1 / 2017 MGVB50HBS**	**Indice b**

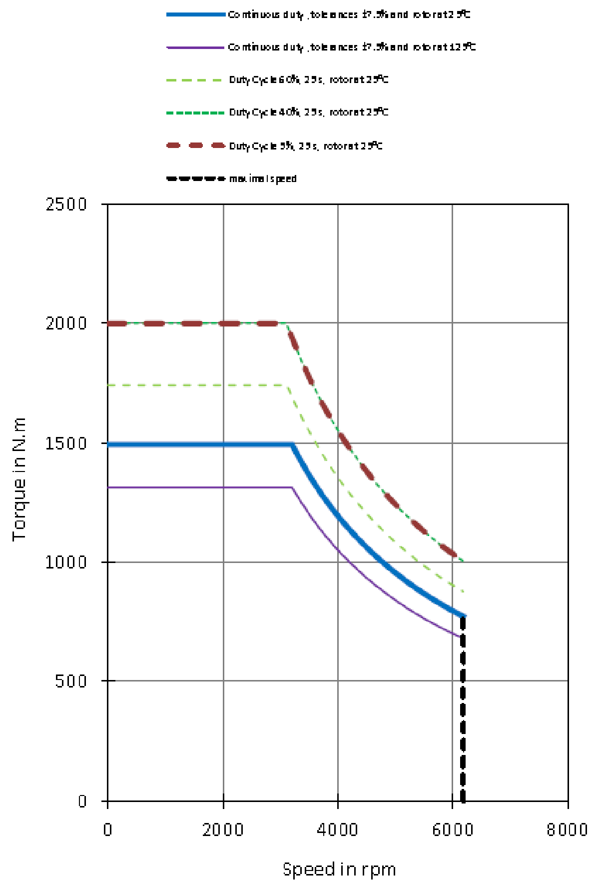
3.2.22. MGVB50HBS Detailed Data with AC890

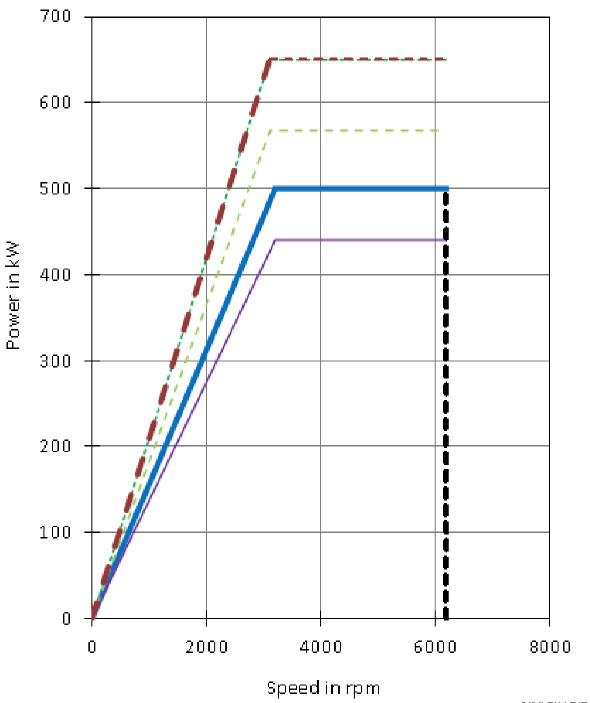
High speed brushless motor
MGVB50HBS
ELECTRONIC DRIVE
3X890PXSA-43580M

*S1 power **/****	500 / 405	*kW*	*Ps1*
*S6 power **/****	650 / 526	*kW*	*Ps6*
*Low speed torque ** / ****	1500 / 1210	*N.m*	M_0
*Low speed S6 torque **/****	2000 / 1620	*N.m*	M_0S6
Base speed (S1)	3200	*rpm*	*Nb*
*Max speed *****	6180	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	$\hat{U}$
Permanent current at low speed	1010	*Arms*	I_0
S6 current at low speed	1340	*Arms*	I_0S6
*Winding resistance(25°C) **	0.00417	*Ω*	*Rb*
Rotor inertia	1.04	$kg.m^2$	*J*
Thermal time constant	5	*min*	*Tth*
Motor mass	740	*kg*	*M*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	50	*l/min*	*Wf*

All data are given in typical values under standard conditions

* Phase to phase
** Tolerances ± 7.5% and rotor at 25°C
*** minimum value with rotor at 125°C
**** Speed limit due to the bearings:
Steel bearings limited to = ./. rpm
Hybrid bearings limited to = ./. rpm
X LIFE bearings limited to = 8000 rpm





FICH ELV-012

Creation : 5 / 4 / 2016	Edition : 12 / 1 / 2017	Indice b

High speed brushless motor

MGVB50HBS

ELECTRONIC DRIVE

3X890PXSA-43580M

Main characteristics

*S1 power **/****	500 / 405	*kW*	*Ps1*
*S6 power **/****	650 / 526	*kW*	*Ps6*
*Low speed torque ** / ****	1500 / 1210	*N.m*	M_0
*Low speed S6 torque **/****	2000 / 1620	*N.m*	$M_0 S6$
Base speed (S1)	3200	*rpm*	*Nb*
*Max speed *****	6180	*rpm*	*Nmax*
DC voltage supply when motor is loaded	540	*Vdc*	$\hat{U}$
Permanent current at low speed	1010	*Arms*	I_0
S6 current at low speed	1340	*Arms*	$I_0 S6$

Mechanical parameters

Rotor inertia	1.04	*kg.m²*	*J*
Motor mass	740	*kg*	*M*
Maximum speed with steel bearings	-	*rpm*	N_1
Maximum speed with hybrid bearings	-	*rpm*	N_2
Maximum speed with X LIFE bearings	8000	*rpm*	N_3
Maximum speed with Drive	6180	*rpm*	*Nmax*
Maximum mechanical speed	8000	*rpm*	*Nmec*

Electrical parameters

Number of poles	16		
*Winding resistance (25°C) **	0.00417	*Ω*	*Rb*
Back EMF voltage phase to phase / 1000 rpm	97.2	*Vrms / 1000 rpm*	*ke*
Back EMF voltage phase to phase / (rad/s)	0.928	*Vrms / (rad/s)*	*ku*
Torque constant	1.49	*N.m / Arms*	*Kt*
Short circuit current	1290	*Arms*	*Icc*
*Inductance Lq phase to phase (Back EMF voltage axis) **	0.125	*mH*	*Lq*
*Inductance Ld phase to phase **	0.104	*mH*	*Ld*
Optimal phasing at permanent current	10	*electrical degree*	ψo
Optimal phasing at S6 current	13	*electrical degree*	ψm

Thermal parameters

Motor thermal resistance	0.00624	*K/W*	*Rth*
Motor thermal time constant	5	*min*	*Tth*
Winding thermal time constant	1.1	*min*	*Tthw*
Min water cooling flow (Inlet 25°C MAX, 30% glycol)	50	*l/min*	*Wf*
Thermal class according to IEC 60034-1	F		

All data are given in typical values under standard conditions

* Phase to phase

** Tolerances ± 7.5% and rotor at 25°C

*** minimum value with rotor at 125°C

**** Speed limit due to the bearings:

FICH ELV-012

Creation : 5 / 4 / 2016 **Edition : 12 / 1 / 2017** **MGVB50HBS** **Indice b**

3.2.23. Time constants of the motor

3.2.23.1. Electric time constant:

$$\tau_{elec} = \frac{L_{ph\_ph}}{R_{ph\_ph}}$$

With following values given in the motor data sheet
L_{ph_ph} inductance of the motor phase to phase [H],
R_{ph_ph} resistance of the motor phase to phase at 25°C [Ohm].

Example:
Motor series MGV840CAP
L_{ph_ph} = 15.4 mH or 15.4E-3 H
R_{ph_ph} at 25°C = 0.823 Ohm
→ τ_{elec} = 15.4E-3/0.823 = **18.7 ms**

An overall summary of motor time constants is given a little further.

3.2.23.2. Mechanical time constant:

$$\tau_{mech} = \frac{R_{ph\_n} * J}{Kt * Ke_{ph\_n}} = \frac{0.5 * R_{ph\_ph} * J}{(3 * \frac{Ke_{ph\_ph}}{\sqrt{3}}) * \frac{Ke_{ph\_ph}}{\sqrt{3}}}$$

$$\tau_{mech} = \frac{0.5 * R_{ph\_ph} * J}{(Ke_{ph\_ph})^2}$$

With following values obtained from the motor data sheet:
R_{ph_ph} resistance of the motor phase to phase at 25°C [Ohm],
J inertia of the rotor [kgm²],
Ke_{ph_ph} back emf phase coefficient phase to phase [V_{rms}/rad/s].

The coefficient ***Ke_{ph_ph}*** in the formula above is given in [V_{rms}/rad/s]
To calculate this coefficient from the datasheet, use the following relation:

$$Ke_{ph\_ph[V_{rms}/rad/s]} = \frac{Ke_{ph\_ph[V_{rms}/1000rpm]}}{\frac{2 * \pi * 1000}{60}}$$

Example:
Motor series MGV840CAP
R_{ph_ph} at 25°C = 0.823 Ohm
J = 0.0186 kgm²
Ke_{ph_ph} [V_{rms}/1000rpm] = 113 [V_{rms}/1000rpm]
→ Ke_{ph_ph} [V_{rms}/rad/s] = 113/(2*π*1000/60) = 1.079 [V_{rms}/rad/s]
→ τ_{mech}=0.5*0.823*0.0186/(1.079²) = **6.5 ms**

Remarks:

For a DC motor, the mechanical time constant σ_{mech} represents the duration needed to reach 63% of the final speed when applying a voltage step without any resistant torque, if the electrical time constant is much smaller than the mechanical time constant.

An overall summary of motor time constants is given a little further.

3.2.23.3. Thermal time constant of the copper:

$$\tau_{therm} = Rth_{copper\_iron} * Cth_{copper}$$

$$Cth_{copper_{[J/°K]}} = Mass_{copper_{[Kg]}} * 389_{[J/kg°K]}$$

With:

***Rth**copper_iron* thermal resistance between copper and iron [°K/W]
***Cth**copper* thermal capacity of the copper [J/°K]
***Mass**copper* mass of the copper (winding) [kg]

Hereunder is given an overall summary of motor time constants:

Type	Electric time constant [ms]	Mechanical time constant [ms]	Thermal time constant of copper [s]
MGV430BA	11,5	7,31	23
MGV635CA	10,2	5,95	34
MGV840CA	18,4	6,39	39
MGV860CB	18,3	3,63	35
MGV950CA	39,4	3,34	45
MGV966DA	22,1	1,37	37
MGVA50DA	30,8	5,62	55
MGVA50DB	33,1	3,51	61
MGVB40HA	30,0	3,83	66
MGVB50HB	30,0	2,52	64

3.2.24. Voltage withstand characteristics of MGV series

The motors fed by converters are subject to higher stresses than in case of sinusoidal power supply. The combination of fast switching inverters with cables will cause over voltage due to the transmission line effects. The peak voltage is determined by the voltage supply, the length of the cables and the voltage rise time. As an example, with a rise time of 200 ns and a 30 m (100 ft) cable, the voltage at the motor terminals is twice the inverter voltage.
The insulation system of the MGV motors is designed to withstand high repetitive pulse voltages and largely exceeds the recommendations of the IEC/TS 60034-25 ed 2.0 2007-03-12 for motors without filters up to 480V AC.
Higher supply voltages are available on request.

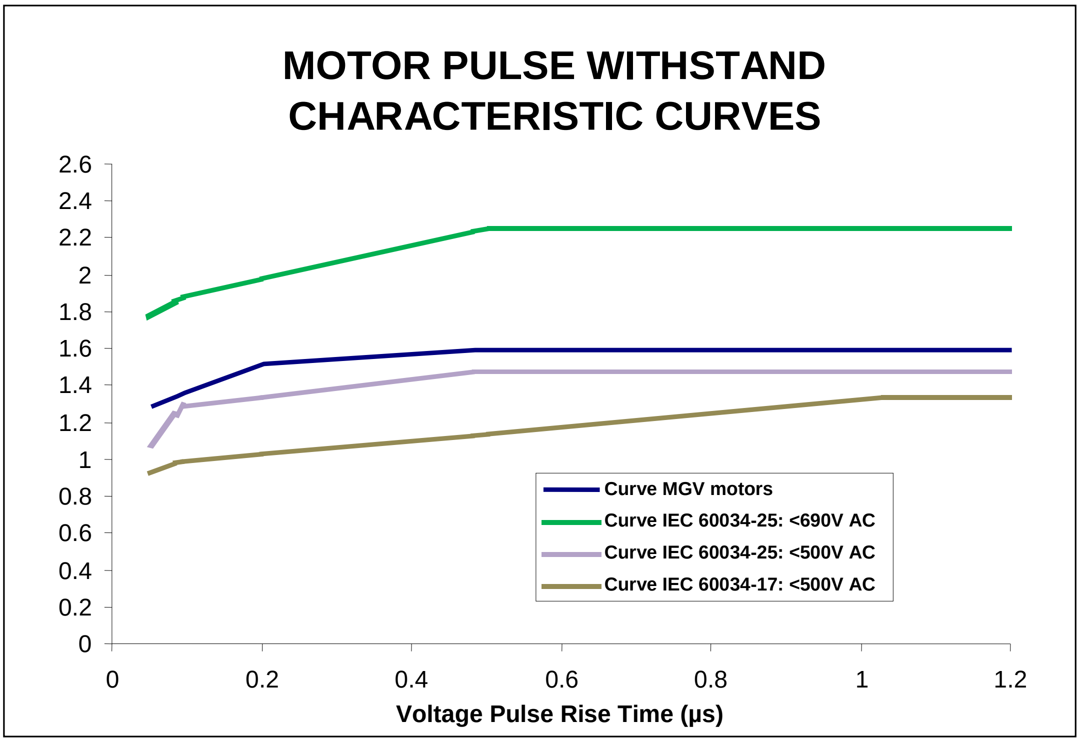


Figure 1: Minimum Voltage withstands characteristics for motors insulations according to IEC standards. At the top are the typical capabilities for the MGV motors with additional insulation.

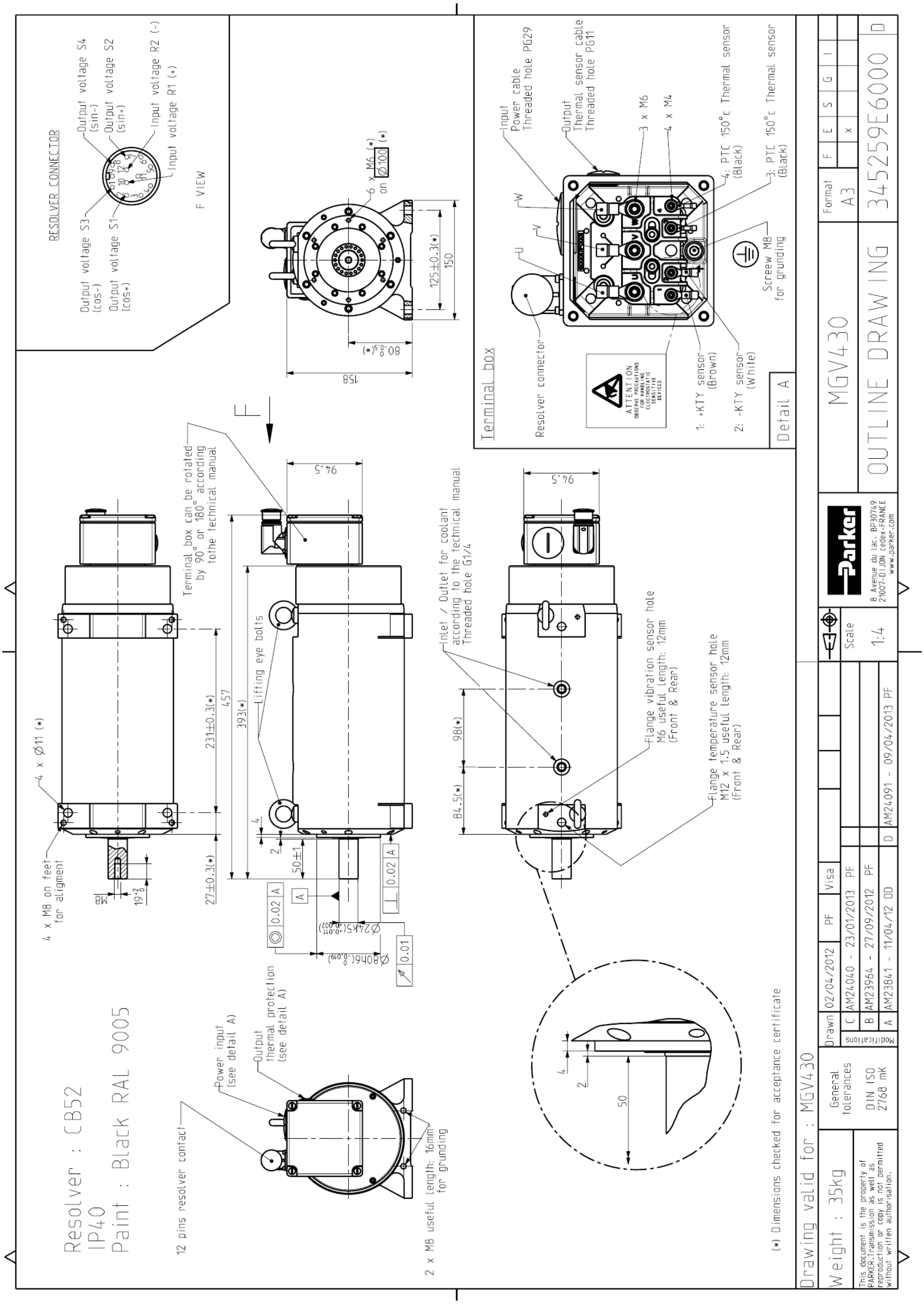
Note: The pulse rise times are defined in accordance with the IEC/TS 60034-17 ed4.0 2006-05-09.

The MGV motors can be used with a supply voltage up to 480 V under the following conditions:

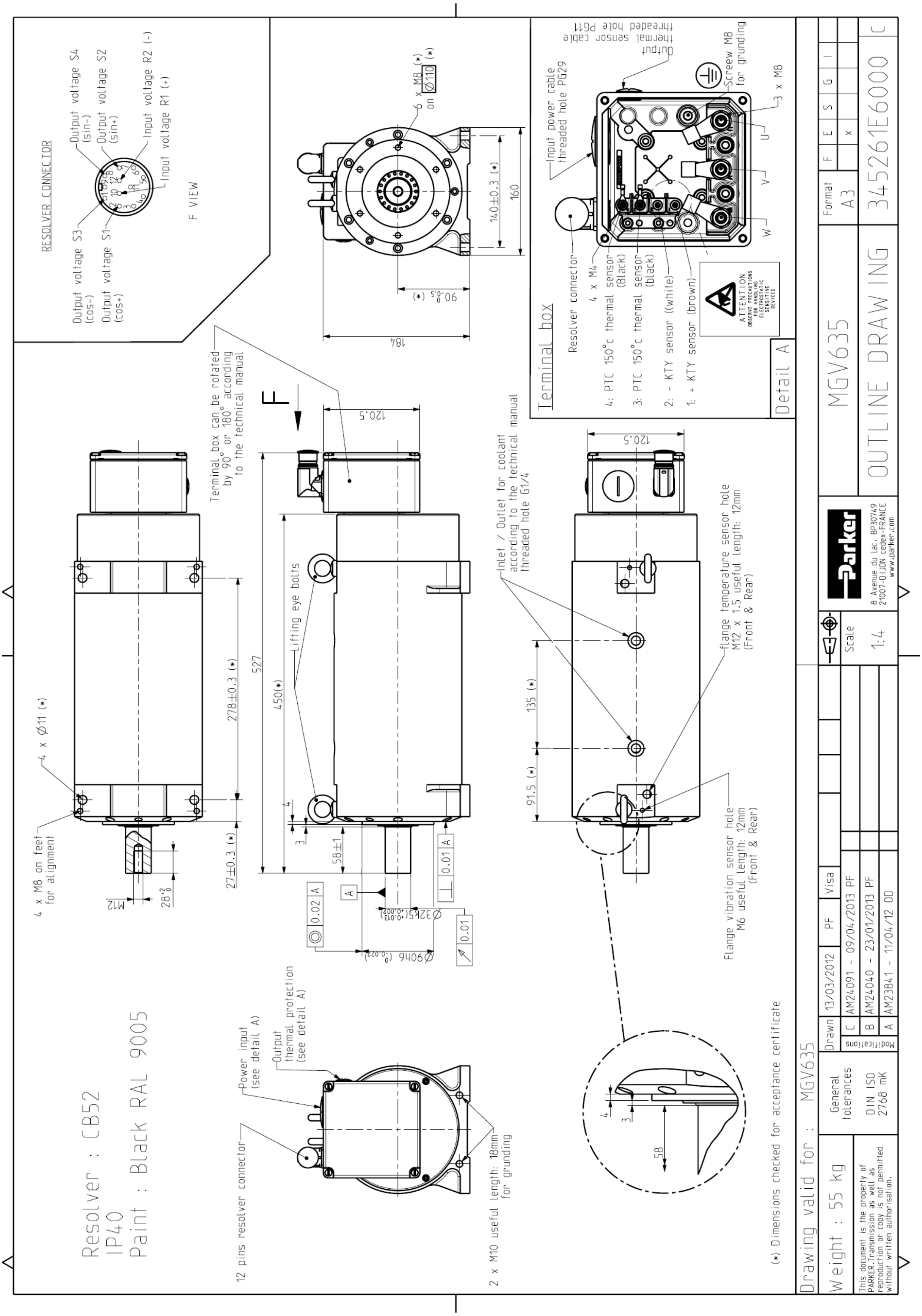
- The pulse rise times must be longer than 50 ns.
- The repetitive pulse voltages must not exceed the values given in figure 1, Curve IEC 60034-25 : <500V AC.

3.3. Dimension drawings

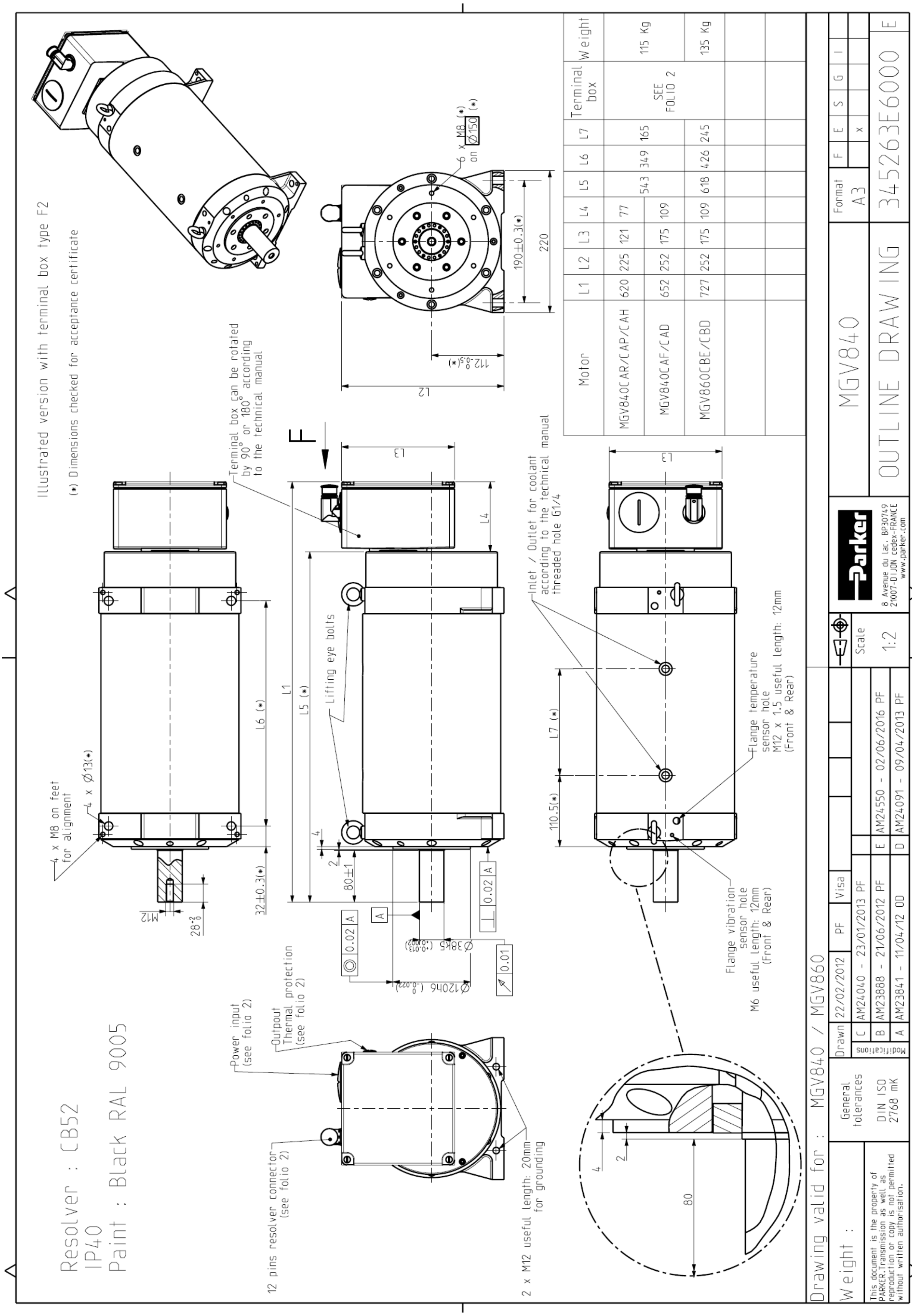
3.3.1. MGV4 outline drawing

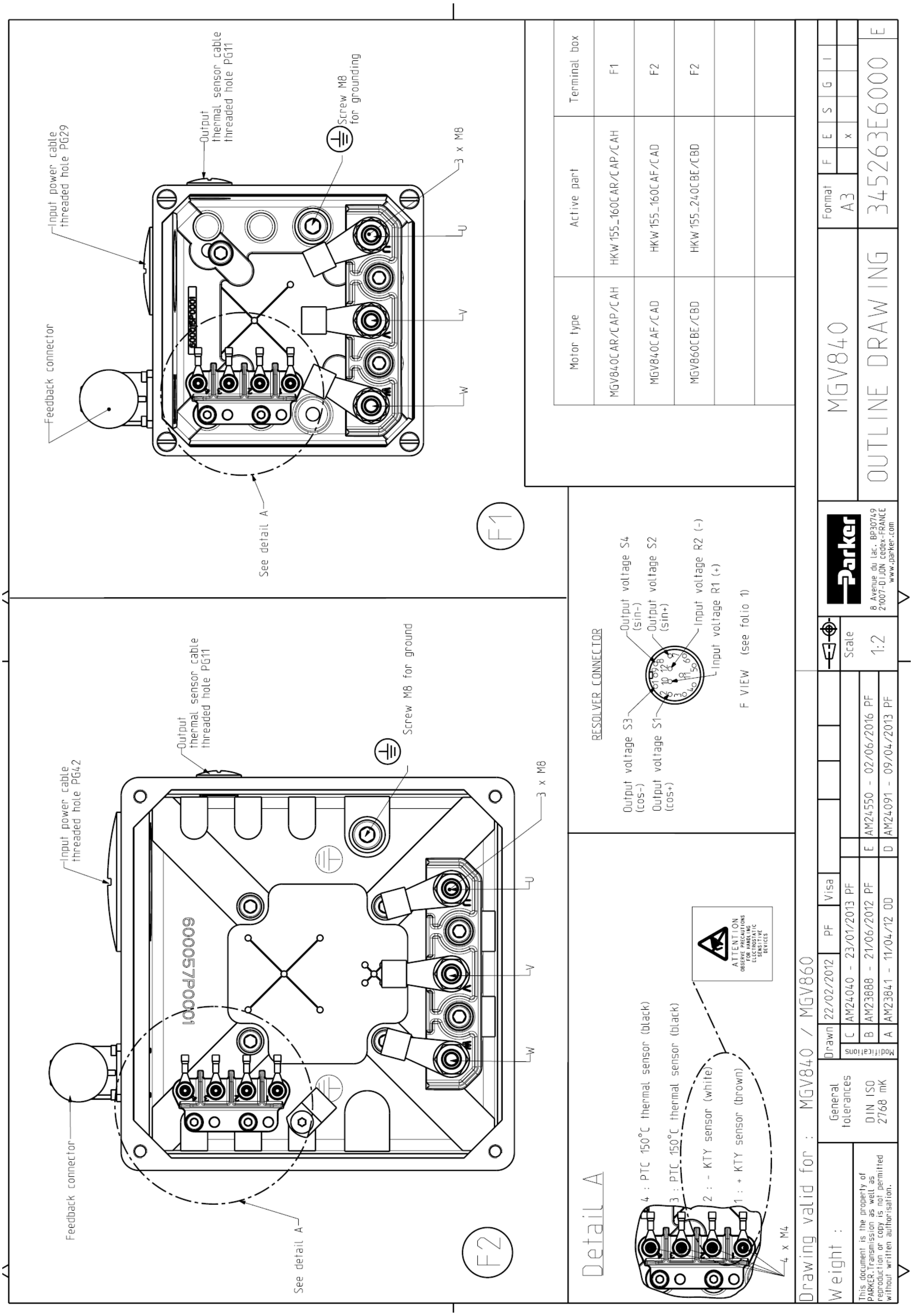


3.3.2. MGV6 outline drawing



3.3.3. MGV8 outline drawing




Input power cable threaded hole PG29
Output thermal sensor cable threaded hole PG11
Screw M8 for grounding
3 x M8
Feedback connector
See detail A
U
V
W
F1
Input power cable threaded hole PG42
Output thermal sensor cable threaded hole PG11
Screw M8 for ground
F2
Detail A
4 : PTC 150°C thermal sensor (black)
3 : PTC 150°C thermal sensor (black)
2 : - KTY sensor (white)
1 : + KTY sensor (brown)
4 x M4
ATTENTION OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES
RESOLVER CONNECTOR
Output voltage S4 (sin-)
Output voltage S2 (sin+)
Input voltage R2 (-)
Input voltage R1 (+)
Output voltage S3 (cos-)
Output voltage S1 (cos+)
F VIEW (see folio 1)
Motor type
Active part
Terminal box
MGV840CAR/CAP/CAH
HKW155_160CAR/CAP/CAH
F1
MGV840CAF/CAD
HKW155_160CAF/CAD
F2
MGV860CBE/CBD
HKW155_240CBE/CBD
F2
Drawing valid for : MGV840 / MGV860
Weight :
General tolerances
DIN ISO 2768 mK
Drawn 22/02/2012 PF Visa
C AM24040 - 23/01/2013 PF
B AM23888 - 21/06/2012 PF
A AM23841 - 11/04/12 DD
E AM24550 - 02/06/2016 PF
D AM24091 - 09/04/2013 PF
Modifications
Scale 1:2
8 Avenue du lac. BP30749 21007-DIJON cedex-FRANCE www.parker.com
MGV840
OUTLINE DRAWING
Format A3
345263E6000
E
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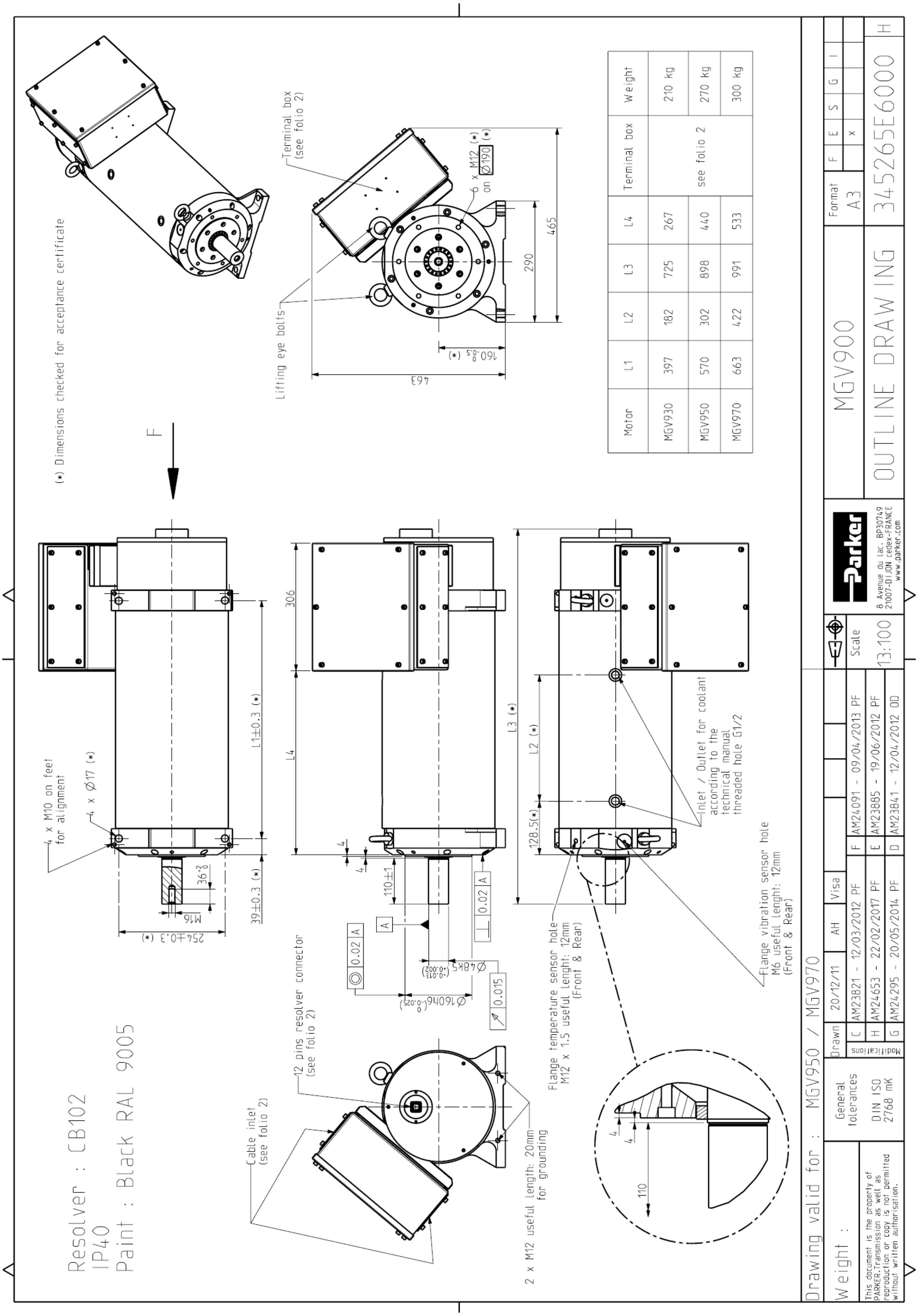
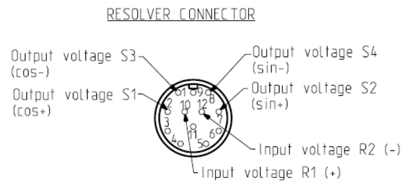
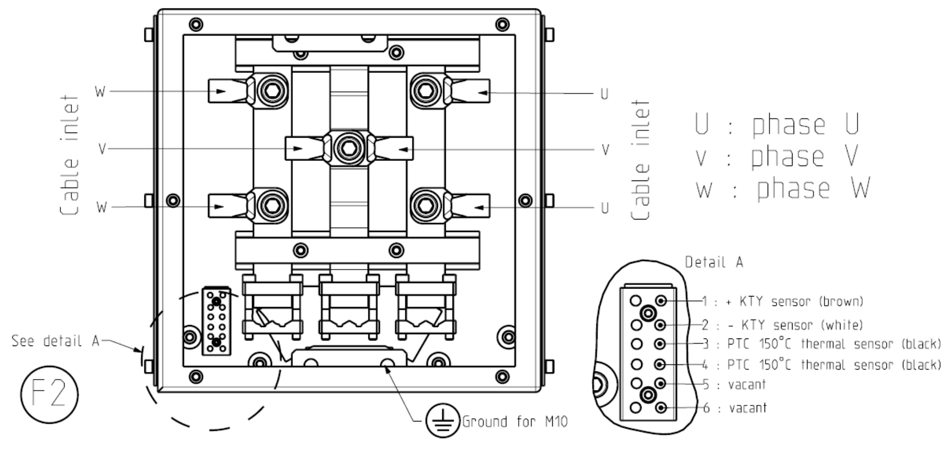
3.3.4. MGV9 outline drawing



Motor	L1	L2	L3	L4	Terminal box	Weight
MGV930	397	182	725	267	see folio 2	210 kg
MGV950	570	302	898	440		270 kg
MGV970	663	422	991	533		300 kg

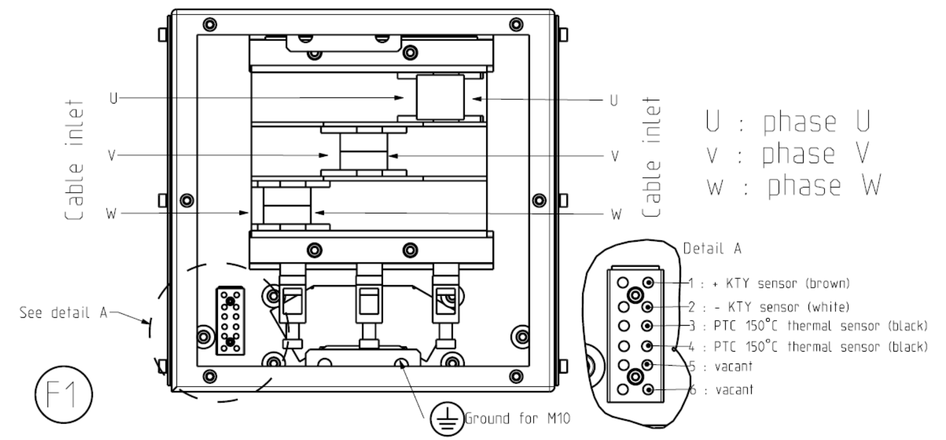


F View



-Terminal box for current between 560 to 630 A, the maxi cable cross section is 2x120 mm²

Motor type	Active part	Terminal box
MGV930CAC	HKW195_180CAC	F1
MGV930CAJ	HKW195_180CAJ	
MGV950CAC	HKW195_300CAC	
MGV950CAJ	HKW195_300CAJ	
MGV950CBU	HKW195_300CBU	
MGV950CAX	HKW195_300CAX	F2
MGV950CBX	HKW195_300CBX	
MGV950CHW	HKW195_300CHW	
MGV970CBX	HKW195_420CBX	



-Terminal box for current < 320 A, the cable cross section is between 95 to 185 mm²
-Terminal box to current between 320 to 560 A, tje cable cross section is betwenn 150 to 300 mm²

Drawing valid for : -

Weight :

General tolerances: DIN ISO 2768 mK

Drawn	20/12/11	AH	Visa

Modifications			
C	AM23821 - 12/03/2012 PF	F	AM24091 - 09/04/2013 PF
H	AM24653 - 22/02/2017 PF	E	AM23885 - 19/06/2012 PF
G	AM24295 - 20/05/2014 PF	D	AM23841 - 12/04/2012 OD

Scale 13:100

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21007-DIJON cedex-FRANCE
www.parker.com

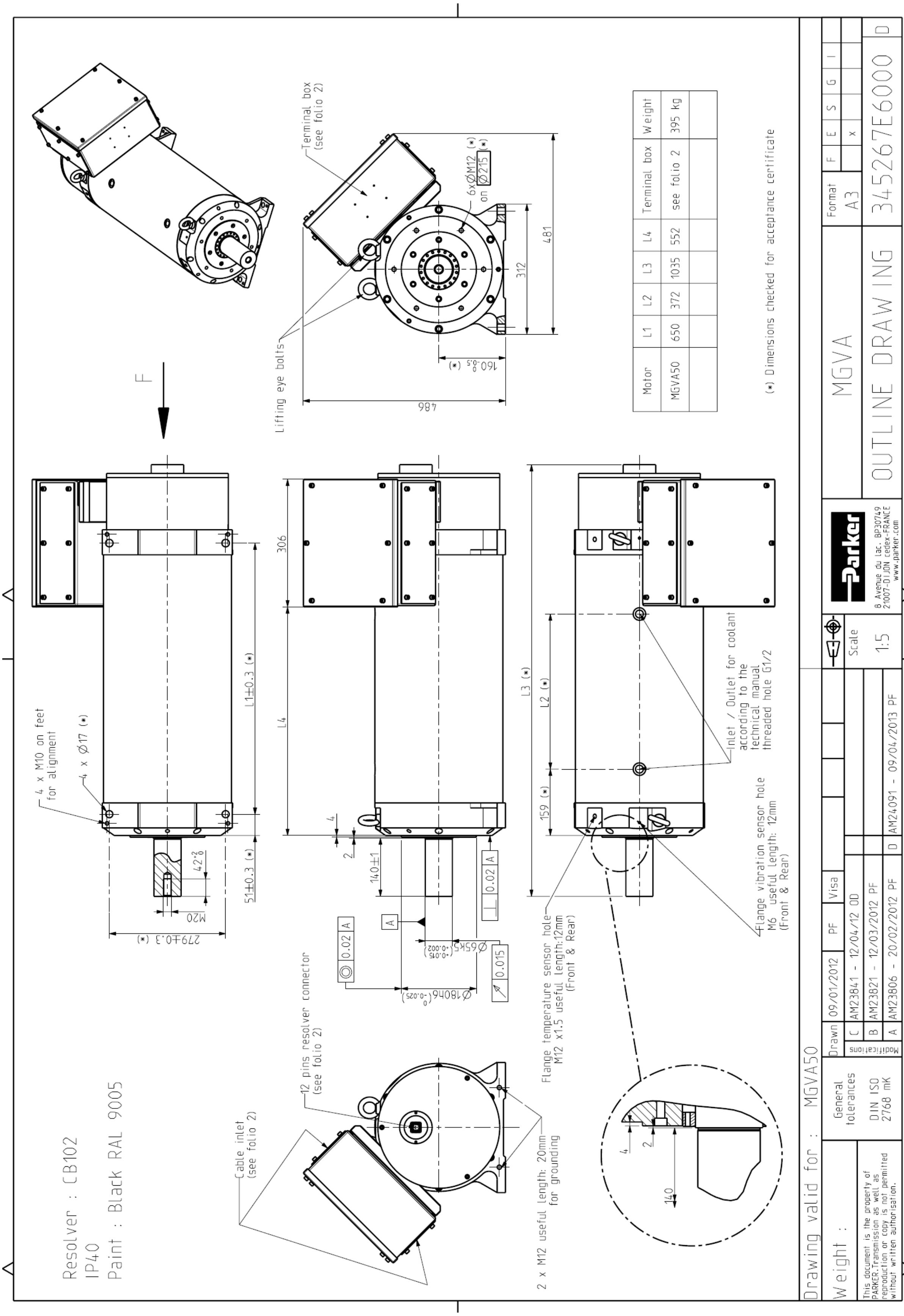
MGV900

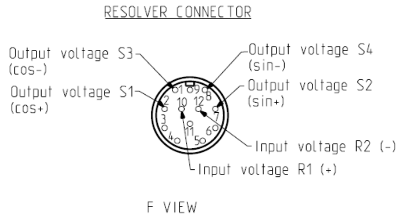
OUTLINE DRAWING

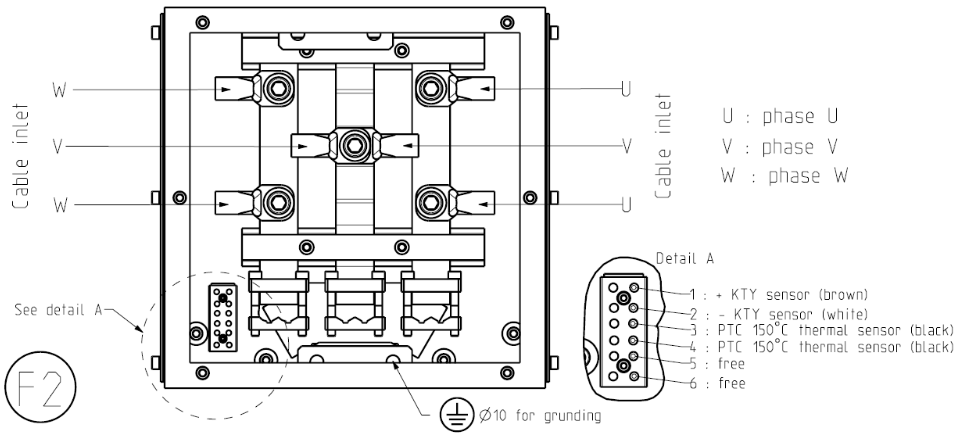
Format	F	E	S	G	I
A3		x			

345265E6000 H

3.3.5. MGVA outline drawing

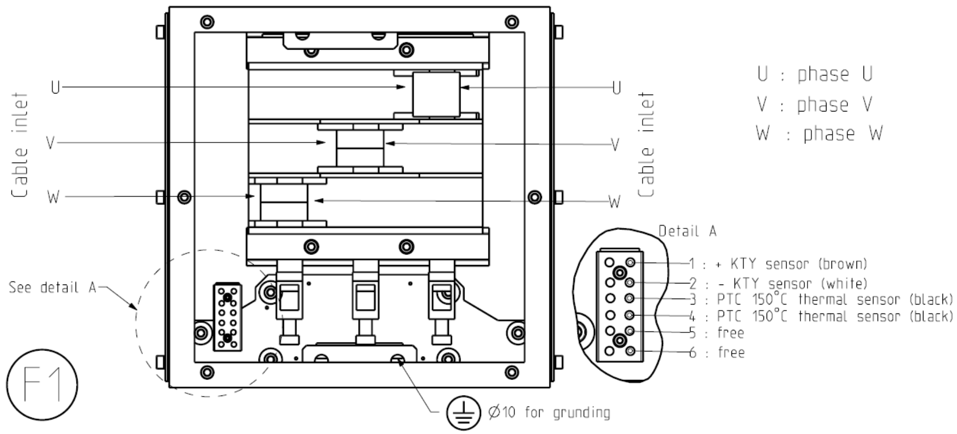






-Terminal box for current between 560 to 630 A, the maxi cable cross section is 2x120 mm²

Motor type	Active part	Terminal box
MGVA50DAC	HKW242_375DAC	F1
MGVA50DAB	HKW242_375DAB	
MGVA50DAA	HKW242_375DAA	F2
MGVA50DBB	HKW242_375DBB	
MGVA50DBY	HKW242_375DBY	



-Terminal box for current < 320 A, the maxi cable cross section is between 95 to 185 mm²
-Terminal box for current between 320 to 560 A, the maxi cable cross section is between 150 to 300 mm²

Drawing valid for : -

Weight :

General tolerances DIN ISO 2768 mK

Drawn 09/01/2012 PF Visa

Modifications:
C AM23841 - 12/04/12 OD
B AM23821 - 12/03/2012 PF
A AM23806 - 20/02/2012 PF
D AM24091 - 09/04/2013 PF

Scale 1:5

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MGVA

OUTLINE DRAWING

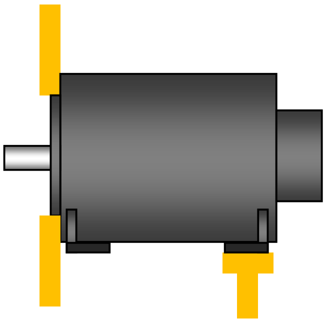
Format A3 | F | E | S | G | I |
x

345267E6000 D

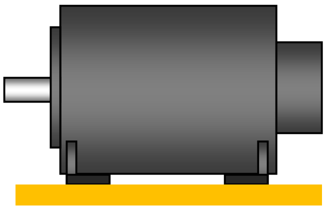
3.4. Motor mounting

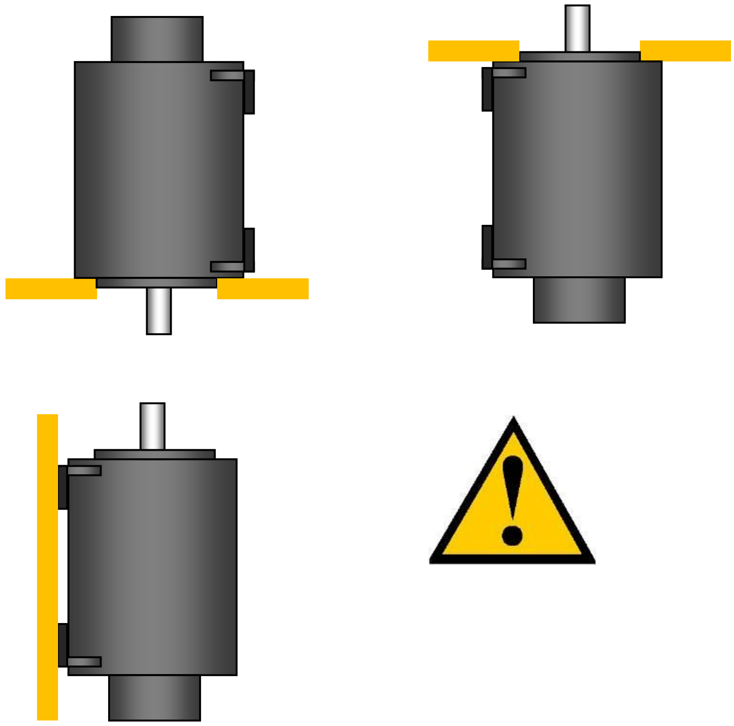
3.4.1. Motor mounting

By flange and feet



By feet

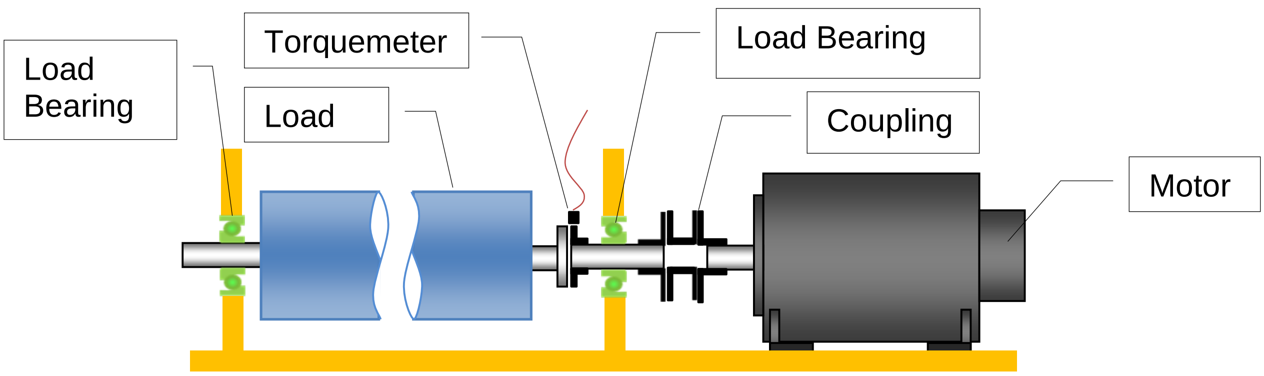




For vertical mounting, Please consult us.
The pre-load on the bearing has to be different to avoid vibration

3.4.2. Typical mounting.

	Warning : **The load must be supported by bearings**. No additional weight must be mounted on the shaft without extra bearings, even if this weight generates a force lower than the maximum force allowed on the shaft. Indeed, this weight can reduced the shaft resonance frequency and leads to its failure. (example : couplings or semi couplings alone on the motor shaft for test). The torque meter has to be treated as a load and it has to be beared by bearings.

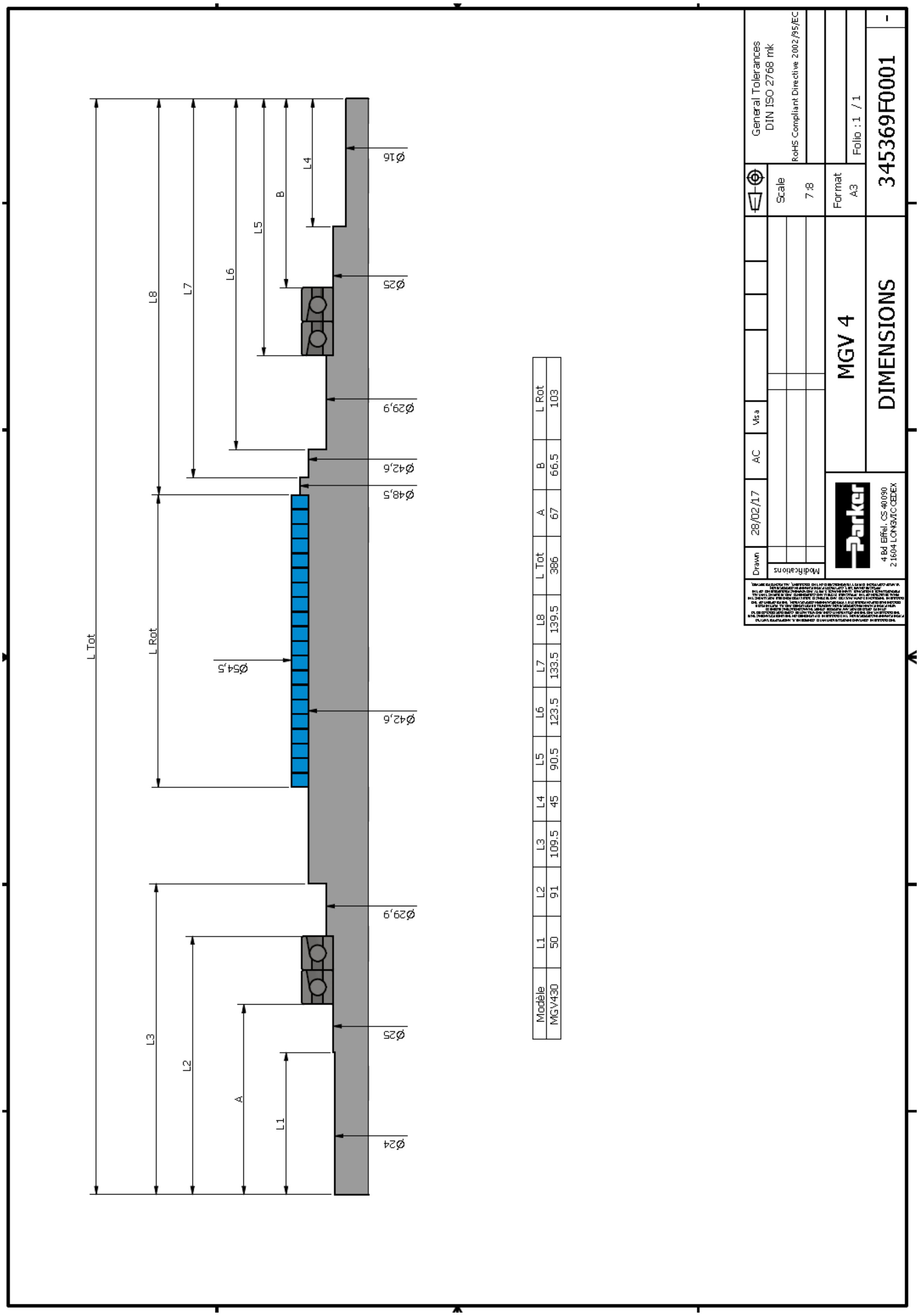


3.4.3. Integration recommendation

	Warning : The user has the entire responsibility to design and prepare the support, the coupling device, shaft line alignment, shaft line balancing and he has to calculate the resonance frequencies (torsion and bending) and to ensure they are compatible with maximum speed of the motor (with a margin of 20%)
	Warning : A bad setting of the electronic control of the close loop (gain too high, incorrect filtring …) can occur an instability of the shaft line, vibration, motor overheating or/and breakdown - Please consult us
	Warning : It is mandatory to calculate the resonance frequencies (torsion and bending) of the complete shaft line (motor, coupling, load, torque meter…) AND to compare to the max speed to avoid any resonance and device breakdown : In torsion: For an inertia ratio between motor and load <5: Natural frequency(Hz) > 1.2 x max speed (rpm) / 60 For an inertia ratio between motor and load >10: Natural frequency(Hz) > 1.7 x max speed (rpm) / 60 For an inertia ratio between motor and load >20: Please consult us In case of no respect of these rules, the setting of the electronic control of the system has to be done carefully – Please consult us In flexion: Natural frequency(Hz) > 1.2 x max speed (rpm) / 60 We highly recommend to do the commissioning with a Parker Engineer to set up correctly the Parker drive.

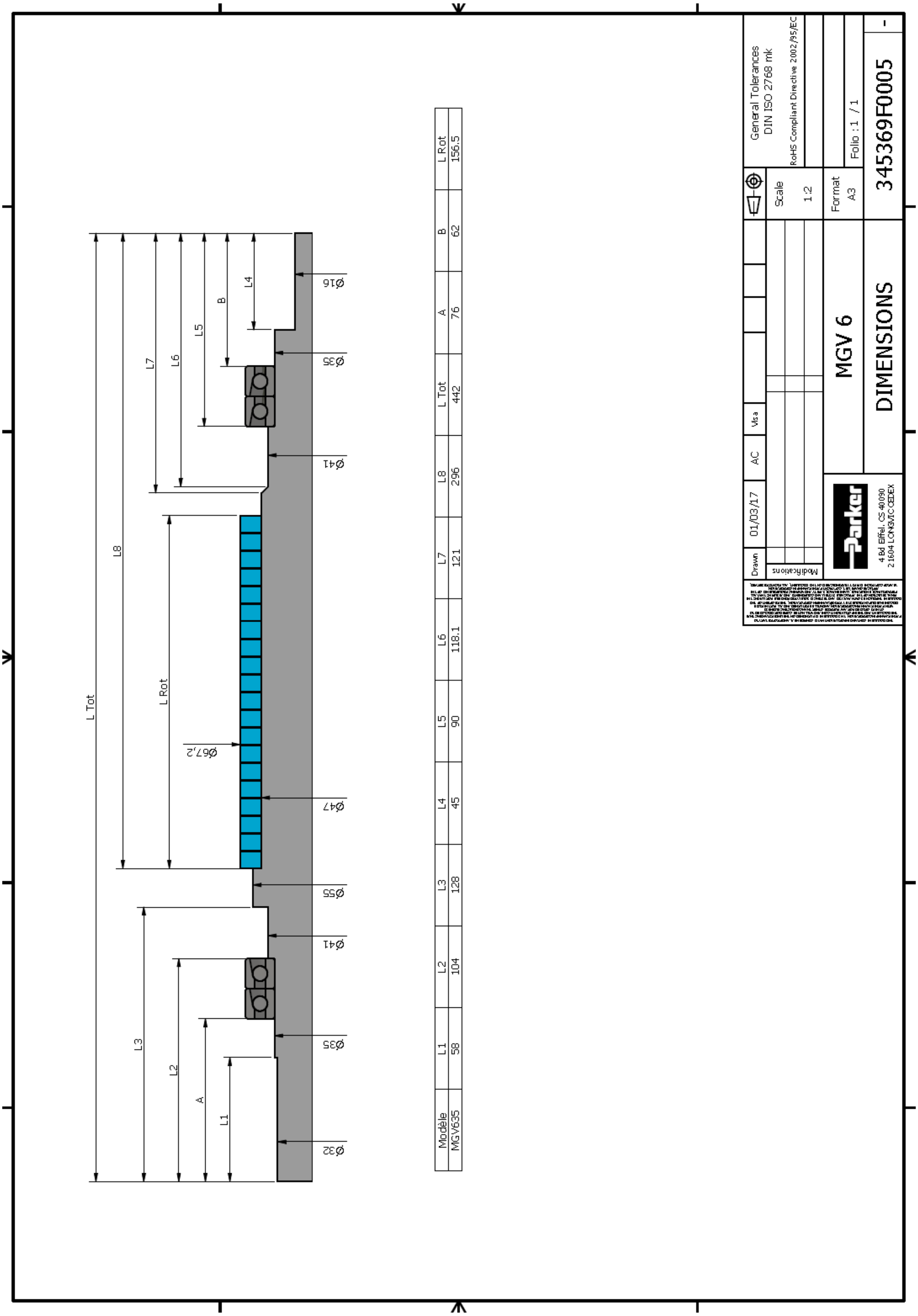
3.4.4. Shaft drawings for calculationof the natural frequencies

3.4.4.1. MGV4



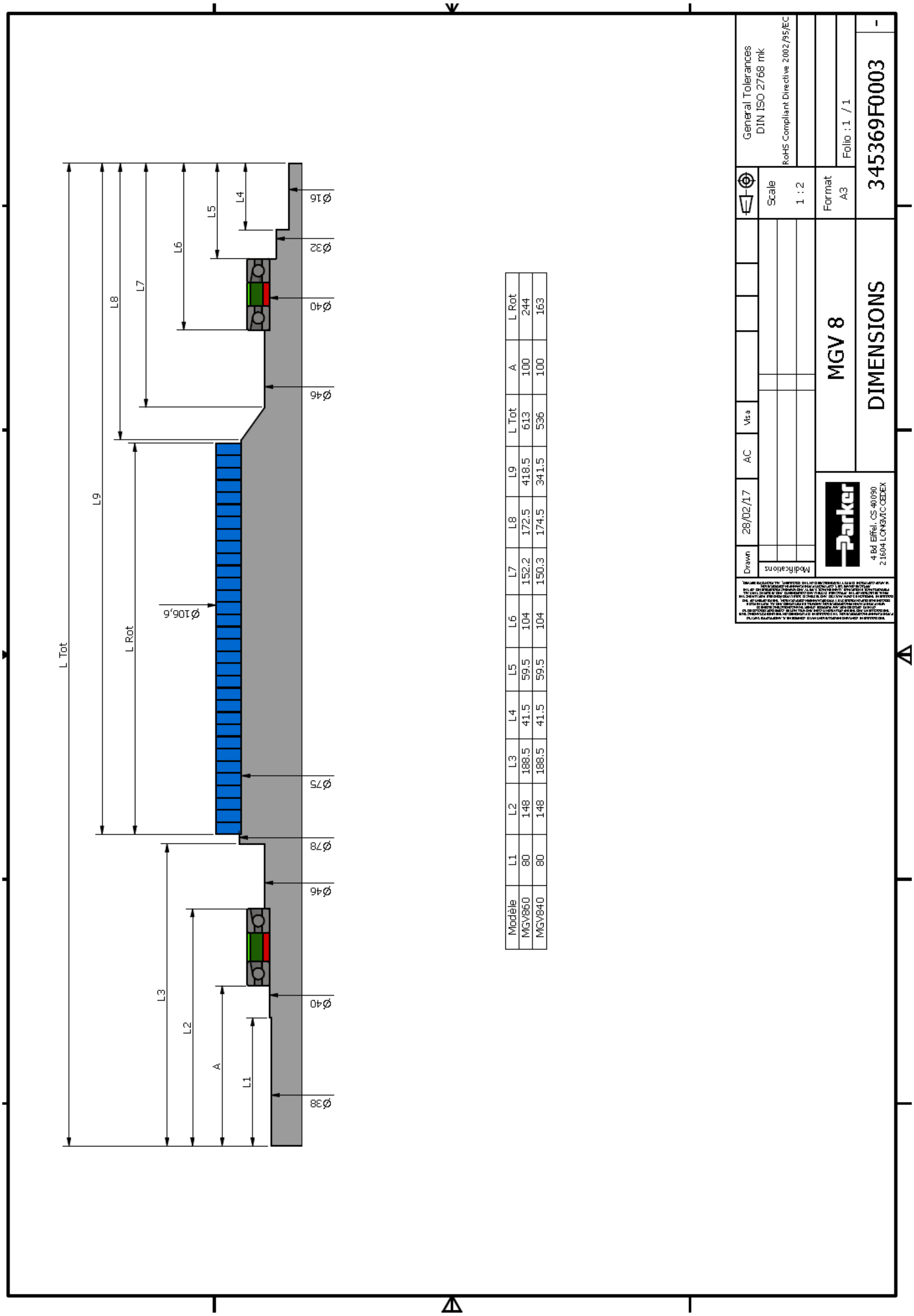
Modèle	L1	L2	L3	L4	L5	L6	L7	L8	L Tot	A	B	L Rot
MGV430	50	91	109.5	45	90.5	123.5	133.5	139.5	386	67	66.5	103

3.4.4.2. MGV6



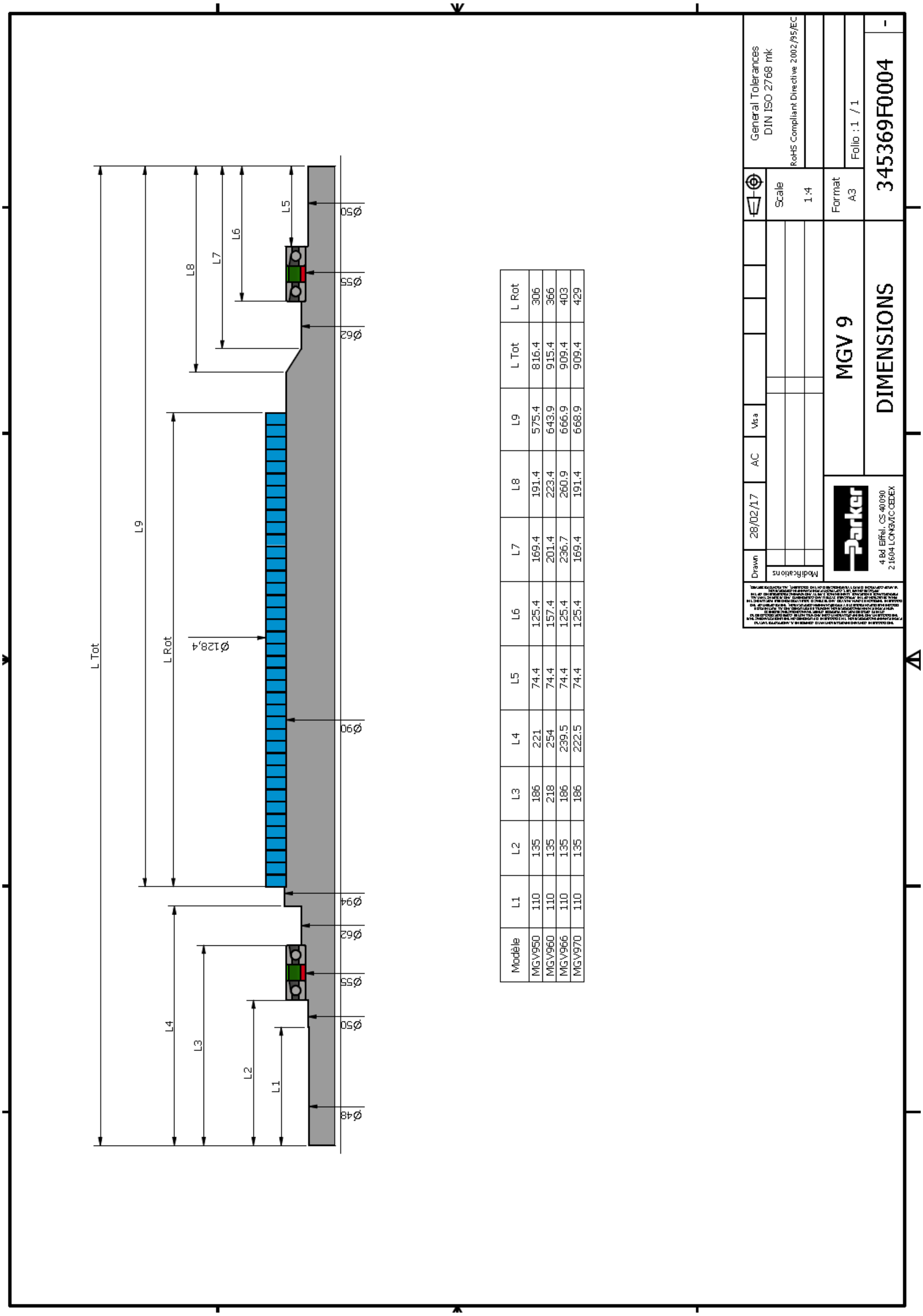
Modèle	L1	L2	L3	L4	L5	L6	L7	L8	L Tot	A	B	L Rot
MGV635	58	104	128	45	90	118.1	121	296	442	76	62	156.5

3.4.4.1. MGV8



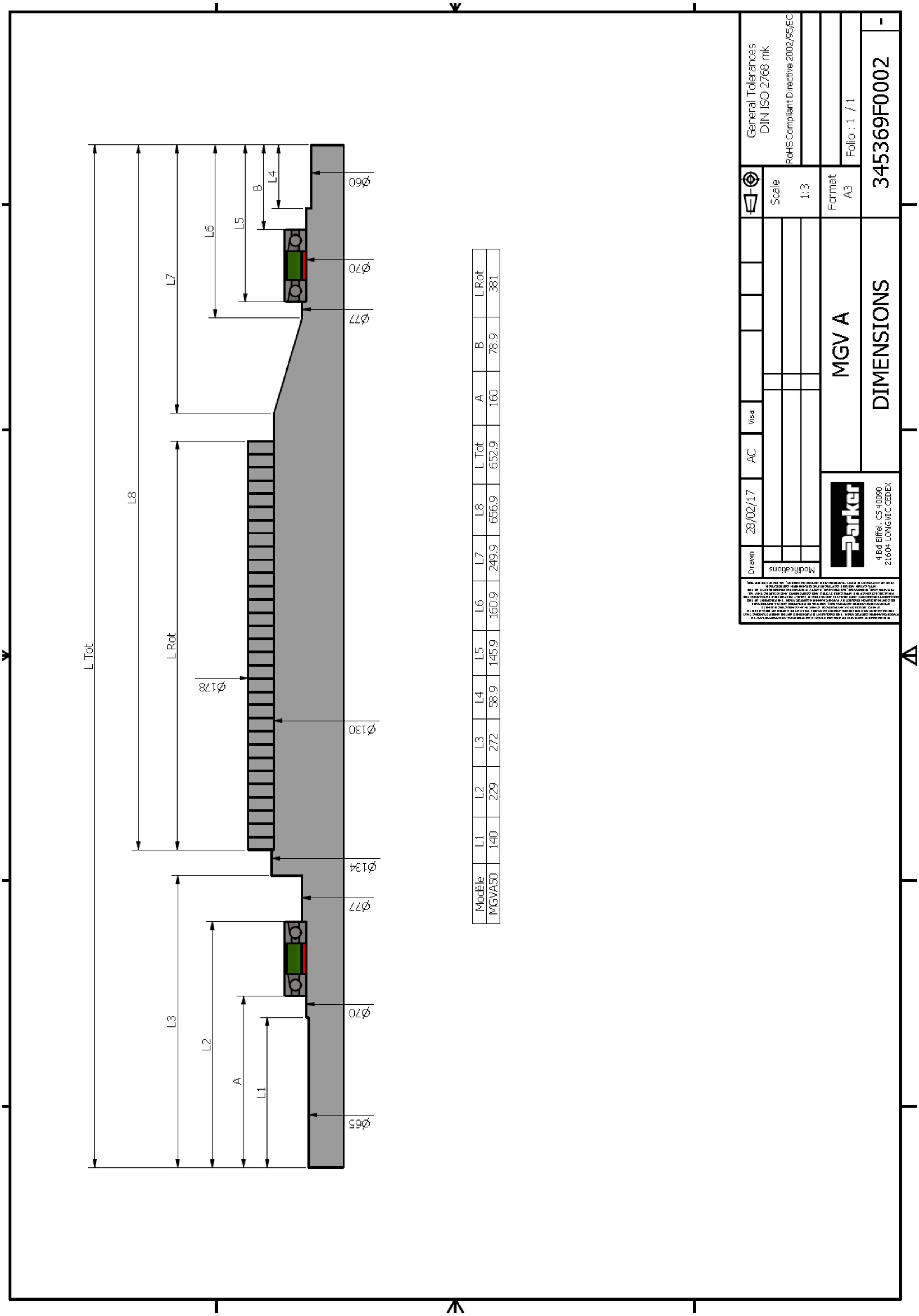
Modèle	L1	L2	L3	L4	L5	L6	L7	L8	L9	L Tot	A	L Rot
MGV860	80	148	188.5	41.5	59.5	104	152.2	172.5	418.5	613	100	244
MGV840	80	148	188.5	41.5	59.5	104	150.3	174.5	341.5	536	100	163

3.4.4.1. MGV9



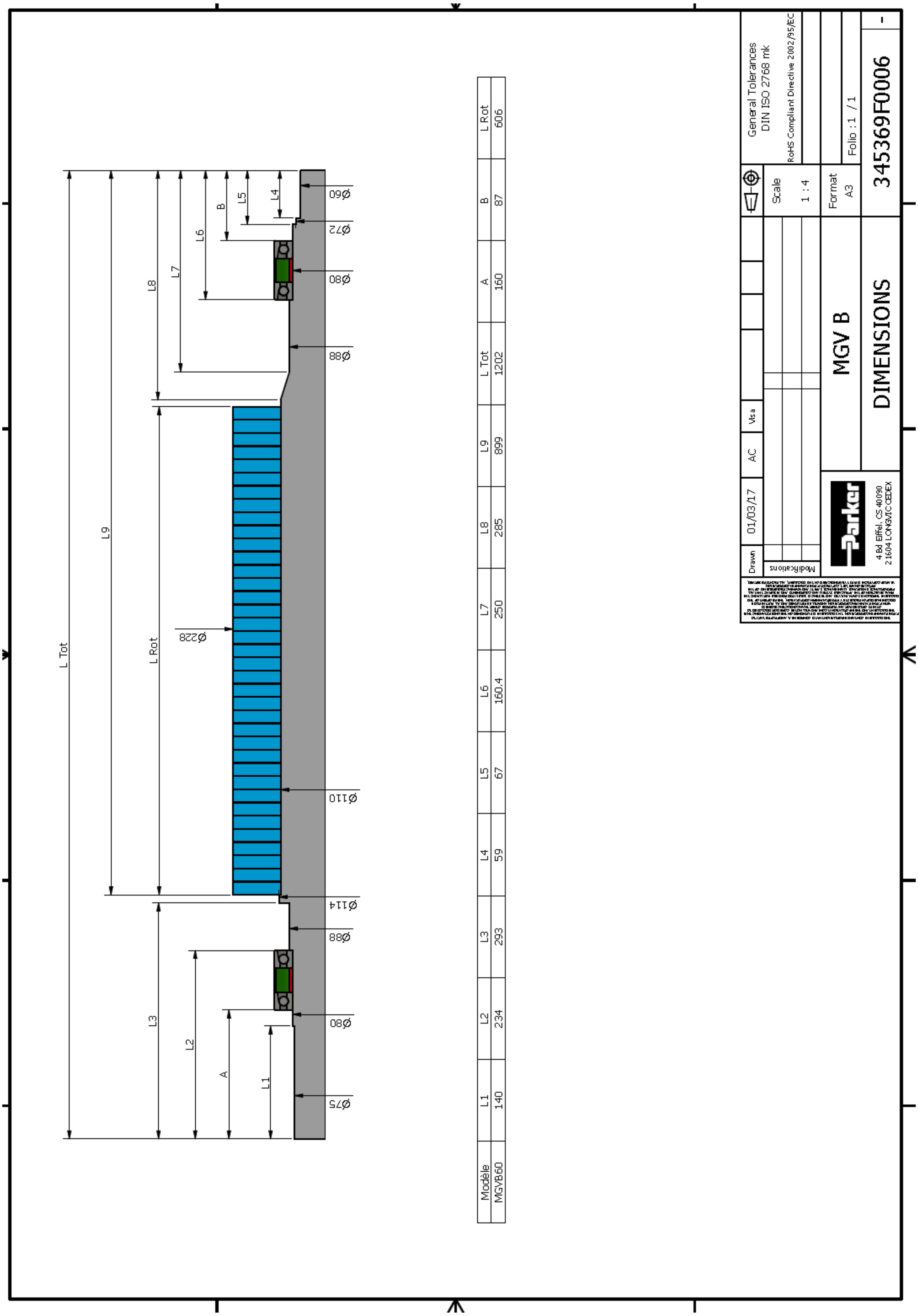
Modèle	L1	L2	L3	L4	L5	L6	L7	L8	L9	L Tot	L Rot
MGV950	110	135	186	221	74.4	125.4	169.4	191.4	575.4	816.4	306
MGV960	110	135	218	254	74.4	157.4	201.4	223.4	643.9	915.4	366
MGV966	110	135	186	239.5	74.4	125.4	236.7	260.9	666.9	909.4	403
MGV970	110	135	186	222.5	74.4	125.4	169.4	191.4	668.9	909.4	429

3.4.4.1. MGVA



Modèle	L1	L2	L3	L4	L5	L6	L7	L8	L Tot	A	B	L Rot
MGVA50	140	229	272	58.9	145.9	160.9	249.9	656.9	652.9	160	78.9	381

3.4.4.2. MGVB



Modèle	L1	L2	L3	L4	L5	L6	L7	L8	L9	L Tot	A	B	L Rot
MGVB60	140	234	293	59	67	160.4	250	285	899	1202	160	87	606

3.4.5. Frame recommendation

Foundation must be even, sufficiently rigid and shall be dimensioned in order to avoid vibrations due to resonances. It is mandatory to calculate natural frequencies of the foundation.

The high-speed motors need a rigid support, machined and of good quality.
The maximum flatness of the support has to be lower than 0.05mm.

The motor vibration magnitudes in rms value are in accordance with IEC 60034-14 – grade A:

- maximum rms vibration velocity for MGV4/MGV6/MGV8 is 1.3mm/s for rigid mounting
- maximum rms vibration velocity for MGV9/MGVA/MGVB is 1.8mm/s for rigid mounting

	Warning : A grade A motor (according to IEC 60034-14) well-balanced, may exhibit large vibrations when installed in-situ arising from various causes, such as unsuitable foundations, reaction of the driven motor, current ripple from the power supply, etc. Vibration may also be caused by driving elements with a natural oscillation frequency very close to the excitation due to the small residual unbalance of the rotating masses of the motor. In such cases, checks should be carried out not only on the machine, but also on each element of the installation. (See ISO 10816-3).

3.4.6. Coupling

The permitted loads on the shaft are limited to low values low level (excepted with specific bearing), it is mandatory to use a flexible coupling between the motor and the load.

Different kind of couplings can be used like bellow coupling or disc coupling. They offer hard torsion stiffness.

To fit the coupling on the shaft, we recommend using shrink disc or locking assembly. Other devices like keyways are unbalanced and are not compatible with the high speed.

⚠	To choose the coupling, all the components of the shaft line must be taken into account: motor, load, load's bearings, coupling, speed, acceleration, balancing, alignment…. The coupling supplier can help to define the best coupling.

⚠	Warning: The coupling misalignment generates strains and loads on motor shaft depending on the stiffness of the coupling. Thermal expansion can also generate strain and load. These forces (axial and radial) must be calculated and remain below the maximum shaft allowed forces (§3.5).

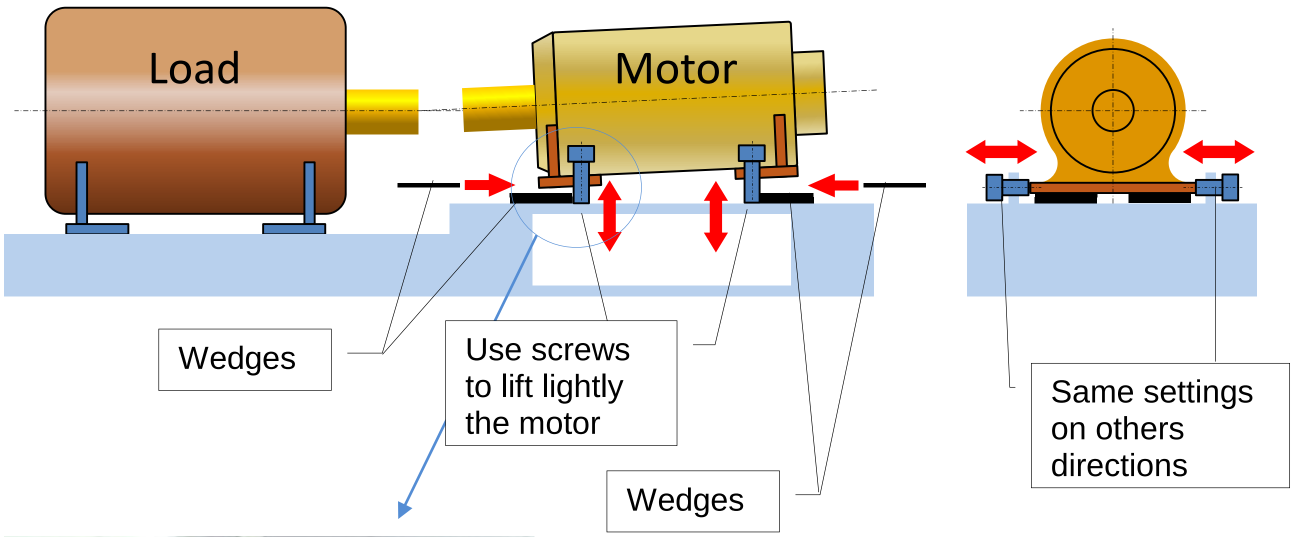
⚠	Warning : Parker will not be responsible for any motor shaft failure due to excessive strains or vibrations on the shaft .

⚠	Warning : The coupling between motor and bearing has to be the shortest as possible to have the bearing of the load close to the motor.

⚠	Warning : It is strictly forbidden to use couplings which generate axial force under load.

3.4.7. Motor alignment

To align easily the motor with the load, we recommend adding screws on the frame to push the motor smoothly. The MGV has a thread hole on each foot to lift it smoothly. Enough screws must be used to move the motor (or the load) in all directions. At each step of the setting, wedges have to be inserted between the motor feet and the frame. The allowable offset and angle of misalignment have to be the result of a calculation to guarantee a vibration level below the requirement of the standard ISO 10816-3.

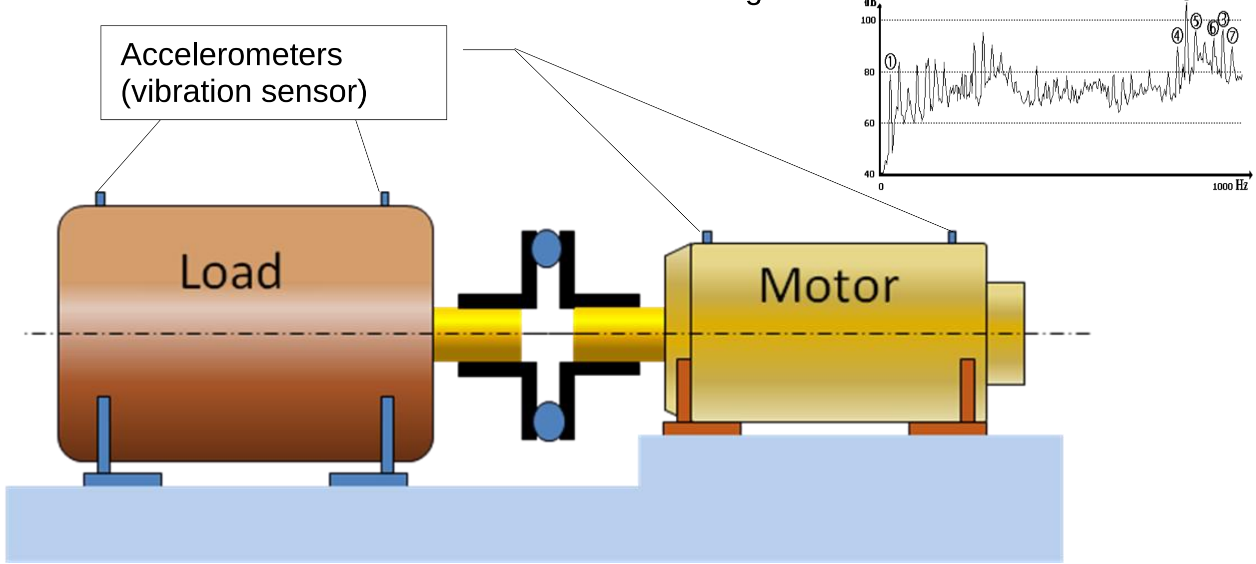


3.4.8. Pulley/belt

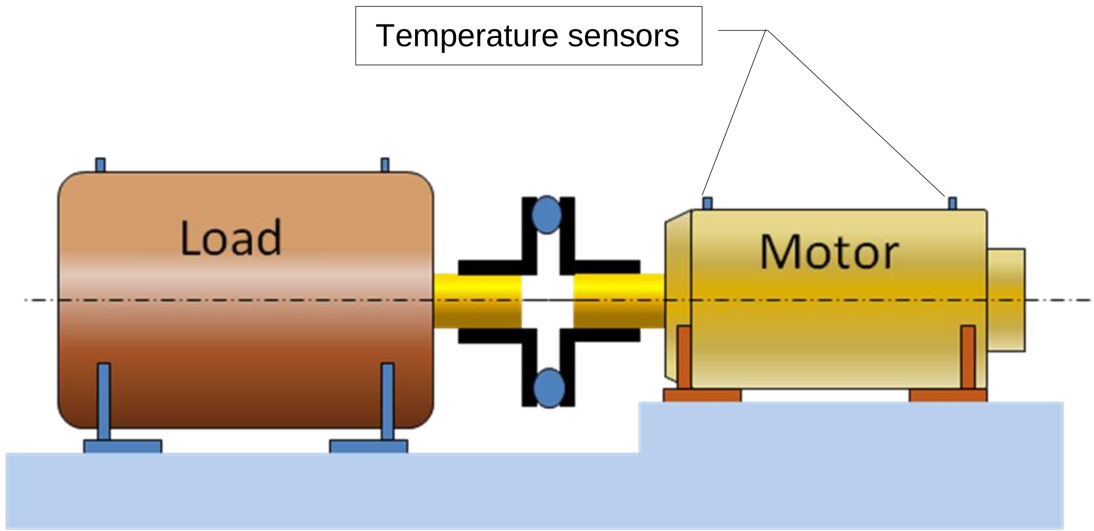
	Warning : The MGV motors are not designed to operate with pulley / belt systems. By limiting the speed and/or using specific bearing assemblies, it can be possible in some cases to use pulley / belt systems. It is mandatory to raise a request to the factory before doing so.

3.4.9. Vibration and bearings temperature control

It is highly recommended to implement a vibratory control in accordance with the ISO 10816 standard to detect any sign of mechanical evolution before breakdown.
Accelerometers must be located closed to the bearings



Moreover, it is highly recommended to monitor the bearings temperature. This control can detect temperature evolutions that are the first signs of the bearings end life. We recommend the process below:
- record initial bearing temperature after 1 hour of running.
- calculate the temperature rise = bearing temperature – ambient temperature.
- if temperature rise increase by 15°C during the machine life, the motor must be stopped.



3.4.10. Vibration resistance to shaft end

Frequency domain :10 to 55 Hz according to EN 60068 -2-6
Vibration resistance to the shaft end :
- radial 0.9 g
- axial 0,3 g

3.5. Bearings

The bearings are greased for life.
The statistic bearings life is limited from 6000h up to 10000h depending on the way there are assembled and used, it is recommended to control the vibrations every 3000h or to change it once the predicted lifetime is reached.
This period is indicative and has to be considered with the load and speed limits taken into account for the bearings calculation.
Depending on the maximum speed, the loads and the needed lifetime, those high-speed motors can be equipped with different kind of bearings: steel ball bearings, hybrid ball bearings (ceramic balls with a synthetic cage) or Xlife bearings (ceramic balls with rings made with high performance iron).

⚠	Other limitations can come from the winding or the drive (cf: §3.1.4-Drive selection)

⚠	The bearing arrangement is made with 2 x 2 angular ball bearings (two on the shaft end + two on the rear). The front bearings are blocked in axial translation and the rear one is free in translation with a pre-load to avoid any stress from the shaft thermal expansion during the running. The bearing arrangement is called big X : >> <<

3.5.1. Bearing max speed, part numbering, pre-load and load

		L : STEEL STRAIGHT BEARINGS	H : HYBRID BEARINGS	X : X-LIFE BEARINGS
MGV4	Max Speed [rpm]	26000	33000	45000
	Bearing	2 x 2 x HSS7005E	2 x 2 x HCS7005E	2 x 2 x XCS71905E
	Pre-load [N]	250	200	150
	Max radial Load [N]	100	100	100
	Max axial Load [N]	30	30	20
MGV635	Max Speed [rpm]	18500	25000	30000
	Bearing	2 x 2 x B7007E	2 x 2 x HCS7007E	2 x 2 x XCS7007E
	Pre-load [N]	400	300	300
	Max radial Load [N]	320	320	240
	Max axial Load [N]	80	80	60
MGV8	Max Speed [rpm]	14300	18000	24000
	Bearing	2 x 2 x B7008E	2 x 2 x HCS7008E	2 x 2 x XCS7008E
	Pre-load [N]	550	400	375
	Max radial Load [N]	400	400	400
	Max axial Load [N]	100	100	100

		L : STEEL STRAIGHT BEARINGS	H : HYBRID BEARINGS	X : X-LIFE BEARINGS
MGV950	Max Speed [rpm]	11700	16000	20000
	Bearing	2 x 2 x B7011E	2 x 2 x HCS7011E	2 x 2 x XCS7011E
	Pre-load [N]	2000	1500	1500
	Max radial Load [N]	500	700	500
	Max axial Load [N]	120	160	120
MGV966	Max Speed [rpm]	-	-	8000
	Bearing	-	-	4 x XCS7011E
	Pre-load [N]	-	-	2000
	Max radial Load [N]	-	-	300
	Max axial Load [N]	-	-	120
MGV970	Max Speed [rpm]	-	12000	-
	Bearing	-	2 x 2 x HCS7011E	-
	Pre-load [N]	-	1500	-
	Max radial Load [N]	-	500	-
	Max axial Load [N]	-	200	-
MGVA	Max Speed [rpm]	9200	12000	-
	Bearing	Consult us	2 x 2 x 70BER10HT	-
	Pre-load [N]	Consult us	2500	-
	Max radial Load [N]	700	700	-
	Max axial Load [N]	120	120	-
MGVB	Max Speed [rpm]	5400	8000	-
	Bearing	2 x 2 x 7016A5TR	Consult us	-
	Pre-load [N]	2600	Consult us	-
	Max radial Load [N]	1000	1000	-
	Max axial Load [N]	150	150	-

3.6. Cooling

In compliance with the IEC 60034-1 standards:

3.6.1. General recommendations

	Danger: The cooling system has to be operational when the motor is running or energized.
	Danger: The Inlet temperature and the water flow have to be monitored to avoid any damage.
	Caution: When motor is not running, the cooling system has to be stopped 10 minutes after the motor shut down.
	Caution: Condensation and risk of rust may occur when the temperature gradient between the air and the water becomes significant. Condensation is also linked to hygrometry rate. To avoid any issue, we recommend: $T_{water} > T_{air}$ - 2°C. The motor can be used with an ambient temperature between 27°C to 40°C with a high water temperature but with derating. If inlet water temperature becomes higher than 25°C, derating factor must be applied according to §3.1.2 Temperature Derating
	Caution: the ambient air temperature shall not exceed 40°C in the vicinity of the motor flange.
	Danger: If the water flow stops, the motor can be damaged or destroyed causing accidents.

3.6.2. Additives for water as cooling media

Please refer to motor technical data for coolant flow rates.

The water inlet temperature must not exceed **25°C** to get the full performances.

The inner pressure of the cooling liquid must not exceed **5 bars**.

	Caution: To avoid the corrosion of the motor cooling system (aluminum or steel), the water must have anti-corrosion additive.

The spindle servomotors are water cooled. Corrosion inhibitors must be added to the water to avoid the corrosion. The complete cooling system must be taken into account to choose the right additive, this includes: the different materials in the cooling circuit, the chiller manufacturer recommendations, the quality of the water…
The right additive solution is the responsibility of the user. Some additives like TYFOCOR or GLYSANTIN G48 correctly used have demonstrated their ability to prevent corrosion in a closed cooling circuit

For example: Glysantin G48 recommendations are :
- Water hardness: 0 to 20°dH (0 – 3.6 mmol/l)
- Chloride content: max. 100ppm
- Sulphate content: max. 100ppm

	Caution: The water quality is very important and must comply with supplier recommendations. The additive quantity and periodic replacement must respect the same supplier recommendations.

	Caution: The additive choice must take into account the global cooling system (chiller or water exchanger recommendations…).

	Select carefully the materials of all the cooling system parts (chiller, exchanger, hoses, adapters and fittings) because the difference between material galvanic potential can generate corrosion.

3.6.3. Motor cooling circuit data and chiller selection

MGV servomotors are cooled by water. An anti-corrosion product must be mixed to the water. The main characteristics of cooling are given in the table bellow:

Chiller must be able to evacuate motor power loss (see table above).
Chiller pump must provide water flow through motor and pipe pressure drop.
Inlet temperature must be inferior to 25°C.

You can find various chillers solutions in Parker Hiross - http://www.dh-hiross.com/

Motor	Water flow necessary for cooling (with water + 30% glycol)	Maxi drop pressure @ nominal water flow **in the motor**	Motor power losses at max speed and continuous operation	**Hyperchill Plus** with single pump 5 bar : **P5 option** (mandatory)
	l/min	Bars	kW	
MGV420B	2,2	3 maxi	1,3	ICEP002-WASP5T0xxxxxx1
MGV430B	3,3		1,6	ICEP003-WASP5T0xxxxxx1
MGV620C	3,3		1,5	ICEP003-WASP5T0xxxxxx1
MGV635C	5,6		2,5	ICEP003-WASP5T0xxxxxx1
MGV820C	6		2,1	ICEP003-WASP5T0xxxxxx1
MGV840C	11		4,3	ICEP005-WATP5T0xxxxxx1
MGV860C	17		6,8	ICEP007-WATP5T0xxxxxx1
MGV920C	8		3.2	ICEP005-WATP5T0xxxxxx1
MGV930C	11		5.8	ICEP007-WATP5T0xxxxxx1
MGV950C	18		7	ICEP010-WATP5T0xxxxxx1
MGV960C	22		11	ICEP014-WATP5T0xxxxxx1
MGV966D	28		11,7	ICEP014-WATP5T0xxxxxx1
MGV970C	28		12	ICEP014-WATP5T0xxxxxx1
MGVA30D	17		7	ICEP010-WATP5T0xxxxxx1
MGVA50D	28		12	ICEP014-WATP5T0xxxxxx1
MGVB30H	30		10	ICEP014-WATP5T0xxxxxx1
MGVB40H	40		14	ICEP020-WATP5T0xxxxxx1
MGVB50H	50		20	ICEP024-WATP5T0xxxxxx1
MGVB60H	60		24	ICE039-A4003501P50FFxxxxx

3.6.4. Flow derating according to glycol concentration

Flow rate [l/min]	Glycol concentration [%] 0	10	20	30	40	50
	5	5.1	5.3	5.6	5.9	6.2
	10	10.2	10.6	11.1	11.8	12.4
	15	15.3	15.9	16.7	17.6	18.7
	20	20.4	21.2	22.2	23.5	24.9
	25	25.5	26.5	27.8	29.4	31.1
	30	30.6	31.8	33.4	35.3	37.3
	35	35.7	37.1	38.9	41.1	43.6
	40	40.8	42.4	44.5	47.0	49.8
	45	45.9	47.7	50.0	52.9	56.0
	50	51.0	53.0	55.6	58.8	62.2
	55	56.1	58.3	61.2	64.7	68.4
	60	61.2	63.5	66.7	70.5	74.7
	65	66.4	68.8	72.3	76.4	80.9
	70	71.5	74.1	77.8	82.3	87.1
	75	76.6	79.4	83.4	88.2	93.3
	80	81.7	84.7	89.0	94.1	99.5
	85	86.8	90.0	94.5	99.9	105.8
	90	91.9	95.3	100.1	105.8	112.0
	95	97.0	100.6	105.6	111.7	118.2
	100	102.1	105.9	111.2	117.6	124.4
	110	112.3	116.5	122.3	129.3	136.9
	120	122.5	127.1	133.4	141.1	149.3
	130	132.7	137.7	144.6	152.8	161.8
	140	142.9	148.3	155.7	164.6	174.2
	150	153.1	158.9	166.8	176.3	186.6
	160	163.3	169.5	177.9	188.1	199.1
	170	173.5	180.1	189.0	199.9	211.5
	180	183.7	190.6	200.2	211.6	224.0
	190	194.0	201.2	211.3	223.4	236.4
	200	204.2	211.8	222.4	235.1	248.9

Use of the table above - Example

If the motor needs **25 l/min** with **0%** glycol,
If application needs **20%** glycol, the water flow must be **26.5 l/min**,
If application needs **40%** glycol, the water flow must be **29.4 l/min**.

Main formulas

$$Flow\_rate = \frac{Power\_dissipation * 60}{\Delta\theta° * C_p}$$

With: *Flow rate* [l/min]
Power_dissipation [W]
$\Delta\theta°$ Gradient inlet-outlet [°C]
Cp thermal specific capacity of the water as coolant [J/kg°K]
(***Cp*** depends on the % glycol concentration please see below)

Thermal specific capacity *Cp* according to % glycol concentration and temperature

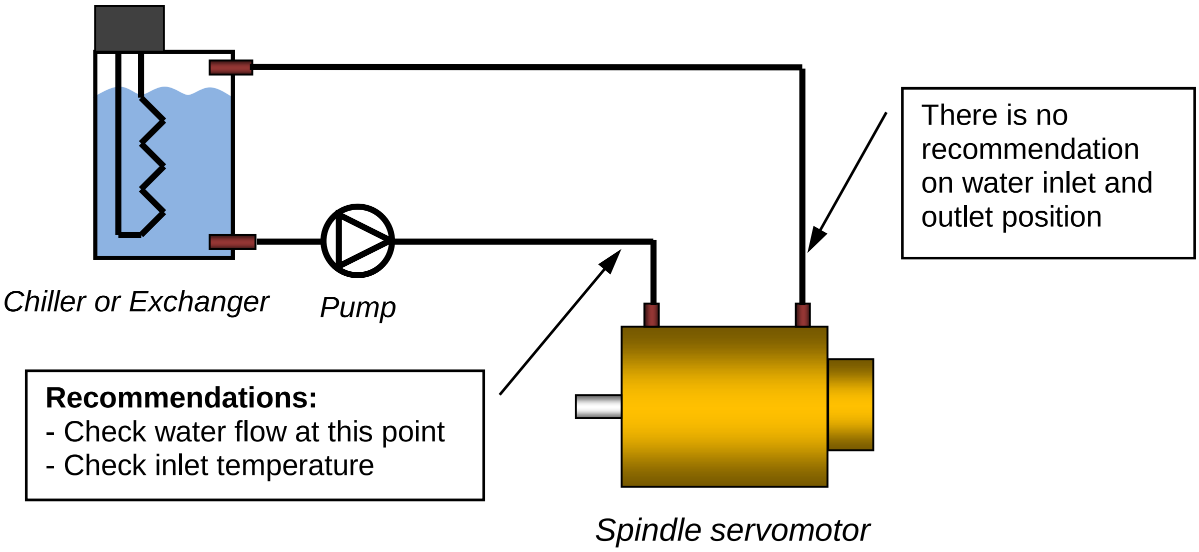
We have considered an average temperature of the coolant of 30°C.

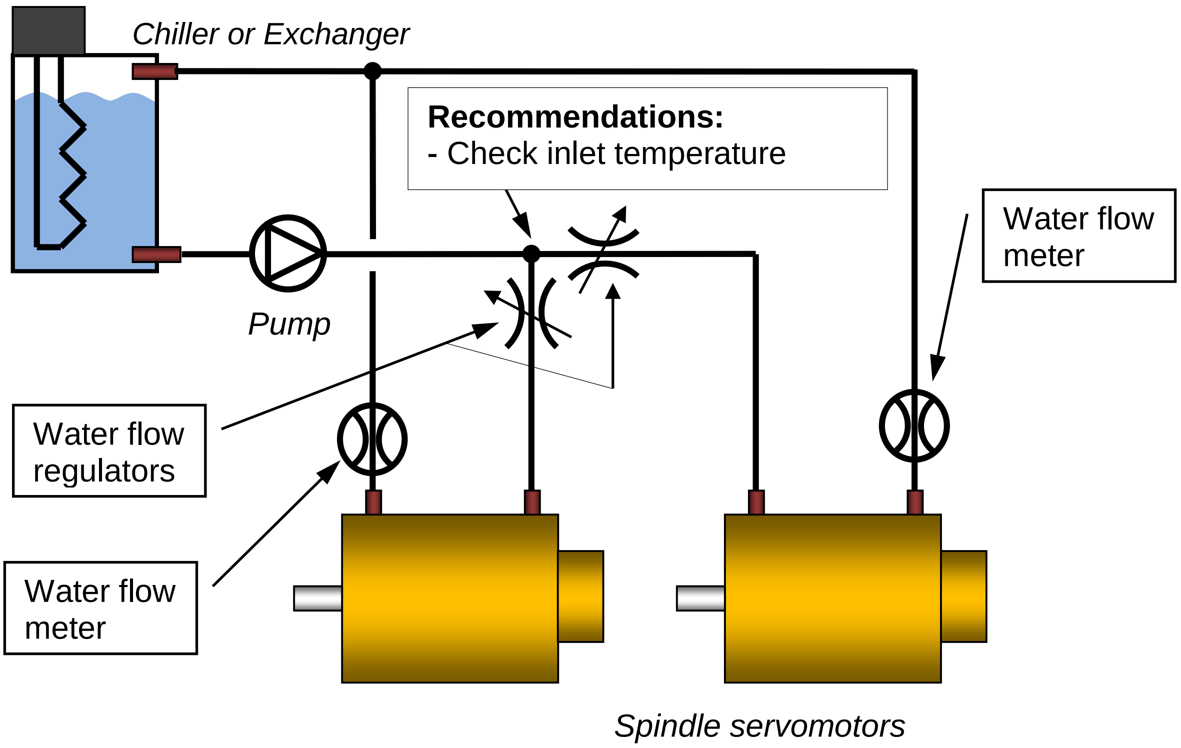
Glycol concentration [%]	Average temperature of the water as coolant [°C]	Thermal specific capacity of the water ***Cp*** [J/kg°K]
0	30	4176
30	30	3755
40	30	3551
50	30	3354

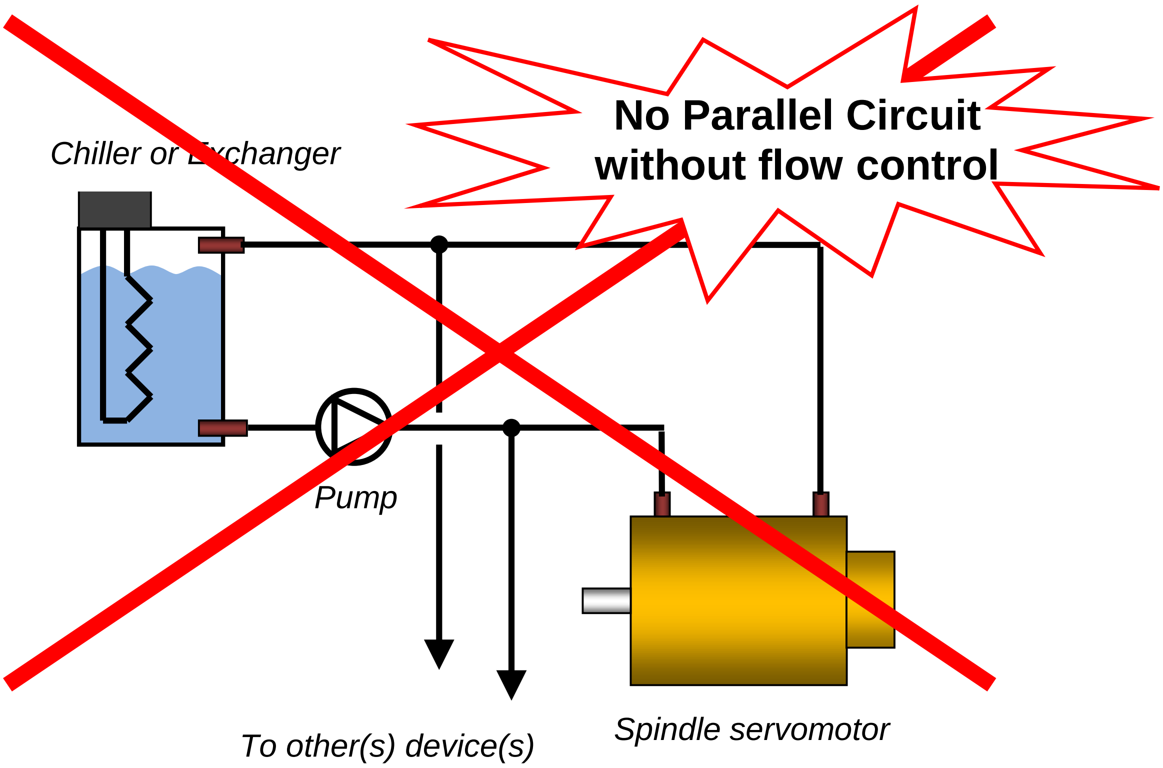
3.6.5. Water cooling diagram

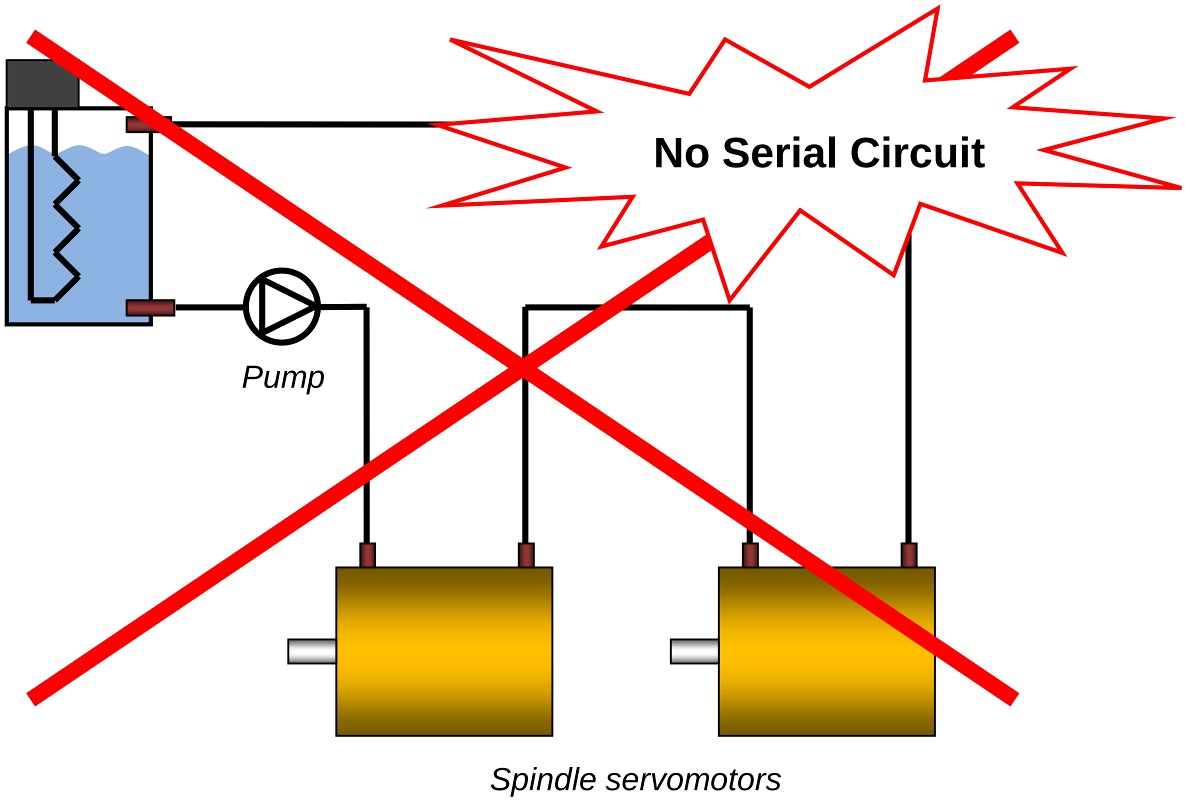
Recommendation: The use of a filter allows reducing the presence of impurities or chips in the water circuit in order to prevent its obstruction. We recommend a 0.1mm filter.

This section shows typical water cooling diagram:





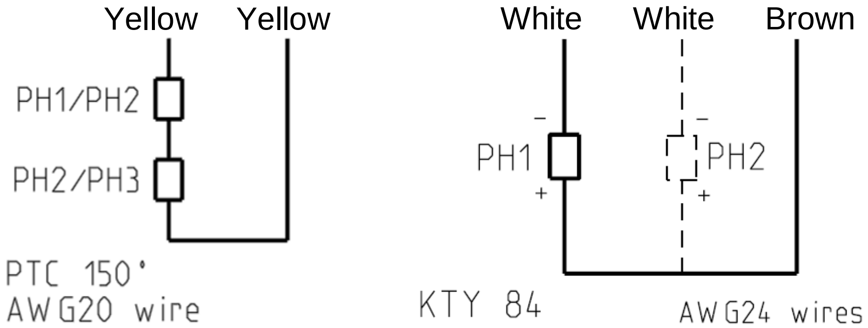

No Parallel Circuit
without flow control
Chiller or Exchanger
Pump
To other(s) device(s)
Spindle servomotor


No Serial Circuit
Pump
Spindle servomotors

3.7. Thermal Protection

Protection against thermal overloading of the motor is provided by two PTC thermistors and one KTY temperature sensor (and one more in case of KTY failure) built into the stator winding as standard. The thermal sensors, due to their thermal inertia, are unable to follow very fast winding temperature variations. They achieve their thermal steady state after a few minutes.

Warning: To protect correctly the motor against very fast overload, please refer to 3.1.7. Peak current limitations

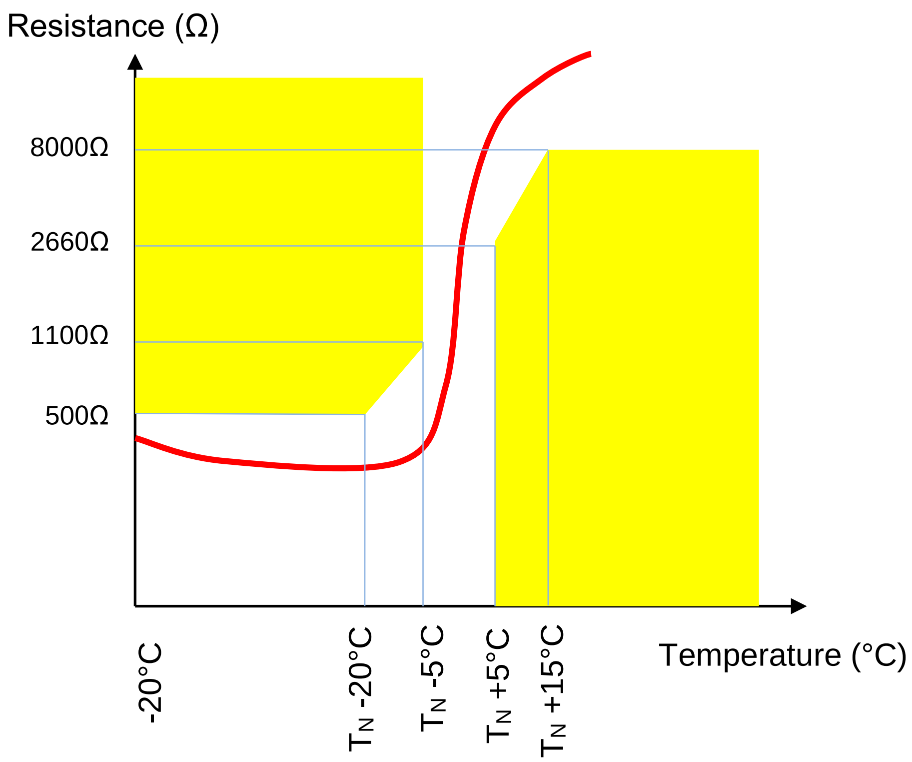


3.7.1. Alarm tripping with PTC thermistors :

The thermal probes (PTC thermistors) fitted in the servomotor winding trip the electronic system at 150° ± 5° C. When the rated tripping temperature is reached, the PTC thermistor resistance changes very quickly. This resistance can be monitored by the drive to protect the motor.

The graph and tab below shows the PTC resistance as a function of temperature (T_N is nominal temperature)

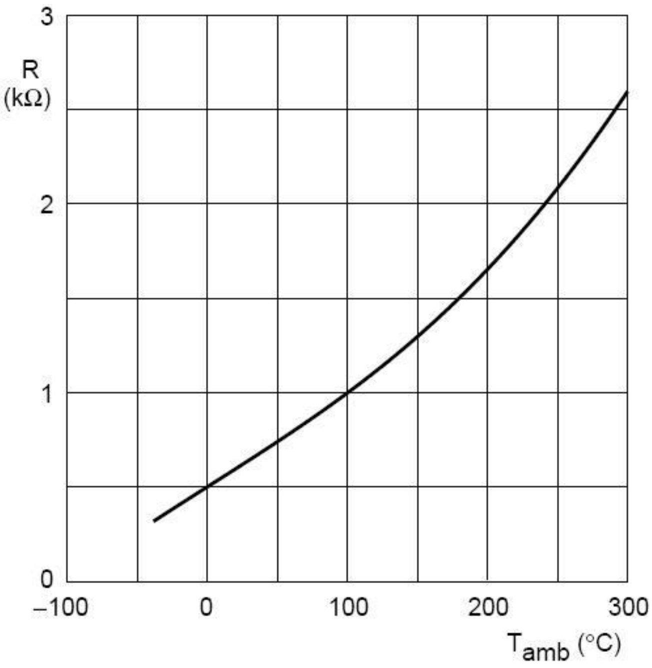
Temperature	Resistance value
-20°C up to TN-20°C	R≤500Ω
TNF-5°C	R≤1100Ω
TNF+5°C	R≥2660Ω
TNF+15°C	R≥8000Ω

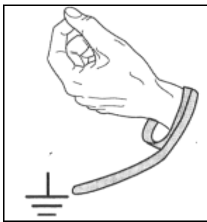


3.7.2. Temperature measurement with KTY sensors:

Motor temperature can also be continuously measured by the drive using a KTY 84-130 thermal sensor built in to the stator winding. KTY sensors are semiconductor sensors that change their resistance according to an approximately linear characteristic. The required temperature limits for alarm and tripping can be set in the drive.

The graph below shows the KTY sensor resistance vs temperature, for a current of 2 mA:



	Warning: KTY sensor is sensitive to electrostatic discharge. So, always wear an antistatic wrist strap during KTY handling.

	Warning: KTY sensor is polarized. Do not invert the wires.

	Warning: KTY sensor is sensitive. Do not check it with an Ohmmeter or any measuring or testing device.

3.8. Power electrical connection

3.8.1. Wires sizes

In every country, you must respect all the local electrical installation regulations and standards.

Not limiting example in France: NFC 15-100 or IEC 60364 as well in Europe.

Cable selection depends on the cable construction, so refer to the cable technical documentation to choose wire sizes

Some drives have cable limitations or recommendations; please refer to the drive technical documentation for any further information.

Cable selection

At standstill, the current must be limited at 80% of the low speed current I_o and the cable has to support the peak current for a long period. So, if the motor works at standstill, the current to select the right wire size is $\sqrt{2} \times 0.8\, I_o \cong \mathbf{1{,}13 \times I_o}$.

Sizes for H07 RN-F cable, for a 3 cores in a cable tray at 30°C max

Section [mm²]	I_{max} [A_{rms}]
1.5	17
2.5	23
4	31
6	42
10	55
16	74
25	97
35	120
50	146
70	185
95	224
120	260
150	299
185	341
240	401
300	461

Example of sizes for H07 RN-F cable :
Conditions of use:
Case of 3 conductors type H07 RN-F: **60°C maximum**
Ambient temperature: 30°C
Cable runs on dedicated cables ways
Current limited to 80%*I_0 at low speed or at motor stall.

Example:
Io=100 Arms
Permanent current at standstill : 80 Arms
Max permanent current in the cable = 113 Arms
Cable section selection = 35mm² for a 3 cores in a cable tray at 30°C max.

You also have to respect the Drive commissioning manual and the cables current densities or voltage specifications

3.8.2. Conversion Awg/kcmil/mm²:

Awg	kcmil	mm²
	500	253
	400	203
	350	177
	300	152
	250	127
0000 (4/0)	212	107
000 (3/0)	168	85
00 (2/0)	133	67.4
0 (1/0)	106	53.5
1	83.7	42.4
2	66.4	33.6
3	52.6	26.7
4	41.7	21.2
5	33.1	16.8
6	26.3	13.3
7	20.8	10.5
8	16.5	8.37
9	13.1	6.63
10	10.4	5.26
11	8.23	4.17
12	6.53	3.31
14	4.10	2.08
16	2.58	1.31
18	1.62	0.82
20	1.03	0.52
22	0.63	0.32
24	0.39	0.20
26	0.26	0.13

3.8.3. Motor cable length

For motors which present low inductance values or low resistance values, the own cable inductance, respectively own resistance, in case of large cable length can greatly reduce the maximum speed of the motor. Please contact Parker for further information.

⚠	Caution: It might be necessary to fit a filter at the servo-drive output if the length of the cable exceeds 25 m. Consult us.

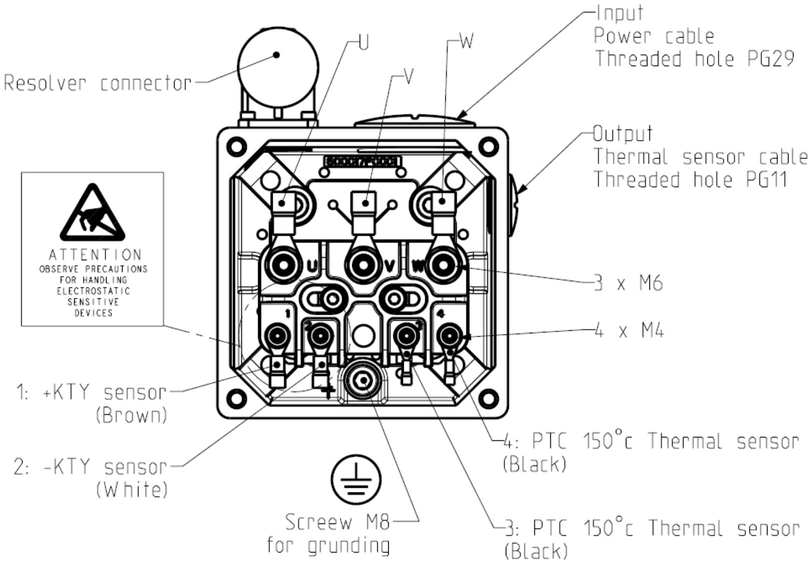
3.8.4. Mains supply connection diagrams

⚠	Caution: A bad tightening on the cable or a too small cable section can generate an overheating and burn the terminals box

3.8.4.1. Ground connection

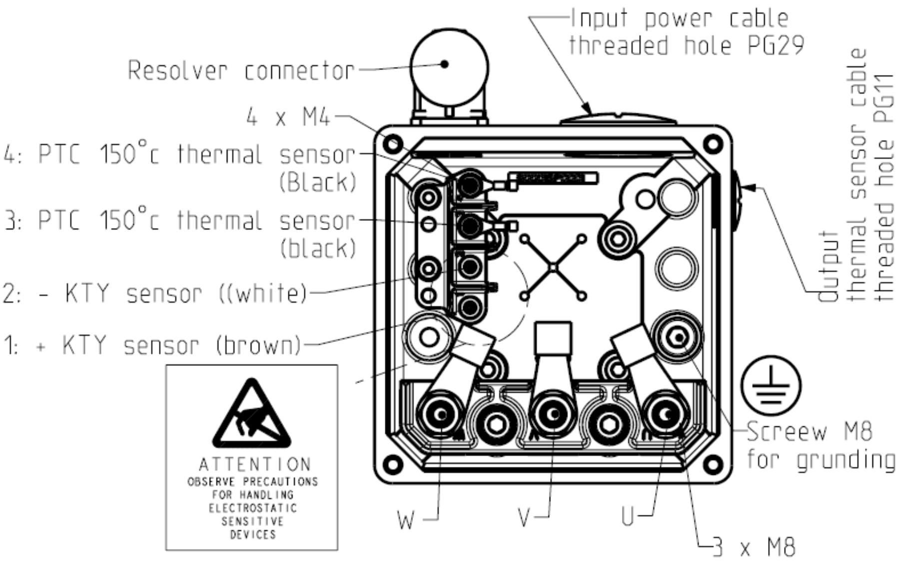
⚠	DANGER: For the safety, you need to connect motor to the ground. Consult the local regulations to choose the right cross section and to know the resistance limits to check ground continuity between frame and ground wire.

3.8.4.2. MGV4 – terminal box 95x95



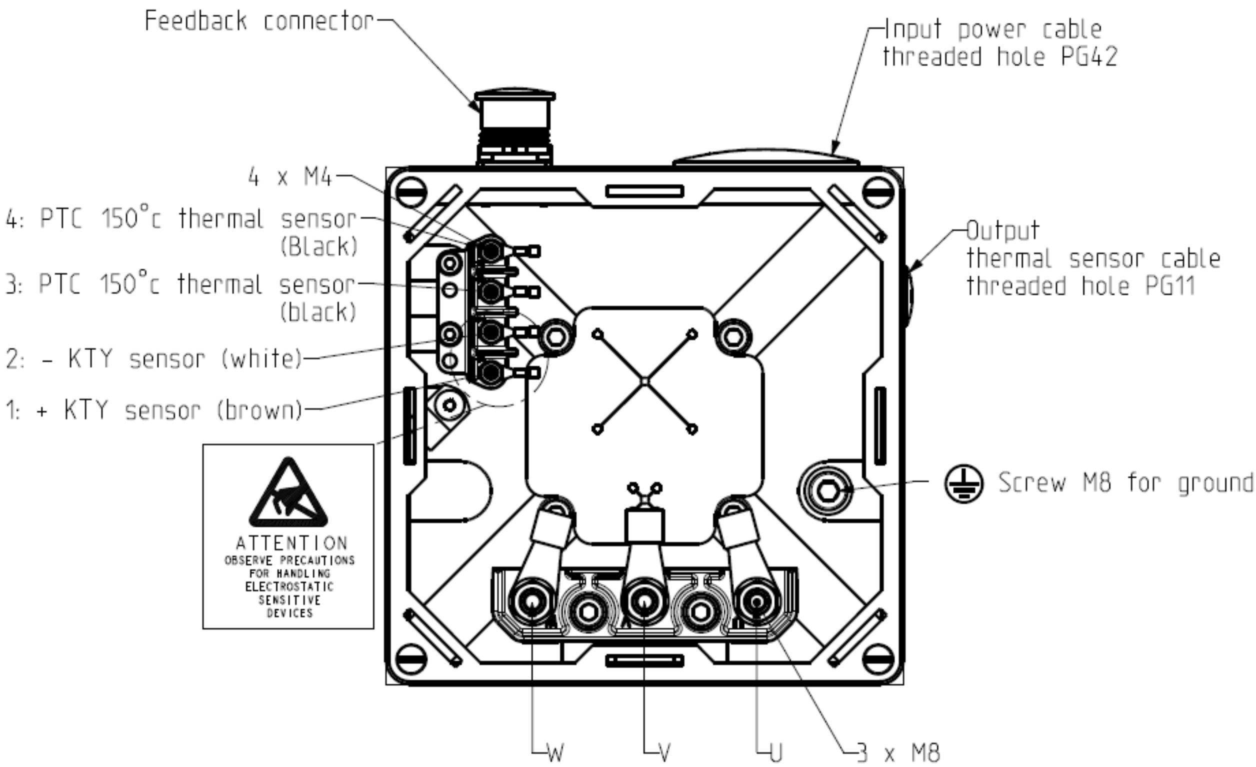
	Power	Accessories
Tightening torque	8.5 N.m	2.5 N.m

3.8.4.3. MGV6 and MGV8 – terminal box 120x120



	Power	Accessories
Tightening torque	20 N.m	2.5 N.m

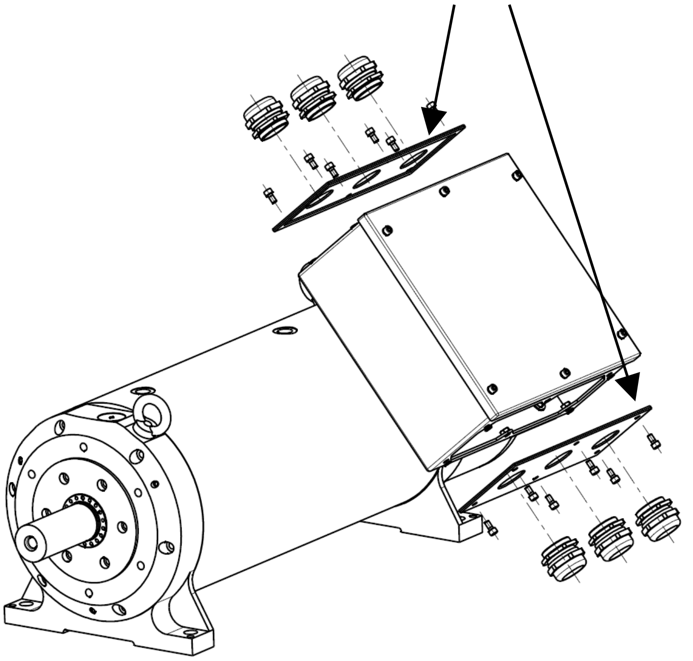
3.8.4.4. MGV8 – terminal box 175x175



	Power	Accessories
Tightening torque	20 N.m	2.5 N.m

3.8.4.5. MGV9, MGVA and MGVB with current < 320A – cable cross section: 95 to 185mm² max and 320 < current < 560A – cable cross section: 150 to 300mm²

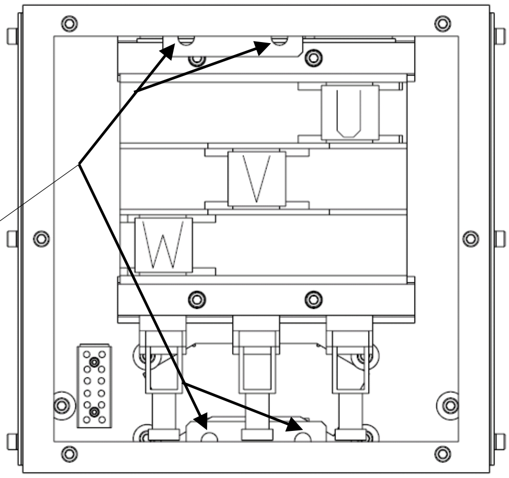
The side plates can be removed and drilled to install the cables glands (not provided).
The plate useful area to drill is 270mm x 95mm



U, V, W : Clamp Power Connection

1: KTY Sensor + (Brown)
2: KTY Sensor – (White)
3: PTC 150°C Thermal Probe (Black)
4: PTC 150°C Thermal Probe (Black)
5: PTC 140°C Thermal Probe (White)
6: PTC 140°C Thermal Probe (Blue)

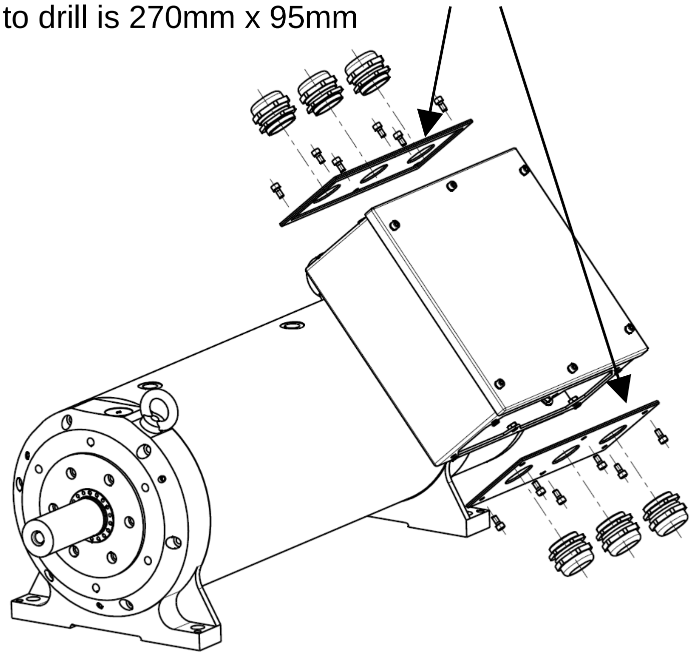
GND: 4 holes Ø10.5mm in terminal box
And 2 thread holes M12 on rear flange



	Power	Accessories
Tightening torque	30 N.m	0,6 – 0,8 N.m
Cables section capacity	95 to 185 mm² (320 A) 150 to 300 mm² (450 and 560 A)	0,2 to 4 mm²

3.8.4.6. MGV9, MGVA and MGVB with 560 < current < 630A – cable cross section: 2x120mm² max

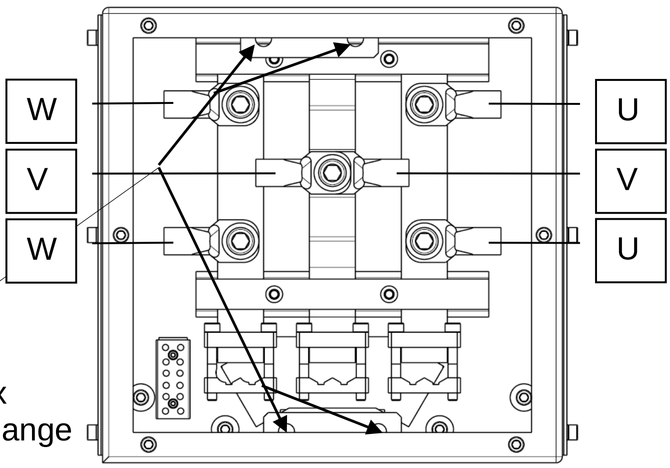
The side plates can be removed and drilled to install the cables glands (not provided).
The plate useful area to drill is 270mm x 95mm



U, V, W : ∅12.5 for Power Connection

1: KTY Sensor + (Brown)
2: KTY Sensor – (White)
3: PTC 150°C Thermal Probe (Black)
4: PTC 150°C Thermal Probe (Black)
5: PTC 140°C Thermal Probe (White)
6: PTC 140°C Thermal Probe (Blue)

GND: 4 holes Ø10.5mm on terminal box
And 2 thread holes M12 on rear flange



	Power	Accessories
Tightening torque	30 N.m	0,6 – 0,8 N.m
Cables section capacity	2 x 120mm² ring terminal per phase	0,2 to 4 mm²

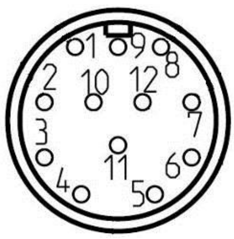
⚠	This terminal box is limited to a 120mm² cross section.
⚠	For higher current than 630 Arms or higher cable cross section, please consult us.

3.9. Feedback system

3.9.1. Resolver

A resolver determines the rotor position.
Its signals are processed by the drive in order to control the stator currents, the speed and the position.
Two resolver types can be associated with the MGV: CB52 or CB102 with a connector seat.

	CB52	CB102
Motor associated	***MGV4 / MGV6 / MGV8***	***MGV9 / MGVA / MGVB***
Maximum speed	50 000 rpm	20 000 rpm
Number of pole	2 poles	2 poles
Feeding voltage at 8 KHz	7 Vrms	7 Vrms
Feeding current at 8 KHz	70mA maximum	70mA maximum
Precision under 7Vrms at 8KHz	+/-6’	+/-10’
Transformation ratio at 8 KHz	0.425 mini, 0.55 maxi	0.425 mini, 0.55 maxi
Input DC resistance, supply transformer (R1-R2)	Mini 24 Ω Maxi 26 Ω	Mini : 15.1 Ω Maxi : 16.2 Ω
DC stator resistance output sin (S2-S4) output cos (S1-S3)	Mini 34.5 Ω Maxi 37.5 Ω	Mini 57.4 Ω Maxi 63Ω
Insulation resistance	≥ 50MΩ	≥ 50MΩ
Assembly	Direct on shaft end	Direct on shaft end
Operating temperature	-55 – +155 °C	-55 – +155 °C

<table>
<tr><th>Resolver connector</th><th>PIN</th><th>Signal</th></tr>
<tr><td rowspan="12">
</td><td>1</td><td>Output voltage S3 (cos-)</td></tr>
<tr><td>2</td><td>Output voltage S1 (cos+)</td></tr>
<tr><td>3</td><td></td></tr>
<tr><td>4</td><td></td></tr>
<tr><td>5</td><td></td></tr>
<tr><td>6</td><td></td></tr>
<tr><td>7</td><td>Output voltage S2 (sin+)</td></tr>
<tr><td>8</td><td>Output voltage S4 (sin-)</td></tr>
<tr><td>9</td><td></td></tr>
<tr><td>10</td><td>Input voltage R1</td></tr>
<tr><td>11</td><td></td></tr>
<tr><td>12</td><td>Input voltage R2</td></tr>
</table>

3.9.2. Cables and connectors associated to the resolver

Cable reference for DIGIVEX drive: CD1UA1F1R0xxx depending on length
Cable reference for AC 890 drive: CS4UA1F1R0xxx depending on length.
The "xxx" in the part number must be replaced by the length in meter.
Ex : for 20m cable, "xxx" = 020.

Resolver connector reference for seat, pins to be soldered: 220065R4621
Cable reference : 6537P0047

3.9.3. Resolver setting

During the setting procedure, it is strictly necessary to respect the 3 following conditions:

- The rotor must be able to rotate freely. The maximum friction torque on the rotor must not exceed 1% of the motor permanent torque.
- The cooling circuit has to be in use.
- The operator must be able to reach the resolver stator and to manually turn it and lock it (access to the locking screws).

Look at the drive instruction manual for the setting procedure details.

3.9.4. Sin-Cos Encoder (on request)

1V~, 250Khz max
Restriction: As the encoder is not absolute on one turn, the setting is lost at each power OFF. You must either set the encoder at each power ON or keep alive the low power supplies. The advantage of the sin-cos encoder is the excellent accuracy that allows very good power, speed and position control.

4. COMMISSIONING, USE AND MAINTENANCE

4.1. Reception, handling, storage

4.1.1. Equipment delivery

All the high-speed motors are strictly controlled during manufacturing, before shipping. While receiving it, it is necessary to verify motor condition and if it has not been damaged in transit. Remove it carefully from its packaging. Verify that the data written on the label are the same as the ones on the acknowledgement of order, and that all documents or needed accessories for user are present in the packaging.

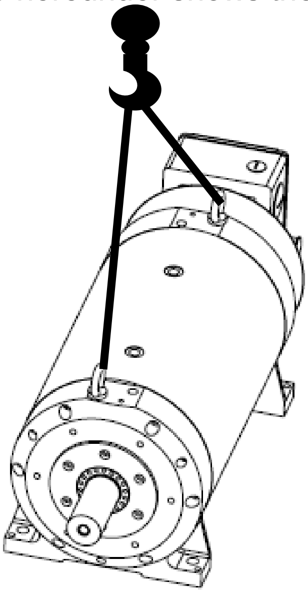
Warning : In case of damaged material during the transport, the recipient must **immediately** make reservations to the carrier through a registered mail within 24 h.

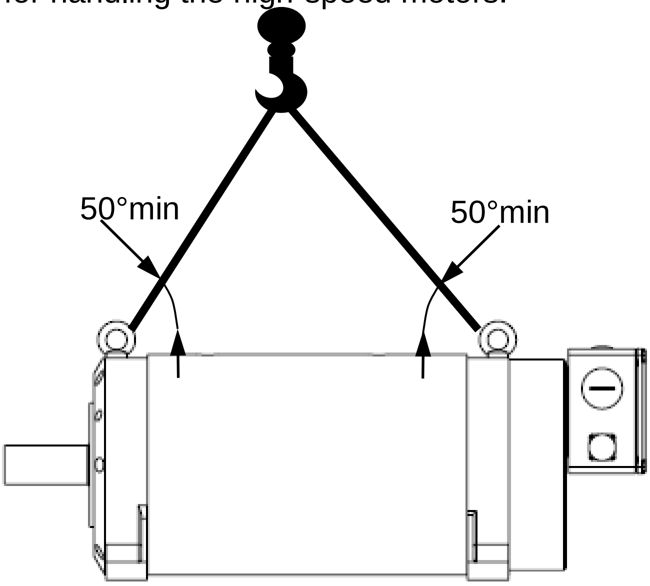
4.1.2. Handling

The high-speed motors are equipped with 2 lifting rings for handling.

DANGER: Only use the lifting rings the high-speed motors are equipped with for handling operations. Never use cables, connectors, input/output of cooling circuit, or any other inappropriate lifting device.

The picture hereunder shows the correct way for handling the high-speed motors.





DANGER: Choose the correct slings for the motor weight. The two slings must the same length and a minimum angle of 50° has to be respected between the motor axis and the slings.

4.1.3. Storage

Before being mounted, the motor has to be stored in a dry place, without rapid or important temperature variations in order to avoid condensation.
During storage, the ambient temperature must be kept between -20 and +60°C.
If the high-speed motor has to be stored for a long time, verify that the shaft end, feet and the flange are coated with corrosion proof product.
After a long storage duration (more than 3 month), run the motor at low speed in both directions, in order to blend the bearing grease spreading.
The motor is delivered with caps for the water inlet and outlet to protect the cooling circuit. Keep them on place until the motor commissioning.

4.2. Installation

4.2.1. Mounting

Foundation must be even, sufficiently rigid and shall be dimensioned in order to avoid vibrations due to resonance. Before bolting the motor's feet, the foundation surface must be cleaned and checked in order to detect any excessive height difference between the foot locations. The variation from one foot to any other shall not exceed 0,05 mm. In any case we recommend using shims to compensate small irregularities.

Caution: The user bears the entire responsibility for the preparation of the foundation.

The table below gives the average tightening torques required regarding the fixing screw diameter. These values are valid for both motor's feet and flange bolting.

Screw diameter	Tightening torque
M2 x 0.35	0.35 N.m
M2.5 x 0.4	0.6 N.m
M3 x 0.5	1.1 N.m
M3.5 x 0.6	1.7 N.m
M4 x 0.7	2.5 N.m
M5 x 0.8	5 N.m
M6 x1	8.5 N.m
M7 x 1	14 N.m
M8 x 1.25	20 N.m

Screw diameter	Tightening torque
M9 x 1.25	31 N.m
M10 x 1.5	40 N.m
M11 x 1.5	56 N.m
M12 x 1.75	70 N.m
M14 x 2	111 N.m
M16 x 2	167 N.m
M18 x 2.5	228 N.m
M20 x 2.5	329 N.m
M22 x 2.5	437 N.m
M24 x 3	564 N.m

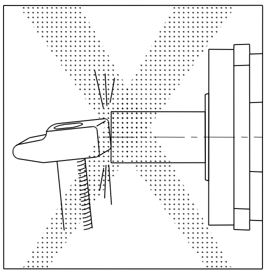
Warning: After 15 days, check all tightening torques on all screws and nuts.

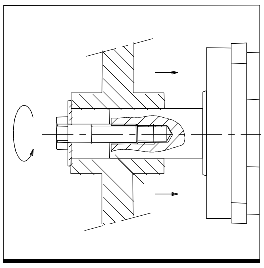
4.2.2. Preparation

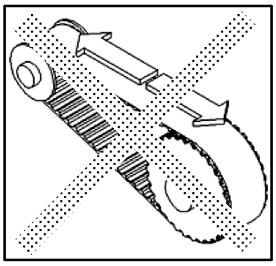
Once the motor is installed, it must be possible to access to the wiring, and read the manufacturer's plate. Air must be able to circulate freely around the motor for cooling purposes.
Clean the shaft using a cloth soaked in white spirit or alcohol. Pay attention that the cleaning solution does not get on to the bearings.
The motor must be in a horizontal position during cleaning or running.

	Caution: Do not step on the motor, the connector or the terminal box
	Caution: Always bear in mind that some parts of the surface of the motor can reach or exceed 100°C

4.2.3. Mechanical assembly







The operation life of servomotor bearings depends largely on the care and attention given to this operation.

- Prohibit any impact on the shaft and avoid press fittings which could mark the bearing tracks. If press fitting cannot be avoided, it is advisable to immobilize the shaft in motion; this solution is nevertheless dangerous as it puts the resolver at risk.
- Use the thread at the end of the shaft in accordance with the diagram for fitting accessories. It is possible to put pressure on the shoulder of the shaft located in front of the bearing.
- Carefully check the alignment of the motor shaft with the driven machine to avoid vibrations, irregular rotations or applying too much strain on the shaft.
- The MGV can't hold a pulley due to the exceeded radial load from the belt on the high speed bearings.

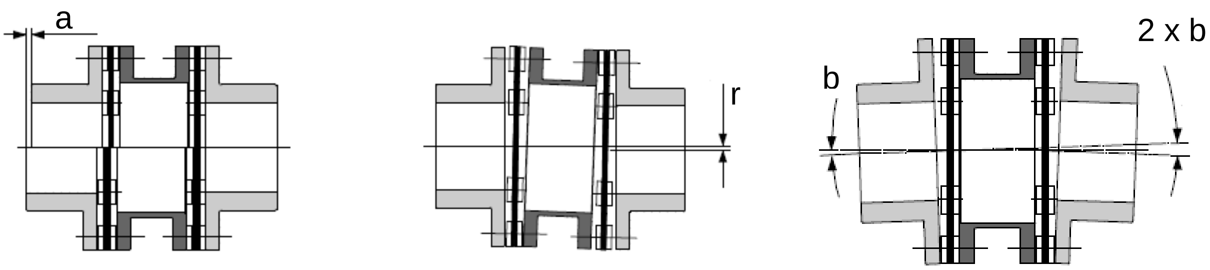
	Warning : The user has the entire responsibility to prepare the support, the coupling device, shaft line alignment, and shaft line balancing.

4.2.4. Alignment

In order to control the loads applied on the motor shaft, the shafts must be aligned very carefully, even if a flexible coupling system is used.

The operation has to set:

- Axial alignment a Radial alignment r Angular alignment b



As the total misalignment is a combination of the three misalignments (axial, radial, angular), do not exceed, for each setting, 20% of the maximum value given by the coupling device manufacturer.
The efforts on the shaft due to misalignments, taking into account the coupling stiffness, must not exceed the specified values given for the motor (see §3.5 "Bearings").

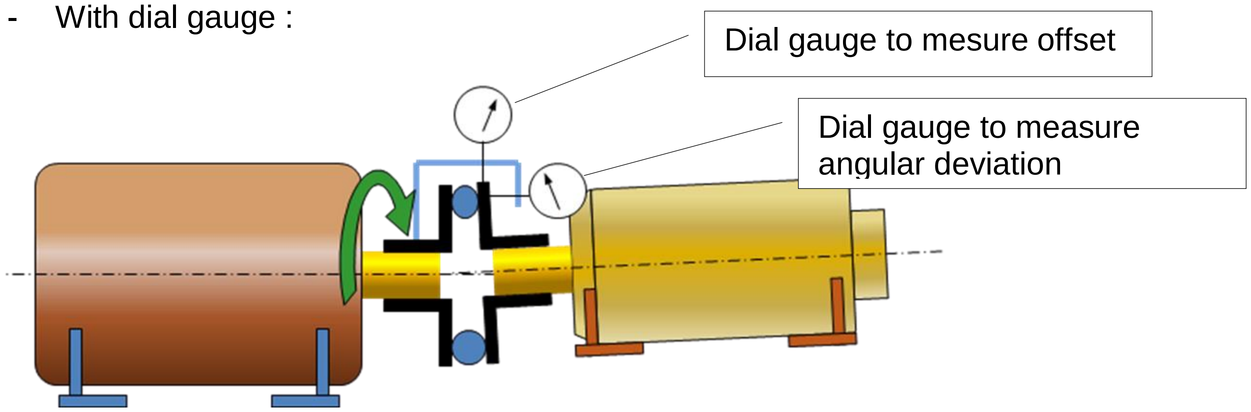
	Warning: Coupling misalignment generates strain and load on motor shaft depending on the rigidity of the coupling. Variations in temperature generate strain and load due to the expansion. These forces (axial and radial) must not exceed the specified loads (§3.5). Coupling misalignment generates also vibrations.

	Danger : Coupling misalignment generates vibrations that can lead to a shaft failure.

	Warning : Parker will not be responsible for any motor shaft fatigue due to excessive strain or vibrations on the shaft, a bad alignment or bad shaft line balancing .

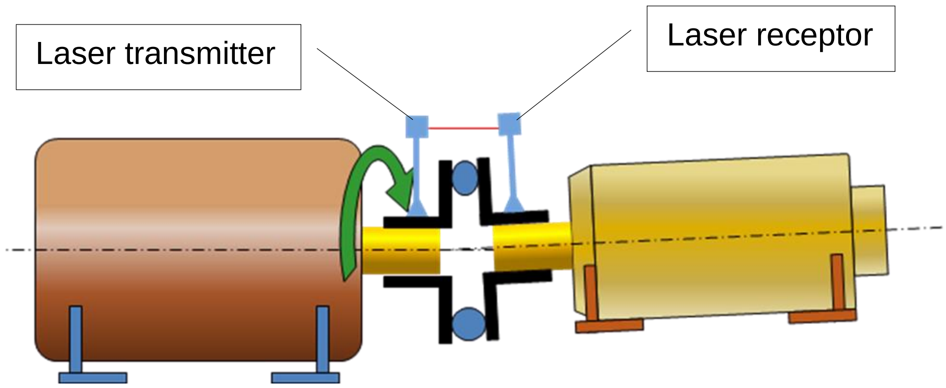
Different solutions are possible to align motor with load:

- With dial gauge :



- With laser

A laser alignment is highly recommended for speeds > 10000rpm



	<u>Warning</u> : **The load must be supported by bearings**. Any weight on the shaft (even below maxi bearing force capacity) cannot be supported by motor bearings: balancing default generates centrifugal force and vibration as a result is breakdown shaft.

	For the fixed through feet motors, after alignment operation, the wobbly foot has to be steadied before tightening.

4.2.5. Motor startup

The delivered motor has been controlled and burned in. Nevertheless, it is recommended to start it gradually by 1000-rpm steps with a speed ramp, during 1 minute for each step until the maximum speed. Monitor the bearing temperature. It must be stabilized. Typical temperatures are 60-70°C.

Warning: Strong speed step without speed ramp can damage bearings or can excite natural frequency.

Warning : We highly recommend to do the commissioning with a Parker Engineer to set up correctly the Parker drive.

4.2.6. Shaft line balancing and vibration control

Once the motor is fixed on its frame and linked with the driven load, it is highly recommended to check complete shaft line balancing to minimize vibrations.

Moreover, it is highly recommended to implement a vibratory control in accordance with the ISO 10816 standard: the efficient speed vibration on the frequency range between 10 to 1000Hz must not run over 2.8 mm/s for an endless supply.
The motor has to be tested on the whole speed range in order to detect a potential natural frequency with the frame.
Rotation speed for which a resonance appears have to be avoided or the resonance has to be suppressed.

4.3. Electrical connection

	Warning : Check that the power to the electrical cabinet is safely off prior to make any connections.
	Warning : The wiring must comply with the drive commissioning manual, with recommended cables, the standard and the local regulations
	Warning : The high-speed motor must be grounded by connecting to an unpainted section of the motor.
	Danger: After 15 days, check all tightening torques on cable connection. Bad connections can lead to overheating and fire.

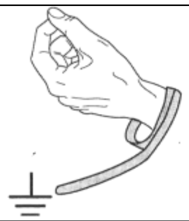
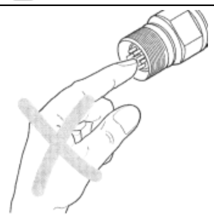
4.3.1. Cable connection

Please, read **§3.7 "Electrical connection"** to have information about cable and terminal box.
Many useful informations are already available in the drive documentations.

4.3.2. Encoder cable handling

	Danger: before any intervention the drive must be stopped in accordance with the procedure.

	Caution: It is forbidden to disconnect the Encoder cable under voltage (high risk of damage and sensor destruction).

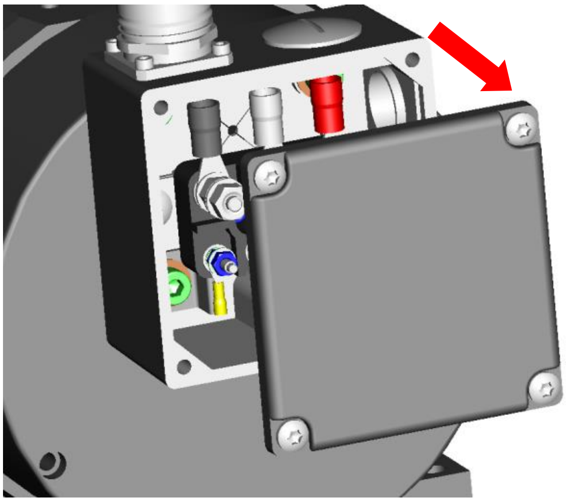
	Warning: Always wear an antistatic wrist strap during encoder handling.
	Warning: Do not touch encoder contacts (risk of damage due to electrostatic discharges ESD.

4.3.3. Terminal box rotation (only for MGV4, 6 and 8)

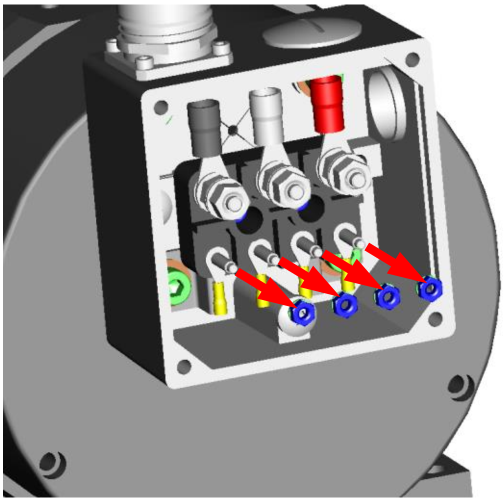
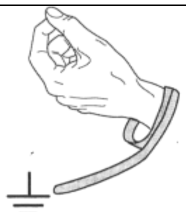
For MGV4, 6 or 8, it's possible to rotate the terminal box to change the direction of the cable output. Please, find below the step by step process :

4.3.3.1. MGV4

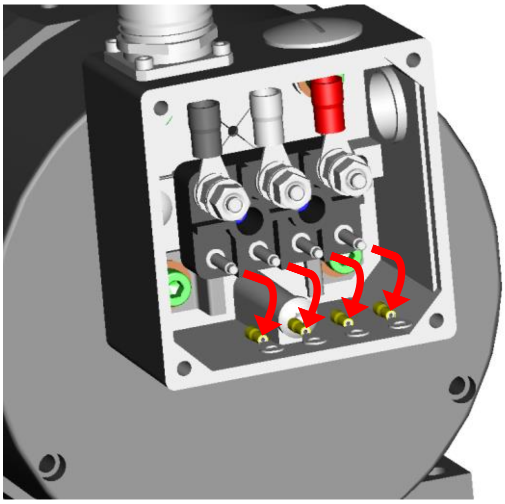
Step 1

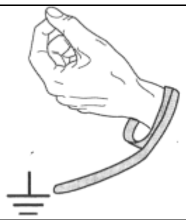
	Remove the cap of the terminal box

Step 2

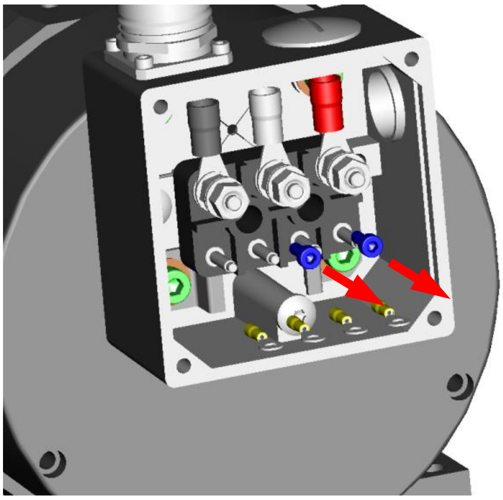
	Remove the 4 nuts of the auxiliaries terminals
	Warning: KTY sensor is sensitive to electrostatic discharge. So, always wear an antistatic wrist strap during KTY handling.

Step 3

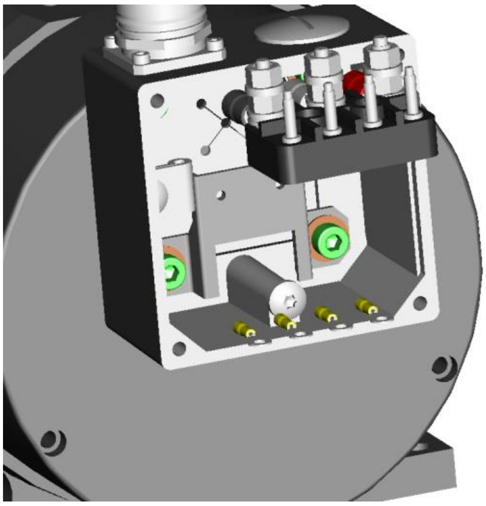
	Disconnect the auxiliaries terminals. Be careful: Keep in mind the right position for re-connection in next step. Recommendation: connect KTY+ and KTY- together to avoid electrostatic damage during operation.

	Warning: KTY sensor is sensitive to electrostatic discharge. So, always wear an antistatic wrist strap during KTY handling.

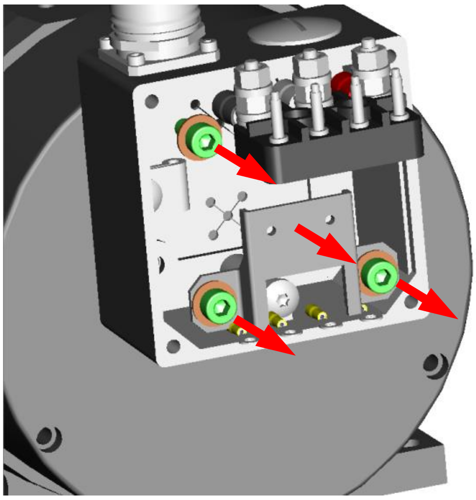
Step 4

	Remove the 2 screws that fix the terminal

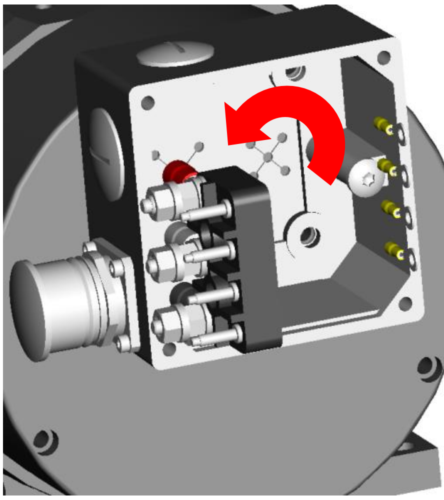
Step 5

	Turn the terminal like the picture. Be careful: do not hurt the power cables.

Step 6

	Remove the 4 screws and terminal support that fix the box.

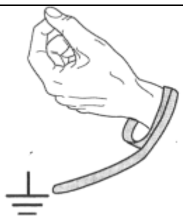
Step 7

	Rotate the box in clockwise or counter-clockwise

Step 8

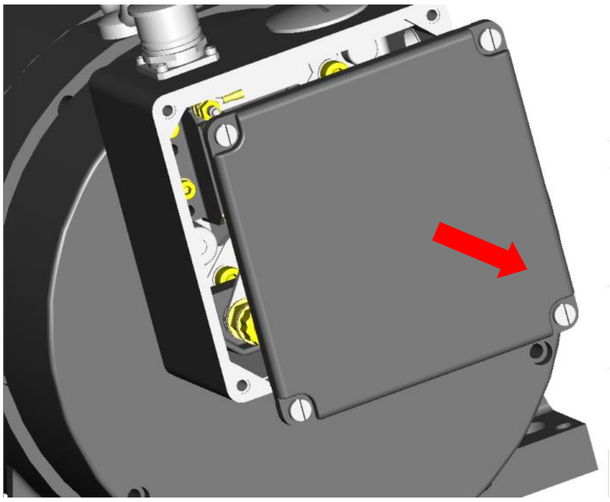
Re-assemble from step 6 to 1.

	**Attention:** respect the tightening torques from §4.2.1

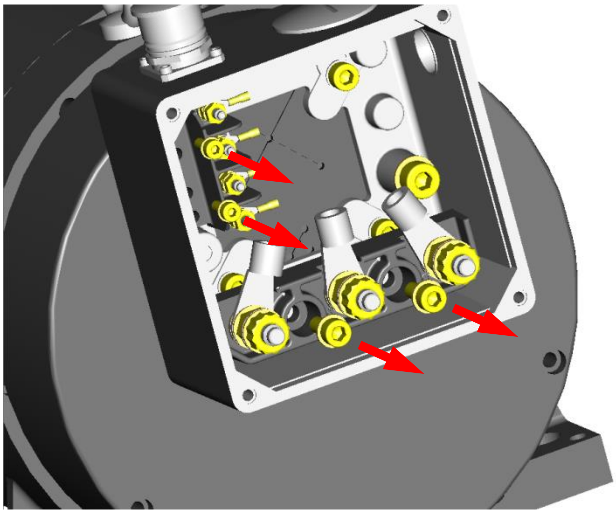
	<u>Warning</u>: KTY sensor is sensitive to electrostatic discharge. So, always wear an antistatic wrist strap during KTY handling.

4.3.3.1. MGV6 and MGV8

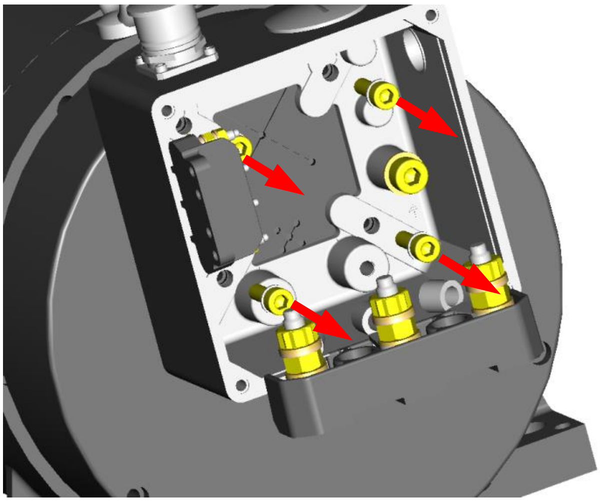
Step 1

	Remove the cap of the terminal box

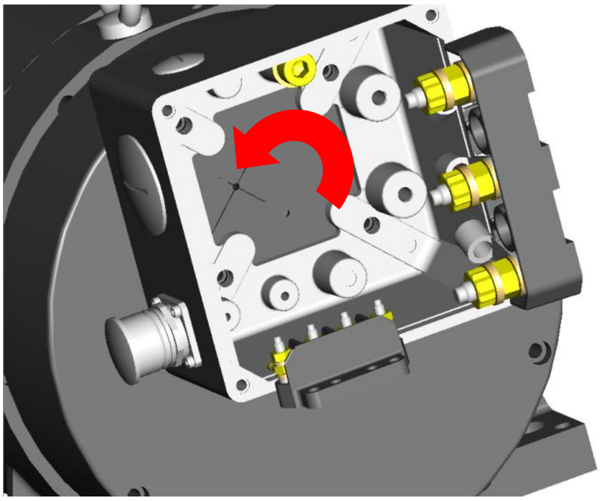
Step 2

	Remove all the screws that fix the terminals (power and auxiliaries)

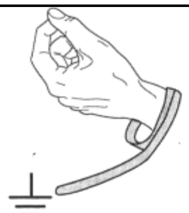
Step 3

	Turn the terminals like the picture. Remove the 4 screws that fix the box.

Step 4

	Rotate the box in clockwise or counter-clockwise

Step 8
Re-assemble from step 4 to 1.

	**Attention:** respect the tightening torques from §4.2.1
	Warning: KTY sensor is sensitive to electrostatic discharge. So, always wear an antistatic wrist strap during KTY handling.

4.4. Maintenance Operations

Generality

<u>DANGER:</u> The installation, commissioning and maintenance operations must be performed by qualified personnel, in conjunction with this documentation.

The qualified personnel must know the safety (C18510 authorization, standard VDE 0105 or IEC 0364) and local regulations.

They must be authorized to install, commissioning and operate in accordance with established practices and standards.

Please contact PARKER for technical assistance.

Operation	Periodicity	Section number
Vibration and bearings temperature checking	Every 3000h	§3.4.7
Alignment checking	Every year	§4.2.4
Cooling water quality inspection	Every year	§3.6
Check all tightening torques on all screws in the terminals box	Every year	§4.2
Clean the motor	Every year	

4.5. Troubleshooting

We provide hereunder a symptom list in regard with their possible cause. This is not an exhaustive list so in case of trouble, please refer to the associated servo drive manual (the diagnostic board indications will help you investigating) or contact us at: http://www.parker.com/eme/repairservice.

You note that the motor does not turn by hand when the motor is not connected to the drive.	• Check there is no mechanical blockage or if the motor terminals are not short-circuited. • Check the power supply to the brake.
You have difficulty starting the motor or making it run	• Check on the fuses, the voltage at the terminals (there could be an overload or the bearings could be jammed), also checks on the load current. • Check the power supply to the brake (+ 24 V ± 10 %) and its polarity. • Check on any thermal protection, its connection and how it is set in the drive. • Check on the servomotor insulation (if in doubt, carry out hot and cold measurements). The minimum insulation resistance value measured under a max. 50V DC is 50 MΩ: • Between the phase and the casing • Between the thermal protection and the casing • Between the brake coil and the casing • Between the resolver coils and the casing.
You find that the motor speed is drifting	• Reset the offset of the servoamplifier after having given a zero instruction to the speed setpoint input.
You notice that the motor is racing	• Check the speed setpoint of the servo drive. • Check you are well and truly in speed regulation (and not in torque regulation). • Check the encoder setting • Check on the servomotor phase order: U, V, W
You notice vibrations	• Check the encoder and tachometer connections, the earth connections (carefully) and the earthing of the earth wire, the setting of the servo drive speed loop, tachometer screening and filtering. • Check the stability of the secondary voltages. • Check the rigidity of the frame and motor support. • Check motor fixing on its base. • Check the balancing. • Check the alignment between motor and load.

You think the motor is becoming unusually hot	• It may be overloaded or the rotation speed is too low : check the current and the operating cycle of the motor. • Check if the mounting surface is enough or if this surface is not a heat source – see §3.6 cooling. • Friction in the machine may be too high : - Test the motor current with and without a load. - Check the motor does not have thermal insulation. - Check that there is no friction from the brake when the brake power is on. - Check the cooling circuit
You find that the motor is too noisy	Several possible explanations : • Unsatisfactory mechanical balancing • There is friction from the brake: mechanical jamming. • Defective coupling • Loosening of several pieces • Poor adjustment of servo drive or position loop : check rotation in open loop • Low drive switching frequency
The motor is warmer on its top	Air bubbles can be stocked in the water cooling circuit. You need to purge the circuit or to double the water flow rate during 10 minutes to remove the air bubbles.