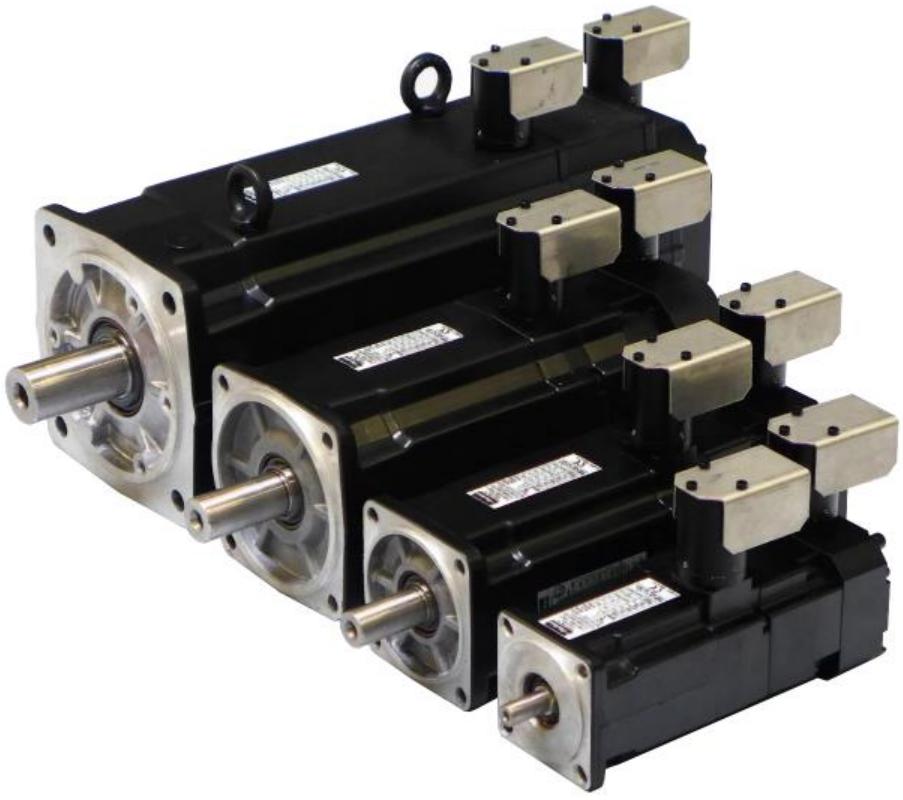
Servomotors

EY Series

Technical Manual
Preliminary

PVD 3675 - EY



EU Declaration of Conformity

(Original)

Document No:	DCE-EY-003rev7
Manufacturer:	Parker Hannifin Manufacturing France SAS Electric Motion & Pneumatic Division
Address:	4 boulevard Eiffel – 21604 Longvic Cedex - France

Herewith we declare under our sole responsibility that the following products

Type of Product:	BRUSHLESS SERVOMOTORS EY
Product Name:	EY3, EY4, EY6, EY8

meet the requirements of following EU legislations including their amendments in force at the time of the declaration:

Reference	**Name**
2014/34/UE	"Equipment and protective systems intended for use in potentially explosive atmospheres"
2014/35/EU	"Low Voltage Directive", LVD
2011/65/EU + (EU) 2015/863	RoHS Directive, supplemented by delegated regulation

Following harmonized standards have been applied:

Reference	**Edition**
IEC 60034-1	2022
EN 60034-1	2011
EN IEC 60079-0	2018
EN 60079-7	2016
EN 60079-31	2014
EN IEC 63000	2018

Notes:

These products must be installed and operated with reference to the instructions in the product manual. All instructions, warnings and safety information of the product manual must be adhered to.

The products are components to be incorporated into machinery and may not be operated alone. The complete machinery or installation may only be put into service when the safety considerations of the Machinery Directive 2006/42/EC are fully adhered to.

CE mark first applied:

EY3 CE	31/03/16	EY6 CE	31/03/16
EY4 CE	31/03/16	EY8 CE	31/03/16

Signed for and on behalf of:	Parker Hannifin Manufacturing France SAS
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CERTIFICATE FOR CHINA COMPULSORY PRODUCT CERTIFICATION

CERTIFICATE NO.: 2024322301006044

NAME AND ADDRESS OF THE APPLICANT
Parker Hannifin Manufacturing France, Etablissement secondaire
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NAME, SERIES, MODEL AND SPECIFICATION
Servomotors
EY Series

THE STANDARDS AND TECHNICAL REQUIREMENTS FOR THE PRODUCTS
GB/T 3836.1-2021、GB/T 3836.3-2021、GB/T 3836.31-2021

This is to certify that the above-mentioned product(s)complies with the requirements of implementation rules for compulsory certification (CNCA-C23-01:2024).
Issue date:2024-06-26 Valid until:2029-06-25

Date of initial issue:2024-06-26
Type of Certification: Type test + Initial inspection + Surveillance inspection

The certificate details and validity can be verified by scanning the QR code below or logging into the issuing authority's official website. It can also be inquired on the CNCA website (www.cnca.gov.cn).

(In case of dispute, the Chinese text shall prevail.)

APPROVAL:

Shanghai Inspection and Testing Institute of Instruments and Automation Systems Co., Ltd.

http://www.sitilas.com.cn 103 Cao Bao Road, Shanghai 200233,China Tel: +86 21 64518419

中国国家强制性产品认证证书

证书编号：2024322301006044

认证委托人名称及地址
Parker Hannifin Manufacturing France, Etablissement secondaire
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生产企业名称及地址
Parker Hannifin Manufacturing France, Etablissement secondaire
4, BD EIFFEL, 21600 LONGVIC, France

产品名称和系列、型号、规格
伺服电机
EY 系列

产品标准和技术要求
GB/T 3836.1-2021、GB/T 3836.3-2021、GB/T 3836.31-2021

上述产品符合《强制性产品认证实施规则 防爆电气》
(CNCA-C23-01:2024)的要求，特发此证。
发证日期:2024 年 06 月 26 日　有效期至:2029 年 06 月 25 日

首次发证日期:2024 年 06 月 26 日
认证模式:型式试验+初始工厂检查+获证后监督

证书信息和有效性可扫描下方二维码或登录发证机构网站查验，
也可在认监委网站（www.cnca.gov.cn）查询。

批　准：

上海仪器仪表自控系统检验测试所有限公司

http://www.sitiias.com.cn　中国•上海•漕宝路103号200233　电话：+86 21 64518419

中国国家强制性产品认证证书

证书编号：2024322301006044
证书附页：第 1 页共 2 页

产品名称：
伺服电机

型号规格：
EY *a* *b* E *c* *d* B 7 *e* *f*

a 代表电机机座代号，可选代码：3、4、6、8；

b 代表电机长度，可选代码：10（当 *a* 为 3 时），20（当 *a* 为 4，6，8 时），30（当 *a* 为 4，6 时），40、60（当 *a* 为 8 时）；

c 代表反馈传感器，可选代码：A 代表带旋转变压器，Y 代表不带旋转变压器；

d 代表转矩/速度特性，可选代码见 2.5；

e 代表制动器和温度传感器选项，可选代码：1、4、A、D；

f 代表机械接口，可选代码：10 代表 IP65，光轴，11 代表 IP65，轴上带键。

防爆标志：
Ex ec ⅡC T3 Gc; Ex tc ⅢC T200℃ Dc

电气参数：
AC230V，AC400V

相关报告编号：
2023S17402-011499

使用条件：
1.特殊（限制）使用条件

1）爆炸性环境严禁开盖、维修或维护。

2）产品需配接外部插接件方可用于爆炸性环境。外部插接件应符合 GB/T 3836.1-2021 和 GB/T 3836.3-2021 的要求，且连接后须确保设备整体外壳防护等级不低于 IP65。外部插接件及电缆最高工作温度不应低于 140℃。

本页为证书附页，应与证书主页同时使用。

批 准：

上海仪器仪表自控系统检验测试所有限公司

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中国国家强制性产品认证证书

证书编号：2024322301006044

证书附页：第 2 页共 2 页

3) 严禁带电插拔产品电气连接件。

4）可燃性粉尘中使用时，应定期清扫产品表面以防粉尘堆积，但不得使用压缩空气吹扫。

2. 产品外壳防护等级 IP65。

本页为证书附页，应与证书主页同时使用。

批 准：

上海仪器仪表自控系统检验测试所有限公司

http://www.sitiias.com.cn 中国•上海•漕宝路103号200233 电话：+86 21 64518419

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 EY servomotors.

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 servomotors 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.
	Motors for ATEX zones : Servomotors type EY manufactured for the European market are designed to operate in ATEX classified zones.
	Motors for CCC Market : Servomotors type EY manufactured CCC marked are designed to operate only for Chinese Market, to operate in hazardous classified areas.

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. Servomotors 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. Check the drive recommendations. The motor must be permanently connected to an appropriate safety earth. 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, 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 well clear of the danger area.
	**Burning Hazard** Always bear in mind that some parts of the surface of the motor can reach a temperature of 135°C.
	**Atex servomotors** This motor can be used in hazardous areas. May particular attention to the notes marked with  ..
	European directive 99/92/EC makes explicit the responsibility of employers to protect employees who may be exposed to risk of ATEX environments (Explosive Atmosphere). The employer must assess the risk and classify potentially dangerous areas. Equipment and materials must also be suited for use in dangerous areas in accordance with ATEX directives 94/9/EC and 2014/34/EU.

1.2.3. Operating category and marking of EY servomotors

1.2.3.1. ATEX gazeous atmospheres

II 3 G Ex ec IIC T3 Gc IP65

II	3	G	Ex	ec	II	C	T3	Gc	IP65
I Mines	M1 Very high level of protection	**G** Gas/Vapour	ATEX protection	nC Equipment with protection against sparks	I Mines	Methane	T1 450 °C	Ma Very high level of protection	**IP65**
	M2 High level of protection			nR Equipment with restricted breathing			T2 300 °C	Mb High level of protection	
II Surface	1 Very high level of protection			**ec** Increased Safety	**II** Surface Gas	A Propane	**T3** 200 °C	Ga Very high level of protection	
	2 High level of protection					B Ethylene	T4 135 °C	Gb High level of protection	
	3 Normal level of protection					**C** Hydrogen Acetylene	T5 100 °C	**Gc** Normal level of protection	
							T6 85 °C		

	Suitable for ATEX servomotors

1.2.3.2. ATEX dusty atmospheres

II 3 GD Ex ec IIC T3 Gc IP65 / Ex tc IIIC T200°C Dc IP65

II	3	D	Ex	tc	III	C	T200 °C	Dc	IP65
I Mines	M1 Very high level of protection	**D** Combustible dust	ATEX protection	ta Protection by enclosure	**III** Dust	A Combustible flying	T1 450 °C	Ma Very high level of protection	**IP65**
	M2 High level of protection			tb / **tc** Protection by enclosure			T2 300 °C	Mb High level of protection	
II Surface	1 Very high level of protection			pb / pc Pressurized enclosure		B Non conductive dust	**T3** 200 °C	Da Very high level of protection	
	2 High level of protection			ia / ib / ic Intrinsic safety			T4 135 °C	Db High level of protection	
	3 Normal level of protection			ma / mb / mc Encapsulation		**C** Conductive dust	T5 100 °C	**Dc** Normal level of protection	
							T6 85 °C		

	Suitable for ATEX servomotors

1.2.3.3. CCC Certified motors

The CCC EY motors are verified and certified according to CNCA-C23-01: 2024 China Compulsory Certification Implementation Rule on Explosion Protected Electrical Product and the SITIIAS-C23-01-2023. The reference standard are : GB/T 3836.1-2021; GB/T 3836.3-2021; GB/T 3836.31-2021.

CCC: "CCC" motors have exactly the same construction as ATEX motors (with the exception of a specific nameplate). They are intended for use in the same areas (gas or dust) and have the same degree of safety. Refer to standards GB/T 3836.1-2021; GB/T 3836.3-2021; GB/T 3836.31-2021, the CNCA-C23-01: 2024. & and the SITIIAS-C23-01-2023.

The CCC EY have a specific name plate that bears only the CCC certification. All the EY with a CCC certificate have a C at the end of the part number to differentiate them to the “ATEX” EY motors.

DANGER: All the instructions for the ATEX motors shall be applied to CCC motors in addition to the local regulation, the standards GB/T 3836.1-2021; GB/T 3836.3-2021; GB/T 3836.31-2021, the CNCA-C23-01: 2024 and the SITIIAS-C23-01-2023.

2. PRODUCT DESCRIPTION

2.1. Quick URL

All informations and data are avaible on :

http://www.parker.com/eme/**ey**

2.2. Overview

The EY servomotors from Parker are specifically designed to operate in explosive atmospheres for industrial applications.
The EY motors are brushless synchronous servomotors, with permanent magnets, based on NX active parts.

A large set of torque / speed characteristics, options and customization possibilities are available, making EY servomotors the ideal solution for most servosystems applications in explosive atmospheres.

Advantages

- High precision
- High motion quality
- High dynamic performances
- Low cogging
- Compact dimensions and robustness
- Large set of options and customization possibilities
- CE marking certification available.

2.3. Applications

Painting applications
Packaging machinery
Robot applications
Special machines
Cleaning applications
Printing applications
Actuator for valve in Energy applications

2.4. General Technical Data for ATEX motors

	EY3, EY4, EY6	EY8
Motor type	Permanent-magnet synchronous motor	
Magnets material	Neodymium Iron Boron (Nd-Fe-B)	
Number of poles	10	
Type of construction	IMB5 – IMV1 – IMV3 (CEI 60034-7)	
Degree of protection	IP65	
Cooling	Natural cooling	
Rated voltage	230 VAC, 400 VAC	
Insulation of the stator winding	Class F according to CEI 60034-1	Class F according to CEI 60034-1 with potting
Altitude	Up to 1000m (IEC 60034-1) No allowed for higher altitude	
Ambiant temperature	-20°C à +40°C -20°C to +60°C with performances derating	
Storage temperature	-20°C à +60°C	
Connexions	Connectors with disconnecting protection for ATEX	
Marking	CE	
Paint	Black RAL9005	
Sensor	Resolver as a standard Sensorless as an option	
Brake	Parking brake as an option	
Thermal protection	PTC	
Remark	Numerous customization are possible on request (special shaft, special flange,…)	

2.5. Product Code

The EY servomotors are defined by its electrical and mechanical characteristics, by its accompanying accessories and by any customer specificity. This information is coded and entered in the “Type” column on the manufacturer’s plate for the basic codification; the specificities are entered in a separate column.

Code	E	Y	3	1	0	E					1		C
	1		2	3		4	5	6	7	8	9	10	11
1	Product series					**EY**							
2	Motor size					**3**							
3	Motor length					**10**							
4	Motor version					**E**		ATEX / CCC motor					
5	Feedback sensor					**A**		resolver 2 poles transformation ratio = 0.5					
						K		Without sensor					
						Y		Without sensor and Parker AC drive					
6	Torque speed characteristics					**A, B... to Z**		See motor data sheet					
7	Painting					**B**		Black painting RAL9005					
8	Electric connection					**7**		Connector					
9	Brake and thermal sensor option					**1**		Without brake and PTC sensor on power connector					
						4		With brake and PTC sensor on power connector					
						A		Without brake and PTC sensor on signal connector					
						D		With brake and PTC sensor on signal connector					
10	Mechanical interface					**10**		IP65 Plain shaft					
						11		IP65 key on shaft					
11	Name plate					**C**		CCC					
								ATEX					

Code	E	Y	4			E					1		C
	1		2	3		4	5	6	7	8	9	10	11
1	Product series					**EY**							
2	Motor size					**4**							
3	Motor length					**20, 30**							
4	Motor version					**E**		ATEX / CCC motor					
5	Feedback sensor					**A**		resolver 2 poles transformation ratio = 0.5					
						K		Without sensor					
						Y		Without sensor and Parker AC drive					
6	Torque speed characteristics					**A, B... to Z**		See motor data sheet					
7	Painting					**B**		Black painting RAL9005					
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						A		Without brake and PTC sensor on signal connector					
						D		With brake and PTC sensor on signal connector					
10	Mechanical interface					**10**		IP65 Plain shaft					
						11		IP65 key on shaft					
11	Name plate					**C**		CCC					
								ATEX					

Code	E	Y	6			E					1		C
	1		2	3		4	5	6	7	8	9	10	11
1	Product series					**EY**							
2	Motor size					**6**							
3	Motor length					**20, 30**							
4	Motor version					**E**		ATEX / CCC motor					
5	Feedback sensor					**A**		resolver 2 poles transformation ratio = 0.5					
						K		Without sensor					
						Y		Without sensor and Parker AC drive					
6	Torque speed characteristics					**A, B... to Z**		See motor data sheet					
7	Painting					**B**		Black painting RAL9005					
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9	Brake and thermal sensor option					**1**		Without brake and PTC sensor on power connector					
						4		With brake and PTC sensor on power connector					
						A		Without brake and PTC sensor on signal connector					
						D		With brake and PTC sensor on signal connector					
10	Mechanical interface					**10**		IP65 Plain shaft					
						11		IP65 key on shaft					
11	Name plate					**C**		CCC					
								ATEX					

Code	E	Y	8		E					1		C
	1		2	3	4	5	6	7	8	9	10	11
1	Product series				**EY**							
2	Motor size				**8**							
3	Motor length				**20, 40, 60**							
4	Motor version				**E**		ATEX / CCC motor					
5	Feedback sensor				**A**		resolver 2 poles transformation ratio = 0.5					
					K		Without sensor					
					Y		Without sensor and Parker AC drive					
6	Torque speed characteristics				**A, B... to Z**		See motor data sheet					
7	Painting				**B**		Black painting RAL9005					
8	Electric connection				**7**		Connector					
9	Brake and thermal sensor option				**1**		Without brake and PTC sensor on power connector					
					4		With brake and PTC sensor on power connector					
					A		Without brake and PTC sensor on signal connector					
					D		With brake and PTC sensor on signal connector					
10	Mechanical interface				**10**		IP65 Plain shaft					
					11		IP65 key on shaft					
11	Name plate				**C**		CCC					
							ATEX					

3. TECHNICAL DATA

3.1. Motor selection

3.1.1. EX standard atmospheric conditions

EY motors are designed to operate in inside area:

- with a pressure between 80 kPa (0.8 bar) and 110 kPa (1.1 bar).
- air with normal oxygen content, typically 21 % v/v.
- air with a maximum relative humidity of 80%, without condensation.

In other conditions, like outside environment, please consult us.

3.1.2. Altitude derating

From 0 to 1000 m : no derating
> 1000 m : the EY motors are not designed to operate in hazardous area for this altitude.

3.1.3. Ambient pressure

The EY motors are designed to operate in area with a pressure between 80 kPa (0.8 bar) and 110 kPa (1.1 bar).

3.1.4. Temperature derating

EY servomotors are designed to operate with a maximum ambient temperature of 40°C. In case of using with an ambient temperature above 40°C and less or equal than 60°C, a derating of performances is applied according to data recommended by Parker.

3.1.5. 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 of motor. 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 :

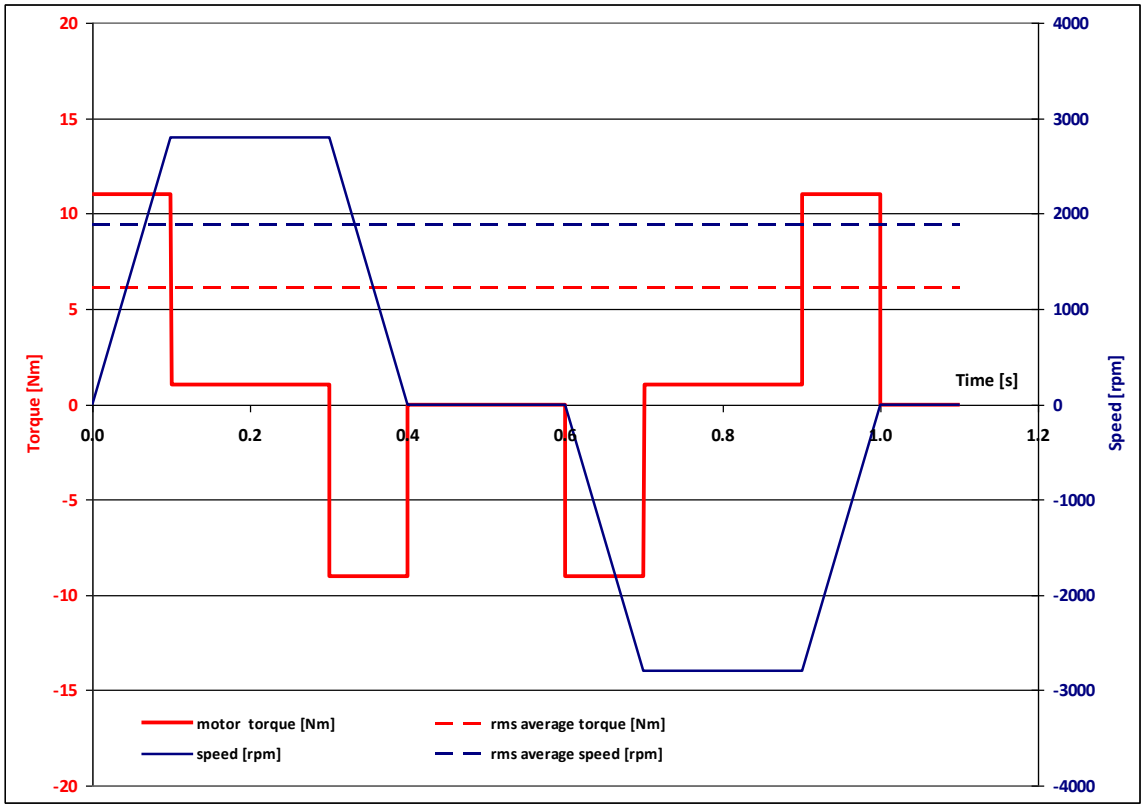
$$M_{rms} = \sqrt{\frac{1}{T} * \sum_{i=1}^{n} M_i^2 \Delta t_i}$$

Example :
For a cycle of 2s at 0 Nm, 2s at 10Nm and a period of 4 s, the rms torque is:

$$M_{rms} = \sqrt{\frac{1}{4} * 10^2 * 2} = 7{,}07 Nm$$

Illustration :

Acceleration-deceleration torque: 10 Nm for 0,1 s.
Resistant torque: 1 Nm during all the movement.
Max-min speed: ± 2800 rpm during 0,2 s.
Max torque provided by the motor: 11 Nm.
rms torque: 6 Nm.



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.

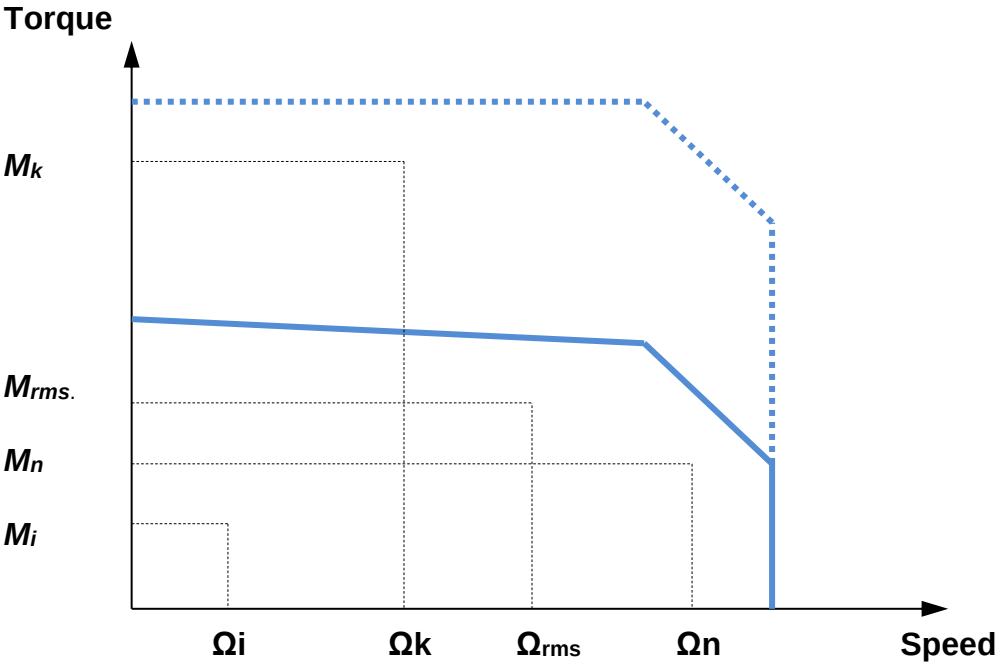
Selection of the motor :

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.



3.1.6. Servo drive selection :

Selection of drive depends on its rated power, rated current and its mode selection which leads to the maximal current duration.

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

AC30 PARKER drive example:

With EY servomotors, the power is usually < 37 kW, the rated current corresponds to 100 %.

Power of servo drive AC30	**< 37 kW**
Mode	Servo
Overload capability [%]	200 % during 4 s

Illustration:

Example :

The application needs:
- a rms torque of **6 Nm** at the rms speed of 4000 rpm,
- an acceleration torque of **25 Nm**,
- a maximal speed of 4000 rpm.

Selection of motor:

The selected motor is the type **EY630EAN**.
The nominal speed is equals to 4000 rpm.
The maximal speed is equals to 4000 rpm.
The torque sensitivity is equals to 1.45 Nm/Arms.

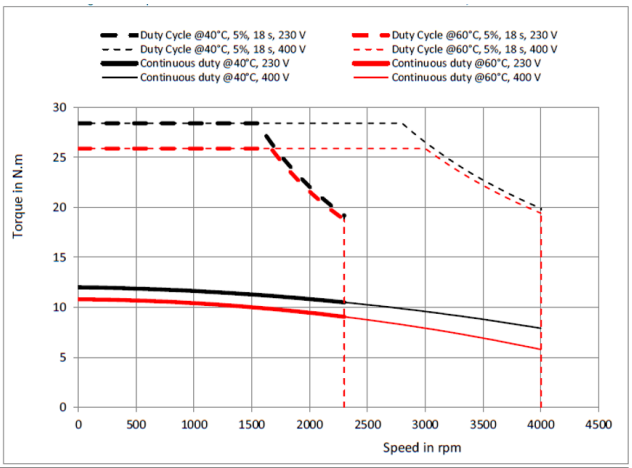
BRUSHLESS MOTOR
EY630EAN
ELECTRONIC DRIVE
DRIVE 9/21

No UL certification

			@40°C		@60°C	
	Max ambient temperature:	°C				
UR	Voltage of the mains:	V_{rms}	230 VAC	400 VAC	230 VAC	400 VAC
Pn	**Rated power ****	kW	2.53	3.31	2.18	2.42
Mn	**Rated torque ****	N.m	10.5	7.9	9.05	5.78
Nn	**Rated speed**	/min	2300	4000	2300	4000
In	**Rated current**	A_{rms}	7.29	5.57	6.3	4.12
Un	**Rated voltage ***	V_{rms}	225	374	221	367
U_{bus}	DC voltage supply when motor is loaded	V	310	540	310	540
M_0	**Low speed torque ****	N.m	12	12	10.8	10.8
I_0	**Permanent current at low speed**	A_{rms}	8.26	8.26	7.43	7.43
M_p	Max. torque **	N.m	28.4	28.4	25.9	25.9
I_p	Max. current	A_{rms}	20.6	20.6	18.6	18.6
N_{max}	Max. speed	/min	2300	4000	2300	4000
F_{max}	Electrical frequency @max. speed:	Hz	192	333	192	333
η	Efficiency at rated torque:	%	92.9	93.7	93.3	93
$\eta_{75\%}$	Efficiency at 75% of rated torque:	%	93.6	93	93.6	91.7

2p	Number of poles:	10		**Environment:**
J	Rotor inertia	0.00147	$kg.m^2$	Altitude: <1000m
Ke	Back emf constant at 1000 rpm (25°C)*	90.7	V_{rms}	Thermal class F (according to IEC 60034-1)
Kt	Torque sensitivity (25°C)	1.45	Nm/A_{rms}	Cooling type: Natural Air cooling
Rb	Winding resistance(25°C) *	1.12	Ω	Flange 400*400*12mm(ALU)
L	Winding inductance *	11.2	mH	with flange temperature <= T_a

All data are given in typical values under standard conditions.
Characteristics are given for an optimal drive of the motor.
* Phase to Phase
** General tolerances ±7.5 %, rotor at 25°C



Creation : 17 / 5 / 2016 Edition : 1 / 9 / 2016 Revision : a

The permanent current **I_0** of the motor is **8.26 Arms** for **M_0=12 Nm** at low speed.
The nominal current **I_n** of the motor is **5.57 Arms** for **M_n = 7.9 Nm** at the nominal speed.

Selection of the drive:

The drive has to provide at least a permanent current equals to I_0 (8.26 Arms). In order to obtain an acceleration torque of **25 Nm**, the current will be about 25/1.45=18 Arms. This means that the drive has to provide at least 18 Arms as transient current.

→ Therefore, we can select the drive **AC30** 31V-4D0012 which delivers under 400 VAC:
12 Arms as permanent current and about,
12*200%=24 Arms as maximal transient current during 4 s.
The drive is set with **"Servo Mode"**.

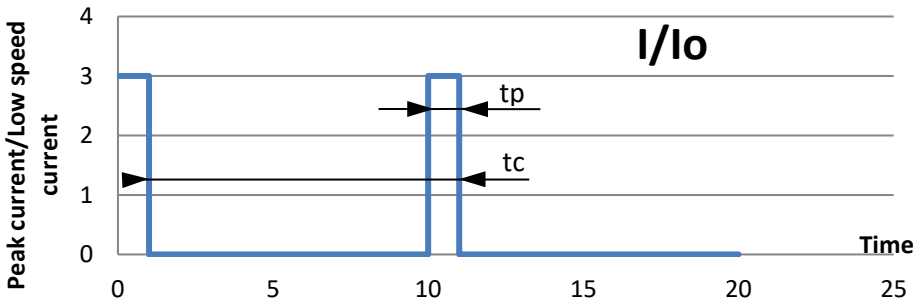
3.1.7. Current limitation at stall conditions (i.e. speed < 3 rpm)

Recommended reduced current at speed < 3 rpm:

$$I_{reduced} = \frac{1}{\sqrt{2}} * I_0 \cong 0.7 * I_0$$

	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 70% 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.

3.1.8. Peak current limitation



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

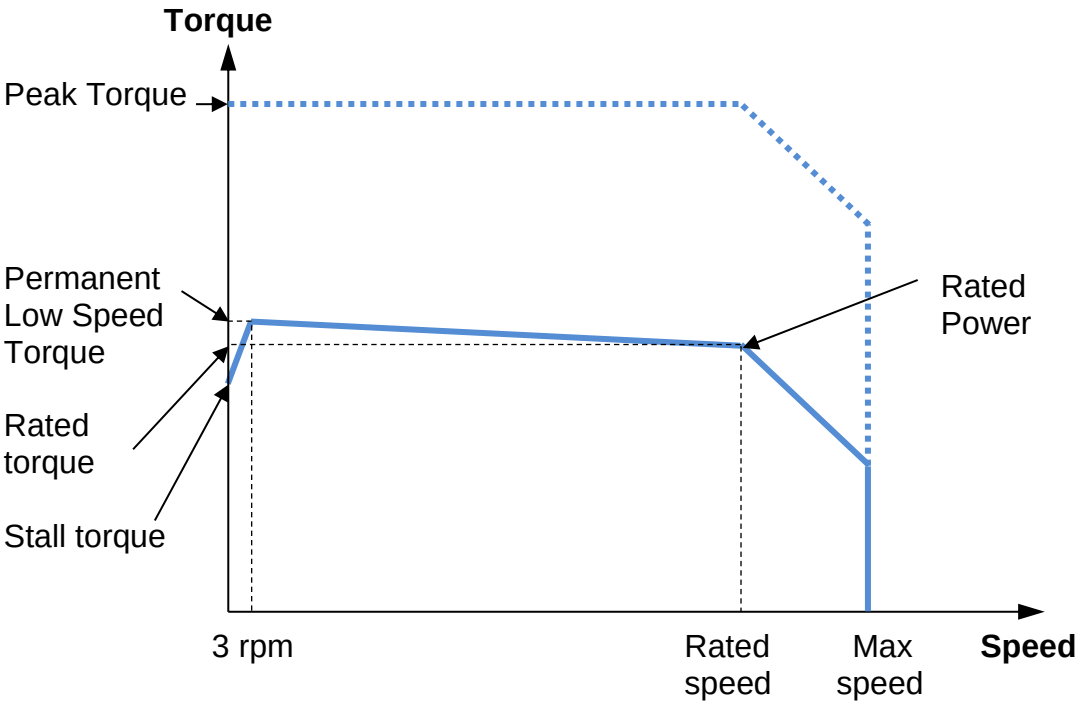
1) The peak currents and peak torques given in the data sheet must never be exceeded.
2) The thermal equivalent torque must be respected (§3.1.4).
3) If 1) and 2) are respected (it can limit the peak current value or duration), the peak current duration (*tp*) must be limited, in addition, accordingly to the following table (Io is the permanent current at low speed).

	I_{pi}/Io =2	I_{pi}/Io = 3	I_p/Io = 4	I_{pi}/Io >5
EY310	tp<0.8 s	tp<0.3s	tp<0.15s	tp<0.1s
EY420				
EY430				
EY620	tp<1.5s	tp<0.6s	tp<0.3s	tp<0.2s
EY630				
EY820				
EY840				
EY860				

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

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

The torque vs speed graph below explains different intrinsic values given in next tables.



3.2.1. ATEX 230V

Motor	Rated Power Pn (kW)	Rated Torque Mn (Nm)	Rated Speed Nn [rpm]	Rated Current In [Arms]	Low Speed Torque Mo [Nm]	Low speed Current Io [Arms]	Peak Torque Mpeak [Nm]	Peak Current I peak [Arms]	Max. Speed Nmax [rpm]
With 40°C ambiant temperature									
EY310EAP	0.456	1.89	2300	1.37	2	1.43	4.72	3.58	2300
EY310EAK	0.718	1.71	4000	2.2	2	2.5	4.72	6.25	4000
EY420EAP	0.911	3.78	2300	2.69	4	2.81	9.47	7.03	2300
EY420EAJ	1.42	3.38	4000	4.21	4	4.87	9.47	12.2	4000
EY430EAL	1.2	4.99	2300	3.45	5.5	3.76	13.1	9.4	2300
EY430EAF	1.72	4.1	4000	5.05	5.5	6.6	13.1	16.5	4000
EY620EAV	0.905	7.85	1100	2.78	8	2.82	18.9	7.04	1100
EY620EAR	1.71	7.42	2200	4.95	8	5.29	18.9	13.2	2200
EY630EAR	1.72	11.3	1450	5.19	12	5.47	28.4	13.7	1450
EY630EAN	2.53	10.5	2300	7.29	12	8.26	28.4	20.6	2300
EY820EAR	3.34	14.5	2200	9.74	16	10.7	36.8	26.7	2200
EY840EAK	4.91	23.5	2000	13.7	28	16.2	65.8	40.4	2000
EY860EAJ	5.23	34.4	1450	14.9	41	17.7	96.7	44.2	1450

Motor	Rated Power Pn (kW)	Rated Torque Mn (Nm)	Rated Speed Nn [rpm]	Rated Current In [Arms]	Low Speed Torque Mo [Nm]	Low speed Current Io [Arms]	Peak Torque Mpeak [Nm]	Peak Current I peak [Arms]	Max. Speed Nmax [rpm]
With 60°C ambiant temperature									
EY310EAP	0.4	1.66	2300	1.2	1.8	1.29	4.3	3.21	2300
EY310EAK	0.61	1.46	4000	1.88	1.8	2.25	4.3	5.62	4000
EY420EAP	0.752	3.12	2300	2.22	3.4	2.39	8.17	5.97	2300
EY420EAJ	1.13	2.7	4000	3.38	3.4	4.13	8.17	10.3	4000
EY430EAL	1.06	4.41	2300	3.05	5	3.41	12	8.54	2300
EY430EAF	1.41	3.36	4000	4.16	5	5.99	12	15	4000
EY620EAV	0.8	6.95	1100	2.46	7.2	2.53	17.3	6.33	1100
EY620EAR	1.47	6.38	2200	4.25	7.2	4.75	17.3	11.9	2200
EY630EAR	1.53	10.1	1450	4.61	10.8	4.92	25.9	12.3	1450
EY630EAN	2.18	9.05	2300	6.3	10.8	7.43	25.9	18.6	2300
EY820EAR	2.69	11.7	2200	7.85	14	9.32	32.9	23.3	2200
EY840EAK	3.86	18.4	2000	10.8	25.5	14.7	60.8	36.8	2000
EY860EAJ	4.4	29	1450	12.6	37	15.9	88.5	39.8	1450

3.2.2. ATEX 400V

Motor	Rated Power Pn (kW)	Rated Torque Mn (Nm)	Rated Speed Nn [rpm]	Rated Current In [Arms]	Low Speed Torque Mo [Nm]	Low speed Current Io [Arms]	Peak Torque Mpeak [Nm]	Peak Current I peak [Arms]	Max. Speed Nmax [rpm]
With 40°C ambiant temperature									
EY310EAP	0.718	1.71	4000	1.26	2	1.43	4.72	3.58	4000
EY310EAK	0.873	1.39	6000	1.82	2	2.5	4.72	6.25	6000
EY420EAP	1.42	3.38	4000	2.43	4	2.81	9.47	7.03	4000
EY420EAJ	1.59	3.04	5000	3.83	4	4.87	9.47	12.2	5000
EY430EAL	1.72	4.1	4000	2.87	5.5	3.76	13.1	9.4	4000
EY430EAF	1.77	3.37	5000	4.21	5.5	6.6	13.1	16.5	5000
EY620EAV	1.57	7.52	2000	2.67	8	2.82	18.9	7.04	2000
EY620EAR	2.52	6.17	3900	4.16	8	5.29	18.9	13.2	3900
EY630EAR	2.83	10	2700	4.61	12	5.47	28.4	13.7	2700
EY630EAN	3.31	7.9	4000	5.57	12	8.26	28.4	20.6	4000
EY820EAR	5.29	12.9	3900	8.78	16	10.7	36.8	26.7	3900
EY840EAK	6.8	18.6	3500	11	28	16.2	65.8	40.4	3500
EY860EAJ	6.27	23	2600	10.2	41	17.7	96.7	44.2	2600

Motor	Rated Power Pn (kW)	Rated Torque Mn (Nm)	Rated Speed Nn [rpm]	Rated Current In [Arms]	Low Speed Torque Mo [Nm]	Low speed Current Io [Arms]	Peak Torque Mpeak [Nm]	Peak Current I peak [Arms]	Max. Speed Nmax [rpm]
With 60°C ambiant temperature									
EY310EAP	0.61	1.46	4000	1.07	1.8	1.29	4.3	3.21	4000
EY310EAK	0.697	1.11	6000	1.48	1.8	2.25	4.3	5.62	6000
EY420EAP	1.13	2.7	4000	1.95	3.4	2.39	8.17	5.97	4000
EY420EAJ	1.24	2.36	5000	3	3.4	4.13	8.17	10.3	5000
EY430EAL	1.41	3.36	4000	2.37	5	3.41	12	8.54	4000
EY430EAF	1.33	2.59	4900	3.28	5	5.99	12	15	4900
EY620EAV	1.36	6.5	2000	2.31	7.2	2.53	17.3	6.33	2000
EY620EAR	1.98	4.86	3900	3.29	7.2	4.75	17.3	11.9	3900
EY630EAR	2.38	8.43	2700	3.9	10.8	4.92	25.9	12.3	2700
EY630EAN	2.42	5.78	4000	4.12	10.8	7.43	25.9	18.6	4000
EY820EAR	3.17	7.76	3900	5.35	14	9.32	32.9	23.3	3900
EY840EAK	3.85	14.1	2600	8.38	25.5	14.7	60.8	36.8	2600
EY860EAJ	4.8	21.8	2100	9.61	37	15.9	88.5	39.8	2100

3.2.3. Electromagnetic losses

	Caution: Following data result from our best estimations but are indicative. They can vary from one motor to another and with temperature. No responsibility will be accepted for direct or indirect losses or damages due to the use of these data.

Following data are indicative, without any friction coming from lip seals.

Type	Tf [Nm]	Kd [Nm/1000rpm]
EY310	0.067	0.033
EY420	0.090	0.114
EY430	0.106	0.149
EY620	0.106	0.196
EY630	0.131	0.245
EY820	0.160	0.300
EY840	0.190	0.380
EY860	0.220	0.460

Torque losses (N.m) = Tf + Kd x *speed(rpm)*/1000

3.2.4. Time constants of the motor

3.2.4.1. 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 EY630EAN
L_{ph_ph} = 11.2 mH or 11.2 10^{-3} H
R_{ph_ph} at 25°C = 1.12 Ohm
→ σ_{elec} = 11.2.10^{-3}/1.12 = **10 ms**

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

3.2.4.2. 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 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:

$$Ke_{ph\_ph[V_{rms}/rad/s]} = \frac{Ke_{ph\_ph[V_{rms}/1000\text{tr.min-1}]}}{\frac{2 * \pi * 1000}{60}}$$

Example :
Motor series EY630EAN
R_{ph_ph} at 25°C = 1.12 Ohm
J = 147.10^{-5} kgm²
Ke_{ph_ph} [$V_{rms}/1000 tr.min^{-1}$] = 90.7 [$V_{rms}/1000 tr.min^{-1}$]
→ Ke_{ph_ph} [V_{rms}/rad/s] = 90.7/(2*π*1000/60) = 0.866 [V_{rms}/rad/s]
→ σ_{mech}=0.5*1.12*147.10^{-5} /(0.866²) = **1.1 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. However this value makes sense only if the electric time constant σ_{elec} is much smaller than the mechanical time constant σ_{mech} (for the motor EY630EAN taken as illustration, it is not the case because we obtain $\sigma_{mech}<\sigma_{elec}$.).

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

3.2.4.3. Constante de temps thermique du cuivre :

$$\tau_{therm} = Rth * Cth_{cuivre}$$

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

With:

Rth	thermal resistance between copper and ambient temperature [°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]
EY310	3.0	1.1	60.2
EY420	4.6	1.4	71.0
EY430	5.2	1.1	79.8
EY620	8.6	1.3	137
EY630	10.3	1.0	158
EY820	8.5	2.1	135
EY840	11.0	1.5	171
EY860	12.9	1.3	206

3.2.5. Speed ripple

The typical speed ripple for a EY motor with a resolver at 4000rpm is 3% peak to peak. This value is given as indicative data because depending on the settings of the drive (gains of both speed and current regulation loops, presence of filtering or not, load inertia, resistant torque and type of sensor in use), without external load (neither external inertia nor resistant torque).

3.2.6. Cogging torque

The typical cogging for a EY series below is the maximum value peak to peak in N.cm:

Motor	Cooging Maxi [N.cm]
EY310	2.5
EY420	4.4
EY430	5.7
EY620	5.3
EY630	6.8
EY820	9
EY840	16
EY860	20

3.2.7. Voltage withstand characteristics of EY 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 overvoltage 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 servomotors EY 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 500V AC (See figure 1).

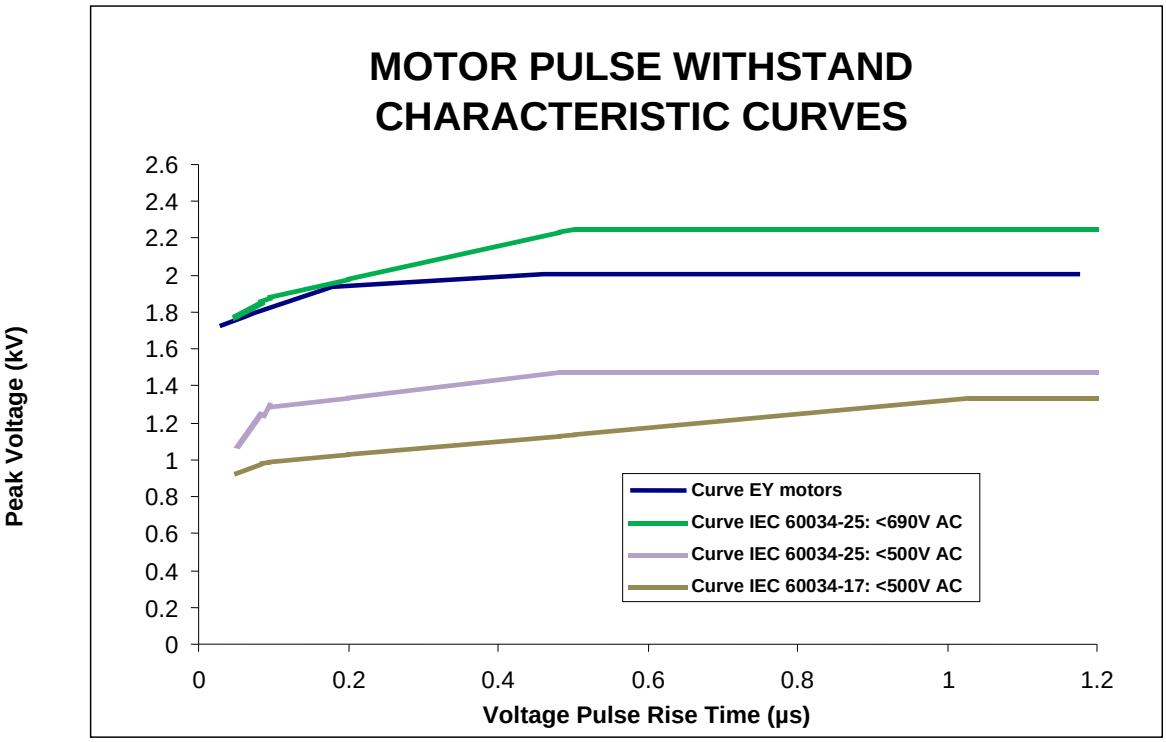


Figure 1: Minimum Voltage withstands characteristics for motors insulations according to IEC standards. At the top are the typical capabilities for the EY motors.

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

The EY motors can be used with a supply voltage up to 400 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 EY motors*" in dark blue.

3.2.8. Maximum speed to respect minimum airgap

In order to respect the minimum airgap, (IEC 60079-0 §5.2.6) the maximum speed allowed are defined in the following table

Motor		EY3…	EY4…	EY6…	EY820	EY840	EY860
Maximum speed	rpm	6000	5000	5000	4000	4000	3500

3.2.9. Voltage and current during operating

EY motors present an ATEX certification and due to this certificate are subjected to strict rules regarding their use. One of such rules is the use of a servoamplifier that meets specific characteristics.These characteristics are valid for an ambient temperature comprised between -20°C and 40°C. For an ambient temperature comprised between 40°C and 60°C, a derating of performances has to be applied.

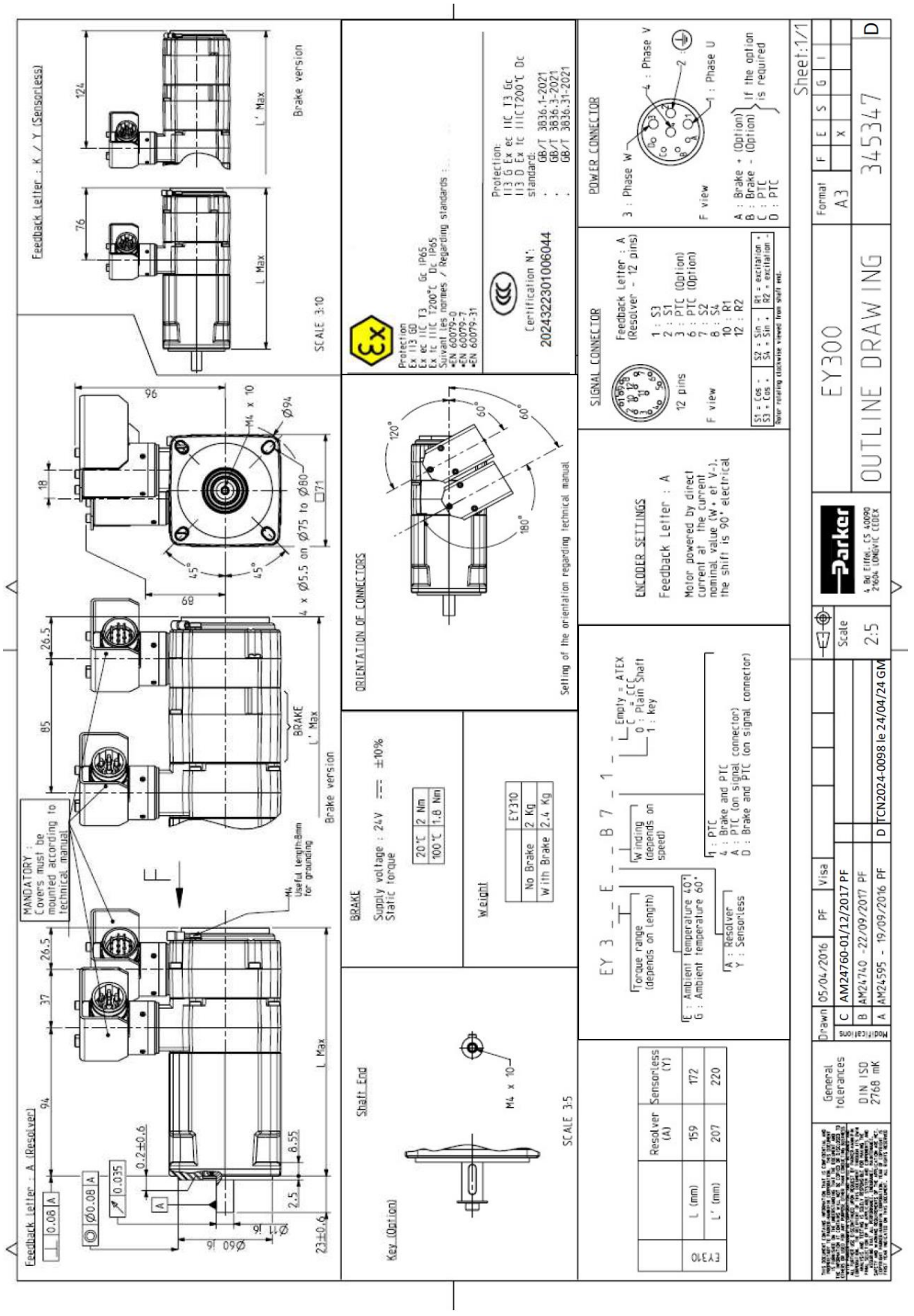
Supply voltage of combined servo drive [Vrms]	**230 V one-phase / three-phase**	**400 V three-phase**
Supply Direct Current voltage [Vdc]	310 ±10%	550 ±10%
Electric frequency of motor [Hz]	0 à 500	0 à 500
Permanent current in one phase I_0 [Arms] with T° ambient=+40°C		
EY310…*	4.7 Maxi	2.5 Maxi
EY430…*	10.2 Maxi	6.6 Maxi
EY630…*	14.5 Maxi	10.3 Maxi
EY860…*	21.3 Maxi	20.2 Maxi
Permanent current in one phase I_0 [Arms] with T° ambient =+60°C		
EY310…*	4.2 Maxi	2.25 Maxi
EY430…*	9.3 Maxi	6 Maxi
EY630…*	13.1 Maxi	8.4 Maxi
EY860…*	16.6 Maxi	15.9 Maxi
Maximum current in one phase [Arms]		
EY310…*	17.6 Maxi	9.4 Maxi
EY430…*	39 Maxi	25.1 Maxi
EY630…*	55.2 Maxi	39 Maxi
EY860…*	80.0 Maxi	78.4 Maxi
Maximum mechanical speed [rpm]		
EY3…*	6000 Maxi	6000 Maxi
EY4…*	5000 Maxi	5000 Maxi
EY6…*	5000 Maxi	5000 Maxi
EY820…*	4000 Maxi	4000 Maxi
EY840…*	4000 Maxi	4000 Maxi
EY860…*	3500 Maxi	3500 Maxi
Maximum **permanent** power of motor [W]		
EY310…*	876 Maxi	876 Maxi
EY430…*	1757 Maxi	1628 Maxi
EY630…*	3304 Maxi	3142 Maxi
EY860…*	5542 Maxi	6011 Maxi

Minimum inverter switching frequency (PWM) = 8kHz

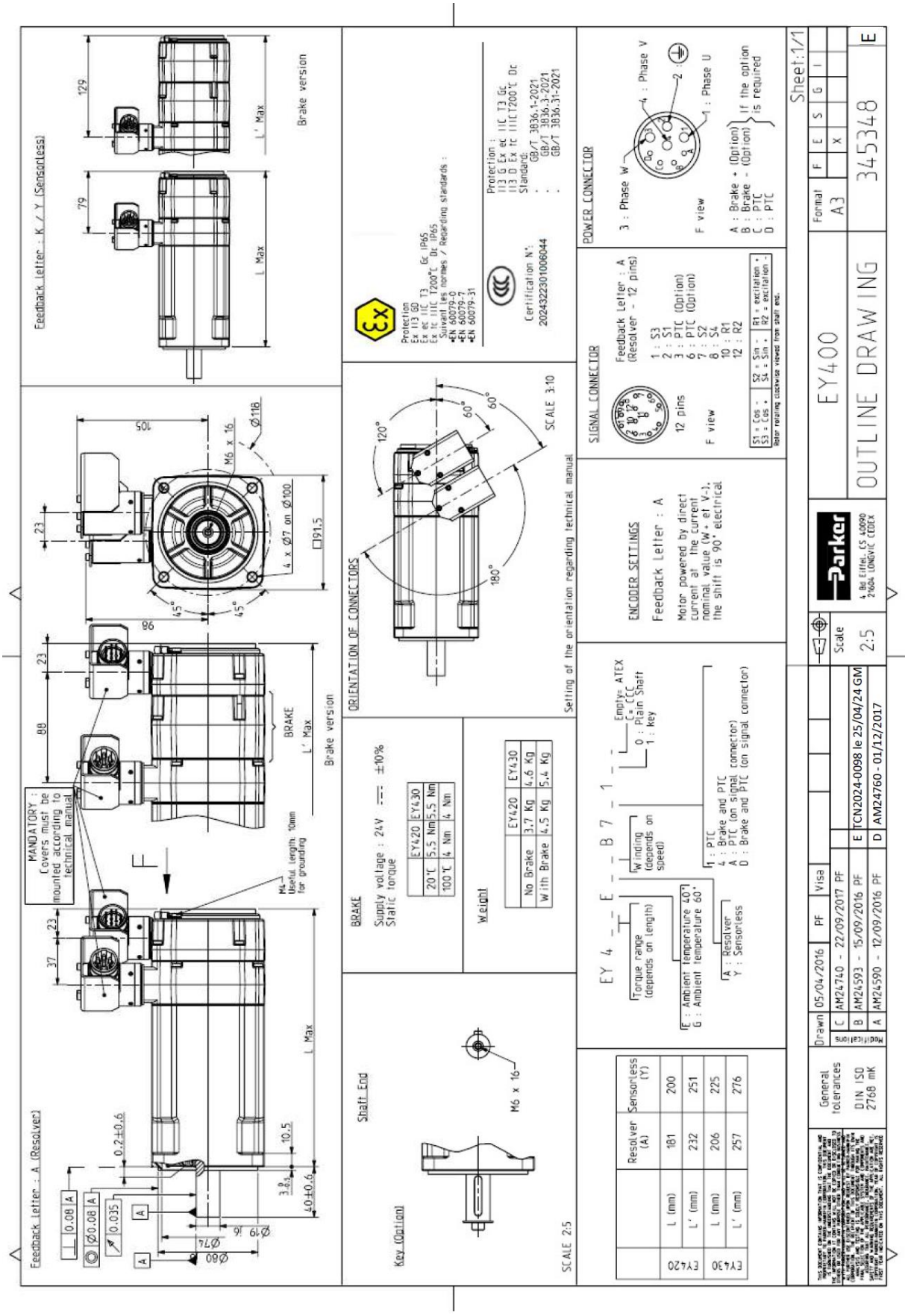
	Attention: EY motors must be connected in accordance with the diagrams given in chapter §4.3.5

3.3. Outline drawings

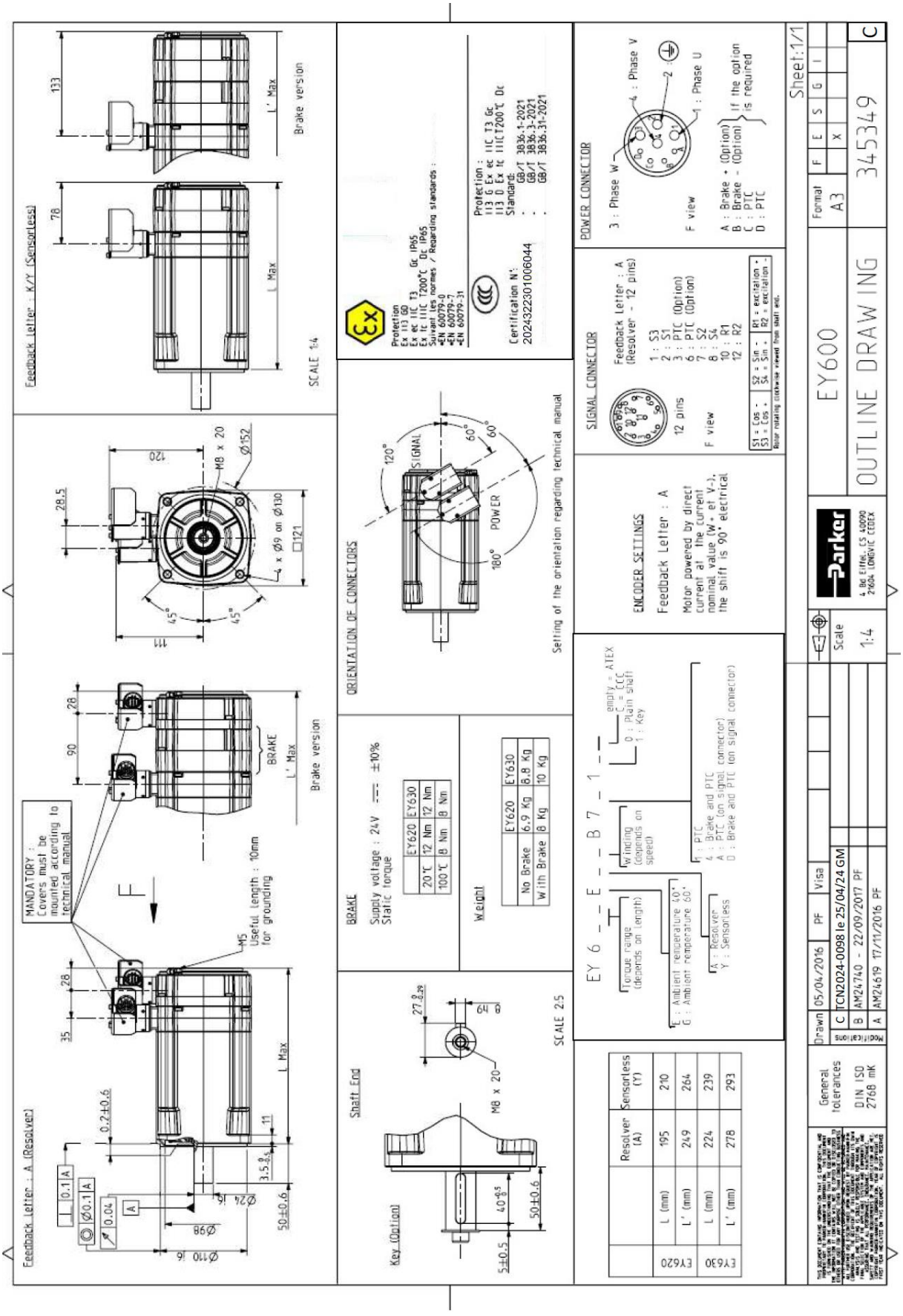
3.3.1. EY310E



3.3.2. EY420E EY430E



3.3.3. EY620E EY630E

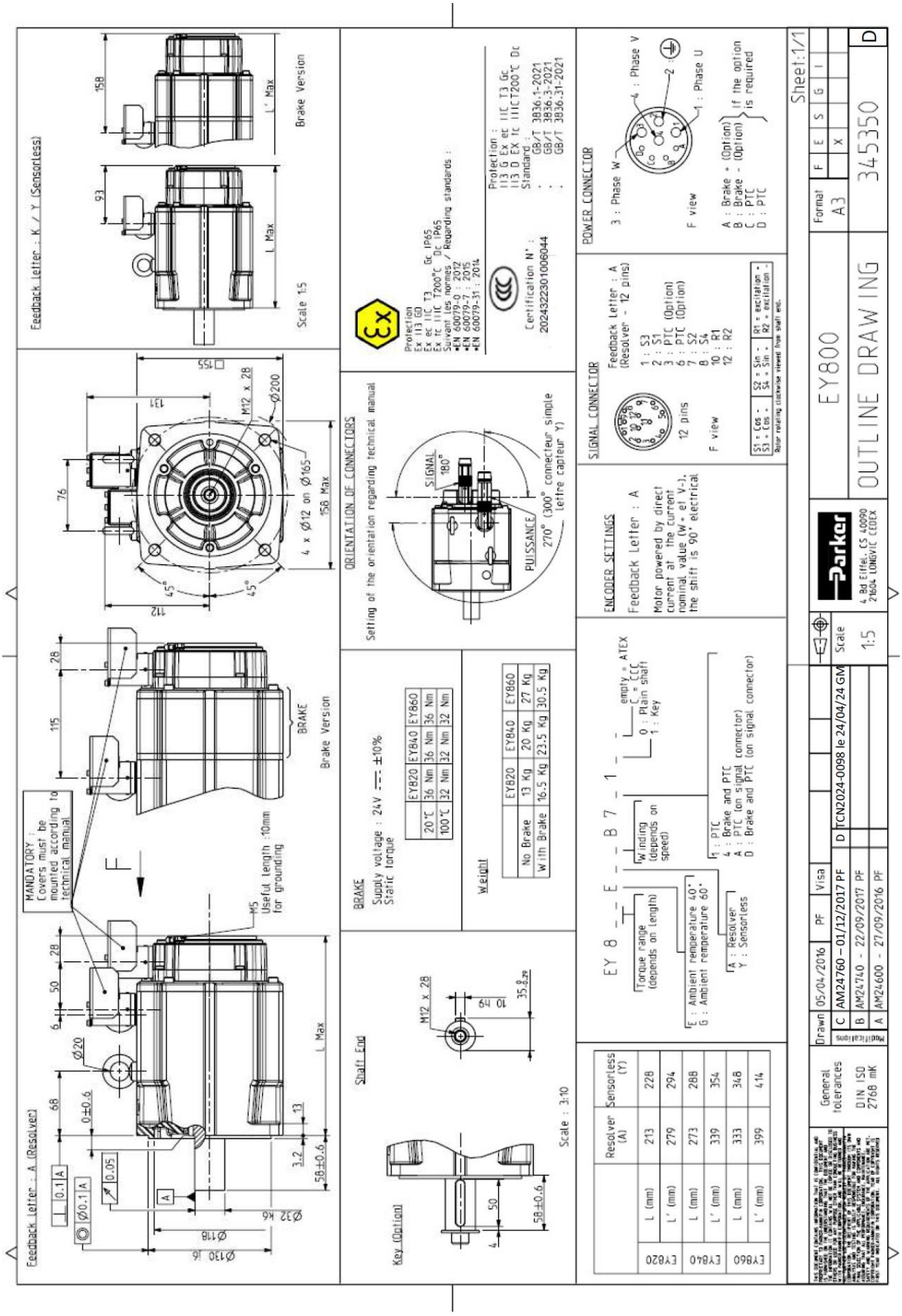


		Resolver (A)	Sensorless (Y)
EY620	L (mm)	195	210
	L' (mm)	249	264
EY630	L (mm)	224	239
	L' (mm)	278	293

	EY620	EY630
20°C	12 Nm	12 Nm
100°C	8 Nm	8 Nm

	EY620	EY630
No Brake	6.9 Kg	8.8 Kg
With Brake	8 Kg	10 Kg

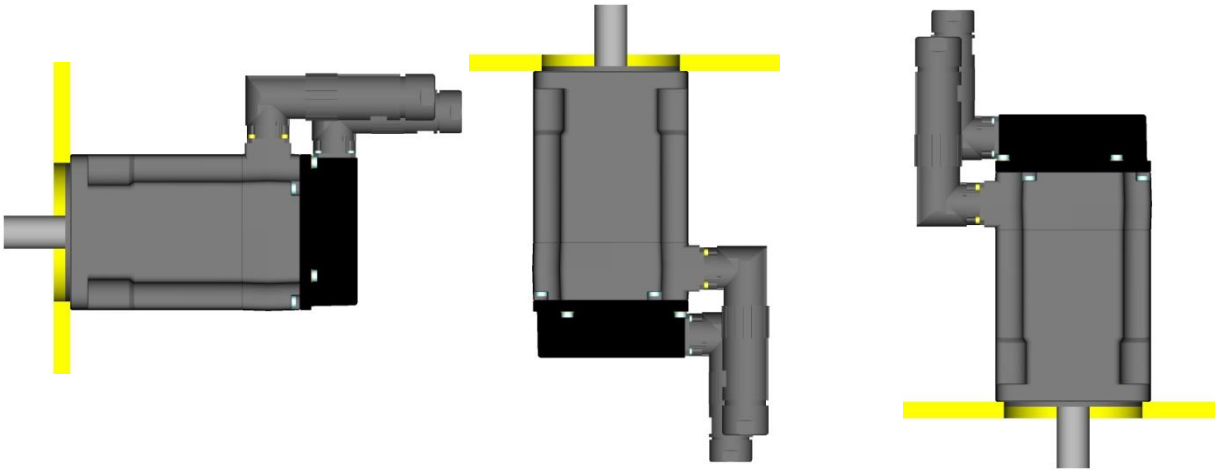
3.3.4. EY820E EY840E EY860E



3.4. Motor mounting

3.4.1. Motor mounting

By flange in any direction.



3.4.2. Installation of ATEX machines

Keep in mind that EY motors are equipments with protect mode "nA" non sparking for hazardous area of gas and with protection by enclosure "tc" for hazardous area of dust ignition.

	When installing electric systems in hazardous locations, carefully observe the corresponding country regulations.

3.4.3. Frame recommendation

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

Foundation must be even, sufficiently rigid and shall be dimensioned in order to avoid vibrations due to resonances.
The servomotors 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 EY is 1.3mm/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).

	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 or/and breakdown - . Please consult us

3.5. Shaft Loads

3.5.1. Vibration resistance toshaft end

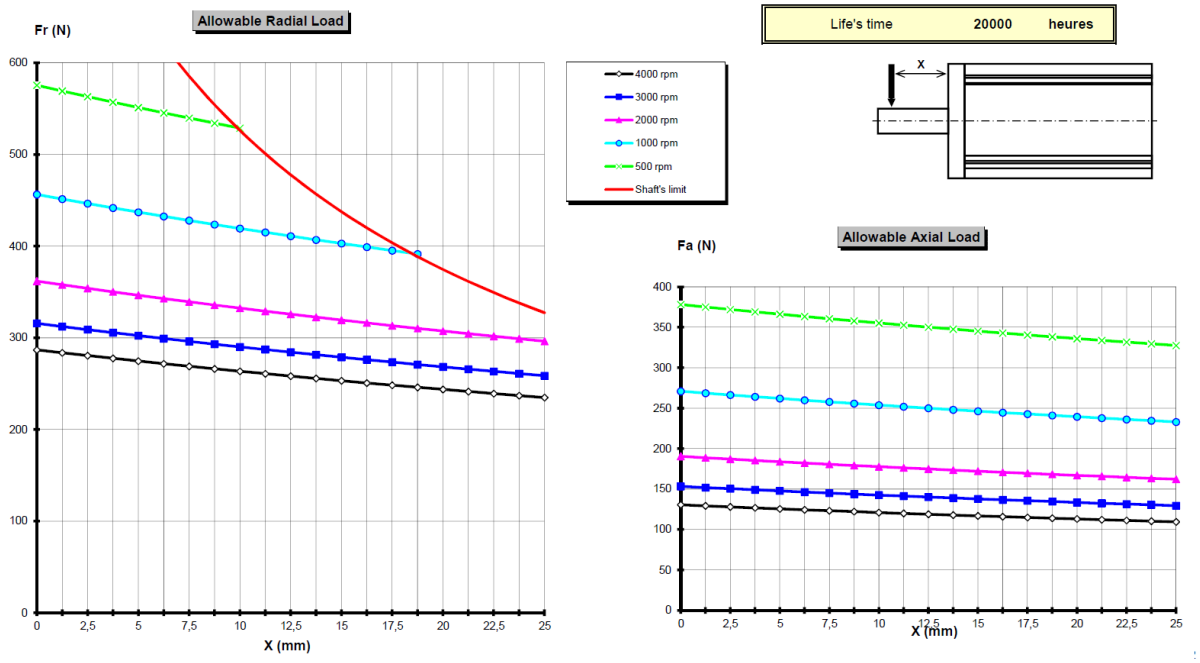
Frequency domain :10 to 55 Hz according to EN 60068 -2-6
Vibration resistance to the shaft end :
- radial 3 g
- axial 1 g

3.5.2. Maximum load acceptable on the shaft

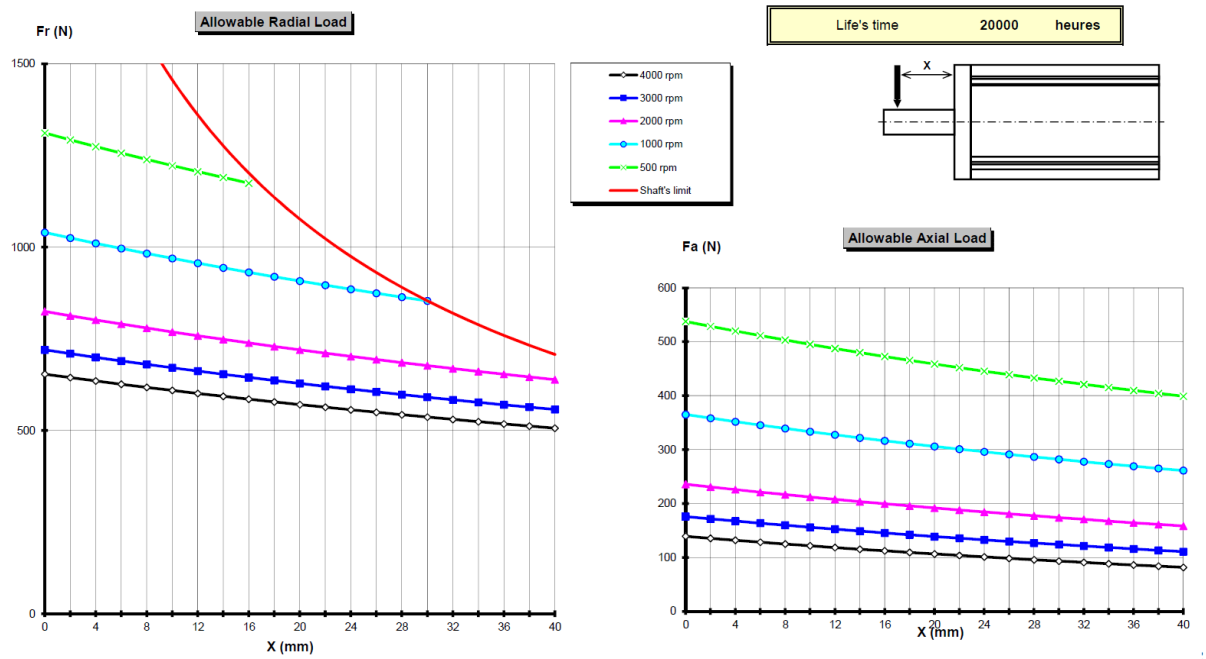
Notice: Curves below are valid only for horizontal mounting and a life time L10 of 20 000h at constant speed in accordance with ISO281.

Notice: Radial and Axial Loads are not additive.

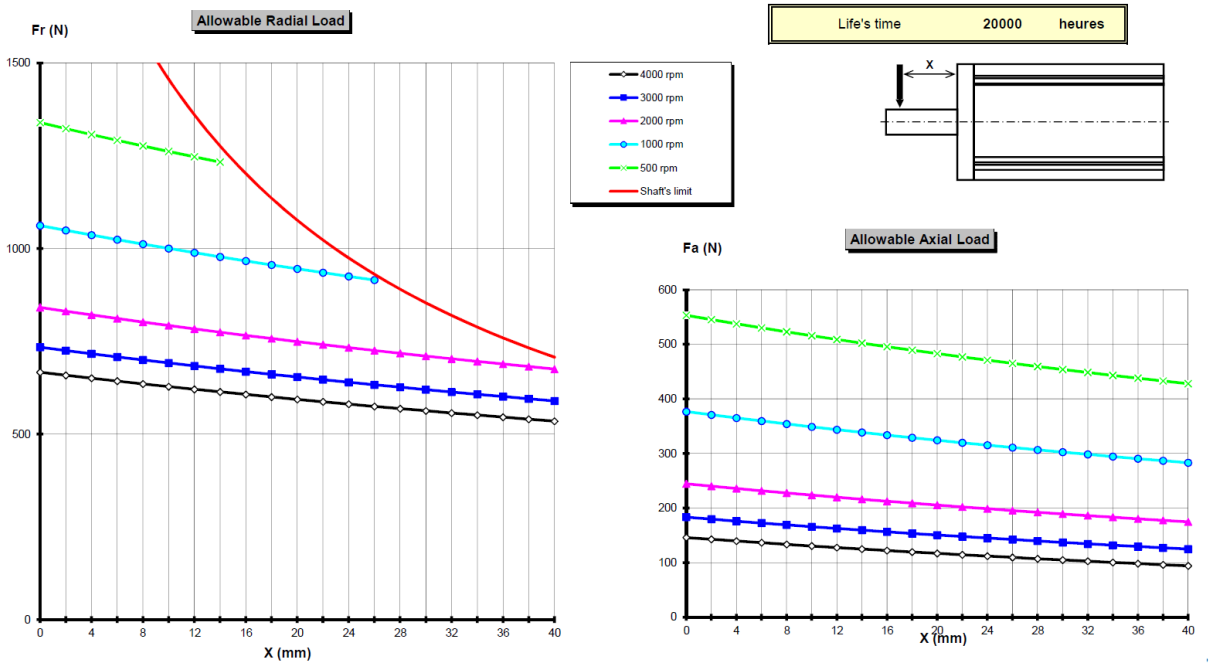
3.5.2.1. EY310



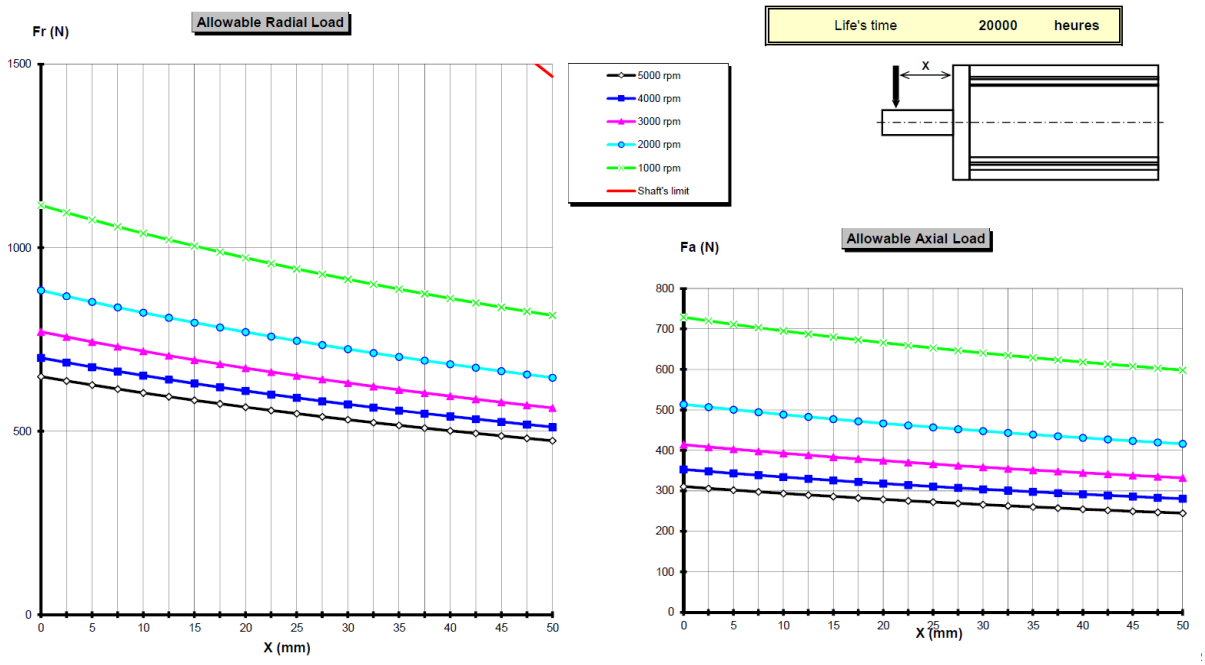
3.5.2.2. EY420



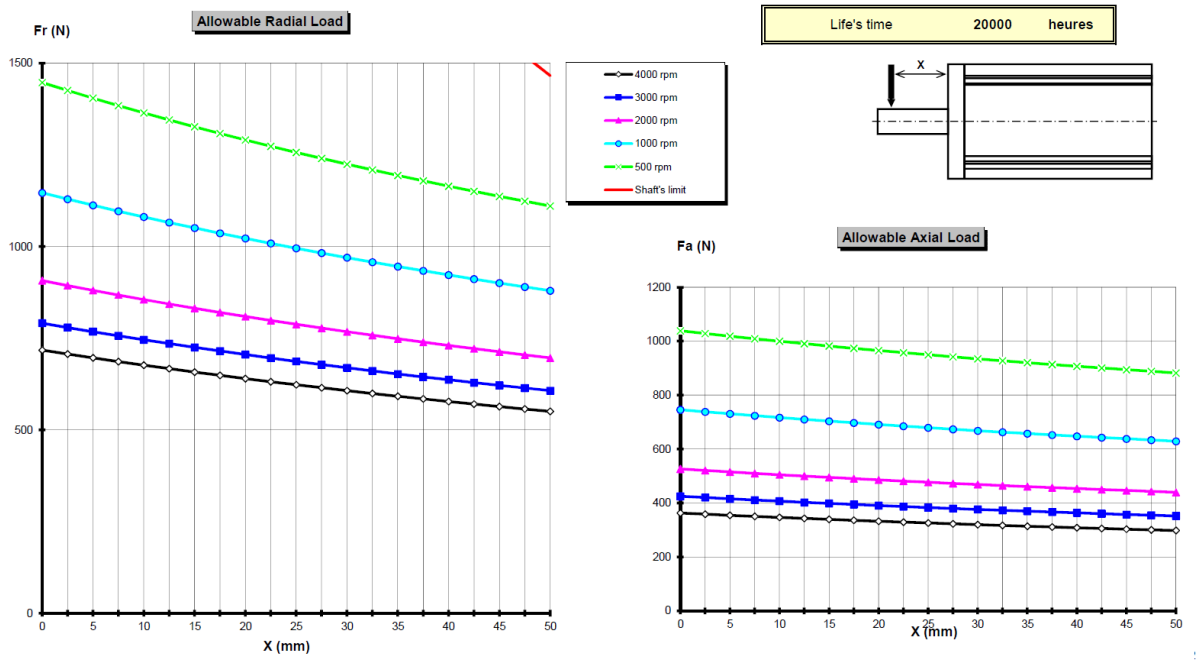
3.5.2.3. EY430



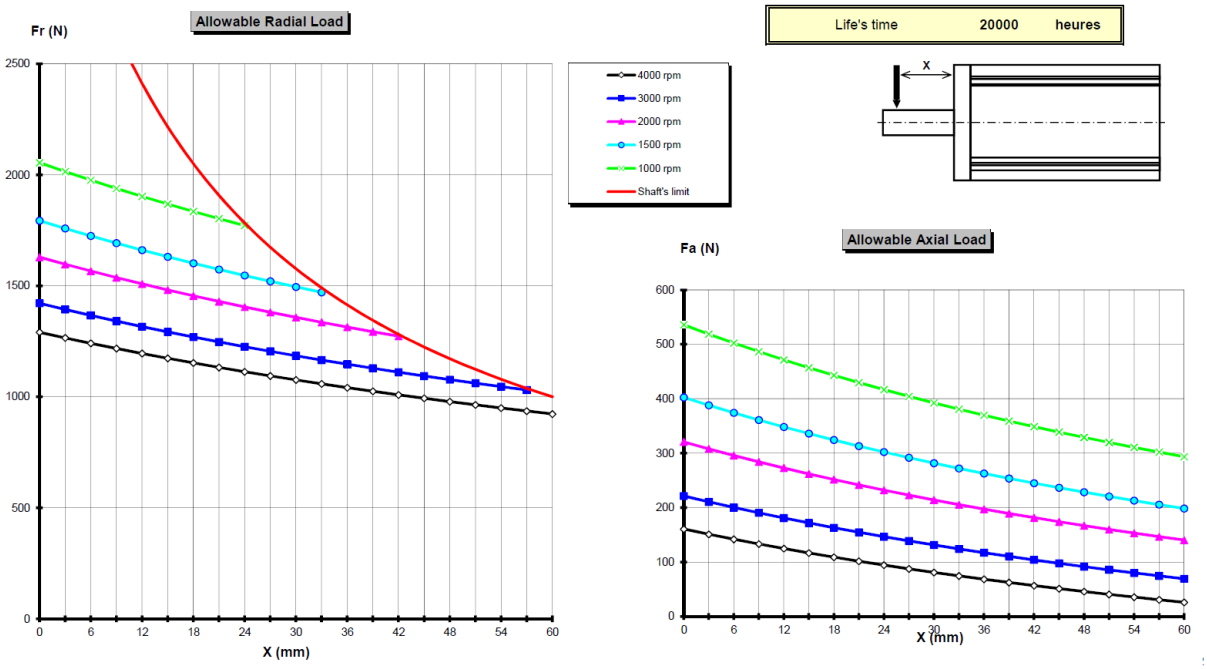
3.5.2.4. EY620



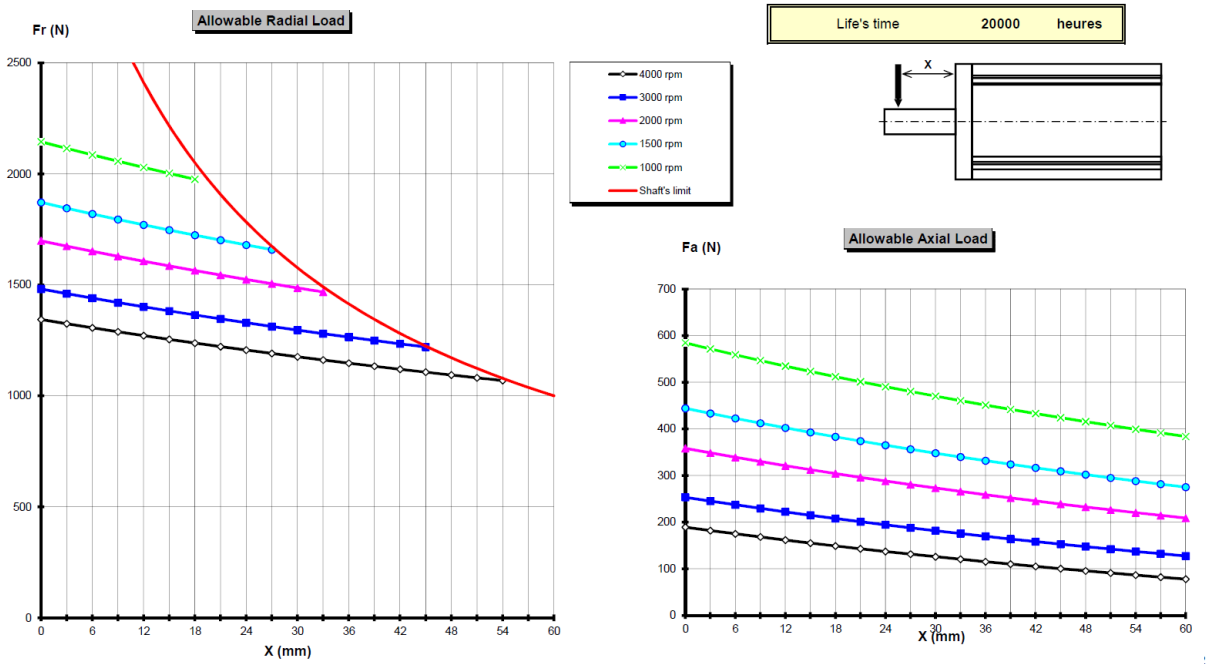
3.5.2.5. EY630



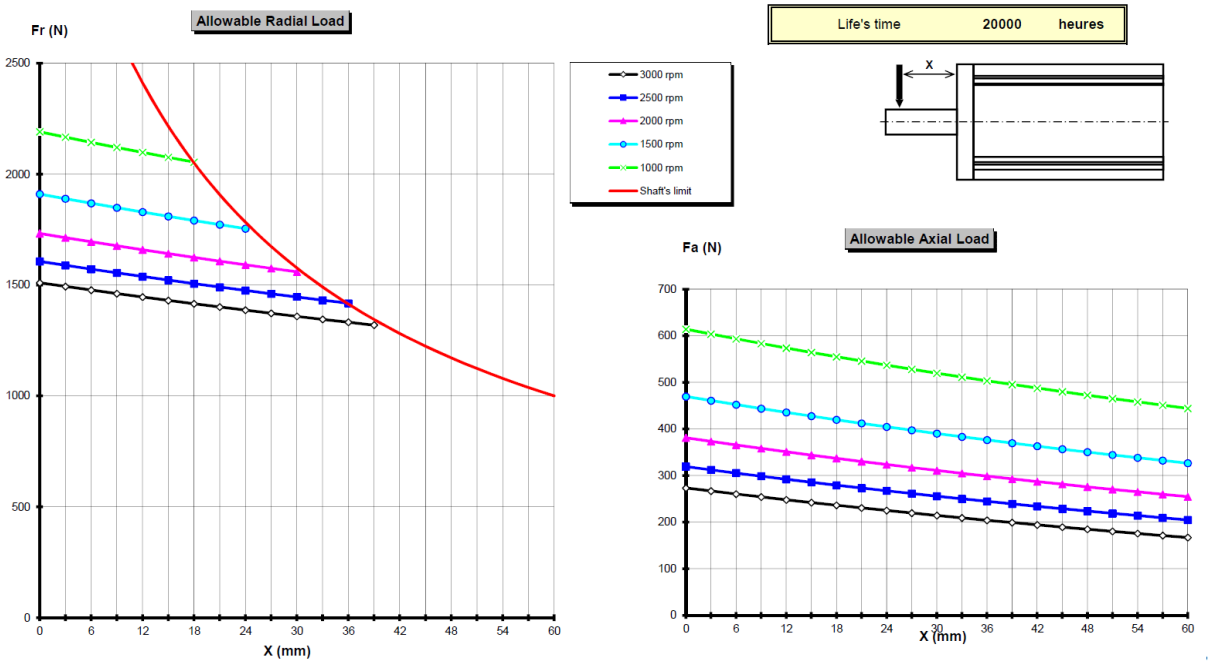
3.5.2.6. EY820



3.5.2.7. EY840



3.5.2.8. EY860


Allowable Radial Load
Fr (N)
2500
2000
1500
1000
500
0
0
6
12
18
24
30
36
42
48
54
60
X (mm)
3000 rpm
2500 rpm
2000 rpm
1500 rpm
1000 rpm
Shaft's limit
Life's time 20000 heures
X
Allowable Axial Load
Fa (N)
700
600
500
400
300
200
100
0
X (mm)

3.6. Cooling

In compliance with the IEC 60034-1 standards:
The ambient air temperature shall not be less than **-20°C** and more than **40°C.**

	It is possible to use the motors in an higher ambient temperature between **40°C** to **60°C** but with an associated derating to the motor performances.

	Warning: To reach the motor performances calculated, the motor must be thermally well connected to a aluminium flange with a dimension of 400 mm x 400 mm and with a thickness of 12 mm.

	Caution: the ambient air temperature shall not exceed 40°C (respectively 60°C with associated derating) in the vicinity of the motor flange

	Warning: A significant part of the heat produced by the motor is evacuated through the flange. • if the air is not able to circulate freely around the motor, • if the motor is mounted on a surface that dissipates not well the heating (surface with little dimensions for instance), • if the motor is thermally isolated, • if the motor is mounted on a warm surface (mounted on a gearbox for instance), then the motor has to be used at a torque less than the rated torque.

3.7. Thermal Protection

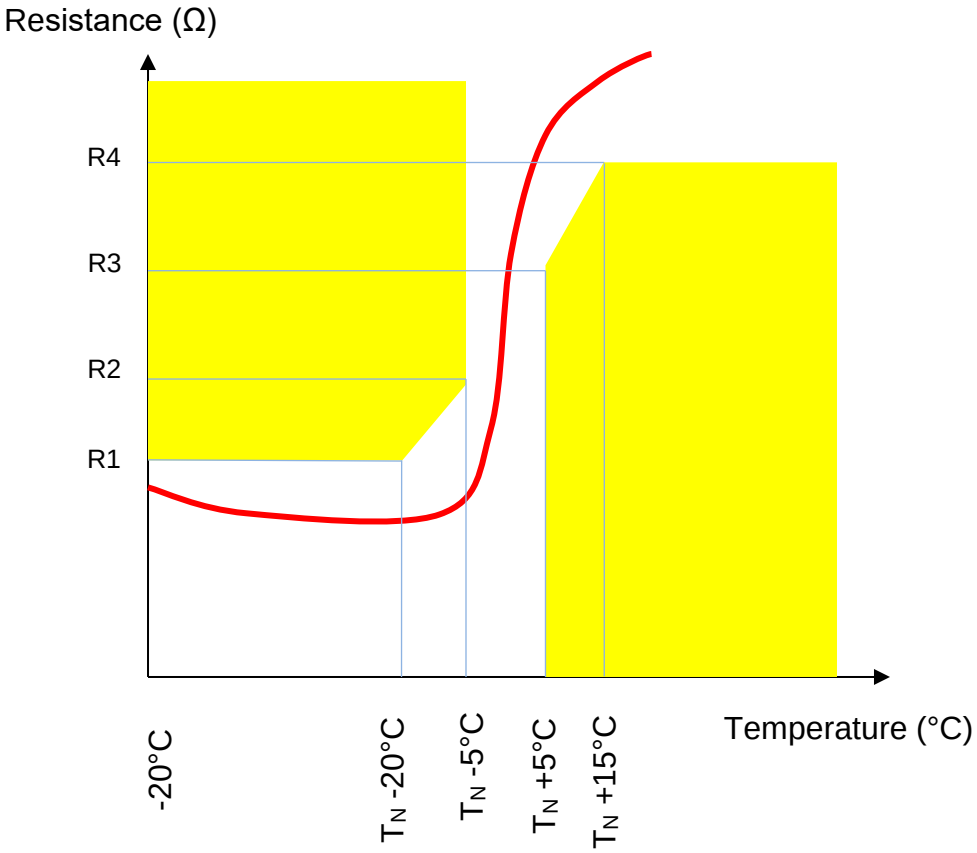
The protection against thermal overloading of the motor is a PTC thermistors (as standard) built into the stator winding. The thermal sensor, due to their thermal inertia, are unable to follow very fast winding temperature variations. They acheive their thermal steady state after a few minutes.

	Warning: To protect correctly the motor against very fast overload, please refer to §3.1.6. Peak current limitations

3.7.1. Alarm tripping with PTC thermistors

Once thermal probe (PTC thermistors) fitted in the EY servomotor winding, trips the electronic system at **150° ± 5° C** for class F version. When the rated tripping temperature is reached, the PTC thermistor undergoes a step change in resistance. This means that a limit can be easily and reliably detected by the drive.

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



Temperature	Resistance value for EY3 , EY4, EY6, EY8
from -20°C to T_N-20°C	R1≤750 Ω
from T_N-20°C to T_N-5°C	R2≤1650 Ω
from T_N+5°C to T_N+15°C	R3≥3990 Ω
greater than T_N+15°C	R4≥12000 Ω

3.8. Power Electrical Connections

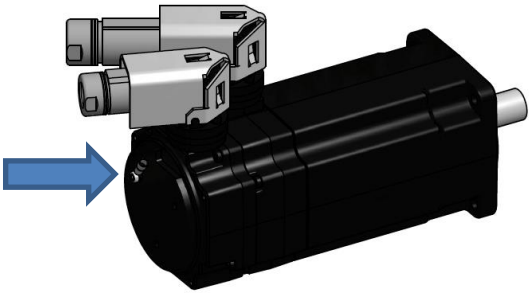
3.8.1. Wires sizes

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

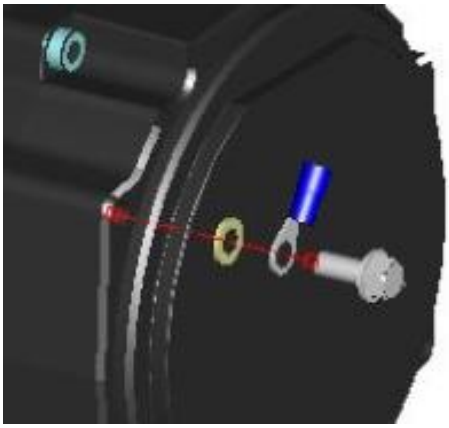
Not limiting example in France: NFC 15-100 or IEC 60364 as well in Europe.

⚠	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 cable has to support peak current for a long period. So, if the motor works at standstill, the current to select wire size is $\sqrt{2} \times 0.8\ Io \cong$ **1,13 x I_o**..
Ex	For the ATEX installations, you have to use special cables C2 type auto-extinguish regarding the standard EN 50265-2-1.
Ex	It is mandatory to connect 2 (green-yellow) ground cables between the motor frame and machine. • the first one is connected to the ground pin #2 of power connector, • the other one is connected to the external motor housing  The connecting of these two grounding devices is mandatory in order to comply with ATEX standard IEC/EN 60079-0. The ground cable cross-section must be the same as the power cable cross-section

3.8.1. Earth connection to the rear cover



Picture of the toothed washer which is placed between the rear cover and the lug and which prevents any rotation

The earth cable has to be fixed to the motor with a tooth washer, a lug and a screw. This assembly holds the cable and secures the cable to prevent any rotation or movement in accordance with the requirements of standards IEC 60079-15 and EN 60079-15 cf. §7.2 Field wiring connections §7.2.4 Connections designed for use with cable lugs and similar devices.

Tightening torque of the earth lug retaining screw:

EY6, EY8 : 4N.m +/-0,5

EY3, EY4 : 2N.m +/-0,2

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 windings 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.

3.9. Feeback system

3.9.1. Direction of shaft rotation regarding electrical connections

With the connection explained in the documentation and with a positive speed request on the drive, the shaft will turn in clockwise direction (see customer shaft end).

3.9.2. Sensorless connection

EY servomotors in sensorless version do not have a feedback cable. The connection of power cable has to be made according to the connection diagrams given in this documentation. In the detailed diagrams see §4.3.5, do not take into account the connection of the feedback cable and please keep the same connections for the other devices.

3.9.3. Resolveur 2 poles transformation ratio = 0.5 – code A

	EY3	**EY4, EY6 et EY8**
Parker part number	220005P1001	220005P1002
Electrical specification	Values @ 8 kHz	
Polarity	2 poles	
Input voltage	7 Vrms	
Input current	86mA Maximum	
Zero voltage	20mV Maximum	
Sensor accuracy	± 10’ Maximum	
Transformation ratio	0,5 ± 5 %	
Output impedance (primary in short circuit whatever the position of the rotor)	Typical 120 + 200j Ω	
Dielectric rigidity (50 – 60 Hz)	500 V – 1 min	
Insulation resistance	≥ 100MΩ	
Rotor inertia	~30 g.cm²	
Operating temperature range	-55 to +155 °C	

3.10. Cables

You can connect EY motors to PARKER servo drives : AC30 or PSD.
You can use complete cables with part numbers given as follows.
The "xxx" in the part number must be replaced by the length in meter.
Ex : for 20m cable, "xxxx" = 0200.

Special requirements for ATEX servomotors

	For the ATEX installations, you have to use special cables C2 type auto-extinguish regarding the standard EN 50265-2-1.
	Caution : For an ambient temperature of 40°C, the standard cables withstand a maximum surface temperature of 80°C. For an ambient temperature of 60°C, cables able to withtand a greater maximum surface temperature have to be provided. Please consult us.

3.10.1. Resolver signal cable

Drive	
PSD1S, PSD1M18	**CBM015TD-T03-D01-xxxx-00**
PSD1M (except M18)	**CBM015TD-T03-D02-xxxx-00**

3.10.2. Power cable with or without brake

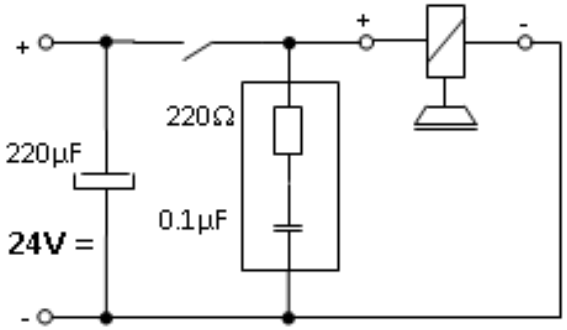
Drive	Current - 12 A @40°C ambient t°
	Current - 9 A @60°C ambient t°
PSD1S, PSD1M18	**CBM015HB-C04-D01-xxxx-00**
PSD1M (except M18)	**CBM015HB-C04-D02-xxxx-00**
Compax3	**CBM015HB-C04-D01-xxxx-00**

Drive	Current - 24 A @40°C ambient t°
	Current - 17 A @60°C ambient t°
PSD1S, PSD1M18	**CBM025HB-C04-D01-xxxx-00**
PSD1M (except M18)	**CBM025HB-C04-D02-xxxx-00**
Compax3	**CBM025HB-C04-D01-xxxx-00**

3.11. Brake option

	Caution: The holding brake is used to completely immobilize the servomotor under load. The brakes are parking brakes, they must be supplied when the motor is rotating. The brake should only be closed after the motor has come to a complete stop.

The standard brake power supply is 24 Vcc DC ± 10%.
Follow the polarity and the permissible voltage, and use shielded cables.
A 220 µF capacitor avoids untimely braking if the 24 V voltage is disturbed by the external relay. Check the voltage value once this capacitor has been fitted. The RC network (220 Ω, 0.1 µF) is needed to eliminate interference produced by the brake coil.
Position the contactor in the DC circuit to reduce brake response times. Follow the connection instructions taking the brake polarisation into account.



Motor	Static torque @20°C (N.m)	Static torque @100°C (N.m)	Power (W)	Engaging time (ms)	Disengaging time (ms)	Extra Inertia ($Kg.m^2.10^{-5}$)	Angular backlash (°)
EY3	2	1.8	11	13	25	0.68	0
EY4	5.5	4	12	17	35	1.8	0
EY6	12	8	18	28	40	5.4	0
EY8	36	32	26	45	100	55.6	0

Table with typical values

4. COMMISSIONING, USE AND MAINTENANCE

4.1. Instructions for commissioning, use and maintenance

4.1.1. Equipment delivery

All servomotors 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.

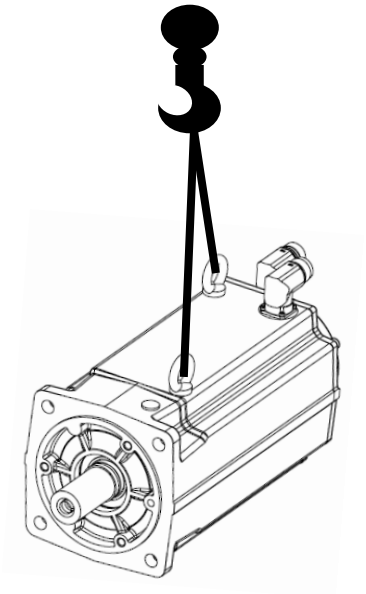
	Warning: In case of damaged material during the transport, the recipient must **immediately** make reservations to the carrier through a registered mail within 24 h.

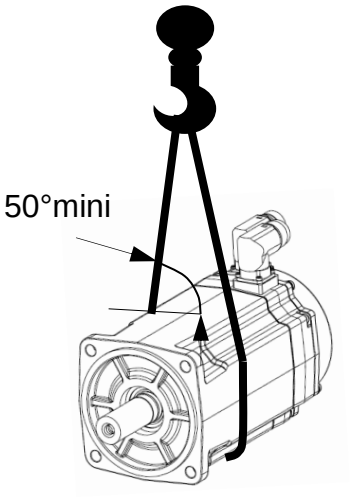
4.1.2. Handling

The servomotors EX8 are equipped with two lifting rings intended for handling.

	Caution: Use only servomotors lifting rings, if present, or slings to handle the motor. Do not handle the motor with the help of electrical cables, connectors or use any other inappropriate method.

The drawings below show the correct handling procedure.





	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. (Any slinging must be done according to current standards and regulations in each country.)

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 torque 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.

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, the foundation surface must be cleaned and checked in order to detect any excessive height difference between the motor locations. The surface variation shall not exceed 0,1 mm. In all cases, we recommend using shims in order to compensate small irregularities.

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

4.2.2. Torque value for the screws

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.

Diamètre de vis	Couple de serrage
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

Diameter de vis	Couple de serrage
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

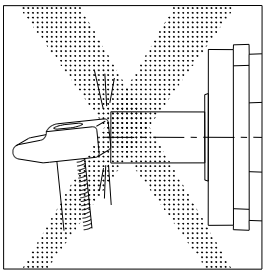
	Warning: After 15 days, check all tightening torques on all screw and nuts.

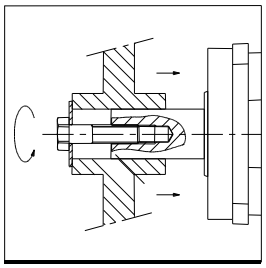
4.2.3. Preparation

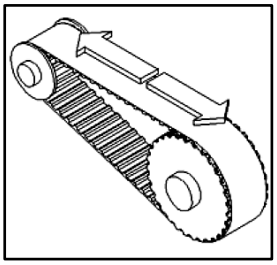
Once the motor is installed, it must be possible to access the wiring, and read the manufacturer's plate. Air must be able to circulate around the motor for cooling purposes.
Clean the shaft using a cloth soaked in white spirit or alcohol. Pay attention that the cleaning solution does not get on to the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

	Caution : Do not step on the motor, on the connectors or on the connector protectors
	Caution: Always bear in mind that some parts of the surface of the motor can reach a temperature of 135°C.

4.2.4. Mechanical assembly







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

- In the event that the servomotor shaft has a cotter pin, make sure that the coupling components have been balanced correctly without the cotter pin, the servomotor having been balanced with its cotter pin.
- 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 pulleys or accessories. It is possible to put pressure on the shoulder of the shaft located in front of the bearing.
- In the event that the front bearing block is sealed by a lip seal which rubs on the rotating section (version IP 65), we recommended that you lubricate the seal with grease thus prolonging its operational life.
- In the event that the drive system uses a pulley and belt, the drive pulley must be fixed as close as possible to the flange. The pulley diameter is to be selected so that the radial load does not exceed the limits given in the catalog.
- CAUTION: Any equipment such as gearbox, mechanical speed drives, brakes, forced ventilation, integrated frequency converters, sensors, actuators, etc. associated with the motor must also have ATEX certification.

	Warning : a misalignment of the coupling device makes stress and load on the motor shaft depending the rigidity of the installation. The variations of the temperature makes stress and load due to the dilatation. These loads (axials and radiale) do not exceed the load written (§ 3.5).
	Warning : The misalignment of the coupling device makes vibration who can realize a destruction of the motor shaft.
	We cannot be held responsible for wear on the drive shaft resulting from excessive strain.

4.3. Electrical connections

	Danger: Check that the power to the electrical cabinet is off prior to making any connections.

	Caution: The wiring must comply with the drive commissioning manual and with recommended cables, as well as local regulations and standards.

	Caution: The motor has to be connected to both grounding connections available (one is linked to an internal part of motor through a pin of connector, the other one to the external housing by dedicated lug).

	Caution: After 15 days, check all tightening torques on cable connection Incorrect connections may cause overheating or fire.

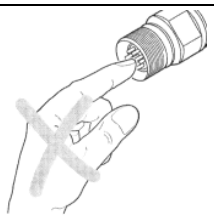
4.3.1. Cable connection

Please read **§3.8 "Electrical connection**" and **§3.3 "outline drawings"** to get information about cables connection.
Many useful informations are already available in the drive documentations.

4.3.2. Cable handling

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

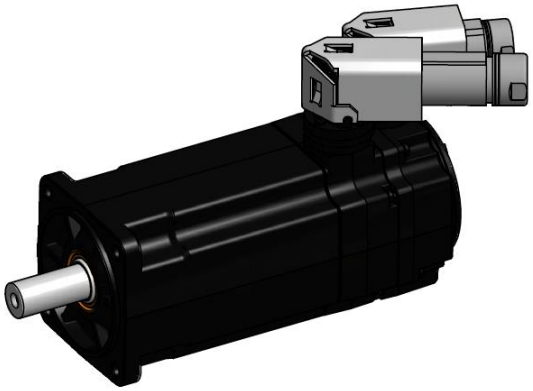
	Danger: It is forbidden to disconnect any cable under voltage (high risk of explosion, damage and sensor destruction).

	Warning: Do not touch contacts (risk of damage due to electrostatic discharges ESD

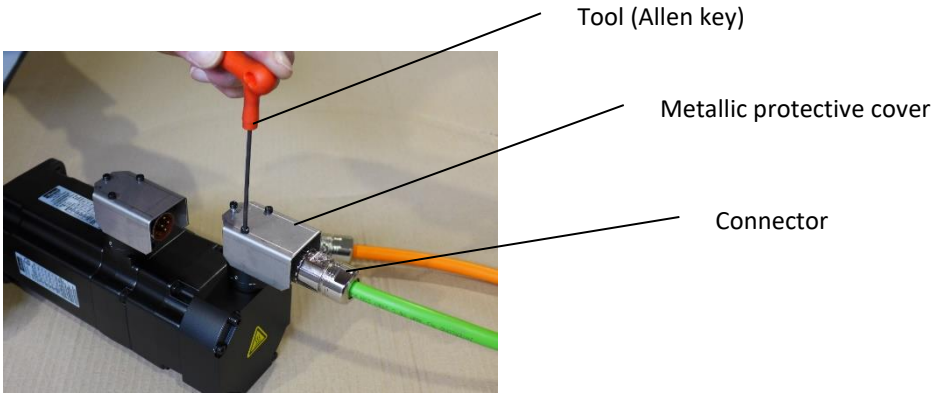
4.3.3. Use of two grounding devices with EY servomotors

	EY servomotors have two equipotential connections for grounding : • the first one is connected to the ground pin #2 of power connector, • the other one is connected to the external motor housing (see below). The connecting of these two grounding devices is mandatory in order to comply with standard IEC/EN 60079-0.

4.3.4. Protection of connectors – Mounting recommendations



After connecting male and female part of connector, cover the assembly of connector with its Metallic protective cover.The protection is foreseen to be adjusted on the connector.



Once the assembly correctly positioned, lock the device with the Allen screws – Their tightening torque is comprised between 0.9 and 1.2 Nm.

Protections of connector shall be capable of being released or removed only with the aid of a tool according to standard IEC/EN 60079-0.
The protections are designed

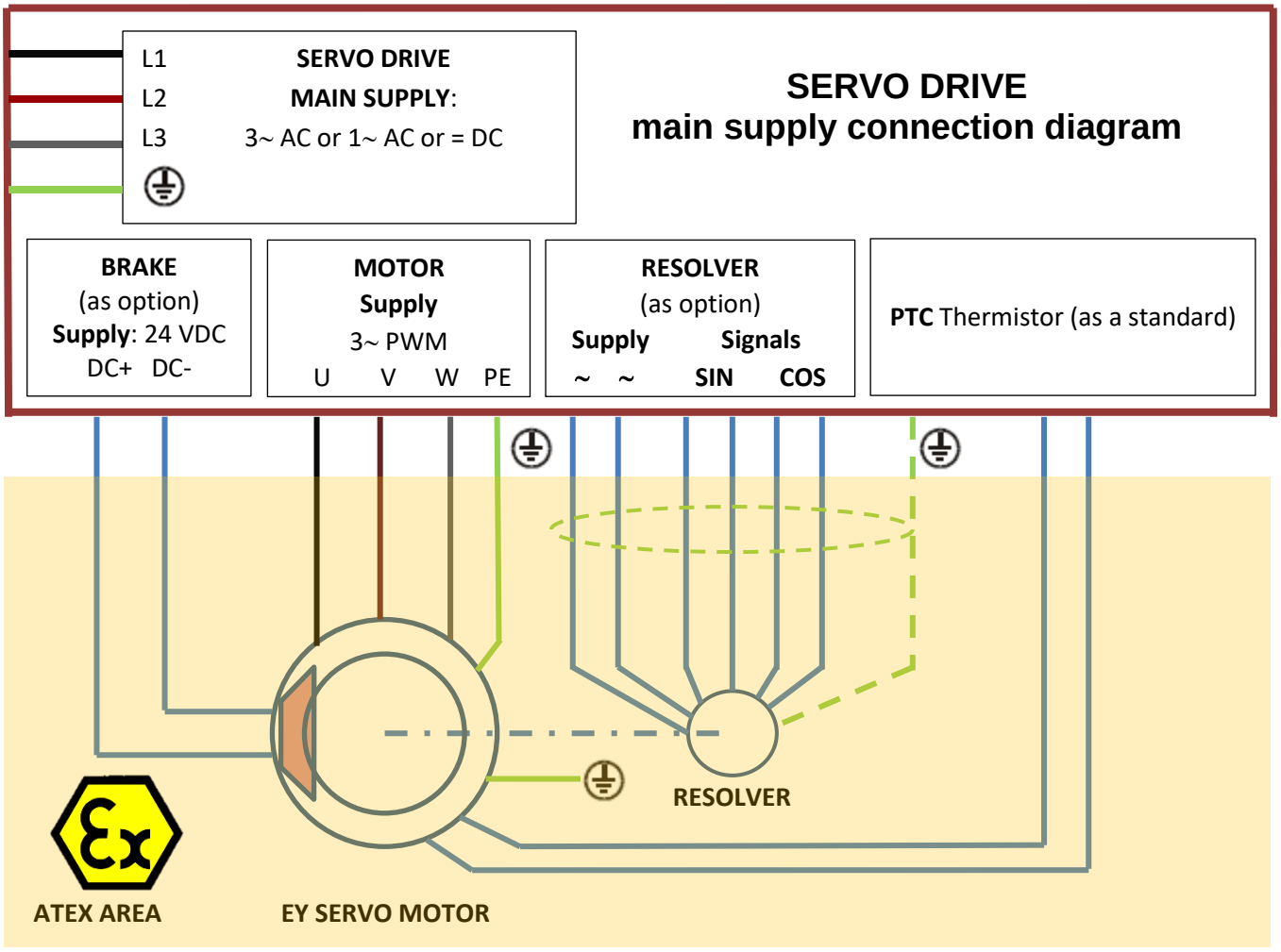
- To absorb an impact energy of 7 joules.
- to prevent any disconnection when the motor run

	Caution : Check the mechanical integrity of connector protectors before their mounting. The use of connector protectors is mandatory in order to be in accordance with standard IEC/EN 60079-0.

	Caution : The connector protector is a **single-use**. In case of shock on the latter, be sure to replace it with a new connector protector. Parker part number: 345352P0001

4.3.5. Connection diagrams

⚠	Caution: The wiring must comply with the drive commissioning manual and with recommended cables.
⚠	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, overheating or/and breakdown - . Please consult us



Ex	It is mandatory to connect 2 (green-yellow) ground cables between the motor frame and machine. • the first one is connected to the ground pin #2 of power connector, • the other one is connected to the external motor housing (see below). The connecting of these two grounding devices is mandatory in order to comply with ATEX standard IEC/EN 60079-0. The ground cable cross-section must be the same as the power cable cross-section

4.4. Maintenance Operations

4.4.1. Summary maintenance operations

	**Generality** DANGER: The installation, commission 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, commission and operate in accordance with established practices and standards. Please contact PARKER for technical assistance.

	Danger: Before any intervention, the motor must be disconnected from the power supply. Due to the presence of permanent magnets, a voltage is generated at the terminals when the motor shaft is turning.

Special requirements for ATEX servomotors

	If an assembly screw of enclosure has to be replaced, the new one screw must present a quality 8.8 or higher.
	If the motor is used in dust explosive atmospheres, do not forget to do a regular cleaning in order to avoid the deposits of dusts.

Operation	Periodicity
Clean the motor	Every year
Motor inspection (vibration changes, temperature changes, tightening torques on all scews)	Every year
Cable inspection, no degradation (colour, flexibility, cracks…)	Every year
Bearing replacement	Every 20 000h
Front seal	Every year

4.5. Troubleshooting

Some symptoms and their possible causes are listed below. This list is not comprehensive. Whenever an operating incident occurs, consult the relevant servo drive installation instructions (the troubleshooting display indications will help you in your investigation) 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 feedback sensor 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..

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.
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