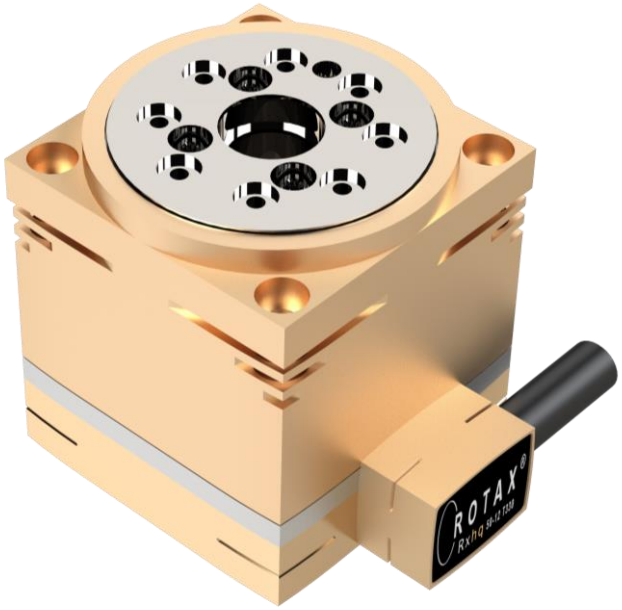
Data Sheet ROTAX® Rxhq (High Torque)

Edition October 2020

Compact Hollow Shaft Motor ROTAX®



Highlights

Compact direct drive with high torque up to 1'020mNm *(9.03 lbf·in)*

Flexible positioning with a repeatability of ±0.003° / ±11 arcsec

Single-turn absolute encoder

Large hollow shaft with a diameter of 12mm *(0.47")*

No wear and tear, the direct drive ensures maximum precision over the entire service life

Variable one-cable connection to XENAX® in 90° grid orientation

Force control, force limitation and force recording with XENAX® servo controller

General

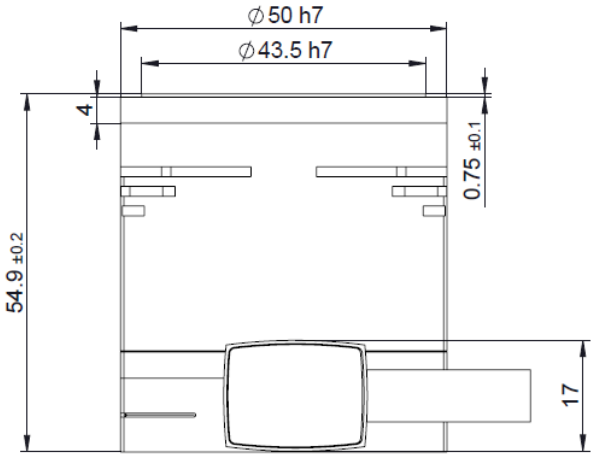
The self-developed direct drive servo motor is based on the magnetic flux technology of wind turbine generators.
This generates a high torque at low speed. In figures this means a factor 2-3 higher torque with the same construction volume compared to a conventional direct drive of competitors.

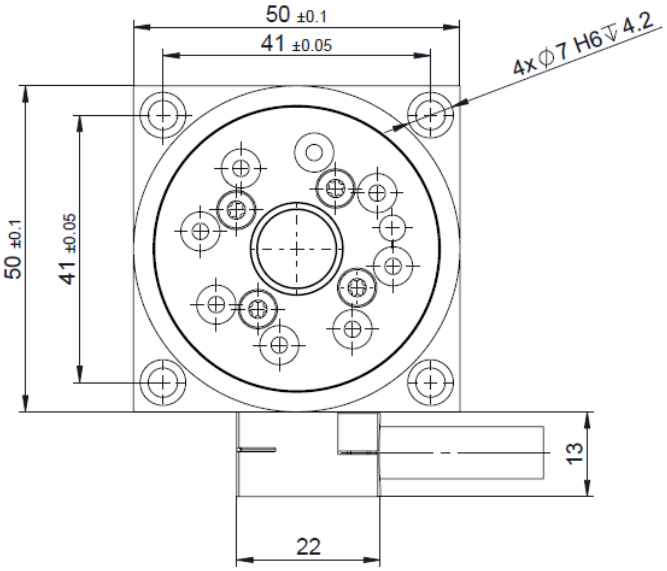
Alois Jenny
Jenny Science AG

Inhaltsverzeichnis

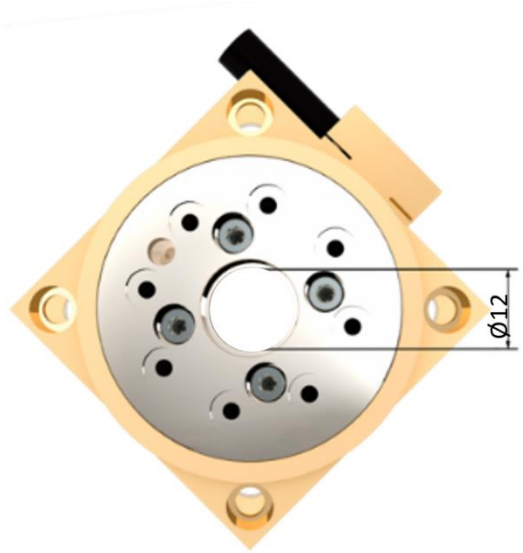
1 Dimension ROTAX® Rxhq 50-12

1.1 Installation dimension

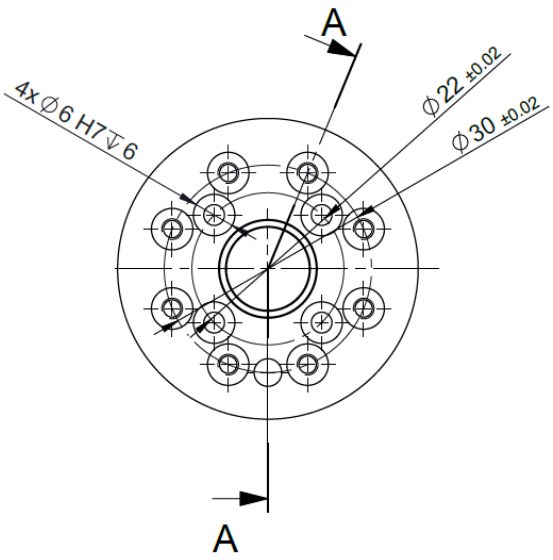


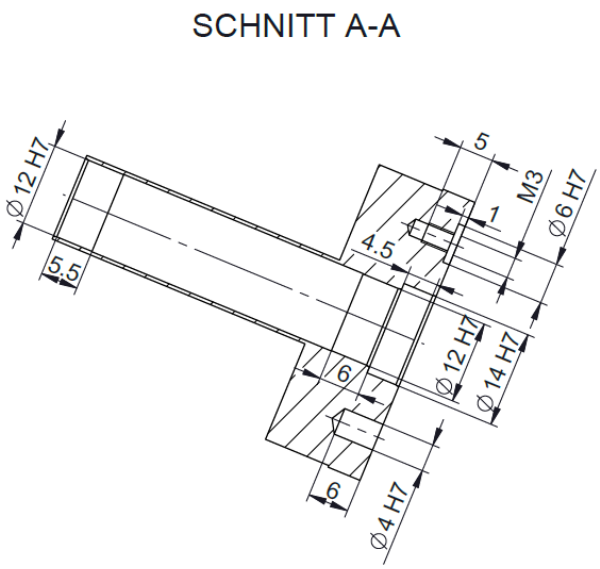


1.2 Hollow shaft



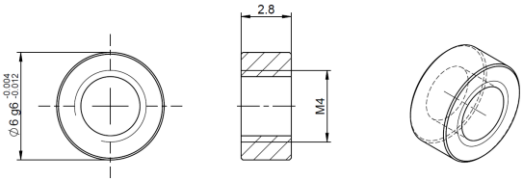
1.2.1 Front flange dimensions





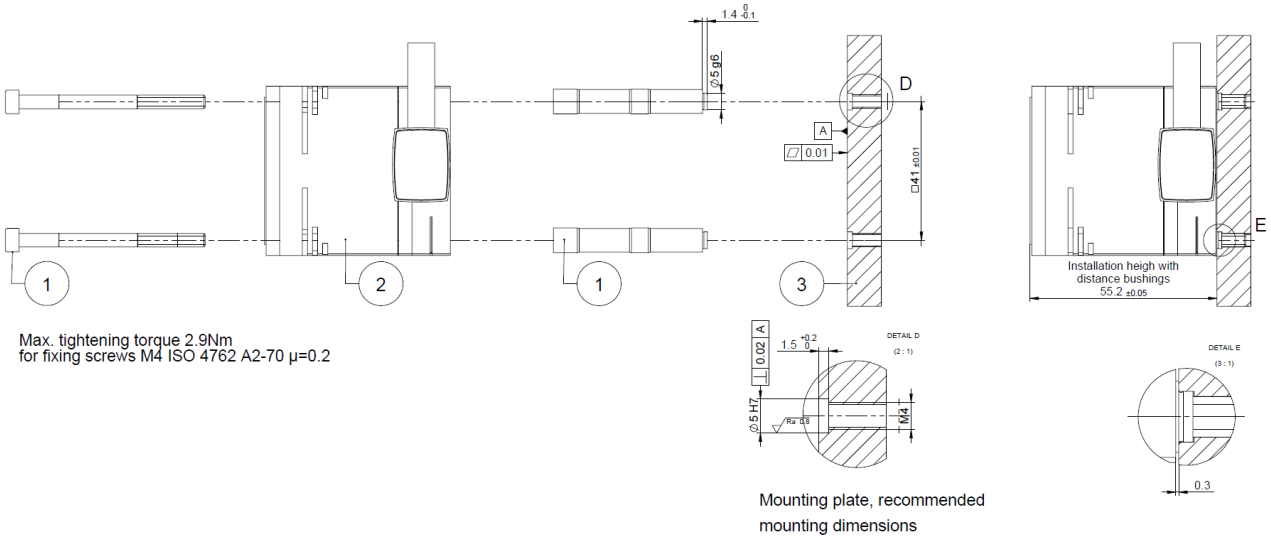
1.2.2 Centering rings

Centering rings for boreholes Ø6H7x1 in
Pitch circle diameter 30



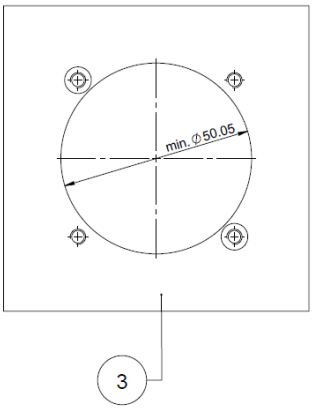
1.3 Installation options

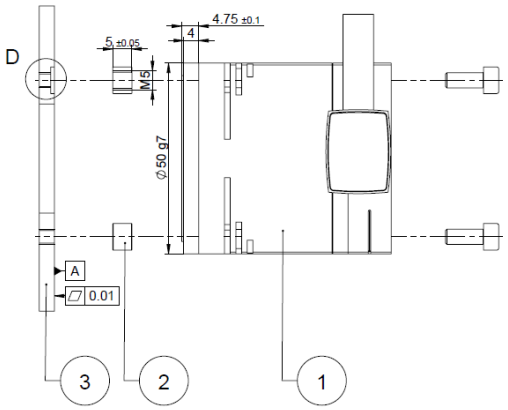
1.3.1 Installation rear side with distance sleeves

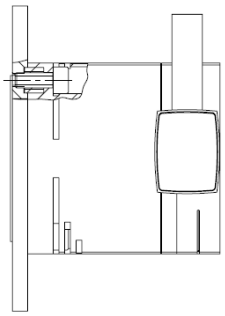


Pos.	QTY	Designation
1	4	Fixing screws with distance bushings ROTAX® Rxhq 50-12
2	1	ROTAX® Rxhq 50-12
3	1	Mounting plate, customer

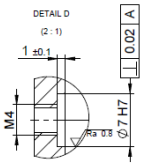
1.3.2 Installation flange side with centering ring







Max. tightening torque 2.9Nm
for fixing screws M4 ISO 4762 A2-70 µ=0.2



Mounting plate, recommended
mounting dimensions

Pos.	QTY	Designation
1	1	ROTAX® Rxhq 50-12
2	4	Centering ring D7x5 ROTAX®
3	1	Mounting plate, customer

2 Modular Sytem

2.1 Angle bracket to LINAX® Lxu F60

Mounting to LINAX® Lxu F60 base plate
Grid 40 x 40mm *(1.57" x 1.57")*

2 x Dowel pin Ø4 x 8
4 x Torx, M4 x 14

4 x Distance bushings with centering Rxhq 50-12
4 x Hexagon socket screws, M4 x 55

2.2 Angle bracket to LINAX® Lxc F10/F40

Mounting to LINAX® Lxc F10/F40 slider
Grid 33 x 28mm *(1.30" x 1.10")*

2 x Dowel pin Ø2.5 x 6
4 x Torx, M3 x 12

4 x Distance bushings with centering Rxhq 50-12
4 x Hexagon socket screws, M4 x 55

2.3 Angle bracket to ELAX® Ex F20

Mounting to ELAX® Ex F20 slider
Grid 20 x 25mm *(0.79" x 0.98")*

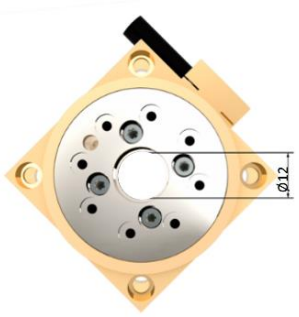
2 x Centering ring Ø6
4 x Torx, M3 x 12

4 x Distance bushings with centering Rxhq 50-12
4 x Hexagon socket screws, M4 x 55

3 Smart Praxis Oriented Details

3.1 Hollow shaft diameter

The large hollow shaft with a diameter of 12mm *(0.47")* offers generous space for cables, vacuum or compressed air lines, light and laser beams, glass fibres and other media.



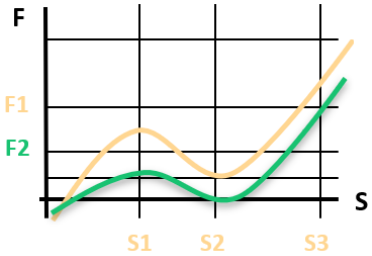
3.2 Single-Turn Absolut Encoder

Thanks to the integrated absolute encoder with a resolution of 120,000inc. per revolution, repeatability of ± 11arcsec can be achieved.

Due to the absolute position, the ROTAX® Rxhq is immediately ready for operation after power-on, no reference drive is necessary.

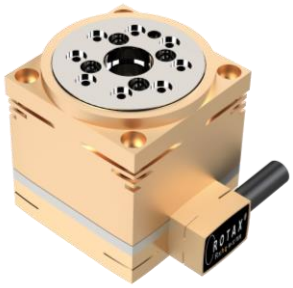
3.3 Record and Limit Forces

The patented function „Force Calibration“ is able to compensate the magnetic cogging forces, the load and the friction forces of the Rotax® direct drive in a very simple way. This is how it becomes possible to control, to limit and to monitor forces in process. Together with the XENAX® servo controller it is also possible to record complete force/way diagrams. No need for an additional force sensor.



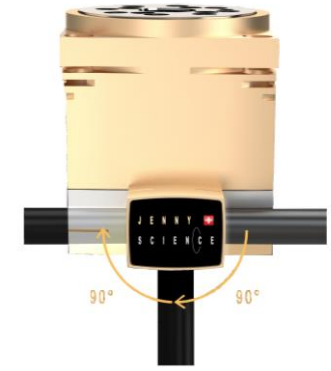
3.4 One-Cable connection reduces cabling requirements

The one-cable connection from Jenny Science simplifies the whole machine cabling complexity. In addition, the cable chains are more compact and lighter, need less room and achieve higher dynamics.



3.5 Cabel connection 90° pattern

The cable connection can be selected to the right, left and downwards. The corresponding article number must be specified when ordering. The cable outlet cannot be turned by yourself.



4 Performance data

4.1 Techniscal specification

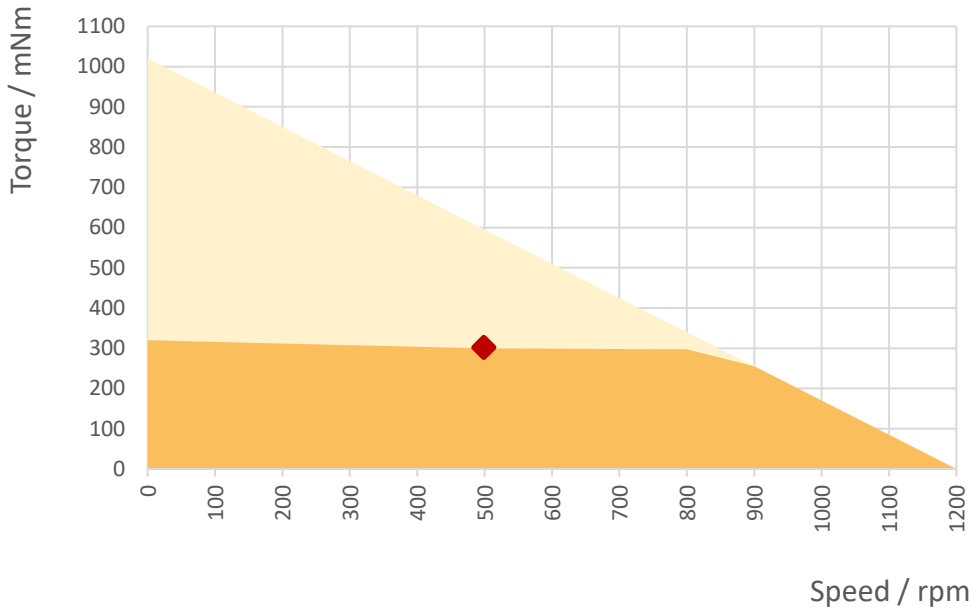
Supply voltage				24V DC	48V DC
Max speed	n_0	rpm		1’200	2’400
Nominal speed (1)	n_N	rpm		500	1’500
Stall torque	M_0	Nm	(lbf·in)	0.32 (2.83)	0.32 (2.83)
Nominal torque (1)	M_N	Nm	(lbf·in)	0.30 (2.66)	0.29 (2.57)
Peak torque (2)	M_P	Nm	(lbf·in)	1.02 (9.03)	1.02 (9.03)
Nominal current (1)	I_N	A		2.30	2.28
Peak current (2)	I_P	A		7.85	7.85
Mechanical Data					
Max. axial load (3)		N	(lbf)	1750 (393.4)	
Max. moment load (3)		Nm	(lbf·in)	5 (44.25)	
Rotor moment of inertia	J_{Rot}	g·cm^2	(lbf·in^2)	400 (0.137)	
Total weight	m	g	(lbs)	440 (0.970)	

(1) continuous operation with 25C° *(77°F)* ambient temperature and convection cooling (ambient air)
(2) peak operation (duty 10%)
(3) maximum load only with prescribed mounting according to point 1.3

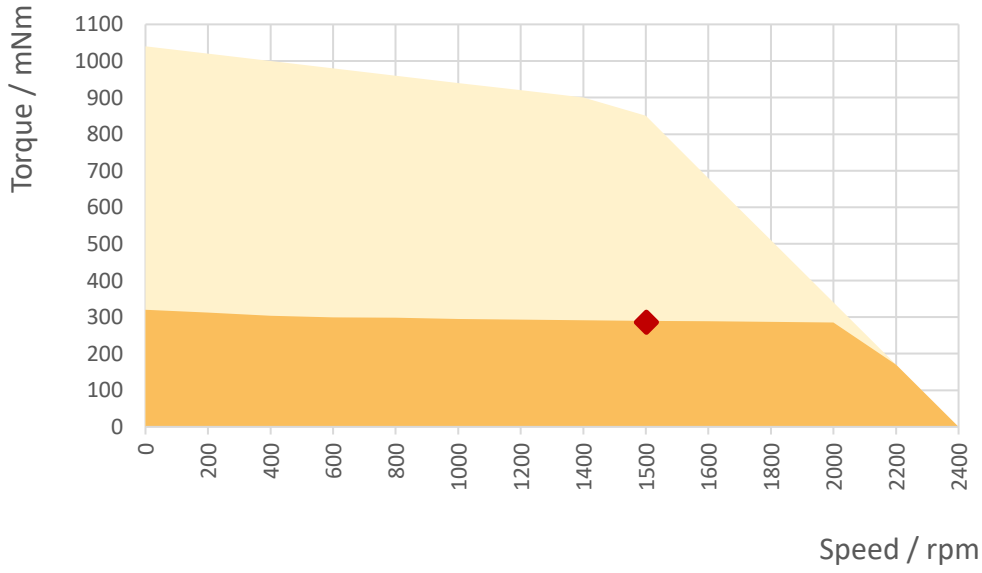
4.2 Torque/Speed curve

Nominal operation | Continous operation | Peak operation

Supply voltage U_S = 24VDC



Supply voltage U_S = 48VDC

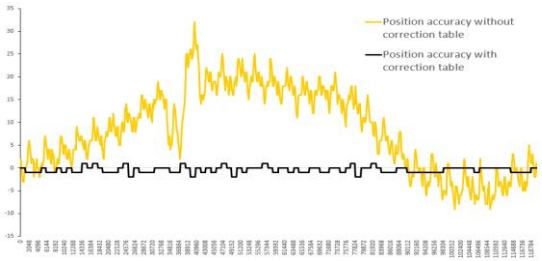


5 Accuracy

5.1 Positioning

Resolution polring	120`000 Inc. / revolution
Position accuracy absolute with correction table (1)	± 23.4 arcsec (± 3 Inc.)
Position accuracy absolute without correction table	± 378.0 arcsec (±35 Inc.)

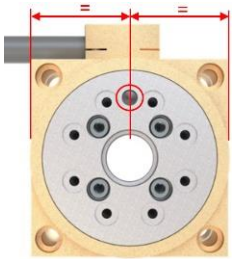
Position accuracy [Inc.]



(1) Correction table available if following conditions are given:
- XENAX® Xvi75V8s or Xvi48V8
- XENAX® FW-Version >= V4.16
- ROTAX® Serial number >= 50-12.2027.0234

Uni-directional repeatability	± 7 arcsec
Bi-directional repeatability	± 11 arcsec
Reference drive	With the single-turn absolute encoder the position is available immediately after power-on. Therefore no reference drive is necessary.

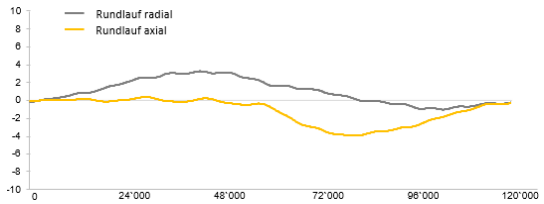
Zero point absolut



For the alignment of the rotor flange a single hole Ø4H7 is provided. With centric alignment of this hole on the side of the connector housing, the absolute zero point can be found.

5.2 Mechanical accuracy

Runout [µm]



Der ROTAX® Rxhq is delivered with the following tolerances as standard.

Runout radial	10µm
Runout axial(2)	10µm

(2) Measuring point 20mm radial from the centre of the front flange

6 Maintenance, Life time

6.1 Lubrication

The double row angular contact ball bearing of the ROTAX® Rxhq is maintenance-free and cannot be relubricated.

6.2 Life time

The ROTAX® Rxhq is a direct drive. This means no wear and tear and therefore highest precision over the whole lifetime.

Basically, the preloaded double row angular contact ball bearing is the life-determining element.

Life time calculation

SWISS MADE

ROTAX® Rxhq 50

$$L_{10h} = \frac{\left(\frac{C}{P}\right)^{p} * 10^{6}}{60 * n}$$

L_{10h}	nominal life time
C	dynamic load rating
P	dynamic equivalent bearing load
p	Life time exponent: Ball bearing p=3
n	Speed of the bearing

Beispielrechnung:

C=	6350[N] *(1428lbf)*
P=	50[N] *(11.2lbf)*
n_{24V}=	500[rpm]
n_{48V}=	1500[rpm]

U_s = 24V:

$$L_{10h} = \frac{\left(\frac{6350}{50}\right)^{3} * 10^{6}}{60 * 500} = \underline{68 * 10^{6}h}$$

U_s = 48V:

$$L_{10h} = \frac{\left(\frac{6350}{50}\right)^{3} * 10^{6}}{60 * 1500} = \underline{\underline{22 * 10^{6}h}}$$

Actions with which life time can be extended:

- Trajectories with curve profiles instead of trapezoidal profiles (XENAX® Servo controller, default value S-curve profile = 20%).
- Dynamics not higher than needed.
- Completing non cycle time critical motions slower.
- Avoid pollution in the guides.

7 Safety, Environment

7.1 Safety with XENAX® Servo Controller

EN 61000-6-2:2005 Electromagnetic compatibility (EMC), Immunity for industrial environments	EMC Immunity Testing, Industrial Class A
EN 61326-3-1	Immunity for Functional Safety
IFA:2012	Functional safety of power drive systems
EN 61326-1, EN 61800-3, EN 50370-1	Electrostatic discharges ESD, Electromagnetic Fields, Fast electric transients Bursts, radio frequency common mode
EN 61000-6-3:2001 Electromagnetic compatibility (EMC), Emission standard for residential, commercial and light-industrial environments	EMC Emissions Testing, Residential Class B
EN 61326-1, EN61800-3, EN50370-1	Radiated EM Field, Interference voltage
IFA:2012	Functional safety of power drive systems

7.1 Environmental Conditions

Storage and transport	No outdoor storage. Storage rooms have to be well vented and dry. Storage temperature -25°C up to +55°C *(-13°F up to 131°F)*.
Operational temperature	5°C - 50°C *(41°F - 122°F)* Environment, reduction in performance at 40°C *(104°F)*.
Operational humidity	10-90% non-condensing.
Cooling	No need of external cooling. The mechanical mounting to a flange allows additional heat dissipation thanks to thermal conduction. This allows a higher performance.
Protection category	IP 40

8 Note

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Information in this instruction manual is subject to Modifications.

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