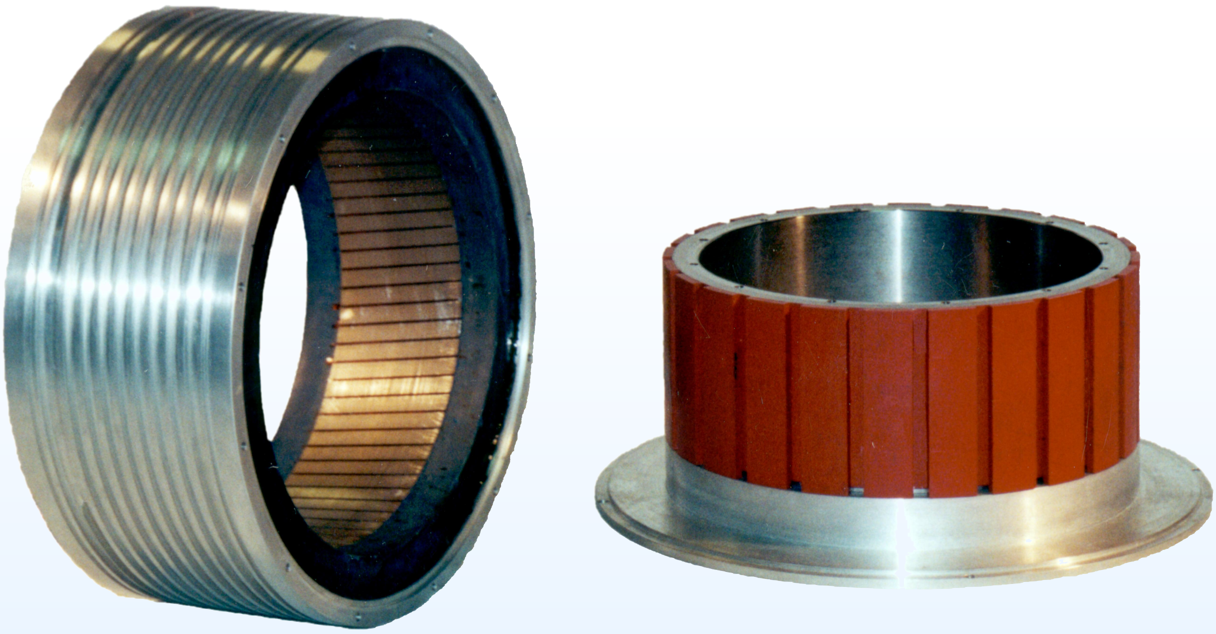
# FRAMELESS BRUSHLESS MOTORS FOR DIRECT DRIVE

# ALXION STK



**ALXION**

**AUTOMATIQUE**
**& PRODUCTIQUE**

# INDEX

# STK RANGE OF FRAMELESS BRUSHLESS SERVOMOTORS FOR DIRECT DRIVE

Since the early 90's, **ALXION** is well known to be an uncontested specialist of Direct Drive motors with its FC motors range. This built-in range of motors "ready to use" is the ideal solution for printing machines, bending machines, or machine tools, which require an excellent regularity of rotation especially at very low speed and a very high accuracy with a hollow shaft available up to 70 mm.

With the STK range, **ALXION** addresses direct drive applications that could not be satisfied with the FC range:

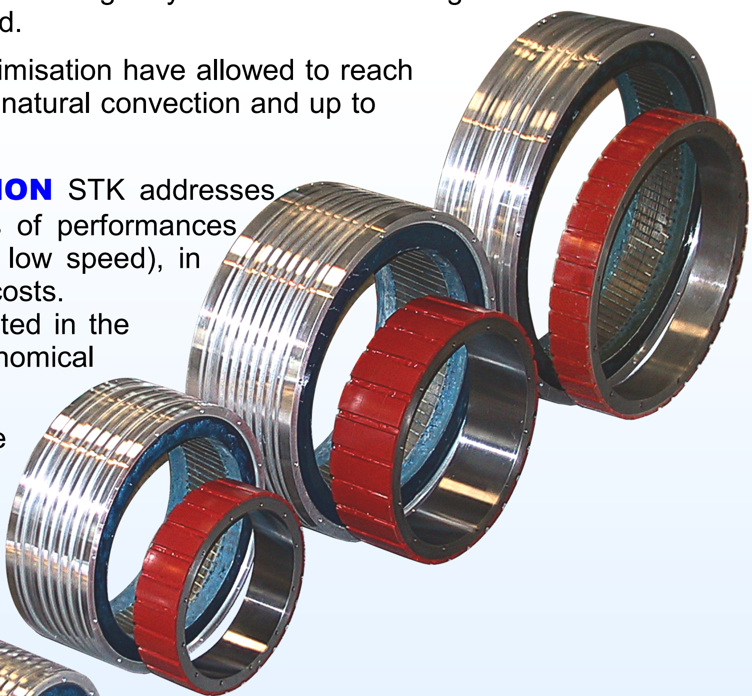
- The applications needing a full integration of the motor in the servomechanisms due to volume and weight criteria ;
- The applications needing a high diameter crossing hollow shaft demanding a ring type technology.

## MAIN CHARACTERISTICS:

- Continuous torque from 14.6 Nm up to 2708 Nm in natural convection and up to 6100Nm in fluid cooling depending on the size.
- Six external diameters from 145 mm up to 800 mm.
- Internal diameter from 56 mm up to 630 mm.
- Various available windings from 30 rpm up to 1500 rpm depending on the size.

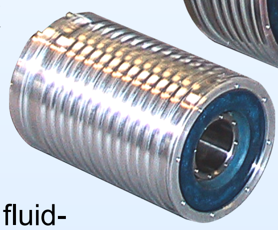
The range of permanent magnets brushless motors **ALXION** STK has been specially designed for the direct drive of axis without gears needing very low volume and weight regarding the torques and powers to be developed.

Therefore, both electromagnetic and thermal optimisation have allowed to reach continuous torque-to-weight up to 15 Nm / Kg in natural convection and up to 30 Nm / Kg in fluid cooling.



However, the range of frameless motors **ALXION** STK addresses very demanding industrial applications in terms of performances (dynamics, compacity, accuracy in regularity at low speed), in reliability but also in terms of costs.
A particular attention has therefore been dedicated in the design so that a mixed technical and economical optimisation could be achieved.

On another hand, the industrial users can be sometimes unsatisfied by direct drive motors because they are generally torque motors getting therefore a reduced power and speed. **ALXION** got the ambition to answer that objection with the STK range by creating motors that could satisfy the low speed applications with their related speed regularity and also to address the direct drive applications up to 30 KW in natural convection and 100 KW in fluid-cooling with speed reaching up to 1500 rpm, depending on the size.



The various speeds can be reached thanks to several windings versions. Some of them are illustrated in that catalogue but numerous winding versions allowing to optimise the drive current rating can be easily achieved.

| |
|---|
| For all detailed specifications related to integration and environment, please ask for our « handbooks for integration » |

## MOTOR CONSTITUTION

**ARMATURE**: It is consistent of iron laminations bearing the windings and fixed to the external housing. The windings are encapsulated in resin. Housing is either smooth either grinded for bearing the engravement of the cooling circuit when it is requested.

- Winding in H class.
- Output cable class 6 with 4 shielded wires for the power.
- Thermal protection by PTC resistor and linear resistor KTY84 embedded in the winding. Output cable class 6 with 2 shielded pairs.

**ROTOR**: Rare earth magnets protected against corrosion are stuck around a magnetic iron ring.

## STATOR AND ROTOR MOUNTING

Optionally STK armatures and rotors can be shipped mounted on a centering and positioning flange for avoiding the user to make the operation of mounting and centering the rotor inside the stator.

## OPERATION IN NATURAL CONVECTION

The armature is the source of both current losses and hysteretic and eddy current losses. It will be necessary to take it into account for integrating the motor. Here are the main elements to be taken in consideration:

- Permanent torques of the motors are indicated for a copper temperature rise of 120°C for armatures in contact with ambient air or integral on all their peripheral area with a metallic part in contact with ambient air. In addition, the motor housing has to be fixed on a metallic flange with an area equal to at least twice its section.
  For example, for a 400 mm diameter motor, the flange will have an area equal to: $2 \cdot \frac{\pi \cdot 0.4^2}{4}$ *i.e. 0.25m²*

- Avoid any enclosed environment or if it is necessary consult us for knowing the motor derating.

- Be sure that the materials located in the motor vicinity can bear high temperatures or if it is not the case consult us for knowing the motor derating.

## FLUID COOLING

For avoiding to be dependent from environment problems related to overheating or in the case when continuous torques higher than those got in natural convection are needed, a fluid cooling will be used.

Two operating points are characterised in fluid cooling:

- Winding at 60°C.

- Maximum cooling (winding at 140°C) for getting the maximum continuous torque of the motor.

Use glycoled softened water or a fluid approved for closed cooling circuit in order to minimise the risks of corrosion and deposits.

The housing engravement is consistent of 2 extremity grooves for O - ring, then two circular grooves allowing the input and the output of the fluid separated by the cooling circuit.

When mounting the device, the input and output pipes will be axially aligned at the opposite of the input and the output of the cooling circuit.

## DRIVES AND ASSOCIATED POSITION SENSORS

The frameless motors **ALXION** STK have been designed for minimising the torque harmonics when they are fed by sinusoidal wave drives for brushless motors.

The STK motors are therefore compatible with a wide spectrum of brushless drives available on the market and namely with the ranges of single axis digital drives MOOG, DBS and DS 2000 and multiaxis DBM, SIEMENS 611D with AN power supply, NUM Schneider MDLU, Parker COMPAX, GE FANUC, CONTROL-TECHNIQUES UNIDRIVE, B & R, DANAHER Servostar 600, ...

However, in the aim of maximising the servo performances, we do recommend to use drives including the following features:

· Digital current loop with programmable gains or self adaptative gains.

· Built-in anti-resonant programmable filters on the speed error in order to maintain high servo gains in the case when the load inertia is very high related to the rotor inertia.

· Various positioning sensor interfaces: the drives can be compatible with 4 kinds of positioning interfaces:

- Resolver:

  The resolvers are in the best cases (**ALXION** resolver RES FC6 72 32) limited to an accuracy of 1 arc minute. In most of the resolvers available on the market, accuracy is rather around several minutes.

  It will be necessary to check whether the desired positioning accuracy is compatible with the resolver accuracy and also the electronic resolver-to-digital circuit.

  On another hand, the resolvers limit the applications due to the crossing hollow shaft. The resolvers **ALXION** RES FC6 72 32 allow a hollow shaft up to 90 mm.

  Finally, the resolvers allow to get a resolution up to several hundred thousands of points per revolution but such a high resolution is not useful because it is not compatible with the accuracy of the measurement system.

- TTL encoder or TTL optical scale:

  The TTL encoders have generally a limited number of cpr (from 500 up to 5000). One can find some encoders with hollow shaft up to 50 mm internal diameter and with a number of cpr between 15000 and 20000 (to be multiplied by 4).

  The best solution in terms of resolution and accuracy consists in the optical scales with pitches from 0.5 to 5 µ that can be stuck on a hollow hub with appropriate diameter. They can allow a resolution equal to 1 million cpr or much more according to the diameter.

  The associated read heads are characterised by a maximum frequency limiting so the speed for a given resolution.

- Sin / cos encoder or sin /cos scales:

  These encoders or scales are the most widely used.

  The same limitations as previously mentioned exist on these devices. However, the advantage of this technology consists in the possibility to multiply the sine wave signals of these encoders thanks to appropriate drive interfaces. Thus, an encoder with 1024 sine waves per resolution will allow with multiplication per 1000 to get one million cpr. The sin / cos optical scale gets the advantage to allow both high resolution either naturally either by internal drive interpolation and a crossing hollow shaft without any limitation thanks to its sticking on an appropriate diameter hub. Some encoder suppliers integrate in their catalogue optical scales mounted on hubs with various diameters. Some bearing manufacturers integrate sine wave measuring scales in the bearings.

- Absolute encoders:

  The absolute encoders allow to get the characteristics described for the TTL or Sin-Cos encoders without the need of starting sequence for phase commutation (see following paragraph). They do not need a homing phase for the axis origin.

## PHASES COMMUTATION

The permanent magnets synchronous motors need a constant phase between the armature and the rotor rotating fields in order to control the torque. The resolver allows this phasing and gives simultaneously the axis position (on one polar pitch). The absolute encoders allow also that phasing. It is not the case with incremental encoders or scales.

The encoder suppliers have therefore specific ranges for brushless motors including either:

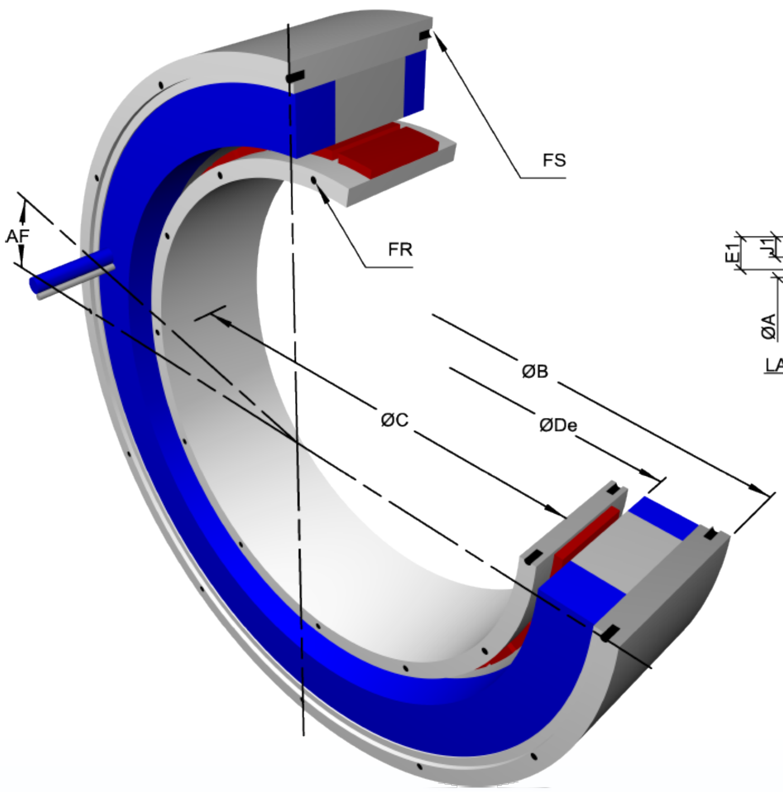
a) Three phase commutation rectangular signals $U, V, W, \overline{U}, \overline{V}, \overline{W}$ in the case of TTL encoders ; but these waveforms should have the same number of periods per revolution than the motor (polarity).

b) Sine waves signals (1 period per revolution) sine and cosine giving the absolute position on a revolution in the case of sin / cos encoders. The drive electronic interface multiplies that frequency by the number of the motor pole pairs.

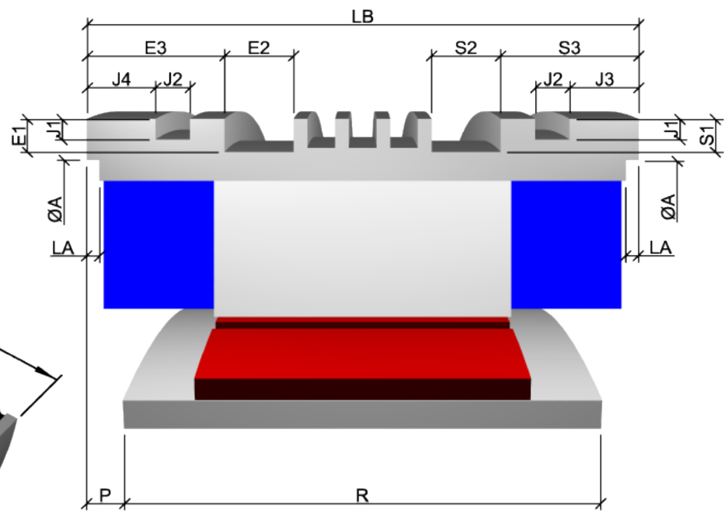
In the case of optical scales mounted on hubs, the information related to the phasing between the armature and the rotor fields is not known. Therefore an initialisation sequence is needed during start-up ; during that sequence the rotor will operate an indexing motion or at least a microvibration.

# MOTORS 145 STK

*Natural convection*




*Fluid cooling*




| DIMENSIONS FOR ALL 145 STK | | |
|---|---|---|
| Housing internal centering diameter | A H8 | 130 |
| Angle wire output / tapped holes | AF | 22°30' |
| Housing external centering diameter (fluid cooling) | B f8 | 153 |
| Housing external centering diameter (natural convection) | B f8 | 145 |
| Rotoric internal centering diameter | C H7 | 56 |
| Housing internal diameter | De | 78.5 |
| Depth of fluid front input / output groove | E1 | 4 |
| Width of fluid front input / output groove | E2 | 13.35 |
| Position of fluid front I/O groove | E3 | 16.3 |
| Rotoric fixation holes | FR | 8xM5 sur Ø63 |
| Housing fixation holes | FS | 8xM5 sur Ø136 |
| O-ring groove depth | J1 | 2.3 |
| O-ring groove width | J2 | 4 |
| Position of rear o-ring groove | J3 | 3 |
| Position of front o-ring groove | J4 | 10.8 |
| Depth of housing internal centering diameter | LA | 2 |
| Alignment rotor / housing | P ± 0.1 | 20.5 |
| Maximum rotoric contact diameter | Pmax | 75 |
| Depth of fluid rear I/O groove | S1 | 4 |
| Width of fluid rear I/O groove | S2 | 13.35 |
| Position of fluid rear I/O groove | S3 | 8.5 |

| DIMENSIONS ACCORDING TO SIZE | | 145STK1M | 145STK2M | 145STK3M | 145STK4M | 145STK5M | 145STK6M | 145STK7M | 145STK8M |
|---|---|---|---|---|---|---|---|---|---|
| Housing length | LB±0.15 | 92 | 119 | 146 | 173 | 200 | 227 | 254 | 281 |
| Rotor length | R +0.15 | 59 | 86 | 113 | 140 | 167 | 194 | 221 | 248 |

**INTEGRATION:**

- ✓ The cables are made of PU, class 6, foreseen for cable-bearing chains, 2 mt standard length, copper square section according rated current.
- ✓ Rotor / housing alignment (P) has to be executed within +/- 0.1 mm. Optionally, we can supply a mounting tool for achieving that alignment in case of assembly without possibility of accurate alignment.
- ✓ Thermal devices cable consists of 2 shielded pairs 2x2x0.25mm² section, 7 mm max external diameter.
- ✓ (De) represents: 1- The maximum diameter passing inside the housing.
  2- The minimum diameter necessary for rotor assembly.
- ✓ (Pmax) diameter for pieces in contact with the rotor must never be exceeded.
- ✓ Tapped holes on each side of rotor and housing are angularly aligned.
- ✓ Cable positioning (AF) is theoretical. Leave a free room with a +/- 10 arc degrees tolerance around that position, on a 50 mm height from the housing side, for avoiding to stress the cables at the motor output.
  Do not tighten, twist or bend the power cable on the first 50 mm from motor side. Clamp the cable after those 50 mm.
- ✓ When designing the assembly, take care to insure a perfect contact between housing and user's bore for avoiding thermal problems.
- ✓ For housing mounting, use either external centering diameter (B) or internal centering diameters (A).
- ✓ For execution tolerances (perpendicularity, concentricity...), please consult us.
- ✓ Fluid input and output pipes have to be placed at the opposite of wire outputs on the same axial plane.
- ✓ O-ring grooves designed for 3 mm diameter o-rings.

A full integration handbook can be supplied to our customers upon request
For further information or specific request about our motors, feel free to contact us.

# TECHNICAL CHARACTERISTICS

## Windings for 400V / 460Vac drives (See Application note)

NATURAL CONVECTION

| | | | 145STK1M | | 145STK2M | | 145STK3M | | 145STK4M | | 145STK6M | | 145STK8M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated speed | | rpm | 500 | 1500 | 500 | 1500 | 500 | 1500 | 500 | 1500 | 500 | 1500 | 500 | 1500 |
| Continuous torque at stall | (1)(4) | N.m | 8 | | 14.6 | | 20.5 | | 26.4 | | 37.3 | | 47.4 | |
| Current at continuous torque | (1) | A | 1.6 | 2.9 | 2.3 | 5.2 | 2.9 | 6.7 | 3.7 | 9.2 | 5 | 12.7 | 6.4 | 15.7 |
| Peak torque | (2)(3) | N.m | 27.5 | | 55 | | 83 | | 110 | | 165 | | 220 | |
| Current at peak torque | (2) | A | 6.9 | 11.1 | 10.2 | 23.1 | 14.9 | 34.2 | 17.8 | 45.5 | 27.3 | 68.3 | 35.6 | 91.1 |
| Rated power | (1) | W | 390 | 866 | 710 | 1850 | 992 | 2504 | 1260 | 3080 | 1770 | 3830 | 2230 | 4580 |
| Inertia | | $10^{-3}$kg.m$^2$ | 0.80 | | 1.28 | | 1.76 | | 2.24 | | 3.19 | | 4.14 | |
| Weight | | kg | 4.1 | | 6.2 | | 8.5 | | 10.4 | | 14.5 | | 18.7 | |
| Thermal time constant | (1) | s | 850 | | 1012 | | 1206 | | 1399 | | 1667 | | 1866 | |
| Thermal resistance | (1) | °C / W | 0.447 | | 0.394 | | 0.36 | | 0.324 | | 0.275 | | 0.239 | |
| Phase resistance at 20°C | (2) | Ω | 21.6 | 7.9 | 12.9 | 2.55 | 7.52 | 1.43 | 6.2 | 0.95 | 3.46 | 0.55 | 2.51 | 0.38 |
| Phase inductance at I continuous | | mH | 72 | 25.8 | 66.7 | 12.4 | 47.8 | 9.1 | 44.5 | 6.8 | 28.2 | 4.5 | 22.2 | 3.4 |
| Electrical time constant | (2) | ms | 3.4 | | 5.1 | | 6.4 | | 7.2 | | 8.2 | | 8.9 | |
| Back emf constant (line to line) | (2) | V/rad.s | 3.13 | 1.86 | 4.25 | 1.91 | 4.38 | 1.91 | 4.88 | 1.91 | 4.78 | 1.91 | 4.88 | 1.91 |
| Power cable square section | | nxmm$^2$ | 4x1.5 | | 4x1.5 | | 4x1.5 | | 4x1.5 | | 4x1.5 | | 4x1.5 | |
| Power cable diameter | | mm | Ø8.6 | | Ø8.6 | | Ø8.6 | | Ø8.6 | | Ø8.6 | | Ø8.6 | |
| Number of poles | | | 12 | | | | | | | | | | | |

COMPLEMENTARY DATA FOR FLUID-COOLED MOTORS WINDING AT 60°C

| | | | 145STK1M | | 145STK2M | | 145STK3M | | 145STK4M | | 145STK6M | | 145STK8M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Continuous torque at stall | (4) | N.m | 11 | | 22.8 | | 33.8 | | 45.3 | | 67.6 | | 90 | |
| Current at continuous torque | | A | 2.4 | 4 | 3.5 | 8 | 5.2 | 12 | 6.3 | 15.6 | 9 | 22.8 | 12.1 | 29.8 |
| Fluid input temperature | (5)(6) | °C | 20 | | 20 | | 20 | | 20 | | 20 | | 20 | |
| Fluid temperature rise | | °C | 3 | | 5 | | 4 | | 5 | | 7 | | 8 | |
| Housing temperature | | °C | < 30 | | < 30 | | < 30 | | < 30 | | < 30 | | < 30 | |
| Fluid flow | | l / mn | 2 | | 3 | | 3 | | 3 | | 3 | | 3 | |
| Losses | | W | 490 | | 620 | | 780 | | 930 | | 1220 | | 1510 | |
| Pressure drop | | Bar | 0.1 | | 0.2 | | 0.2 | | 0.3 | | 0.4 | | 0.5 | |
| Power cable square section | | nxmm$^2$ | 4x1.5 | | 4x1.5 | | 4x1.5 | | 4x1.5 | | 4x1.5 | 4x4 | 4x1.5 | 4x4 |
| Power cable diameter | | mm | Ø8.6 | | Ø8.6 | | Ø8.6 | | Ø8.6 | | Ø8.6 | Ø12.2 | Ø8.6 | Ø12.2 |

COMPLEMENTARY DATA FOR FLUID-COOLED MOTORS WINDING AT 140°C

| | | | 145STK1M | | 145STK2M | | 145STK3M | | 145STK4M | | 145STK6M | | 145STK8M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Continuous torque at stall | (4) | N.m | 15 | | 29.9 | | 46 | | 59.8 | | 90 | | 120 | |
| Current at continuous torque | | A | 3.4 | 5.7 | 5.4 | 12.3 | 7.5 | 17.1 | 9.7 | 24 | 14 | 35.5 | 19 | 46.8 |
| Fluid input temperature | (5)(6) | °C | 20 | | 20 | | 20 | | 20 | | 20 | | 20 | |
| Fluid temperature rise | | °C | 5 | | 8 | | 8 | | 8 | | 10 | | 12 | |
| Housing temperature | | °C | < 30 | | 33 | | < 30 | | < 30 | | < 30 | | 31 | |
| Fluid flow | | l / mn | 4 | | 3 | | 4 | | 5 | | 5 | | 5 | |
| Losses | | W | 1187 | | 1532 | | 1855 | | 2240 | | 2950 | | 3660 | |
| Pressure drop | | Bar | 0.2 | | 0.2 | | 0.4 | | 0.7 | | 1 | | 1.3 | |
| Power cable square section | | nxmm$^2$ | 4x1.5 | | 4x1.5 | | 4x1.5 | 4x2.5 | 4x1.5 | 4x4 | 4x1.5 | 4x6 | 4x2.5 | 4x10 |
| Power cable diameter | | mm | Ø8.6 | | Ø8.6 | | Ø8.6 | Ø10.8 | Ø8.6 | Ø12.2 | Ø8.6 | Ø14 | Ø10.8 | Ø17.6 |

(1) Thermal conditions:
Ambient temperature 20°C
Winding temperature rise 120°C
Stator housing in contact with the ambient air or integral on all its peripheral area with a metallic armature in contact with the ambient air.
Stator housing secured on a metallic frame having an area equal to twice the cross section of the housing.

(2) Cold motor at 20°C

(3) See torque vs speed characteristics on :
http://www.alxion.com/

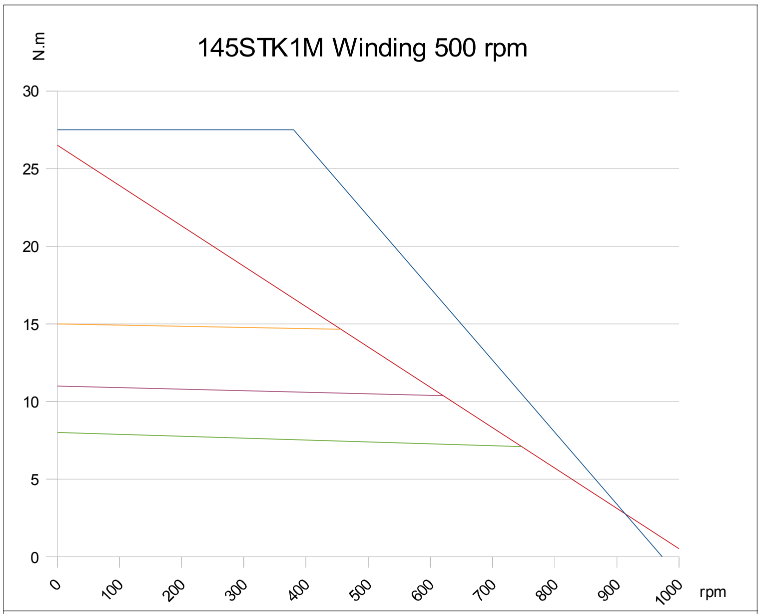
(4) Torque at stall or low speed.

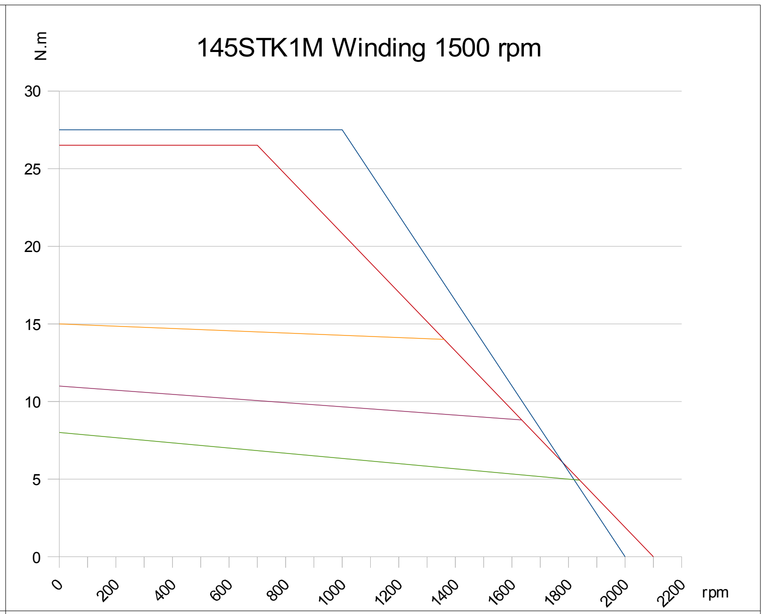
(5) Fluid input temperature should not be lower for avoiding condensation inside the motor.

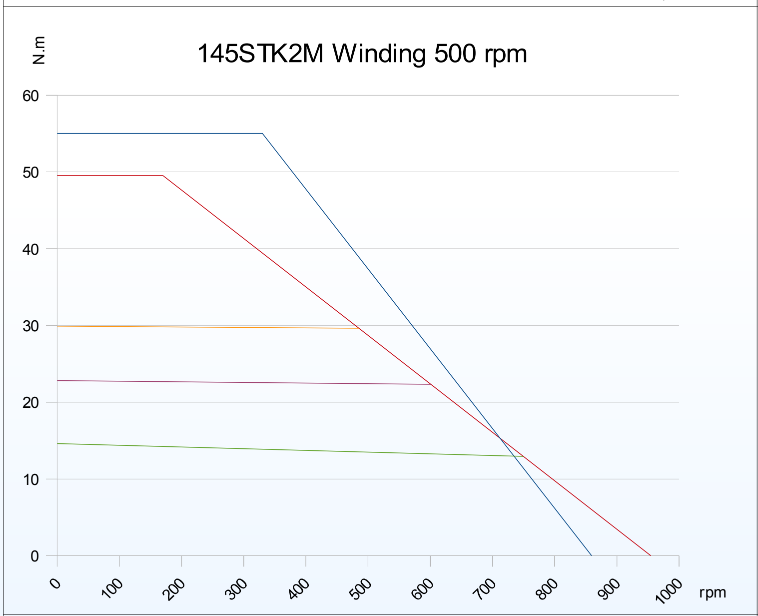
(6) For cooling fluid, use softened gycol-added water or fluids approved for closed cooling circuits.

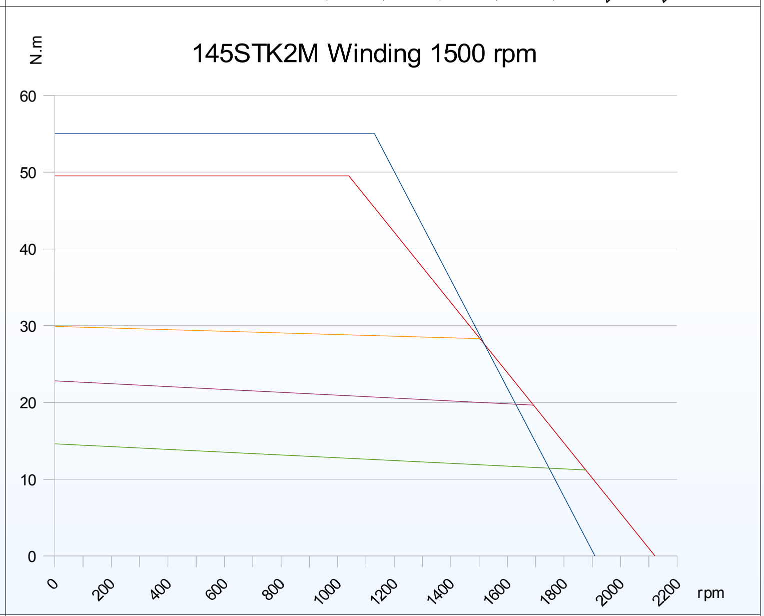
Other speed characteristics are available, please contact us.

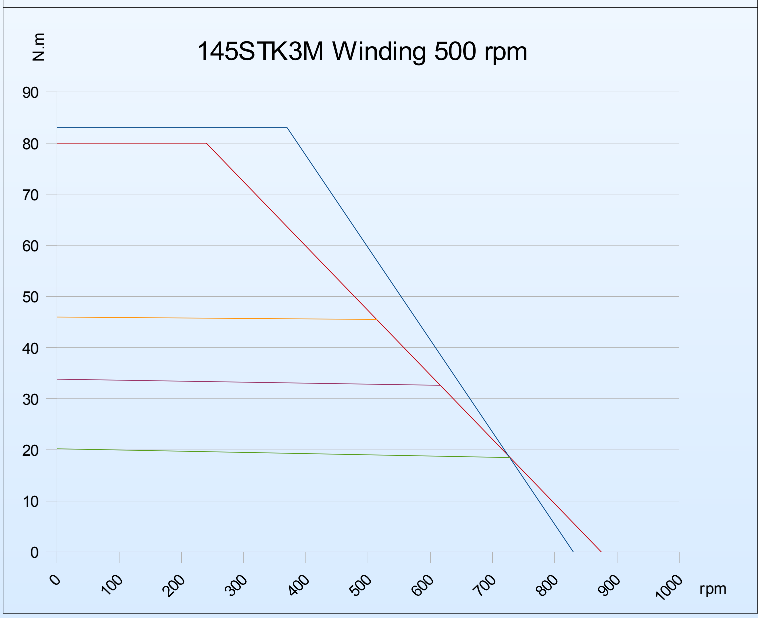
# TORQUE VS SPEED CURVES   MOTORS 145STK



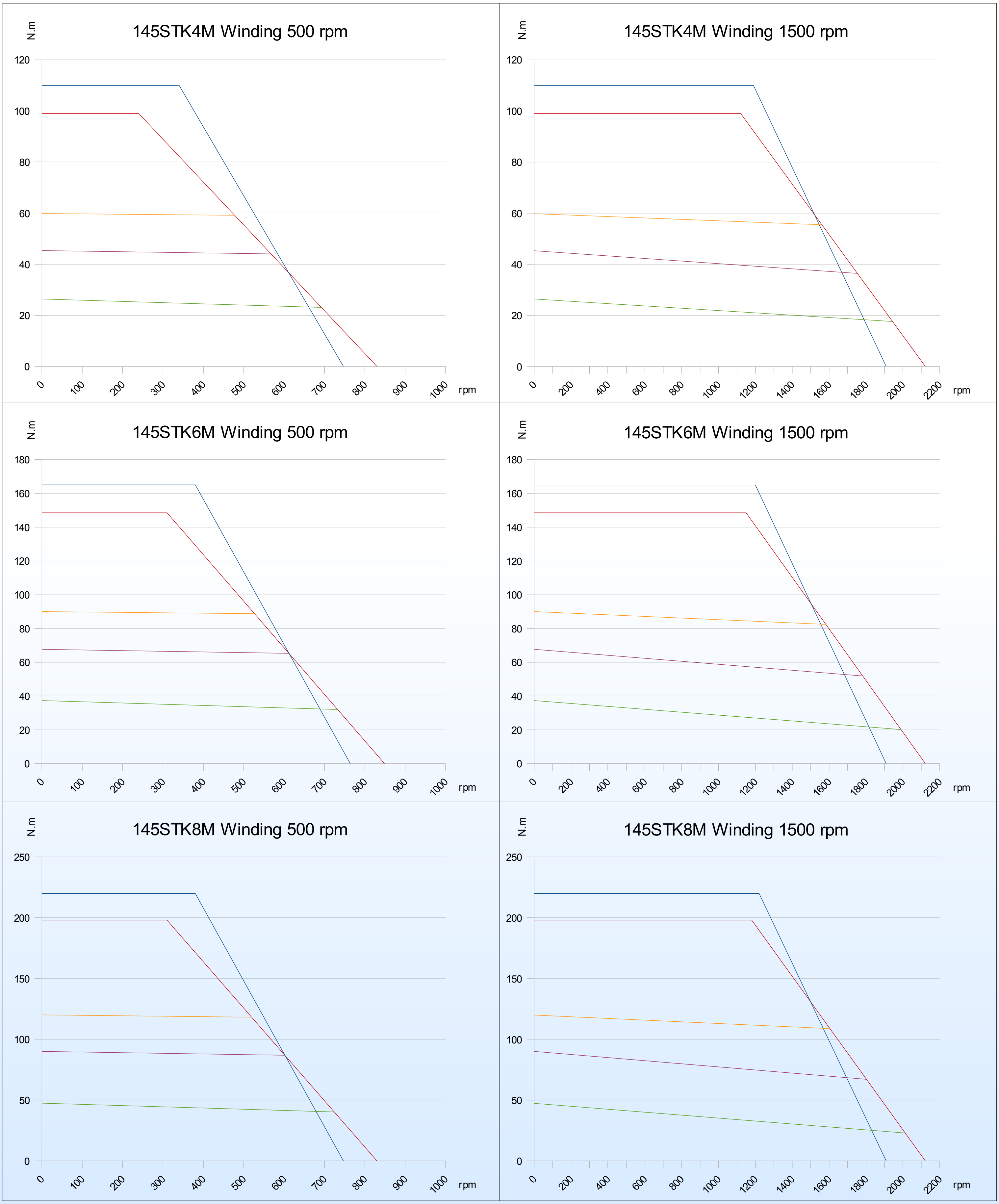





- Continuous torque with natural convection
- Continuous torque liquid cooled winding at 60°C
- Continuous torque liquid cooled winding at 140°C
- Max. transient characteristics motor at 20°C 400VAC mains / 540VDC bus with flux vector control
- Max. transient characteristics motor at rated temp 400VAC mains / 540VDC bus with flux vector control

Other windings can be supplied for matching your needs ; please contact us.

# TORQUE VS SPEED CURVES   MOTORS 145STK

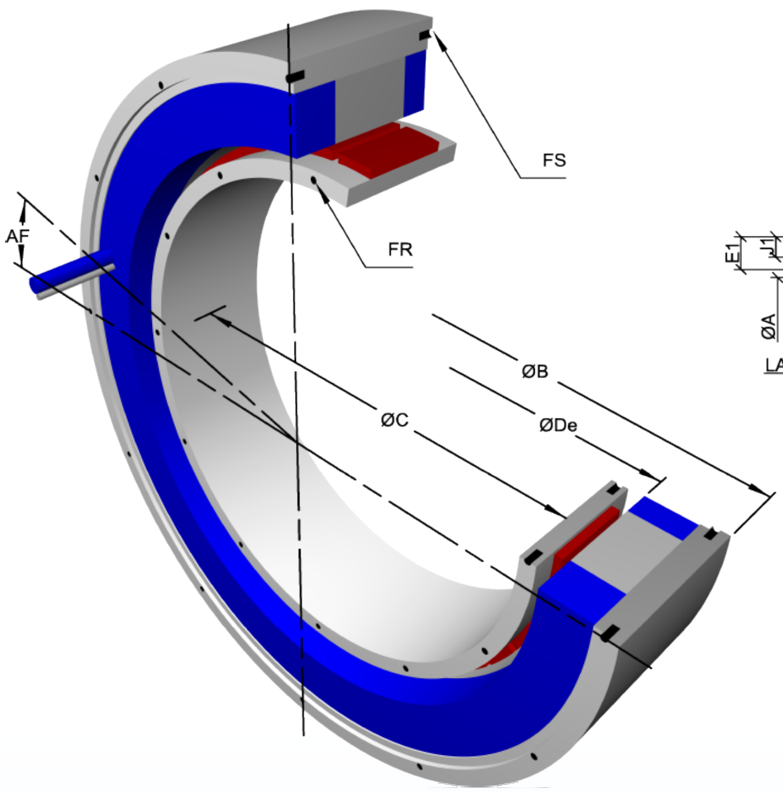



- Continuous torque with natural convection
- Continuous torque liquid cooled winding at 60°C
- Continuous torque liquid cooled winding at 140°C
- Max. transient characteristics motor at 20°C 400VAC mains / 540VDC bus with flux vector control
- Max. transient characteristics motor at rated temp 400VAC mains / 540VDC bus with flux vector control

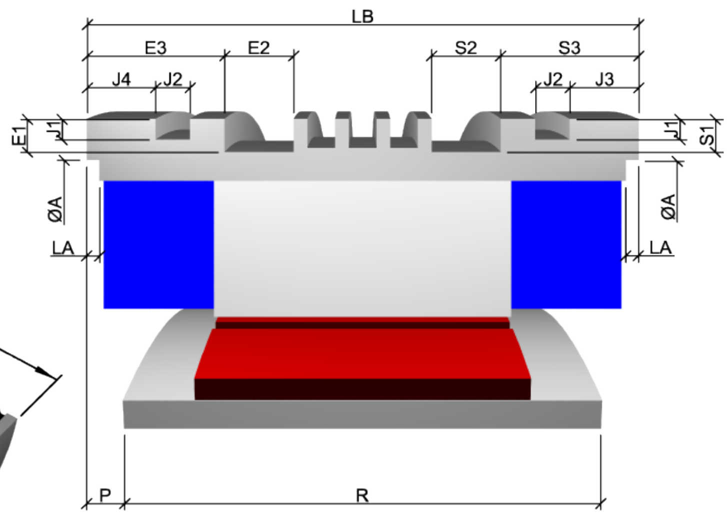
Other windings can be supplied for matching your needs ; please contact us.

# MOTORS 190 STK

## *Natural convection*




## *Fluid cooling*




| *DIMENSIONS FOR ALL 190 STK* | | |
|---|---|---|
| Housing internal centering diameter | A H8 | 172 |
| Angle wire output / tapped holes | AF | 22°30' |
| Housing external centering diameter (fluid cooling) | B f8 | 193 |
| Housing external centering diameter (natural convection) | B f8 | 190 |
| Rotoric internal centering diameter | C H7 | 72 |
| Housing internal diameter | De | 98 |
| Depth of fluid front input / output groove | E1 | 3 |
| Width of fluid front input / output groove | E2 | 11.7 |
| Position of fluid front I/O groove | E3 | 15.5 (45.5) |
| Rotoric fixation holes | FR | 8xM5 sur Ø80 |
| Housing fixation holes | FS | 8xM5 sur Ø180 |
| O-ring groove depth | J1 | 2.3 |
| O-ring groove width | J2 | 4 |
| Position of rear o-ring groove | J3 | 5 |
| Position of front o-ring groove | J4 | 10 (40) |
| Depth of housing internal centering diameter | LA | 2 |
| Alignment rotor / housing | P ± 0.1 | 23 (53) |
| Maximum rotoric contact diameter | Pmax | 94 |
| Depth of fluid rear I/O groove | S1 | 3 |
| Width of fluid rear I/O groove | S2 | 11.7 |
| Position of fluid rear I/O groove | S3 | 10.5 |

| *DIMENSIONS ACCORDING TO SIZE* | | 190STK1M | 190STK2M | 190STK3M | 190STK4M | 190STK5M | 190STK6M | 190STK7M | 190STK8M |
|---|---|---|---|---|---|---|---|---|---|
| Housing length | LB±0.15 | 103.75 (133.75) | 140 (175) | 176.25 (206.25) | 212.5 (242.5) | 248.75 (278.75) | 285 (315) | 321.25 (351.25) | 357.5 (387.5) |
| Rotor length | R +0.15 | 68.25 | 104.5 | 140.75 | 177 | 213.25 | 249.5 | 285.75 | 322 |

The dimensions in red in the table are valid in the case of a rated current greater than 53 A and class 6 shielded cable output

We also offer the possibility of not shielded output wires without need of stator length increase.

**INTEGRATION:**

- ✓ The cables are made of PU, class 6, foreseen for cable-bearing chains, 2 mt standard length, copper square section according rated current.
- ✓ Rotor / housing alignment (P) has to be executed within +/- 0.1 mm. Optionally, we can supply a mounting tool for achieving that alignment in case of assembly without possibility of accurate alignment.
- ✓ Thermal devices cable consists of 2 shielded pairs 2x2x0.25mm² section, 7 mm max external diameter.
- ✓ (De) represents: 1- The maximum diameter passing inside the housing.
  2- The minimum diameter necessary for rotor assembly.
- ✓ (Pmax) diameter for pieces in contact with the rotor must never be exceeded.
- ✓ Tapped holes on each side of rotor and housing are angularly aligned.
- ✓ Cable positioning (AF) is theoretical. Leave a free room with a +/- 10 arc degrees tolerance around that position, on a 50 mm height from the housing side, for avoiding to stress the cables at the motor output.
  Do not tighten, twist or bend the power cable on the first 50 mm from motor side. Clamp the power cable after those 50 mm.
- ✓ When designing the assembly, take care to insure a perfect contact between housing and user's bore for avoiding thermal problems.
- ✓ For housing mounting, use either external centering diameter (B) or internal centering diameters (A).
- ✓ For execution tolerances (perpendicularity, concentricity...), please consult us.
- ✓ Fluid input and output pipes have to be placed at the opposite of wire outputs on the same axial plane.
- ✓ O-ring grooves designed for 3 mm diameter o-rings.

A full integration handbook can be supplied to our customers upon request
For further information or specific request about our motors, feel free to contact us.

# TECHNICAL CHARACTERISTICS

## Windings for 400V / 460Vac drives (See Application note)

**NATURAL CONVECTION**

| | | | 190STK1M | | 190STK2M | | 190STK3M | | 190STK4M | | 190STK6M | | 190STK8M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated speed | | rpm | 500 | 1500 | 500 | 1500 | 500 | 1500 | 500 | 1500 | 500 | 1000 | 500 | 1000 |
| Continuous torque at stall | (1)(4) | N.m | 19 | | 36 | | 49 | | 63 | | 89 | | 111 | |
| Current at continuous torque | (1) | A | 3 | 6.5 | 4.5 | 11.7 | 5.9 | 13.2 | 7.1 | 19.3 | 11.1 | 20 | 13.3 | 23.3 |
| Peak torque | (2)(3) | N.m | 62 | | 124 | | 186 | | 248 | | 372 | | 496 | |
| Current at peak torque | (2) | A | 11.8 | 25.6 | 18.6 | 48.9 | 27 | 60.3 | 34.2 | 93.2 | 56.9 | 102.5 | 73.2 | 128.1 |
| Rated power | (1) | W | 910 | 2560 | 1730 | 4230 | 2360 | 5259 | 3024 | 6590 | 4250 | 7085 | 5250 | 8530 |
| Inertia | | $10^{-3}$kg.m² | 2.4 | | 4.12 | | 5.8 | | 7.5 | | 10.88 | | 14.26 | |
| Weight | | kg | 8.5 | | 13 | | 17.5 | | 22 | | 31 | | 40 | |
| Thermal time constant | (1) | s | 1200 | | 1506 | | 1850 | | 2129 | | 2559 | | 2865 | |
| Thermal resistance | (1) | °C / W | 0.28 | | 0.25 | | 0.23 | | 0.2 | | 0.17 | | 0.15 | |
| Phase resistance at 20°C | (2) | Ω | 9.45 | 2 | 4.76 | 0.69 | 2.76 | 0.56 | 2.12 | 0.28 | 1.02 | 0.31 | 0.77 | 0.25 |
| Phase inductance at I continuous | | mH | 55.2 | 11.8 | 48.2 | 7 | 31.7 | 6.4 | 28.8 | 3.9 | 15.7 | 4.8 | 12.7 | 4.1 |
| Electrical time constant | (2) | ms | 5.9 | | 10.1 | | 11.5 | | 13.6 | | 15.6 | | 16.5 | |
| Back emf constant (line to line) | (2) | V/rad.s | 4.06 | 1.87 | 5.13 | 1.96 | 5.32 | 2.38 | 5.6 | 2.05 | 5.04 | 2.8 | 5.22 | 2.99 |
| Power cable square section | (7) | nxmm² | 4x1.5 | | 4x1.5 | | 4x1.5 | | 4x1.5 | 4x2.5 | 4x1.5 | 4x2.5 | 4x1.5 | 4x4 |
| Power cable diameter | (7) | mm | Ø8.6 | | Ø8.6 | | Ø8.6 | | Ø8.6 | Ø10.8 | Ø8.6 | Ø10.8 | Ø8.6 | Ø12.2 |
| Number of poles | | | 12 | | | | | | | | | | | |

**COMPLEMENTARY DATA FOR FLUID-COOLED MOTORS WINDING AT 60°C**

| | | | 190STK1M | | 190STK2M | | 190STK3M | | 190STK4M | | 190STK6M | | 190STK8M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Continuous torque at stall | (4) | N.m | 26.6 | | 57 | | 84 | | 109 | | 162 | | 209 | |
| Current at continuous torque | | A | 4.3 | 9.4 | 7.5 | 19.6 | 10.4 | 23.2 | 13 | 35.5 | 21.3 | 38.4 | 26.6 | 46.2 |
| Fluid input temperature | (5)(6) | °C | 20 | | 20 | | 20 | | 20 | | 20 | | 20 | |
| Fluid temperature rise | | °C | 5 | | 6 | | 7 | | 7 | | 8 | | 10 | |
| Housing temperature | | °C | < 30 | | < 30 | | < 30 | | < 30 | | < 30 | | < 30 | |
| Fluid flow | | l / mn | 2 | | 3 | | 3 | | 4 | | 4 | | 4 | |
| Losses | | W | 650 | | 995 | | 1110 | | 1330 | | 1710 | | 1980 | |
| Pressure drop | | Bar | < 0.1 | | 0.12 | | 0.12 | | 0.3 | | 0.5 | | 0.6 | |
| Power cable square section | (7) | nxmm² | 4x1.5 | | 4x1.5 | 4x2.5 | 4x1.5 | 4x4 | 4x1.5 | 4x6 | 4x2.5 | 4x10 | 4x4 | 4x10 |
| Power cable diameter | (7) | mm | Ø8.6 | | Ø8.6 | Ø10.8 | Ø8.6 | Ø12.2 | Ø8.6 | Ø14 | Ø10.8 | Ø17.6 | Ø12.2 | Ø17.6 |

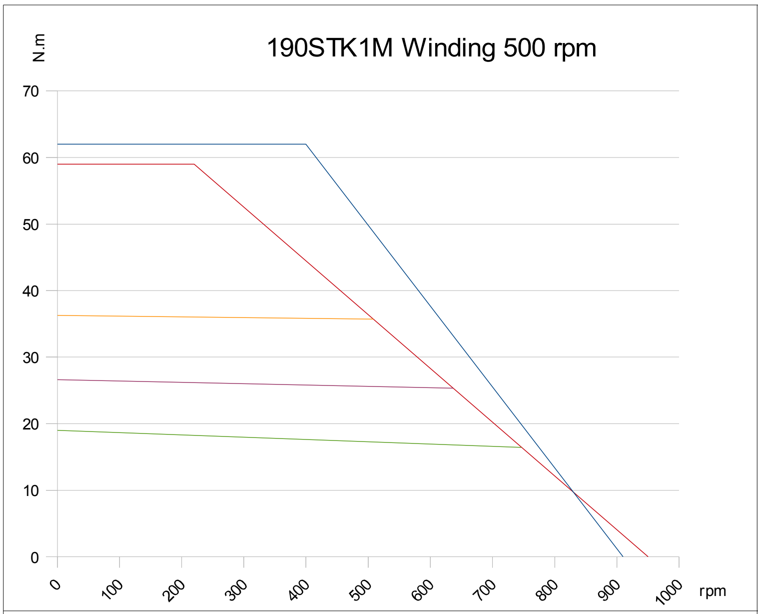
**COMPLEMENTARY DATA FOR FLUID-COOLED MOTORS WINDING AT 140°C**

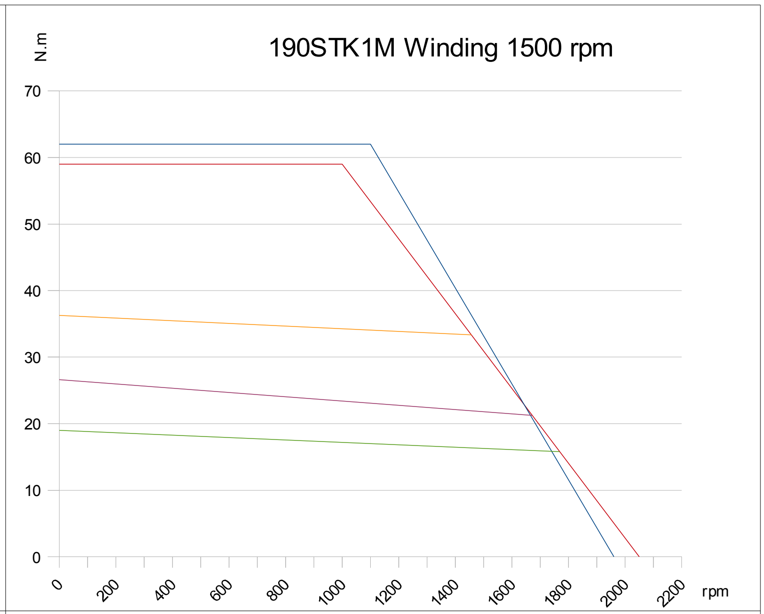
| | | | 190STK1M | | 190STK2M | | 190STK3M | | 190STK4M | | 190STK6M | | 190STK8M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Continuous torque at stall | (4) | N.m | 36.3 | | 71.4 | | 106 | | 141 | | 210 | | 274 | |
| Current at continuous torque | | A | 6.1 | 13.2 | 9.5 | 24.8 | 13.5 | 30.2 | 17.3 | 47.2 | 29.3 | 52.7 | 36 | 63 |
| Fluid input temperature | (5)(6) | °C | 20 | | 20 | | 20 | | 20 | | 20 | | 20 | |
| Fluid temperature rise | | °C | 5 | | 6 | | 7 | | 7 | | 8 | | 10 | |
| Housing temperature | | °C | < 30 | | < 30 | | < 30 | | < 30 | | < 30 | | < 30 | |
| Fluid flow | | l / mn | 4 | | 6 | | 6 | | 7 | | 9 | | 8 | |
| Losses | | W | 1533 | | 1900 | | 2290 | | 2800 | | 3850 | | 4390 | |
| Pressure drop | | Bar | 0.1 | | 0.4 | | 0.6 | | 0.85 | | 1.8 | | 1.9 | |
| Power cable square section | (7) | nxmm² | 4x1.5 | | 4x1.5 | 4x4 | 4x1.5 | 4x6 | 4x2.5 | 4x10 | 4x4 | 4x10 | 4x6 | 4x10 |
| Power cable diameter | (7) | mm | Ø8.6 | | Ø8.6 | Ø12.2 | Ø8.6 | Ø14 | Ø10.8 | Ø17.6 | Ø12 .2 | Ø17.6 | Ø14 | 4x Ø9.5 |

(1) Thermal conditions:
Ambient temperature 20°C
Winding temperature rise 120°C
Stator housing in contact with the ambient air or integral on all its peripheral area with a metallic armature in contact with the ambient air.
Stator housing secured on a metallic frame having an area equal to twice the cross section of the housing.
(2) Cold motor at 20°C
(3) See torque vs speed characteristics on :
http://www.alxion.com/
(4) Torque at stall or low speed.
(5) Fluid input temperature should not be lower for avoiding condensation inside the motor.
(6) For cooling fluid, use softened gycol-added water or fluids approved for closed cooling circuits.
(7) For curents lower than 53 Amps, one shielded cable
For curents over 53 Amps, four single shielded wires output (highlighted in the table)

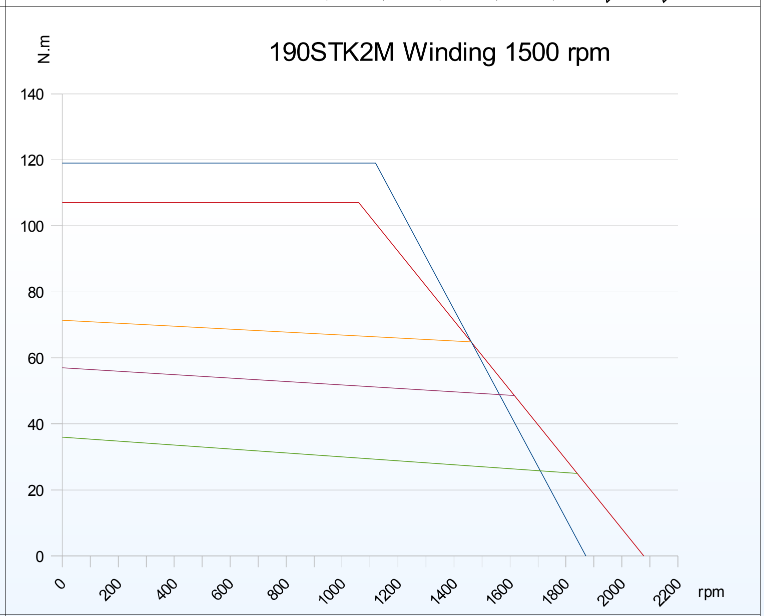
Other speed characteristics are available, please contact us.

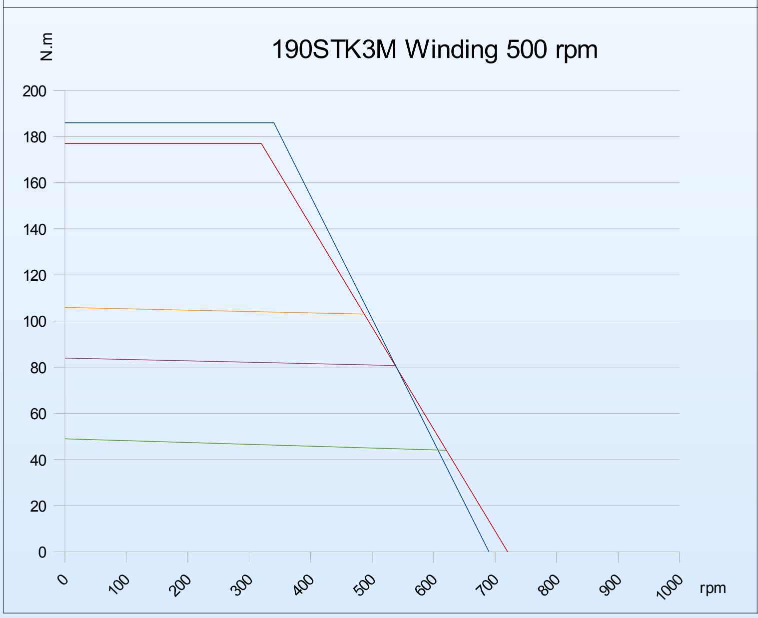
# TORQUE VS SPEED CURVES   MOTORS 190STK







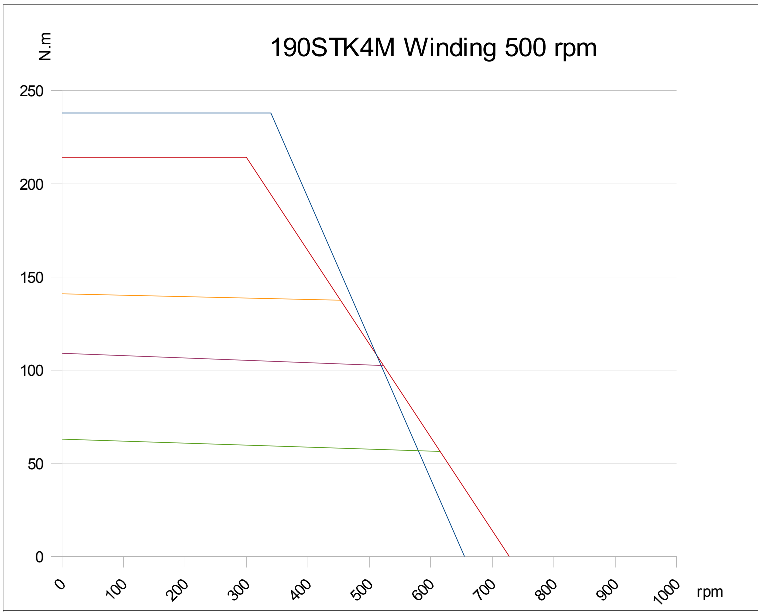



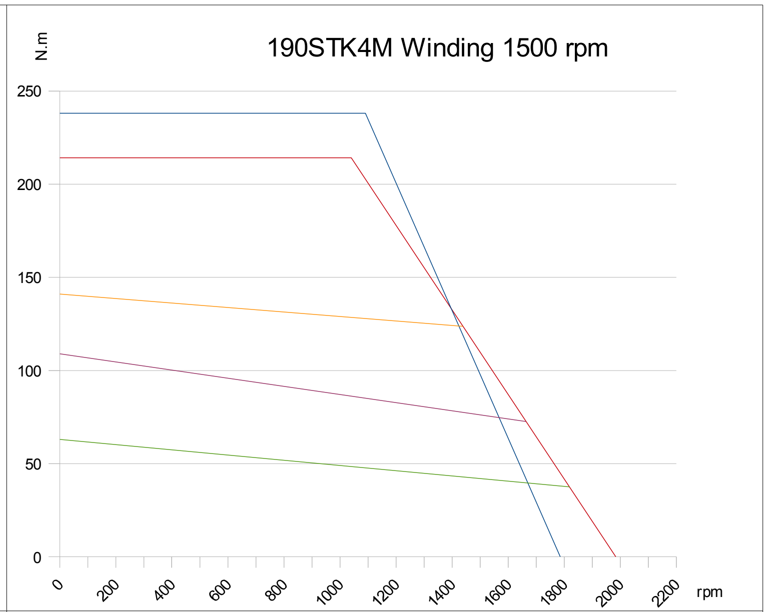


- Continuous torque with natural convection
- Continuous torque liquid cooled winding at 60°C
- Continuous torque liquid cooled winding at 140°C
- Max. transient characteristics motor at 20°C 400VAC mains / 540VDC bus with flux vector control
- Max. transient characteristics motor at rated temp 400VAC mains / 540VDC bus with flux vector control

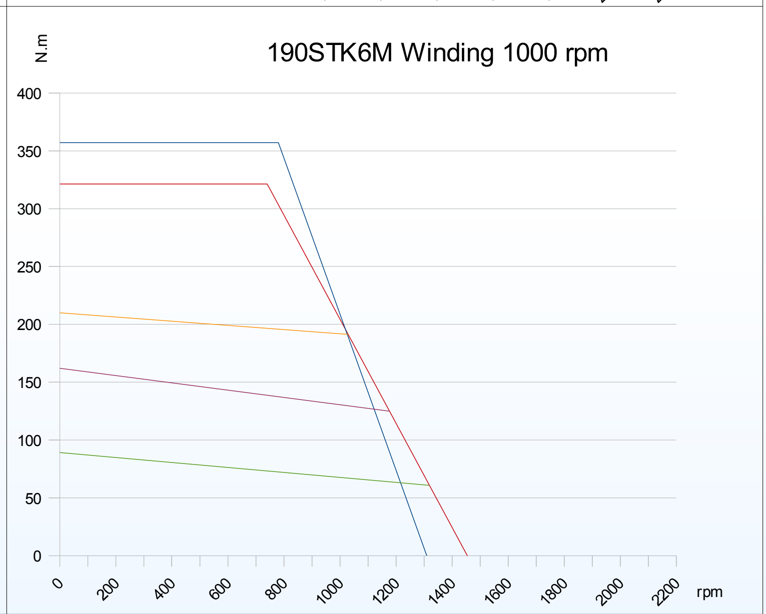
Other windings can be supplied for matching your needs ; please contact us.

# TORQUE VS SPEED CURVES MOTORS 190STK







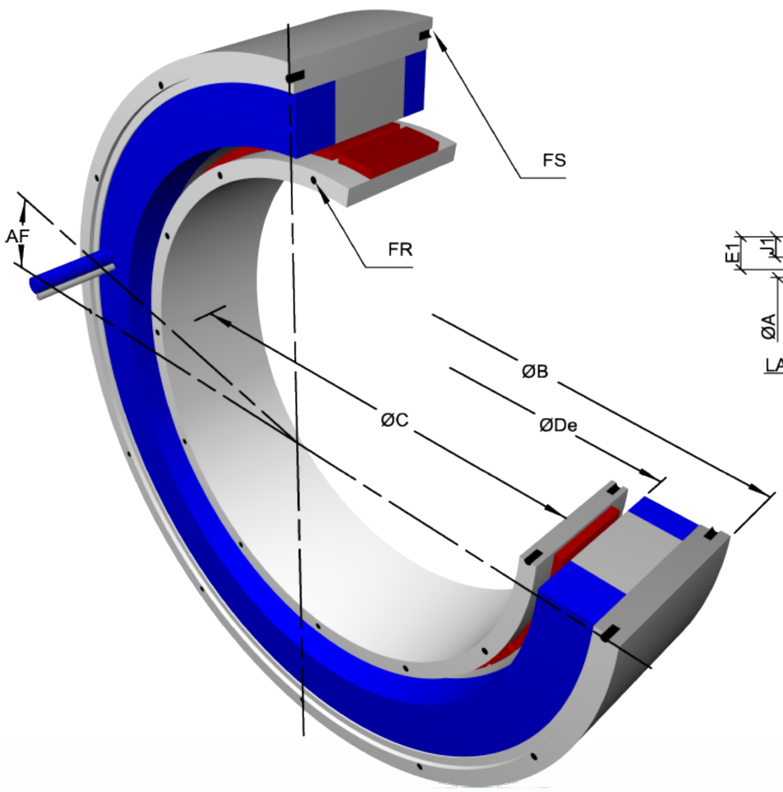



- Continuous torque with natural convection
- Continuous torque liquid cooled winding at 60°C
- Continuous torque liquid cooled winding at 140°C
- Max. transient characteristics motor at 20°C 400VAC mains / 540VDC bus with flux vector control
- Max. transient characteristics motor at rated temp 400VAC mains / 540VDC bus with flux vector control

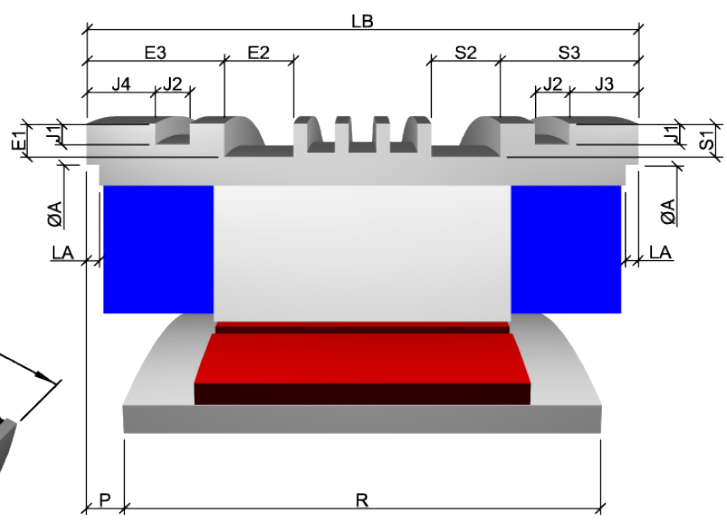
Other windings can be supplied for matching your needs ; please contact us.

# MOTORS 300 STK

*Natural convection*




*Fluid cooling*




| ***DIMENSIONS FOR ALL 300 STK*** | | |
|---|---|---|
| Housing internal centering diameter | A H8 | 282 |
| Angle wire output / tapped holes | AF | 15° |
| Housing external centering diameter (fluid cooling) | B f8 | 303 |
| Housing external centering diameter (natural convection) | B f8 | 303 |
| Rotoric internal centering diameter | C H7 | 190 |
| Housing internal diameter | De | 228 |
| Depth of fluid front input / output groove | E1 | 4 |
| Width of fluid front input / output groove | E2 | 12 |
| Position of fluid front I/O groove | E3 | 20 (50) |
| Rotoric fixation holes | FR | 12xM5 sur Ø199 |
| Housing fixation holes | FS | 12xM5 sur Ø290 |
| O-ring groove depth | J1 | 2.3 |
| O-ring groove width | J2 | 4 |
| Position of rear o-ring groove | J3 | 9 |
| Position of front o-ring groove | J4 | 11.5 (41.5) |
| Depth of housing internal centering diameter | LA | 3 |
| Alignment rotor / housing | P ± 0.1 | 34.5 (64.5) |
| Maximum rotoric contact diameter | Pmax | 213 |
| Depth of fluid rear I/O groove | S1 | 4 |
| Width of fluid rear I/O groove | S2 | 10 |
| Position of fluid rear I/O groove | S3 | 18 |

| ***DIMENSIONS ACCORDING TO SIZE*** | | 300STK1M | 300STK2M | 300STK3M | 300STK4M | 300STK5M | 300STK6M | 300STK7M | 300STK8M |
|---|---|---|---|---|---|---|---|---|---|
| Housing length | LB±0.15 | 87.5 (117.5) | 115 (145) | 142.5 (172.5) | 170 (200) | 197.5 (227.5) | 225 (255) | 252.5 (282.5) | 280 (310) |
| Rotor length | R +0.15 | 27.5 | 55 | 82.5 | 110 | 137.5 | 165 | 192.5 | 220 |

The dimensions in red in the table are valid in the case of a rated current greater than 38 A and class 6 shielded cable output

We also offer the possibility of not shielded output wires without need of stator length increase.

**INTEGRATION:**

- ✓ The cables are made of PU, class 6, foreseen for cable-bearing chains, 2 mt standard length, copper square section according rated current.
- ✓ Rotor / housing alignment (P) has to be executed within +/- 0.1 mm. Optionally, we can supply a mounting tool for achieving that alignment in case of assembly without possibility of accurate alignment.
- ✓ Thermal devices cable consists of 2 shielded pairs 2x2x0.25mm² section, 7 mm max external diameter.
- ✓ (De) represents: 1- The maximum diameter passing inside the housing.
  2- The minimum diameter necessary for rotor assembly.
- ✓ (Pmax) diameter for pieces in contact with the rotor must never be exceeded.
- ✓ Tapped holes on each side of rotor and housing are angularly aligned.
- ✓ Cable positioning (AF) is theoretical. Leave a free room with a +/- 10 arc degrees tolerance around that position, on a 50 mm height from the housing side, for avoiding to stress the cables at the motor output.
  Do not tighten, twist or bend the power cable on the first 50 mm from motor side. Clamp the power cable after those 50 mm.
- ✓ When designing the assembly, take care to insure a perfect contact between housing and user's bore for avoiding thermal problems.
- ✓ For housing mounting, use either external centering diameter (B) or internal centering diameters (A).
- ✓ For execution tolerances (perpendicularity, concentricity...), please consult us.
- ✓ Fluid input and output pipes have to be placed at the opposite of wire outputs on the same axial plane.
- ✓ O-ring grooves designed for 3 mm diameter o-rings.

A full integration handbook can be supplied to our customers upon request

For further information or specific request about our motors, feel free to contact us.

# TECHNICAL CHARACTERISTICS

## Windings for 400V / 460Vac drives (See Application note)

### NATURAL CONVECTION

| | | | 300STK1M | | 300STK2M | | 300STK3M | | 300STK4M | | 300STK6M | | 300STK8M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated speed | | rpm | 200 | 800 | 200 | 800 | 200 | 800 | 200 | 800 | 200 | 800 | 200 | 800 |
| Continuous torque at stall | (1)(4) | N.m | 54 | | 98 | | 145 | | 184 | | 261 | | 319 | |
| Current at continuous torque | (1) | A | 4.2 | 10.7 | 7 | 17.6 | 9 | 27 | 11.2 | 36 | 15.5 | 48.5 | 20.3 | 65 |
| Peak torque | (2)(3) | N.m | 194 | | 387 | | 580 | | 774 | | 1161 | | 1548 | |
| Current at peak torque | (2) | A | 20.9 | 50.7 | 36.7 | 92.6 | 50.6 | 152 | 66.5 | 212.9 | 96.8 | 304.1 | 133.1 | 425.8 |
| Rated power | (1) | kW | 1.06 | 3.65 | 2 | 7.06 | 2.89 | 8.9 | 3.65 | 10.92 | 4.7 | 13.86 | 5.8 | 15.12 |
| Inertia | | $10^{-3}$kg.m² | 26.4 | | 52.7 | | 79.2 | | 105.5 | | 158.2 | | 211 | |
| Weight | | kg | 11.5 | | 18 | | 24.5 | | 31 | | 44 | | 57 | |
| Thermal time constant | (1) | s | 495 | | 669 | | 907 | | 1145 | | 1621 | | 2097 | |
| Thermal resistance | (1) | °C / W | 0.184 | | 0.164 | | 0.15 | | 0.135 | | 0.115 | | 0.1 | |
| Phase resistance at 20°C | (2) | Ω | 7.05 | 1.09 | 2.82 | 0.44 | 1.85 | 0.205 | 1.286 | 0.126 | 0.808 | 0.082 | 0.54 | 0.053 |
| Phase inductance at I continuous | | mH | 27.4 | 4.1 | 17.7 | 2.8 | 13.9 | 1.53 | 11.1 | 1.1 | 7.8 | 0.8 | 5.5 | 0.53 |
| Electrical time constant | (2) | ms | 3.88 | | 6.3 | | 7.5 | | 8.6 | | 9.7 | | 10.2 | |
| Back emf constant (line to line) | (2) | V/rad.s | 8.02 | 3.15 | 9.13 | 3.62 | 9.93 | 3.31 | 10.07 | 3.15 | 10.38 | 3.31 | 10.04 | 3.14 |
| Power cable square section | (7) | nxmm² | 4x1.5 | | 4x1.5 | 4x2.5 | 4x1.5 | 4x4 | 4x1.5 | 4x6 | 4x1.5 | 4x6 | 4x2.5 | 4x10 |
| Power cable diameter | (7) | mm | Ø8.6 | | Ø8.6 | Ø10.8 | Ø8.6 | Ø12.2 | Ø8.6 | Ø14 | Ø8.6 | 4x Ø7.7 | Ø10.8 | 4x Ø9.5 |
| Number of poles | | | 24 | | | | | | | | | | | |

### COMPLEMENTARY DATA FOR FLUID-COOLED MOTORS WINDING AT 60°C

| | | | 300STK1M | | 300STK2M | | 300STK3M | | 300STK4M | | 300STK6M | | 300STK8M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Continuous torque at stall | (4) | N.m | 83 | | 170 | | 246 | | 323 | | 484 | | 677 | |
| Current at continuous torque | | A | 6.5 | 16.5 | 12.2 | 30.8 | 16.2 | 48.7 | 21 | 67.4 | 34.2 | 116.5 | 44 | 140.8 |
| Fluid input temperature | (5)(6) | °C | 20 | | 20 | | 20 | | 20 | | 20 | | 20 | |
| Fluid temperature rise | | °C | 5 | | 8 | | 8 | | 7 | | 7 | | 10 | |
| Housing temperature | | °C | < 25 | | < 30 | | < 30 | | < 30 | | < 30 | | < 30 | |
| Fluid flow | | l / mn | 4 | | 4 | | 4 | | 5 | | 7 | | 7 | |
| Losses | | W | 1060 | | 1540 | | 1815 | | 2075 | | 2770 | | 3760 | |
| Pressure drop | | Bar | 0.2 | | 0.6 | | 0.8 | | 0.3 | | 0.5 | | 0.7 | |
| Power cable square section | (7) | nxmm² | 4x1.5 | | 4x1.5 | 4x6 | 4x1.5 | 4x6 | 4x2.5 | 4x10 | 4x6 | 4x25 | 4x6 | 4x35 |
| Power cable diameter | (7) | mm | Ø8.6 | | Ø8.6 | Ø14 | Ø8.6 | 4x Ø7.7 | Ø10.8 | 4x Ø9.5 | Ø14 | 4x Ø13 | 4x Ø7.7 | 4x Ø15 |

### COMPLEMENTARY DATA FOR FLUID-COOLED MOTORS WINDING AT 140°C

| | | | 300STK1M | | 300STK2M | | 300STK3M | | 300STK4M | | 300STK6M | | 300STK8M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Continuous torque at stall | (4) | N.m | 106 | | 219 | | 325 | | 436 | | 651 | | 871 | - |
| Current at continuous torque | | A | 9 | 22.8 | 16.3 | 41 | 22.1 | 66.4 | 29.5 | 94.5 | 42.7 | 133.6 | 58.7 | - |
| Fluid input temperature | (5)(6) | °C | 20 | | 20 | | 20 | | 20 | | 20 | | 20 | - |
| Fluid temperature rise | | °C | 5 | | 8 | | 10 | | 7 | | 7 | | 10 | - |
| Housing temperature | | °C | < 25 | | < 30 | | < 30 | | < 30 | | < 30 | | < 30 | - |
| Fluid flow | | l / mn | 8 | | 7 | | 7 | | 12 | | 16 | | 14 | - |
| Losses | | W | 2440 | | 3275 | | 4020 | | 4972 | | 6384 | | 7956 | - |
| Pressure drop | | Bar | 1.1 | | 1.5 | | 2 | | 1.6 | | 2.2 | | 2.2 | - |
| Power cable square section | (7) | nxmm² | 4x1.5 | 4x4 | 4x1.5 | 4x6 | 4x4 | 4x10 | 4x4 | 4x25 | 4x6 | 4x35 | 4x10 | - |
| Power cable diameter | (7) | mm | Ø8.6 | Ø12.2 | Ø8.6 | 4x Ø7.7 | Ø12.2 | 4x Ø9.5 | Ø12.2 | 4x Ø13 | 4x Ø7.7 | 4x Ø15 | 4xØ9.5 | - |

(1) Thermal conditions:
Ambient temperature 20°C
Winding temperature rise 120°C
Stator housing in contact with the ambient air or integral on all its peripheral area with a metallic armature in contact with the ambient air.
Stator housing secured on a metallic frame having an area equal to twice the cross section of the housing.

(2) Cold motor at 20°C

(3) See torque vs speed characteristics on :
http://www.alxion.com/

(4) Torque at stall or low speed.

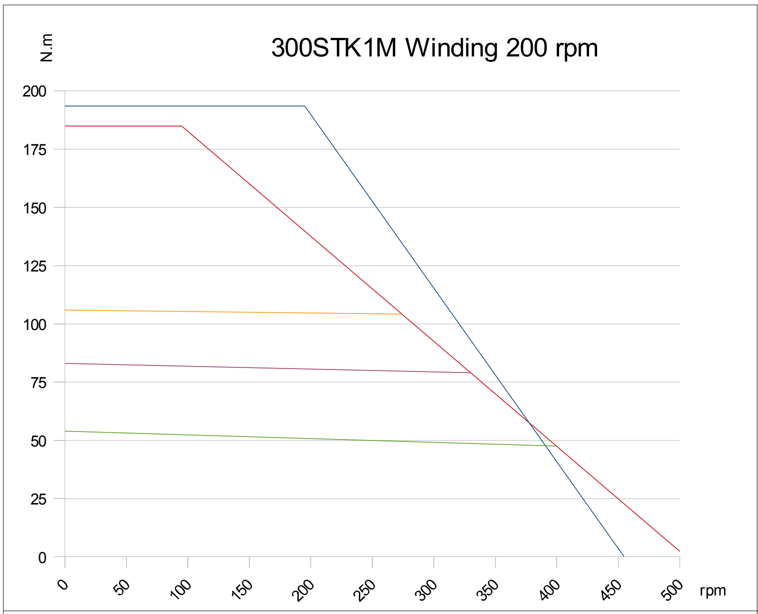
(5) Fluid input temperature should not be lower for avoiding condensation inside the motor.

(6) For cooling fluid, use softened gycol-added water or fluids approved for closed cooling circuits.

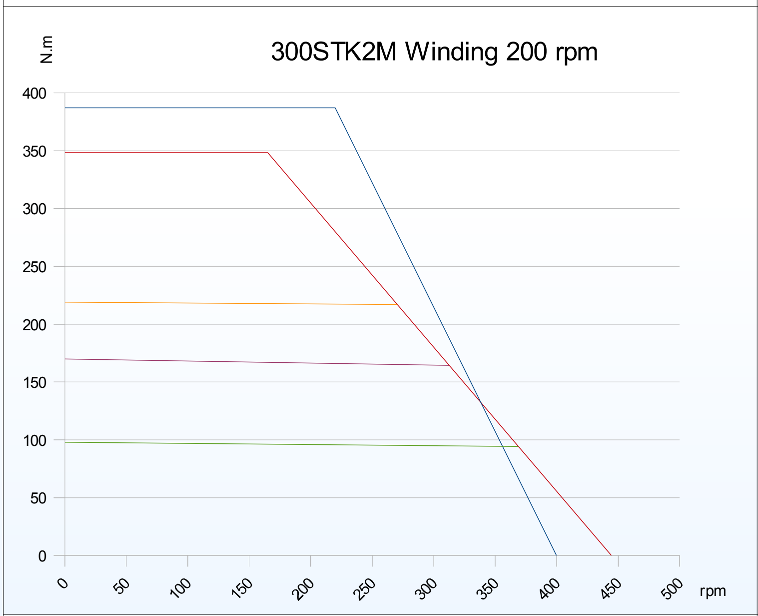
(7) For curents lower than 38 Amps, one shielded cable
For curents over 38 Amps, four single shielded wires output (highlighted in the table)

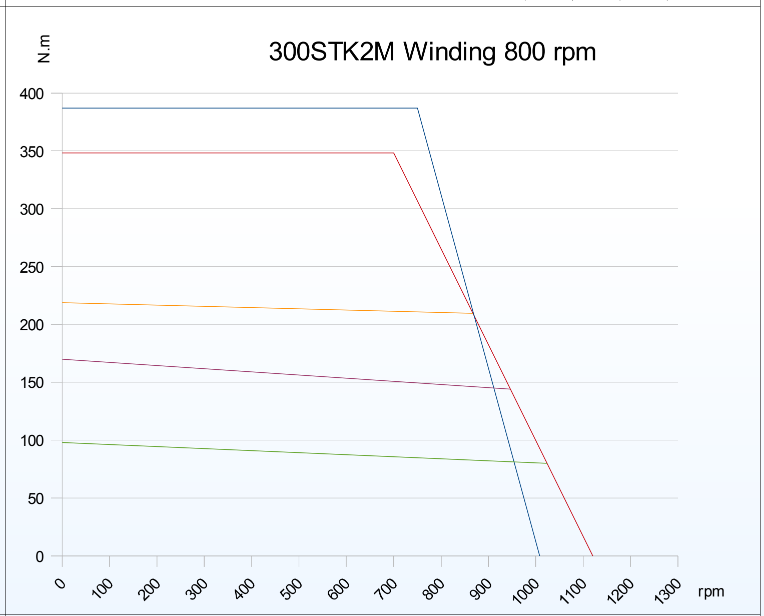
Other speed characteristics are available, please contact us.

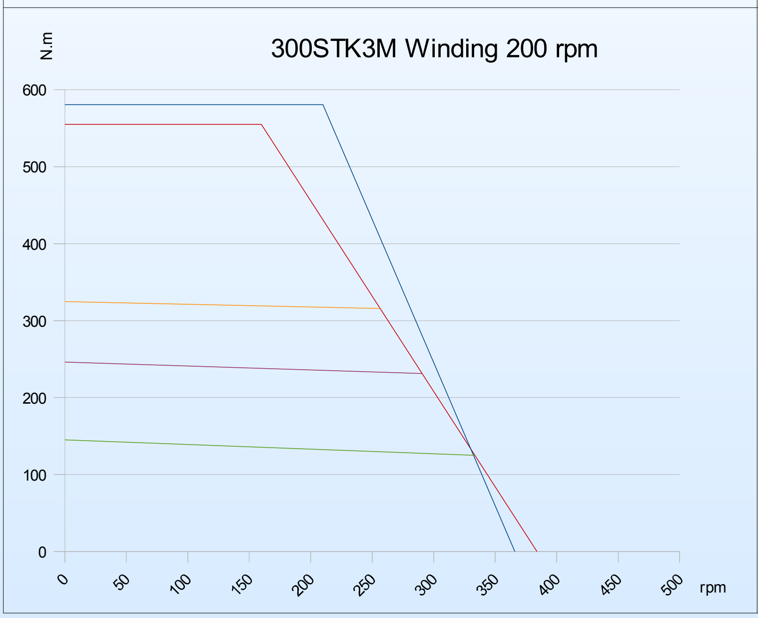
# TORQUE VS SPEED CURVES   MOTORS 300STK

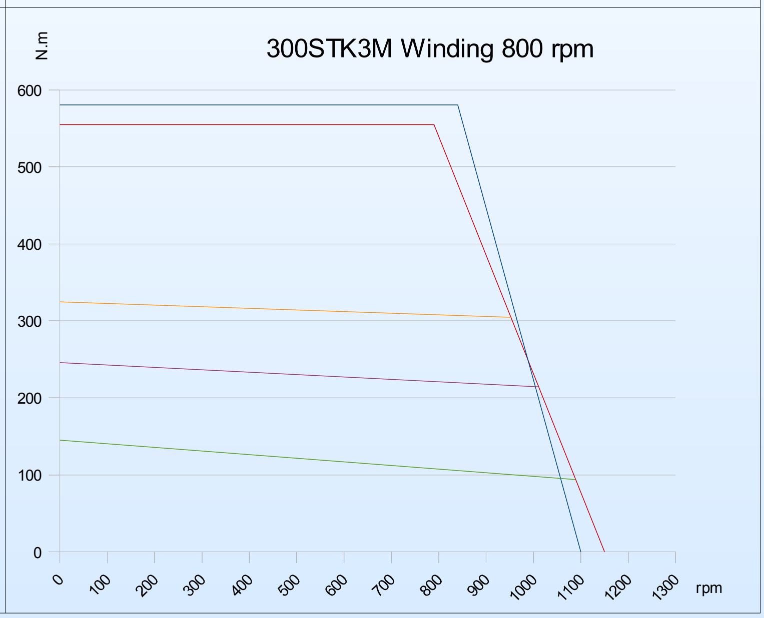






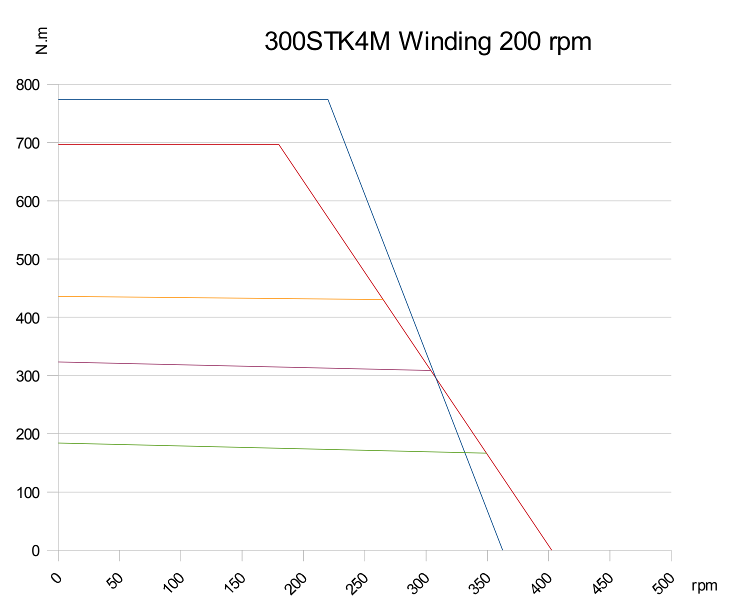



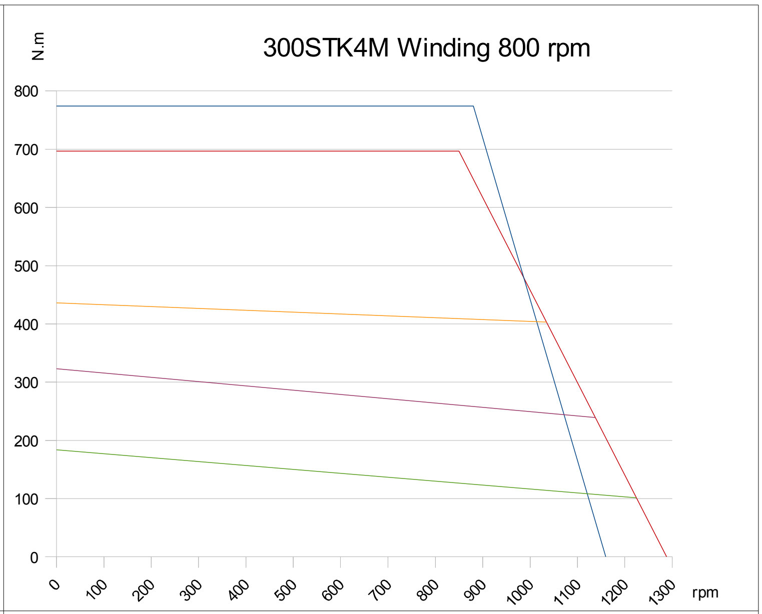



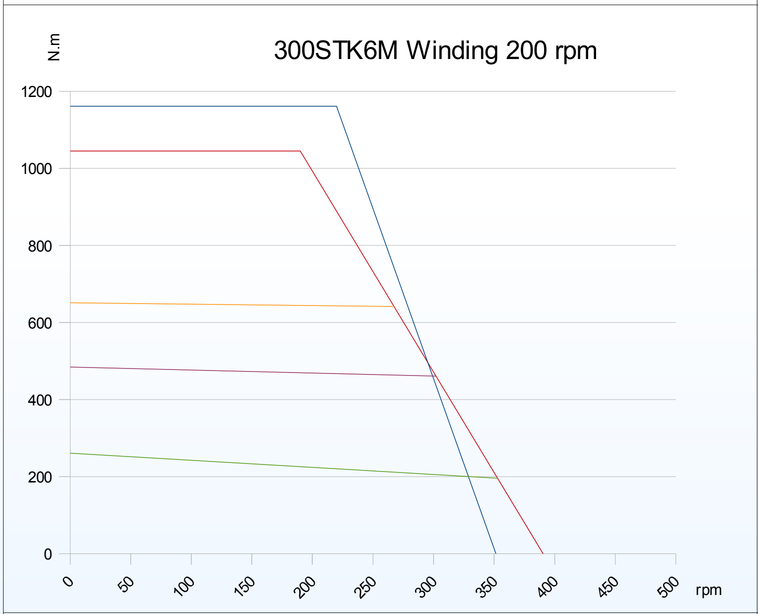

- Continuous torque with natural convection
- Continuous torque liquid cooled winding at 60°C
- Continuous torque liquid cooled winding at 140°C
- Max. transient characteristics motor at 20°C 400VAC mains / 540VDC bus with flux vector control
- Max. transient characteristics motor at rated temp 400VAC mains / 540VDC bus with flux vector control

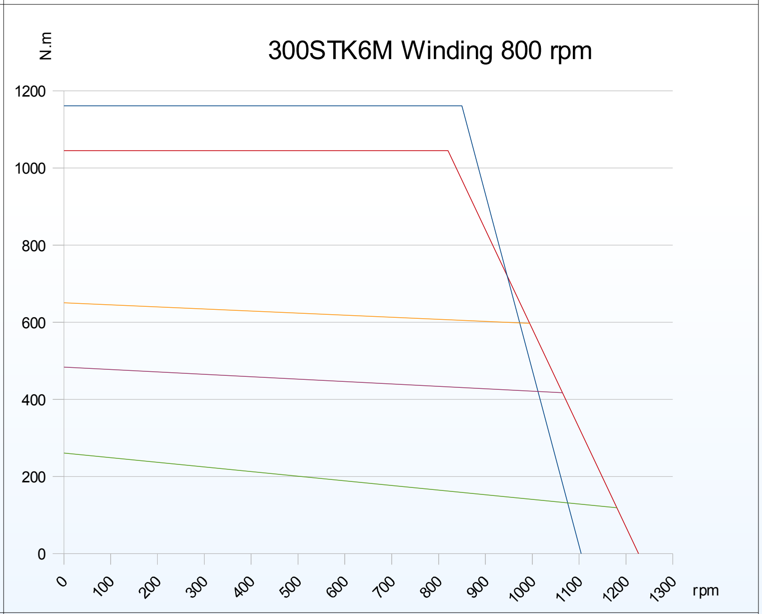
Other windings can be supplied for matching your needs ; please contact us.

# TORQUE VS SPEED CURVES MOTORS 300STK

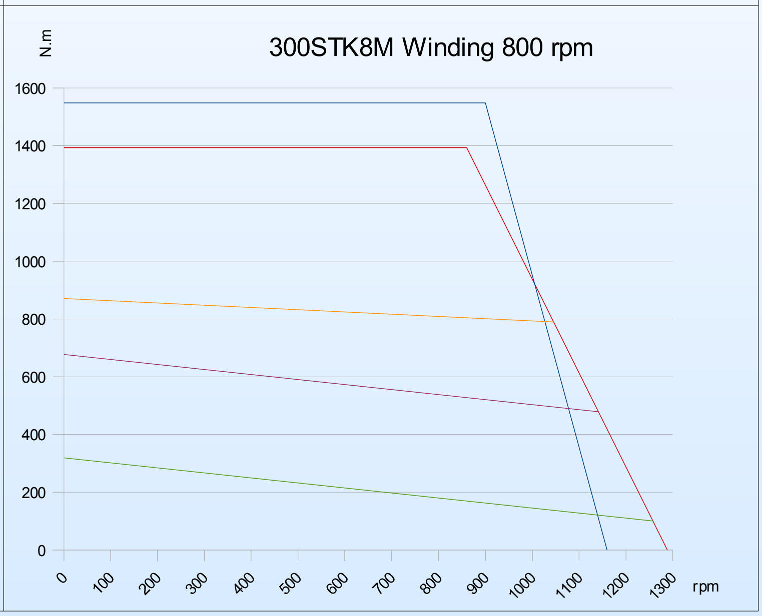







- Continuous torque with natural convection
- Continuous torque liquid cooled winding at 60°C
- Continuous torque liquid cooled winding at 140°C
- Max. transient characteristics motor at 20°C 400VAC mains / 540VDC bus with flux vector control
- Max. transient characteristics motor at rated temp 400VAC mains / 540VDC bus with flux vector control

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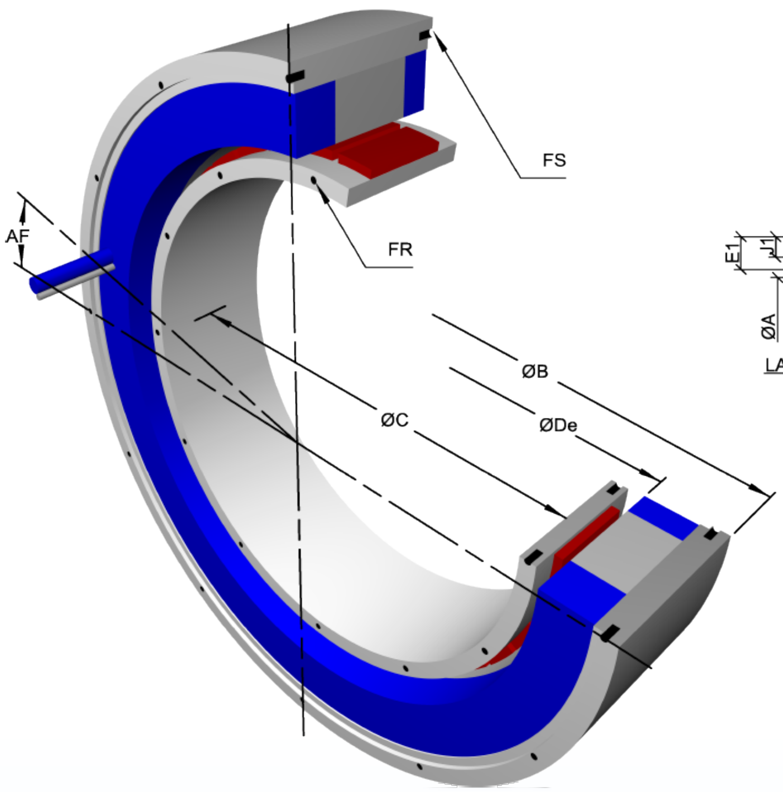
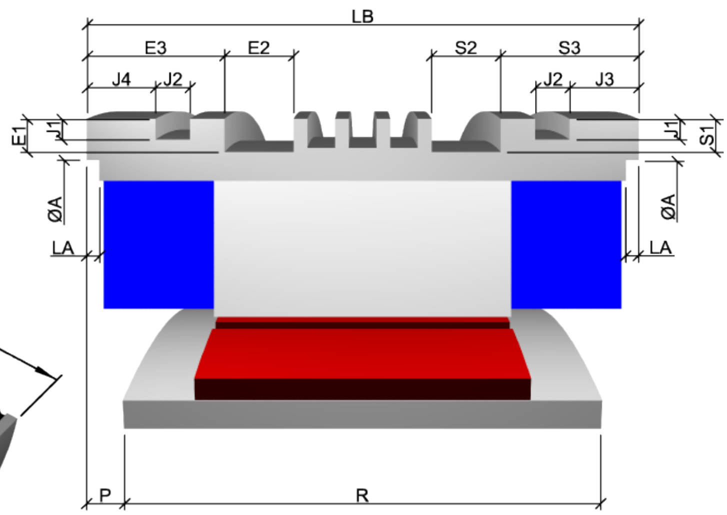
# MOTORS 400 STK

*Natural convection*




*Fluid cooling*




| DIMENSIONS FOR ALL 400 STK | | |
|---|---|---|
| Housing internal centering diameterr | A H8 | 380 |
| Angle wire output / tapped holes | AF | 15° |
| Housing external centering diameter (fluid cooling) | B f8 | 404 |
| Housing external centering diameter (natural convection) | B f8 | 404 |
| Rotoric internal centering diameter | C H7 | 258 |
| Housing internal diameter | De | 306 |
| Depth of fluid front input / output groove | E1 | 5.5 |
| Width of fluid front input / output groove | E2 | 9.3 |
| Position of fluid front I/O groove | E3 | 27.2 (57.2) |
| Rotoric fixation holes | FR | 12xM6 sur Ø268 |
| Housing fixation holes | FS | 12xM6 sur Ø390 |
| O-ring groove depth | J1 | 3.4 |
| O-ring groove width | J2 | 5.2 |
| Position of rear o-ring groove | J3 | 18 |
| Position of front o-ring groove | J4 | 18 (48) |
| Depth of housing internal centering diameter | LA | 3 |
| Alignment rotor / housing | P ± 0.1 | 39 (69) |
| Maximum rotoric contact diameter | Pmax | 287 |
| Depth of fluid rear I/O groove | S1 | 5.5 |
| Width of fluid rear I/O groove | S2 | 9.3 |
| Position of fluid rear I/O groove | S3 | 27.2 |

| DIMENSIONS ACCORDING TO SIZE | | 400STK1M | 400STK2M | 400STK3M | 400STK4M | 400STK5M | 400STK6M | 400STK7M | 400STK8M |
|---|---|---|---|---|---|---|---|---|---|
| Housing length | LB±0.15 | 100.5 (130.5) | 128 (158) | 155.5 (185.5) | 183 (213) | 210.5 (240.5) | 238 (268) | 265.5 (295.5) | 293 (323) |
| Rotor length | R +0.15 | 27.5 | 55 | 82.5 | 110 | 137.5 | 165 | 192.5 | 220 |

The dimensions in red in the table are valid in the case of a rated current greater than 53 A and class 6 shielded cable output

We also offer the possibility of not shielded output wires without need of stator length increase.

**INTEGRATION:**

- ✓ The cables are made of PU, class 6, foreseen for cable-bearing chains, 2 mt standard length, copper square section according rated current.
- ✓ Rotor / housing alignment (P) has to be executed within +/- 0.1 mm. Optionally, we can supply a mounting tool for achieving that alignment in case of assembly without possibility of accurate alignment.
- ✓ Thermal devices cable consists of 2 shielded pairs 2x2x0.25mm² section, 7 mm max external diameter.
- ✓ (De) represents: 1- The maximum diameter passing inside the housing.
  2- The minimum diameter necessary for rotor assembly.
- ✓ (Pmax) diameter for pieces in contact with the rotor must never be exceeded.
- ✓ Tapped holes on each side of rotor and housing are angularly aligned.
- ✓ Cable positioning (AF) is theoretical. Leave a free room with a +/- 10 arc degrees tolerance around that position, on a 50 mm height from the housing side, for avoiding to stress the cables at the motor output.
  Do not tighten, twist or bend the power cable on the first 50 mm from motor side. Clamp the power cable after those 50 mm.
- ✓ When designing the assembly, take care to insure a perfect contact between housing and user's bore for avoiding thermal problems.
- ✓ For housing mounting, use either external centering diameter (B) or internal centering diameters (A).
- ✓ For execution tolerances (perpendicularity, concentricity...), please consult us.
- ✓ Fluid input and output pipes have to be placed at the opposite of wire outputs on the same axial plane.
- ✓ O-ring grooves designed for 4 mm diameter o-rings.

A full integration handbook can be supplied to our customers upon request
For further information or specific request about our motors, feel free to contact us.

# TECHNICAL CHARACTERISTICS

## Windings for 400V / 460Vac drives (See Application note)

NATURAL CONVECTION

| | | | 400STK1M | | 400STK2M | | 400STK3M | | 400STK4M | | 400STK6M | | 400STK8M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated speed | | rpm | 200 | 800 | 200 | 800 | 200 | 800 | 200 | 800 | 200 | 800 | 200 | - |
| Continuous torque at stall | (1)(4) | N.m | 113 | | 225 | | 319 | | 400 | | 570 | | 730 | - |
| Current at continuous torque | (1) | A | 8.7 | 23.5 | 14.5 | 46.8 | 18 | 52.2 | 24.5 | 77 | 34.9 | 103 | 41 | - |
| Peak torque | (2)(3) | N.m | 440 | | 880 | | 1320 | | 1760 | | 2640 | | 3520 | - |
| Current at peak torque | (2) | A | 46.9 | 126 | 78.1 | 252.3 | 102.5 | 298 | 149.1 | 468.6 | 218.7 | 656 | 273.3 | - |
| Rated power | (1) | kW | 2.25 | 7.6 | 4.3 | 15.5 | 5.96 | 18.3 | 7.6 | 21 | 9.5 | 24 | 11.3 | - |
| Inertia | | $10^{-3}$kg.m² | 82 | | 163 | | 244 | | 325 | | 488 | | 650 | - |
| Weight | | kg | 23 | | 35 | | 46.5 | | 58 | | 81 | | 104 | - |
| Thermal time constant | (1) | s | 990 | | 1307 | | 1530 | | 1756 | | 2218 | | 2547 | - |
| Thermal resistance | (1) | °C / W | 0.117 | | 0.098 | | 0.094 | | 0.078 | | 0.071 | | 0.063 | - |
| Phase resistance at 20°C | (2) | Ω | 2.23 | 0.31 | 0.981 | 0.094 | 0.69 | 0.081 | 0.39 | 0.04 | 0.236 | 0.026 | 0.187 | - |
| Phase inductance at I continuous | | mH | 11.8 | 1.62 | 8.7 | 0.83 | 7.3 | 0.86 | 4.8 | 0.49 | 3.4 | 0.37 | 2.9 | - |
| Electrical time constant | (2) | ms | 5.6 | | 8.9 | | 10.6 | | 12.3 | | 14.4 | | 15.5 | - |
| Back emf constant (line to line) | (2) | V/rad.s | 7.96 | 2.96 | 9.54 | 2.95 | 10.9 | 3.7 | 10 | 3.18 | 10.2 | 3.41 | 10.9 | - |
| Power cable square section | (7) | nxmm² | 4x1.5 | 4x4 | 4x1.5 | 4x10 | 4x2.5 | 4x10 | 4x4 | 4x16 | 4x6 | 4x25 | 4x10 | - |
| Power cable diameter | (7) | mm | Ø8.6 | Ø12.2 | Ø8.6 | Ø17.6 | Ø10.8 | Ø17.6 | Ø12.2 | 4xØ11 | Ø14 | 4xØ13 | Ø17.6 | - |
| Number of poles | | | 24 | | | | | | | | | | | |

COMPLEMENTARY DATA FOR FLUID-COOLED MOTORS WINDING AT 60°C

| | | | 400STK1M | | 400STK2M | | 400STK3M | | 400STK4M | | 400STK6M | | 400STK8M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Continuous torque at stall | (4) | N.m | 174 | | 396 | | 561 | | 780 | | 1133 | | 1428 | - |
| Current at continuous torque | | A | 13.6 | 36.5 | 27 | 87.2 | 33.4 | 97.3 | 51 | 160 | 72.2 | 216 | 85 | - |
| Fluid input temperature | (5)(6) | °C | 20 | | 20 | | 20 | | 20 | | 20 | | 20 | - |
| Fluid temperature rise | | °C | 8 | | 8 | | 10 | | 10 | | 10 | | 10 | - |
| Housing temperature | | °C | < 30 | | < 30 | | < 30 | | < 30 | | < 30 | | < 30 | - |
| Fluid flow | | l / mn | 4 | | 7 | | 5 | | 7 | | 8 | | 9 | - |
| Losses | | W | 1645 | | 2760 | | 3027 | | 3660 | | 4420 | | 4940 | - |
| Pressure drop | | Bar | 0.1 | | 0.9 | | 0.75 | | 0.4 | | 0.4 | | 0.6 | - |
| Power cable square section | (7) | nxmm² | 4x1.5 | 4x6 | 4x4 | 4x16 | 4x6 | 4x25 | 4x10 | 4x50 | 4x16 | 4x70 | 4x16 | - |
| Power cable diameter | (7) | mm | Ø8.6 | Ø14 | Ø12.2 | 4xØ11 | Ø14 | 4xØ13 | Ø17.6 | 4xØ17 | 4xØ11 | 4xØ20 | 4xØ11 | - |

COMPLEMENTARY DATA FOR FLUID-COOLED MOTORS WINDING AT 140°C

| | | | 400STK1M | | 400STK2M | | 400STK3M | | 400STK4M | | 400STK6M | | 400STK8M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Continuous torque at stall | (4) | N.m | 225 | | 467 | | 698 | | 935 | | 1384 | - | 1846 | - |
| Current at continuous torque | | A | 18.7 | 50.4 | 32.7 | 106 | 42.5 | 123.6 | 62.6 | 197 | 90 | - | 113 | - |
| Fluid input temperature | (5)(6) | °C | 20 | | 20 | | 20 | | 20 | | 20 | - | 20 | - |
| Fluid temperature rise | | °C | 8 | | 8 | | 10 | | 10 | | 10 | - | 10 | - |
| Housing temperature | | °C | < 30 | | < 30 | | < 30 | | < 30 | | < 30 | - | < 30 | - |
| Fluid flow | | l / mn | 8 | | 11 | | 10 | | 12 | | 15 | - | 18 | - |
| Losses | | W | 3740 | | 4830 | | 5833 | | 6580 | | 8180 | - | 10400 | - |
| Pressure drop | | Bar | 0.6 | | 1.9 | | 2.3 | | 0.9 | | 1.2 | - | 2.1 | - |
| Power cable square section | (7) | nxmm² | 4x2.5 | 4x10 | 4x6 | 4x25 | 4x10 | 4x25 | 4x10 | 4x50 | 4x16 | - | 4x25 | - |
| Power cable diameter | (7) | mm | Ø10.8 | Ø17.6 | Ø14 | 4xØ13 | Ø17.6 | 4xØ13 | 4x Ø9.5 | 4xØ17 | 4xØ11 | - | 4xØ13 | - |

(1) Thermal conditions:
Ambient temperature 20°C
Winding temperature rise 120°C
Stator housing in contact with the ambient air or integral on all its peripheral area with a metallic armature in contact with the ambient air.
Stator housing secured on a metallic frame having an area equal to twice the cross section of the housing.

(2) Cold motor at 20°C

(3) See torque vs speed characteristics on :
http://www.alxion.com/

(4) Torque at stall or low speed.

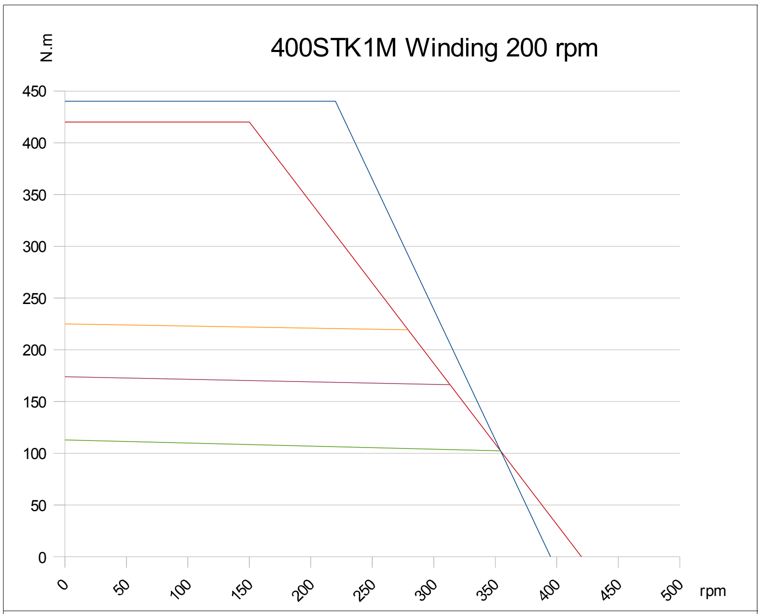
(5) Fluid input temperature should not be lower for avoiding condensation inside the motor.

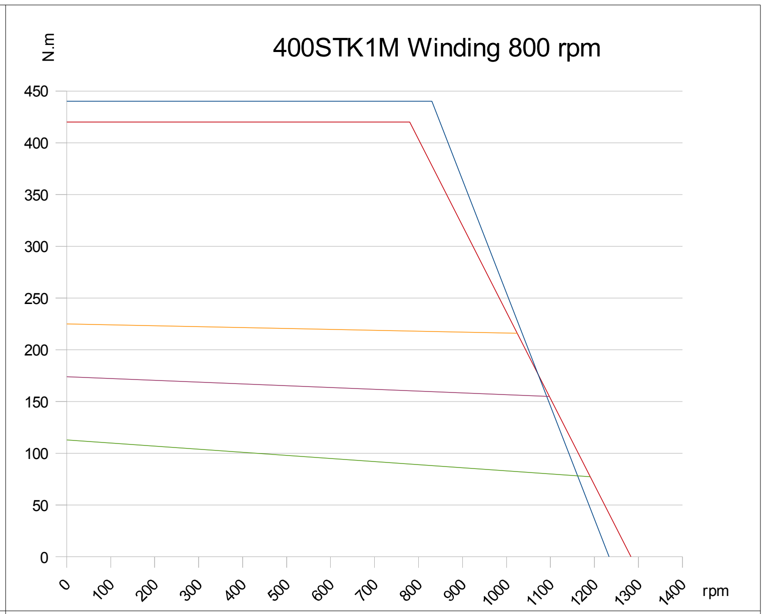
(6) For cooling fluid, use softened gycol-added water or fluids approved for closed cooling circuits.

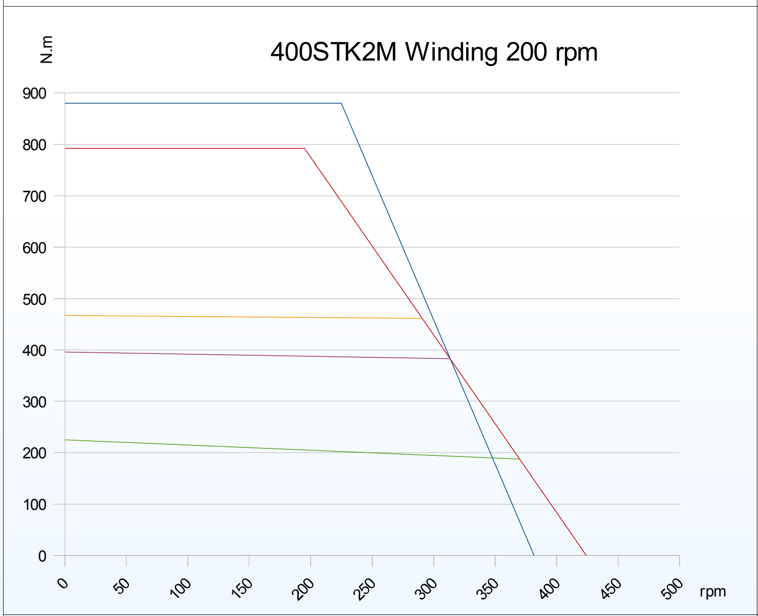
(7) For curents lower than 53 Amps, one shielded cable
For curents over 53 Amps, four single shielded wires output (highlighted in the table)

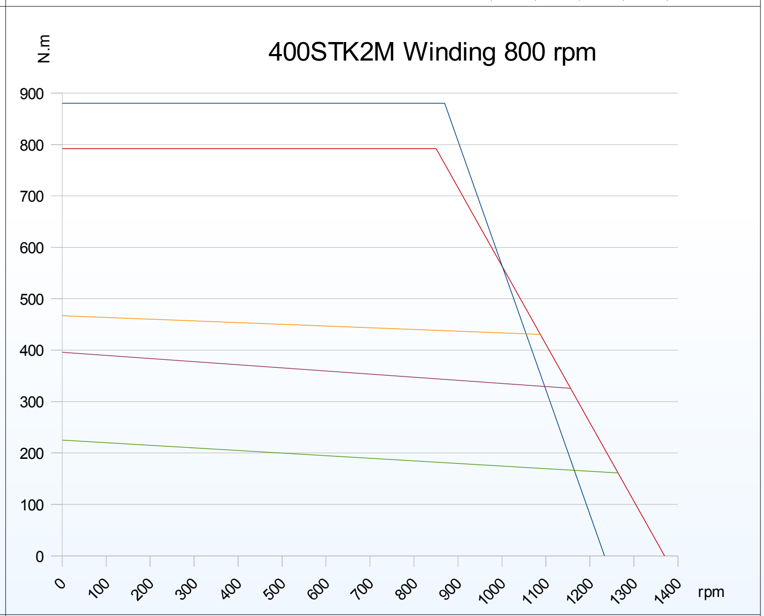
Other speed characteristics are available, please contact us.

# TORQUE VS SPEED CURVES   MOTORS 400STK

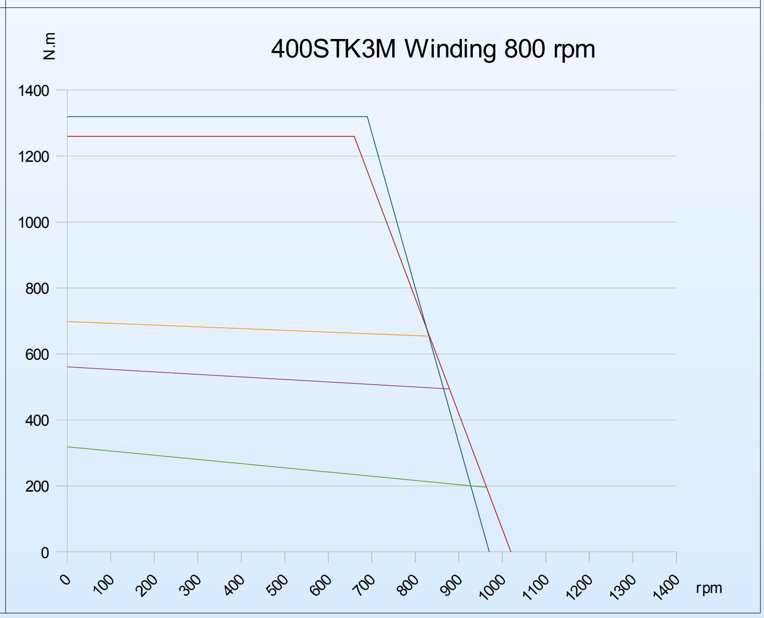


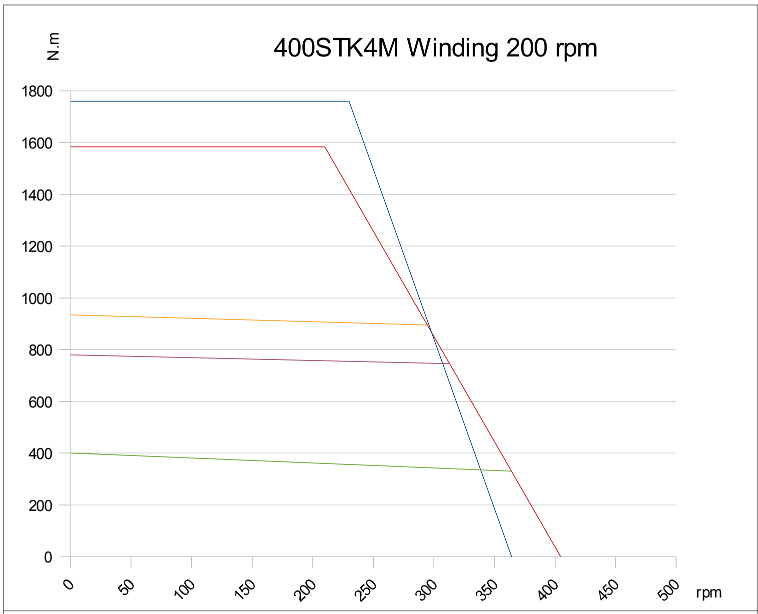


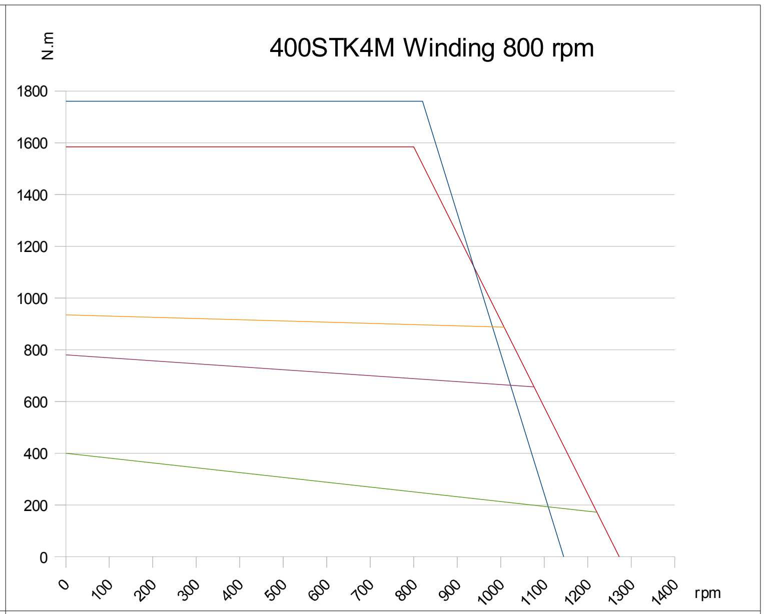


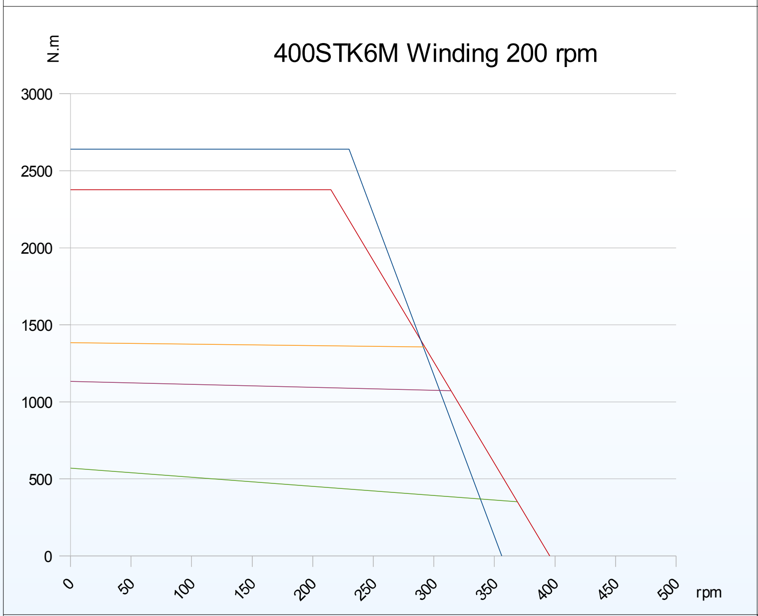

- Continuous torque with natural convection
- Continuous torque liquid cooled winding at 60°C
- Continuous torque liquid cooled winding at 140°C
- Max. transient characteristics motor at 20°C 400VAC mains / 540VDC bus with flux vector control
- Max. transient characteristics motor at rated temp 400VAC mains / 540VDC bus with flux vector control

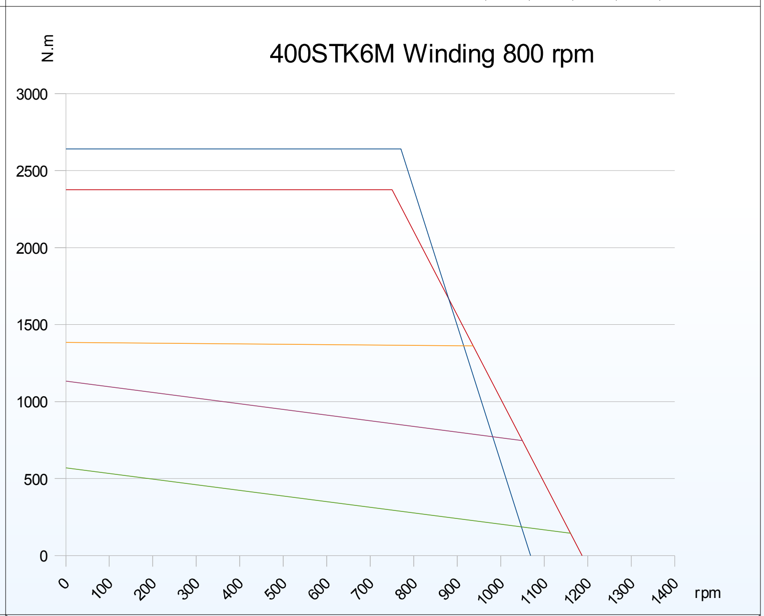
Other windings can be supplied for matching your needs ; please contact us.

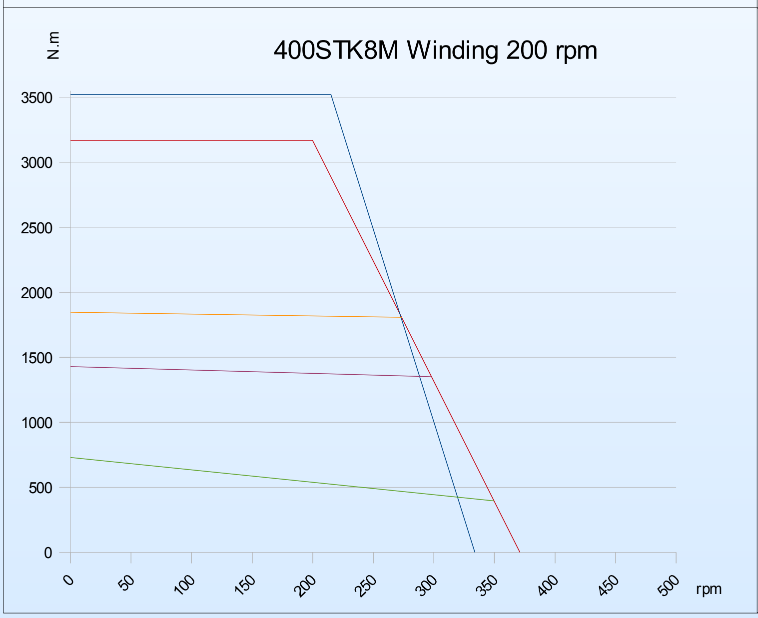
# TORQUE VS SPEED CURVES   MOTORS 400STK



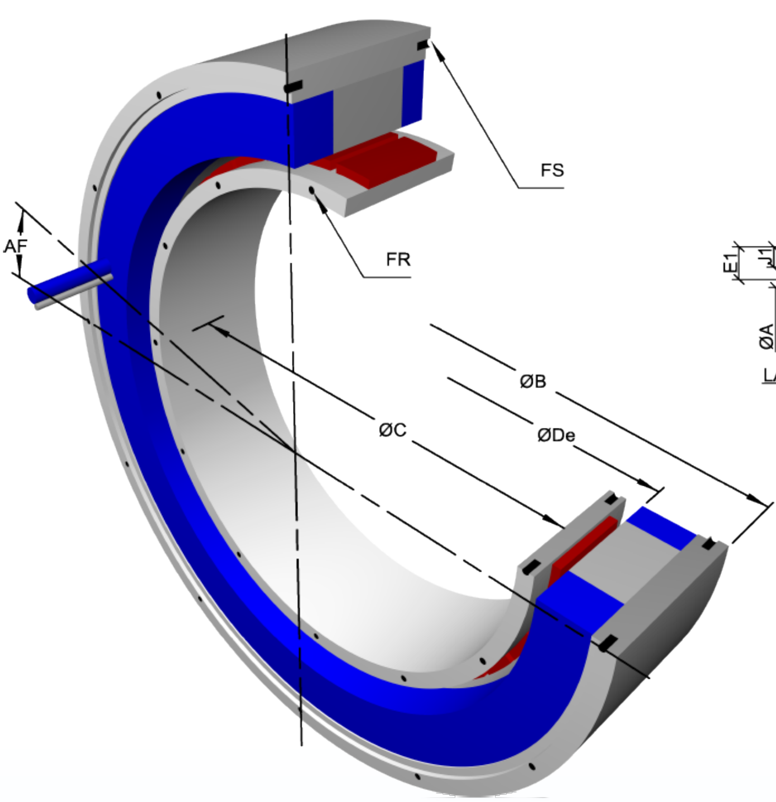




- Continuous torque with natural convection
- Continuous torque liquid cooled winding at 60°C
- Continuous torque liquid cooled winding at 140°C
- Max. transient characteristics motor at 20°C 400VAC mains / 540VDC bus with flux vector control
- Max. transient characteristics motor at rated temp 400VAC mains / 540VDC bus with flux vector control

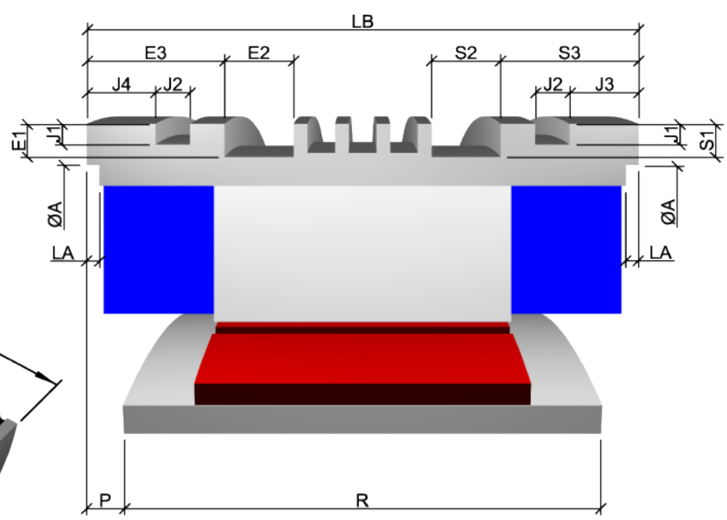
Other windings can be supplied for matching your needs ; please contact us.

# MOTORS 500 STK

*Natural convection*




*Fluid cooling*




| ***DIMENSIONS FOR ALL 500 STK*** | | |
|---|---|---|
| Housing internal centering diameter | A H8 | 470 |
| Angle wire output / tapped holes | AF | 15° |
| Housing external centering diameter (fluid cooling) | B f8 | 502 |
| Housing external centering diameter (natural convection) | B f8 | 502 |
| Rotoric internal centering diameter | C H7 | 350 |
| Housing internal diameter | De | 403 |
| Depth of fluid front input / output groove | E1 | 5 |
| Width of fluid front input / output groove | E2 | 18.95 |
| Position of fluid front I/O groove | E3 | 23.2 (63.2) |
| Rotoric fixation holes | FR | 12xM8 sur Ø364 |
| Housing fixation holes | FS | 12xM8 sur Ø482 |
| O-ring groove depth | J1 | 3.4 |
| O-ring groove width | J2 | 5.2 |
| Position of rear o-ring groove | J3 | 9 |
| Position of front o-ring groove | J4 | 14 (54) |
| Depth of housing internal centering diameter | LA | 3 |
| Alignment rotor / housing | P ± 0.1 | 37 (77) |
| Maximum rotoric contact diameter | Pmax | 384 |
| Depth of fluid rear I/O groove | S1 | 5 |
| Width of fluid rear I/O groove | S2 | 18.9 |
| Position of fluid rear I/O groove | S3 | 18.2 |

| ***DIMENSIONS ACCORDING TO SIZE*** | | 500STK1M | 500STK2M | 500STK3M | 500STK4M | 500STK5M | 500STK6M | 500STK7M | 500STK8M | 500STK9M |
|---|---|---|---|---|---|---|---|---|---|---|
| Housing length | LB±0.15 | 93 (133) | 120.5 (160.5) | 148 (188) | 175.5 (215.5) | 203 (243) | 230.5 (270.5) | 258 (298) | 285.5 (325.5) | 313 (353) |
| Rotor length | R +0.15 | 27.5 | 55 | 82.5 | 110 | 137.5 | 165 | 192.5 | 220 | 247.5 |

The dimensions in red in the table are valid in the case of a rated current greater than 53 A and class 6 shielded cable output

We also offer the possibility of not shielded output wires without need of stator length increase.

**INTEGRATION:**

- ✓ The cables are made of PU, class 6, foreseen for cable-bearing chains, 2 mt standard length, copper square section according rated current.
- ✓ Rotor / housing alignment (P) has to be executed within +/- 0.1 mm. Optionally, we can supply a mounting tool for achieving that alignment in case of assembly without possibility of accurate alignment.
- ✓ Thermal devices cable consists of 2 shielded pairs 2x2x0.25mm² section, 7 mm max external diameter.
- ✓ (De) represents: 1- The maximum diameter passing inside the housing.
  2- The minimum diameter necessary for rotor assembly.
- ✓ (Pmax) diameter for pieces in contact with the rotor must never be exceeded.
- ✓ Tapped holes on each side of rotor and housing are angularly aligned.
- ✓ Cable positioning (AF) is theoretical. Leave a free room with a +/- 10 arc degrees tolerance around that position, on a 50 mm height from the housing side, for avoiding to stress the cables at the motor output.
  Do not tighten, twist or bend the power cable on the first 50 mm from motor side. Clamp the power cable after those 50 mm.
- ✓ When designing the assembly, take care to insure a perfect contact between housing and user's bore for avoiding thermal problems.
- ✓ For housing mounting, use either external centering diameter (B) or internal centering diameters (A).
- ✓ For execution tolerances (perpendicularity, concentricity...), please consult us.
- ✓ Fluid input and output pipes have to be placed at the opposite of wire outputs on the same axial plane.
- ✓ O-ring grooves designed for 4 mm diameter o-rings.

A full integration handbook can be supplied to our customers upon request
For further information or specific request about our motors, feel free to contact us.

# TECHNICAL CHARACTERISTICS

## Windings for 400V / 460Vac drives (See Application note)

**NATURAL CONVECTION**

| | | | 500STK1M | | 500STK2M | | 500STK3M | | 500STK4M | | 500STK6M | | 500STK9M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated speed | | rpm | 50 | 600 | 50 | 600 | 50 | 600 | 50 | 600 | 50 | - | 50 | - |
| Continuous torque at stall | (1)(4) | N.m | 210 | | 365 | | 520 | | 640 | | 878 | - | 1185 | - |
| Current at continuous torque | (1) | A | 7.3 | 37.4 | 9.2 | 58.3 | 13 | 82.3 | 14.8 | 91.8 | 18.8 | - | 23.1 | - |
| Peak torque | (2)(3) | N.m | 768 | | 1536 | | 2304 | | 3072 | | 4608 | - | 6912 | - |
| Current at peak torque | (2) | A | 32.4 | 166.3 | 46.7 | 295.6 | 70 | 443 | 85.8 | 532 | 120.9 | - | 166.3 | - |
| Rated power | (1) | kW | 1.05 | 9.95 | 1.8 | 19 | 2.6 | 24.3 | 3.3 | 27.3 | 4.6 | - | 6.22 | - |
| Inertia | | $10^{-3}$kg.m² | 216 | | 433 | | 649 | | 865 | | 1296 | - | 1944 | - |
| Weight | | kg | 27.4 | | 43 | | 58 | | 73 | | 103 | - | 148 | - |
| Thermal time constant | (1) | s | 1036 | | 1593 | | 2153 | | 2710 | | 3830 | - | 4670 | - |
| Thermal resistance | (1) | °C / W | 0.084 | | 0.078 | | 0.072 | | 0.068 | | 0.059 | - | 0.05 | - |
| Phase resistance at 20°C | (2) | Ω | 5.66 | 0.218 | 3.46 | 0.086 | 1.83 | 0.046 | 1.44 | 0.038 | 0.927 | - | 0.665 | - |
| Phase inductance at I continuous | | mH | 26.2 | 1 | 25.3 | 0.63 | 17 | 0.42 | 15.1 | 0.4 | 11.5 | - | 9.2 | - |
| Electrical time constant | (2) | ms | 4.6 | | 7.3 | | 9.3 | | 10.5 | | 12.4 | - | 13.8 | - |
| Back emf constant (line to line) | (2) | V/rad.s | 18.91 | 3.69 | 26.23 | 4.15 | 26.28 | 4.15 | 28.59 | 4.61 | 30.43 | - | 33.2 | - |
| Power cable square section | (7) | nxmm² | 4x1.5 | 4x6 | 4x1.5 | 4x10 | 4x1.5 | 4x16 | 4x1.5 | 4x16 | 4x2.5 | - | 4x4 | - |
| Power cable diameter | (7) | mm | Ø8.6 | Ø14 | Ø8.6 | 4x Ø9.5 | Ø8.6 | 4xØ11 | Ø8.6 | 4xØ11 | Ø10.8 | - | Ø12.2 | - |
| Number of poles | | | 36 | | | | | | | | | | | |

**COMPLEMENTARY DATA FOR FLUID-COOLED MOTORS WINDING AT 60°C**

| | | | 500STK1M | | 500STK2M | | 500STK3M | | 500STK4M | | 500STK6M | | 500STK9M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Continuous torque at stall | (4) | N.m | 285 | | 588 | | 831 | | 1122 | | 1731 | - | 2530 | - |
| Current at continuous torque | | A | 9.9 | 50.7 | 14.8 | 93.7 | 20.7 | 131 | 25.9 | 160.6 | 37.3 | - | 50 | - |
| Fluid input temperature | (5)(6) | °C | 20 | | 20 | | 20 | | 20 | | 20 | - | 20 | - |
| Fluid temperature rise | | °C | 6 | | 6 | | 6 | | 5 | | 6 | - | 8 | - |
| Housing temperature | | °C | < 30 | | < 30 | | < 30 | | < 30 | | < 30 | - | < 30 | - |
| Fluid flow | | l / mn | 5 | | 8 | | 9 | | 12 | | 14 | - | 14 | - |
| Losses | | W | 2090 | | 2790 | | 2970 | | 3570 | | 4870 | - | 6190 | - |
| Pressure drop | | Bar | 0.1 | | 0.4 | | 0.3 | | 0.4 | | 0.4 | - | 0.6 | - |
| Power cable square section | (7) | nxmm² | 4x1.5 | 4x10 | 4x1.5 | 4x16 | 4x2.5 | 4x35 | 4x4 | 4x50 | 4x6 | - | 4x10 | - |
| Power cable diameter | (7) | mm | Ø8.6 | Ø17.6 | Ø8.6 | 4xØ11 | Ø10.8 | 4xØ15 | Ø12.2 | 4xØ17 | Ø14 | - | Ø17.6 | - |

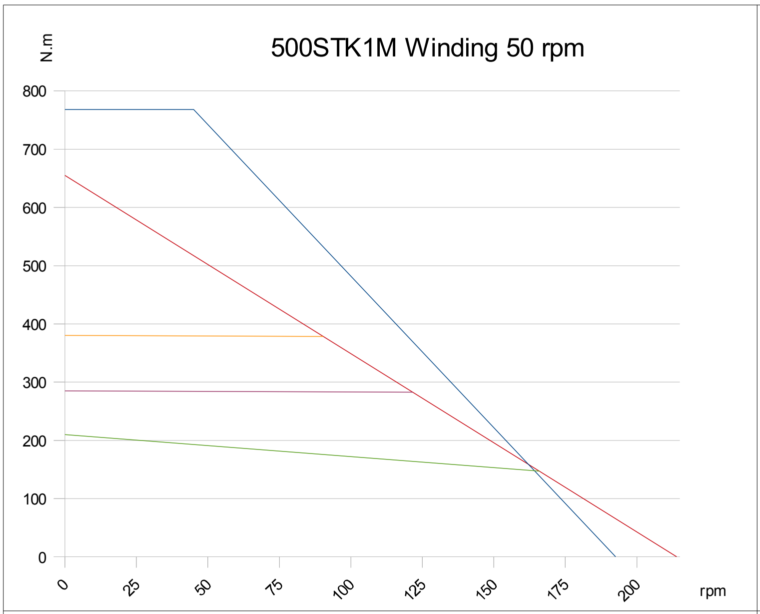
**COMPLEMENTARY DATA FOR FLUID-COOLED MOTORS WINDING AT 140°C**

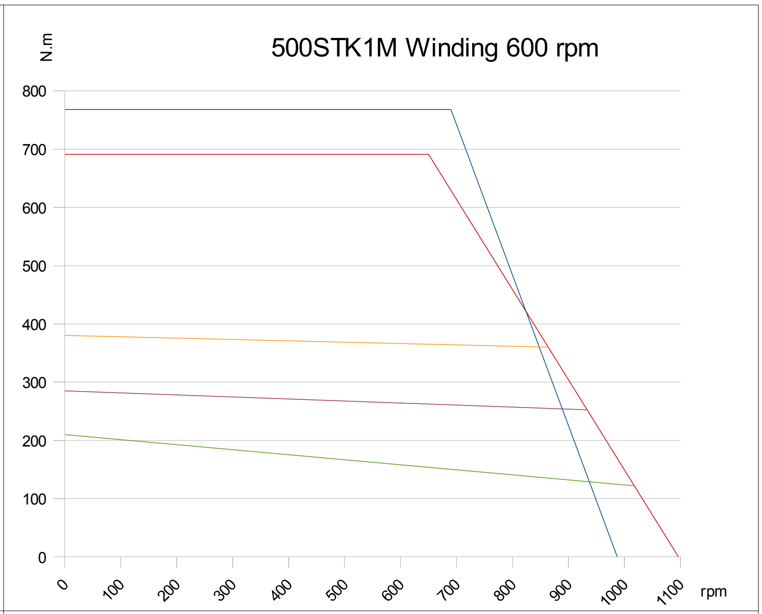
| | | | 500STK1M | | 500STK2M | | 500STK3M | | 500STK4M | | 500STK6M | | 500STK9M | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Continuous torque at stall | (4) | N.m | 380 | | 785 | | 1180 | | 1550 | | 2394 | - | 3590 | - |
| Current at continuous torque | | A | 13.5 | 69.2 | 20.3 | 130 | 30.7 | 194 | 37.2 | 230.5 | 54 | - | 73.4 | - |
| Fluid input temperature | (5)(6) | °C | 20 | | 20 | | 20 | | 20 | | 20 | - | 20 | - |
| Fluid temperature rise | | °C | 6 | | 6 | | 6 | | 6 | | 6 | - | 8 | - |
| Housing temperature | | °C | 25 | | 25 | | 25 | | < 25 | | 25 | - | < 30 | - |
| Fluid flow | | l / mn | 14 | | 18 | | 23 | | 25 | | 35 | - | 35 | - |
| Losses | | W | 4620 | | 6260 | | 7760 | | 8770 | | 12160 | - | 15890 | - |
| Pressure drop | | Bar | 0.4 | | 1.8 | | 1.3 | | 1.6 | | 2 | - | 3 | - |
| Power cable square section | (7) | nxmm² | 4x1.5 | 4x10 | 4x2.5 | 4x35 | 4x6 | 4x50 | 4x6 | 4x70 | 4x10 | - | 4x16 | - |
| Power cable diameter | (7) | mm | Ø8.6 | 4x Ø9.5 | Ø10.8 | 4xØ15 | Ø14 | 4xØ17 | Ø14 | 4x Ø20 | 4xØ9.5 | - | 4xØ11 | - |

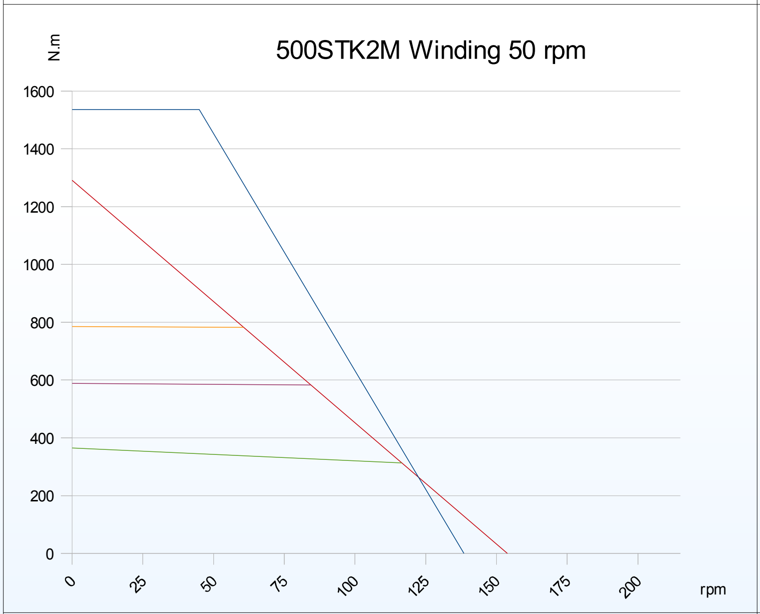
(1) Thermal conditions:
Ambient temperature 20°C
Winding temperature rise 120°C
Stator housing in contact with the ambient air or integral on all its peripheral area with a metallic armature in contact with the ambient air.
Stator housing secured on a metallic frame having an area equal to twice the cross section of the housing.
(2) Cold motor at 20°C.
(3) See torque vs speed characteristics on :
http://www.alxion.com/
(4) Torque at stall or low speed.
(5) Fluid input temperature should not be lower for avoiding condensation inside the motor.
(6) For cooling fluid, use softened gycol-added water or fluids approved for closed cooling circuits.
(7) For curents lower than 53 Amps, one shielded cable
For curents over 53 Amps, four single shielded wires output (highlighted in the table)

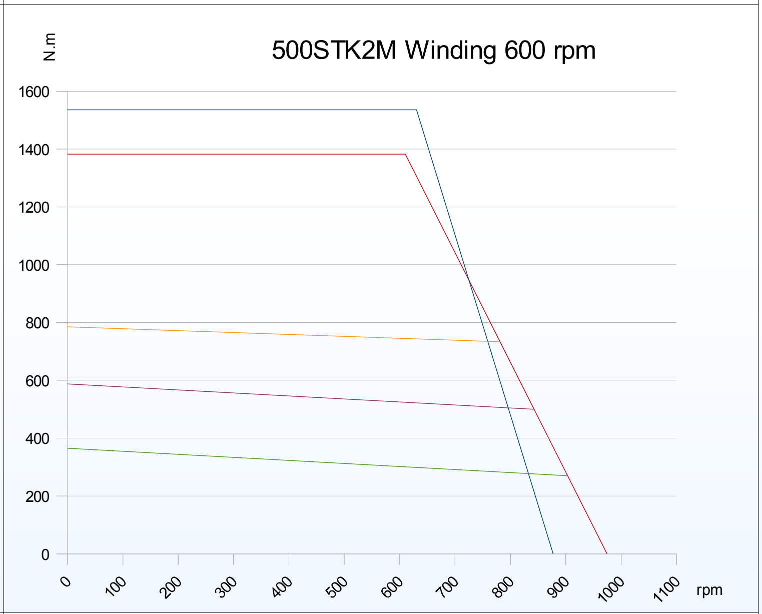
Other speed characteristics are available, please contact us.

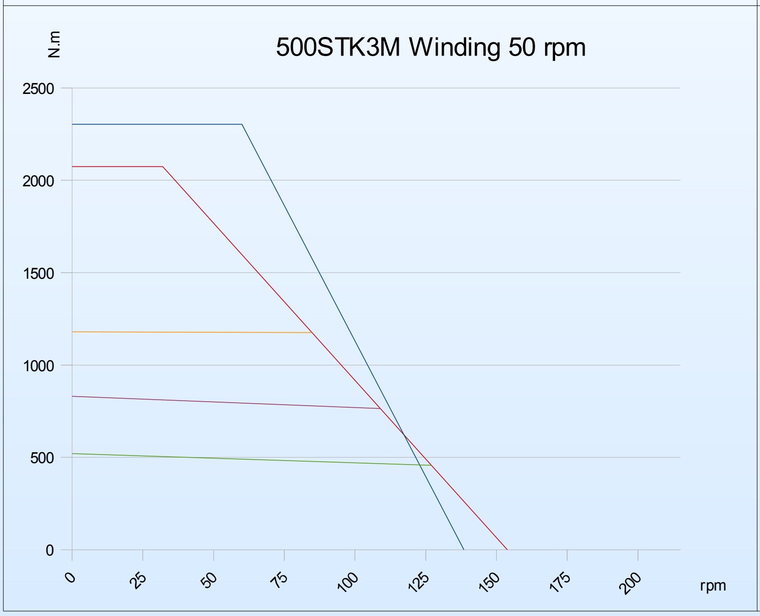
# TORQUE VS SPEED CURVES   MOTORS 500STK

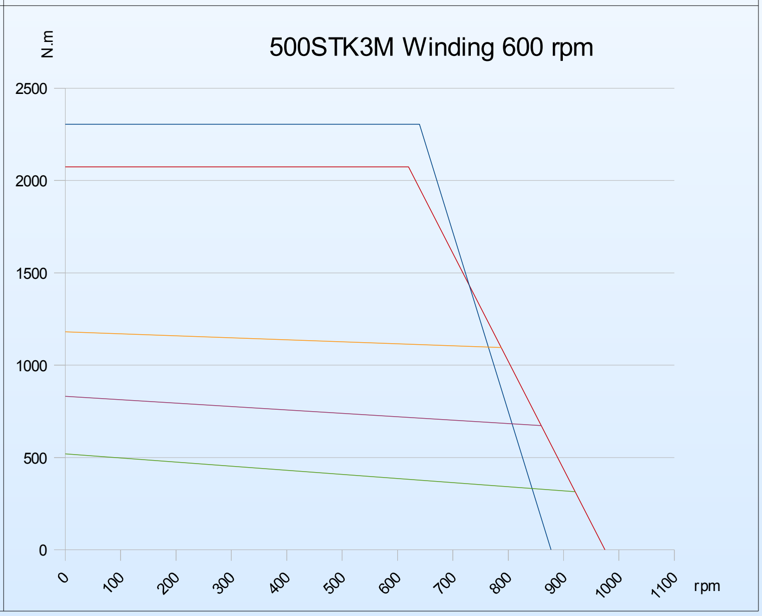


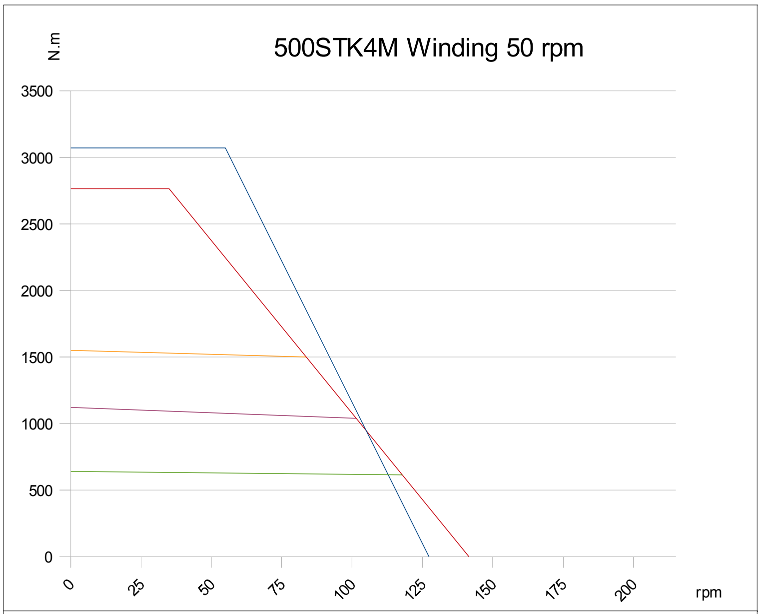



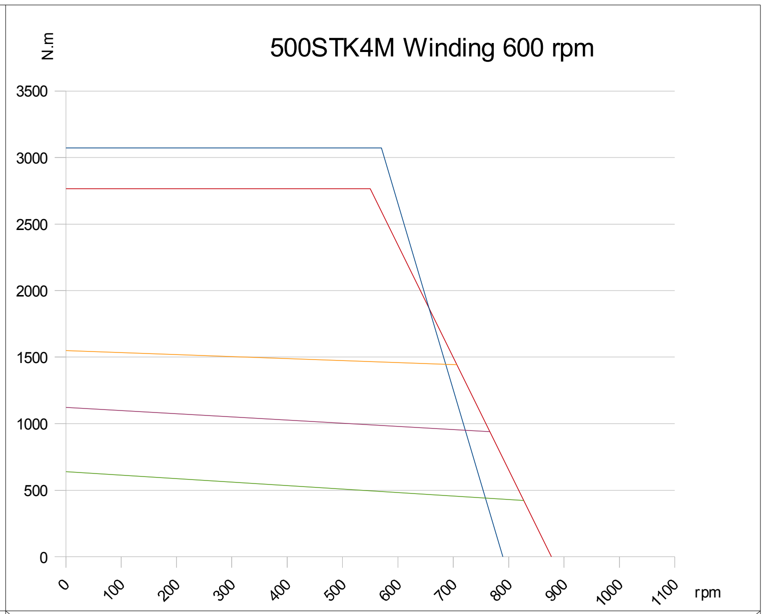



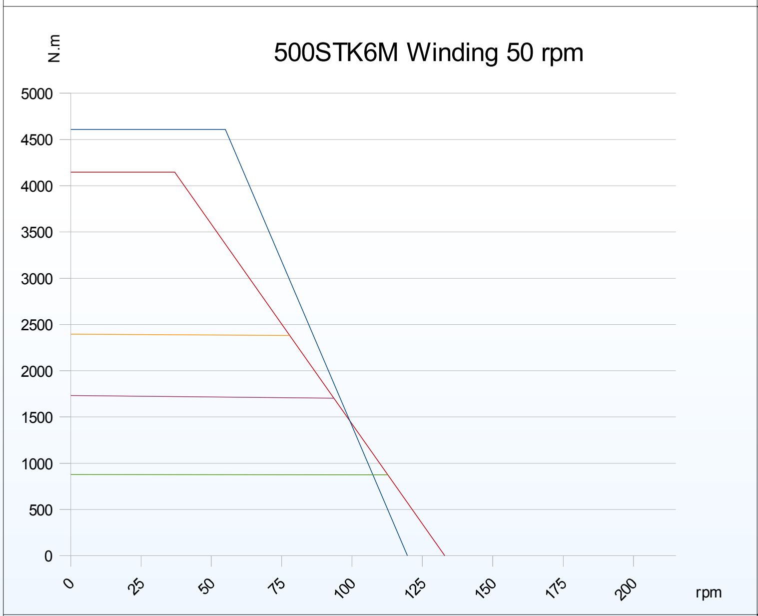

- Continuous torque with natural convection
- Continuous torque liquid cooled winding at 60°C
- Continuous torque liquid cooled winding at 140°C
- Max. transient characteristics motor at 20°C 400VAC mains / 540VDC bus with flux vector control
- Max. transient characteristics motor at rated temp 400VAC mains / 540VDC bus with flux vector control

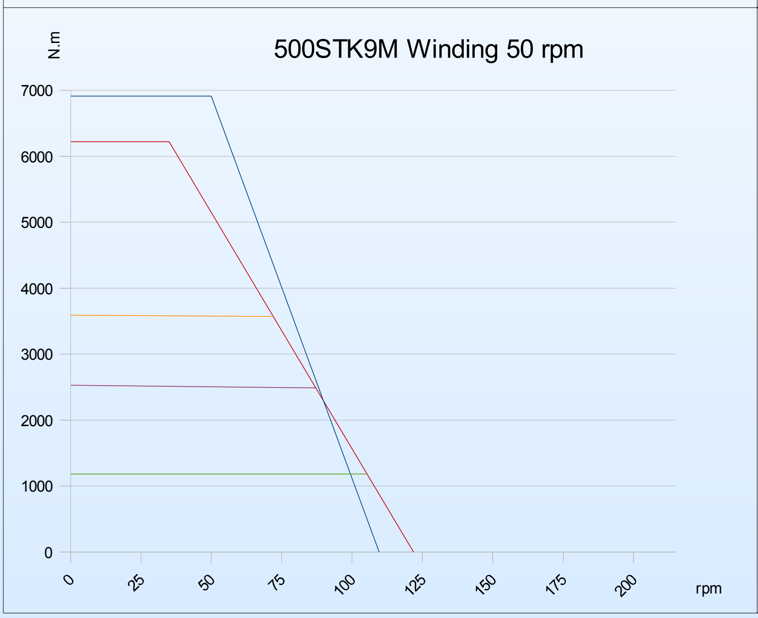
Other windings can be supplied for matching your needs ; please contact us.

# TORQUE VS SPEED CURVES   MOTORS 500STK




- Continuous torque with natural convection
- Continuous torque liquid cooled winding at 60°C
- Continuous torque liquid cooled winding at 140°C
- Max. transient characteristics motor at 20°C 400VAC mains / 540VDC bus with flux vector control
- Max. transient characteristics motor at rated temp 400VAC mains / 540VDC bus with flux vector control

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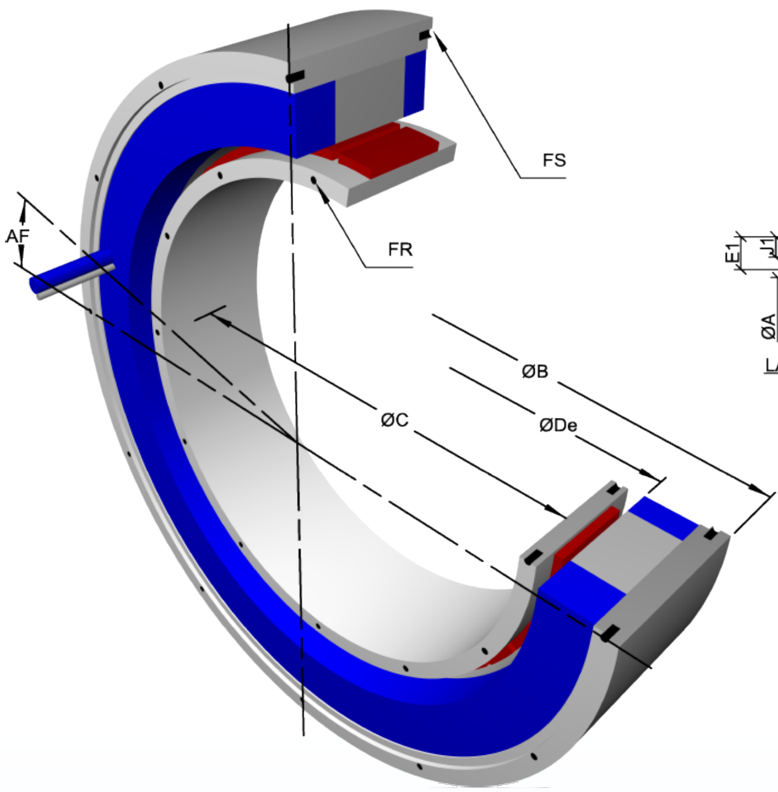
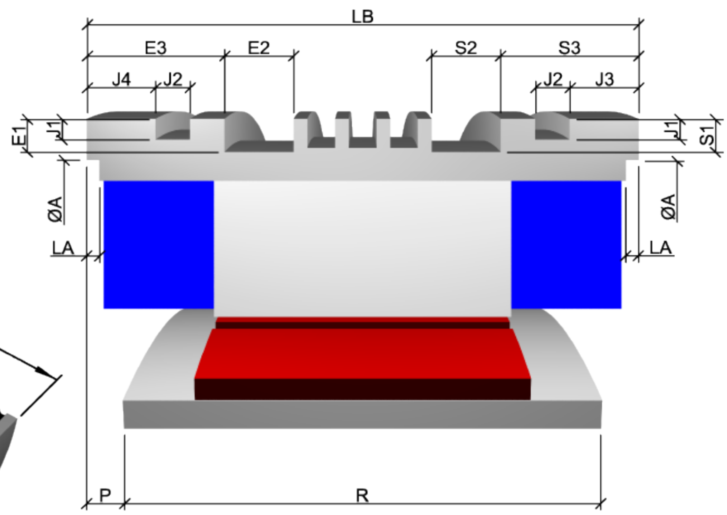
# MOTORS 800 STK

*Natural convection*




*Fluid cooling*




| DIMENSIONS FOR ALL 800 STK | | |
|---|---|---|
| Housing internal centering diameter | A H8 | 762 |
| Angle wire output / tapped holes | AF | 11.25° |
| Housing external centering diameter (fluid cooling) | B f8 | 795 |
| Housing external centering diameter (natural convection) | B f8 | 795 |
| Rotoric internal centering diameter | C H7 | 630 |
| Housing internal diameter | De | 689 |
| Depth of fluid front input / output groove | E1 | 8 |
| Width of fluid front input / output groove | E2 | 15.5 |
| Position of fluid front I/O groove | E3 | 28 (68) |
| Rotoric fixation holes | FR | 16xM8 sur Ø645 |
| Housing fixation holes | FS | 16xM8 sur Ø774 |
| O-ring groove depth | J1 | 4.9 |
| O-ring groove width | J2 | 7.4 |
| Position of rear o-ring groove | J3 | 13.7 |
| Position of front o-ring groove | J4 | 15.7 (55.7) |
| Depth of housing internal centering diameter | LA | 5 |
| Alignment rotor / housing | P ± 0.2 | 47 (87) |
| Maximum rotoric contact diameter | Pmax | 666 |
| Depth of fluid rear I/O groove | S1 | 8 |
| Width of fluid rear I/O groove | S2 | 15.5 |
| Position of fluid rear I/O groove | S3 | 26 |

| DIMENSIONS ACCORDING TO SIZE | | 800STK1M | 800STK2M | 800STK4M | 800STK6M |
|---|---|---|---|---|---|
| Housing length | LB±0.15 | 112.5 (152.5) | 140 (180) | 195 (235) | 250 (290) |
| Rotor length | R +0.15 | 27.5 | 55 | 110 | 165 |

The dimensions in red in the table are valid in the case of a rated current greater than 53 A and class 6 shielded cable output

We also offer the possibility of not shielded output wires without need of stator length increase.

**INTEGRATION:**

- ✓ The cables are made of PU, class 6, foreseen for cable-bearing chains, 2 mt standard length, copper square section according rated current.
- ✓ Rotor / housing alignment (P) has to be executed within +/- 0.2 mm. Optionally, we can supply a mounting tool for achieving that alignment in case of assembly without possibility of accurate alignment.
- ✓ Thermal devices cable consists of 2 shielded pairs 2x2x0.25mm² section, 7 mm max external diameter.
- ✓ (De) represents: 1- The maximum diameter passing inside the housing.
  2- The minimum diameter necessary for rotor assembly.
- ✓ (Pmax) diameter for pieces in contact with the rotor must never be exceeded.
- ✓ Tapped holes on each side of rotor and housing are angularly aligned.
- ✓ Cable positioning (AF) is theoretical. Leave a free room with a +/- 5 arc degrees tolerance around that position, on a 50 mm height from the housing side, for avoiding to stress the cables at the motor output.
  Do not tighten, twist or bend the power cable on the first 50 mm from motor side. Clamp the power cable after those 50 mm.
- ✓ When designing the assembly, take care to insure a perfect contact between housing and user's bore for avoiding thermal problems.
- ✓ For housing mounting, use either external centering diameter (B) or internal centering diameters (A).
- ✓ For execution tolerances (perpendicularity, concentricity...), please consult us.
- ✓ Fluid input and output pipes have to be placed at the opposite of wire outputs on the same axial plane.
- ✓ O-ring grooves designed for 6 mm diameter o-rings.

A full integration handbook can be supplied to our customers upon request
For further information or specific request about our motors, feel free to contact us.

# TECHNICAL CHARACTERISTICS

## Windings for 400V / 460Vac drives (See Application note)

NATURAL CONVECTION

| | | | 800STK1M | | 800STK2M | | 800STK4M | | 800STK6M | |
|---|---|---|---|---|---|---|---|---|---|---|
| Rated speed | | rpm | 30 | 250 | 30 | 250 | 30 | 250 | 30 | - |
| Continuous torque at stall | (1)(4) | N.m | 610 | | 1127 | | 2010 | | 2708 | - |
| Current at continuous torque | (1) | A | 13.9 | 43.2 | 19 | 65.6 | 26.5 | 106 | 33.5 | - |
| Peak torque | (2)(3) | N.m | 1885 | | 3770 | | 7540 | | 11310 | - |
| Current at peak torque | (2) | A | 50.8 | 158 | 74.9 | 258.6 | 118.5 | 474.2 | 167.4 | - |
| Rated power | (1) | kW | 1.92 | 15.01 | 3.5 | 22.6 | 6.3 | 33.1 | 8.53 | - |
| Inertia | | $10^{-3}$kg.m² | 1270 | | 2540 | | 5080 | | 7620 | - |
| Weight | | kg | 55 | | 82 | | 138 | | 193 | - |
| Thermal time constant | (1) | s | 444 | | 685 | | 1166 | | 1656 | - |
| Thermal resistance | (1) | °C / W | 0.035 | | 0.033 | | 0.03 | | 0.028 | - |
| Phase resistance at 20°C | (2) | Ω | 3.16 | 0.326 | 1.66 | 0.139 | 0.95 | 0.06 | 0.585 | - |
| Phase inductance at I continuous | | mH | 15.4 | 1.6 | 14.2 | 1.2 | 11.3 | 0.7 | 8.6 | - |
| Electrical time constant | (2) | ms | 4.9 | | 8.5 | | 11.9 | | 14.7 | - |
| Back emf constant (line to line) | (2) | V/rad.s | 28.6 | 9.2 | 38.9 | 11.2 | 48.94 | 12.3 | 52.1 | - |
| Power cable square section | (7) | nxmm² | 4x1.5 | 4x10 | 4x2.5 | 4x10 | 4x4 | 4x25 | 4x6 | - |
| Power cable diameter | (7) | mm | Ø8.6 | Ø17.6 | Ø10.8 | 4xØ9.5 | Ø12.2 | 4xØ13 | Ø14 | - |
| Number of poles | | | 48 | | | | | | | |

COMPLEMENTARY DATA FOR FLUID-COOLED MOTORS WINDING AT 60°C

| | | | 800STK1M | | 800STK2M | | 800STK4M | | 800STK6M | |
|---|---|---|---|---|---|---|---|---|---|---|
| Continuous torque at stall | (4) | N.m | 803 | | 1580 | | 3160 | | 4720 | - |
| Current at continuous torque | | A | 18.2 | 53.6 | 26.3 | 90.9 | 41.5 | 166 | 58.5 | - |
| Fluid input temperature | (5)(6) | °C | 20 | | 20 | | 20 | | 20 | - |
| Fluid temperature rise | | °C | 10 | | 10 | | 10 | | 10 | - |
| Housing temperature | | °C | 32 | | 30 | | < 30 | | < 30 | - |
| Fluid flow | | l / mn | 7 | | 8 | | 11 | | 15 | - |
| Losses | | W | 3710 | | 4110 | | 5830 | | 7400 | - |
| Pressure drop | | Bar | < 0.1 | | 0.1 | | 0.3 | | 0.7 | - |
| Power cable square section | (7) | nxmm² | 4x2.5 | 4x10 | 4x4 | 4x16 | 4x10 | 4x50 | 4x10 | - |
| Power cable diameter | (7) | mm | Ø10.8 | 4xØ9.5 | Ø12.2 | 4xØ11 | Ø17.6 | 4xØ17 | 4xØ9.5 | - |

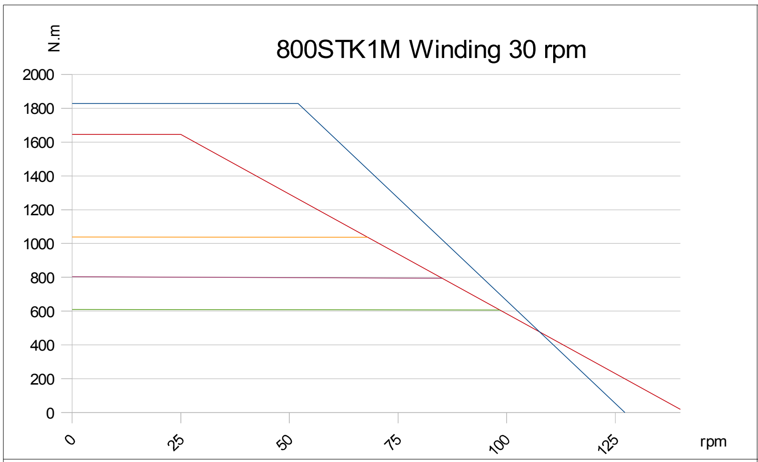
COMPLEMENTARY DATA FOR FLUID-COOLED MOTORS WINDING AT 140°C

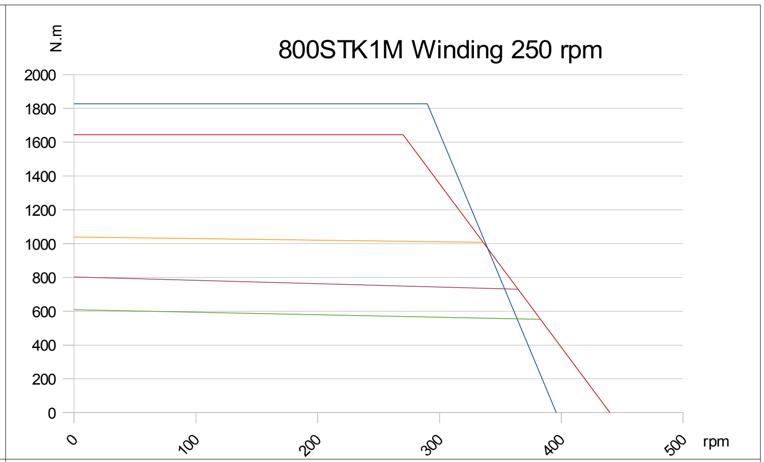
| | | | 800STK1M | | 800STK2M | | 800STK4M | | 800STK6M | |
|---|---|---|---|---|---|---|---|---|---|---|
| Continuous torque at stall | (4) | N.m | 1039 | | 2057 | | 4100 | | 6100 | - |
| Current at continuous torque | | A | 24 | 74.7 | 35.2 | 121.6 | 55.5 | 222 | 77.4 | - |
| Fluid input temperature | (5)(6) | °C | 20 | | 20 | | 20 | | 20 | - |
| Fluid temperature rise | | °C | 10 | | 10 | | 10 | | 10 | - |
| Housing temperature | | °C | 31 | | < 30 | | < 30 | | < 30 | - |
| Fluid flow | | l / mn | 14 | | 16 | | 23 | | 29 | - |
| Losses | | W | 7940 | | 9060 | | 12830 | | 15850 | - |
| Pressure drop | | Bar | 0.2 | | 0.3 | | 1.2 | | 2.1 | - |
| Power cable square section | (7) | nxmm² | 4x4 | 4x16 | 4x6 | 4x25 | 4x10 | 4x70 | 4x16 | - |
| Power cable diameter | (7) | mm | Ø12.2 | 4xØ11 | Ø14 | 4xØ13 | 4xØ9.5 | 4xØ20 | 4xØ11 | - |

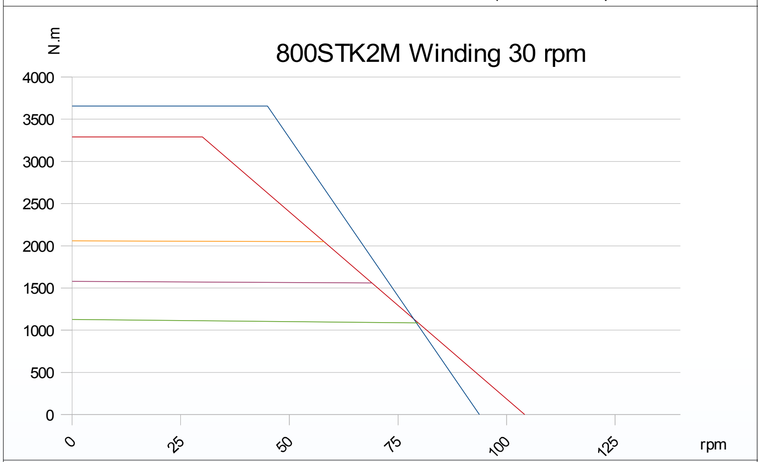
(1) Thermal conditions:
Ambient temperature 20°C
Winding temperature rise 120°C
Stator housing in contact with the ambient air or integral on all its peripheral area with a metallic armature in contact with the ambient air.
Stator housing secured on a metallic frame having an area equal to twice the cross section of the housing.
(2) Cold motor at 20°C.
(3) See torque vs speed characteristics on :
http://www.alxion.com/
(4) Torque at stall or low speed.
(5) Fluid input temperature should not be lower for avoiding condensation inside the motor.
(6) For cooling fluid, use softened gycol-added water or fluids approved for closed cooling circuits.
(7) For curents lower than 53 Amps, one shielded cable
For curents over 53 Amps, four single shielded wires output (highlighted in the table)

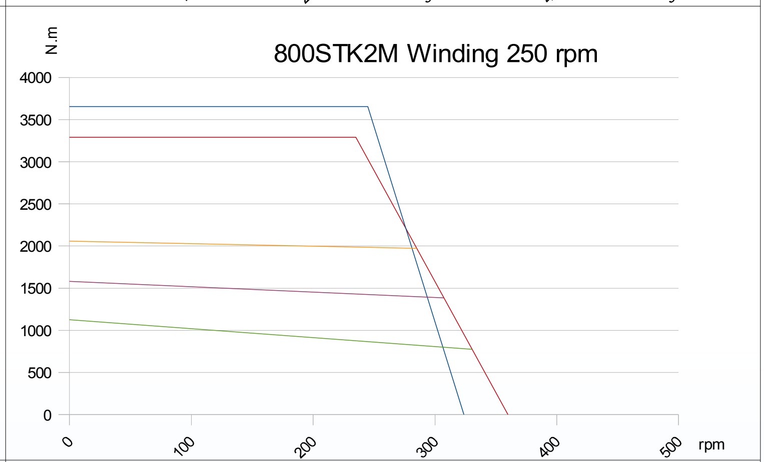
Other speed characteristics are available, please contact us.

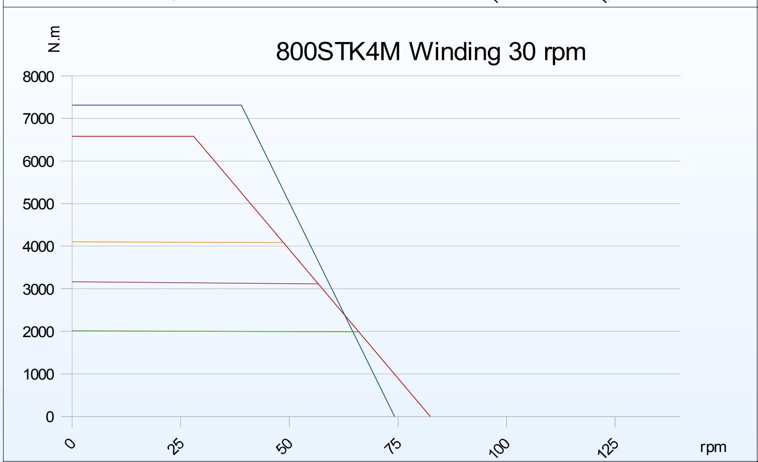
# TORQUE VS SPEED CURVES   MOTORS 800STK

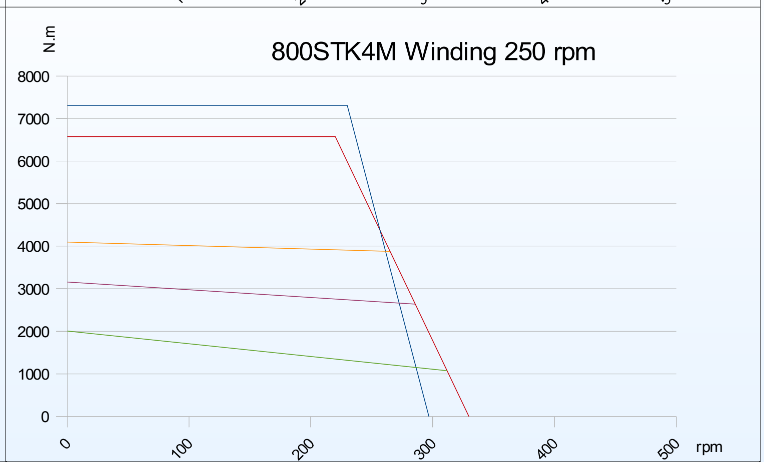


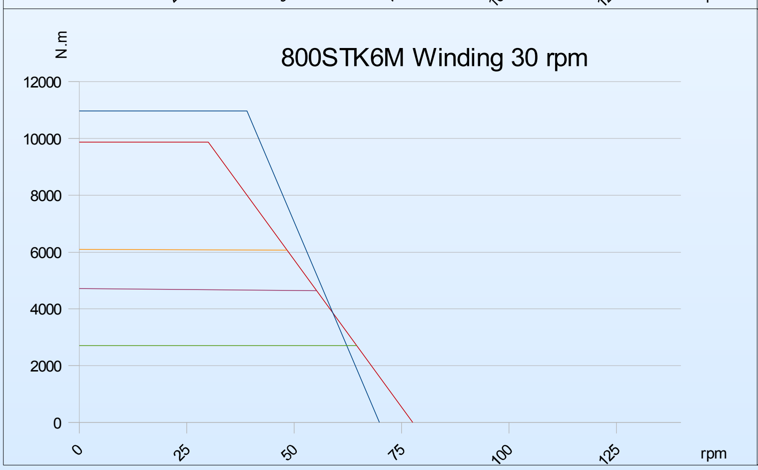



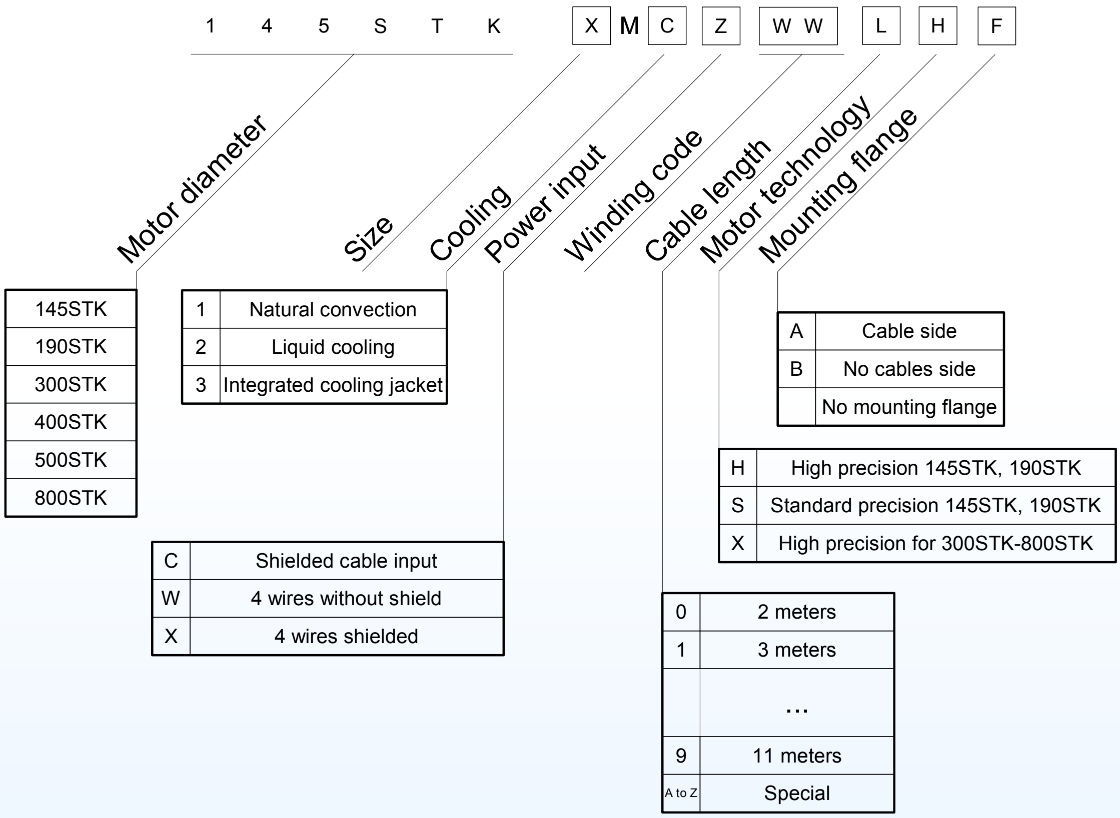




- Continuous torque with natural convection
- Continuous torque liquid cooled winding at 60°C
- Continuous torque liquid cooled winding at 140°C
- Max. transient characteristics motor at 20°C 400VAC mains / 540VDC bus with flux vector control
- Max. transient characteristics motor at rated temp 400VAC mains / 540VDC bus with flux vector control

Other windings can be supplied for matching your needs ; please contact us.

# CODIFICATION FOR STK MOTORS




| |
|---|
| 145STK |
| 190STK |
| 300STK |
| 400STK |
| 500STK |
| 800STK |

| | |
|---|---|
| 1 | Natural convection |
| 2 | Liquid cooling |
| 3 | Integrated cooling jacket |

| | |
|---|---|
| C | Shielded cable input |
| W | 4 wires without shield |
| X | 4 wires shielded |

| | |
|---|---|
| A | Cable side |
| B | No cables side |
| | No mounting flange |

| | |
|---|---|
| H | High precision 145STK, 190STK |
| S | Standard precision 145STK, 190STK |
| X | High precision for 300STK-800STK |

| | |
|---|---|
| 0 | 2 meters |
| 1 | 3 meters |
| | … |
| 9 | 11 meters |
| A to Z | Special |

C: Cooling:
- 1: Natural convection:
  Motor housing without cooling grooves
- 2: Liquid cooling:
  Motor housing with cooling grooves
- 3: Integrated cooling jacket:
  Motor with integrated cooling jacket (see table for dimensions)

W: Winding code:
- 01: Low speed in table of characteristics
- 02: High speed in table of characteristics
- XX: Special windings, contact us

H: Motor technology:
- H: High precision technology ; cogging <1% of rated torque in natural convection (145STK-190STK)
- S: Standard precision technology ; cogging ≤2% of rated torque in natural convection (145STK-190STK)
- X: High precision technology ; cogging <2% of rated torque in natural convection (300STK-800STK)

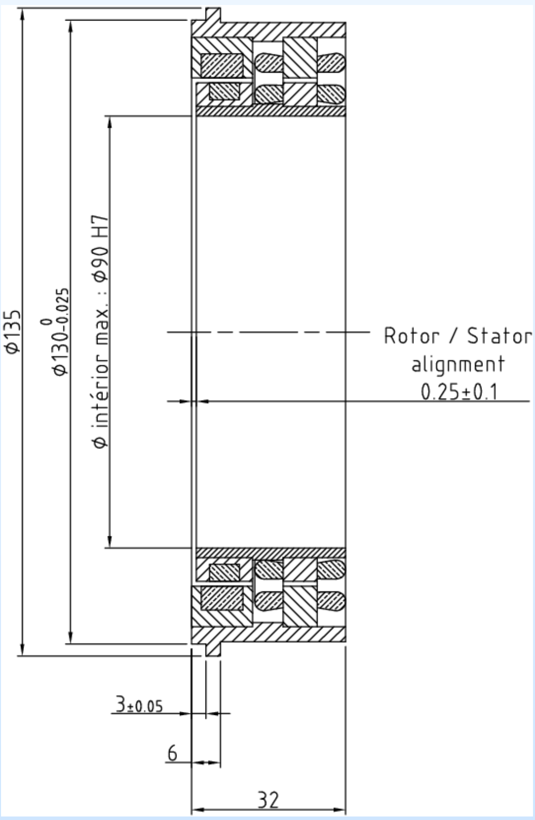
L: Cable length:
- 0 to 9 : Length since side of the motor
- A to Z : Length and/or specific square section

# *High accuracy resolver **ALXION** RES FC (up to +/- 1 arc min) with high internal diameter (90 mm)*


Based on the need for a maximal accuracy of the servomechanism, the resolvers developed by **ALXION** are adapted to the Motors for Direct Drive of its FC Range and ST Range and can be used advantageously in axis using STK motors. They represent a further necessary step towards the exploitation of the direct drive technology.

| | RES FC 6-72-32-90 | RES FC 6-72-32-90-50 | RES FC 1-72-32-90 |
|---|---|---|---|
| Number of poles | 12 | 12 | 2 |
| Mechanical accuracy | ±1 arc min | ±1 arc min | ±50 arc min |
| Internal diameter | Ø90mm | Ø90mm | Ø90mm |
| Rated supply voltage | 7V | 7V | 7V |
| Frequency | 10 kHz | 10 kHz | 10 kHz |
| Transformation ratio | 0.23 | 0.50 | 0.165 |
| Input impedance | Zro = 77 + j177 | Zro = 77 + j177 | Zro = 131 + j 198 |
| Output impedance | Zss = 118 + j 258 | Zss = 369 + j869 | Zss = 311 + j 431 |
| Phase shift | 7° | 7° | 5° |
| Noise at null coupling | < 3 / 1000 | < 3 / 1000 | < 3 / 1000 |

## DIMENSIONS




| Color | Signal |
|---|---|
| Yellow | Sin+ |
| Blue | Sin- |
| Red | Cos+ |
| Black | Cos- |
| Red / White | +Vref |
| Black / White | 0 |

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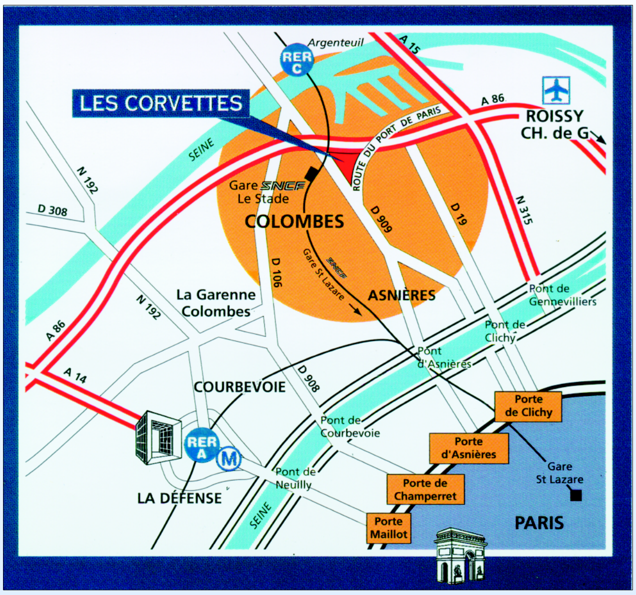


**ALXION**
Automatique
& Productique

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