

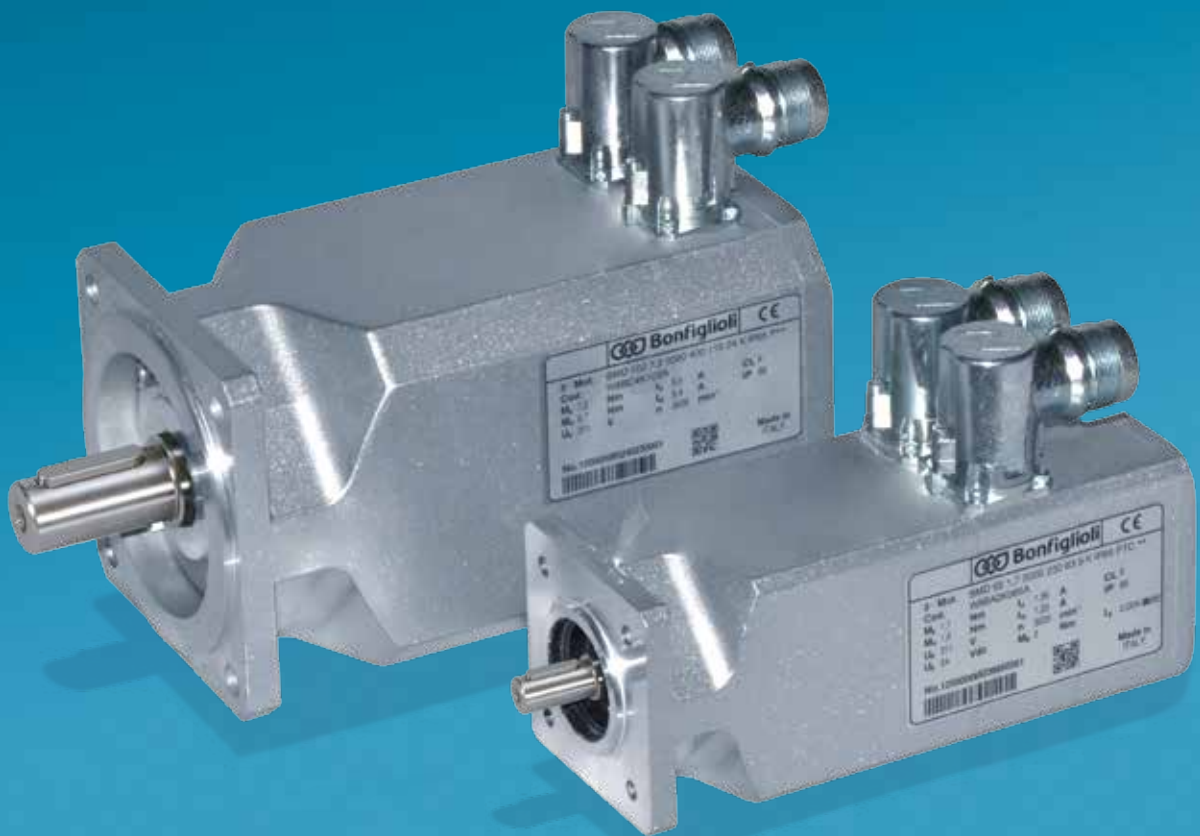


# Bonfiglioli

## Riduttori

### BMD

Permanent Magnet AC  
Synchronous Motors



# Bonfiglioli

power, control and green solutions

# Power, control and green solutions



## Bonfiglioli, one name for a large international group.

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It was back in 1956 that Clementino Bonfiglioli established in Bologna, Italy, the company that still bears his name. Now, some fifty years later, the same enthusiasm and dedication is driving Bonfiglioli to become the world's top name in power transmission and control solutions. Through directly controlled subsidiaries and production plants around the world, Bonfiglioli designs, manufactures and distributes a complete range of gearmotors, drive systems and planetary gearboxes, and boasts the most integrated offering on the market today.

Now, to emphasise its commitment to health, safety and environmental sustainability, Bonfiglioli is adding the term "green" to the description of its offering.

This commitment can be seen too in the Group's new trademark, made up of three shapes and colours identifying Bonfiglioli's three main business areas - Power, Control & Green Solutions and symbolising a set of values that includes openness and respect for other cultures.

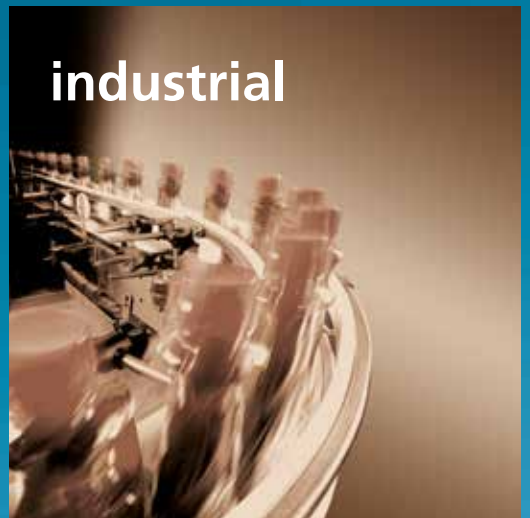
In a market in which excellent product quality alone is no longer sufficient, Bonfiglioli also provides experience, know-how, an extensive sales network, excellent pre-sales and after-sales service and modern communication tools and systems to create high level solutions for industry, mobile machinery and renewable energy.

# Bonfiglioli solutions

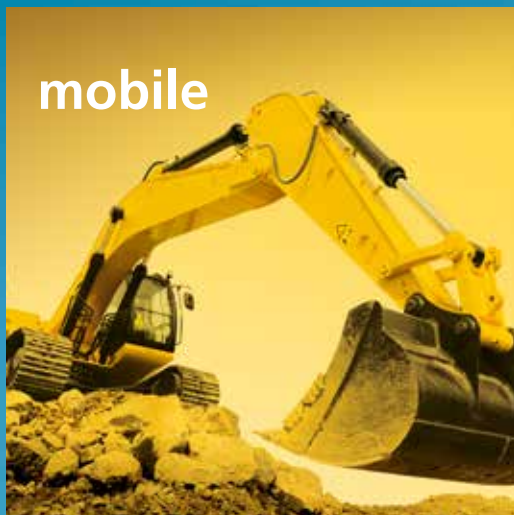
wind



industrial



mobile



photovoltaic



## Innovative solutions for industrial field.

Bonfiglioli Riduttori today is one of the top brands in the power transmission industry. The company's success is the result of a business strategy that relies on three fundamental factors: know-how, innovation and quality. The complete range of Bonfiglioli brand gearmotors offers excellent technical characteristics and guarantees the highest performance. Substantial investment and technical expertise have enabled the company to achieve an annual production output of 1600000 units using completely automated processes. Certification of the company's Quality System by TÜV is proof of the high quality standards achieved. With the acquisition of the Vectron brand, Bonfiglioli is now established as leader of the industrial automation sector.

Bonfiglioli offers excellent and integrated solutions for power transmission and control. We design, manufacture and distribute a complete range of motors, gearmotors, drive systems and planetary gearboxes. Our solutions are used in a vast range of applications all over the world, in industry, mobile machinery and automation, to improve the quality of life and work on a daily basis.

Over the last several years, automation industry has undergone significant development. The constant demand for higher performance in an area where mechanical and electronic sectors work in synergy to achieve reliability, performance, cost-effectiveness and ease of installation, has prompted Bonfiglioli Riduttori to develop an integrated product in which the mechanical speed reducer, brushless motor and electronic frequency converter coexist in a single compact unit.

Bonfiglioli Vectron delivers products and services for completely integrated inverter solutions. These solutions complement Bonfiglioli's power transmission and control offering to the industrial sector.

Since 1976, Bonfiglioli Trasmital's know-how in the power transmission industry has focused on special applications offering 100% reliability in the manufacturing of gearmotors for mobile machinery. This includes the full range of slew and wheel drive applications and gearboxes for wind turbine pitch and yaw drive systems. Today Bonfiglioli Trasmital stands at the forefront of the industry as a key partner to top manufacturers worldwide.





## Advanced technologies for all industrial fields.

These permanent magnet AC synchronous servomotors are ideal for any type of automatic machinery in particular applications with high dynamic requirements. They are particularly suited to typical applications in plastic and metal machining, packaging, food and beverage processing, winding and textile industries.

They are manufactured using the "salient pole" technology. The dimensions of the motor are drastically reduced, with considerable advantages in terms of torque density, overall dimensions and dynamic performance.

Thanks to the high quality and of the neodymium iron boron rare-earth magnets performance are maximized in terms of very high accelerations and withstand high overloads without risk of demagnetization of the magnets.

The motors are available in six frames covering a stall torque range between 1.7 ÷ 45 Nm.

These brushless sinusoidal motors are designed for a three phase power supply, 230Vac and 400Vac.

BMD motor series are manufactured using class F insulation materials, cooling method IC410 (free ventilation).

Since each servomotor has a protective temperature sensor (PTC or KTY) integrated in the motor windings, operating temperature is constantly acquired and monitored by the drive to prevent all risk of damage to the motor irrespective of operating conditions.

An optional electromechanical holding brake is available for all models. Brake operation is controlled entirely by the frequency inverter.

The following feedback devices are available:

- Resolver with excitation frequency 8 and 10 kHz
- Single turn and Multi-turn: Hiperface and EnDAT protocols supported
- Sensorless versions (specific control algorithms with sensorless servo drive are required).

BMD Series servomotors is controlled in speed and/or torque by a suitable electronic servo drive. The servo drive therefore constitutes an integral part of the actuator and requires perfect synchronization with it in order to achieve optimum performance.

The combination of BMD servomotors with frequency inverters from Bonfiglioli Vectron's Active Cube series guarantees excellent synergy by optimizing the mathematical model of the motor in the drive using a self-learning function assisted by the frequency inverter's own configuration software. For further information on frequency inverters, refer to the Bonfiglioli Vectron Active Cube catalogues and manuals.

BMD motors are optionally available with an internal additional flywheel mass. These motors combine high torques and precision in a compact design, and further provide excellent control characteristic with high external masses having an excellent match for equipment requiring "higher" inertial matching for the machine.

BMD series is available with degree of protection IP65 (standard) and IP67 (optional).

The housing is painted (RAL 9005, black).

BMD motors are designed for use as part of a machine and should only be installed after a thorough check on compatibility with other devices.

Always bear in mind that synchronous servomotors are designed for use by expert mechatronic technicians.



# Sensorless servo drive

Bonfiglioli Agile drive matches with Permanent Magnet AC synchronous motor technology by featuring a sensorless control of these motors without feedback. Standard applications that are sensitive to dimensions and energy saving will first benefit from Permanent Magnet AC synchronous motors sensorless driven by Agile.

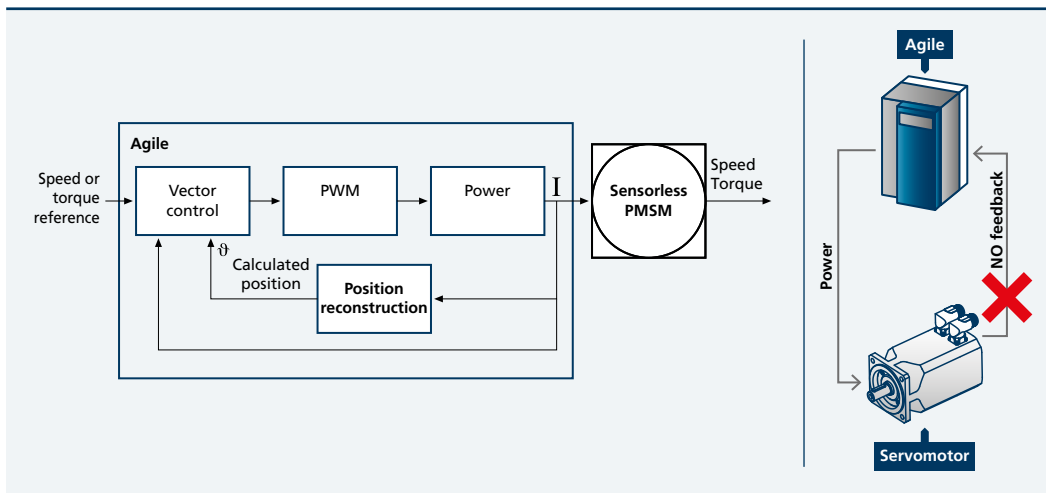
### Sensorless Servo Drive is expected to be a competitive “package”.

In brushless motor control, the exact angular position of the rotor must be known at all times for the drive to commutate the inverter phases. The conventional method for tracking rotor position is to incorporate an encoder or resolver inside the servomotor to provide the drive with the necessary electrical signals. This however, requires extra cabling, devices and controls. Thanks to innovative technology, Bonfiglioli Agile drives can control brushless servomotors without the need of sensors, eliminating the cost of superfluous components, wiring, devices and controls. Bonfiglioli Agile drives use efficient algorithms to

estimate the instantaneous angular position of the motor shaft from measurements of the current absorbed by the motor. By combining analytic techniques to reconstruct the electrical status of the motor and functional analyses of its magnetic circuit, Bonfiglioli Agile drives provide effective speed and torque vector control.

There are several benefits to eliminate electromechanical position sensors:

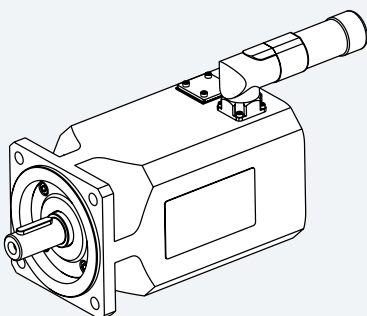
- Energy savings and compactness when compared to conventional solutions based on induction motors
- Wide Constant Torque Speed Range when compared to conventional solutions based on induction motors
- Reliability improvement of the system
- Eliminates the criticalities inherent in sensors
- Simplifies the control system
- Temperature limits on resolvers
- In compact applications, where is not be possible to accommodate position sensors
- Overall cost reduction



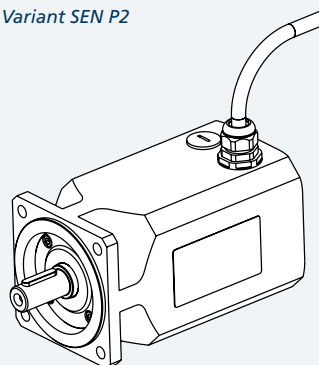
The standard sensorless motor is provided of a 1 meter cable. It corresponds to the variants designation **SEN P2**. It is also available the possibility to have an 8-pin power connector

designation by selecting the **SEN P1/P1N** variant. In both cases the field related to the signal connector remains blank.

Variant **SEN P1**



Variant **SEN P2**





## Standards and directives

BMD motors are manufactured in accordance with applicable standards and Directive listed in the following tables.

### Standard

#### IEC 60034-1, EN 60034-1

Rotating electrical machines  
 Part 1: Rating and performance

#### IEC 60034-5, EN 60034-5

Rotating electrical machines  
 Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) - Classification

#### IEC 60034-6, EN 60034-6

Rotating electrical machines  
 Part 6: Methods of cooling (IC Code)

#### IEC 60034-8, EN 60034-8

Rotating electrical machines  
 Part 8: Terminal markings and direction of rotation

#### IEC 60034-14, IEC 60034-14

Rotating electrical machines  
 Part 14: Mechanical vibration - Measurement, evaluation and limits of vibration severity

#### IEC 60072-1

Dimensions and output series for rotating electrical machines - Part 1

#### IEC TS 60034-25

Rotating electrical machines  
 Part 25: Guidance for the design and performance of a.c. motors specifically designed for converter supply

### Directives

Low Voltage Directive: 2006/95/EC

The BMD servomotors series comply with UL/CSA standards for the North American market (UL file number E358266).

#### UL 1004-1

Rotating Electrical Machines  
 General Requirements

#### UL 1004-6

Servo and Stepper Motors

#### CSA C22.2 No. 100

Motors and Generators

## Symbols and units of measure

| Symbol         | U.m.                                   | Description                                                                                  |
|----------------|----------------------------------------|----------------------------------------------------------------------------------------------|
| $n_n$          | [min <sup>-1</sup> ]                   | Rated speed                                                                                  |
| $M_n$          | [Nm]                                   | Rated torque                                                                                 |
| $P_n$          | [kW]                                   | Rated power                                                                                  |
| $I_n$          | [A]                                    | Rated current                                                                                |
| $M_0$          | [Nm]                                   | Stall torque                                                                                 |
| $I_0$          | [A]                                    | Stall current                                                                                |
| $M_{max}$      | [Nm]                                   | Max torque                                                                                   |
| $I_{max}$      | [A]                                    | Max current                                                                                  |
| $K_T$          | [Nm/A]                                 | Torque constant                                                                              |
| $K_c$          | [V/1000min <sup>-1</sup> ]             | Back EMF constant                                                                            |
| $R_{pp}$       | [Ω]                                    | Stator phase-phase resistance                                                                |
| $L_{pp}$       | [mH]                                   | Stator phase-phase inductance                                                                |
| $\tau_{el}$    | [ms]                                   | Electric time constant                                                                       |
| $\tau_{therm}$ | [min]                                  | Thermal time constant                                                                        |
| $J_M$          | [kgm <sup>2</sup> x 10 <sup>-4</sup> ] | Motor moment of inertia                                                                      |
| $m_M$          | [kg]                                   | Motor mass without brake                                                                     |
| $J_b$          | [kgm <sup>2</sup> x 10 <sup>-4</sup> ] | Brake moment of inertia                                                                      |
| $m_b$          | [kg]                                   | Brake mass                                                                                   |
| $M_b$          | [Nm]                                   | Brake torque                                                                                 |
| $P_b$          | [W]                                    | Brake electrical power at 20°C                                                               |
| $V_b$          | [V]                                    | Brake DC voltage                                                                             |
| $I_b$          | [A]                                    | Brake current                                                                                |
| $m_{MB}$       | [kg]                                   | Motor mass with brake                                                                        |
| $t_1$          | [ms]                                   | Brake engaging time (time from disconnecting the current until the rated torque is attained) |
| $t_2$          | [ms]                                   | Brake Release time (time from connecting the current until the torque decreases)             |

# Bonfiglioli permanent magnet synchronous motors range

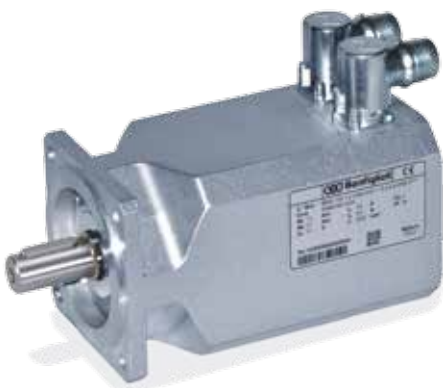
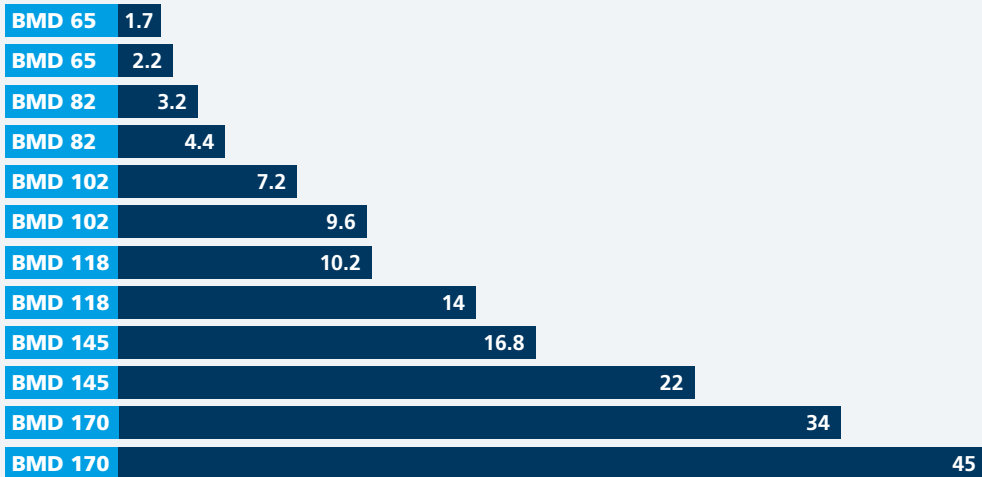
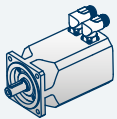
The Bonfiglioli permanent magnet synchronous motors are available in six sizes with a stall torque comprises between 1.7 ÷ 45 Nm.

BMD servomotor – Bonfiglioli Permanent Magnet High Density

Product Line Up

- Competitive technology
- Low inertia
- Highest dynamics;
- High torque density;
- Precision;
- Compact design
- Compatibility with gears & inverters

## BMD series Permanent Magnet AC Motors



## Commercial designation of Bonfiglioli permanent magnet synchronous motors

BMD servo motors are technically identified by their designation. This consists of a rigorous succession of alphanumeric characters, whose positions and values conform to precise rules and define the characteristics of the product.

The complete designation provides a unique identification of the exact servomotor configuration and distinguishes it from all the other possible configurations available from the catalogue.

The designation is made up of two main parts, containing fields for:

- BASIC variants
- OPTIONAL variants

Both the BASIC variant and OPTIONAL variant sections of the designation are divided into fields, each of which defines a particular design feature of the motor.

Bonfiglioli servomotors BASIC variants are identified by its: series (BMD), sizes (65, 82, 102, 118, 145, 170), stall torque, rated speed, AC supply voltage, flange and shaft diameter.

Bonfiglioli OPTIONAL variants complete the designation with: Shaft keyway, Degree of protection, Thermal protection, Feedback device, Power connector, signal connector, Brake, Flywheel, connector orientation.

All basic variant and optional variant fields can assume only one value at a time. These values are selected from a limited set of pre-defined values for each field in the designation.

**Is mandatory to select one of the possible choices in all variants fields. The variant can be missed only where a blank is a possible choice.**

Housing of BMD servomotors is painted RAL 9005, black.

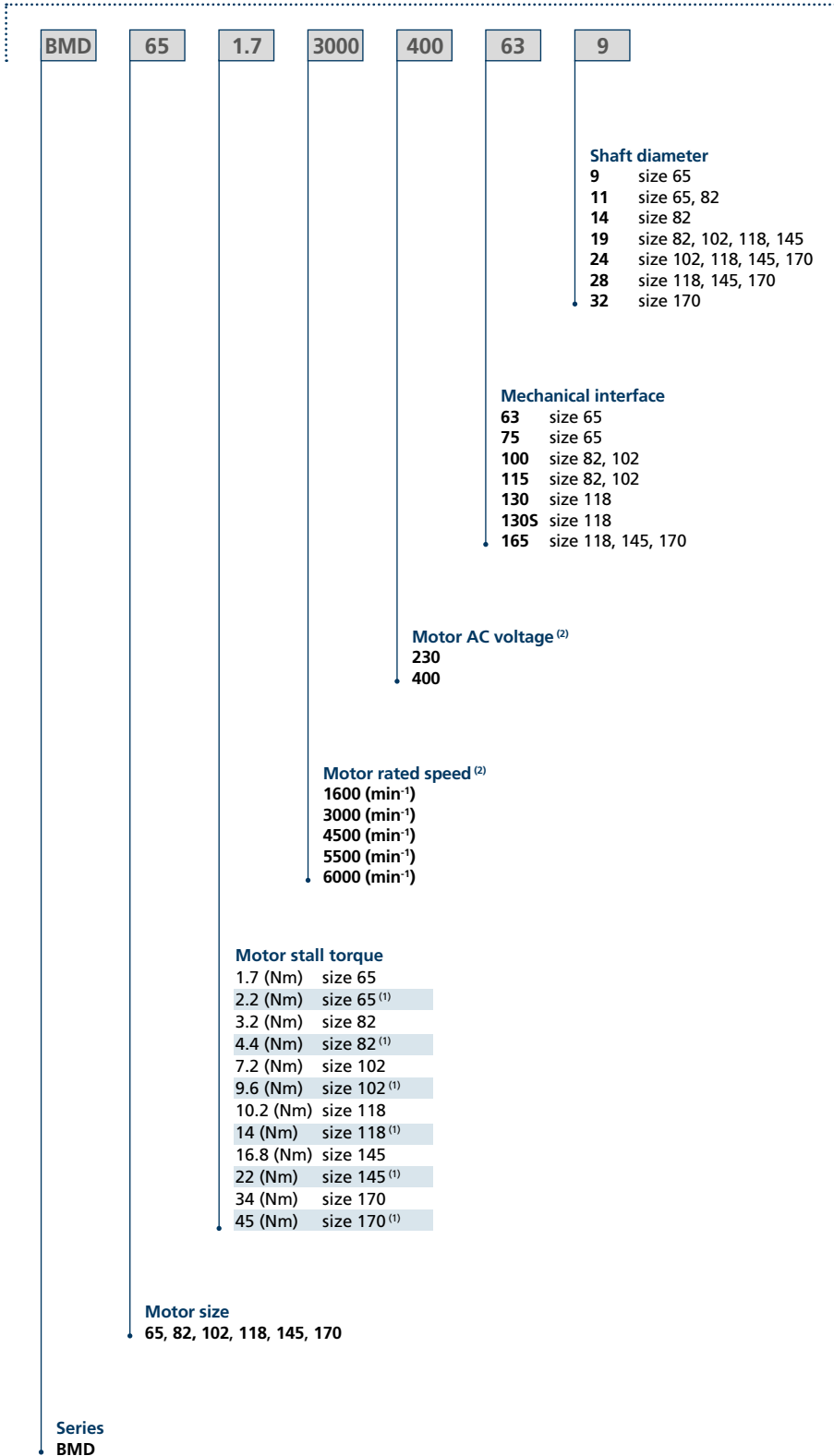
A brief overview of the available combinations of the basic variants such as motor size, motor stall torque, nominal voltage and nominal speed can be found in the following table.

|       |          | BMD 65 |        | BMD 82 |        | BMD 102 |        | BMD 118 |       | BMD 145 |       | BMD 170 |       |
|-------|----------|--------|--------|--------|--------|---------|--------|---------|-------|---------|-------|---------|-------|
|       |          | 1.7 Nm | 2.2 Nm | 3.2 Nm | 4.4 Nm | 7.2 Nm  | 9.6 Nm | 10.2 Nm | 14 Nm | 16.8 Nm | 22 Nm | 34 Nm   | 45 Nm |
| 400 V | 1600 rpm | X      | X      | X      | X      | X       | X      | X       | X     | X       | X     | X       | X     |
|       | 3000 rpm | X      | X      | X      | X      | X       | X      | X       | X     | X       | X     | X       | X     |
|       | 4500 rpm | X      | X      | X      | X      | X       | X      | X       | X     | X       | X     |         |       |
|       | 5500 rpm | X      | X      | X      | X      | X       | X      | X       | X     | X       | X     |         |       |
|       | 6000 rpm | X      | X      | X      | X      | X       | X      | X       | X     | X       |       |         |       |
| 230 V | 1600 rpm | X      | X      | X      | X      | X       | X      | X       | X     | X       | X     | X       |       |
|       | 3000 rpm | X      | X      | X      | X      | X       | X      | X       | X     | X       | X     | X       |       |
|       | 4500 rpm | X      | X      | X      | X      | X       | X      | X       |       |         |       |         |       |
|       | 5500 rpm | X      | X      | X      | X      | X       | X      | X       |       |         |       |         |       |
|       | 6000 rpm | X      | X      | X      | X      | X       | X      |         |       |         |       |         |       |

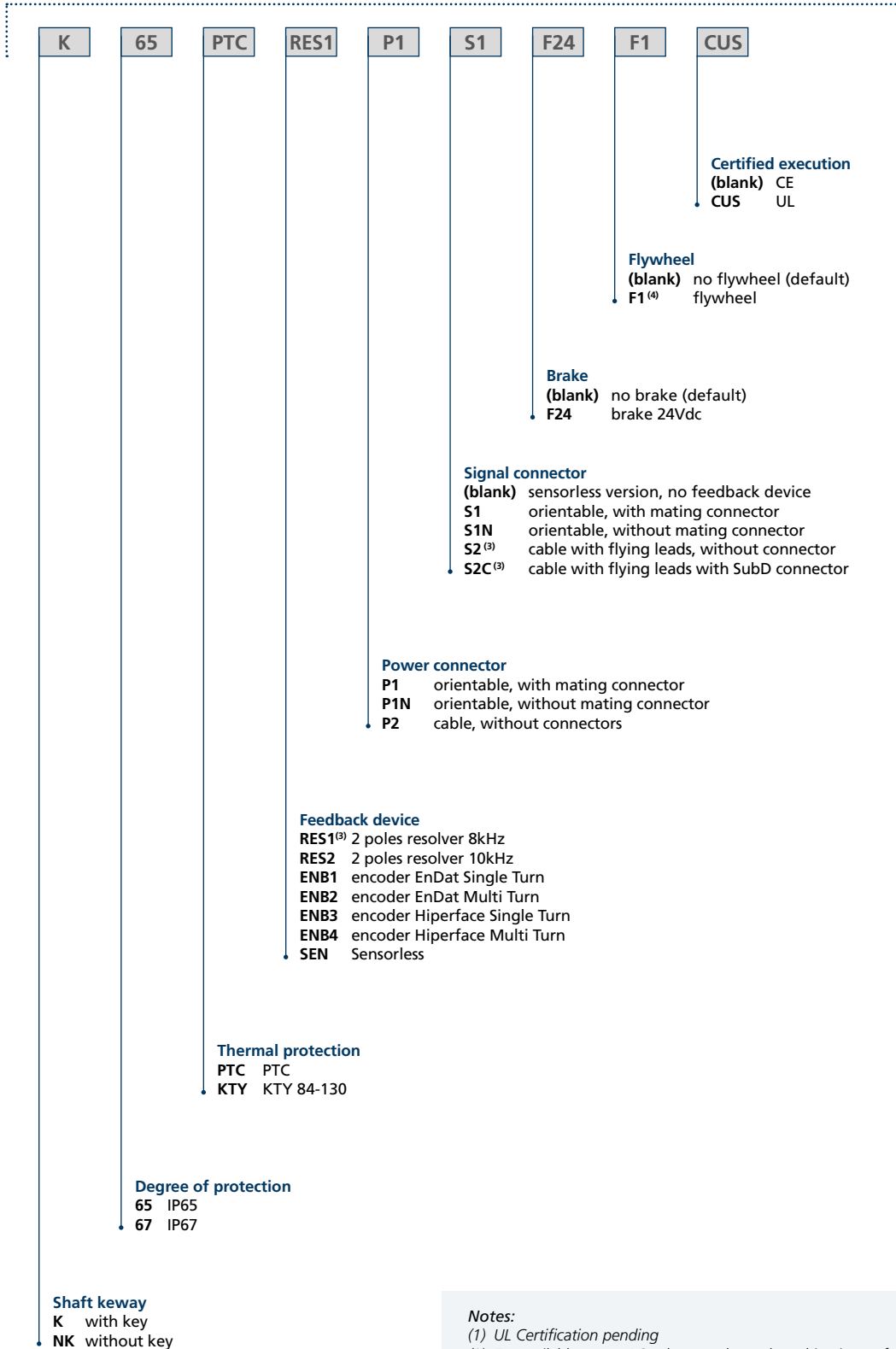
# Product designation of Bonfiglioli servomotors

## Brushless Motors designation

### Basic Variants



### Basic Variants



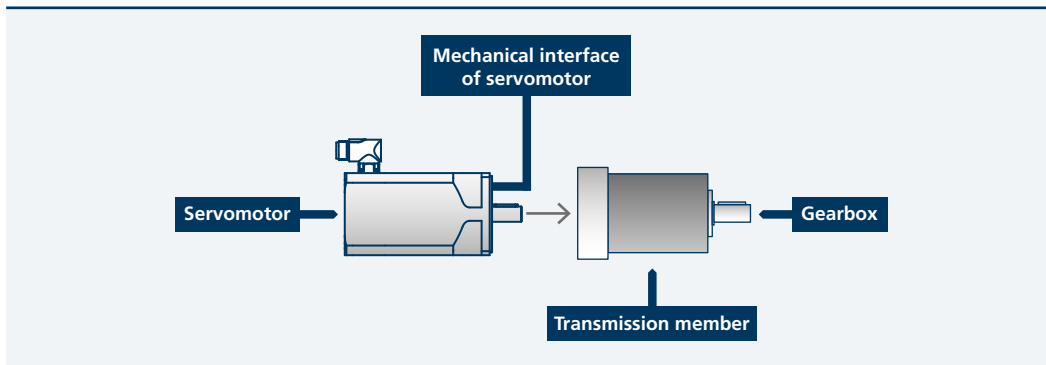
**Notes:**

- (1) UL Certification pending
- (2) For available motor AC voltage and speed combinations refer to general overview of page 11
- (3) Not available for motor size BMD 65
- (4) Not available when brake is provided

# Mechanical interface

Concerning BMD servomotors, the physical part in charge of coupling with other transmission components (gearboxes, joints, ...) is named Mechanical Interface. Therefore the Mechanical Interface is a part of the motor and includes both flange and shaft

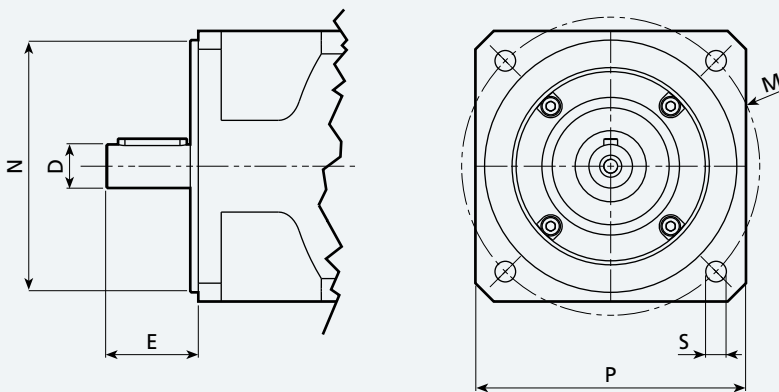
univocally defined by its geometrical dimensions. The flanges and the shafts of BMD are described by fixed geometrics according to a standard Bonfiglioli configuration oriented to coupling with gearboxes, but also available to be adapted to other application requirements.



## Mechanical interface: connection flange + trasmission shaft.

According to IEC 72-1, the interface geometry is defined by quantities D, E, P, M, N, S published in the side drawing whose numerical values (mm) depend on motor series and motor size.

The basic configuration of BMD servomotors is defined by the following table:



IMB table (Basic Mechanical Interface)

|                               |          | Servomotors   |    |                         |     |                |     |                         |     |      |                         |      |                         |
|-------------------------------|----------|---------------|----|-------------------------|-----|----------------|-----|-------------------------|-----|------|-------------------------|------|-------------------------|
|                               |          | BMD65         |    | BMD82                   |     | BMD102         |     | BMD118                  |     |      | BMD145                  |      | BMD170                  |
| Shaft diameter x shaft length | DxE [mm] | 9x20<br>11x23 |    | 11x23<br>14x30<br>19x40 |     | 19x40<br>24x50 |     | 19x40<br>24x50<br>28x60 |     |      | 19x40<br>24x50<br>28x60 |      | 24x50<br>28x60<br>32x60 |
| Flange square                 | P [mm]   | 65            | 65 | 82                      | 100 | 102            | 102 | 118                     | 118 | 145  | 145                     | 170  |                         |
| Flange pitch holes diameter   | M [mm]   | 63            | 75 | 100                     | 115 | 100            | 115 | 130 <sup>(1)</sup>      | 130 | 165  | 165                     | 165  |                         |
| Centering hole diameter       | N [mm]   | 40            | 60 | 80                      | 95  | 80             | 95  | 95                      | 110 | 130  | 130                     | 130  |                         |
| Hole diameter                 | S [mm]   | 5.5           | 6  | 6.5                     | 9   | 7              | 9   | 9                       | 9   | 11.5 | 11.5                    | 11.5 |                         |

Notes:

(1) Mechanical interface 130S

## Tolerances

Dimensions and tolerances of shaft extension, key and flange are in accordance with EN 50347, IEC 60072-1.

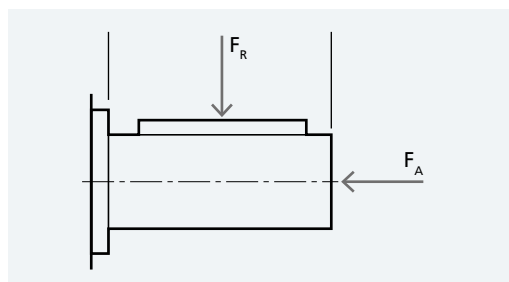
Shaft extension features an axial threaded hole in accordance with UNI 3221, DIN 332.

Tolerances for the different parts are reported in the table.

| Component | Dimensions | Tolerance |
|-----------|------------|-----------|
| Shaft end | D [mm]     | Ø 9 - 28  |
|           |            | Ø 32      |
| Key       | F [mm]     | h9        |
| Flange    | N [mm]     | Ø < 250   |

## Shaft loads

The loads in the following tables have been calculated using ISO 281 calculation L10(h). The loads and speeds used are considered to be constant throughout the life of the bearing. The radial load  $F_R$  is applied to the half shaft end length.



### Maximum radial load $F_R$ [N]

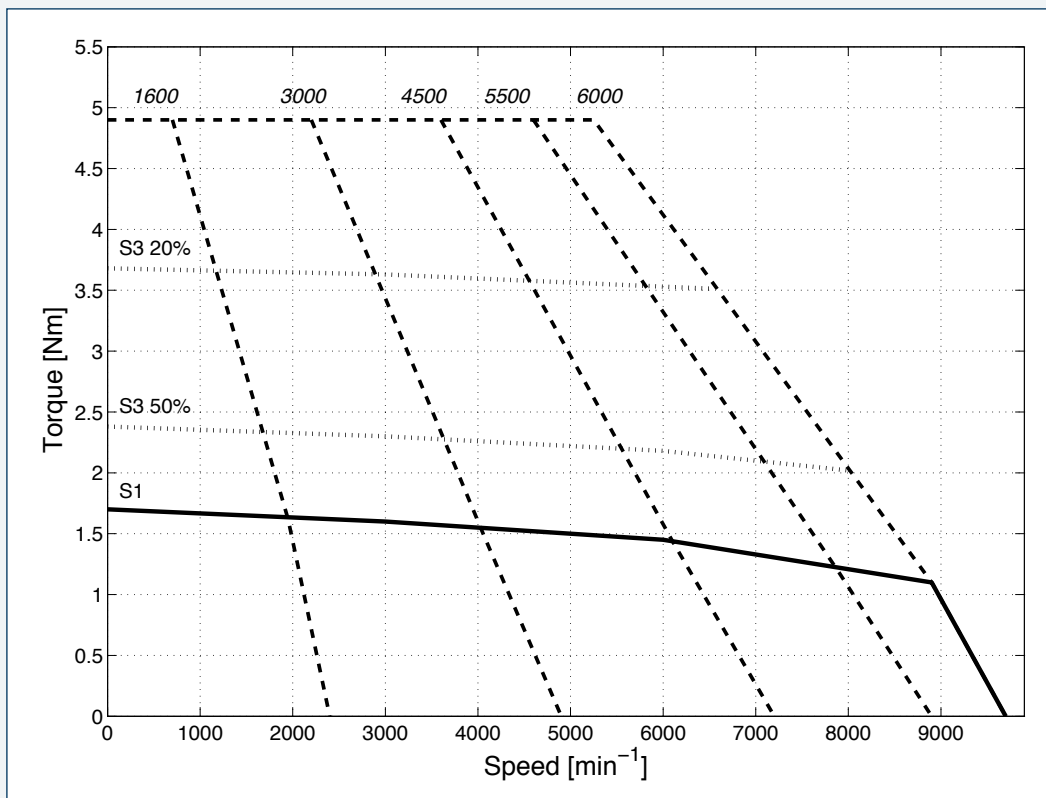
| Size    | Speed [min <sup>-1</sup> ] |      |      |      |               |      |
|---------|----------------------------|------|------|------|---------------|------|
|         | [Nm]                       | 1600 | 3000 | 4500 | 5500          | 6000 |
| BMD 65  | 1.7                        | 330  | 270  | 230  | 220           | 210  |
|         | 2.2                        | 350  | 280  | 250  | 230           | 220  |
| BMD 82  | 3.2                        | 580  | 470  | 410  | 390           | 370  |
|         | 4.4                        | 610  | 500  | 430  | 410           | 390  |
| BMD 102 | 7.2                        | 750  | 610  | 530  | 500           | 480  |
|         | 9.6                        | 800  | 650  | 570  | 530           | 520  |
| BMD 118 | 10.2                       | 860  | 700  | 610  | 570           | 550  |
|         | 14                         | 910  | 740  | 650  | 600           | 590  |
| BMD 145 | 16.8                       | 1400 | 1150 | 1000 | 940           | 910  |
|         | 22                         | 1500 | 1200 | 1050 | 980           | 960  |
| BMD 170 | 34                         | 900  | 730  | 640  | Not available |      |
|         | 45                         | 1500 | 1200 | 1050 |               |      |

### Maximum axial load $F_A$ [N]

| Size    | Speed [min <sup>-1</sup> ] |      |      |      |               |      |
|---------|----------------------------|------|------|------|---------------|------|
|         | [Nm]                       | 1600 | 3000 | 4500 | 5500          | 6000 |
| BMD 65  | 1.7                        | 65   | 53   | 46   | 43            | 42   |
|         | 2.2                        | 69   | 56   | 49   | 46            | 44   |
| BMD 82  | 3.2                        | 115  | 94   | 82   | 77            | 75   |
|         | 4.4                        | 120  | 100  | 85   | 81            | 79   |
| BMD 102 | 7.2                        | 150  | 120  | 105  | 100           | 95   |
|         | 9.6                        | 160  | 130  | 110  | 105           | 100  |
| BMD 118 | 10.2                       | 170  | 139  | 121  | 115           | 110  |
|         | 14                         | 180  | 145  | 130  | 120           | 115  |
| BMD 145 | 16.8                       | 280  | 230  | 200  | 185           | 180  |
|         | 22                         | 295  | 240  | 210  | 195           | 190  |
| BMD 170 | 34                         | 180  | 145  | 125  | Not available |      |
|         | 45                         | 295  | 240  | 210  |               |      |

# BMD 65 • 1.7 Nm - 230V

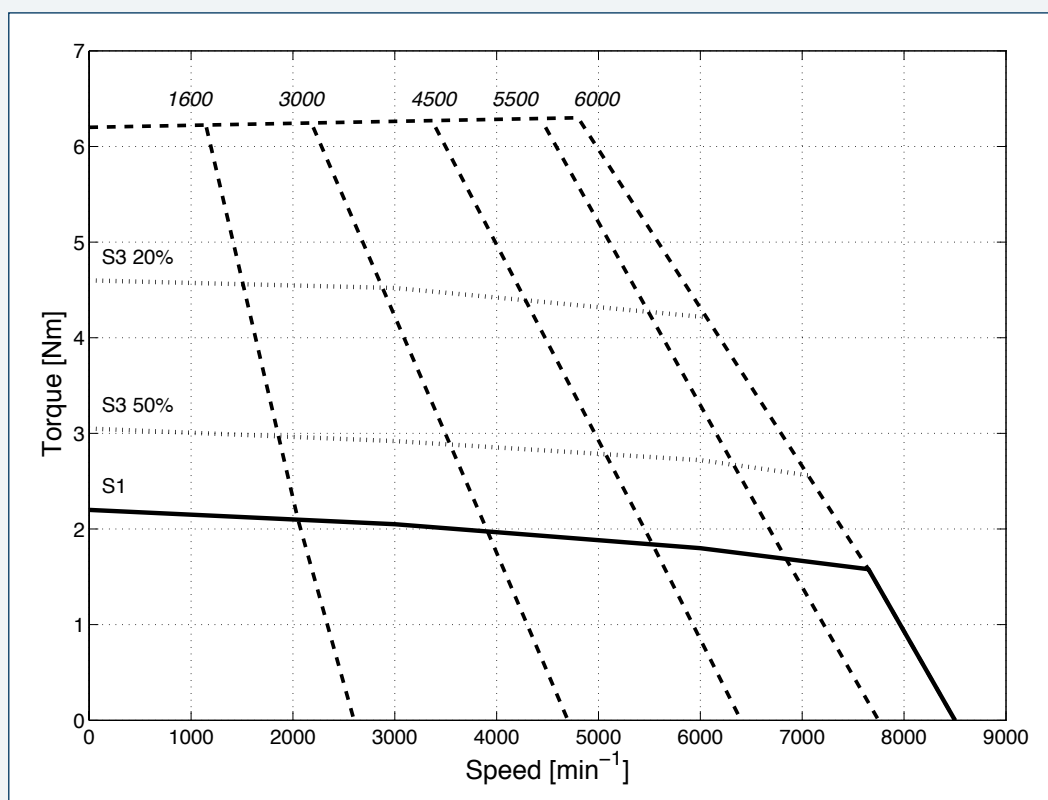
| Parameter                               | Symbol         | Unit                              | Speed [ $\text{min}^{-1}$ ] |      |      |      |      |
|-----------------------------------------|----------------|-----------------------------------|-----------------------------|------|------|------|------|
|                                         |                |                                   | 1600                        | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                              | 1.7                         |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                              | 107                         | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                | 193                         | 180  | 180  | 174  | 171  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                              | 1.65                        | 1.60 | 1.52 | 1.48 | 1.45 |
| Current at rated speed                  | $I_n$          | [A]                               | 1.25                        | 2.30 | 3.2  | 3.9  | 4.2  |
| Standstill current                      | $I_0$          | [A]                               | 1.26                        | 2.34 | 3.4  | 4.2  | 4.7  |
| Max Torque                              | $M_{max}$      | [Nm]                              | 4.9                         | 4.9  | 4.9  | 4.9  | 4.9  |
| Max Current                             | $I_{max}$      | [A]                               | 4.3                         | 8.0  | 11.5 | 14.5 | 15.9 |
| Back EMF constant                       | $K_e$          | [V/1000 $\text{min}^{-1}$ ]       | 89                          | 48   | 33   | 26   | 24   |
| Torque constant                         | $K_T$          | [Nm/A]                            | 1.35                        | 0.73 | 0.50 | 0.40 | 0.36 |
| Rated Power                             | $P_n$          | [kW]                              | 0.28                        | 0.50 | 0.72 | 0.85 | 0.91 |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [ $\Omega$ ]                      | 30.4                        | 8.79 | 4.19 | 2.66 | 2.20 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                              | 91.9                        | 26.6 | 12.6 | 8.0  | 6.6  |
| Rotor inertia                           | $J_m$          | [ $\text{kgm}^2 \times 10^{-4}$ ] | 0.4                         |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                              | 3.0                         |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                             | 20                          |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                              | 1.9                         |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                              | 2.1                         |      |      |      |      |





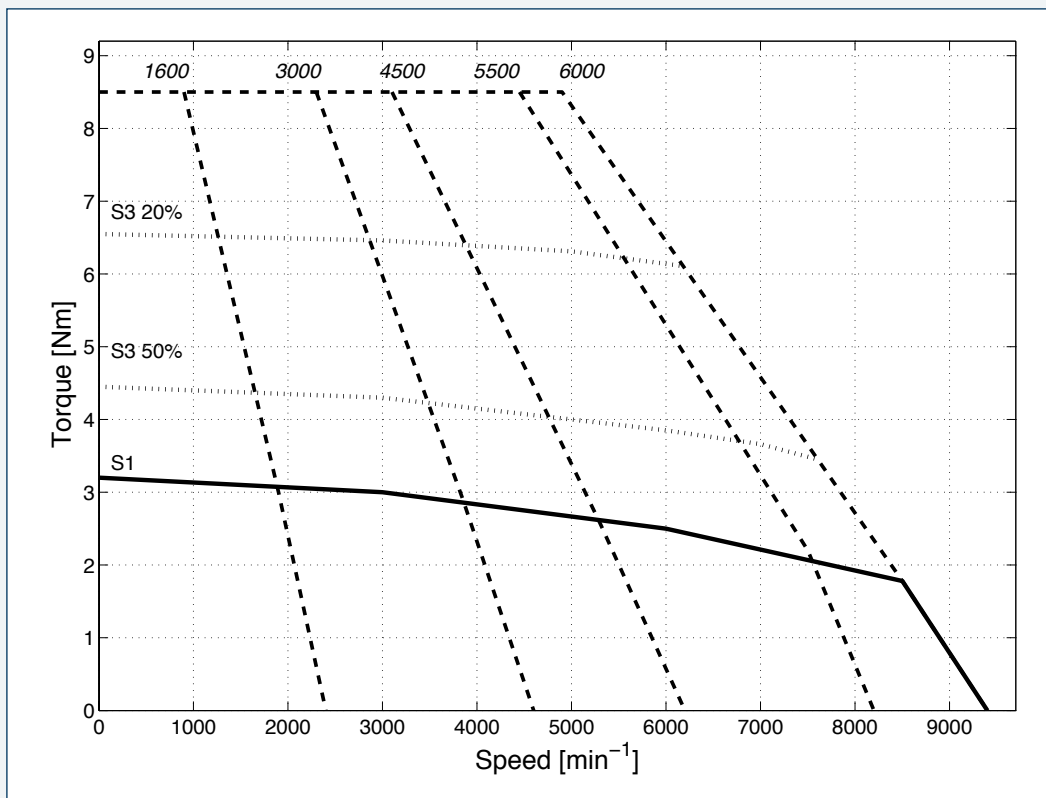
## BMD 65 • 2.2 Nm - 230V

| Parameter                               | Symbol         | Unit                                   | Speed [min <sup>-1</sup> ] |      |      |      |      |
|-----------------------------------------|----------------|----------------------------------------|----------------------------|------|------|------|------|
|                                         |                |                                        | 1600                       | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                                   | 2.2                        |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                                   | 107                        | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                     | 179                        | 180  | 191  | 192  | 190  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                                   | 2.12                       | 2.05 | 1.95 | 1.85 | 1.80 |
| Current at rated speed                  | $I_n$          | [A]                                    | 1.65                       | 2.78 | 3.6  | 4.1  | 4.4  |
| Standstill current                      | $I_0$          | [A]                                    | 1.70                       | 2.96 | 4.1  | 4.9  | 5.4  |
| Max Torque                              | $M_{max}$      | [Nm]                                   | 6.2                        | 6.2  | 6.2  | 6.2  | 6.2  |
| Max Current                             | $I_{max}$      | [A]                                    | 5.4                        | 9.4  | 12.9 | 15.6 | 17.1 |
| Back EMF constant                       | $K_e$          | [V/1000min <sup>-1</sup> ]             | 90                         | 52   | 38   | 31   | 28   |
| Torque constant                         | $K_T$          | [Nm/A]                                 | 1.29                       | 0.74 | 0.54 | 0.45 | 0.41 |
| Rated Power                             | $P_n$          | [kW]                                   | 0.36                       | 0.64 | 0.92 | 1.07 | 1.13 |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [Ω]                                    | 18.8                       | 6.21 | 3.27 | 2.26 | 1.86 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                                   | 56.9                       | 18.8 | 9.9  | 6.8  | 5.6  |
| Rotor inertia                           | $J_m$          | [kgm <sup>2</sup> × 10 <sup>-4</sup> ] | 0.6                        |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                                   | 3.0                        |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                                  | 26                         |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                                   | 2.6                        |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                                   | 2.8                        |      |      |      |      |



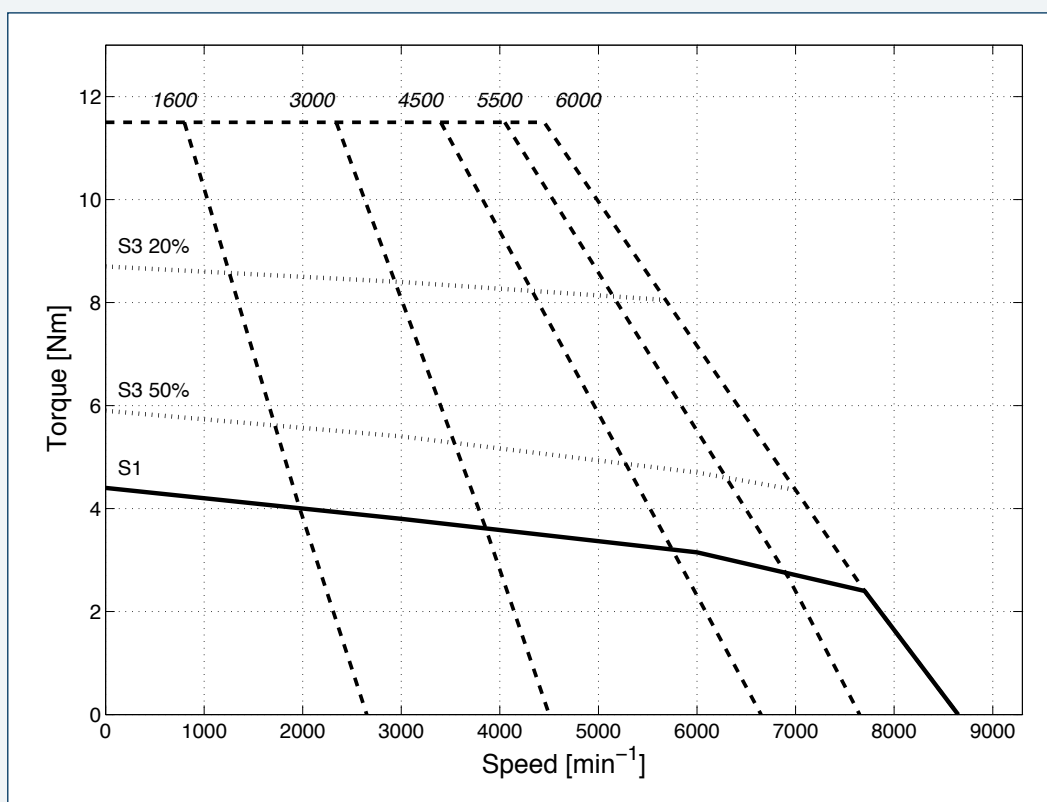
# BMD 82 • 3.2 Nm - 230V

| Parameter                               | Symbol         | Unit                              | Speed [ $\text{min}^{-1}$ ] |      |      |      |      |
|-----------------------------------------|----------------|-----------------------------------|-----------------------------|------|------|------|------|
|                                         |                |                                   | 1600                        | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                              | 3.2                         |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                              | 107                         | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                | 191                         | 181  | 200  | 176  | 176  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                              | 3.15                        | 3    | 2.8  | 2.6  | 2.5  |
| Current at rated speed                  | $I_n$          | [A]                               | 2.37                        | 4.3  | 5.3  | 7.0  | 7.6  |
| Standstill current                      | $I_0$          | [A]                               | 2.41                        | 4.5  | 6.0  | 8.3  | 9.0  |
| Max Torque                              | $M_{max}$      | [Nm]                              | 8.5                         | 8.5  | 8.5  | 8.5  | 8.5  |
| Max Current                             | $I_{max}$      | [A]                               | 8.3                         | 15.5 | 20.6 | 28.4 | 31   |
| Back EMF constant                       | $K_e$          | [V/1000 $\text{min}^{-1}$ ]       | 92                          | 49   | 37   | 27   | 24   |
| Torque constant                         | $K_T$          | [Nm/A]                            | 1.33                        | 0.71 | 0.53 | 0.39 | 0.35 |
| Rated Power                             | $P_n$          | [kW]                              | 0.53                        | 0.94 | 1.32 | 1.50 | 1.57 |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [ $\Omega$ ]                      | 11.3                        | 3.23 | 1.81 | 0.96 | 0.81 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                              | 64.2                        | 18.3 | 10.3 | 5.4  | 4.6  |
| Rotor inertia                           | $J_m$          | [ $\text{kgm}^2 \times 10^{-4}$ ] | 1.4                         |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                              | 5.7                         |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                             | 26                          |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                              | 3.5                         |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                              | 4.1                         |      |      |      |      |



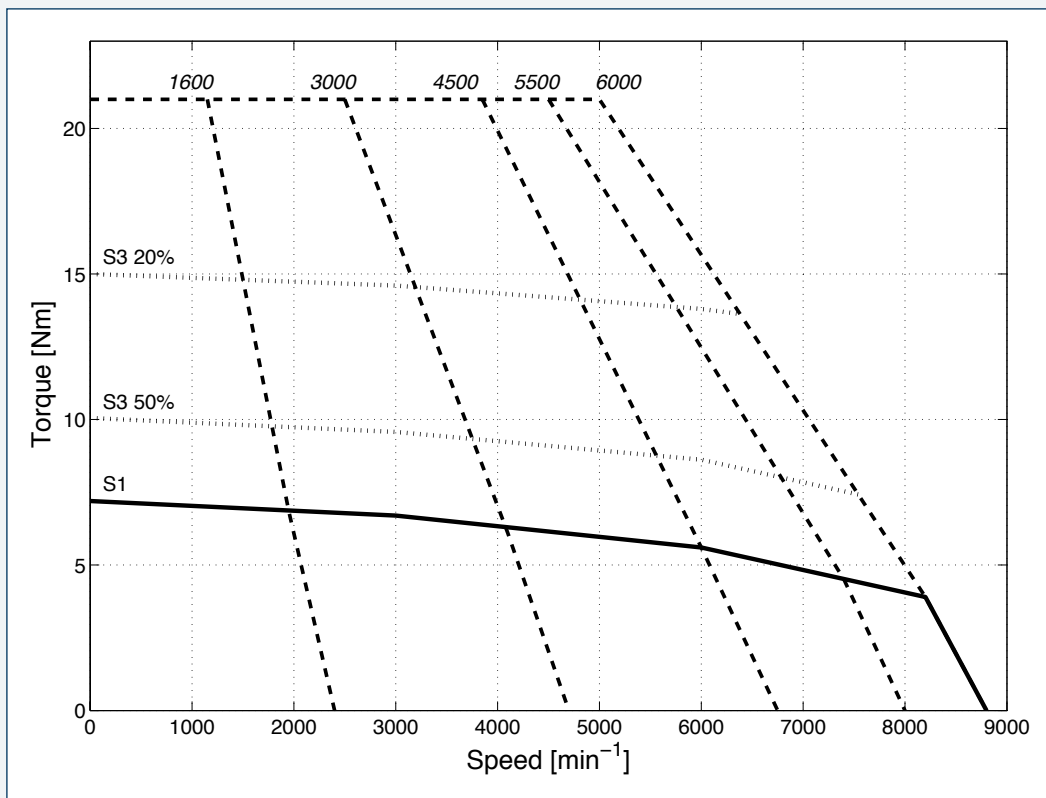
## BMD 82 • 4.4 Nm - 230V

| Parameter                               | Symbol         | Unit                                   | Speed [min <sup>-1</sup> ] |      |      |      |      |
|-----------------------------------------|----------------|----------------------------------------|----------------------------|------|------|------|------|
|                                         |                |                                        | 1600                       | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                                   | 4.4                        |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                                   | 107                        | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                     | 181                        | 184  | 188  | 196  | 197  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                                   | 4.2                        | 3.8  | 3.55 | 3.3  | 3.15 |
| Current at rated speed                  | $I_n$          | [A]                                    | 3.1                        | 5.1  | 6.8  | 7.3  | 7.6  |
| Standstill current                      | $I_0$          | [A]                                    | 3.3                        | 5.8  | 8.4  | 9.7  | 10.6 |
| Max Torque                              | $M_{max}$      | [Nm]                                   | 11.5                       | 11.5 | 11.5 | 11.5 | 11.5 |
| Max Current                             | $I_{max}$      | [A]                                    | 9.8                        | 17.4 | 25.1 | 29.2 | 32   |
| Back EMF constant                       | $K_e$          | [V/1000min <sup>-1</sup> ]             | 93                         | 52   | 36   | 31   | 29   |
| Torque constant                         | $K_T$          | [Nm/A]                                 | 1.35                       | 0.76 | 0.53 | 0.45 | 0.42 |
| Rated Power                             | $P_n$          | [kW]                                   | 0.70                       | 1.19 | 1.67 | 1.90 | 2.0  |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [Ω]                                    | 6.89                       | 2.19 | 1.05 | 0.78 | 0.66 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                                   | 39.0                       | 12.4 | 6.0  | 4.4  | 3.7  |
| Rotor inertia                           | $J_m$          | [kgm <sup>2</sup> × 10 <sup>-4</sup> ] | 1.7                        |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                                   | 5.7                        |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                                  | 33                         |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                                   | 4.6                        |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                                   | 5.2                        |      |      |      |      |



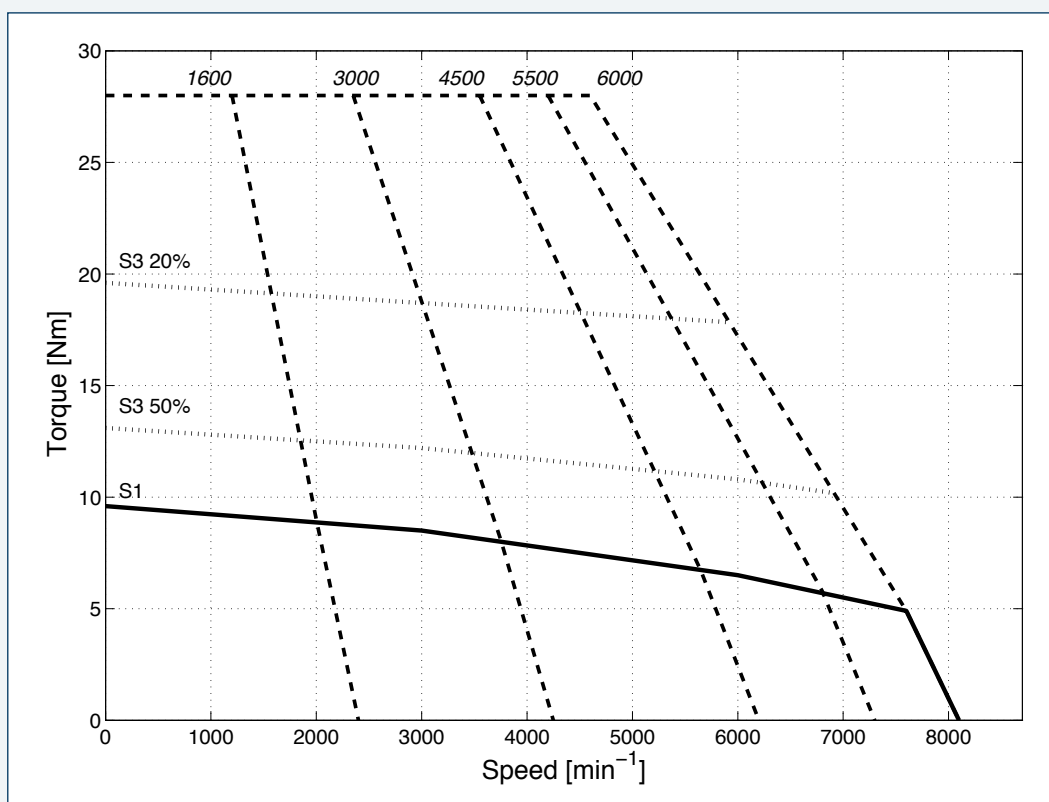
# BMD 102 • 7.2 Nm - 230V

| Parameter                               | Symbol                | Unit                              | Speed [ $\text{min}^{-1}$ ] |      |      |      |      |
|-----------------------------------------|-----------------------|-----------------------------------|-----------------------------|------|------|------|------|
|                                         |                       |                                   | 1600                        | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$                 | [Nm]                              | 7.2                         |      |      |      |      |
| Motor rated frequency                   | $f_n$                 | [Hz]                              | 107                         | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$                 | [V <sub>AC</sub> ]                | 187                         | 177  | 182  | 183  | 185  |
| Rated Torque (dT=105K)                  | $M_n$                 | [Nm]                              | 7                           | 6.7  | 6    | 5.8  | 5.6  |
| Current at rated speed                  | $I_n$                 | [A]                               | 5.0                         | 9.5  | 12.6 | 14.4 | 15.4 |
| Standstill current                      | $I_0$                 | [A]                               | 5.0                         | 9.7  | 13.9 | 16.9 | 18.2 |
| Max Torque                              | $M_{\text{max}}$      | [Nm]                              | 21                          | 21   | 21   | 21   | 21   |
| Max Current                             | $I_{\text{max}}$      | [A]                               | 18.3                        | 35   | 51   | 61   | 66   |
| Back EMF constant                       | $K_e$                 | [V/1000 $\text{min}^{-1}$ ]       | 94                          | 49   | 34   | 28   | 26   |
| Torque constant                         | $K_T$                 | [Nm/A]                            | 1.43                        | 0.75 | 0.52 | 0.43 | 0.40 |
| Rated Power                             | $P_n$                 | [kW]                              | 1.17                        | 2.10 | 2.83 | 3.3  | 3.5  |
| Stator phase-phase Resistance (at 20°C) | $R_{\text{pp}}$       | [ $\Omega$ ]                      | 3.02                        | 0.82 | 0.40 | 0.27 | 0.23 |
| Stator phase-phase Inductance           | $L_{\text{pp}}$       | [mH]                              | 25.4                        | 6.9  | 3.3  | 2.3  | 1.9  |
| Rotor inertia                           | $J_m$                 | [ $\text{kgm}^2 \times 10^{-4}$ ] | 3.4                         |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{\text{el}}$    | [ms]                              | 8.4                         |      |      |      |      |
| Thermal time constant                   | $\tau_{\text{therm}}$ | [min]                             | 31                          |      |      |      |      |
| Motor mass without brake                | $m_M$                 | [kg]                              | 5.8                         |      |      |      |      |
| Motor mass with brake                   | $m_{\text{MB}}$       | [kg]                              | 7                           |      |      |      |      |



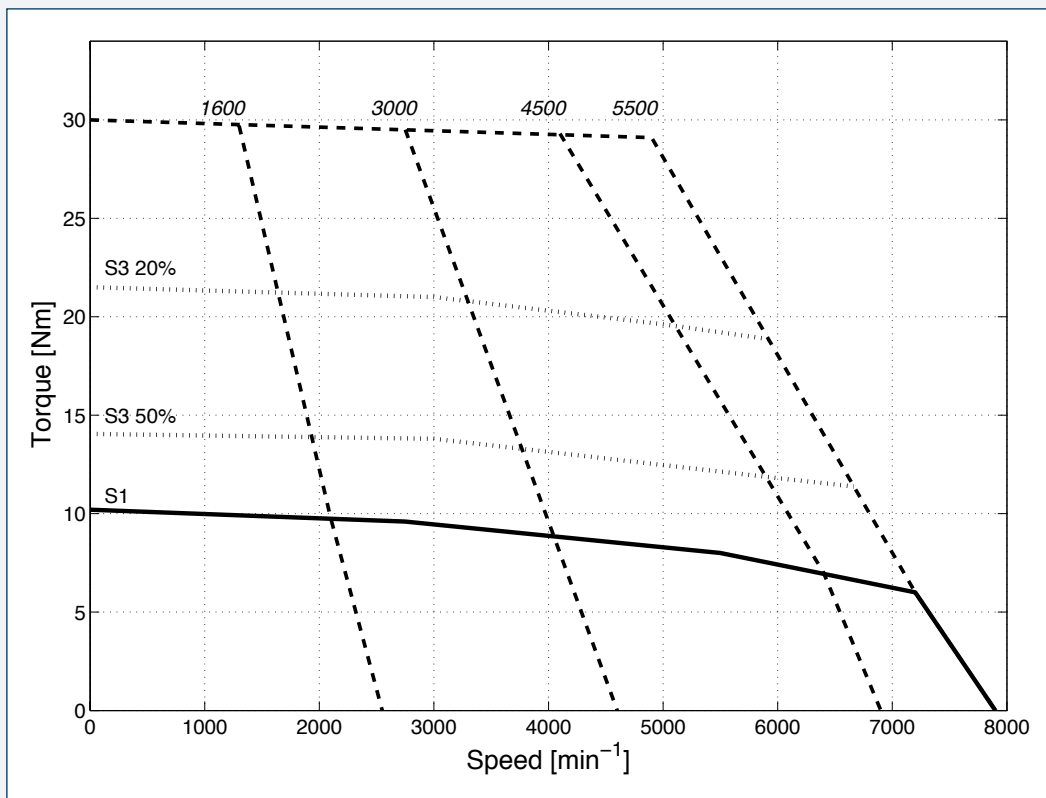
## BMD 102 • 9.6 Nm - 230V

| Parameter                               | Symbol         | Unit                                   | Speed [min <sup>-1</sup> ] |      |      |      |      |
|-----------------------------------------|----------------|----------------------------------------|----------------------------|------|------|------|------|
|                                         |                |                                        | 1600                       | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                                   | 9.6                        |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                                   | 107                        | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                     | 183                        | 184  | 187  | 192  | 190  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                                   | 9.2                        | 8.5  | 7.7  | 6.9  | 6.5  |
| Current at rated speed                  | $I_n$          | [A]                                    | 6.0                        | 10.2 | 13.5 | 14.3 | 14.8 |
| Standstill current                      | $I_0$          | [A]                                    | 6.3                        | 11.5 | 16.8 | 19.8 | 21.8 |
| Max Torque                              | $M_{max}$      | [Nm]                                   | 28                         | 28   | 28   | 28   | 28   |
| Max Current                             | $I_{max}$      | [A]                                    | 20.4                       | 37   | 54   | 64   | 70   |
| Back EMF constant                       | $K_e$          | [V/1000min <sup>-1</sup> ]             | 102                        | 56   | 38   | 33   | 30   |
| Torque constant                         | $K_T$          | [Nm/A]                                 | 1.52                       | 0.84 | 0.57 | 0.48 | 0.44 |
| Rated Power                             | $P_n$          | [kW]                                   | 1.54                       | 2.7  | 3.6  | 4.0  | 4.1  |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [Ω]                                    | 2.24                       | 0.68 | 0.32 | 0.23 | 0.19 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                                   | 18.8                       | 5.7  | 2.7  | 1.9  | 1.6  |
| Rotor inertia                           | $J_m$          | [kgm <sup>2</sup> x 10 <sup>-4</sup> ] | 4.7                        |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                                   | 8.4                        |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                                  | 38                         |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                                   | 7.4                        |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                                   | 8.6                        |      |      |      |      |



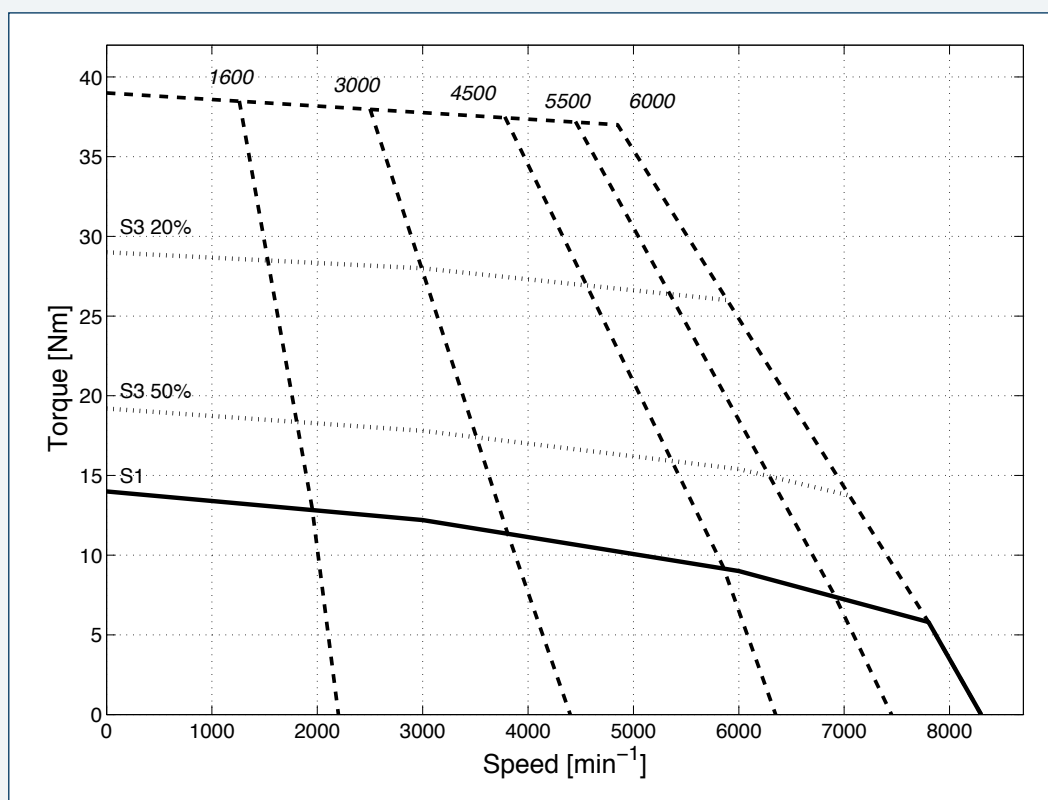
# BMD 118 • 10.2 Nm - 230V

| Parameter                               | Symbol             | Unit                                   | Speed [min <sup>-1</sup> ] |      |      |      |
|-----------------------------------------|--------------------|----------------------------------------|----------------------------|------|------|------|
|                                         |                    |                                        | 1600                       | 3000 | 4500 | 5500 |
| Standstill torque (dT=105K)             | M <sub>0</sub>     | [Nm]                                   | 10.2                       |      |      |      |
| Motor rated frequency                   | f <sub>n</sub>     | [Hz]                                   | 107                        | 200  | 300  | 367  |
| Motor rated voltage                     | V <sub>n</sub>     | [V <sub>AC</sub> ]                     | 184                        | 178  | 174  | 196  |
| Rated Torque (dT=105K)                  | M <sub>n</sub>     | [Nm]                                   | 10                         | 9.5  | 8.5  | 8    |
| Current at rated speed                  | I <sub>n</sub>     | [A]                                    | 7.2                        | 13.5 | 18.3 | 17.4 |
| Standstill current                      | I <sub>0</sub>     | [A]                                    | 7.2                        | 13.7 | 20.8 | 22.6 |
| Max Torque                              | M <sub>max</sub>   | [Nm]                                   | 30                         | 30   | 30   | 30   |
| Max Current                             | I <sub>max</sub>   | [A]                                    | 25.3                       | 48   | 73   | 79   |
| Back EMF constant                       | K <sub>e</sub>     | [V/1000min <sup>-1</sup> ]             | 95                         | 50   | 33.1 | 30.4 |
| Torque constant                         | K <sub>T</sub>     | [Nm/A]                                 | 1.41                       | 0.75 | 0.49 | 0.45 |
| Rated Power                             | P <sub>n</sub>     | [kW]                                   | 1.7                        | 3.0  | 4.0  | 4.6  |
| Stator phase-phase Resistance (at 20°C) | R <sub>pp</sub>    | [Ω]                                    | 1.56                       | 0.43 | 0.19 | 0.16 |
| Stator phase-phase Inductance           | L <sub>pp</sub>    | [mH]                                   | 20.5                       | 5.7  | 2.5  | 2.1  |
| Rotor inertia                           | J <sub>m</sub>     | [kgm <sup>2</sup> x 10 <sup>-4</sup> ] | 7.8                        |      |      |      |
| Electric time constant (at 20°C)        | τ <sub>el</sub>    | [ms]                                   | 13                         |      |      |      |
| Thermal time constant                   | τ <sub>therm</sub> | [min]                                  | 34                         |      |      |      |
| Motor mass without brake                | m <sub>M</sub>     | [kg]                                   | 9.7                        |      |      |      |
| Motor mass with brake                   | m <sub>MB</sub>    | [kg]                                   | 11.9                       |      |      |      |



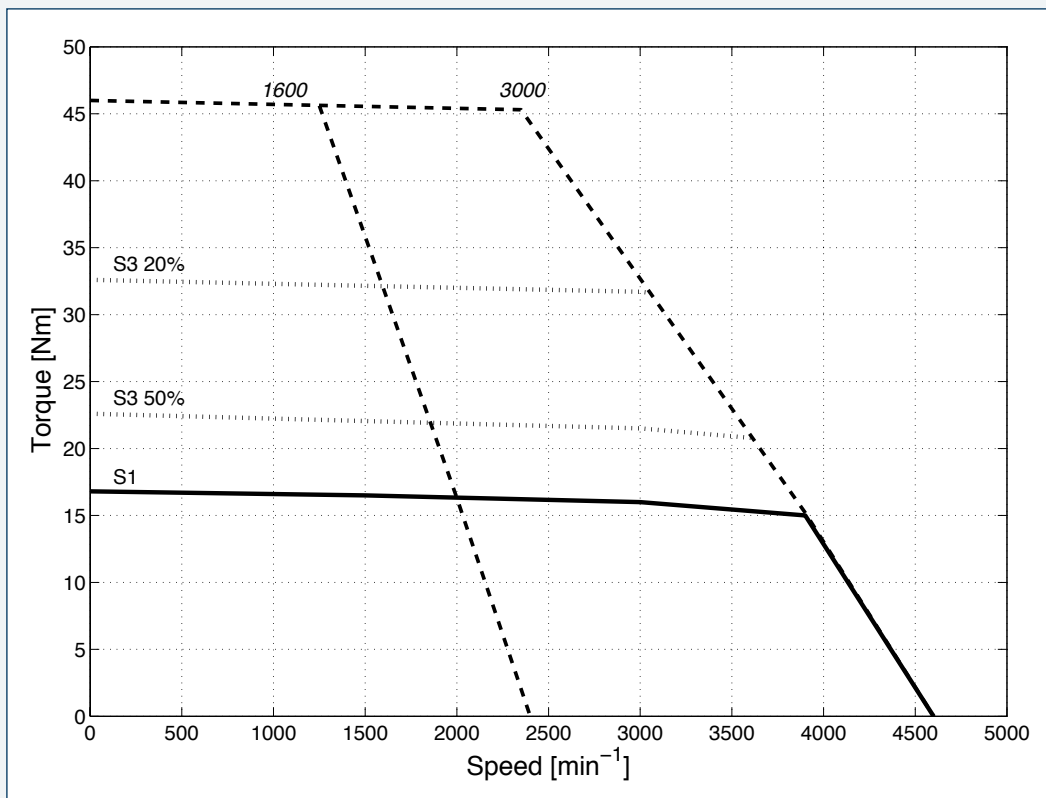
## BMD 118 • 14 Nm - 230V

| Parameter                               | Symbol         | Unit                                   | Speed [min <sup>-1</sup> ] |      |
|-----------------------------------------|----------------|----------------------------------------|----------------------------|------|
|                                         |                |                                        | 1600                       | 3000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                                   | 14.0                       |      |
| Motor rated frequency                   | $f_n$          | [Hz]                                   | 107                        | 200  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                     | 184                        | 192  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                                   | 13.3                       | 12.2 |
| Current at rated speed                  | $I_n$          | [A]                                    | 8.6                        | 14.0 |
| Standstill current                      | $I_0$          | [A]                                    | 9.2                        | 16.3 |
| Max Torque                              | $M_{max}$      | [Nm]                                   | 39                         | 39   |
| Max Current                             | $I_{max}$      | [A]                                    | 30                         | 53   |
| Back EMF constant                       | $K_e$          | [V/1000min <sup>-1</sup> ]             | 104                        | 59   |
| Torque constant                         | $K_T$          | [Nm/A]                                 | 1.51                       | 0.86 |
| Rated Power                             | $P_n$          | [kW]                                   | 2.2                        | 3.8  |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [Ω]                                    | 1.17                       | 0.37 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                                   | 15.4                       | 4.9  |
| Rotor inertia                           | $J_m$          | [kgm <sup>2</sup> × 10 <sup>-4</sup> ] | 9.9                        |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                                   | 13                         |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                                  | 42                         |      |
| Motor mass without brake                | $m_M$          | [kg]                                   | 11.7                       |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                                   | 12.9                       |      |



# BMD 145 • 16.8 Nm - 230V

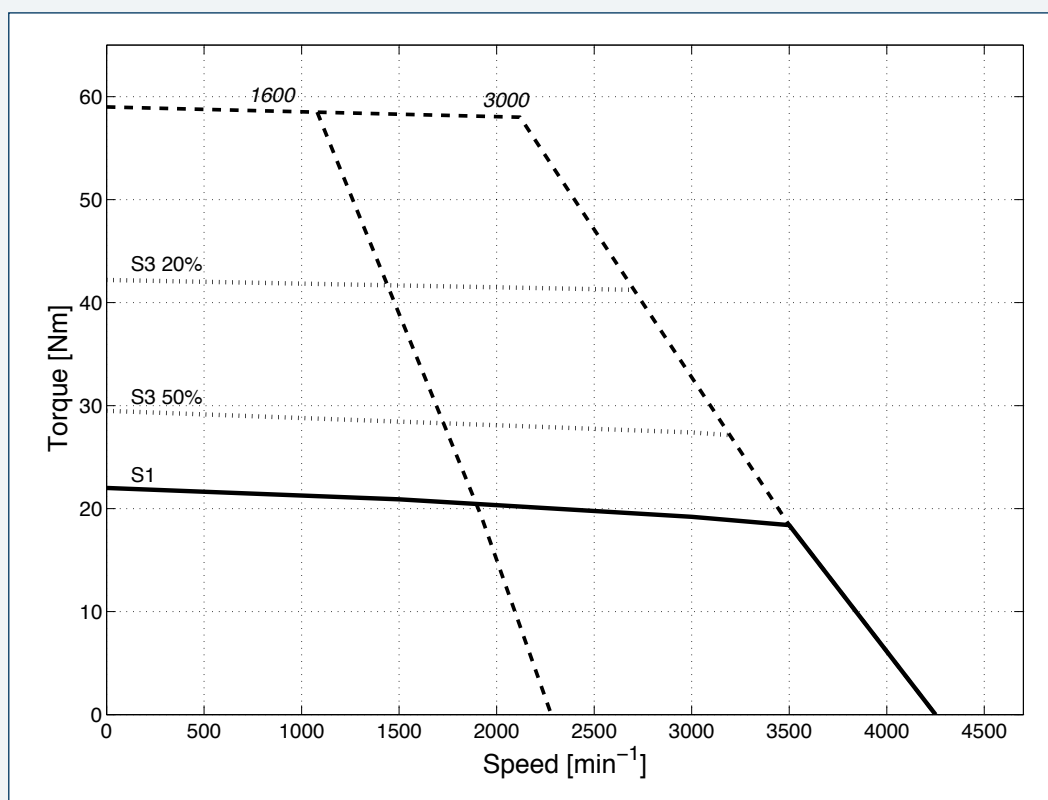
| Parameter                               | Symbol             | Unit                                   | Speed [min <sup>-1</sup> ] |      |
|-----------------------------------------|--------------------|----------------------------------------|----------------------------|------|
|                                         |                    |                                        | 1600                       | 3000 |
| Standstill torque (dT=105K)             | M <sub>0</sub>     | [Nm]                                   | 16.8                       |      |
| Motor rated frequency                   | f <sub>n</sub>     | [Hz]                                   | 107                        | 200  |
| Motor rated voltage                     | V <sub>n</sub>     | [V <sub>AC</sub> ]                     | 180                        | 176  |
| Rated Torque (dT=105K)                  | M <sub>n</sub>     | [Nm]                                   | 16.5                       | 16   |
| Current at rated speed                  | I <sub>n</sub>     | [A]                                    | 11.9                       | 21.9 |
| Standstill current                      | I <sub>0</sub>     | [A]                                    | 12.1                       | 22.8 |
| Max Torque                              | M <sub>max</sub>   | [Nm]                                   | 46                         | 46   |
| Max Current                             | I <sub>max</sub>   | [A]                                    | 46                         | 88   |
| Back EMF constant                       | K <sub>e</sub>     | [V/1000min <sup>-1</sup> ]             | 89                         | 47   |
| Torque constant                         | K <sub>T</sub>     | [Nm/A]                                 | 1.39                       | 0.74 |
| Rated Power                             | P <sub>n</sub>     | [kW]                                   | 2.76                       | 5.0  |
| Stator phase-phase Resistance (at 20°C) | R <sub>pp</sub>    | [Ω]                                    | 0.84                       | 0.24 |
| Stator phase-phase Inductance           | L <sub>pp</sub>    | [mH]                                   | 13.3                       | 3.8  |
| Rotor inertia                           | J <sub>m</sub>     | [kgm <sup>2</sup> x 10 <sup>-4</sup> ] | 12.8                       |      |
| Electric time constant (at 20°C)        | τ <sub>el</sub>    | [ms]                                   | 16                         |      |
| Thermal time constant                   | τ <sub>therm</sub> | [min]                                  | 36                         |      |
| Motor mass without brake                | m <sub>M</sub>     | [kg]                                   | 15.2                       |      |
| Motor mass with brake                   | m <sub>MB</sub>    | [kg]                                   | 17.8                       |      |





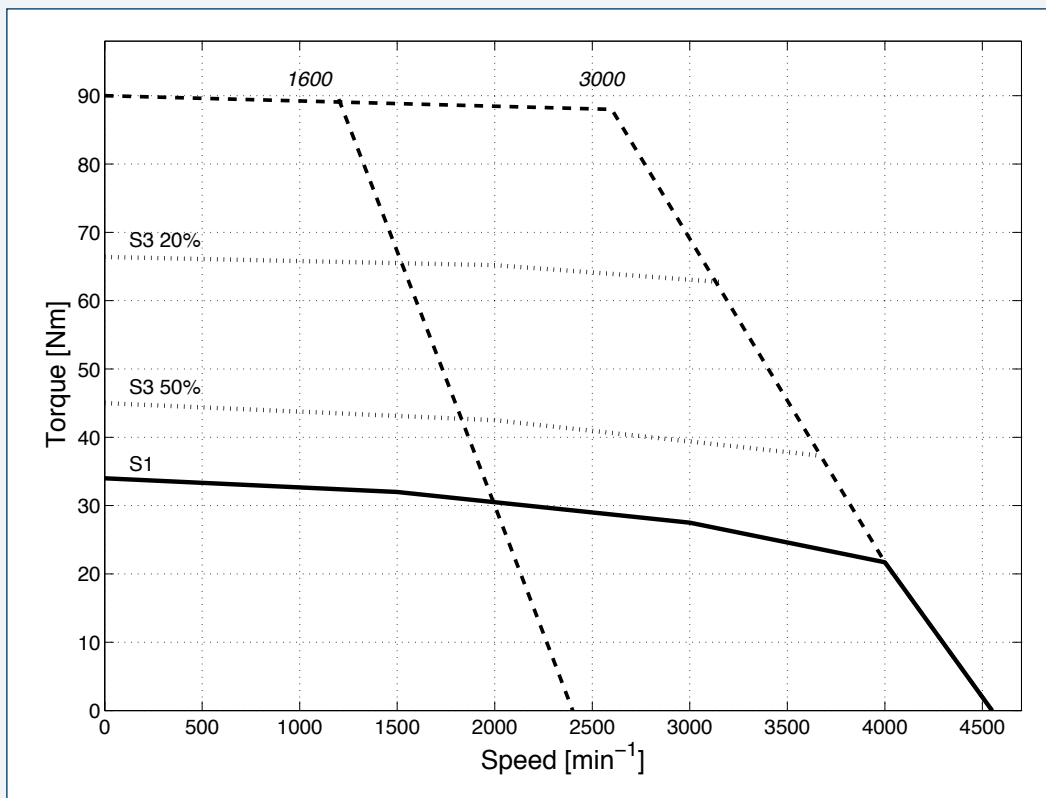
## BMD 145 • 22 Nm - 230V

| Parameter                               | Symbol                | Unit                              | Speed [ $\text{min}^{-1}$ ] |      |
|-----------------------------------------|-----------------------|-----------------------------------|-----------------------------|------|
|                                         |                       |                                   | 1600                        | 3000 |
| Standstill torque (dT=105K)             | $M_0$                 | [Nm]                              | 22.0                        |      |
| Motor rated frequency                   | $f_n$                 | [Hz]                              | 107                         | 200  |
| Motor rated voltage                     | $V_n$                 | [V <sub>AC</sub> ]                | 185                         | 202  |
| Rated Torque (dT=105K)                  | $M_n$                 | [Nm]                              | 20.7                        | 19.2 |
| Current at rated speed                  | $I_n$                 | [A]                               | 14.5                        | 22.9 |
| Standstill current                      | $I_0$                 | [A]                               | 15.4                        | 26.5 |
| Max Torque                              | $M_{\text{max}}$      | [Nm]                              | 59                          | 59   |
| Max Current                             | $I_{\text{max}}$      | [A]                               | 51                          | 87   |
| Back EMF constant                       | $K_e$                 | [V/1000 $\text{min}^{-1}$ ]       | 102                         | 60   |
| Torque constant                         | $K_T$                 | [Nm/A]                            | 1.42                        | 0.83 |
| Rated Power                             | $P_n$                 | [kW]                              | 3.5                         | 6.0  |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$              | [ $\Omega$ ]                      | 0.67                        | 0.23 |
| Stator phase-phase Inductance           | $L_{pp}$              | [mH]                              | 10.6                        | 3.6  |
| Rotor inertia                           | $J_m$                 | [ $\text{kgm}^2 \times 10^{-4}$ ] | 17.6                        |      |
| Electric time constant (at 20°C)        | $\tau_{\text{el}}$    | [ms]                              | 16                          |      |
| Thermal time constant                   | $\tau_{\text{therm}}$ | [min]                             | 47                          |      |
| Motor mass without brake                | $m_M$                 | [kg]                              | 18.2                        |      |
| Motor mass with brake                   | $m_{MB}$              | [kg]                              | 20.8                        |      |



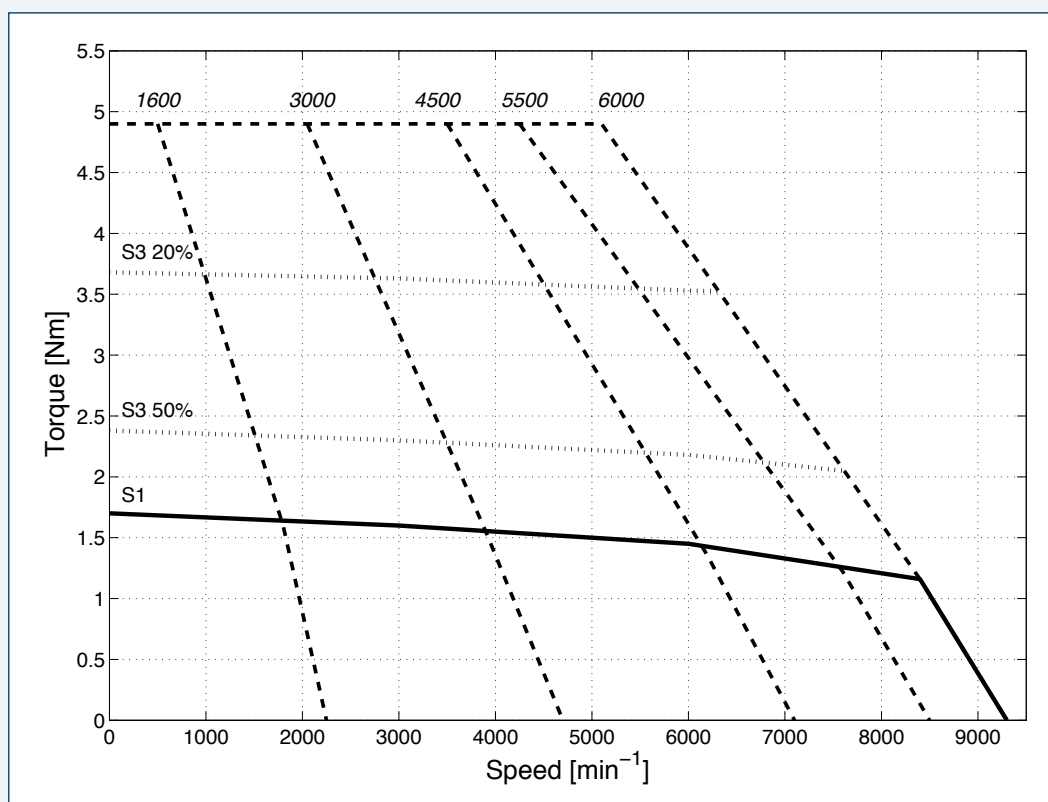
# BMD 170 • 34 Nm - 230V

| Parameter                               | Symbol         | Unit                                   | Speed [min <sup>-1</sup> ] |      |
|-----------------------------------------|----------------|----------------------------------------|----------------------------|------|
|                                         |                |                                        | 1600                       | 3000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                                   | 34.0                       |      |
| Motor rated frequency                   | $f_n$          | [Hz]                                   | 107                        | 200  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                     | 181                        | 182  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                                   | 31                         | 27.5 |
| Current at rated speed                  | $I_n$          | [A]                                    | 19.7                       | 32.2 |
| Standstill current                      | $I_0$          | [A]                                    | 21.8                       | 40.4 |
| Max Torque                              | $M_{max}$      | [Nm]                                   | 90                         | 90   |
| Max Current                             | $I_{max}$      | [A]                                    | 66                         | 121  |
| Back EMF constant                       | $K_e$          | [V/1000min <sup>-1</sup> ]             | 99                         | 54   |
| Torque constant                         | $K_T$          | [Nm/A]                                 | 1.56                       | 0.84 |
| Rated Power                             | $P_n$          | [kW]                                   | 5.2                        | 8.6  |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [Ω]                                    | 0.30                       | 0.09 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                                   | 5.8                        | 1.7  |
| Rotor inertia                           | $J_m$          | [kgm <sup>2</sup> x 10 <sup>-4</sup> ] | 28.2                       |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                                   | 20                         |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                                  | 50                         |      |
| Motor mass without brake                | $m_M$          | [kg]                                   | 25                         |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                                   | 29.5                       |      |



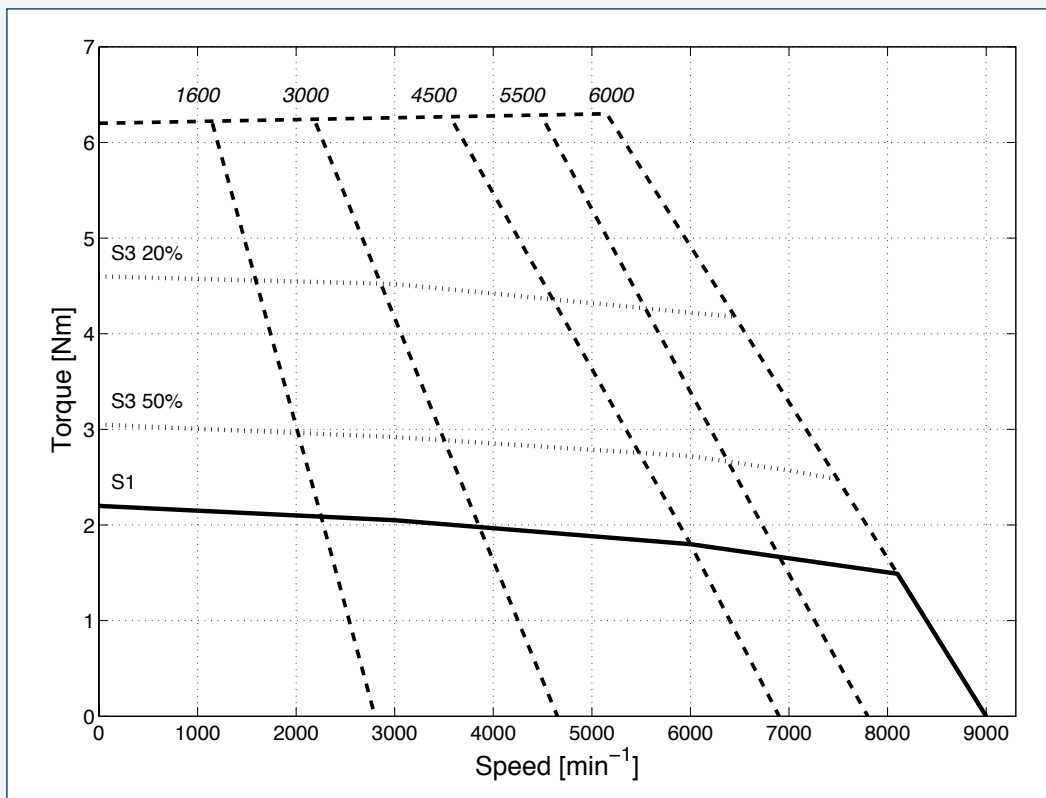
## BMD 65 • 1.7 Nm - 400V

| Parameter                               | Symbol         | Unit                                   | Speed [min <sup>-1</sup> ] |      |      |      |      |
|-----------------------------------------|----------------|----------------------------------------|----------------------------|------|------|------|------|
|                                         |                |                                        | 1600                       | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                                   | 1.7                        |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                                   | 107                        | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                     | 336                        | 311  | 308  | 316  | 300  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                                   | 1.65                       | 1.60 | 1.52 | 1.48 | 1.45 |
| Current at rated speed                  | $I_n$          | [A]                                    | 0.72                       | 1.33 | 1.85 | 2.14 | 2.43 |
| Standstill current                      | $I_0$          | [A]                                    | 0.72                       | 1.35 | 1.98 | 2.34 | 2.68 |
| Max Torque                              | $M_{max}$      | [Nm]                                   | 4.9                        | 4.9  | 4.9  | 4.9  | 4.9  |
| Max Current                             | $I_{max}$      | [A]                                    | 2.46                       | 4.6  | 6.7  | 8.0  | 9.1  |
| Back EMF constant                       | $K_e$          | [V/1000min <sup>-1</sup> ]             | 155                        | 83   | 57   | 48   | 42   |
| Torque constant                         | $K_T$          | [Nm/A]                                 | 2.36                       | 1.26 | 0.86 | 0.73 | 0.63 |
| Rated Power                             | $P_n$          | [kW]                                   | 0.28                       | 0.50 | 0.72 | 0.85 | 0.91 |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [Ω]                                    | 92.3                       | 26.3 | 12.2 | 8.79 | 6.65 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                                   | 279                        | 79.5 | 37.0 | 26.6 | 20.1 |
| Rotor inertia                           | $J_m$          | [kgm <sup>2</sup> × 10 <sup>-4</sup> ] | 0.4                        |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                                   | 3.0                        |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                                  | 20                         |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                                   | 1.9                        |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                                   | 2.1                        |      |      |      |      |



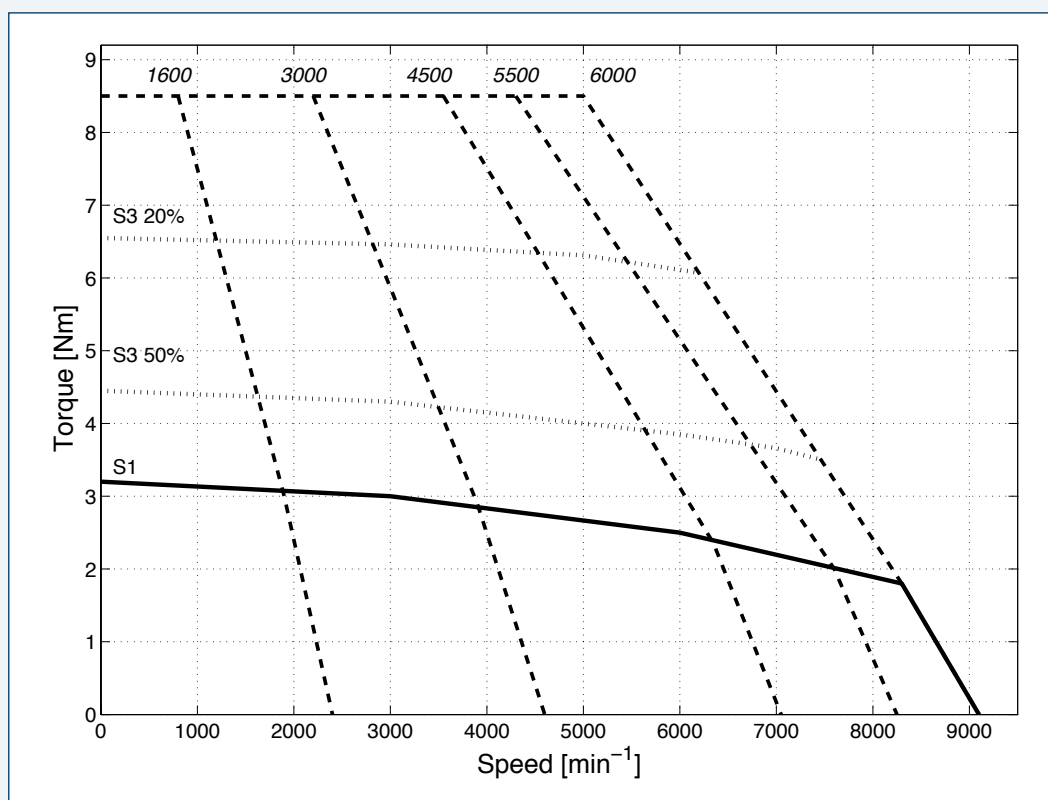
## BMD 65 • 2.2 Nm - 400V

| Parameter                               | Symbol         | Unit                                   | Speed [min <sup>-1</sup> ] |      |      |      |      |
|-----------------------------------------|----------------|----------------------------------------|----------------------------|------|------|------|------|
|                                         |                |                                        | 1600                       | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                                   | 2.2                        |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                                   | 107                        | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                     | 285                        | 314  | 314  | 328  | 313  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                                   | 2.12                       | 2.05 | 1.95 | 1.85 | 1.80 |
| Current at rated speed                  | $I_n$          | [A]                                    | 1.04                       | 1.60 | 2.20 | 2.41 | 2.68 |
| Standstill current                      | $I_0$          | [A]                                    | 1.07                       | 1.70 | 2.48 | 2.88 | 3.27 |
| Max Torque                              | $M_{max}$      | [Nm]                                   | 6.2                        | 6.2  | 6.2  | 6.2  | 6.2  |
| Max Current                             | $I_{max}$      | [A]                                    | 3.4                        | 5.4  | 7.9  | 9.1  | 10.4 |
| Back EMF constant                       | $K_e$          | [V/1000min <sup>-1</sup> ]             | 143                        | 90   | 62   | 53   | 47   |
| Torque constant                         | $K_T$          | [Nm/A]                                 | 2.06                       | 1.29 | 0.89 | 0.76 | 0.67 |
| Rated Power                             | $P_n$          | [kW]                                   | 0.36                       | 0.64 | 0.92 | 1.07 | 1.13 |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [Ω]                                    | 47.6                       | 18.8 | 8.82 | 6.56 | 5.08 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                                   | 144                        | 56.9 | 26.7 | 19.8 | 15.4 |
| Rotor inertia                           | $J_m$          | [kgm <sup>2</sup> x 10 <sup>-4</sup> ] | 0.6                        |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                                   | 3.0                        |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                                  | 26                         |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                                   | 2.6                        |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                                   | 2.8                        |      |      |      |      |



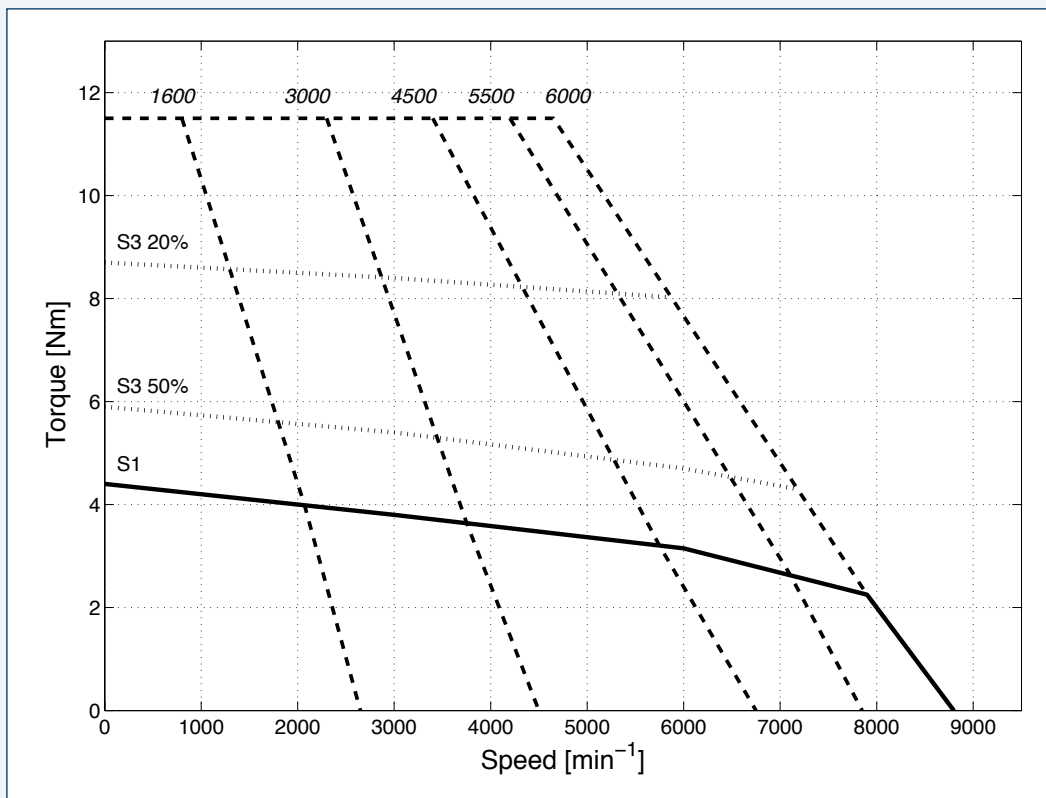
## BMD 82 • 3.2 Nm - 400V

| Parameter                               | Symbol         | Unit                                   | Speed [min <sup>-1</sup> ] |      |      |      |      |
|-----------------------------------------|----------------|----------------------------------------|----------------------------|------|------|------|------|
|                                         |                |                                        | 1600                       | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                                   | 3.2                        |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                                   | 107                        | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                     | 332                        | 315  | 312  | 323  | 308  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                                   | 3.15                       | 3    | 2.8  | 2.6  | 2.5  |
| Current at rated speed                  | $I_n$          | [A]                                    | 1.36                       | 2.50 | 3.4  | 3.8  | 4.3  |
| Standstill current                      | $I_0$          | [A]                                    | 1.39                       | 2.60 | 3.9  | 4.5  | 5.2  |
| Max Torque                              | $M_{max}$      | [Nm]                                   | 8.5                        | 8.5  | 8.5  | 8.5  | 8.5  |
| Max Current                             | $I_{max}$      | [A]                                    | 4.7                        | 8.9  | 13.2 | 15.5 | 17.7 |
| Back EMF constant                       | $K_e$          | [V/1000min <sup>-1</sup> ]             | 159                        | 85   | 57   | 49   | 43   |
| Torque constant                         | $K_T$          | [Nm/A]                                 | 2.31                       | 1.23 | 0.83 | 0.71 | 0.62 |
| Rated Power                             | $P_n$          | [kW]                                   | 0.53                       | 0.94 | 1.32 | 1.50 | 1.57 |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [Ω]                                    | 34.3                       | 9.75 | 4.42 | 3.23 | 2.47 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                                   | 194                        | 55.2 | 25.0 | 18.3 | 14.0 |
| Rotor inertia                           | $J_m$          | [kgm <sup>2</sup> × 10 <sup>-4</sup> ] | 1.4                        |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                                   | 5.7                        |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                                  | 26                         |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                                   | 3.5                        |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                                   | 4.1                        |      |      |      |      |



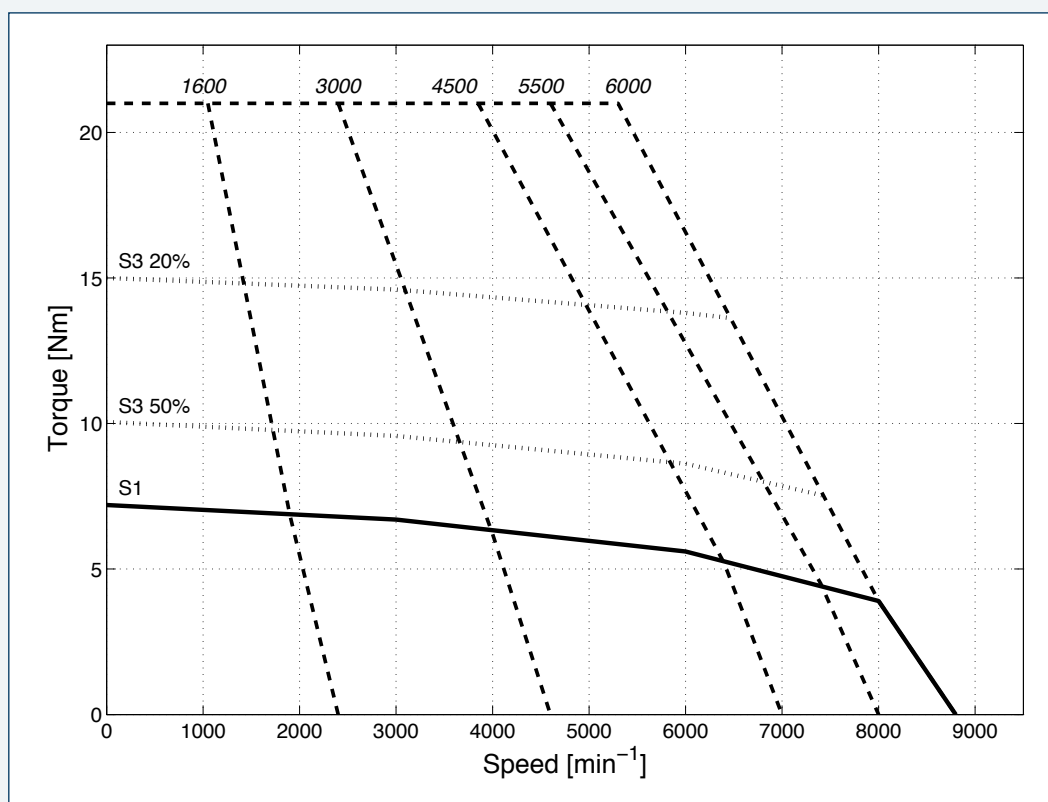
## BMD 82 • 4.4 Nm - 400V

| Parameter                               | Symbol         | Unit                              | Speed [ $\text{min}^{-1}$ ] |      |      |      |      |
|-----------------------------------------|----------------|-----------------------------------|-----------------------------|------|------|------|------|
|                                         |                |                                   | 1600                        | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                              | 4.4                         |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                              | 107                         | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                | 315                         | 323  | 328  | 335  | 335  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                              | 4.2                         | 3.8  | 3.55 | 3.3  | 3.15 |
| Current at rated speed                  | $I_n$          | [A]                               | 1.76                        | 2.90 | 3.9  | 4.3  | 4.5  |
| Standstill current                      | $I_0$          | [A]                               | 1.88                        | 3.3  | 4.8  | 5.7  | 6.2  |
| Max Torque                              | $M_{\max}$     | [Nm]                              | 11.5                        | 11.5 | 11.5 | 11.5 | 11.5 |
| Max Current                             | $I_{\max}$     | [A]                               | 5.6                         | 9.9  | 14.4 | 17.1 | 18.6 |
| Back EMF constant                       | $K_e$          | [V/1000 $\text{min}^{-1}$ ]       | 161                         | 92   | 63   | 53   | 49   |
| Torque constant                         | $K_T$          | [Nm/A]                            | 2.34                        | 1.33 | 0.92 | 0.77 | 0.71 |
| Rated Power                             | $P_n$          | [kW]                              | 0.70                        | 1.19 | 1.67 | 1.90 | 2.0  |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [ $\Omega$ ]                      | 20.8                        | 6.77 | 3.21 | 2.26 | 1.92 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                              | 118                         | 38.3 | 18.1 | 12.8 | 10.8 |
| Rotor inertia                           | $J_m$          | [ $\text{kgm}^2 \times 10^{-4}$ ] | 1.7                         |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                              | 5.7                         |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                             | 33                          |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                              | 4.6                         |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                              | 5.2                         |      |      |      |      |



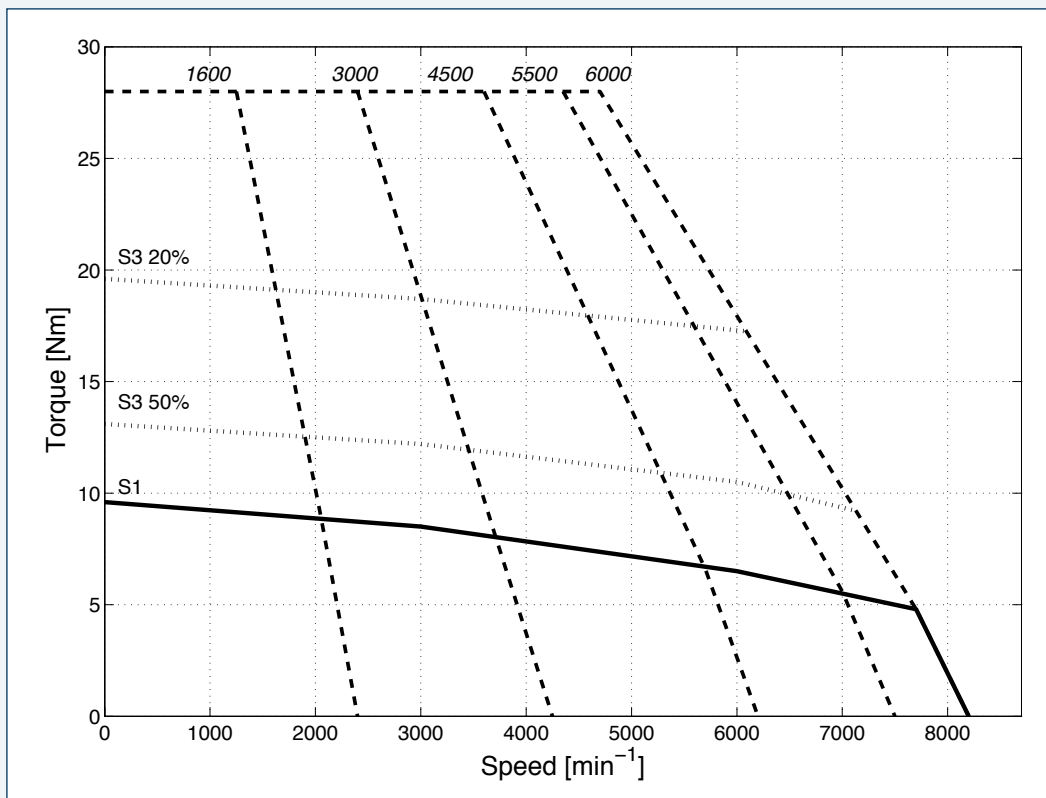
## BMD 102 • 7.2 Nm - 400V

| Parameter                               | Symbol         | Unit                                   | Speed [min <sup>-1</sup> ] |      |      |      |      |
|-----------------------------------------|----------------|----------------------------------------|----------------------------|------|------|------|------|
|                                         |                |                                        | 1600                       | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                                   | 7.2                        |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                                   | 107                        | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                     | 320                        | 311  | 305  | 320  | 305  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                                   | 7                          | 6.7  | 6    | 5.8  | 5.6  |
| Current at rated speed                  | $I_n$          | [A]                                    | 2.92                       | 5.4  | 7.5  | 8.2  | 9.3  |
| Standstill current                      | $I_0$          | [A]                                    | 2.94                       | 5.5  | 8.3  | 9.7  | 11.0 |
| Max Torque                              | $M_{max}$      | [Nm]                                   | 21                         | 21   | 21   | 21   | 21   |
| Max Current                             | $I_{max}$      | [A]                                    | 10.7                       | 20.0 | 30   | 35   | 40   |
| Back EMF constant                       | $K_e$          | [V/1000min <sup>-1</sup> ]             | 161                        | 86   | 57   | 49   | 43   |
| Torque constant                         | $K_T$          | [Nm/A]                                 | 2.45                       | 1.31 | 0.87 | 0.75 | 0.65 |
| Rated Power                             | $P_n$          | [kW]                                   | 1.17                       | 2.10 | 2.83 | 3.3  | 3.5  |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [Ω]                                    | 8.87                       | 2.53 | 1.11 | 0.82 | 0.63 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                                   | 74.7                       | 21.3 | 9.4  | 6.9  | 5.3  |
| Rotor inertia                           | $J_m$          | [kgm <sup>2</sup> x 10 <sup>-4</sup> ] | 3.7                        |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                                   | 1.4                        |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                                  | 31                         |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                                   | 5.8                        |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                                   | 7                          |      |      |      |      |



# BMD 102 • 9.6 Nm - 400V

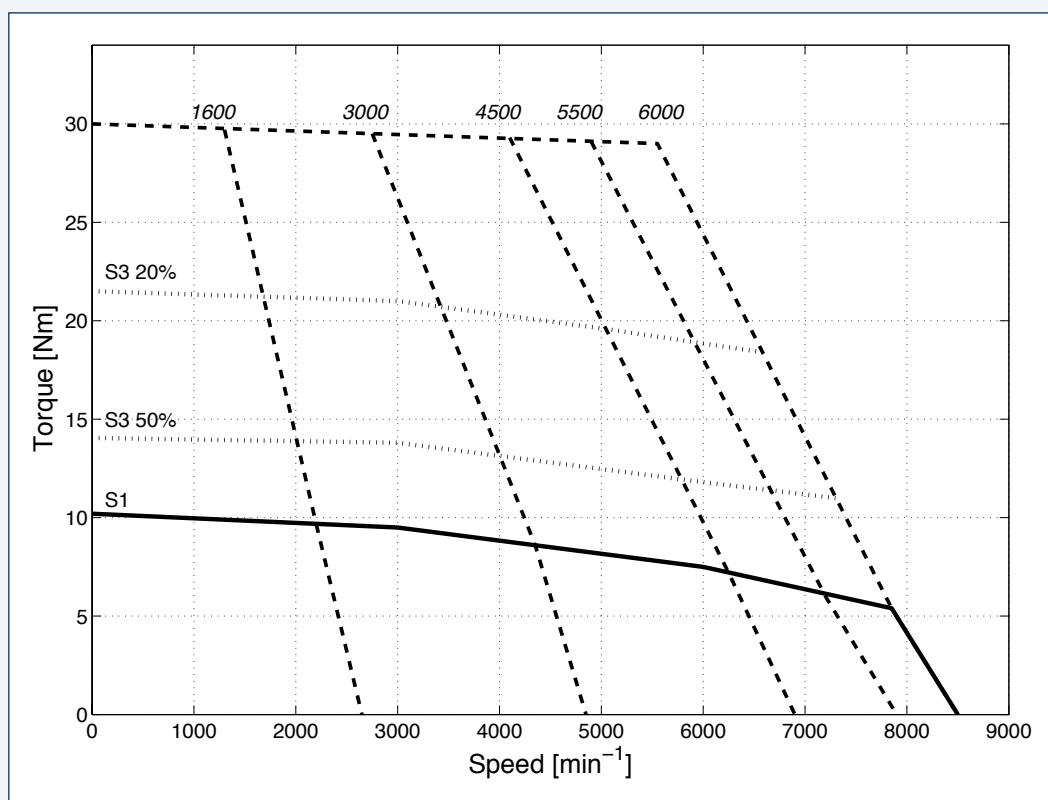
| Parameter                               | Symbol         | Unit                              | Speed [ $\text{min}^{-1}$ ] |      |      |      |      |
|-----------------------------------------|----------------|-----------------------------------|-----------------------------|------|------|------|------|
|                                         |                |                                   | 1600                        | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                              | 9.6                         |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                              | 107                         | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                | 318                         | 324  | 323  | 332  | 333  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                              | 9.2                         | 8.5  | 7.7  | 6.9  | 6.5  |
| Current at rated speed                  | $I_n$          | [A]                               | 3.4                         | 5.8  | 7.8  | 8.3  | 8.4  |
| Standstill current                      | $I_0$          | [A]                               | 3.6                         | 6.5  | 9.7  | 11.5 | 12.4 |
| Max Torque                              | $M_{max}$      | [Nm]                              | 28                          | 28   | 28   | 28   | 28   |
| Max Current                             | $I_{max}$      | [A]                               | 11.7                        | 21.0 | 31   | 37   | 40   |
| Back EMF constant                       | $K_e$          | [V/1000 $\text{min}^{-1}$ ]       | 177                         | 99   | 66   | 56   | 52   |
| Torque constant                         | $K_T$          | [Nm/A]                            | 2.65                        | 1.48 | 0.99 | 0.84 | 0.77 |
| Rated Power                             | $P_n$          | [kW]                              | 1.54                        | 2.7  | 3.6  | 4.0  | 4.1  |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [ $\Omega$ ]                      | 6.77                        | 2.11 | 0.95 | 0.68 | 0.58 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                              | 56.8                        | 17.7 | 8.0  | 5.7  | 4.8  |
| Rotor inertia                           | $J_m$          | [ $\text{kgm}^2 \times 10^{-4}$ ] | 4.7                         |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                              | 8.4                         |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                             | 38                          |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                              | 7.4                         |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                              | 8.4                         |      |      |      |      |





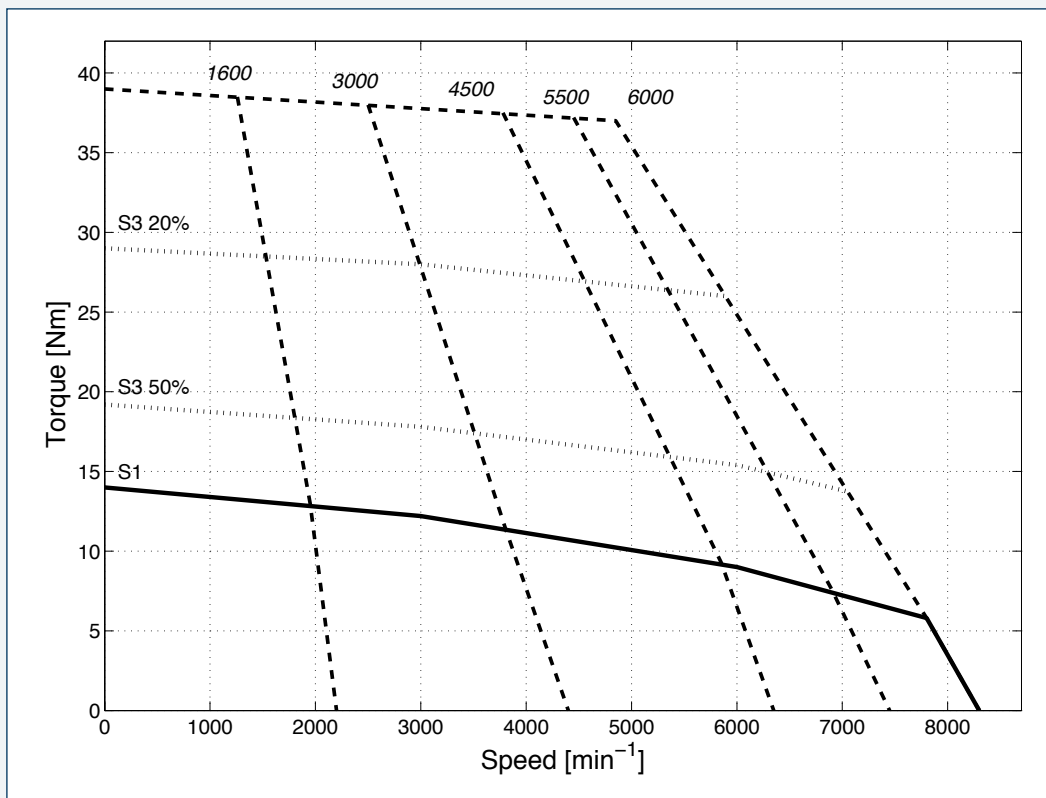
## BMD 118 • 10.2 Nm - 400V

| Parameter                               | Symbol         | Unit                                   | Speed [min <sup>-1</sup> ] |      |      |      |      |
|-----------------------------------------|----------------|----------------------------------------|----------------------------|------|------|------|------|
|                                         |                |                                        | 1600                       | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                                   | 10.2                       |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                                   | 107                        | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                     | 312                        | 305  | 314  | 323  | 306  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                                   | 10                         | 9.5  | 8.5  | 8    | 7.5  |
| Current at rated speed                  | $I_n$          | [A]                                    | 4.2                        | 7.9  | 10.2 | 10.5 | 11.4 |
| Standstill current                      | $I_0$          | [A]                                    | 4.3                        | 8.0  | 11.6 | 13.7 | 15.8 |
| Max Torque                              | $M_{max}$      | [Nm]                                   | 30                         | 30   | 30   | 30   | 30   |
| Max Current                             | $I_{max}$      | [A]                                    | 14.9                       | 28.0 | 40   | 48   | 55   |
| Back EMF constant                       | $K_e$          | [V/1000min <sup>-1</sup> ]             | 161                        | 86   | 60   | 50   | 44   |
| Torque constant                         | $K_T$          | [Nm/A]                                 | 2.39                       | 1.28 | 0.88 | 0.75 | 0.65 |
| Rated Power                             | $P_n$          | [kW]                                   | 1.68                       | 3.0  | 4.0  | 4.6  | 4.7  |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [Ω]                                    | 4.47                       | 1.27 | 0.61 | 0.43 | 0.33 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                                   | 58.8                       | 16.7 | 8.0  | 5.7  | 4.3  |
| Rotor inertia                           | $J_m$          | [kgm <sup>2</sup> × 10 <sup>-4</sup> ] | 7.8                        |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                                   | 13                         |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                                  | 34                         |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                                   | 9.7                        |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                                   | 11.9                       |      |      |      |      |



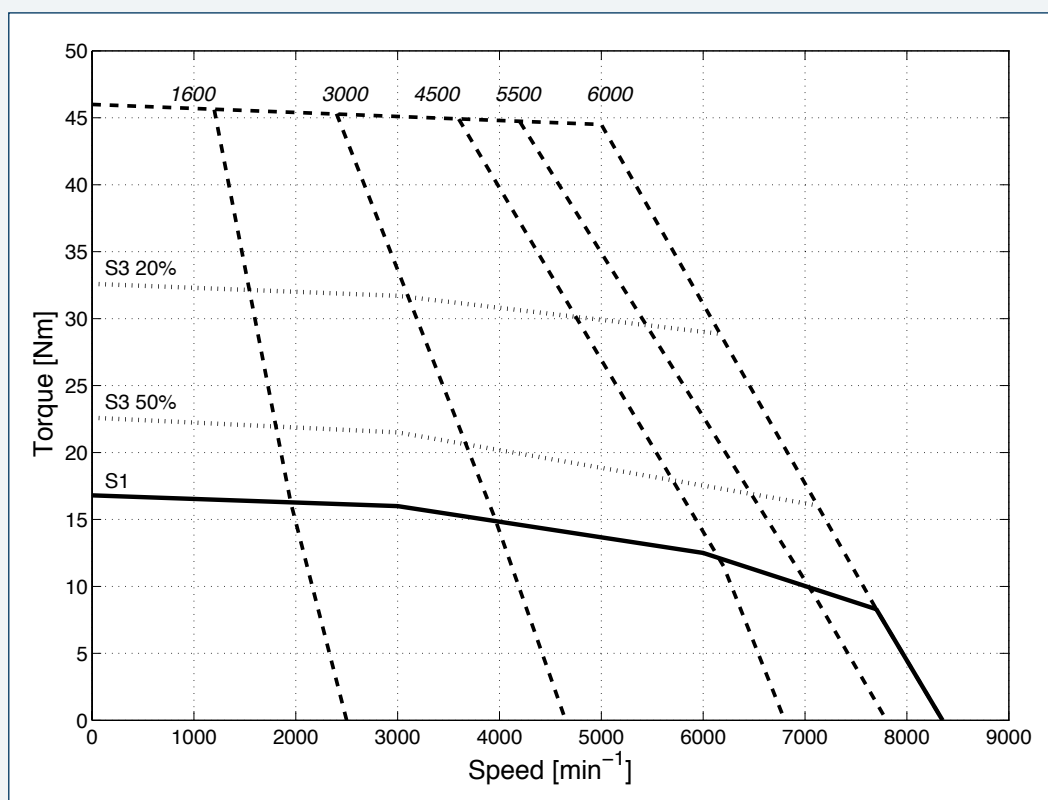
# BMD 118 • 14 Nm - 400V

| Parameter                               | Symbol             | Unit                                   | Speed [min <sup>-1</sup> ] |      |      |      |      |
|-----------------------------------------|--------------------|----------------------------------------|----------------------------|------|------|------|------|
|                                         |                    |                                        | 1600                       | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | M <sub>0</sub>     | [Nm]                                   | 14.0                       |      |      |      |      |
| Motor rated frequency                   | f <sub>n</sub>     | [Hz]                                   | 107                        | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | V <sub>n</sub>     | [V <sub>AC</sub> ]                     | 323                        | 320  | 325  | 335  | 329  |
| Rated Torque (dT=105K)                  | M <sub>n</sub>     | [Nm]                                   | 13.3                       | 12.2 | 10.9 | 9.7  | 9.0  |
| Current at rated speed                  | I <sub>n</sub>     | [A]                                    | 4.9                        | 8.4  | 10.9 | 11.4 | 11.8 |
| Standstill current                      | I <sub>0</sub>     | [A]                                    | 5.3                        | 9.8  | 14.4 | 16.9 | 18.9 |
| Max Torque                              | M <sub>max</sub>   | [Nm]                                   | 39                         | 39   | 39   | 39   | 39   |
| Max Current                             | I <sub>max</sub>   | [A]                                    | 17.2                       | 32   | 47   | 55   | 62   |
| Back EMF constant                       | K <sub>e</sub>     | [V/1000min <sup>-1</sup> ]             | 182                        | 98   | 67   | 57   | 51   |
| Torque constant                         | K <sub>T</sub>     | [Nm/A]                                 | 2.66                       | 1.43 | 0.97 | 0.83 | 0.74 |
| Rated Power                             | P <sub>n</sub>     | [kW]                                   | 2.2                        | 3.8  | 5.0  | 5.3  | 5.3  |
| Stator phase-phase Resistance (at 20°C) | R <sub>pp</sub>    | [Ω]                                    | 3.60                       | 1.04 | 0.48 | 0.35 | 0.28 |
| Stator phase-phase Inductance           | L <sub>pp</sub>    | [mH]                                   | 47.4                       | 13.7 | 6.3  | 4.6  | 3.7  |
| Rotor inertia                           | J <sub>m</sub>     | [kgm <sup>2</sup> x 10 <sup>-4</sup> ] | 9.9                        |      |      |      |      |
| Electric time constant (at 20°C)        | τ <sub>el</sub>    | [ms]                                   | 13                         |      |      |      |      |
| Thermal time constant                   | τ <sub>therm</sub> | [min]                                  | 42                         |      |      |      |      |
| Motor mass without brake                | m <sub>M</sub>     | [kg]                                   | 11.7                       |      |      |      |      |
| Motor mass with brake                   | m <sub>MB</sub>    | [kg]                                   | 12.9                       |      |      |      |      |



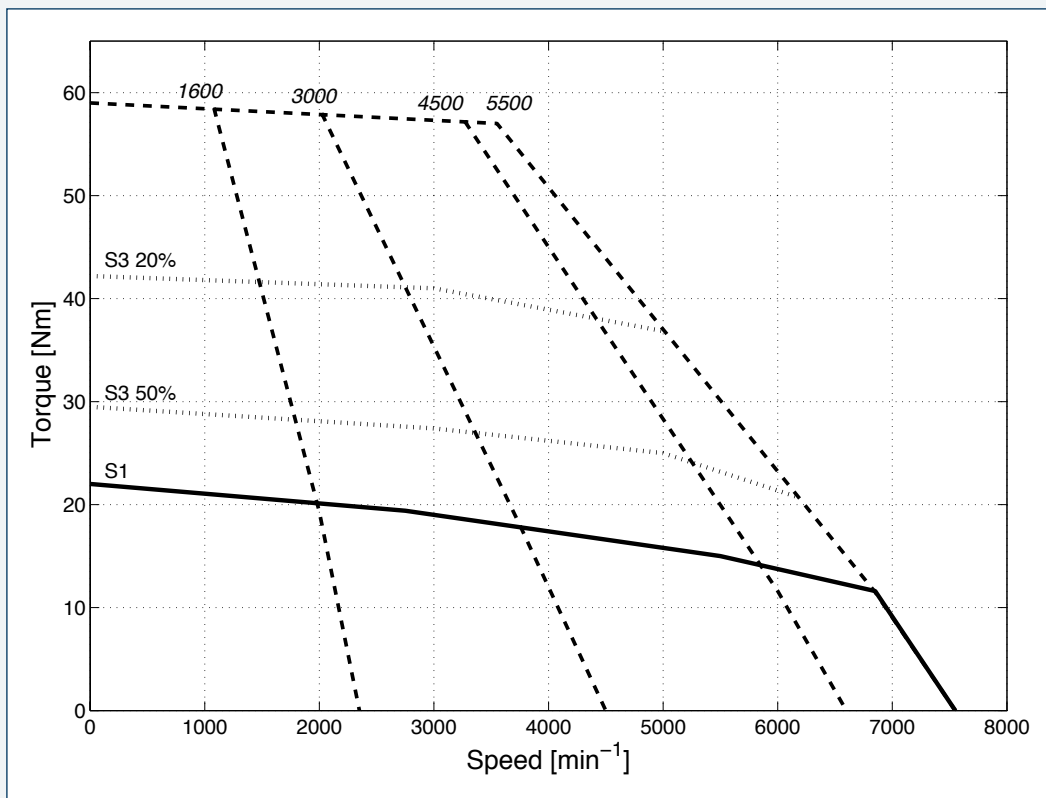
## BMD 145 • 16.8 Nm - 400V

| Parameter                               | Symbol         | Unit                                   | Speed [min <sup>-1</sup> ] |      |      |      |      |
|-----------------------------------------|----------------|----------------------------------------|----------------------------|------|------|------|------|
|                                         |                |                                        | 1600                       | 3000 | 4500 | 5500 | 6000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                                   | 16.8                       |      |      |      |      |
| Motor rated frequency                   | $f_n$          | [Hz]                                   | 107                        | 200  | 300  | 367  | 400  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                     | 314                        | 308  | 314  | 319  | 305  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                                   | 16.5                       | 16   | 14   | 13   | 12.5 |
| Current at rated speed                  | $I_n$          | [A]                                    | 6.8                        | 12.5 | 16.4 | 17.5 | 19   |
| Standstill current                      | $I_0$          | [A]                                    | 6.9                        | 13.0 | 19.0 | 22.8 | 26   |
| Max Torque                              | $M_{max}$      | [Nm]                                   | 46                         | 46   | 46   | 46   | 46   |
| Max Current                             | $I_{max}$      | [A]                                    | 26.7                       | 50   | 73   | 88   | 100  |
| Back EMF constant                       | $K_e$          | [V/1000min <sup>-1</sup> ]             | 156                        | 83   | 57   | 47   | 42   |
| Torque constant                         | $K_T$          | [Nm/A]                                 | 2.42                       | 1.29 | 0.88 | 0.74 | 0.65 |
| Rated Power                             | $P_n$          | [kW]                                   | 2.76                       | 5.0  | 6.6  | 7.5  | 7.9  |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [Ω]                                    | 2.53                       | 0.72 | 0.34 | 0.24 | 0.18 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                                   | 40.4                       | 11.5 | 5.4  | 3.8  | 2.9  |
| Rotor inertia                           | $J_m$          | [kgm <sup>2</sup> x 10 <sup>-4</sup> ] | 12.8                       |      |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                                   | 16                         |      |      |      |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                                  | 36                         |      |      |      |      |
| Motor mass without brake                | $m_M$          | [kg]                                   | 15.2                       |      |      |      |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                                   | 17.8                       |      |      |      |      |



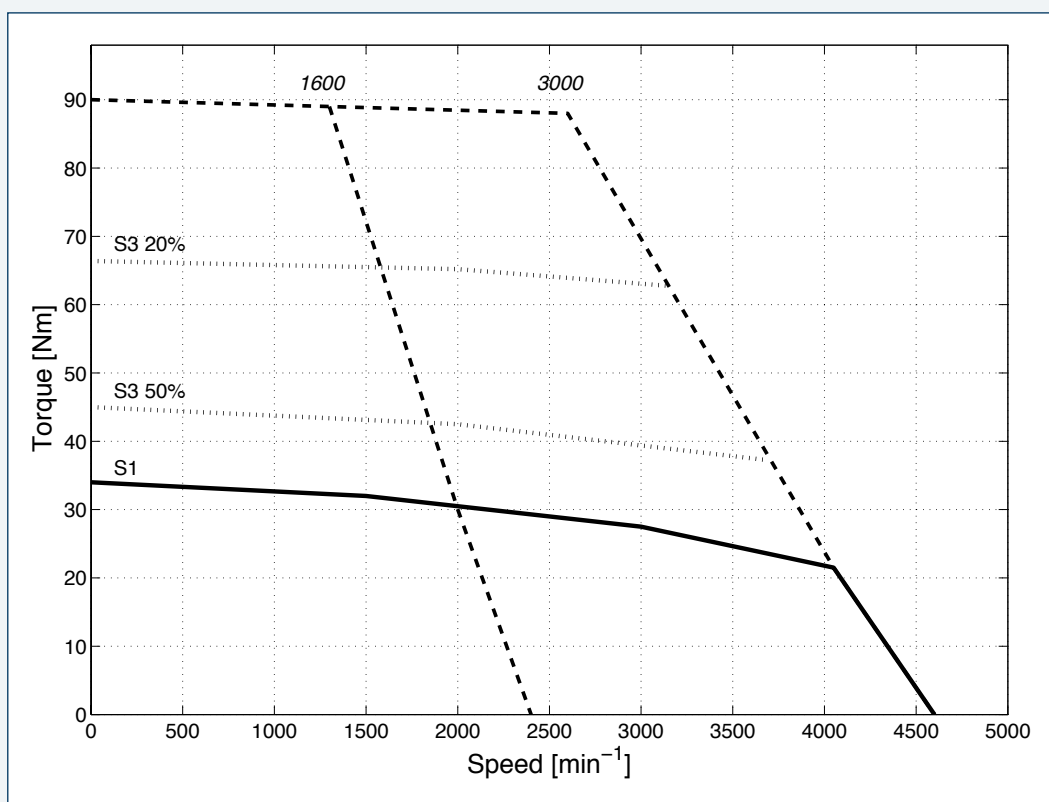
# BMD 145 • 22 Nm - 400V

| Parameter                               | Symbol                | Unit                              | Speed [ $\text{min}^{-1}$ ] |      |      |      |
|-----------------------------------------|-----------------------|-----------------------------------|-----------------------------|------|------|------|
|                                         |                       |                                   | 1600                        | 3000 | 4500 | 5500 |
| Standstill torque (dT=105K)             | $M_0$                 | [Nm]                              | 22.0                        |      |      |      |
| Motor rated frequency                   | $f_n$                 | [Hz]                              | 107                         | 200  | 300  | 367  |
| Motor rated voltage                     | $V_n$                 | [V <sub>AC</sub> ]                | 319                         | 321  | 323  | 357  |
| Rated Torque (dT=105K)                  | $M_n$                 | [Nm]                              | 20.7                        | 19.2 | 17   | 15   |
| Current at rated speed                  | $I_n$                 | [A]                               | 8.4                         | 14.2 | 18.3 | 17.6 |
| Standstill current                      | $I_0$                 | [A]                               | 9.0                         | 16.4 | 24.3 | 26.5 |
| Max Torque                              | $M_{\text{max}}$      | [Nm]                              | 59                          | 59   | 59   | 59   |
| Max Current                             | $I_{\text{max}}$      | [A]                               | 29.5                        | 54   | 80   | 87   |
| Back EMF constant                       | $K_e$                 | [V/1000 $\text{min}^{-1}$ ]       | 176                         | 96   | 65   | 59   |
| Torque constant                         | $K_T$                 | [Nm/A]                            | 2.45                        | 1.34 | 0.90 | 0.83 |
| Rated Power                             | $P_n$                 | [kW]                              | 3.5                         | 6.0  | 8.0  | 8.6  |
| Stator phase-phase Resistance (at 20°C) | $R_{\text{pp}}$       | [ $\Omega$ ]                      | 1.97                        | 0.59 | 0.27 | 0.23 |
| Stator phase-phase Inductance           | $L_{\text{pp}}$       | [mH]                              | 31.5                        | 9.4  | 4.3  | 3.6  |
| Rotor inertia                           | $J_m$                 | [ $\text{kgm}^2 \times 10^{-4}$ ] | 17.6                        |      |      |      |
| Electric time constant (at 20°C)        | $\tau_{\text{el}}$    | [ms]                              | 16                          |      |      |      |
| Thermal time constant                   | $\tau_{\text{therm}}$ | [min]                             | 47                          |      |      |      |
| Motor mass without brake                | $m_M$                 | [kg]                              | 18.2                        |      |      |      |
| Motor mass with brake                   | $m_{\text{MB}}$       | [kg]                              | 20.8                        |      |      |      |



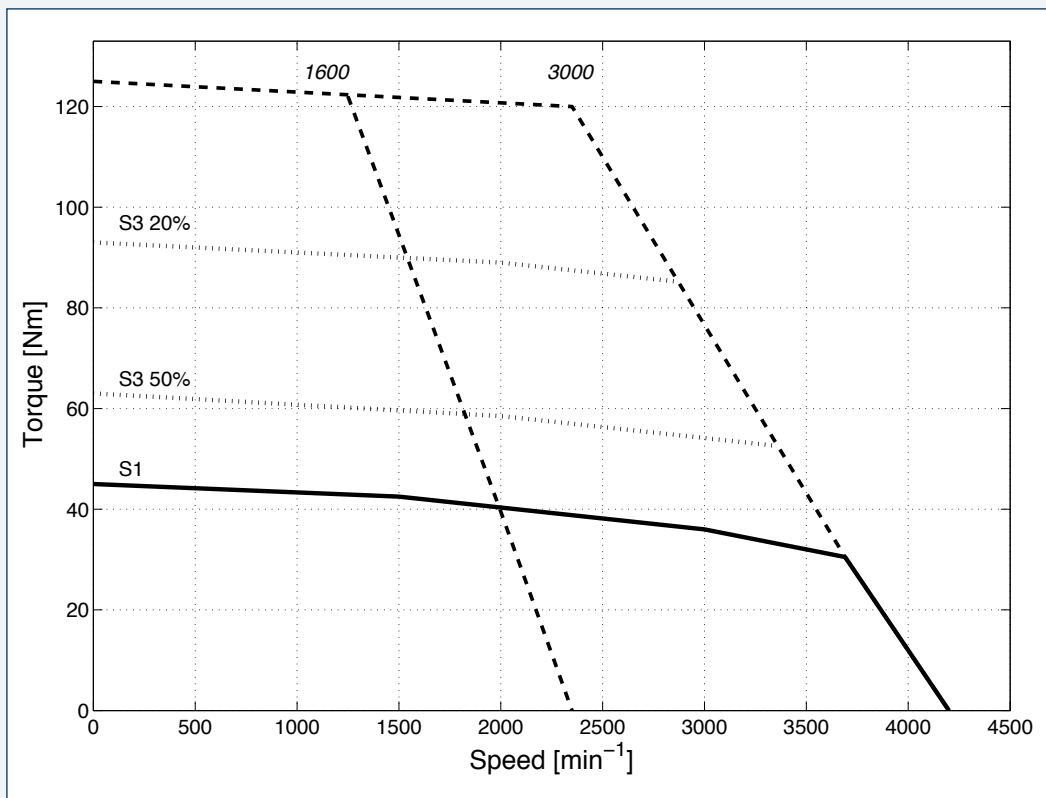
## BMD 170 • 34 Nm - 400V

| Parameter                               | Symbol         | Unit                                   | Speed [min <sup>-1</sup> ] |      |
|-----------------------------------------|----------------|----------------------------------------|----------------------------|------|
|                                         |                |                                        | 1600                       | 3000 |
| Standstill torque (dT=105K)             | $M_0$          | [Nm]                                   | 34.0                       |      |
| Motor rated frequency                   | $f_n$          | [Hz]                                   | 107                        | 200  |
| Motor rated voltage                     | $V_n$          | [V <sub>AC</sub> ]                     | 319                        | 315  |
| Rated Torque (dT=105K)                  | $M_n$          | [Nm]                                   | 31                         | 27.5 |
| Current at rated speed                  | $I_n$          | [A]                                    | 11.2                       | 18.6 |
| Standstill current                      | $I_0$          | [A]                                    | 12.4                       | 23.3 |
| Max Torque                              | $M_{max}$      | [Nm]                                   | 90                         | 90   |
| Max Current                             | $I_{max}$      | [A]                                    | 37                         | 70   |
| Back EMF constant                       | $K_e$          | [V/1000min <sup>-1</sup> ]             | 174                        | 93   |
| Torque constant                         | $K_T$          | [Nm/A]                                 | 2.74                       | 1.46 |
| Rated Power                             | $P_n$          | [kW]                                   | 5.2                        | 8.6  |
| Stator phase-phase Resistance (at 20°C) | $R_{pp}$       | [Ω]                                    | 0.91                       | 0.26 |
| Stator phase-phase Inductance           | $L_{pp}$       | [mH]                                   | 17.9                       | 5.1  |
| Rotor inertia                           | $J_m$          | [kgm <sup>2</sup> × 10 <sup>-4</sup> ] | 28.2                       |      |
| Electric time constant (at 20°C)        | $\tau_{el}$    | [ms]                                   | 20                         |      |
| Thermal time constant                   | $\tau_{therm}$ | [min]                                  | 50                         |      |
| Motor mass without brake                | $m_M$          | [kg]                                   | 25                         |      |
| Motor mass with brake                   | $m_{MB}$       | [kg]                                   | 29.5                       |      |

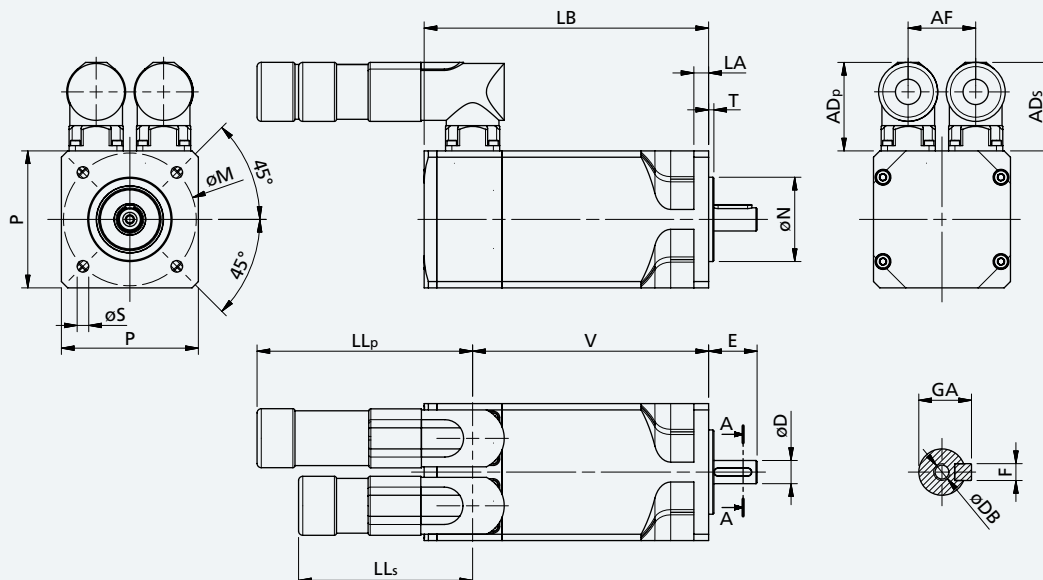


# BMD 170 • 45 Nm - 400V

| Parameter                               | Symbol             | Unit                                   | Speed [min <sup>-1</sup> ] |      |
|-----------------------------------------|--------------------|----------------------------------------|----------------------------|------|
|                                         |                    |                                        | 1600                       | 3000 |
| Standstill torque (dT=105K)             | M <sub>0</sub>     | [Nm]                                   | 45.0                       |      |
| Motor rated frequency                   | f <sub>n</sub>     | [Hz]                                   | 107                        | 200  |
| Motor rated voltage                     | V <sub>n</sub>     | [V <sub>AC</sub> ]                     | 310                        | 314  |
| Rated Torque (dT=105K)                  | M <sub>n</sub>     | [Nm]                                   | 42                         | 36   |
| Current at rated speed                  | I <sub>n</sub>     | [A]                                    | 15.9                       | 24.9 |
| Standstill current                      | I <sub>0</sub>     | [A]                                    | 17.1                       | 31   |
| Max Torque                              | M <sub>max</sub>   | [Nm]                                   | 125                        | 125  |
| Max Current                             | I <sub>max</sub>   | [A]                                    | 52                         | 96   |
| Back EMF constant                       | K <sub>e</sub>     | [V/1000min <sup>-1</sup> ]             | 185                        | 101  |
| Torque constant                         | K <sub>T</sub>     | [Nm/A]                                 | 2.74                       | 1.50 |
| Rated Power                             | P <sub>n</sub>     | [kW]                                   | 7.0                        | 11.3 |
| Stator phase-phase Resistance (at 20°C) | R <sub>pp</sub>    | [Ω]                                    | 0.57                       | 0.17 |
| Stator phase-phase Inductance           | L <sub>pp</sub>    | [mH]                                   | 11.1                       | 3.3  |
| Rotor inertia                           | J <sub>m</sub>     | [kgm <sup>2</sup> x 10 <sup>-4</sup> ] | 47.5                       |      |
| Electric time constant (at 20°C)        | τ <sub>el</sub>    | [ms]                                   | 19                         |      |
| Thermal time constant                   | τ <sub>therm</sub> | [min]                                  | 65                         |      |
| Motor mass without brake                | m <sub>M</sub>     | [kg]                                   | 30                         |      |
| Motor mass with brake                   | m <sub>MB</sub>    | [kg]                                   | 34.5                       |      |



## Dimensions (from BMD 65 to BMD 102)



| Type | Shaft |    |    |                   |                  |
|------|-------|----|----|-------------------|------------------|
|      | D     | E  | DB | GA <sup>(1)</sup> | F <sup>(1)</sup> |
| 65   | 9     | 20 | M3 | 10.2              | 3                |
|      | 11    | 23 | M4 | 12.5              | 4                |
| 82   | 11    | 23 | M4 | 12.5              | 4                |
|      | 14    | 30 | M5 | 16                | 5                |
|      | 19    | 40 | M6 | 21.5              | 6                |
| 102  | 19    | 40 | M6 | 21.5              | 6                |
|      | 24    | 50 | M8 | 27                | 8                |

| Type | Flange |    |     |     |     |    |
|------|--------|----|-----|-----|-----|----|
|      | M      | N  | P   | S   | T   | LA |
| 65   | 63     | 40 | 65  | 5.5 | 2.5 | 7  |
|      | 75     | 60 | 65  | 6   | 2.5 | 7  |
| 82   | 100    | 80 | 82  | 6.5 | 3   | 10 |
|      | 115    | 95 | 100 | 9   | 3   | 10 |
| 102  | 100    | 80 | 102 | 7   | 3   | 10 |
|      | 115    | 95 | 102 | 9   | 3   | 10 |

| Type | Motor          |     |                 |                 |                 |                 |                 |                 |      |      |    |     |     |                |                |                 |                 |
|------|----------------|-----|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|------|----|-----|-----|----------------|----------------|-----------------|-----------------|
|      | T <sub>0</sub> | AC  | LB <sub>2</sub> | LB <sub>3</sub> | LB <sub>4</sub> | LB <sub>5</sub> | LB <sub>6</sub> | LB <sub>7</sub> | ADp  | ADs  | AF | LLp | LLs | V <sub>8</sub> | V <sub>9</sub> | V <sub>10</sub> | V <sub>11</sub> |
| 65   | 1.7            | 65  | 135             | 166             | 153             | 153             | 202             | 202             | 41.5 | 41.5 | 32 | 96  | 96  | 112            | 112            | 161             | 161             |
|      | 2.2            |     | 161             | 192             | 179             | 179             | 228             | 228             |      |      |    |     |     | 138            | 138            | 187             | 187             |
| 82   | 3.2            | 82  | 160             | 200             | 183             | 160             | 223             | 223             | 41.5 | 41.5 | 36 | 96  | 96  | 132            | 132            | 195             | 195             |
|      | 4.4            |     | 180             | 220             | 203             | 180             | 243             | 243             |      |      |    |     |     | 152            | 152            | 215             | 215             |
| 102  | 7.2            | 102 | 180             | 220             | 203             | 180             | 243             | 220             | 41.5 | 41.5 | 39 | 96  | 96  | 150            | 150            | 190             | 190             |
|      | 9.6            |     | 207             | 247             | 230             | 207             | 297             | 247             |      |      |    |     |     | 177            | 177            | 217             | 217             |

**Notes:**

(1) Motor shaft extension without key available.

LB2 Motor length with resolver, or in sensorless version.

LB3 Motor length with resolver, or in sensorless version, and with brake or flywheel.

LB4 Motor length with encoder EnDat (ENB1, ENB2).

LB5 Motor length with encoder Hyperface (ENB3, ENB4).

LB6 Motor length with encoder EnDat (ENB1, ENB2) and with brake or flywheel

LB7 Motor length with encoder Hyperface (ENB3, ENB4) and with brake or flywheel

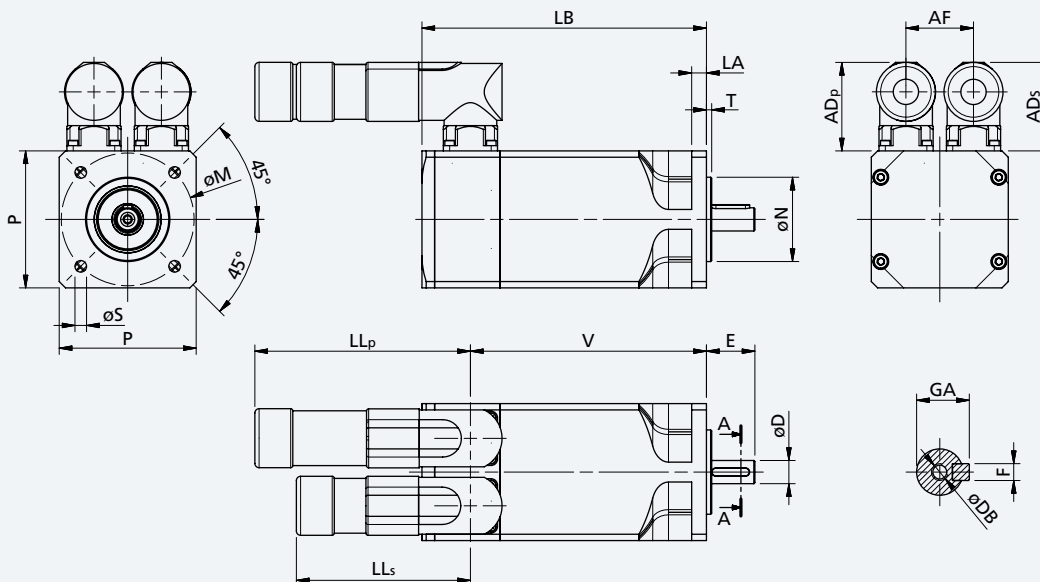
V8 Motor with resolver, encoder (ENB1, ENB2, ENB3, ENB4) or in sensorless version.

V9 Motor with resolver, or in sensorless version and with brake or flywheel.

V10 Motor with encoder EnDat (ENB1, ENB2) and with brake or flywheel

V11 Motor with encoder Hyperface (ENB3, ENB4) and with brake or flywheel

## Dimensions (from BMD 118 to BMD 170)



| Type | Shaft |    |     |                   |                  |
|------|-------|----|-----|-------------------|------------------|
|      | D     | E  | DB  | GA <sup>(1)</sup> | F <sup>(1)</sup> |
| 118  | 19    | 40 | M6  | 21.5              | 6                |
|      | 24    | 50 | M8  | 27                | 8                |
|      | 28    | 60 | M10 | 31                | 8                |
| 145  | 19    | 40 | M6  | 21.5              | 6                |
|      | 24    | 50 | M8  | 27                | 8                |
|      | 28    | 60 | M10 | 31                | 8                |
| 170  | 24    | 50 | M8  | 27                | 8                |
|      | 28    | 60 | M10 | 31                | 8                |
|      | 32    | 60 | M12 | 35                | 10               |

| Type | Flange             |     |     |      |     |    |
|------|--------------------|-----|-----|------|-----|----|
|      | M                  | N   | P   | S    | T   | LA |
| 118  | 130 <sup>(1)</sup> | 95  | 118 | 9    | 3.5 | 10 |
|      | 130                | 110 | 118 | 9    | 3.5 | 10 |
|      | 165                | 130 | 145 | 11.5 | 3.5 | 10 |
| 145  | 165                | 130 | 145 | 11.5 | 3.5 | 12 |
| 170  | 165                | 130 | 170 | 11.5 | 3.5 | 12 |

| Type | Motor          |     |                 |                 |                 |                 |                 |                 |      |      |     |     |     |                |                |                 |                 |
|------|----------------|-----|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|------|-----|-----|-----|----------------|----------------|-----------------|-----------------|
|      | T <sub>0</sub> | AC  | LB <sub>2</sub> | LB <sub>3</sub> | LB <sub>4</sub> | LB <sub>5</sub> | LB <sub>6</sub> | LB <sub>7</sub> | ADp  | ADs  | AF  | LLp | LLs | V <sub>8</sub> | V <sub>9</sub> | V <sub>10</sub> | V <sub>11</sub> |
| 118  | 10.2           | 118 | 210             | 260             | 235             | 210             | 285             | 260             | 41.5 | 41.5 | 96  | 96  | 96  | 175            | 225            | 225             | 225             |
|      |                |     | 243             | 293             | 268             | 243             | 351             | 293             |      |      |     |     |     | 208            | 258            | 258             | 258             |
| 145  | 16.8           | 145 | 230             | 280             | 255             | 230             | 305             | 280             | 41.5 | 41.5 | 96  | 96  | 96  | 195            | 245            | 245             | 245             |
|      |                |     | 265             | 315             | 290             | 265             | 375             | 315             |      |      |     |     |     | 230            | 280            | 280             | 280             |
| 170  | 34             | 170 | 265             | 340             | 303             | 265             | 378             | 340             | 41.5 | 41.5 | 140 | 96  | 96  | 233            | 308            | 308             | 308             |
|      |                |     | 319             | 394             | 357             | 319             | 432             | 394             |      |      |     |     |     | 287            | 362            | 362             | 362             |

**Notes:**

(1) Motor shaft extension without key available.

(2) Mechanical interface 130S.

LB2 Motor length with resolver, or in sensorless version.

LB3 Motor length with resolver, or in sensorless version, and with brake or flywheel.

LB4 Motor length with encoder EnDat (ENB1, ENB2).

LB5 Motor length with encoder Hyperface (ENB3, ENB4).

LB6 Motor length with encoder EnDat (ENB1, ENB2) and with brake or flywheel

LB7 Motor length with encoder Hyperface (ENB3, ENB4) and with brake or flywheel

V8 Motor with resolver, encoder (ENB1, ENB2, ENB3, ENB4) or in sensorless version.

V9 Motor with resolver, or in sensorless version and with brake or flywheel.

V10 Motor with encoder EnDat (ENB1, ENB2) and with brake or flywheel

V11 Motor with encoder Hyperface (ENB3, ENB4) and with brake or flywheel



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## Feedback devices

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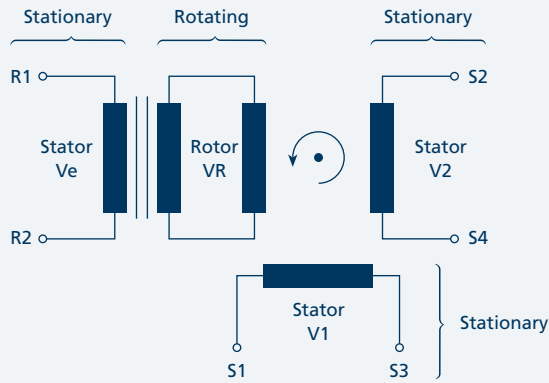
Bonfiglioli BMD servomotor series is available with different feedback devices. Available feedbacks are resolver and optical absolute encoders, single turn or multi turn. All available feedback devices are managed by the Bonfiglioli Vectron frequency inverter of ACTIVE CUBE series. Dedicated feedback interfaces are available.

The resolver is a passive wound device consisting of a stator and rotor elements excited from an external source. It produces two output signals that correspond to the sine and cosine angle of the motor shaft. This is a robust absolute device of low accuracy, capable of withstanding high temperature and high levels of vibration. Positional information is absolute within one turn.

The optical absolute encoder uses a high precision optical disc. The high resolution performed is based on a combination of absolute information, transmitted via a serial link, and sine/cosine signals with incremental techniques. Single turn absolute encoder has an absolute positional information only within one turn.

Multi turn absolute encoder is provided of extra gear wheels that account for several shaft revolution. Therefore the output is unique for each shaft position and revolution up to available resolution.

# Resolver datasheet



| Item                                                 | BMD 65            |                                    | BMD82 - BMD170    |                   |
|------------------------------------------------------|-------------------|------------------------------------|-------------------|-------------------|
|                                                      | RES2              | RES1                               | RES2              | RES2              |
| Poles number                                         | 2                 | 2                                  | 2                 | 2                 |
| Transformation ratio                                 | 0.5 ±5%           | 0.5 <sup>+15%</sup> <sub>-5%</sub> | 0.5 ±5%           | 0.5 ±5%           |
| Input voltage [Vac <sub>rms</sub> ]                  | 7                 | 11                                 | 5.5               | 5.5               |
| Input current [mA]                                   | 65                | 57                                 | 61                | 61                |
| Input frequency [kHz]                                | 10                | 8                                  | 10                | 10                |
| Phase shift                                          | 0°                | -11°                               | -12°              | -12°              |
| Input impedance Zro (Ω)                              | 70 + j100         | 75 + j185                          | 43 + j79          | 43 + j79          |
| Output impedance Zss (Ω)                             | 175 + j275        | 135 + j265                         | 62 + j112         | 62 + j112         |
| Electrical error                                     | ±10'              | ±10'                               | ±10'              | ±10'              |
| Accuracy ripple                                      | 1' max            | 1' max                             | 1' max            | 1' max            |
| Operating temperature                                | -55°C ... + 155°C | -55°C ... + 155°C                  | -55°C ... + 155°C | -55°C ... + 155°C |
| Max Speed [min <sup>-1</sup> ]                       | 10000             | 20000                              | 10000             | 10000             |
| Mass [kg]                                            | 0.065             | 0.28                               | 0.28              | 0.28              |
| Rotor Inertia [kgm <sup>2</sup> x 10 <sup>-6</sup> ] | 3.0               | 1.9                                | 3.0               | 3.0               |

# Encoder datasheet

## HEIDENHAIN ENCODERS

| Item                                                 | BMD 65           |                  | BMD82 - BMD170   |                  |
|------------------------------------------------------|------------------|------------------|------------------|------------------|
|                                                      | ENB1             | ENB2             | ENB1             | ENB2             |
| Data interface                                       | EnDat            |                  | EnDat            |                  |
| Model                                                | ECN1113          | EQN1125          | ECN1313          | EQN1325          |
| Type                                                 | Single turn      | Multi turn       | Single turn      | Multi turn       |
| Power supply                                         | 3.6VDC ... 14VDC | 3.6VDC ... 14VDC | 3.6VDC ... 14VDC | 3.6VDC ... 14VDC |
| Current consumption                                  | 85mA (5V)        | 105mA (5V)       | 85mA (5V)        | 105mA (5V)       |
| Periods per revolution                               | 512              | 512              | 2048             | 2048             |
| Position per revolution                              | 8192 (13 bits)   | 8192 (13 bits)   | 8192 (13 bits)   | 8192 (13 bits)   |
| Revolutions                                          | -                | 4096 (12 bits)   | -                | 4096 (12 bits)   |
| Operating temperature                                | -40°C ... +115°C |                  | -40°C ... +115°C |                  |
| Max Speed [min <sup>-1</sup> ]                       | 12000            |                  | 12000            |                  |
| Mass [kg]                                            | 0.10             |                  | 0.25             |                  |
| Rotor Inertia [kgm <sup>2</sup> x 10 <sup>-6</sup> ] | 0.40             |                  | 2.60             |                  |

## SICK STEGMANN ENCODERS

| Item                                                 | BMD 65           |                | BMD82 - BMD170   |                |
|------------------------------------------------------|------------------|----------------|------------------|----------------|
|                                                      | ENB3             | ENB4           | ENB3             | ENB4           |
| Data interface                                       | Hiperface        |                | Hiperface        |                |
| Model                                                | SKS36            | SKM36          | SR550            | SRM50          |
| Type                                                 | Single turn      | Multi turn     | Single turn      | Multi turn     |
| Power supply                                         | 7VDC ... 12VDC   | 7VDC ... 12VDC | 7VDC ... 12VDC   | 7VDC ... 12VDC |
| Current consumption                                  | 60mA             | 60mA           | 80mA             | 80mA           |
| Periods per revolution                               | 128              | 128            | 1024             | 1024           |
| Position per revolution                              | 4096 (12 bits)   | 4096 (12 bits) | 32768 (15 bit)   | 32768 (15 bit) |
| Revolutions                                          | -                | 4096 (12 bits) | -                | 4096 (12 bits) |
| Operating temperature                                | -30°C ... +110°C |                | -20°C ... +110°C |                |
| Max Speed [min <sup>-1</sup> ]                       | 10000            |                | 12000            |                |
| Mass [kg]                                            | 0.07             |                | 0.20             |                |
| Rotor Inertia [kgm <sup>2</sup> x 10 <sup>-6</sup> ] | 0.45             |                | 1.00             |                |

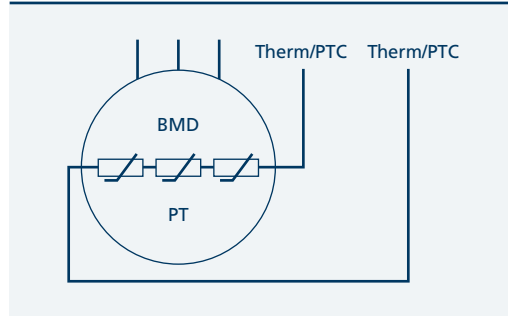
## PTC/KTY thermal protection

All motors in the BMD Series are equipped with an integrated PTC temperature as standard to protect the windings against overtemperatures exceeding the capacity of the motor's class F insulation. These sensors are in conformity to DIN standard 44081.

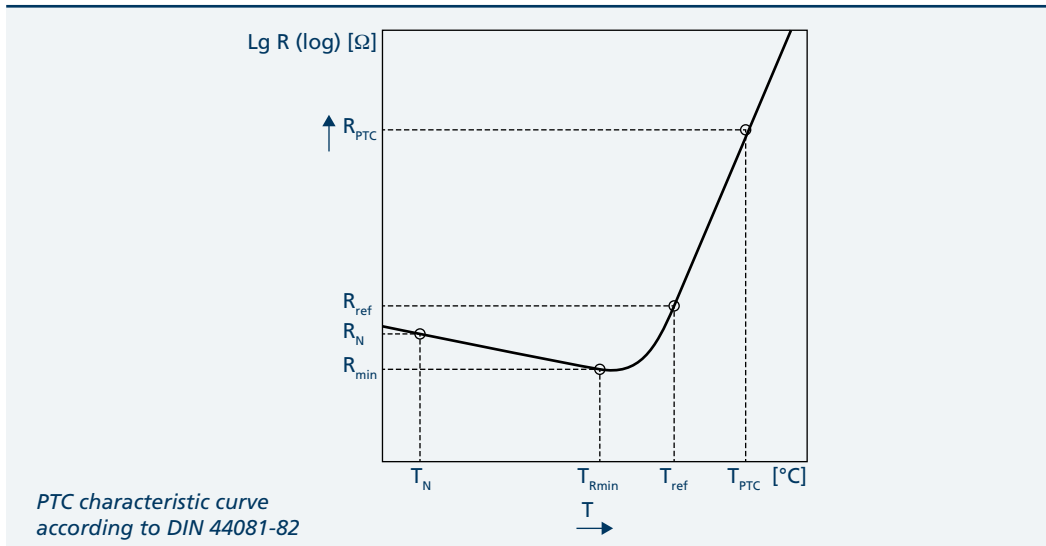
Optionally a KTY sensor is available, to fit any needs for temperature feedback.

The PTC temperature sensor consists of a special ceramic resistor whose Ohmic value varies with the temperature of the electrical winding with which it is held on close contact. Each temperature value generates a known resistance, so that provided the resistor is fed at a constant voltage, the output current can be used to determine the corresponding temperature. If temperature

reaches an established limit, the circuit monitoring the signal trips the necessary cutout to disconnect power to the motor and prevent damage.

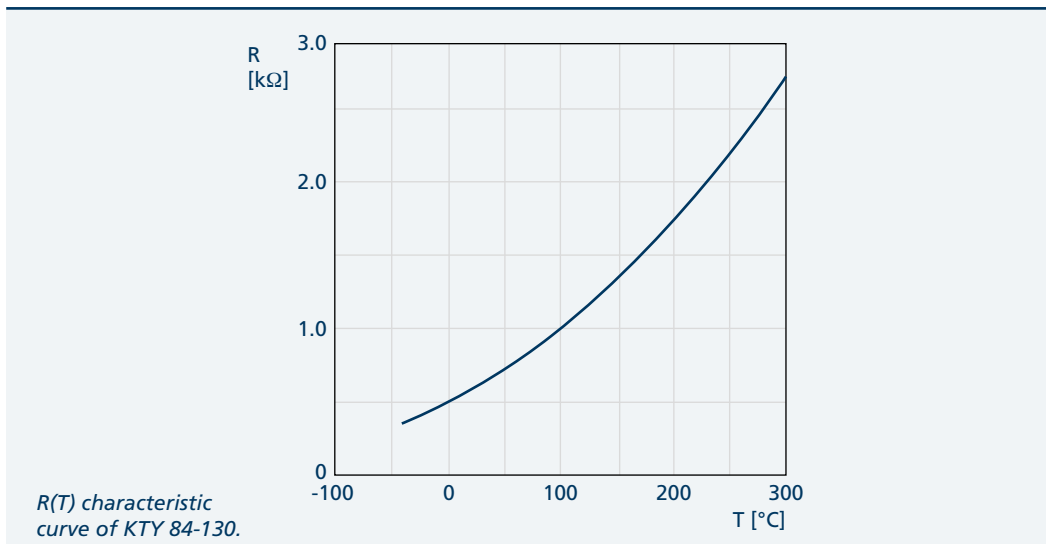


A triple PTC thermistor rated to 150°C is placed into the motor winding. The resistance curve of the PTC thermistor is in accordance with IEC 60034-11.



### KTY 84-130

KTY 84-130 silicon sensors are optionally available. Working temperature range:  $-40^{\circ}C \div +260^{\circ}C$ .



## Electromechanical holding brake

BMD motors are used as four-quadrant actuators then they are designed to offer positive torque when they are running as motors, as well negative torque when they are running as generator. Therefore they are able to brake dynamically and statically (standstill torque) the mechanical load in every work-point consistent with corresponding motor curve.

Anyway when an enduring downtime is required to the motor, an optional parking brake is available in order to save energy. The brake option can be ordered by using the value F24 into corresponding position of the servomotor designation.

When the motor is delivered without brake, the brake fitting is not possible.

The brake coil power supply must be 24V DC-voltage. The brake option is responsible of an increment of the motor length (see length in each motor drawing) When the brake is installed, its wires are linked to power connector together motor winding.

Please note that the brake option is not available when the "additional inertia" option is selected.

| Motor      | Motor stall torque | Rated brake torque 20°C Mb | Rated brake torque 100°C Mb | Brake voltage Vb | Brake current Ib | Brake power 20°C Pb | Brake inertia                      | Mass mb | Engaging time t1 | Release time t2 |            |      |     |    |      |    |      |      |    |    |     |            |      |    |    |      |    |      |     |    |    |     |            |      |    |    |     |    |      |     |    |    |    |            |      |    |    |     |    |      |     |    |    |    |            |    |
|------------|--------------------|----------------------------|-----------------------------|------------------|------------------|---------------------|------------------------------------|---------|------------------|-----------------|------------|------|-----|----|------|----|------|------|----|----|-----|------------|------|----|----|------|----|------|-----|----|----|-----|------------|------|----|----|-----|----|------|-----|----|----|----|------------|------|----|----|-----|----|------|-----|----|----|----|------------|----|
|            | Nm                 | Nm                         | Nm                          | Vdc              | A                | W                   | Kgm <sup>2</sup> x10 <sup>-4</sup> | kg      | ms               | ms              |            |      |     |    |      |    |      |      |    |    |     |            |      |    |    |      |    |      |     |    |    |     |            |      |    |    |     |    |      |     |    |    |    |            |      |    |    |     |    |      |     |    |    |    |            |    |
| <b>65</b>  | 1.7                | 2                          | 1.8                         | 24               | 0.46             | 11                  | 0.068                              | 0.15    | 6                | 25              |            |      |     |    |      |    |      |      |    |    |     |            |      |    |    |      |    |      |     |    |    |     |            |      |    |    |     |    |      |     |    |    |    |            |      |    |    |     |    |      |     |    |    |    |            |    |
|            | 2.2                |                            |                             |                  |                  |                     |                                    |         |                  |                 | <b>82</b>  | 3.2  | 4.5 | 4  | 0.5  | 12 | 0.18 | 0.35 | 7  | 35 | 4.4 | <b>102</b> | 7.2  | 9  | 8  | 0.75 | 18 | 0.54 | 0.7 | 7  | 40 | 9.6 | <b>118</b> | 10.2 | 18 | 15 | 1.0 | 24 | 1.66 | 1.1 | 10 | 50 | 14 | <b>145</b> | 16.8 | 18 | 15 | 1.0 | 24 | 1.66 | 1.1 | 10 | 50 | 22 | <b>170</b> | 34 |
| <b>82</b>  | 3.2                | 4.5                        | 4                           |                  | 0.5              | 12                  | 0.18                               | 0.35    | 7                | 35              |            |      |     |    |      |    |      |      |    |    |     |            |      |    |    |      |    |      |     |    |    |     |            |      |    |    |     |    |      |     |    |    |    |            |      |    |    |     |    |      |     |    |    |    |            |    |
|            | 4.4                |                            |                             |                  |                  |                     |                                    |         |                  |                 | <b>102</b> | 7.2  | 9   | 8  | 0.75 | 18 | 0.54 | 0.7  | 7  | 40 | 9.6 | <b>118</b> | 10.2 | 18 | 15 | 1.0  | 24 | 1.66 | 1.1 | 10 | 50 | 14  | <b>145</b> | 16.8 | 18 | 15 | 1.0 | 24 | 1.66 | 1.1 | 10 | 50 | 22 | <b>170</b> | 34   | 36 | 32 | 1.1 | 26 | 5.56 | 1.8 | 22 | 90 | 45 |            |    |
| <b>102</b> | 7.2                | 9                          | 8                           |                  | 0.75             | 18                  | 0.54                               | 0.7     | 7                | 40              |            |      |     |    |      |    |      |      |    |    |     |            |      |    |    |      |    |      |     |    |    |     |            |      |    |    |     |    |      |     |    |    |    |            |      |    |    |     |    |      |     |    |    |    |            |    |
|            | 9.6                |                            |                             |                  |                  |                     |                                    |         |                  |                 | <b>118</b> | 10.2 | 18  | 15 | 1.0  | 24 | 1.66 | 1.1  | 10 | 50 | 14  | <b>145</b> | 16.8 | 18 | 15 | 1.0  | 24 | 1.66 | 1.1 | 10 | 50 | 22  | <b>170</b> | 34   | 36 | 32 | 1.1 | 26 | 5.56 | 1.8 | 22 | 90 | 45 |            |      |    |    |     |    |      |     |    |    |    |            |    |
| <b>118</b> | 10.2               | 18                         | 15                          |                  | 1.0              | 24                  | 1.66                               | 1.1     | 10               | 50              |            |      |     |    |      |    |      |      |    |    |     |            |      |    |    |      |    |      |     |    |    |     |            |      |    |    |     |    |      |     |    |    |    |            |      |    |    |     |    |      |     |    |    |    |            |    |
|            | 14                 |                            |                             |                  |                  |                     |                                    |         |                  |                 | <b>145</b> | 16.8 | 18  | 15 | 1.0  | 24 | 1.66 | 1.1  | 10 | 50 | 22  | <b>170</b> | 34   | 36 | 32 | 1.1  | 26 | 5.56 | 1.8 | 22 | 90 | 45  |            |      |    |    |     |    |      |     |    |    |    |            |      |    |    |     |    |      |     |    |    |    |            |    |
| <b>145</b> | 16.8               | 18                         | 15                          |                  | 1.0              | 24                  | 1.66                               | 1.1     | 10               | 50              |            |      |     |    |      |    |      |      |    |    |     |            |      |    |    |      |    |      |     |    |    |     |            |      |    |    |     |    |      |     |    |    |    |            |      |    |    |     |    |      |     |    |    |    |            |    |
|            | 22                 |                            |                             |                  |                  |                     |                                    |         |                  |                 | <b>170</b> | 34   | 36  | 32 | 1.1  | 26 | 5.56 | 1.8  | 22 | 90 | 45  |            |      |    |    |      |    |      |     |    |    |     |            |      |    |    |     |    |      |     |    |    |    |            |      |    |    |     |    |      |     |    |    |    |            |    |
| <b>170</b> | 34                 | 36                         | 32                          | 1.1              | 26               | 5.56                | 1.8                                | 22      | 90               |                 |            |      |     |    |      |    |      |      |    |    |     |            |      |    |    |      |    |      |     |    |    |     |            |      |    |    |     |    |      |     |    |    |    |            |      |    |    |     |    |      |     |    |    |    |            |    |
|            | 45                 |                            |                             |                  |                  |                     |                                    |         |                  |                 |            |      |     |    |      |    |      |      |    |    |     |            |      |    |    |      |    |      |     |    |    |     |            |      |    |    |     |    |      |     |    |    |    |            |      |    |    |     |    |      |     |    |    |    |            |    |

### Note

The electromechanical brake is for use as a holding brake with the motor shaft stationary. Do NOT use it as a dynamic brake, except for emergencies such as a mains supply failure.

## Additional inertia feature

BMD Permanent Magnet AC Synchronous Motor series is provided optionally with additional inertia. The BMD with additional inertia compared with standard version have a higher rotor moment of inertia.

Additional inertia is designed to be used in application with high load inertia. The increased rotor moment of inertia provides a comfortable control response due to "higher" inertial matching of the machine.

| Motor      | Motor stall torque | Additional inertia                 | Additional weight |
|------------|--------------------|------------------------------------|-------------------|
|            | Nm                 | Kgm <sup>2</sup> x10 <sup>-4</sup> | kg                |
| <b>65</b>  | 1.7                | 0.5                                | 0.3               |
|            | 2.2                |                                    |                   |
| <b>82</b>  | 3.2                | 3                                  | 0.7               |
|            | 4.4                |                                    |                   |
| <b>102</b> | 7.2                | 7.5                                | 1.3               |
|            | 9.6                |                                    |                   |
| <b>118</b> | 10.2               | 16                                 | 2.4               |
|            | 14                 |                                    |                   |
| <b>145</b> | 16.8               | 36                                 | 3.6               |
|            | 22                 |                                    |                   |
| <b>170</b> | 34                 | 70                                 | 5.5               |
|            | 45                 |                                    |                   |

## Power connections

The motor connections can be made by connectors (P1N,P1, S1N, S1 options) or by cables (P2, S2 options).

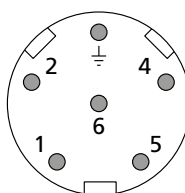
### Power connections

The 6-pin power connector of the motor with feedback includes the pin of the motor supply

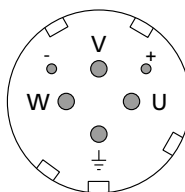
and the ones for the brake supply (if provided).

The 8-pin power connector of the sensorless motor is provided also of the pins for the thermal protection (PTC or KTY). Same layouts are used for motor with flying cable connection option.

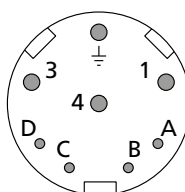
| MOTOR WITH FEEDBACK DEVICE / BMD65 - BMD145 |             |                         |
|---------------------------------------------|-------------|-------------------------|
| Power connector layout (P1N/P1 options)     |             | Power cable (P2 option) |
| Connector PIN number                        | Description | Cable label or color    |
| 1                                           | Phase U     | L1 / 1 / U              |
| 2                                           | Phase V     | L2 / 2 / V              |
| $\perp$                                     | Earth - SL  | Yellow - Green          |
| 4                                           | Brake +     | White (If present)      |
| 5                                           | Brake -     | Black (If present)      |
| 6                                           | Phase W     | L3 / 3 / W              |



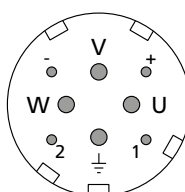
| MOTOR WITH FEEDBACK DEVICE / BMD170     |             |                         |
|-----------------------------------------|-------------|-------------------------|
| Power connector layout (P1N/P1 options) |             | Power cable (P2 option) |
| Connector PIN number                    | Description | Cable label or color    |
| U                                       | Phase U     | L1 / 1 / U              |
| V                                       | Phase V     | L2 / 2 / V              |
| W                                       | Phase W     | L3 / 3 / W              |
| $\perp$                                 | Earth - SL  | Yellow - Green          |
| +                                       | Brake +     | White (If present)      |
| -                                       | Brake -     | Black (If present)      |



| SENSORLESS MOTOR / BMD65 - BMD145       |             |                         |
|-----------------------------------------|-------------|-------------------------|
| Power connector layout (P1N/P1 options) |             | Power cable (P2 option) |
| Connector PIN number                    | Description | Cable label or color    |
| 1                                       | Phase U     | L1 / 1 / U              |
| $\perp$                                 | Earth - SL  | Yellow - Green          |
| 3                                       | Phase W     | L3 / 3 / W              |
| 4                                       | Phase V     | L2 / 2 / V              |
| A                                       | Ptc / Kty + | White / 5 (If present)  |
| B                                       | Ptc / Kty - | Black / 6 (If present)  |
| C                                       | Brake +     | 7 (If present)          |
| D                                       | Brake -     | 8 (If present)          |



| SENSORLESS MOTOR / BMD170               |             |                         |
|-----------------------------------------|-------------|-------------------------|
| Power connector layout (P1N/P1 options) |             | Power cable (P2 option) |
| Connector PIN number                    | Description | Cable label or color    |
| U                                       | Phase U     | L1 / 1 / U              |
| V                                       | Phase V     | L2 / 2 / V              |
| W                                       | Phase W     | L3 / 3 / W              |
| $\perp$                                 | Earth - SL  | Yellow - Green          |
| 1                                       | Ptc / Kty + | White / 5 (If present)  |
| 2                                       | Ptc / Kty - | Black / 6 (If present)  |
| +                                       | Brake +     | 7 (If present)          |
| -                                       | Brake -     | 8 (If present)          |

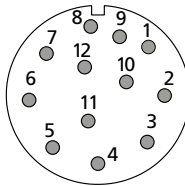


# Signal connections

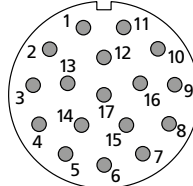
The signal connections are in charge of electrical link among feedback device housed into the servomotor and the inverter assigned to reception of him. In the same connection (both connector and cable) are also included the PTC/

KTY terminals coming from motor winding where they are installed for motor thermal protection. The connector and cable layout depend to the feedback device type only.

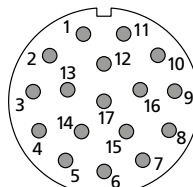
| MOTOR WITH RESOLVER (RES1/RES2) / BMD65 - BMD170 |               |                          |
|--------------------------------------------------|---------------|--------------------------|
| Signal connector layout (S1N/S1 options)         |               | Signal cable (S2 option) |
| Connector PIN number                             | Description   | Cable color              |
| 1                                                | Sin -         | Brown                    |
| 2                                                | Sin +         | Green                    |
| 3                                                | not connected | not connected            |
| 4                                                | Shield cable  | -                        |
| 5                                                | not connected | not connected            |
| 6                                                | not connected | not connected            |
| 7                                                | Exct -        | Black                    |
| 8                                                | Ptc / Kty -   | White (If present)       |
| 9                                                | Ptc / Kty +   | Brown (If present)       |
| 10                                               | Exct +        | Red                      |
| 11                                               | Cos +         | Gray                     |
| 12                                               | Cos -         | Rose                     |



| MOTOR WITH ENDAT ENCODER (ENB1/ENB2) / BMD65 - BMD170 |               |                          |
|-------------------------------------------------------|---------------|--------------------------|
| Signal connector layout (S1N/S1 options)              |               | Signal cable (S2 option) |
| Connector PIN number                                  | Description   | Cable color              |
| 1                                                     | UP SENSOR     | Violet                   |
| 2                                                     | not connected | not connected            |
| 3                                                     | not connected | not connected            |
| 4                                                     | 0V SENSOR     | Yellow                   |
| 5                                                     | Ptc / Kty -   | Blue (If present)        |
| 6                                                     | Ptc / Kty +   | White (If present)       |
| 7                                                     | UP            | White Green              |
| 8                                                     | Clock +       | Blue                     |
| 9                                                     | Clock -       | Black                    |
| 10                                                    | 0V            | Brown Green              |
| 11                                                    | Shield cable  | -                        |
| 12                                                    | B +           | Red Black                |
| 13                                                    | B -           | Green Black              |
| 14                                                    | DATA +        | Gray                     |
| 15                                                    | A +           | Blue Black               |
| 16                                                    | A -           | Yellow Black             |
| 17                                                    | DATA -        | Rose                     |



| MOTOR WITH HYPERFACE ENCODER (ENB3/ENB4) / BMD65 - BMD170 |               |                          |
|-----------------------------------------------------------|---------------|--------------------------|
| Signal connector layout (S1N/S1 options)                  |               | Signal cable (S2 option) |
| Connector PIN number                                      | Description   | Cable color              |
| 1                                                         | Sin +         | Green                    |
| 2                                                         | Sin -         | Brown                    |
| 3                                                         | RS485 +       | Blue                     |
| 4                                                         | not connected | not connected            |
| 5                                                         | Shield cable  | -                        |
| 6                                                         | not connected | not connected            |
| 7                                                         | GND (0V)      | Black                    |
| 8                                                         | Ptc / Kty -   | White (If present)       |
| 9                                                         | Ptc / Kty +   | Brown (If present)       |
| 10                                                        | + Vdc         | Red                      |
| 11                                                        | Cos +         | Gray                     |
| 12                                                        | Cos -         | Rose                     |
| 13                                                        | RS485 -       | Violet                   |
| 14                                                        | not connected | not connected            |
| 15                                                        | not connected | not connected            |
| 16                                                        | not connected | not connected            |
| 17                                                        | not connected | not connected            |





## Servocables

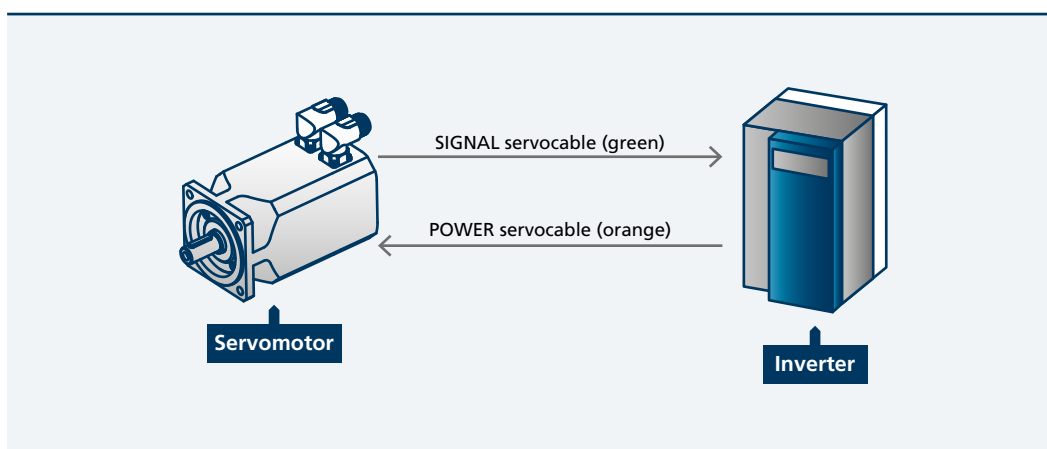
The word servocable is referred to electrical cable connecting Bonfiglioli servomotor to respective inverter.

For BMD servomotors a servocables selection is available for power supply and sensor feed-back, justifying the distinction between power cables and signal cables.

The power cable besides providing energy to motor, also supports the brake feed-in when it is present on board as option.

The signal cables instead are in charge of transmission of electrical signals generated by feed-back equipment installed on motor. The same cable is also oriented to convey the PTC signals always installed inside the motor.

All servocables are available in three different and fixed lengths (3 meters, 5 m, 10 m) offering to user an exhaustive proposal to numerous needs of configuration.



Servocables

# Power servocables

Power cables are recognized by the orange color according to Desina standard. The conductors cross-section depends on the motor nominal current. In order to face different current level absorbed by different motor sizes, the power cables are executed with four conductors cross sections (1.5 mm<sup>2</sup>, 2.5 mm<sup>2</sup>, 4.0 mm<sup>2</sup>, 10.0 mm<sup>2</sup>). On inverter side, every cable terminates with flying

leads covered by ferrules for plug-in into screw terminals. On motor side the cable is equipped with metal circular connector with Speed-Tech technology for easy and sure plug-in with corresponding motor male connector. According to page 50, power connectors have 6 pins for motor with feedback and 8 pins for sensorless motor variants.



Inverter side

Motor side

### The power cables fulfil the following technical requirements:

| Technical Data         |                                                                   |
|------------------------|-------------------------------------------------------------------|
| Properties             | Oil resistant shielded cable for dynamic laying                   |
| Conductor              | Tinned Stranded Cu wire complying with IEC 60228 Cl 5 / 6         |
| Outer Sheath           | PUR or equivalent thermoplastic material - Color: orange RAL 2003 |
| Inner Sheath           | PP or TPE                                                         |
| Tinned Cu braid Shield | Coverage overall screen > 80%                                     |

| Electrical Data             |                             |
|-----------------------------|-----------------------------|
| Nom. Volt. Power cores      | U <sub>0</sub> /U 600/1000V |
| Nom. Volt. Control cores    | U <sub>0</sub> /U 300/500V  |
| AC Test Volt. Power cores   | 4 kV                        |
| AC Test Volt. Control cores | 1 kV                        |
| Insulation Resistance       | > 5 MOhm/km                 |

| Mechanical Data        |                       |
|------------------------|-----------------------|
| Service Temperature    | -15 / +80 °C          |
| Minimum Bending Radius | 10 x D                |
| N° bending cycles      | ≥ 10 <sup>6</sup>     |
| Max Speed              | ≥ 180 m/min           |
| Max Acceleration       | ≥ 15 m/s <sup>2</sup> |

### Standard and Certifications

UL/CSA, RoHS, DESINA

### The cable ordering code is structured in the following mode with five fields:

|            |                                                    |                                                                                                                                    |                                                                    |                                                                                                                                                                                                                                                              |
|------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>MPC</b> | <b>3</b>                                           | <b>15</b>                                                                                                                          | <b>NB</b>                                                          | <b>C1</b>                                                                                                                                                                                                                                                    |
|            |                                                    |                                                                                                                                    |                                                                    | <b>Connector size and type</b><br>C1 6-pin connector, motor with feedback, sizes 65 ... 145<br>C2 6-pin connector, motor with feedback, size 170<br>C3 8-pin connector, sensorless motor, sizes 65 ... 145<br>C4 8-pin connector, sensorless motor, size 170 |
|            |                                                    |                                                                                                                                    | <b>Brake wires</b><br>NB Without brake wires<br>B With brake wires |                                                                                                                                                                                                                                                              |
|            |                                                    | <b>Phase wire section</b><br>015 1.5 mm <sup>2</sup><br>025 2.5 mm <sup>2</sup><br>040 4 mm <sup>2</sup><br>100 10 mm <sup>2</sup> |                                                                    |                                                                                                                                                                                                                                                              |
|            | <b>Cable length</b><br>03 3 m<br>05 5 m<br>10 10 m |                                                                                                                                    |                                                                    |                                                                                                                                                                                                                                                              |

## Power servocables

For user helping during servomotor-cable match selection, the following matching tables are proposed. Field XX refers to the cable length (03,

05, 10), while field YY refers to the brake variant (NB, B): see previous page for field description.

| Size                                                          | Stall torque |                  | Nominal speed          |                        |                        |                        |                        |
|---------------------------------------------------------------|--------------|------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
|                                                               | Nm           |                  | 1600 min <sup>-1</sup> | 3000 min <sup>-1</sup> | 4500 min <sup>-1</sup> | 5500 min <sup>-1</sup> | 6000 min <sup>-1</sup> |
| <b>400V NOMINAL VOLTAGE – MOTOR WITH FEEDBACK</b>             |              |                  |                        |                        |                        |                        |                        |
| 65                                                            | 1.7          |                  |                        |                        |                        |                        |                        |
|                                                               | 2.2          |                  |                        |                        |                        |                        |                        |
| 82                                                            | 3.2          |                  |                        |                        |                        |                        |                        |
|                                                               | 4.4          |                  |                        |                        | MPC XX 015 YY C1       |                        |                        |
| 102                                                           | 7.2          |                  |                        |                        |                        |                        |                        |
|                                                               | 9.6          |                  |                        |                        |                        |                        |                        |
| 118                                                           | 10.2         |                  |                        |                        |                        |                        |                        |
|                                                               | 14           |                  |                        |                        | MPC XX 025 YY C1       |                        |                        |
| 145                                                           | 16.8         |                  |                        |                        |                        |                        |                        |
|                                                               | 22           |                  |                        |                        | MPC XX 040 YY C1       |                        |                        |
| 170                                                           | 34           | MPC XX 040 YY C2 |                        |                        |                        |                        |                        |
|                                                               | 45           |                  | MPC XX 100 YY C2       |                        |                        |                        | Not available          |
| <b>400V NOMINAL VOLTAGE – SENSORLESS MOTOR WITH CONNECTOR</b> |              |                  |                        |                        |                        |                        |                        |
| 65                                                            | 1.7          |                  |                        |                        |                        |                        |                        |
|                                                               | 2.2          |                  |                        |                        |                        |                        |                        |
| 82                                                            | 3.2          |                  |                        |                        |                        |                        |                        |
|                                                               | 4.4          |                  |                        |                        | MPC XX 015 YY C3       |                        |                        |
| 102                                                           | 7.2          |                  |                        |                        |                        |                        |                        |
|                                                               | 9.6          |                  |                        |                        |                        |                        |                        |
| 118                                                           | 10.2         |                  |                        |                        |                        |                        |                        |
|                                                               | 14           |                  |                        |                        | MPC XX 025 YY C3       |                        |                        |
| 145                                                           | 16.8         |                  |                        |                        |                        |                        |                        |
|                                                               | 22           |                  |                        |                        | MPC XX 040 YY C3       |                        |                        |
| 170                                                           | 34           | MPC XX 040 YY C4 |                        |                        |                        |                        |                        |
|                                                               | 45           |                  | MPC XX 100 YY C4       |                        |                        |                        | Not available          |
| <b>230V NOMINAL VOLTAGE – MOTOR WITH FEEDBACK</b>             |              |                  |                        |                        |                        |                        |                        |
| 65                                                            | 1.7          |                  |                        |                        |                        |                        |                        |
|                                                               | 2.2          |                  |                        |                        |                        |                        |                        |
| 82                                                            | 3.2          |                  |                        |                        |                        |                        |                        |
|                                                               | 4.4          |                  |                        |                        | MPC XX 015 YY C1       |                        |                        |
| 102                                                           | 7.2          |                  |                        |                        |                        |                        |                        |
|                                                               | 9.6          |                  |                        |                        | MPC XX 025 YY C1       |                        |                        |
| 118                                                           | 10.2         |                  |                        |                        |                        |                        |                        |
|                                                               | 14           |                  |                        |                        |                        | MPC XX 040 YY C1       |                        |
| 145                                                           | 16.8         | MPC XX 025 YY C1 |                        |                        |                        |                        |                        |
|                                                               | 22           |                  | MPC XX 040 YY C1       |                        |                        |                        | Not available          |
| 170                                                           | 34           | MPC XX 040 YY C2 |                        |                        |                        |                        |                        |
|                                                               |              |                  | MPC XX 100 YY C2       |                        |                        |                        |                        |
| <b>230V NOMINAL VOLTAGE – SENSORLESS MOTOR WITH CONNECTOR</b> |              |                  |                        |                        |                        |                        |                        |
| 65                                                            | 1.7          |                  |                        |                        |                        |                        |                        |
|                                                               | 2.2          |                  |                        |                        |                        |                        |                        |
| 82                                                            | 3.2          |                  |                        |                        |                        |                        |                        |
|                                                               | 4.4          |                  |                        |                        | MPC XX 015 YY C3       |                        |                        |
| 102                                                           | 7.2          |                  |                        |                        |                        |                        |                        |
|                                                               | 9.6          |                  |                        |                        | MPC XX 025 YY C3       |                        |                        |
| 118                                                           | 10.2         |                  |                        |                        |                        |                        |                        |
|                                                               | 14           |                  |                        |                        |                        | MPC XX 040 YY C3       |                        |
| 145                                                           | 16.8         | MPC XX 025 YY C3 |                        |                        |                        |                        |                        |
|                                                               | 22           |                  | MPC XX 040 YY C3       |                        |                        |                        | Not available          |
| 170                                                           | 34           | MPC XX 040 YY C4 |                        |                        |                        |                        |                        |
|                                                               |              |                  | MPC XX 100 YY C4       |                        |                        |                        |                        |

# Signal servocables

Signal cables are recognized by the green color according to Desina standard. The conductors number, their cross-section and their terminal type depend by the transducer typology supported by the cable. Cables are available for connection of every feedback option, either resolver and absolute encoders. On motor side, the cable is equipped with metal circular connector with Speed-Tech technology for an easy and sure plug-in with respective male connector present on motor.

On inverter side the cable end can be executed with two different terminations:

- with SUB-D male standard connector for easy and sure plug-in with corresponding SUB-D female of the module interface.
- with ferrules for connection to screw terminals of the module interface.

Connections layouts are dedicated to Bonfiglioli Vectron Active Cube interface modules.



*Inverter side*

*Motor side*

### The signal cables fulfil the following technical requirements:

| Technical Data         |                                                                  |
|------------------------|------------------------------------------------------------------|
| Properties             | Oil resistant shielded cable for dynamic laying                  |
| Conductor              | Tinned Stranded Cu wire complying with IEC 60228 Cl 5 / 6        |
| Outer Sheath           | PUR or equivalent thermoplastic material - Color: green RAL 6018 |
| Inner Sheath           | PP or TPE                                                        |
| Tinned Cu braid Shield | Coverage overall screen > 80%                                    |

| Electrical Data           |              |
|---------------------------|--------------|
| Nominal Voltage           | 30 V         |
| AC Test Voltage           | 1500 V       |
| Insulation Resistance     | > 10 MOhm/km |
| Capacitance strand/strand | < 150 pF/m   |

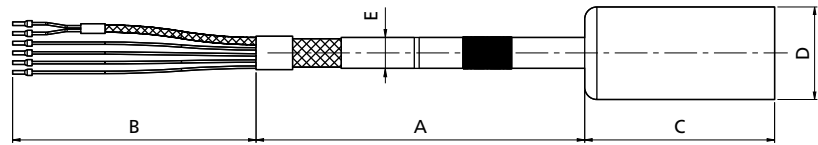
| Mechanical Data        |                       |
|------------------------|-----------------------|
| Service Temperature    | -20 / +80 °C          |
| Minimum Bending Radius | 10 x D                |
| N° bending cycles      | ≥ 10 <sup>6</sup>     |
| Max Speed              | ≥ 180 m/min           |
| Max Acceleration       | ≥ 15 m/s <sup>2</sup> |

| Standard and Certifications |
|-----------------------------|
| UL/CSA, RoHS, DESINA        |

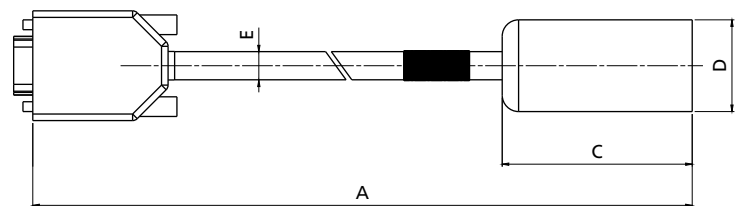
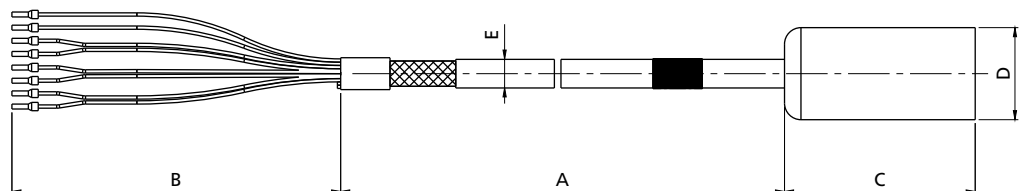
### The ordering codes of the signal cables are described in the following table:

| Feedback device | Inverter side termination | Inverter feedback module | Cable length  |               |               |
|-----------------|---------------------------|--------------------------|---------------|---------------|---------------|
|                 |                           |                          | 3 m           | 5m            | 10 m          |
| RES1 / RES2     | Flying wires              | EM-RES-01                | MSC 03 RES FW | MSC 05 RES FW | MSC 10 RES FW |
|                 | SUB-D9                    | EM-RES-03                | MSC 03 RES SC | MSC 05 RES SC | MSC 10 RES SC |
| ENB1 / ENB2     | SUB-D15                   | EM-ABS-01                | MSC 03 EN1 SC | MSC 05 EN1 SC | MSC 10 EN1 SC |
|                 | Flying wires              | -                        | MSC 03 EN1 FW | MSC 05 EN1 FW | MSC 10 EN1 FW |
| ENB3 / ENB4     | SUB-D15                   | EM-ABS-01                | MSC 03 EN3 SC | MSC 05 EN3 SC | MSC 10 EN3 SC |
|                 | Flying wires              | -                        | MSC 03 EN3 FW | MSC 05 EN3 FW | MSC 10 EN3 FW |

## Power cable layout



## Signal cable layout



| Connector size |         | A                                         | B    | C    | D    |
|----------------|---------|-------------------------------------------|------|------|------|
|                |         | [m]                                       | [mm] | [mm] | [mm] |
| Power Cable    | C1 / C3 | 3 - 5 - 10<br>according to<br>designation | 150  | 76   | 28   |
|                | C2 / C4 |                                           |      | 93   | 46   |
| Signal Cable   | -       | 3 - 5 - 10<br>according to<br>designation | 150  | 76   | 28   |

|             | Wire section       | Brake option | $E_{max}$ |
|-------------|--------------------|--------------|-----------|
|             | [mm <sup>2</sup> ] |              | [mm]      |
| Power Cable | 1.5                | NB           | 11.6      |
|             |                    | B            | 12.8      |
|             | 2.5                | NB           | 13        |
|             |                    | B            | 14.2      |
|             | 4                  | NB           | 14.7      |
|             |                    | B            | 16.3      |
| 10          | NB                 | 19.7         |           |
|             | B                  | 21.8         |           |

|              | Feedback designation | E    |
|--------------|----------------------|------|
|              |                      | [mm] |
| Signal Cable | RES                  | 8.6  |
|              | EN1                  | 8.7  |
|              | EN3                  | 8.6  |

Power and signal cable marking follows the label and wire colors reported in the pages 51 and 52.

## Servo gearheads

---

Motion application requires the use of planetary gearboxes to adapt speeds and torques, while ensuring the precision demanded by the application.

Bonfiglioli Riduttori has chosen to use planetary gearboxes with the BMD range of servo motors. Bonfiglioli Low backlash planetary match with BMD Permanent Magnet synchronous motors series and provide industrial motion control equipment with torque multiplication and proper inertial matching.

These gearheads combined with powerful drive electronics are designed for servo applications requiring highest standards in terms of dynamics, precision, robustness, durability, and long trouble-free operation.

**Low backlash at a competitive price.**

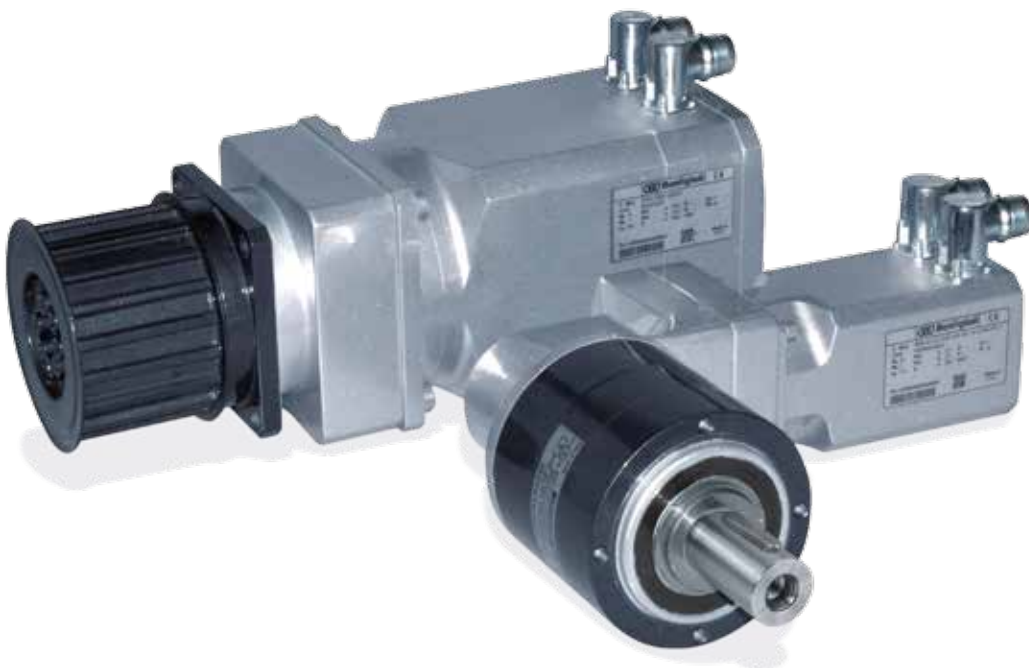
The LC Series of planetary gearboxes is characterized by low backlash, silent running and easy motor coupling.

**High precision for excellent results.**

The MP Series of low backlash planetary gearboxes is characterized by a wide range of mounting configurations, silent running, and superbly easy motor coupling.

**Maximum precision for highly dynamic applications.**

The TQ Series of Precision planetary gearboxes is designed to deliver the highest possible level of transmission precision. Low backlash combined with a high torsional stiffness guarantees a very competent product, especially in high dynamic and reversing applications. The technical design of this gearbox also allows high axial and radial loads on the output shaft and a very silent operation.



## BMD Servomotor LC series precision planetary gearbox combination

Ratios from 3:1 to 50:1

| Type    | Stall torque | Ratios           |                  |                  |                  |                  |        |                  |                  |        |        | Motor inertia |
|---------|--------------|------------------|------------------|------------------|------------------|------------------|--------|------------------|------------------|--------|--------|---------------|
|         |              | [Nm]             | 3:1              | 4:1              | 5:1              | 7:1              | 10:1   | 16:1             | 20:1             | 25:1   | 40:1   |               |
| BMD 65  | 1.7          | LC 050<br>LC 070 | LC 050<br>LC 070 | LC 050<br>LC 070 | LC 070<br>LC 090 | LC 070<br>LC 090 | LC 090 | LC 090<br>LC 120 | LC 090<br>LC 120 | LC 120 | LC 120 | 0.04          |
|         | 2.2          | LC 050<br>LC 070 | LC 050<br>LC 070 | LC 050<br>LC 070 | LC 070<br>LC 090 | LC 070<br>LC 090 | LC 090 | LC 090<br>LC 120 | LC 090<br>LC 120 | LC 120 | LC 120 | 0.06          |
| BMD 82  | 3.2          | LC 050<br>LC 070 | LC 070<br>LC 090 | LC 070<br>LC 090 | LC 070<br>LC 090 | LC 090<br>LC 120 | LC 120 | LC 120           | LC 120<br>LC 155 | LC 155 | LC 155 | 0.14          |
|         | 4.4          | LC 070<br>LC 090 | LC 070<br>LC 090 | LC 070<br>LC 090 | LC 070<br>LC 090 | LC 120           | LC 120 | LC 120           | LC 120<br>LC 155 | LC 155 | LC 155 | 0.17          |
| BMD 102 | 7.2          | LC 090           | LC 090           | LC 090<br>LC 120 | LC 120           | LC 120<br>LC 155 | LC 155 | LC 155           | LC 155           | LC 155 |        | 0.34          |
|         | 9.6          | LC 090           | LC 090           | LC 090<br>LC 120 | LC 120           | LC 155           | LC 155 | LC 155           | LC 155           |        |        | 0.47          |
| BMD 118 | 10.2         | LC 090<br>LC 120 | LC 120           | LC 120           | LC 120           | LC 155           | LC 155 | LC 155           | LC 155           |        |        | 0.9           |
|         | 14           | LC 120           | LC 120           | LC 120           | LC 120           | LC 155           | LC 155 | LC 155           |                  |        |        | 0.99          |
| BMD 145 | 16.8         | LC 120           | LC 120           | LC 120<br>LC 155 | LC 155           | LC 155           | LC 155 |                  |                  |        |        | 1.4           |
|         | 22           | LC 120           | LC 120           | LC 120<br>LC 155 | LC 155           | LC 155           |        |                  |                  |        |        | 1.76          |
| BMD 170 | 34           | LC 155           | LC 155           | LC 155           | LC 155           |                  |        |                  |                  |        |        | 2.9           |
|         | 45           | LC 155           | LC 155           | LC 155           |                  |                  |        |                  |                  |        |        | 4.75          |

| Distribution of nominal torque $M_{n2}$ [Nm] |     |     |     |     |     |     |     |     |     |     |     |
|----------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                                              | 3   | 4   | 5   | 7   | 10  | 16  | 20  | 25  | 40  | 50  | 70  |
| LC 050                                       | 10  | 12  | 12  | 12  | -   | 12  | 12  | 12  | -   | -   | -   |
| LC 070                                       | 18  | 25  | 25  | 25  | 18  | 25  | 25  | 25  | 25  | 25  | 25  |
| LC 090                                       | 37  | 43  | 43  | 43  | 37  | 43  | 43  | 43  | 43  | 43  | 43  |
| LC 120                                       | 95  | 110 | 110 | 110 | 95  | 110 | 110 | 110 | 110 | 110 | 110 |
| LC 155                                       | 250 | 300 | 300 | 300 | 250 | 300 | 300 | 300 | 300 | 300 | 300 |

Notes:

Input speed between 1600 min<sup>-1</sup> to 3000 min<sup>-1</sup>.

Safety factor 1 < S ≤ 4.

For any additional technical information about gearboxes selection see relevant catalogues.

## BMD Servomotor MP series precision planetary gearbox combination

Ratios from 3:1 to 70:1

| Type    | Stall torque<br>[Nm] | Ratios           |                  |                  |                  |                  |                  |                            |                            |                            |                  |                  |                  | Motor inertia<br>kgm <sup>2</sup> x 10 <sup>-3</sup> |
|---------|----------------------|------------------|------------------|------------------|------------------|------------------|------------------|----------------------------|----------------------------|----------------------------|------------------|------------------|------------------|------------------------------------------------------|
|         |                      | 3:1              | 4:1              | 5:1              | 6:1              | 7:1              | 10:1             | 16:1                       | 20:1                       | 25:1                       | 40:1             | 50:1             | 70:1             |                                                      |
| BMD 65  | 1.7                  | MP 053<br>MP 060 | MP 053<br>MP 060 | MP 053<br>MP 060 | MP 053<br>MP 060 | MP 053<br>MP 060 | MP 060<br>MP 080 | MP 060<br>MP 080           | MP 080<br>MP 080           | MP 080<br>MP 080           | MP 080<br>MP 105 | MP 105<br>MP 105 | MP 105<br>MP 105 | 0.04                                                 |
|         | 2.2                  | MP 053<br>MP 060 | MP 053<br>MP 060 | MP 053<br>MP 060 | MP 053<br>MP 060 | MP 053<br>MP 060 | MP 060<br>MP 080 | MP 080                     | MP 080<br>MP 080           | MP 080<br>MP 080           | MP 080<br>MP 105 | MP 105<br>MP 105 | MP 105<br>MP 105 | 0.06                                                 |
| BMD 82  | 3.2                  | MP 053<br>MP 060 | MP 053<br>MP 060 | MP 060<br>MP 080 | MP 060<br>MP 080 | MP 060<br>MP 080 | MP 080<br>MP 105 | MP 080<br>MP 105           | MP 080<br>MP 105           | MP 105                     | MP 105<br>MP 130 | MP 105<br>MP 130 | MP 130<br>MP 160 | 0.14                                                 |
|         | 4.4                  | MP 060           | MP 060           | MP 060<br>MP 080 | MP 060<br>MP 080 | MP 060<br>MP 080 | MP 080<br>MP 105 | MP 080<br>MP 105           | MP 080<br>MP 105           | MP 105                     | MP 105<br>MP 130 | MP 105<br>MP 130 | MP 130<br>MP 160 | 0.17                                                 |
| BMD 102 | 7.2                  | MP 080           | MP 080           | MP 080           | MP 080<br>MP 105 | MP 080<br>MP 105 | MP 105           | MP 105                     | MP 105<br>MP 130           | MP 130                     | MP 130<br>MP 160 | MP 130<br>MP 160 | MP 160           | 0.34                                                 |
|         | 9.6                  | MP 080           | MP 080           | MP 080           | MP 105           | MP 105           | MP 105           | MP 105                     | MP 105<br>MP 130           | MP 130                     | MP 130<br>MP 160 | MP 130<br>MP 160 | MP 160           | 0.47                                                 |
| BMD 118 | 10.2                 | MP 105           | MP 105           | MP 105           | MP 105           | MP 105           | MP 130<br>MP 160 | MP 130                     | MP 130<br>MP 160           | MP 130<br>MP 160           | MP 130<br>MP 160 | MP 130<br>MP 160 | MP 160<br>MP 190 | 0.9                                                  |
|         | 14                   | MP 105           | MP 105           | MP 105           | MP 105           | MP 105           | MP 130<br>MP 160 | MP 130                     | MP 130<br>MP 160           | MP 130<br>MP 160           | MP 130<br>MP 160 | MP 130<br>MP 160 | MP 160<br>MP 190 | 0.99                                                 |
| BMD 145 | 16.8                 | MP 105           | MP 105           | MP 105           | MP 105<br>MP 130 | MP 105<br>MP 130 | MP 130<br>MP 160 | MP 130<br>MP 160<br>MP 190 | MP 130<br>MP 160<br>MP 190 | MP 130<br>MP 160<br>MP 190 | MP 160<br>MP 190 | MP 160<br>MP 190 | MP 190           | 1.4                                                  |
|         | 22                   | MP 105           | MP 105           | MP 105           | MP 105<br>MP 130 | MP 130           | MP 160           | MP 130<br>MP 160<br>MP 190 | MP 130<br>MP 160<br>MP 190 | MP 130<br>MP 160<br>MP 190 | MP 160<br>MP 190 | MP 160<br>MP 190 | MP 190           | 1.76                                                 |
| BMD 170 | 34                   | MP 105           | MP 105<br>MP 130 | MP 130           | MP 130           | MP 130           | MP 160           | MP 160<br>MP 190           | MP 160<br>MP 190           | MP 160<br>MP 190           | MP 190           |                  |                  | 2.9                                                  |
|         | 45                   | MP 130           | MP 130           | MP 130           | MP 130<br>MP 160 | MP 130<br>MP 160 | MP 190           | MP 160<br>MP 190           | MP 160<br>MP 190           | MP 160<br>MP 190           | MP 190           |                  |                  | 4.75                                                 |

| Distribution of nominal torque M <sub>n2</sub> [Nm] |     |     |     |     |     |     |      |      |      |      |      |      |
|-----------------------------------------------------|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
|                                                     | 3   | 4   | 5   | 6   | 7   | 10  | 16   | 20   | 25   | 40   | 50   | 70   |
| MP 053                                              | 12  | 15  | 15  | 15  | 15  | -   | 20   | 20   | 20   | -    | -    | -    |
| MP 060                                              | 18  | 25  | 25  | 25  | 25  | 18  | 30   | 30   | 30   | 30   | 30   | 30   |
| MP 080                                              | 40  | 50  | 50  | 50  | 50  | 40  | 70   | 70   | 70   | 70   | 70   | 70   |
| MP 105                                              | 100 | 140 | 140 | 140 | 140 | 100 | 170  | 170  | 170  | 170  | 170  | 170  |
| MP 130                                              | 215 | 380 | 380 | 380 | 380 | 215 | 450  | 450  | 450  | 450  | 450  | 450  |
| MP 160                                              | 350 | 500 | 500 | 500 | 500 | 350 | 700  | 700  | 700  | 700  | 700  | 700  |
| MP 190                                              | 500 | 700 | 700 | 700 | 700 | 500 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |

Notes:

Input speed between 1600 min<sup>-1</sup> to 3000 min<sup>-1</sup>.

Safety factor 1<S≤4.

For any additional technical information about gearboxes selection see relevant catalogues.



## BMD Servomotor TQ series precision planetary gearbox combination

Ratios from 3:1 to 50:1

| Type    | Stall torque<br>[Nm] | Ratios           |                  |                  |                  |                  |                  |                  |                  |                  |                  | Motor inertia<br>kgm <sup>2</sup> x 10 <sup>-3</sup> |
|---------|----------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------------------------------------------|
|         |                      | 3:1              | 4:1              | 5:1              | 7:1              | 10:1             | 16:1             | 20:1             | 25:1             | 40:1             | 50:1             |                                                      |
| BMD 65  | 1.7                  | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | 0.04                                                 |
|         | 2.2                  | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 070           | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | TQ 060<br>TQ 070 | 0.06                                                 |
| BMD 82  | 3.2                  | TQ 070           | TQ 070           | TQ 070           | TQ 070           | TQ 090           | TQ 070           | TQ 070           | TQ 070           | TQ 070           | TQ 090           | 0.14                                                 |
|         | 4.4                  | TQ 070           | TQ 070           | TQ 070           | TQ 070           | TQ 090           | TQ 070           | TQ 070           | TQ 070           | TQ 070           | TQ 090           | 0.17                                                 |
| BMD 102 | 7.2                  | TQ 070           | TQ 090           | TQ 090<br>TQ 090 | TQ 070<br>TQ 090 | TQ 090           | TQ 070           | TQ 090           | TQ 090           | TQ 070<br>TQ 090 | TQ 090           | 0.34                                                 |
|         | 9.6                  | TQ 070           | TQ 090           | TQ 090<br>TQ 090 | TQ 070<br>TQ 090 | TQ 090           | TQ 070           | TQ 090           | TQ 090           | TQ 070<br>TQ 090 | TQ 090           | 0.47                                                 |
| BMD 118 | 10.2                 | TQ 070<br>TQ 090 | TQ 070<br>TQ 090 | TQ 070<br>TQ 090 | TQ 090           | TQ 090           | TQ 070<br>TQ 090 | TQ 070<br>TQ 090 | TQ 070<br>TQ 090 | TQ 090           | TQ 090           | 0.9                                                  |
|         | 14                   | TQ 090           | TQ 090           | TQ 090           | TQ 090<br>TQ 130 | TQ 130           | TQ 090           | TQ 090           | TQ 090           | TQ 090<br>TQ 130 | TQ 130           | 0.99                                                 |
| BMD 145 | 16.8                 | TQ 090           | TQ 090           | TQ 090           | TQ 090<br>TQ 130 | TQ 130           | TQ 090           | TQ 090           | TQ 090           | TQ 090<br>TQ 130 | TQ 130           | 1.4                                                  |
|         | 22                   | TQ 090           | TQ 090           | TQ 090           | TQ 090<br>TQ 130 | TQ 130           | TQ 090           | TQ 090           | TQ 090           | TQ 090<br>TQ 130 | TQ 130           | 1.76                                                 |
| BMD 170 | 34                   | TQ 090<br>TQ 130 | TQ 090<br>TQ 130 | TQ 090<br>TQ 130 | TQ 130           | TQ 160           | TQ 090<br>TQ 130 | TQ 090<br>TQ 130 | TQ 090<br>TQ 130 | TQ 130           | TQ 160           | 2.9                                                  |
|         | 45                   | TQ 130           | TQ 130           | TQ 130           | TQ 130           | TQ 160           | TQ 130           | TQ 130           | TQ 130           | TQ 130           | TQ 160           | 4.75                                                 |

| Distribution of nominal torque M <sub>n2</sub> [Nm] |     |     |     |     |     |     |     |     |     |     |     |
|-----------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                                                     | 3   | 4   | 5   | 7   | 10  | 16  | 20  | 25  | 40  | 50  | 70  |
| TQ 060                                              | 21  | 30  | 30  | 25  | 20  | 30  | 30  | 30  | 30  | 30  | 25  |
| TQ 070                                              | 45  | 70  | 70  | 60  | 40  | 70  | 70  | 70  | 70  | 70  | 60  |
| TQ 090                                              | 130 | 200 | 180 | 160 | 110 | 200 | 180 | 180 | 200 | 180 | 160 |
| TQ 130                                              | 260 | 400 | 400 | 360 | 280 | 400 | 400 | 400 | 400 | 400 | 360 |
| TQ 160                                              | 530 | 800 | 800 | 750 | 550 | 800 | 800 | 800 | 800 | 800 | 750 |

Notes:

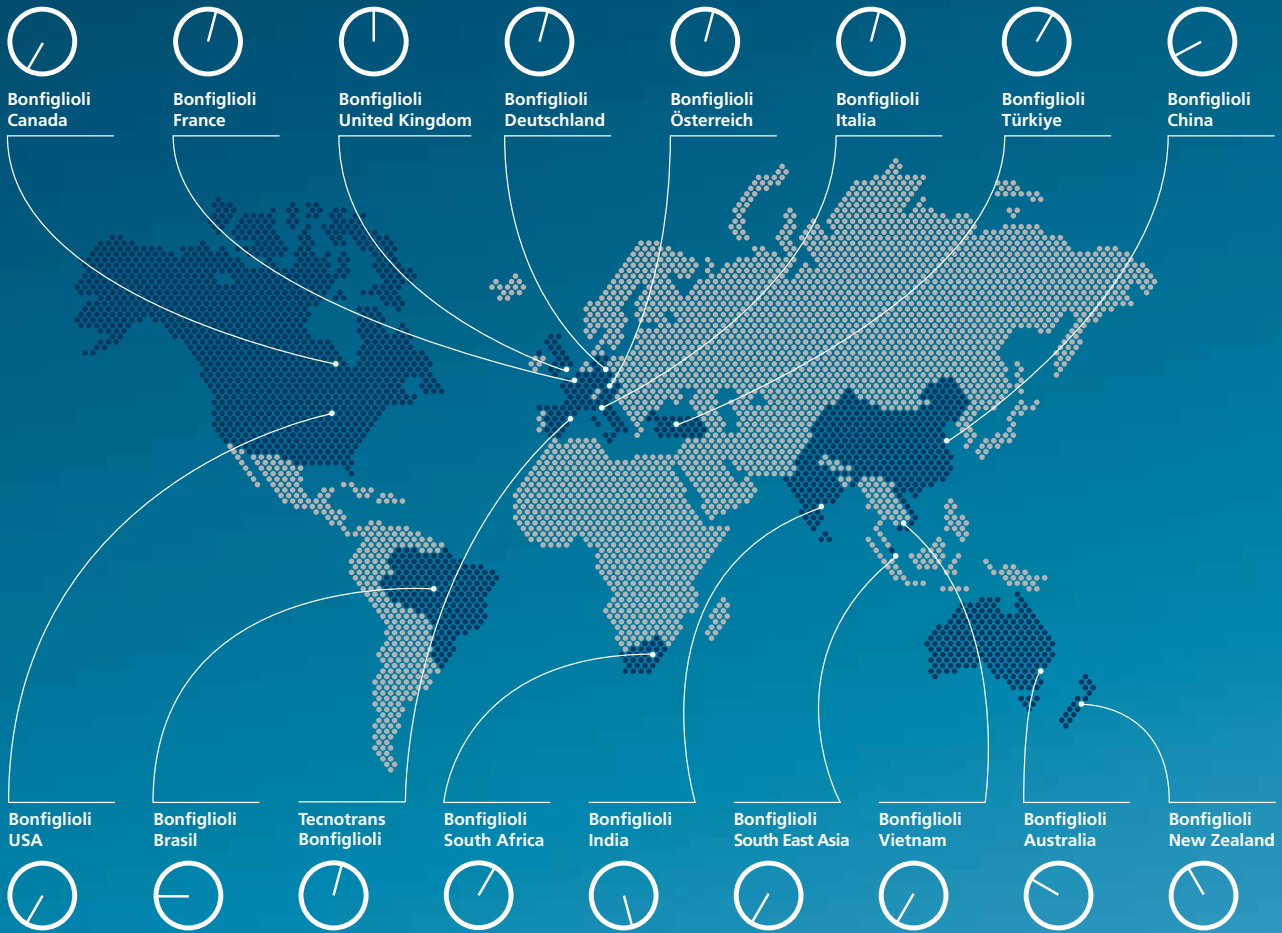
Input speed between 1600 min<sup>-1</sup> to 3000 min<sup>-1</sup>.

Safety factor 1 < S ≤ 4.

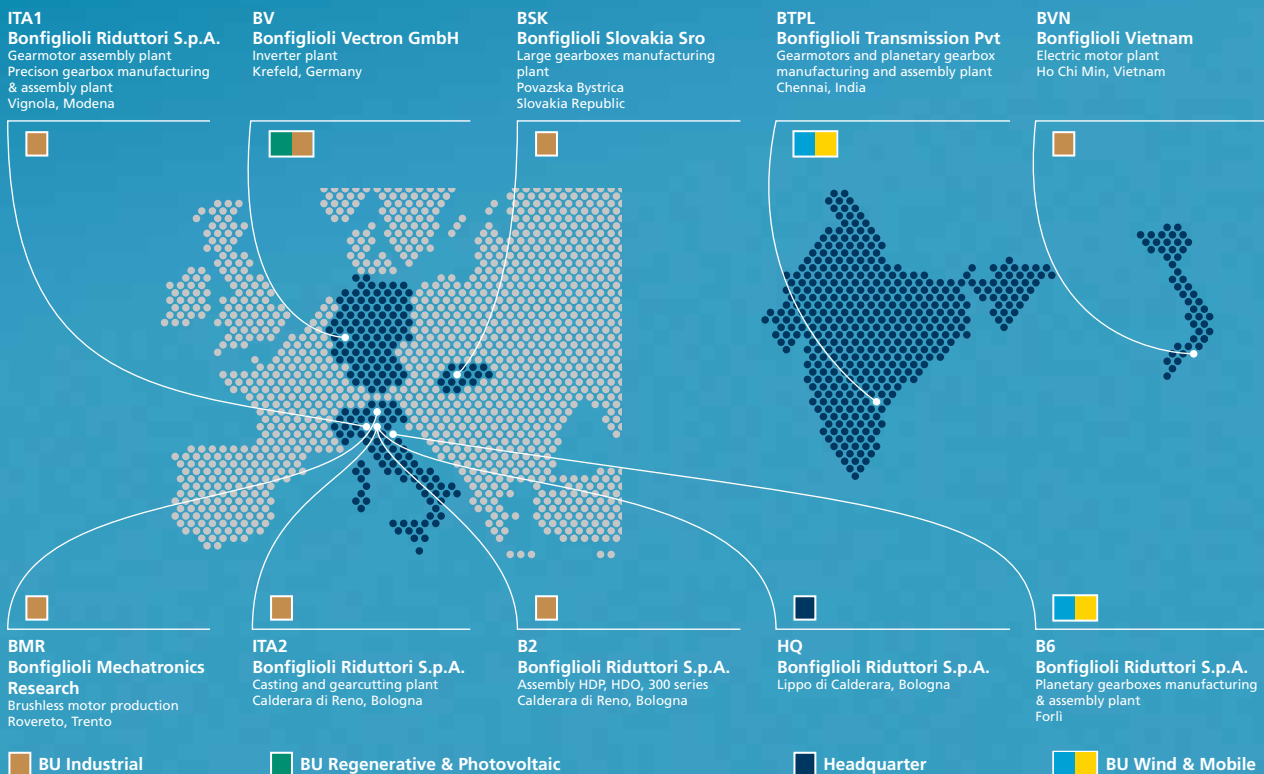
For any additional technical information about gearboxes selection see relevant catalogues.

# Branches and facilities

## Our branches



## Our production facilities



## Bonfiglioli is your partner worldwide for power transmission and motion control.

Customer satisfaction has always been one of Bonfiglioli's key values. It is pursued around the world, and in a wide range of contexts, by a network of subsidiaries located in 17 countries and on 5 continents.

Each subsidiary provides rapid and efficient pre-sales and after-sales service, and can guarantee prompt deliveries from local assembly plant and warehouses.

In addition to our directly controlled subsidiaries, Bonfiglioli can also rely on an extensive network of authorised dealers, selected for their ability to guarantee excellent pre-sales and after-sales assistance.

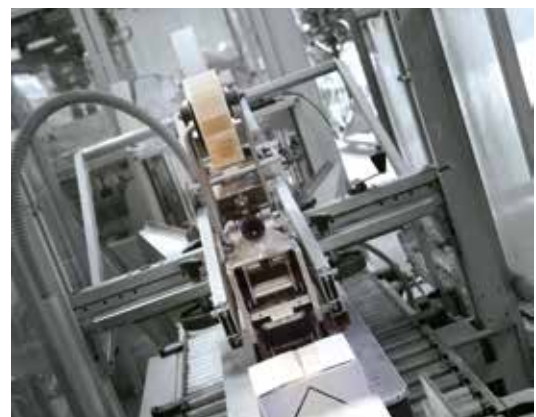
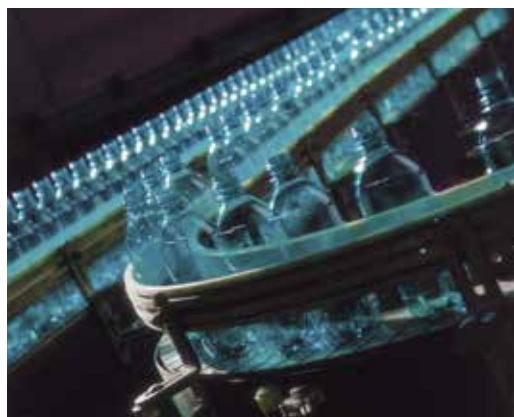
To give everybody the chance to purchase a Bonfiglioli product - anywhere.

This is the ambitious objective that drives the development of our added value sales networks, off and on-line.

BEST (Bonfiglioli Excellence Service Team) is one of the most modern sales organisations in the field of power transmission.

Our BEST partners can benefit from our local assembly plant and warehouses, our training courses and tools, and our promotional activities.

For the first time ever, manufacturer and distributors are working together from the product assembly stage and in the design of new applications, in a sharing process that sees one party transferring know-how and technology and the other partly providing a thorough knowledge of the local market.



# Bonfiglioli worldwide network.

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BMD Brushless motor photos used inside this catalogue do not represent the real product colour.  
The actual colour is black (RAL 9005). Silver dressing has to be intended for marketing and promotional purposes only.



Bonfiglioli has been designing and developing innovative and reliable power transmission and control solutions for industry, mobile machinery and renewable energy applications since 1956.

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