

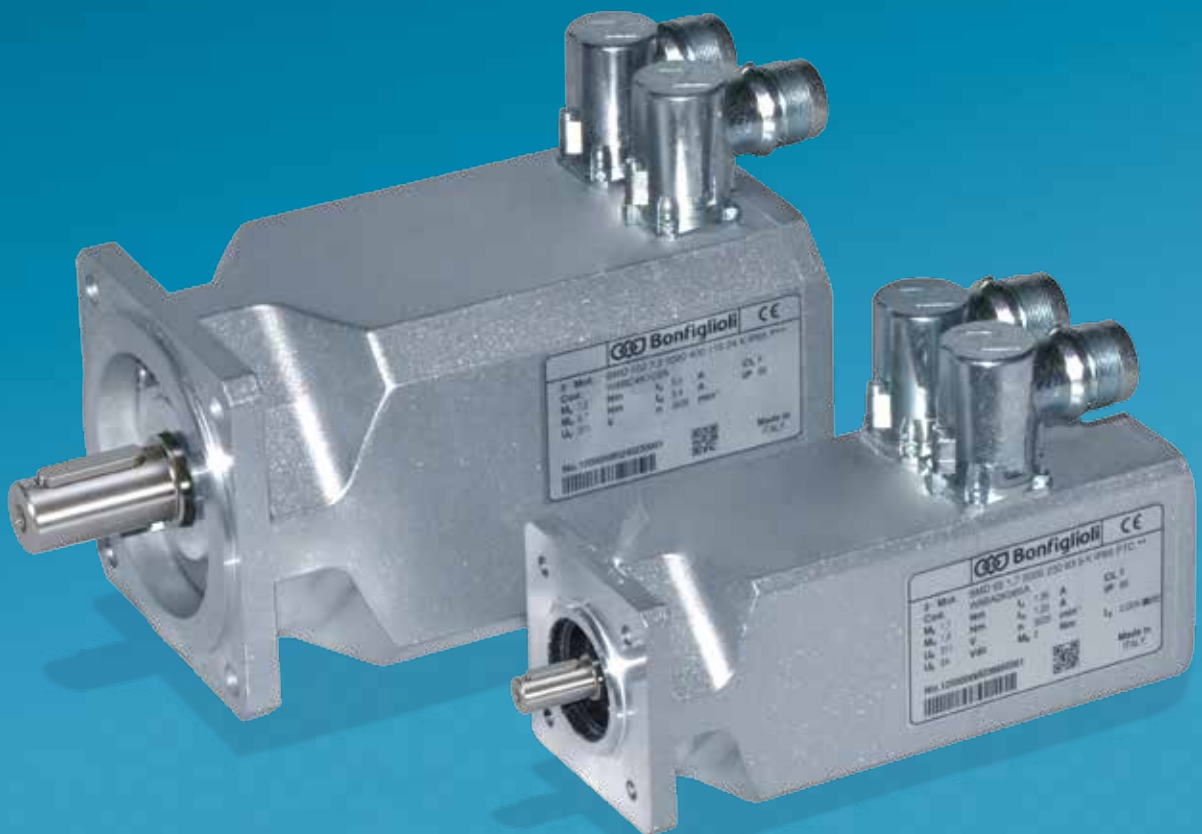


# Bonfiglioli

## 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.

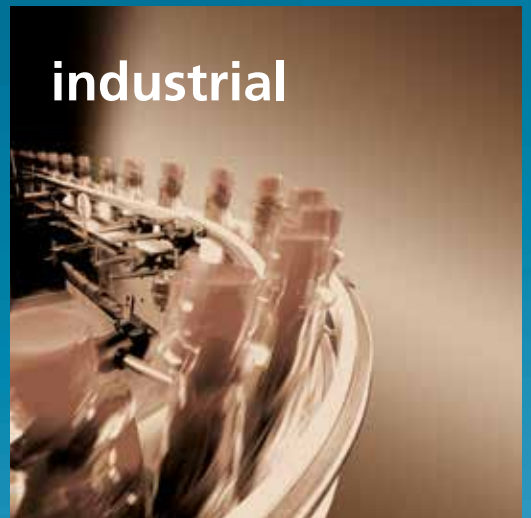
In a market in which excellent product quality alone is no longer sufficient, Bonfiglioli also provides experience, know-how, an extensive sales network, excellent pre-sales and after-sales service and modern communication tools and systems to create high level solutions for industry, mobile machinery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

# Bonfiglioli solutions

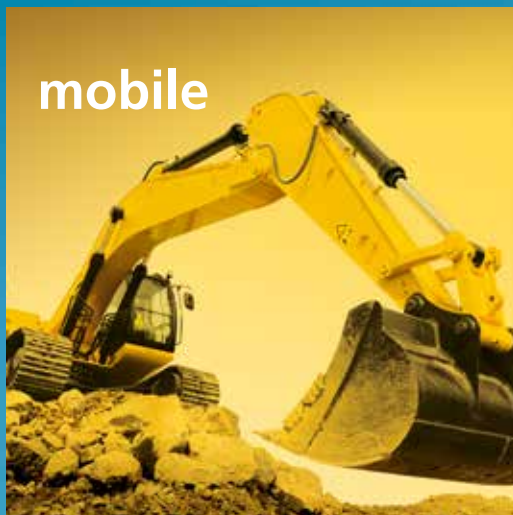
wind



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 performance of the neodymium iron boron rare-earth magnets maximize performance in terms of very high accelerations and withstand high overloads without risk of demagnetization of the magnets.

The motors are available in six frame sizes covering a stall torque range between 1.7 ÷ 34 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".

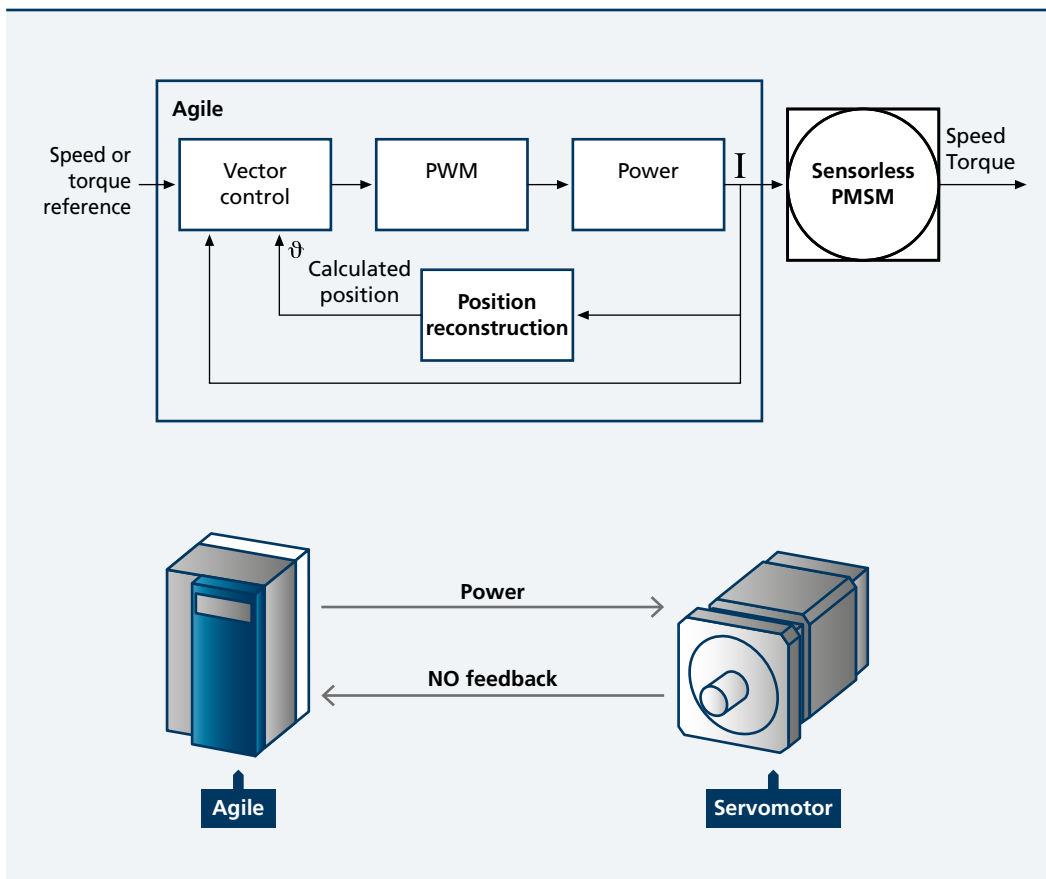
In brushless motor control, the exact angular position of the rotor must be known at all times for the drive to commutate the inverter phases. The conventional method for tracking rotor position is to incorporate an encoder or resolver inside the servomotor to provide the drive with the necessary electrical 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





## Standards and directives

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

### Standard

Rotating electrical machines  
 Part 1: Rating and performance  
**IEC 60034-1, EN 60034-1**

Rotating electrical machines  
 Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) - Classification  
**IEC 60034-5, EN 60034-5**

Rotating electrical machines  
 Part 6: Methods of cooling (IC Code)  
**IEC 60034-6, EN 60034-6**

Rotating electrical machines  
 Part 8: Terminal markings and direction of rotation  
**IEC 60034-8, EN 60034-8**

Rotating electrical machines  
 Part 9: Noise limits  
**IEC 60034-9, EN 60034-9**

Rotating electrical machines  
 Part 14: Mechanical vibration - Measurement, evaluation and limits of vibration severity  
**IEC 60034-14, IEC 60034-14**

Dimensions and output series for rotating electrical machines - Part 1  
**IEC 60072-1**

Rotating electrical machines  
 Part 25: Guidance for the design and performance of a.c. motors specifically designed for converter supply  
**IEC TS 60034-25**

### Directives

Low Voltage Directive: 2006/95/EC  
 EMC Directive: 2004/108/EC

It is the responsibility of the manufacturer or assembler of the machine in which these motors are incorporated to ensure the safety of that machine as a whole and its conformity to all relevant end product directives.

## 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>-3</sup> ]	Motor moment of inertia
$m_M$	[kg]	Motor mass without brake
$J_b$	[kgm <sup>2</sup> x 10 <sup>-3</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

# Bonfiglioli permanent magnet synchronous motors range

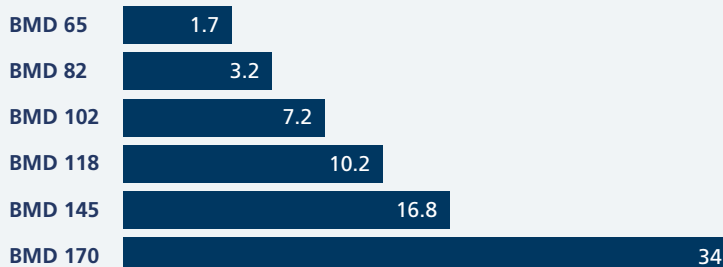
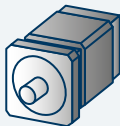
The Bonfiglioli permanent magnet synchronous motors are available in six sizes with a stall torque comprises between 1.7 ÷ 34Nm.

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



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## Commercial designation of Bonfiglioli permanent magnet synchronous motors

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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.

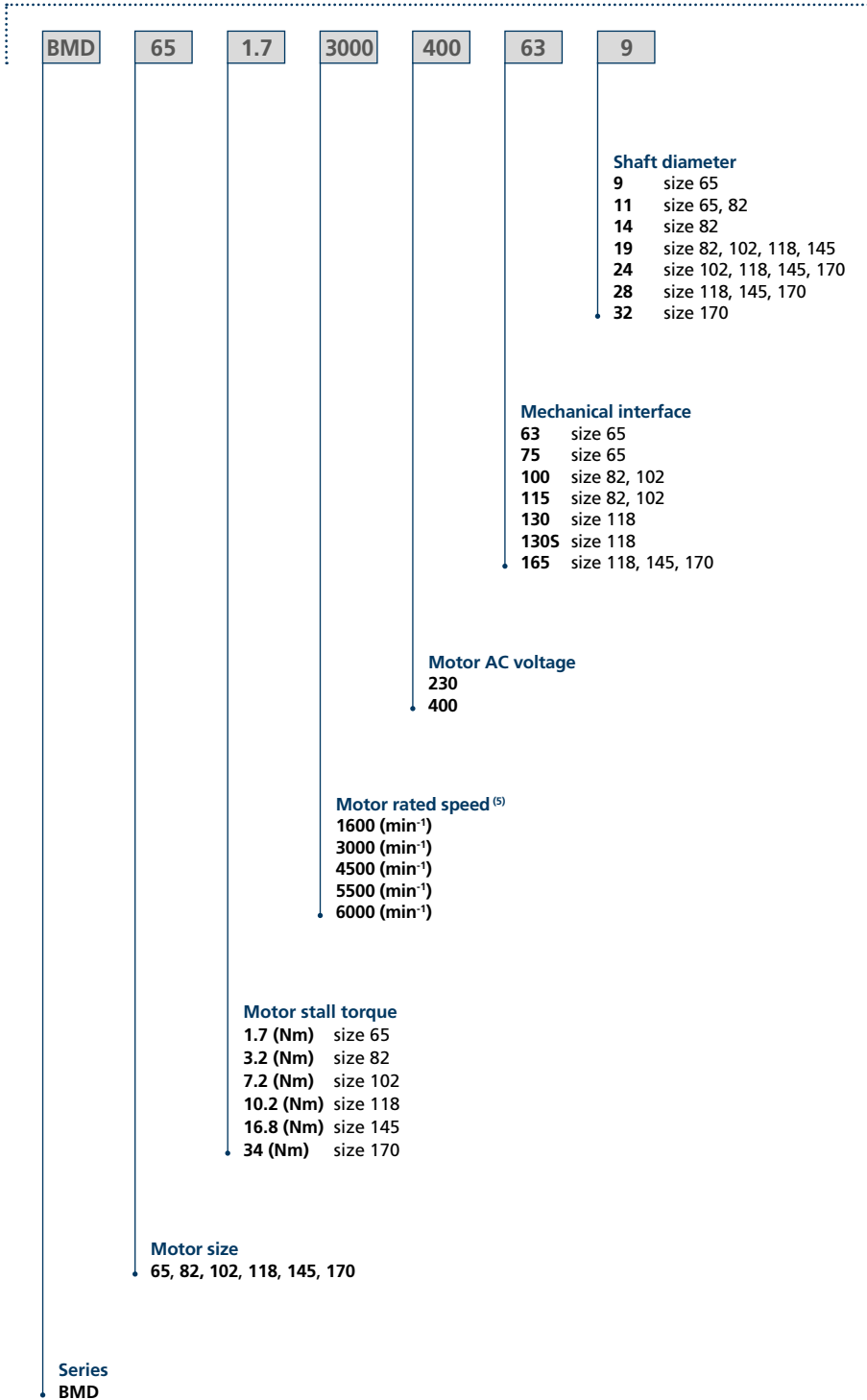
**Is mandatory to select one of the possible choices in all variants fields. The variant can be missed only where a blank is a possible choice.**

Housing of BMD servomotors is painted RAL 9005, black.

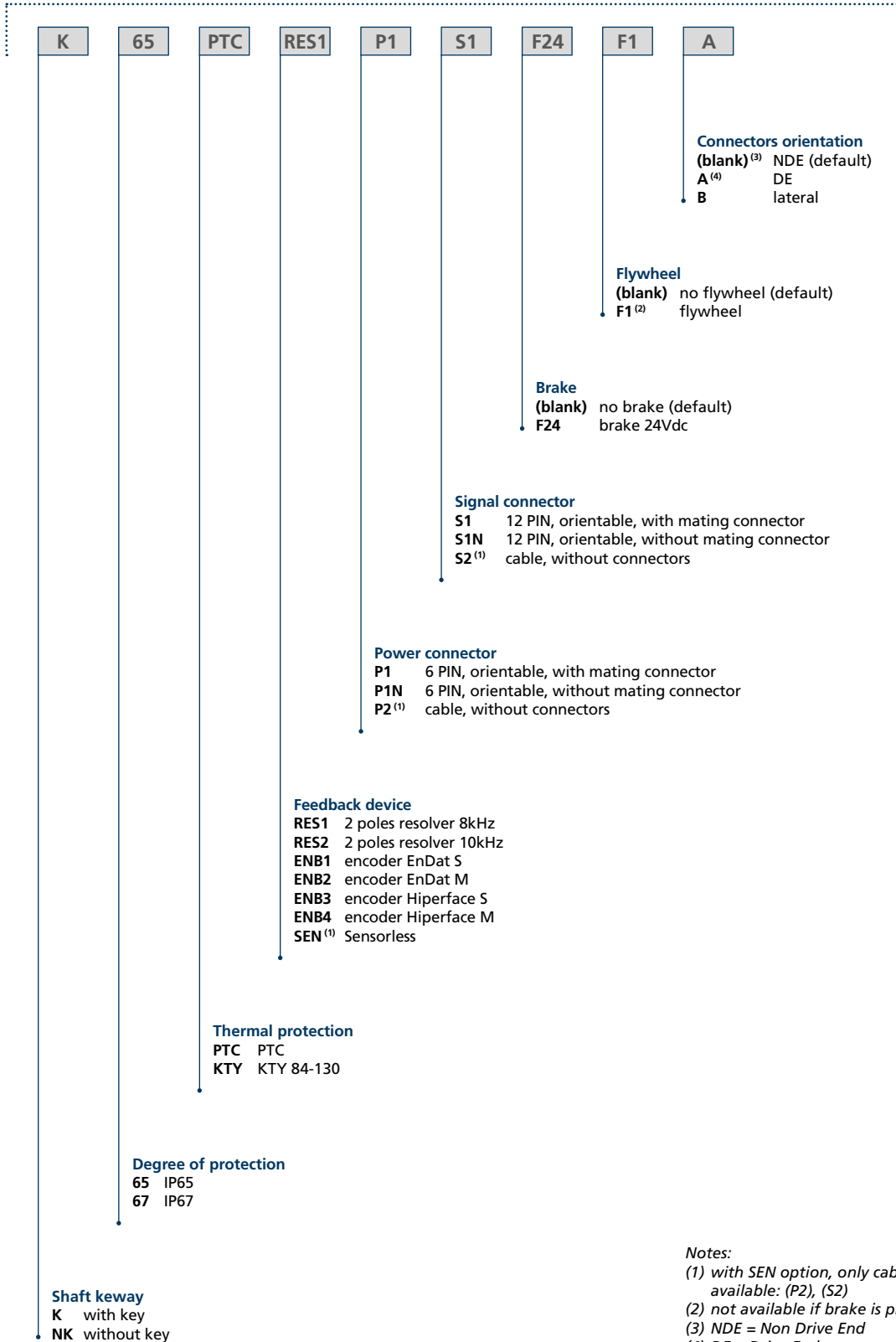
# Commercial designation of Bonfiglioli servomotors

## Brushless Motors designation

### Basic variants



### Optional variants



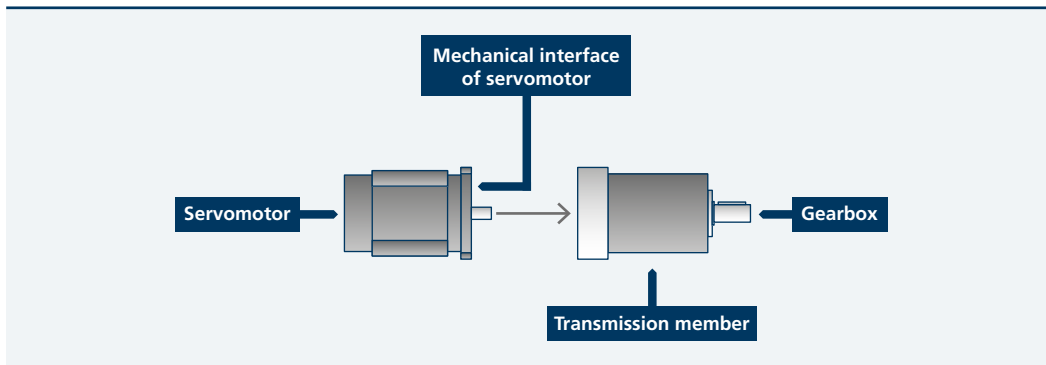
**Notes:**

- (1) with SEN option, only cables without connectors are available: (P2), (S2)
- (2) not available if brake is provided
- (3) NDE = Non Drive End
- (4) DE = Drive End
- (5) BMD 170 available with speeds 1600 min<sup>-1</sup> and 3000 min<sup>-1</sup>

# 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

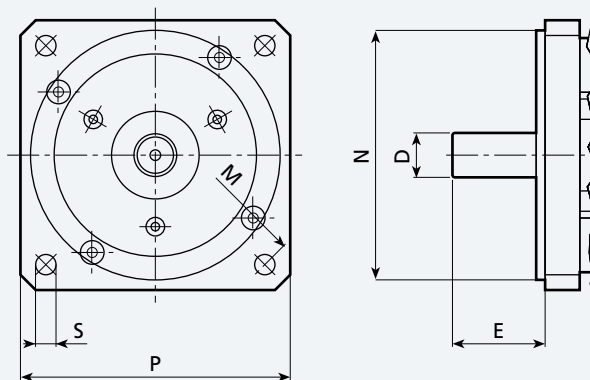
univocally defined by its geometrical dimensions. The flanges and the shafts of BMD are described by fixed geometrics according to a standard Bonfiglioli configuration oriented to coupling with gearboxes, but also available to be adapted to other application requirements.



**Mechanical interface:**  
connection Flange + transmission Shaft.  
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 11x23		11x23 14x30 19x40		19x40 24x50		19x40 24x50 28x60		19x40 24x50 28x60		24x50 28x60 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	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

Different interface dimension can be agreed upon technical evaluation and feasibility analysis of application.

## Servo rated gearheads

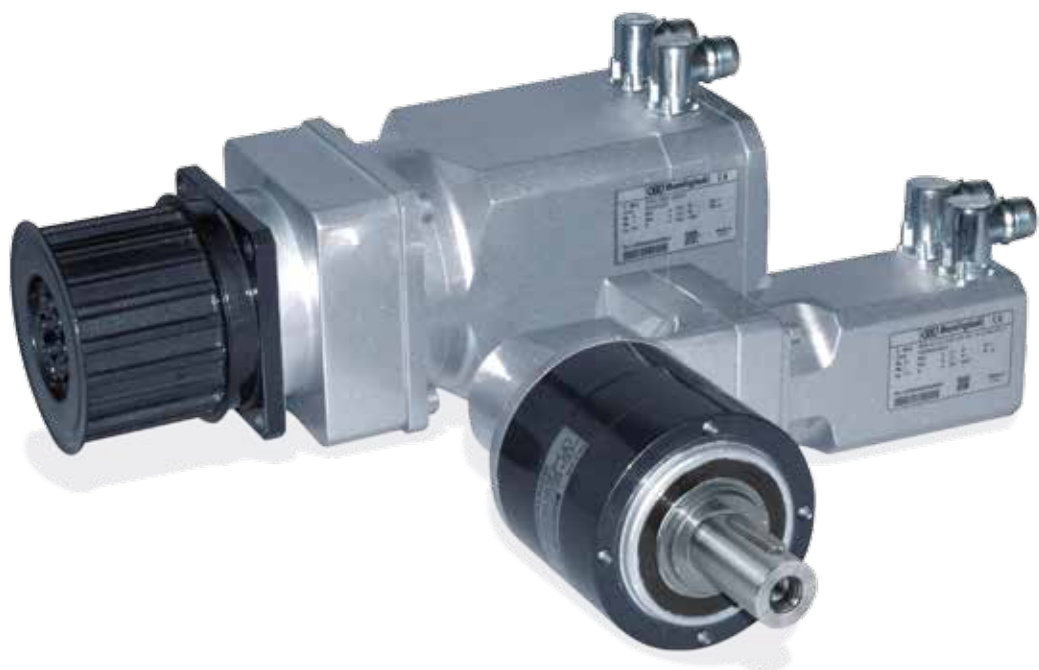
Motion application requires the use of planetary gearboxes to adapt speeds and torques, while ensuring the precision demanded by the application.

Bonfiglioli Riduttori has chosen to use planetary gearboxes TR, LC, SL 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.



## BMD servo motor TR series coaxial Right angle planetary gearbox combinations

Ratios from 3:1 to 10:1

Type	Stall torque [Nm]	Ratios						Motor inertia kgm <sup>2</sup> x 10 <sup>-3</sup>
		3:1	4:1	5:1	6:1	7:1	10:1	
BMD 65	1.7	TR 053	TR 053	TR 053	TR 053	TR 053	TR 060	0.04
		TR 060	TR 060	TR 060	TR 060	TR 060	TR 080	
BMD 82	3.2	TR 053	TR 053	TR 060	TR 060	TR 060	TR 080	0.14
		TR 060	TR 060	TR 080	TR 080	TR 080	TR 105	
BMD 102	7.2	TR 080	TR 080	TR 080	TR 080	TR 080	TR 105	0.34
					TR 105	TR 105		
BMD 118	10.2	TR 080	TR 080	TR 105	TR 105	TR 105	TR 130	0.9
		TR 105	TR 105				TR 160	
BMD 145	16.8	TR 105	TR 105	TR 105	TR 105	TR 105	TR 130	1.4
					TR 130	TR 130	TR 160	
BMD 170	34	TR 105	TR 105	TR 130	TR 130	TR 130	TR 130	2.9
			TR 130					

Ratios from 16:1 to 70:1

Type	Stall torque [Nm]	Ratios						Motor inertia kgm <sup>2</sup> x 10 <sup>-3</sup>
		16:1	20:1	25:1	40:1	50:1	70:1	
BMD 65	1.7	TR 060	TR 080	TR 080	TR 080	TR 105	TR 105	0.04
		TR 080	TR 080	TR 080	TR 105	TR 105	TR 105	
BMD 82	3.2	TR 080	TR 080	TR 105	TR 105	TR 105	TR 130	0.14
		TR 105	TR 105		TR 130	TR 130	TR 160	
BMD 102	7.2	TR 105	TR 105	TR 130	TR 130	TR 130	TR 160	0.34
			TR 130		TR 160	TR 160		
BMD 118	10.2	TR 130	TR 130	TR 130	TR 130	TR 160	TR 190	0.9
			TR 160	TR 160	TR 160			
BMD 145	16.8	TR 130	TR 130	TR 160	TR 160	TR 190		1.4
		TR 160	TR 160	TR 190	TR 190			
BMD 170	34	TR 160	TR 160	TR 190				2.9
		TR 190	TR 190					

### Distribution of nominal torque M<sub>n2</sub> [Nm]

	3	4	5	6	7	10	16	20	25	40	50	70
TR 053	12	15	15	15	15	-	20	20	20	-	-	-
TR 060	18	25	25	25	25	18	30	30	30	30	30	30
TR 080	40	50	50	50	50	40	70	70	70	70	70	70
TR 105	100	140	140	140	140	100	170	170	170	170	170	170
TR 130	215	380	380	380	380	215	450	450	450	450	450	450
TR 160	350	500	500	500	500	350	700	700	700	700	700	700
TR 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>.

1600 min<sup>-1</sup>

Safety factor 1 < S ≤ 4.

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



## BMD servo motor LC series coaxial Right angle planetary gearbox combinations

Ratios from 3:1 to 10:1

Type	Stall torque [Nm]	Ratios						Motor inertia kgm <sup>2</sup> x 10 <sup>-3</sup>
		3:1	4:1	5:1	6:1	7:1	10:1	
BMD 65	1.7	LC 050	LC 050	LC 050	LC 070	LC 070	TR 060	0.04
		LC 070	LC 070	LC 070	LC 090	LC 090	TR 080	
BMD 82	3.2	LC 050	LC 070	LC 070	LC 070	LC 090	TR 080	0.14
		LC 070	LC 090	LC 090	LC 090	LC 120	TR 105	
BMD 102	7.2	LC 090	LC 090	LC 090	LC 120	LC 120	TR 105	0.34
				LC 120		LC 155		
BMD 118	10.2	LC 090	LC 120	LC 120	LC 120	LC 155	TR 130	0.9
		LC 120					TR 160	
BMD 145	16.8	LC 120	LC 120	LC 120	LC 155	LC 155	TR 130	1.4
				LC 155			TR 160	
BMD 170	34	LC 155	LC 155	LC 155	LC 155		TR 130	2.9

Ratios from 16:1 to 70:1

Type	Stall torque [Nm]	Ratios						Motor inertia kgm <sup>2</sup> x 10 <sup>-3</sup>
		16:1	20:1	25:1	40:1	50:1	70:1	
BMD 65	1.7	LC 090	LC 090 LC 120	LC 090 LC 120	LC 120	LC 120		0.04
BMD 82	3.2	LC 120	LC 120	LC 120 LC 155	LC 155	LC 155		0.14
BMD 102	7.2	LC 155	LC 155	LC 155	LC 155			0.34
BMD 118	10.2	LC 155	LC 155	LC 155	LC 155			0.9
BMD 145	16.8	LC 155						1.4
BMD 170	34							2.9

### Distribution of nominal torque $M_{n2}$

	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>.

■ 1600 min<sup>-1</sup>

Safety factor 1 < S ≤ 4.

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

## BMD servo motor SL series coaxial Planetary gearbox combinations

Ratios from 3:1 to 10:1


Type	Stall torque [Nm]	Ratios					Motor inertia kgm <sup>2</sup> x 10 <sup>-3</sup>
		3:1	4:1	5:1	7:1	10:1	
BMD 65	1.7	SL 070	SL 070	SL 070	SL 070 SL 090	SL 070 SL 090	0.04
BMD 82	3.2	SL 070	SL 070 SL 090	SL 070 SL 090	SL 070 SL 090	SL 090 SL 120	0.14
BMD 102	7.2	SL 090	SL 090	SL 090 SL 120	SL 120	SL 120	0.34
BMD 118	10.2	SL 090 SL 120	SL 120	SL 120	SL 120		0.9
BMD 145	16.8	SL 120	SL 120	SL 120			1.4
BMD 170	34						2.9

### Distribution of nominal torque $M_{n2}$ [Nm]

	3	4	5	7	10
SL 070	18	25	25	25	18
SL 090	37	43	43	43	37
SL 120	95	110	120	110	95

**Notes:**

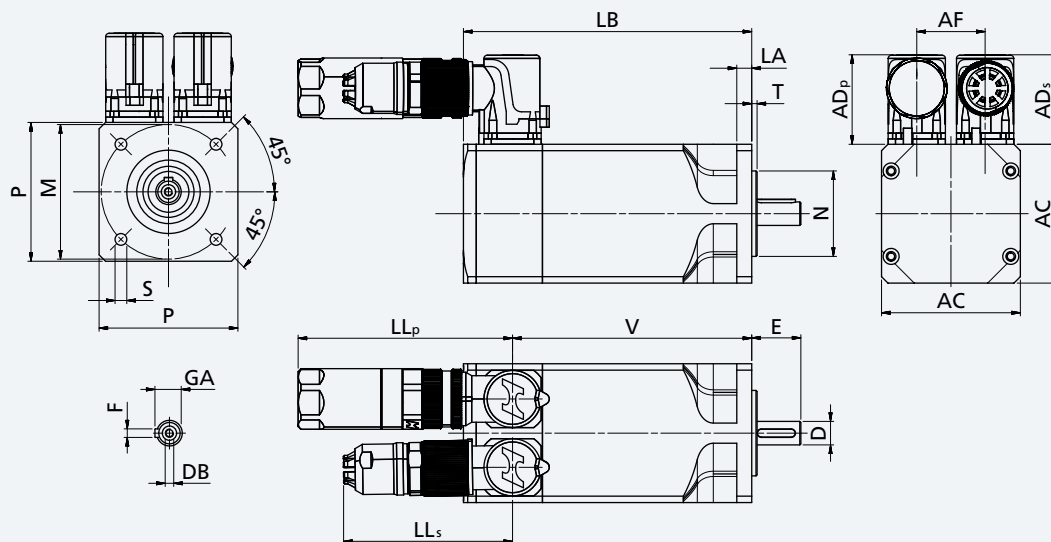
Input speed between 1600 min<sup>-1</sup> to 3000 min<sup>-1</sup>.

 1600 min<sup>-1</sup>

Safety factor 1 < S ≤ 4.

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

## Dimensions (from BMD 65 to BMD 102)



Type	Shaft				
	D	E	DB	GA (1)	F (1)
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

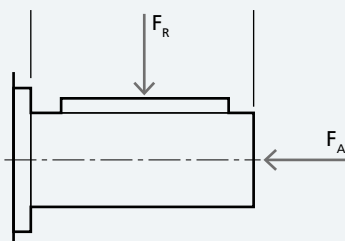
Type	Flange					
	M	N	P	S	T	LA
65	63	40	65	5.5	2.5	7
	75	60	65	6	2.5	7
82	100	80	82	6.5	3	10
	115	95	100	9	3	10
102	100	80	102	7	3	10
	115	95	102	9	3	10

Type	Motor										
	AC	LB <sub>2</sub>	LB <sub>3</sub>	LB <sub>4</sub>	LB <sub>5</sub>	ADp	ADs	AF	LLp	LLs	V
65	65	135	166	152	152	41.5	41.5	32	96	96	112
82	82	160	200	160	183	41.5	41.5	36	96	96	134.5
102	102	180	220	180	195	41.5	41.5	39	96	96	150.5

Notes:

(1) It is available the version with motor shaft without key.  
 LB<sub>2</sub> Standard motor length.  
 LB<sub>3</sub> Length of motor with brake or motor with flywheel.

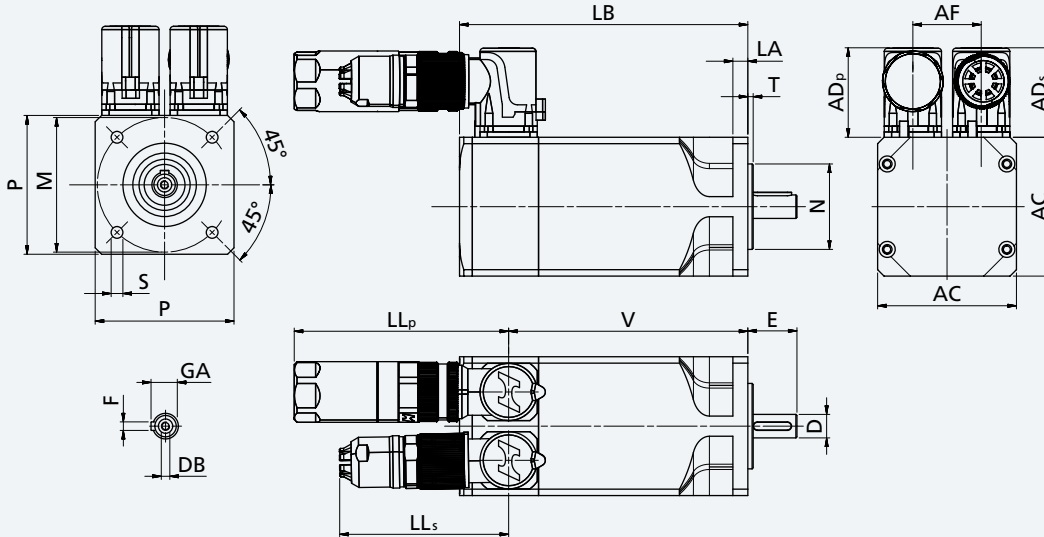
LB<sub>4</sub> Motor with encoder Hiperface (ENB3, ENB4) length.  
 LB<sub>5</sub> Length of motor with encoder EnDat (ENB1, ENB2).



### Max load on shaft

Motor	Speed	Radial (F <sub>R</sub> )	Axial (F <sub>A</sub> )
		N	N
65	3000	320	65
82	3000	550	110
102	3000	600	120

## Dimensions (from BMD 118 to BMD 170)



Type	Shaft				
	D	E	DB	GA (1)	F (1)
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	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										
	AC	LB <sub>2</sub>	LB <sub>3</sub>	LB <sub>4</sub>	LB <sub>5</sub>	ADp	ADs	AF	LLp	LLs	V
118	118	210	260	210	225	41.5	41.5	50	96	96	175
145	145	230	280	230	245	41.5	41.5	45	96	96	195
170	170	265	315	265	280	57.5	41.5	90	140	96	233

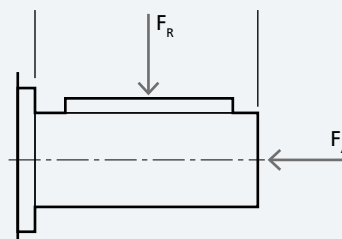
**Notes:**

(1) It is available the version with motor shaft without key.  
 LB<sub>2</sub> Standard motor length.  
 LB<sub>3</sub> Length of motor with brake or motor with flywheel.

LB<sub>4</sub> Motor with encoder HIperface (ENB3, ENB4) length.  
 LB<sub>5</sub> Length of motor with encoder EnDat (ENB1, ENB2).

**Max load on shaft**

Motor	Speed min <sup>-1</sup>	Radial (F <sub>R</sub> )	Axial (F <sub>A</sub> )
		N	N
118	3000	820	165
145	3000	870	170
170	3000	1400	280

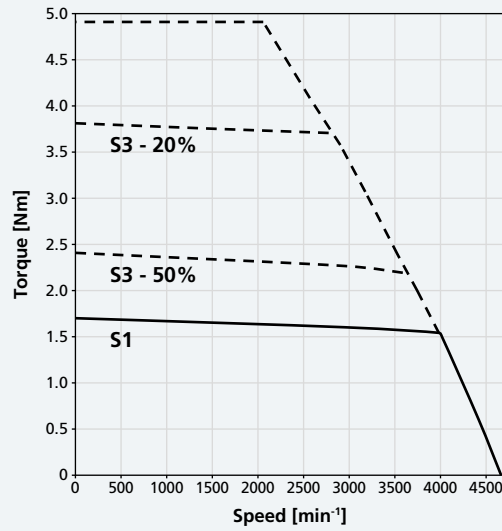


## Datasheet BMD 400V

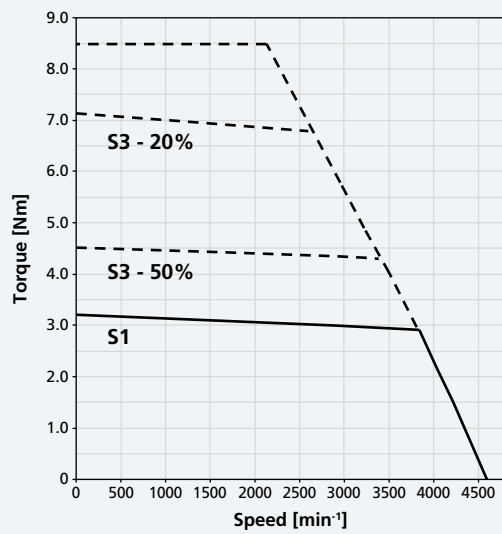
Parameter	Symbol	Unit	Motor					
			65	82	102	118	145	170
Standstill torque (dT=100K)	$M_0$	[Nm]	1.7	3.2	7.2	10.2	16.8	34
Rated Speed	$n_n$	[min <sup>-1</sup> ]	3000	3000	3000	3000	3000	3000
Motor rated voltage	$V_n$	[VAC]	311	315	311	305	308	315
Number of motor poles	$p_{mot}$		8	8	8	8	8	8
Number of poles (resolver)	$p_{res}$		2	2	2	2	2	2
Rated Torque (dT=100K)	$M_n$	[Nm]	1.60	3.0	6.7	9.5	16	27.5
Current at rated speed	$I_n$	[A]	1.33	2.50	5.4	7.9	12.5	18.6
Standstill current	$I_0$	[A]	1.35	2.60	5.5	8.0	13	23.3
Max Torque	$M_{max}$	[Nm]	4.9	8.5	21	30	46	90
Max Current	$I_{max}$	[A]	4.6	8.9	20	28	50	70
Back EMF constant	$K_e$	[V/1000min <sup>-1</sup> ]	83	85	86	86	83	93
Torque constant	$K_T$	[Nm/A]	1.26	1.25	1.31	1.28	1.29	1.46
Rated Power	$P_n$	[kW]	0.50	0.94	2.1	3.0	5.0	8.6
Stator phase-phase Resistance (at 20°C)	$R_{pp}$	[Ω]	26.31	9.75	2.53	1.27	0.72	0.26
Stator phase-phase Inductance	$L_{pp}$	[mH]	79.5	55.2	21.3	16.7	11.5	5.1
Rotor inertia (without brake)	$J_m$	[kgm <sup>2</sup> x 10 <sup>-3</sup> ]	0.04	0.14	0.34	0.78	1.28	2.82
Electric time constant (at 20°C)	$\tau_{el}$	[ms]	3.0	5.7	8.4	13	16	20
Thermal time constant	$\tau_{therm}$	[min]	20	26	31	34	36	50
Motor mass without brake	$m_M$	[kg]	1.9	3.5	5.8	9.7	15.2	25

# Torque speed diagrams

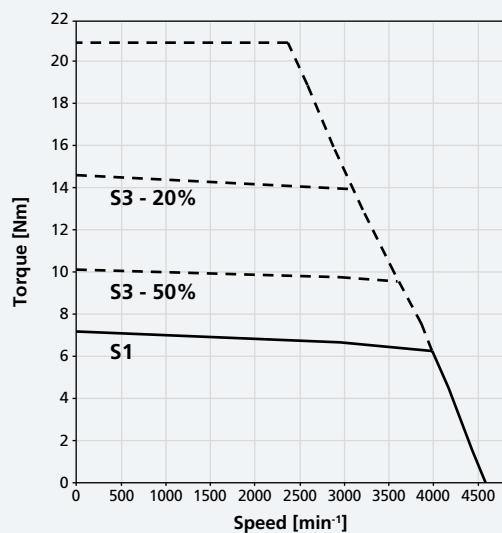
## BMD 65



## BMD 82

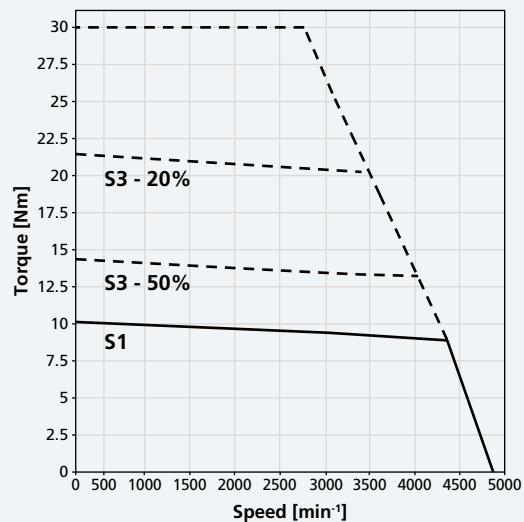


## BMD 102

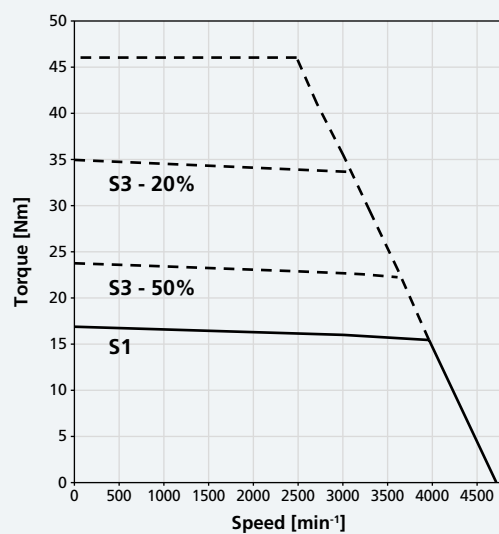


## Torque speed diagrams

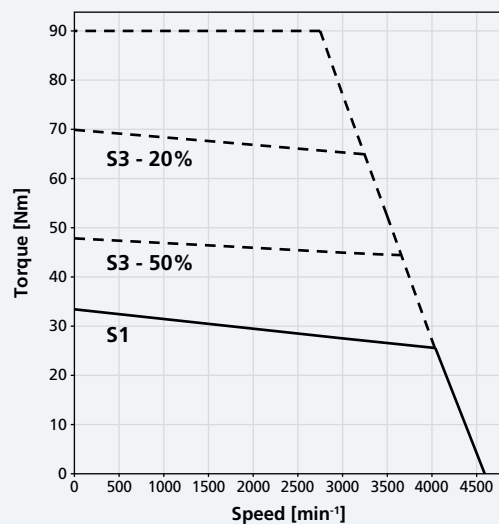
### BMD 118



### BMD 145

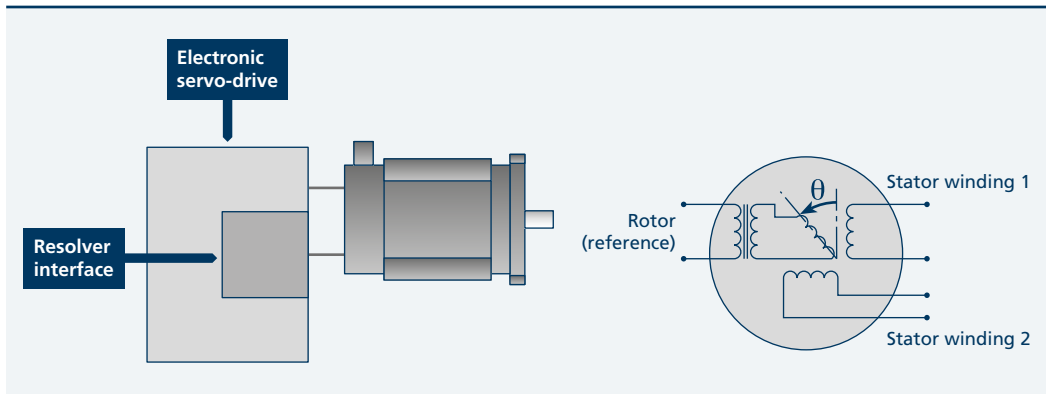


### BMD 170

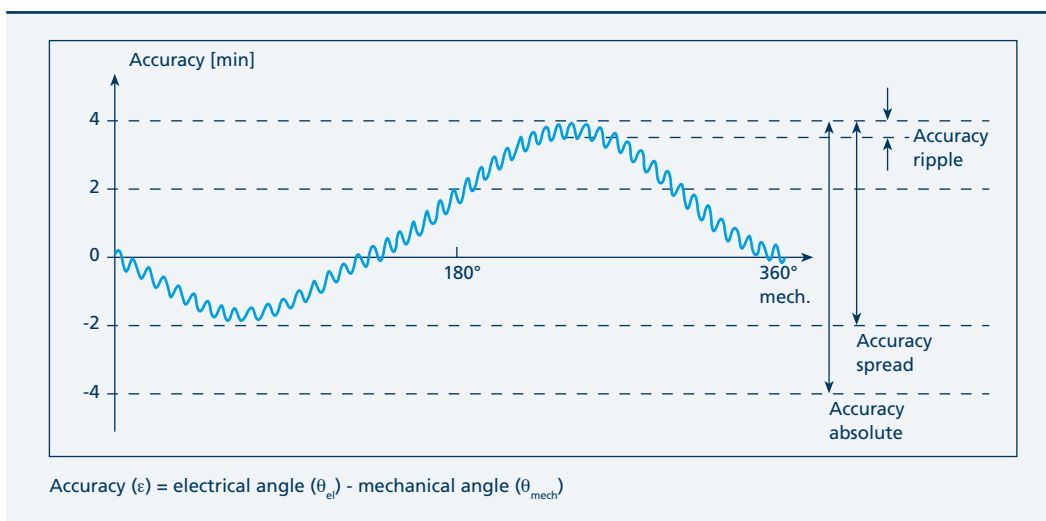


## Feedback resolver

All servomotors in the Bonfiglioli BMD series use a two - pole feedback resolver to achieve a level of accuracy of 1' of ripple at the motor shaft.



Use of this type of transducer guarantees an absolute accuracy of  $\pm 4'$  at the motor shaft as well as a maximum ripple of 1'.



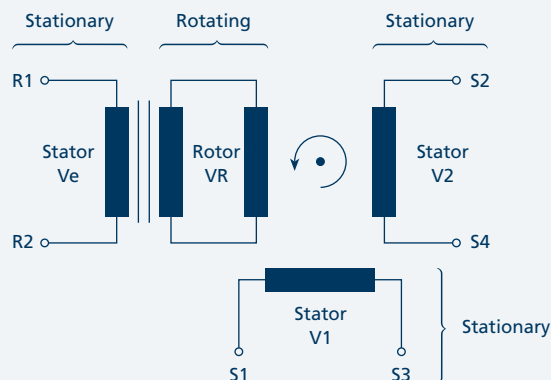
Frequency inverters from the Bonfiglioli Vectron ACTIVE series use a sophisticated electronic interface to acquire drive signals. Use of BMD servomotors with these frequency inverters dramatically reduces the effects of harmonic distortion on the sinusoidal signals

and significantly improves both absolute and ripple accuracy.

On option, BMD servomotors can be fitted with absolute encoders based on following standards: EnDat, Hiperface.



## Resolver datasheet



Item	RES1	RES2	RES2
	(sizes 82...170)	(size 65 only)	(sizes 82...170)
Poles number	2	2	2
Transformation ratio	0.5 $\begin{matrix} +15\% \\ -5\% \end{matrix}$	0.5 $\pm 5\%$	0.5 $\pm 5\%$
Input voltage [Vac <sub>rms</sub> ]	11	7	5.5
Input current [mA]	57	65	61
Input frequency [kHz]	8	10	10
Phase shift	-11°	0°	-12°
Input impedance Zro (Ω)	75 + j185	70 + j100	43 + j79
Output impedance Zss (Ω)	135 + j265	175 + j275	62 + j112
Electrical error	±10'	±10'	±10'
Accuracy ripple	1' max	1' max	1' max
Operating temperature	-55°C ... +155°C	-55°C ... +155°C	-55°C ... +155°C
Max Speed [min <sup>-1</sup> ]	20000	10000	10000
Mass [kg]	0.28	0.065	0.28
Rotor Inertia [kgm <sup>2</sup> x 10 <sup>-6</sup> ]	1.9	3.0	3.0

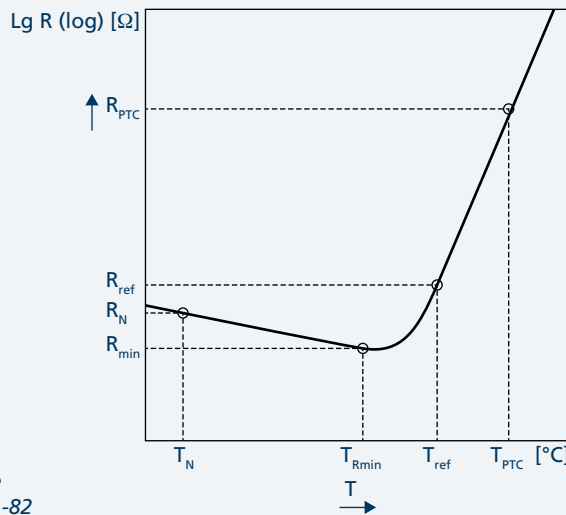
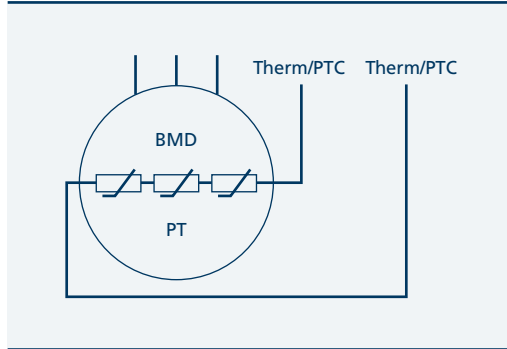
## Encoder datasheet

Item	ENB1 / ENB2	ENB1 / ENB2	ENB3 / ENB4	ENB3 / ENB4
	(size 65 only)	(sizes 82...170)	(size 65 only)	(sizes 82...170)
Data interface	EnDat	EnDat	Hiperface	Hiperface
Power supply	3.6VDC ... 14VDC	3.6VDC ... 14VDC	7VDC ... 12VDC	7VDC ... 12VDC
Periods per revolution	512	2048	128	1024
Positions per revolution	13 bit	13 bit	12 bit	15 bit
Revolutions (multiturn)	12 bit	12 bit	12 bit	12 bit
Operating temperature	-40°C ... +115°C	-40°C ... +115°C	-30°C ... +110°C	-20°C ... +110°C
Max Speed [min <sup>-1</sup> ]	12000	12000	10000	12000
Mass [kg]	0.1	0.25	0.07	0.20
Rotor Inertia [kgm <sup>2</sup> x 10 <sup>-6</sup> ]	0.4	2.6	0.45	1.0

## PTC/KTY thermal protection

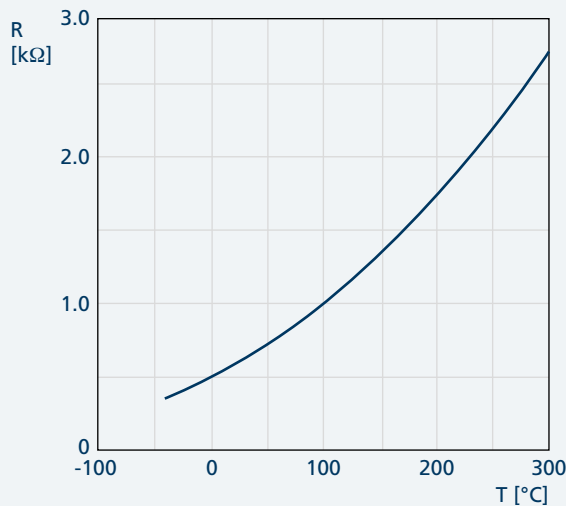
All motors in the BMD Series are equipped with an integrated PTC temperature as standard to protect the windings against overtemperatures exceeding the capacity of the motor's class F insulation. These sensors are in conformity to DIN standard 44081. Optionally a KTY sensor is available, to fit any needs 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.



### KYT 84-130

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



## Electromechanical holding brake (option)

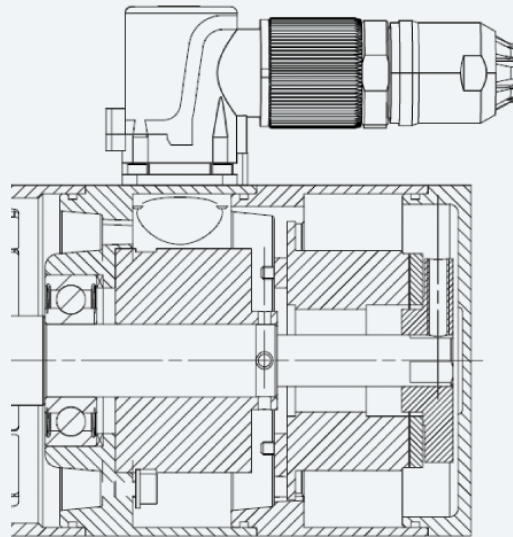
BMD motors are used as four-quadrant actuators then they are designed to offer positive torque when they are running as motors, as well negative torque when they are running as generator. Therefore they are able to brake dynamically and statically (standstill torque) the mechanical load in every work-point 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	Brake	Brake torque Mb	Brake voltage Vb	Brake current Ib	Power Pb 20°C	Moment of inertia Jb	Mass mb
		Nm		A	W	kgm <sup>2</sup> x10 <sup>-4</sup>	kg
65	03	2	24Vdc	0.46	11	0.068	0.15
82	05	4,5		0.5	12	0.20	0.35
102	06	9		0.75	18	0.58	0.7
118	07	18		1.0	24	2.0	1.1
145	07	18		1.0	24	2.0	1.1
170	08	36		1.1	26	5.6	1.8

## 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.

### Technical data overview

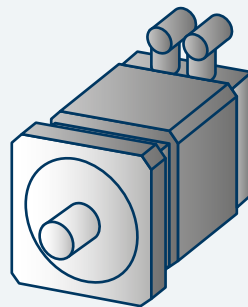
Motor	Additional inertia
	gm <sup>2</sup>
65	0.05
82	0.30
102	0.75
118	1.60
145	3.60
170	7.00

## Electrical connectors

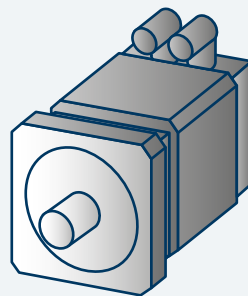
Even in their basic configurations, BMD series servomotors come complete with all the necessary power and signal round connectors and mating connectors.

These are located at the top rear of the motor where they are easily accessible to cables.

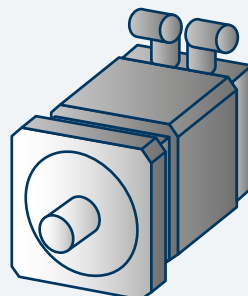
Connectors come with horizontally oriented pins, opposite to shaft direction as default, but are also available with horizontal pins facing the flange (type A) or side (lateral) direction (type B).



Orientation opposite to flange (default)



Orientation facing flange "A" option



Side (lateral) orientation "B" option

# Connectors layout

The connectors are integral part of BMD servomotors. The functional layout of electrical contacts internally housed does not depend on orientation of connector.

**Power connector (motor and brake)**  
The power connectors include the pins for motor supply, and the ones for brake supply (if provided).

## Power connector layout - BMD65 ... 145

	PIN	Description	Cable color	Notes
	1	Phase U	White	-
	2	Phase V	Green	-
	$\frac{\perp}{\text{---}}$	Earth - SL	Yellow/Green	-
	4	Brake +	-	If present
	5	Brake -	-	If present
	6	Phase W	Blue	-

## Power connector layout - BMD170

	PIN	Description	Cable color	Notes
	U	Phase U	White	-
	V	Phase V	Green	-
	$\frac{\perp}{\text{---}}$	Earth - SL	Yellow/Green	-
	+	Brake +	-	If present
	-	Brake -	-	If present
	W	Phase W	Blue	-

## Signal connector (resolver and PTC/KTY)

The signal connectors are in charge of electrical link among feedback device (either resolver or absolute encoder) housed into servomotor and inverter assigned to reception of him. In the same

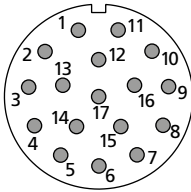
connector are also included the PTC/KTY terminals coming from motor winding where they are installed for motor thermal protection. The pins layout is independent on motor size.

## Signal connector layout for 2 poles resolver - BMD65 ... 170

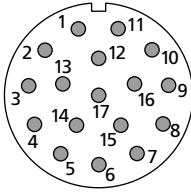
	PIN	Description	Cable color	Notes
	1	Sin -	Black	-
	2	Sin +	Red	-
	3	n.c.	-	Not connected
	4	Screen	-	-
	5	n.c.	-	Not connected
	6	n.c.	-	Not connected
	7	Exct -	White-Yellow	-
	8	PTC / KTY -	-	If present
	9	PTC / KTY +	-	If present
	10	Exct +	White-Red	-
	11	Cos +	Yellow	-
	12	Cos -	Blue	-

## Connectors layout

Signal connector layout for absolute encoder Hiperface (ENB3 / ENB4) - BMD65 ... 170

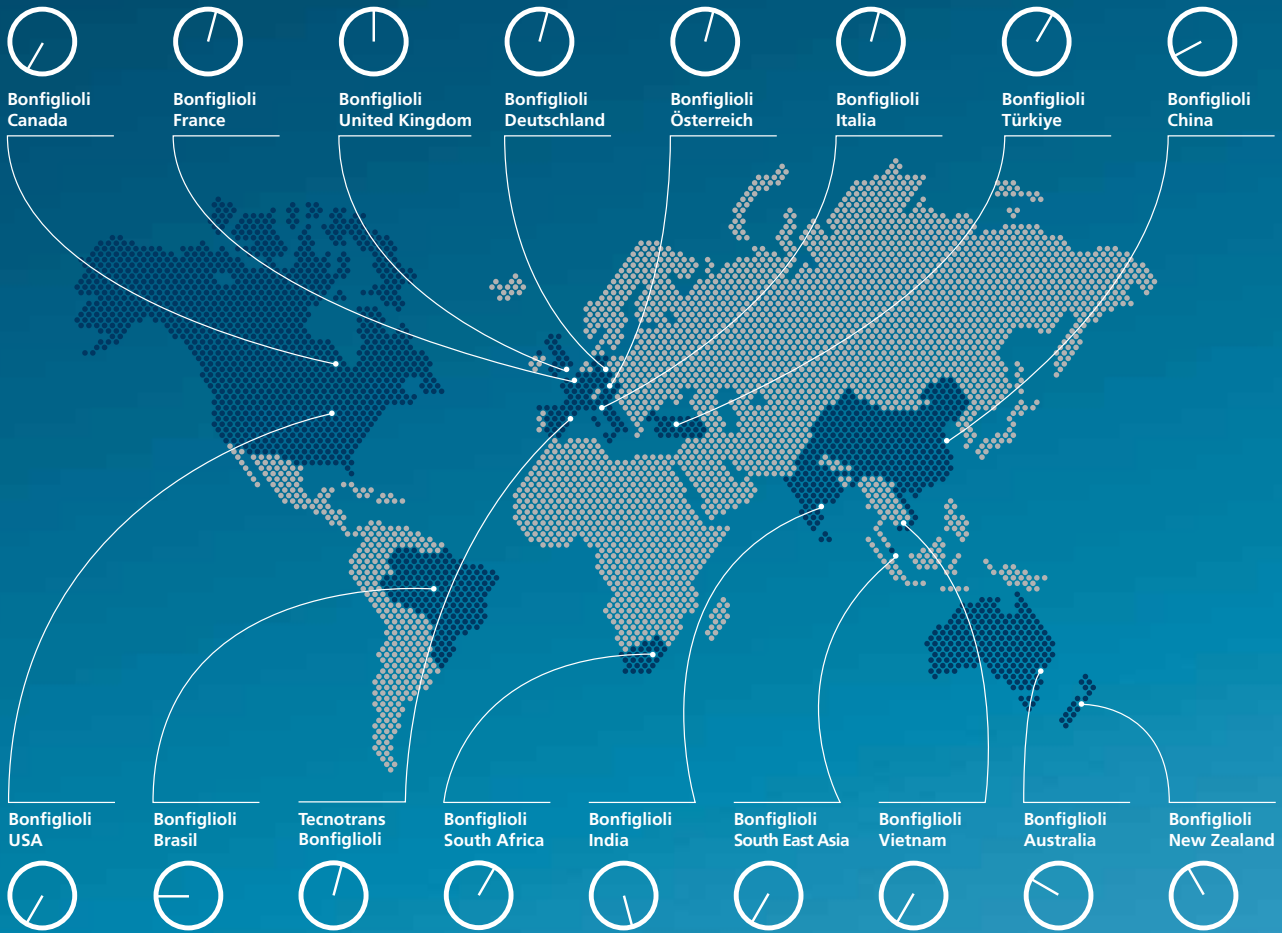
	PIN	Description	Cable color	Notes
	1	Sin +	White	-
	2	Sin -	Brown	-
	3	RS485 +	Grey or yellow	-
	4	n.c.	-	Not connected
	5	n.c.	-	Not connected
	6	n.c.	-	Not connected
	7	Earth (0V) / GND (0V)	Blue	-
	8	PTC / KTY -	-	If present
	9	PTC / KTY +	-	If present
	10	+ Vdc	Red	-
	11	Cos +	Pink	-
	12	Cos -	Black	-
	13	RS485 -	Green or purple	-
	14	n.c.	-	Not connected
	15	n.c.	-	Not connected
	16	n.c.	-	Not connected
	17	n.c.	-	Not connected

Signal connector layout for absolute encoder EnDat (ENB1 / ENB2) - BMD65 ... 170

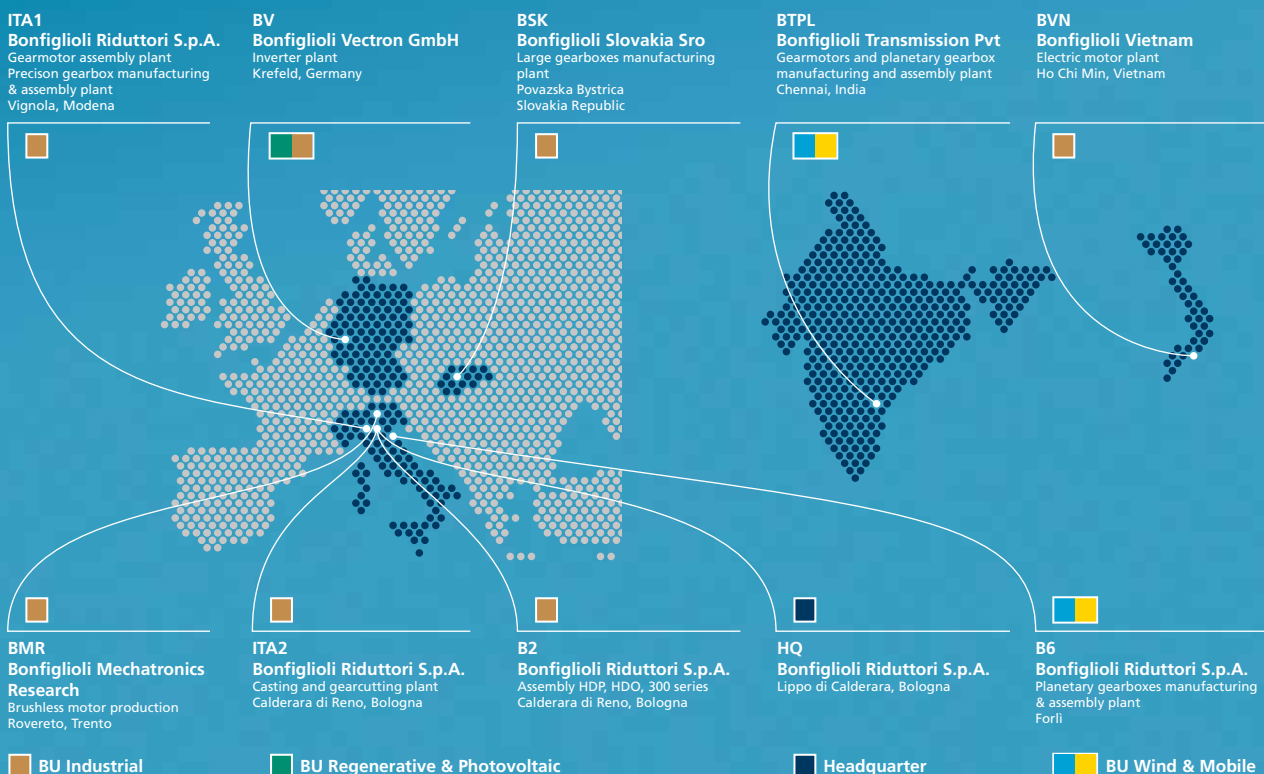
	PIN	Description	Cable color	Notes
	1	UP Sensor	Blue	-
	2	n.c.	-	Not connected
	3	n.c.	-	Not connected
	4	0V Sensor	White	-
	5	PTC / KTY -	-	If present
	6	PTC / KTY +	-	If present
	7	UP	Brown/Green	-
	8	Clock +	Violet	-
	9	Clock -	Yellow	-
	10	0V	White/Green	-
	11	Cable inner shield	-	-
	12	B +	Blue/Black	-
	13	B -	Red/Black	-
	14	DATA +	Gray	-
	15	A +	Green/Black	-
	16	A -	Yellow/Black	-
	17	DATA -	Pink	-

# 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.

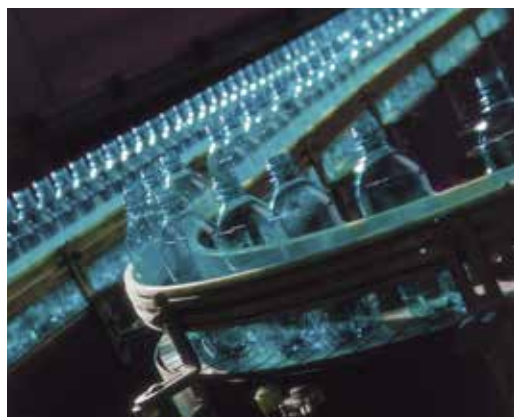
To give everybody the chance to purchase a Bonfiglioli product - anywhere.

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.



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The actual colour is black (RAL 9005). Silver dressing has to be intended for marketing and promotional purposes only.



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