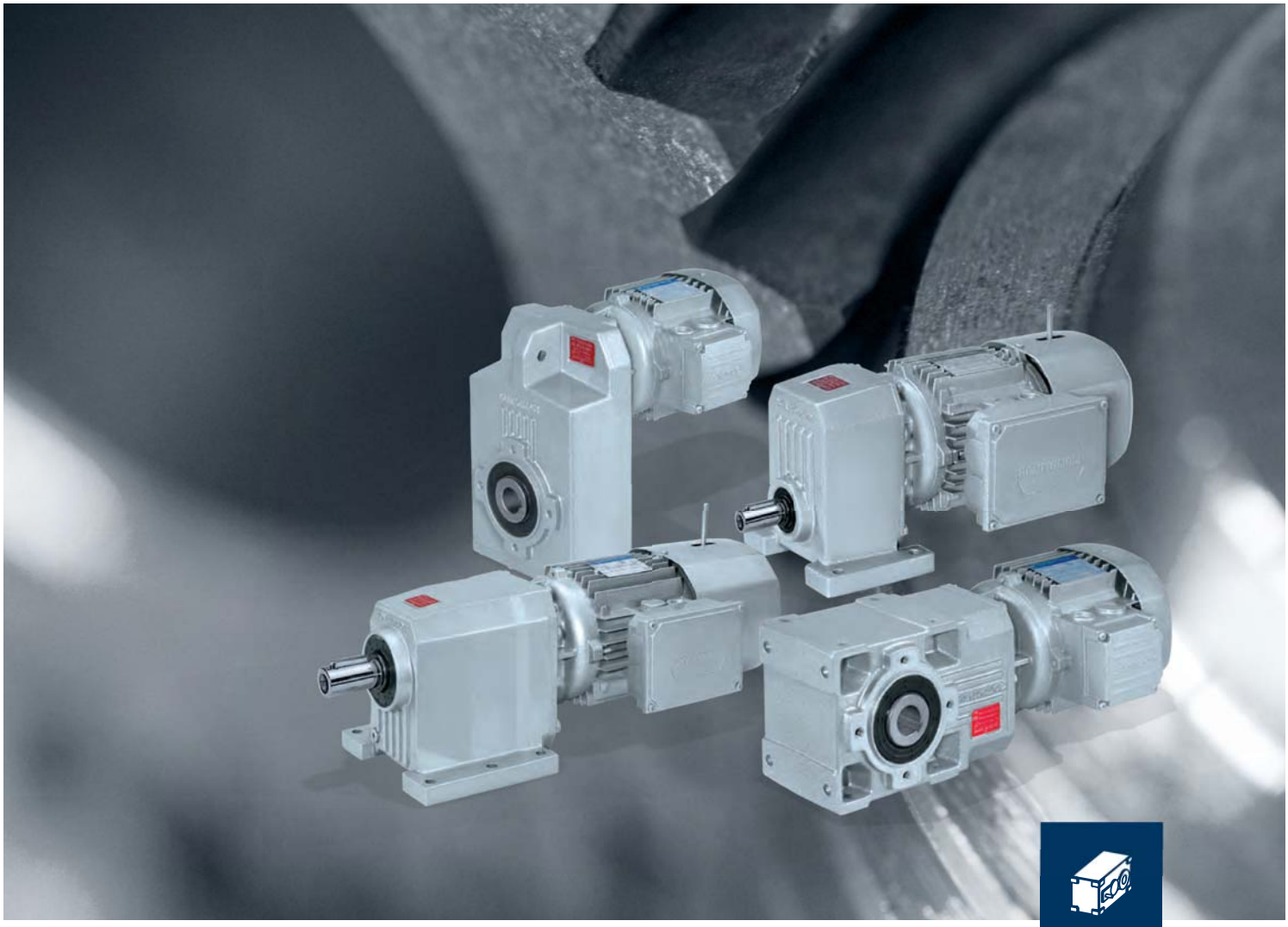
Bonfiglioli

Riduttori

C-A-F-S series

Helical gear units C
Helical bevel gear units A
Shaft mounted gear units F
Single stage gearboxes S



PRODUCT

Bonfiglioli
Forever Forward

GENERAL INFORMATION

1 SYMBOLS AND UNITS OF MEASURE

Symbols	Units of Measure	Description
$A_{N\ 1,2}$	[N]	Permissible axial force
f_s	–	Service factor
f_T	–	Thermal factor
f_{TP}	–	Temperature factor
i	–	Gear ratio
I	–	Cyclic duration factor
J_C	[Kgm^2]	Mass moment of inertia to be driven
J_M	[Kgm^2]	Motor mass moment of inertia
J_R	[Kgm^2]	Mass moment of inertia for the gear unit
K	–	Mass acceleration factor
K_r	–	Transmission element factor
$M_{1,2}$	[Nm]	Torque
$M_{c\ 1,2}$	[Nm]	Calculated torque
$M_{n\ 1,2}$	[Nm]	Rated torque
$M_{r\ 1,2}$	[Nm]	Torque demand
$n_{1,2}$	[min^{-1}]	Speed

Symbols	Units of Measure	Description
$P_{1,2}$	[kW]	Power
$P_{N\ 1,2}$	[kW]	Rated power
$P_{R\ 1,2}$	[kW]	Power demand
$R_{C\ 1,2}$	[N]	Calculated radial force
$R_{N\ 1,2}$	[N]	Permissible overhung load
S	–	Safety factor
t_a	[°C]	Ambient temperature
t_s	[°C]	Surface temperature
t_o	[°C]	Oil temperature
t_f	[min]	Work time under constant load
t_r	[min]	Rest time
η_d	–	Dynamic efficiency
η_s	–	Static efficiency
φ	[']	Output shaft angular backlash (with locked input shaft)

$_1$ value applies to input shaft

$_2$ value applies to output shaft

The symbol shows the page the information can be sorted from.

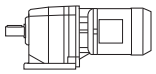
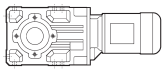
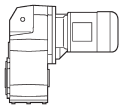
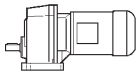
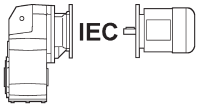
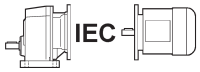
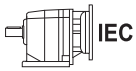
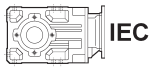
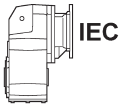
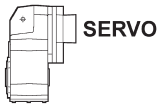
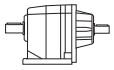
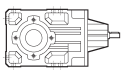
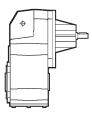
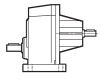
This symbol refers to the angle the overhung load applies (viewing from drive end).

Symbol refers to weight of gearmotors and speed reducers.
Figure for gearmotors incorporates the weight of the 4-pole motor and for life lubricated units, where applicable, the weight of the oil.

DANGER - WARNING
This symbol indicates situations of danger, which if ignored, may result in serious injury to the operator.

IMPORTANT
This symbol indicates important technical information.

Apply to equipment complying with "ATEX" Directive.

Series C	Series A	Series F	Series S	
				Gearmotor with compact motor.
				Gearmotor with IEC motor.
				Gear unit with IEC motor interface.
				Gear unit with servomotor input adapter.
				Speed reducer with solid input shaft.

2 ALLOWED TEMPERATURE LIMITS

Symbols	Description / Condition	Value (*)	
		Synthetic Oil	Mineral Oil
t_a	Ambient temperature		
$t_{au\ min}$	Minimum operating ambient temperature	**-30°C**	**-10°C**
$t_{au\ Max}$	Maximum operating ambient temperature	**+50°C**	**+40°C**
$t_{as\ min}$	Minimum storage ambient temperature	**-40°C**	**-10°C**
$t_{as\ Max}$	Maximum storage ambient temperature	**+50°C**	**+50°C**
t_s	Surface temperature		
$t_{s\ min}$	Minimum gearbox surface temperature starting with partial load (#)	**-25°C**	**-10°C**
$t_{sc\ min}$	Minimum gearbox surface temperature starting with full load	**-10°C**	**-5°C**
$t_{s\ Max}$	Maximum casing surface temperature during continuous operation (measured next to the gearbox input)	**+100°C**	**+100°C** (@)
t_o	Oil temperature		
$t_{o\ Max}$	Maximum oil temperature during continuous operation	**+95°C**	**+95°C** (@)

(*) = Refer to the table “Selection of the optimal oil viscosity” for further information about minimum and maximum values of different oil viscosity. For values of t_a < -20°C and t_s, t_o > 80 °C, choose (as permitted in the product configuration stage) the sealing type of the most suitable material to the type of application. If needed contact Bonfiglioli Technical Service.

(@) = Continuous operation it is not advised if t_s and t_o range is 80°C to 95 °C.

(#) = For full load start-up it is recommended to ramp-up and provide for greater absorption of the motor. If needed, contact Bonfiglioli Technical Service.

3 TORQUE

3.1 Rated torque M_{n2} [Nm]

The torque that can be transmitted continuously through the output shaft, with the gear unit operated under a service factor $f_s = 1$.
Rating is speed sensitive.

3.2 Required torque M_{r2} [Nm]

The torque demand based on application requirement.
It must always be equal to or less than torque M_{n2} the gearbox under study is rated for.

3.3 Calculated torque M_{c2} [Nm]

Computational torque value to be used when selecting the gearbox. It is calculated considering the required torque M_{r2} and service factor fs , as per the equation here after:

$$M_{c2} = M_{r2} \cdot f_s < M_{n2} \quad (1)$$

4 POWER

4.1 Rated power P_{n1} [kW]

In the gearbox selection charts this is the power applicable to input shaft, based on input speed n_1 and corresponding to service factor $f_s = 1$.

5 THERMAL CAPACITY P_t [kW]

P_t is the power that can be transmitted through the gear unit, under a continuous duty and an ambient temperature of 20 °C, without resulting into damage of the inner parts or degradation of the lubricant properties. Refer to chart (A1) for specific kW ratings.
In case of intermittent duty, or an operating ambient temperature other than the rated 20°C, the P_t value should be adjusted through the factor f_t , obtained from chart (A2), as per the following equation:
$P_t' = P_t \times f_t$

Gear units featuring more than 2 reductions and/or a gear ratio greater than i = 45 do not normally require the thermal limit to be checked as in these cases the thermal rating usually exceeds the mechanical rating.

(A 1)

P_t [kW] 20 °C		
	n_1 = 1400 min^{-1}	n_1 = 2800 min^{-1}
C 05 2	—	—
C 12 2	—	—
C 22 2	—	—
C 32 2	—	4.5
C 36 2	6.5	5.0
C 41 2	8.0	6.0
C 51 2	11.0	7.8
C 61 2	14.0	10.0
C 70 2	21	16.0
C 80 2	32	24
C 90 2	43	32
C 100 2	59	42

P_t [kW] 20 °C		
	n_1 = 1400 min^{-1}	n_1 = 2800 min^{-1}
A 05 2	2.0	1.5
A 10 2	2.1	1.5
A 20 2	6.0	5.4
A 30 2	8.0	6.6
A 35 2	9.5	8.2
A 41 2	11.5	9.6
A 50 2	20	18.0
A 55 2	21	18.0
A 60 2	27	23
A 70 3	31	24
A 80 3	44	33
A 90 3	64	48

P_t [kW] 20 °C		
	n_1 = 1400 min^{-1}	n_1 = 2800 min^{-1}
F 10 2	3.8	2.7
F 20 2	9.1	6.5
F 25 2	10.2	7.4
F 31 2	11.7	8.5
F 41 2	14.3	10.4
F 51 2	21.5	15.0
F 60 3	26.0	18.9
F 70 3	36.4	26.0
F 80 3	52	36
F 90 3	75	53

P_t [kW] 20 °C		
	n_1 = 1400 min^{-1}	n_1 = 2800 min^{-1}
S 10 1	5.5	4.9
S 20 1	7.8	7.2
S 30 1	10.0	9.1
S 40 1	15.6	14.3
S 50 1	21	18.9

(A 2)

f_t					
t_a [°C]	Continuous duty	Intermittent duty			
		Degree of intermittence [I]			
		80%	**60%**	**40%**	**20%**
40	0.80	1.1	1.3	1.5	1.6
30	0.85	1.3	1.5	1.6	1.8
20	1.0	1.5	1.6	1.8	2.0
10	1.15	1.6	1.8	2.0	2.3

Where cyclic duration factor (I)% is the relationship of operating time under load t_f to total time ($t_f + t_r$) expressed as a percentage.

$$I = \frac{t_f}{t_f + t_r} \cdot 100 \qquad (2)$$

The condition to be verified is:

$$P_{r1} \leq P_t \times f_t \qquad (3)$$

6 EFFICIENCY

6.1 Dynamic efficiency η_d

Obtained from the relationship of delivered power P_2 to input power P_1 , according to the following equation:

$$\eta_d = \frac{P_2}{P_1} \cdot 100 \quad [\%] \qquad (4)$$

(A 3)

	2 x	**3 x**	**4 x**
η_d	95%	93%	90%

	2 x	**3 x**	**4 x**
η_d	94%	91%	89%

	2 x	**3 x**	**4 x**
η_d	95%	93%	90%

	1 x
η_d	98%

7 GEAR RATIO i

The value for the gear ratio is referred to with the letter [i] and calculated through the relationship of the input speed n_1 to the output speed n_2:

$$i = \frac{n_1}{n_2} \quad (5)$$

The gear ratio is usually a decimal number which in this catalogue is truncated at one digit after the comma (no decimals for i > 1000).
If interested in knowing the exact value see also chapters “EXACT RATIOS”.

8 ANGULAR VELOCITY

8.1 Input speed n_1 [min^{-1}]

The speed is related to the prime mover selected. Catalogue values refer to speed of either single or double speed motors that are common in the industry.
If the gearbox is driven by an external transmission it is recommended to operate it with a speed of 1400 min-1, or lower, in order to optimise operating conditions and lifetime.
Higher input speeds are permitted, however in this case consider that torque rating M_{n2} is affected adversely.
Please consult a Bonfiglioli representative.

8.2 Output speed n_2 [min^{-1}]

The output speed value n_2 is calculated from the relationship of input speed n_1 to the gear ratio i, as per the following equation:

$$n_2 = \frac{n_1}{i} \quad (6)$$

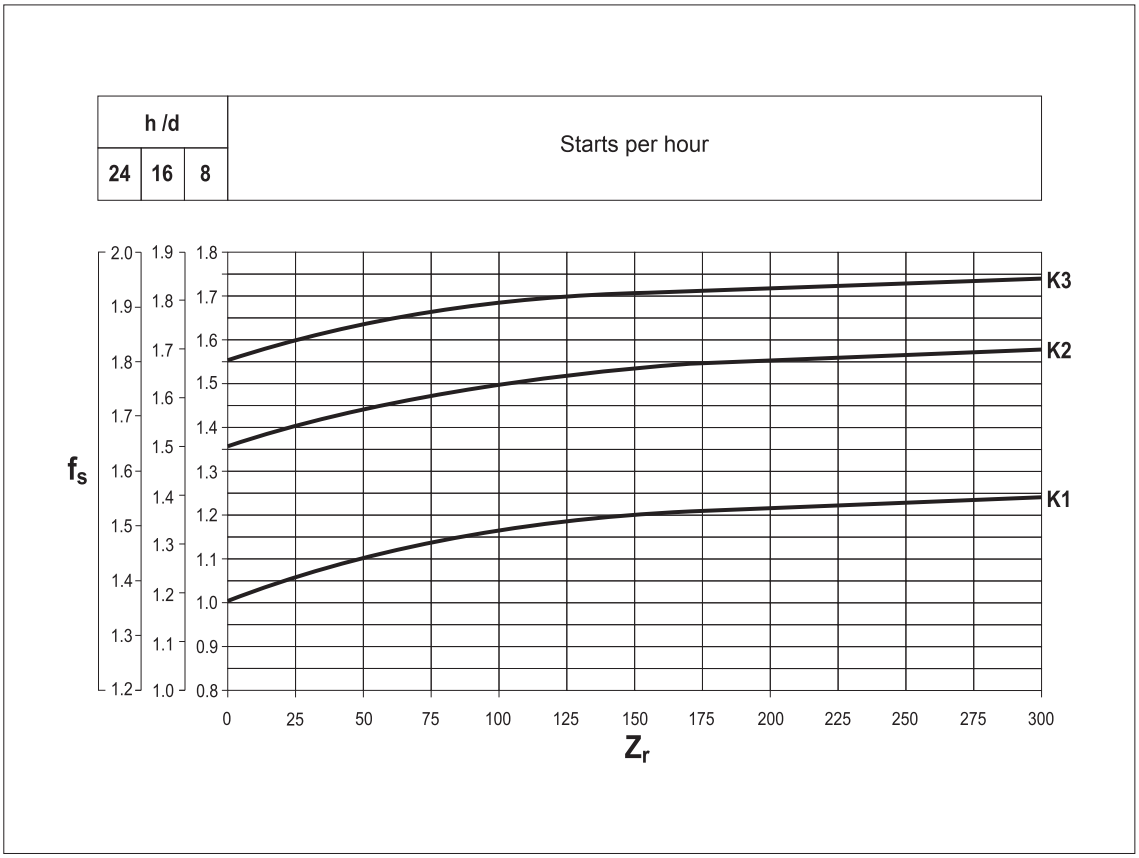
9 MOMENT OF INERTIA J_r [Kgm^2]

Moments of inertia specified in the catalogue refer to the gear unit input axis.
They are therefore related to motor speed, in the case of direct motor mounting.

10 SERVICE FACTOR f_s

This factor is the numeric value describing reducer service duty. It takes into consideration, with unavoidable approximation, daily operating conditions, load variations and overloads connected with reducer application. In the graph (A4) below, after selecting proper “daily working hours” column, the service factor is given by intersecting the number of starts per hour and one of the K1, K2 or K3 curves. K_ curves are linked with the service nature (approximately: uniform, medium and heavy) through the acceleration factor of masses K, connected to the ratio between driven masses and motor inertia values. Regardless of the value given for the service factor, we would like to remind that in some applications, which for example involve lifting of parts, failure of the reducer may expose the operators to the risk of injuries. If in doubt, please contact our Technical Service Department.

(A 4)



10.1 Acceleration factor of masses K

This parameter serves for selecting the right curve for the type of load.
The value is given by the following ratio:

(A 5)

$$K = \frac{J_c}{J_m} \rightarrow$$

J_c = Moment of inertia of driven masses referred to motor drive shaft

J_m = Motor moment of inertia

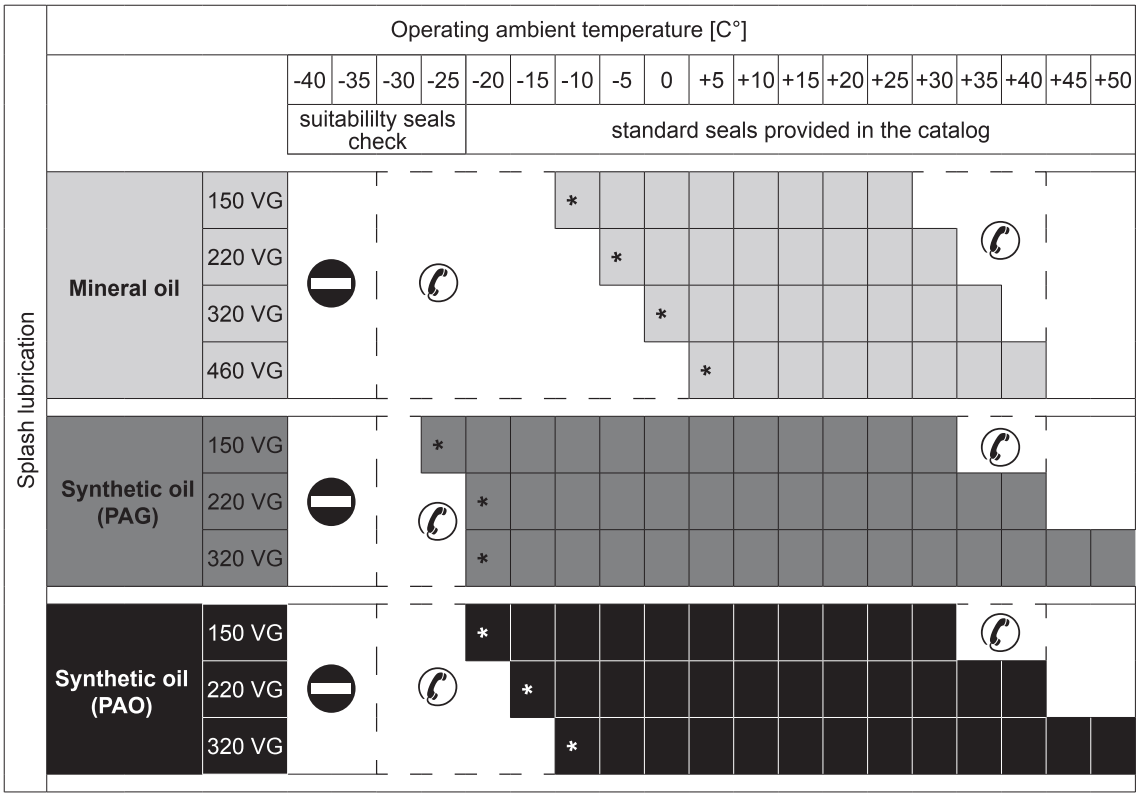
K ≤ 0,25	→ **K1**	Uniform load
0,25 < K ≤ 3	→ **K2**	Moderate shock load
3 < K ≤ 10	→ **K3**	Heavy shock load
K > 10	→	Please consult Bonfiglioli Technical Service

11 LUBRICATION

Life lubricated gearboxes do not require any periodical oil changes.
Refer to the User's Manual available at www.bonfiglioli.com for indications about checking the oil level and its replacement for other types of gearboxes.
Do not mix mineral oils with synthetic oils and/or different brands.
However, oil level should be checked at regular intervals and topped up as required.
Check monthly if unit operates under intermittent duty, more frequently if duty is continuous.

11.1 Selection of the optimal oil viscosity (data relating to Shell Oils)

(A 6)



Recommended operating limits

Allowed operating limits.

Forbidden operating limits.

* = It is recommended to ramp-up and to provide for greater absorption of the motor.
If needed and in the event of impulse loads, contact Bonfiglioli Technical Service.

11.2 Lubrication for C, A, F, S series gearboxes

The inner parts of Bonfiglioli gear units are oil-bath and splash lubricated.
Frame sizes C 05...C 41, A 05...A 41, F 10...F 41, S 10...S 40 are supplied by the factory, or by the authorized dealers, already filled with oil.
Unless otherwise specified, units size C 51, A 50, F 51, S 50 and larger are usually supplied unlubricated at it will be the customer care to fill them with oil prior to putting them into operation.
In both cases, depending on the version, prior to putting the gear unit into operation may need to replace the closed plug used for transportation purposes with breather plug supplied with.
For the reference charts of oil plugs placement and quantity of lubricant, refer to the Installation, Operation and Maintenance Manual (available on www.bonfiglioli.com).
The “long life” poliglycol-based lubricant supplied by the factory, in the absence of contamination, does not require periodical oil changes throughout the lifetime of the gear unit.

11.3 Lubrication for A-EX (Atex) gearboxes

The inner parts of Bonfiglioli gear units are oil-bath and splash lubricated.
The ATEX version gear unit (with some exceptions see Table below) are factory-charged with “long-life” lubricant SHELL OMALA S4 WE 320 in the quantity suitable for the mounting position specified in the order.

(A 7)

A 05	A 10	A 20	A 30	A 35	A 41	A 50	A 55 [1)]	A 60 2 [2)]	A 60 3 [1)]	A 60 4 [1)]	A 70 [1)]	A 80 [1)]	A 90 [1)]

Gearbox pre-filled with a synthetic “for life” lubricant Gearbox pre-filled with a synthetic lubricant

(1) Without lubricant for mounting positions B6 and B7
(2) Without lubricant for mounting positions B6, B7 and VB

Gearboxes are fitted with sealed filler plugs for transport purposes. Depending on version, they may be supplied with a vented plug which the user must fit before putting the gearbox into service.
Refer to the installation, operation and maintenance manual to replace the filler plug correctly. (These manuals are available in a number of languages and can be downloaded in pdf format from the website www.bonfiglioli.com.)
When a gearbox is supplied with no lubricant, it is recommended to fill it with a lubricant of a similar type, selected from those listed in its installation, operation and maintenance manual.

12 SELECTION

Some fundamental data are necessary to assist the correct selection of a gearbox or gearmotor. The table below (A7) briefly sums up this information.
To simplify selection, fill in the table and send a copy to our Technical Service which will select the most suitable drive unit for your application.

(A 8)

	Type of application	
P_{r2}	Output power at n_2 max	.....kW
P_{r2}'	Output power at n_2 min	.....kW
M_{r2}	Output torque at n_2 max	.....Nm
n_2	Max.output speed	.....min^{-1}
n_2'	Min.output speed	.....min^{-1}
n_1	Max.input speed	.....min^{-1}
n_1'	Min.input speed	.....min^{-1}
R_{c2}	Radial load on output shaft	.....N
x_2	Load application distance (*)	.....mm
	Load orientation at output	.....
	Output shaft rotation direction (CW-CCW) (**)	.....
R_{c1}	Radial load on input shaft	.....N
x_1	Load application distance (*)	.....mm
	Load orientation at input	.....
	Input shaft rotation direction (CW-CCW) (**)	.....
A_{c2}	Thrust load on output shaft (+/–)(***)	.....N

A_{c1}	Thrust load on input shaft (+/–)(***)	.....N
J_c	Moment of inertia of the load	.....Kgm^2
t_a	Ambient temperature	.....C°
	Altitude above sea level	.....m
	Duty type to IEC norms	S...../.....%
Z	Starting frequency	.....1/h
	Motor voltage	V
	Brake voltage	V
	Frequency	.....Hz
M_b	Brake torque	.....Nm
	Motor protection degree	IP.....
	Insulation class	.....

(*) Distance x1-2 is between force application point and shaft shoulder (if not indicated the force acting at mid-point of the shaft extension will be considered).

(**) CW = clockwise;
CCW = counterclockwise

(***) + = push
– = pull

For the selection of Series A gear units in Atex configuration, see also the specific chapter on page 322.

12.1 Selection of a gearmotor

a) Determine service factor f_s according to type of duty (factor K), number of starts per hour Z_r and hours of operation.

$$P_{r1} = \frac{M_{r2} \cdot n_2}{9550 \cdot \eta_d} \text{ [kW]} \quad (7)$$

b) From values of torque M_{r2}, speed n_2 and efficiency η_d the required input power can be calculated from the equation:

Value of η_d for the captioned gear unit can be sorted out from paragraph 6.

$$P_n \geq P_{r1} \quad (8)$$

c) Consult the gearmotor selection charts and locate the table corresponding to normalised power P_n:

Unless otherwise specified, power P_n of motors indicated in the catalogue refers to continuous duty S1. For motors used in conditions other than S1, the type of duty required by reference to CEI 2-3/IEC 34-1 Standards must be mentioned.
For duties from S2 to S8 in particular and for motor frame 132 or smaller, extra power output can be obtained with respect to continuous duty.
Accordingly the following condition must be satisfied:

$$P_n \geq \frac{P_{r1}}{f_m} \quad (9)$$

The adjusting factor f_m can be obtained from table (A9).

12.2 Intermittence ratio

$$I = \frac{t_f}{t_f + t_r} \cdot 100 \quad (10)$$

t_f = work time at constant load
t_r = rest time

(A 9)

	DUTY						
	S2			**S3***			**S4 - S8**
	Cycle duration [min]			Cyclic duration factor (l)			Please contact us
	10	**30**	**60**	**25%**	**40%**	**60%**	
f_m	1.35	1.15	1.05	1.25	1.15	1.1	

* Cycle duration, in any event, must be 10 minutes or less. If it is longer, please contact our Technical Service.

Next, refer to the appropriate $\mathbf{P_n}$ section within the gearmotor selection charts and locate the unit that features the desired output speed $\mathbf{n_2}$, or closest to, along with a safety factor **S** that meets or exceeds the applicable service factor $\mathbf{f_s}$.

The safety factor is so defined:

$$S = \frac{M_{n2}}{M_2} = \frac{P_{n1}}{P_1} \quad (11)$$

As standard, gear and motor combinations are implemented with 2, 4 and 6 pole motors, 50 Hz supplied.
Should the drive speed be different from 2800, 1400 or 900 min^{-1}, base the selection on the gear unit nominal rating.

12.3 Selection of speed reducer and gearbox with IEC motor adapter

a) Determine service factor f_s.

b) Assuming the required output torque for the application M_{r2} is known, the calculation torque can be then defined as:

$$M_{c2} = M_{r2} \cdot f_s \quad (12)$$

c) The gear ratio is calculated according to requested output speed n_2 and drive speed n_1:

$$i = \frac{n_1}{n_2} \quad (13)$$

Once values for M_{c2} and i are known consult the rating charts under the appropriate input speed n_1 and locate the gear unit that features the gear ratio closest to [i] and at same time offers a rated torque value M_{n2} so that:

$$M_{n2} \geq M_{c2} \quad (14)$$

If a IEC normalized motor must be fitted check geometrical compatibility with the gear unit at paragraph “MOTOR AVAILABILITY”.

13 VERIFICATION

After the selection of the speed reducer, or gearmotor, is complete it is recommended that the following verifications are conducted:

a) Thermal capacity
Make sure that the thermal capacity of the gearbox is equal to or greater than the power required by the application according to equation (3) on page 7.
If this condition is not verified, select a larger gearbox or apply a forced cooling system.

b) Maximum torque
The maximum torque (intended as instantaneous peak load) applicable to the gearbox must not, in general, exceed 200% of rated torque M_{n2}. Therefore, check that this limit is not exceeded, using suitable torque limiting devices, if necessary.
For three-phase double speed motors, it is important to pay attention to the switching torque which is generated when switching from high to low speed, because it could be significantly higher than maximum torque.
A simple, economical way to minimize overloading is to power only two phases of the motor during switch-over (power-up time on two phases can be controlled with a time-relay):

$M_{g2} = 0.5 \cdot M_{g3}$
M_{g2} = Switching torque with two-phase power-up
M_{g3} = Switching torque with three-phase power-up

We recommend, in any event, to contact our Technical Service.

c) Radial loads
Make sure that radial forces applying on input and/or output shaft are within permittend catalogue values.
If they were higher consider designing a different bearing arrangement before switching to a larger gear unit.
Catalogue values for rated overhung loads refer to mid-point of shaft under study.
Should application point of the overhung load be localised further out the revised loading capability must be adjusted as per instructions given in this manual.
Please refer to the paragraphs relating to radial loads.

d) Thrust loads
Actual thrust load must be found within 20% of the equivalent overhung load capacity.
Should an extremely high, or a combination of radial and axial load apply, consult Bonfiglioli Technical Service.

e) Starts per hour
For duties featuring a high number of switches the actual starting capability in loaded condition [Z] must be calculated.
Actual number of starts per hour must be lower than value so calculated.

14 INSTALLATION

The following installation instructions must be observed:

a) Make sure that the gearbox is correctly secured to avoid vibrations.
If shocks or overloads are expected, install hydraulic couplings, clutches, torque limiters, etc.

b) Before being paint coated, the machined surfaces and the outer face of the oil seals must be protected to prevent paint drying out the rubber and jeopardising the sealing function.

c) Parts fitted on the gearbox output shaft must be machined to ISO H7 tolerance to prevent interference fits that could damage the gearbox itself.
Further, to mount or remove such parts, use suitable pullers or extraction devices using the tapped hole located at the top of the shaft extension.

d) Mating surfaces must be cleaned and treated with suitable protective products before mounting to avoid oxidation and, as a result, seizure of parts.

e) Prior to putting the gear unit into operation make sure that the equipment that incorporates the same complies with the current revision of the Machines Directive 2006/42/EC.

f) Before starting up the machine, make sure that oil level conforms to the mounting position specified for the gear unit and the viscosity is adequate (refer to the User's Manual available at www.bonfiglioli.com).

g) For outdoor installation provide adequate guards in order to protect the drive from rainfalls as well as direct sun radiation.

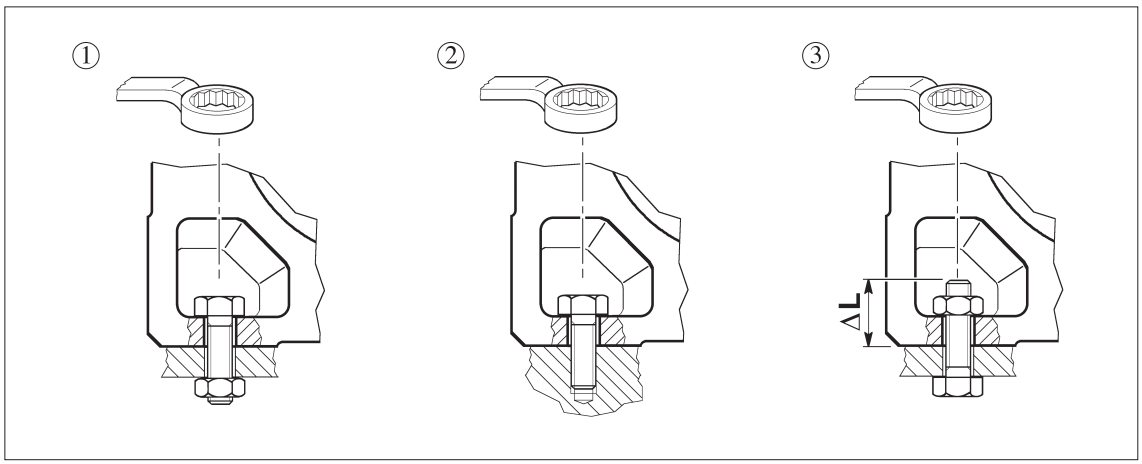
14.1 Fitting servomotors to gear heads featuring a clamping device (adapter type SC)

Turn the clamping device until its slot is aligned to those that are milled on the reducer input shaft. If the motor shaft features a key, this must be removed and the relevant keyway must also be aligned with the slots of clamping device and gear head input shaft, prior to inserting the servomotor into site. The keyway must be sitting on the same side as the locking screw. Tighten the bolts that hold the servomotor to the gear head, insert a torque wrench through the hole on the side of the flange and tighten the locking screw of the clamping device to the torque that is specified in the drawing section for the given adapter.

15 INSTALLATION INSTRUCTIONS

Schemes in table (A10) show the 3 possible installation patterns for A gear units to the machine frame. For each of these circumstances, table (A11) indicates exagonal head screw sizes to be used. Besides, to facilitate the installation, we suggest to use a wrench of the type shown in table (A10).

(A 10)



(A 11)

	Bolt type			
	①	②	③	ΔL (mm)
A 05	M8x22	M8x20	M8x ...	22
A 10	M8x25	M8x20	M8x …	20
A 20	M8x25	M8x20	M8x …	20
A 30	M10x30	M10x25	M10x …	25
A 35	M10x30	M10x25	M10x ...	25
A 41	M12x35	M12x30	M12x …	30

	Bolt type			
	①	②	③	ΔL (mm)
A 50	M14x45	M14x40	M14x …	35
A 55	M14x40	M14x40	M14x ...	35
A 60	M16x50	M16x45	M16x …	40
A 70	M20x60	M20x55	M20x …	45
A 80	M24x70	M24x65	M24x …	55
A 90	M24x90	M24x80	M24x …	65

16 STORAGE

Observe the following instructions to ensure correct storage of the products:

a) Do not store outdoors, in areas exposed to weather or with excessive humidity.

b) Always place boards, wood or other material between the products and the floor.
The gearboxes should not have direct contact with the floor.

c) In case of long-term storage all machined surfaces such as flanges, shafts and couplings must be coated with a suitable rust inhibiting product (Mobilarma 248 or equivalent).

Furthermore gear units must be placed with the fill plug in the highest position and filled up with oil. Before putting the units into operation the appropriate quantity, and type, of oil must be restored (refer to the User's Manual available at www.bonfiglioli.com).

17 CONDITIONS OF SUPPLY

Gear units are supplied as follows:

a) configured for installation in the mounting position specified when ordering;

b) tested to manufacturer specifications;

c) mating machined surfaces come unpainted;

d) nuts and bolts for mounting motors are provided;

e) shafts are protected during transportation by plastic caps;

f) supplied with lifting lug (where applicable).

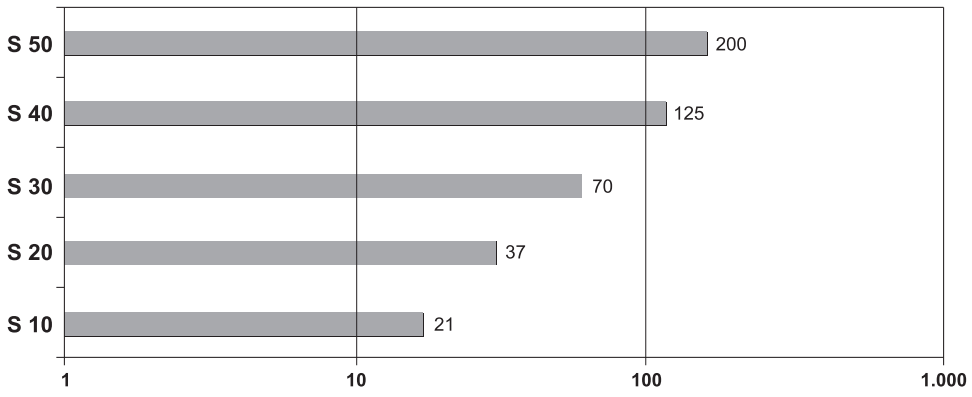
18 PAINT SPECIFICATIONS

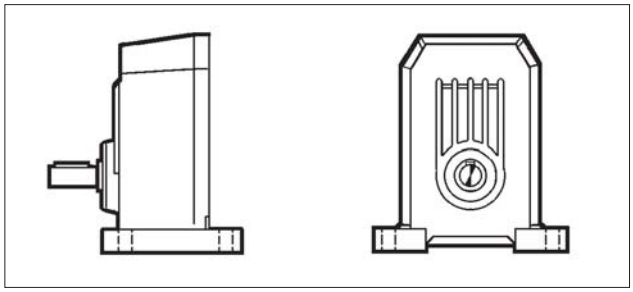
Specifications for paint applied to gearboxes (where applicable) may be obtained from the branches or dealers that supplied the units.

67 DESIGN FEATURES

The main design characteristics are:
- modularity
- space effective
- high efficiency
- quite operation
- gears in hardened and case-hardened steel
- bare aluminium housing for sizes 10, 20, 30, unpainted
  high strength painted cast-iron housings for larger frame sizes
- input and output shafts from high grade steel.

(E 60)

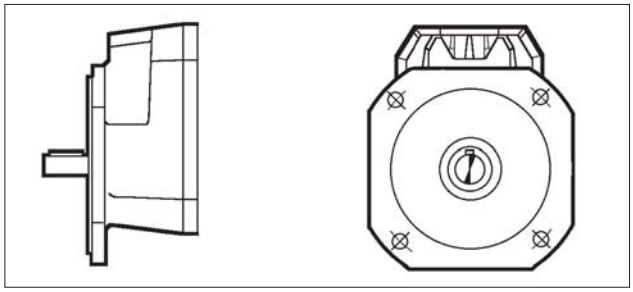




P

Foot mount

S 10 ... S 50



F

Flange mount

S 10 ... S 50

69 DESIGNATION

GEAR UNIT

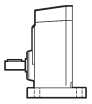
S **10** **1** **P** **1.4** **S1** **B3** .....

OPTIONS

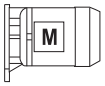
MOUNTING POSITION

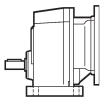
S...P: **B3** (Standard), **B6**, **B7**, **B8**, **V5**, **V6**
S...F: **B5** (Standard), **B51**, **B52**, **B53**, **V1**, **V3**

INPUT CONFIGURATION



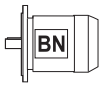
S05	**S3**
S1	**S4**
S2	**S5**

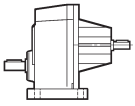




IEC_

P63	**P112**
P71	**P132**
P80	**P160**
P90	**P180**
P100	

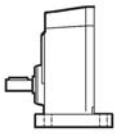




HS

GEAR RATIO

VERSION



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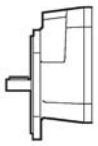
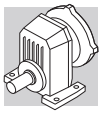


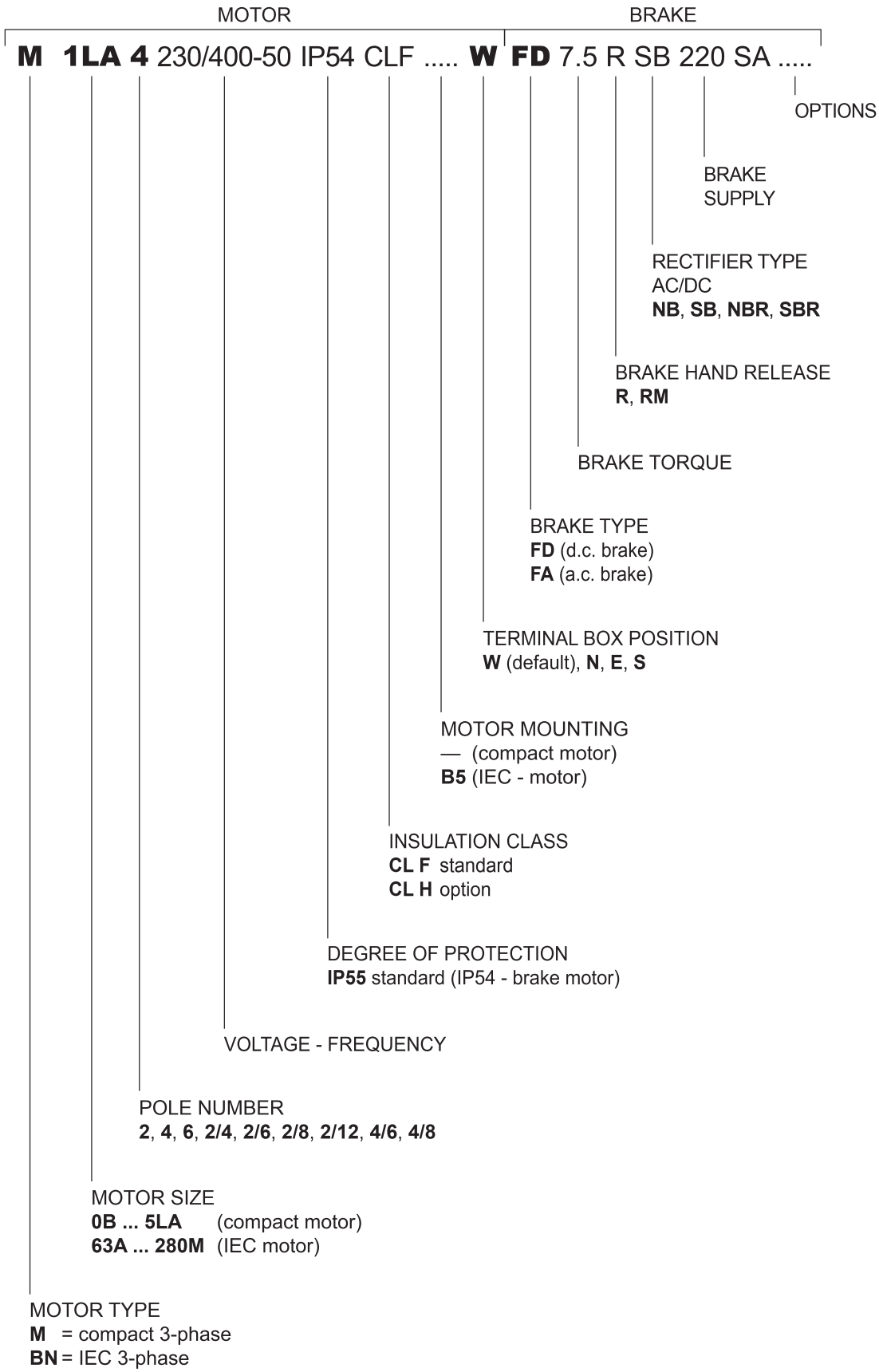
F

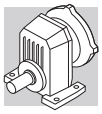
REDUCTIONS
1

GEAR FRAME SIZE
10, **20**, **30**, **40**, **50**

TYPE: **S** = single stage gear unit




MOTOR
BRAKE
M 1LA 4 230/400-50 IP54 CLF ..... W FD 7.5 R SB 220 SA .....
OPTIONS
BRAKE SUPPLY
RECTIFIER TYPE
AC/DC
NB, SB, NBR, SBR
BRAKE HAND RELEASE
R, RM
BRAKE TORQUE
BRAKE TYPE
FD (d.c. brake)
FA (a.c. brake)
TERMINAL BOX POSITION
W (default), N, E, S
MOTOR MOUNTING
— (compact motor)
B5 (IEC - motor)
INSULATION CLASS
CL F standard
CL H option
DEGREE OF PROTECTION
IP55 standard (IP54 - brake motor)
VOLTAGE - FREQUENCY
POLE NUMBER
2, 4, 6, 2/4, 2/6, 2/8, 2/12, 4/6, 4/8
MOTOR SIZE
0B ... 5LA (compact motor)
63A ... 280M (IEC motor)
MOTOR TYPE
M = compact 3-phase
BN = IEC 3-phase



69.1 Gearbox options

SO

Gear units S10, S20, S30, S40, usually factory filled with oil, to be supplied unlubricated.

LO

Gearbox S50, usually supplied without oil, to be supplied with synthetic oil currently used by BONFIGLIOLI RIDUTTORI and filled according to requested mounting position.

DV

Dual oil seals on input shaft. (Available only for compact gearmotors).

VV

Fluoro elastomer oil seal on input shaft.

PV

All oil seals in Fluoro elastomer.

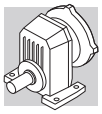
SURFACE PROTECTION

When no specific protection class is requested, the painted (ferrous) surfaces of gearboxes are protected to at least corrosivity class C2 (UNI EN ISO 12944-2). For improved resistance to atmospheric corrosion, gearboxes can be delivered with **C3** and **C4** surface protection, obtained by painting the complete gearbox.

(E 61)

SURFACE PROTECTION	Typical environments	Maximum surface temperature	Corrosivity class according to UNI EN ISO 12944-2
C3	Urban and industrial environments with up to 100% relative humidity (medium air pollution)	120°C	C3
C4	Industrial areas, coastal areas, chemical plant, with up to 100% relative humidity (high air pollution)	120°C	C4

Gearboxes with optional protection to class **C3** or **C4** are available in a choice of colours.
If no specific colour is requested (see the “PAINTING” option) gearboxes are finished in RAL 7042.
Gearboxes can also be supplied with surface protection for corrosivity class **C5** according to UNI EN ISO 12944-2. Contact our Technical Service for further details.



PAINTING

Gearboxes with optional protection to class C3 or C4 are available in the colours listed in the following table.

(E 62)

PAINTING	Colour	RAL number
RAL7042*	Traffic Grey A	7042
RAL5010	Gentian Blue	5010
RAL9005	Jet Black	9005
RAL9006	White Aluminium	9006
RAL9010	Pure White	9010

* Gearboxes are supplied in this standard colour if no other colour is specified.

NOTE – “PAINTING” options can only be specified in conjunction with “SURFACE PROTECTION” options.

CERTIFICATES

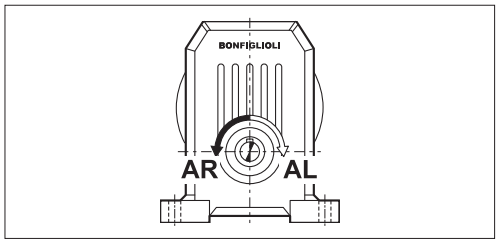
AC - Certificate of compliance
The document certifies the compliance of the product with the purchase order and the construction in conformity with the applicable procedures of the Bonfiglioli Quality System.

CC - Inspection certificate
The document entails checking on order compliance, the visual inspection of external conditions and of mating dimensions. Checking on main functional parameters in unloaded conditions is also performed along with oil seal proofing, both in static and in running conditions. Units inspected are sampled within the shipping batch and marked individually.

69.2 Motor options

AL, AR
A backstop device on the motor itself, as described in the electric motors section of this catalogue, is available for gearmotors with integral M Series motors. The following table shows the direction of free rotation of the gearbox, on the basis of which the correct option must be selected.

(E 64)



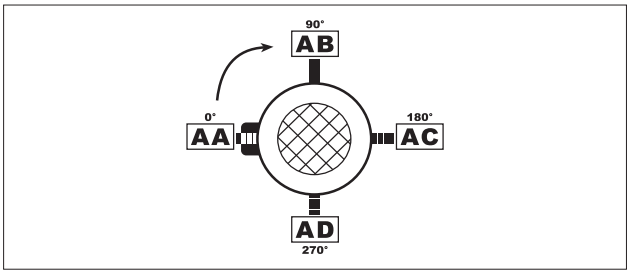
For further information on options, consult the electric motors section.

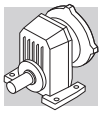
70 MOUNTING POSITION AND TERMINAL BOX ANGULAR LOCATION

Location of motor terminal box can be specified by viewing the motor from the fan side; standard location is shown in black (W).

Angular position of the brake release lever.
Unless otherwise specified, brake motors have the manual device side located, 90° apart from terminal box.
Different angles can be specified through the relevant options available.

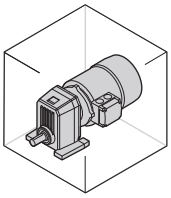
(E 63)





S ... P

B3



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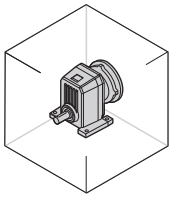

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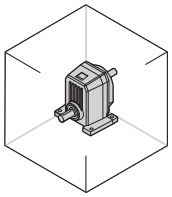

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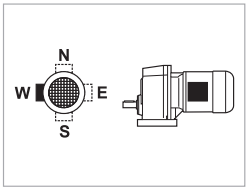
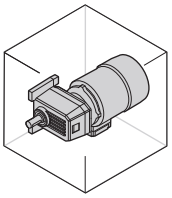


B6



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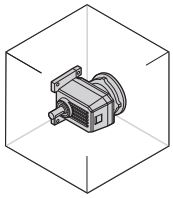

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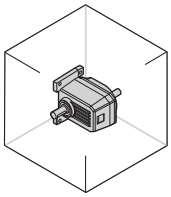

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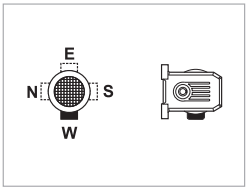
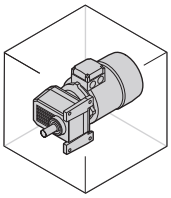


B7



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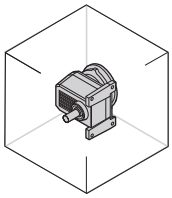

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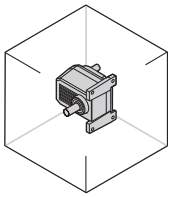

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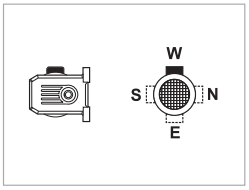
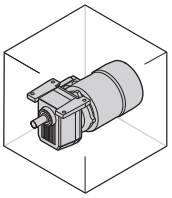


B8



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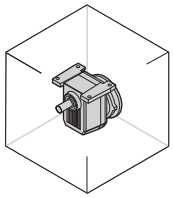

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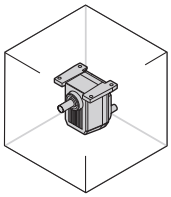

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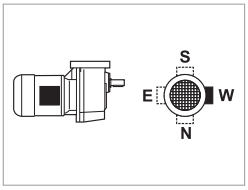
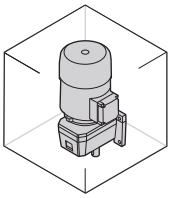


V5



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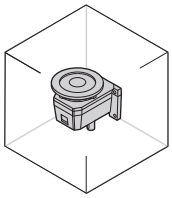

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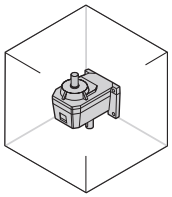

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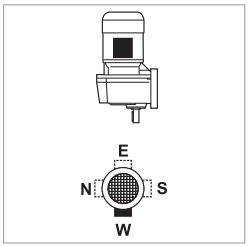

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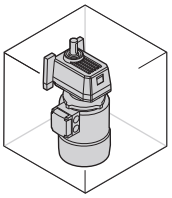

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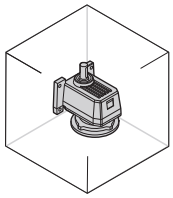

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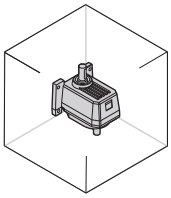

_HS

W = Default

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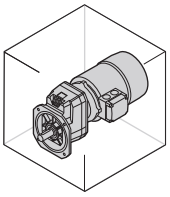
B5



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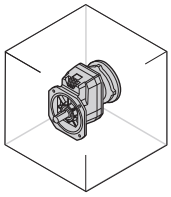

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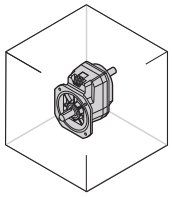

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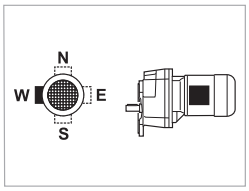

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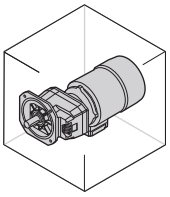

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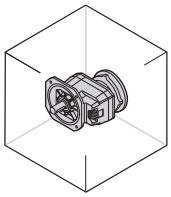

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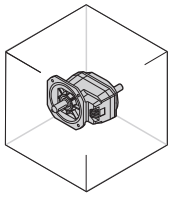

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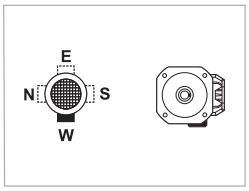

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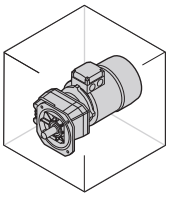

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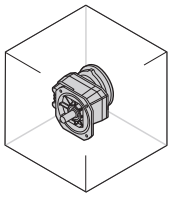

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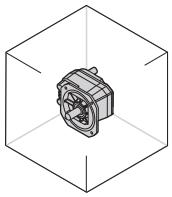

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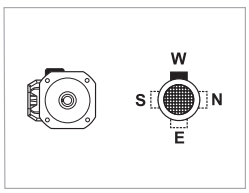

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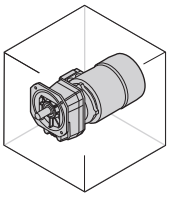

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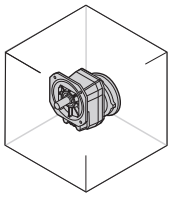

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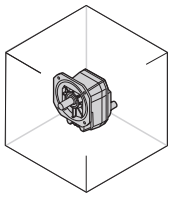

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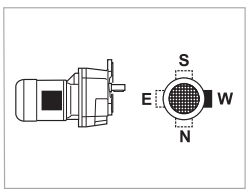

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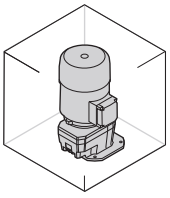

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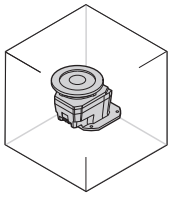

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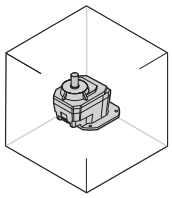

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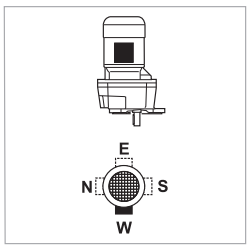

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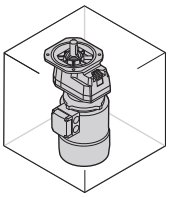

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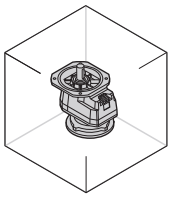

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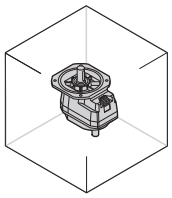


_HS

W = Default

71 OVERHUNG LOADS

External transmissions keyed onto input and/or output shaft generate loads that act radially onto same shaft.
Resulting shaft loading must be compatible with both the bearing and the shaft capacity. Namely shaft loading (R_{c1} for input shaft, R_{c2} for output shaft), must be equal or lower than admissible overhung load capacity for shaft under study (R_{n1} for input shaft, R_{n2} for output shaft). OHL capability listed in the rating chart section.
In the formulas given below, index (1) applies to parameters relating to input shaft, whereas index (2) refers to output shaft.
The load generated by an external transmission can be calculated with close approximation by the following equations:

$$R_{c1}[N] = \frac{2000 \cdot M_1[Nm] \cdot K_r}{d\,[mm]} \quad ; \quad R_{c2}[N] = \frac{2000 \cdot M_2[Nm] \cdot K_r}{d\,[mm]} \qquad (44)$$

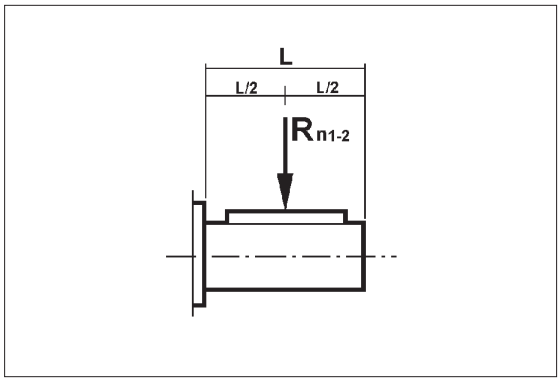
(E 65)

M_1 [Nm]	Torque applied to input shaft
M_2 [Nm]	Torque drawn at output shaft
d [mm]	Pitch diameter of element keyed onto shaft
K_r = 1	Chain transmission

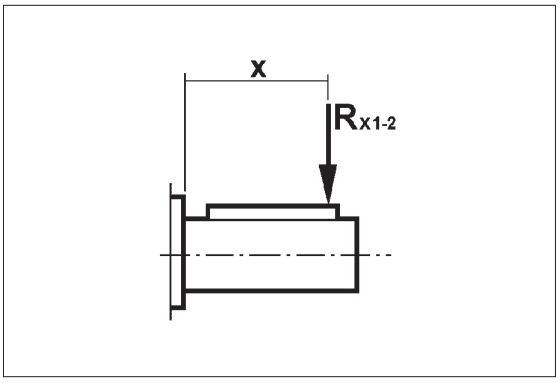
K_r = 1,25	Gear transmission
K_r = 1,5	V-belt transmission
K_r = 2,0	Flat belt transmission

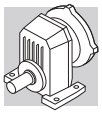
Verification of OHL capability varies depending on whether load applies at midpoint of shaft or it is shifted further out:

(E 66)



(E 67)





a) Load applied at midpoint of shaft, tab. (E66)

A comparison of shaft loading with catalogue OHL ratings should verify the following condition:

$Rc1 \leq Rn1$ [input shaft]

or

$Rc2 \leq Rn2$ [output shaft]

b) Load off the midpoint tab. (E67)

When load is shifted at an “x” distance from shaft shoulder, permissible load must be calculated for that distance.
Revised permissible overhung loads Rx1 (input) and Rx2 (output) are calculated respectively from original rated values Rn1 and Rn2 through factor:

$$\frac{a}{b+x} \qquad (45)$$

(E 68)

	Load location factors					
	Output shaft			Input shaft		
	a	**b**	**c**	**a**	**b**	**c**
S 10 1	61	46	200	21	1	300
S 20 1	73.5	53.5	270	40	20	350
S 30 1	91.5	66.5	380	38.5	18.5	350
S 40 1	126.5	96.5	600	49.5	24.5	450
S 50 1	153.5	113.5	680	49.5	24.5	450

Verification procedure is described here after.

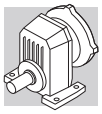
INPUT SHAFT

1. Calculate:

$$R_{x1} = R_{n1} \cdot \frac{a}{b+x} \qquad (46)$$

N.B. Subject to condition:

$$\frac{L}{2} \leq x \leq c \qquad (47)$$



Finally, the following condition must be verified:

$$R_{c1} \leq R_{x1} \tag{48}$$

OUTPUT SHAFT

1. Calculate:

$$R_{x2} = R_{n2} \cdot \frac{a}{b + x} \tag{49}$$

N.B. Subject to condition:

$$\frac{L}{2} \leq x \leq c \tag{50}$$

Finally, the following condition must be verified:

$$R_{c2} \leq R_{x2} \tag{51}$$

72 THRUST LOADS, A_{n1}, A_{n2}

Permissible thrust loads on input [A_{n1}] and output [A_{n2}] shafts are obtained from the radial loading for the shaft under consideration [R_{n1}] and [R_{n2}] through the following equation:

$$A_{n1} = R_{n1} \cdot 0.2$$
$$A_{n2} = R_{n2} \cdot 0.2 \tag{52}$$

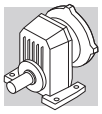
The thrust loads calculated through these formulas apply to thrust forces occurring at the same time as rated radial loads.
In the only case that no overhung load acts on the shaft the value of the admissible thrust load [A_n] amounts to 50% of rated OHL [R_n] on same shaft.
Where thrust loads exceed permissible value or largely prevail over radial loads, contact Bonfiglioli Riduttori for an in-depth analysis of the application.

0.09 kW

n_2 min-1	M_2 Nm	S	i	R_{n2} N			IEC	
69	12.1	2.9	13.1	2400			**S301_13.1 P63 BN63A6**	507
73	11.5	1.7	12.4	1500	**S201_12.4 S05 M05A6**	504	**S201_12.4 P63 BN63A6**	505
74	11.4	1.1	12.3	1160	**S101_12.3 S05 M05A6**	502	**S101_12.3 P63 BN63A6**	503
85	10.0	2.0	10.8	1500	**S201_10.8 S05 M05A6**	504	**S201_10.8 P63 BN63A6**	505
88	9.5	1.3	10.3	1100	**S101_10.3 S05 M05A6**	502	**S101_10.3 P63 BN63A6**	503
103	8.2	1.5	8.9	1060	**S101_8.9 S05 M05A6**	502	**S101_8.9 P63 BN63A6**	503
107	7.9	2.5	8.5	1500	**S201_8.5 S05 M05A6**	504	**S201_8.5 P63 BN63A6**	505
132	6.4	2.7	6.9	990	**S101_6.9 S05 M05A6**	502	**S101_6.9 P63 BN63A6**	503
149	5.7	3.0	6.1	960	**S101_6.1 S05 M05A6**	502	**S101_6.1 P63 BN63A6**	503
193	4.4	3.2	4.7	890	**S101_4.7 S05 M05A6**	502	**S101_4.7 P63 BN63A6**	503
237	3.6	3.9	3.8	830	**S101_3.8 S05 M05A6**	502	**S101_3.8 P63 BN63A6**	503
284	3.0	4.7	3.2	790	**S101_3.2 S05 M05A6**	502	**S101_3.2 P63 BN63A6**	503
364	2.3	5.2	2.5	730	**S101_2.5 S05 M05A6**	502	**S101_2.5 P63 BN63A6**	503
485	1.7	6.9	1.9	670	**S101_1.9 S05 M05A6**	502	**S101_1.9 P63 BN63A6**	503
640	1.3	9.1	1.4	610	**S101_1.4 S05 M05A6**	502	**S101_1.4 P63 BN63A6**	503

0.12 kW

n_2 min-1	M_2 Nm	S	i	R_{n2} N			IEC	
69	16.2	2.2	13.1	2400			**S301_13.1 P63 BN63A4**	507
73	15.3	1.3	12.4	1500	**S201_12.4 S05 M05B6**	504	**S201_12.4 P63 BN63B6**	505
85	13.3	1.5	10.8	1500	**S201_10.8 S05 M05B6**	504	**S201_10.8 P63 BN63B6**	505
88	12.7	2.8	10.3	2400			**S301_10.3 P63 BN63B6**	507
88	12.7	0.9	10.3	1060	**S101_10.3 S05 M05B6**	502	**S101_10.3 P63 BN63B6**	503
102	11.0	3.2	8.9	2400			**S301_8.9 P63 BN63B6**	507
103	11.0	1.1	8.9	1030	**S101_8.9 S05 M05B6**	502	**S101_8.9 P63 BN63B6**	503
107	10.5	2.8	13.1	2400			**S301_13.1 P63 BN63B6**	507
107	10.5	1.9	8.5	1500	**S201_8.5 S05 M05B6**	504	**S201_8.5 P63 BN63B6**	505
113	10.0	1.7	12.4	1500	**S201_12.4 S05 M05A4**	504	**S201_12.4 P63 BN63A4**	505
114	9.9	1.0	12.3	1000	**S101_12.3 S05 M05A4**	502	**S101_12.3 P63 BN63A4**	503
126	8.9	3.4	7.2	1500	**S201_7.2 S05 M05B6**	504	**S201_7.2 P63 BN63B6**	505
130	8.6	2.0	10.8	1500	**S201_10.8 S05 M05A4**	504	**S201_10.8 P63 BN63A4**	505
132	8.5	2.0	6.9	960	**S101_6.9 S05 M05B6**	502	**S101_6.9 P63 BN63B6**	503
136	8.3	1.2	10.3	960	**S101_10.3 S05 M05A4**	502	**S101_10.3 P63 BN63A4**	503
149	7.5	2.3	6.1	940	**S101_6.1 S05 M05B6**	502	**S101_6.1 P63 BN63B6**	503
158	7.1	1.4	8.9	920	**S101_8.9 S05 M05A4**	502	**S101_8.9 P63 BN63A4**	503
165	6.8	2.5	8.5	1500	**S201_8.5 S05 M05A4**	504	**S201_8.5 P63 BN63A4**	505
193	5.8	2.4	4.7	870	**S101_4.7 S05 M05B6**	502	**S101_4.7 P63 BN63B6**	503
203	5.5	2.7	6.9	860	**S101_6.9 S05 M05A4**	502	**S101_6.9 P63 BN63A4**	503
229	4.9	3.1	6.1	830	**S101_6.1 S05 M05A4**	502	**S101_6.1 P63 BN63A4**	503
237	4.7	2.9	3.8	820	**S101_3.8 S05 M05B6**	502	**S101_3.8 P63 BN63B6**	503
284	3.9	3.5	3.2	780	**S101_3.2 S05 M05B6**	502	**S101_3.2 P63 BN63B6**	503
296	3.8	3.2	4.7	770	**S101_4.7 S05 M05A4**	502	**S101_4.7 P63 BN63A4**	503
364	3.1	3.9	3.8	720	**S101_3.8 S05 M05A4**	502	**S101_3.8 P63 BN63A4**	503
364	3.1	3.9	2.5	720	**S101_2.5 S05 M05B6**	502	**S101_2.5 P63 BN63B6**	503
438	2.6	4.7	3.2	680	**S101_3.2 S05 M05A4**	502	**S101_3.2 P63 BN63A4**	503



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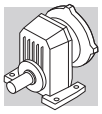
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
485	2.3	5.2	1.9	660	**S101_1.9 S05 M05B6**	502	**S101_1.9 P63 BN63B6**	503
560	2.0	5.0	2.5	630	**S101_2.5 S05 M05A4**	502	**S101_2.5 P63 BN63A4**	503
640	1.8	6.8	1.4	600	**S101_1.4 S05 M05B6**	502	**S101_1.4 P63 BN63B6**	503
747	1.5	6.6	1.9	580	**S101_1.9 S05 M05A4**	502	**S101_1.9 P63 BN63A4**	503
985	1.1	8.8	1.4	530	**S101_1.4 S05 M05A4**	502	**S101_1.4 P63 BN63A4**	503

0.18 kW

n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
69	24.6	1.4	13.1	2400			**S301_13.1 P71 BN71A6**	507
73	23.2	2.5	12.4	3800	**S401_12.4 S1 M1SC6**	508	**S401_12.4 P71 BN71A6**	500
84	20.1	1.0	10.8	1500			**S201_10.8 P71 BN71A6**	505
84	20.0	2.9	10.7	3800	**S401_10.7 S1 M1SC6**	508	**S401_10.7 P71 BN71A6**	500
87	19.3	1.8	10.3	2400	**S301_10.3 S1 M1SC6**	506	**S301_10.3 P71 BN71A6**	507
101	16.6	2.1	8.9	2400	**S301_8.9 S1 M1SC6**	506	**S301_8.9 P71 BN71A6**	507
106	15.9	1.3	8.5	1500	**S201_8.5 S1 M1SC6**	504	**S201_8.5 P71 BN71A6**	505
106	15.9	1.9	13.1	2400			**S301_13.1 P63 BN63B4**	507
112	15.1	1.1	12.4	1500	**S201_12.4 S05 M05B4**	504	**S201_12.4 P63 BN63B4**	505
112	15.0	3.3	12.4	3800			**S401_12.4 P63 BN63B4**	509
125	13.5	2.2	7.2	1500	**S201_7.2 S1 M1SC6**	504	**S201_7.2 P71 BN71A6**	505
129	13.0	1.3	10.8	1500	**S201_10.8 S05 M05B4**	504	**S201_10.8 P63 BN63B4**	505
130	12.9	1.3	6.9	910	**S101_6.9 S1 M1SC6**	502	**S101_6.9 P71 BN71A6**	503
135	12.5	2.4	10.3	2330			**S301_10.3 P63 BN63B4**	507
147	11.4	1.5	6.1	890	**S101_6.1 S1 M1SC6**	502	**S101_6.1 P71 BN71A6**	503
155	10.9	2.8	5.8	1500	**S201_5.8 S1 M1SC6**	504	**S201_5.8 P71 BN71A6**	505
156	10.8	2.8	8.9	2230			**S301_8.9 P63 BN63B4**	507
157	10.8	0.9	8.9	880	**S101_8.9 S05 M05B4**	502	**S101_8.9 P63 BN63B4**	503
164	10.3	1.7	8.5	1500	**S201_8.5 S05 M05B4**	504	**S201_8.5 P63 BN63B4**	505
189	8.9	3.4	4.8	1500	**S201_4.8 S1 M1SC6**	504	**S201_4.8 P71 BN71A6**	505
190	8.8	1.6	4.7	830	**S101_4.7 S1 M1SC6**	502	**S101_4.7 P71 BN71A6**	503
192	8.8	3.0	7.2	1500	**S201_7.2 S05 M05B4**	504	**S201_7.2 P63 BN63B4**	505
201	8.4	1.8	6.9	820	**S101_6.9 S05 M05B4**	502	**S101_6.9 P63 BN63B4**	503
214	7.9	3.1	13.1	2020			**S301_13.1 P63 BN63A2**	507
226	7.5	1.7	12.4	1480	**S201_12.4 S05 M05A2**	504	**S201_12.4 P63 BN63A2**	505
227	7.4	2.0	6.1	800	**S101_6.1 S05 M05B4**	502	**S101_6.1 P63 BN63B4**	503
228	7.4	1.1	12.3	800	**S101_12.3 S05 M05A2**	502	**S101_12.3 P63 BN63A2**	503
234	7.2	1.9	3.8	790	**S101_3.8 S1 M1SC6**	502	**S101_3.8 P71 BN71A6**	503
261	6.4	2.0	10.8	1420	**S201_10.8 S05 M05A2**	504	**S201_10.8 P63 BN63A2**	505
273	6.2	1.3	10.3	760	**S101_10.3 S05 M05A2**	502	**S101_10.3 P63 BN63A2**	503
281	6.0	2.3	3.2	750	**S101_3.2 S1 M1SC6**	502	**S101_3.2 P71 BN71A6**	503
294	5.7	2.1	4.7	750	**S101_4.7 S05 M05B4**	502	**S101_4.7 P63 BN63B4**	503
317	5.3	1.5	8.9	730	**S101_8.9 S05 M05A2**	502	**S101_8.9 P63 BN63A2**	503
331	5.1	2.6	8.5	1320	**S201_8.5 S05 M05A2**	504	**S201_8.5 P63 BN63A2**	505
360	4.7	2.6	2.5	700	**S101_2.5 S1 M1SC6**	502	**S101_2.5 P71 BN71A6**	503
361	4.7	2.6	3.8	700	**S101_3.8 S05 M05B4**	502	**S101_3.8 P63 BN63B4**	503
407	4.1	2.9	6.9	680	**S101_6.9 S05 M05A2**	502	**S101_6.9 P63 BN63A2**	503
434	3.9	3.1	3.2	670	**S101_3.2 S05 M05B4**	502	**S101_3.2 P63 BN63B4**	503
460	3.7	3.3	6.1	660	**S101_6.1 S05 M05A2**	502	**S101_6.1 P63 BN63A2**	503



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n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
480	3.5	3.4	1.9	640	**S101_1.9 S1 M1SC6**	502	**S101_1.9 P71 BN71A6**	503
556	3.0	3.3	2.5	620	**S101_2.5 S05 M05B4**	502	**S101_2.5 P63 BN63B4**	503
594	2.8	3.5	4.7	610	**S101_4.7 S05 M05A2**	502	**S101_4.7 P63 BN63A2**	503
633	2.7	4.5	1.4	590	**S101_1.4 S1 M1SC6**	502	**S101_1.4 P71 BN71A6**	503
731	2.3	4.3	3.8	570	**S101_3.8 S05 M05A2**	502	**S101_3.8 P63 BN63A2**	503
741	2.3	4.4	1.9	570	**S101_1.9 S05 M05B4**	502	**S101_1.9 P63 BN63B4**	503
878	1.9	5.2	3.2	540	**S101_3.2 S05 M05A2**	502	**S101_3.2 P63 BN63A2**	503
978	1.7	5.8	1.4	520	**S101_1.4 S05 M05B4**	502	**S101_1.4 P63 BN63B4**	503
1124	1.5	5.3	2.5	500	**S101_2.5 S05 M05A2**	502	**S101_2.5 P63 BN63A2**	503
1499	1.1	7.1	1.9	460	**S101_1.9 S05 M05A2**	502	**S101_1.9 P63 BN63A2**	503
1977	0.9	9.4	1.4	420	**S101_1.4 S05 M05A2**	502	**S101_1.4 P63 BN63A2**	503

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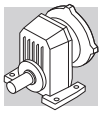
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
69	34.1	1.0	13.1	2400			**S301_13.1 P71 BN71B6**	507
70	33.5	3.0	12.9	6520	**S501_12.9 S1 M1SD6**	510	**S501_12.9 P71 BN71B6**	511
73	32.2	1.8	12.4	3800	**S401_12.4 S1 M1SD6**	508	**S401_12.4 P71 BN71B6**	509
84	27.7	2.1	10.7	3800	**S401_10.7 S1 M1SD6**	508	**S401_10.7 P71 BN71B6**	509
87	26.8	1.3	10.3	2400	**S301_10.3 S1 M1SD6**	506	**S301_10.3 P71 BN71B6**	507
101	23.1	1.5	8.9	2400	**S301_8.9 S1 M1SD6**	506	**S301_8.9 P71 BN71B6**	507
104	22.5	3.1	8.6	3800	**S401_8.6 S1 M1SD6**	508	**S401_8.6 P71 BN71B6**	509
105	22.3	1.3	13.1	2400			**S301_13.1 P71 BN71A4**	507
106	22.1	0.9	8.5	1500	**S201_8.5 S1 M1SD6**	504	**S201_8.5 P71 BN71B6**	505
111	21.1	2.4	12.4	3800			**S401_12.4 P71 BN71A4**	509
125	18.8	1.6	7.2	1500	**S201_7.2 S1 M1SD6**	504	**S201_7.2 P71 BN71B6**	505
127	18.4	3.1	7.1	2340	**S301_7.1 S1 M1SD6**	506	**S301_7.1 P71 BN71B6**	507
128	18.3	0.9	10.8	1500	**S201_10.8 S05 M05C4**	504	**S201_10.8 P71 BN71A4**	505
129	18.2	2.8	10.7	3800			**S401_10.7 P71 BN71A4**	509
130	17.9	0.9	6.9	850	**S101_6.9 S1 M1SD6**	502	**S101_6.9 P71 BN71B6**	503
133	17.5	1.7	10.3	2300			**S301_10.3 P71 BN71A4**	507
147	15.9	1.1	6.1	840	**S101_6.1 S1 M1SD6**	502	**S101_6.1 P71 BN71B6**	503
155	15.1	2.0	5.8	1500	**S201_5.8 S1 M1SD6**	504	**S201_5.8 P71 BN71B6**	505
155	15.1	2.0	8.9	2200			**S301_8.9 P71 BN71A4**	507
162	14.5	1.2	8.5	1500	**S201_8.5 S05 M05C4**	504	**S201_8.5 P71 BN71A4**	505
189	12.4	2.4	4.8	1500	**S201_4.8 S1 M1SD6**	504	**S201_4.8 P71 BN71B6**	505
190	12.3	1.1	4.7	790	**S101_4.7 S1 M1SD6**	502	**S101_4.7 P71 BN71B6**	503
190	12.3	2.1	7.2	1500	**S201_7.2 S05 M05C4**	504	**S201_7.2 P71 BN71A4**	505
199	11.7	1.3	6.9	780	**S101_6.9 S05 M05C4**	502	**S101_6.9 P71 BN71A4**	503
214	10.9	2.2	13.1	2000			**S301_13.1 P63 BN63B2**	507
225	10.4	1.4	6.1	770	**S101_6.1 S05 M05C4**	502	**S101_6.1 P71 BN71A4**	503
226	10.3	1.3	12.4	1450	**S201_12.4 S05 M05B2**	504	**S201_12.4 P63 BN63B2**	505
229	10.2	2.9	3.9	1440	**S201_3.9 S1 M1SD6**	504	**S201_3.9 P71 BN71B6**	505
234	10.0	1.4	3.8	750	**S101_3.8 S1 M1SD6**	502	**S101_3.8 P71 BN71B6**	503
236	9.9	2.6	5.8	1430	**S201_5.8 S05 M05C4**	504	**S201_5.8 P71 BN71A4**	505
261	9.0	1.5	10.8	1390	**S201_10.8 S05 M05B2**	504	**S201_10.8 P63 BN63B2**	505
273	8.6	2.8	10.3	1860			**S301_10.3 P63 BN63B2**	507
273	8.6	0.9	10.3	730	**S101_10.3 S05 M05B2**	502	**S101_10.3 P63 BN63B2**	503



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n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
281	8.3	1.7	3.2	720	**S101_3.2 S1 M1SD6**	502	**S101_3.2 P71 BN71B6**	503
288	8.1	3.2	4.8	1350	**S201_4.8 S05 M05C4**	504	**S201_4.8 P71 BN71A4**	505
291	8.0	1.5	4.7	720	**S101_4.7 S05 M05C4**	502	**S101_4.7 P71 BN71A4**	503
316	7.4	3.2	8.9	1770			**S301_8.9 P63 BN63B2**	507
317	7.4	1.1	8.9	710	**S101_8.9 S05 M05B2**	502	**S101_8.9 P63 BN63B2**	503
331	7.1	1.8	8.5	1300	**S201_8.5 S05 M05B2**	504	**S201_8.5 P63 BN63B2**	505
358	6.5	1.8	3.8	680	**S101_3.8 S05 M05C4**	502	**S101_3.8 P71 BN71A4**	503
360	6.5	1.8	2.5	680	**S101_2.5 S1 M1SD6**	502	**S101_2.5 P71 BN71B6**	503
389	6.0	3.5	7.2	1240	**S201_7.2 S05 M05B2**	504	**S201_7.2 P63 BN63B2**	505
407	5.7	2.1	6.9	660	**S101_6.9 S05 M05B2**	502	**S101_6.9 P63 BN63B2**	503
430	5.4	2.2	3.2	650	**S101_3.2 S05 M05C4**	502	**S101_3.2 P71 BN71A4**	503
460	5.1	2.4	6.1	640	**S101_6.1 S05 M05B2**	502	**S101_6.1 P63 BN63B2**	503
480	4.9	2.5	1.9	620	**S101_1.9 S1 M1SD6**	502	**S101_1.9 P71 BN71B6**	503
550	4.3	2.4	2.5	610	**S101_2.5 S05 M05C4**	502	**S101_2.5 P71 BN71A4**	503
594	3.9	2.5	4.7	600	**S101_4.7 S05 M05B2**	502	**S101_4.7 P63 BN63B2**	503
633	3.7	3.2	1.4	580	**S101_1.4 S1 M1SD6**	502	**S101_1.4 P71 BN71B6**	503
731	3.2	3.1	3.8	560	**S101_3.8 S05 M05B2**	502	**S101_3.8 P63 BN63B2**	503
733	3.2	3.1	1.9	560	**S101_1.9 S05 M05C4**	502	**S101_1.9 P71 BN71A4**	503
878	2.7	3.8	3.2	530	**S101_3.2 S05 M05B2**	502	**S101_3.2 P63 BN63B2**	503
968	2.4	4.1	1.4	510	**S101_1.4 S05 M05C4**	502	**S101_1.4 P71 BN71A4**	503
1124	2.1	3.8	2.5	500	**S101_2.5 S05 M05B2**	502	**S101_2.5 P63 BN63B2**	503
1499	1.6	5.1	1.9	450	**S101_1.9 S05 M05B2**	502	**S101_1.9 P63 BN63B2**	503
1977	1.2	6.8	1.4	420	**S101_1.4 S05 M05B2**	502	**S101_1.4 P63 BN63B2**	503

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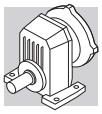
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
71	49.0	2.0	12.9	6420	**S501_12.9 S1 M1LA6**	510	**S501_12.9 P80 BN80A6**	511
73	47.2	1.2	12.4	3800	**S401_12.4 S1 M1LA6**	508	**S401_12.4 P80 BN80A6**	509
85	40.6	1.4	10.7	3800	**S401_10.7 S1 M1LA6**	508	**S401_10.7 P80 BN80A6**	509
87	39.8	2.9	10.5	6020	**S501_10.5 S1 M1LA6**	510	**S501_10.5 P80 BN80A6**	511
102	33.8	1.0	8.9	2400	**S301_8.9 S1 M1LA6**	506	**S301_8.9 P80 BN80A6**	507
104	33.2	0.9	13.1	2390			**S301_13.1 P71 BN71B4**	507
105	32.9	2.1	8.6	3800	**S401_8.6 S1 M1LA6**	508	**S401_8.6 P80 BN80A6**	509
106	32.6	3.1	12.9	5650	**S501_12.9 S1 M1SD4**	510	**S501_12.9 P71 BN71B4**	511
110	31.3	1.6	12.4	3800	**S401_12.4 S1 M1SD4**	508	**S401_12.4 P71 BN71B4**	509
126	27.5	1.1	7.2	1500	**S201_7.2 S1 M1LA6**	504	**S201_7.2 P80 BN80A6**	505
127	27.2	3.3	7.2	3800	**S401_7.2 S1 M1LA6**	508	**S401_7.2 P80 BN80A6**	509
128	27.0	2.1	7.1	2260	**S301_7.1 S1 M1LA6**	506	**S301_7.1 P80 BN80A6**	507
128	27.0	1.9	10.7	3800	**S401_10.7 S1 M1SD4**	508	**S401_10.7 P71 BN71B4**	509
133	26.0	1.2	10.3	2240	**S301_10.3 S1 M1SD4**	506	**S301_10.3 P71 BN71B4**	507
154	22.5	1.3	8.9	2150	**S301_8.9 S1 M1SD4**	506	**S301_8.9 P71 BN71B4**	507
156	22.2	2.6	5.8	2140	**S301_5.8 S1 M1LA6**	506	**S301_5.8 P80 BN80A6**	507
156	22.1	1.4	5.8	1500	**S201_5.8 S1 M1LA6**	504	**S201_5.8 P80 BN80A6**	505
159	21.8	2.7	8.6	3610	**S401_8.6 S1 M1SD4**	508	**S401_8.6 P71 BN71B4**	509
184	18.8	3.1	4.9	2040	**S301_4.9 S1 M1LA6**	506	**S301_4.9 P80 BN80A6**	507
190	18.3	1.4	7.2	1460	**S201_7.2 S1 M1SD4**	504	**S201_7.2 P71 BN71B4**	505
191	18.1	1.7	4.8	1460	**S201_4.8 S1 M1LA6**	504	**S201_4.8 P80 BN80A6**	505



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n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
193	17.9	2.8	7.1	2020	**S301_7.1 S1 M1SD4**	506	**S301_7.1 P71 BN71B4**	507
214	16.2	1.5	13.1	1960			**S301_13.1 P71 BN71A2**	507
224	15.4	1.0	6.1	710	**S101_6.1 S1 M1SD4**	502	**S101_6.1 P71 BN71B4**	503
227	15.3	2.6	12.4	3230			**S401_12.4 P71 BN71A2**	509
231	15.0	2.0	3.9	1380	**S201_3.9 S1 M1LA6**	504	**S201_3.9 P80 BN80A6**	505
234	14.8	3.4	5.8	1900	**S301_5.8 S1 M1SD4**	506	**S301_5.8 P71 BN71B4**	507
235	14.7	1.8	5.8	1390	**S201_5.8 S1 M1SD4**	504	**S201_5.8 P71 BN71B4**	505
237	14.6	1.0	3.8	690	**S101_3.8 S1 M1LA6**	502	**S101_3.8 P80 BN80A6**	503
261	13.2	1.0	10.8	1350	**S201_10.8 S05 M05C2**	504	**S201_10.8 P71 BN71A2**	505
263	13.1	3.0	10.7	3080			**S401_10.7 P71 BN71A2**	509
273	12.7	1.9	10.3	1820			**S301_10.3 P71 BN71A2**	507
284	12.2	1.1	3.2	670	**S101_3.2 S1 M1LA6**	502	**S101_3.2 P80 BN80A6**	503
287	12.1	2.2	4.8	1310	**S201_4.8 S1 M1SD4**	504	**S201_4.8 P71 BN71B4**	505
290	11.9	1.0	4.7	670	**S101_4.7 S1 M1SD4**	502	**S101_4.7 P71 BN71B4**	503
293	11.8	2.5	3.1	1300	**S201_3.1 S1 M1LA6**	504	**S201_3.1 P80 BN80A6**	505
316	11.0	2.2	8.9	1740			**S301_8.9 P71 BN71A2**	507
331	10.5	1.2	8.5	1270	**S201_8.5 S05 M05C2**	504	**S201_8.5 P71 BN71A2**	505
348	9.9	2.6	3.9	1240	**S201_3.9 S1 M1SD4**	504	**S201_3.9 P71 BN71B4**	505
356	9.7	1.2	3.8	640	**S101_3.8 S1 M1SD4**	502	**S101_3.8 P71 BN71B4**	503
364	9.5	1.3	2.5	630	**S101_2.5 S1 M1LA6**	502	**S101_2.5 P80 BN80A6**	503
373	9.3	3.2	2.4	1210	**S201_2.4 S1 M1LA6**	504	**S201_2.4 P80 BN80A6**	505
389	8.9	2.4	7.2	1210	**S201_7.2 S05 M05C2**	504	**S201_7.2 P71 BN71A2**	505
407	8.5	1.4	6.9	630	**S101_6.9 S05 M05C2**	502	**S101_6.9 P71 BN71A2**	503
428	8.1	1.5	3.2	620	**S101_3.2 S1 M1SD4**	502	**S101_3.2 P71 BN71B4**	503
440	7.9	3.3	3.1	1160	**S201_3.1 S1 M1SD4**	504	**S201_3.1 P71 BN71B4**	505
460	7.5	1.6	6.1	610	**S101_6.1 S05 M05C2**	502	**S101_6.1 P71 BN71A2**	503
480	7.2	2.8	1.9	1130	**S201_1.9 S1 M1LA6**	504	**S201_1.9 P80 BN80A6**	505
483	7.2	2.9	5.8	1130	**S201_5.8 S05 M05C2**	504	**S201_5.8 P71 BN71A2**	505
485	7.1	1.7	1.9	590	**S101_1.9 S1 M1LA6**	502	**S101_1.9 P80 BN80A6**	503
548	6.3	1.6	2.5	580	**S101_2.5 S1 M1SD4**	502	**S101_2.5 P71 BN71B4**	503
594	5.8	1.7	4.7	570	**S101_4.7 S05 M05C2**	502	**S101_4.7 P71 BN71A2**	503
640	5.4	2.2	1.4	550	**S101_1.4 S1 M1LA6**	502	**S101_1.4 P80 BN80A6**	503
731	4.7	2.1	3.8	540	**S101_3.8 S05 M05C2**	502	**S101_3.8 P71 BN71A2**	503
731	4.7	2.1	1.9	540	**S101_1.9 S1 M1SD4**	502	**S101_1.9 P71 BN71B4**	503
878	3.9	2.5	3.2	520	**S101_3.2 S05 M05C2**	502	**S101_3.2 P71 BN71A2**	503
964	3.6	2.8	1.4	500	**S101_1.4 S1 M1SD4**	502	**S101_1.4 P71 BN71B4**	503
1124	3.1	2.6	2.5	480	**S101_2.5 S05 M05C2**	502	**S101_2.5 P71 BN71A2**	503
1499	2.3	3.5	1.9	440	**S101_1.9 S05 M05C2**	502	**S101_1.9 P71 BN71A2**	503
1977	1.8	4.6	1.4	410	**S101_1.4 S05 M05C2**	502	**S101_1.4 P71 BN71A2**	503

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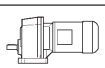
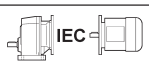
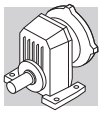
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC 	
71	72.1	1.4	12.9	6290	**S501_12.9 S2 M2SA6**	510	**S501_12.9 P80 BN80B6**	511
86	59.7	1.0	10.7	3800	**S401_10.7 S2 M2SA6**	508	**S401_10.7 P80 BN80B6**	509
88	58.5	2.0	10.5	5910	**S501_10.5 S2 M2SA6**	510	**S501_10.5 P80 BN80B6**	511
105	49.1	2.5	8.8	5600	**S501_8.8 S2 M2SA6**	510	**S501_8.8 P80 BN80B6**	511
107	48.3	1.4	8.6	3800	**S401_8.6 S2 M2SA6**	508	**S401_8.6 P80 BN80B6**	509



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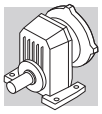
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
107	48.1	2.1	12.9	5560	**S501_12.9 S1 M1LA4**	510	**S501_12.9 P80 BN80A4**	511
111	46.3	1.1	12.4	3800	**S401_12.4 S1 M1LA4**	508	**S401_12.4 P80 BN80A4**	509
124	41.4	3.4	7.4	5310	**S501_7.4 S2 M2SA6**	510	**S501_7.4 P80 BN80B6**	511
129	40.0	2.2	7.2	3780	**S401_7.2 S2 M2SA6**	508	**S401_7.2 P80 BN80B6**	509
129	39.8	1.3	10.7	3770	**S401_10.7 S1 M1LA4**	508	**S401_10.7 P80 BN80A4**	509
130	39.7	1.5	7.1	2150	**S301_7.1 S2 M2SA6**	506	**S301_7.1 P80 BN80B6**	507
132	39.0	2.8	10.5	5220	**S501_10.5 S1 M1LA4**	510	**S501_10.5 P80 BN80A4**	511
152	33.9	3.1	6.1	3600	**S401_6.1 S2 M2SA6**	508	**S401_6.1 P80 BN80B6**	509
155	33.2	0.9	8.9	2060	**S301_8.9 S1 M1LA4**	506	**S301_8.9 P80 BN80A4**	507
157	32.7	1.8	5.8	2050	**S301_5.8 S2 M2SA6**	506	**S301_5.8 P80 BN80B6**	507
157	32.7	3.4	8.8	4940	**S501_8.8 S1 M1LA4**	510	**S501_8.8 P80 BN80A4**	511
158	32.6	0.9	5.8	1420	**S201_5.8 S2 M2SA6**	504	**S201_5.8 P80 BN80B6**	505
160	32.2	1.9	8.6	3540	**S401_8.6 S1 M1LA4**	508	**S401_8.6 P80 BN80A4**	509
186	27.6	2.1	4.9	1960	**S301_4.9 S2 M2SA6**	506	**S301_4.9 P80 BN80B6**	507
191	26.9	1.0	7.2	1370	**S201_7.2 S1 M1LA4**	504	**S201_7.2 P80 BN80A4**	505
193	26.7	1.1	4.8	1370	**S201_4.8 S2 M2SA6**	504	**S201_4.8 P80 BN80B6**	505
193	26.7	3.0	7.2	3350	**S401_7.2 S1 M1LA4**	508	**S401_7.2 P80 BN80A4**	509
195	26.4	1.9	7.1	1940	**S301_7.1 S1 M1LA4**	506	**S301_7.1 P80 BN80A4**	507
214	24.0	1.0	13.1	1900			**S301_13.1 P71 BN71B2**	507
218	23.6	3.4	12.9	4460	**S501_12.9 S1 M1SD2**	510	**S501_12.9 P71 BN71B2**	511
227	22.7	1.8	12.4	3190	**S401_12.4 S1 M1SD2**	508	**S401_12.4 P71 BN71B2**	509
233	22.1	2.6	3.9	1850	**S301_3.9 S2 M2SA6**	506	**S301_3.9 P80 BN80B6**	507
234	22.0	1.4	3.9	1300	**S201_3.9 S2 M2SA6**	504	**S201_3.9 P80 BN80B6**	505
236	21.8	2.3	5.8	1840	**S301_5.8 S1 M1LA4**	506	**S301_5.8 P80 BN80A4**	507
237	21.7	1.2	5.8	1310	**S201_5.8 S1 M1LA4**	504	**S201_5.8 P80 BN80A4**	505
263	19.5	2.0	10.7	3040	**S401_10.7 S1 M1SD2**	508	**S401_10.7 P71 BN71B2**	509
273	18.9	1.3	10.3	1780	**S301_10.3 S1 M1SD2**	506	**S301_10.3 P71 BN71B2**	507
280	18.4	2.7	4.9	1760	**S301_4.9 S1 M1LA4**	506	**S301_4.9 P80 BN80A4**	507
289	17.8	1.5	4.8	1250	**S201_4.8 S1 M1LA4**	504	**S201_4.8 P80 BN80A4**	505
296	17.4	1.7	3.1	1230	**S201_3.1 S2 M2SA6**	504	**S201_3.1 P80 BN80B6**	505
300	17.1	3.4	3.1	1720	**S301_3.1 S2 M2SA6**	506	**S301_3.1 P80 BN80B6**	507
316	16.3	1.5	8.9	1700	**S301_8.9 S1 M1SD2**	506	**S301_8.9 P71 BN71B2**	507
325	15.8	3.0	8.6	2850	**S401_8.6 S1 M1SD2**	508	**S401_8.6 P71 BN71B2**	509
350	14.7	3.4	3.9	1650	**S301_3.9 S1 M1LA4**	506	**S301_3.9 P80 BN80A4**	507
351	14.7	1.8	3.9	1190	**S201_3.9 S1 M1LA4**	504	**S201_3.9 P80 BN80A4**	505
377	13.6	2.2	2.4	1160	**S201_2.4 S2 M2SA6**	504	**S201_2.4 P80 BN80B6**	505
389	13.2	1.6	7.2	1160	**S201_7.2 S1 M1SD2**	504	**S201_7.2 P71 BN71B2**	505
396	13.0	3.1	7.1	1600	**S301_7.1 S1 M1SD2**	506	**S301_7.1 P71 BN71B2**	507
407	12.6	0.9	6.9	570	**S101_6.9 S1 M1SD2**	502	**S101_6.9 P71 BN71B2**	503
431	11.9	1.0	3.2	560	**S101_3.2 S1 M1LA4**	502	**S101_3.2 P80 BN80A4**	503
444	11.6	2.2	3.1	1120	**S201_3.1 S1 M1LA4**	504	**S201_3.1 P80 BN80A4**	505
460	11.2	1.1	6.1	570	**S101_6.1 S1 M1SD2**	502	**S101_6.1 P71 BN71B2**	503
483	10.7	2.0	5.8	1100	**S201_5.8 S1 M1SD2**	504	**S201_5.8 P71 BN71B2**	505
486	10.6	1.9	1.9	1080	**S201_1.9 S2 M2SA6**	504	**S201_1.9 P80 BN80B6**	505
491	10.5	1.1	1.9	540	**S101_1.9 S2 M2SA6**	502	**S101_1.9 P80 BN80B6**	503
504	10.2	3.4	1.8	1470	**S301_1.8 S2 M2SA6**	506	**S301_1.8 P80 BN80B6**	507
552	9.3	1.1	2.5	540	**S101_2.5 S1 M1LA4**	502	**S101_2.5 P80 BN80A4**	503
566	9.1	2.9	2.4	1050	**S201_2.4 S1 M1LA4**	504	**S201_2.4 P80 BN80A4**	505
589	8.7	2.4	4.8	1040	**S201_4.8 S1 M1SD2**	504	**S201_4.8 P71 BN71B2**	505
594	8.7	1.2	4.7	540	**S101_4.7 S1 M1SD2**	502	**S101_4.7 P71 BN71B2**	503
647	8.0	1.5	1.4	510	**S101_1.4 S2 M2SA6**	502	**S101_1.4 P80 BN80B6**	503



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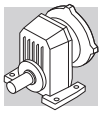
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
661	7.8	2.6	1.4	990	**S201_1.4 S2 M2SA6**	504	**S201_1.4 P80 BN80B6**	505
714	7.2	2.9	3.9	980	**S201_3.9 S1 M1SD2**	504	**S201_3.9 P71 BN71B2**	505
728	7.1	2.4	1.9	970	**S201_1.9 S1 M1LA4**	504	**S201_1.9 P80 BN80A4**	505
731	7.0	1.4	3.8	510	**S101_3.8 S1 M1SD2**	502	**S101_3.8 P71 BN71B2**	503
736	7.0	1.4	1.9	500	**S101_1.9 S1 M1LA4**	502	**S101_1.9 P80 BN80A4**	503
878	5.9	1.7	3.2	490	**S101_3.2 S1 M1SD2**	502	**S101_3.2 P71 BN71B2**	503
971	5.3	1.9	1.4	470	**S101_1.4 S1 M1LA4**	502	**S101_1.4 P80 BN80A4**	503
992	5.2	3.3	1.4	890			**S201_1.4 P80 BN80A4**	505
1124	4.6	1.7	2.5	460	**S101_2.5 S1 M1SD2**	502	**S101_2.5 P71 BN71B2**	503
1499	3.4	2.3	1.9	430	**S101_1.9 S1 M1SD2**	502	**S101_1.9 P71 BN71B2**	503
1977	2.6	3.1	1.4	390	**S101_1.4 S1 M1SD2**	502	**S101_1.4 P71 BN71B2**	503

0.75 kW

n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
71	98.3	1.0	12.9	6170	**S501_12.9 S2 M2SB6**	510	**S501_12.9 P90 BN90S6**	511
88	79.8	1.4	10.5	5810	**S501_10.5 S2 M2SB6**	510	**S501_10.5 P90 BN90S6**	511
105	66.9	1.9	8.8	5520	**S501_8.8 S2 M2SB6**	510	**S501_8.8 P90 BN90S6**	511
107	65.9	1.1	8.6	3800	**S401_8.6 S2 M2SB6**	508	**S401_8.6 P90 BN90S6**	509
109	64.6	1.5	12.9	5460	**S501_12.9 S2 M2SA4**	510	**S501_12.9 P80 BN80B4**	511
124	56.5	2.5	7.4	5240	**S501_7.4 S2 M2SB6**	510	**S501_7.4 P90 BN90S6**	511
129	54.6	1.6	7.2	3700	**S401_7.2 S2 M2SB6**	508	**S401_7.2 P90 BN90S6**	509
130	54.1	1.1	7.1	2040	**S301_7.1 S2 M2SB6**	506	**S301_7.1 P90 BN90S6**	507
131	53.5	0.9	10.7	3670	**S401_10.7 S2 M2SA4**	508	**S401_10.7 P80 BN80B4**	509
134	52.4	2.1	10.5	5130	**S501_10.5 S2 M2SA4**	510	**S501_10.5 P80 BN80B4**	511
152	46.3	2.3	6.1	3530	**S401_6.1 S2 M2SB6**	508	**S401_6.1 P90 BN90S6**	509
152	46.2	3.2	6.1	4940	**S501_6.1 S2 M2SB6**	510	**S501_6.1 P90 BN90S6**	511
157	44.6	1.3	5.8	1960	**S301_5.8 S2 M2SB6**	506	**S301_5.8 P90 BN90S6**	507
160	44.0	2.5	8.8	4870	**S501_8.8 S2 M2SA4**	510	**S501_8.8 P80 BN80B4**	511
162	43.3	1.4	8.6	3460	**S401_8.6 S2 M2SA4**	508	**S401_8.6 P80 BN80B4**	509
186	37.6	1.5	4.9	1880	**S301_4.9 S2 M2SB6**	506	**S301_4.9 P90 BN90S6**	507
190	36.9	2.8	4.8	3300	**S401_4.8 S2 M2SB6**	508	**S401_4.8 P90 BN90S6**	509
196	35.9	2.2	7.2	3280	**S401_7.2 S2 M2SA4**	508	**S401_7.2 P80 BN80B4**	509
197	35.6	1.4	7.1	1860	**S301_7.1 S2 M2SA4**	506	**S301_7.1 P80 BN80B4**	507
217	32.3	2.5	12.9	4420	**S501_12.9 S1 M1LA2**	510	**S501_12.9 P80 BN80A2**	511
226	31.1	1.3	12.4	3150	**S401_12.4 S1 M1LA2**	508	**S401_12.4 P80 BN80A2**	509
231	30.4	3.0	6.1	3120	**S401_6.1 S2 M2SA4**	508	**S401_6.1 P80 BN80B4**	509
233	30.1	1.9	3.9	1780	**S301_3.9 S2 M2SB6**	506	**S301_3.9 P90 BN90S6**	507
234	30.0	1.0	3.9	1220	**S201_3.9 S2 M2SB6**	504	**S201_3.9 P90 BN90S6**	505
239	29.3	1.7	5.8	1780	**S301_5.8 S2 M2SA4**	506	**S301_5.8 P80 BN80B4**	507
263	26.7	1.5	10.7	3000	**S401_10.7 S1 M1LA2**	508	**S401_10.7 P80 BN80A2**	509
268	26.2	3.2	10.5	4140	**S501_10.5 S1 M1LA2**	510	**S501_10.5 P80 BN80A2**	511
272	25.8	0.9	10.3	1730	**S301_10.3 S1 M1LA2**	506	**S301_10.3 P80 BN80A2**	507
284	24.7	2.0	4.9	1700	**S301_4.9 S2 M2SA4**	506	**S301_4.9 P80 BN80B4**	507
294	23.9	1.1	4.8	1180	**S201_4.8 S2 M2SA4**	504	**S201_4.8 P80 BN80B4**	505
296	23.7	1.3	3.1	1160	**S201_3.1 S2 M2SB6**	504	**S201_3.1 P90 BN90S6**	505
300	23.4	2.5	3.1	1670	**S301_3.1 S2 M2SB6**	506	**S301_3.1 P90 BN90S6**	507
315	22.3	1.1	8.9	1660	**S301_8.9 S1 M1LA2**	506	**S301_8.9 P80 BN80A2**	507



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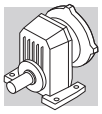
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
324	21.7	2.2	8.6	2820	**S401_8.6 S1 M1LA2**	508	**S401_8.6 P80 BN80A2**	509
355	19.8	2.5	3.9	1600	**S301_3.9 S2 M2SA4**	506	**S301_3.9 P80 BN80B4**	507
356	19.7	1.3	3.9	1130	**S201_3.9 S2 M2SA4**	504	**S201_3.9 P80 BN80B4**	505
377	18.6	1.6	2.4	1110	**S201_2.4 S2 M2SB6**	504	**S201_2.4 P90 BN90S6**	505
380	18.5	3.1	2.4	1560	**S301_2.4 S2 M2SB6**	506	**S301_2.4 P90 BN90S6**	507
388	18.1	1.2	7.2	1120	**S201_7.2 S1 M1LA2**	504	**S201_7.2 P80 BN80A2**	505
395	17.8	2.3	7.1	1560	**S301_7.1 S1 M1LA2**	506	**S301_7.1 P80 BN80A2**	507
450	15.6	1.7	3.1	1070	**S201_3.1 S2 M2SA4**	504	**S201_3.1 P80 BN80B4**	505
457	15.4	3.3	3.1	1490	**S301_3.1 S2 M2SA4**	506	**S301_3.1 P80 BN80B4**	507
479	14.7	2.7	5.8	1480	**S301_5.8 S1 M1LA2**	506	**S301_5.8 P80 BN80A2**	507
481	14.6	1.4	5.8	1060	**S201_5.8 S1 M1LA2**	504	**S201_5.8 P80 BN80A2**	505
486	14.5	1.4	1.9	1040	**S201_1.9 S2 M2SB6**	504	**S201_1.9 P90 BN90S6**	505
504	13.9	2.5	1.8	1440	**S301_1.8 S2 M2SB6**	506	**S301_1.8 P90 BN90S6**	507
568	12.4	3.2	4.9	1410	**S301_4.9 S1 M1LA2**	506	**S301_4.9 P80 BN80A2**	507
574	12.2	2.1	2.4	1010	**S201_2.4 S2 M2SA4**	504	**S201_2.4 P80 BN80B4**	505
587	12.0	1.8	4.8	1010	**S201_4.8 S1 M1LA2**	504	**S201_4.8 P80 BN80A2**	505
647	10.8	1.1	1.4	460	**S101_1.4 S2 M2SB6**	502	**S101_1.4 P90 BN90S6**	503
654	10.7	3.3	1.4	1330	**S301_1.4 S2 M2SB6**	506	**S301_1.4 P90 BN90S6**	507
661	10.6	1.9	1.4	960	**S201_1.4 S2 M2SB6**	504	**S201_1.4 P90 BN90S6**	505
712	9.9	2.1	3.9	960	**S201_3.9 S1 M1LA2**	504	**S201_3.9 P80 BN80A2**	505
728	9.6	1.0	3.8	480	**S101_3.8 S1 M1LA2**	502	**S101_3.8 P80 BN80A2**	503
739	9.5	1.8	1.9	940	**S201_1.9 S2 M2SA4**	504	**S201_1.9 P80 BN80B4**	505
747	9.4	1.1	1.9	460	**S101_1.9 S2 M2SA4**	502	**S101_1.9 P80 BN80B4**	503
767	9.2	3.3	1.8	1280	**S301_1.8 S2 M2SA4**	506	**S301_1.8 P80 BN80B4**	507
875	8.0	1.2	3.2	460	**S101_3.2 S1 M1LA2**	502	**S101_3.2 P80 BN80A2**	503
900	7.8	2.7	3.1	900	**S201_3.1 S1 M1LA2**	504	**S201_3.1 P80 BN80A2**	505
985	7.1	1.4	1.4	440	**S101_1.4 S2 M2SA4**	502	**S101_1.4 P80 BN80B4**	503
1006	7.0	2.4	1.4	860	**S201_1.4 S2 M2SA4**	504	**S201_1.4 P80 BN80B4**	505
1120	6.3	1.3	2.5	440	**S101_2.5 S1 M1LA2**	502	**S101_2.5 P80 BN80A2**	503
1149	6.1	3.4	2.4	840	**S201_2.4 S1 M1LA2**	504	**S201_2.4 P80 BN80A2**	505
1478	4.7	2.7	1.9	780	**S201_1.9 S1 M1LA2**	504	**S201_1.9 P80 BN80A2**	505
1493	4.7	1.7	1.9	410	**S101_1.9 S1 M1LA2**	502	**S101_1.9 P80 BN80A2**	503
1970	3.6	2.2	1.4	380	**S101_1.4 S1 M1LA2**	502	**S101_1.4 P80 BN80A2**	503

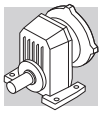
1.1 kW

n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
88	117.0	1.0	10.5	5650	**S501_10.5 S3 M3SA6**	510	**S501_10.5 P90 BN90L6**	511
105	98.1	1.3	8.8	5380	**S501_8.8 S3 M3SA6**	510	**S501_8.8 P90 BN90L6**	511
109	94.8	1.1	12.9	5320	**S501_12.9 S2 M2SB4**	510	**S501_12.9 P90 BN90S4**	511
124	82.8	1.7	7.4	5120	**S501_7.4 S3 M3SA6**	510	**S501_7.4 P90 BN90L6**	511
129	80.1	1.1	7.2	3550	**S401_7.2 S3 M3SA6**	508	**S401_7.2 P90 BN90L6**	509
134	76.9	1.4	10.5	5020	**S501_10.5 S2 M2SB4**	510	**S501_10.5 P90 BN90S4**	511
152	67.9	1.5	6.1	3400	**S401_6.1 S3 M3SA6**	508	**S401_6.1 P90 BN90L6**	509
152	67.8	2.2	6.1	4840	**S501_6.1 S3 M3SA6**	510	**S501_6.1 P90 BN90L6**	511
160	64.5	1.7	8.8	4770	**S501_8.8 S2 M2SB4**	510	**S501_8.8 P90 BN90S4**	511
162	63.5	0.9	8.6	3350	**S401_8.6 S2 M2SB4**	508	**S401_8.6 P90 BN90S4**	509
186	55.2	1.1	4.9	1740	**S301_4.9 S3 M3SA6**	506	**S301_4.9 P90 BN90L6**	507



1.1 kW

n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
189	54.4	2.4	7.4	4530	**S501_7.4 S2 M2SB4**	510	**S501_7.4 P90 BN90S4**	511
190	54.1	1.9	4.8	3200	**S401_4.8 S3 M3SA6**	508	**S401_4.8 P90 BN90L6**	509
194	53.2	3.3	4.8	4500	**S501_4.8 S3 M3SA6**	510	**S501_4.8 P90 BN90L6**	511
196	52.6	1.5	7.2	3180	**S401_7.2 S2 M2SB4**	508	**S401_7.2 P90 BN90S4**	509
197	52.1	1.0	7.1	1730	**S301_7.1 S2 M2SB4**	506	**S301_7.1 P90 BN90S4**	507
217	47.4	1.7	12.9	4350	**S501_12.9 S2 M2SA2**	510	**S501_12.9 P80 BN80B2**	511
231	44.6	2.0	6.1	3040	**S401_6.1 S2 M2SB4**	508	**S401_6.1 P90 BN90S4**	509
231	44.5	2.9	6.1	4270	**S501_6.1 S2 M2SB4**	510	**S501_6.1 P90 BN90S4**	511
233	44.1	1.3	3.9	1670	**S301_3.9 S3 M3SA6**	506	**S301_3.9 P90 BN90L6**	507
239	43.0	1.2	5.8	1670	**S301_5.8 S2 M2SB4**	506	**S301_5.8 P90 BN90S4**	507
241	42.7	2.5	3.8	2990	**S401_3.8 S3 M3SA6**	508	**S401_3.8 P90 BN90L6**	509
263	39.2	1.0	10.7	2930	**S401_10.7 S2 M2SA2**	508	**S401_10.7 P80 BN80B2**	509
268	38.4	2.2	10.5	4090	**S501_10.5 S2 M2SA2**	510	**S501_10.5 P80 BN80B2**	511
284	36.3	1.4	4.9	1610	**S301_4.9 S2 M2SB4**	506	**S301_4.9 P90 BN90S4**	507
290	35.5	2.5	4.8	2850	**S401_4.8 S2 M2SB4**	508	**S401_4.8 P90 BN90S4**	509
300	34.3	1.7	3.1	1580	**S301_3.1 S3 M3SA6**	506	**S301_3.1 P90 BN90L6**	507
301	34.2	3.1	3.1	2810	**S401_3.1 S3 M3SA6**	508	**S401_3.1 P90 BN90L6**	509
319	32.2	2.6	8.8	3870	**S501_8.8 S2 M2SA2**	510	**S501_8.8 P80 BN80B2**	511
324	31.8	1.5	8.6	2760	**S401_8.6 S2 M2SA2**	508	**S401_8.6 P80 BN80B2**	509
355	29.0	1.7	3.9	1530	**S301_3.9 S2 M2SB4**	506	**S301_3.9 P90 BN90S4**	507
367	28.0	3.2	3.8	2650	**S401_3.8 S2 M2SB4**	508	**S401_3.8 P90 BN90S4**	509
377	27.3	1.1	2.4	1010	**S201_2.4 S3 M3SA6**	504	**S201_2.4 P90 BN90L6**	505
380	27.1	2.1	2.4	1490	**S301_2.4 S3 M3SA6**	506	**S301_2.4 P90 BN90L6**	507
391	26.3	2.4	7.2	2610	**S401_7.2 S2 M2SA2**	508	**S401_7.2 P80 BN80B2**	509
395	26.1	1.5	7.1	1500	**S301_7.1 S2 M2SA2**	506	**S301_7.1 P80 BN80B2**	507
450	22.9	1.1	3.1	990	**S201_3.1 S2 M2SB4**	504	**S201_3.1 P90 BN90S4**	505
457	22.5	2.2	3.1	1430	**S301_3.1 S2 M2SB4**	506	**S301_3.1 P90 BN90S4**	507
462	22.3	3.1	6.1	2490	**S401_6.1 S2 M2SA2**	508	**S401_6.1 P80 BN80B2**	509
479	21.5	1.9	5.8	1420	**S301_5.8 S2 M2SA2**	506	**S301_5.8 P80 BN80B2**	507
481	21.4	1.0	5.8	990	**S201_5.8 S2 M2SA2**	504	**S201_5.8 P80 BN80B2**	505
486	21.2	0.9	1.9	960	**S201_1.9 S3 M3SA6**	504	**S201_1.9 P90 BN90L6**	505
497	20.7	3.4	1.9	2420	**S401_1.9 S3 M3SA6**	508	**S401_1.9 P90 BN90L6**	509
504	20.4	1.7	1.8	1380	**S301_1.8 S3 M3SA6**	506	**S301_1.8 P90 BN90L6**	507
568	18.1	2.2	4.9	1360	**S301_4.9 S2 M2SA2**	506	**S301_4.9 P80 BN80B2**	507
574	17.9	1.5	2.4	940	**S201_2.4 S2 M2SB4**	504	**S201_2.4 P90 BN90S4**	505
578	17.8	2.8	2.4	1340	**S301_2.4 S2 M2SB4**	506	**S301_2.4 P90 BN90S4**	507
587	17.5	1.2	4.8	950	**S201_4.8 S2 M2SA2**	504	**S201_4.8 P80 BN80B2**	505
654	15.7	2.2	1.4	1290	**S301_1.4 S3 M3SA6**	506	**S301_1.4 P90 BN90L6**	507
661	15.6	1.3	1.4	900	**S201_1.4 S3 M3SA6**	504	**S201_1.4 P90 BN90L6**	505
710	14.5	2.8	3.9	1280	**S301_3.9 S2 M2SA2**	506	**S301_3.9 P80 BN80B2**	507
712	14.5	1.5	3.9	910	**S201_3.9 S2 M2SA2**	504	**S201_3.9 P80 BN80B2**	505
739	13.9	1.2	1.9	890	**S201_1.9 S2 M2SB4**	504	**S201_1.9 P90 BN90S4**	505
767	13.4	2.2	1.8	1240	**S301_1.8 S2 M2SB4**	506	**S301_1.8 P90 BN90S4**	507
900	11.4	1.8	3.1	860	**S201_3.1 S2 M2SA2**	504	**S201_3.1 P80 BN80B2**	505
985	10.4	1.0	1.4	390	**S101_1.4 S2 M2SB4**	502	**S101_1.4 P90 BN90S4**	503
995	10.3	2.9	1.4	1150	**S301_1.4 S2 M2SB4**	506	**S301_1.4 P90 BN90S4**	507
1006	10.2	1.7	1.4	820	**S201_1.4 S2 M2SB4**	504	**S201_1.4 P90 BN90S4**	505
1149	9.0	2.3	2.4	810	**S201_2.4 S2 M2SA2**	504	**S201_2.4 P80 BN80B2**	505
1478	7.0	1.9	1.9	750	**S201_1.9 S2 M2SA2**	504	**S201_1.9 P80 BN80B2**	505
1493	6.9	1.2	1.9	380	**S101_1.9 S2 M2SA2**	502	**S101_1.9 P80 BN80B2**	503
1970	5.2	1.5	1.4	350	**S101_1.4 S2 M2SA2**	502	**S101_1.4 P80 BN80B2**	503

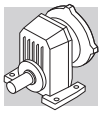


1.1 kW

n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
2013	5.1	2.5	1.4	690	**S201_1.4 S2 M2SA2**	504	**S201_1.4 P80 BN80B2**	505

1.5 kW

n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
88	117.0	1.0	10.5	5650	**S501_10.5 S3 M3SA6**	510	**S501_10.5 P90 BN90L6**	511
105	98.1	1.3	8.8	5380	**S501_8.8 S3 M3SA6**	510	**S501_8.8 P90 BN90L6**	511
109	94.8	1.1	12.9	5320	**S501_12.9 S3 M3SA4**	510	**S501_12.9 P90 BN90S4**	511
124	82.8	1.7	7.4	5120	**S501_7.4 S3 M3SA6**	510	**S501_7.4 P90 BN90L6**	511
129	80.1	1.1	7.2	3550	**S401_7.2 S3 M3SA6**	508	**S401_7.2 P90 BN90L6**	509
134	76.9	1.4	10.5	5020	**S501_10.5 S3 M3SA4**	510	**S501_10.5 P90 BN90S4**	511
152	67.9	1.5	6.1	3400	**S401_6.1 S3 M3SA6**	508	**S401_6.1 P90 BN90L6**	509
152	67.8	2.2	6.1	4840	**S501_6.1 S3 M3SA6**	510	**S501_6.1 P90 BN90L6**	511
160	64.5	1.7	8.8	4770	**S501_8.8 S3 M3SA4**	510	**S501_8.8 P90 BN90S4**	511
162	63.5	0.9	8.6	3350	**S401_8.6 S3 M3SA4**	508	**S401_8.6 P90 BN90S4**	509
186	55.2	1.1	4.9	1740	**S301_4.9 S3 M3SA6**	506	**S301_4.9 P90 BN90L6**	507
189	54.4	2.4	7.4	4530	**S501_7.4 S3 M3SA4**	510	**S501_7.4 P90 BN90S4**	511
190	54.1	1.9	4.8	3200	**S401_4.8 S3 M3SA6**	508	**S401_4.8 P90 BN90L6**	509
194	53.2	3.3	4.8	4500	**S501_4.8 S3 M3SA6**	510	**S501_4.8 P90 BN90L6**	511
196	52.6	1.5	7.2	3180	**S401_7.2 S3 M3SA4**	508	**S401_7.2 P90 BN90S4**	509
197	52.1	1.0	7.1	1730	**S301_7.1 S3 M3SA4**	506	**S301_7.1 P90 BN90S4**	507
217	47.4	1.7	12.9	4350	**S501_12.9 S2 M2SA2**	510	**S501_12.9 P80 BN80B2**	511
231	44.6	2.0	6.1	3040	**S401_6.1 S3 M3SA4**	508	**S401_6.1 P90 BN90S4**	509
231	44.5	2.9	6.1	4270	**S501_6.1 S3 M3SA4**	510	**S501_6.1 P90 BN90S4**	511
233	44.1	1.3	3.9	1670	**S301_3.9 S3 M3SA6**	506	**S301_3.9 P90 BN90L6**	507
239	43.0	1.2	5.8	1670	**S301_5.8 S3 M3SA4**	506	**S301_5.8 P90 BN90S4**	507
241	42.7	2.5	3.8	2990	**S401_3.8 S3 M3SA6**	508	**S401_3.8 P90 BN90L6**	509
263	39.2	1.0	10.7	2930	**S401_10.7 S2 M2SA2**	508	**S401_10.7 P80 BN80B2**	509
268	38.4	2.2	10.5	4090	**S501_10.5 S2 M2SA2**	510	**S501_10.5 P80 BN80B2**	511
284	36.3	1.4	4.9	1610	**S301_4.9 S3 M3SA4**	506	**S301_4.9 P90 BN90S4**	507
290	35.5	2.5	4.8	2850	**S401_4.8 S3 M3SA4**	508	**S401_4.8 P90 BN90S4**	509
300	34.3	1.7	3.1	1580	**S301_3.1 S3 M3SA6**	506	**S301_3.1 P90 BN90L6**	507
301	34.2	3.1	3.1	2810	**S401_3.1 S3 M3SA6**	508	**S401_3.1 P90 BN90L6**	509
319	32.2	2.6	8.8	3870	**S501_8.8 S2 M2SA2**	510	**S501_8.8 P80 BN80B2**	511
324	31.8	1.5	8.6	2760	**S401_8.6 S2 M2SA2**	508	**S401_8.6 P80 BN80B2**	509
355	29.0	1.7	3.9	1530	**S301_3.9 S3 M3SA4**	506	**S301_3.9 P90 BN90S4**	507
367	28.0	3.2	3.8	2650	**S401_3.8 S3 M3SA4**	508	**S401_3.8 P90 BN90S4**	509
377	27.3	1.1	2.4	1010	**S201_2.4 S3 M3SA6**	504	**S201_2.4 P90 BN90L6**	505
380	27.1	2.1	2.4	1490	**S301_2.4 S3 M3SA6**	506	**S301_2.4 P90 BN90L6**	507
391	26.3	2.4	7.2	2610	**S401_7.2 S2 M2SA2**	508	**S401_7.2 P80 BN80B2**	509
395	26.1	1.5	7.1	1500	**S301_7.1 S2 M2SA2**	506	**S301_7.1 P80 BN80B2**	507
450	22.9	1.1	3.1	990	**S201_3.1 S3 M3SA4**	504	**S201_3.1 P90 BN90S4**	505
457	22.5	2.2	3.1	1430	**S301_3.1 S3 M3SA4**	506	**S301_3.1 P90 BN90S4**	507
462	22.3	3.1	6.1	2490	**S401_6.1 S2 M2SA2**	508	**S401_6.1 P80 BN80B2**	509
479	21.5	1.9	5.8	1420	**S301_5.8 S2 M2SA2**	506	**S301_5.8 P80 BN80B2**	507
481	21.4	1.0	5.8	990	**S201_5.8 S2 M2SA2**	504	**S201_5.8 P80 BN80B2**	505
486	21.2	0.9	1.9	960	**S201_1.9 S3 M3SA6**	504	**S201_1.9 P90 BN90L6**	505
497	20.7	3.4	1.9	2420	**S401_1.9 S3 M3SA6**	508	**S401_1.9 P90 BN90L6**	509

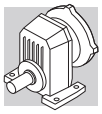


1.5 kW

n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
504	20.4	1.7	1.8	1380	**S301_1.8 S3 M3SA6**	506	**S301_1.8 P90 BN90L6**	507
568	18.1	2.2	4.9	1360	**S301_4.9 S2 M2SA2**	506	**S301_4.9 P80 BN80B2**	507
574	17.9	1.5	2.4	940	**S201_2.4 S3 M3SA4**	504	**S201_2.4 P90 BN90S4**	505
578	17.8	2.8	2.4	1340	**S301_2.4 S3 M3SA4**	506	**S301_2.4 P90 BN90S4**	507
587	17.5	1.2	4.8	950	**S201_4.8 S2 M2SA2**	504	**S201_4.8 P80 BN80B2**	505
654	15.7	2.2	1.4	1290	**S301_1.4 S3 M3SA6**	506	**S301_1.4 P90 BN90L6**	507
661	15.6	1.3	1.4	900	**S201_1.4 S3 M3SA6**	504	**S201_1.4 P90 BN90L6**	505
710	14.5	2.8	3.9	1280	**S301_3.9 S2 M2SA2**	506	**S301_3.9 P80 BN80B2**	507
712	14.5	1.5	3.9	910	**S201_3.9 S2 M2SA2**	504	**S201_3.9 P80 BN80B2**	505
739	13.9	1.2	1.9	890	**S201_1.9 S3 M3SA4**	504	**S201_1.9 P90 BN90S4**	505
767	13.4	2.2	1.8	1240	**S301_1.8 S3 M3SA4**	506	**S301_1.8 P90 BN90S4**	507
900	11.4	1.8	3.1	860	**S201_3.1 S2 M2SA2**	504	**S201_3.1 P80 BN80B2**	505
985	10.4	1.0	1.4	390	**S101_1.4 S3 M3SA4**	502	**S101_1.4 P90 BN90S4**	503
995	10.3	2.9	1.4	1150	**S301_1.4 S3 M3SA4**	506	**S301_1.4 P90 BN90S4**	507
1006	10.2	1.7	1.4	820	**S201_1.4 S3 M3SA4**	504	**S201_1.4 P90 BN90S4**	505
1149	9.0	2.3	2.4	810	**S201_2.4 S2 M2SA2**	504	**S201_2.4 P80 BN80B2**	505
1478	7.0	1.9	1.9	750	**S201_1.9 S2 M2SA2**	504	**S201_1.9 P80 BN80B2**	505
1493	6.9	1.2	1.9	380	**S101_1.9 S2 M2SA2**	502	**S101_1.9 P80 BN80B2**	503
1970	5.2	1.5	1.4	350	**S101_1.4 S2 M2SA2**	502	**S101_1.4 P80 BN80B2**	503
2013	5.1	2.5	1.4	690	**S201_1.4 S2 M2SA2**	504	**S201_1.4 P80 BN80B2**	505

2.2 kW

n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
154	134.1	1.1	6.1	4520	**S501_6.1 S3 M3LC6**	510	**S501_6.1 P112 BN112M6**	511
191	108.1	1.2	7.4	4280	**S501_7.4 S3 M3LA4**	510	**S501_7.4 P100 BN100LA4**	511
192	107.0	1.0	4.8	2880	**S401_4.8 S3 M3LC6**	508	**S401_4.8 P112 BN112M6**	509
196	105.2	1.7	4.8	4230	**S501_4.8 S3 M3LC6**	510	**S501_4.8 P112 BN112M6**	511
232	88.6	1.0	6.1	2790	**S401_6.1 S3 M3LA4**	508	**S401_6.1 P100 BN100LA4**	509
233	88.4	1.5	6.1	4060	**S501_6.1 S3 M3LA4**	510	**S501_6.1 P100 BN100LA4**	511
242	85.1	2.1	3.8	4000	**S501_3.8 S3 M3LC6**	510	**S501_3.8 P112 BN112M6**	511
244	84.4	1.2	3.8	2730	**S401_3.8 S3 M3LC6**	508	**S401_3.8 P112 BN112M6**	509
269	76.6	1.1	10.5	3910	**S501_10.5 S3 M3SA2**	510	**S501_10.5 P90 BN90L2**	511
292	70.6	1.3	4.8	2640	**S401_4.8 S3 M3LA4**	508	**S401_4.8 P100 BN100LA4**	509
297	69.4	2.2	4.8	3790	**S501_4.8 S3 M3LA4**	510	**S501_4.8 P100 BN100LA4**	511
305	67.6	1.6	3.1	2590	**S401_3.1 S3 M3LC6**	508	**S401_3.1 P112 BN112M6**	509
306	67.4	2.4	3.0	3750	**S501_3.0 S3 M3LC6**	510	**S501_3.0 P112 BN112M6**	511
320	64.3	1.3	8.8	3730	**S501_8.8 S3 M3SA2**	510	**S501_8.8 P90 BN90L2**	511
367	56.1	2.7	3.8	3570	**S501_3.8 S3 M3LA4**	510	**S501_3.8 P100 BN100LA4**	511
370	55.7	1.6	3.8	2490	**S401_3.8 S3 M3LA4**	508	**S401_3.8 P100 BN100LA4**	509
380	54.2	1.8	7.4	3540	**S501_7.4 S3 M3SA2**	510	**S501_7.4 P90 BN90L2**	511
384	53.6	1.1	2.4	1260	**S301_2.4 S3 M3LC6**	506	**S301_2.4 P112 BN112M6**	507
386	53.3	2.8	2.4	3500	**S501_2.4 S3 M3LC6**	510	**S501_2.4 P112 BN112M6**	511
389	52.9	2.0	2.4	2450	**S401_2.4 S3 M3LC6**	508	**S401_2.4 P112 BN112M6**	509
393	52.4	1.2	7.2	2460	**S401_7.2 S3 M3SA2**	508	**S401_7.2 P90 BN90L2**	509
460	44.7	1.1	3.1	1240	**S301_3.1 S3 M3LA4**	506	**S301_3.1 P100 BN100LA4**	507
462	44.6	2.0	3.1	2340	**S401_3.1 S3 M3LA4**	508	**S401_3.1 P100 BN100LA4**	509
463	44.5	1.6	6.1	2360	**S401_6.1 S3 M3SA2**	508	**S401_6.1 P90 BN90L2**	509

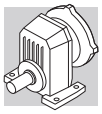


2.2 kW

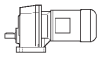
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
463	44.4	3.2	3.0	3340	**S501_3.0 S3 M3LA4**	510	**S501_3.0 P100 BN100LA4**	511
464	44.4	2.3	6.1	3340	**S501_6.1 S3 M3SA2**	510	**S501_6.1 P90 BN90L2**	511
481	42.8	0.9	5.8	1250	**S301_5.8 S3 M3SA2**	506	**S301_5.8 P90 BN90L2**	507
502	41.0	1.7	1.9	2280	**S401_1.9 S3 M3LC6**	508	**S401_1.9 P112 BN112M6**	509
520	39.6	3.2	1.8	3210	**S501_1.8 S3 M3LC6**	510	**S501_1.8 P112 BN112M6**	511
570	36.1	1.1	4.9	1220	**S301_4.9 S3 M3SA2**	506	**S301_4.9 P90 BN90L2**	507
581	35.4	2.0	4.8	2210	**S401_4.8 S3 M3SA2**	508	**S401_4.8 P90 BN90L2**	509
582	35.4	1.4	2.4	1190	**S301_2.4 S3 M3LA4**	506	**S301_2.4 P100 BN100LA4**	507
590	34.9	2.6	2.4	2200	**S401_2.4 S3 M3LA4**	508	**S401_2.4 P100 BN100LA4**	509
592	34.8	3.4	4.8	3110	**S501_4.8 S3 M3SA2**	510	**S501_4.8 P90 BN90L2**	511
661	31.2	1.1	1.4	1140	**S301_1.4 S3 M3LC6**	506	**S301_1.4 P112 BN112M6**	507
682	30.2	2.3	1.4	2090	**S401_1.4 S3 M3LC6**	508	**S401_1.4 P112 BN112M6**	509
712	28.9	1.4	3.9	1160	**S301_3.9 S3 M3SA2**	506	**S301_3.9 P90 BN90L2**	507
737	27.9	2.5	3.8	2070	**S401_3.8 S3 M3SA2**	508	**S401_3.8 P90 BN90L2**	509
761	27.0	2.2	1.9	2040	**S401_1.9 S3 M3LA4**	508	**S401_1.9 P100 BN100LA4**	509
772	26.7	1.1	1.8	1120	**S301_1.8 S3 M3LA4**	506	**S301_1.8 P100 BN100LA4**	507
903	22.8	0.9	3.1	730	**S201_3.1 S3 M3SA2**	504	**S201_3.1 P90 BN90L2**	505
918	22.4	1.8	3.1	1100	**S301_3.1 S3 M3SA2**	506	**S301_3.1 P90 BN90L2**	507
921	22.4	3.1	3.1	1940	**S401_3.1 S3 M3SA2**	508	**S401_3.1 P90 BN90L2**	509
1002	20.6	1.5	1.4	1050	**S301_1.4 S3 M3LA4**	506	**S301_1.4 P100 BN100LA4**	507
1034	19.9	3.0	1.4	1860	**S401_1.4 S3 M3LA4**	508	**S401_1.4 P100 BN100LA4**	509
1153	17.9	1.2	2.4	710	**S201_2.4 S3 M3SA2**	504	**S201_2.4 P90 BN90L2**	505
1161	17.7	2.3	2.4	1030	**S301_2.4 S3 M3SA2**	506	**S301_2.4 P90 BN90L2**	507
1483	13.9	0.9	1.9	670	**S201_1.9 S3 M3SA2**	504	**S201_1.9 P90 BN90L2**	505
1539	13.4	1.8	1.8	960	**S301_1.8 S3 M3SA2**	506	**S301_1.8 P90 BN90L2**	507
1997	10.3	2.3	1.4	890	**S301_1.4 S3 M3SA2**	506	**S301_1.4 P90 BN90L2**	507
2020	10.2	1.3	1.4	630	**S201_1.4 S3 M3SA2**	504	**S201_1.4 P90 BN90L2**	505

3.0 kW

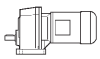
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
198	141.9	1.2	4.8	4040	**S501_4.8 S4 M4SA6**	510	**S501_4.8 P132 BN132S6**	511
233	120.6	1.1	6.1	3910	**S501_6.1 S3 M3LB4**	510	**S501_6.1 P100 BN100LB4**	511
245	114.8	1.5	3.8	3840	**S501_3.8 S4 M4SA6**	510	**S501_3.8 P132 BN132S6**	511
247	113.9	0.9	3.8	2550	**S401_3.8 S4 M4SA6**	508	**S401_3.8 P132 BN132S6**	509
292	96.2	0.9	4.8	2490	**S401_4.8 S3 M3LB4**	508	**S401_4.8 P100 BN100LB4**	509
297	94.6	1.6	4.8	3670	**S501_4.8 S3 M3LB4**	510	**S501_4.8 P100 BN100LB4**	511
308	91.2	1.2	3.1	2440	**S401_3.1 S4 M4SA6**	508	**S401_3.1 P132 BN132S6**	509
309	90.9	1.8	3.0	3630	**S501_3.0 S4 M4SA6**	510	**S501_3.0 P132 BN132S6**	511
326	86.1	1.0	8.8	3600	**S501_8.8 S3 M3LA2**	510	**S501_8.8 P100 BN100L2**	511
367	76.5	2.0	3.8	3470	**S501_3.8 S3 M3LB4**	510	**S501_3.8 P100 BN100LB4**	511
370	75.9	1.2	3.8	2370	**S401_3.8 S3 M3LB4**	508	**S401_3.8 P100 BN100LB4**	509
386	72.6	1.4	7.4	3440	**S501_7.4 S3 M3LA2**	510	**S501_7.4 P100 BN100L2**	511
390	71.9	2.1	2.4	3390	**S501_2.4 S4 M4SA6**	510	**S501_2.4 P132 BN132S6**	511
393	71.4	1.5	2.4	2320	**S401_2.4 S4 M4SA6**	508	**S401_2.4 P132 BN132S6**	509
462	60.8	1.5	3.1	2250	**S401_3.1 S3 M3LB4**	508	**S401_3.1 P100 BN100LB4**	509
463	60.6	2.3	3.0	3260	**S501_3.0 S3 M3LB4**	510	**S501_3.0 P100 BN100LB4**	511
471	59.6	1.2	6.1	2260	**S401_6.1 S3 M3LA2**	508	**S401_6.1 P100 BN100L2**	509

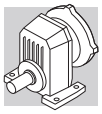


3.0 kW

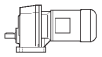
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
472	59.4	1.7	6.1	3260	**S501_6.1 S3 M3LA2**	510	**S501_6.1 P100 BN100L2**	511
508	55.3	1.3	1.9	2170	**S401_1.9 S4 M4SA6**	508	**S401_1.9 P132 BN132S6**	509
526	53.4	2.3	1.8	3120	**S501_1.8 S4 M4SA6**	510	**S501_1.8 P132 BN132S6**	511
582	48.2	1.0	2.4	1080	**S301_2.4 S3 M3LB4**	506	**S301_2.4 P100 BN100LB4**	507
586	47.9	2.7	2.4	3040	**S501_2.4 S3 M3LB4**	510	**S501_2.4 P100 BN100LB4**	511
590	47.6	1.9	2.4	2120	**S401_2.4 S3 M3LB4**	508	**S401_2.4 P100 BN100LB4**	509
592	47.4	1.5	4.8	2130	**S401_4.8 S3 M3LA2**	508	**S401_4.8 P100 BN100L2**	509
602	46.6	2.6	4.8	3030	**S501_4.8 S3 M3LA2**	510	**S501_4.8 P100 BN100L2**	511
661	42.4	2.9	1.4	2920	**S501_1.4 S4 M4SA6**	510	**S501_1.4 P132 BN132S6**	511
689	40.7	1.7	1.4	2010	**S401_1.4 S4 M4SA6**	508	**S401_1.4 P132 BN132S6**	509
725	38.7	1.0	3.9	1070	**S301_3.9 S3 M3LA2**	506	**S301_3.9 P100 BN100L2**	507
744	37.7	3.2	3.8	2850	**S501_3.8 S3 M3LA2**	510	**S501_3.8 P100 BN100L2**	511
750	37.4	1.9	3.8	2000	**S401_3.8 S3 M3LA2**	508	**S401_3.8 P100 BN100L2**	509
761	36.9	1.6	1.9	1970	**S401_1.9 S3 M3LB4**	508	**S401_1.9 P100 BN100LB4**	509
789	35.6	3.1	1.8	2780	**S501_1.8 S3 M3LB4**	510	**S501_1.8 P100 BN100LB4**	511
934	30.1	1.3	3.1	1020	**S301_3.1 S3 M3LA2**	506	**S301_3.1 P100 BN100L2**	507
937	30.0	2.3	3.1	1880	**S401_3.1 S3 M3LA2**	508	**S401_3.1 P100 BN100L2**	509
1002	28.0	1.1	1.4	980	**S301_1.4 S3 M3LB4**	506	**S301_1.4 P100 BN100LB4**	507
1034	27.2	2.2	1.4	1820	**S401_1.4 S3 M3LB4**	508	**S401_1.4 P100 BN100LB4**	509
1181	23.8	1.7	2.4	980	**S301_2.4 S3 M3LA2**	506	**S301_2.4 P100 BN100L2**	507
1196	23.5	3.0	2.4	1760	**S401_2.4 S3 M3LA2**	508	**S401_2.4 P100 BN100L2**	509
1544	18.2	2.6	1.9	1630	**S401_1.9 S3 M3LA2**	508	**S401_1.9 P100 BN100L2**	509
1566	17.9	1.3	1.8	910	**S301_1.8 S3 M3LA2**	506	**S301_1.8 P100 BN100L2**	507
2032	13.8	1.7	1.4	850	**S301_1.4 S3 M3LA2**	506	**S301_1.4 P100 BN100L2**	507
2056	13.7	1.0	1.4	580	**S201_1.4 S3 M3LA2**	504	**S201_1.4 P100 BN100L2**	505

4.0 kW

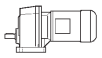
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
200	187.2	0.9	4.8	3810	**S501_4.8 S4 M4LA6**	510	**S501_4.8 P132 BN132MA6**	511
247	151.4	1.2	3.8	3650	**S501_3.8 S4 M4LA6**	510	**S501_3.8 P132 BN132MA6**	511
293	127.9	1.2	4.8	3530	**S501_4.8 S3 M3LC4**	510	**S501_4.8 P112 BN112M4**	511
312	119.9	1.3	3.0	3470	**S501_3.0 S4 M4LA6**	510	**S501_3.0 P132 BN132MA6**	511
362	103.5	1.4	3.8	3360	**S501_3.8 S3 M3LC4**	510	**S501_3.8 P112 BN112M4**	511
388	96.5	1.0	7.4	3320	**S501_7.4 S3 M3LB2**	510	**S501_7.4 P112 BN112M2**	511
395	94.9	1.6	2.4	3270	**S501_2.4 S4 M4LA6**	510	**S501_2.4 P132 BN132MA6**	511
397	94.2	1.1	2.4	2180	**S401_2.4 S4 M4LA6**	508	**S401_2.4 P132 BN132MA6**	509
455	82.2	1.1	3.1	2130	**S401_3.1 S3 M3LC4**	508	**S401_3.1 P112 BN112M4**	509
457	82.0	1.7	3.0	3170	**S501_3.0 S3 M3LC4**	510	**S501_3.0 P112 BN112M4**	511
474	79.0	1.3	6.1	3160	**S501_6.1 S3 M3LB2**	510	**S501_6.1 P112 BN112M2**	511
513	73.0	1.0	1.9	2050	**S401_1.9 S4 M4LA6**	508	**S401_1.9 P132 BN132MA6**	509
531	70.5	1.8	1.8	3020	**S501_1.8 S4 M4LA6**	510	**S501_1.8 P132 BN132MA6**	511
577	64.8	2.0	2.4	2970	**S501_2.4 S3 M3LC4**	510	**S501_2.4 P112 BN112M4**	511
581	64.4	1.4	2.4	2030	**S401_2.4 S3 M3LC4**	508	**S401_2.4 P112 BN112M4**	509
594	63.0	1.1	4.8	2040	**S401_4.8 S3 M3LB2**	508	**S401_4.8 P112 BN112M2**	509
604	62.0	1.9	4.8	2960	**S501_4.8 S3 M3LB2**	510	**S501_4.8 P112 BN112M2**	511
669	56.0	2.2	1.4	2830	**S501_1.4 S4 M4LA6**	510	**S501_1.4 P132 BN132MA6**	511
697	53.7	1.3	1.4	1920	**S401_1.4 S4 M4LA6**	508	**S401_1.4 P132 BN132MA6**	509



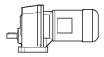
4.0 kW

n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
747	50.1	2.4	3.8	2790	**S501_3.8 S3 M3LB2**	510	**S501_3.8 P112 BN112M2**	511
751	49.9	1.2	1.9	1900	**S401_1.9 S3 M3LC4**	508	**S401_1.9 P112 BN112M4**	509
753	49.7	1.4	3.8	1930	**S401_3.8 S3 M3LB2**	508	**S401_3.8 P112 BN112M2**	509
777	48.2	2.3	1.8	2730	**S501_1.8 S3 M3LC4**	510	**S501_1.8 P112 BN112M4**	511
937	39.9	1.0	3.1	940	**S301_3.1 S3 M3LB2**	506	**S301_3.1 P112 BN112M2**	507
940	39.8	1.8	3.1	1820	**S401_3.1 S3 M3LB2**	508	**S401_3.1 P112 BN112M2**	509
943	39.7	2.8	3.0	2610	**S501_3.0 S3 M3LB2**	510	**S501_3.0 P112 BN112M2**	511
978	38.3	2.9	1.4	2560	**S501_1.4 S3 M3LC4**	510	**S501_1.4 P112 BN112M4**	511
1019	36.7	1.6	1.4	1760	**S401_1.4 S3 M3LC4**	508	**S401_1.4 P112 BN112M4**	509
1185	31.6	1.3	2.4	910	**S301_2.4 S3 M3LB2**	506	**S301_2.4 P112 BN112M2**	507
1192	31.4	3.2	2.4	2430	**S501_2.4 S3 M3LB2**	510	**S501_2.4 P112 BN112M2**	511
1200	31.2	2.2	2.4	1710	**S401_2.4 S3 M3LB2**	508	**S401_2.4 P112 BN112M2**	509
1550	24.2	2.0	1.9	1590	**S401_1.9 S3 M3LB2**	508	**S401_1.9 P112 BN112M2**	509
1572	23.8	1.0	1.8	860	**S301_1.8 S3 M3LB2**	506	**S301_1.8 P112 BN112M2**	507
2039	18.4	1.3	1.4	810	**S301_1.4 S3 M3LB2**	506	**S301_1.4 P112 BN112M2**	507
2105	17.8	2.7	1.4	1460	**S401_1.4 S3 M3LB2**	508	**S401_1.4 P112 BN112M2**	509

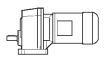
5.5 kW

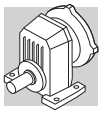
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
311	165.8	1.0	3.0	3260	**S501_3.0 S4 M4LB6**	510	**S501_3.0 P132 BN132MB6**	511
375	137.3	1.1	3.8	3150	**S501_3.8 S4 M4SA4**	510	**S501_3.8 P132 BN132S4**	511
393	131.1	1.1	2.4	3090	**S501_2.4 S4 M4LB6**	510	**S501_2.4 P132 BN132MB6**	511
473	108.8	1.3	3.0	3000	**S501_3.0 S4 M4SA4**	510	**S501_3.0 P132 BN132S4**	511
477	107.9	0.9	6.1	3020	**S501_6.1 S4 M4SA2**	510	**S501_6.1 P132 BN132SA2**	511
529	97.4	1.3	1.8	2880	**S501_1.8 S4 M4LB6**	510	**S501_1.8 P132 BN132MB6**	511
598	86.1	1.5	2.4	2830	**S501_2.4 S4 M4SA4**	510	**S501_2.4 P132 BN132S4**	511
602	85.5	1.1	2.4	1870	**S401_2.4 S4 M4SA4**	508	**S401_2.4 P132 BN132S4**	509
608	84.6	1.4	4.8	2840	**S501_4.8 S4 M4SA2**	510	**S501_4.8 P132 BN132SA2**	511
665	77.4	1.6	1.4	2720	**S501_1.4 S4 M4LB6**	510	**S501_1.4 P132 BN132MB6**	511
693	74.3	0.9	1.4	1780	**S401_1.4 S4 M4LB6**	508	**S401_1.4 P132 BN132MB6**	509
752	68.4	1.8	3.8	2690	**S501_3.8 S4 M4SA2**	510	**S501_3.8 P132 BN132SA2**	511
758	67.9	1.0	3.8	1810	**S401_3.8 S4 M4SA2**	508	**S401_3.8 P132 BN132SA2**	509
778	66.2	0.9	1.9	1770	**S401_1.9 S4 M4SA4**	508	**S401_1.9 P132 BN132S4**	509
805	63.9	1.7	1.8	2610	**S501_1.8 S4 M4SA4**	510	**S501_1.8 P132 BN132S4**	511
947	54.4	1.3	3.1	1730	**S401_3.1 S4 M4SA2**	508	**S401_3.1 P132 BN132SA2**	509
950	54.2	2.0	3.0	2530	**S501_3.0 S4 M4SA2**	510	**S501_3.0 P132 BN132SA2**	511
1013	50.8	2.2	1.4	2450	**S501_1.4 S4 M4SA4**	510	**S501_1.4 P132 BN132S4**	511
1056	48.7	1.2	1.4	1660	**S401_1.4 S4 M4SA4**	508	**S401_1.4 P132 BN132S4**	509
1200	42.9	2.3	2.4	2370	**S501_2.4 S4 M4SA2**	510	**S501_2.4 P132 BN132SA2**	511
1209	42.6	1.6	2.4	1640	**S401_2.4 S4 M4SA2**	508	**S401_2.4 P132 BN132SA2**	509
1561	33.0	1.5	1.9	1530	**S401_1.9 S4 M4SA2**	508	**S401_1.9 P132 BN132SA2**	509
1616	31.8	2.7	1.8	2170	**S501_1.8 S4 M4SA2**	510	**S501_1.8 P132 BN132SA2**	511
2034	25.3	3.4	1.4	2030	**S501_1.4 S4 M4SA2**	510	**S501_1.4 P132 BN132SA2**	511
2119	24.3	2.0	1.4	1410	**S401_1.4 S4 M4SA2**	508	**S401_1.4 P132 BN132SA2**	509

7.5 kW

n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
473	148.4	0.9	3.0	2810	**S501_3.0 S4 M4LA4**	510	**S501_3.0 P132 BN132MA4**	511
534	131.4	1.0	1.8	2690			**S501_1.8 P160 BN160M6**	511
598	117.3	1.1	2.4	2670	**S501_2.4 S4 M4LA4**	510	**S501_2.4 P132 BN132MA4**	511
611	115.0	1.0	4.8	2690	**S501_4.8 S4 M4SB2**	510	**S501_4.8 P132 BN132SB2**	511
672	104.4	1.2	1.4	2560			**S501_1.4 P160 BN160M6**	511
755	93.0	1.3	3.8	2570	**S501_3.8 S4 M4SB2**	510	**S501_3.8 P132 BN132SB2**	511
805	87.1	1.3	1.8	2490	**S501_1.8 S4 M4LA4**	510	**S501_1.8 P132 BN132MA4**	511
950	73.9	0.9	3.1	1610	**S401_3.1 S4 M4SB2**	508	**S401_3.1 P132 BN132SB2**	509
953	73.7	1.5	3.0	2440	**S501_3.0 S4 M4SB2**	510	**S501_3.0 P132 BN132SB2**	511
1013	69.3	1.6	1.4	2350	**S501_1.4 S4 M4LA4**	510	**S501_1.4 P132 BN132MA4**	511
1056	66.5	0.9	1.4	1540	**S401_1.4 S4 M4LA4**	508	**S401_1.4 P132 BN132MA4**	509
1205	58.3	1.7	2.4	2290	**S501_2.4 S4 M4SB2**	510	**S501_2.4 P132 BN132SB2**	511
1213	57.9	1.2	2.4	1540	**S401_2.4 S4 M4SB2**	508	**S401_2.4 P132 BN132SB2**	509
1566	44.8	1.1	1.9	1450	**S401_1.9 S4 M4SB2**	508	**S401_1.9 P132 BN132SB2**	509
1622	43.3	2.0	1.8	2110	**S501_1.8 S4 M4SB2**	510	**S501_1.8 P132 BN132SB2**	511
2041	34.4	2.5	1.4	1980	**S501_1.4 S4 M4SB2**	510	**S501_1.4 P132 BN132SB2**	511
2127	33.0	1.5	1.4	1350	**S401_1.4 S4 M4SB2**	508	**S401_1.4 P132 BN132SB2**	509

9.2 kW

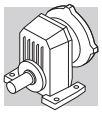
n_2 min^{-1}	M_2 Nm	S	i	R_{n2} N			IEC	
598	143.9	0.9	2.4	2530	**S501_2.4 S4 M4LB4**	510	**S501_2.4 P132 BN132MB4**	511
755	114.1	1.1	3.8	2470	**S501_3.8 S4 M4LA2**	510	**S501_3.8 P132 BN132M2**	511
805	106.9	1.0	1.8	2390	**S501_1.8 S4 M4LB4**	510	**S501_1.8 P132 BN132MB4**	511
953	90.4	1.2	3.0	2360	**S501_3.0 S4 M4LA2**	510	**S501_3.0 P132 BN132M2**	511
1013	85.0	1.3	1.4	2270	**S501_1.4 S4 M4LB4**	510	**S501_1.4 P132 BN132MB4**	511
1205	71.5	1.4	2.4	2220	**S501_2.4 S4 M4LA2**	510	**S501_2.4 P132 BN132M2**	511
1213	71.0	1.0	2.4	1460	**S401_2.4 S4 M4LA2**	508	**S401_2.4 P132 BN132M2**	509
1622	53.1	1.6	1.8	2060	**S501_1.8 S4 M4LA2**	510	**S501_1.8 P132 BN132M2**	511
2041	42.2	2.0	1.4	1930	**S501_1.4 S4 M4LA2**	510	**S501_1.4 P132 BN132M2**	511
2127	40.5	1.2	1.4	1300	**S401_1.4 S4 M4LA2**	508	**S401_1.4 P132 BN132M2**	509



S 10 — 21 Nm

	i	n_1 = 2800 min^{-1}					n_1 = 1400 min^{-1}					
		n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	
S 10 1_1.4	1.4	1972	8.0	1.7	800	310	986	10.0	1.1	800	390	503
S 10 1_1.9	1.9	1489	8.0	1.3	800	360	745	10.0	0.80	800	460	
S 10 1_2.5	2.5	1120	8.0	0.96	800	420	560	10.0	0.60	800	520	
S 10 1_3.2	3.2	875	10.0	0.93	800	440	438	12.0	0.56	800	560	
S 10 1_3.8	3.8	727	10.0	0.78	800	480	364	12.0	0.47	800	610	
S 10 1_4.7	4.7	592	10.0	0.63	800	520	296	12.0	0.38	800	660	
S 10 1_6.1	6.1	458	12.0	0.59	800	560	229	15.0	0.37	800	710	
S 10 1_6.9	6.9	406	12.0	0.52	800	580	203	15.0	0.33	800	740	
S 10 1_8.9	8.9	315	8.0	0.27	800	700	158	10.0	0.17	800	880	
S 10 1_10.3	10.3	272	8.0	0.23	800	740	136	10.0	0.15	800	930	
S 10 1_12.3	12.3	227	8.0	0.19	800	800	114	10.0	0.12	800	1000	

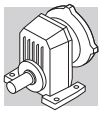
	i	n_1 = 900 min^{-1}					n_1 = 500 min^{-1}					
		n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	
S 10 1_1.4	1.4	634	12.0	0.81	800	450	352	14.0	0.53	800	560	503
S 10 1_1.9	1.9	479	12.0	0.61	800	520	266	14.0	0.40	800	640	
S 10 1_2.5	2.5	360	12.0	0.46	800	600	200	14.0	0.30	800	740	
S 10 1_3.2	3.2	281	14.0	0.42	800	650	156	17.0	0.28	800	790	
S 10 1_3.8	3.8	234	14.0	0.35	800	700	130	17.0	0.24	800	850	
S 10 1_4.7	4.7	190	14.0	0.28	800	770	106	17.0	0.19	800	930	
S 10 1_6.1	6.1	147	17.0	0.27	800	820	82	21	0.18	800	1000	
S 10 1_6.9	6.9	130	17.0	0.24	800	860	72	21	0.16	800	1040	
S 10 1_8.9	8.9	101	12.0	0.13	800	1020	56	14.0	0.08	800	1200	
S 10 1_10.3	10.3	87	12.0	0.11	800	1080	49	14.0	0.07	800	1200	
S 10 1_12.3	12.3	73	12.0	0.09	800	1160	41	14.0	0.06	800	1200	



S 20 — 37 Nm

	i	n_1 = 2800 min^{-1}					n_1 = 1400 min^{-1}					
		n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	
S 20 1_1.4	1.4	2014	13.0	2.8	1000	590	1007	17.0	1.8	1000	740	505
S 20 1_1.9	1.9	1481	13.0	2.1	1000	680	741	17.0	1.3	1000	860	
S 20 1_2.4	2.4	1148	21	2.6	640	680	574	26	1.6	850	860	
S 20 1_3.1	3.1	900	21	2.0	730	750	450	26	1.3	960	950	
S 20 1_3.9	3.9	712	21	1.6	820	840	356	26	0.99	1000	1060	
S 20 1_4.8	4.8	587	21	1.3	910	920	294	26	0.82	1000	1160	
S 20 1_5.8	5.8	481	21	1.1	960	1000	241	26	0.67	1000	1260	
S 20 1_7.2	7.2	388	21	0.87	980	1090	194	26	0.54	1000	1370	
S 20 1_8.5	8.5	329	13.0	0.46	1000	1240	165	17.0	0.30	1000	1500	
S 20 1_10.8	10.8	260	13.0	0.36	1000	1350	130	17.0	0.24	1000	1500	
S 20 1_12.4	12.4	225	13.0	0.31	1000	1430	113	17.0	0.20	1000	1500	

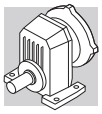
	i	n_1 = 900 min^{-1}					n_1 = 500 min^{-1}					
		n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	
S 20 1_1.4	1.4	647	20	1.4	1000	850	360	24	0.92	1000	1040	505
S 20 1_1.9	1.9	476	20	1.0	1000	990	265	24	0.68	1000	1210	
S 20 1_2.4	2.4	369	30	1.2	990	990	205	37	0.81	1000	1200	
S 20 1_3.1	3.1	289	30	0.93	1000	1110	161	37	0.64	1000	1340	
S 20 1_3.9	3.9	229	30	0.73	1000	1230	127	37	0.50	1000	1490	
S 20 1_4.8	4.8	189	30	0.60	1000	1350	105	37	0.41	1000	1500	
S 20 1_5.8	5.8	155	30	0.50	1000	1460	86	37	0.34	1000	1500	
S 20 1_7.2	7.2	125	30	0.40	1000	1500	69	37	0.27	1000	1500	
S 20 1_8.5	8.5	106	20	0.23	1000	1500	59	24	0.15	1000	1500	
S 20 1_10.8	10.8	84	20	0.18	1000	1500	47	24	0.12	1000	1500	
S 20 1_12.4	12.4	72	20	0.15	1000	1500	40	24	0.10	1000	1500	



S 30 — 70 Nm

	i	n_1 = 2800 min^{-1}					n_1 = 1400 min^{-1}					
		n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	
S 30 1_1.4	1.4	1986	24	5.1	1500	770	993	30	3.2	1500	970	507
S 30 1_1.8	1.8	1530	24	3.9	1500	870	765	30	2.5	1500	1090	
S 30 1_2.4	2.4	1157	40	4.9	1270	850	579	50	3.1	1500	1070	
S 30 1_3.1	3.1	915	40	3.9	1470	950	458	50	2.4	1500	1200	
S 30 1_3.9	3.9	711	40	3.0	1500	1070	355	50	1.9	1500	1360	
S 30 1_4.9	4.9	568	40	2.4	1500	1190	284	50	1.5	1500	1500	
S 30 1_5.8	5.8	479	40	2.0	1500	1280	239	50	1.3	1500	1610	
S 30 1_7.1	7.1	395	40	1.7	1500	1390	197	50	1.1	1500	1750	
S 30 1_8.9	8.9	315	24	0.81	1500	1650	157	30	0.50	1500	2080	
S 30 1_10.3	10.3	272	24	0.70	1500	1740	136	30	0.44	1500	2190	
S 30 1_13.1	13.1	213	24	0.55	1500	1900	107	30	0.34	1500	2400	

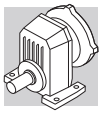
	i	n_1 = 900 min^{-1}					n_1 = 500 min^{-1}					
		n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	
S 30 1_1.4	1.4	638	35	2.4	1500	1120	355	42	1.6	1500	1360	507
S 30 1_1.8	1.8	492	35	1.8	1500	1260	273	42	1.2	1500	1540	
S 30 1_2.4	2.4	372	58	2.3	1500	1240	207	70	1.5	1500	1510	
S 30 1_3.1	3.1	294	58	1.8	1500	1390	163	70	1.2	1500	1700	
S 30 1_3.9	3.9	228	58	1.4	1500	1570	127	70	0.95	1500	1920	
S 30 1_4.9	4.9	183	58	1.1	1500	1740	101	70	0.76	1500	2120	
S 30 1_5.8	5.8	154	58	0.95	1500	1870	85	70	0.64	1500	2280	
S 30 1_7.1	7.1	127	58	0.79	1500	2030	71	62	0.47	1500	2400	
S 30 1_8.9	8.9	101	35	0.38	1500	2400	56	42	0.25	1500	2400	
S 30 1_10.3	10.3	87	35	0.33	1500	2400	49	42	0.22	1500	2400	
S 30 1_13.1	13.1	69	35	0.26	1500	2400	38	37	0.15	1500	2400	



S 40 — 125 Nm

	i	n_1 = 2800 min^{-1}					n_1 = 1400 min^{-1}					
		n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	
S 40 1_1.4	1.4	2059	48	10.6	2000	1270	1029	60	6.6	2000	1600	509
S 40 1_1.9	1.9	1514	48	7.8	2000	1450	757	60	4.9	2000	1830	
S 40 1_2.4	2.4	1172	70	8.8	1860	1490	586	90	5.6	2000	1870	
S 40 1_3.1	3.1	918	70	6.9	2000	1660	459	90	4.4	2000	2080	
S 40 1_3.8	3.8	735	70	5.5	2000	1830	367	90	3.5	2000	2290	
S 40 1_4.8	4.8	580	70	4.3	2000	2020	290	90	2.8	2000	2530	
S 40 1_6.1	6.1	461	70	3.5	2000	2220	231	90	2.2	2000	2790	
S 40 1_7.2	7.2	392	63	2.6	2000	2410	196	80	1.7	2000	3030	
S 40 1_8.6	8.6	324	48	1.7	2000	2670	162	60	1.0	2000	3370	
S 40 1_10.7	10.7	262	40	1.1	2000	2930	131	50	0.70	2000	3690	
S 40 1_12.4	12.4	226	40	1.0	2000	3100	113	50	0.60	2000	3800	

	i	n_1 = 900 min^{-1}					n_1 = 500 min^{-1}					
		n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	
S 40 1_1.4	1.4	662	70	4.9	2000	1850	368	85	3.3	2000	2250	509
S 40 1_1.9	1.9	486	70	3.6	2000	2120	270	85	2.5	2000	2580	
S 40 1_2.4	2.4	377	105	4.2	2000	2160	209	125	2.8	2000	2650	
S 40 1_3.1	3.1	295	105	3.3	2000	2400	164	125	2.2	2000	2940	
S 40 1_3.8	3.8	236	105	2.7	2000	2650	131	125	1.8	2000	3240	
S 40 1_4.8	4.8	186	105	2.1	2000	2930	104	125	1.4	2000	3580	
S 40 1_6.1	6.1	148	105	1.7	2000	3220	82	110	1.0	2000	3800	
S 40 1_7.2	7.2	126	90	1.2	2000	3530	70	90	0.67	2000	3800	
S 40 1_8.6	8.6	104	70	0.78	2000	3800	58	85	0.53	2000	3800	
S 40 1_10.7	10.7	84	58	0.52	2000	3800	47	70	0.35	2000	3800	
S 40 1_12.4	12.4	73	58	0.45	2000	3800	40	70	0.30	2000	3800	



S 50 — 200 Nm

	i	n_1 = 2800 min^{-1}					n_1 = 1400 min^{-1}					
		n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	
S 50 1_1.4	1.4	1972	85	17.9	730	1720	986	110	11.6	730	2150	511
S 50 1_1.8	1.8	1564	85	14.2	1220	1920	782	110	9.2	1370	2400	
S 50 1_2.4	2.4	1162	100	12.4	930	2110	581	130	8.1	970	2640	
S 50 1_3.0	3.0	921	110	10.8	860	2300	461	140	6.9	1020	2880	
S 50 1_3.8	3.8	729	120	9.3	640	2480	365	150	5.8	860	3130	
S 50 1_4.8	4.8	589	120	7.6	880	2710	295	150	4.7	1160	3420	
S 50 1_6.1	6.1	462	100	4.9	1980	3100	231	130	3.2	2330	3880	
S 50 1_7.4	7.4	378	100	4.0	2060	3340	189	130	2.6	2400	4190	
S 50 1_8.8	8.8	319	85	2.9	2400	3640	160	110	1.9	2400	4570	
S 50 1_10.5	10.5	268	85	2.4	2400	3880	134	110	1.6	2400	4870	
S 50 1_12.9	12.9	217	80	1.9	2400	4200	109	100	1.2	2400	5300	

	i	n_1 = 900 min^{-1}					n_1 = 500 min^{-1}					
		n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	n_2 min^{-1}	M_{n2} Nm	P_{n1} kW	R_{n1} N	R_{n2} N	
S 50 1_1.4	1.4	634	125	8.5	1010	2510	352	155	5.8	1040	3040	511
S 50 1_1.8	1.8	503	125	6.7	1730	2790	279	155	4.6	1940	3380	
S 50 1_2.4	2.4	373	150	6.0	1160	3060	207	180	4.0	1530	3730	
S 50 1_3.0	3.0	296	160	5.1	1290	3350	164	200	3.5	1310	4050	
S 50 1_3.8	3.8	234	175	4.4	940	3620	130	200	2.8	1740	4460	
S 50 1_4.8	4.8	189	175	3.5	1290	3960	105	180	2.0	2400	4970	
S 50 1_6.1	6.1	149	150	2.4	2400	4500	83	150	1.3	2400	5620	
S 50 1_7.4	7.4	122	140	1.8	2400	4900	68	140	1.0	2400	6100	
S 50 1_8.8	8.8	103	125	1.4	2400	5310	57	125	0.80	2400	6580	
S 50 1_10.5	10.5	86	115	1.1	2400	5700	48	115	0.60	2400	7050	
S 50 1_12.9	12.9	70	100	0.70	2400	6210	39	100	0.40	2400	7200	

75 MOTOR AVAILABILITY

Please be aware that motor-gearbox combinations resulting from the following charts are purely based on geometrical compatibility.

When selecting a gearmotor, refer to procedure specified at paragraph 12 and observe particularly the condition $S \geq f_s$.

(E 69)

		IEC_ BN (IM B5)								
		BN								
P_{n1}(#) [kW]	2p	0.37	0.75	1.5	2.2	4	4	9.2	18.5	22
	4p	0.25	0.55	1.1	1.85	3	4	9.2	15	22
	6p	0.12	0.37	0.75	1.1	1.85	2.2	5.5	11	15
		P63	P71	P80	P90	P100	P112	P132	P160	P180
S 10 1	i =	1.4_12.3	1.4_12.3	1.4_8.9	1.4_8.9	1.4_8.9	1.4_8.9			
S 20 1		1.9_12.4	1.9_12.4	1.4_10.8	1.4_10.8	1.4_10.8	1.4_10.8			
S 30 1		2.4_13.1	2.4_13.1	1.4_13.1	1.4_13.1	1.4_13.1	1.4_13.1	1.4_4.9		
S 40 1		3.1_12.4	3.1_12.4	1.4_12.4	1.4_12.4	1.4_12.4	1.4_12.4	1.4_6.1		
S 50 1		3.8_12.9	3.8_12.9	1.4_12.9	1.4_12.9	1.4_12.9	1.4_12.9	1.4_7.4	1.4_7.4	1.4_7.4

(#) P_{n1} = maximum installable power on input P_

(E 70)

		M					
		M05	M1	M2	M3	M4	M5
S 10 1	i =	1.4_12.3	1.4_6.9	1.4_8.9	1.4_8.9		
S 20 1		1.9_12.4	1.9_8.5	1.4_10.8	1.4_10.8		
S 30 1			2.4_10.3	1.4_13.1	1.4_13.1	1.4_4.9	
S 40 1			3.1_12.4	1.4_12.4	1.4_12.4	1.4_6.1	
S 50 1			3.8_12.9	1.4_12.9	1.4_12.9	1.4_7.4	1.4_7.4

76 MOMENT OF INERTIA

The following charts indicate moment of inertia values Jr [kgm^2] referred to the gear unit high speed shaft. A key to the symbols used follows:

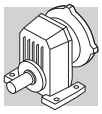
Values under this icon refer to compact gear units, without motor. To obtain the overall moment of inertia for the gearmotor just add the value of the inertia for the specific compact motor, given in the relevant rating chart.

Values under this symbol refer to gearboxes with IEC motor adaptor (IEC size...).

This symbol refers to gearbox values.

S 10

	i	J (•10-4) [kgm^2]							
			IEC						
			63	71	80	90	100	112	
S 10 1_1.4	1.4	0.33	1.8	1.8	3.2	3.1	4.4	4.4	1.2
S 10 1_1.9	1.9	0.22	1.7	1.7	3.1	3.0	4.3	4.3	1.1
S 10 1_2.5	2.5	0.16	1.6	1.6	3.0	2.9	4.2	4.2	1.0
S 10 1_3.2	3.2	0.10	1.6	1.6	3.0	2.9	4.2	4.2	0.97
S 10 1_3.9	3.9	0.08	1.5	1.5	2.9	2.9	4.2	4.2	0.95
S 10 1_4.7	4.7	0.06	1.5	1.5	2.9	2.8	4.1	4.1	0.93
S 10 1_6.1	6.1	0.04	1.5	1.5	2.9	2.8	4.1	4.1	0.92
S 10 1_6.9	6.9	0.03	1.5	1.5	2.9	2.8	4.1	4.1	0.91
S 10 1_8.9	8.9	0.02	1.5	1.5	2.9	2.8	4.1	4.1	0.90
S 10 1_10.3	10.3	0.02	1.5	1.5	—	—	—	—	0.89
S 10 1_12.3	12.3	0.01	1.5	1.5	—	—	—	—	0.89

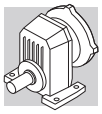


S 20

	i	J (•10-4) [kgm2]							
			IEC						
			63	71	80	90	100	112	
S 20 1_1.4	1.4	0.73	—	—	3.6	3.5	4.8	4.8	2.7
S 20 1_1.9	1.9	0.48	1.9	1.9	3.3	3.3	4.6	4.6	2.4
S 20 1_2.4	2.4	0.34	1.8	1.8	3.2	3.1	4.4	4.4	2.3
S 20 1_3.1	3.1	0.20	1.7	1.7	3.0	3.0	4.3	4.3	2.1
S 20 1_3.9	3.9	0.14	1.6	1.6	3.0	2.9	4.2	4.2	2.1
S 20 1_4.8	4.8	0.12	1.6	1.6	3.0	2.9	4.2	4.2	2.0
S 20 1_5.8	5.8	0.08	1.6	1.5	2.9	2.9	4.2	4.2	2.0
S 20 1_7.2	7.2	0.06	1.5	1.5	2.9	2.8	4.1	4.1	2.0
S 20 1_8.5	8.5	0.05	1.5	1.5	2.9	2.8	4.1	4.1	2.0
S 20 1_10.8	10.8	0.03	1.5	1.5	2.9	2.8	4.1	4.1	1.9
S 20 1_12.4	12.4	0.02	1.5	1.5	—	—	—	—	1.9

S 30

	i	J (•10-4) [kgm2]								
			IEC							
			63	71	80	90	100	112	132	
S 30 1_1.4	1.4	1.5	—	—	4.3	4.3	5.6	5.6	18	3.8
S 30 1_1.8	1.8	1.1	—	—	3.9	3.8	5.1	5.1	18	3.4
S 30 1_2.4	2.4	0.59	2.1	2.0	3.4	3.4	4.7	4.7	17	2.9
S 30 1_3.1	3.1	0.45	1.9	1.9	3.3	3.2	4.5	4.5	17	2.8
S 30 1_3.9	3.9	0.33	1.8	1.8	3.2	3.1	4.4	4.4	17	2.7
S 30 1_4.9	4.9	0.24	1.7	1.7	3.1	3.0	4.3	4.3	17	2.6
S 30 1_5.8	5.8	0.19	1.7	1.7	3.0	3.0	4.3	4.3	—	2.6
S 30 1_7.1	7.1	0.14	1.6	1.6	3.0	2.9	4.2	4.2	—	2.5
S 30 1_8.9	8.9	0.10	1.6	1.6	2.9	2.9	4.2	4.2	—	2.5
S 30 1_10.3	10.3	0.08	1.5	1.5	2.9	2.9	4.2	4.2	—	2.4
S 30 1_13.1	13.1	0.05	1.5	1.5	2.9	2.8	4.1	4.1	—	2.4

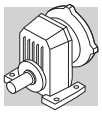


S 40

	i	J (•10-4) [kgm2]								
			IEC							
			63	71	80	90	100	112	132	
S 40 1_1.4	1.4	3.7	—	—	6.5	6.5	7.8	7.8	23	14
S 40 1_1.9	1.9	2.4	—	—	5.2	5.2	6.5	6.5	21	13
S 40 1_2.4	2.4	1.6	—	—	4.4	4.4	5.7	5.7	21	12
S 40 1_3.1	3.1	1.1	2.6	2.6	4.0	3.9	5.2	5.2	20	12
S 40 1_3.8	3.8	0.82	2.3	2.3	3.7	3.6	4.9	4.9	18	11
S 40 1_4.8	4.8	0.50	2.0	2.0	3.3	3.3	4.6	4.6	18	11
S 40 1_6.1	6.1	0.39	1.8	1.8	3.2	3.2	4.5	4.5	18	11
S 40 1_7.2	7.2	0.30	1.8	1.8	3.1	3.1	4.4	4.4	—	11
S 40 1_8.6	8.6	0.22	1.7	1.7	3.1	3.0	4.3	4.3	—	11
S 40 1_10.7	10.7	0.15	1.6	1.6	3.0	2.9	4.2	4.2	—	11
S 40 1_12.4	12.4	0.12	1.6	1.6	3.0	2.8	4.2	4.2	—	11

S 50

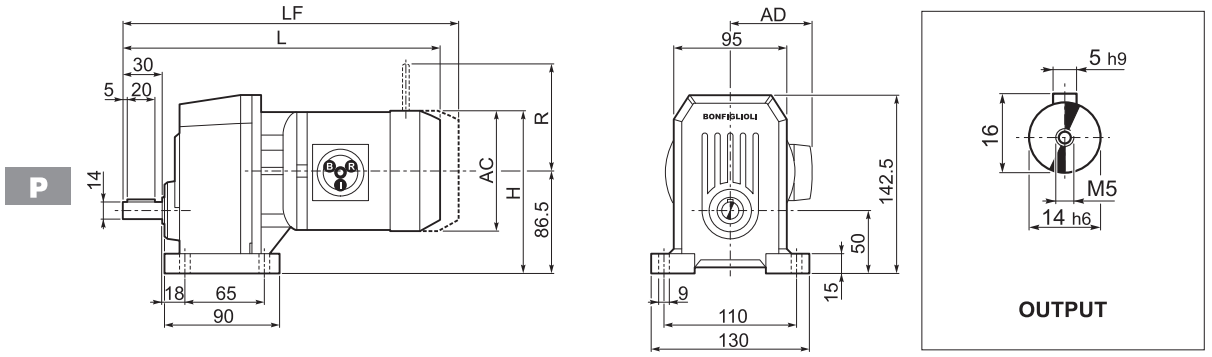
	i	J (•10-4) [kgm2]										
			IEC									
			63	71	80	90	100	112	132	160	180	
S 50 1_1.4	1.4	8.2	—	—	11	11	12	12	27	86	84	19
S 50 1_1.8	1.8	5.9	—	—	8.8	8.7	10	10	25	84	82	16
S 50 1_2.4	2.4	3.9	—	—	6.8	6.7	8.0	8.0	23	82	80	14
S 50 1_3.0	3.0	2.7	—	—	5.5	5.5	6.8	6.8	22	81	79	13
S 50 1_3.8	3.8	1.9	3.3	3.3	4.7	4.6	5.9	5.9	21	80	78	12
S 50 1_4.8	4.8	1.4	2.8	2.8	4.2	4.1	5.4	5.4	21	79	77	12
S 50 1_6.1	6.1	0.89	2.4	2.4	3.7	3.7	5.0	5.0	21	79	77	11
S 50 1_7.4	7.4	0.63	2.1	2.1	3.5	3.4	4.7	4.7	20	79	77	11
S 50 1_8.8	8.8	0.50	2.0	2.0	3.4	3.3	4.6	4.6	—	—	—	11
S 50 1_10.5	10.5	0.36	1.8	1.8	3.2	3.1	4.4	4.4	—	—	—	11
S 50 1_12.9	12.9	0.25	1.7	1.7	3.1	3.0	4.3	4.3	—	—	—	11



77 DIMENSIONS

S 10...M

P



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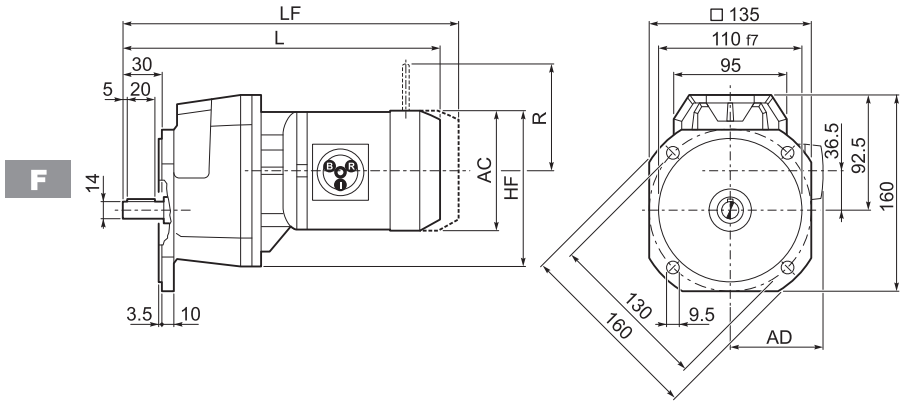
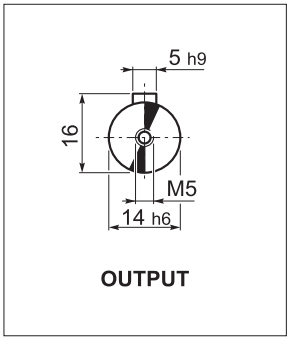
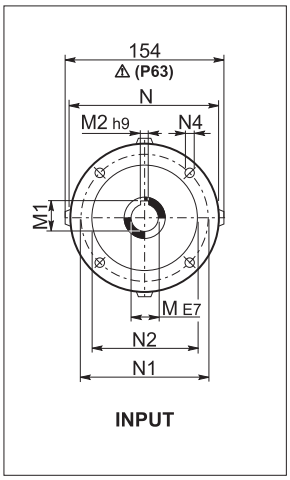
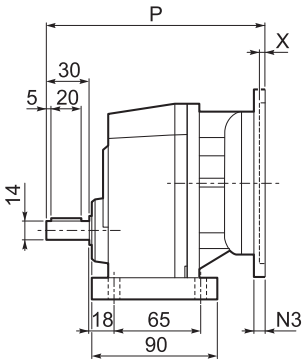


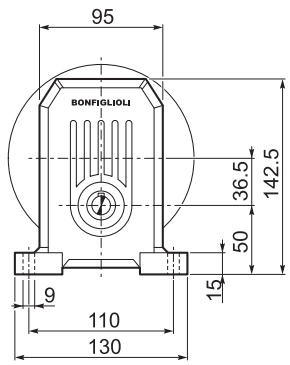
									M...FD M...FA		M...FD		M...FA	
			AC	H	HF	L	AD	Kg	LF	Kg	R	AD	R	AD
S 10 1	**S05**	**M05**	121	147	143	315	95	8	381	11	96	122	116	95
S 10 1	**S1**	**M1**	137	155	151	344	102	10	405	13	103	135	124	108
S 10 1	**S2**	**M2S**	156	164	160	367	111	13	443	17	129	146	134	119
S 10 1	**S3**	**M3S**	195	184	180	416	135	19	512	24	160	158	160	142
S 10 1	**S3**	**M3L**	195	184	180	448	135	21	539	26	160	158	160	142

S 10...P (IEC)









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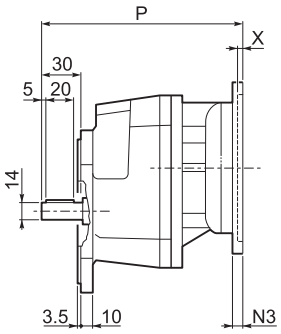
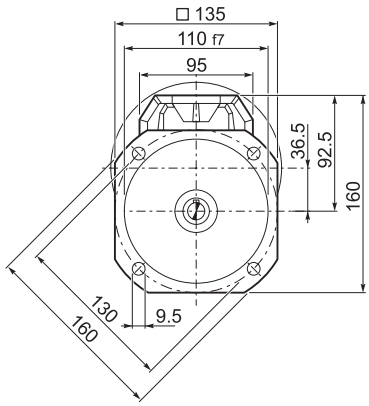
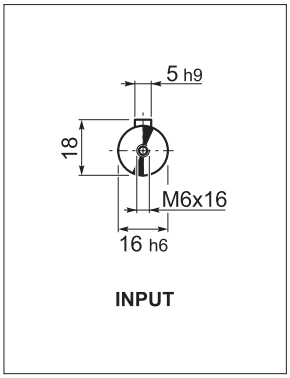


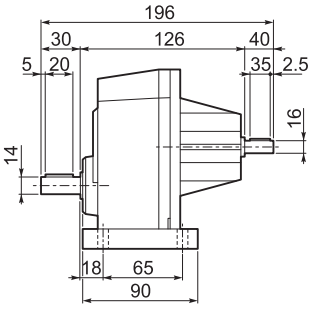


F

		M	M1	M2	N	N1	N2	N3	N4	P	X	Kg
S 10 1	**P63**	11	12.8	4	140	115	95	—	M8x10	189	4	5
S 10 1	**P71**	14	16.3	5	160	130	110	—	M8x10	189	4.5	5
S 10 1	**P80**	19	21.8	6	200	165	130	—	M10x14.5	208	4	6
S 10 1	**P90**	24	27.3	8	200	165	130	—	M10x14.5	208	4	6
S 10 1	**P100**	28	31.3	8	250	215	180	—	M12x16	218	4.5	10
S 10 1	**P112**	28	31.3	8	250	215	180	—	M12x16	218	4.5	10

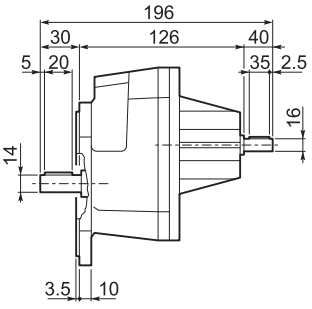
S 10...HS





P

Kg	4.4



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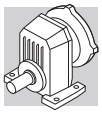
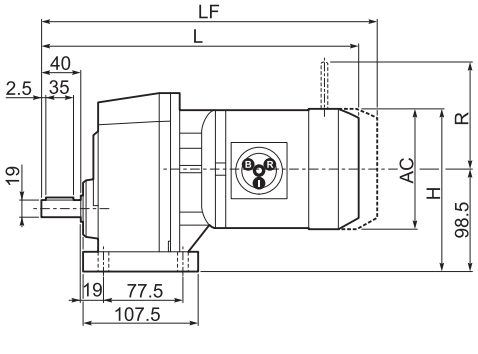
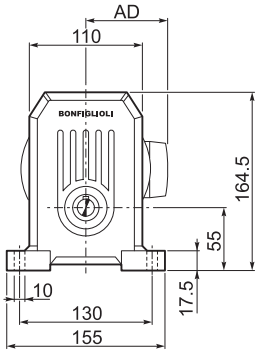
Kg	4.5

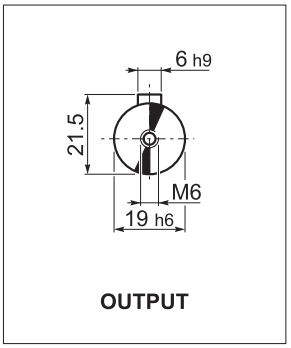


S 20...M

P







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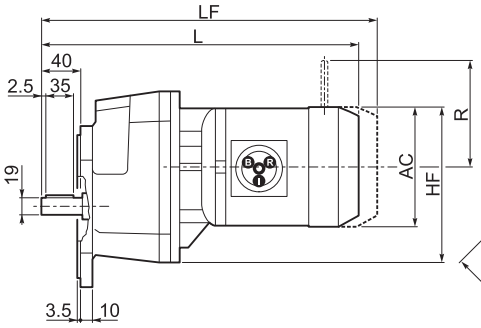
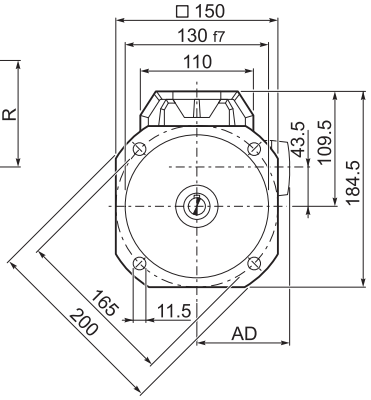
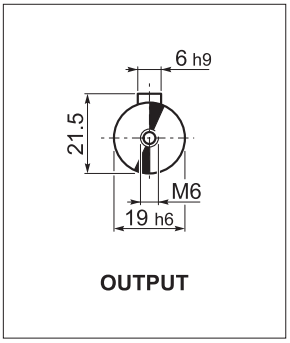
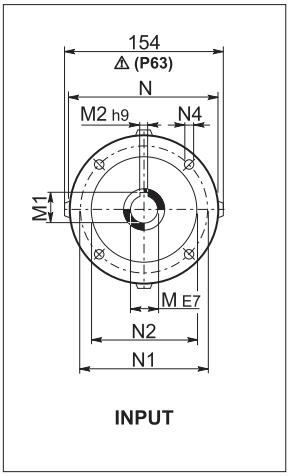


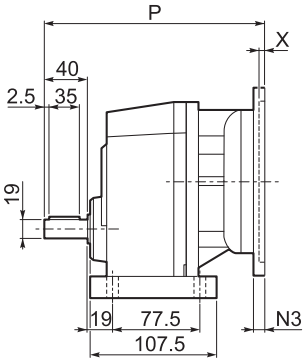


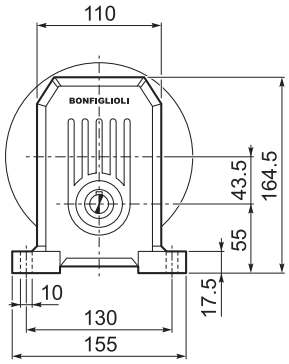
									M...FD M...FA		M...FD		M...FA	
			AC	H	HF	L	AD	Kg	LF	Kg	R	AD	R	AD
S 20 1	**S05**	**M05**	121	159	153	333.5	95	10	399.5	12	96	122	116	95
S 20 1	**S1**	**M1**	137	167	161	362.5	102	12	423.5	14	103	135	124	108
S 20 1	**S2**	**M2S**	156	176	170	385.5	111	16	461.5	19	129	146	134	119
S 20 1	**S3**	**M3S**	195	196	190	434.5	135	20	530.5	25	160	158	160	142
S 20 1	**S3**	**M3L**	195	196	190	466.5	135	26	557.5	31	160	158	160	142

S 20...P(IEC)









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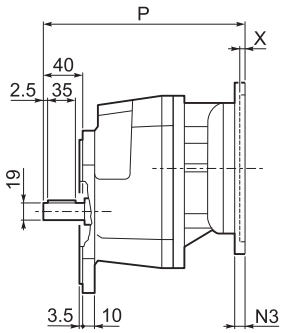
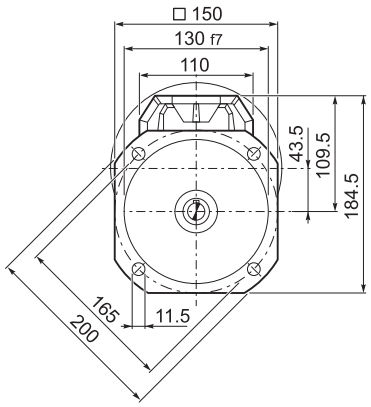
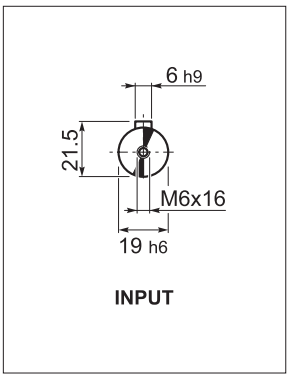


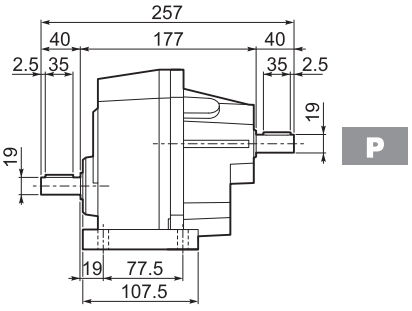


F

		M	M1	M2	N	N1	N2	N3	N4	P	X	Kg
S 20 1	**P63**	11	12.8	4	140	115	95	—	M8x10	207	4	6
S 20 1	**P71**	14	16.3	5	160	130	110	—	M8x10	207	4.5	6
S 20 1	**P80**	19	21.8	6	200	165	130	—	M10x14.5	227	4	7
S 20 1	**P90**	24	27.3	8	200	165	130	—	M10x14.5	227	4	7
S 20 1	**P100**	28	31.3	8	250	215	180	—	M12x16	237	4.5	11
S 20 1	**P112**	28	31.3	8	250	215	180	—	M12x16	237	4.5	11

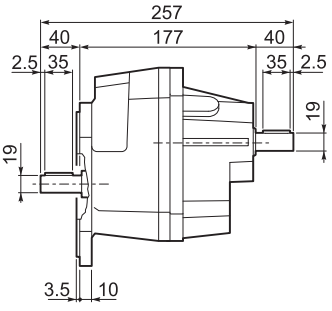
S 20...HS





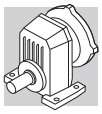
P

Kg	6.0



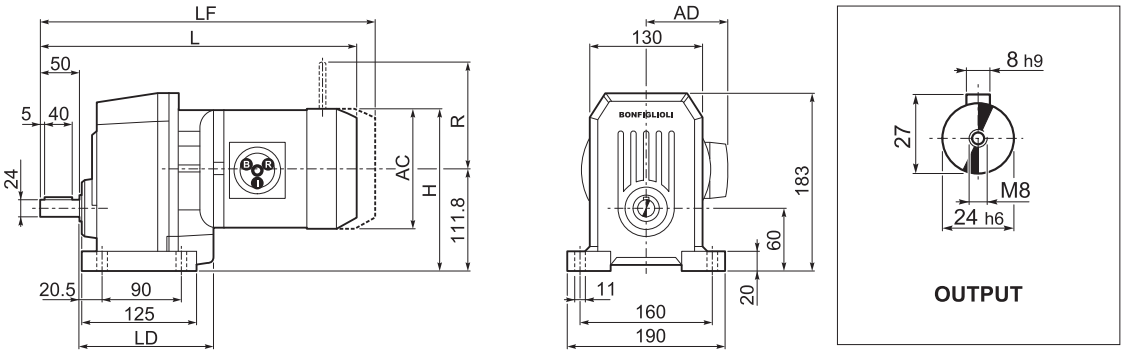
F

Kg	6.2



S 30...M

P



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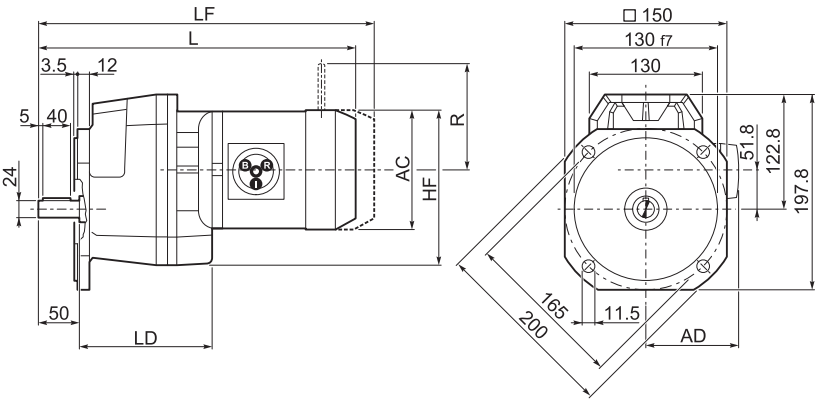
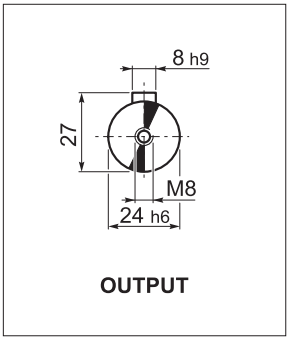
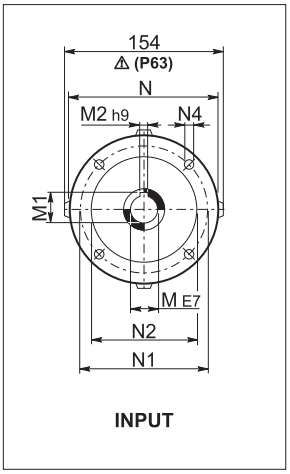
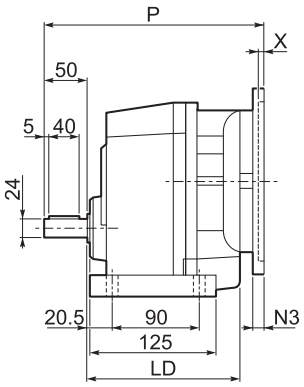


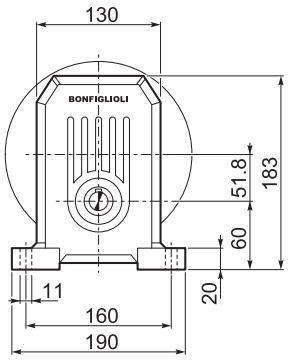
										M...FD M...FA		M...FD		M...FA	
			AC	H	HF	L	LD	AD	Kg	LF	Kg	R	AD	R	AD
S 30 1	**S1**	**M1**	137	180	177	387.5	140.5	102	14	448.5	16	103	135	124	108
S 30 1	**S2**	**M2S**	156	190	186	410.5	152.5	111	18	486.5	21	129	146	134	119
S 30 1	**S3**	**M3S**	195	209	206	459.5	162.5	135	23	555.5	28	160	158	160	142
S 30 1	**S3**	**M3L**	195	209	206	491.5	162.5	135	32	582.5	37	160	158	160	142
S 30 1	**S4**	**M4**	258	240.8	237	599.5	—	193	71	708.5	87	226	210	217	193
S 30 1	**S4**	**M4LC**	258	240.8	237	634.5	—	193	79	733.5	95	226	210	217	193

S 30...P(IEC)









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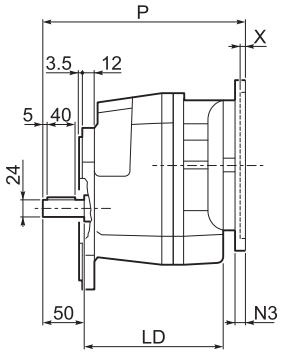
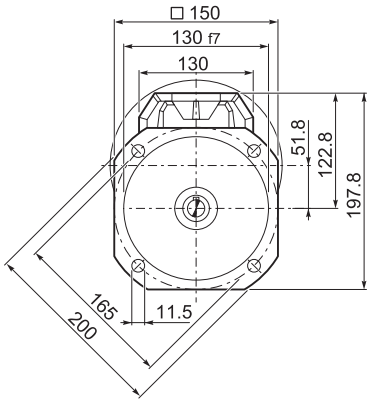
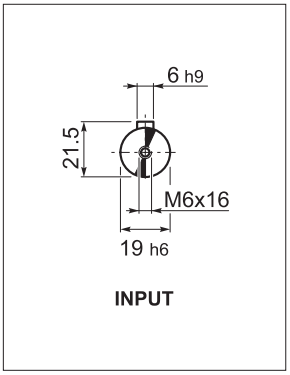


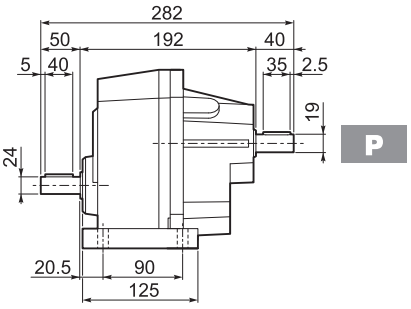


F

		LD	M	M1	M2	N	N1	N2	N3	N4	P	X	Kg
S 30 1	**P63**	152.5	11	12.8	4	140	115	95	—	M8x10	232	4	8
S 30 1	**P71**	152.5	14	16.3	5	160	130	110	—	M8x10	232	4.5	8
S 30 1	**P80**	162.5	19	21.8	6	200	165	130	—	M10x14.5	252	4	9
S 30 1	**P90**	162.5	24	27.3	8	200	165	130	—	M10x14.5	252	4	9
S 30 1	**P100**	162.5	28	31.3	8	250	215	180	—	M12x16	262	4.5	13
S 30 1	**P112**	162.5	28	31.3	8	250	215	180	—	M12x16	262	4.5	13
S 30 1	**P132**	—	38	41.3	10	300	265	230	16	14	298.5	5	21

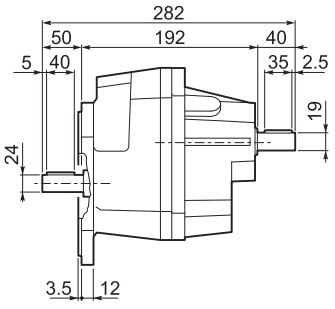
S 30...HS





P

Kg	9.0

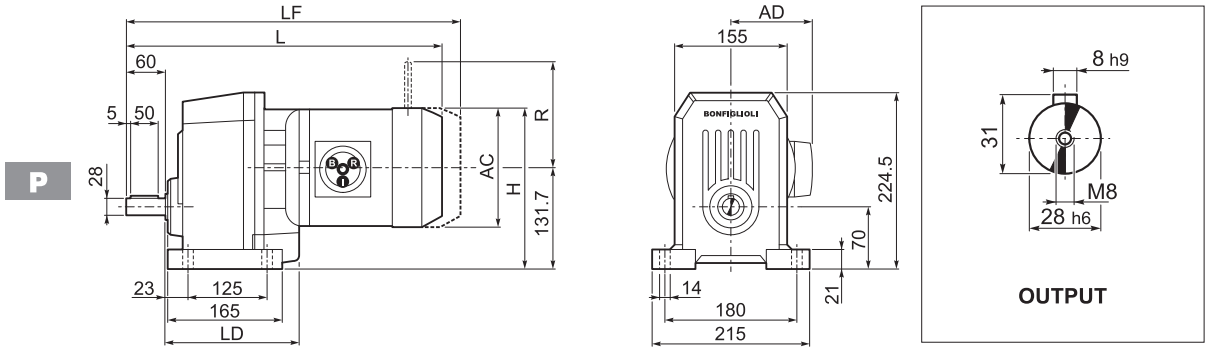


F

Kg	9.3

S 40...M

P



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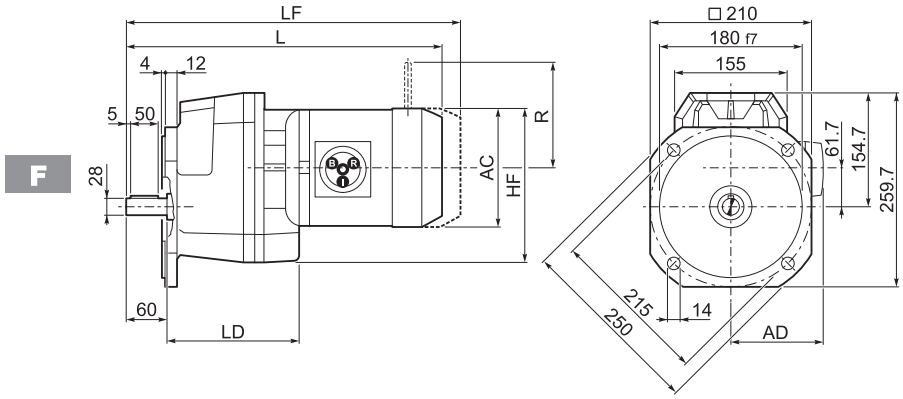
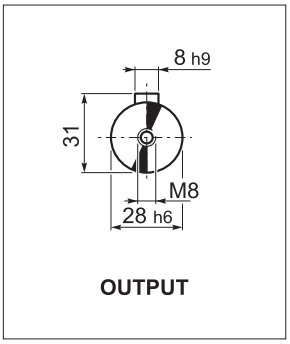
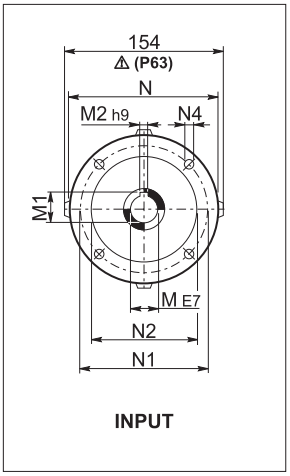
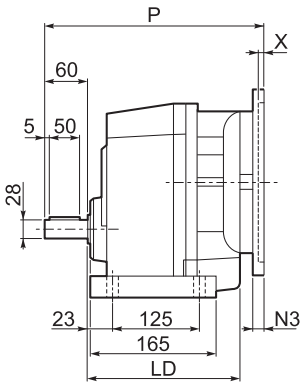


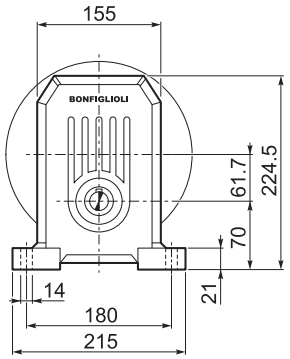
										M...FD M...FA		M...FD		M...FA	
			AC	H	HF	L	LD	AD	Kg	LF	Kg	R	AD	R	AD
S 40 1	**S1**	**M1**	137	200	197	429.5	168	102	28	490.5	31	103	135	124	108
S 40 1	**S2**	**M2S**	156	210	206	452.5	183.5	111	34	528.5	37	129	146	134	119
S 40 1	**S3**	**M3S**	195	229	226	501.5	199.5	135	39	597.5	44	160	158	160	142
S 40 1	**S3**	**M3L**	195	229	226	533.5	199.5	135	48	624.5	53	160	158	160	142
S 40 1	**S4**	**M4**	258	261	257	641.5	—	193	74	750.5	86	226	210	217	193
S 40 1	**S4**	**M4LC**	258	261	257	676.5	—	193	90	775.5	106	226	210	217	193

S 40...P(IEC)









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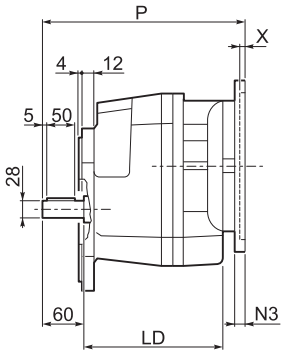
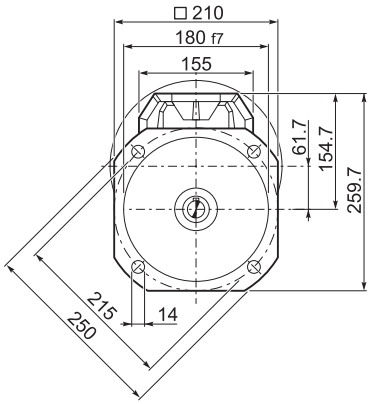
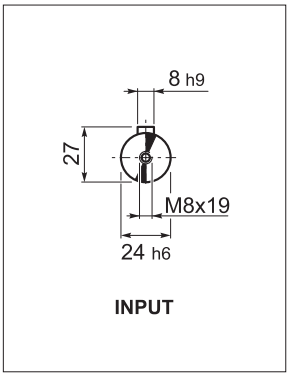


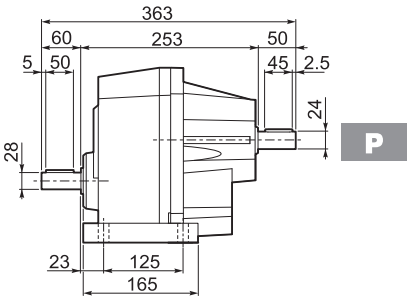


F

		LD	M	M1	M2	N	N1	N2	N3	N4	P	X	Kg
S 40 1	**P63**	183.5	11	12.8	4	140	115	95	—	M8x10	274	4	25
S 40 1	**P71**	183.5	14	16.3	5	160	130	110	—	M8x10	274	4.5	26
S 40 1	**P80**	199.5	19	21.8	6	200	165	130	—	M10x14.5	294	4	26
S 40 1	**P90**	199.5	24	27.3	8	200	165	130	—	M10x14.5	294	4	30
S 40 1	**P100**	—	28	31.3	8	250	215	180	—	M12x16	304	4.5	30
S 40 1	**P112**	—	28	31.3	8	250	215	180	—	M12x16	304	4.5	30
S 40 1	**P132**	—	38	41.3	10	300	265	230	16	14	340	5	32

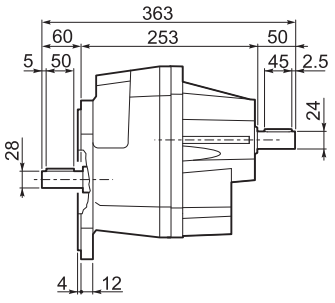
S 40...HS





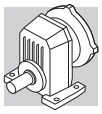
P

Kg	26.0



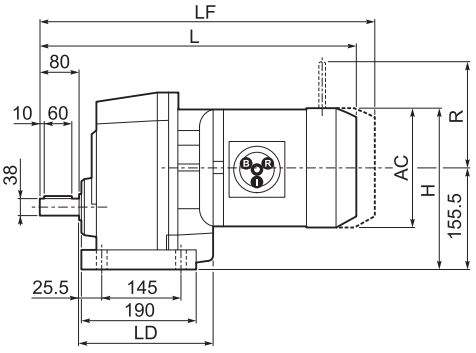
F

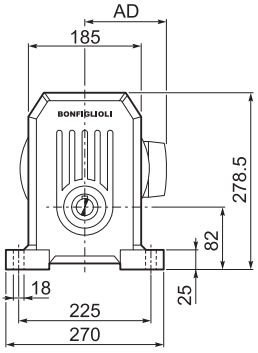
Kg	27.7

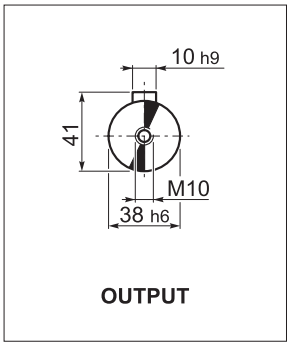


S 50...M

P







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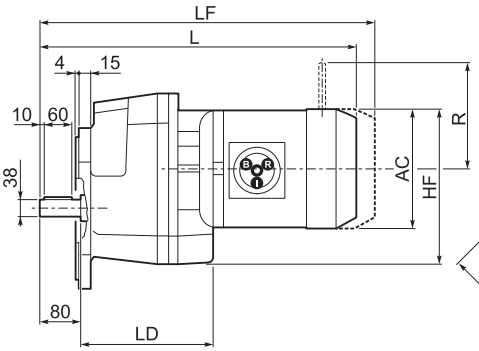
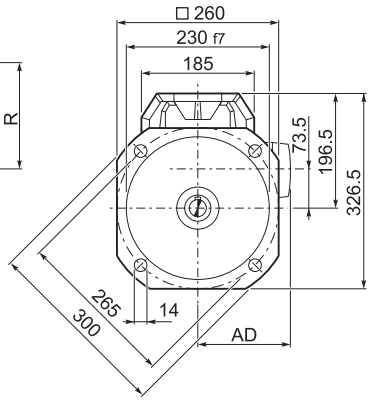
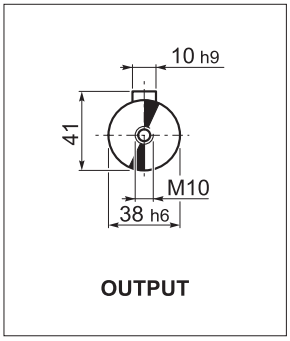
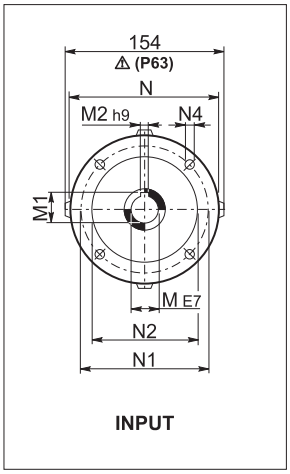


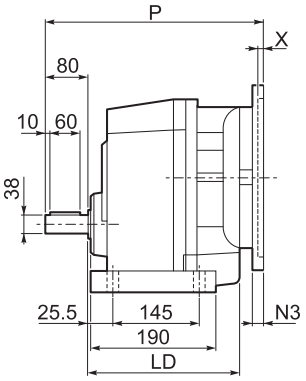


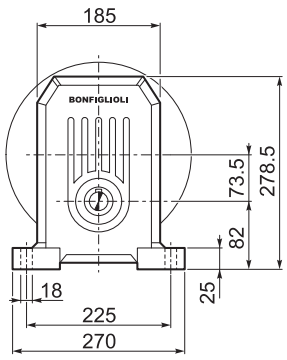
										M...FD M...FA		M...FD		M...FA	
			AC	H	HF	L	LD	AD	Kg	LF	Kg	R	AD	R	AD
S 50 1	**S1**	**M1**	137	225	222	469	—	102	40	530	42	103	135	124	108
S 50 1	**S2**	**M2S**	156	233	230	492.5	204.5	111	44	568.5	47	129	146	134	119
S 50 1	**S3**	**M3S**	195	253	250	541.5	219.5	135	51	637.5	56	160	158	160	142
S 50 1	**S3**	**M3L**	195	253	250	573.5	219.5	135	60	664.5	65	160	158	160	142
S 50 1	**S4**	**M4**	258	284	281	681.5	204.5	193	86	790.5	98	226	210	217	193
S 50 1	**S4**	**M4LC**	258	284	281	716.5	204.5	193	94	815.5	106	226	210	217	193
S 50 1	**S5**	**M5S**	310	310.5	307	768	—	245	114	908	138	266	245	247	245
S 50 1	**S5**	**M5L**	310	310.5	307	812	—	245	130	952	154	266	245	247	245

S 50...P(IEC)









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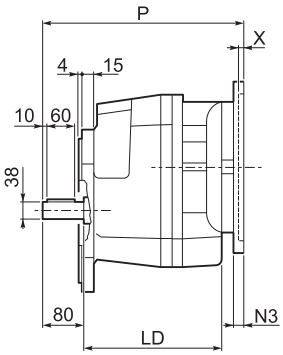
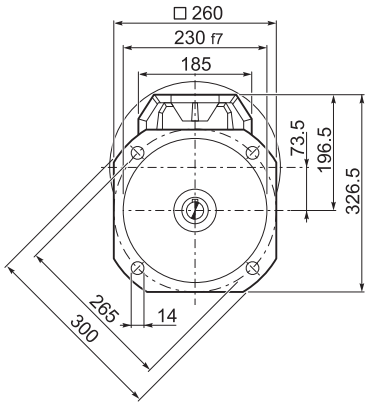
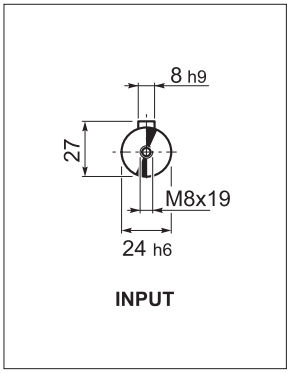


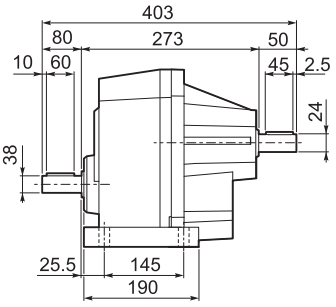


F

		LD	M	M1	M2	N	N1	N2	N3	N4	P	X	Kg
S 50 1	**P63**	204.5	11	12.8	4	140	115	95	—	M8x10	314	4	35
S 50 1	**P71**	204.5	14	12.8	4	160	130	110	—	M8x10	314	4.5	35
S 50 1	**P80**	219.5	19	16.3	5	200	165	130	—	M10x14.5	314	4	37
S 50 1	**P90**	219.5	24	21.8	6	200	165	130	—	M10x14.5	334	4	37
S 50 1	**P100**	204.5	28	27.3	8	250	215	180	—	M12x16	344	4.5	41
S 50 1	**P112**	204.5	28	31.3	8	250	215	180	—	M12x16	344	4.5	41
S 50 1	**P132**	204.5	38	41.3	10	300	265	230	16	14	380	5	44
S 50 1	**P160**	—	42	45.3	12	350	300	250	23	18	431	5.5	48
S 50 1	**P180**	—	48	51.8	14	350	300	250	23	18	431	5.5	48

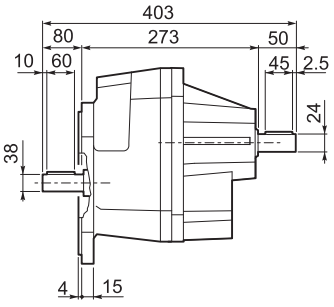
S 50...HS





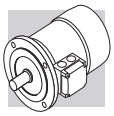
P

Kg	36



F

Kg	39

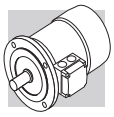


ELECTRIC MOTORS

M1 SYMBOLS AND UNITS OF MEASUREMENT

Symbols	Units of Measure	Description
$\cos\varphi$	–	Power factor
η	–	Efficiency
f_m	–	Power adjusting factor
I	–	Cyclic duration factor
I_N	[A]	Rated current
I_S	[A]	Locked rotor current
J_C	[Kgm^2]	Load moment of inertia
J_M	[Kgm^2]	Moment of inertia
K_c	–	Torque factor
K_d	–	Load factor
K_J	–	Inertia factor
M_A	[Nm]	Mean breakaway torque
M_B	[Nm]	Brake torque
M_N	[Nm]	Rated torque
M_L	[Nm]	Counter-torque during acceleration
M_S	[Nm]	Starting torque

Symbols	Units of Measure	Description
n	[min^{-1}]	Rated speed
P_B	[W]	Power drawn by the brake at 20°C
P_n	[kW]	Motor rated power
P_r	[kW]	Required power
t_1	[ms]	Brake response time with one-way rectifier
t_{1s}	[ms]	Brake response time with electronic-controlled rectifier
t_2	[ms]	Brake reaction time with a.c. disconnect
t_{2c}	[ms]	Brake reaction time with a.c. and d.c. disconnect
t_a	[°C]	Ambient temperature
t_f	[min]	Work time at constant load
t_r	[min]	Rest time
W	[J]	Braking work between service interval
W_{max}	[J]	Maximum brake work for each braking
Z	[1/h]	Permissible starting frequency, loaded
Z_0	[1/h]	Max. permissible unloaded starting frequency (I = 50%)



M2 GENERAL CHARACTERISTICS

M2.1 Production range

The asynchronous three-phase electric motors of BONFIGLIOLI RIDUTTORI's production, are available in basic designs IMB5 and derived versions.
The technical characteristics of compact motors, M type, are also supplied in this manual.

M2.2 Standards

The motors described in this catalogue are manufactured to the applicable standards shown in the following table.

(F 1)

Title	CEI	IEC
General requirements for rotating electrical machines	**CEI EN 60034-1**	**IEC 60034-1**
Terminal markings and direction of rotation of rotating machines	**CEI 2-8**	**IEC 60034-8**
Methods of cooling for electrical machines	**CEI EN 60034-6**	**IEC 60034-6**
Dimensions and output ratings for rotating electrical machines	**EN 50347**	**IEC 60072**
Classification of degree of protection provided by enclosures for rotating machines	**CEI EN 60034-5**	**IEC 60034-5**
Noise limits	**CEI EN 60034-9**	**IEC 60034-9**
Classification of type of construction and mounting arrangements	**CEI EN 60034-7**	**IEC 60034-7**
Rated voltage for low voltage mains power	**CEI 8-6**	**IEC 60038**
Vibration level of electric machines	**CEI EN 60034-14**	**IEC 60034-14**

The motors also comply with foreign standards adapted to IEC 60034-1 as shown here below.

(F 2)

DIN VDE 0530	Germany
BS5000 / BS4999	Great Britain
AS 1359	Australia
NBNC 51 - 101	Belgium
NEK - IEC 34	Norway
NF C 51	France
OEVE M 10	Austria
SEV 3009	Switzerland
NEN 3173	Netherlands
SS 426 01 01	Sweden

M2.3 Motors for USA and Canada

CUS

CUS option is available in NEMA Design C execution for BN motors, and NEMA Design B for BX motors, with regards to the electrical features. Motors are certified in compliance with CSA (Canadian Standard) C22.2 N° 100 and UL (Underwriters Laboratory) UL 1004-1 standards, as stated on UL file E308649.
BN motors nameplates show the below marks:

NOTE:
Starting from **June, 1st 2016**, CUS motors whose efficiency is below IE3 (i.e. “Premium Efficiency”) cannot be any longer sold in the USA and Canada, unless one or more of the following conditions apply:

- Double speed motors;
- Motors plated for a non - continuous duty (<80%);
- Motors intended to be operated through variable frequency drive only (properly equipped with “Inverter Duty Only” label, or similar).

The CUS option does not apply to servo-ventilated motors.
US power mains voltages and the corresponding rated voltages to be specified for the motor are indicated in the following table:

(F 3)

Frequency	Mains voltage	V_{mot}
60 Hz	208 V	**200 V**
	240 V	**230 V**
	480 V	**460 V**
	600 V	**575 V**

CUS option is applicable onto 50 Hz operating motors as well.

Motors with voltage in ratio 2 (e.g. 230/460-60; 220/440-60) feature, as standard, a 9-stud terminal board. For same executions, as well as for 575V-60Hz supply, the nominal rating is coincident with the correspondent 50Hz rating.
For DC brake motors type FD, the rectifier is connected to a single-phase 230 VAC supply voltage in the motor terminal box.
Brake power supply for brake motors is as follows:

(F 4)

BN_FD M_FD
Wired to terminal box 1~230V a.c.

BN_FA M_FA		Specify
Separate power supply	230V Δ	230SA
Separate power supply	460V Y	460SA

M2.4 China Compulsory Certification

CCC

Electric motors destined for sale in the People's Republic of China have to be certified under the CCC (China Compulsory Certification) system. BN motors of up to 7 Nm in rated torque are available with CCC certification and a special nameplate bearing the mark shown below:

CCC option is not currently available for servo - ventilated motors.

M2.5 Directives 2006/95/EC (LVD) and 2004/108/EC (EMC)

BN and M motors meet the requirements of Directives 2006/95/EC (Low Voltage Directive) and 2004/108/EC (Electromagnetic Compatibility Directive) and their name plates bear the CE mark.
As for the EMC Directive, construction is in accordance with standards CEI EN 60034-1, EN 61000-6-2, EN 61000-6-4.
Motors with FD brakes, when fitted with the suitable capacitive filter at rectifier input (option **CF**), meet the emission limits required by Standard EN 61000-6-3:2007 "Electromagnetic compatibility - Generic Emission Standard - Part 6-3 Residential, commercial and light industrial environment".
Motors also meet the requirements of standard CEI EN 60204-1 "Electrical equipment of machines".
The responsibility for final product safety and compliance with applicable directives rests with the manufacturer or the assembler who incorporate the motors as component parts.

M2.6 Tolerances

As per the Norms applicable the tolerances here below apply to the following quantities.

(F 5)

-0.15 (1 - η) P ≤ 50kW	Efficiency
-(1 - cosφ)/6 min 0.02 max 0.07	Power factor
±20% *	Slip
+20%	Locked rotor current
-15% +25%	Locked rotor torque
-10%	Max. torque

* ± 30% for motors with Pn < 1 kW

M3 MECHANICAL FEATURES

M3.1 Versions

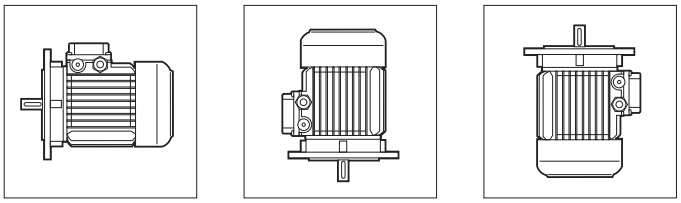
EC-normalised BN motors are available in the design versions indicated in table (F6) as per Standards CEI EN 60034-14.

Mounting versions are:

IM B5 (basic)
IM V1, IM V3 (derived)

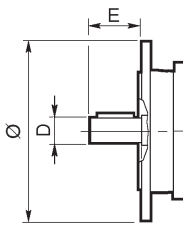
IM B5 design motors can be installed in positions IM V1 and IM V3; in such cases, the basic design IM B5 is indicated on the motor name plate.
In design versions with a vertically located motor and shaft downwards, it is recommended to request the drip cover (always necessary for brake motors). This facility, included in the option list should be specified when ordering as it does not come as a standard device

(F 6)



Flange output motors are also available with reduced coupling dimensions, as indicated in the table below - executions **B5R**. Their use in combination with gearboxes must be however coherent with the maximum installable power on gearboxes themselves (see chapters “Motors availability”). In case this condition is not met need to contact the Technical Service for the checking of the combination.

(F 7)



	BN 71	BN 80	BN 90	BN 100	BN 112	BN 132
	DxE - Ø					
B5R (1)	11x23 - 140	14x30 - 160	19x40 - 200	24x50 - 200	24x50 - 200	28x60 - 250

(1) flange with through holes

M3.2 Degree of protection

IP..

The following chart provides an overview of the degrees of protection available.
In addition to the degree of protection specified when ordering, motors to be installed outdoors require protection against direct sunlight and also – when they are to be installed vertically down – a drip cover to prevent the ingress of water and solid particles (option **RC**).

(F 8)

		IP 54	IP 55	IP 56
BN	**M**	⛔	standard	on request
BN_FD **BN_FA**	**M_FD** **M_FA**	standard	on request	⛔

M3.3 Cooling

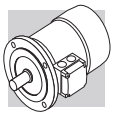
The motors are externally ventilated (IC 411 to CEI EN 60034-6) and are equipped with a plastic fan working in both directions. The motors must be installed allowing sufficient space between fan cowl and the nearest wall to ensure free air intake and allow access for maintenance purposes on motor and brake, if supplied.
Independent, forced air ventilation (IC 416) can be supplied on request (option U1).
This solution enables to increase the motor duty factor when driven by an inverter and operating at reduced speed.

M3.4 Direction of rotation

Rotation is possible in both directions. If terminals U1, V1, and W1 are connected to line phases L1,L2 and L3, clockwise rotation (looking from drive end) is obtained. For counterclockwise rotation, switch two phases.

M3.5 Noise

Noise levels, measured using the method prescribed by ISO 1680 Standards, are within the maximum levels specified by Standards CEI EN 60034-9.



M3.6 Vibrations and balancing

Rotor shafts are balanced with half key fitted and fall within the vibration class N, as per Standard CEI EN 60034-14.
If a further reduced noise level is required improved balancing carequired improved balancing can be optionally requested (class B).
Table below shows the value for the vibration velocity for standard (A) and improved (B) balancing.

(F 9)

Vibration class	Angular velocity n [min^{-1}]	Limits of the vibration velocity [mm/s] **BN 56 ≤ H ≤ BN 200** **M05 ≤ H ≤ M5**
A	600 < n < 3600	1.6
B	600 < n < 3600	0.70

Values refer to measures with freely suspended motor in unloaded conditions.

M3.7 Terminal box

Terminal board features 6 studs for eyelet terminal connection (9 studs execution for US voltage “Dual Voltage”).
A ground terminal is also supplied for earthing of the equipment.
Terminals number and type are shown in the following table.
For brake power supply, please read par. M6 (brake FD), M7 (brake FA).
Brakemotors house the a.c./d.c. rectifier (factory pre-wired) inside the terminal box.
Wiring instructions are provided either in the box or in the user manual.

(F 10)

		No. of terminals	Terminal threads	Wire max cross section area mm^2
BN 56 ... BN 71	**M05, M1**	6	M4	2.5
BN 80, BN 90	**M2**	6	M4	2.5
BN 100 ... BN 112	**M3**	6	M5	6
BN 132 ... BN 160MR	**M4**	6	M5	6
BN 160M ... BN 180M	**M5**	6	M6	16
BN 180L ... BN 200L	**–**	6	M8	25
BN 63 ... BN 160MR	**M05 ... M4**	9	M4	6
BN 160M ... BN 200L	**M5**	9	M6	16

M3.8 Cable entry

The holes used to bring cables to terminal boxes use metric threads in accordance with standard EN 50262 as indicated in the table here after.

(F 11)

		Cable entry	Max. cable diameter allowed [mm]
BN 63	**M05**	2 x M20 x 1.5	13
BN 71	**M1**	2 x M25 x 1.5	17
BN 80 - BN 90	**M2**	2 x M25 x 1.5	17
BN 100	**M3**	2 x M32 x 1.5	21
		2 x M25 x 1.5	17
BN 112	**—**	2 x M32 x 1.5	21
		2 x M25 x 1.5	17
BN 132...BN 160MR	**M4**	4 x M32 x 1.5	21
BN 160M...BN 200L	**M5**	2 x M40 x 1.5	28

M3.9 Bearings

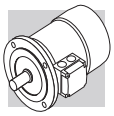
Life lubricated preloaded radial ball bearings are used, types are shown in the chart here under.
Calculated endurance lifetime L_{10h}, as per ISO 281, in unloaded condition, exceeds 40000 hrs.
DE = drive end
NDE = non drive end

(F 12)

	DE	**NDE**	
	M, M_FD, M_FA	**M**	**M_FD, M_FA**
M05	6004 2Z C3	6201 2Z C3	6201 2RS C3
M1	6004 2Z C3	6202 2Z C3	6202 2RS C3
M2	6007 2Z C3	6204 2Z C3	6204 2RS C3
M3	6207 2Z C3	6206 2Z C3	6206 2RS C3
M4	6309 2Z C3	6308 2Z C3	6308 2RS C3
M5	6309 2Z C3	6309 2Z C3	6309 2RS C3

(F 13)

	DE	**NDE**	
	BN	**BN**	**BN_FD BN_FA**
BN 56	6201 2Z C3	6201 2Z C3	–
BN 63	6201 2Z C3	6201 2Z C3	6201 2RS C3
BN 71	6202 2Z C3	6202 2Z C3	6202 2RS C3
BN 80	6204 2Z C3	6204 2Z C3	6204 2RS C3
BN 90	6205 2Z C3	6205 2Z C3	6305 2RS C3
BN 100	6206 2Z C3	6206 2Z C3	6206 2RS C3
BN 112	6306 2Z C3	6306 2Z C3	6306 2RS C3
BN 132	6308 2Z C3	6308 2Z C3	6308 2RS C3
BN 160MR	6309 2Z C3	6308 2Z C3	6308 2RS C3
BN 160M/L	6309 2Z C3	6309 2Z C3	6309 2RS C3
BN 180M	6310 2Z C3	6309 2Z C3	6309 2RS C3
BN 180L	6310 2Z C3	6310 2Z C3	6310 2RS C3
BN 200L	6312 2Z C3	6310 2Z C3	6310 2RS C3



M4 ELECTRICAL CHARACTERISTICS

M4.1 Voltage

Single speed motors are provided in standard execution either for nominal voltage 230 / 400 V Δ/Y, 50 Hz, or 400 / 690 V Δ/Y, 50 Hz, with a voltage tolerance of ± 10%, according to what is specified on the below table.
On all the motors BN and M, for which the voltage / frequency configuration is not included on the below table, the voltage tolerance is reduced down to ± 5%.
For the operation out of the tolerance boundaries, the temperature may exceed by 10 K the limit provided by the adopted insulation class.
The motors are suitable for operation on distribution European grid with voltage complying with the pubblication IEC 60038.

(F 14)

			V_{mot} ± 10 % 3 ~	**Configuation**
IE1	**BN 56 ... BN 132**	**M0 ... M4**	230 / 400 V - Δ/Y - 50 Hz	Standard
			400 / 690 V - Δ/Y - 50 Hz	On request at no extra charge
			460 V Y - 60 Hz	Standard
	BN 160 ... 200	**M5**	400 / 690 V - Δ/Y - 50 Hz	Standard
			460 V Δ - 60 Hz	Standard

[1] 4 pole motor only

The only rated voltage for motors type 50Hz and all double speed motors is 400V.
Applicable tolerances as per CEI EN 60034-1.

The table below shows the wiring options available.

(F 15)

Pole		Wiring options
2	**BN 63 ... BN 200**	Δ / Y (²)
4	**BN 56 ... BN 200**	
6	**BN 63 ... BN 200**	
8	**BN 71 ... BN 132**	
2/4	**BN 63 ... BN 132**	Δ / YY (Dahlander)
2/6	**BN 71 ... BN 132**	Y / Y (Two windings)
2/8	**BN 71 ... BN 132**	
2/12	**BN 80 ... BN 132**	
4/6	**BN 71 ... BN 132**	
4/8	**BN 80 ... BN 132**	Δ / YY (Dahlander)

(²) Motors with voltage in ratio 2 (ex. 230/460 - 60) will be equipped with a 9 pin terminal box with winding connection either Δ Δ/ Δ or YY / Y (except 6 pole BN 63 Δ / Y)

M4.2 Frequency

Rated output power BN / M for 60 Hz operation is shown in the following diagram.

(F 16)

		P_n [kW]			
		2P	4P	6P	8P (*)
BN 56A	–	–	0.07	–	–
BN 56B	M0B	–	0.1	–	–
BN 63A	M05A	0.21	0.14	0.1	–
BN 63B	M05B	0.3	0.21	0.14	–
BN 63C	M05C	0.45	0.3	–	–
BN 71A	–	0.45	0.3	0.21	0.1
–	M1SC	–	–	0.21	–
BN 71B	M05SD	0.65	0.45	0.3	0.14
BN 71C	M1LA	0.9	0.65	0.45	–
BN 80A	–	0.9	0.65	0.45	0.21
BN 80B	M2SA	1.3	0.9	0.65	0.30
BN 80C	M2SB	1.8	1.3	0.9	–
BN 90S		–	1.3	0.9	0.45
BN 90SA	–	1.8	–	–	–
BN 90SB		2.2	–	–	–
BN 90L	M3SA	2.5	–	1.3	0.65
BN 90LA		–	1.8	–	–
BN 90LB	–	–	2.2	–	–

		P_n [kW]			
		2P	4P	6P	8P (*)
BN 100L	M3LA	3.5	–	–	–
BN 100LA		–	2.5	1.8	0.9
BN 100LB	M3LB	4.7	3.5	2.2	1.3
BN 112M	–	4.7	4.7	2.5	1.8
–	M3LC	–	4.7	2.5	–
BN 132S	M4SA	–	6.5	3.5	2.5
BN 132SA		6.5	–	–	–
BN 132SB	M4SB	8.7	–	–	–
BN 132M	M4LA	11	–	–	3.5
BN 132MA		–	8.7	4.6	–
BN 132MB	M4LB	–	11	6.5	–
BN 160MR	M4LC	12.5	12.5	–	–
BN 160M	M5SA	–	–	8.6	–
BN 160MB	–	17.5	–	–	–
–	M5SB	17.5	17.5	–	–
BN 160L	–	21.5	17.5	12.6	–
–	M5SC	21.5	–	–	–
BN 180M	M5LA	24.5	21.5	–	–
BN 180L	–	–	25.3	17.5	–
BN 200L	–	–	34	–	–
BN 200LA	–	34	–	22	–

(*) Excluded M_ motors

Double speed BN / M motors supplied at 60 Hz will have an increase of nominal power, referred to 50 Hz, equal to 15%.
If a nominal power rating, equal to the normalised nominal power rating at 50 Hz, was requested to be on a nameplate of a motor meant to be voltage supplied at 60 Hz, the PN option shall be specified on the motor designation.
Motors normally designed for a 50 Hz frequency may be used on a 60 Hz operating grid, but the related data shall be updated according to the following table.
Motors designated for 50 Hz operation show on the nameplate also the values for 60 Hz operation (excluding motors in CUS execution and brake motors). See the following table.

(F 17)

50 Hz	60 Hz			
V - 50 Hz	**V** - 60 Hz	**Pn** - 60 Hz	$\mathbf{M_n}$, $\mathbf{M_a/M_n}$ - 60 Hz	**n** [min^{-1}] - 60 Hz
230/400 Δ/Y	220 - 240 Δ	1	0.83	1.2
	380 - 415 Y			
400/690 Δ/Y	380 - 415 Δ			
230/400 Δ/Y	265 - 280 Δ	1.15	1	1.2
	440 - 480 Y			
400/690 Δ/Y	440 - 480 Δ			

M4.3 Ambient temperature

Catalogue rating values are calculated for 50 Hz operation and for standard ambient conditions (temperature 40 °C; elevation <1000 m a.s.l.) as per the CEI EN 60034-1 Standards.
The motors can be used within the 40 - 60 °C temperature range with rated power output adjusted by factors given in the following charts.

(F 18)

Ambient temperature (°C)	40°	45°	50°	55°	60°
Permitted power as a % of rated power	100%	95%	90%	85%	80%

Should a derating factor higher than 15% apply please consult factory.

M4.4 Insulation class

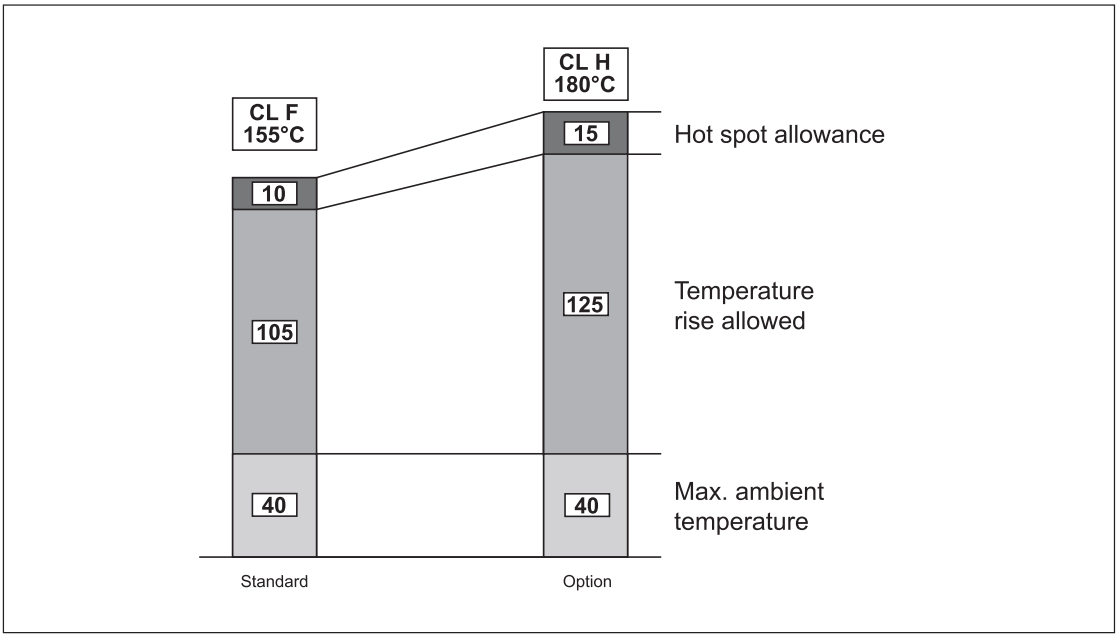
CL F

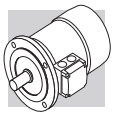
Bonfiglioli motors use class **F** insulating materials (enamelled wire, insulators, impregnation resins) as compare to the standard motor.

CL H

Motors manufactured in insulation class **H** are available at request.
In standard motors, stator windings over temperature normally stays below the 80 K limit corresponding to class B over temperature.
A careful selection of insulating components makes the motors compatible with tropical climates and normal vibration.
For applications involving the presence of aggressive chemicals or high humidity, contact Bonfiglioli Engineering for assistance with product selection.
Not available for motors in compliance with CSA e UL standards (CUS option).

(F 19)





M4.5 Type of duty

Unless otherwise specified, catalogue motor power refers to continuous duty S1.
Any operating conditions other than S1 duty must be identified in accordance with duty cycle definitions laid down in standards CEI EN 60034-1.
For duty cycles S2 and S3, the power increase co-efficient reported in the following table may be used. Please note that the table provided below applies to single-speed motors.
As an alternative to S1 continuous duty, one of the following values can be specified at the product configuration stage: S2, S3 or S9. The motor nameplate will be marked with an increased power rating to suit the type of duty, and with specific electrical data and a duty type of S2-30 min, S3-70% or S9 respectively.
For further details, contact Bonfiglioli's Technical Service.
Please contact Bonfiglioli Engineering for the power increase coefficients applicable to switch-pole motors.
(F 20)

	Duty						
	S2			**S3 ***			**S4 - S9**
	Cycle duration (min)			Cyclic duration factor (I)			
	10	**30 (*)**	**60**	**25%**	**40%**	**70% (*)**	Consult factory
f_m	1.35	1.15	1.05	1.25	1.15	1.1	

* Cycle duration must, in any event, be equal to or less than 10 minutes; if this time is exceeded, please contact our Technical Service.
(*) Default values from options.

M4.5.1 Cyclic duration factor:

$$I = \frac{t_f}{t_f + t_r} \cdot 100 \qquad (23)$$

t_f = work time under constant load
t_r = rest time

M4.5.2 Limited duration duty S2

This type of duty is characterized by operation at constant load for a limited time, which is shorter than the time required to reach thermal equilibrium, followed by a rest period of sufficient duration to restore ambient temperature in the motor.

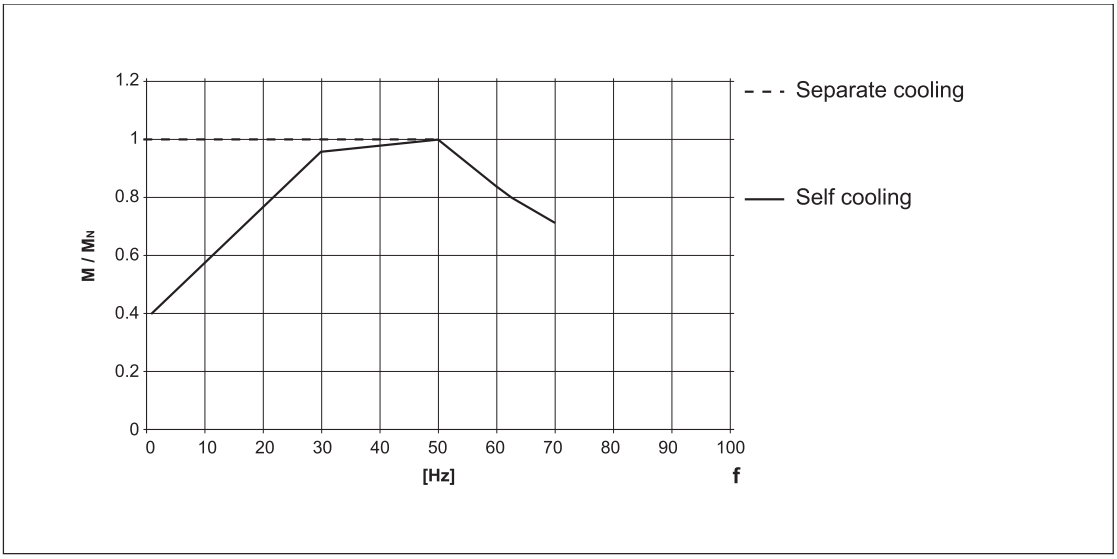
M4.5.3 Periodical intermittent duty S3:

This type of duty is characterized by a sequence of identical operation cycles, each including a constant load operation period and a rest period.
For this type of duty, the starting current does not significantly influence overtemperature.

M4.6 Inverter-controlled motors

The electric motors of series BN and M may be used in combination with PWM inverters with rated voltage at transformer input up to 500 V.Standard motors use a phase insulating system with separators, class 2 enamelled wire and class H impregnation resins (1600V peak-to-peak voltage pulse capacity and rise edge t_s > 0.1µs at motor terminals). The following table shows the typical torque/speed curves referred to S1 duty for motors with base frequency f_b = 50 Hz.
Because ventilation is somewhat impaired in operation at lower frequencies (about 30 Hz), standard motors with incorporated fan (IC411) require adequate torque derating or - alternately - the addition of a separate supply fan cooling.
Above base frequency, upon reaching the maximum output voltage of the inverter, the motor enters a steady-power field of operation, and shaft torque drops with ratio (f/f_b).
As motor maximum torque decreases with $(f/f_b)^2$, the allowed overloading must be reduced progressively.

(F 21)



The following table reports the mechanical limit speed for motor operation above rated frequency:

(F 22)

		n [min^{-1}]		
		2p	**4p**	**6p**
≤ BN 112	**M05…M3**	5200	4000	3000
≥ BN 132	**M4, M5**	4500	4000	3000

Above rated speed, motors generate increased mechanical vibration and fan noise. Class B rotor balancing is highly recommended in these applications. Installing a separate supply fan cooling may also be advisable.

Remote-controlled fan and brake (if fitted) must always be connected direct to mains power supply.

M4.7 Permissible starts per hour, Z

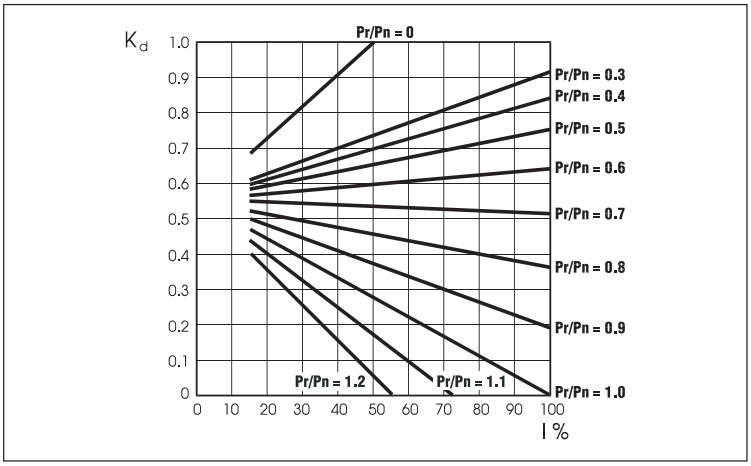
The rating charts of brakemotors lend the permitted number of starts Z_0, based on 50% intermittence and for unloaded operation.
The catalogue value represents the maximum number of starts per hour for the motor without exceeding the rated temperature for the insulation class F.
To give a practical example for an application characterized by inertia J_c, drawing power P_r and requiring mean torque at start-up M_L the actual number of starts per hour for the motor can be calculated approximately through the following equation:

$$Z = \frac{Z_0 \cdot K_c \cdot K_d}{K_J} \qquad (24)$$

where:

$K_J = \frac{J_m + J_c}{J_m}$	inertia factor
$K_c = \frac{M_a - M_L}{M_a}$	torque factor
$K_d =$	load factor see table (F23)

(F 23)



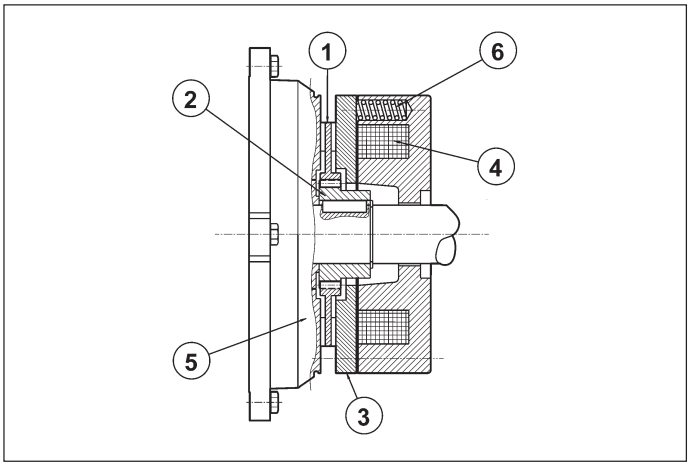
If actual starts per hour is within permitted value (Z) it may be worth checking that braking work is compatible with brake (thermal) capacity W_{max} also given in tables (F30), (F38) and dependent on the number of switches (c/h).

M5 ASYNCHRONOUS BRAKE MOTORS

M5.1 Operation

Versions with incorporated brake use spring-applied DC (FD option) or AC (FA options) brakes.
All brakes are designed to provide fail-safe operation, meaning that they are applied by spring-action in the event of power failure.

(F 24)



Key:
① brake disc
② disc carrier
③ pressure plate
④ brake coil
⑤ motor rear shield
⑥ brake springs

When voltage is interrupted, pressure springs push the armature plate against the brake disc. The disc becomes trapped between the armature plate and motor shield and stops the shaft from rotation. When the coil is energized, a magnetic field strong enough to overcome spring action attracts the armature plate, so that the brake disc – which is integral with the motor shaft – is released.

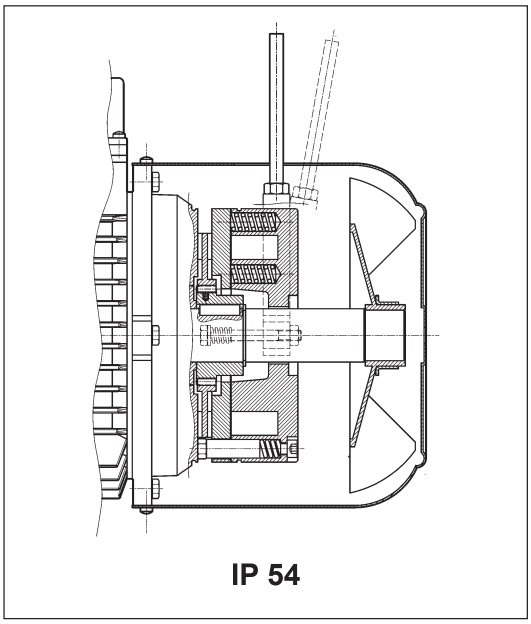
M5.2 Most significant features

- High braking torques (normally $M_b \approx 2$ Mn), braking torque adjustment.
- Steel brake disc with double friction lining (low-wear, asbestos-free lining).
- Hexagonal seat on motor shaft fan end (N.D.E.) for manual rotation (not compatible with options PS, RC, TC, U1, U2, EN1, EN2, EN3, EN4, EN5, EN6).
- Manual release lever (options **R** and **RM** for BN/M_FD; option **R** for BN/M_FA).
- Corrosion-proof treatment on all brake surfaces.
- Insulation class F.

M6 DC BRAKE MOTORS TYPE BN_FD and M_FD

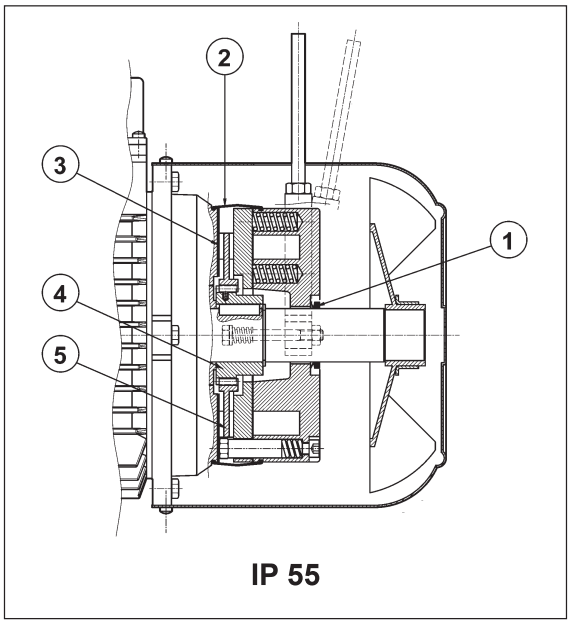
Frame sizes: BN 63 … BN 200L / M05 ... M5

(F 25)



IP 54

(F 26)



IP 55

Direct current toroidal-coil electromagnetic brake bolted onto motor shield. Preloading springs provide axial positioning of magnet body.
Brake disc slides axially on steel hub shrunk onto motor shaft with anti-vibration device.
Brake torque factory setting is indicated in the corresponding motor rating charts. Braking torque may be modified by changing the type and/or number of springs.
At request, motors may be equipped with manual release lever with automatic return (**R**) or system for holding brake in the released position (**RM**).
See variant at paragraph “BRAKE RELEASE SYSTEMS” for available release lever locations.
FD brakes ensure excellent dynamic performance with low noise. DC brake operating characteristics may be optimized to meet application requirements by choosing from the various rectifier/power supply and wiring connection options available.
For applications involving lifting and/or high hourly energy dissipation, contact Bonfiglioli’s Technical Service.

M6.1 Degree of protection

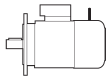
Standard protection class is IP54.
Brake motor FD is also available in protection class **IP55**, which mandates the following variants:

① V-ring at N.D.E. of motor shaft
② dust and water-proof rubber boot
③ stainless steel ring placed between motor shieldand brake disc
④ stainless steel hub
⑤ stainless steel brake disc

M6.2 FD brake power supply

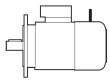
A rectifier accommodated inside the terminal box feeds the DC brake coil. Wiring connection across rectifier and brake coil is performed at the factory.
On all single-pole motors, rectifier is connected to the motor terminal board.
Rectifier standard power supply voltage VB is as indicated in the following table, regardless of mains frequency:

(F 27)

2, 4, 6 P					**1 speed**
		**BN_FD / M_FD** V_{mot} ± 10% 3 ~	**BN_FD / M_FD** V_B ± 10% 1 ~	brake connected to terminal board power supply	separate power supply
BN 63…BN 132	**M05...M4LB**	230/400 V – 50 Hz	230 V	standard	specify **V_B SA** o **V_B SD**
BN 160…BN 200	**M4LC...M5**	400/690 V – 50 Hz	400 V	standard	specify **V_B SA** o **V_B SD**

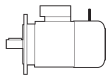
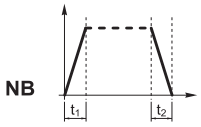
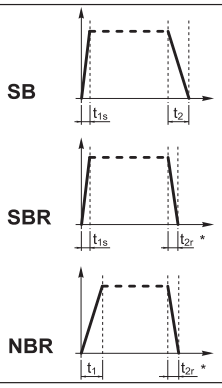
Switch-pole motors feature a separate power supply line for the brake with rectifier input voltage V_B as indicated in the table below:

(F 28)

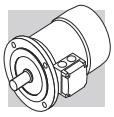
2/4, 2/6, 2/8, 2/12, 4/6, 4/8 P					**2 speed**
		**BN_FD / M_FD** V_{mot} ± 10% 3 ~	**BN_FD / M_FD** V_B ± 10% 1 ~	brake connected to terminal board power supply	separate power supply
BN 63…BN 132	**M05...M4LB**	400 V – 50 Hz	230 V	⛔	specify **V_B SA** o **V_B SD**

The diode half-wave rectifier (VDC ≈ 0,45 x VAC) is available in versions **NB, SB, NBR** e **SBR**, as detailed in the table below:

(F 29)

		brake	~/⎓ **standard**	~/⎓ **at request**
BN 63	**M05**	**FD 02**		
BN 71	**M1**	**FD 03** **FD 53**		
BN 80	**M2**	**FD 04**		
BN 90S	**—**	**FD 14**		
BN 90L	**—**	**FD 05**		
BN 100	**M3**	**FD 15**		
—		**FD 55**		
BN 112	**—**	**FD 06S**		
BN 132 - BN 160MR	**M4**	**FD 56** **FD 06** **FD 07**		
BN 160L - BN 180M	**M5**	**FD 08**		
BN 180L - BN 200M	**—**	**FD 09**		

(*) $t_{2c} < t_{2r} < t_2$



Rectifier **SB** with electronic energizing control over-energizes the electromagnet upon power-up to cut brake release response time and then switches to normal half-wave operation once the brake has been released.

Use of the **SB** rectifier is mandatory in the event of:
- high number of operations per hour
- reduced brake release response time
- brake is exposed to extreme thermal stress

Rectifiers **NBR** or **SBR** are available for applications requiring quick brake intervention (braking condition reinstatement) response.
These rectifiers complement the **NB** and **SB** types as their electronic circuit incorporates a static switch that de-energizes the brake quickly in the event voltage is missing.
This arrangement ensures short brake release response time with no need for additional external wiring and contacts.
Optimum performance of rectifiers **NBR** and **SBR** is achieved with separate brake power supply.
Versions available: 230Vac ±10%, 400Vac ± 10%, 50/60 Hz (with power supply); 100Vdc ±10%, 180Vdc ± 10% (with SD option).

M6.3 FD brake technical specifications

The table below reports the technical specifications of DC brakes FD.

(F 30)

Brake	Brake torque M_b [Nm] springs			Release		Braking		W_{max} per brake operation [J]			W	P
				t_1	$t_{1\,s}$	t_2	t_{2c}					
	6	4	2	[ms]	[ms]	[ms]	[ms]	10 s/h	100 s/h	1000 s/h	[MJ]	[W]
FD02	–	3.5	1.75	30	15	80	9	4500	1400	180	15	17
FD03	5	3.5	1.75	50	20	100	12	7000	1900	230	25	24
FD53	7.5	5	2.5	60	30	100	12					
FD04	15	10	5	80	35	140	15	10000	3100	350	30	33
FD14												
FD05	40	26	13	130	65	170	20	18000	4500	500	50	45
FD15	40	26	13	130	65	170	20					
FD55	55	37	18	–	65	170	20					
FD06S	60	40	20	–	80	220	25	20000	4800	550	70	55
FD56	–	75	37	–	90	250	20	29000	7400	800	80	65
FD06		100	50		100	250	20					
FD07	150	100	50	–	120	200	25	40000	9300	1000	130	65
FD08*	250	200	170	–	140	350	30	60000	14000	1500	230	100
FD09**	400	300	200	–	200	450	40	70000	15000	1700	230	120

* brake torque values obtained with 9, 7 and 6 springs, respectively

** brake torque values obtained with 12, 9 and 6 springs, respectively

t_1 = brake release time with half-wave rectifier
t_{1s} = brake release time with over-energizing rectifier
t_2 = brake engagement time with AC line interruption and separate power supply
t_{2c} = brake engagement time with AC and DC line interruption – Values for t1, t1s, t2, t2c indicated in the tab. (F30) are referred to brake set at maximum torque, medium air gap and rated voltage
W_{max} = max energy per brake operation
W = braking energy between two successive air gap adjustments
P_b = brake power absorption at 20 °C
M_b = static braking torque (±15%)
s/h = starts per hour

The brake pad wear depends on the operating/ambient conditions (temperature, humidity, angular speed, specifica pressure); Therefore the declared wear rate must be considered as indicative.

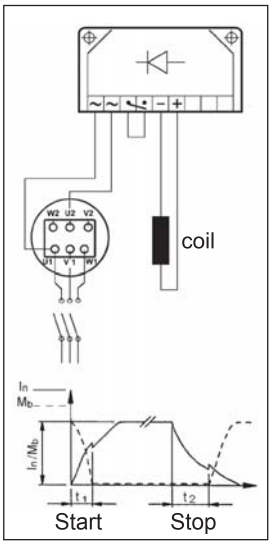
M6.4 FD brake connections

On standard single-pole motors, the rectifier is connected to the motor terminal board at the factory. For switch-pole motors and where a separate brake power supply is required, connection to rectifier must comply with brake voltage VB stated in motor name plate.
Because the load is of the inductive type, brake control and DC line interruption must use contacts from the usage class AC-3 to IEC 60947-4-1.

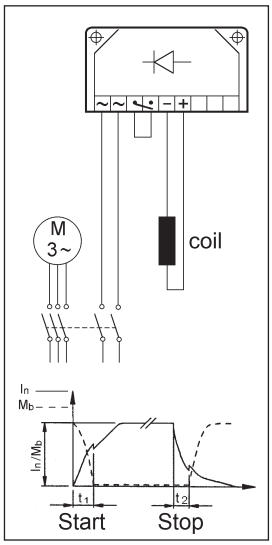
Table (F31) – Brake power supply from motor terminals and AC line interruption
Delayed stop time t_2 and function of motor time constants.
Mandatory when soft-start/stops are required.
Table (F32) – Brake coil with separate power supply and AC line interruption
Normal stop time independent of motor.
Achieved stop times t_2 are indicated in the table (F30).
Table (F33) – Brake coil power supply from motor terminals and AC/DC line interruption.
Quick stop with operation times t_{2c} as per table (F30).
Table (F34) – Brake coil with separate power supply and AC/DC line interruption.
Stop time decreases by values t_{2c} indicated in the table (F30).

The brake may be voltage supplied directly from the motor terminal box (from tab. F31 to tab. F34) only if the nominal voltage of the brake is the same as the smaller voltage of the motor.

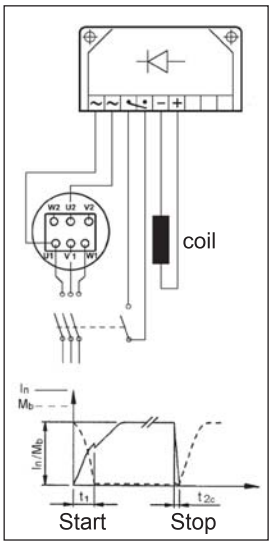
(F 31)



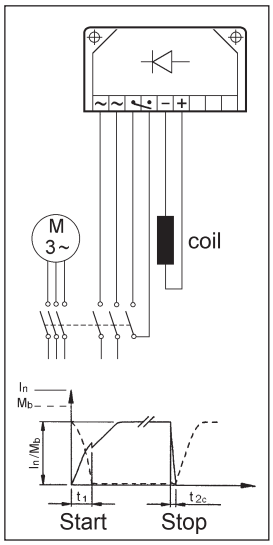
(F 32)



(F 33)



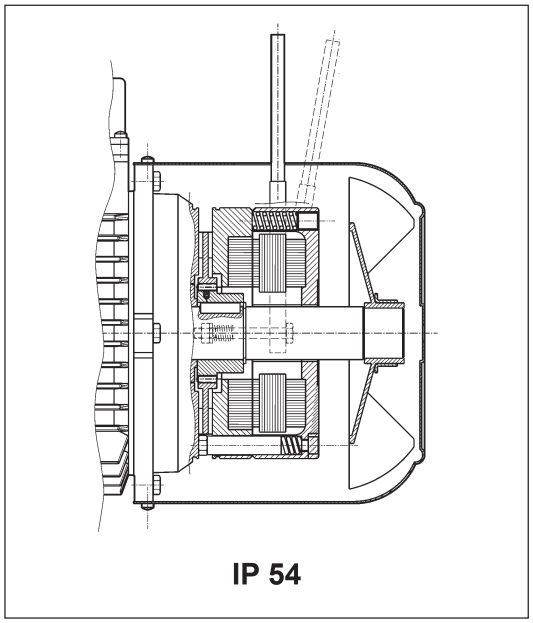
(F 34)



M7 AC BRAKE MOTORS TYPE BN_FA and M_FA

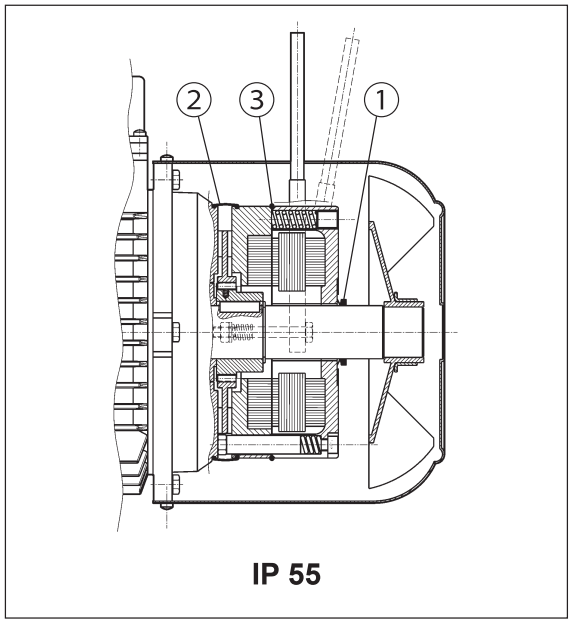
Frame sizes: BN 63 … BN 180M / M05 ... M5

(F 35)



IP 54

(F 36)



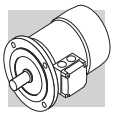
IP 55

Electromagnetic brake operates from three-phase **alternated current** power supply and is bolted onto conveyor shield. Preloading springs provide axial positioning of magnet body.
Steel brake disc slides axially on steel hub shrunk onto motor shaft with anti-vibration device.
Brake torque factory setting is indicated in the corresponding motor rating charts.
Spring preloading screws provide stepless braking torque adjustment.
Torque adjustment range is 30% $M_{bMAX} < M_b < M_{bMAX}$ (where M_{bMAX} is maximum braking torque as shown in tab. (F38).
Thanks to their high dynamic characteristics, FA brakes are ideal for heavy-duty applications as well as applications requiring frequent stop/starts and very fast response time.
Motors may be equipped with manual release lever with automatic return (**R**) at request. See variant at paragraph “BRAKE RELEASE SYSTEMS” for available release lever locations.
For applications involving lifting and/or high hourly energy dissipation, contact Bonfiglioli’s Technical Service.

M7.1 Degree of protection

Standard protection class is IP54.
Brake motor FA is also available in protection class **IP55**, which mandates the following variants:

① V-ring at N.D.E. of motor shaft
② dust and water-proof rubber boot
③ O-ring



M7.2 FA brake power supply

In single speed motors, power supply is brought to the brake coil direct from the motor terminal box. As a result, brake voltage and motor voltage are the same. In this case, brake voltage indication may be omitted in the designation.
Switch-pole motors and motors with separate brake power supply feature an auxiliary terminal board with 6 terminals for connection to brake line. In both cases, brake voltage indication in the designation is mandatory.
The following table reports standard AC brake power supply ratings for single- and switch-pole motors:
(F 37)

	BN 63…BN 132	BN 160…BN 180
single-pole motor	**M05...M4LB**	**M4LC...M5**
	230Δ / 400Y V ±10% – 50 Hz	400Δ/ 690Y V ±10% – 50 Hz
	265Δ / 460Y ±10% - 60 Hz	460Y – 60 Hz

	BN 63…BN 132
switch-pole motors (separate power supply line)	**M05...M4**
	230Δ / 400Y V ±10% – 50 Hz
	460Y - 60 Hz

Unless otherwise specified, standard brake power supply is 230Δ /400Y V - 50 Hz.

Special voltages in the 24…690 V, 50-60 Hz range are available at request.

M7.3 Technical specifications of FA brakes

(F 38)

Brake	Brake torque M_b [Nm]	Release t_1 [ms]	Braking t_2 [ms]	W_{max} [J] 10 s/h	100 s/h	1000 s/h	W [MJ]	P [VA]
FA 02	3.5	4	20	4500	1400	180	15	60
FA 03	7.5	4	40	7000	1900	230	25	80
FA 04	15	6	60	10000	3100	350	30	110
FA 14								
FA 05	40	8	90	18000	4500	500	50	250
FA 15								
FA 06S	60	16	120	20000	4800	550	70	470
FA 06	75	16	140	29000	7400	800	80	550
FA 07	150	16	180	40000	9300	1000	130	600
FA 08	250	20	200	60000	14000	1500	230	1200

M_b = max static braking torque (±15%)
t_1 = brake release time
t_2 = brake engagement time
W_{max} = max energy per brake operation (brake thermal capacity)
W = braking energy between two successive air gap adjustments
P_b = power drawn by brake at 20° (50 Hz)
s/h = starts per hour

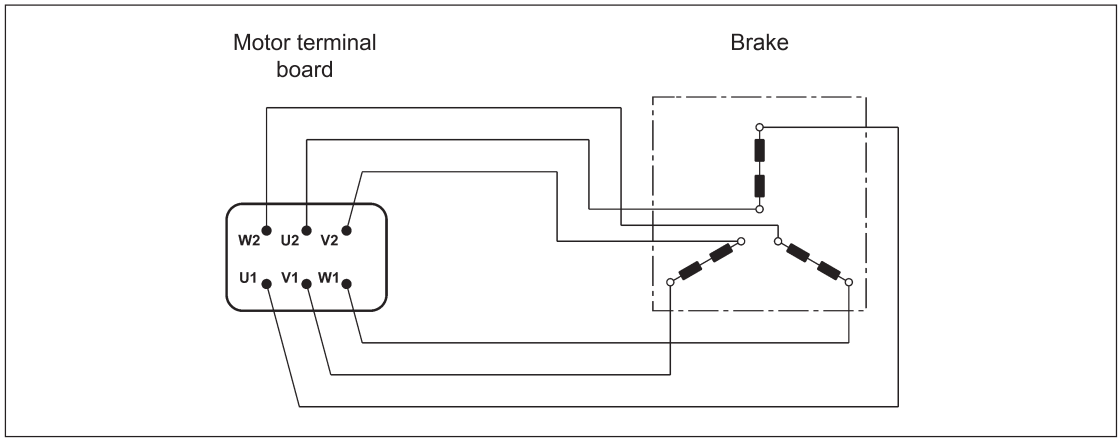
NOTE
Values t_1 and t_2 in the table refer to a brake set at rated torque, medium air gap and rated voltage.

The brake pad wear depends on the operating/ambient conditions (temperature, humidity, angular speed, specifica pressure); Therefore the declared wear rate must be considered as indicative.

M7.4 FA brake connections

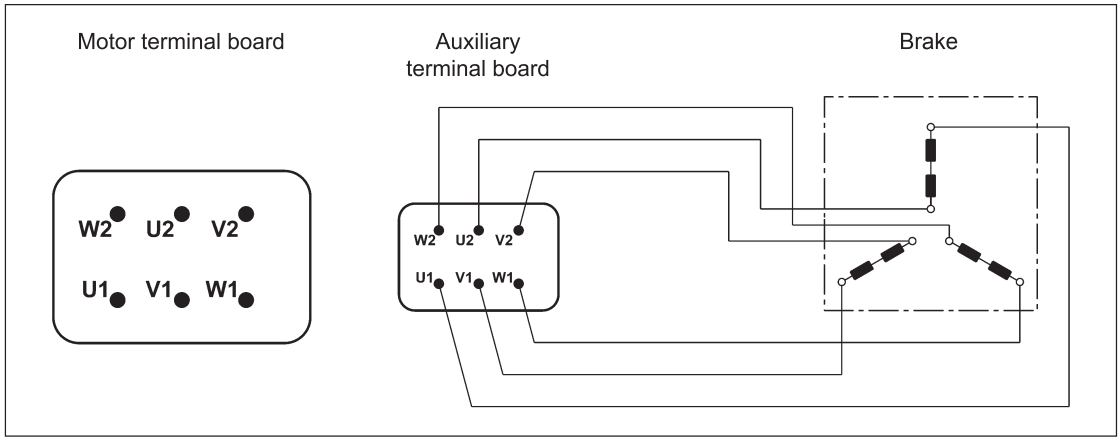
The diagram below shows the wiring when brake is connected directly to same power supply of the motor:

(F 39)



Switch-pole motors and, at request, single-pole motors with separate power supply are equipped with an auxiliary terminal board with 6 terminals for brake connection.
In this version, motors feature a larger terminal box. See diagram below:

(F 40)

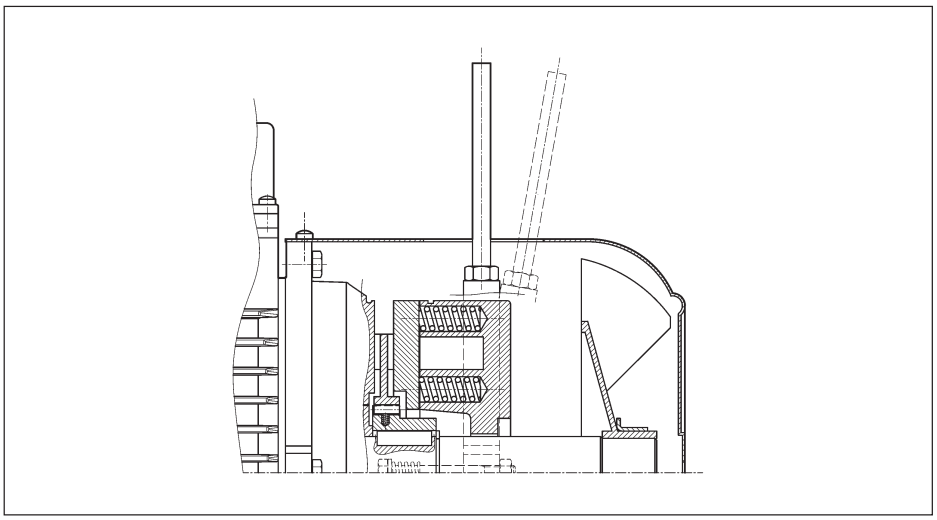


M8 BRAKE RELEASE SYSTEMS

Spring-applied brakes type FD and FA may be equipped with optional manual release devices. These are typically used for manually releasing the brake before servicing any machine or plant parts operated by the motor.

(F 41)

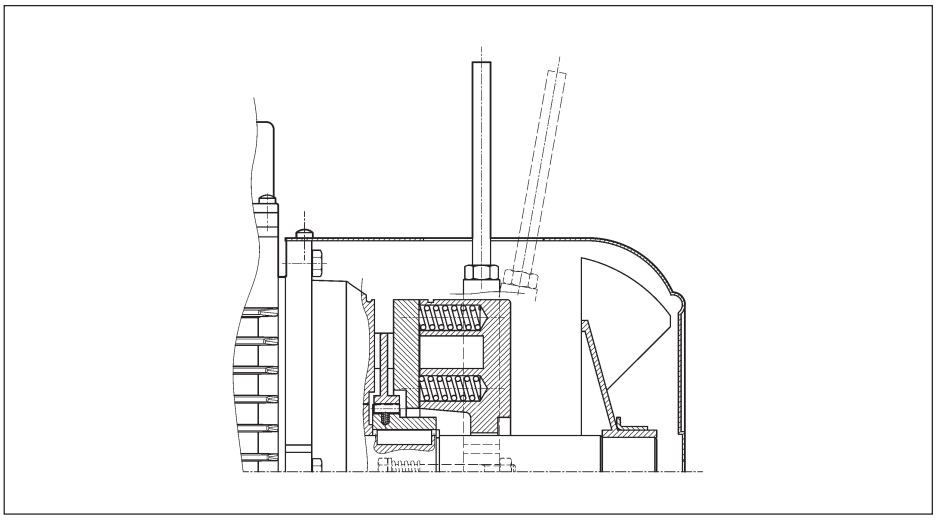
R



A return spring brings the release lever back in the original position.

(F 42)

RM



On brake motors type FD, if the option RM is specified, the release device may be locked in the ”release” position by tightening the lever until its end becomes engaged with a brake housing projection. The availability for the various disengagement devices is charted here below:

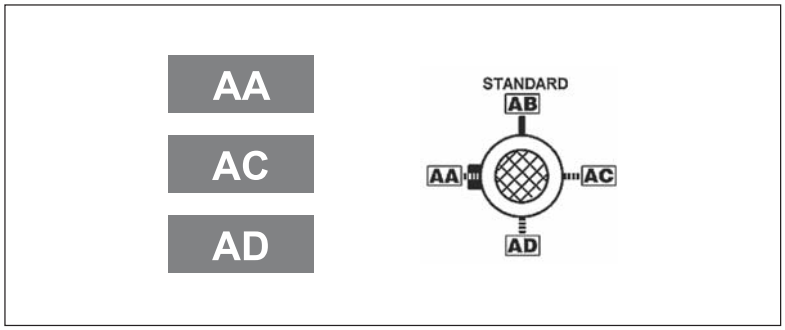
(F 43)

	R	RM
BN_FD	BN 63...BN 200	2p 63A2 ≤ H ≤ 132M2 4p 63A4 ≤ H ≤ 132MA4 6p 63A6 ≤ H ≤ 132MA6
M_FD	M 05...M 5	M 05...M 4LA
BN_FA	BN 63...BN 180M	⛔
M_FA	M 05...M 5	

M8.1 Release lever orientation

Unless otherwise specified, the release lever is located 90° away from the terminal box – identified by letters [**AB**] in the diagram below – in a clockwise direction on both options **R** and **RM**.
Alternative lever positions [**AA**], [**AC**] and [**AD**] are also possible when the corresponding option is specified:

(F 44)



M8.2 Separate brake supply

...SA

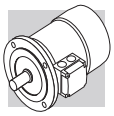
The brake coil is directly fed through an independent line, separately from the motor.
In this case the rated voltage for the coil must be specified, e.g.230SA. The option is applicable to all motors with brake type FD and FA.

...SD

The brake coil is directly fed with DC current and the rectifier is out of the scope for supply.
The rated voltage for the coil must be specified, e.g. 24SD.

M8.3 Fly-wheel data (F1)

The table below shows values of weight and inertia of flywheel (option F1). Overall dimensions of motors remain unchanged.



(F 45)

Main data for flywheel of motore type: BN_FD, M_FD			
		Fly-wheel weight [Kg]	**Fly-wheel inertia** [Kgm^2]
BN 63	**M05**	0.69	0.00063
BN 71	**M1**	1.13	0.00135
BN 80	**M2**	1.67	0.00270
BN 90 S - BN 90 L	**–**	2.51	0.00530
BN 100	**M3**	3.48	0.00840
BN 112	**–**	4.82	0.01483
BN 132 S - BN 132 M	**M4**	6.19	0.02580

M9 OPTIONS

M9.1 Thermal protective devices

In addition to the standard protection provided by the magneto-thermal device, motors can be supplied with built-in thermal probes to protect the winding against overheating caused, by insufficient ventilation or by an intermittent duty.
This additional protection should always be specified for servoventilated motors (IC416).

M9.2 Capacitive filter

CF

An optional capacitive filter is available for brake motors type FD only. When the suitable capacitive filter is installed upstream of the rectifier (option CF), motors comply with the emission limits required by standard EN61000-6-3:2007“ Electromagnetic Compatibility – Generic Emission Standard – Part 6-3: Residential, commercial and light industrial environment”.

M9.3 Thermistors

E3

These are semi-conductors having rapid resistance variation when they are close to the rated switch off temperature (150 °C).
Variations of the R = f(T) characteristic are specified under DIN 44081, IEC 34-11 Standards.
Positive temperature coefficient thermistors are normally used (also known as PTC “cold conductor resistors”).
Thermistors cannot control relays directly and must be connected to a suitable disconnect device.
Thus protected, three PTCs connected in series are installed in the winding, the terminals of which are located on the auxiliary terminal-board.

K1

The design characteristics of this sub-group of PTC thermistors allow them to be used as positive temperature coefficient sensors with variable resistance.
Functioning temperature range: 0°C ... +260°C.
Thermistors cannot control relays directly and must be connected to a suitable disconnect device.
Terminals (polarised) for 1 x KTY 84-130 are provided on an auxiliary terminal strip.

M9.4 Bimetallic thermostates

D3

These types of protective devices house a bimetal disk. When the rated switch off temperature (150 °C) is reached, the disk switches the contacts from their initial rest position.
As temperature falls, the disk and the contacts automatically return to rest position.
Three bimetallic thermostates connected in series are usually employed, with normally closed contacts. The terminals are located on an auxiliary terminal-board.

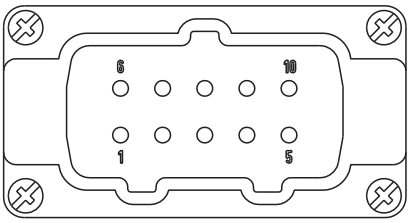
M9.5 Plug connector

CON

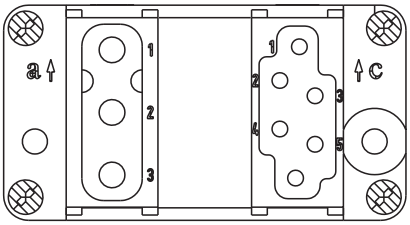
Three types of connectors (CON 1, CON 2, CON 3) are provided; they can be mounted in two different positions: right side of terminal box cover (C1D, C2D, C3D); left side of terminal box cover (C1S, C2S, C3S).
The option CON is applicable to single speed BN and M motors (2, 4, 6, 8 poles), and it is not applicable to switch-pole motors. More details about the motor sizes are available in the next table.
The connectors CON 1 / CON 2 are available for BN and M motors without brake and for brakemotors equipped with DC brake type FD, for the motor sizes listed below.
The male connector (with pins) is mounted on the motor, the female connector is not provided. With CON option, the winding connection is always Y.
With option U1 “forced ventilation”, the fan unit supply is available inside the separate terminal box fixed to fan cover.
With options EN1...EN6, the encoder connection is made by a cable not connected to the motor plug connector.
The CON option is not applicable to brakemotors equipped with AC brake type FA. The CON option is not available when at least one of the next options are selected: the U2, CUS, IC.

Specifications

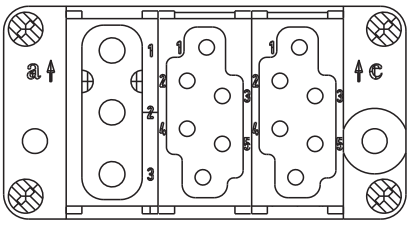
(F 46)

Option	**CON 1**
Motor size	**BN63…BN112 / M05...M3**
Connector view	
Type of connector	Harting Han 10ES
Housing	Han EMC 10B with 2 levers
Numbers of pins - nominal current	10 x 16A
Voltage	500 Vac
Contact connection	Screw terminals

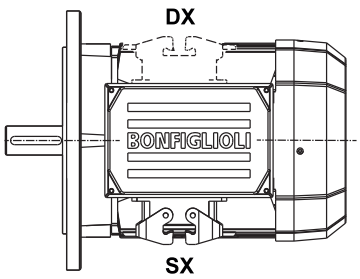
(F 47)

Option	CON 2
Motor size	**BN63…BN160MR / M05...M4L**
Connector view	
Type of connector	Harting Han Modular
Housing	Han EMC 10B with 2 levers
Module type	Module C + Empty module + Module E
Numbers of pins - nominal current	3 x 36A / 6 x 16A
Voltage	500 Vac
Contact connection	Crimping contacts

(F 48)

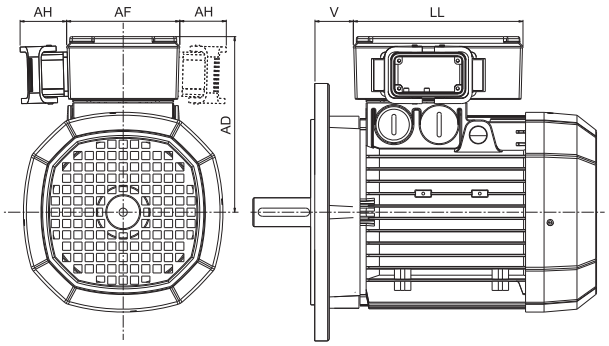
Option	CON 3
Motor size	**BN63…BN160M / M05...M4L**
Connector view	
Type of connector	Harting Han Modular
Housing	Han EMC 10B with 2 levers
Module type	Module C + Module E + Module E
Numbers of pins - nominal current	3 x 36A / 6 + 6 x 16A
Voltage	500 Vac
Contact connection	Crimping contacts

(F 49)

Connector orientation


(F 50)

Motors without brake dimensions

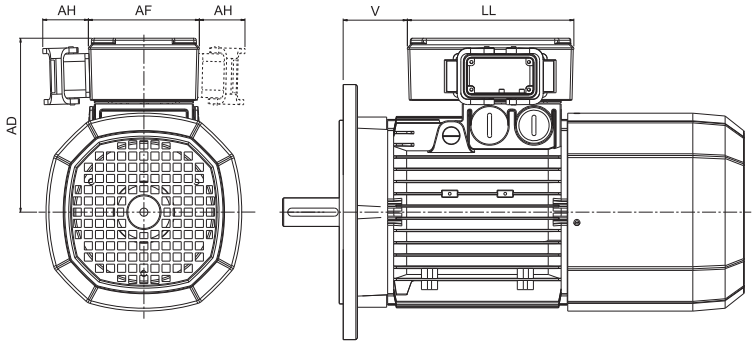


		AD (mm)	**AF** (mm)	**AH** (mm)	**LL** (mm)	**V**(*) (mm)
BN63	**M05**	136	110	45	165	4.5
BN71	**M1**	149	110	45	165	15.5
BN80	**M2**	160	110	45	165	16.5
BN90	**—**	162	110	45	165	31.5
BN100	**M3**	171	110	45	165	37.5
BN112	**—**	186	110	45	165	39
BN132	**M4**	210	140	45	188	45.5
BN160MR	**—**	210	140	45	188	161

(*) Dimension valid only for motors BN.

(F 51)

Motors with FD brake dimensions



		AD (mm)	**AF** (mm)	**AH** (mm)	**LL** (mm)	**V**(*) (mm)
BN63	**M05**	136	110	45	165	4.5
BN71	**M1**	149	110	45	165	1.5
BN80	**M2**	160	110	45	165	18.5
BN90	**—**	162	110	45	165	39.5
BN100	**M3**	171	110	45	165	63.5
BN112	**—**	186	110	45	165	75
BN132	**M4**	210	140	45	188	122
BN160MR	**—**	210	140	45	188	161

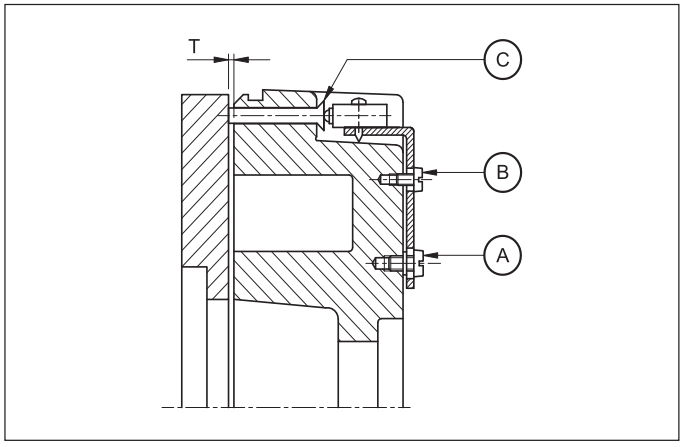
(*) Dimension valid only for motors BN.

M9.6 Control of brake operation

MSW

The microswitch can be set in order to obtain from it a signal related to the attraction/release of anchor plate, or it can be set in order to give feedback when the air gap reaches the maximum value.
MSW option is available for brakes FD03...FD09.
The microswitch is provided with three lead wires (NC, NO, COM). The next figure shown the main components of the brake equipped with microswitch.

(F 52)



A: Plate fixing screws
B: Setting screws
C: Actuator control pin

M9.7 Additional cable entry for brakemotors

IC

The terminal box cover of brakemotors BN63...BN160MR / M05...M4 is provided with two additional cable entry M16 x 1.5 (one cable entry per side).
The terminal box cover of brakemotors BN160...BN200 / M5 is provided with an additional cable entry M16 x 1.5 next to the cable entry used for the brake.

M9.8 Anti-condensation heaters

H1 **NH1**

Where an application involves high humidity or extreme temperature fluctuation, motors may be equipped with an anti-condensate heater.
A single-phase power supply is available in the auxiliary terminal board inside the main terminal box.
Values for the absorbed power are listed here below:

(F 53)

		H1	NH1
		1~ 230V ± 10% P [W]	1~ 115V ± 10% P [W]
BN 56...BN 80	**M0...M2**	10	10
BN 90...BN 160MR	**M3 - M4**	25	25
BN 160M...BN 180M	**M5**	50	50
BN 180L...BN 200L	**—**		

Warning!
Always remove power supply to the anti-condensante hea- ter before operating the motor.

M9.9 Tropicalization

TP

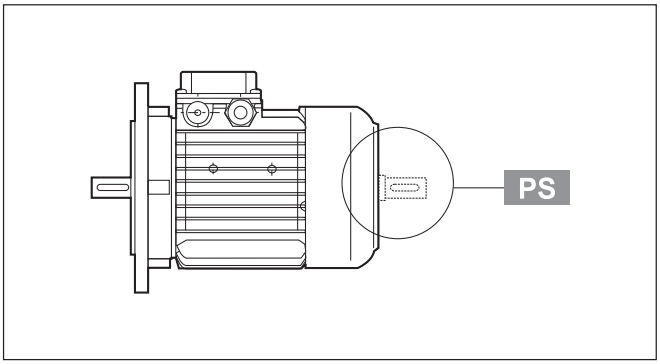
When option **TP** is specified, motor windings receive additional protection for operation in high humidity and temperature conditions.

M9.10 Second shaft extension

PS

This option is not compatible with variants RC, TC, U1, U2, EN1, EN2, EN3, EN4, EN5, EN6.
For shaft dimensions please see motor dimensions tables.

(F 54)



M9.11 Backstop device

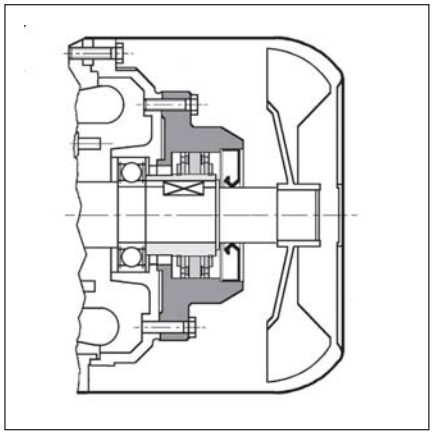
AL **AR**

For applications where backdriving must be avoided, motors equipped with an anti run-back device can be used (available for the M series only). While allowing rotation in the direction required, this device operates instantaneously in case of a power failure, preventing the shaft from running back. The anti run-back device is life lubricated with special grease for this specific application. When ordering, customers should indicate the required rotation direction, AL or AR.
Never use the anti run-back device to prevent reverse rotation caused by faulty electrical connection. Table (F55) shows rated and maximum locking torques for the anti run-back devices. A diagram of the device can be seen in Table (F56). Overall dimensis are same as the corresponding brake motor. The direction of free rotation is described in the “MOTOR OPTIONS” section of specifically dedicated sections to gear units.

(F 55)

	Rated locking torque [Nm]	Max. locking torque [Nm]	Release speed [min^{-1}]
M1	6	10	750
M2	16	27	650
M3	54	92	520
M4	110	205	430

(F 56)



M9.12 Ventilation

Motors are cooled through outer air blow (IC 411 according to CEI EN 60034-6) and are equipped with a plastic radial fan, which operates in both directions.
Ensure that fan cover is installed at a suitable distance from the closest wall so to allow air circulation and servicing of motor and brake, if fitted.
On request, motors can be supplied with independently power-supplied forced ventilation system starting from BN 71 or M1 size.
Motor is cooled by an axial fan with independent power supply and fitted on the fan cover (IC 416 cooling system).
This version is used in case of motor driven by inverter so that steady torque operation is possible even at low speed or when high starting frequencies are needed.
Brake all motors with rear shaft projection (PS option) are excluded.

(F 57)

Power supply					
		V a.c. ± 10%	**Hz**	**P** [W]	**I** [A]
BN 71	**M1**	1~ 230	50 / 60	22	0.12
BN 80	**M2**			22	0.12
BN 90	**—**			40	0.30
BN 100 (*)	**M3**			50	0.25
BN 112	**—**	3~ 230 Δ / 400Y		50	0.26 / 0.15
BN 132S	**M4S**			110	0.38 / 0.22
BN 132M...BN 160MR	**M4L**				
BN 160...BN 180M	**M5**		50	180	1.25 / 0.72

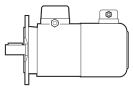
This variant has two different models, called **U1** and **U2**, having the same longitudinal size. Longer side of fan cover (**DL**) is specified for both models in the table below. Overall dimension can be reckoned from motor size table.

(F 58)

Extra length for servoventilated motors			
		ΔL_1	ΔL_2
BN 71	**M1**	93	32
BN 80	**M2**	127	55
BN 90	**—**	131	48
BN 100	**M3**	119	28
BN 112	**—**	130	31
BN 132S	**M4S**	161	51
BN 132M	**M4L**	161	51

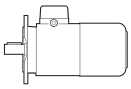
ΔL_1 = extra length to LB value of corresponding standard motor
ΔL_2 = extra length to LB value of corresponding brake motor

U1



Fan wiring terminals are housed in a separate terminal box.
In brake motors of size BN 71...BN 160MR, M1...M4L, with **U1** model, the release lever cannot be positioned to AA.
The option is not applicable to motors compliant with the CSA and UL norms (option CUS).

U2



Fan terminals are wired in the motor terminal box.
The **U2** option does not apply to motors BN 160 through BN 200L, M5, with the only exception of motor BN 160MR for which the option is available instead and to motors with option CUS (ompliant to norms CSA and UL).

(F 59)

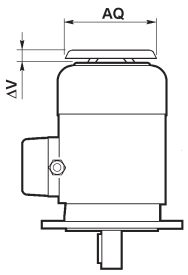
		V a.c. ±10%	**Hz**	**P** [W]	**I** [A]
BN 71	**M1**	1 ~ 230	50 / 60	22	0.12
BN 80	**M2**			22	0.12
BN 90	**–**			40	0.30
BN 100	**M3**	3 ~ 230Δ / 400Y		40	0.26 / 0.09
BN 112	**–**			50	0.26 / 0.15
BN 132 ... BN 160MR	**M4L**			110	0.38 / 0.22

M9.13 Rain canopy

RC

The rain canopy protects the motor from dripping and avoids the ingress of solid bodies. It is recommended when motor is installed in a vertical position with the shaft downwards.
Relevant dimensions are indicated in the table below.
The drip cover is not compatible with variants PS, EN1, EN2, EN3, EN4, EN5, EN6.

(F 60)

		AQ	ΔV	
BN 63	**M05**	118	24	
BN 71	**M1**	134	27	
BN 80	**M2**	152	25	
BN 90	**—**	168	30	
BN 100	**M3**	190	28	
BN 112	**—**	211	32	
BN 132...BN 160MR	**M4**	254	32	
BN 160M...BN 180M	**M5**	302	36	
BN 180L...BN 200L	**—**	340	36	

M9.14 Textile canopy

TC

Option TC is a cover variant for textile industry environments, where lint may obstruct the fan grid and prevent a regular flow of cooling air.
This option is not compatible with variants EN1, EN2, EN3, EN4, EN5, EN6.
Overall dimensions are the same as drip cover type RC.

M9.15 Feedback units

Motors may be combined with six different types of encoders to achieve feedback circuits.
Configurations with double-extended shaft (PS) and rain canopy (RC, TC) are not compatible with encoder installation.

EN1

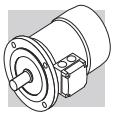
Incremental encoder, V_{IN} = 5 V, line-driver output RS 422.

EN2

Incremental encoder, V_{IN} = 10-30 V, line-driver output RS 422.

EN3

Incremental encoder, V_{IN} = 12-30 V, push-pull output 12-30 V



EN4

Encoder sin/cos, V_{IN} = 4.5-5.5 V, output Sinus $0.5V_{PP}$.

EN5

Absolute encoder singleturn, HIPERFACE® interface, V_{IN} = 7-12 V.

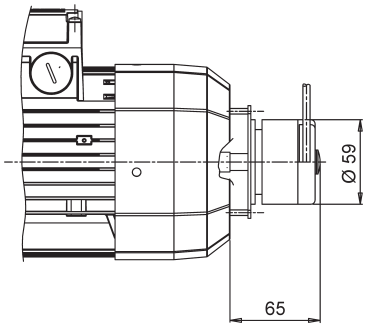
EN6

Absolute encoder multiturn, HIPERFACE® interface, V_{IN} = 7-12 V.

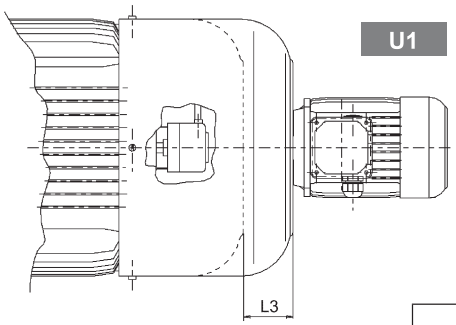
(F 61)

		EN1	EN2	EN3	EN4	EN5	EN6
Interface		TTL/RS 422	TTL/RS 422	HTL/push-pull	Sinus 0.5 VPP	HIPERFACE®	HIPERFACE®
Power supply voltage	[V]	4...6	10...30	12...30	4.4...5.5	7...12	7...12
Output voltage	[V]	5	5	12...30	—	—	—
No-load operating current	[mA]	120	100	100	40	80	80
No. of pulses per revolution		1024					
Steps per revolution		—	—	—	—	15 bit	15 bit
Revolutions		—	—	—	—	—	12 bit
No. of signals		6 (A, B, Z + inverted signals)			6 (cos-, cos+, sin-, sin+, Z, $\overline{Z}$)	—	—
Max. output frequency	[kHz]	600			200		
Max. speed	[min^{-1}]	6000 (9000 min^{-1} for 10 s)					
Working temperature range	[°C]	-30 ... +100					
Protection class		IP 65					

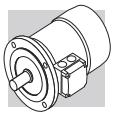
(F 63)

EN1, EN2, EN3, EN4, EN5, EN6	
	
BN 63...BN 200L	**M05...M5**
BN 63_FD...BN 200L_FD	**M05_FD...M5_FD**
BN 63_FA...BN 200L_FA	**M05_FA...M5_FA**

(F 62)

EN_ + U1		
		
		L3
BN 160M...BN 180M	**M5**	72
BN 180L...BN 200L	**-**	82
BN 160M_FD...BN 180M_FD	**M5_FD**	35
BN 180L_FD...BN 200L_FD	**-**	41

If the encoder device (option EN_) is specified on motors BN71...BN160MR / M1...M4, along with the independent fan cooling (options U1, U2), the extra length of motor is coincident with that of the correspondent U1 and U2 execution.



M9.16 Surface protection

C_

When no specific protection class is requested, the painted (ferrous) surfaces of motors are protected to at least corrosivity class C2 (UNI EN ISO 12944-2). For improved resistance to atmospheric corrosion, motors can be delivered with C3 and C4 surface protection.

SURFACE PROTECTION	Typical environments	Maximum surface temperature	Corrosivity class according to UNI EN ISO 12944-2
C3	Urban and industrial environments with up to 100% relative humidity (medium air pollution)	120°C	C3
C4	Industrial areas, coastal areas, chemical plant, with up to 100% relative humidity (high air pollution)	120°C	C4

Motors with optional protection to class C3 or C4 are available in a choice of colours. If no specific colour is requested (see the “PAINTING” option) motors are finished in RAL 7042.
Motors can also be supplied with surface protection for corrosivity class C5 according to UNI EN ISO 12944-2. Contact our Technical Service for further details.

M9.17 Painting

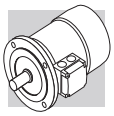
RAL_

Gearboxes with optional protection to class C3 or C4 are available in the colours listed in the following table.

PAINTING	Colour	RAL number
RAL7042*	Traffic Grey A	7042
RAL5010	Gentian Blue	5010
RAL9005	Jet Black	9005
RAL9006	White Aluminium	9006
RAL9010	Pure White	9010

* Gearboxes are supplied in this standard colour if no other colour is specified.

NOTE – “PAINTING” options can only be specified in conjunction with “SURFACE PROTECTION” options.



M9.18 Certificates

ACM

Certificate of compliance of motors

The document certifies the compliance of the product with the purchase order and the construction in conformity with the applicable procedures of the Bonfiglioli Quality System.

CC

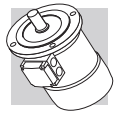
Inspection certificate

The document entails checking on order compliance, the visual inspection of external conditions and instrumental testing of the electrical characteristics in unloaded conditions. Units inspected are sampled within the shipping batch and marked individually.

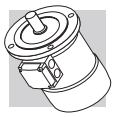
2P — 3000 min^{-1} - S1 — 50 Hz

																d.c. brake						a.c. brake					
																FD						FA					
P_n		n	M_n	IE1	η (100%)	η (75%)	η (50%)	cosφ	In 400V	Is / In	Ms / Mn	Ma / Mn	J_m x 10^{-4}	IM B5	Mod	Mb	Z_o 1/h		J_m x 10^{-4}	IM B5	Mod	Mb	Z_o 1/h	J_m x 10^{-4}	IM B5
kW		min^{-1}	Nm		%	%	%		A				kgm^2	Kg		Nm	NB	SB	kgm^2	Kg		Nm		kgm^2	Kg
0.18	**BN 63A 2**	2730	0.63	○	59.9	56.9	51.9	0.77	0.56	3.0	2.1	2.0	2.0	3.5	**FD 02**	1.75	3900	4800	2.6	5.2	**FA 02**	1.75	4800	2.6	5.0
0.25	**BN 63B 2**	2740	0.87	○	66.0	64.8	64.8	0.76	0.72	3.3	2.3	2.3	2.3	3.9	**FD 02**	1.75	3900	4800	3.0	5.6	**FA 02**	1.75	4800	3.0	5.4
0.37	**BN 63C 2**	2800	1.26	○	69.1	66.8	66.8	0.78	0.99	3.9	2.6	2.6	3.3	5.1	**FD 02**	3.5	3600	4500	3.9	6.8	**FA 02**	3.5	4500	3.9	6.6
0.37	**BN 71A 2**	2820	1.25	○	73.8	73.0	70.6	0.76	0.95	4.8	2.8	2.6	3.5	5.4	**FD 03**	3.5	3000	4100	4.6	8.1	**FA 03**	3.5	4200	4.6	7.8
0.55	**BN 71B 2**	2820	1.86	○	76.0	75.8	74.8	0.76	1.37	5.0	2.9	2.8	4.1	6.2	**FD 03**	5	2900	4200	5.3	8.9	**FA 03**	5	4200	5.3	8.6
0.75	**BN 71C 2**	2810	2.6	○	76.6	76.2	76.2	0.76	1.86	5.1	3.1	2.8	5.0	7.3	**FD 03**	5	1900	3300	6.1	10.0	**FA 03**	5	3600	6.1	9.7
0.75	**BN 80A 2**	2810	2.6	•	76.2	75.5	68.3	0.81	1.75	4.8	2.6	2.2	7.8	8.6	**FD 04**	5	1700	3200	9.4	12.5	**FA 04**	5	3200	9.4	12.4
1.1	**BN 80B 2**	2800	3.8	•	76.4	76.2	75.0	0.81	2.57	4.8	2.8	2.4	9.0	9.5	**FD 04**	10	1500	3000	10.6	13.4	**FA 04**	10	3000	10.6	13.3
1.5	**BN 80C 2**	2800	5.1	•	79.1	79.5	77.2	0.81	3.4	4.9	2.7	2.4	11.4	11.3	**FD 04**	15	1300	2600	13.0	15.2	**FA 04**	15	2600	13.0	15.1
1.5	**BN 90SA 2**	2870	5.0	•	82.0	81.5	78.1	0.80	3.4	5.9	2.7	2.6	12.5	12.3	**FD 14**	15	900	2200	14.1	16.5	**FA 14**	15	2200	14.1	16.4
1.85	**BN 90SB 2**	2880	6.1	•	82.5	82.0	75.4	0.80	4.0	6.2	2.9	2.6	16.7	14	**FD 14**	15	900	2200	18.3	18.2	**FA 14**	15	2200	18.3	18.1
2.2	**BN 90L 2**	2880	7.3	•	82.7	82.1	80.8	0.80	4.8	6.3	2.9	2.7	16.7	14	**FD 05**	26	900	2200	21	20	**FA 05**	26	2200	21	20.7
3	**BN 100L 2**	2860	10.0	•	81.5	81.3	77.4	0.79	6.7	5.6	2.6	2.2	31	20	**FD 15**	26	700	1600	35	26	**FA 15**	26	1600	35	27
4	**BN 100LB 2**	2870	13.3	•	83.1	83.0	77.8	0.80	8.7	5.8	2.7	2.5	39	23	**FD 15**	40	450	900	43	29	**FA 15**	40	1000	43	30
4	**BN 112M 2**	2900	13.2	•	85.5	84.5	83.0	0.82	8.2	6.9	3.0	2.9	57	28	**FD 06S**	40	—	950	66	39	**FA 06S**	40	950	66	40
5.5	**BN 132SA 2**	2890	18.2	•	84.7	84.5	81.2	0.84	11.2	5.9	2.6	2.2	101	35	**FD 06**	50	—	600	112	48	**FA 06**	50	600	112	49
7.5	**BN 132SB 2**	2900	25	•	86.5	86.3	84.4	0.85	14.7	6.4	2.6	2.2	145	42	**FD 06**	50	—	550	154	55	**FA 06**	50	550	154	56
9.2	**BN 132M 2**	2930	30	•	87.0	86.5	83.6	0.86	17.7	6.7	2.8	2.3	178	53	**FD 56**	75	—	430	189	66	**FA 06**	75	430	189	67
11	**BN 160MR 2**	2920	36	•	87.6	87.0	86.0	0.88	20.6	6.9	2.9	2.5	210	65											
15	**BN 160MB 2**	2930	49	•	89.6	89.4	88.0	0.86	28.1	7.1	2.6	2.3	340	84											
18.5	**BN 160L 2**	2930	60	•	90.4	90.1	89.0	0.86	34	7.6	2.7	2.3	420	97											
22	**BN 180M 2**	2930	72	•	89.9	89.7	89.5	0.88	40	7.8	2.6	2.4	490	109											
30	**BN 200LA 2**	2930	98	•	90.7	90.1	87.6	0.89	54	7.8	2.7	2.9	770	140											

○ = n.a. • = IE1



4P — 1500 min^{-1} - S1 — 50 Hz



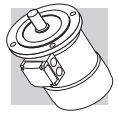
															d.c. brake						a.c. brake				
															FD						FA				
P_n		n	M_n	IE1	η (100%)	η (75%)	η (50%)	cosφ	In 400V	Is / In	Ms / Mn	Ma / Mn	J_m x 10^{-4}	IM B5	Mod	Mb	Z_o 1/h		J_m x 10^{-4}	IM B5	Mod	Mb	Z_o 1/h	J_m x 10^{-4}	IM B5
kW		min^{-1}	Nm		%	%	%		A				kgm^2	Kg		Nm	NB	SB	kgm^2	Kg		Nm		kgm^2	Kg
0.06	**BN 56A** **4**	1340	0.43	○	46.8	44.2	41.3	0.65	0.28	2.6	2.3	2.0	1.5	3.1											
0.09	**BN 56B** **4**	1350	0.64	○	51.7	47.6	42.9	0.60	0.42	2.6	2.5	2.4	1.5	3.1											
0.12	**BN 63A** **4**	1350	0.85	○	59.8	56.2	47.0	0.62	0.47	2.6	1.9	1.8	2.0	3.5	**FD 02**	1.75	10000	13000	2.6	5.2	**FA 02**	1.75	13000	2.6	5.0
0.18	**BN 63B** **4**	1320	1.30	○	54.8	52.9	52.5	0.67	0.71	2.6	2.2	2.0	2.3	3.9	**FD 02**	3.5	10000	13000	3.0	5.6	**FA 02**	3.5	13000	3.0	5.4
0.25	**BN 63C** **4**	1340	1.78	○	65.3	65.0	57.9	0.69	0.80	2.7	2.1	1.9	3.3	5.1	**FD 02**	3.5	7800	10000	3.9	6.8	**FA 02**	3.5	10000	3.9	6.6
0.25	**BN 71A** **4**	1380	1.73	○	63.7	62.2	59.1	0.73	0.78	3.3	1.9	1.7	5.8	5.1	**FD 03**	3.5	7700	11000	6.9	7.8	**FA 03**	3.5	11000	6.9	7.5
0.37	**BN 71B** **4**	1370	2.6	○	66.8	66.7	63.0	0.76	1.05	3.7	2.0	1.9	6.9	5.9	**FD 03**	5	6000	9400	8.0	8.6	**FA 03**	5.0	9400	8.0	8.3
0.55	**BN 71C** **4**	1380	3.8	○	69.0	68.9	68.8	0.74	1.55	4.1	2.3	2.3	9.1	7.3	**FD 53**	7.5	4300	8700	10.2	10.0	**FA 03**	7.5	8700	10.2	9.7
0.55	**BN 80A** **4**	1390	3.8	○	72.0	71.3	69.7	0.77	1.43	4.1	2.3	2.0	15	8.2	**FD 04**	10	4100	8000	16.6	12.1	**FA 04**	10	8000	16.6	12.0
0.75	**BN 80B** **4**	1400	5.1	•	75.0	74.5	69.3	0.78	1.85	4.9	2.7	2.5	20	9.9	**FD 04**	15	4100	7800	22	13.8	**FA 04**	15	7800	22	13.7
1.1	**BN 80C** **4**	1400	7.5	•	75.5	76.2	70.4	0.78	2.7	5.1	2.8	2.5	25	11.3	**FD 04**	15	2600	5300	27	15.2	**FA 04**	15	5300	27	15.1
1.1	**BN 90S** **4**	1390	7.6	•	76.5	76.2	72.2	0.77	2.70	4.6	2.6	2.2	21	12.2	**FD 14**	15	4800	8000	23	16.4	**FA 14**	15	8000	23	16.3
1.5	**BN 90LA** **4**	1410	10.2	•	78.7	78.5	74.9	0.77	3.6	5.3	2.8	2.4	28	13.6	**FD 05**	26	3400	6000	32	19.6	**FA 05**	26	6000	32	20.3
1.85	**BN 90LB** **4**	1390	12.7	•	78.6	78.9	77.2	0.79	4.3	5.1	2.8	2.6	30	15.1	**FD 05**	26	3200	5900	34	21.1	**FA 05**	26	5900	34	21.8
2.2	**BN 100LA** **4**	1410	14.9	•	81.1	81.4	79.9	0.75	5.2	4.5	2.2	2.0	40	18	**FD 15**	40	2600	4700	44	25	**FA 15**	40	4700	44	25
3	**BN 100LB** **4**	1410	20	•	82.6	83.8	83.7	0.77	6.8	5.0	2.3	2.2	54	22	**FD 15**	40	2400	4400	58	28	**FA 15**	40	4400	58	29
4	**BN 112M** **4**	1430	27	•	84.4	84.2	81.6	0.81	8.4	5.6	2.7	2.5	98	30	**FD 06S**	60	—	1400	107	40	**FA 06S**	60	2100	107	42
5.5	**BN 132S** **4**	1440	36	•	84.7	84.8	82.5	0.81	11.6	5.5	2.3	2.2	213	44	**FD 56**	75	—	1050	223	57	**FA 06**	75	1200	223	58
7.5	**BN 132MA** **4**	1440	50	•	86.0	86.3	85.3	0.81	15.5	5.7	2.5	2.4	270	53	**FD 06**	100	—	950	280	66	**FA 07**	100	1000	280	71
9.2	**BN 132MB** **4**	1440	61	•	88.4	88.6	87.5	0.81	18.8	5.9	2.7	2.5	319	59	**FD 07**	150	—	900	342	75	**FA 07**	150	900	342	77
11	**BN 160MR** **4**	1440	73	•	87.6	87.8	86.0	0.81	22.4	6.0	2.7	2.5	360	70	**FD 07**	150	—	850	382	86	**FA 07**	150	850	382	88
15	**BN 160L** **4**	1460	98	•	88.7	88.5	88.4	0.81	30	6.0	2.3	2.1	650	99	**FD 08**	200	—	750	725	129	**FA 08**	200	750	710	128
18.5	**BN 180M** **4**	1460	121	•	89.3	89.5	89.2	0.81	37	6.2	2.6	2.5	790	115	**FD 08**	250	—	700	865	145	**FA 08**	250	700	850	144
22	**BN 180L** **4**	1460	144	•	89.9	90.0	90.0	0.80	44	6.4	2.5	2.5	1250	135	**FD 09**	300	—	400	1450	175					
30	**BN 200L** **4**	1460	196	•	91.4	91.7	91.0	0.80	59	7.1	2.7	2.8	1650	157	**FD 09**	400	—	300	1850	197					

○ = n.a. • = IE1

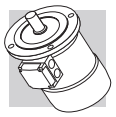
6P — 1000 min^{-1} - S1 — 50 Hz

P_n kW			n min^{-1}	M_n Nm	IE1	η (100%) %	η (75%) %	η (50%) %	cosφ	In 400V A	Is / In	Ms / Mn	Ma / Mn	J_m x 10^{-4} kgm^2	IM B5 Kg	d.c. brake FD Mod	Mb Nm	Z_o 1/h NB	Z_o 1/h SB	J_m x 10^{-4} kgm^2	IM B5 Kg	a.c. brake FA Mod	Mb Nm	Z_o 1/h	J_m x 10^{-4} kgm^2	IM B5 Kg
0.09	**BN 63A**	**6**	880	0.98	○	41.0	41.0	32.9	0.53	0.60	2.1	2.1	1.8	3.4	4.6	**FD 02**	3.5	9000	14000	4.0	6.3	**FA 02**	3.5	14000	4.0	6.1
0.12	**BN 63B**	**6**	870	1.32	○	45.0	44.0	41.8	0.60	0.64	2.1	1.9	1.7	3.7	4.9	**FD 02**	3.5	9000	14000	4.3	6.6	**FA 02**	3.5	14000	4.3	6.4
0.18	**BN 71A**	**6**	900	1.91	○	55.0	55.5	51.0	0.69	0.68	2.6	1.9	1.7	8.4	5.5	**FD 03**	5	8100	13500	9.5	8.2	**FA 03**	5.0	13500	9.5	7.9
0.25	**BN 71B**	**6**	900	2.70	○	62.0	58.5	51.4	0.71	0.82	2.6	1.9	1.7	10.9	6.7	**FD 03**	5	7800	13000	12	9.4	**FA 03**	5.0	13000	12	9.1
0.37	**BN 71C**	**6**	910	3.9	○	66.0	60.0	53.3	0.69	1.17	3.0	2.4	2.0	12.9	7.7	**FD 53**	7.5	5100	9500	14	10.4	**FA 03**	7.5	9500	14	10.1
0.37	**BN 80A**	**6**	910	3.9	○	68.0	67.4	63.3	0.68	1.15	3.2	2.2	2.0	21	9.9	**FD 04**	10	5200	8500	23	13.8	**FA 04**	10	8500	23	13.7
0.55	**BN 80B**	**6**	920	5.7	○	70.0	69.8	64.3	0.68	1.67	3.9	2.6	2.2	25	11.3	**FD 04**	15	4800	7200	27	15.2	**FA 04**	15	7200	27	15.1
0.75	**BN 80C**	**6**	920	7.8	•	70.0	70.0	64.4	0.65	2.38	3.8	2.5	2.2	28	12.2	**FD 04**	15	3400	6400	30	16.1	**FA 04**	15	6400	30	16.0
0.75	**BN 90S**	**6**	920	7.8	•	70.0	69.0	64.2	0.68	2.27	3.8	2.4	2.2	26	12.6	**FD 14**	15	3400	6500	28	16.8	**FA 14**	15	6500	28	16.7
1.1	**BN 90L**	**6**	920	11.4	•	72.9	72.6	69.1	0.69	3.2	3.9	2.3	2.0	33	15	**FD 05**	26	2700	5000	37	21	**FA 05**	26	5000	37	22
1.5	**BN 100LA**	**6**	940	15.2	•	75.2	74.2	70.3	0.72	4.0	4.1	2.1	2.0	82	22	**FD 15**	40	1900	4100	86	28	**FA 15**	40	4100	86	29
1.85	**BN 100LB**	**6**	930	19.0	•	76.6	72.8	62.6	0.73	4.8	4.6	2.1	2.0	95	24	**FD 15**	40	1700	3600	99	30	**FA 15**	40	3600	99	31
2.2	**BN 112M**	**6**	940	22	•	78.5	79.0	76.5	0.73	5.5	4.8	2.2	2.0	168	32	**FD 06S**	60	—	2100	177	42	**FA 06S**	60	2100	177	44
3	**BN 132S**	**6**	940	30	•	79.7	77.0	75.1	0.76	7.1	5.1	1.9	1.8	216	36	**FD 56**	75	—	1400	226	49	**FA 06**	75	1400	226	50
4	**BN 132MA**	**6**	950	40	•	81.4	81.5	79.5	0.77	9.2	5.5	2.0	1.8	295	45	**FD 06**	100	—	1200	305	58	**FA 07**	100	1200	318	63
5.5	**BN 132MB**	**6**	945	56	•	83.1	80.9	79.1	0.78	12.2	6.1	2.1	1.9	383	56	**FD 07**	150	—	1050	406	72	**FA 07**	150	1050	406	74
7.5	**BN 160M**	**6**	955	75	•	85.0	85.0	84.8	0.81	15.7	5.9	2.2	2.0	740	83	**FD 08**	170	—	900	815	112	**FA 08**	170	900	815	113
11	**BN 160L**	**6**	960	109	•	86.4	86.5	85.9	0.81	22.7	6.6	2.5	2.3	970	103	**FD 08**	200	—	800	1045	133	**FA 08**	200	800	1045	133
15	**BN 180L**	**6**	970	148	•	87.7	88.0	87.3	0.82	30	6.2	2.0	2.4	1550	130	**FD 09**	300	—	600	1750	170					
18.5	**BN 200LA**	**6**	960	184	•	88.6	88.0	87.3	0.81	37	5.9	2.0	2.3	1700	145	**FD 09**	400	—	450	1900	185					

○ = n.a. • = IE1



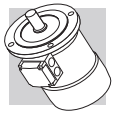
8P — 750 min^{-1} - S1 — 50 Hz



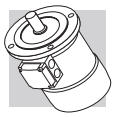
													d.c. brake						a.c. brake				
													FD						FA				
P_n		n	M_n	η	cosφ	In	Is/In	Ms/Mn	Ma/Mn	J_m	IM B5		Mod	Mb	Z_o 1/h		J_m	IM B5	Mod	Mb	Z_o	J_m	IM B5
						400V				x 10^{-4}							x 10^{-4}				1/h	x 10^{-4}	
kW		min^{-1}	Nm	%		A				kgm^2	Kg			Nm	NB	SB	kgm^2	Kg		Nm		kgm^2	Kg
0.09	**BN 71A**	**8**	680	1.26	47	0.59	0.47	2.3	2.4	2.3	10.9	6.7	**FD 03**	3.5	9000	16000	12.0	9.4	**FA 03**	3.5	16000	12.0	9.1
0.12	**BN 71B**	**8**	680	1.69	51	0.59	0.58	2.1	2.3	2.2	12.9	7.7	**FD 03**	5.0	9000	16000	14.0	10.4	**FA 03**	5.0	16000	14.0	10.1
0.18	**BN 80A**	**8**	690	2.49	51	0.60	0.85	2.4	2.2	2.2	15	8.2	**FD 04**	5.0	6500	11000	16.6	12.1	**FA 04**	5.0	11000	16.6	12.0
0.25	**BN 80B**	**8**	680	3.51	54	0.63	1.06	2.4	2.0	1.9	20	9.9	**FD 04**	10.0	6000	10000	22	13.8	**FA 04**	10.0	10000	23	13.7
0.37	**BN 90S**	**8**	675	5.2	58	0.60	1.53	2.6	2.3	2.1	26	12.6	**FD 14**	15.0	4800	7500	28	16.8	**FA 14**	15.0	7500	28	16.7
0.55	**BN 90L**	**8**	670	7.8	62	0.60	2.13	2.6	2.2	2.0	33	15	**FD 05**	26	4000	6400	37	21	**FA 05**	26	6400	37	22
0.75	**BN 100LA**	**8**	700	10.2	68	0.63	2.53	3.4	1.9	1.7	82	22	**FD 15**	26	2800	4800	86	28	**FA 15**	26	4800	86	29
1.1	**BN 100LB**	**8**	700	15.0	68	0.64	3.65	3.2	1.7	1.7	95	24	**FD 15**	40	2500	4000	99	30	**FA 15**	40	4000	99	31
1.5	**BN 112M**	**8**	710	20.2	71	0.66	4.6	3.7	1.8	1.9	168	32	**FD 06S**	60	—	3000	177	42	**FA 06S**	60	3000	177	44
2.2	**BN 132S**	**8**	710	29.6	75	0.66	6.4	3.8	1.8	2.0	295	45	**FD 56**	75	—	2300	305	58	**FA 06**	75	2300	305	56
3	**BN 132MA**	**8**	710	40.4	76	0.69	8.3	3.9	1.6	1.8	370	53	**FD 06**	100	—	1900	394	69	**FA 07**	100	1900	406	74

2/4P — 3000/1500 min^{-1} - S1 — 50 Hz

													d.c. brake						a.c. brake				
													FD						FA				
P_n			n	M_n	η	cosφ	In	Is/In	Ms/Mn	Ma/Mn	J_m	IM B5	Mod	Mb	Z_o 1/h		J_m	IM B5	Mod	Mb	Z_o	J_m	IM B5
kW			min^{-1}	Nm	%		400V A				x 10^{-4} kgm^2	Kg		Nm	NB	SB	x 10^{-4} kgm^2	Kg		Nm	1/h	x 10^{-4} kgm^2	Kg
0.20	BN 63B	2	2700	0.71	55	0.82	0.64	3.5	2.1	1.9	2.9	4.4	FD 02	3.5	2200	2600	3.5	6.1	FA 02	3.5	2600	3.5	5.9
0.15		4	1350	1.06	49	0.67	0.66	2.6	1.8	1.7					4000	5100					5100		
0.28	BN 71A	2	2700	0.99	56	0.82	0.88	2.9	1.9	1.7	4.7	4.4	FD 03	3.5	2100	2400	5.8	7.1	FA 03	3.5	2400	5.8	6.8
0.20		4	1370	1.39	59	0.72	0.68	3.1	1.8	1.7					3800	4800					4800		
0.37	BN 71B	2	2740	1.29	56	0.82	1.16	3.5	1.8	1.8	5.8	5.1	FD 03	5.0	1400	2100	6.9	7.8	FA 03	5.0	2100	6.9	7.5
0.25		4	1390	1.72	60	0.73	0.82	3.3	2.0	1.9					2900	4200					4200		
0.45	BN 71C	2	2780	1.55	63	0.85	1.21	3.8	1.8	1.8	6.9	5.9	FD 03	5.0	1400	2100	8.0	8.6	FA 03	5.0	2100	8.0	8.3
0.30		4	1400	2.0	63	0.73	0.94	3.6	2.0	1.9					2900	4200					4200		
0.55	BN 80A	2	2800	1.9	63	0.85	1.48	3.9	1.7	1.7	15	8.2	FD 04	5.0	1600	2300	17	12.1	FA 04	5.0	2300	16.6	12.0
0.37		4	1400	2.5	67	0.79	1.01	4.1	1.8	1.9					3000	4000					4000		
0.75	BN 80B	2	2780	2.6	65	0.85	1.96	3.8	1.9	1.8	20	9.9	FD 04	10	1400	1600	22	13.8	FA 04	10	1600	22	13.7
0.55		4	1400	3.8	68	0.81	1.44	3.9	1.7	1.7					2700	3600					3600		
1.1	BN 90S	2	2790	3.8	71	0.82	2.73	4.7	2.3	2.0	21	12.2	FD 14	10	1500	1600	23	16.4	FA 14	10	1600	23	16.3
0.75		4	1390	5.2	66	0.79	2.08	4.6	2.4	2.2					2300	2800					2800		
1.5	BN 90L	2	2780	5.2	70	0.85	3.64	4.5	2.4	2.1	28	14.0	FD 05	26	1050	1200	32	20	FA 05	26	1200	32	21
1.1		4	1390	7.6	73	0.81	2.69	4.7	2.5	2.2					1600	2000					2000		
2.2	BN 100LA	2	2800	7.5	72	0.85	5.2	4.5	2.0	1.9	40	18.3	FD 15	26	600	900	44	25	FA 15	26	900	44	25
1.5		4	1410	10.2	73	0.79	3.8	4.7	2.0	2.0					1300	2300					2300		
3.5	BN 100LB	2	2850	11.7	80	0.84	7.5	5.4	2.2	2.1	61	25	FD 15	40	500	900	65	31	FA 15	40	900	65	32
2.5		4	1420	16.8	82	0.80	5.5	5.2	2.2	2.2					1000	2100					2100		
4	BN 112M	2	2880	13.3	79	0.83	8.8	6.1	2.4	2.0	98	30	FD 06S	60	—	700	107	40	FA 06S	60	700	107	42
3.3		4	1420	22.2	80	0.80	7.4	5.1	2.1	2.0					—	1200					1200		
5.5	BN 132S	2	2890	18.2	80	0.87	11.4	5.9	2.4	2.0	213	44	FD 56	75	—	350	223	57	FA 06	75	350	223	58
4.4		4	1440	29	82	0.84	9.2	5.3	2.2	2.0					—	900					900		
7.5	BN 132MA	2	2900	25	82	0.87	15.2	6.5	2.4	2.0	270	53	FD 06	100	—	350	280	66	FA 07	100	350	293	71
6		4	1430	40	84	0.85	12.1	5.8	2.3	2.1					—	900					900		
9.2	BN 132MB	2	2920	30	83	0.86	18.6	6.0	2.6	2.2	319	59	FD 07	150	—	300	342	75	FA 07	150	300	342	77
7.3		4	1440	48	85	0.85	14.6	5.5	2.3	2.1					—	800					800		



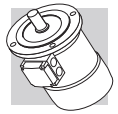
2/6P — 3000/1000 min^{-1} - S3 60/40% — 50 Hz



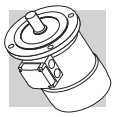
													d.c. brake						a.c. brake				
													FD						FA				
P_n		n	M_n	η	cosφ	In	Is	Ms	Ma	J_m	IM B5		Mod	Mb	Z_o 1/h		J_m	IM B5	Mod	Mb	Z_o	J_m	IM B5
						400V	In	Mn	Mn	x 10^{-4}							x 10^{-4}				1/h	x 10^{-4}	
kW		min^{-1}	Nm	%		A				kgm^2	Kg			Nm	NB	SB	kgm^2	Kg		Nm		kgm^2	Kg
0.25	**BN 71A**	**2**	2850	0.84	60	0.82	0.73	4.3	1.9	1.8	6.9	5.9	**FD 03**	1.75	1500	1700	8.0	8.6	**FA 03**	2.5	1700	8.0	8.3
0.08		**6**	910	0.84	43	0.70	0.38	2.1	1.4	1.5					10000	13000					13000		
0.37	**BN 71B**	**2**	2880	1.23	62	0.80	1.08	4.4	1.9	1.8	9.1	7.3	**FD 03**	3.5	1000	1300	10.2	10.0	**FA 03**	3.5	1300	10.2	9.7
0.12		**6**	900	1.27	44	0.73	0.54	2.4	1.4	1.5					9000	11000					11000		
0.55	**BN 80A**	**2**	2800	1.88	63	0.86	1.47	4.5	1.9	1.7	20	9.9	**FD 04**	5.0	1500	1800	22	13.8	**FA 04**	5.0	1800	22	13.7
0.18		**6**	930	1.85	52	0.65	0.77	3.3	2.0	1.9					4100	6300					6300		
0.75	**BN 80B**	**2**	2800	2.6	66	0.87	1.89	4.3	1.8	1.6	25	11.3	**FD 04**	5.0	1700	1900	27	15.2	**FA 04**	5.0	1900	27	15.1
0.25		**6**	930	2.6	54	0.67	1.00	3.2	1.7	1.8					3800	6000					6000		
1.10	**BN 90L**	**2**	2860	3.7	67	0.84	2.82	4.7	2.1	1.9	28	14.0	**FD 05**	13	1400	1600	32	20	**FA 05**	13	1600	32	21
0.37		**6**	920	3.8	59	0.71	1.27	3.3	1.6	1.6					3400	5200					5200		
1.5	**BN 100LA**	**2**	2880	5	73	0.84	3.53	5.1	1.9	2.0	40	18.3	**FD 15**	13	1000	1200	44	24	**FA 15**	13	1200	44	25
0.55		**6**	940	5.6	64	0.67	1.85	3.5	1.7	1.8					2900	4000					4000		
2.2	**BN 100LB**	**2**	2900	7.2	77	0.85	4.9	5.9	2.0	2.0	61	25	**FD 15**	26	700	900	65	31	**FA 15**	26	900	65	32
0.75		**6**	950	7.5	67	0.64	2.5	3.3	1.9	1.8					2100	3000					3000		
3	**BN 112M**	**2**	2900	9.9	78	0.87	6.4	6.3	2.0	2.1	98	30	**FD 06S**	40	—	1000	107	40	**FA 06S**	40	1000	107	32
1.1		**6**	950	11.1	72	0.64	3.4	3.9	1.8	1.8					—	2600					2600		
4.5	**BN 132S**	**2**	2910	14.8	78	0.84	9.9	5.8	1.9	1.8	213	44	**FD 56**	37	—	500	223	57	**FA 06**	37	500	223	58
1.5		**6**	960	14.9	74	0.67	4.4	4.2	1.9	2.0					—	2100					2100		
5.5	**BN 132M**	**2**	2920	18.0	78	0.87	11.7	6.2	2.1	1.9	270	53	**FD 56**	50	—	400	280	66	**FA 06**	50	400	280	67
2.2		**6**	960	22	77	0.71	5.8	4.3	2.1	2.0					—	1900					1900		

2/8P — 3000/750 min^{-1} - S3 60/40% — 50 Hz

													d.c. brake						a.c. brake				
													FD						FA				
P_n		n	M_n	η	cosφ	In	Is/In	Ms/Mn	Ma/Mn	J_m	IM B5	Mod	Mb	Z_o 1/h		J_m	IM B5	Mod	Mb	Z_o	J_m	IM B5
kW		min^{-1}	Nm	%		400V A				x 10^{-4} kgm^2	Kg		Nm	NB	SB	x 10^{-4} kgm^2	Kg		Nm	1/h	x 10^{-4} kgm^2	Kg
0.25	**BN 71A** **2**	2790	0.86	61	0.87	0.68	3.9	1.8	1.9	10.9	6.7	**FD 03**	1.75	1300	1400	12	9.4	**FA 03**	2.5	1400	12	9.1
0.06	**8**	680	0.84	31	0.61	0.46	2.0	1.8	1.9					10000	13000					13000		
0.37	**BN 71B** **2**	2800	1.26	63	0.86	0.99	3.9	1.8	1.9	12.9	7.7	**FD 03**	3.5	1200	1300	14	10.4	**FA 03**	3.5	1300	14	10.1
0.09	**8**	670	1.28	34	0.75	0.51	1.8	1.4	1.5					9500	13000					13000		
0.55	**BN 80A** **2**	2830	1.86	66	0.86	1.40	4.4	2.1	2.0	20	9.9	**FD 04**	5.0	1500	1800	22	13.8	**FA 04**	5.0	1800	22	13.7
0.13	**8**	690	1.80	41	0.64	0.72	2.3	1.6	1.7					5600	8000					8000		
0.75	**BN 80B** **2**	2800	2.6	68	0.88	1.81	4.6	2.1	2.0	25	11.3	**FD 04**	10	1700	1900	27	15.2	**FA 04**	10	1900	27	15.1
0.18	**8**	690	2.5	43	0.66	0.92	2.3	1.6	1.7					4800	7300					7300		
1.10	**BN 90L** **2**	2830	3.7	63	0.84	3.00	4.5	2.1	1.9	28	14.0	**FD 05**	13	1400	1600	32	20	**FA 05**	13	1600	32	21
0.28	**8**	690	3.9	48	0.63	1.34	2.4	1.8	1.9					3400	5100					5100		
1.5	**BN 100LA** **2**	2880	5.0	69	0.85	3.69	4.7	1.9	1.8	40	18.3	**FD 15**	13	1000	1200	44	25	**FA 15**	13	1200	44	25
0.37	**8**	690	5.1	46	0.63	1.84	2.1	1.6	1.6					3300	5000					5000		
2.4	**BN 100LB** **2**	2900	7.9	75	0.82	5.6	5.4	2.1	2.0	61	25	**FD 15**	26	550	700	65	31	**FA 15**	26	700	65	32
0.55	**8**	700	7.5	54	0.58	2.5	2.6	1.8	1.8					2000	3500					3500		
3	**BN 112M** **2**	2900	9.9	76	0.87	6.5	6.3	2.1	1.9	98	30	**FD 06S**	40	—	900	107	40	**FA 06S**	40	900	107	42
0.75	**8**	690	10.4	60	0.65	2.8	2.5	1.6	1.6					—	2900					2900		
4	**BN 132S** **2**	2870	13.3	73	0.84	9.4	5.6	2.3	2.4	213	44	**FD 56**	37	—	500	223	57	**FA 06**	37	500	223	58
1	**8**	690	13.8	66	0.62	3.5	2.9	1.9	1.8					—	3500					3500		
5.5	**BN 132M** **2**	2870	18.3	75	0.84	12.6	6.1	2.4	2.5	270	53	**FD 06**	50	—	400	280	66	**FA 06**	50	400	280	67
1.5	**8**	690	21	68	0.63	5.1	2.9	1.9	1.9					—	2400					2400		



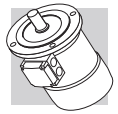
2/12P — 3000/500 min^{-1} - S3 60/40% — 50 Hz



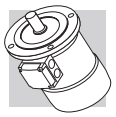
													d.c. brake						a.c. brake				
													FD						FA				
P_n			n	M_n	η	cosφ	In	Is/In	Ms/Mn	Ma/Mn	J_m	IM B5	Mod	Mb	Z_o 1/h		J_m	IM B5	Mod	Mb	Z_o	J_m	IM B5
kW			min^{-1}	Nm	%		400V A				x 10^{-4} kgm^2	Kg		Nm	NB	SB	x 10^{-4} kgm^2	Kg		Nm	1/h	x 10^{-4} kgm^2	Kg
0.55	**BN 80B**	**2**	2820	1.86	64	0.89	1.39	4.2	1.6	1.7	25	11.3	**FD 04**	5.0	1000	1300	27	15.2	**FA 04**	5.0	1300	27	15.1
0.09		**12**	430	2.0	30	0.63	0.69	1.8	1.9	1.8					8000	12000					12000		
0.75	**BN 90L**	**2**	2790	2.6	56	0.89	2.17	4.2	1.8	1.7	26	12.6	**FD 05**	13	1000	1150	30	18.6	**FA 05**	13	1150	30	19.3
0.12		**12**	430	2.7	26	0.63	1.06	1.7	1.4	1.6					4600	6300					6300		
1.10	**BN 100LA**	**2**	2850	3.7	65	0.85	2.87	4.5	1.6	1.8	40	18.3	**FD 15**	13	700	900	44	25	**FA 15**	13	900	44	25
0.18		**12**	430	4.0	26	0.54	1.85	1.5	1.3	1.5					4000	6000					6000		
1.5	**BN 100LB**	**2**	2900	4.9	67	0.86	3.76	5.6	1.9	1.9	54	22	**FD 15**	13	700	900	58	28	**FA 15**	13	900	58	29
0.25		**12**	440	5.4	36	0.46	2.18	1.8	1.7	1.8					3800	5000					5000		
2	**BN 112M**	**2**	2900	6.6	74	0.88	4.43	6.5	2.1	2.0	98	30	**FD 06S**	20	—	800	107	40	**FA 06S**	20	800	107	42
0.3		**12**	460	6.2	46	0.43	2.19	2.0	2.1	2.0					—	3400					3400		
3	**BN 132S**	**2**	2920	9.8	74	0.87	6.7	6.8	2.3	1.9	213	44	**FD 56**	37	—	450	223	57	**FA 06**	37	450	223	58
0.5		**12**	470	10.2	51	0.43	3.3	2.0	1.7	1.6					—	3000					3000		
4	**BN 132M**	**2**	2920	13.1	75	0.89	8.6	5.9	2.4	2.3	270	53	**FD 56**	37	—	400	280	66	**FA 06**	37	400	280	67
0.7		**12**	460	14.5	53	0.44	4.3	1.9	1.7	1.6					—	2800					2800		

4/6P — 1500/1000 min^{-1} - S1 — 50 Hz

													d.c. brake						a.c. brake				
													FD						FA				
P_n			n	M_n	η	cosφ	In 400V	Is / In	Ms / Mn	Ma / Mn	J_m x 10^{-4}	IM B5	Mod	Mb	Z_o 1/h		J_m x 10^{-4}	IM B5	Mod	Mb	Z_o	J_m x 10^{-4}	IM B5
kW			min^{-1}	Nm	%		A				kgm^2	Kg		Nm	NB	SB	kgm^2	Kg		Nm	1/h	kgm^2	Kg
0.22	BN 71B	4	1410	1.5	64	0.74	0.67	3.9	1.8	1.9	9.1	7.3	FD 03	3.5	2500	3500	10.2	10.0	FA 03	3.5	3500	10.2	9.7
0.13		6	920	1.4	43	0.67	0.65	2.3	1.6	1.7					5000	9000					9000		
0.30	BN 80A	4	1410	2.0	61	0.82	0.87	3.5	1.3	1.5	15	8.2	FD 04	5.0	2500	3100	16.6	12.1	FA 04	5.0	3100	16.6	12.0
0.20		6	930	2.1	54	0.66	0.81	3.2	1.9	2.0					4000	6000					6000		
0.40	BN 80B	4	1430	2.7	63	0.75	1.22	3.9	1.8	1.8	20	9.9	FD 04	10	1800	2300	22	13.8	FA 04	10	2300	22	13.7
0.26		6	930	2.7	55	0.70	0.97	2.7	1.5	1.6					3600	5500					5500		
0.55	BN 90S	4	1420	3.7	70	0.78	1.45	4.5	2.0	1.9	21	12.2	FD 14	10	1500	2100	23	16.1	FA 14	10	2100	23	16.3
0.33		6	930	3.4	62	0.70	1.10	3.7	2.3	2.0					2500	4100					4100		
0.75	BN 90L	4	1420	5.0	74	0.78	1.88	4.3	1.9	1.8	28	14	FD 05	13	1400	2000	32	20	FA 05	13	2000	32	21
0.45		6	920	4.7	66	0.71	1.39	3.3	2.0	1.9					2300	3600					3600		
1.1	BN 100LA	4	1450	7.2	74	0.79	2.72	5.0	1.7	1.9	82	22	FD 15	26	1400	2000	86	28	FA 15	26	2000	86	29
0.8		6	950	8.0	65	0.69	2.57	4.1	1.9	2.1					2100	3300					3300		
1.5	BN 100LB	4	1450	9.9	75	0.79	3.65	5.1	1.7	1.9	95	25	FD 15	26	1300	1800	99	31	FA 15	26	1800	99	32
1.1		6	950	11.1	72	0.68	3.24	4.3	2.0	2.1					2000	3000					3000		
2.3	BN 112M	4	1450	15.2	75	0.78	5.7	5.2	1.8	1.9	168	32	FD 06S	40	—	1600	177	42	FA 06S	40	1600	177	44
1.5		6	960	14.9	73	0.72	4.1	4.9	2.0	2.0					—	2400					2400		
3.1	BN 132S	4	1460	20	83	0.83	6.5	5.9	2.1	2.0	213	44	FD 56	37	—	1200	223	57	FA 06	37	1200	223	58
2		6	960	20	77	0.75	4.9	4.5	2.1	2.1					—	1900					1900		
4.2	BN 132MA	4	1460	27	84	0.82	8.8	5.9	2.1	2.2	270	53	FD 06	50	—	900	280	66	FA 06	50	900	280	67
2.6		6	960	26	79	0.72	6.6	4.3	2.0	2.0					—	1500					1500		



4/8P — 1500/750 min^{-1} - S1 — 50 Hz

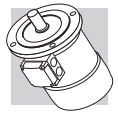


													d.c. brake						a.c. brake				
													FD						FA				
P_n			n	M_n	η	cosφ	In	Is	Ms	Ma	J_m	IM B5	Mod	Mb	Z_o 1/h		J_m	IM B5	Mod	Mb	Z_o	J_m	IM B5
							400V	In	Mn	Mn	x 10^{-4}						x 10^{-4}				1/h	x 10^{-4}	
kW			min^{-1}	Nm	%		A				kgm^2	Kg		Nm	NB	SB	kgm^2	Kg		Nm		kgm^2	Kg
0.37	**BN 80A**	**4**	1400	2.5	63	0.82	1.03	3.3	1.4	1.4	15	8.2	**FD 04**	10	2300	3500	16.6	12.1	**FA 04**	10	3500	16.6	12.0
0.18		**8**	690	2.5	44	0.60	0.98	2.2	1.5	1.6					4500	7000					7000		
0.55	**BN 80B**	**4**	1390	3.8	65	0.86	1.42	3.8	1.7	1.6	20	9.9	**FD 04**	10	2200	2900	22	13.8	**FA 04**	10	2900	22	13.7
0.30		**8**	670	4.3	49	0.65	1.36	2.3	1.7	1.8					4200	6500					6500		
0.65	**BN 90S**	**4**	1390	4.5	73	0.85	1.51	4.0	1.9	1.9	28	13.6	**FD 14**	15	2300	2800	30	17.8	**FA 14**	15	2800	30	17.7
0.35		**8**	690	4.8	49	0.57	1.81	2.5	2.1	2.2					3500	6000					6000		
0.9	**BN 90L**	**4**	1370	6.3	73	0.87	2.05	3.8	1.8	1.8	30	15.1	**FD 05**	26	1700	2100	34	21	**FA 05**	26	2100	34	22
0.5		**8**	670	7.1	57	0.62	2.04	2.4	2.1	2.0					2500	4200					4200		
1.30	**BN 100LA**	**4**	1420	8.7	72	0.83	3.14	4.3	1.7	1.8	82	22	**FD 15**	40	1300	1700	86	28	**FA 15**	40	1700	86	29
0.70		**8**	700	9.6	58	0.64	2.72	2.8	1.8	1.8					2000	3400					3400		
1.8	**BN 100LB**	**4**	1420	12.1	69	0.87	4.3	4.2	1.6	1.7	95	25	**FD 15**	40	1200	1700	99	31	**FA 15**	40	1700	99	32
0.9		**8**	700	12.3	62	0.63	3.3	3.2	1.7	1.8					1600	2600					2600		
2.2	**BN 112M**	**4**	1440	14.6	77	0.85	4.9	5.3	1.8	1.8	168	32	**FD 06S**	60	—	1200	177	42	**FA 06S**	60	1200	177	43
1.2		**8**	710	16.1	70	0.63	3.9	3.3	1.9	1.8					—	2000					2000		
3.6	**BN 132S**	**4**	1440	24	80	0.82	7.9	6.5	2.1	1.9	295	45	**FD 56**	75	—	1000	305	58	**FA 06**	75	1000	305	59
1.8		**8**	720	24	72	0.55	6.6	4.6	1.9	2.0					—	1400					1400		
4.6	**BN 132M**	**4**	1450	30	81	0.83	9.9	6.5	2.2	1.9	383	56	**FD 06**	100	—	1000	393	69	**FA 07**	100	1000	406	74
2.3		**8**	720	31	73	0.54	8.4	4.4	2.3	2.0					—	1300					1300		

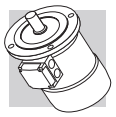
2P — 3000 min^{-1} - S1 — 50 Hz

																d.c. brake						a.c. brake				
																FD						FA				
P_n		n	M_n	IE1	η (100%)	η (75%)	η (50%)	cosφ	In 400V	Is / In	Ms / Mn	Ma / Mn	J_m x 10^{-4}	IM B5		Mod	Mb	Z_o 1/h		J_m x 10^{-4}	IM B5	Mod	Mb	Z_o 1/h	J_m x 10^{-4}	IM B5
kW		min^{-1}	Nm		%	%	%		A				kgm^2	Kg			Nm	NB	SB	kgm^2	Kg		Nm		kgm^2	Kg
0.18	M 05A	2	2730	0.63	○	59.9	56.9	51.9	0.77	0.56	3.0	2.1	2.0	2.0	3.2	FD 02	1.75	3900	4800	2.6	4.9	FA 02	1.75	4800	2.6	4.7
0.25	M 05B	2	2740	0.87	○	66.0	64.8	64.8	0.76	0.72	3.3	2.3	2.3	2.3	3.6	FD 02	1.75	3900	4800	3.0	5.3	FA 02	1.75	4800	3.0	5.1
0.37	M 05C	2	2800	1.26	○	69.1	66.8	66.8	0.78	0.99	3.9	2.6	2.6	3.3	4.8	FD 02	3.5	3600	4500	3.9	6.5	FA 02	3.5	4500	3.9	6.3
0.55	M 1SD	2	2820	1.86	○	76.0	75.8	74.8	0.76	1.37	5.0	2.9	2.8	4.1	5.8	FD 03	5	2900	4200	5.3	8.5	FA 03	5	4200	5.3	8.2
0.75	M 1LA	2	2810	2.6	○	76.6	76.2	76.2	0.76	1.86	5.1	3.1	2.8	5.0	6.9	FD 03	5	1900	3300	6.1	9.6	FA 03	5	3300	6.1	9.3
1.1	M 2SA	2	2800	3.8	•	76.4	76.2	75.0	0.81	2.57	4.8	2.8	2.4	9.0	8.8	FD 04	10	1500	3000	10.6	11.9	FA 04	10	3000	10.6	12.6
1.5	M 2SB	2	2800	5.1	•	79.1	79.5	77.2	0.81	3.4	4.9	2.7	2.4	11.4	10.6	FD 04	15	1300	2600	13.0	9.9	FA 04	15	2600	13.0	14.4
2.2	M 3SA	2	2880	7.3	•	82.7	82.1	81.0	0.80	4.8	6.3	2.9	2.7	24	15.5	FD 15	26	1100	2400	28	22	FA 15	26	2400	28	23
3	M 3LA	2	2860	10.0	•	81.5	81.3	77.4	0.79	6.7	5.6	2.6	2.2	31	18.7	FD 15	26	700	1600	35	25	FA 15	26	1600	35	26
4	M 3LB	2	2870	13.3	•	83.1	83.0	77.8	0.80	8.7	5.8	2.7	2.5	39	22	FD 15	40	450	900	43	28	FA 15	40	900	43	29
5.5	M 4SA	2	2890	18.2	•	84.7	84.5	81.2	0.84	11.2	5.9	2.6	2.2	101	33	FD 06	50	—	600	112	46	FA 06	50	600	112	47
7.5	M 4SB	2	2900	25	•	86.5	86.3	84.4	0.85	14.7	6.4	2.6	2.2	145	40	FD 06	50	—	550	154	53	FA 06	50	550	154	54
9.2	M 4LA	2	2930	30	•	87.0	86.5	83.6	0.86	17.7	6.7	2.8	2.3	178	51	FD 56	75	—	430	189	64	FA 06	75	430	189	65
11	M 4LC	2	2920	36	•	87.6	87.0	86.0	0.88	20.6	6.9	2.9	2.5	210	60											
15	M 5SB	2	2930	49	•	89.6	89.4	88.0	0.86	28.1	7.1	2.6	2.3	340	70											
18.5	M 5SC	2	2930	60	•	90.4	90.1	89.0	0.86	34	7.6	2.7	2.3	420	83											
22	M 5LA	2	2930	72	•	89.9	89.7	89.5	0.88	40	7.8	2.6	2.4	490	95											

○ = n.a. • = IE1



4P — 1500 min^{-1} - S1 — 50 Hz



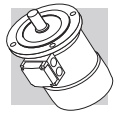
																d.c. brake						a.c. brake				
																FD						FA				
P_n		n	M_n	IE1	η (100%)	η (75%)	η (50%)	cosφ	In 400V	Is/In	Ms/Mn	Ma/Mn	J_m x 10^{-4}	IM B5		Mod	Mb	Z_o 1/h		J_m x 10^{-4}	IM B5	Mod	Mb	Z_o	J_m x 10^{-4}	IM B5
kW		min^{-1}	Nm		%	%	%		A				kgm^2	Kg			Nm	NB	SB	kgm^2	Kg		Nm	1/h	kgm^2	Kg
0.09	**M 0B**	**4**	1350	0.64	○	51.7	47.6	42.9	0.60	0.42	2.6	2.5	2.4	1.5	2.9											
0.12	**M 05A**	**4**	1350	0.85	○	59.8	56.2	47.0	0.62	0.47	2.6	1.9	1.8	2.0	3.2	**FD 02**	1.75	10000	13000	2.6	4.9	**FA 02**	1.75	13000	2.6	4.7
0.18	**M 05B**	**4**	1320	1.30	○	54.8	52.9	52.5	0.67	0.71	2.6	2.2	2.0	2.3	3.6	**FD 02**	3.5	10000	13000	3.0	5.3	**FA 02**	3.5	13000	3.0	5.1
0.25	**M 05C**	**4**	1340	1.78	○	65.3	65.0	57.9	0.69	0.80	2.7	2.1	1.9	3.3	4.8	**FD 02**	3.5	7800	10000	3.9	6.5	**FA 02**	3.5	10000	3.9	6.3
0.37	**M 1SD**	**4**	1370	2.6	○	66.8	66.7	63.0	0.76	1.05	3.7	2.0	1.9	6.9	5.5	**FD 03**	5	6000	9400	8.0	8.2	**FA 03**	5	9400	8.0	7.9
0.55	**M 1LA**	**4**	1380	3.8	○	69.0	68.9	68.8	0.74	1.55	4.1	2.3	2.3	9.1	6.9	**FD 53**	7.5	4300	8700	10.2	9.6	**FA 03**	7.5	8700	10.2	9.3
0.75	**M 2SA**	**4**	1400	5.1	•	75.0	74.5	69.3	0.78	1.85	4.9	2.7	2.5	20	9.2	**FD 04**	15	4100	7800	22	13.1	**FA 04**	15	7800	22	13.0
1.1	**M 2SB**	**4**	1400	7.5	•	76.4	76.2	70.4	0.78	2.66	5.1	2.8	2.5	25	10.6	**FD 04**	15	2600	5300	27	14.5	**FA 04**	15	5300	27	14.4
1.5	**M 3SA**	**4**	1410	10.2	•	79.6	80.5	79.3	0.77	3.5	4.6	2.1	2.1	34	15.5	**FD 15**	26	2800	4900	38	22	**FA 15**	26	4900	38	23
2.2	**M 3LA**	**4**	1410	14.9	•	81.1	81.4	79.9	0.75	5.2	4.5	2.2	2.0	40	17	**FD 15**	40	2600	4700	44	24	**FA 15**	40	4700	44	24
3	**M 3LB**	**4**	1410	20	•	82.6	83.8	83.7	0.77	6.8	5.0	2.3	2.2	54	21	**FD 15**	40	2400	4400	58	27	**FA 15**	40	4400	58	28
4	**M 3LC**	**4**	1400	27	○	82.7	83.1	80.5	0.78	9.0	4.7	2.3	2.2	61	23	**FD 55**	55	—	1300	65	29	**FA 15**	40	1300	65	30
5.5	**M 4SA**	**4**	1440	36	•	84.7	84.8	82.5	0.81	11.6	5.5	2.3	2.2	213	42	**FD 56**	75	—	1050	223	55	**FA 06**	75	1050	223	56
7.5	**M 4LA**	**4**	1440	50	•	86.0	86.3	85.3	0.81	15.5	5.7	2.5	2.4	270	51	**FD 06**	100	—	950	280	64	**FA 07**	100	950	280	65
9.2	**M 4LB**	**4**	1440	61	•	88.4	88.6	87.5	0.81	18.8	5.9	2.7	2.5	319	57	**FD 07**	150	—	900	342	73	**FA 07**	150	900	342	75
11	**M 4LC**	**4**	1440	73	•	87.6	87.8	86.0	0.81	22.4	6.0	2.7	2.5	360	65	**FD 07**	150	—	850	382	81	**FA 07**	150	850	382	83
15	**M 5SB**	**4**	1460	98	•	88.7	88.5	88.4	0.81	30.1	6.0	2.3	2.1	650	85	**FD 08**	200	—	750	725	115	**FA 08**	200	750	710	114
18.5	**M 5LA**	**4**	1460	121	•	89.3	89.5	89.2	0.81	37	6.2	2.6	2.5	790	101	**FD 08**	250	—	700	865	131	**FA 08**	250	700	850	130

○ = n.a. • = IE1

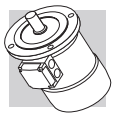
6P — 1000 min^{-1} - S1 — 50 Hz

																d.c. brake						a.c. brake				
																FD						FA				
P_n kW		n min^{-1}	M_n Nm	IE1	η (100%) %	η (75%) %	η (50%) %	cosφ	In 400V A	Is / In	Ms / Mn	Ma / Mn	J_m x 10^{-4} kgm^2	IM B5 Kg	Mod	Mb Nm	Z_o 1/h NB	Z_o 1/h SB	J_m x 10^{-4} kgm^2	IM B5 Kg	Mod	Mb Nm	Z_o 1/h	J_m x 10^{-4} kgm^2	IM B5 Kg
0.09	**M 05A**	**6**	880	0.98	○	41.0	41.0	32.9	0.53	0.60	2.1	2.1	1.8	3.4	4.3	**FD 02**	3.5	9000	14000	4.0	6.0	**FA 02**	3.5	14000	4.0	5.8
0.12	**M 05B**	**6**	870	1.32	○	45.0	44.0	41.8	0.60	0.64	2.1	1.9	1.7	3.7	4.6	**FD 02**	3.5	9000	14000	4.3	6.3	**FA 02**	3.5	14000	4.3	6.1
0.18	**M 1SC**	**6**	900	1.91	○	55.0	55.5	51.0	0.69	0.68	2.6	1.9	1.7	8.4	5.1	**FD 03**	5	8100	13500	9.5	7.8	**FA 03**	5	13500	9.5	7.5
0.25	**M 1SD**	**6**	900	2.7	○	62.0	58.5	51.4	0.71	0.82	2.6	1.9	1.7	10.9	6.3	**FD 03**	5	7800	13000	12	9.0	**FA 03**	5	13000	12	8.7
0.37	**M 1LA**	**6**	910	3.9	○	66.0	60.0	53.3	0.69	1.17	3.0	2.4	2.0	12.9	7.3	**FD 53**	7.5	5100	9500	14	10.0	**FA 03**	7.5	9500	14	9.7
0.55	**M 2SA**	**6**	920	5.7	○	70.0	69.8	64.3	0.68	1.67	3.9	2.6	2.2	25	10.6	**FD 04**	15	4800	7200	27	14.5	**FA 04**	15	7200	27	14.4
0.75	**M 2SB**	**6**	920	7.8	•	70.0	70.0	64.4	0.65	2.38	3.8	2.5	2.2	28	11.5	**FD 04**	15	3400	6400	30	15.4	**FA 04**	15	6400	30	15.3
1.1	**M 3SA**	**6**	920	11.4	•	75.0	74.0	72.0	0.72	2.9	4.3	2.0	1.8	33	17	**FD 15**	26	2700	5000	37	23	**FA 15**	26	5000	37	24
1.5	**M 3LA**	**6**	940	15.2	•	75.2	74.2	70.3	0.72	4.0	4.1	2.1	2.0	82	21	**FD 15**	40	1900	4100	86	27	**FA 15**	40	4100	86	28
1.85	**M 3LB**	**6**	930	19.0	•	76.6	72.8	62.6	0.73	4.8	4.6	2.1	2.0	95	23	**FD 15**	40	1700	3600	99	29	**FA 15**	40	3600	99	30
2.2	**M 3LC**	**6**	930	23	•	77.7	76.8	72.4	0.71	5.8	4.7	2.3	2.1	95	23	**FD 55**	55	—	1900	99	29	**FA 15**	40	1900	99	30
3	**M 4SA**	**6**	940	30	•	79.7	77.0	75.1	0.76	7.1	5.1	1.9	1.8	216	34	**FD 56**	75	—	1400	226	47	**FA 06**	75	1400	226	48
4	**M 4LA**	**6**	950	40	•	81.4	81.5	79.5	0.77	9.2	5.5	2.0	1.8	295	43	**FD 06**	100	—	1200	305	56	**FA 07**	100	1200	305	57
5.5	**M 4LB**	**6**	945	56	•	83.1	80.9	79.1	0.78	12.2	6.1	2.1	1.9	383	54	**FD 07**	150	—	1050	406	70	**FA 07**	150	1050	406	72
7.5	**M 5SA**	**6**	955	75	•	85.0	85.0	84.8	0.81	15.7	5.9	2.2	2.0	740	69	**FD 08**	170	—	900	815	98	**FA 08**	170	900	800	98
11	**M 5SB**	**6**	960	109	•	86.4	86.5	85.9	0.81	22.7	6.6	2.5	2.3	970	89	**FD 08**	200	—	800	1045	119	**FA 08**	200	800	1030	118

○ = n.a. • = IE1



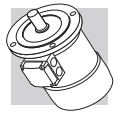
2/4P — 3000/1500 min^{-1} - S1 — 50 Hz



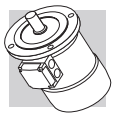
													d.c. brake						a.c. brake				
													FD						FA				
P_n		n	M_n	η	cosφ	In	Is/In	Ms/Mn	Ma/Mn	J_m	IM B5		Mod	Mb	Z_o 1/h		J_m	IM B5	Mod	Mb	Z_o	J_m	IM B5
						400V				x 10^{-4}							x 10^{-4}				1/h	x 10^{-4}	
kW		min^{-1}	Nm	%		A				kgm^2	Kg			Nm	NB	SB	kgm^2	Kg		Nm		kgm^2	Kg
0.20	**M 05A**	**2**	2700	0.71	55	0.82	0.64	3.5	2.1	1.9	2.9	4.1	**FD 02**	3.5	2200	2600	3.5	5.8	**FA 02**	3.5	2600	3.5	5.6
0.15		**4**	1350	1.06	49	0.67	0.66	2.6	1.8	1.7					4000	5100					5100		
0.28	**M 1SB**	**2**	2700	0.99	56	0.82	0.88	2.9	1.9	1.7	4.7	4.0	**FD 03**	3.5	2100	2400	5.8	6.7	**FA 03**	3.5	2400	5.8	6.4
0.20		**4**	1370	1.39	59	0.68	1.02	3.1	1.8	1.7					3800	4800					4800		
0.37	**M 1SC**	**2**	2740	1.29	56	0.82	1.16	3.5	1.8	1.8	5.8	4.7	**FD 03**	5	1400	2100	6.9	7.4	**FA 03**	5	2100	6.9	7.1
0.25		**4**	1390	1.72	60	0.73	0.82	3.3	2.0	1.9					2900	4200					4200		
0.45	**M 1SD**	**2**	2780	1.55	63	0.85	1.21	3.8	1.8	1.8	6.9	5.5	**FD 03**	5	1400	2100	8.0	8.2	**FA 03**	5	2100	8.0	7.9
0.30		**4**	1400	2.0	63	0.74	0.93	3.8	2.1	1.9					2900	4200					4200		
0.55	**M 1LA**	**2**	2800	1.9	73	0.79	1.38	4.2	2.0	1.8	9.1	6.9	**FD 03**	5	1600	2200	10.2	9.6	**FA 03**	5	2200	10.2	9.3
0.37		**4**	1400	2.5	68	0.72	1.09	3.9	2.2	2.0					3300	4600					4600		
0.75	**M 2SA**	**2**	2780	2.6	65	0.85	1.96	3.8	1.9	1.8	20	9.2	**FD 04**	10	1400	1600	22	13.1	**FA 04**	10	1600	22	13.0
0.55		**4**	1400	3.8	68	0.81	1.44	3.9	1.7	1.7					2700	3600					3600		
1.1	**M 2SB**	**2**	2730	3.9	65	0.86	2.84	3.9	2.0	1.9	25	10.7	**FD 04**	10	1200	1500	27	14.5	**FA 04**	10	1500	27	14.5
0.75		**4**	1410	5.1	75	0.81	1.78	4.5	2.1	2.0					2300	3100					3100		
1.5	**M 3SA**	**2**	2830	5.1	74	0.83	3.5	4.7	2.1	2.0	34	15.5	**FD 15**	26	700	1000	38	22	**FA 15**	26	1000	38	23
1.1		**4**	1420	7.4	77	0.78	2.6	4.3	2.1	2.0					1600	2600					2600		
2.2	**M 3LA**	**2**	2800	7.5	72	0.85	5.2	4.5	2.0	1.9	40	17	**FD 15**	26	600	900	44	24	**FA 15**	26	900	44	24
1.5		**4**	1410	10.2	73	0.79	3.8	4.7	2.0	2.0					1300	2300					2300		
3.5	**M 3LB**	**2**	2850	11.7	80	0.84	7.5	5.4	2.2	2.1	61	23	**FD 15**	40	500	900	65	29	**FA 15**	40	900	65	30
2.5		**4**	1420	16.8	82	0.80	5.5	5.2	2.2	2.2					1000	2100					2100		
4.8	**M 4 SA**	**2**	2900	15.8	81	0.88	9.7	6.0	2.0	1.9	213	42	**FD 06**	50	—	400	233	55	**FA 06**	50	400	233	56
3.8		**4**	1430	25.4	81	0.84	8.1	5.2	2.1	2.1					—	950					950		
5.5	**M 4SB**	**2**	2890	18.2	80	0.87	11.4	5.9	2.4	2.0	213	42	**FD 56**	75	—	350	223	55	**FA 06**	75	350	223	56
4.4		**4**	1440	29	82	0.84	9.2	5.3	2.2	2.0					—	900					900		
7.5	**M 4LA**	**2**	2900	25	82	0.87	15.2	6.5	2.4	2.0	270	51	**FD 06**	100	—	350	280	64	**FA 07**	100	350	280	65
6		**4**	1430	40	84	0.85	12.1	5.8	2.3	2.1					—	950					950		
9.2	**M 4LB**	**2**	2920	30	83	0.86	18.6	6.0	2.6	2.2	319	57	**FD 07**	150	—	300	342	73	**FA 07**	150	300	342	75
7.3		**4**	1440	48	85	0.85	14.6	5.5	2.3	2.1					—	800					800		

2/6P — 3000/1000 min^{-1} - S3 60/40% — 50 Hz

													d.c. brake						a.c. brake				
													FD						FA				
P_n		n	M_n	η	cosφ	In 400V	Is / In	Ms / Mn	Ma / Mn	J_m x 10^{-4}	IM B5		Mod	Mb	Z_o 1/h		J_m x 10^{-4}	IM B5	Mod	Mb	Z_o	J_m x 10^{-4}	IM B5
kW		min^{-1}	Nm	%		A				kgm^2	Kg			Nm	NB	SB	kgm^2	Kg		Nm	1/h	kgm^2	Kg
0.25	M 1SA	2	2850	0.84	60	0.82	0.73	4.3	1.9	1.8	6.9	5.5	FD 03	1.75	1500	1700	8.0	8.2	FA 03	1.75	1700	8.0	7.9
0.08		6	910	0.84	43	0.70	0.38	2.1	1.4	1.5					10000	13000					13000		
0.37	M 1LA	2	2880	1.23	62	0.80	1.08	4.4	1.9	1.8	9.1	6.9	FD 03	3.5	1000	1300	10.2	9.6	FA 03	3.5	1300	10.2	9.3
0.12		6	900	1.27	44	0.73	0.54	2.4	1.4	1.5					9000	11000					11000		
0.55	M 2SA	2	2800	1.88	63	0.86	1.47	4.5	1.9	1.7	20	9.2	FD 04	5	1500	1800	22	13.1	FA 04	5	1800	22	13.0
0.18		6	930	1.85	52	0.65	0.77	3.3	2.0	1.9					4100	6300					6300		
0.75	M 2SB	2	2800	2.6	66	0.87	1.89	4.3	1.8	1.6	25	10.6	FD 04	5	1700	1900	27	14.5	FA 04	5	1900	27	14.4
0.25		6	930	2.6	54	0.67	1.00	3.2	1.7	1.8					3800	6000					6000		
1.1	M 3SA	2	2870	3.7	71	0.82	2.73	4.9	1.8	1.9	34	15.5	FD 15	13	1000	1300	38	22	FA 15	13	1300	38	23
0.37		6	930	3.8	63	0.70	1.21	3.1	1.5	1.8					3500	5000					5000		
1.5	M 3LA	2	2880	5.0	73	0.84	3.53	5.1	1.9	2.0	40	17	FD 15	13	1000	1200	44	24	FA 15	13	1200	44	24
0.55		6	940	5.6	64	0.67	1.85	3.5	1.7	1.8					2900	4000					4000		
2.2	M 3LB	2	2900	7.2	77	0.85	4.9	5.9	2.0	2.0	61	23	FD 15	26	700	900	65	29	FA 15	26	900	65	30
0.75		6	950	7.5	67	0.64	2.5	3.3	1.9	1.8					2100	3000					3000		
3	M 4SA	2	2910	9.9	74	0.88	6.6	5.6	2.0	2.1	170	36	FD 56	37	—	600	182	48	FA 06	37	600	182	50
1.1		6	960	10.9	73	0.68	3.2	4.5	2.2	2.0					—	2200					2200		
4.5	M 4SB	2	2910	14.8	78	0.84	9.9	5.8	1.9	1.8	213	42	FD 56	37	—	500	223	55	FA 06	37	500	223	56
1.5		6	960	14.9	74	0.67	4.4	4.2	1.9	2.0					—	2100					2100		
5.5	M 4LA	2	2920	18.0	78	0.87	11.7	6.2	2.1	1.9	270	51	FD 06	50	—	400	280	64	FA 06	50	400	280	65
2.2		6	960	22	77	0.71	5.8	4.3	2.1	2.0					—	1900					1900		



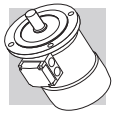
2/8P — 3000/750 min^{-1} - S3 60/40% — 50 Hz



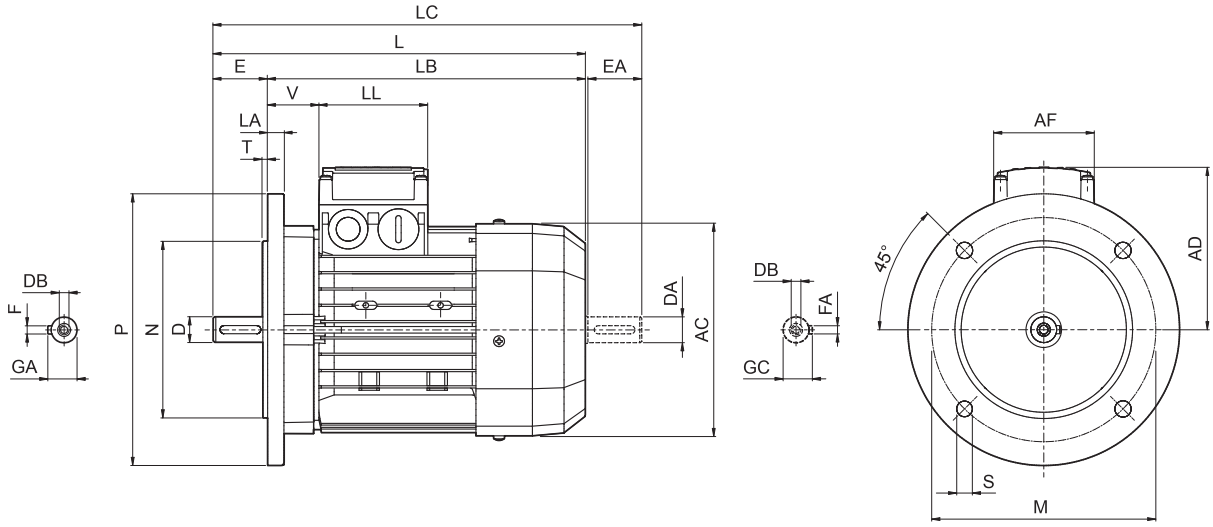
													d.c. brake						a.c. brake				
													FD						FA				
P_n		n	M_n	η	cosφ	In 400V	Is / In	Ms / Mn	Ma / Mn	J_m x 10^{-4}	IM B5		Mod	Mb	Z_o 1/h		J_m x 10^{-4}	IM B5	Mod	Mb	Z_o	J_m x 10^{-4}	IM B5
kW		min^{-1}	Nm	%		A				kgm^2	Kg			Nm	NB	SB	kgm^2	Kg		Nm	1/h	kgm^2	Kg
0.37	**M 1LA**	**2**	2800	1.26	63	0.86	0.99	3.9	1.8	1.9	12.9	7.3	**FD 03**	3.5	1200	1300	14	10.0	**FA 03**	3.5	1300	14	9.7
0.09		**8**	670	1.28	34	0.75	0.51	1.8	1.4	1.5					9500	13000					13000		
0.55	**M 2SA**	**2**	2830	1.86	66	0.86	1.40	4.4	2.1	2.0	20	9.2	**FD 04**	5	1500	1800	22	13.1	**FA 04**	5	1800	22	13.0
0.13		**8**	690	1.80	41	0.64	0.72	2.3	1.6	1.7					5600	8000					8000		
0.75	**M 2SB**	**2**	2800	2.6	68	0.88	1.81	4.6	2.1	2.0	25	10.6	**FD 04**	10	1700	1900	27	14.5	**FA 04**	10	1900	27	14.4
0.18		**8**	690	2.5	43	0.66	0.92	2.3	1.6	1.7					4800	7300					7300		
1.1	**M 3SA**	**2**	2870	3.7	69	0.84	2.74	4.6	1.8	1.7	34	15.5	**FD 15**	13	1000	1300	38	22	**FA 15**	13	1300	38	23
0.28		**8**	690	3.9	44	0.56	1.64	2.3	1.4	1.7					3400	5000					5000		
1.5	**M 3LA**	**2**	2880	5.0	69	0.85	3.69	4.7	1.9	1.8	40	17	**FD 15**	13	1000	1200	44	24	**FA 15**	13	1200	44	24
0.37		**8**	690	5.1	46	0.63	1.84	2.1	1.6	1.6					3300	5000					5000		
2.4	**M 3LB**	**2**	2900	7.9	75	0.82	5.6	5.4	2.1	2.0	61	23	**FD 15**	26	550	700	65	29	**FA 15**	26	700	65	30
0.55		**8**	700	7.5	54	0.58	2.5	2.6	1.8	1.8					2000	3500					3500		
3	**M 4SA**	**2**	2920	9.8	72	0.85	7.1	5.6	2.0	1.8	162	36	**FD 56**	37	—	600	182	48	**FA 06**	37	600	182	50
0.75		**8**	710	10.1	61	0.64	2.8	3.0	1.7	1.8					—	3400					3400		
4	**M 4SB**	**2**	2870	13.3	73	0.84	9.4	5.6	2.3	2.4	213	42	**FD 56**	37	—	500	223	55	**FA 06**	37	500	223	56
1		**8**	690	13.8	66	0.62	3.5	2.9	1.9	1.8					—	3500					3500		
5.5	**M 4LA**	**2**	2870	18.3	75	0.84	12.6	6.1	2.4	2.5	270	51	**FD 06**	50	—	400	280	64	**FA 06**	50	400	280	65
1.5		**8**	690	21	68	0.63	5.1	2.9	1.9	1.9					—	2400					2400		

2/12P — 3000/500 min^{-1} - S3 60/40% — 50 Hz

													d.c. brake						a.c. brake				
													FD						FA				
P_n			n	M_n	η	cosφ	In 400V	Is / In	Ms / Mn	Ma / Mn	J_m x 10^{-4}	IM B5	Mod	Mb	Z_o 1/h		J_m x 10^{-4}	IM B5	Mod	Mb	Z_o	J_m x 10^{-4}	IM B5
kW			min^{-1}	Nm	%		A				kgm^2	Kg		Nm	NB	SB	kgm^2	Kg		Nm	1/h	kgm^2	Kg
0.55	M 2SA	2	2820	1.86	64	0.89	1.39	4.2	1.6	1.7	25	10.6	FD 04	5	1000	1300	27	14.5	FA 04	5	1300	27	14.4
0.09		12	430	2.0	30	0.63	0.69	1.8	1.9	1.8					8000	12000					12000		
0.75	M 3SA	2	2900	2.5	65	0.81	2.06	5.2	1.9	2.1	34	15.5	FD 15	13	700	900	38	22	FA 15	13	900	38	23
0.12		12	460	2.5	33	0.43	1.22	1.9	1.3	1.6					5000	7000					7000		
1.1	M 3LA	2	2850	3.7	65	0.85	2.87	4.5	1.6	1.8	40	17	FD 15	13	700	900	44	24	FA 15	13	900	44	24
0.18		12	430	4.0	26	0.54	1.85	1.5	1.3	1.5					4000	6000					6000		
1.5	M 3LB	2	2900	4.9	67	0.86	3.76	5.6	1.9	1.9	54	21	FD 15	13	700	900	58	27	FA 15	13	900	58	28
0.25		12	440	5.4	36	0.46	2.18	1.8	1.7	1.8					3800	5000					5000		
2	M 3LC	2	2850	6.7	70	0.84	4.9	4.9	1.8	1.7	61	23	FD 55	18	—	700	65	29	FA 15	18	700	65	30
0.3		12	450	6.4	38	0.47	2.4	1.7	1.6	1.7					—	3500					3500		
3	M 4SA	2	2920	9.8	74	0.87	6.7	6.8	2.3	1.9	213	42	FD 56	37	—	450	223	55	FA 06	37	450	223	56
0.5		12	470	10.2	51	0.43	3.3	2.0	1.7	1.6					—	3000					3000		
4	M 4LA	2	2920	13.1	75	0.89	8.6	5.9	2.4	2.3	270	51	FD 56	37	—	400	280	64	FA 06	37	400	280	65
0.7		12	460	14.5	53	0.44	4.3	1.9	1.7	1.6					—	2800					2800		



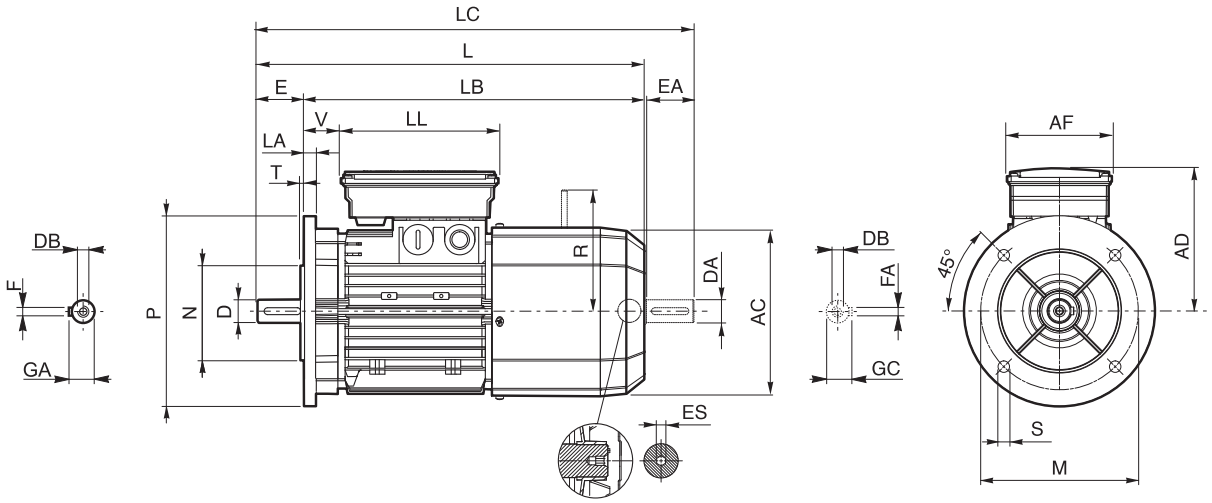
BN - IM B5



	Shaft					Flange						Motor							
	D DA	E EA	DB	GA GC	F FA	M	N	P	S	T	LA	AC	L	LB	LC	AD	AF	LL	V
BN 56	9	20	M3	10.2	3	100	80	120	7	3	8	110	185	165	207	91	74	80	34
BN 63	11	23	M4	12.5	4	115	95	140	9.5		10	121	207	184	232	95			26
BN 71	14	30	M5	16	5	130	110	160		3.5	11.5	138	249	219	281	108			37
BN 80	19	40	M6	21.5	6	165	130	200	11.5			156	274	234	315	119			38
BN 90	24	50	M8	27	8							176	326	276	378	133	98	98	44
BN 100	28	60	M10	31		215	180	250	14	4	14	195	367	307	429	142			50
BN 112											15	219	385	325	448	157			52
BN 132	38	80	M12	41	10	265	230	300			20	258	493	413	576	193	118	118	58
BN 160 MR	42 38 (1)	110 80 (1)	M16 M12 (1)	45 41 (1)	12 10 (1)	300	250	350	18.5	5	15		562	452	645				218
BN 160 M												310	596	486	680	245	187	187	51
BN 160 L																			
BN 180 M	48 38 (1)	110 110 (1)	M16 M12 (1)	51.5 41 (1)	14 10 (1)							310	640	530	724				
BN 180 L	48 42 (1)		M16 M16 (1)	51.5 45 (1)	14 12 (1)						18	348	708	598	823	261			52
BN 200 L	55 42 (1)		M20 M16 (1)	59 45 (1)	16 12 (1)	350	300	400					722	612	837				66

NOTE:
1) These values refer to the rear shaft end.

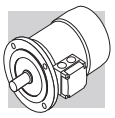
BN_FD ; IM B5



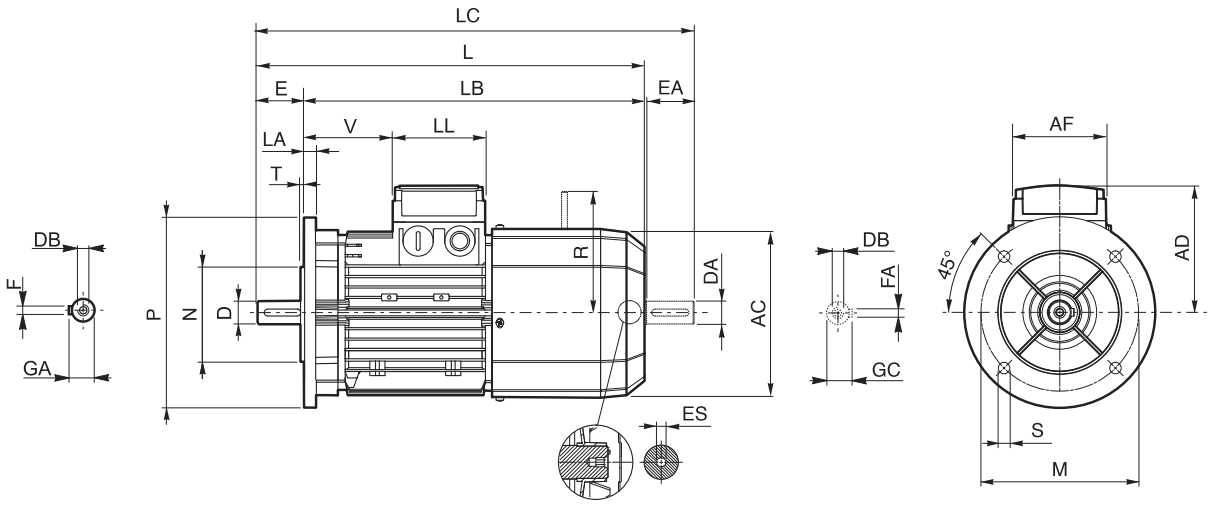
	Shaft					Flange						Motor									
	D DA	E EA	DB	GA GC	F FA	M	N	P	S	T	LA	AC	L	LB	LC	AD	AF	LL	V	R	ES
BN 63	11	23	M4	12.5	4	115	95	140	9.5	3	10	121	272	249	297	122	98	133	14	96	5
BN 71	14	30	M5	16	5	130	110	160	9.5	3.5	11.5	138	310	280	342	135			25	103	
BN 80	19	40	M6	21.5	6	165	130	200	11.5			156	346	306	388	146			41	129	
BN 90 S	24	50	M8	27	8							176	409	359	461	149	110	165	39		6
BN 90 L																146				160	
BN 100	28	60	M10	31		215	180	250	14	4	14	195	458	398	521	158		165	62		
BN 112											15	219	484	424	547	173		165	73	199	
BN 132	38	80	M12	41	10	265	230	300			20	258	603	523	686	210	140	188	46	204 (2)	
BN 160 MR	42 38 (1)	110 80 (1)	M16 M12 (1)	45 41 (1)	12 10 (1)	300	250	350	18.5	5	15		672	562	755				161	226	
BN 160 M												310	736	626	820	245	187	187	51	266	—
BN 160 L	42 38 (1)	110 80 (1)	M16 M12 (1)	45 41 (1)	12 10 (1)								780	670	864						
BN 180 M	48 38 (1)			51.5 41 (1)	14 10 (1)																
BN 180 L	48 42 (1)	110 110 (1)	M16 M16 (1)	51.5 45 (1)	14 12 (1)						18	348	866	756	981	261			52	305	
BN 200 L	55 42 (1)		M20 M16 (1)	59 45 (1)	16 12 (1)	350	300	400	18.5				878	768	993				64		

NOTE:
1) These values refer to the rear shaft end.
2) For FD07 brake value R=226.

ES hexagon is not supplied with PS option.



BN_FA - IM B5



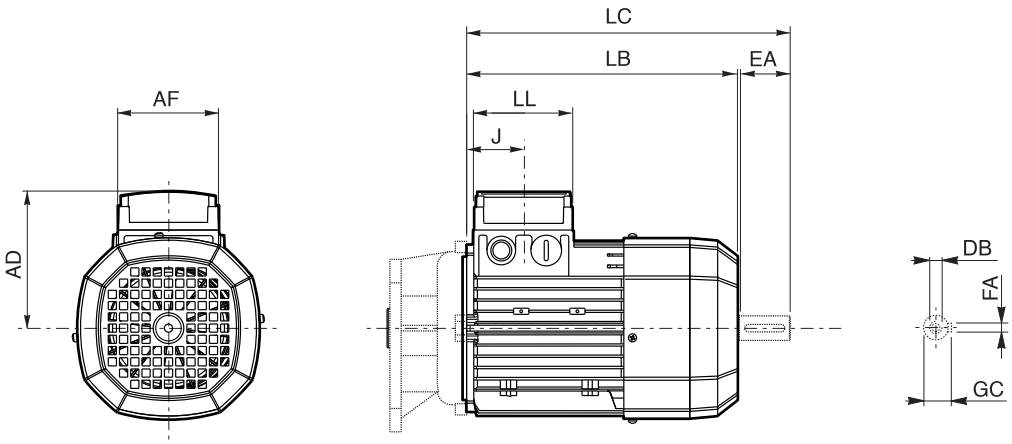
	Shaft					Flange						Motor									
	D DA	**E EA**	**DB**	**GA GC**	**F FA**	**M**	**N**	**P**	**S**	**T**	**LA**	**AC**	**L**	**LB**	**LC**	**AD**	**AF**	**LL**	**V**	**R**	**ES**
BN 63	11	23	M4	12.5	4	115	95	140	9.5	3	10	121	272	249	297	95	74	80	26	116	5
BN 71	14	30	M5	16	5	130	110	160		3.5		138	310	280	342	108			68	124	
BN 80	19	40	M6	21.5	6	165	130	200	11.5		11.5	156	346	306	388	119			83	134	
BN 90	24	50	M8	27	8							176	409	359	461	133	98	98	95	160	6
BN 100	28	60	M10	31		215	180	250	14	4	14	195	458	398	521	142			119		
BN 112											15	219	484	424	547	157			128	198	
BN 132	38	80	M12	41	10	265	230	300			20	258	603	523	686	210	140	188	46	200 (2)	
BN 160 MR	42 38 (1)	110 80 (1)	M16 M12 (1)	45 41 (1)	12 10 (1)	300	250	350	18.5	5	15		672	562	755	193	118	118	218	217	
BN 160 M												310	736	626	820	245	187	187	51	247	—
BN 160 L																					
BN 180 M				51.5 41 (1)	14 10 (1)								780	670	864						

NOTE:
1) These values refer to the rear shaft end.
2) For FA07 brake value R=217.

Dimensions AD, AF, LL and V, relevant to terminal box of motors BN…FA featuring the separate brake supply (option SA), are coincident with corresponding dimensions of same-size BN…FD motors

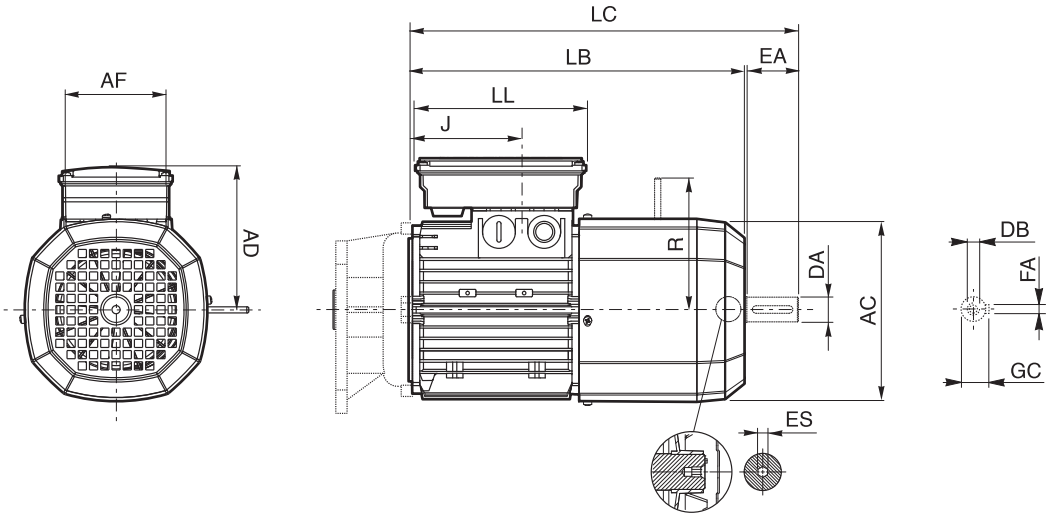
ES hexagon is not supplied with PS option.

M



	Rear shaft end					Motor						
	DA	**EA**	**DB**	**FA**	**GC**	**AC**	**LB**	**LC**	**AF**	**LL**	**J**	**AD**
M 0	9	20	M3	3	10.2	110	133	155	74	80	42	91
M 05	11	23	M4	4	12.5	121	165	191			48	95
M 1	14	30	M5	5	16	138	187	219			45	108
M 2 S	19	40	M6	6	21.5	156	202	245			44	119
M 3 S	28	60	M10	8	31	195	230	293	98	98	53.5	142
M 3 L							262	325				
M 4	38	80	M12	10	41	258	361	444	118	118	64.5	193
M 4 LC							396	479				
M 5 S						310	418	502	187	187	77	245
M 5 L							462	546				

M_FD

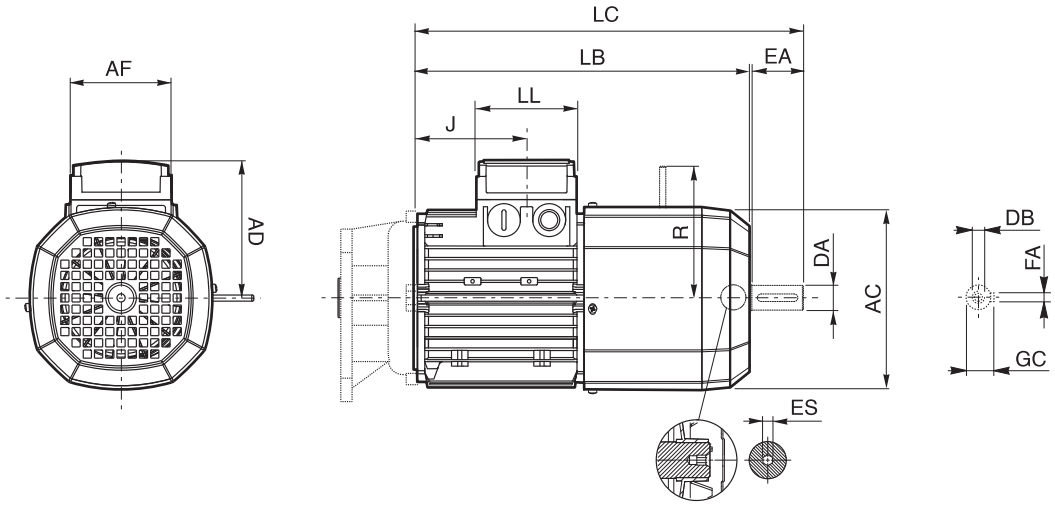


	Rear shaft end					Motor								
	DA	**EA**	**DB**	**FA**	**GC**	**AC**	**LB**	**LC**	**AF**	**LL**	**J**	**AD**	**R**	**ES**
M 05	11	23	M4	4	12.5	121	231	256	98	133	48	122	96	5
M 1	14	30	M5	5	16	138	248	280			73	135	103	
M 2 S	19	40	M6	6	21.5	156	272	314			88	146	129	
M 3 S	28	60	M10	8	31	195	326	389	110	165	124.5	158	160	6
M 3 L							353	416						
M 4	38	80	M12	10	41	258	470	553	140	188	185.5	210	204 (1)	
M 4 LC							495	578			64.5		226	
M 5 S						310	558	642	187	187	77	245	266	—
M 5 L							602	686						

NOTE:
1) For FD07 brake value R=226.

ES hexagon is not supplied with PS option.

M_FA



	Rear shaft end					Motor								
	DA	**EA**	**DB**	**FA**	**GC**	**AC**	**LB**	**LC**	**AF**	**LL**	**J**	**AD**	**R**	**ES**
M 05	11	23	M4	4	12.5	121	231	256	74	80	48	95	116	5
M 1	14	30	M5	5	16	138	248	280			73	108	124	
M 2 S	19	40	M6	6	21.5	156	272	314			88	119	134	
M 3 S	28	60	M10	8	31	195	326	389	98	98	124.5	142	160	6
M 3 L							353	416						
M 4	38	80	M14	10	41	258	470	553	140	188	185.5	210	200 (1)	
M 4 LC							495	578			64.5		217	
M 5 S			M12			310	558	642	187	187	77	245	247	—
M 5 L							602	686						

NOTE:
1) For FA07 brake value R=217.

Dimensions AD, AF, LL and V, relevant to terminal box of motors M…FA featuring the separate brake supply (option SA), are coincident with corresponding dimensions of same-size M…FD motors

ES hexagon is not supplied with PS option.

INDEX OF REVISIONS

BR_CAT_CAFS_STD_ENG_R09_3	
	Description
170	Amended drawings for the backstop option of serie A gearboxes.
486, 487	Updated 1.5 kW technical data for gearmotors series S.
512…571	Updated section “Electric Motors”.
...	Removed combinations of gearboxes C514 and F514 with inputs P132 and M4.
40…45	Updated 0.37 ; 0.55 kW technical data for gearmotors series C.

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We have a relentless commitment to excellence, innovation and sustainability. Our team creates, distributes and services world-class power transmission and drive solutions to keep the world in motion.

HEADQUARTERS
Bonfiglioli Riduttori S.p.A.
Via Giovanni XXIII, 7/A
40012 Lippo di Calderara di Reno
Bologna (Italy)
tel: +39 051 647 3111
fax: +39 051 647 3126
bonfiglioli@bonfiglioli.com
www.bonfiglioli.com