INDUSTRY PROCESS
AND AUTOMATION SOLUTIONS

BONFIGLIOLI
RIDUTTORI

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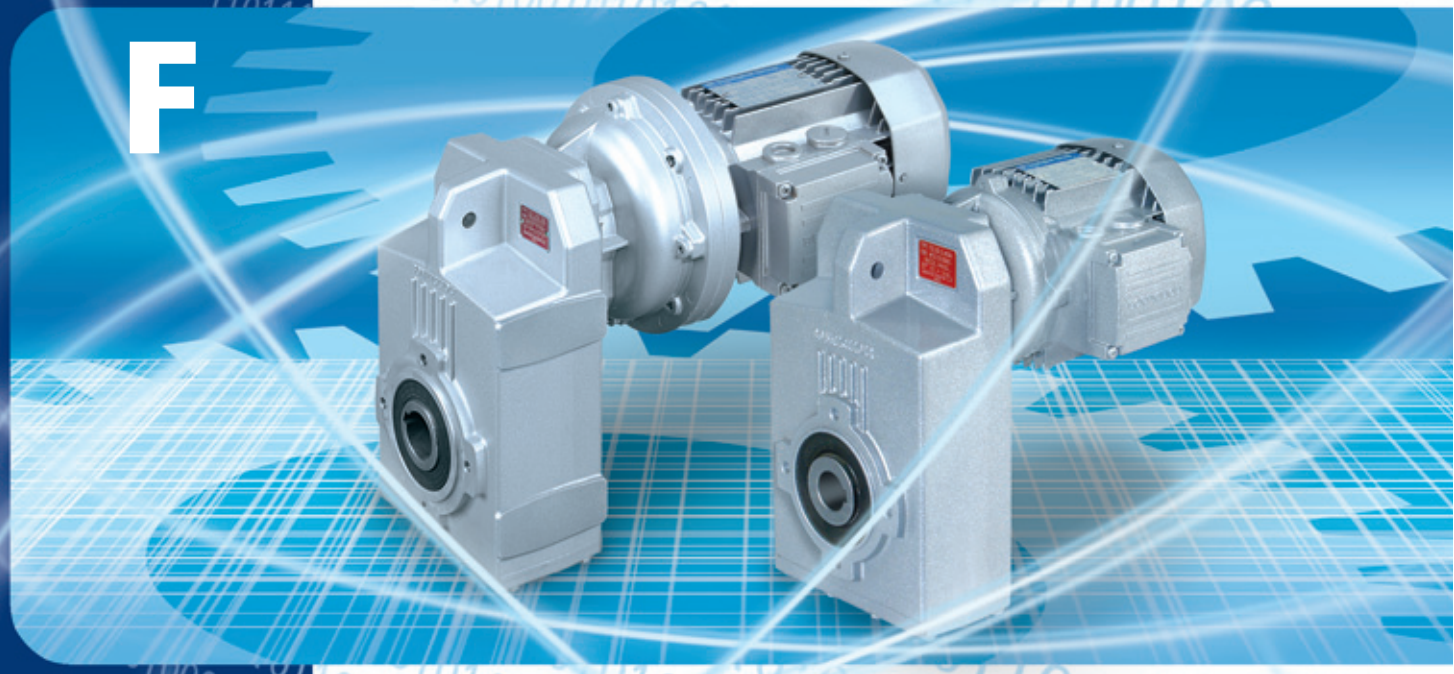

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BONFIGLIOLI

Soluzioni Specifiche per il Controllo e la Trasmissione di Potenza

Diversificazione dell'offerta, automazione dei processi produttivi e qualità, hanno fatto di Bonfiglioli un grande protagonista del settore. Punti fondamentali della filosofia Bonfiglioli sono: le soluzioni integrate, la competenza, l'innovazione tecnologica e una produzione protesa a perseguire gli standards più elevati di qualità. La gamma di prodotti Bonfiglioli si prefigge di soddisfare i massimi requisiti in termini di processo industriale e soluzione di automazione, come pure di soluzioni per applicazioni mobili.

Specific Solutions for Power Transmission and Motion Control

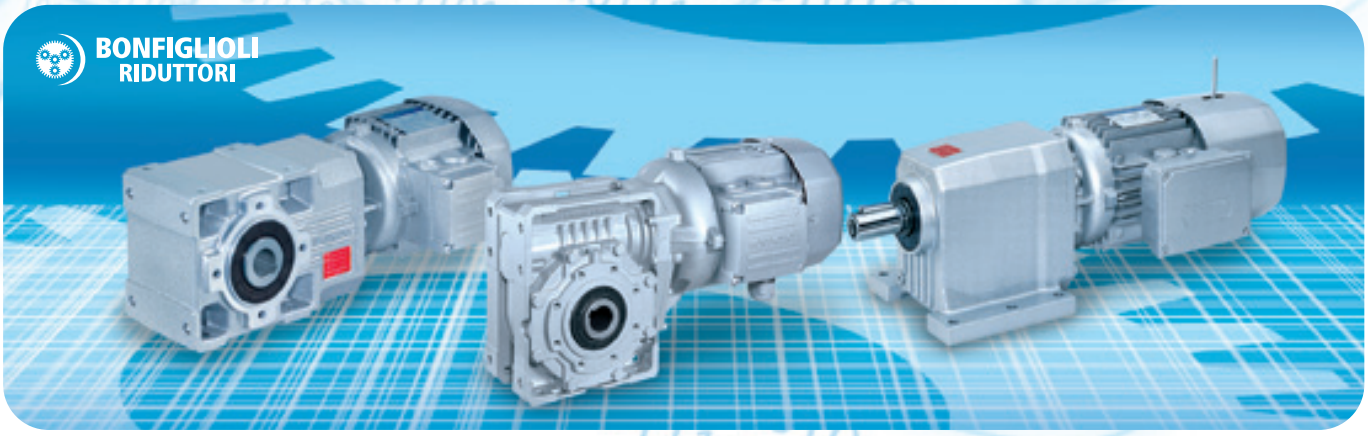
Product diversification, process automation, and quality have enabled Bonfiglioli to play a leading role in the industry. Bonfiglioli's policy focuses on integrated solutions, competence and innovative technology as key factors, indispensable to ensure customer satisfaction, while production is aimed at achieving the highest standards. Bonfiglioli product portfolio aims at meeting the toughest and most sophisticated requirement for Industrial Process and Automation Solution and for Mobile Equipment Solutions.

Individuelle Lösungen für Antriebstechnik und Motion Control

Eine breite Produktpalette, weitgehende Prozessautomatisierung und ein hohes Qualitätsniveau haben es Bonfiglioli ermöglicht, eine führende Rolle in der Industrie einzunehmen. Die Politik von Bonfiglioli konzentriert sich auf integrierte Lösungen, hohe Kompetenz und innovative Technik als die Hauptfaktoren, die für die Sicherung der Kundenzufriedenheit unverzichtbar sind, während sich die Produktion an höchsten Standards orientiert. Die Bonfiglioli-Produktpalette zielt darauf ab, den härtesten und kompliziertesten Anforderungen für verfahrenstechnische und Automatisierungslösungen sowie für Lösungen in mobilen Maschinen gerecht zu werden.

Solutions spécifiques pour la transmission de l'énergie et le contrôle du mouvement

La diversification des produits, l'automation des procédés et la qualité ont permis à Bonfiglioli de jouer un rôle directeur dans son secteur industriel. La politique de Bonfiglioli est toute concentrée sur la mise au point de solutions intégrées, de compétences et d'une technologie innovatrice en tant que facteurs clés, indispensables pour garantir la satisfaction du client, tandis que la production vise à atteindre les standards de production les plus élevés. La gamme des produits Bonfiglioli vise à répondre aux exigences les plus rigides et rigoureuses quant aux solutions pour les procédés industriels et d'automatisation ainsi qu'aux solutions pour les équipements mobiles.



SUMMARY

Revisions

Refer to page 70 for the catalogue revision index.

Visit www.bonfiglioli.com to search for catalogues with up-to-date revisions.

1 GENERAL INFORMATION

1.1 SYMBOLS AND UNITS OF MEASURE

An	**[N]**	The **admissible thrust load** represents the force which can be applied axially to the gear unit's shaft, along with the rated radial load.
f_S	-	The **service factor** is a coefficient representing the severity of the duty for the operating cycle.
f_{TP}	-	The **adjusting factor** takes into account the influence of the ambient temperature in calculating the computational torque. This factor is relevant for worm gear units.
i	-	The **gear ratio** is expressed as the relationship of the input shaft speed to the output shaft speed.

$$i = \frac{n_1}{n_2}$$

I	-	The **intermittence** is defined as follows:

$$I = \frac{t_f}{t_f + t_r} \cdot 100$$

J_c	[Kgm^2]	**Moment of inertia of the driven load.**
J_m	[Kgm^2]	**Moment of inertia of the motor.**
J_R	[Kgm^2]	**Moment of inertia of the gear unit.**
K	-	The load **acceleration factor** is used to calculate the service factor, and is defined as follows:

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

K_R	-	The **transmission factor** is a computational parameter, proportional to the tension generated by an external transmission keyed to the gear unit shaft.
M_2	[Nm]	Net **output torque**
Mn_2	[Nm]	The **rated torque** at the output shaft. The catalogue value is calculated for a service factor f_S= 1.
Mr_2	[Nm]	The application's **required torque** . This should always be less than or equal to the gear unit's rated torque Mn_2.
Mc_2	[Nm]	**Computational torque**. This is a virtual parameter used to select the gear unit, by means of the equation:

$$M_{c2} = M_{r2} \cdot f_s$$

n	[min^{-1}]	**Shaft speed.**
Pn_1	[kW]	**Rated power** at the input shaft, calculated for a service factor f_S = 1.
P_R	[kW]	The application's **required power** .
R_C	[N]	The **computational radial load** is generated by an external transmission and, for the input and output shafts respectively, can be calculated from the following equations:

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

R_N	**[N]**	The **admissible radial load** should always be more than or equal to the computational radial load. The point value is given in the catalogue for each unit's gear frame size and transmission ratio, and refers to the shaft's centre line.
S	**-**	The **safety factor** is defined as follows:

$$S = \frac{Mn_2}{M_2} = \frac{Pn_1}{P_1}$$

t_a	**[°C]**	**Ambient temperature.**
t_f	**[min]**	The **operating time** is the total duration of the work cycle phases.
t_r	**[min]**	The **rest time** is the interval of no work between two phases.
Z_r	**-**	**Number** of starts per hour.
η_d	**-**	The **dynamic efficiency** is expressed as the ratio between the power measured at the output shaft and that applied to the input shaft:

$$\eta_d = \frac{P_2}{P_1} \cdot 100 \qquad [\%]$$

$[\,]_1$	This value refers to the input shaft.
$[\,]_2$	This value refers to the output shaft.

Danger. May cause slight injury to persons.

1.2 INTRODUCTION TO THE ATEX DIRECTIVES

1.2.1 EXPLOSIVE ATMOSPHERE

Under the provisions of Directive 94/9/EC, an explosive atmosphere is defined as a mixture:

a. of **flammable substances**, whether gas, vapour, mist or dust;
b. with **air**;
c. in certain **atmospheric conditions**;
d. in which, following ignition, combustion spreads to the entire unburned mixture (note that in the case of dust, the entire quantity of dust is not always completely burnt after combustion).

An atmosphere which may potentially be transformed into an explosive atmosphere due to operating and/or ambient conditions is defined as a **potentially explosive atmosphere**. The products governed by Directive 94/9/EC are intended for use only in a potentially explosive atmosphere defined in this way.

1.2.2 EUROPEAN HARMONISED ATEX STANDARDS

The European Union has issued two harmonisation guidelines in the area of health and safety. These directives are known as ATEX 100a and ATEX 137.

Directive ATEX 100a (EU/94/9/EC) stipulates the minimum safety requirements for products intended for use in explosion risk areas within the member countries of the European Union. The directive also assigns such equipment to **categories**, which are defined by the directive itself.

Directive ATEX 137 (EU/99/92/EC) defines the minimum health and safety requirements for the workplace, for working conditions and for the handling of products and materials in explosion risk areas. The directive also divides the workplace into **zones** and defines the criteria for the application of product **categories** in said zones.
The following table describes the **zones** into which the user of a plant, in which an explosive atmosphere may occur, is required to divide the equipment application areas.

Zones		Formation frequency of a potentially explosive atmosphere	Type of danger
Gaseous atmosphere G	Dusty atmosphere D		
0	20	Present continuously or for long periods	Permanent
1	21	Likely to occur in normal operation occasionally	Potential
2	22	Not likely to occur in normal operation but if it does occur will persist for short period only	Minimal

BONFIGLIOLI RIDUTTORI gear units selectedin this catalogue are suitable for installation in zones 1, 21, 2 and22, as highlightedin grey in the above table.
Electric motors described in this catalogue are certified in category 2D (125°C max. temperature) and
therefore suitable for installation in zones 21 and 22.

As from 1 July 2003 the ATEX directives come into force throughout the entire European Union, and replace existing conflicting national and European laws on explosive atmospheres.
It should be emphasised that, for the first time, the directives also govern mechanical, hydraulic and pneumatic equipment, and not only electrical equipment as has been the case so far.
With regard to the Machinery Directive 98/37/EC it should be noted that directive 94/9/EC is a set of extremely specific requirements dedicated to the dangers deriving from potentially explosive atmospheres, whereas the Machinery Directive contains only very general explosion safety requirements (Annex I).
Consequently, as regards protection against explosion in potentially explosive atmospheres, Directive 94/9/EC (ATEX 100a) takes precedence over the Machinery Directive. The requirements of the Machinery Directive apply to all other risks regarding machinery.

1.2.3 LEVELS OF PROTECTION FOR THE VARIOUS CATEGORIES OF EQUIPMENT

The various categories of equipment must be able to operate in conformity with the Manufacturer's operational specifications, at certain defined levels of protection.

Protection level	Category		Type of protection	Operating conditions
	Group I	Group II		
Very high	M1		Two independent means of protection or safety capable of operating even when two independent faults occur	The equipment remains powered and operational even in the presence of an explosive atmosphere
Very high		**1**	Two independent means of protection or safety capable of operating even when two independent faults occur	The equipment remains powered and operational in zones 0, 1, 2 (G) and/or zones 20, 21, 22 (D)
High	M2		Protection suitable for normal operation and heavy duty conditions	Power to the equipment is shut off in the presence of a potentially explosive atmosphere
High		**2**	Protection suitable for normal operation and frequent faults or equipment in which malfunction is normal.	The equipment remains powered and operational in zones 1, 2 (G) and/or zones 21, 22 (D)
Normal		**3**	Protection suitable for normal operation	The equipment remains powered and operational in zones 2 (G) and/or 22 (D)

1.2.4 DEFINITION OF GROUPS (EN 1127-1)

Group I Applies to equipment intended for use underground in parts of mines and those parts of surface installations of such mines, liable to be endangered by firedamp and/or combustible dust.

Group II Applies to equipment intended for use in other places liable to be endangered by explosive atmospheres.

BONFIGLIOLI RIDUTTORI products may not therefore be installed in mines, classified in **Group I** and in **Group II**, category 1.

To summarise, the classification of equipment into groups, categories and zones is illustrated in the table below, whereby the availability of BONFIGLIOLI RIDUTTORI products is highlighted in grey.

Group	**I** mines, firedamp		**II** other potentially explosive areas (gas, dust)					
Category	M1	M2	1		2		3	
Atmosphere(1)			G	D	G	D	G	D
Zone			0	20	1	21	2	22
Type of protection gear unit					c, k	c, k	c, k	c, k
Type of protection motor					d, e	IP6X + temp.max	n(A)	IP5X o IP6X + temp. max

(1) **G** = gas **D** = dust

This catalogue describes BONFIGLIOLI RIDUTTORI **gear units and gearmotor**, intended for use in potentially explosive atmospheres, with limitation to categories 2 and 3.
The products described herein conform to the minimum safety requirements of European Directive 94/9/EC, which is part of the directives known as ATEX (ATmosphères EXplosibles).

1.2.5 DECLARATION OF CONFORMITY

The Declaration of Conformity, a copy of which is available in this catalogue, is the document which attests to the conformity of the product to Directive 94/9/EC.
The validity of the Declaration is bound to observance of the instructions given in the User, Installation and Service Manual for safe use of the product throughout its service life.
The instructions regarding ambient conditions are of particular importance inasmuch as failure to observe them during operation of the product renders the certificate null and void.
In case of doubt regarding the validity of the certificate of conformity, contact the BONFIGLIOLI RIDUTTORI technical department.

1.3 USE, INSTALLATION AND MAINTENANCE

The instructions for safe storage, handling and use of the product are given in the unit's User, Installation and Service Manual.
This can be downloaded from www.bonfiglioli.com/atex.html where the manual is available in PDF format in a number of languages.
This document must be kept in a suitable place, in the vicinity of the installed gear unit, as a reference for all persons authorised to work with or on the product throughout its service life.

The Manufacturer reserves the right to modify, supplement or improve the Manual, in the interests of the User.

1.4 SELECTING THE TYPE OF EQUIPMENT

1.4.1 SELECTION PROCEDURE:

Determine the application service factor f_S in relation to the type of load (K factor), number of starts per hour Z_r and hours of operation per day.

Now determine the power required at the motor shaft:

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

The efficiency value « η_d » can be determined as follows (approximately):

	η_d
1	0.98
2	0.96
3	0.93
4	0.90

The selection procedure now depends on the type of gear unit, as follows:

a. gear unit equipped with IEC motor fitting
b. gear unit equipped with solid input shaft.

Proceed as follows:

1.4.2 SELECTING A GEARMOTOR

a. Determine service factor $\mathbf{f_s}$ as formerly specified.
b. Determine power required at gearbox input shaft:

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

c. Consult the gearmotor rating charts and locate the table corresponding to normalised power $\mathbf{P_n}$:

$$P_n \geq P_{r1}$$

Unless otherwise specified, power $\mathbf{P_n}$ 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:

$$P_n \geq \frac{P_{r1}}{f_m}$$

The adjusting factor $\mathbf{f_m}$ can be obtained from table here after.

1.4.3 GEAR UNIT WITH MOTOR FITTING

- with reference to the rating charts, identify the gear unit which, for the required speed n_2, provides a rated power Pn_1 such that:

$$Pn_1 \geq Pr_1 \times f_s$$

- Select an electric motor rated:

$$P_1 \geq Pr_1$$

- Finally, check that the motor/gear unit combination generates a safety factor equal to or greater than the service factor for the application in question, in other words:

$$S = \frac{P_{n1}}{P_1} \geq f_s$$

- If the selected gear unit is of type F102 or F202 with ratio i > 40 ,operating with a number of hourly starts Z > 30 ,correct the service factor taken from the graph by a factor of 1.2.
Finally, check that the recalculatedservice factor fs still satisfies the condition S $\geqslant$ f_s.

1.4.4 SPEED REDUCER WITH SOLID INPUT SHAFT

- Calculate the value of the computational torque:

$$Mc_2 = Mr_2 \times f_s \times f_{tp}$$

f_{tp}				
Helical gear units C, A, F, S	Worm gear units VF, W			
	Type of load	Ambient temperature [°C]		
		20°	30°	40°
$f_{tp} = 1$	**K1** uniform load	1.00	1.00	1.06
	K2 moderate shock load	1.00	1.02	1.12
	K3 heavy shock load	1.00	1.04	1.17

- for the speed n_2 closest to that required, select the gear unit with a rated torque Mn_2 equal to or greater than the computational torque Mc_2, in other words:

$$M_{n2} \geq M_{c2}$$

1.4.5 POST-SELECTION CHECKS

Once the gear unit or gearmotor has been selected, we recommend checking the selection as follows:

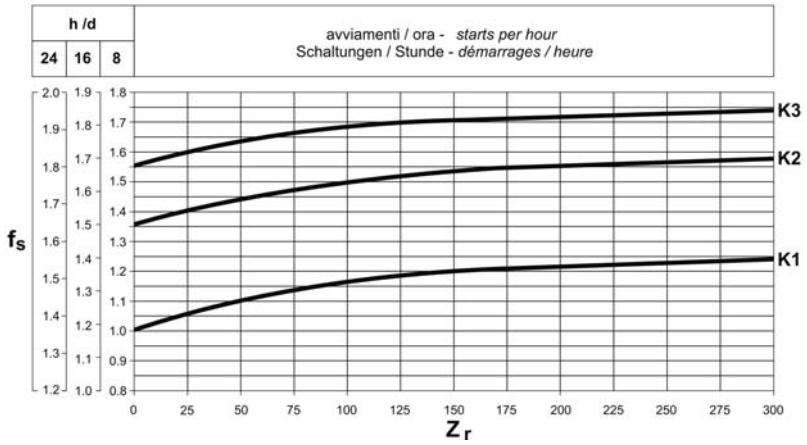
- **Momentary peak torque**
  The momentary peak torque is of the order of 200% of the rated torque Mn_2. Check that the point value of the peak torque satisfies this condition and equip the installation with a torque limiter if necessary.
- **Radial load**
  The catalogue gives the values of the maximum admissible radial load for both the input shaft « Rn_1 » and the output shaft « Rn_2 ». These values refer to a load applied at the shafts' centre lines and must always be greater than the actually applied load. See paragraph: Radial loads.
- **Thrust load**
  Check that the thrust component of the load does not exceed the maximum admissible value as given in the paragraph: Thrust loads.

1.4.6 OPERATING CONDITIONS FOR ATEX-SPECIFIED EQUIPMENT

- Ambient temperature -20°C < to < +40°C.
- The gear unit must be installed in the mounting position specified in the order and given on the nameplate. Any deviation from this requirement must be approved in advance by BONFIGLIOLI RIDUTTORI.
- Do not under any circumstances install the gear unit with its shaft in an inclined orientation, unless previously authorised to do so by the BONFIGLIOLI RIDUTTORI Technical Service Department.
- The speed of the motor mounted to the gear unit must not exceed n = 1500 min^{-1}.
- Should the gearbox be connected to an inverter driven motor the latter must be explicitly suitable for the purpose and used in full compliance with the instructions set forth by the manufacturer. Under no circumstances the setting of the inverter shall allow the motor to exceed the maximum speed permitted (1500 min^{-1}) or overload the gearbox itself.
- All the instructions in the User Manual (www.bonfiglioli.com/atex.html) regarding installation, use and routine maintenance of the unit must be followed in full.

1.4.7 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 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.



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:

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

where:

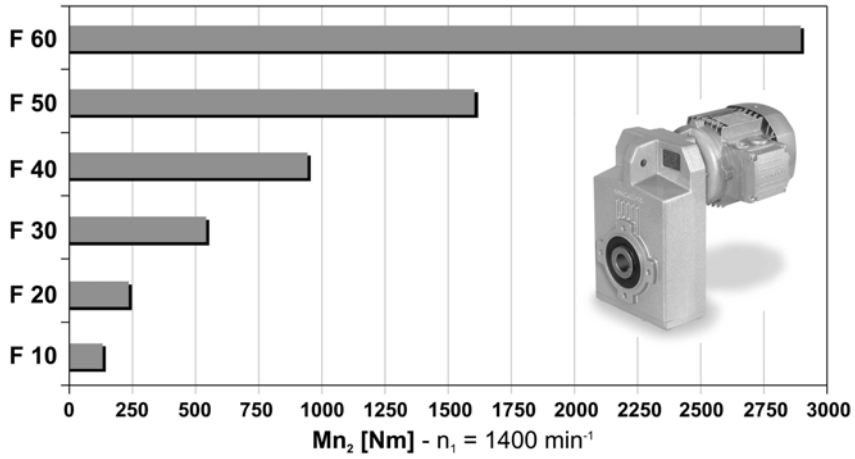
$\mathbf{J_c}$ moment of inertia of driven masses referred to motor shaft
$\mathbf{J_m}$ moment of inertia of motor

$K = J_c / J_m$	curve	type of duty
$K \leqslant 0.25$	**K1**	uniform load
$0.25 < K \leqslant 3$	**K2**	moderate shock load
$3 < K \leqslant 10$	**K3**	heavy shock load
$K > 10$	**-**	please contact Bonfiglioli's Technical Service

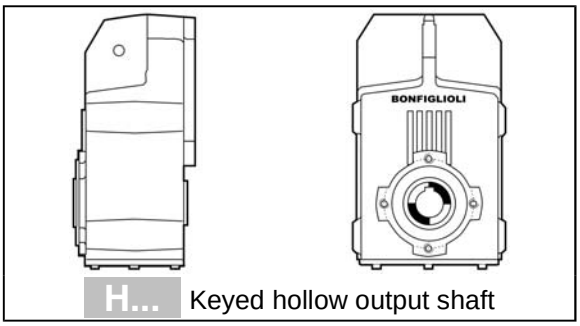
2 SHAFT-MOUNTED GEAR UNITS FOR POTENTIALLY EXPLOSIVE ATMOSPHERES

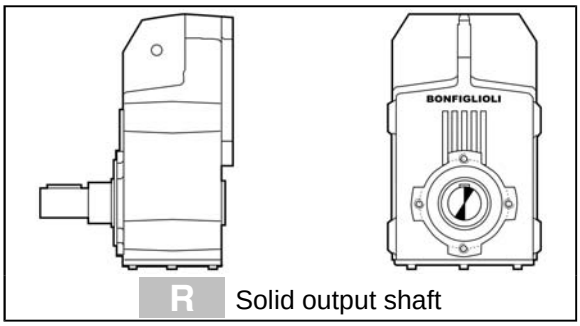
2.1 CONSTRUCTION OF ATEX-SPECIFIED EQUIPMENT

- Equipped with service plugs for periodic lubricant level checks.
- Factory-charged with lubricant, depending on the mounting position specified in the order.
- Viton® seal rings as standard.
- Side surfaces machined and tapped provide for extra mounting flexibility.
- No plastic component parts.
- Nameplate indication of the product category and type of protection.

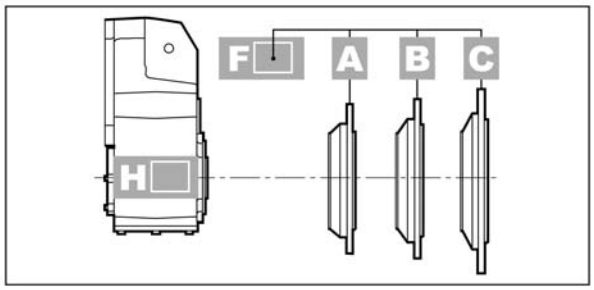


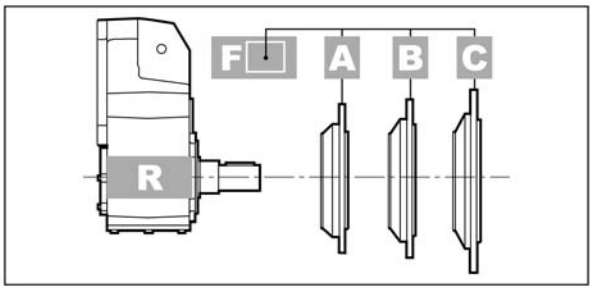
2.2 VERSION





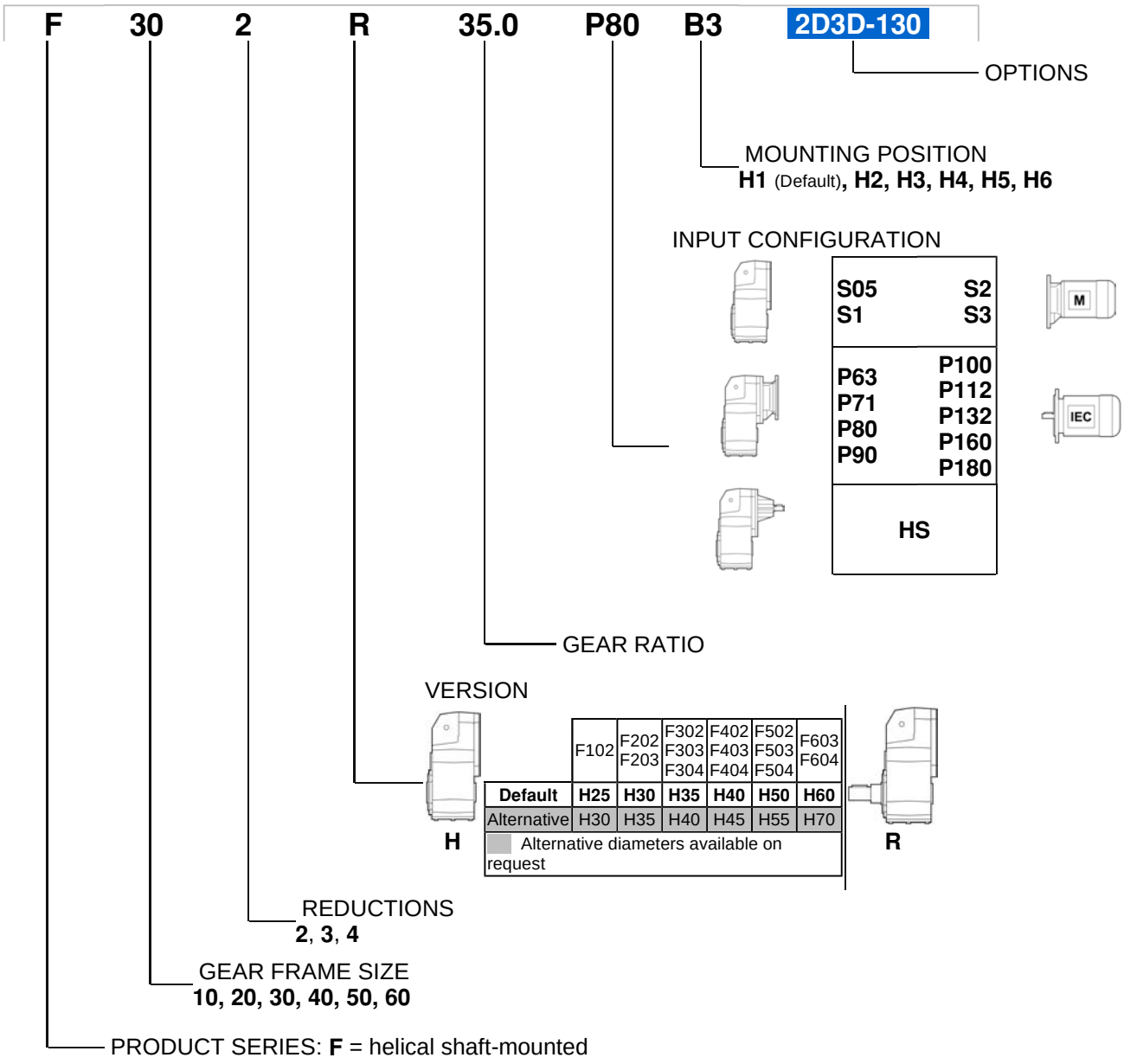
Motor version with flange
Motor versions H and R can be configured with mounting flanges (available in a range of diameters to fit all gear frame sizes). The type of flange (A, B, C) is specified in the product designation.
E.g.:





2.3 ORDERING NUMBERS

2.3.1 VARIANTS OF GEAR UNIT

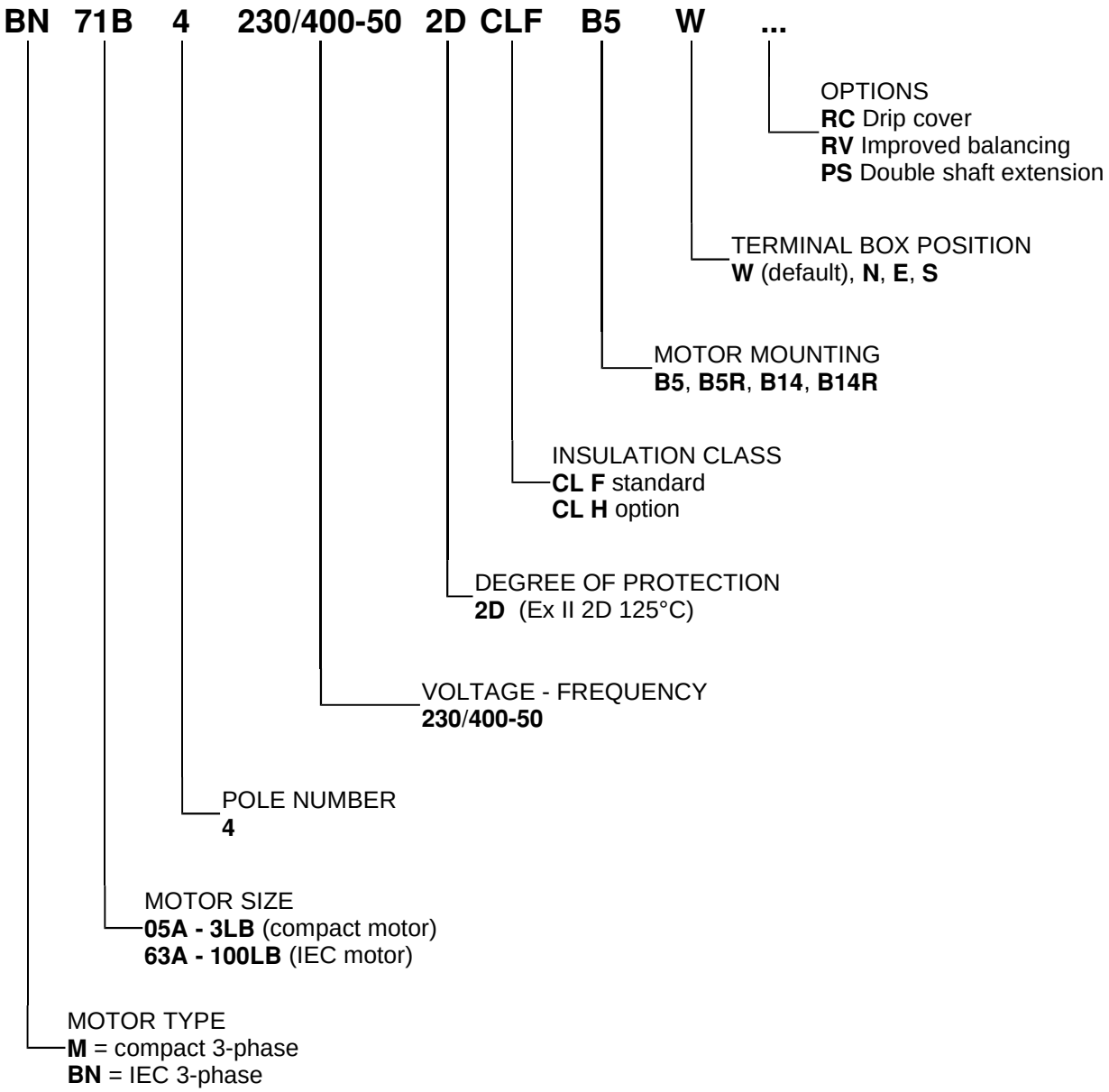


2.3.2 OPTIONS

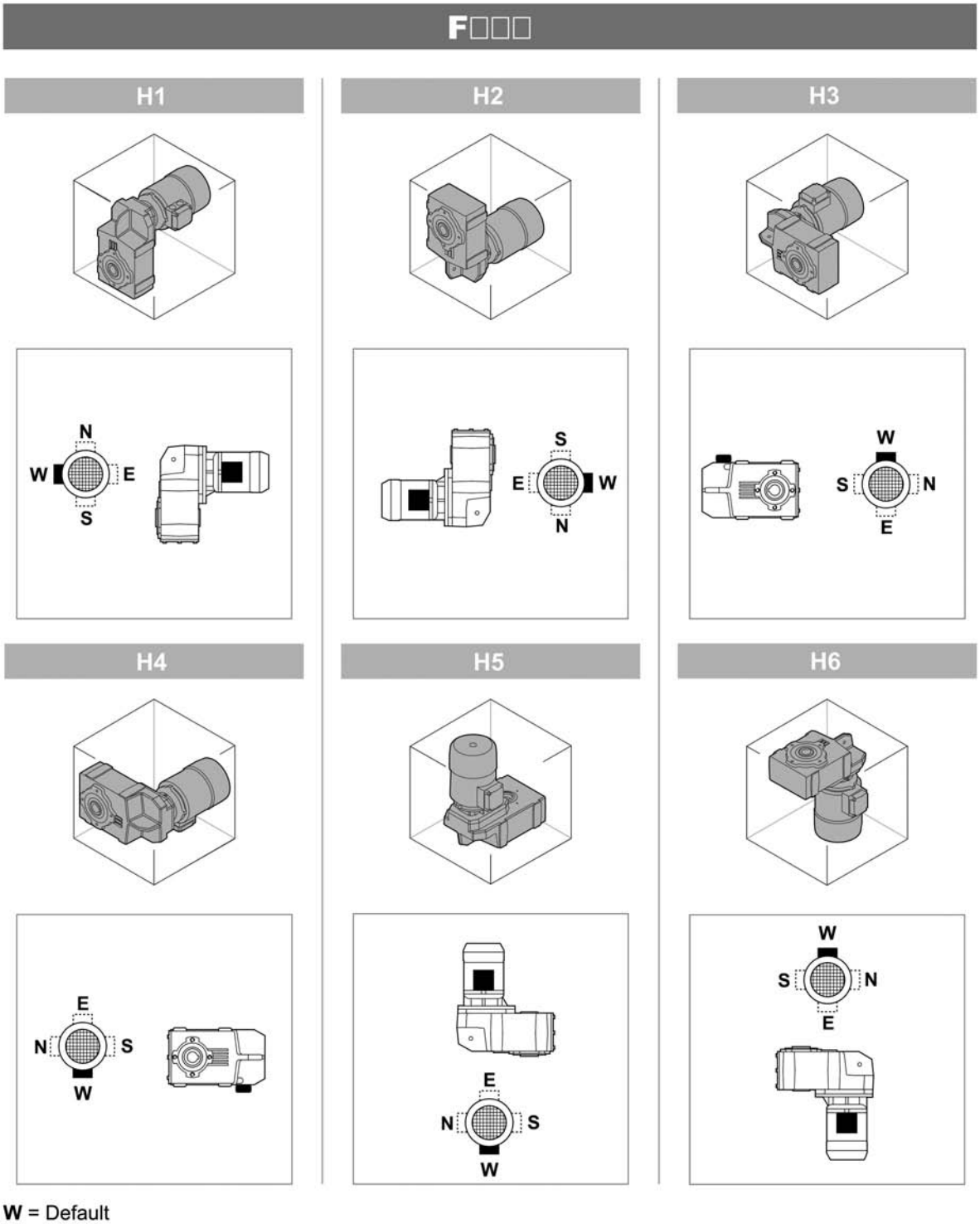
The applicability of the various options is indicated in the technical data tables according to the specific configuration and gear ratio.

2D3D-160	The gear unit can be installed in zones 21 and 22 (categories 2D and 3D). The unit's surface temperature is less than 160°C.
2D3D-130	The gear unit can be installed in zones 21 and 22 (categories 2D and 3D). The unit's surface temperature is less than 130°C.
2G3G-T3	The gear unit can be installed in zones 1 and 2 (categories 2G and 3G). The temperature class is T3 (max. 200 °C).
2G3G-T4	The gear unit can be installed in zones 1 and 2 (categories 2G and 3G). The temperature class is T4 (max. 135 °C).

2.3.3 VARIANTS OF ELECTRIC MOTOR



2.4 MOUNTING POSITION



W = Default

2.5 LUBRICATION

The gear units are factory-charged with long-life synthetic lubricant in the quantity suitable for the mounting position specified in the order.
Type F302, F402, F502 and F603-F604 units configured for mounting position **H6** are the exception to this rule. They are supplied without lubricant and must be filled with oil by the Client before being put into operation.
During shipment, the gear units are usually fitted with a closed filler plug, which must be replaced by the user with the vented plug supplied before putting the unit into service. The level plug is coloured yellow.

	oil [l]					
	H1	**H2**	**H3**	**H4**	**H5**	**H6**
F 10 2	1.2	1.3	0.70	0.80	0.80	1.1
F 20 2	2.0	1.7	0.90	1.3	1.2	1.7
F 20 3	2.3	1.8	1.2	1.5	1.8	1.8
F 30 2	2.6	2.6	1.5	1.7	2.5	2.6
F 30 3	2.5	2.5	1.5	1.6	2.4	2.5
F 30 4	3.0	2.7	1.9	2.0	3.3	2.7
F 40 2	5.5	4.4	4.5	3.6	5.6	4.9
F 40 3	5.5	4.4	4.5	3.6	5.6	4.9
F 40 4	5.3	4.3	4.3	3.3	5.5	4.4
F 50 2	9.7	7.2	8.1	5.2	9.7	7.6
F 50 3	9.7	7.2	8.1	5.2	9.7	7.6
F 50 4	9.7	7.4	8.1	5.1	9.9	7.4
F 60 3	14	11	7.9	11	15	11
F 60 4	15	12	8.0	11	15	11

Shell Tivela oil S 320

Life-time lubricated gear units.

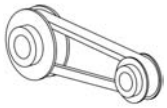
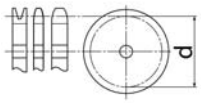
Lubricant is not factory filled.

2.6 ADMISSIBLE OVERHUNG LOADS

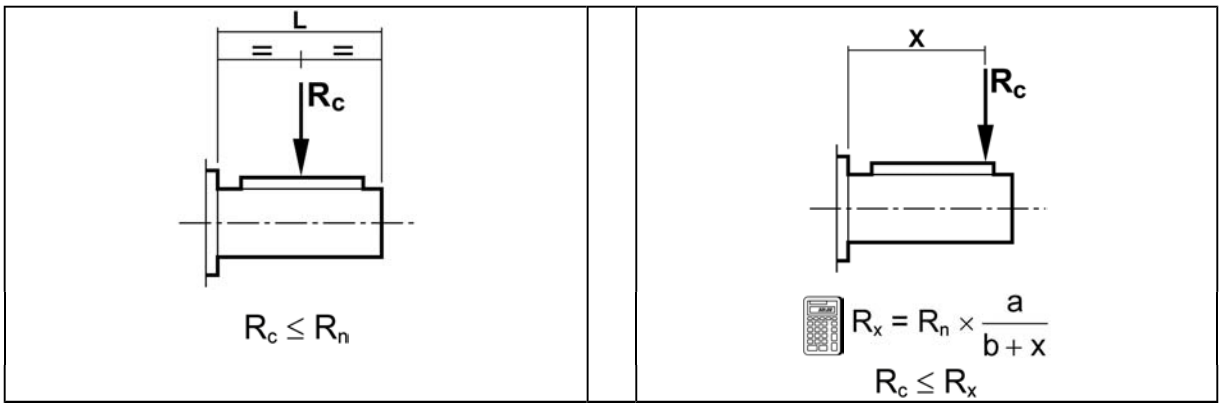
2.6.1 RADIAL LOADS

2.6.1.1 CALCULATING THE RESULTING OVERHUNG LOAD

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 equation:

$R_c = \frac{2000 \times M \times K_r}{d}$	
K_r = 1	
K_r = 1.25	
K_r = 1.5 - 2.0	
M [Nm]	
d [mm]	

2.6.1.2 OVERHUNG LOADING VERIFICATION



2.6.1.3 LOAD LOCATION FACTOR

	Output shaft			Input shaft		
	a	**b**	**c**	**a**	**b**	**c**
F102	123	100.5	450	-	-	-
F202	145	115	600	40	20	350
F203	145	115	600	-	-	-
F302 - F303	165	135	850	38.5	18.5	350
F304	165	135	850	-	-	-
F402 -F403	191.5	151.5	1000	49.5	24.5	450
F404	191.5	151.5	1000	40	20	350
F502 -F503	233.5	183.5	1300	49.5	24.5	450
F504	233.5	183.5	1300	38.5	18.5	350
F603	258.5	198.5	1100	55.5	25.5	600
F604	258.5	198.5	1100	49.5	24.5	450

2.6.1.4 THRUST LOADS An_1, An_2

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:

$$A_{n1} = R_{n1} \cdot 0{,}2$$

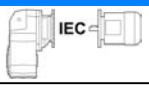
$$A_{n2} = R_{n2} \cdot 0{,}2$$

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.

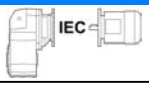
Where thrust loads exceed permissible value or largely prevail over radial loads, contact Bonfiglioli Riduttori for an in-depth analysis of the application.

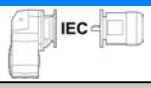
2.7 GEARMOTOR RATING CHARTS

2.7.1 0.12 kW

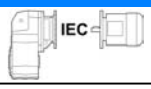
0.12 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
0.9	1178	1.4	1439	12000	**F504_1439 S05 M05A4**	**F504_1439 P63 BN63A4**
1.1	993	1.0	1213	8500	**F404_1213 S05 M05A4**	**F404_1213 P63 BN63A4**
1.1	956	1.7	1168	12000	**F504_1168 S05 M05A4**	**F504_1168 P63 BN63A4**
1.1	934	3.1	1141	20000	**F604_1141 S05 M05A4**	**F604_1141 P63 BN63A4**
1.2	862	3.4	1054	20000	**F604_1054 S05 M05A4**	**F604_1053 P63 BN63A4**
1.3	804	1.2	982.4	8500	**F404_982.4 S05 M05A4**	**F404_982.4 P63 BN63A4**
1.3	802	2.0	979.4	12000	**F504_979.4 S05 M05A4**	**F504_979.4 P63 BN63A4**
1.4	785	3.7	958.9	20000	**F604_958.9 S05 M05A4**	**F604_958.9 P63 BN63A4**
1.6	676	2.4	826.4	12000	**F504_826.4 S05 M05A4**	**F504_826.4 P63 BN63A4**
1.6	666	1.4	813.8	8500	**F404_813.8 S05 M05A4**	**F404_813.8 P63 BN63A4**
1.9	565	1.7	690.1	8500	**F404_690.1 S05 M05A4**	**F404_690.1 P63 BN63A4**
1.9	549	1.0	685.6	6500	**F304_685.6 S05 M05A4**	**F304_685.6 P63 BN63A4**
1.9	553	2.9	676.3	12000	**F504_676.3 S05 M05A4**	**F504_676.3 P63 BN63A4**
2.3	463	1.2	578.6	6500	**F304_578.6 S05 M05A4**	**F304_578.6 P63 BN63A4**
2.4	450	2.1	549.8	8500	**F404_549.8 S05 M05A4**	**F404_549.8 P63 BN63A4**
2.5	434	3.7	530.5	12000	**F504_530.5 S05 M05A4**	**F504_530.5 P63 BN63A4**
2.8	370	1.5	462.6	6500	**F304_462.6 S05 M05A4**	**F304_462.6 P63 BN63A4**
3.0	355	2.7	433.7	8500	**F404_433.7 S05 M05A4**	**F404_433.7 P63 BN63A4**
3.5	305	1.8	374.4	6500		**F303_374.4 P63 BN63A4**
3.8	281	3.4	344.8	8500		**F403_344.8 P63 BN63A4**
4.1	259	1.0	316.9	4000	**F203_316.9 S05 M05A4**	**F203_316.9 P63 BN63A4**
4.4	241	3.9	296.6	8500		**F403_296.6 P63 BN63A4**
4.5	239	2.3	293.8	6500		**F303_293.8 P63 BN63A4**
5.1	209	1.2	255.3	4000	**F203_255.3 S05 M05A4**	**F203_255.3 P63 BN63A4**
5.2	206	2.7	253.6	6500		**F303_253.6 P63 BN63A4**
6.3	171	1.5	209.3	4000	**F203_209.3 S05 M05A4**	**F203_209.3 P63 BN63A4**
6.5	165	3.3	202.3	6500		**F303_202.3 P63 BN63A4**
7.6	141	1.8	172.6	4000	**F203_172.6 S05 M05A4**	**F203_172.6 P63 BN63A4**
9.9	110	1.9	132.2	4000	**F202_132.2 S05 M05A4**	**F202_132.2 P63 BN63A4**
10.0	106	1.3	127.1	2800	**F102_127.1 S05 M05A4**	**F102_127.1 P63 BN63A4**
11.5	95	2.5	114.3	4000	**F202_114.3 S05 M05A4**	**F202_114.3 P63 BN63A4**
12.0	88	1.6	106.0	2800	**F102_106.0 S05 M05A4**	**F102_106.0 P63 BN63A4**
14.0	76	1.8	91.5	2800	**F102_91.5 S05 M05A4**	**F102_91.5 P63 BN63A4**
14.5	75	3.3	90.4	4000	**F202_90.4 S05 M05A4**	**F202_90.4 P63 BN63A4**
17.1	64	3.9	76.8	4000	**F202_76.8 S05 M05A4**	**F202_76.8 P63 BN63A4**
18.0	59	2.3	71.1	2800	**F102_71.1 S05 M05A4**	**F102_71.1 P63 BN63A4**
21.0	52	2.5	63.0	2800	**F102_63.0 S05 M05A4**	**F102_63.0 P63 BN63A4**
27.0	40	2.9	48.7	2800	**F102_48.7 S05 M05A4**	**F102_48.7 P63 BN63A4**
33	33	3.3	39.6	2800	**F102_39.6 S05 M05A4**	**F102_39.6 P63 BN63A4**
40	27	3.7	33.0	2800	**F102_33.0 S05 M05A4**	**F102_33.0 P63 BN63A4**

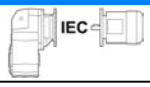
2.7.2 0.18 kW

0.18 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
1.1	1412	1.1	1168	12000	**F504_1168 S05 M05B4**	**F504_1168 P63 BN63B4**
1.2	1380	2.1	1141	20000	**F604_1141 S05 M05B4**	**F604_1141 P63 BN63B4**
1.3	1274	2.3	1054	20000	**F604_1054 S05 M05B4**	**F604_1054 P63 BN63B4**
1.3	1184	1.4	979.4	12000	**F504_979.4 S05 M05B4**	**F504_979.4 P63 BN63B4**
1.4	1159	2.5	958.9	20000	**F604_958.9 S05 M05B4**	**F604_958.9 P63 BN63B4**
1.5	1070	2.7	885.1	20000	**F604_885.1 S05 M05B4**	**F604_885.1 P63 BN63B4**
1.6	999	1.6	826.4	12000	**F504_826.4 S05 M05B4**	**F504_826.4 P63 BN63B4**
1.6	990	2.9	819.0	20000	**F604_819.0 S05 M05B4**	**F604_819.0 P63 BN63B4**
1.6	984	1.0	813.8	8500	**F404_813.8 S05 M05B4**	**F404_813.8 P63 BN63B4**

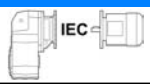
0.18 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
1.7	914	3.2	756.0	20000	F604_756.0 S05 M05B4	F604_756.0 P63 BN63B4
1.9	834	1.1	690.1	8500	F404_690.1 S05 M05B4	F404_690.1 P63 BN63B4
2.0	818	2.0	676.3	12000	F504_676.3 S05 M05B4	F504_676.3 P63 BN63B4
2.0	801	3.6	662.4	20000	F604_662.4 S05 M05B4	F604_662.4 P63 BN63B4
2.2	739	3.9	611.4	20000	F604_611.4 S05 M05B4	F604_611.4 P63 BN63B4
2.4	665	1.4	549.8	8500	F404_549.8 S05 M05B4	F404_549.8 P63 BN63B4
2.5	641	2.5	530.5	12000	F504_530.5 S05 M05B4	F504_530.5 P63 BN63B4
2.9	547	1.0	462.6	6500	F304_462.6 S05 M05B4	F304_462.6 P63 BN63B4
3.0	524	1.8	433.7	8500	F404_433.7 S05 M05B4	F404_433.7 P63 BN63B4
3.1	519	3.1	429.1	12000	F504_429.1 S05 M05B4	F504_429.1 P63 BN63B4
3.5	453	1.2	374.4	6500		F303_374.4 P63 BN63B4
3.7	427	3.7	352.5	12000	F503_352.5 S05 M05B4	F503_352.5 P63 BN63B4
3.8	418	2.3	344.8	8500		F403_344.8 P63 BN63B4
4.5	359	2.6	296.6	8500		F403_296.6 P63 BN63B4
4.5	356	1.5	293.8	6500		F303_293.8 P63 BN63B4
5.2	307	1.8	253.6	6500		F303_253.6 P63 BN63B4
5.5	291	3.3	240.1	8500		F403_240.1 P63 BN63B4
6.3	253	1.0	209.3	4000	F203_209.3 S05 M05B4	F203_209.3 P63 BN63B4
6.5	245	2.2	202.3	6500		F303_202.3 P63 BN63B4
6.6	241	3.9	198.9	8500		F403_198.9 P63 BN63B4
7.6	209	1.2	172.6	4000	F203_172.6 S05 M05B4	F203_172.6 P63 BN63B4
7.9	202	2.7	166.8	6500		F303_166.8 P63 BN63B4
9.4	170	3.1	140.7	6500		F303_140.7 P63 BN63B4
10.0	164	1.3	132.2	4000	F202_132.2 S05 M05B4	F202_132.2 P63 BN63B4
11.5	141	1.7	114.3	4000	F202_114.3 S05 M05B4	F202_114.3 P63 BN63B4
11.7	136	3.6	112.5	6500		F303_112.5 P63 BN63B4
12.0	131	1.1	106.0	2800	F102_106.0 S05 M05B4	F102_106.0 P63 BN63B4
14.0	113	1.2	91.5	2800	F102_91.5 S05 M05B4	F102_91.5 P63 BN63B4
14.6	112	2.2	90.4	4000	F202_90.4 S05 M05B4	F202_90.4 P63 BN63B4
17.2	95	2.6	76.8	4000	F202_76.8 S05 M05B4	F202_76.8 P63 BN63B4
19.0	88	1.6	71.1	2800	F102_71.1 S05 M05B4	F102_71.1 P63 BN63B4
21.0	78	1.7	63.0	2800	F102_63.0 S05 M05B4	F102_63.0 P63 BN63B4
21.3	77	3.1	61.9	4000	F202_61.9 S05 M05B4	F202_61.9 P63 BN63B4
26.0	63	3.5	50.7	4000	F202_50.7 S05 M05B4	F202_50.7 P63 BN63B4
27.0	60	2.0	48.7	2800	F102_48.7 S05 M05B4	F102_48.7 P63 BN63B4
32	52	4.0	41.8	3900	F202_41.8 S05 M05B4	F202_41.8 P63 BN63B4
33	49	2.2	39.6	2800	F102_39.6 S05 M05B4	F102_39.6 P63 BN63B4
40	41	2.5	33.0	2800	F102_33.0 S05 M05B4	F102_33.0 P63 BN63B4
51	32	2.9	25.8	2780	F102_25.8 S05 M05B4	F102_25.8 P63 BN63B4
68	24	3.3	19.3	2540	F102_19.3 S05 M05B4	F102_19.3 P63 BN63B4
90	18	3.9	14.6	2330	F102_14.6 S05 M05B4	F102_14.6 P63 BN63B4
101	16	3.8	13.0	2240	F102_13.0 S05 M05B4	F102_13.0 P63 BN63B4

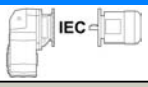
2.7.3 0.25 kW

0.25 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
1.2	1921	1.5	1141	20000	F604_1141 S05 M05C4	F604_1141 P71 BN71A4
1.3	1774	1.6	1054	20000	F604_1054 S05 M05C4	F604_1054 P71 BN71A4
1.3	1649	1.0	979.4	12000	F504_979.4 S05 M05C4	F504_979.4 P71 BN71A4
1.4	1614	1.8	958.9	20000	F604_958.9 S05 M05C4	F604_958.9 P71 BN71A4
1.5	1490	1.9	885.1	20000	F604_885.1 S05 M05C4	F604_885.1 P71 BN71A4
1.6	1391	1.2	826.4	12000	F504_826.4 S05 M05C4	F504_826.4 P71 BN71A4
1.6	1379	2.1	819.0	20000	F604_819.0 S05 M05C4	F604_819.0 P71 BN71A4
1.7	1273	2.3	756.0	20000	F604_756.0 S05 M05C4	F604_756.0 P71 BN71A4
2.0	1138	1.4	676.3	12000	F504_676.3 S05 M05C4	F504_676.3 P71 BN71A4
2.0	1115	2.6	662.4	20000	F604_662.4 S05 M05C4	F604_662.4 P71 BN71A4
2.2	1029	2.8	611.4	20000	F604_611.4 S05 M05C4	F604_611.4 P71 BN71A4
2.4	925	1.0	549.8	8500	F404_549.8 S05 M05C4	F404_549.8 P71 BN71A4

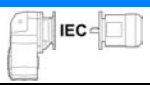
0.25 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
2.5	893	3.2	530.7	20000	F604_530.7 S05 M05C4	F604_530.7 P71 BN71A4
2.5	893	1.8	530.5	12000	F504_530.5 S05 M05C4	F504_530.5 P71 BN71A4
2.7	825	3.5	489.8	20000	F604_489.8 S05 M05C4	F604_489.8 P71 BN71A4
3.0	730	1.3	433.7	8500	F404_433.7 S05 M05C4	F404_433.7 P71 BN71A4
3.1	728	4.0	432.6	20000	F604_432.6 S05 M05C4	F604_432.6 P71 BN71A4
3.1	722	2.2	429.1	12000	F504_429.1 S05 M05C4	F504_429.1 P71 BN71A4
3.7	593	2.7	352.5	12000	F503_352.5 S05 M05C4	F503_352.5 P71 BN71A4
3.8	580	1.6	344.8	8500		F403_344.8 P71 BN71A4
4.5	499	1.9	296.6	8500		F403_296.6 P71 BN71A4
4.5	494	1.1	293.8	6500		F303_293.8 P71 BN71A4
4.6	481	3.3	285.9	12000	F503_285.9 S05 M05C4	F503_285.9 P71 BN71A4
5.2	427	1.3	253.6	6500		F303_253.6 P71 BN71A4
5.5	404	2.4	240.1	8500		F403_240.1 P71 BN71A4
5.5	403	4.0	239.8	12000	F503_239.8 S05 M05C4	F503_239.8 P71 BN71A4
6.5	340	1.6	202.3	6500		F303_202.3 P71 BN71A4
6.6	335	2.8	198.9	8500		F403_198.9 P71 BN71A4
7.8	284	3.3	168.7	8500		F403_168.7 P71 BN71A4
7.9	281	2.0	166.8	6500		F303_166.8 P71 BN71A4
9.4	237	2.2	140.7	6500		F303_140.7 P71 BN71A4
11.5	196	1.2	114.3	4000	F202_114.3 S05 M05C4	F202_114.3 P71 BN71A4
11.7	189	2.6	112.5	6500		F303_112.5 P71 BN71A4
14.6	155	1.6	90.4	4000	F202_90.4 S05 M05C4	F202_90.4 P71 BN71A4
15.1	147	3.1	87.4	6500	F303_87.4 S05 M05C4	F303_87.4 P71 BN71A4
17.2	132	1.9	76.8	4000	F202_76.8 S05 M05C4	F202_76.8 P71 BN71A4
19.0	122	1.1	71.1	2800	F102_71.1 S05 M05C4	F102_71.1 P71 BN71A4
19.1	116	3.6	69.1	6500		F303_69.1 P71 BN71A4
21.0	108	1.2	63.0	2800	F102_63.0 S05 M05C4	F102_63.0 P71 BN71A4
21.3	106	2.2	61.9	4000	F202_61.9 S05 M05C4	F202_61.9 P71 BN71A4
26.0	87	2.5	50.7	4000	F202_50.7 S05 M05C4	F202_50.7 P71 BN71A4
27.0	84	1.4	48.7	2800	F102_48.7 S05 M05C4	F102_48.7 P71 BN71A4
32	72	2.9	41.8	3790	F202_41.8 S05 M05C4	F202_41.8 P71 BN71A4
33	68	1.6	39.6	2800	F102_39.6 S05 M05C4	F102_39.6 P71 BN71A4
40	57	3.3	33.1	3580	F202_33.1 S05 M05C4	F202_33.1 P71 BN71A4
40	57	1.8	33.0	2800	F102_33.0 S05 M05C4	F102_33.0 P71 BN71A4
51	45	3.9	25.9	3320	F202_25.9 S05 M05C4	F202_25.9 P71 BN71A4
51	44	2.1	25.8	2750	F102_25.8 S05 M05C4	F102_25.8 P71 BN71A4
68	33	2.4	19.3	2520	F102_19.3 S05 M05C4	F102_19.3 P71 BN71A4
90	25	2.8	14.6	2310	F102_14.6 S05 M05C4	F102_14.6 P71 BN71A4
101	22	2.7	13.0	2230	F102_13.0 S05 M05C4	F102_13.0 P71 BN71A4

2.7.4 0.37 kW

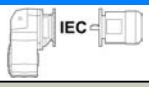
0.37 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
1.2	2760	1.1	1141	20000	F604_1141 S1 M1SD4	F604_1141 P71 BN71B4
1.3	2548	1.1	1054	20000	F604_1054 S1 M1SD4	F604_1054 P71 BN71B4
1.4	2319	1.3	958.9	20000	F604_958.9 S1 M1SD4	F604_958.9 P71 BN71B4
1.5	2140	1.4	885.1	20000	F604_885.1 S1 M1SD4	F604_885.1 P71 BN71B4
1.7	1980	1.5	819.0	20000	F604_819.0 S1 M1SD4	F604_819.0 P71 BN71B4
1.8	1828	1.6	756.0	20000	F604_756.0 S1 M1SD4	F604_756.0 P71 BN71B4
2.0	1635	1.0	676.3	12000	F504_676.3 S1 M1SD4	F504_676.3 P71 BN71B4
2.1	1602	1.8	662.4	20000	F604_662.4 S1 M1SD4	F604_662.4 P71 BN71B4
2.2	1478	2.0	611.4	20000	F604_611.4 S1 M1SD4	F604_611.4 P71 BN71B4
2.6	1283	2.3	530.7	20000	F604_530.7 S1 M1SD4	F604_530.7 P71 BN71B4
2.6	1283	1.2	530.5	12000	F504_530.5 S1 M1SD4	F504_530.5 P71 BN71B4
2.8	1184	2.4	489.8	20000	F604_489.8 S1 M1SD4	F604_489.8 P71 BN71B4
3.2	1046	2.8	432.6	20000	F604_432.6 S1 M1SD4	F604_432.6 P71 BN71B4
3.2	1038	1.5	429.1	12000	F504_429.1 S1 M1SD4	F504_429.1 P71 BN71B4
3.4	966	3.0	399.3	20000	F604_399.3 S1 M1SD4	F604_399.3 P71 BN71B4

0.37 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
3.9	846	1.9	352.5	12000	**F503_352.5 S1 M1SD4**	**F503_352.5 P71 BN71B4**
4.0	827	1.1	344.8	8500	**F403_344.8 S1 M1SD4**	**F403_344.8 P71 BN71B4**
4.0	826	3.5	341.7	20000	**F604_341.7 S1 M1SD4**	**F604_341.7 P71 BN71B4**
4.3	763	3.8	315.4	20000	**F604_315.4 S1 M1SD4**	**F604_315.4 P71 BN71B4**
4.6	711	1.3	296.6	8500	**F403_296.6 S1 M1SD4**	**F403_296.6 P71 BN71B4**
4.8	686	2.3	285.9	12000	**F503_285.9 S1 M1SD4**	**F503_285.9 P71 BN71B4**
5.7	576	1.6	240.1	8500	**F403_240.1 S1 M1SD4**	**F403_240.1 P71 BN71B4**
5.7	575	2.8	239.8	12000	**F503_239.8 S1 M1SD4**	**F503_239.8 P71 BN71B4**
6.8	485	3.3	202.4	12000	**F503_202.4 S1 M1SD4**	**F503_202.4 P71 BN71B4**
6.8	485	1.1	202.3	6500	**F303_202.3 S1 M1SD4**	**F303_202.3 P71 BN71B4**
6.9	477	2.0	198.9	8500	**F403_198.9 S1 M1SD4**	**F403_198.9 P71 BN71B4**
8.1	405	2.3	168.7	8500	**F403_168.7 S1 M1SD4**	**F403_168.7 P71 BN71B4**
8.2	400	1.4	166.8	6500	**F303_166.8 S1 M1SD4**	**F303_166.8 P71 BN71B4**
9.7	338	1.6	140.7	6500	**F303_140.7 S1 M1SD4**	**F303_140.7 P71 BN71B4**
10.2	322	2.9	134.4	8500	**F403_134.4 S1 M1SD4**	**F403_134.4 P71 BN71B4**
12.2	270	1.8	112.5	6500	**F303_112.5 S1 M1SD4**	**F303_112.5 P71 BN71B4**
12.9	254	3.3	106.0	8500	**F403_106.0 S1 M1SD4**	**F403_106.0 P71 BN71B4**
15.2	222	1.1	90.4	4000	**F202_90.4 S1 M1SD4**	**F202_90.4 P71 BN71B4**
15.7	210	2.1	87.4	6500	**F303_87.4 S1 M1SD4**	**F303_87.4 P71 BN71B4**
16.1	204	3.8	84.9	8500	**F403_84.9 S1 M1SD4**	**F403_84.9 P71 BN71B4**
17.8	188	1.3	76.8	4000	**F202_76.8 S1 M1SD4**	**F202_76.8 P71 BN71B4**
19.8	166	2.5	69.1	6500	**F303_69.1 S1 M1SD4**	**F303_69.1 P71 BN71B4**
22.1	152	1.5	61.9	4000	**F202_61.9 S1 M1SD4**	**F202_61.9 P71 BN71B4**
26.3	125	3.0	52.1	6500	**F303_52.1 S1 M1SD4**	**F303_52.1 P71 BN71B4**
27.0	124	1.8	50.7	3900	**F202_50.7 S1 M1SD4**	**F202_50.7 P71 BN71B4**
33	103	2.0	41.8	3700	**F202_41.8 S1 M1SD4**	**F202_41.8 P71 BN71B4**
34	96	3.6	40.2	6500	**F303_40.2 S1 M1SD4**	**F303_40.2 P71 BN71B4**
35	97	1.1	39.6	2800	**F102_39.6 S1 M1SD4**	**F102_39.6 P71 BN71B4**
39	86	3.5	35.0	6500	**F302_35.0 S1 M1SD4**	**F302_35.0 P71 BN71B4**
41	81	2.3	33.1	3460	**F202_33.1 S1 M1SD4**	**F202_33.1 P71 BN71B4**
42	81	1.3	33.0	2800	**F102_33.0 S1 M1SD4**	**F102_33.0 P71 BN71B4**
53	64	2.8	25.9	3220	**F202_25.9 S1 M1SD4**	**F202_25.9 P71 BN71B4**
53	63	1.4	25.8	2690	**F102_25.8 S1 M1SD4**	**F102_25.8 P71 BN71B4**
68	49	3.1	20.2	2990	**F202_20.2 S1 M1SD4**	**F202_20.2 P71 BN71B4**
71	47	1.7	19.3	2470	**F102_19.3 S1 M1SD4**	**F102_19.3 P71 BN71B4**
93	36	3.6	14.8	2720	**F202_14.8 S1 M1SD4**	**F202_14.8 P71 BN71B4**
94	36	2.0	14.6	2280	**F102_14.6 S1 M1SD4**	**F102_14.6 P71 BN71B4**
105	32	1.9	13.0	2200	**F102_13.0 S1 M1SD4**	**F102_13.0 P71 BN71B4**
122	28	3.7	11.2	2490	**F202_11.2 S1 M1SD4**	**F202_11.2 P71 BN71B4**

2.7.5 0.55 kW

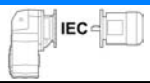
0.55 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
1.7	2894	1.0	819.0	20000	**F604_819.0 S1 M1LA4**	**F604_819.0 P80 BN80A4**
1.8	2672	1.1	756.0	20000	**F604_756.0 S1 M1LA4**	**F604_756.0 P80 BN80A4**
2.1	2341	1.2	662.4	20000	**F604_662.4 S1 M1LA4**	**F604_662.4 P80 BN80A4**
2.3	2161	1.3	611.4	20000	**F604_611.4 S1 M1LA4**	**F604_611.4 P80 BN80A4**
2.6	1875	1.5	530.7	20000	**F604_530.7 S1 M1LA4**	**F604_530.7 P80 BN80A4**
2.8	1731	1.7	489.8	20000	**F604_489.8 S1 M1LA4**	**F604_489.8 P80 BN80A4**
3.2	1529	1.9	432.6	20000	**F604_432.6 S1 M1LA4**	**F604_432.6 P80 BN80A4**
3.2	1516	1.1	429.1	12000	**F504_429.1 S1 M1LA4**	**F504_429.1 P80 BN80A4**
3.5	1411	2.1	399.3	20000	**F604_399.3 S1 M1LA4**	**F604_399.3 P80 BN80A4**
3.9	1248	1.3	352.5	12000	**F503_352.5 S1 M1LA4**	**F503_352.5 P80 BN80A4**
4.0	1207	2.4	341.7	20000	**F604_341.7 S1 M1LA4**	**F604_341.7 P80 BN80A4**
4.4	1115	2.6	315.4	20000	**F604_315.4 S1 M1LA4**	**F604_315.4 P80 BN80A4**
4.8	1012	1.6	285.9	12000	**F503_285.9 S1 M1LA4**	**F503_285.9 P80 BN80A4**
4.9	994	2.9	280.7	20000	**F603_280.7 S1 M1LA4**	**F603_280.7 P80 BN80A4**
5.3	917	3.2	259.1	20000	**F603_259.1 S1 M1LA4**	**F603_259.1 P80 BN80A4**

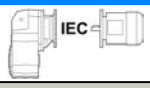
0.55 kW

n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
5.7	850	1.1	240.1	8500	**F403_240.1 S1 M1LA4**	**F403_240.1 P80 BN80A4**
5.8	849	1.9	239.8	12000	**F503_239.8 S1 M1LA4**	**F503_239.8 P80 BN80A4**
5.9	835	3.5	235.8	20000	**F603_235.8 S1 M1LA4**	**F603_235.8 P80 BN80A4**
6.3	770	3.8	217.6	20000	**F603_217.6 S1 M1LA4**	**F603_217.6 P80 BN80A4**
6.8	716	2.2	202.4	12000	**F503_202.4 S1 M1LA4**	**F503_202.4 P80 BN80A4**
6.9	704	1.3	198.9	8500	**F403_198.9 S1 M1LA4**	**F403_198.9 P80 BN80A4**
8.2	597	1.6	168.7	8500	**F403_168.7 S1 M1LA4**	**F403_168.7 P80 BN80A4**
8.3	586	2.7	165.6	12000	**F503_165.6 S1 M1LA4**	**F503_165.6 P80 BN80A4**
9.8	498	1.1	140.7	6500	**F303_140.7 S1 M1LA4**	**F303_140.7 P80 BN80A4**
10.3	476	2.0	134.4	8500	**F403_134.4 S1 M1LA4**	**F403_134.4 P80 BN80A4**
10.6	460	3.2	129.9	12000	**F503_129.9 S1 M1LA4**	**F503_129.9 P80 BN80A4**
12.3	398	1.2	112.5	6500	**F303_112.5 S1 M1LA4**	**F303_112.5 P80 BN80A4**
13.0	375	2.3	106.0	8500	**F403_106.0 S1 M1LA4**	**F403_106.0 P80 BN80A4**
13.1	372	3.7	105.1	12000	**F503_105.1 S1 M1LA4**	**F503_105.1 P80 BN80A4**
15.8	309	1.5	87.4	6500	**F303_87.4 S1 M1LA4**	**F303_87.4 P80 BN80A4**
16.3	300	2.6	84.9	8500	**F403_84.9 S1 M1LA4**	**F403_84.9 P80 BN80A4**
20.0	244	1.7	69.1	6500	**F303_69.1 S1 M1LA4**	**F303_69.1 P80 BN80A4**
20.8	235	3.0	66.5	8500	**F403_66.5 S1 M1LA4**	**F403_66.5 P80 BN80A4**
22.3	224	1.1	61.9	3890	**F202_61.9 S1 M1LA4**	**F202_61.9 P80 BN80A4**
26.5	184	2.1	52.1	6500	**F303_52.1 S1 M1LA4**	**F303_52.1 P80 BN80A4**
26.8	182	3.5	51.5	8500	**F403_51.5 S1 M1LA4**	**F403_51.5 P80 BN80A4**
27.2	183	1.2	50.7	3720	**F202_50.7 S1 M1LA4**	**F202_50.7 P80 BN80A4**
33	151	1.4	41.8	3550	**F202_41.8 S1 M1LA4**	**F202_41.8 P80 BN80A4**
34	142	2.4	40.2	6500	**F303_40.2 S1 M1LA4**	**F303_40.2 P80 BN80A4**
39	128	3.8	35.3	8500	**F402_35.3 S1 M1LA4**	**F402_35.3 P80 BN80A4**
39	127	2.4	35.0	6500	**F302_35.0 S1 M1LA4**	**F302_35.0 P80 BN80A4**
42	120	1.6	33.1	3340	**F202_33.1 S1 M1LA4**	**F202_33.1 P80 BN80A4**
48	104	3.2	28.9	6500	**F302_28.9 S1 M1LA4**	**F302_28.9 P80 BN80A4**
53	94	1.9	25.9	3130	**F202_25.9 S1 M1LA4**	**F202_25.9 P80 BN80A4**
68	73	2.1	20.2	2910	**F202_20.2 S1 M1LA4**	**F202_20.2 P80 BN80A4**
71	70	1.1	19.3	2400	**F102_19.3 S1 M1LA4**	**F102_19.3 P80 BN80A4**
93	54	2.5	14.8	2660	**F202_14.8 S1 M1LA4**	**F202_14.8 P80 BN80A4**
94	53	1.3	14.6	2220	**F102_14.6 S1 M1LA4**	**F102_14.6 P80 BN80A4**
106	47	1.3	13.0	2140	**F102_13.0 S1 M1LA4**	**F102_13.0 P80 BN80A4**
123	41	2.5	11.2	2450	**F202_11.2 S1 M1LA4**	**F202_11.2 P80 BN80A4**

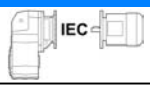
2.7.6 0.75 kW

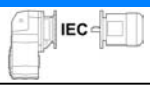
0.75 kW

n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
2.3	2900	1.0	611.4	20000	**F604_611.4 S2 M2SA4**	**F604_611.4 P80 BN80B4**
2.6	2517	1.2	530.7	20000	**F604_530.7 S2 M2SA4**	**F604_530.7 P80 BN80B4**
2.9	2323	1.2	489.8	20000	**F604_489.8 S2 M2SA4**	**F604_489.8 P80 BN80B4**
3.2	2052	1.4	432.6	20000	**F604_432.6 S2 M2SA4**	**F604_432.6 P80 BN80B4**
3.5	1894	1.5	399.3	20000	**F604_399.3 S2 M2SA4**	**F604_399.3 P80 BN80B4**
4.1	1621	1.8	341.7	20000	**F604_341.7 S2 M2SA4**	**F604_341.7 P80 BN80B4**
4.4	1496	1.9	315.4	20000	**F604_315.4 S2 M2SA4**	**F604_315.4 P80 BN80B4**
4.9	1360	1.2	285.9	12000	**F503_285.9 S2 M2SA4**	**F503_285.9 P80 BN80B4**
5.0	1335	2.2	280.7	20000	**F603_280.7 S2 M2SA4**	**F603_280.7 P80 BN80B4**
5.4	1233	2.4	259.1	20000	**F603_259.1 S2 M2SA4**	**F603_259.1 P80 BN80B4**
5.8	1141	1.4	239.8	12000	**F503_239.8 S2 M2SA4**	**F503_239.8 P80 BN80B4**
5.9	1122	2.6	235.8	20000	**F603_235.8 S2 M2SA4**	**F603_235.8 P80 BN80B4**
6.4	1036	2.8	217.6	20000	**F603_217.6 S2 M2SA4**	**F603_217.6 P80 BN80B4**
6.9	963	1.7	202.4	12000	**F503_202.4 S2 M2SA4**	**F503_202.4 P80 BN80B4**
7.0	958	3.0	201.4	20000	**F603_201.4 S2 M2SA4**	**F603_201.4 P80 BN80B4**
7.0	946	1.0	198.9	8500	**F403_198.9 S2 M2SA4**	**F403_198.9 P80 BN80B4**
7.5	884	3.3	185.9	20000	**F603_185.9 S2 M2SA4**	**F603_185.9 P80 BN80B4**
8.3	803	1.2	168.7	8500	**F403_168.7 S2 M2SA4**	**F403_168.7 P80 BN80B4**
8.5	788	2.0	165.6	12000	**F503_165.6 S2 M2SA4**	**F503_165.6 P80 BN80B4**

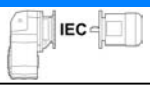
0.75 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
8.6	775	3.7	162.9	20000	**F603_162.9 S2 M2SA4**	**F603_162.9 P80 BN80B4**
10.4	639	1.5	134.4	8500	**F403_134.4 S2 M2SA4**	**F403_134.4 P80 BN80B4**
10.8	618	2.4	129.9	12000	**F503_129.9 S2 M2SA4**	**F503_129.9 P80 BN80B4**
13.2	504	1.7	106.0	8500	**F403_106.0 S2 M2SA4**	**F403_106.0 P80 BN80B4**
13.3	500	2.7	105.1	12000	**F503_105.1 S2 M2SA4**	**F503_105.1 P80 BN80B4**
16.0	416	1.1	87.4	6500	**F303_87.4 S2 M2SA4**	**F303_87.4 P80 BN80B4**
16.5	404	1.9	84.9	8500	**F403_84.9 S2 M2SA4**	**F403_84.9 P80 BN80B4**
16.8	396	3.2	83.2	12000	**F503_83.2 S2 M2SA4**	**F503_83.2 P80 BN80B4**
20.3	329	1.3	69.1	6500	**F303_69.1 S2 M2SA4**	**F303_69.1 P80 BN80B4**
21.1	316	2.3	66.5	8500	**F403_66.5 S2 M2SA4**	**F403_66.5 P80 BN80B4**
21.3	313	3.5	65.8	12000	**F503_65.8 S2 M2SA4**	**F503_65.8 P80 BN80B4**
26.9	248	1.5	52.1	6500	**F303_52.1 S2 M2SA4**	**F303_52.1 P80 BN80B4**
27.2	245	2.6	51.5	8500	**F403_51.5 S2 M2SA4**	**F403_51.5 P80 BN80B4**
33	203	1.0	41.8	3370	**F202_41.8 S2 M2SA4**	**F202_41.8 P80 BN80B4**
35	191	1.8	40.2	6500	**F303_40.2 S2 M2SA4**	**F303_40.2 P80 BN80B4**
37	180	3.1	37.9	8500	**F403_37.9 S2 M2SA4**	**F403_37.9 P80 BN80B4**
40	172	2.8	35.3	8500	**F402_35.3 S2 M2SA4**	**F402_35.3 P80 BN80B4**
40	170	1.8	35.0	6500	**F302_35.0 S2 M2SA4**	**F302_35.0 P80 BN80B4**
42	161	1.2	33.1	3200	**F202_33.1 S2 M2SA4**	**F202_33.1 P80 BN80B4**
47	145	3.7	29.9	8500	**F402_29.9 S2 M2SA4**	**F402_29.9 P80 BN80B4**
49	140	2.4	28.9	6500	**F302_28.9 S2 M2SA4**	**F302_28.9 P80 BN80B4**
54	126	1.4	25.9	3020	**F202_25.9 S2 M2SA4**	**F202_25.9 P80 BN80B4**
57	118	3.1	24.4	6500	**F302_24.4 S2 M2SA4**	**F302_24.4 P80 BN80B4**
69	98	1.6	20.2	2830	**F202_20.2 S2 M2SA4**	**F202_20.2 P80 BN80B4**
95	72	1.8	14.8	2600	**F202_14.8 S2 M2SA4**	**F202_14.8 P80 BN80B4**
125	55	1.9	11.2	2390	**F202_11.2 S2 M2SA4**	**F202_11.2 P80 BN80B4**

2.7.7 1.1 kW

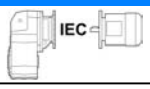
1.1 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
3.2	3018	1.0	432.6	20000	**F604_432.6 S2 M2SB4**	**F604_432.6 P90 BN90S4**
3.5	2785	1.0	399.3	20000	**F604_399.3 S2 M2SB4**	**F604_399.3 P90 BN90S4**
4.1	2383	1.2	341.7	20000	**F604_341.7 S2 M2SB4**	**F604_341.7 P90 BN90S4**
4.4	2200	1.3	315.4	20000	**F604_315.4 S2 M2SB4**	**F604_315.4 P90 BN90S4**
5.0	1959	1.5	280.7	20000	**F603_280.7 S2 M2SB4**	**F603_280.7 P90 BN90S4**
5.4	1808	1.6	259.1	20000	**F603_259.1 S2 M2SB4**	**F603_259.1 P90 BN90S4**
5.9	1645	1.8	235.8	20000	**F603_235.8 S2 M2SB4**	**F603_235.8 P90 BN90S4**
6.4	1519	1.9	217.6	20000	**F603_217.6 S2 M2SB4**	**F603_217.6 P90 BN90S4**
6.9	1412	1.1	202.4	12000	**F503_202.4 S2 M2SB4**	**F503_202.4 P90 BN90S4**
7.0	1405	2.1	201.4	20000	**F603_201.4 S2 M2SB4**	**F603_201.4 P90 BN90S4**
7.5	1297	2.2	185.9	20000	**F603_185.9 S2 M2SB4**	**F603_185.9 P90 BN90S4**
8.5	1156	1.4	165.6	12000	**F503_165.6 S2 M2SB4**	**F503_165.6 P90 BN90S4**
8.6	1137	2.6	162.9	20000	**F603_162.9 S2 M2SB4**	**F603_162.9 P90 BN90S4**
9.3	1049	2.8	150.4	20000	**F603_150.4 S2 M2SB4**	**F603_150.4 P90 BN90S4**
10.7	911	3.2	130.5	20000	**F603_130.5 S2 M2SB4**	**F603_130.5 P90 BN90S4**
10.8	907	1.6	129.9	12000	**F503_129.9 S2 M2SB4**	**F503_129.9 P90 BN90S4**
11.6	841	3.5	120.5	20000	**F603_120.5 S2 M2SB4**	**F603_120.5 P90 BN90S4**
13.2	742	3.9	106.4	20000	**F603_106.4 S2 M2SB4**	**F603_106.4 P90 BN90S4**
13.2	740	1.1	106.0	8500	**F403_106.0 S2 M2SB4**	**F403_106.0 P90 BN90S4**
13.3	733	1.9	105.1	12000	**F503_105.1 S2 M2SB4**	**F503_105.1 P90 BN90S4**
16.5	592	1.3	84.9	8500	**F403_84.9 S2 M2SB4**	**F403_84.9 P90 BN90S4**
16.8	581	2.2	83.2	12000	**F503_83.2 S2 M2SB4**	**F503_83.2 P90 BN90S4**
21.1	464	1.5	66.5	8500	**F403_66.5 S2 M2SB4**	**F403_66.5 P90 BN90S4**
21.3	459	2.4	65.8	12000	**F503_65.8 S2 M2SB4**	**F503_65.8 P90 BN90S4**
26.9	364	1.0	52.1	6500	**F303_52.1 S2 M2SB4**	**F303_52.1 P90 BN90S4**
27.2	359	1.8	51.5	8500	**F403_51.5 S2 M2SB4**	**F403_51.5 P90 BN90S4**
28.6	341	3.1	48.9	12000	**F503_48.9 S2 M2SB4**	**F503_48.9 P90 BN90S4**
35	280	1.2	40.2	6500	**F303_40.2 S2 M2SB4**	**F303_40.2 P90 BN90S4**

1.1 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
36	271	3.5	38.9	12000	**F503_38.9 S2 M2SB4**	**F503_38.9 P90 BN90S4**
37	265	2.1	37.9	8500	**F403_37.9 S2 M2SB4**	**F403_37.9 P90 BN90S4**
40	252	1.9	35.3	8500	**F402_35.3 S2 M2SB4**	**F402_35.3 P90 BN90S4**
40	250	1.2	35.0	6500	**F302_35.0 S2 M2SB4**	**F302_35.0 P90 BN90S4**
46	219	3.5	30.7	12000	**F502_30.7 S2 M2SB4**	**F502_30.7 P90 BN90S4**
47	213	2.5	29.9	8500	**F402_29.9 S2 M2SB4**	**F402_29.9 P90 BN90S4**
49	206	1.6	28.9	6500	**F302_28.9 S2 M2SB4**	**F302_28.9 P90 BN90S4**
57	174	2.1	24.4	6500	**F302_24.4 S2 M2SB4**	**F302_24.4 P90 BN90S4**
59	170	3.7	23.8	8500	**F402_23.8 S2 M2SB4**	**F402_23.8 P90 BN90S4**
69	144	1.1	20.2	2690	**F202_20.2 S2 M2SB4**	**F202_20.2 P90 BN90S4**
72	139	2.7	19.5	6370	**F302_19.5 S2 M2SB4**	**F302_19.5 P90 BN90S4**
93	108	3.5	15.1	5930	**F302_15.1 S2 M2SB4**	**F302_15.1 P90 BN90S4**
95	105	1.3	14.8	2500	**F202_14.8 S2 M2SB4**	**F202_14.8 P90 BN90S4**
125	80	1.3	11.2	2310	**F202_11.2 S2 M2SB4**	**F202_11.2 P90 BN90S4**

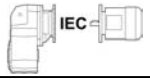
2.7.8 1.5 kW

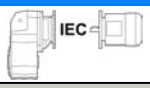
1.5 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
5.0	2652	1.1	280.7	20000	**F603_280.7 S3 M3SA4**	**F603_280.7 P90 BN90LA4**
5.4	2448	1.2	259.1	20000	**F603_259.1 S3 M3SA4**	**F603_259.1 P90 BN90LA4**
6.0	2228	1.3	235.8	20000	**F603_235.8 S3 M3SA4**	**F603_235.8 P90 BN90LA4**
6.5	2056	1.4	217.6	20000	**F603_217.6 S3 M3SA4**	**F603_217.6 P90 BN90LA4**
7.0	1903	1.5	201.4	20000	**F603_201.4 S3 M3SA4**	**F603_201.4 P90 BN90LA4**
7.6	1756	1.7	185.9	20000	**F603_185.9 S3 M3SA4**	**F603_185.9 P90 BN90LA4**
8.5	1565	1.0	165.6	12000	**F503_165.6 S3 M3SA4**	**F503_165.6 P90 BN90LA4**
8.7	1539	1.9	162.9	20000	**F603_162.9 S3 M3SA4**	**F603_162.9 P90 BN90LA4**
9.4	1421	2.0	150.4	20000	**F603_150.4 S3 M3SA4**	**F603_150.4 P90 BN90LA4**
10.8	1233	2.4	130.5	20000	**F603_130.5 S3 M3SA4**	**F603_130.5 P90 BN90LA4**
10.9	1227	1.2	129.9	12000	**F503_129.9 S3 M3SA4**	**F503_129.9 P90 BN90LA4**
11.7	1138	2.5	120.5	20000	**F603_120.5 S3 M3SA4**	**F603_120.5 P90 BN90LA4**
13.3	1005	2.9	106.4	20000	**F603_106.4 S3 M3SA4**	**F603_106.4 P90 BN90LA4**
13.4	993	1.4	105.1	12000	**F503_105.1 S3 M3SA4**	**F503_105.1 P90 BN90LA4**
14.4	928	3.1	98.2	20000	**F603_98.2 S3 M3SA4**	**F603_98.2 P90 BN90LA4**
16.8	794	3.7	84.0	20000	**F603_84.0 S3 M3SA4**	**F603_84.0 P90 BN90LA4**
16.9	786	1.6	83.2	12000	**F503_83.2 S3 M3SA4**	**F503_83.2 P90 BN90LA4**
18.2	733	4.0	77.6	20000	**F603_77.6 S3 M3SA4**	**F603_77.6 P90 BN90LA4**
21.2	628	1.1	66.5	8500	**F403_66.5 S3 M3SA4**	**F403_66.5 P90 BN90LA4**
21.4	622	1.8	65.8	12000	**F503_65.8 S3 M3SA4**	**F503_65.8 P90 BN90LA4**
27.4	487	1.3	51.5	8500	**F403_51.5 S3 M3SA4**	**F403_51.5 P90 BN90LA4**
28.8	462	2.3	48.9	12000	**F503_48.9 S3 M3SA4**	**F503_48.9 P90 BN90LA4**
36	367	2.6	38.9	12000	**F503_38.9 S3 M3SA4**	**F503_38.9 P90 BN90LA4**
37	358	1.5	37.9	8500	**F403_37.9 S3 M3SA4**	**F403_37.9 P90 BN90LA4**
40	341	1.4	35.3	8500	**F402_35.3 S3 M3SA4**	**F402_35.3 P90 BN90LA4**
46	296	2.6	30.7	11900	**F502_30.7 S3 M3SA4**	**F502_30.7 P90 BN90LA4**
47	289	1.9	29.9	8500	**F402_29.9 S3 M3SA4**	**F402_29.9 P90 BN90LA4**
49	279	1.2	28.9	6500	**F302_28.9 S3 M3SA4**	**F302_28.9 P90 BN90LA4**
58	235	1.6	24.4	6500	**F302_24.4 S3 M3SA4**	**F302_24.4 P90 BN90LA4**
59	232	3.9	24.0	11100	**F502_24.0 S3 M3SA4**	**F502_24.0 P90 BN90LA4**
59	230	2.7	23.8	8430	**F402_23.8 S3 M3SA4**	**F402_23.8 P90 BN90LA4**
72	188	2.0	19.5	6160	**F302_19.5 S3 M3SA4**	**F302_19.5 P90 BN90LA4**
75	182	3.8	18.8	7930	**F402_18.8 S3 M3SA4**	**F402_18.8 P90 BN90LA4**
93	146	2.6	15.1	5770	**F302_15.1 S3 M3SA4**	**F302_15.1 P90 BN90LA4**
118	115	3.3	12.0	5410	**F302_12.0 S3 M3SA4**	**F302_12.0 P90 BN90LA4**

2.7.9 2.2 kW

2.2 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
7.0	2791	1.0	201.4	20000	**F603_201.4 S3 M3LA4**	**F603_201.4 P100 BN100LA4**
7.6	2576	1.1	185.9	20000	**F603_185.9 S3 M3LA4**	**F603_185.9 P100 BN100LA4**
8.7	2257	1.3	162.9	20000	**F603_162.9 S3 M3LA4**	**F603_162.9 P100 BN100LA4**
9.4	2084	1.4	150.4	20000	**F603_150.4 S3 M3LA4**	**F603_150.4 P100 BN100LA4**
10.8	1808	1.6	130.5	20000	**F603_130.5 S3 M3LA4**	**F603_130.5 P100 BN100LA4**
11.7	1669	1.7	120.5	20000	**F603_120.5 S3 M3LA4**	**F603_120.5 P100 BN100LA4**
13.3	1474	2.0	106.4	20000	**F603_106.4 S3 M3LA4**	**F603_106.4 P100 BN100LA4**
14.4	1361	2.1	98.2	20000	**F603_98.2 S3 M3LA4**	**F603_98.2 P100 BN100LA4**
16.8	1164	2.5	84.0	20000	**F603_84.0 S3 M3LA4**	**F603_84.0 P100 BN100LA4**
16.9	1154	1.1	83.2	12000	**F503_83.2 S3 M3LA4**	**F503_83.2 P100 BN100LA4**
18.2	1075	2.7	77.6	20000	**F603_77.6 S3 M3LA4**	**F603_77.6 P100 BN100LA4**
20.7	946	3.1	68.3	20000	**F603_68.3 S3 M3LA4**	**F603_68.3 P100 BN100LA4**
21.4	912	1.2	65.8	12000	**F503_65.8 S3 M3LA4**	**F503_65.8 P100 BN100LA4**
22.4	873	3.3	63.0	20000	**F603_63.0 S3 M3LA4**	**F603_63.0 P100 BN100LA4**
28.8	678	1.6	48.9	12000	**F503_48.9 S3 M3LA4**	**F503_48.9 P100 BN100LA4**
36	539	1.8	38.9	12000	**F503_38.9 S3 M3LA4**	**F503_38.9 P100 BN100LA4**
37	525	1.1	37.9	8500	**F403_37.9 S3 M3LA4**	**F403_37.9 P100 BN100LA4**
46	434	1.7	30.7	11500	**F502_30.7 S3 M3LA4**	**F502_30.7 P100 BN100LA4**
47	424	1.3	29.9	8280	**F402_29.9 S3 M3LA4**	**F402_29.9 P100 BN100LA4**
58	345	1.1	24.4	6060	**F302_24.4 S3 M3LA4**	**F302_24.4 P100 BN100LA4**
59	340	2.7	24.0	10800	**F502_24.0 S3 M3LA4**	**F502_24.0 P100 BN100LA4**
59	338	1.9	23.8	7930	**F402_23.8 S3 M3LA4**	**F402_23.8 P100 BN100LA4**
72	276	1.4	19.5	5800	**F302_19.5 S3 M3LA4**	**F302_19.5 P100 BN100LA4**
72	275	3.6	19.5	10200	**F502_19.5 S3 M3LA4**	**F502_19.5 P100 BN100LA4**
75	266	2.6	18.8	7540	**F402_18.8 S3 M3LA4**	**F402_18.8 P100 BN100LA4**
93	214	1.8	15.1	5490	**F302_15.1 S3 M3LA4**	**F302_15.1 P100 BN100LA4**
94	213	3.2	15.1	7160	**F402_15.1 S3 M3LA4**	**F402_15.1 P100 BN100LA4**
118	169	2.2	12.0	5190	**F302_12.0 S3 M3LA4**	**F302_12.0 P100 BN100LA4**
120	167	3.7	11.8	6730	**F402_11.8 S3 M3LA4**	**F402_11.8 P100 BN100LA4**

2.7.10 3 kW

3 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
10.8	2466	1.2	130.5	20000	**F603_130.5 S3 M3LB4**	**F603_130.5 P100 BN100LB4**
11.7	2276	1.3	120.5	20000	**F603_120.5 S3 M3LB4**	**F603_120.5 P100 BN100LB4**
13.3	2010	1.4	106.4	20000	**F603_106.4 S3 M3LB4**	**F603_106.4 P100 BN100LB4**
14.4	1856	1.6	98.2	20000	**F603_98.2 S3 M3LB4**	**F603_98.2 P100 BN100LB4**
16.8	1588	1.8	84.0	20000	**F603_84.0 S3 M3LB4**	**F603_84.0 P100 BN100LB4**
18.2	1466	2.0	77.6	20000	**F603_77.6 S3 M3LB4**	**F603_77.6 P100 BN100LB4**
20.7	1290	2.2	68.3	20000	**F603_68.3 S3 M3LB4**	**F603_68.3 P100 BN100LB4**
22.4	1191	2.4	63.0	20000	**F603_63.0 S3 M3LB4**	**F603_63.0 P100 BN100LB4**
27.2	979	3.0	51.8	20000	**F603_51.8 S3 M3LB4**	**F603_51.8 P100 BN100LB4**
28.8	924	1.1	48.9	12000	**F503_48.9 S3 M3LB4**	**F503_48.9 P100 BN100LB4**
29.5	904	3.2	47.8	20000	**F603_47.8 S3 M3LB4**	**F603_47.8 P100 BN100LB4**
34	795	3.6	42.1	20000	**F603_42.1 S3 M3LB4**	**F603_42.1 P100 BN100LB4**
36	734	1.3	38.9	11800	**F503_38.9 S3 M3LB4**	**F503_38.9 P100 BN100LB4**
36	734	4.0	38.8	20000	**F603_38.8 S3 M3LB4**	**F603_38.8 P100 BN100LB4**
55	480	4.0	25.4	20000	**F603_25.4 S3 M3LB4**	**F603_25.4 P100 BN100LB4**
59	464	1.9	24.0	10500	**F502_24.0 S3 M3LB4**	**F502_24.0 P100 BN100LB4**
72	375	2.7	19.5	9910	**F502_19.5 S3 M3LB4**	**F502_19.5 P100 BN100LB4**
75	363	1.9	18.8	7090	**F402_18.8 S3 M3LB4**	**F402_18.8 P100 BN100LB4**
92	297	3.3	15.4	9300	**F502_15.4 S3 M3LB4**	**F502_15.4 P100 BN100LB4**
93	292	1.3	15.1	5180	**F302_15.1 S3 M3LB4**	**F302_15.1 P100 BN100LB4**
94	291	2.4	15.1	6800	**F402_15.1 S3 M3LB4**	**F402_15.1 P100 BN100LB4**

3 kW						
n_2 min^{-1}	M_2 Nm	S	i	Rn_2 N		
116	235	3.9	12.2	8710	**F502_12.2 S3 M3LB4**	**F502_12.2 P100 BN100LB4**
118	231	1.6	12.0	4940	**F302_12.0 S3 M3LB4**	**F302_12.0 P100 BN100LB4**
120	228	2.7	11.8	6450	**F402_11.8 S3 M3LB4**	**F402_11.8 P100 BN100LB4**

2.8 RATING CHARTS

2.8.1 SELECTION EXAMPLE:

① The gear unit can be installed

In zones **21** and **22** with surface temperature limit of **160°C**

In zones **1** and **2** with temperature class limit **T3** (200°C)

		n_1 = 1400 min^{-1}			
		n_2 min^{-1}	Mn_2 Nm	Pn_1 kW	Rn_2 N
2D3D-130—2G3G-T4 / 2D3D-160—2G3G-T3	F102_13.0 (1)	108	61	0,72	1940
	F102_14.6	96	70	0,74	2000
	F102_19.3	73	79	0,63	2180
	F102_25.8	54	91	0,54	2430
	F102_33.0	42	101	0,47	2670
	F102_39.6 (2)	35	109	0,42	2800
	F102_48.7	28,7	118	0,37	2800
	F102_63.0	22,2	130	0,32	2800
	F102_71.1	19,7	137	0,3	2800
	F102_91.5	15,3	140	0,24	2800
	F102_106.0	13,2	140	0,20	2800
	F102_127.1	11	138	0,17	2800

② The gear unit can be installed

In zones **21** and **22** with surface temperature limit of **130°C**

In zones **21** and **22** with surface temperature limit of **160°C**

In zones **1** and **2** with temperature class limit **T4** (135°C)

In zones **1** and **2** with temperature class limit **T3** (200°C)

2.8.2 F 10 - ATEX

IEC		n_1 = 1400 min^{-1}					n_1 = 1400 min^{-1}				
		n_2 min^{-1}	Mn_2 Nm	Pn_1 kW	Rn_2 N		n_2 min^{-1}	Mn_2 Nm	Pn_1 kW		Rn_2 N
2D3D-130—2G3G-T4 / 2D3D-160—2G3G-T3	F102_13.0	108	61	0.72	1940						
	F102_14.6	96	70	0.74	2000						
	F102_19.3	73	79	0.63	2180						
	F102_25.8	54	91	0.54	2430						
	F102_33.0	42	101	0.47	2670						
	F102_39.6	35	109	0.42	2800						
	F102_48.7	28.7	118	0.37	2800						
	F102_63.0	22.2	130	0.32	2800						
	F102_71.1	19.7	137	0.30	2800						
	F102_91.5	15.3	140	0.24	2800						
	F102_106.0	13.2	140	0.20	2800						
	F102_127.1	11.0	138	0.17	2800						

2.8.3 F 20 - ATEX

	IEC	n_1 = 1400 min^{-1}					IEC	n_1 = 1400 min^{-1}				
		n_2 min^{-1}	Mn_2 Nm	Pn_1 kW	Rn_2 N			n_2 min^{-1}	Mn_2 Nm	Pn_1 kW	Rn_1 N	Rn_2 N
2D3D-130—2G3G-T4	F202_11.2	125	102	1.4	2010	2G3G-T4	F202_11.2	125	102	1.4	(-)	2010
	F202_14.8	95	132	1.4	2210		F202_14.8	95	132	1.4	900	2210
2D3D-160—2G3G-T3	F202_20.2	69	155	1.2	2460	2G3G-T3	F202_20.2	69	155	1.2	860	2460
	F202_25.9	54	175	1.0	2680		F202_25.9	54	175	1.0	810	2680
	F202_33.1	42	190	0.88	2940		F202_33.1	42	190	0.88	760	2940
	F202_41.8	33	205	0.76	3240		F202_41.8	33	205	0.76	730	3240
	F202_50.7	27.6	220	0.67	3500		F202_50.7	27.6	220	0.67	710	3500
	F202_61.9	22.6	235	0.59	3790		F202_61.9	22.6	235	0.59	660	3790
	F202_76.8	18.2	250	0.50	4000		F202_76.8	18.2	250	0.50	590	4000
	F202_90.4	15.5	250	0.43	4000		F202_90.4	15.5	250	0.43	640	4000
	F202_114.3	12.2	235	0.32	4000		F202_114.3	12.2	235	0.32	750	4000
	F202_132.2	10.6	210	0.24	4000		F202_132.2	10.6	210	0.24	930	4000
	F203_172.6	8.1	250	0.23	4000							
	F203_209.3	6.7	250	0.19	4000							
	F203_255.3	5.5	250	0.15	4000							
	F203_316.9	4.4	250	0.12	4000							
	F203_372.9	3.8	250	0.11	4000							
	F203_471.7	3.0	250	0.08	4000							
	F203_545.3	2.6	250	0.07	4000							

(-) Contact Bonfiglioli's Technical Service and advise radial load data (direction of rotation, load angle and axial position) for in-depth calculation.

2.8.4 F 30 - ATEX

	IEC	n_1 = 1400 min^{-1}					IEC	n_1 = 1400 min^{-1}				
		n_2 min^{-1}	Mn_2 Nm	Pn_1 kW	Rn_2 N			n_2 min^{-1}	Mn_2 Nm	Pn_1 kW	Rn_1 N	Rn_2 N
2D3D-130—2G3G-T4	F302_12.0	117	380	4.9	4350	2G3G-T4	F302_12.0	117	250	3.2	(-)	4500
	F302_15.1	93	380	3.9	4830		F302_15.1	93	270	2.8	(-)	4880
2D3D-160—2G3G-T3	F302_19.5	72	380	3.0	5400	2G3G-T3	F302_19.5	72	270	2.1	210	5400
	F302_24.4	57	370	2.3	5930		F302_24.4	57	270	1.7	410	5930
	F302_28.9	48	335	1.8	6370		F302_28.9	48	270	1.4	520	6370
	F302_35.0	40	300	1.3	6500		F302_35.0	40	255	1.1	800	6500
	F303_40.2	35	345	1.4	6500		F303_40.2	35	345	1.4	1730	6500
	F303_52.1	26.9	380	1.2	6500		F303_52.1	26.9	380	1.2	1730	6500
	F303_69.1	20.3	415	0.95	6500		F303_69.1	20.3	415	0.95	1740	6500
	F303_87.4	16.0	450	0.81	6500		F303_87.4	16.0	450	0.81	1730	6500
	F303_112.5	12.4	490	0.69	6500		F303_112.5	12.4	490	0.69	1730	6500
	F303_140.7	10.0	525	0.59	6500		F303_140.7	10.0	525	0.59	1720	6500
	F303_166.8	8.4	550	0.52	6500		F303_166.8	8.4	550	0.52	1720	6500
	F303_202.3	6.9	550	0.43	6500		F303_202.3	6.9	550	0.43	1730	6500
	F303_253.6	5.5	550	0.34	6500		F303_253.6	5.5	550	0.34	1740	6500
	F303_293.8	4.8	550	0.30	6500		F303_293.8	4.8	550	0.30	1740	6500
	F303_374.4	3.7	550	0.23	6500		F303_374.4	3.7	550	0.23	1750	6500
	F304_462.6	3.0	550	0.19	6500							
	F304_578.6	2.4	550	0.15	6500							
	F304_685.6	2.0	550	0.13	6500							
	F304_831.6	1.7	550	0.11	6500							
	F304_1042	1.3	550	0.09	6500							
	F304_1208	1.2	550	0.07	6500							
	F304_1539	0.9	550	0.06	6500							

(-) Contact Bonfiglioli's Technical Service and advise radial load data (direction of rotation, load angle and axial position) for in-depth calculation.

2.8.5 F 40 - ATEX

IEC		n_1 = 1400 min^{-1}						n_1 = 1400 min^{-1}				
		n_2 min^{-1}	Mn_2 Nm	Pn_1 kW	Rn_2 N			n_2 min^{-1}	Mn_2 Nm	Pn_1 kW	Rn_1 N	Rn_2 N
2D3D-130—2G3G-T4	2D3D-160—2G3G-T3	**F402_11.8**	119	615	8.0	4670	2G3G-T4	**F402_11.8**	119	445	5.8	(-)	5330
		F402_15.1	93	685	7.0	4990		**F402_15.1**	93	470	4.8	(-)	5870
		F402_18.8	74	690	5.7	5590		**F402_18.8**	74	500	4.1	(-)	6390
		F402_23.8	59	630	4.1	6590		**F402_23.8**	59	500	3.2	190	7050
		F402_29.9	47	535	2.8	7780		**F402_29.9**	47	500	2.6	510	7950
		F402_35.3	40	485	2.1	8500		**F402_35.3**	40	450	2.0	1130	8500
		F403_37.9	37	555	2.3	8500		**F403_37.9**	37	555	2.3	2640	8500
		F403_51.5	27.2	635	1.9	8500		**F403_51.5**	27.2	635	1.9	2630	8500
		F403_66.5	21.1	715	1.7	8500		**F403_66.5**	21.1	715	1.7	2630	8500
		F403_84.9	16.5	780	1.5	8500		**F403_84.9**	16.5	780	1.5	2620	8500
		F403_106.0	13.2	850	1.3	8500		**F403_106.0**	13.2	850	1.3	2610	8500
		F403_134.4	10.4	935	1.1	8500		**F403_134.4**	10.4	935	1.1	2590	8500
		F403_168.7	8.3	950	0.89	8500		**F403_168.7**	8.3	950	0.89	2600	8500
		F403_198.9	7.0	950	0.76	8500		**F403_198.9**	7.0	950	0.76	2610	8500
		F403_240.1	5.8	950	0.63	8500		**F403_240.1**	5.8	950	0.63	2620	8500
		F403_296.6	4.7	950	0.51	8500		**F403_296.6**	4.7	950	0.51	2630	8500
		F403_344.8	4.1	950	0.44	8500		**F403_344.8**	4.1	950	0.44	2640	8500
		F404_433.7	3.2	950	0.36	8500		**F404_433.7**	3.2	950	0.36	1080	8500
		F404_549.8	2.5	950	0.28	8500		**F404_549.8**	2.5	950	0.28	1130	8500
		F404_690.1	2.0	950	0.22	8500		**F404_690.1**	2.0	950	0.22	1170	8500
		F404_813.8	1.7	950	0.19	8500		**F404_813.8**	1.7	950	0.19	1200	8500
		F404_982.4	1.4	950	0.16	8500		**F404_982.4**	1.4	950	0.16	1220	8500
		F404_1213	1.2	950	0.13	8500		**F404_1213**	1.2	950	0.13	1240	8500
		F404_1411	1.0	950	0.11	8500		**F404_1411**	1.0	950	0.11	1250	8500

(-) Contact Bonfiglioli's Technical Service and advise radial load data (direction of rotation, load angle and axial position) for in-depth calculation.

2.8.6 F 50 - ATEX

IEC		n_1 = 1400 min^{-1}						n_1 = 1400 min^{-1}				
		n_2 min^{-1}	Mn_2 Nm	Pn_1 kW	Rn_2 N			n_2 min^{-1}	Mn_2 Nm	Pn_1 kW	Rn_1 N	Rn_2 N
	F502_12.2	115	925	11.7	6280		F502_12.2	115	525	6.6	(-)	7490
	F502_15.4	91	995	10.0	6820		F502_15.4	91	570	5.7	(-)	8120
2D3D-130—2G3G-T4	F502_19.5	72	995	7.9	7730	2G3G-T4	F502_19.5	72	595	4.7	(-)	8830
	F502_24.0	58	905	5.8	9020		F502_24.0	58	625	4.0	(-)	9550
	F502_30.7	46	755	3.8	10430		F502_30.7	46	655	3.3	(-)	10430
	F503_38.9	36	955	3.9	10520		F503_38.9	36	955	3.9	2460	10520
	F503_48.9	28.6	1060	3.4	11210		F503_48.9	28.6	1060	3.4	2460	11210
	F503_65.8	21.3	1095	2.6	12000		F503_65.8	21.3	1095	2.6	2500	12000
	F503_83.2	16.8	1265	2.4	12000		F503_83.2	16.8	1265	2.4	2470	12000
2D3D-160—2G3G-T3	F503_105.1	13.3	1365	2.1	12000	2G3G-T3	F503_105.1	13.3	1365	2.1	2460	12000
	F503_129.9	10.8	1465	1.8	12000		F503_129.9	10.8	1465	1.8	2450	12000
	F503_165.6	8.5	1590	1.5	12000		F503_165.6	8.5	1590	1.5	2440	12000
	F503_202.4	6.9	1600	1.3	12000		F503_202.4	6.9	1600	1.3	2450	12000
	F503_239.8	5.8	1600	1.1	12000		F503_239.8	5.8	1600	1.1	2460	12000
	F503_285.9	4.9	1600	0.89	12000		F503_285.9	4.9	1600	0.89	2470	12000
	F503_352.5	4.0	1600	0.72	12000		F503_352.5	4.0	1600	0.72	2480	12000
	F504_429.1	3.3	1600	0.60	12000		F504_429.1	3.3	1600	0.60	1640	12000
	F504_530.5	2.6	1600	0.49	12000		F504_530.5	2.6	1600	0.49	1720	12000
	F504_676.3	2.1	1600	0.38	12000		F504_676.3	2.1	1600	0.38	1780	12000
	F504_826.4	1.7	1600	0.31	12000		F504_826.4	1.7	1600	0.31	1780	12000
	F504_979.4	1.4	1600	0.26	12000		F504_979.4	1.4	1600	0.26	1780	12000
	F504_1168	1.2	1600	0.22	12000		F504_1168	1.2	1600	0.22	1780	12000
	F504_1439	1.0	1600	0.18	12000		F504_1439	1.0	1600	0.18	1780	12000

(-) Contact Bonfiglioli's Technical Service and advise radial load data (direction of rotation, load angle and axial position) for in-depth calculation.

2.8.7 F 60 - ATEX

IEC		n_1 = 1400 min^{-1}						n_1 = 1400 min^{-1}					
		n_2 min^{-1}	Mn_2 Nm	Pn_1 kW	Rn_2 N			n_2 min^{-1}	Mn_2 Nm	Pn_1 kW	Rn_1 N	Rn_2 N
2D3D-130—2G3G-T4	2D3D-160—2G3G-T3	F603_11.8	119	1785	24	16800	2G3G-T4	2G3G-T3	F603_11.8	119	1010	13.5	(-)	16800
		F603_12.7	110	1900	24	17100			F603_12.7	110	1100	13.7	(-)	17100
		F603_14.5	97	1900	21	17900			F603_14.5	97	1090	11.9	(-)	17900
		F603_15.7	89	1900	19.1	18500			F603_15.7	89	1170	11.8	(-)	18500
		F603_19.1	73	1900	15.7	19800			F603_19.1	73	1180	9.8	(-)	19800
		F603_20.7	68	1900	14.5	20000			F603_20.7	68	1280	9.8	(-)	20000
		F603_23.5	60	1900	12.8	20000			F603_23.5	60	1240	8.3	(-)	20000
		F603_25.4	55	1900	11.8	20000			F603_25.4	55	1350	8.4	(-)	20000
		F603_29.6	47	2770	14.8	20000			F603_29.6	47	2770	14.8	671	20000
		F603_32.1	44	2780	13.7	20000			F603_32.1	44	2780	13.7	1250	20000
		F603_38.8	36	2900	11.8	20000			F603_38.8	36	2900	11.8	1170	20000
		F603_42.1	33	2900	10.9	20000			F603_42.1	33	2900	10.9	1740	20000
		F603_47.8	29.3	2900	9.6	20000			F603_47.8	29.3	2900	9.6	1690	20000
		F603_51.8	27.0	2900	8.9	20000			F603_51.8	27.0	2900	8.9	2220	20000
		F603_63.0	22.2	2900	7.3	20000			F603_63.0	22.2	2900	7.3	2230	20000
		F603_68.3	20.5	2900	6.7	20000			F603_68.3	20.5	2900	6.7	2720	20000
		F603_77.6	18.0	2900	5.9	20000			F603_77.6	18.0	2900	5.9	2550	20000
		F603_84.0	16.7	2900	5.5	20000			F603_84.0	16.7	2900	5.5	2940	20000
		F603_98.2	14.3	2900	4.7	20000			F603_98.2	14.3	2900	4.7	2840	20000
		F603_106.4	13.2	2900	4.3	20000			F603_106.4	13.2	2900	4.3	3000	20000
		F603_120.5	11.6	2900	3.8	20000			F603_120.5	11.6	2900	3.8	2960	20000
		F603_130.5	10.7	2900	3.5	20000			F603_130.5	10.7	2900	3.5	3040	20000
		F603_150.4	9.3	2900	3.0	20000			F603_150.4	9.3	2900	3.0	3000	20000
		F603_162.9	8.6	2900	2.8	20000			F603_162.9	8.6	2900	2.8	3080	20000
		F603_185.9	7.5	2900	2.5	20000			F603_185.9	7.5	2900	2.5	3030	20000
		F603_201.4	7.0	2900	2.3	20000			F603_201.4	7.0	2900	2.3	3110	20000
		F603_217.6	6.4	2900	2.1	20000			F603_217.6	6.4	2900	2.1	3050	20000
		F603_235.8	5.9	2900	1.9	20000			F603_235.8	5.9	2900	1.9	3130	20000
		F603_259.1	5.4	2900	1.8	20000			F603_259.1	5.4	2900	1.8	3060	20000
		F603_280.7	5.0	2900	1.6	20000			F603_280.7	5.0	2900	1.6	3140	20000
		F604_315.4	4.4	2875	1.5	20000			F604_315.4	4.4	2875	1.5	2340	20000
		F604_341.7	4.1	2900	1.4	20000			F604_341.7	4.1	2900	1.4	2390	20000
		F604_399.3	3.5	2900	1.2	20000			F604_399.3	3.5	2900	1.2	2480	20000
		F604_432.6	3.2	2900	1.1	20000			F604_432.6	3.2	2900	1.1	2520	20000
		F604_489.8	2.9	2900	0.96	20000			F604_489.8	2.9	2900	0.96	2580	20000
		F604_530.7	2.6	2900	0.89	20000			F604_530.7	2.6	2900	0.89	2610	20000
		F604_611.4	2.3	2900	0.77	20000			F604_611.4	2.3	2900	0.77	2660	20000
		F604_662.4	2.1	2900	0.71	20000			F604_662.4	2.1	2900	0.71	2690	20000
		F604_756.0	1.9	2900	0.62	20000			F604_756.0	1.9	2900	0.62	2720	20000
		F604_819.0	1.7	2900	0.57	20000			F604_819.0	1.7	2900	0.57	2750	20000
		F604_885.1	1.6	2900	0.53	20000			F604_885.1	1.6	2900	0.53	2760	20000
		F604_958.9	1.5	2900	0.49	20000			F604_958.9	1.5	2900	0.49	2780	20000
		F604_1054	1.3	2900	0.45	20000			F604_1054	1.3	2900	0.45	2800	20000
		F604_1141	1.2	2900	0.41	20000			F604_1141	1.2	2900	0.41	2820	20000

(-) Contact Bonfiglioli's Technical Service and advise radial load data (direction of rotation, load angle and axial position) for in-depth calculation.

2.9 MOTOR COMBINATIONS

The following table lists the gear ratios for which the motor/gear unit combinations are technically feasible.
The gearmotor must be selected in accordance with the selection procedure given in this catalogue.
In particular, the condition $Mn_2 \geqslant Mr_2 \times fs$ must always be verified.

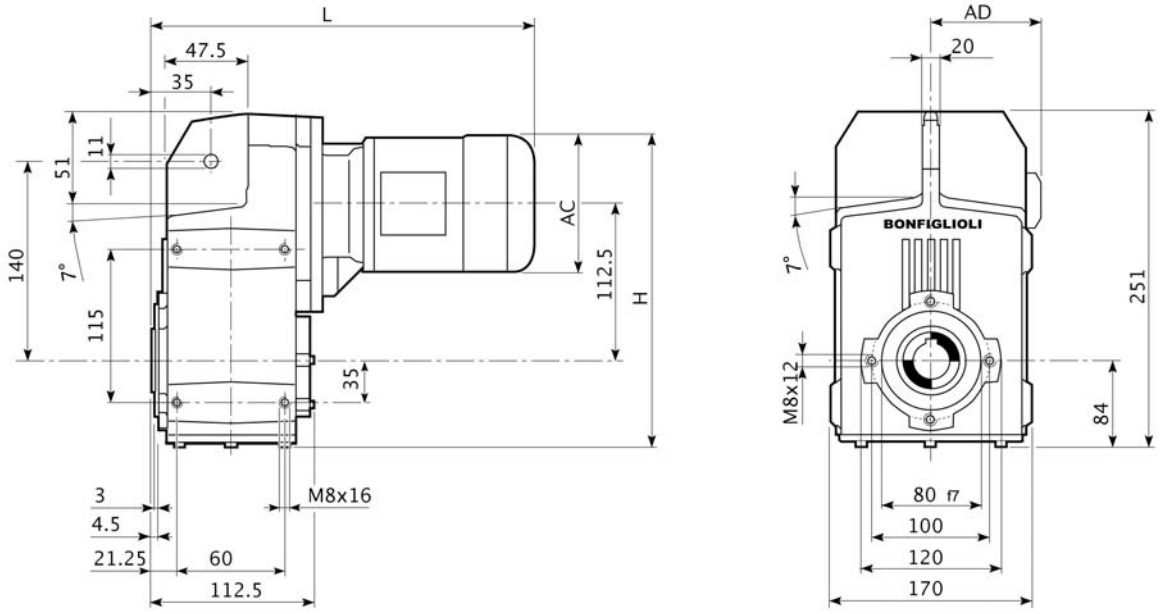
	IEC (IMB5)								
	63A	63B	71A	71B	80A	80B	90S	90LA	90LB
F102	13.0_127.1	13.0_106.0	13.0_71.1	13.0_39.6	13.0_19.3	-	-	-	-
F202	11.2_132.2 (14.8)	11.2_132.2 (14.8)	11.2_114.3 (14.8)	11.2_90.4 (14.8)	11.2_61.9	11.2_41.8	11.2_20.2	-	-
F203	172.6_372.9	172.6_255.3	-	-	-	-	-	-	-
F302	12.0_35.0	12.0_35.0	12.0_35.0	12.0_35.0	12.0_35.0	12.0_35.0	12.0_35.0	12.0_24.4	12.0_19.5
F303	69.1_374.4	69.1_374.4	69.1_293.8	69.1_202.3	40.2_140.7	40.2_87.4	40.2_52.1	-	-
F304	462.6_685.6	-	-	-	-	-	-	-	-
F402	15.1_35.3	15.1_35.3	15.1_35.3	15.1_35.3	11.8_35.3	11.8_35.3	11.8_35.3	11.8_29.9	11.8_23.8
F403	84.9_344.8	84.9_344.8	84.9_344.8	84.9_344.8	37.9_240.1	37.9_168.7	37.9_106.0	37.9_66.5	37.9_51.5
F404	433.7_982.4	433.7_690.1	433.7_549.8	-	-	-	-	-	-
F502	19.5_30.7	19.5_30.7	19.5_30.7	19.5_30.7	12.2_30.7	12.2_30.7	12.2_30.7	12.2_30.7	12.2_30.7
F503	105.1_352.5	105.1_352.5	105.1_352.5	105.1_352.5	38.9_352.5	38.9_285.9	38.9_202.4	38.9_165.6	38.9_105.1
F504	429.1_1439	429.1_1168	429.1_826.4	429.1_676.3	429.01.00	-	-	-	-
F603	98.2_280.7	98.2_280.7	98.2_280.7	98.2_280.7	98.2_280.7	11.8_280.7 (29.6_32.1)	11.8_280.7 (29.6_32.1)	11.8_201.4 (29.6_32.1)	11.8_162.9 (29.6_32.1)
F604	315.4_1141	315.4_1141	315.4_1141	315.4_1141	315.4_819.0	315.4_611.4	315.4_399.3	-	-

	IEC (IMB5)								
	100LA	100LB	112M	132SA	132MA	132MB	160M	160L	180M
F102	-	-	-	-	-	-	-	-	-
F202	-	-	-	-	-	-	-	-	-
F203	-	-	-	-	-	-	-	-	-
F302	12.0_24.4	12.0_19.5	12.0	-	-	-	-	-	-
F303	-	-	-	-	-	-	-	-	-
F304	-	-	-	-	-	-	-	-	-
F402	11.8_29.9	11.8_23.8	11.8_23.8	11.8_15.1	-	-	-	-	-
F403	37.9_66.5	-	-	-	-	-	-	-	-
F404	-	-	-	-	-	-	-	-	-
F502	12.2_30.7	12.2_30.7	12.2_24.0	12.2_19.5	12.2	-	12.2	-	-
F503	38.9_83.2	38.9_48.9	-	-	-	-	-	-	-
F504	-	-	-	-	-	-	-	-	-
F603	11.8_201.4 (29.6_32.1)	11.8_150.4 (29.6_32.1)	11.8_106.4 (29.6_32.1)	11.8_84.0	11.8_51.8 (23.5_25.4)	11.8_47.8 (19.1_25.4)	11.8_42.1	11.8_29.6 (23.5_25.4)	11.8_15.7
F604	-	-	-	-	-	-	-	-	-

Combinations featuring the gear ratios within brackets are not possible.

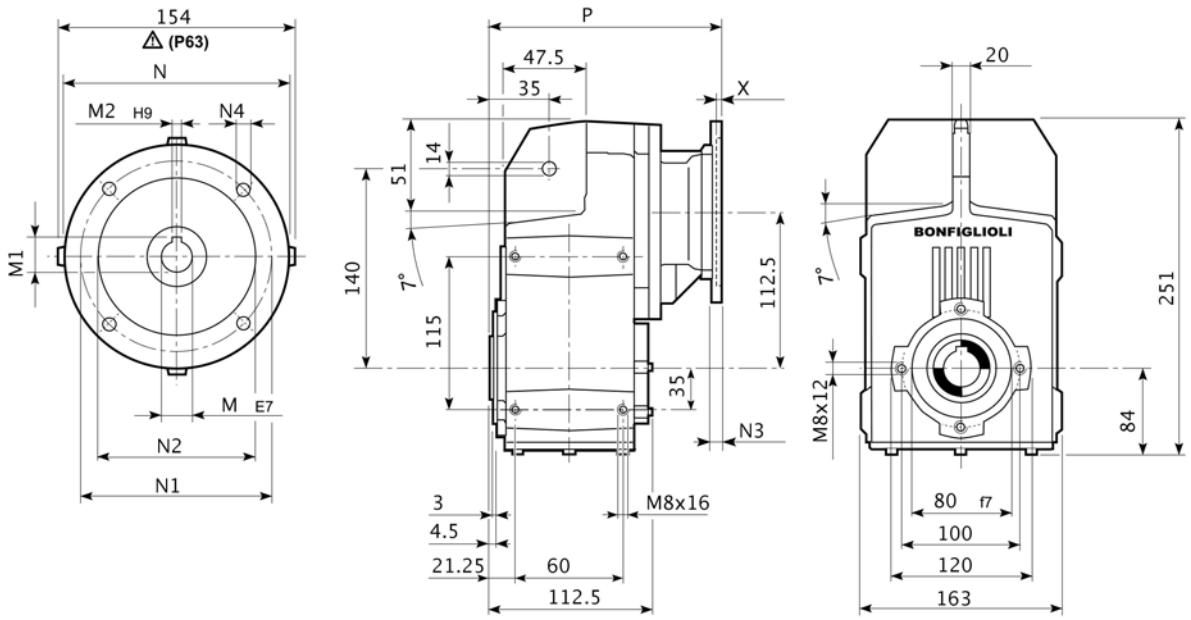
2.10 DIMENSIONS

2.10.1 F 10...M



F 10							
			**AC**	**H**	**L**	**AD**	
F 10 2	**S05**	**M05**	121	220.5	320.5	95	12
F 10 2	**S1**	**M1S**	138	265.5	340.5	108	12
F 10 2	**S1**	**M1L**	138	265.5	344.5	108	14
F 10 2	**S2**	**M2S**	156	274.5	377.5	119	18
F 10 2	**S3**	**M3S**	195	294	444.5	142	22
F 10 2	**S3**	**M3L**	195	294	449.5	142	24

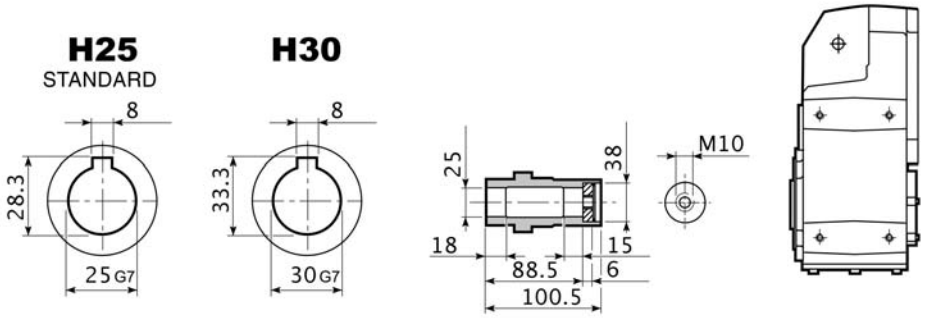
2.10.2 F 10...P(IEC)



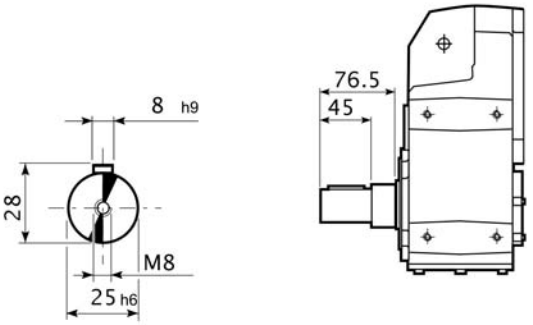
F 10												
		M	**M1**	**M2**	**N**	**N1**	**N2**	**N3**	**N4**	**X**	**P**	Kg
F 10 2	**P63**	11	12.8	4	140	115	95	-	M8x19	4	185.5	8
F 10 2	**P71**	14	16.3	5	160	130	110	-	M8x16	4.5	185.5	8
F 10 2	**P80**	19	21.8	6	200	165	130	-	M10x12	4	205	9

2.10.3 F 10

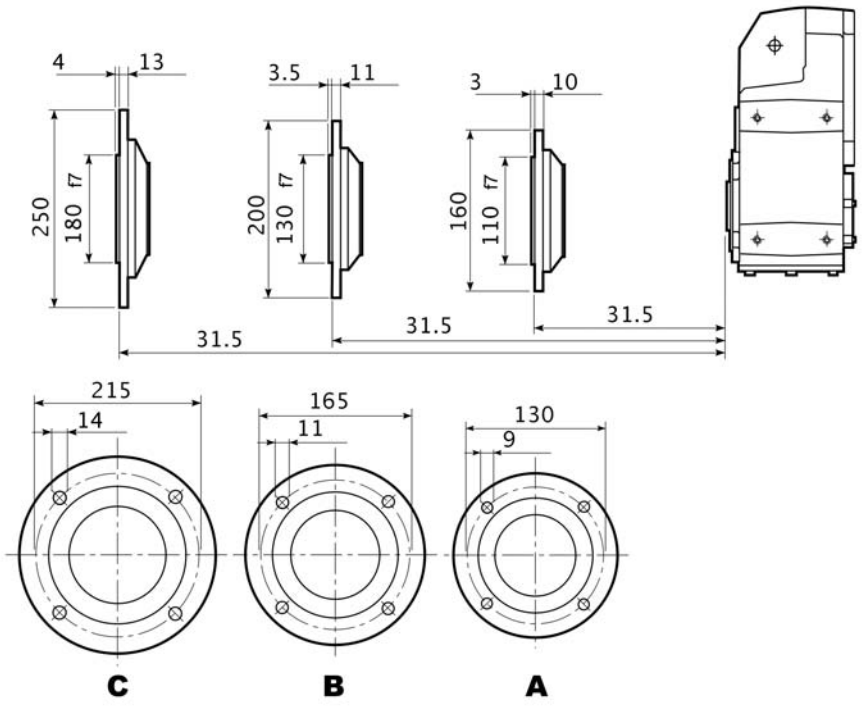
F 10...H



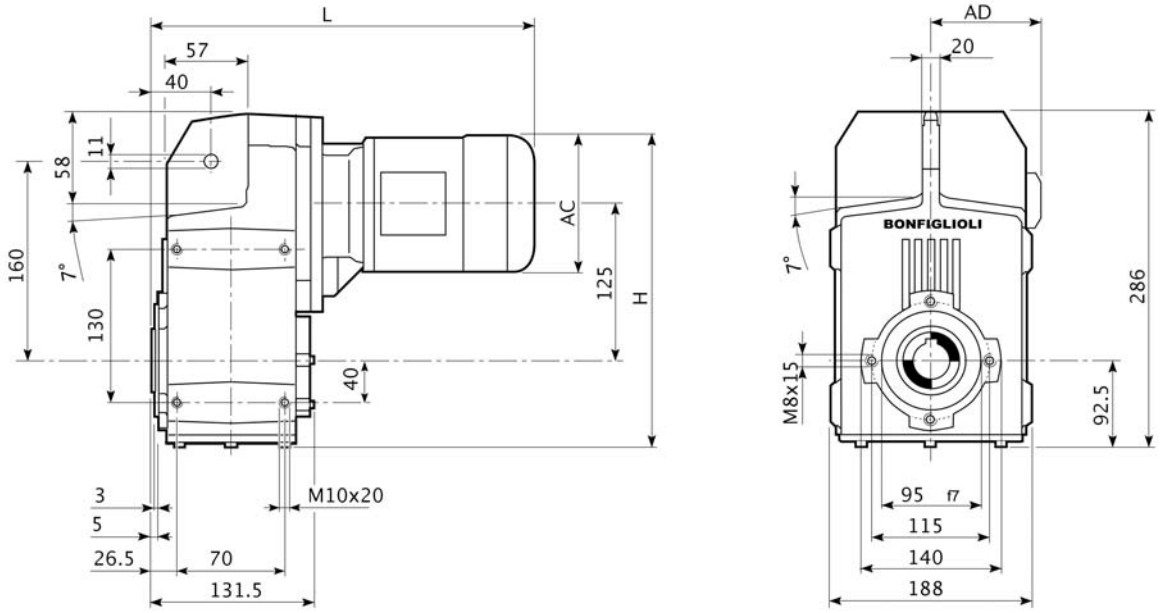
F 10...R



F 10...F...

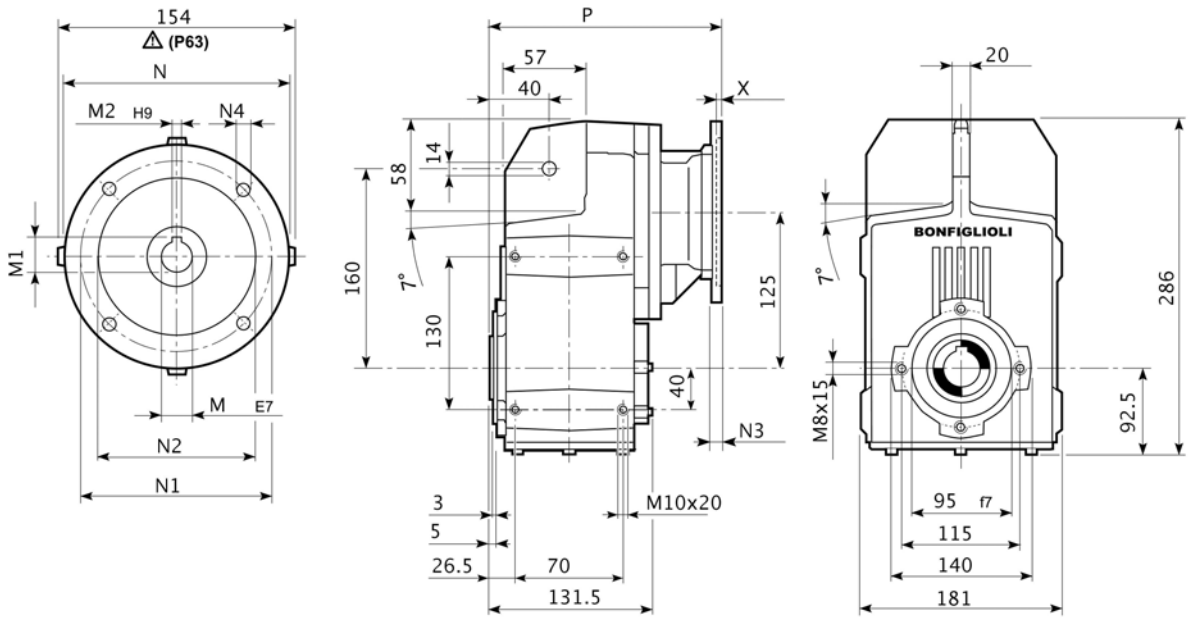


2.10.4 F 20...M



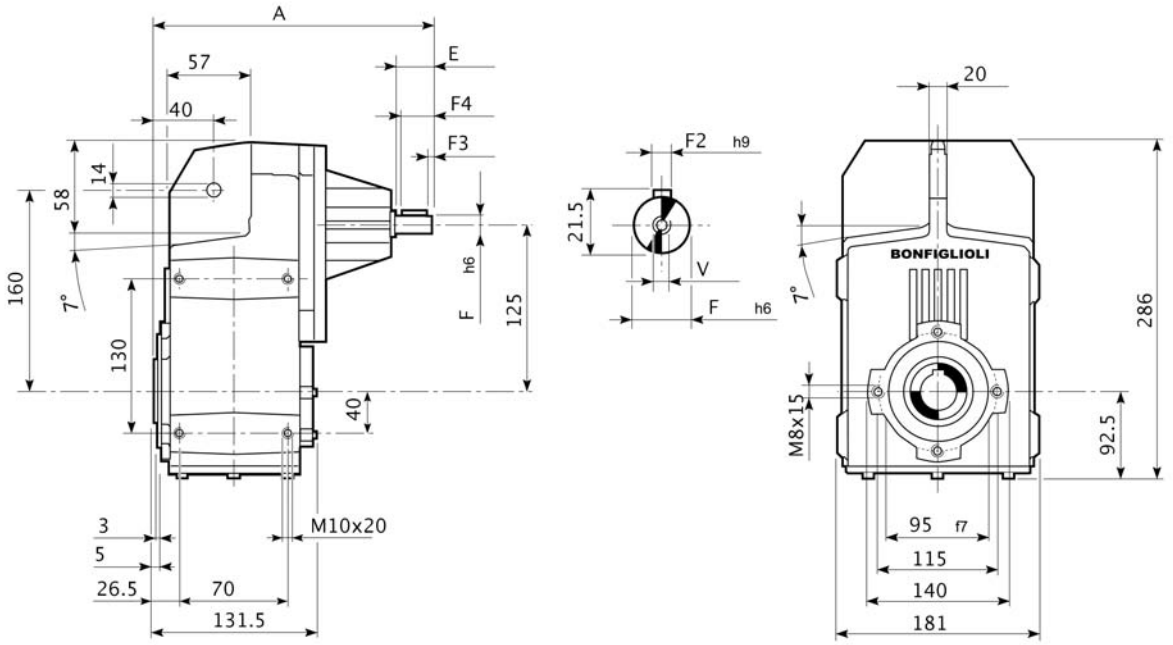
F 20							
			**AC**	**H**	**L**	**AD**	Kg
F 20 2	**S05**	**M05**	121	278.2	332.5	95	15
F 20 2	**S1**	**M1S**	138	286.7	352.5	108	16
F 20 2	**S1**	**M1L**	138	286.7	356.5	108	17
F 20 2	**S2**	**M2S**	156	295.7	389.5	119	21
F 20 2	**S3**	**M3S**	195	315.2	456.5	142	26
F 20 2	**S3**	**M3L**	195	315.2	461.5	142	31
F 20 3	**S05**	**M05**	121	278.2	388	95	17
F 20 3	**S1**	**M1S**	138	286.7	408	108	18
F 20 3	**S1**	**M1L**	138	286.7	412	108	19
F 20 3	**S2**	**M2S**	156	295.7	445	119	22
F 20 3	**S3**	**M3S**	195	315.2	512	142	27
F 20 3	**S3**	**M3L**	195	315.2	517	142	32

2.10.5 F 20...P(IEC)



F 20												
		M	M1	M2	N	N1	N2	N3	N4	X	P	Kg
F 20 2	**P63**	11	12.8	4	140	115	95	-	M8x19	4	197.5	12
F 20 2	**P71**	14	16.3	5	160	130	110	-	M8x16	4.5	197.5	12
F 20 2	**P80**	19	21.8	6	200	165	130	-	M10x12	4	217	13
F 20 2	**P90**	24	27.3	8	200	165	130	-	M10x12	4	217	12
F 20 3	**P63**	11	12.8	4	140	115	95	-	M8x19	4	253	13

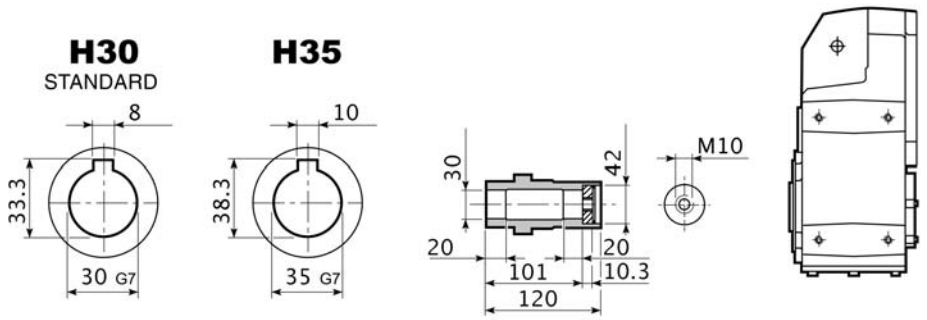
2.10.6 F 20...HS



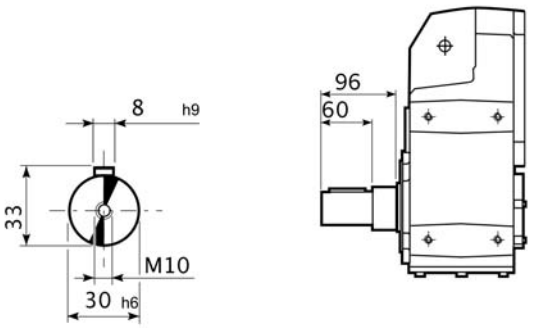
F 20										
		A	**E**	**F**	**F1**	**F2**	**F3**	**F4**	**V**	Kg
F 20 2	**HS**	247.5	40	19	21.5	6	2.5	35	M6x16	11.5
F 20 3	**HS**	260	40	16	18	5	2.5	35	M6x16	12.4

2.10.7 F 20

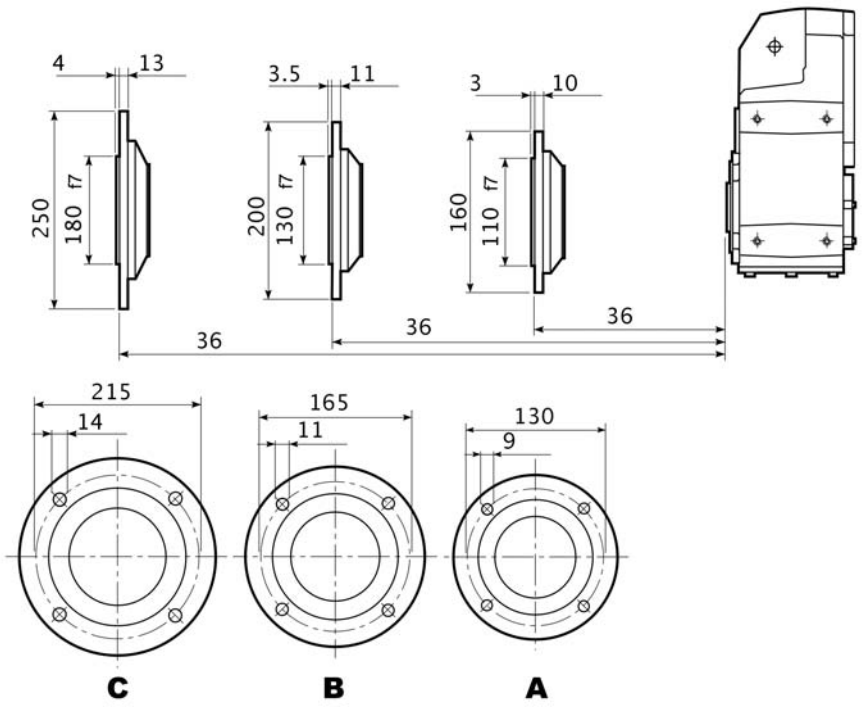
F 20...H



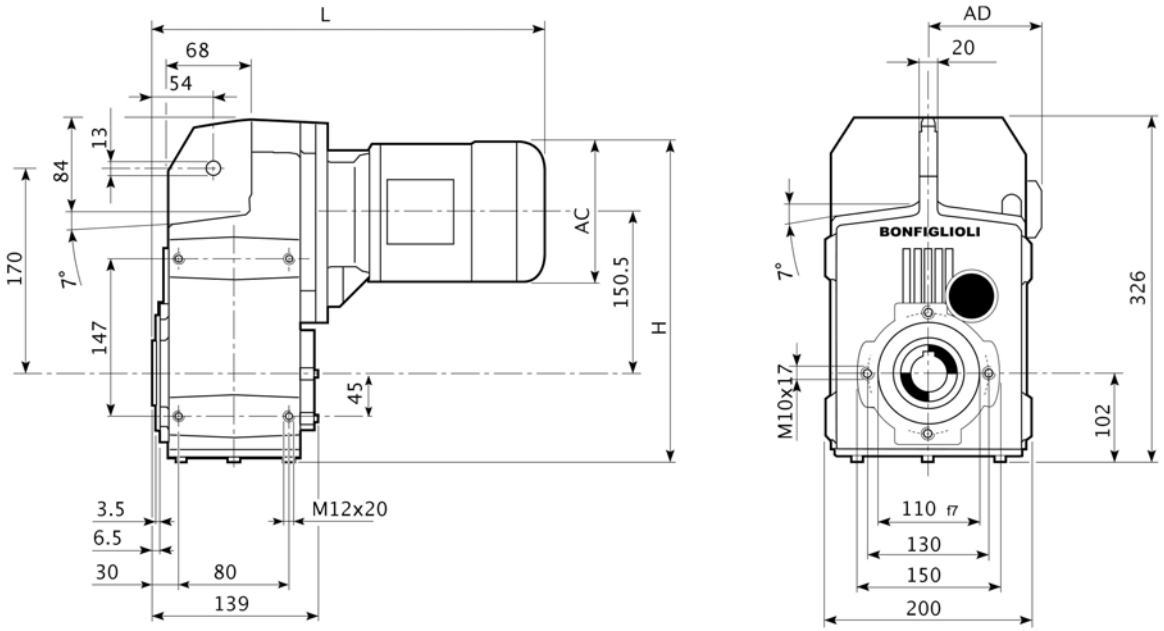
F 20...R



F 20...F...

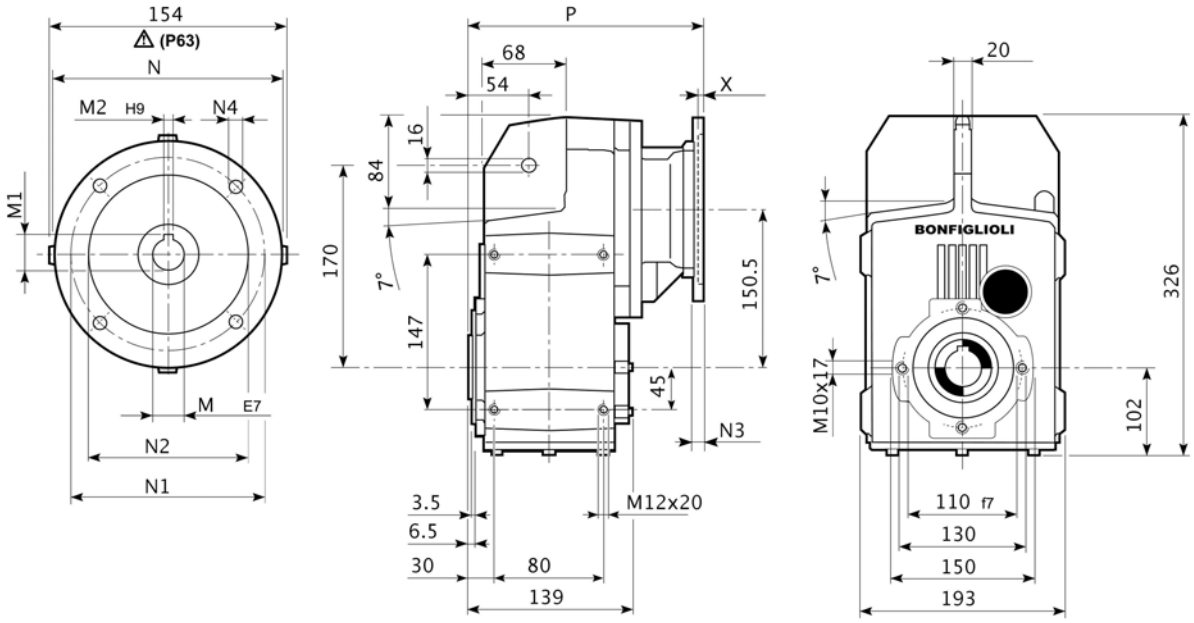


2.10.8 F 30...M



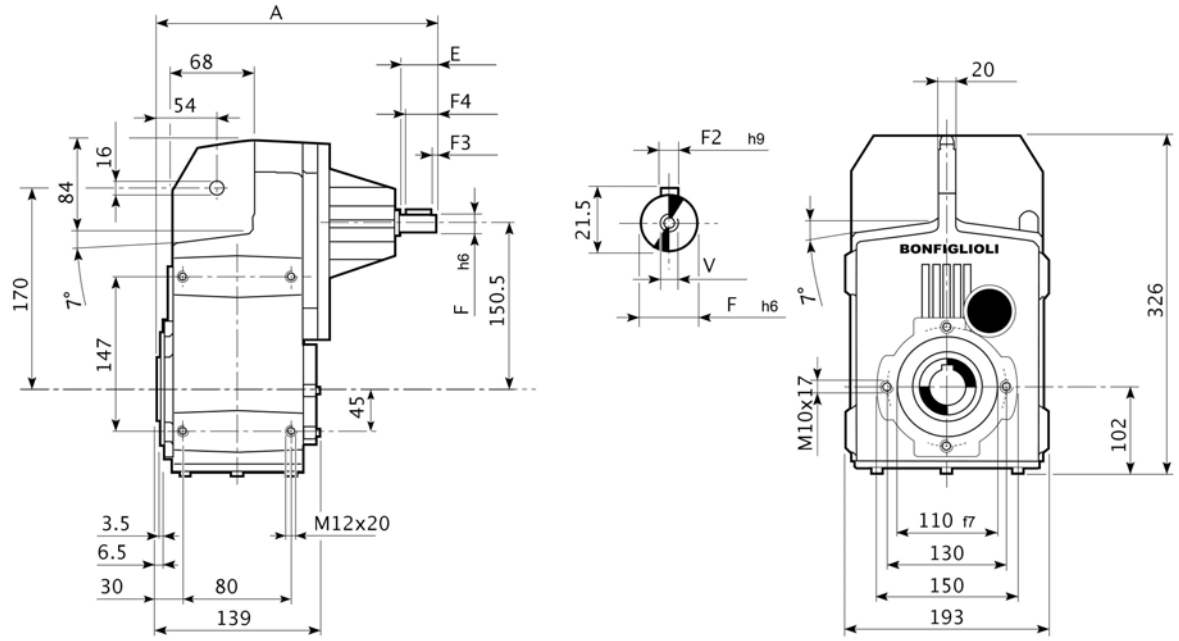
F 30							
			AC	**H**	**L**	**AD**	Kg
F 30 2/3	**S1**	**M1S**	138	321.3	380.5	108	21
F 30 2/3	**S1**	**M1L**	138	321.3	384.5	108	22
F 30 2/3	**S2**	**M2S**	156	330.3	417.5	119	26
F 30 2/3	**S3**	**M3S**	195	349.8	484.5	142	31
F 30 2/3	**S3**	**M3L**	195	349.8	489.5	142	38
F 30 4	**S05**	**M05**	121	312.8	418	95	20
F 30 4	**S1**	**M1S**	138	321.3	438	108	21
F 30 4	**S1**	**M1L**	138	321.3	442	108	22
F 30 4	**S2**	**M2S**	156	330.3	475	119	26
F 30 4	**S3**	**M3S**	195	349.8	542	142	31
F 30 4	**S3**	**M3L**	195	349.8	547	142	38

2.10.9 F 30...P(IEC)



F 30												
		M	M1	M2	N	N1	N2	N3	N4	X	P	Kg
F 30 2/3	**P63**	11	12.8	4	140	115	95	-	M8x19	4	225.5	17
F 30 2/3	**P71**	14	16.3	5	160	130	110	-	M8x16	4.5	225.5	17
F 30 2/3	**P80**	19	21.8	6	200	165	130	-	M10x12	4	245	18
F 30 2/3	**P90**	24	27.3	8	200	165	130	-	M10x12	4	245	17
F 30 2/3	**P100**	28	31.3	8	250	215	180	-	M12x16	4.5	255	21
F 30 2/3	**P112**	28	31.3	8	250	215	180	-	M12x16	4.5	255	21
F 30 4	**P63**	11	12.8	4	140	115	95	-	M8x19	4	283	17

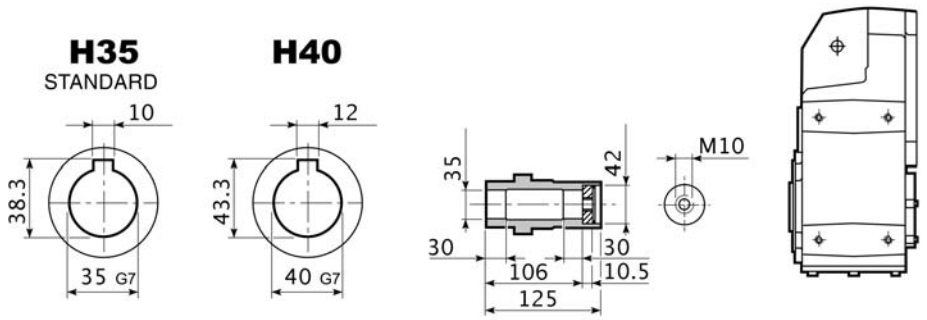
2.10.10 F 30...HS



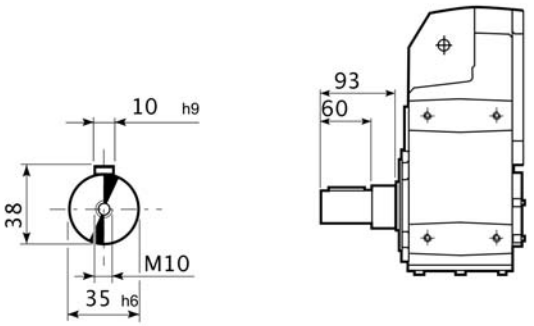
F 30										
		A	**E**	**F**	**F1**	**F2**	**F3**	**F4**	**V**	Kg
F 30 2	**HS**	275.5	40	19	21.5	6	2.5	35	M6x16	16.7
F 30 3	**HS**	275.5	40	19	21.5	6	2.5	35	M6x16	16.7
F 30 4	**HS**	290	40	16	18	5	2.5	35	M6x16	16.5

2.10.11 F 30

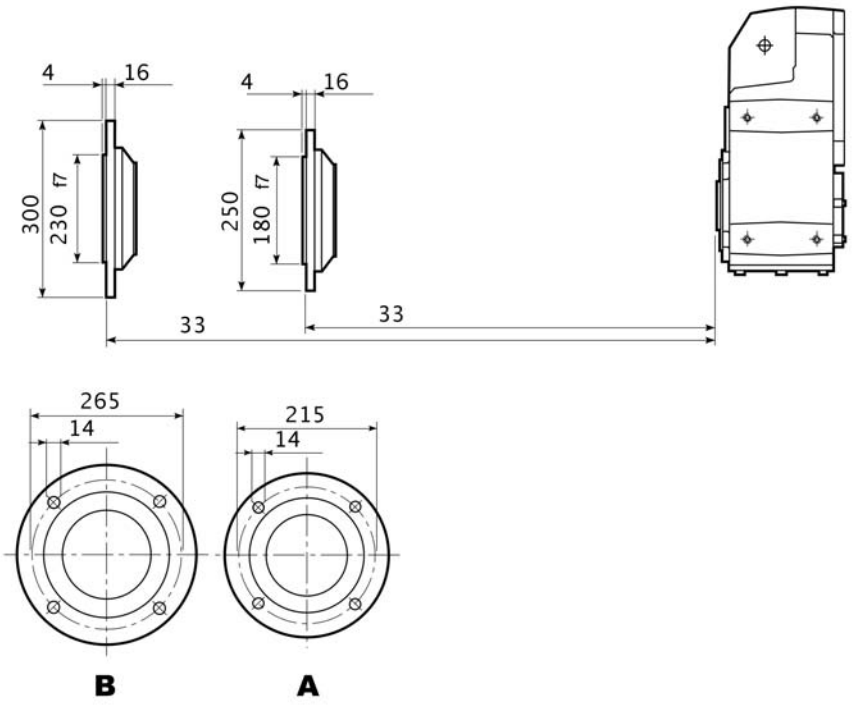
F 30...H



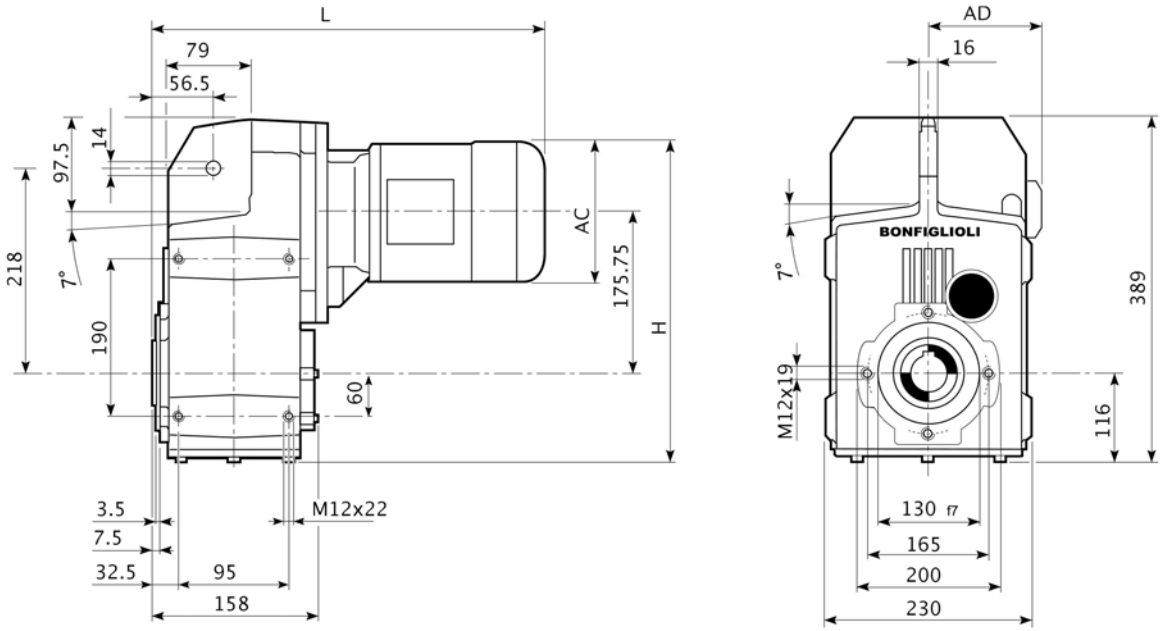
F 30...R



F 30...F...

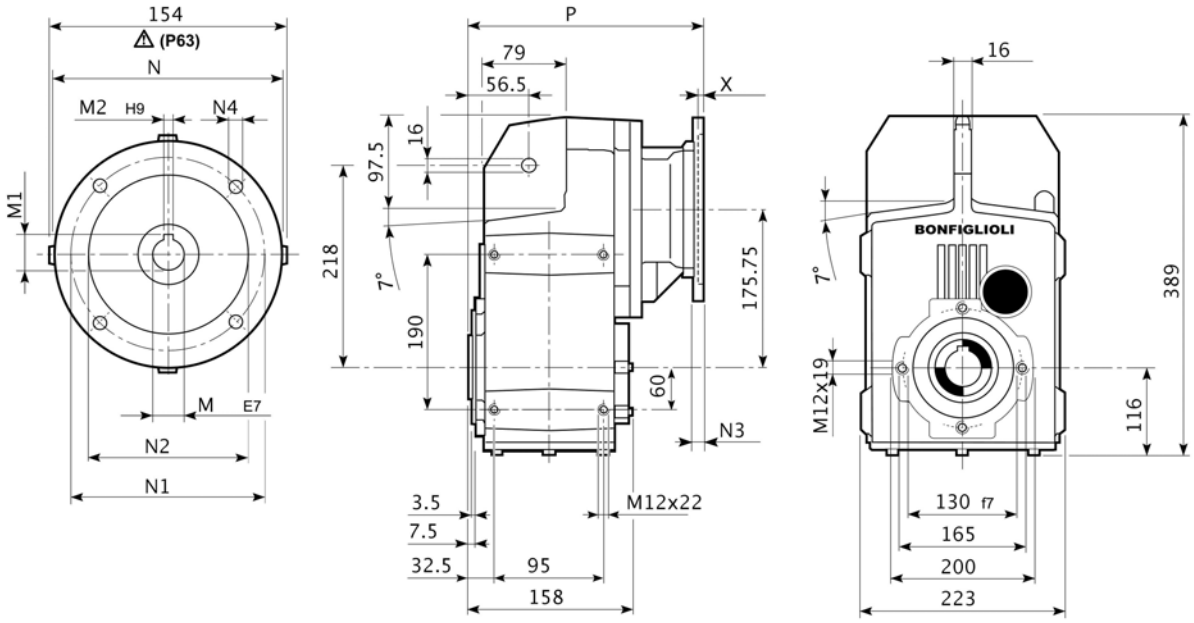


2.10.12 F 40...M



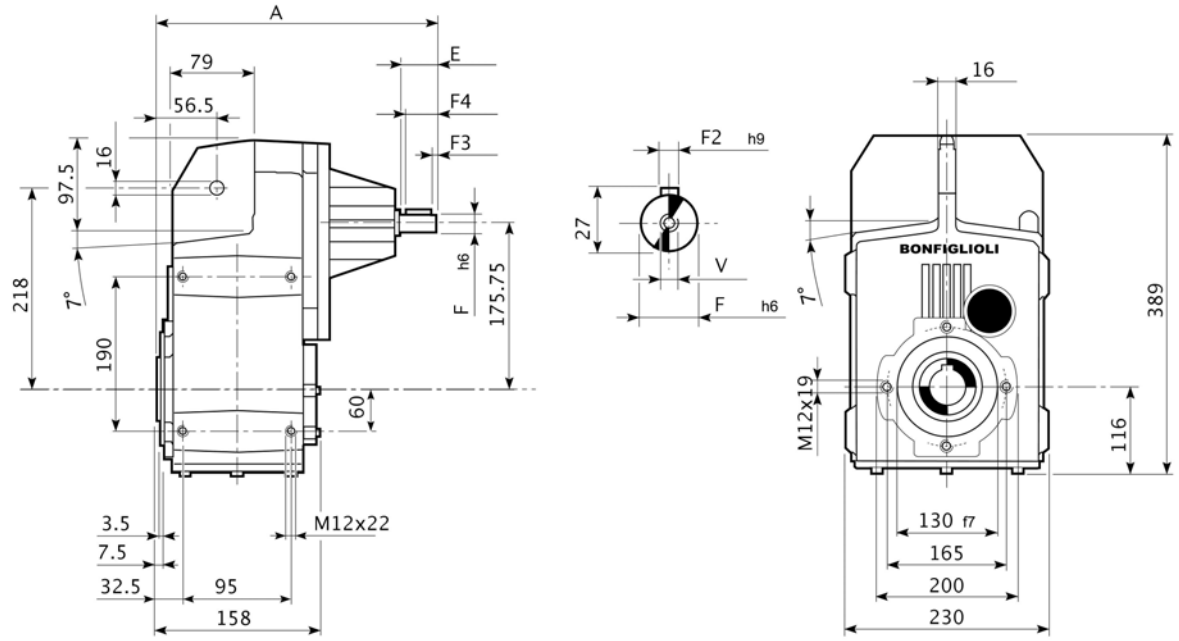
F 40							
			AC	H	L	AD	Kg
F 40 2/3	**S1**	**M1S**	138	360.8	401	108	44
F 40 2/3	**S1**	**M1L**	138	360.8	405	108	46
F 40 2/3	**S2**	**M2S**	156	369.8	438	119	49
F 40 2/3	**S3**	**M3S**	195	389.3	505	142	54
F 40 2/3	**S3**	**M3L**	195	389.3	510	142	62
F 40 4	**S05**	**M05**	231	352.3	433.5	95	45
F 40 4	**S1**	**M1S**	138	360.8	462.5	108	45
F 40 4	**S1**	**M1L**	138	360.8	467.5	108	47
F 40 4	**S2**	**M2S**	156	369.8	499.5	119	50
F 40 4	**S3**	**M3S**	195	389.3	566.5	142	55
F 40 4	**S3**	**M3L**	195	389.3	571.5	142	63

2.10.13 F 40...P(IEC)



F 40												
		M	M1	M2	N	N1	N2	N3	N4	X	P	Kg
F 40 2/3	**P63**	11	12.8	4	140	115	95	-	M8x19	4	246	42
F 40 2/3	**P71**	14	16.3	5	160	130	110	-	M8x16	4.5	246	42
F 40 2/3	**P80**	19	21.8	6	200	165	130	-	M10x12	4	265.5	43
F 40 2/3	**P90**	24	27.3	8	200	165	130	-	M10x12	4	265.5	43
F 40 2/3	**P100**	28	31.3	8	250	215	180	-	M12x16	4.5	275.5	47
F 40 2/3	**P112**	28	31.3	8	250	215	180	-	M12x16	4.5	275.5	47
F 40 2/3	**P132**	38	41.3	10	300	265	230	16	14	5	312	50
F 40 4	**P63**	11	12.8	4	140	115	95	-	M8x19	4	307.5	44
F 40 4	**P71**	14	16.3	5	160	130	110	-	M8x16	4.5	307.5	44

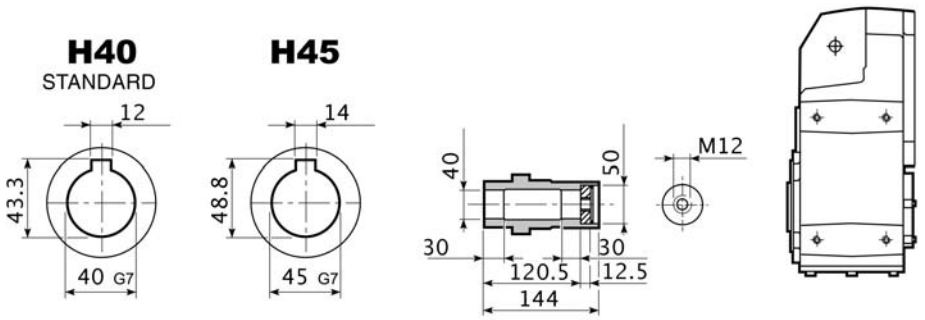
2.10.14 F 40...HS



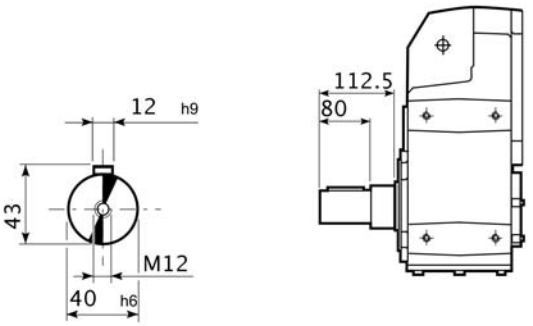
F 40										
		A	**E**	**F**	**F1**	**F2**	**F3**	**F4**	**V**	Kg
F 40 2	**HS**	335.5	50	24	27	8	2.5	45	M8x19	44.9
F 40 3	**HS**	335.5	50	24	27	8	2.5	45	M8x19	46.4
F 40 4	**HS**	357.5	40	19	21.5	6	2.5	35	M6x16	43.5

2.10.15 F 40

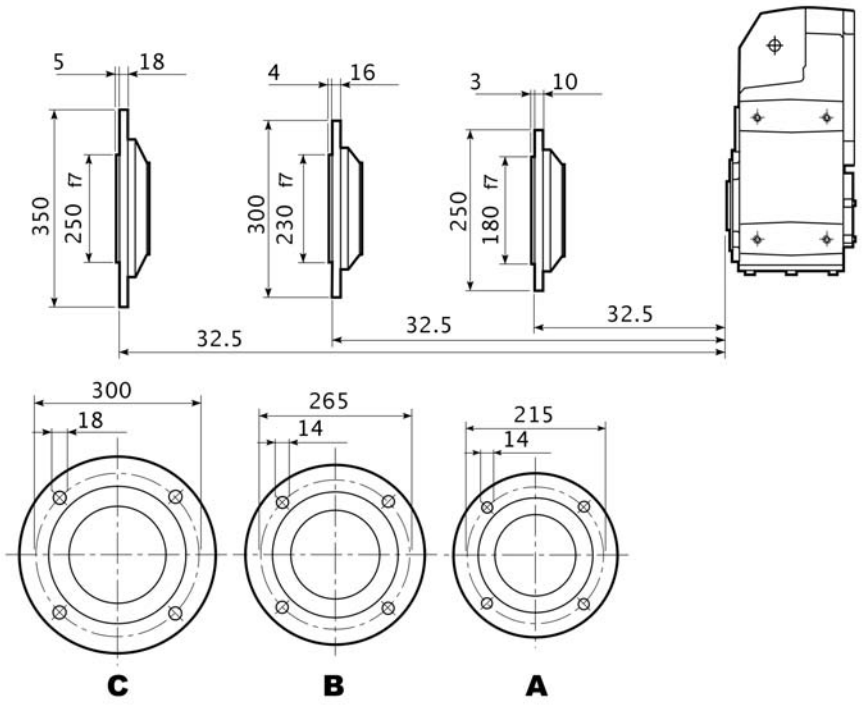
F 40...H



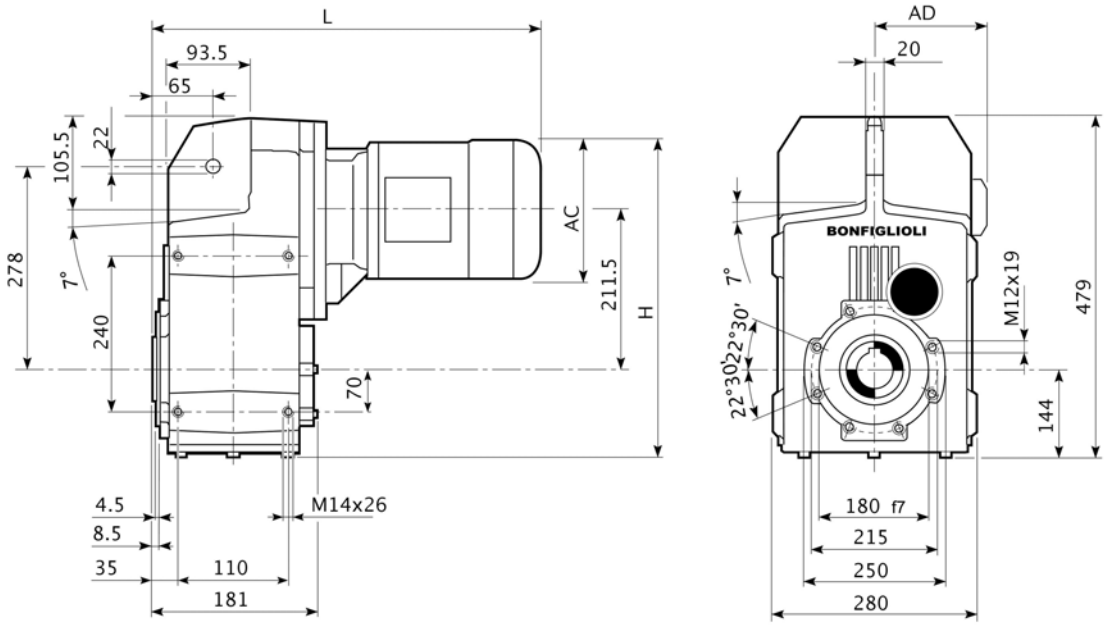
F 40...R



F 40...F...

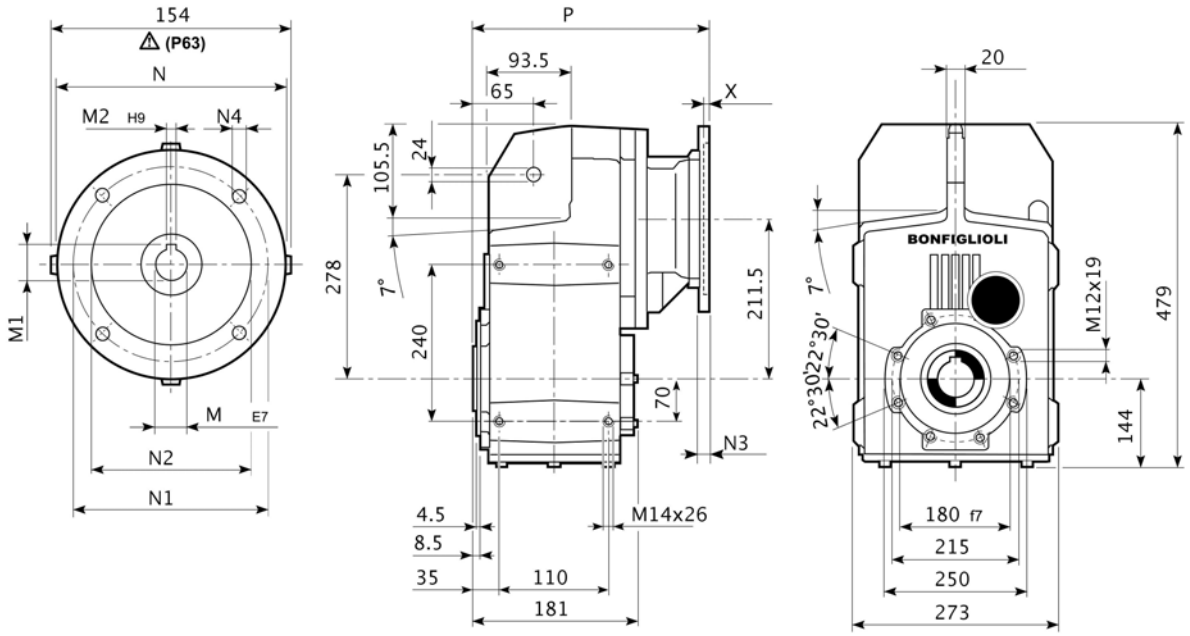


2.10.16 F 50...M



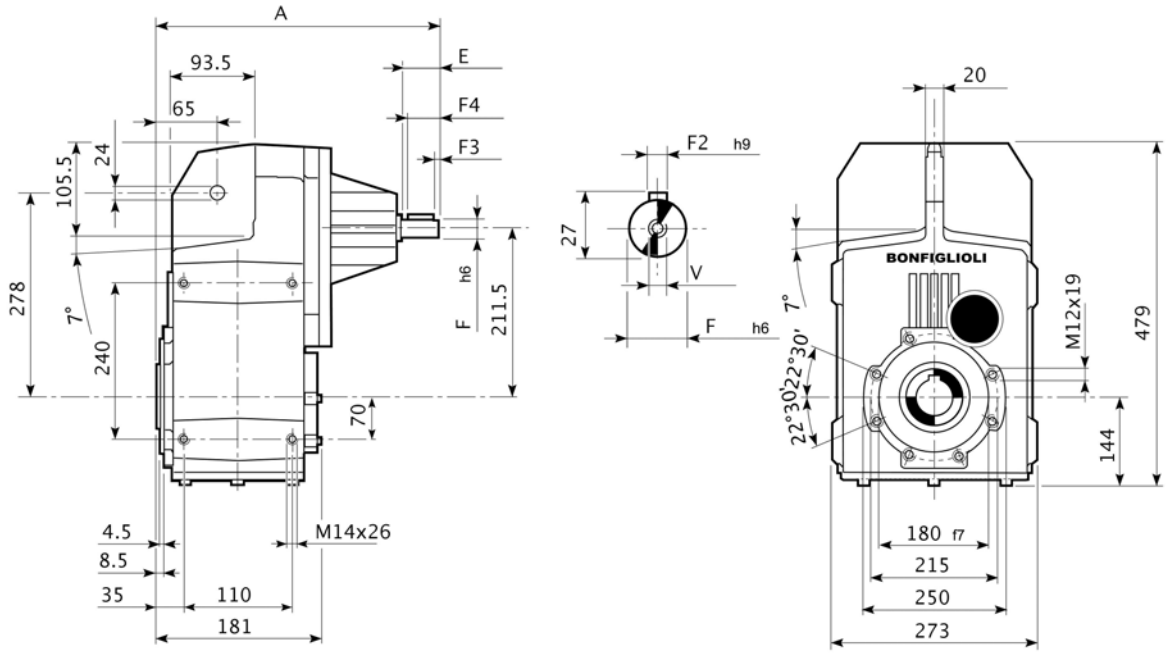
F 50							
			AC	**H**	**L**	**AD**	Kg
F 50 2/3	**S1**	**M1S**	138	424	423	108	72
F 50 2/3	**S1**	**M1L**	138	424	427	108	73
F 50 2/3	**S2**	**M2S**	156	433	460	119	73
F 50 2/3	**S3**	**M3S**	195	452.5	527	142	77
F 50 2/3	**S3**	**M3L**	195	452.5	532	142	85
F 50 4	**S1**	**M1S**	138	424	494.5	108	74
F 50 4	**S1**	**M1L**	138	424	498.5	108	75
F 50 4	**S2**	**M2S**	156	433	531.5	119	79
F 50 4	**S3**	**M3S**	195	452.5	598.5	142	84
F 50 4	**S3**	**M3L**	195	452.5	603.5	142	91

2.10.17 F 50...P(IEC)



F 50												
		M	M1	M2	N	N1	N2	N3	N4	X	P	Kg
F 50 2/3	**P63**	11	12.8	4	140	115	95	-	M8x19	4	268	65
F 50 2/3	**P71**	14	16.3	5	160	130	110	-	M8x16	4.5	268	65
F 50 2/3	**P80**	19	21.8	6	200	165	130	-	M10x12	4	287.5	67
F 50 2/3	**P90**	24	27.3	8	200	165	130	-	M10x12	4	287.5	67
F 50 2/3	**P100**	28	31.3	8	250	215	180	-	M12x16	4.5	297.5	71
F 50 2/3	**P112**	28	31.3	8	250	215	180	-	M12x16	4.5	297.5	71
F 50 2/3	**P132**	38	41.3	10	300	265	230	16	14	5	334	74
F 50 2/3	**P160**	42	45.3	12	350	300	250	23	18	5.5	384.5	87
F 50 4	**P63**	11	12.8	4	140	115	95	-	M8x19	4	339.5	70
F 50 4	**P71**	14	16.3	5	160	130	110	-	M8x16	4.5	339.5	70
F 50 4	**P80**	19	21.8	6	200	165	130	-	M10x12	4	359	71

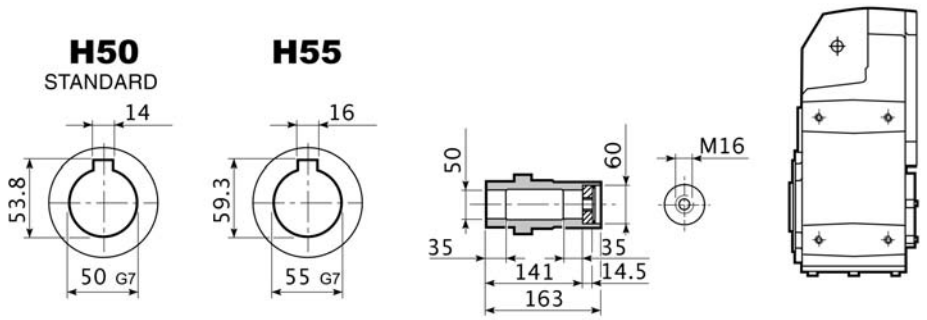
2.10.18 F 50...HS



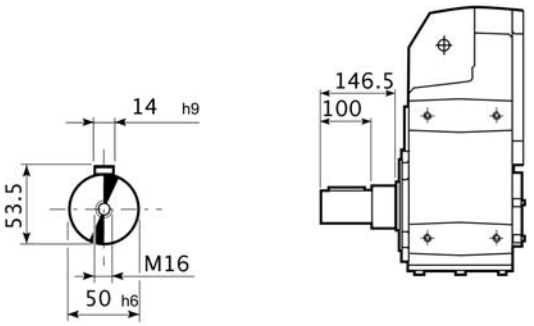
F 50										
		A	**E**	**F**	**F1**	**F2**	**F3**	**F4**	**V**	Kg
F 50 2	**HS**	357.5	50	24	27	8	2.5	45	M8x19	65
F 50 3	**HS**	357.5	50	24	27	8	2.5	45	M8x19	68
F 50 4	**HS**	389.5	40	19	21.5	6	2.5	35	M6x16	70

2.10.19 F 50

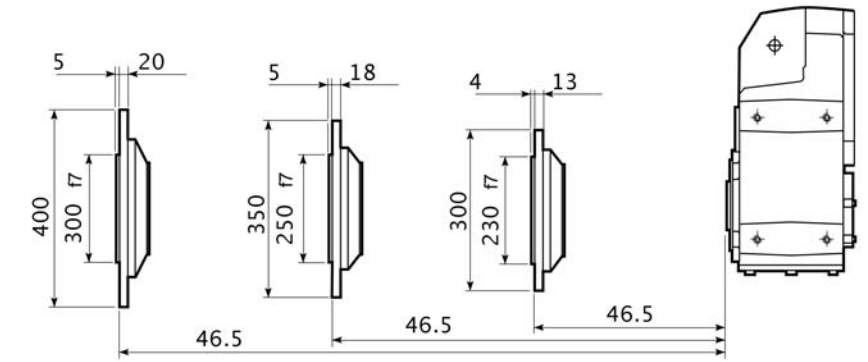
F 50...H

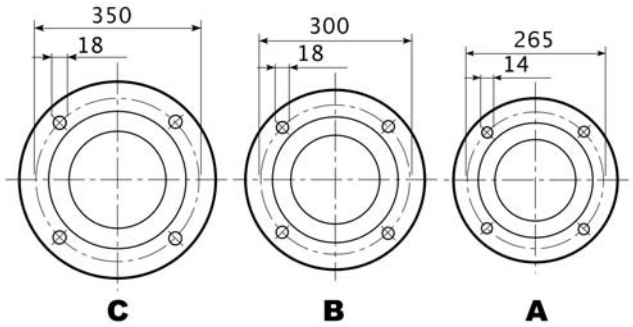


F 50...R

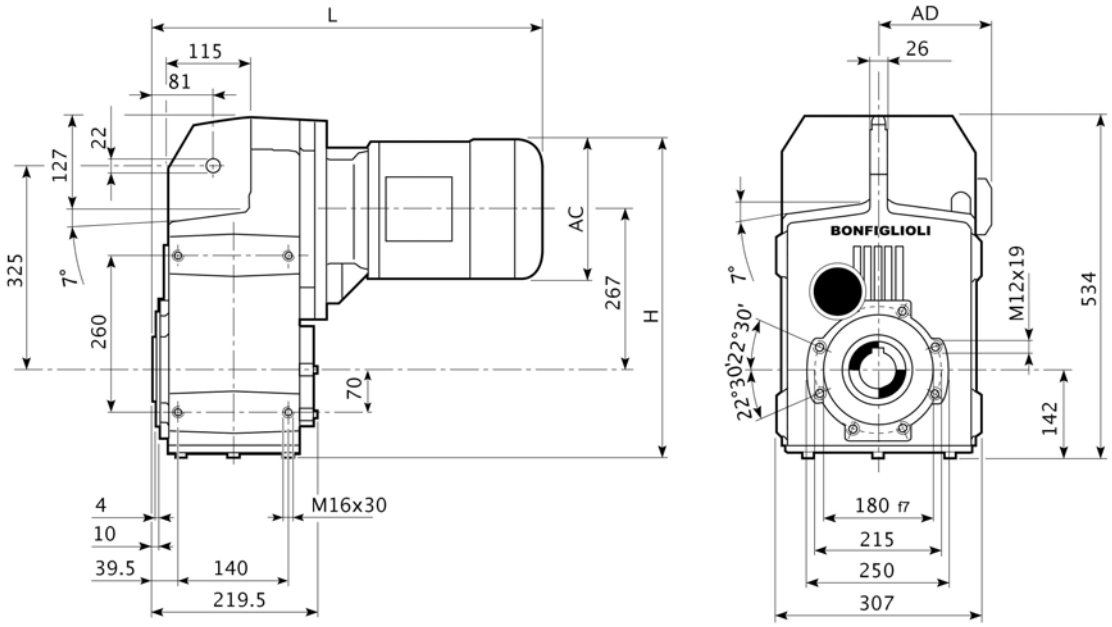


F 50...F...



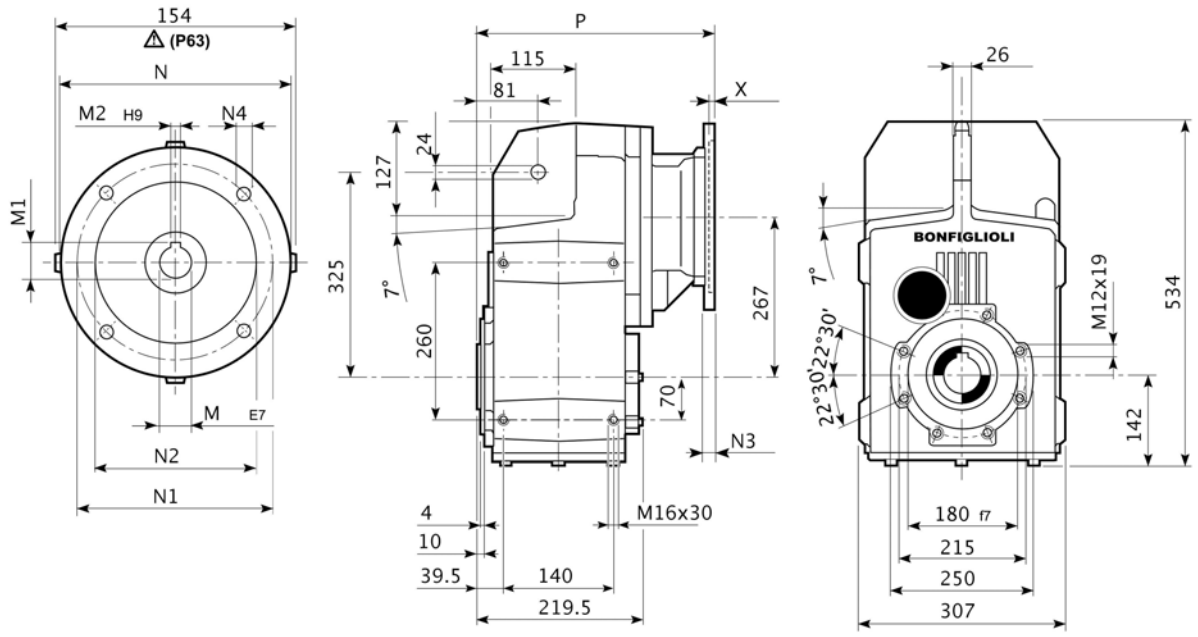


2.10.20 F 60...M



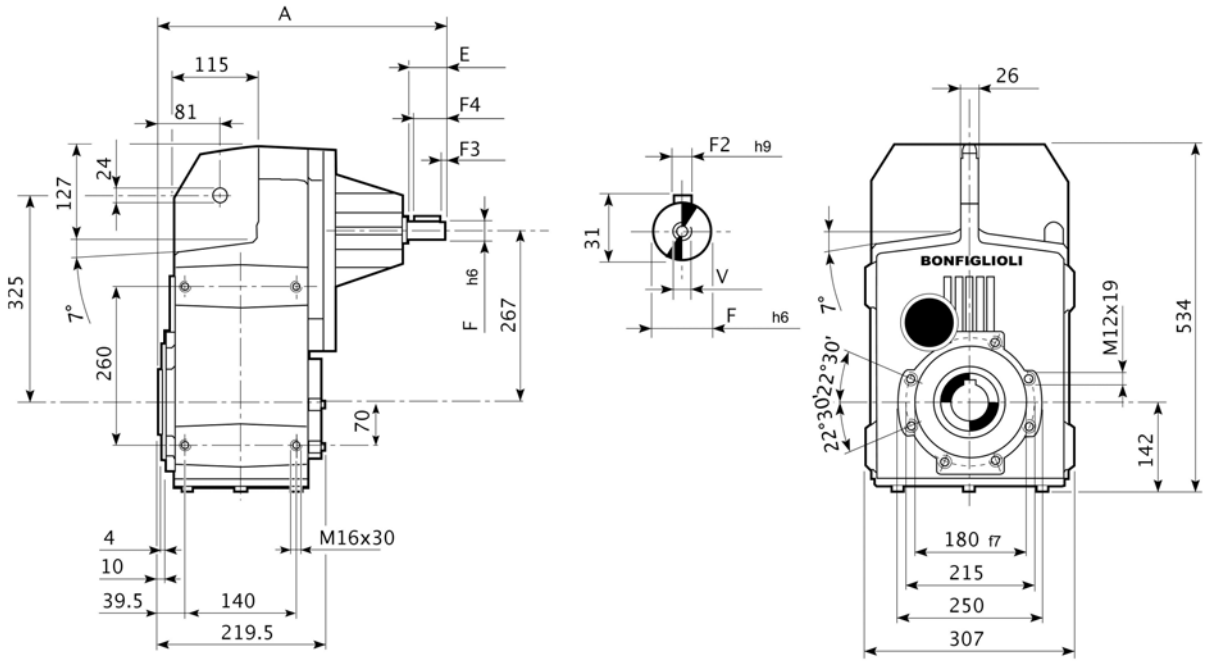
F 60							
			AC	**H**	**L**	**AD**	Kg
F 60 3	**S2**	**M2S**	156	487	494.5	119	114
F 60 3	**S3**	**M3S**	195	506.5	5261.5	142	114
F 60 3	**S3**	**M3L**	195	506.5	566.5	142	122
F 60 4	**S1**	**M1S**	138	478	528	108	112
F 60 4	**S1**	**M1L**	138	478	552	108	113
F 60 4	**S2**	**M2S**	156	487	565	119	117
F 60 4	**S3**	**M3S**	195	506.5	632	142	122
F 60 4	**S3**	**M3L**	195	506.5	637	142	129

2.10.21 F 60...P(IEC)



F 60												
		M	M1	M2	N	N1	N2	N3	N4	X	P	Kg
F 60 3	**P63**	11	12.8	4	140	115	95	—	M8x19	4	302.5	103
F 60 3	**P71**	14	16.3	5	160	130	110	—	M8x16	4.5	302.5	103
F 60 3	**P80**	19	21.8	6	200	165	130	—	M10x12	4	322	104
F 60 3	**P90**	24	27.3	8	200	165	130	—	M10x12	4	322	104
F 60 3	**P100**	28	31.3	8	250	215	180	—	M12x16	4.5	331	108
F 60 3	**P112**	28	31.3	8	250	215	180	—	M12x16	4.5	331	108
F 60 3	**P132**	38	41.3	10	300	265	230	16	14	5	367.5	111
F 60 3	**P160**	42	45.3	12	350	300	250	23	18	5.5	419	123
F 60 3	**P180**	48	51.8	14	350	300	250	23	18	5.5	419	123
F 60 4	**P63**	11	12.8	4	140	115	95	—	M8x19	4	373	108
F 60 4	**P71**	14	16.3	5	160	130	110	—	M8x16	4.5	373	108
F 60 4	**P80**	19	21.8	6	200	165	130	—	M10x12	4	392.5	110
F 60 4	**P90**	24	27.3	8	200	165	130	—	M10x12	4	392.5	110

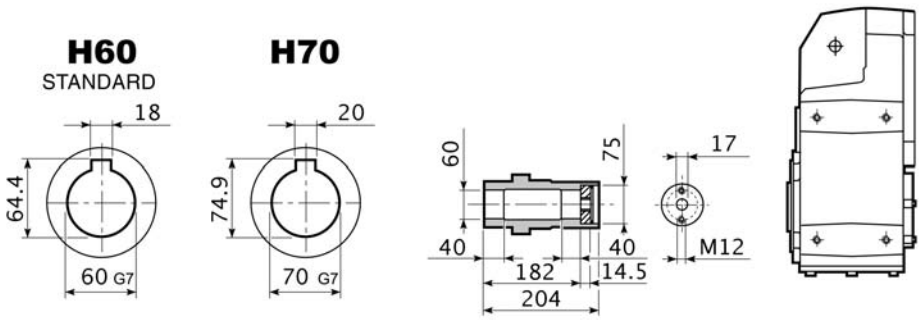
2.10.22 F 60...HS



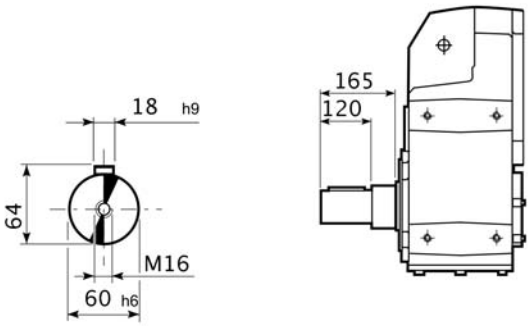
F 60										
		A	**E**	**F**	**F1**	**F2**	**F3**	**F4**	**V**	Kg
F 60 3	**HS**	419	60	28	31	8	5.0	50	M10x22	108
F 60 4	**HS**	462.5	50	24	27	8	2.5	45	M8x19	105

2.10.23 F 60

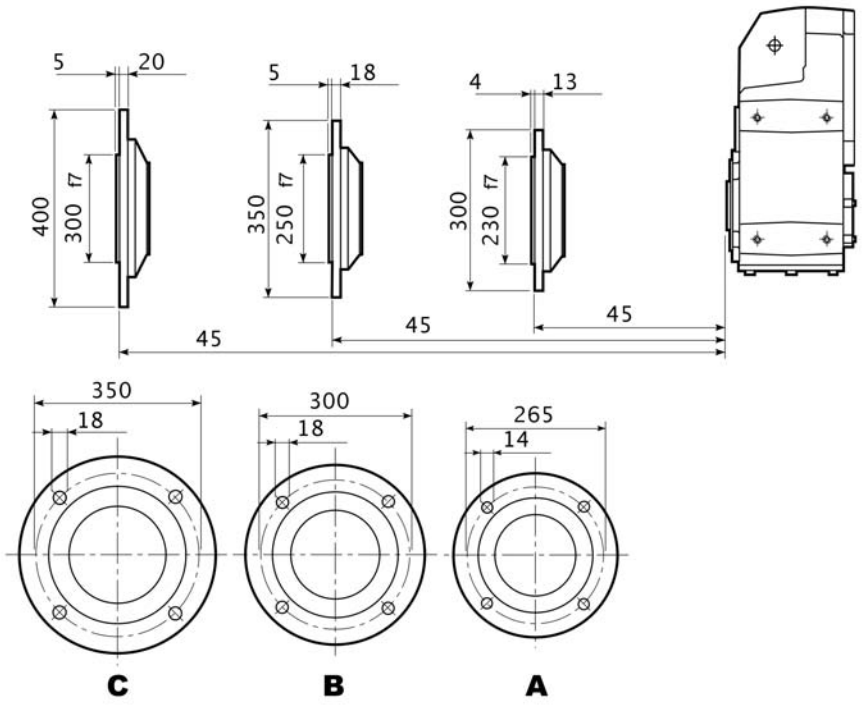
F 60...H



F 60...R

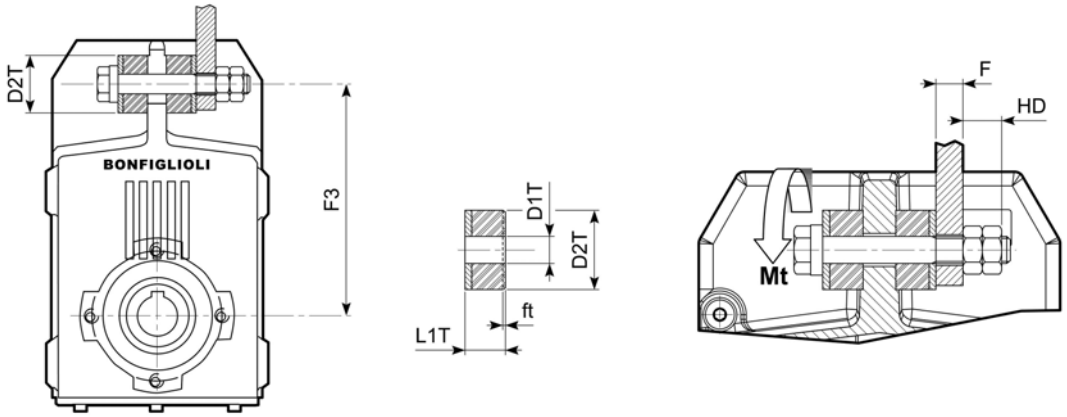


F 60...F...



2.11 ANTI - VIBRATION KIT

A kit comprising a set of damping bushings and connection bolt is available on request for anchoring the torque arm.
The dimensions are given in the table below:



	F3	F (max.)	HD	L1T	D1T	D2T	UNI 5737	ft	Mt [Nm]
F 10	140	10	20	15	11	30	M10x90	1.5	10
F 20	160	10	20	15	11	30	M10x90	1.5	10
F 30	170	20	24	20	12.5	40	M12x120	1.5	20
F 40	218	24	24	20	12.5	40	M12x120	2.3	20
F 50	278	47	40	30	21	60	M20x180	3.0	50
F 60	325	41	40	30	21	60	M20x180	4.0	50

f_t = compression of the pad with connection bolt locked.

2.12 DECLARATION OF CONFORMITY

BONFIGLIOLI RIDUTTORI S.p.A.
Via Giovanni XXIII, 7/a
40012 Lippo di Calderara di Reno
Bologna (Italy)
Tel. +39 051 6473111
Fax +39 051 6473126
bonfiglioli@bonfiglioli.com
www.bonfiglioli.com
Company Certified UNI EN ISO 9001:2000

CERTIFICATE OF COMPLIANCE (according to EC Directive 94l9/CE Annex VIII)

BONFIGLIOLI RIDUTTORI S.p.A.
declares under its own responsibility that the following products:
- helical-bevel gear units type **A**
- helical in-fine gear units type **C**
- worm gear units type **VF** and **W**
- helical shaft-mounted units type **F**

in category **2G** and **2D** to which this certificate refers, are in compliance with the requirements of the following Directive:

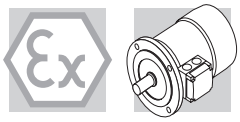
94/9/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of 23 March 1994
Conformity with the provisions of this Directive is proven by complete compliance to the following Standards:

EN 1127-1, EN 13463-1, prEN 13463-5, prEN 13463-8

BONFIGLIOLI RIDUTTORI filed the documents according to 94/9IEC Annex VIII, with the following notified body:
TÜV PRODUCT SERVICE GmbH- Identification number 0123

Lippo di Calderara di Reno, 27/11/2003
Place and date

Ing. Enzo Cognigni
R&D Manager



3 ATEX MOTORS

3.1 SYMBOLS AND UNITS OF MEASUREMENT

cosφ	-	Power factor
η	-	Efficiency
I_N	[A]	Rated current
I_S	[A]	Locked rotor current
J_M	[Kgm^2]	Moment of inertia
M_A	[Nm]	Mean breakaway torque
M_N	[Nm]	Rated torque
M_S	[Nm]	Starting torque
n	[min^{-1}]	Rated speed
P_n	[kW]	Motor rated power
T_a	[°C]	Ambient temperature

3.2 GENERAL CHARACTERISTICS

3.2.1 PRODUCTION RANGE

Motors described in this catalogue are designed and manufactured for use in industrial applications andare suitable for installation in ambients with the presence of potentially explosive dusty atmospheres, according to EN 50281 with type of protection Ex II 2D 125 °C (combustible dust).
The electrical construction complies with the harmonizedNorms EN 50014 andEN 50281-1-1 as well as with the requirements of Directive 94/9/EC.
Motors are three-phase, asynchronous type, with cage rotor and are available in the base versions IMB5, IMB14 and their derivatives. The present catalogue also describes the features and ratings of compact motors **Series M**, designed for direct combination with the speed reducers.

Catalogue ratings refer to motors operating in the following conditions:

- Service S1
- Power supply
- Degree of protection IP65
- Insulation class F
- Ambient temperature: min. -20, max +40 °C
- Altitude $\leqslant$ 1000 m a.s.l.

3.2.2 DIRECTIVES 73/23/EEC (LVD) and 89/336/EEC (EMC)

BN motors comply with the requirements of Directives 73/23/EEC (Low Voltage Directive) and 89/336/EEC (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 Sect. 12, EN 50081, EN50082.
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.

3.2.3 STANDARDS

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

Title	EN
General requirements for rotating electrical machines	EN 60034-1
Electrical apparatus for potentially explosive atmospheres – General requirements	EN 50014
Electrical apparatus for use in the presence of combustible dust Part 1-1: Electrical apparatus protected by enclosures – Construction and testing	EN 50281-1-1
Electrical apparatus for use in the presence of combustible dust Part 1-2: Electrical apparatus protected by enclosures – Selection, installation and maintenance	EN 50281-1-2
Terminal markings and direction of rotation of rotating machines	EN 60034-8
Methods of cooling for electrical machines	EN 60034-6
Dimensions and output ratings for rotating electrical machines	EN 50347
Classification of degree of protection provided by enclosures for rotating machines	EN 60034-5
Noise limits	EN 60034-9
Classification of type of construction and mounting arrangements	EN 60034-7
Vibration level of electrical machines	EN 60034-14

3.2.4 PRODUCT IDENTIFICATION

The name plate shown here under is fitted on the electric motor. The name plate carries the necessary information for the correct use of the motor.

1) Type of motor
2) n° of the ATEX certificate
3) Product code number and production batch
4) Year of production and serial number
5) Type of duty
6) Mounting (barring motors series M)
7) Weight of motor
8) Rated voltage and relevant wiring
9) Rated frequency
10) kW rating
11) Rated current
12) Rated speed
13) Power factor
14) Degree of protection
15) Specific ATEX marking

CE marking certifying the conformity of the product to the applicable European Directives. The number listed underneath identifies the nominated authority TÜV Produkt Service GmbH.

0123

Marking designating the applicable explosion protection.

II 2D Group II, category 2, for potentially explosive dusty atmosphere.

T 125 °C Maximum surface temperature 125 °C.

IP65 Degree of protection for the enclosure.

3.2.5 TOLERANCES

The following tolerances are permitted according to CEI EN 60034-1:

- 0.15x(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%	Breakdown torque

(*) ± 30% for motors with Pn < 1kW

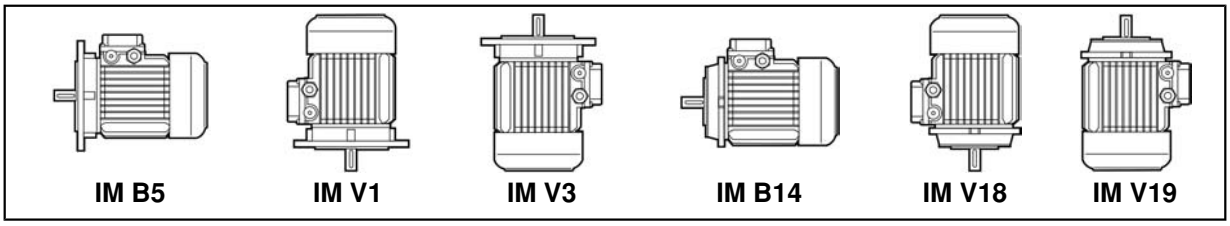
3.3 MECHANICAL FEATURES

3.3.1 MOTOR MOUNTING

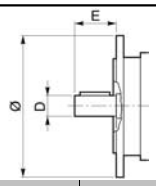
IEC-normalised BN motors are available in the design versions indicated in table (A30) as per Standards CEI
EN 60034-14.

Mounting versions are:
IM B5 (basic)
IM V1, IM V3 (derived)
IM B14 (basic)
IM V18, IMV19 (derived)

IM B5 design motors can be installed in positions IM V1 and IM V3; IM B14 design motors can be installed in positions IM V18 and IM V19. In such cases, the basic design IM B5 or IM B14 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.



Flanged motors can be supplied with a reduced mounting interface, as shown in chart below.



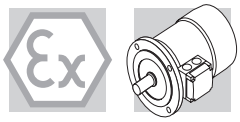
	BN 71	BN 80	BN 90	BN 100
	D x E - Ø			
B5R (1)	11 x 23 - Ø 140	14 x 30 - Ø 160	19 x 40 - Ø 200	24 x 50 - Ø 200
B14R (2)	11 x 23 - Ø 90	14 x 30 - Ø 105	19 x 40 - Ø 120	24 x 50 - Ø 140

(1) flange con through holes
(2) flange with threaded holes

3.3.2 DEGREE OF PROTECTION

In their execution Ex II 2D 125 °C BN and M motors feature, as standard, the IP65 degree of protection. 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**).

		IP65	IP55
BN - Ex II 2D 125°C	**M - Ex II 2D 125°C**	default	⊖



3.3.3 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 installation must ensure a minimum clearance of 50 mm between fan cowl and the nearest wall, in order to provide for an unobstructed air flow and permitting removal of the motor, should the circumstance be required.

3.3.4 DIRECTION OF ROTATION

Motors may operate in both directions of rotation. When the terminals U1, V1, W1 are connected to the line phases L1, L2, L3, the motor will run in a clockwise direction as viewed from the coupling end.
Counter clockwise rotation is obtained by swapping two phases.

3.3.5 NOISE LEVEL

Noise levels measured using the method specified by standard ISO 1680 are within the maximum limits required by standards CEI EN 60034-9.

3.3.6 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 can be optionally requested (class N).
Table below shows the value for the vibration velocity for standard (N) and improved (R) balancing.

Vibration class	Angular velocity n [min^{-1}]	Limits of the vibration velocity [mm/s] **BN 63...BN 100 M05...M3**
N	$600 \leqslant n \leqslant 3600$	1.8
R	$600 \leqslant n \leqslant 1800$	0.71

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

3.3.7 TERMINAL BOX

Terminal board features 6 studs for eyelet terminal connection. A ground terminal is supplied for earthing or equipotential bonding of the connection facilities. A second terminal for earthing or bonding of the protective conductor is fitted externally to the motor (section of conductor $\geqslant$ 4 mm^2). Number and type of terminals are shown in the following table.
Wiring instructions are provided either in the box or in the user manual.

		No. of terminals	Terminals threads	Wire cross section area [mm^2]
BN 63...BN 71	**M05, M1**	6	M4	2.5
BN 80, BN 90	**M2**	6	M4	2.5
BN 100	**M3**	6	M5	6

3.3.8 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.

		Cable entry
BN 63	**M05**	2 x M20 x 1.5
BN 71	**M1**	2 x M25 x 1.5
BN 80, BN 90	**M2**	2 x M25 x 1.5
BN 100	**M3**	2 x M32 x 1.5
		2 x M25 x 1.5

As standard, motors are supplied without cable glands and with cable entries closed by blank plugs compliant with Norm EN 50014. On installing the motors ATEX-compliant cable glands must be used. These must feature the same degree of protection of the motor, or greater.

3.3.9 BEARINGS

Life lubricated preloaded radial ball bearings are used, types are shown in the chart here under.
L10h lifetime of bearings, calculated according to Norm ISO 281, is.

- **serie BN**: in excess of 40000 hours in the absence of loads applying radially on the shaft
- **serie M**: in excess of 5000 hours, based on the maximum loading generated by the gearing when matched to the correspondent gear unit (refer to sales catalogues of BONFIGLIOLI gearmotors).

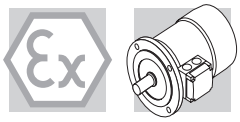
DE = drive end
NDE = non drive end

	**DE**	**NDE**		**DE**	**NDE**
M05	6004 2Z C3	6201 2RS C3	**BN 63**	6201 2RZ C3	6201 2RS C3
M1	6004 2Z C3	6202 2RS C3	**BN 71**	6202 2RZ C3	6202 2RS C3
M2	6007 2Z C3	6204 2RS C3	**BN 80**	6204 2RZ C3	6204 2RS C3
M3	6207 2Z C3	6206 2RS C3	**BN 90**	6205 2RZ C3	6205 2RS C3
			BN 100	6206 2RZ C3	6206 2RS C3

3.4 ELECTRICAL CHARACTERISTICS

3.4.1 VOLTAGE / FREQUENCY

Motors are designed for direct mains supply and, in their standard execution, to be connected 230V Δ / 400V Y, 50Hz with a ± 10% tolerance applying to voltage. In addition to nominal voltage-frequency values the name plate also shows voltage ranges the motor can operate under:
220 - 240V Δ
380 - 415V Y / 50 Hz.
As per Norms CEI EN 60034-1 on above voltage values the ±5% tolerance applies.
Other executions with max. input voltage 600V may be available on request.



3.4.2 ISULATION CLASS

CLF

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

CLH

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.

3.4.3 TYPE OF DUTY

Motors described in this catalogue are rated for continuous duty S1, with mains supply and operating conditions as specified by the Norm EN 60034-1.

3.5 MODIFICATIONS

3.5.1 VIBRATIONS AND BALANCING

Motors are dynamically balanced with a half key and fall within vibration class **N** in accordance with standard CEI EN 60034-14.

RV

Where low noise is a priority requirement, the option **RV** ensures reduced vibration in accordance with vibration class **R**.
The table below reports effective velocity of vibration for normal (N) and R grade balancing.

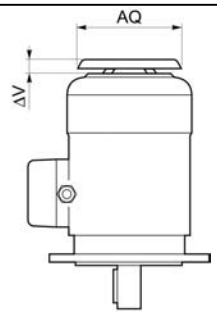
Vibration class	Synchronous speed	Limits of the vibration velocity (mm/s)	
		63 < H ⩽ 132	**132 < H ⩽ 200**
N	600 < n < 3600	1.8	2.8
R	600 < n < 1800	0.71	1.12
	1800 < n < 3600	1.12	1.8

Values are obtained from measurements on freely suspended motor during no-load operation; tolerance ± 10%.

3.5.2 DRIP COVER

RC

The rain canopy protects the motor from dripping and avoids the ingress of solid matter. It is recommended when motor is installed in a vertical position with the shaft pointing downwards. The rain canopy is not compatible with variants PS, EN1, EN2, EN3 and will not fit motors equipped with a BA brake.
Relevant dimensions are indicated in the table.

		**AQ**	**∆V**	
BN 63	**M05**	118	24	
BN 71	**M1**	134	27	
BN 80	**M2**	134	25	
BN 90	**-**	168	30	
BN 100	**M3**	168	28	

3.5.3 SECOND SHAFT EXTENSION

PS

Motors carrying this modification cannot be fitted with the drip cover (option RC).
As a consequence, the IM V1 vertical mounting (shaft pointing downwards) is not permitted for motors featuring the second shaft extension.

3.6 MOTOR RATING CHARTS

3.6.1 BN - Ex II 2D 125°C (1500 min^{-1})

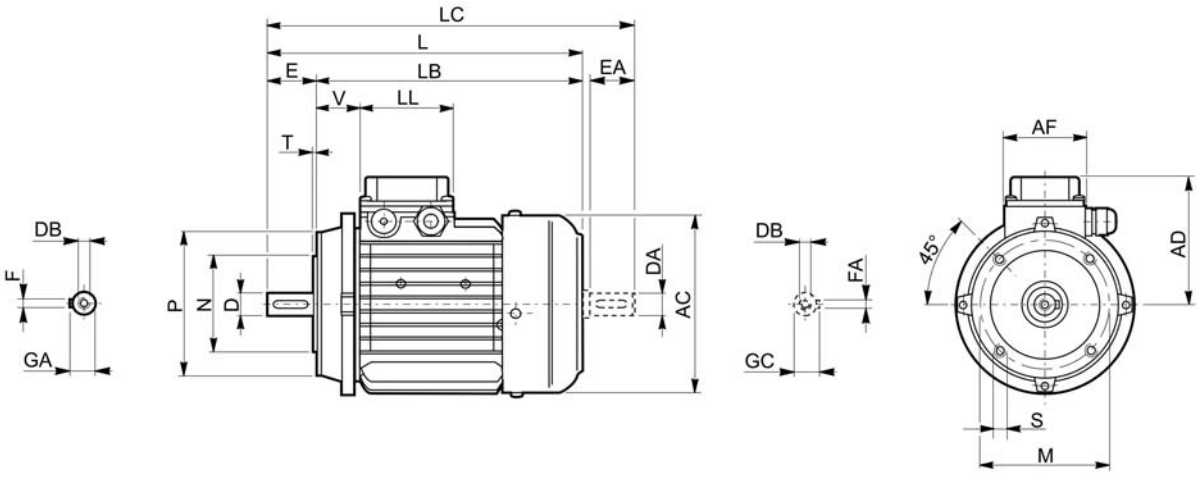
Pn kW		n min^{-1}	Mn Nm	η %	cosφ	In A (400V)	Is/In	Ms/Mn	Ma/Mn	Jm $x10^{-4}$ kgm^2	IMB5 Kg
0.12	**BN63A 4**	1310	0.88	51	0.68	0.5	2.6	1.9	1.8	2	3.5
0.18	**BN63B 4**	1320	1.3	53	0.68	0.72	2.6	2.2	2	2.3	3.9
0.25	**BN63C 4**	1320	1.81	60	0.69	0.87	2.7	2.1	1.9	3.3	5.1
0.25	**BN71A 4**	1375	1.74	62	0.77	0.76	3.3	1.9	1.7	5.8	5.1
0.37	**BN71B 4**	1370	2.6	65	0.77	1.07	3.7	2	1.9	6.9	5.9
0.55	**BN71C 4**	1380	3.8	69	0.74	1.55	4.1	2.3	2.3	9.1	7.3
0.55	**BN80A 4**	1390	3.8	72	0.77	1.43	4.1	2.3	2	15	8.2
0.75	**BN80B 4**	1400	5.1	75	0.78	1.85	4.9	2.7	2.5	20	9.9
1.1	**BN80C 4**	1400	7.5	75	0.79	2.68	5.1	2.8	2.5	25	11.3
1.1	**BN90S 4**	1400	7.5	73	0.77	2.82	4.6	2.6	2.2	21	12.2
1.5	**BN90LA 4**	1410	10.2	77	0.77	3.7	5.3	2.8	2.4	28	13.6
1.85	**BN90LB 4**	1400	12.6	77	0.78	4.4	5.2	2.8	2.6	30	15.1
2.2	**BN100LA 4**	1410	14.9	78	0.76	5.4	4.5	2.2	2	40	18.3
3	**BN100LB 4**	1410	20	80	0.78	6.9	5	2.3	2.2	54	22

3.6.2 M - Ex II 2D 125°C (1500 min^{-1})

Pn kW		n min^{-1}	Mn Nm	η %	cosφ	In A (400V)	Is/In	Ms/Mn	Ma/Mn	Jm $x10^{-4}$ kgm^2	IMB5 Kg
0.12	**M05A 4**	1310	0.88	51	0.68	0.5	2.6	1.9	1.8	2	3.2
0.18	**M05B 4**	1320	1.3	53	0.68	0.72	2.6	2.2	2	2.3	3.6
0.25	**M05C 4**	1320	1.81	60	0.69	0.87	2.7	2.1	1.9	3.3	4.8
0.37	**M1SD 4**	1370	2.6	65	0.77	1.07	3.7	2	1.9	6.9	5.5
0.55	**M1LA 4**	1380	3.8	69	0.74	1.55	4.1	2.3	2.3	9.1	6.9
0.75	**M2SA 4**	1400	5.1	75	0.78	1.85	4.9	2.7	2.5	20	9.2
1.1	**M2SB 4**	1400	7.5	75	0.79	2.68	5.1	2.8	2.5	25	10.6
1.5	**M3SA 4**	1410	10.2	78	0.77	3.6	4.6	2.1	2.1	34	15.5
2.2	**M3LA 4**	1410	14.9	78	0.76	5.4	4.5	2.2	2	40	17
3	**M3LB 4**	1410	20	80	0.78	6.9	5	2.3	2.2	54	21

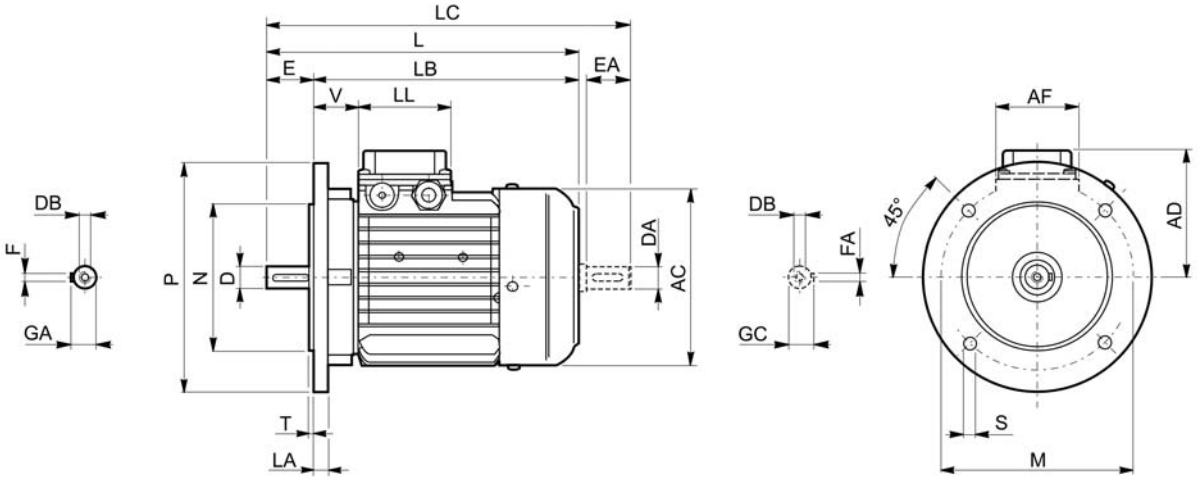
3.7 MOTORS DIMENSIONS

3.7.1 BN - IMB14



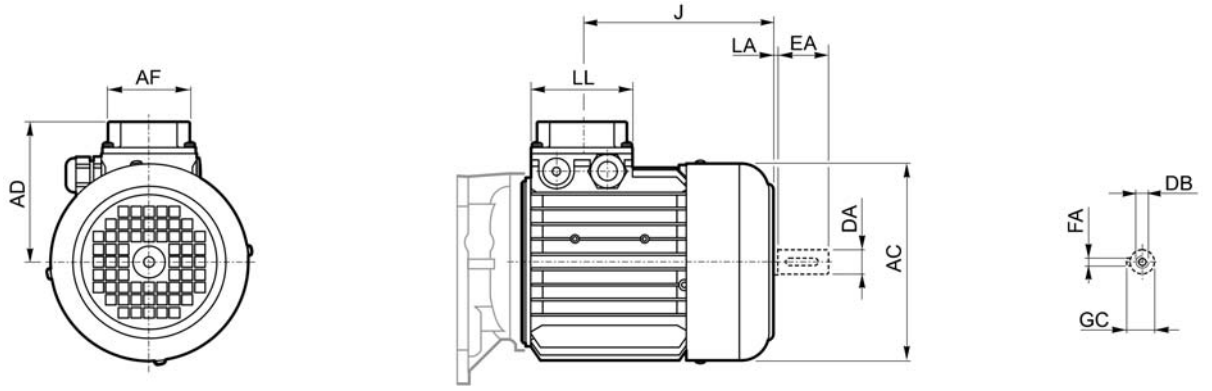
	Shaft					Flange					Motor							
	D DA	E EA	DB	GA GC	F FA	M	N	P	S	T	AC	L	LB	LC	AD	AF	LL	V
BN63_2D	11	23	M4	12.5	4	75	60	90	M5	2.5	121	215	192	240	95	74	80	26
BN71_2D	14	30	M5	16	5	85	70	105	M6	2.5	138	254	224	286	108	74	80	37
BN80_2D	19	40	M6	21.5	6	100	80	120	M6	3	156	276	236	318	119	74	80	38
BN90_2D	24	50	M8	27	8	115	95	140	M8	3	176	326	276	378	133	98	98	44
BN100_2D	28	60	M10	31	8	130	110	160	M8	3.5	195	370	310	472	142	98	98	50

3.7.2 BN - IMB5



	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
BN63_2D	11	23	M4	12.5	4	115	95	140	9.5	3	10	121	207	184	240	95	74	80	26
BN71_2D	14	30	M5	16	5	130	110	160	9.5	3	10	138	249	219	286	108	74	80	37
BN80_2D	19	40	M6	21.5	6	165	130	200	11.5	3.5	11.5	156	274	234	318	119	74	80	38
BN90_2D	24	50	M8	27	8	165	130	200	11.5	3.5	11.5	176	326	276	378	133	98	98	44
BN100_2D	28	60	M10	31	8	215	180	250	14	4	14	195	367	307	432	142	98	98	50

3.7.3 M



	AC	AD	AF	LL	J	DA	EA	LA	DB	GC	FA
M05_2D	121	95	74	80	117	11	23	3	M4	12.5	4
M1S_2D	138	108	74	80	118	14	30	2	M5	16	5
M1L_2D	138	108	74	80	142	14	30	2	M5	16	5
M2S_2D	156	119	74	80	152	19	40	3	M6	21.5	6
M3S_2D	195	142	98	98	176.5	28	60	3	M10	31	8
M3L_2D	195	142	98	98	208.5	28	60	3	M10	31	8

3.8 DECLARATION OF CONFORMITY

BONFIGLIOLI RIDUTTORI S.p.A.
Via Giovanni XXIII, 7/a
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Bologna (Italy)
Tel. +39 051 6473111
Fax +39 051 6473126
bonfiglioli@bonfiglioli.com
www.bonfiglioli.com
Company Certified UNI EN ISO 9001:2000

CERTIFICATE OF COMPLIANCE (according to EC Directive 94I9/CE)

BONFIGLIOLI RIDUTTORI S.p.A.
declares under its own responsibility that the 3-phase electric motors:
- **BN** series, sizes 63 - 100 (4 pole)
- **M** series, sizes M05 - M3 (4 pole)

Group **II**, category **2D**, maximum surface temperature **T 125°C** (TÜV PRODUCT SERVICE 0123 -N° EX5 04 08 29103 006) to which this declaration refers, are in conformity with the requirements of the following Directive:

94/9/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of 23 March 1994
Conformity with the provisions of this Directive is proven by complete compliance to the following Standards:

EN 60034-1, EN 50281-1-1, EN 50014

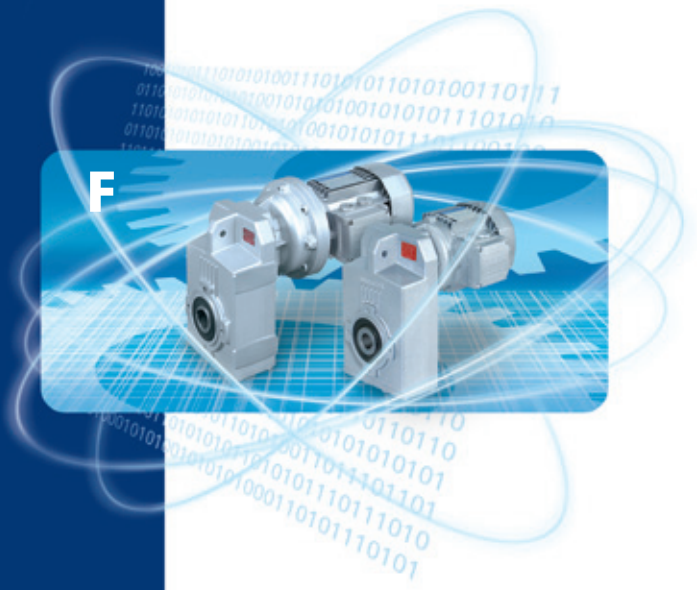
BONFIGLIOLI RIDUTTORI filed the documents according to 94/9/EC, with the following notified body: TÜV PRODUCT SERVICE GmbH- Identification number 0123

Lippo di Calderara di Reno, 27/11/2003
Place and date

Ing. Enzo Cognigni
R&D Manager

INDEX OF REVISIONS (R)	R2
	Description
	- Added gearmotor rating charts - Added gearmotor dimensions - Added electric motors section

INDUSTRY PROCESS
AND AUTOMATION SOLUTIONS



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