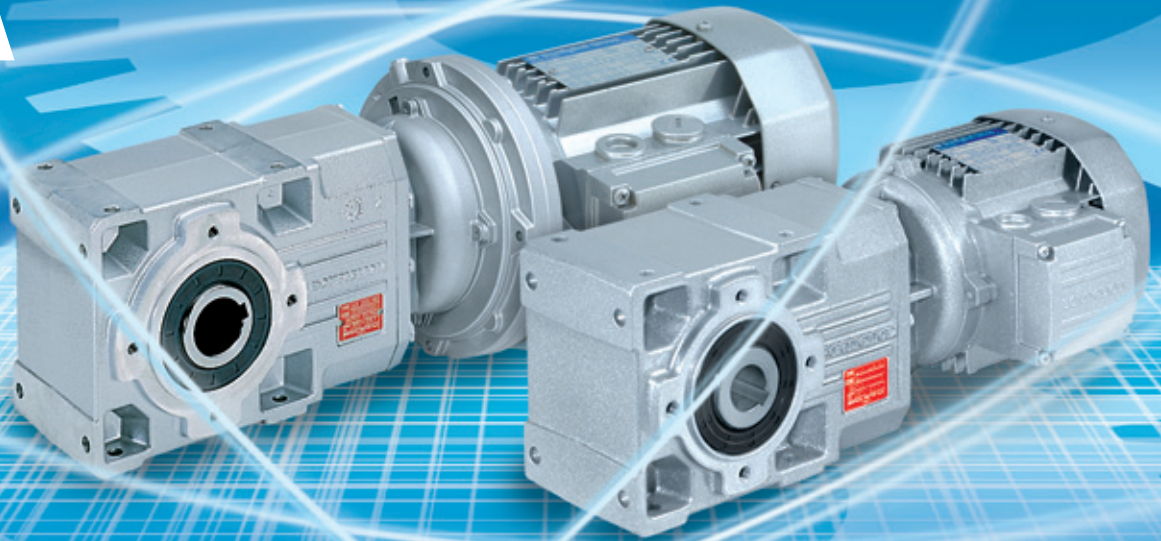


INDUSTRY PROCESS  
AND AUTOMATION SOLUTIONS



**BONFIGLIOLI**  
**RIDUTTORI**

**A**



**BONFIGLIOLI**



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Visit [www.bonfiglioli.com](http://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<sub>s</sub>** - The **service factor** is a coefficient representing the severity of the duty for the operating cycle.
- f<sub>TP</sub>** - 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<sub>c</sub>** [Kgm<sup>2</sup>] **Moment of inertia of the driven load.**

**J<sub>m</sub>** [Kgm<sup>2</sup>] **Moment of inertia of the motor.**

**J<sub>R</sub>** [Kgm<sup>2</sup>] **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<sub>R</sub>** - The **transmission factor** is a computational parameter, proportional to the tension generated by an external transmission keyed to the gear unit shaft.

**M<sub>2</sub>** [Nm] **Net output torque**

**Mn<sub>2</sub>** [Nm] The **rated torque** at the output shaft.  
The catalogue value is calculated for a service factor f<sub>s</sub> = 1.

**Mr<sub>2</sub>** [Nm] The application's **required torque** .  
This should always be less than or equal to the gear unit's rated torque Mn<sub>2</sub>.

**Mc<sub>2</sub>** [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<sup>-1</sup>] **Shaft speed.**

**Pn<sub>1</sub>** [kW] **Rated power** at the input shaft, calculated for a service factor f<sub>s</sub> = 1.

**P<sub>R</sub>** [kW] The application's **required power** .

**R<sub>C</sub>** [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:



$$R_{r1} [N] = \frac{2000 \cdot M_1 [Nm] \cdot K_r}{d [mm]} \quad ; \quad R_{r2} [N] = \frac{2000 \cdot M_2 [Nm] \cdot K_r}{d [mm]}$$

**R<sub>N</sub>** [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<sub>a</sub>** [°C] **Ambient temperature.**

**t<sub>f</sub>** [min] The **operating time** is the total duration of the work cycle phases.

**t<sub>r</sub>** [min] The **rest time** is the interval of no work between two phases.

**Z<sub>r</sub>** - **Number** of starts per hour.

**η<sub>d</sub>** - The **dynamic efficiency** is expressed as the ratio between the power measured at the output shaft and that applied to the input shaft:

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

[ ]<sub>1</sub> This value refers to the input shaft.

[ ]<sub>2</sub> 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 <b>G</b>	Dusty atmosphere <b>D</b>		
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 selected in this catalogue are suitable for installation in zones 1, 21, 2 and 22, as highlighted in 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		II					
	mines, firedamp		other potentially explosive areas (gas, dust)					
Category	M1	M2	1		2		3	
Atmosphere <sup>(1)</sup>			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

<sup>(1)</sup> **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](http://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:

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

The efficiency value «  $\eta_d$  » can be determined as follows (approximately):

	$\eta_d$
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:

- gear unit equipped with IEC motor fitting
- gear unit equipped with solid input shaft.

Proceed as follows:

### 1.4.2 SELECTING A GEARMOTOR

- Determine service factor  $f_s$  as formerly specified.
- Determine power required at gearbox input shaft:

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

- Consult the gearmotor rating charts and locate the table corresponding to normalised power  $P_n$ :

$$P_n \geq P_{r1}$$

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

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

The adjusting factor  $f_m$  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  $P_{n1}$  such that:

$$P_{n1} \geq P_{r1} \times f_s$$

- Select an electric motor rated:

$$P_1 \geq P_{r1}$$

- 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 A102, A202 or A302 with ratio  $i > 60$ , 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 recalculated service factor  $f_s$  still satisfies the condition  $S \geq f_s$ .**

### 1.4.4 SPEED REDUCER WITH SOLID INPUT SHAFT

- Calculate the value of the computational torque:

$$M_{c2} = M_{r2} \times f_s \times f_{tp}$$

Helical gear units C, A, F, S	$f_{tp}$			
	Type of load	Worm gear units VF, W		
		Ambient temperature [°C]		
$f_{tp} = 1$		20°	30°	40°
	<b>K1</b> uniform load	1.00	1.00	1.06
	<b>K2</b> moderate shock load	1.00	1.02	1.12
	<b>K3</b> 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  $M_{n2}$  equal to or greater than the computational torque  $M_{c2}$ , 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  $-20^{\circ}\text{C} < \text{to} < +40^{\circ}\text{C}$ .
- 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 RIDOTTORI.
- 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 RIDOTTORI Technical Service Department.
- The speed of the motor mounted to the gear unit must not exceed  $n = 1500 \text{ min}^{-1}$ .
- 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 ( $1500 \text{ min}^{-1}$ ) or overload the gearbox itself.
- All the instructions in the User Manual ([www.bonfiglioli.com/atex.html](http://www.bonfiglioli.com/atex.html)) regarding installation, use and routine maintenance of the unit must be followed in full.

## 1.4.7 SERVICE FACTOR - [ $f_s$ ]

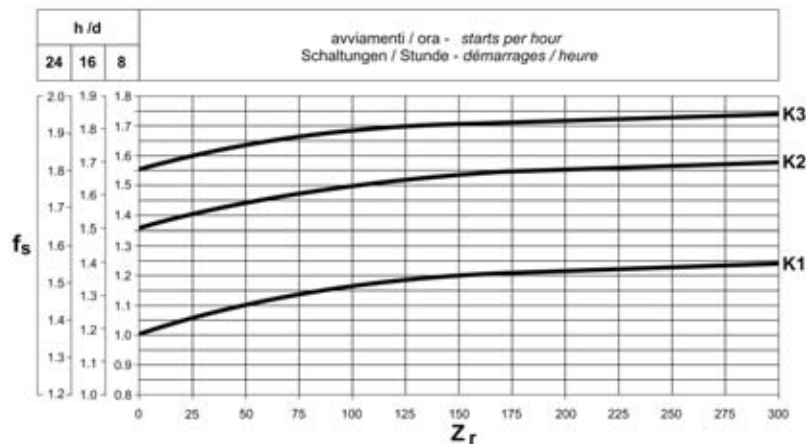
This factor is the numeric value describing reducer service duty. It takes into consideration, with unavoidable approximation, daily operating conditions, load variations and overloads connected with reducer application.

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:

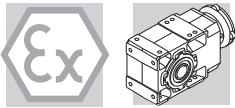
$$K = \frac{J_c}{J_m}$$

where:

$J_c$  moment of inertia of driven masses referred to motor shaft

$J_m$  moment of inertia of motor

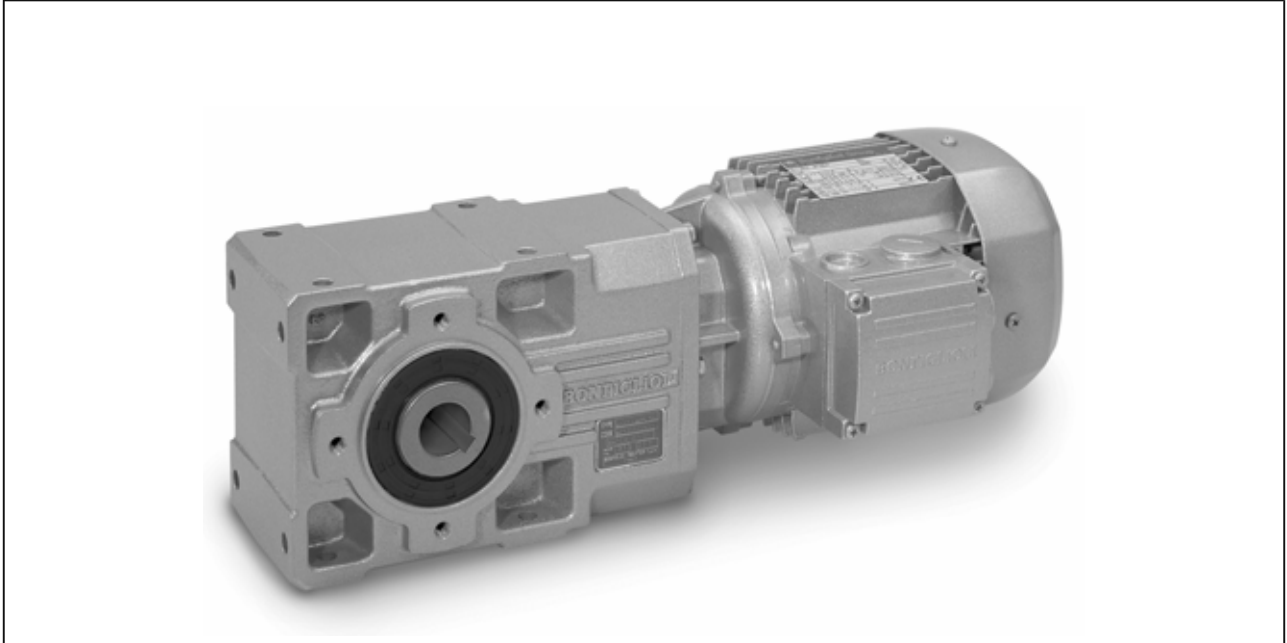
$K = J_c / J_m$	curve	type of duty
$K \leq 0.25$	<b>K1</b>	uniform load
$0.25 < K \leq 3$	<b>K2</b>	moderate shock load
$3 < K \leq 10$	<b>K3</b>	heavy shock load
$K > 10$	-	please contact Bonfiglioli's Technical Service



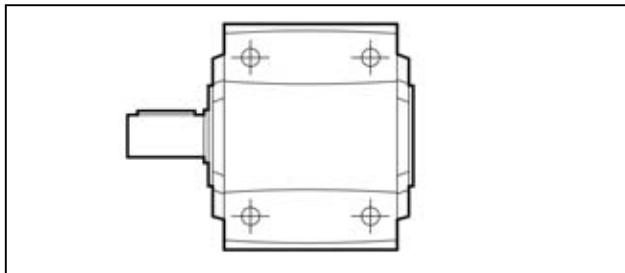
## **2 A SERIES BEVEL HELICAL GEAR UNITS FOR POTENTIALLY EXPLOSIVE ENVIRONMENT**

### **2.1 CONSTRUCTION OF ATEX-SPECIFIED EQUIPMENT**

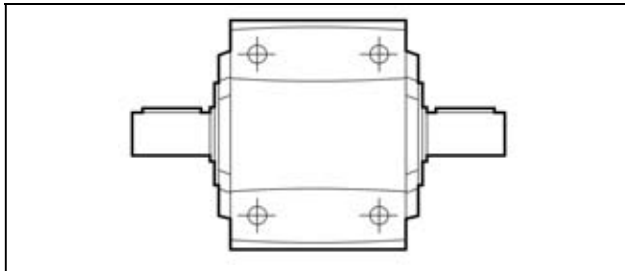
- Equipped with service plugs for periodic lubricant level checks.
- Factory-charged with lubricant, depending on the mounting position specified in the order.
- Viton® seal rings as standard.
- No plastic component parts.
- Nameplate indication of the product category and type of protection.



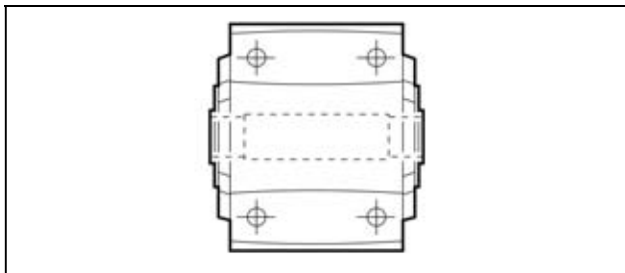
## 2.2 VERSION



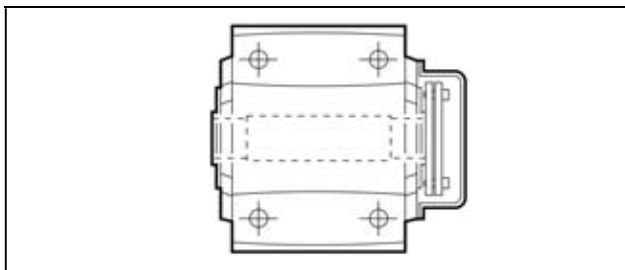
**UR** Solid one-sided output shaft



**UD** Solid two-sided output shaft



**UH** Hollow output shaft with keyway



**US** Hollow output shaft with shrink disk

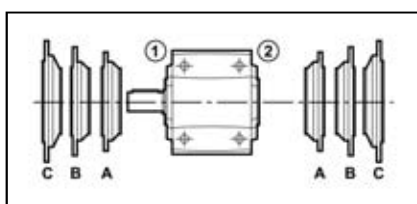
### Versions with flange

Versions UH, UR and UD can be equipped with mounting flanges, available in a range of diameters for each gear frame size.

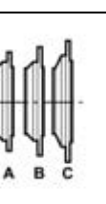
The type of flange (A, B, C) and mounting side (1, 2) are expressed in the product designation.

E.g.:

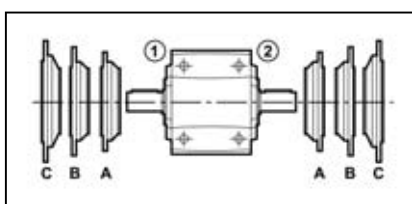
**URF1**



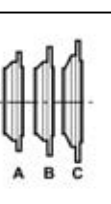
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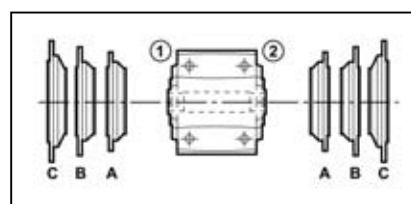
**UDF1**



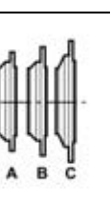
**UDF2**

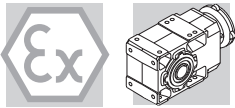


**UHF1**



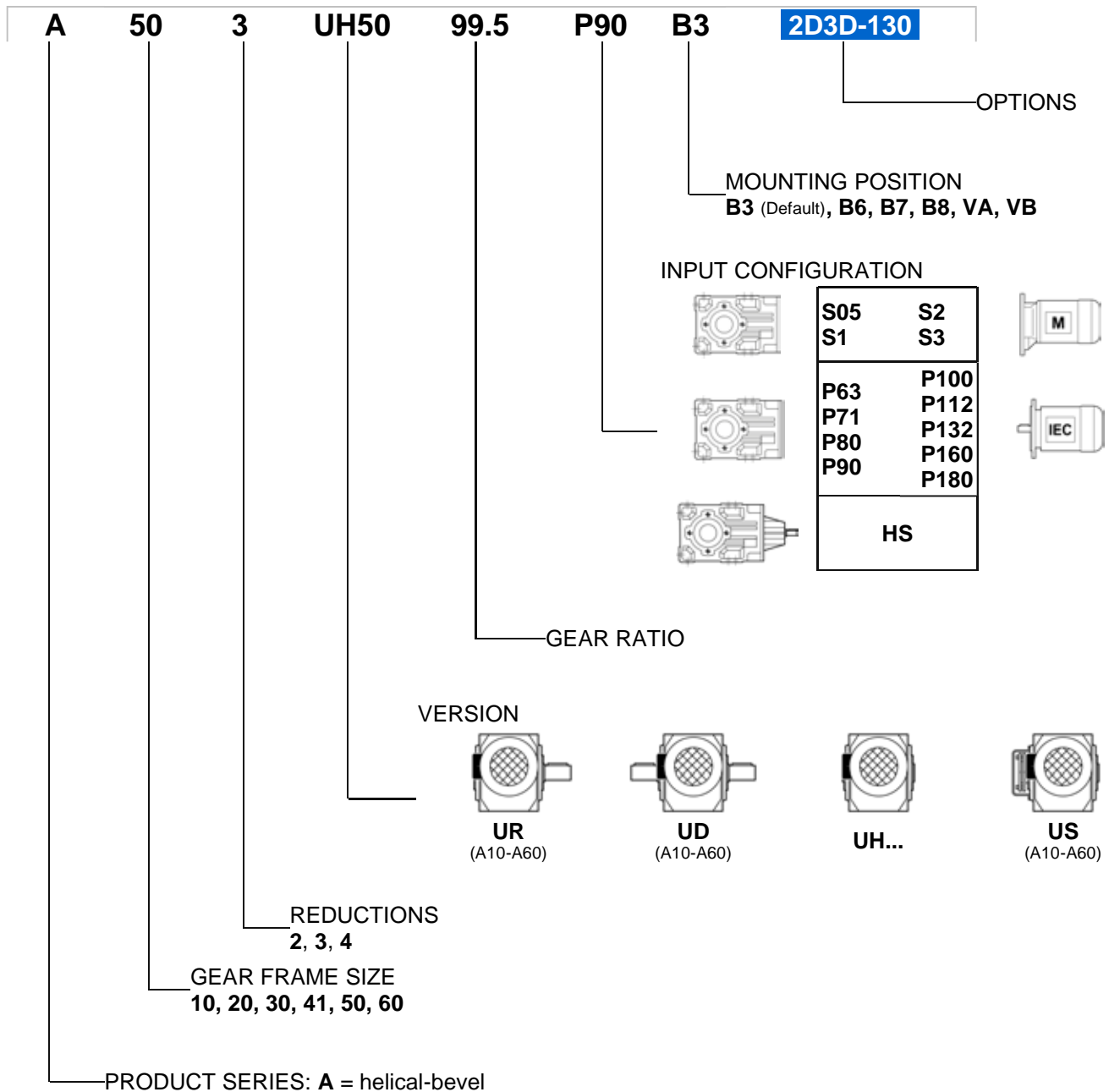
**UHF2**





## 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.

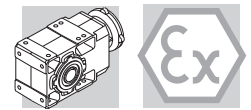
**2D3D-160** The gear unit can be installed in zones 21 and 22 (categories 2D and 3D). The unit's surface temperature is less than 160°C.

**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.

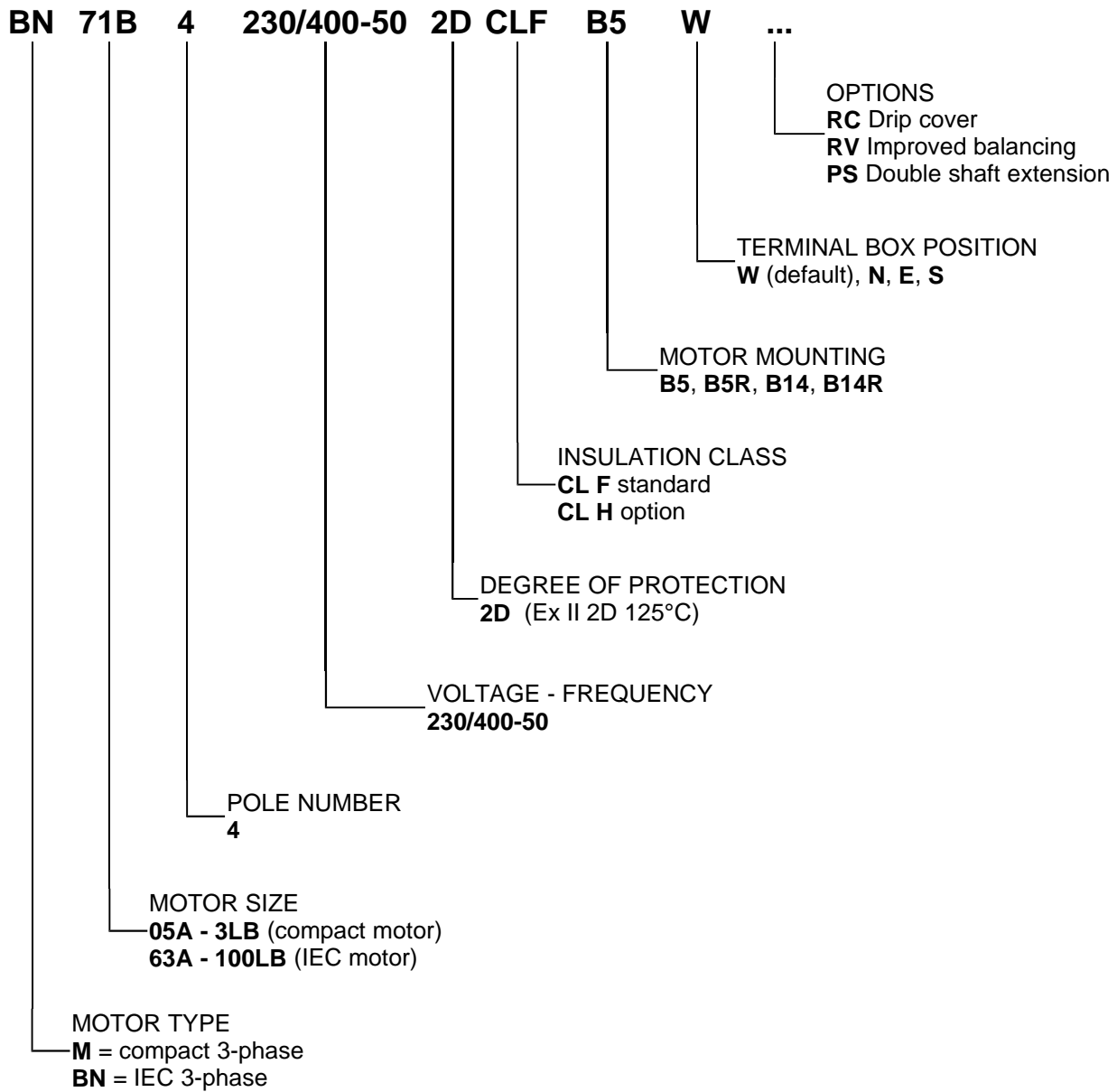
**2G3G-T3** The gear unit can be installed in zones 1 and 2 (categories 2G and 3G). The temperature class is T3 (max. 200 °C).

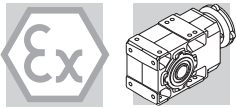
**2G3G-T4** The gear unit can be installed in zones 1 and 2 (categories 2G and 3G). The temperature class is T4 (max. 135 °C).



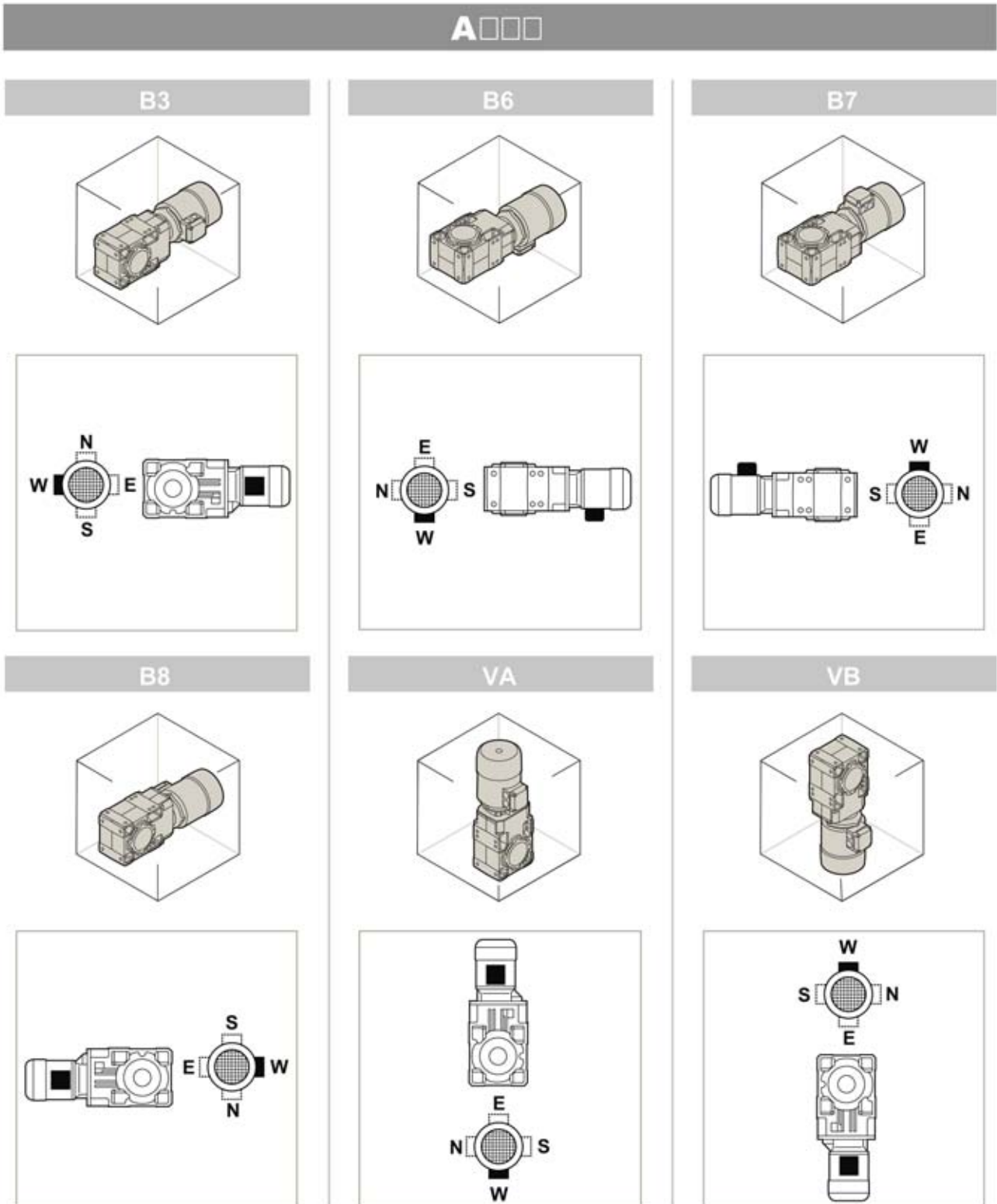


### 2.3.3 VARIANTS OF ELECTRIC MOTOR

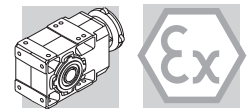




## 2.4 MOUNTING POSITION



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.

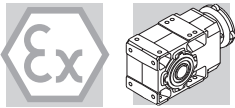
For transportation purposes these units are equipped with closed filler plugs. A vented plug, which the User must replace before putting the unit into service, is supplied along with each unit.

Type A10, A20 and A30 gear units are not equipped with spill-type level plugs. Proceed as described in the User Manual when checking the minimum lubricant level.

	 [I]					
	<b>B3</b>	<b>B6</b>	<b>B7</b>	<b>B8</b>	<b>VA</b>	<b>VB</b>
<b>A 10 2</b>	0.80	1.4	1.4	1.2	1.2	1.1
<b>A 20 2</b>	1.2	2.3	2.3	1.7	1.8	1.5
<b>A 20 3</b>	1.5	2.6	2.6	1.7	2.4	1.6
<b>A 30 2</b>	1.8	3.2	3.2	2.3	2.6	2.1
<b>A 30 3</b>	2.3	3.6	3.6	2.4	3.5	2.3
<b>A 41 2</b>	4.0	4.1	4.1	4.7	5.2	4.4
<b>A 41 3</b>	4.0	4.0	4.0	4.7	6.1	3.9
<b>A 50 2</b>	4.9	8.1	4.7	8.4	11	9.2
<b>A 50 3</b>	5.1	8.1	4.7	8.4	11	9.2
<b>A 50 4</b>	6.3	8.2	5.3	8.3	13	9.1
<b>A 60 2</b>	6.8	8.1	12	15	18	15
<b>A 60 3</b>	6.8	8.1	12	15	18	15
<b>A 60 4</b>	7.2	11	7.4	16	19	14



SHELL Tivela oil S 320



## 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.

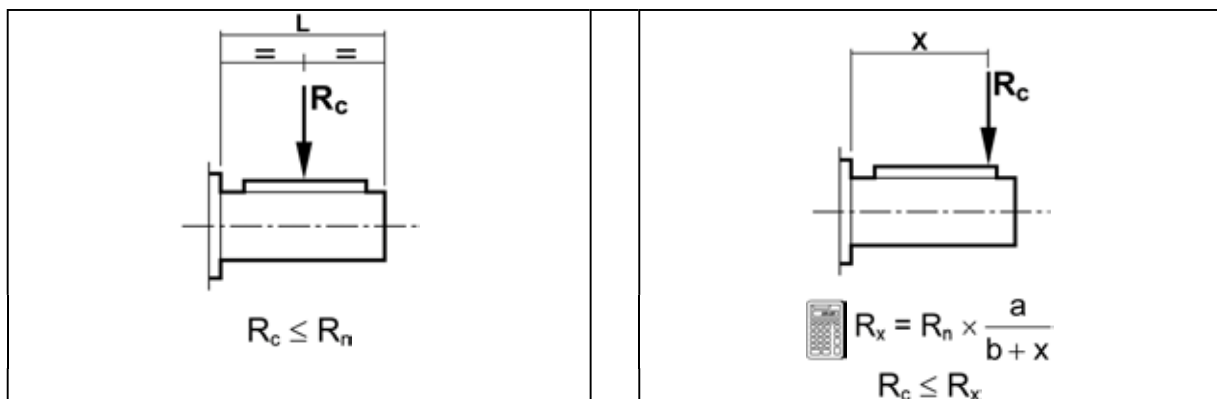
Namely shaft loading ( $R_{c1}$  for input shaft,  $R_{c2}$  for output shaft), must be equal or lower than admissible overhung load capacity for shaft under study ( $R_{n1}$  for input shaft,  $R_{n2}$  for output shaft). OHL capability listed in the rating chart section.

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
<b>A 10 2</b>	123	101	600	21	1	300
<b>A 20 2</b>	150	120	750	40	20	350
<b>A 20 3</b>	150	120	750	21	1	300
<b>A 30 2</b>	168	138	900	38.5	18.5	350
<b>A 30 3</b>	168	138	900	21	1	300
<b>A 41 2</b>	198	158	1050	49.5	24.5	450
<b>A 41 3</b>	198	158	1050	40	20	350
<b>A 50 2 - A 50 3</b>	242.5	201.5	1300	49.5	24.5	450
<b>A 50 4</b>	242.5	201.5	1300	38.5	18.5	350
<b>A 60 2 - A 60 3</b>	242.5	190	1550	55.5	25.5	600
<b>A 60 4</b>	242.5	190	1550	49.5	24.5	450

### 2.6.2 THRUST LOADS $A_{n1}$ , $A_{n2}$

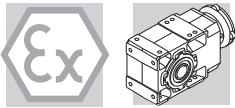
Permissible thrust loads on input [ $A_{n1}$ ] and output [ $A_{n2}$ ] shafts are obtained from the radial loading for the shaft under consideration [ $R_{n1}$ ] and [ $R_{n2}$ ] through the following equation:

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

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

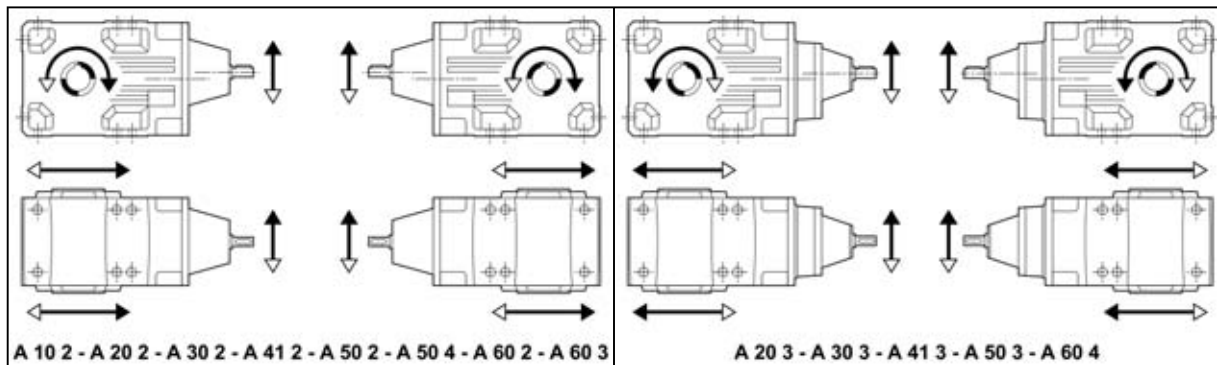
The thrust loads calculated through these formulas apply to thrust forces occurring at the same time as rated radial loads. In the only case that no overhung load acts on the shaft the value of the admissible thrust load [ $A_n$ ] amounts to 50% of rated OHL [ $R_n$ ] on same shaft.

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



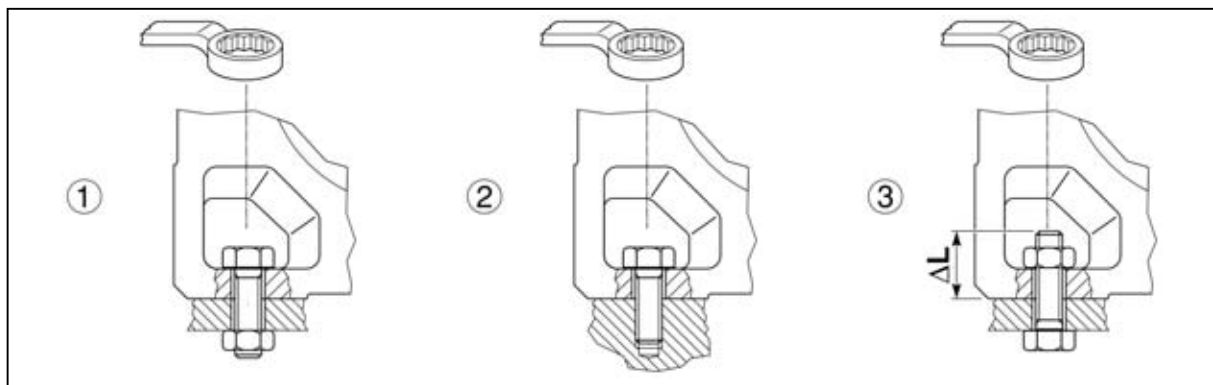
## 2.7 SHAFTS ARRANGEMENT

Table shows standard directions of rotation for 2, 3 and 4 stage helical-bevel gearboxes.

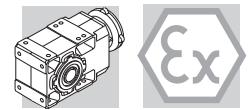


## 2.8 FOOT MOUNTING

Here shown, below, are the three possible options for bolting the gear unit onto the machine framework. The dimension of the recommended hexagonal bolts to be used for each gear unit is also listed below.

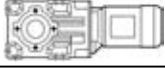



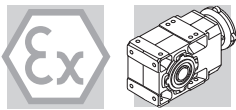
	A 10	A 20	A 30	A 41	A 50	A 60
①	M8x25	M8x25	M10x30	M12x35	M14x45	M16x50
②	M8x20	M8x20	M10x25	M12x30	M14x40	M16x45
③	M8x...	M8x...	M10x...	M12x...	M14x...	M16x...
ΔL [mm]	20	20	25	30	35	40





## 2.9 GEARMOTOR RATING CHARTS

### 2.9.1 0.12 kW

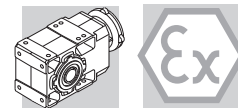
0.12 kW						
$n_2$ min <sup>-1</sup>	$M_2$ Nm	S	i	$Rn_2$ N		
1.7	609	2.3	778.2	20000	A504_778.2 S05 M05A4	A504_778.2 P63 BN63A4
1.7	592	3.7	755.4	30000	A604_755.4 S05 M05A4	A604_755.4 P63 BN63A4
1.9	554	2.3	707.9	20000	A504_707.9 S05 M05A4	A504_707.9 P63 BN63A4
1.9	546	3.7	697.3	30000	A604_697.3 S05 M05A4	A604_697.3 P63 BN63A4
2.1	497	4.4	634.6	30000	A604_634.6 S05 M05A4	A604_634.6 P63 BN63A4
2.1	494	2.8	631.2	20000	A504_631.2 S05 M05A4	A504_631.2 P63 BN63A4
2.2	459	4.4	585.8	30000	A604_585.8 S05 M05A4	A604_585.8 P63 BN63A4
2.3	450	2.8	574.2	20000	A504_574.2 S05 M05A4	A504_574.2 P63 BN63A4
2.4	424	5.0	542.0	30000	A604_542.0 S05 M05A4	A604_542.0 P63 BN63A4
2.5	415	3.2	529.5	20000	A504_529.5 S05 M05A4	A504_529.5 P63 BN63A4
2.6	392	5.1	500.3	30000	A604_500.3 S05 M05A4	A604_500.3 P63 BN63A4
2.7	377	3.3	481.6	20000	A504_481.6 S05 M05A4	A504_481.6 P63 BN63A4
2.9	350	3.7	446.8	20000	A504_446.8 S05 M05A4	A504_446.8 P63 BN63A4
3.0	343	6.0	438.4	30000	A604_438.4 S05 M05A4	A604_438.4 P63 BN63A4
3.2	318	3.8	406.4	20000	A504_406.4 S05 M05A4	A504_406.4 P63 BN63A4
3.2	317	6.1	404.7	30000	A604_404.7 S05 M05A4	A604_404.7 P63 BN63A4
3.5	300	1.8	376.8	15000	A413_376.8 S05 M05A4	A413_376.8 P63 BN63A4
3.6	286	4.4	365.6	20000	A504_365.6 S05 M05A4	A504_365.6 P63 BN63A4
3.7	275	7.3	351.2	30000	A604_351.2 S05 M05A4	A604_351.2 P63 BN63A4
3.9	260	4.5	332.6	20000	A504_332.6 S05 M05A4	A504_332.6 P63 BN63A4
4.0	254	7.4	324.2	30000	A604_324.2 S05 M05A4	A604_324.2 P63 BN63A4
4.0	258	3.1	324.2	15000	A413_324.2 S05 M05A4	A413_324.2 P63 BN63A4
4.2	252	1.4	314.5	9600	A303_314.5 S05 M05A4	A303_314.5 P63 BN63A4
4.6	225	5.4	286.8	20000	A504_286.8 S05 M05A4	A504_286.8 P63 BN63A4
4.6	224	8.6	286.3	30000	A604_286.3 S05 M05A4	A604_286.3 P63 BN63A4
4.8	217	1.7	271.5	9600	A303_271.5 S05 M05A4	A303_271.5 P63 BN63A4
5.0	207	8.7	264.3	30000	A604_264.3 S05 M05A4	A604_264.3 P63 BN63A4
5.0	204	5.5	260.9	20000	A504_260.9 S05 M05A4	A504_260.9 P63 BN63A4
5.0	209	1.1	260.5	6200	A203_260.5 S05 M05A4	A203_260.5 P63 BN63A4
5.6	182	6.3	232.0	20000	A504_232.0 S05 M05A4	A504_232.0 P63 BN63A4
5.9	177	1.4	221.3	6200	A203_221.3 S05 M05A4	A203_221.3 P63 BN63A4
6.0	173	2.1	216.6	9600	A303_216.6 S05 M05A4	A303_216.6 P63 BN63A4
6.2	165	6.4	211.0	20000	A504_211.0 S05 M05A4	A504_211.0 P63 BN63A4
7.3	143	2.4	178.5	9600	A303_178.5 S05 M05A4	A303_178.5 P63 BN63A4
7.3	143	1.7	178.3	6200	A203_178.3 S05 M05A4	A203_178.3 P63 BN63A4
8.7	121	2.7	150.7	9600	A303_150.7 S05 M05A4	A303_150.7 P63 BN63A4
9.0	117	2.0	146.1	6200	A203_146.1 S05 M05A4	A203_146.1 P63 BN63A4
10.9	96	2.2	120.5	6200	A203_120.5 S05 M05A4	A203_120.5 P63 BN63A4
10.9	96	3.1	120.5	9600	A303_120.5 S05 M05A4	A303_120.5 P63 BN63A4
13.4	80	2.8	97.5	9600		A302_97.5 P63 BN63A4
14.2	76	2.0	92.3	6200	A202_92.3 S05 M05A4	A202_92.3 P63 BN63A4
14.3	75	1.3	91.6	5500	A102_91.6 S05 M05A4	A102_91.6 P63 BN63A4
16.4	66	2.5	79.9	6200	A202_79.9 S05 M05A4	A202_79.9 P63 BN63A4
17.1	63	1.9	76.4	5500	A102_76.4 S05 M05A4	A102_76.4 P63 BN63A4
19.9	54	2.5	65.9	5500	A102_65.9 S05 M05A4	A102_65.9 P63 BN63A4
20.7	52	3.6	63.1	6200	A202_63.1 S05 M05A4	A202_63.1 P63 BN63A4
25.6	42	3.6	51.3	5500	A102_51.3 S05 M05A4	A102_51.3 P63 BN63A4
28.9	37	4.0	45.4	5500	A102_45.4 S05 M05A4	A102_45.4 P63 BN63A4
37	29	5.2	35.1	5470	A102_35.1 S05 M05A4	A102_35.1 P63 BN63A4
46	23	6.2	28.6	5140	A102_28.6 S05 M05A4	A102_28.6 P63 BN63A4
55	19.5	6.9	23.8	4580	A102_23.8 S05 M05A4	A102_23.8 P63 BN63A4
71	15.3	8.2	18.6	4490	A102_18.6 S05 M05A4	A102_18.6 P63 BN63A4
94	11.5	10.0	13.9	4100	A102_13.9 S05 M05A4	A102_13.9 P63 BN63A4
124	8.7	12.1	10.6	3750	A102_10.6 S05 M05A4	A102_10.6 P63 BN63A4





## 2.9.2 0.18 kW

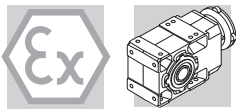
0.18 kW							
$n_2$ min <sup>-1</sup>	$M_2$ Nm	S	i	$Rn_2$ N			IEC
1.7	609	2.3	778.2	20000	A504_778.2 S05 M05A4	A504_778.2 P63 BN63A4	
1.7	592	3.7	755.4	30000	A604_755.4 S05 M05A4	A604_755.4 P63 BN63A4	
1.9	554	2.3	707.9	20000	A504_707.9 S05 M05A4	A504_707.9 P63 BN63A4	
1.9	546	3.7	697.3	30000	A604_697.3 S05 M05A4	A604_697.3 P63 BN63A4	
2.1	497	4.4	634.6	30000	A604_634.6 S05 M05A4	A604_634.6 P63 BN63A4	
2.1	494	2.8	631.2	20000	A504_631.2 S05 M05A4	A504_631.2 P63 BN63A4	
2.2	459	4.4	585.8	30000	A604_585.8 S05 M05A4	A604_585.8 P63 BN63A4	
2.3	450	2.8	574.2	20000	A504_574.2 S05 M05A4	A504_574.2 P63 BN63A4	
2.4	424	5.0	542.0	30000	A604_542.0 S05 M05A4	A604_542.0 P63 BN63A4	
2.5	415	3.2	529.5	20000	A504_529.5 S05 M05A4	A504_529.5 P63 BN63A4	
2.6	392	5.1	500.3	30000	A604_500.3 S05 M05A4	A604_500.3 P63 BN63A4	
2.7	377	3.3	481.6	20000	A504_481.6 S05 M05A4	A504_481.6 P63 BN63A4	
2.9	350	3.7	446.8	20000	A504_446.8 S05 M05A4	A504_446.8 P63 BN63A4	
3.0	343	6.0	438.4	30000	A604_438.4 S05 M05A4	A604_438.4 P63 BN63A4	
3.2	318	3.8	406.4	20000	A504_406.4 S05 M05A4	A504_406.4 P63 BN63A4	
3.2	317	6.1	404.7	30000	A604_404.7 S05 M05A4	A604_404.7 P63 BN63A4	
3.5	300	1.8	376.8	15000	A413_376.8 S05 M05A4	A413_376.8 P63 BN63A4	
3.6	286	4.4	365.6	20000	A504_365.6 S05 M05A4	A504_365.6 P63 BN63A4	
3.7	275	7.3	351.2	30000	A604_351.2 S05 M05A4	A604_351.2 P63 BN63A4	
3.9	260	4.5	332.6	20000	A504_332.6 S05 M05A4	A504_332.6 P63 BN63A4	
4.0	254	7.4	324.2	30000	A604_324.2 S05 M05A4	A604_324.2 P63 BN63A4	
4.0	258	3.1	324.2	15000	A413_324.2 S05 M05A4	A413_324.2 P63 BN63A4	
4.2	252	1.4	314.5	9600	A303_314.5 S05 M05A4	A303_314.5 P63 BN63A4	
4.6	225	5.4	286.8	20000	A504_286.8 S05 M05A4	A504_286.8 P63 BN63A4	
4.6	224	8.6	286.3	30000	A604_286.3 S05 M05A4	A604_286.3 P63 BN63A4	
4.8	217	1.7	271.5	9600	A303_271.5 S05 M05A4	A303_271.5 P63 BN63A4	
5.0	207	8.7	264.3	30000	A604_264.3 S05 M05A4	A604_264.3 P63 BN63A4	
5.0	204	5.5	260.9	20000	A504_260.9 S05 M05A4	A504_260.9 P63 BN63A4	
5.0	209	1.1	260.5	6200	A203_260.5 S05 M05A4	A203_260.5 P63 BN63A4	
5.6	182	6.3	232.0	20000	A504_232.0 S05 M05A4	A504_232.0 P63 BN63A4	
5.9	177	1.4	221.3	6200	A203_221.3 S05 M05A4	A203_221.3 P63 BN63A4	
6.0	173	2.1	216.6	9600	A303_216.6 S05 M05A4	A303_216.6 P63 BN63A4	
6.2	165	6.4	211.0	20000	A504_211.0 S05 M05A4	A504_211.0 P63 BN63A4	
7.3	143	2.4	178.5	9600	A303_178.5 S05 M05A4	A303_178.5 P63 BN63A4	
7.3	143	1.7	178.3	6200	A203_178.3 S05 M05A4	A203_178.3 P63 BN63A4	
8.7	121	2.7	150.7	9600	A303_150.7 S05 M05A4	A303_150.7 P63 BN63A4	
9.0	117	2.0	146.1	6200	A203_146.1 S05 M05A4	A203_146.1 P63 BN63A4	
10.9	96	2.2	120.5	6200	A203_120.5 S05 M05A4	A203_120.5 P63 BN63A4	
10.9	96	3.1	120.5	9600	A303_120.5 S05 M05A4	A303_120.5 P63 BN63A4	
13.4	80	2.8	97.5	9600		A302_97.5 P63 BN63A4	
14.2	76	2.0	92.3	6200	A202_92.3 S05 M05A4	A202_92.3 P63 BN63A4	
14.3	75	1.3	91.6	5500	A102_91.6 S05 M05A4	A102_91.6 P63 BN63A4	
16.4	66	2.5	79.9	6200	A202_79.9 S05 M05A4	A202_79.9 P63 BN63A4	
17.1	63	1.9	76.4	5500	A102_76.4 S05 M05A4	A102_76.4 P63 BN63A4	
19.9	54	2.5	65.9	5500	A102_65.9 S05 M05A4	A102_65.9 P63 BN63A4	
20.7	52	3.6	63.1	6200	A202_63.1 S05 M05A4	A202_63.1 P63 BN63A4	
25.6	42	3.6	51.3	5500	A102_51.3 S05 M05A4	A102_51.3 P63 BN63A4	
28.9	37	4.0	45.4	5500	A102_45.4 S05 M05A4	A102_45.4 P63 BN63A4	
37	29	5.2	35.1	5470	A102_35.1 S05 M05A4	A102_35.1 P63 BN63A4	
46	23	6.2	28.6	5140	A102_28.6 S05 M05A4	A102_28.6 P63 BN63A4	
55	19.5	6.9	23.8	4580	A102_23.8 S05 M05A4	A102_23.8 P63 BN63A4	
71	15.3	8.2	18.6	4490	A102_18.6 S05 M05A4	A102_18.6 P63 BN63A4	
94	11.5	10.0	13.9	4100	A102_13.9 S05 M05A4	A102_13.9 P63 BN63A4	
124	8.7	12.1	10.6	3750	A102_10.6 S05 M05A4	A102_10.6 P63 BN63A4	



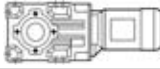



## 2.9.3 0.25 kW



0.25 kW							
$n_2$ min <sup>-1</sup>	$M_2$ Nm	S	i	Rn <sub>2</sub> N			IEC
1.7	1254	1.1	778.2	20000	A504_778.2 S05 M05C4	A504_778.2 P63 BN63C4	
1.7	1217	1.8	755.4	30000	A604_755.4 S05 M05C4	A604_755.4 P63 BN63C4	
1.9	1140	1.1	707.9	20000	A504_707.9 S05 M05C4	A504_707.9 P63 BN63C4	
1.9	1123	1.8	697.3	30000	A604_697.3 S05 M05C4	A604_697.3 P63 BN63C4	
2.1	1022	2.1	634.6	30000	A604_634.6 S05 M05C4	A604_634.6 P63 BN63C4	
2.1	1017	1.3	631.2	20000	A504_631.2 S05 M05C4	A504_631.2 P63 BN63C4	
2.3	944	2.2	585.8	30000	A604_585.8 S05 M05C4	A604_585.8 P63 BN63C4	
2.3	925	1.4	574.2	20000	A504_574.2 S05 M05C4	A504_574.2 P63 BN63C4	
2.4	873	2.4	542.0	30000	A604_542.0 S05 M05C4	A604_542.0 P63 BN63C4	
2.5	853	1.6	529.5	20000	A504_529.5 S05 M05C4	A504_529.5 P63 BN63C4	
2.6	806	2.5	500.3	30000	A604_500.3 S05 M05C4	A604_500.3 P63 BN63C4	
2.7	776	1.6	481.6	20000	A504_481.6 S05 M05C4	A504_481.6 P63 BN63C4	
3.0	720	1.8	446.8	20000	A504_446.8 S05 M05C4	A504_446.8 P63 BN63C4	
3.0	706	2.9	438.4	30000	A604_438.4 S05 M05C4	A604_438.4 P63 BN63C4	
3.2	655	1.8	406.4	20000	A504_406.4 S05 M05C4	A504_406.4 P63 BN63C4	
3.3	652	3.0	404.7	30000	A604_404.7 S05 M05C4	A604_404.7 P63 BN63C4	
3.6	589	2.2	365.6	20000	A504_365.6 S05 M05C4	A504_365.6 P63 BN63C4	
3.8	566	3.5	351.2	30000	A604_351.2 S05 M05C4	A604_351.2 P63 BN63C4	
4.0	536	2.2	332.6	20000	A504_332.6 S05 M05C4	A504_332.6 P63 BN63C4	
4.1	522	3.6	324.2	30000	A604_324.2 S05 M05C4	A604_324.2 P63 BN63C4	
4.1	534	1.5	324.2	15000	A413_324.2 S05 M05C4	A413_324.2 P71 BN71A4	
4.6	462	2.6	286.8	20000	A504_286.8 S05 M05C4	A504_286.8 P63 BN63C4	
4.6	461	4.2	286.3	30000	A604_286.3 S05 M05C4	A604_286.3 P63 BN63C4	
5.0	426	4.3	264.3	30000	A604_264.3 S05 M05C4	A604_264.3 P63 BN63C4	
5.0	432	2.0	262.5	15000	A413_262.5 S05 M05C4	A413_262.5 P71 BN71A4	
5.1	420	2.7	260.9	20000	A504_260.9 S05 M05C4	A504_260.9 P63 BN63C4	
5.7	374	3.1	232.0	20000	A504_232.0 S05 M05C4	A504_232.0 P63 BN63C4	
5.8	364	5.0	226.1	30000	A604_226.1 S05 M05C4	A604_226.1 P63 BN63C4	
6.1	358	2.4	217.4	15000	A413_217.4 S05 M05C4	A413_217.4 P71 BN71A4	
6.1	357	1.0	216.6	9600	A303_216.6 S05 M05C4	A303_216.6 P63 BN63C4	
6.3	340	3.1	211.0	20000	A504_211.0 S05 M05C4	A504_211.0 P63 BN63C4	
6.3	336	5.1	208.7	30000	A604_208.7 S05 M05C4	A604_208.7 P63 BN63C4	
7.2	303	2.8	184.4	15000	A413_184.4 S05 M05C4	A413_184.4 P71 BN71A4	
7.4	294	1.2	178.5	9600	A303_178.5 S05 M05C4	A303_178.5 P63 BN63C4	
8.8	248	1.3	150.7	9600	A303_150.7 S05 M05C4	A303_150.7 P63 BN63C4	
9.0	242	3.5	146.9	15000	A413_146.9 S05 M05C4	A413_146.9 P71 BN71A4	
11.0	198	1.1	120.5	6200	A203_120.5 S05 M05C4	A203_120.5 P63 BN63C4	
11.0	198	1.5	120.5	9600	A303_120.5 S05 M05C4	A303_120.5 P63 BN63C4	
13.5	166	1.4	97.5	9600		A302_97.5 P71 BN71A4	
16.5	136	1.2	79.9	6200	A202_79.9 S05 M05C4	A202_79.9 P71 BN71A4	
17.3	130	2.1	76.5	9600		A302_76.5 P71 BN71A4	
20.0	112	3.5	66.0	9600		A302_66.0 P71 BN71A4	
20.0	112	1.2	65.9	5500	A102_65.9 S05 M05C4	A102_65.9 P71 BN71A4	
20.9	107	1.7	63.1	6200	A202_63.1 S05 M05C4	A202_63.1 P71 BN71A4	
24.6	91	2.7	53.7	6200	A202_53.7 S05 M05C4	A202_53.7 P71 BN71A4	
25.8	87	1.7	51.3	5500	A102_51.3 S05 M05C4	A102_51.3 P71 BN71A4	
29.1	77	1.9	45.4	5500	A102_45.4 S05 M05C4	A102_45.4 P71 BN71A4	
31	73	3.3	43.2	5990	A202_43.2 S05 M05C4	A202_43.2 P71 BN71A4	
37	60	3.7	35.4	5730	A202_35.4 S05 M05C4	A202_35.4 P71 BN71A4	
38	60	2.5	35.1	5260	A102_35.1 S05 M05C4	A102_35.1 P71 BN71A4	
46	49	3.0	28.6	4970	A102_28.6 S05 M05C4	A102_28.6 P71 BN71A4	
56	40	3.3	23.8	4710	A102_23.8 S05 M05C4	A102_23.8 P71 BN71A4	
71	32	4.0	18.6	4390	A102_18.6 S05 M05C4	A102_18.6 P71 BN71A4	
95	24	4.9	13.9	4020	A102_13.9 S05 M05C4	A102_13.9 P71 BN71A4	
125	17.9	5.9	10.6	3700	A102_10.6 S05 M05C4	A102_10.6 P71 BN71A4	

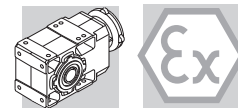


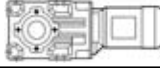


## 2.9.4 0.37 kW

0.37 kW						
$n_2$ min <sup>-1</sup>	$M_2$ Nm	S	i	$Rn_2$ N		
4.2	761	1.0	324.2	15000	A413_324.2 S1 M1SD4	A413_324.2 P71 BN71B4
5.2	616	1.4	262.5	15000	A413_262.5 S1 M1SD4	A413_262.5 P71 BN71B4
6.3	510	1.7	217.4	15000	A413_217.4 S1 M1SD4	A413_217.4 P71 BN71B4
7.2	447	3.4	190.6	20000	A503_190.6 S1 M1SD4	A503_190.6 P71 BN71B4
7.4	436	3.9	185.8	30000	A603_185.8 S1 M1SD4	A603_185.8 P71 BN71B4
7.4	433	2.0	184.4	15000	A413_184.4 S1 M1SD4	A413_184.4 P71 BN71B4
7.9	407	3.5	173.4	20000	A503_173.4 S1 M1SD4	A503_173.4 P71 BN71B4
8.0	402	3.9	171.5	30000	A603_171.5 S1 M1SD4	A603_171.5 P71 BN71B4
9.3	345	2.5	146.9	15000	A413_146.9 S1 M1SD4	A413_146.9 P71 BN71B4
11.8	272	2.9	115.9	15000	A413_115.9 S1 M1SD4	A413_115.9 P71 BN71B4
14.8	218	3.4	92.8	15000	A413_92.8 S1 M1SD4	A413_92.8 P71 BN71B4
17.3	192	3.4	79.2	15000	A412_79.2 S1 M1SD4	A412_79.2 P71 BN71B4
17.9	186	1.5	76.5	9600	A302_76.5 S1 M1SD4	A302_76.5 P71 BN71B4
20.7	160	2.4	66.0	9350	A302_66.0 S1 M1SD4	A302_66.0 P71 BN71B4
21.7	153	1.2	63.1	6200	A202_63.1 S1 M1SD4	A202_63.1 P71 BN71B4
25.5	130	1.9	53.7	6090	A202_53.7 S1 M1SD4	A202_53.7 P71 BN71B4
26.0	128	3.0	52.7	8790	A302_52.7 S1 M1SD4	A302_52.7 P71 BN71B4
26.7	124	1.2	51.3	5490	A102_51.3 S1 M1SD4	A102_51.3 P71 BN71B4
30	110	1.4	45.4	5350	A102_45.4 S1 M1SD4	A102_45.4 P71 BN71B4
32	105	3.5	43.4	8300	A302_43.4 S1 M1SD4	A302_43.4 P71 BN71B4
32	105	2.3	43.2	5780	A202_43.2 S1 M1SD4	A202_43.2 P71 BN71B4
37	89	3.9	36.6	7930	A302_36.6 S1 M1SD4	A302_36.6 P71 BN71B4
39	86	2.6	35.4	5480	A202_35.4 S1 M1SD4	A202_35.4 P71 BN71B4
39	85	1.8	35.1	5040	A102_35.1 S1 M1SD4	A102_35.1 P71 BN71B4
47	71	3.0	29.2	5210	A202_29.2 S1 M1SD4	A202_29.2 P71 BN71B4
48	69	2.1	28.6	4790	A102_28.6 S1 M1SD4	A102_28.6 P71 BN71B4
58	58	2.3	23.8	4570	A102_23.8 S1 M1SD4	A102_23.8 P71 BN71B4
59	56	3.6	23.1	4880	A202_23.1 S1 M1SD4	A202_23.1 P71 BN71B4
74	45	2.8	18.6	4270	A102_18.6 S1 M1SD4	A102_18.6 P71 BN71B4
98	34	3.4	13.9	3940	A102_13.9 S1 M1SD4	A102_13.9 P71 BN71B4
130	26	4.1	10.6	3630	A102_10.6 S1 M1SD4	A102_10.6 P71 BN71B4




## 2.9.5 0.55 kW

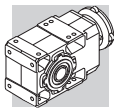
0.55 kW						
$n_2$ min <sup>-1</sup>	$M_2$ Nm	S	i	$Rn_2$ N		
2.2	2146	1.0	634.6	30000	A604_634.6 S1 M1LA4	A604_634.6 P71 BN71C4
2.4	1981	1.0	585.8	30000	A604_585.8 S1 M1LA4	A604_585.8 P71 BN71C4
2.5	1833	1.2	542.0	30000	A604_542.0 S1 M1LA4	A604_542.0 P71 BN71C4
2.8	1692	1.2	500.3	30000	A604_500.3 S1 M1LA4	A604_500.3 P71 BN71C4
3.1	1483	1.4	438.4	30000	A604_438.4 S1 M1LA4	A604_438.4 P71 BN71C4
3.4	1369	1.4	404.7	30000	A604_404.7 S1 M1LA4	A604_404.7 P71 BN71C4
3.8	1236	1.0	365.6	20000	A504_365.6 S1 M1LA4	A504_365.6 P71 BN71C4
3.9	1188	1.7	351.2	30000	A604_351.2 S1 M1LA4	A604_351.2 P71 BN71C4
4.1	1125	1.0	332.6	20000	A504_332.6 S1 M1LA4	A504_332.6 P71 BN71C4
4.3	1096	1.7	324.2	30000	A604_324.2 S1 M1LA4	A604_324.2 P71 BN71C4
4.8	970	1.2	286.8	20000	A504_286.8 S1 M1LA4	A504_286.8 P71 BN71C4
4.8	968	2.0	286.3	30000	A604_286.3 S1 M1LA4	A604_286.3 P71 BN71C4
5.2	894	2.0	264.3	30000	A604_264.3 S1 M1LA4	A604_264.3 P71 BN71C4
5.3	882	1.3	260.9	20000	A504_260.9 S1 M1LA4	A504_260.9 P71 BN71C4
5.9	785	1.5	232.0	20000	A504_232.0 S1 M1LA4	A504_232.0 P71 BN71C4
6.1	765	2.4	226.1	30000	A604_226.1 S1 M1LA4	A604_226.1 P71 BN71C4
6.3	753	1.1	217.4	15000	A413_217.4 S1 M1LA4	A413_217.4 P80 BN80A4
6.5	714	1.5	211.0	20000	A504_211.0 S1 M1LA4	A504_211.0 P71 BN71C4
6.6	706	2.4	208.7	30000	A604_208.7 S1 M1LA4	A604_208.7 P71 BN71C4





0.55 kW						
$n_2$ min <sup>-1</sup>	$M_2$ Nm	S	i	$Rn_2$ N		 IEC 
7.2	660	2.3	190.6	20000	A503_190.6 S1 M1LA4	A503_190.6 P80 BN80A4
7.4	643	2.7	185.8	30000	A603_185.8 S1 M1LA4	A603_185.8 P80 BN80A4
7.5	639	1.3	184.4	15000	A413_184.4 S1 M1LA4	A413_184.4 P80 BN80A4
8.0	600	2.4	173.4	20000	A503_173.4 S1 M1LA4	A503_173.4 P80 BN80A4
8.0	594	2.7	171.5	30000	A603_171.5 S1 M1LA4	A603_171.5 P80 BN80A4
8.8	540	3.5	156.0	30000	A603_156.0 S1 M1LA4	A603_156.0 P80 BN80A4
8.9	535	2.8	154.6	20000	A503_154.6 S1 M1LA4	A503_154.6 P80 BN80A4
9.4	509	1.7	146.9	15000	A413_146.9 S1 M1LA4	A413_146.9 P80 BN80A4
9.6	499	3.5	144.0	30000	A603_144.0 S1 M1LA4	A603_144.0 P80 BN80A4
9.8	487	3.1	140.6	20000	A503_140.6 S1 M1LA4	A503_140.6 P80 BN80A4
10.6	449	3.3	129.7	20000	A503_129.7 S1 M1LA4	A503_129.7 P80 BN80A4
11.7	409	3.7	118.0	20000	A503_118.0 S1 M1LA4	A503_118.0 P80 BN80A4
11.9	401	2.0	115.9	15000	A413_115.9 S1 M1LA4	A413_115.9 P80 BN80A4
12.6	379	4.0	109.4	20000	A503_109.4 S1 M1LA4	A503_109.4 P80 BN80A4
14.9	321	2.3	92.8	15000	A413_92.8 S1 M1LA4	A413_92.8 P80 BN80A4
17.4	283	2.3	79.2	15000	A412_79.2 S1 M1LA4	A412_79.2 P80 BN80A4
20.9	236	1.7	66.0	8880	A302_66.0 S1 M1LA4	A302_66.0 P80 BN80A4
21.5	230	2.8	64.2	15000	A412_64.2 S1 M1LA4	A412_64.2 P80 BN80A4
25.7	192	1.3	53.7	5670	A202_53.7 S1 M1LA4	A202_53.7 P80 BN80A4
26.0	190	3.2	53.1	15000	A412_53.1 S1 M1LA4	A412_53.1 P80 BN80A4
26.2	188	2.0	52.7	8410	A302_52.7 S1 M1LA4	A302_52.7 P80 BN80A4
31	161	3.6	45.1	15000	A412_45.1 S1 M1LA4	A412_45.1 P80 BN80A4
32	155	2.3	43.4	8010	A302_43.4 S1 M1LA4	A302_43.4 P80 BN80A4
32	155	1.6	43.2	5440	A202_43.2 S1 M1LA4	A202_43.2 P80 BN80A4
38	131	2.6	36.6	7660	A302_36.6 S1 M1LA4	A302_36.6 P80 BN80A4
39	127	1.8	35.4	5200	A202_35.4 S1 M1LA4	A202_35.4 P80 BN80A4
39	126	1.2	35.1	4700	A102_35.1 S1 M1LA4	A102_35.1 P80 BN80A4
47	105	3.1	29.3	7210	A302_29.3 S1 M1LA4	A302_29.3 P80 BN80A4
47	105	2.1	29.2	4970	A202_29.2 S1 M1LA4	A202_29.2 P80 BN80A4
48	102	1.4	28.6	4510	A102_28.6 S1 M1LA4	A102_28.6 P80 BN80A4
58	85	1.6	23.8	4330	A102_23.8 S1 M1LA4	A102_23.8 P80 BN80A4
60	83	2.4	23.1	4690	A202_23.1 S1 M1LA4	A202_23.1 P80 BN80A4
61	81	3.7	22.8	6710	A302_22.8 S1 M1LA4	A302_22.8 P80 BN80A4
74	66	1.9	18.6	4090	A102_18.6 S1 M1LA4	A102_18.6 P80 BN80A4
76	65	2.9	18.1	4400	A202_18.1 S1 M1LA4	A202_18.1 P80 BN80A4
98	50	3.4	14.1	4100	A202_14.1 S1 M1LA4	A202_14.1 P80 BN80A4
99	50	2.3	13.9	3800	A102_13.9 S1 M1LA4	A102_13.9 P80 BN80A4
131	38	2.8	10.6	3530	A102_10.6 S1 M1LA4	A102_10.6 P80 BN80A4



### 2.9.6 0.75 kW

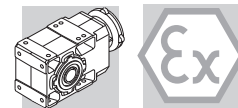
0.75 kW						
$n_2$ min <sup>-1</sup>	$M_2$ Nm	S	i	$Rn_2$ N		 IEC 
3.2	1990	1.0	438.4	30000	A604_438.4 S2 M2SA4	A604_438.4 P80 BN80B4
3.5	1837	1.1	404.7	30000	A604_404.7 S2 M2SA4	A604_404.7 P80 BN80B4
4.0	1594	1.3	351.2	30000	A604_351.2 S2 M2SA4	A604_351.2 P80 BN80B4
4.3	1472	1.3	324.2	30000	A604_324.2 S2 M2SA4	A604_324.2 P80 BN80B4
4.9	1300	1.5	286.3	30000	A604_286.3 S2 M2SA4	A604_286.3 P80 BN80B4
5.3	1200	1.5	264.3	30000	A604_264.3 S2 M2SA4	A604_264.3 P80 BN80B4
6.0	1053	1.1	232.0	20000	A504_232.0 S2 M2SA4	A504_232.0 P80 BN80B4
6.2	1026	1.8	226.1	30000	A604_226.1 S2 M2SA4	A604_226.1 P80 BN80B4
6.6	958	1.1	211.0	20000	A504_211.0 S2 M2SA4	A504_211.0 P80 BN80B4
6.7	947	1.8	208.7	30000	A604_208.7 S2 M2SA4	A604_208.7 P80 BN80B4
7.3	887	1.7	190.6	20000	A503_190.6 S2 M2SA4	A503_190.6 P80 BN80B4
7.5	865	2.0	185.8	30000	A603_185.8 S2 M2SA4	A603_185.8 P80 BN80B4
8.1	807	1.8	173.4	20000	A503_173.4 S2 M2SA4	A503_173.4 P80 BN80B4
8.2	798	2.0	171.5	30000	A603_171.5 S2 M2SA4	A603_171.5 P80 BN80B4
9.0	726	2.6	156.0	30000	A603_156.0 S2 M2SA4	A603_156.0 P80 BN80B4
9.1	720	2.1	154.6	20000	A503_154.6 S2 M2SA4	A503_154.6 P80 BN80B4

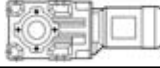



0.75 kW						
$n_2$ min <sup>-1</sup>	$M_2$ Nm	S	i	$Rn_2$ N		
9.5	684	1.2	146.9	15000	A413_146.9 S2 M2SA4	A413_146.9 P80 BN80B4
9.7	671	2.6	144.0	30000	A603_144.0 S2 M2SA4	A603_144.0 P80 BN80B4
10.0	655	2.3	140.6	20000	A503_140.6 S2 M2SA4	A503_140.6 P80 BN80B4
10.8	604	2.5	129.7	20000	A503_129.7 S2 M2SA4	A503_129.7 P80 BN80B4
11.9	549	2.7	118.0	20000	A503_118.0 S2 M2SA4	A503_118.0 P80 BN80B4
12.1	539	1.5	115.9	15000	A413_115.9 S2 M2SA4	A413_115.9 P80 BN80B4
12.8	509	2.9	109.4	20000	A503_109.4 S2 M2SA4	A503_109.4 P80 BN80B4
14.1	463	3.2	99.5	20000	A503_99.5 S2 M2SA4	A503_99.5 P80 BN80B4
15.1	432	1.7	92.8	15000	A413_92.8 S2 M2SA4	A413_92.8 P80 BN80B4
15.6	417	3.6	89.5	20000	A503_89.5 S2 M2SA4	A503_89.5 P80 BN80B4
17.2	379	4.0	81.5	20000	A503_81.5 S2 M2SA4	A503_81.5 P80 BN80B4
17.7	381	1.7	79.2	15000	A412_79.2 S2 M2SA4	A412_79.2 P80 BN80B4
21.2	318	1.2	66.0	8360	A302_66.0 S2 M2SA4	A302_66.0 P80 BN80B4
21.8	309	2.1	64.2	15000	A412_64.2 S2 M2SA4	A412_64.2 P80 BN80B4
26.3	256	2.4	53.1	15000	A412_53.1 S2 M2SA4	A412_53.1 P80 BN80B4
26.6	253	1.5	52.7	7990	A302_52.7 S2 M2SA4	A302_52.7 P80 BN80B4
31	217	2.7	45.1	15000	A412_45.1 S2 M2SA4	A412_45.1 P80 BN80B4
32	209	1.7	43.4	7660	A302_43.4 S2 M2SA4	A302_43.4 P80 BN80B4
32	208	1.2	43.2	5060	A202_43.2 S2 M2SA4	A202_43.2 P80 BN80B4
38	176	2.0	36.6	7360	A302_36.6 S2 M2SA4	A302_36.6 P80 BN80B4
39	173	3.2	35.9	14700	A412_35.9 S2 M2SA4	A412_35.9 P80 BN80B4
40	170	1.3	35.4	4890	A202_35.4 S2 M2SA4	A202_35.4 P80 BN80B4
48	141	2.3	29.3	6960	A302_29.3 S2 M2SA4	A302_29.3 P80 BN80B4
48	141	1.5	29.2	4710	A202_29.2 S2 M2SA4	A202_29.2 P80 BN80B4
49	137	1.1	28.6	4200	A102_28.6 S2 M2SA4	A102_28.6 P80 BN80B4
49	136	3.7	28.3	13700	A412_28.3 S2 M2SA4	A412_28.3 P80 BN80B4
59	114	1.2	23.8	4070	A102_23.8 S2 M2SA4	A102_23.8 P80 BN80B4
61	111	1.8	23.1	4480	A202_23.1 S2 M2SA4	A202_23.1 P80 BN80B4
62	109	2.7	22.8	6520	A302_22.8 S2 M2SA4	A302_22.8 P80 BN80B4
75	89	1.4	18.6	3880	A102_18.6 S2 M2SA4	A102_18.6 P80 BN80B4
77	87	2.1	18.1	4230	A202_18.1 S2 M2SA4	A202_18.1 P80 BN80B4
78	86	3.2	18.0	6110	A302_18.0 S2 M2SA4	A302_18.0 P80 BN80B4
99	68	2.5	14.1	3970	A202_14.1 S2 M2SA4	A202_14.1 P80 BN80B4
101	67	1.7	13.9	3640	A102_13.9 S2 M2SA4	A102_13.9 P80 BN80B4
103	65	4.0	13.6	5640	A302_13.6 S2 M2SA4	A302_13.6 P80 BN80B4
133	51	2.1	10.6	3400	A102_10.6 S2 M2SA4	A102_10.6 P80 BN80B4
135	50	3.1	10.3	3660	A202_10.3 S2 M2SA4	A202_10.3 P80 BN80B4



### 2.9.7 1.1 kW

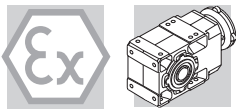
1.1 kW						
$n_2$ min <sup>-1</sup>	$M_2$ Nm	S	i	$Rn_2$ N		
4.9	1911	1.0	286.3	30000	A604_286.3 S2 M2SB4	A604_286.3 P80 BN80C4
5.3	1764	1.0	264.3	30000	A604_264.3 S2 M2SB4	A604_264.3 P80 BN80C4
6.2	1509	1.2	226.1	30000	A604_226.1 S2 M2SB4	A604_226.1 P80 BN80C4
6.7	1393	1.2	208.7	30000	A604_208.7 S2 M2SB4	A604_208.7 P80 BN80C4
7.5	1268	1.4	185.8	30000	A603_185.8 S2 M2SB4	A603_185.8 P90 BN90S4
8.2	1171	1.3	171.5	30000	A603_171.5 S2 M2SB4	A603_171.5 P90 BN90S4
9.0	1066	1.8	156.0	30000	A603_156.0 S2 M2SB4	A603_156.0 P90 BN90S4
9.1	1056	1.4	154.6	20000	A503_154.6 S2 M2SB4	A503_154.6 P90 BN90S4
9.7	984	1.8	144.0	30000	A603_144.0 S2 M2SB4	A603_144.0 P90 BN90S4
10.0	960	1.6	140.6	20000	A503_140.6 S2 M2SB4	A503_140.6 P90 BN90S4
10.5	910	2.9	133.3	30000	A603_133.3 S2 M2SB4	A603_133.3 P90 BN90S4
10.8	885	1.7	129.7	20000	A503_129.7 S2 M2SB4	A503_129.7 P90 BN90S4
11.4	840	3.0	123.0	30000	A603_123.0 S2 M2SB4	A603_123.0 P90 BN90S4
11.9	805	1.9	118.0	20000	A503_118.0 S2 M2SB4	A503_118.0 P90 BN90S4
12.8	747	2.0	109.4	20000	A503_109.4 S2 M2SB4	A503_109.4 P90 BN90S4
13.0	736	3.8	107.8	30000	A603_107.8 S2 M2SB4	A603_107.8 P90 BN90S4
14.1	680	2.2	99.5	20000	A503_99.5 S2 M2SB4	A503_99.5 P90 BN90S4





1.1 kW						
$n_2$ min <sup>-1</sup>	$M_2$ Nm	<b>S</b>	<b>i</b>	$Rn_2$ N		
15.1	633	1.2	92.8	15000	A413_92.8 S2 M2SB4	A413_92.8 P90 BN90S4
15.6	611	2.5	89.5	20000	A503_89.5 S2 M2SB4	A503_89.5 P90 BN90S4
17.2	556	2.7	81.5	20000	A503_81.5 S2 M2SB4	A503_81.5 P90 BN90S4
17.7	559	1.2	79.2	15000	A412_79.2 S2 M2SB4	A412_79.2 P90 BN90S4
19.9	480	3.1	70.2	20000	A503_70.2 S2 M2SB4	A503_70.2 P90 BN90S4
21.8	453	1.4	64.2	15000	A412_64.2 S2 M2SB4	A412_64.2 P90 BN90S4
21.9	436	3.3	63.9	20000	A503_63.9 S2 M2SB4	A503_63.9 P90 BN90S4
24.6	388	3.6	56.8	20000	A503_56.8 S2 M2SB4	A503_56.8 P90 BN90S4
26.3	375	1.6	53.1	15000	A412_53.1 S2 M2SB4	A412_53.1 P90 BN90S4
26.6	372	1.0	52.7	7310	A302_52.7 S2 M2SB4	A302_52.7 P90 BN90S4
27.1	353	3.8	51.7	20000	A503_51.7 S2 M2SB4	A503_51.7 P90 BN90S4
31	318	1.8	45.1	15000	A412_45.1 S2 M2SB4	A412_45.1 P90 BN90S4
32	306	1.2	43.4	7100	A302_43.4 S2 M2SB4	A302_43.4 P90 BN90S4
38	258	1.3	36.6	6880	A302_36.6 S2 M2SB4	A302_36.6 P90 BN90S4
39	253	2.2	35.9	14300	A412_35.9 S2 M2SB4	A412_35.9 P90 BN90S4
48	207	1.6	29.3	6580	A302_29.3 S2 M2SB4	A302_29.3 P90 BN90S4
48	206	1.0	29.2	4290	A202_29.2 S2 M2SB4	A202_29.2 P90 BN90S4
49	200	2.5	28.3	13300	A412_28.3 S2 M2SB4	A412_28.3 P90 BN90S4
61	163	1.2	23.1	4140	A202_23.1 S2 M2SB4	A202_23.1 P90 BN90S4
62	160	1.9	22.8	6220	A302_22.8 S2 M2SB4	A302_22.8 P90 BN90S4
62	160	3.0	22.7	12500	A412_22.7 S2 M2SB4	A412_22.7 P90 BN90S4
77	128	1.4	18.1	3970	A202_18.1 S2 M2SB4	A202_18.1 P90 BN90S4
78	127	2.2	18.0	5880	A302_18.0 S2 M2SB4	A302_18.0 P90 BN90S4
79	125	3.5	17.8	11700	A412_17.8 S2 M2SB4	A412_17.8 P90 BN90S4
99	99	1.7	14.1	3770	A202_14.1 S2 M2SB4	A202_14.1 P90 BN90S4
101	98	1.2	13.9	3380	A102_13.9 S2 M2SB4	A102_13.9 P90 BN90S4
103	96	2.7	13.6	5460	A302_13.6 S2 M2SB4	A302_13.6 P90 BN90S4
133	74	1.4	10.6	3210	A102_10.6 S2 M2SB4	A102_10.6 P90 BN90S4
134	74	3.3	10.5	5090	A302_10.5 S2 M2SB4	A302_10.5 P90 BN90S4
135	73	2.1	10.3	3510	A202_10.3 S2 M2SB4	A202_10.3 P90 BN90S4



## 2.9.8 1.5 kW

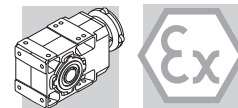
1.5 kW						
$n_2$ min <sup>-1</sup>	$M_2$ Nm	<b>S</b>	<b>i</b>	$Rn_2$ N		
9.0	1443	1.3	156.0	30000	A603_156.0 S3 M3SA4	A603_156.0 P90 BN90LA4
9.1	1429	1.0	154.6	20000	A503_154.6 S3 M3SA4	A503_154.6 P90 BN90LA4
9.8	1332	1.3	144.0	30000	A603_144.0 S3 M3SA4	A603_144.0 P90 BN90LA4
10.0	1300	1.2	140.6	20000	A503_140.6 S3 M3SA4	A503_140.6 P90 BN90LA4
10.6	1232	2.2	133.3	30000	A603_133.3 S3 M3SA4	A603_133.3 P90 BN90LA4
10.9	1199	1.3	129.7	20000	A503_129.7 S3 M3SA4	A503_129.7 P90 BN90LA4
11.5	1137	2.2	123.0	30000	A603_123.0 S3 M3SA4	A603_123.0 P90 BN90LA4
12.0	1090	1.4	118.0	20000	A503_118.0 S3 M3SA4	A503_118.0 P90 BN90LA4
12.9	1012	1.5	109.4	20000	A503_109.4 S3 M3SA4	A503_109.4 P90 BN90LA4
13.1	997	2.8	107.8	30000	A603_107.8 S3 M3SA4	A603_107.8 P90 BN90LA4
14.2	920	1.6	99.5	20000	A503_99.5 S3 M3SA4	A503_99.5 P90 BN90LA4
14.2	920	3.0	99.5	30000	A603_99.5 S3 M3SA4	A603_99.5 P90 BN90LA4
15.7	828	1.8	89.5	20000	A503_89.5 S3 M3SA4	A503_89.5 P90 BN90LA4
16.3	798	3.5	86.4	30000	A603_86.4 S3 M3SA4	A603_86.4 P90 BN90LA4
17.3	753	2.0	81.5	20000	A503_81.5 S3 M3SA4	A503_81.5 P90 BN90LA4
17.7	737	3.8	79.7	30000	A603_79.7 S3 M3SA4	A603_79.7 P90 BN90LA4
20.1	649	2.3	70.2	20000	A503_70.2 S3 M3SA4	A503_70.2 P90 BN90LA4
22.0	613	1.1	64.2	15000	A412_64.2 S3 M3SA4	A412_64.2 P90 BN90LA4
22.1	591	2.4	63.9	20000	A503_63.9 S3 M3SA4	A503_63.9 P90 BN90LA4
24.8	525	2.6	56.8	20000	A503_56.8 S3 M3SA4	A503_56.8 P90 BN90LA4
26.5	508	1.2	53.1	15000	A412_53.1 S3 M3SA4	A412_53.1 P90 BN90LA4
27.3	478	2.8	51.7	19700	A503_51.7 S3 M3SA4	A503_51.7 P90 BN90LA4
31	430	1.3	45.1	14600	A412_45.1 S3 M3SA4	A412_45.1 P90 BN90LA4
31	416	3.1	45.0	19000	A503_45.0 S3 M3SA4	A503_45.0 P90 BN90LA4





1.5 kW						
$n_2$ min <sup>-1</sup>	$M_2$ Nm	<b>S</b>	<b>i</b>	$Rn_2$ N		
34	378	3.2	40.9	18600	A503_ 40.9 S3 M3SA4	A503_ 40.9 P90 BN90LA4
39	343	1.6	35.9	13800	A412_ 35.9 S3 M3SA4	A412_ 35.9 P90 BN90LA4
40	329	3.6	35.6	18000	A503_ 35.6 S3 M3SA4	A503_ 35.6 P90 BN90LA4
44	299	3.8	32.4	17500	A503_ 32.4 S3 M3SA4	A503_ 32.4 P90 BN90LA4
48	280	1.2	29.3	6140	A302_ 29.3 S3 M3SA4	A302_ 29.3 P90 BN90LA4
50	270	1.9	28.3	13000	A412_ 28.3 S3 M3SA4	A412_ 28.3 P90 BN90LA4
62	217	1.4	22.8	5870	A302_ 22.8 S3 M3SA4	A302_ 22.8 P90 BN90LA4
62	217	2.2	22.7	12200	A412_ 22.7 S3 M3SA4	A412_ 22.7 P90 BN90LA4
78	173	1.1	18.1	3660	A202_ 18.1 S3 M3SA4	A202_ 18.1 P90 BN90LA4
78	172	1.6	18.0	5600	A302_ 18.0 S3 M3SA4	A302_ 18.0 P90 BN90LA4
79	170	2.6	17.8	11400	A412_ 17.8 S3 M3SA4	A412_ 17.8 P90 BN90LA4
100	134	1.3	14.1	3530	A202_ 14.1 S3 M3SA4	A202_ 14.1 P90 BN90LA4
102	131	3.1	13.8	10600	A412_ 13.8 S3 M3SA4	A412_ 13.8 P90 BN90LA4
104	130	2.0	13.6	5250	A302_ 13.6 S3 M3SA4	A302_ 13.6 P90 BN90LA4
134	101	1.0	10.6	2990	A102_ 10.6 S3 M3SA4	A102_ 10.6 P90 BN90LA4
135	100	2.4	10.5	4930	A302_ 10.5 S3 M3SA4	A302_ 10.5 P90 BN90LA4
136	99	1.6	10.3	3330	A202_ 10.3 S3 M3SA4	A202_ 10.3 P90 BN90LA4
139	97	3.9	10.1	9680	A412_ 10.1 S3 M3SA4	A412_ 10.1 P90 BN90LA4

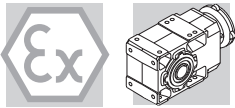
### 2.9.9 2.2 kW

2.2 kW						
$n_2$ min <sup>-1</sup>	$M_2$ Nm	<b>S</b>	<b>i</b>	$Rn_2$ N		
10.6	1807	1.5	133.3	30000	A603_ 133.3 S3 M3LA4	A603_ 133.3 P100 BN100LA4
11.5	1668	1.5	123.0	30000	A603_ 123.0 S3 M3LA4	A603_ 123.0 P100 BN100LA4
12.9	1484	1.0	109.4	20000	A503_ 109.4 S3 M3LA4	A503_ 109.4 P100 BN100LA4
13.1	1462	1.9	107.8	30000	A603_ 107.8 S3 M3LA4	A603_ 107.8 P100 BN100LA4
14.2	1350	1.1	99.5	20000	A503_ 99.5 S3 M3LA4	A503_ 99.5 P100 BN100LA4
14.2	1349	2.1	99.5	30000	A603_ 99.5 S3 M3LA4	A603_ 99.5 P100 BN100LA4
15.7	1214	1.2	89.5	19800	A503_ 89.5 S3 M3LA4	A503_ 89.5 P100 BN100LA4
16.3	1171	2.4	86.4	30000	A603_ 86.4 S3 M3LA4	A603_ 86.4 P100 BN100LA4
17.3	1104	1.4	81.5	19600	A503_ 81.5 S3 M3LA4	A503_ 81.5 P100 BN100LA4
17.7	1081	2.6	79.7	30000	A603_ 79.7 S3 M3LA4	A603_ 79.7 P100 BN100LA4
20.0	955	2.9	70.4	30000	A603_ 70.4 S3 M3LA4	A603_ 70.4 P100 BN100LA4
20.1	952	1.5	70.2	19300	A503_ 70.2 S3 M3LA4	A503_ 70.2 P100 BN100LA4
21.7	881	3.2	65.0	30000	A603_ 65.0 S3 M3LA4	A603_ 65.0 P100 BN100LA4
22.1	866	1.7	63.9	19000	A503_ 63.9 S3 M3LA4	A503_ 63.9 P100 BN100LA4
24.8	770	1.8	56.8	18600	A503_ 56.8 S3 M3LA4	A503_ 56.8 P100 BN100LA4
25.4	754	3.7	55.6	30000	A603_ 55.6 S3 M3LA4	A603_ 55.6 P100 BN100LA4
27.3	701	1.9	51.7	18300	A503_ 51.7 S3 M3LA4	A503_ 51.7 P100 BN100LA4
31	610	2.1	45.0	17900	A503_ 45.0 S3 M3LA4	A503_ 45.0 P100 BN100LA4
34	555	2.2	40.9	17500	A503_ 40.9 S3 M3LA4	A503_ 40.9 P100 BN100LA4
39	503	1.1	35.9	13100	A412_ 35.9 S3 M3LA4	A412_ 35.9 P100 BN100LA4
40	483	2.4	35.6	17000	A503_ 35.6 S3 M3LA4	A503_ 35.6 P100 BN100LA4
44	439	2.6	32.4	16600	A503_ 32.4 S3 M3LA4	A503_ 32.4 P100 BN100LA4
50	397	1.3	28.3	12400	A412_ 28.3 S3 M3LA4	A412_ 28.3 P100 BN100LA4
53	358	2.9	26.4	15900	A503_ 26.4 S3 M3LA4	A503_ 26.4 P100 BN100LA4
59	326	3.1	24.0	15500	A503_ 24.0 S3 M3LA4	A503_ 24.0 P100 BN100LA4
62	318	1.5	22.7	11700	A412_ 22.7 S3 M3LA4	A412_ 22.7 P100 BN100LA4
67	293	3.0	20.9	15800	A502_ 20.9 S3 M3LA4	A502_ 20.9 P100 BN100LA4
78	252	1.1	18.0	5140	A302_ 18.0 S3 M3LA4	A302_ 18.0 P100 BN100LA4
79	249	1.8	17.8	11000	A412_ 17.8 S3 M3LA4	A412_ 17.8 P100 BN100LA4
85	232	3.6	16.6	14800	A502_ 16.6 S3 M3LA4	A502_ 16.6 P100 BN100LA4
102	193	2.1	13.8	10300	A412_ 13.8 S3 M3LA4	A412_ 13.8 P100 BN100LA4
104	190	1.4	13.6	4900	A302_ 13.6 S3 M3LA4	A302_ 13.6 P100 BN100LA4
135	146	1.6	10.5	4660	A302_ 10.5 S3 M3LA4	A302_ 10.5 P100 BN100LA4
136	145	1.1	10.3	3030	A202_ 10.3 S3 M3LA4	A202_ 10.3 P100 BN100LA4
139	142	2.6	10.1	9400	A412_ 10.1 S3 M3LA4	A412_ 10.1 P100 BN100LA4



## 2.9.10 3 kW

3 kW						
$n_2$ min <sup>-1</sup>	$M_2$ Nm	S	i	$Rn_2$ N		
16.3	1597	1.8	86.4	30000	A603_86.4 S3 M3LB4	A603_86.4 P100 BN100LB4
17.7	1474	1.9	79.7	30000	A603_79.7 S3 M3LB4	A603_79.7 P100 BN100LB4
20.0	1302	2.2	70.4	30000	A603_70.4 S3 M3LB4	A603_70.4 P100 BN100LB4
20.1	1299	1.1	70.2	17200	A503_70.2 S3 M3LB4	A503_70.2 P100 BN100LB4
21.7	1202	2.3	65.0	30000	A603_65.0 S3 M3LB4	A603_65.0 P100 BN100LB4
22.1	1181	1.2	63.9	17100	A503_63.9 S3 M3LB4	A503_63.9 P100 BN100LB4
24.8	1050	1.3	56.8	17000	A503_56.8 S3 M3LB4	A503_56.8 P100 BN100LB4
25.4	1028	2.7	55.6	30000	A603_55.6 S3 M3LB4	A603_55.6 P100 BN100LB4
27.3	956	1.4	51.7	16800	A503_51.7 S3 M3LB4	A503_51.7 P100 BN100LB4
27.5	949	3.0	51.3	30000	A603_51.3 S3 M3LB4	A603_51.3 P100 BN100LB4
31	836	3.4	45.2	30000	A603_45.2 S3 M3LB4	A603_45.2 P100 BN100LB4
31	832	1.6	45.0	16500	A503_45.0 S3 M3LB4	A503_45.0 P100 BN100LB4
34	771	3.6	41.7	30000	A603_41.7 S3 M3LB4	A603_41.7 P100 BN100LB4
34	757	1.6	40.9	16300	A503_40.9 S3 M3LB4	A503_40.9 P100 BN100LB4
40	658	1.8	35.6	16000	A503_35.6 S3 M3LB4	A503_35.6 P100 BN100LB4
44	599	1.9	32.4	15700	A503_32.4 S3 M3LB4	A503_32.4 P100 BN100LB4
53	489	2.2	26.4	15100	A503_26.4 S3 M3LB4	A503_26.4 P100 BN100LB4
59	445	2.3	24.0	14800	A503_24.0 S3 M3LB4	A503_24.0 P100 BN100LB4
62	433	1.1	22.7	11200	A412_22.7 S3 M3LB4	A412_22.7 P100 BN100LB4
67	400	2.2	20.9	15500	A502_20.9 S3 M3LB4	A502_20.9 P100 BN100LB4
79	339	1.3	17.8	10600	A412_17.8 S3 M3LB4	A412_17.8 P100 BN100LB4
85	316	2.6	16.6	14500	A502_16.6 S3 M3LB4	A502_16.6 P100 BN100LB4
102	263	1.6	13.8	9990	A412_13.8 S3 M3LB4	A412_13.8 P100 BN100LB4
104	259	1.0	13.6	4500	A302_13.6 S3 M3LB4	A302_13.6 P100 BN100LB4
108	250	3.1	13.1	13600	A502_13.1 S3 M3LB4	A502_13.1 P100 BN100LB4
135	200	1.2	10.5	4350	A302_10.5 S3 M3LB4	A302_10.5 P100 BN100LB4
139	193	1.9	10.1	9230	A412_10.1 S3 M3LB4	A412_10.1 P100 BN100LB4



## 2.10 RATING CHARTS

### 2.10.1 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)

		$n_1 = 1400 \text{ min}^{-1}$				
		$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW	$Rn_2$ N	
2D3D-130—2G3G-T4	2D3D-160—2G3G-T3	A102_10.6	132	105	1.5	2590
		A102_13.1	101	115	1.3	2960
		A102_18.6	75	125	1.0	3380
		A102_23.8	59	135	0.87	3780
		A102_28.6	49	145	0.78	4100
		A102_35.1	40	150	0.66	4470
		A102_45.2	31	150	0.51	4980
		A102_51.3	27.3	150	0.45	5240
		A102_65.9	21.2	135	0.32	5500
		A102_76.4	18.3	120	0.24	5500
		A102_91.6	15.3	100	0.17	5500

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**

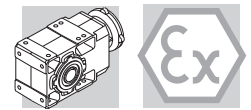
In zones **1** and **2** with temperature class limit **T4** (135°C)

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




### 2.10.2 A 10 - ATEX

		$n_1 = 1400 \text{ min}^{-1}$				$n_1 = 1400 \text{ min}^{-1}$					
		$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW	$Rn_2$ N		$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW		$Rn_2$ N
2D3D-130—2G3G-T4	A102_10.6	132	105	1.5	590						
	A102_13.9	101	115	1.3	2960						
	A102_18.6	75	125	1.0	3380						
	A102_23.8	59	135	0.87	3780						
	A102_28.6	49	145	0.79	4100						
	A102_35.1	40	150	0.67	4470						
	A102_45.4	31	150	0.52	4980						
	A102_51.3	27.3	150	0.46	5240						
	A102_65.9	21.2	135	0.32	5500						
	A102_76.4	18.3	120	0.24	5500						
	A102_91.6	15.3	100	0.17	5500						








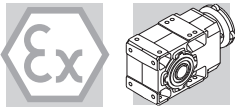
### 2.10.3 A 20 - ATEX

 IEC		$n_1 = 1400 \text{ min}^{-1}$						$n_1 = 1400 \text{ min}^{-1}$						
		$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW	$Rn_2$ N			$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW	$Rn_1$ N	$Rn_2$ N		
<b>2D3D-130—2G3G-T4</b>	<b>2D3D-160—2G3G-T3</b>	A202_10.3	136	155	2.3	2520	<b>2G3G-T4</b>	<b>2G3G-T3</b>	A202_10.3	136	155	2.3	(-)	2520
		A202_14.1	99	170	1.9	2820			A202_14.1	99	170	1.9	(-)	2820
		A202_18.1	77	185	1.6	3170			A202_18.1	77	185	1.6	90	3170
		A202_23.1	61	200	1.3	3580			A202_23.1	61	200	1.4	240	3580
		A202_29.2	48	215	1.1	4000			A202_29.2	48	215	1.1	390	4000
		A202_35.4	40	225	0.98	4380			A202_35.4	40	225	0.99	530	4380
		A202_43.2	32	240	0.86	4790			A202_43.2	32	240	0.87	610	4790
		A202_53.7	26.1	250	0.72	5270			A202_53.7	26.1	250	0.73	650	5270
		A202_63.1	22.2	185	0.45	5680			A202_63.1	22.2	185	0.46	770	5680
		A202_79.9	17.5	165	0.32	6200			A202_79.9	17.5	165	0.32	1120	6200
		A202_92.3	15.2	150	0.25	6200			A202_92.3	15.2	150	0.25	1230	6200
		A203_120.5	11.6	210	0.28	6200								
		A203_146.1	9.6	230	0.25	6200								
		A203_178.3	7.9	245	0.22	6200								
		A203_221.3	6.3	250	0.18	6200								
		A203_260.5	5.4	235	0.14	6200								
		A203_329.4	4.3	205	0.10	6200								
		A203_380.8	3.7	185	0.08	6200								



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

### 2.10.4 A 30 - ATEX

 IEC		$n_1 = 1400 \text{ min}^{-1}$						$n_1 = 1400 \text{ min}^{-1}$						
		$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW	$Rn_2$ N			$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW	$Rn_1$ N	$Rn_2$ N		
<b>2D3D-130—2G3G-T4</b>	<b>2D3D-160—2G3G-T3</b>	A302_10.5	133	240	3.6	3550	<b>2G3G-T4</b>	<b>2G3G-T3</b>	A302_10.5	136	240	3.6	980	3550
		A302_13.6	103	260	3.0	3870			A302_13.6	99	260	2.9	1080	3870
		A302_18.0	78	280	2.4	4290			A302_18.0	77	280	2.4	1160	4290
		A302_22.8	61	300	2.1	4770			A302_22.8	61	300	2.0	1350	4770
		A302_29.3	48	325	1.7	5400			A302_29.3	48	325	1.7	1600	5400
		A302_36.6	38	345	1.5	6010			A302_36.6	40	345	1.5	1740	6010
		A302_43.4	32	365	1.3	6490			A302_43.4	32	365	1.3	1730	6490
		A302_52.7	26.6	385	1.1	7080			A302_52.7	26.1	385	1.1	1730	7080
		A302_66.0	21.2	390	0.9	7940			A302_66.0	22.2	390	1.0	1730	7940
		A302_76.5	18.3	270	0.6	8690			A302_76.5	17.5	270	0.5	1780	8690
		A302_97.5	14.4	225	0.4	9600			A302_97.5	15.2	225	0.4	1780	9600
		A303_120.5	11.6	300	0.40	9600								
		A303_150.7	9.3	330	0.35	9600								
		A303_178.5	7.8	345	0.31	9600								
		A303_216.6	6.5	360	0.27	9600								
		A303_271.5	5.2	380	0.23	9600								
		A303_314.5	4.5	340	0.17	9600								
		A303_400.8	3.5	280	0.11	9600								



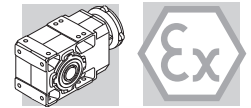
## 2.10.5 A 41 - ATEX

 IEC		$n_1 = 1400 \text{ min}^{-1}$						$n_1 = 1400 \text{ min}^{-1}$						
		$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW	$Rn_2$ N			$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW	$Rn_1$ N	$Rn_2$ N		
2D3D-130—2G3G-T4	2D3D-160—2G3G-T3	A412_10.1	139	375	5.8	7650	2G3G-T4	2G3G-T3	A412_10.1	139	375	5.8	2050	7650
		A412_13.8	101	410	4.6	8510			A412_13.8	101	410	4.6	2170	8510
		A412_17.8	79	440	3.9	9300			A412_17.8	79	440	3.9	2330	9300
		A412_22.7	62	475	3.3	10100			A412_22.7	62	475	3.3	2220	10100
		A412_28.3	49	505	2.8	10900			A412_28.3	49	505	2.8	2130	10900
		A412_35.9	39	545	2.4	11800			A412_35.9	39	545	2.4	2030	11800
		A412_45.1	31	580	2.0	12800			A412_45.1	31	580	2.0	1950	12800
		A412_53.1	26.4	610	1.8	13700			A412_53.1	26.4	610	1.8	1950	13700
		A412_64.2	21.8	645	1.6	14000			A412_64.2	21.8	645	1.6	2080	14000
		A412_79.2	17.7	645	1.3	15000			A412_79.2	17.7	645	1.3	2380	15000
		A413_92.8	15.1	750	1.3	15000			A413_92.8	15.1	750	1.3	(-)	15000
		A413_115.9	12.1	795	1.1	15000			A413_115.9	12.1	795	1.1	(-)	15000
		A413_146.9	9.5	845	0.93	15000			A413_146.9	9.5	845	0.93	530	15000
		A413_184.4	7.6	850	0.74	15000			A413_184.4	7.6	850	0.74	1040	15000
		A413_217.4	6.4	850	0.63	15000			A413_217.4	6.4	850	0.63	1270	15000
		A413_262.5	5.3	850	0.52	15000			A413_262.5	5.3	850	0.52	1310	15000
A413_324.2	4.3	795	0.40	15000	A413_324.2	4.3	795	0.40	1370	15000				
A413_376.8	3.7	545	0.23	15000	A413_376.8	3.7	545	0.23	1430	15000				

■ Ratings shaded in green, for units in the **US** version, are to be limited to **680 Nm**.

For same units, the admissible kW rating «  $Pn_1$  » must be recalculated according to:  $Pn_1(\text{US}) = Pn_1 \times (680/Mn_2)$

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



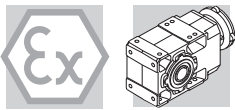
## 2.10.6 A 50 - ATEX

IEC		$n_1 = 1400 \text{ min}^{-1}$						$n_1 = 1400 \text{ min}^{-1}$						
		$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW	$Rn_2$ N			$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW	$Rn_1$ N	$Rn_2$ N		
2D3D-130—2G3G-T4	2D3D-160—2G3G-T3	A502_13.1	107	770	9.2	12100	2G3G-T4	2G3G-T3	A502_13.1	107	670	8.0	(-)	12100
		A502_16.6	84	830	7.8	13000			A502_16.6	84	730	6.9	(-)	13000
		A502_20.9	67	890	6.6	14100			A502_20.9	67	750	5.6	170	14100
		A503_24.0	58	1020	6.8	8540			A503_24.0	58	1020	6.8	790	8540
		A503_26.4	53	1055	6.4	9100			A503_26.4	53	1055	6.4	1420	9100
		A503_32.4	43	1135	5.6	10400			A503_32.4	43	1135	5.6	1480	10400
		A503_35.6	39	1170	5.3	11000			A503_35.6	39	1170	5.3	2050	11000
		A503_40.9	34	1230	4.8	11900			A503_40.9	34	1230	4.8	1920	11900
		A503_45.0	31	1290	4.6	12600			A503_45.0	31	1290	4.6	2130	12600
		A503_51.7	27.1	1350	4.2	13600			A503_51.7	27.1	1350	4.2	1700	13600
		A503_56.8	24.6	1385	3.9	14400			A503_56.8	24.6	1385	3.9	2020	14400
		A503_63.9	21.9	1440	3.6	15300			A503_63.9	21.9	1440	3.6	1610	15300
		A503_70.2	19.9	1475	3.4	16100			A503_70.2	19.9	1475	3.4	1930	16100
		A503_81.5	17.2	1500	3.0	17300			A503_81.5	17.2	1500	3.0	1670	17300
		A503_89.5	15.6	1500	2.7	18200			A503_89.5	15.6	1500	2.7	2100	18200
		A503_99.5	14.1	1500	2.4	19200			A503_99.5	14.1	1500	2.4	1770	19200
		A503_109.4	12.8	1500	2.2	20000			A503_109.4	12.8	1500	2.2	2180	20000
		A503_118.0	11.9	1500	2.0	20000			A503_118.0	11.9	1500	2.0	1900	20000
		A503_129.7	10.8	1500	1.9	20000			A503_129.7	10.8	1500	1.9	2300	20000
		A503_140.6	10.0	1500	1.7	20000			A503_140.6	10.0	1500	1.7	1940	20000
		A503_154.6	9.1	1500	1.6	20000			A503_154.6	9.1	1500	1.6	2340	20000
		A503_173.4	8.1	1420	1.3	20000			A503_173.4	8.1	1420	1.3	2220	20000
		A503_190.6	7.3	1500	1.3	20000			A503_190.6	7.3	1500	1.3	2380	20000
		A504_211.0	6.6	1065	0.83	20000			A504_211.0	6.6	1065	0.83	1500	20000
		A504_232.0	6.0	1150	0.82	20000			A504_232.0	6.0	1150	0.82	1510	20000
		A504_260.9	5.4	1115	0.70	20000			A504_260.9	5.4	1115	0.70	1580	20000
		A504_286.8	4.9	1205	0.69	20000			A504_286.8	4.9	1205	0.69	1590	20000
		A504_332.6	4.2	1175	0.58	20000			A504_332.6	4.2	1175	0.58	1660	20000
		A504_365.6	3.8	1270	0.57	20000			A504_365.6	3.8	1270	0.57	1660	20000
		A504_406.4	3.4	1210	0.49	20000			A504_406.4	3.4	1210	0.49	1700	20000
		A504_446.8	3.1	1305	0.48	20000			A504_446.8	3.1	1305	0.48	1700	20000
		A504_481.6	2.9	1245	0.43	20000			A504_481.6	2.9	1245	0.43	1700	20000
A504_529.5	2.6	1345	0.42	20000	A504_529.5	2.6	1345	0.42	1700	20000				
A504_574.2	2.4	1265	0.36	20000	A504_574.2	2.4	1265	0.36	1700	20000				
A504_631.2	2.2	1365	0.36	20000	A504_631.2	2.2	1365	0.36	1700	20000				
A504_707.9	2.0	1280	0.30	20000	A504_707.9	2.0	1280	0.30	1700	20000				
A504_778.2	1.8	1385	0.29	20000	A504_778.2	1.8	1385	0.29	1700	20000				



■ Ratings shaded in green, for units in the **US** version, are to be limited to **1200 Nm**.

For same units, the admissible kW rating « Pn1 » must be recalculated according to:  $Pn_1(\text{US}) = Pn_1 \times (1200/Mn_2)$ .

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

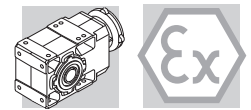


## 2.10.7 A 60 - ATEX

 IEC	$n_1 = 1400 \text{ min}^{-1}$					$n_1 = 1400 \text{ min}^{-1}$								
	$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW	$Rn_2$ N		$n_2$ $\text{min}^{-1}$	$Mn_2$ Nm	$Pn_1$ kW	$Rn_1$ N	$Rn_2$ N				
2D3D-130—2G3G-T4	2D3D-160—2G3G-T3	A602_12.7	110	1625	20.0	30000	2G3G-T3	2G3G-T4	A602_12.7	110	1000	12.3	580	30000
		A602_16.7	84	1770	16.5	30000			A602_16.7	84	1100	10.3	600	30000
		A602_20.6	68	1700	12.9	30000			A602_20.6	68	1150	8.7	670	30000
		A603_25.7	54	2370	14.9	30000			A603_25.7	54	2200	13.8	590	30000
		A603_27.9	50	2485	14.3	30000			A603_27.9	50	2200	12.7	1440	30000
		A603_31.7	44	2555	13.0	30000			A603_31.7	44	2200	11.2	1370	30000
		A603_34.3	41	2645	12.4	30000			A603_34.3	41	2300	10.8	1680	30000
		A603_41.7	34	2800	10.8	30000			A603_41.7	34	2200	8.5	2010	30000
		A603_45.2	31	2800	10.0	30000			A603_45.2	31	2400	8.6	1960	30000
		A603_51.3	27.3	2800	8.8	30000			A603_51.3	27.3	2300	7.2	2060	30000
		A603_55.6	25.2	2800	8.1	30000			A603_55.6	25.2	2500	7.2	2040	30000
		A603_65.0	21.5	2800	6.9	30000			A603_65.0	21.5	2400	5.9	2110	30000
		A603_70.4	19.9	2800	6.4	30000			A603_70.4	19.9	2600	5.9	2110	30000
		A603_79.7	17.6	2800	5.7	30000			A603_79.7	17.6	2500	5.1	2080	30000
		A603_86.4	16.2	2800	5.2	30000			A603_86.4	16.2	2700	5.0	2100	30000
		A603_99.5	14.1	2800	4.5	30000			A603_99.5	14.1	2600	4.2	2020	30000
		A603_107.8	13.0	2800	4.2	30000			A603_107.8	13.0	2800	4.2	2060	30000
		A603_123.0	11.4	2500	3.3	30000			A603_123.0	11.4	2500	3.3	2500	30000
		A603_133.3	10.5	2670	3.2	30000			A603_133.3	10.5	2670	3.2	2590	30000
		A603_144.0	9.7	1740	1.9	30000			A603_144.0	9.7	1740	1.9	3390	30000
		A603_156.0	9.0	1880	1.9	30000			A603_156.0	9.0	1880	1.9	3390	30000
		A603_171.5	8.2	1575	1.5	30000			A603_171.5	8.2	1575	1.5	3460	30000
		A603_185.8	7.5	1715	1.5	30000			A603_185.8	7.5	1715	1.5	3460	30000
		A604_208.7	6.7	1720	1.4	30000			A604_208.7	6.7	1720	1.4	2400	30000
		A604_226.1	6.2	1835	1.3	30000			A604_226.1	6.2	1835	1.3	2410	30000
		A604_264.3	5.3	1810	1.1	30000			A604_264.3	5.3	1810	1.1	2500	30000
		A604_286.3	4.9	1930	1.1	30000			A604_286.3	4.9	1930	1.1	2510	30000
		A604_324.2	4.3	1875	0.95	30000			A604_324.2	4.3	1875	0.95	2580	30000
		A604_351.2	4.0	2000	0.94	30000			A604_351.2	4.0	2000	0.94	2580	30000
		A604_404.7	3.5	1940	0.79	30000			A604_404.7	3.5	1940	0.79	2650	30000
		A604_438.4	3.2	2070	0.78	30000			A604_438.4	3.2	2070	0.78	2650	30000
		A604_500.3	2.8	2000	0.66	30000			A604_500.3	2.8	2000	0.66	2710	30000
A604_542.0	2.6	2135	0.65	30000	A604_542.0	2.6	2135	0.65	2710	30000				
A604_585.8	2.4	2035	0.57	30000	A604_585.8	2.4	2035	0.57	2750	30000				
A604_634.6	2.2	2175	0.56	30000	A604_634.6	2.2	2175	0.56	2750	30000				
A604_697.3	2.0	2040	0.48	30000	A604_697.3	2.0	2040	0.48	2790	30000				
A604_755.4	1.9	2190	0.48	30000	A604_755.4	1.9	2190	0.48	2790	30000				

■ Ratings shaded in green, for units in the **US** version, are to be limited to **2680 Nm**.

For same units, the admissible kW rating « Pn1 » must be recalculated according to:  $Pn_1(US) = Pn_1 \times (2680/Mn_2)$





## 2.11 MOTOR COMBINATIONS

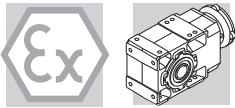
The following table lists the gear ratios for which the motor/gear unit combinations are technically feasible.

The gearmotor must be selected in accordance with the selection procedure given in this catalogue.

**In particular, the condition  $Mn_2 \geq Mr_2 \times fs$  must always be verified.**

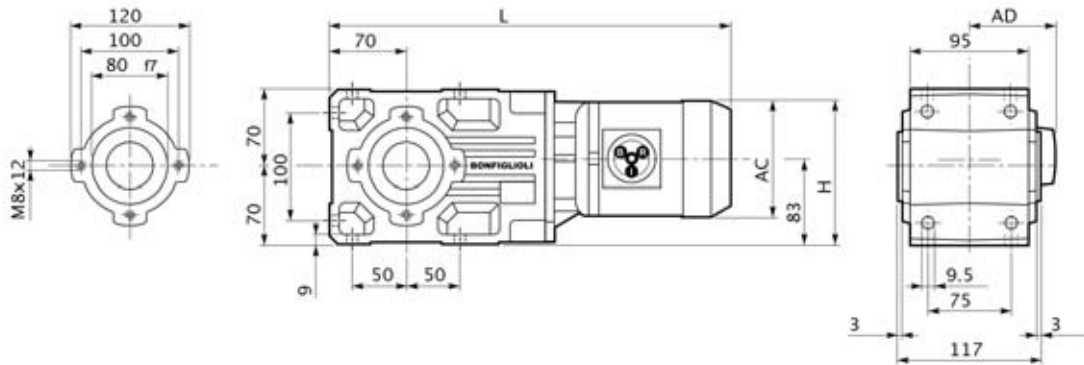
									
	63A	63B	71A	71B	80A	80B	90S	90LA	90LB
A 102	10.6_91.6	10.6_76.4	10.6_65.9	10.6_51.3	10.6_35.1	10.6_28.6	10.6_13.9	10.6	-
A 202	14.1_92.3	14.1_92.3	14.1_79.9	14.1_63.1	10.3_53.7	10.3_35.4	10.3_18.1	10.3_14.1	10.3
A 203	120.5_260.5	120.5_178.3	-	-	-	-	-	-	-
A 302	18.0_97.5	18.0_97.5	18.0_97.5	18.0_76.5	10.5_66.0	10.5_66.0	10.5_52.7	10.5_29.3	10.5_22.8
A 303	120.5_400.8	120.5_314.5	120.5_178.5	-	-	-	-	-	-
A 412	22.7_79.2	22.7_79.2	22.7_79.2	22.7_79.2	10.1_79.2	10.1_79.2	10.1_64.2	10.1_45.1	10.1_35.9
A 413	92.8_376.8	92.8_376.8	92.8_376.8	92.8_324.2	92.8_217.4	92.8_146.9	92.8	-	-
A 502	20.9	20.9	20.9	20.9	13.1_20.9	13.1_20.9	13.1_20.9	13.1_20.9	13.1_20.9
A 503	51.7_190.6	51.7_190.6	51.7_190.6	51.7_190.6	24.0_190.6	24.0_190.6	24.0_154.6	24.0_109.4	24.0_89.5
A 504	211.0_778.2	211.0_778.2	211.0_778.2	211.0_529.5	211.0_365.6	211.0_232.0	-	-	-
A 602	-	-	-	-	12.7_20.6	12.7_20.6	12.7_20.6	12.7_20.6	12.7_20.6
A 603	65.0_185.8	65.0_185.8	65.0_185.8	65.0_185.8	25.7_185.8	25.7_185.8	25.7_185.8	25.7_133.3	25.7_107.8
A 604	208.7_755.4	208.7_755.4	208.7_755.4	208.7_755.4	208.7_634.6	208.7_438.4	286.3438.5	-	-

									
	100LA	100LB	112M	132SA	132MA	132MB	160M	160L	180M
A 102	-	-	-	-	-	-	-	-	-
A 202	-	-	-	-	-	-	-	-	-
A 203	-	-	-	-	-	-	-	-	-
A 302	10.5_13.6	10.5	-	-	-	-	-	-	-
A 303	-	-	-	-	-	-	-	-	-
A 412	10.1_35.9	10.1_22.7	10.1_13.8	10.1	-	-	-	-	-
A 413	-	-	-	-	-	-	-	-	-
A 502	13.1_20.9	13.1_20.9	13.1_20.9	13.1_20.9	13.1	-	-	-	-
A 503	24.0_109.4	24.0_81.5	24.0_51.7	24.0_32.4	-	-	-	-	-
A 504	-	-	-	-	-	-	-	-	-
A 602	12.7_20.6	12.7_20.6	12.7_20.6	12.7_20.6	12.7_16.7	12.7	12.7_20.6	12.7_16.7	12.7
A 603	25.7_133.3	25.7_133.3	25.7_107.8	25.7_70.4	25.7_45.2	25.7_34.3	25.7_41.7	25.7_31.7	-
A 604	-	-	-	-	-	-	-	-	-



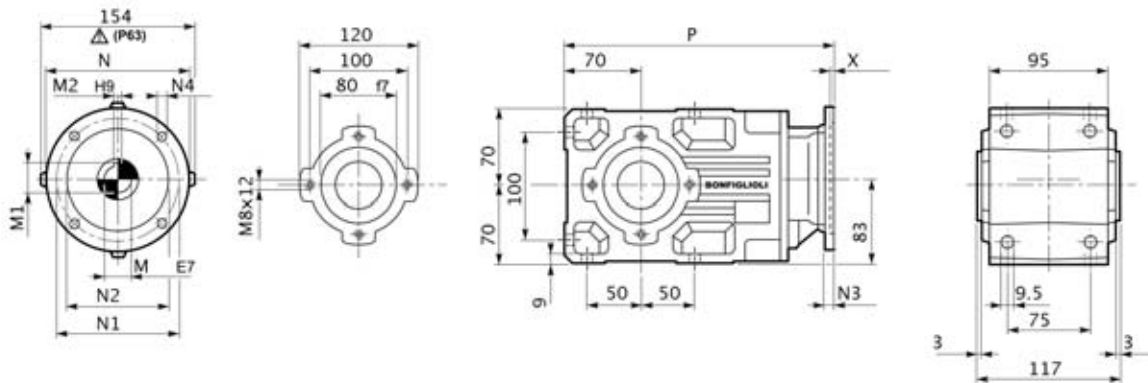
## 2.12 DIMENSIONS

### 2.12.1 A 10\_M



A 10 2	S05	M05	121	143.5	408.5	95	12
A 10 2	S1	M1S	138	152	413.5	108	13
A 10 2	S1	M1L	138	152	437.5	108	14
A 10 2	S2	M2S	156	161	466.5	119	18
A 10 2	S3	M3S	195	180.5	509.5	142	23
A 10 2	S3	M3L	195	180.5	541.5	142	30

### 2.12.2 A 10\_P(IEC)



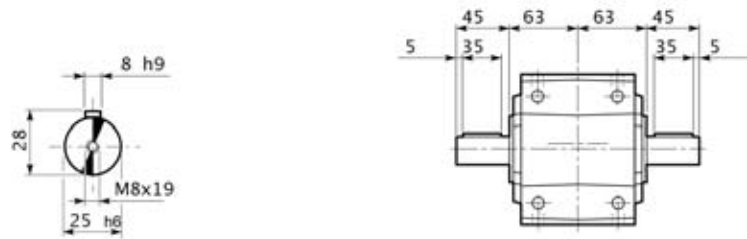
A 10												
		M	M1	M2	N	N1	N2	N3	N4	X	P	
A 10 2	P63	11	12.8	4	140	115	95	—	M8x19	4	282.5	8
A 10 2	P71	14	16.3	5	160	130	110	—	M8x16	4.5	282.5	9
A 10 2	P80	19	21.8	6	200	165	130	—	M10x12	4	302	9
A 10 2	P90	24	27.3	8	200	165	130	—	M10x12	4	302	9

### 2.12.3 A 10

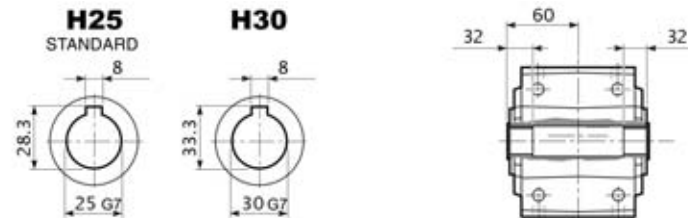
A 10...UR



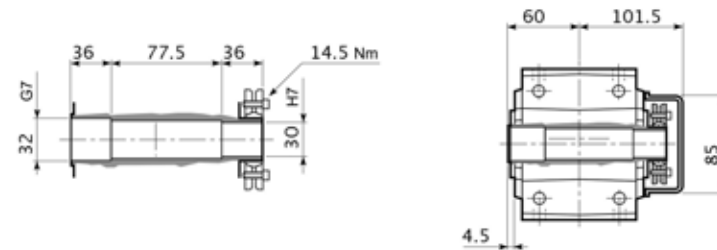
A 10...UD



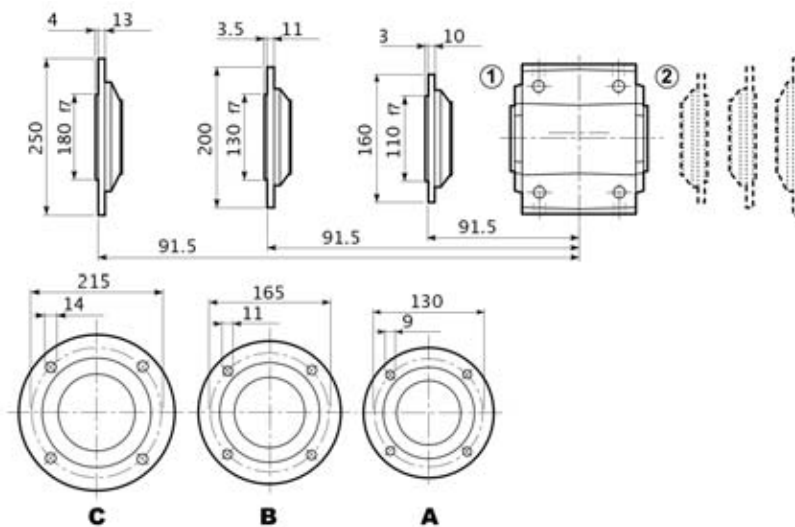
A 10...UH

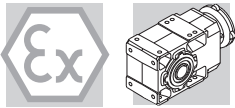


A 10...US

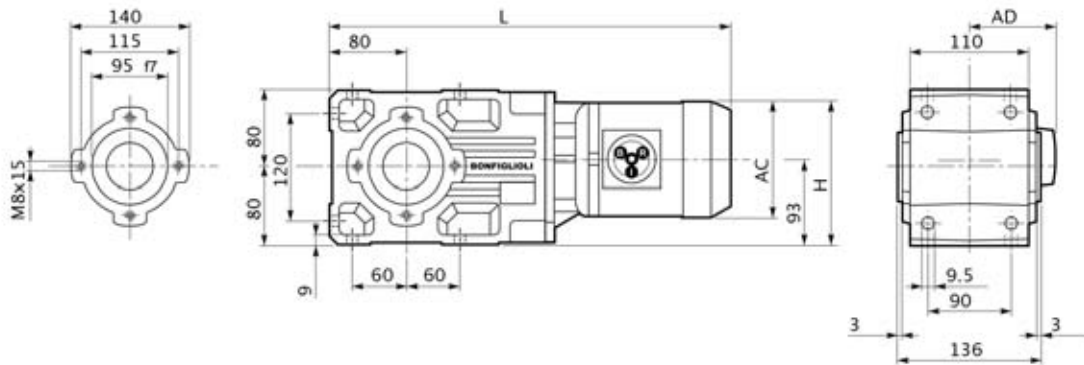


A 10...F...





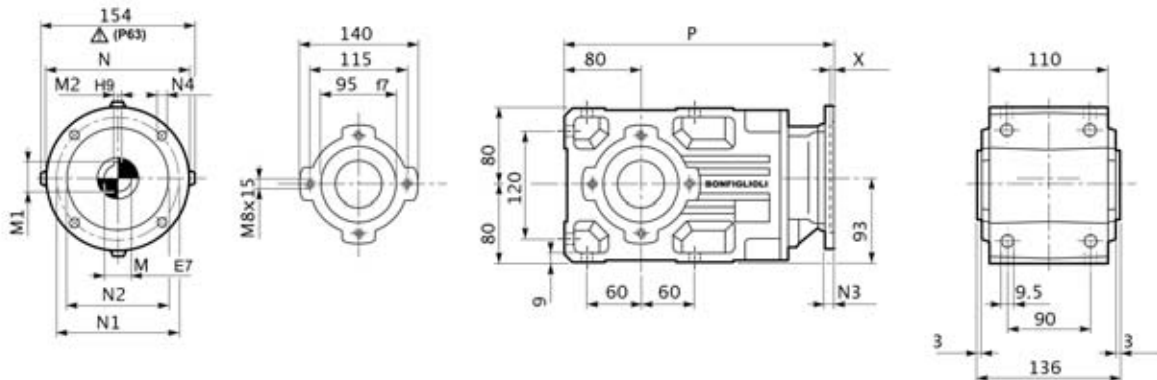
## 2.12.4 A 20\_M






A 20							
			AC	H	L	AD	
A 20 2	S05	M05	121	143.5	432	95	16
A 20 2	S1	M1S	138	152	437	108	17
A 20 2	S1	M1L	138	152	461	108	18
A 20 2	S2	M2S	156	161	490	119	22
A 20 2	S3	M3S	195	180.5	533	142	27
A 20 2	S3	M3L	195	180.5	565	142	34
A 20 3	S05	M05	121	143.5	457.5	95	16
A 20 3	S1	M1S	138	152	462.5	108	17
A 20 3	S1	M1L	138	152	486.5	108	19
A 20 3	S2	M2S	156	161	545.5	119	23
A 20 3	S3	M3S	195	180.5	588.5	142	28
A 20 3	S3	M3L	195	180.5	620.5	142	35

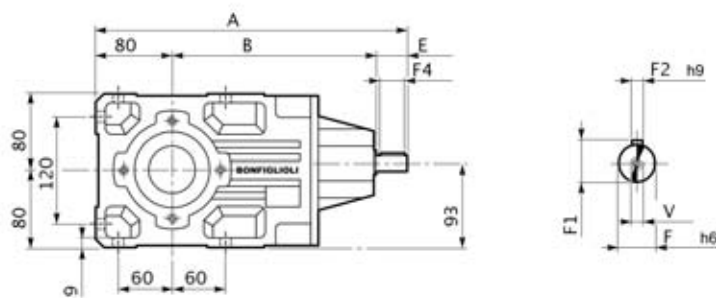





### 2.12.5 A 20\_P(IEC)

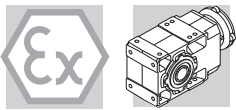


A 20												
		M	M1	M2	N	N1	N2	N3	N4	X	P	
A 20 2	P63	11	12.8	4	140	115	95	—	M8x19	4	306	12
A 20 2	P71	14	16.3	5	160	130	110	—	M8x16	4.5	306	12
A 20 2	P80	19	21.8	6	200	165	130	—	M10x12	4	325.5	13
A 20 2	P90	24	27.3	8	200	165	130	—	M10x12	4	325.5	13
A 20 3	P63	11	12.8	4	140	115	95	—	M8x19	4	361.5	13

### 2.12.6 A 20\_HS



A 20										
		A	B	E	F	F1	F2	F4	V	
A 20 2	HS	356	236	40	19	21.5	6	35	M6x16	11.9

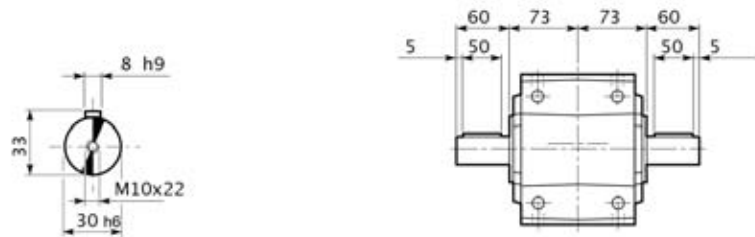


2.12.7 A 20

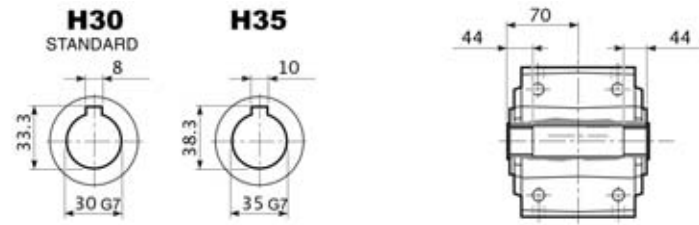
A 20...UR



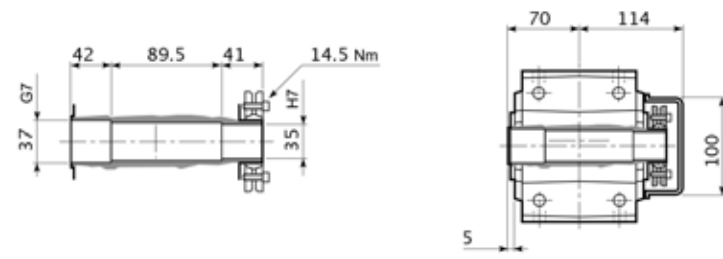
A 20...UD



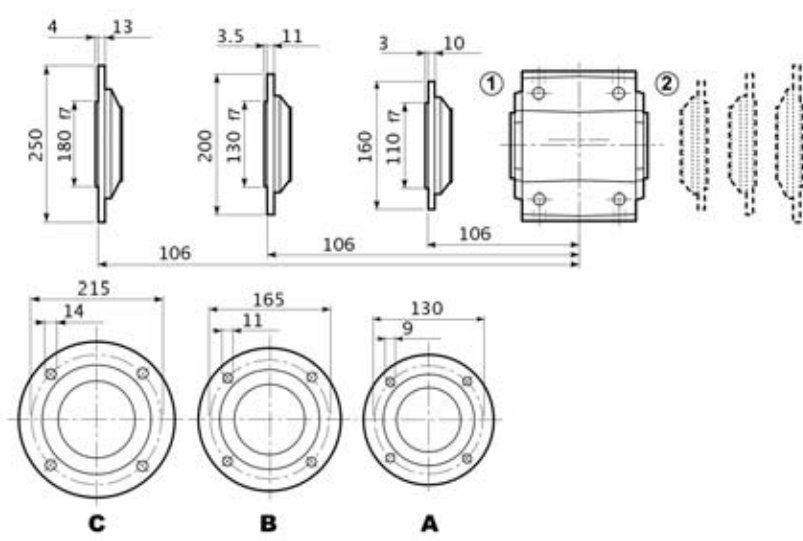
A 20...UH



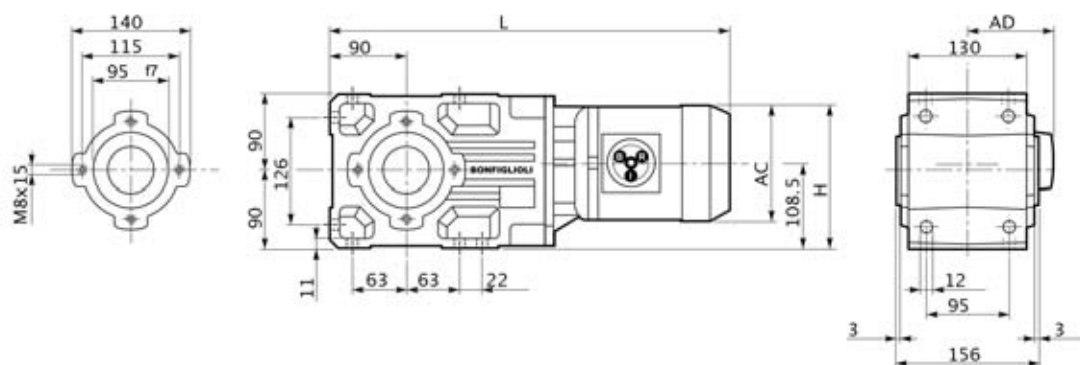
A 20...US







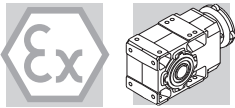
A 20...F...



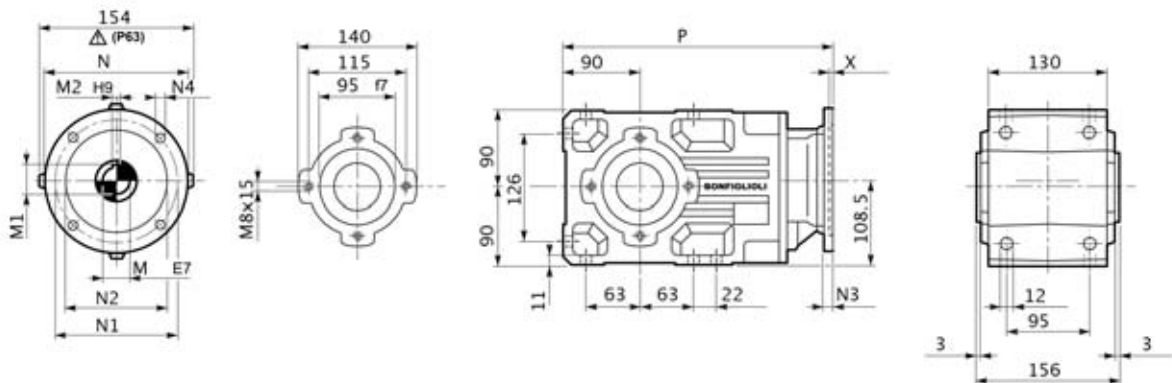
## 2.12.8 A 30\_M



A 30							
			AC	H	L	AD	 Kg
A 30 2	S1	M1S	138	177.5	464	108	20
A 30 2	S1	M1L	138	177.5	488	108	22
A 30 2	S2	M2S	156	186.5	517	119	25
A 30 2	S3	M3S	195	206	560	142	30
A 30 2	S3	M3L	195	206	592	142	38
A 30 3	S05	M05	121	169	516.5	95	21
A 30 3	S1	M1S	138	177.5	521.5	108	21
A 30 3	S1	M1L	138	177.5	545.5	108	23
A 30 3	S2	M2S	156	186.5	574.5	119	25
A 30 3	S3	M3S	195	206	617.5	142	30
A 30 3	S3	M3L	195	206	649.5	142	38

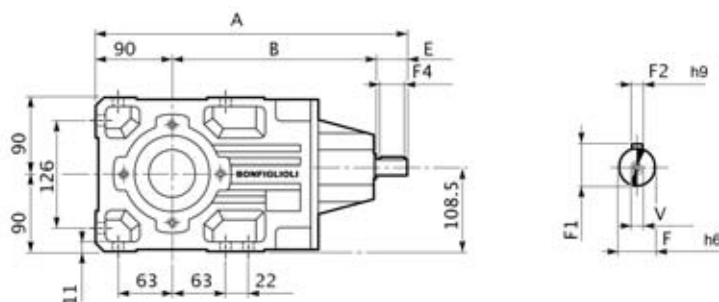


### 2.12.9 A 30\_P(IEC)



A 30												
		M	M1	M2	N	N1	N2	N3	N4	X	P	
A 30 2	P63	11	12.8	4	140	115	95	—	M8x19	4	333	16
A 30 2	P71	14	16.3	5	160	130	110	—	M8x16	4.5	333	16
A 30 2	P80	19	21.8	6	200	165	130	—	M10x12	4	352.5	17
A 30 2	P90	24	27.3	8	200	165	130	—	M10x12	4	352.5	17
A 30 2	P100	28	31.3	8	250	215	180	—	M12x16	4.5	362.5	20
A 30 3	P63	11	12.8	4	140	115	95	—	M8x19	4	390.5	17
A 30 3	P71	14	16.3	5	160	130	110	—	M8x16	4.5	390.5	17

### 2.12.10 A 30\_HS



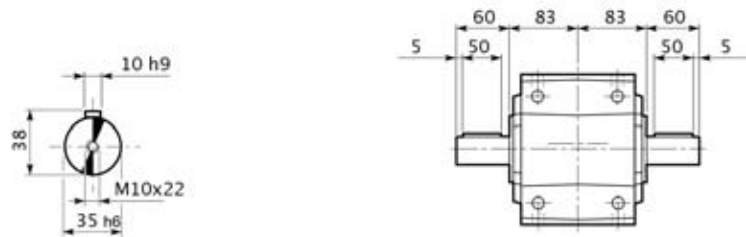
A 30										
		A	B	E	F	F1	F2	F4	V	
A 30 2	HS	383	253	40	19	21.5	6	40	M6x16	16.7

## 2.12.11 A 30

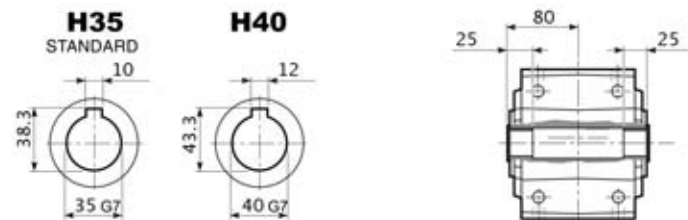
A 30...UR



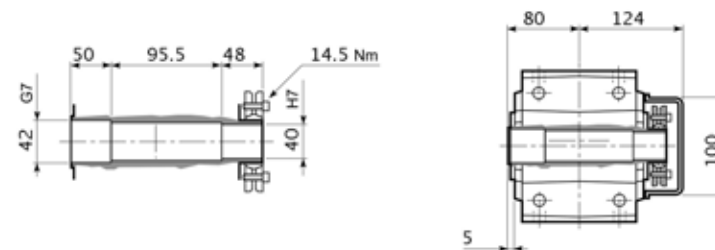
A 30...UD



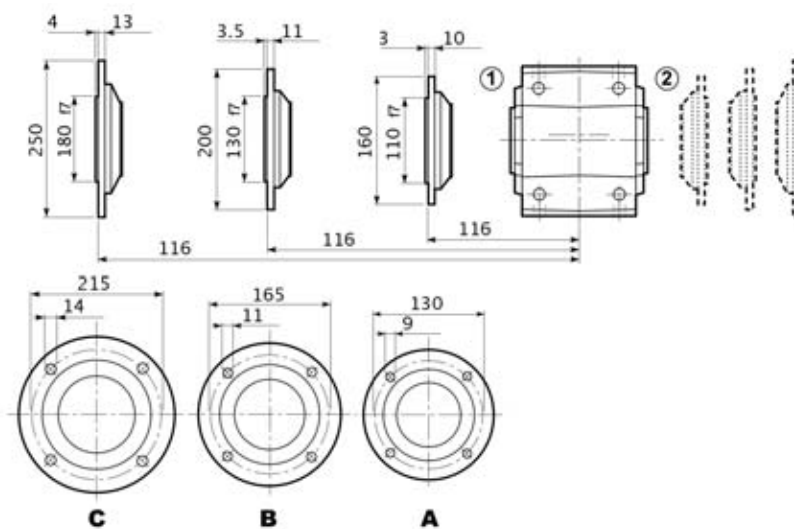
A 30...UH

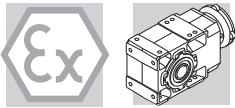


A 30...US

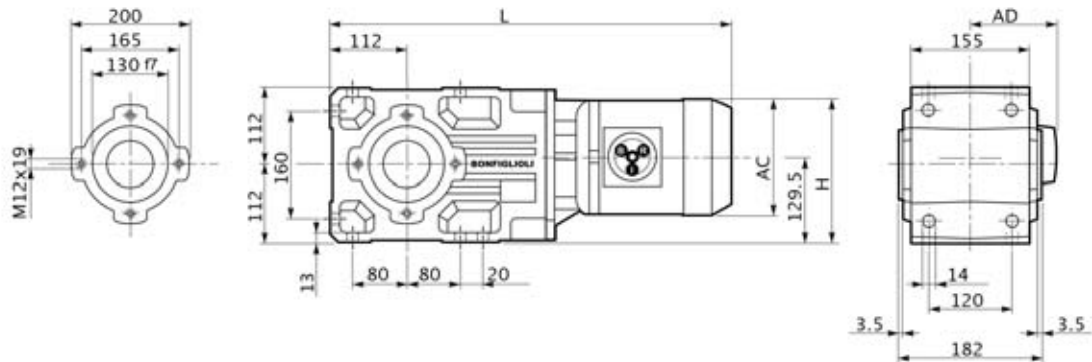


A 30...F...



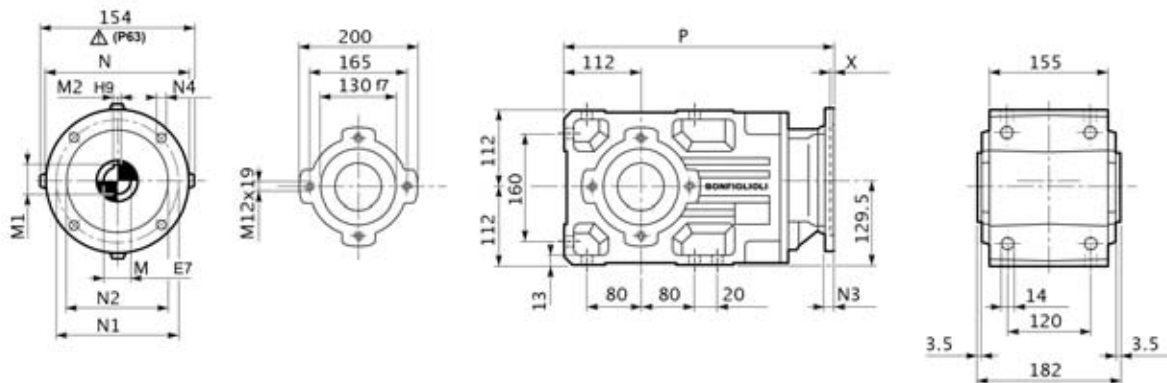





## 2.12.12 A 41\_M



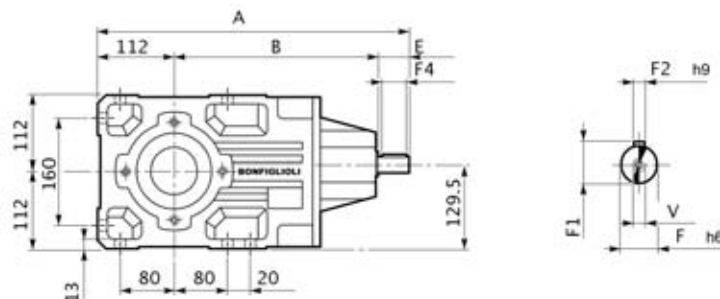
A 41							
			AC	H	L	AD	
A 41 2	S1	M1S	138	198.5	506	108	40
A 41 2	S1	M1L	138	198.5	530	108	41
A 41 2	S2	M2S	156	207.5	559	119	45
A 41 2	S3	M3S	195	227	602	142	50
A 41 2	S3	M3L	195	227	634	142	58
A 41 3	S05	M05	121	245	562.5	95	44
A 41 3	S1	M1S	138	198.5	567.5	108	45
A 41 3	S1	M1L	138	198.5	591.5	108	46
A 41 3	S2	M2S	156	207.5	620.5	119	50
A 41 3	S3	M3S	195	227	663.5	142	55
A 41 3	S3	M3L	195	227	695.5	142	61




### 2.12.13 A 41\_P(IEC)

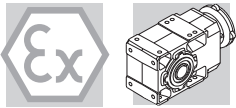


A 30												
		M	M1	M2	N	N1	N2	N3	N4	X	P	
A 41 2	P63	11	12.8	4	140	115	95	—	M8x19	4	375	37
A 41 2	P71	14	16.3	5	160	130	110	—	M8x16	4.5	375	38
A 41 2	P80	19	21.8	6	200	165	130	—	M10x12	4	394.5	39
A 41 2	P90	24	27.3	8	200	165	130	—	M10x12	4	394.5	39
A 41 2	P100	28	31.3	8	250	215	180	—	M12x16	4.5	404.5	43
A 41 2	P112	28	31.3	8	250	215	180	—	M12x16	4.5	404.5	43
A 41 2	P132	38	41.3	10	300	265	230	16	14	5	441	46
A 41 3	P63	11	12.8	4	140	115	95	—	M8x19	4	436.5	39
A 41 3	P71	14	16.3	5	160	130	110	—	M8x16	4.5	436.5	39
A 41 3	P80	19	21.8	6	200	165	130	—	M10x12	4	456	40
A 41 3	P90	24	27.3	8	200	165	130	—	M10x12	4	456	40

### 2.12.14 A 41\_HS



A 41										
		A	B	E	F	F1	F2	F4	V	
A 41 2	HS	464	302.5	50	24	27	8	45	M8x19	40.7
A 41 3	HS	486.5	334.5	40	19	21.5	6	35	M6x16	39.5

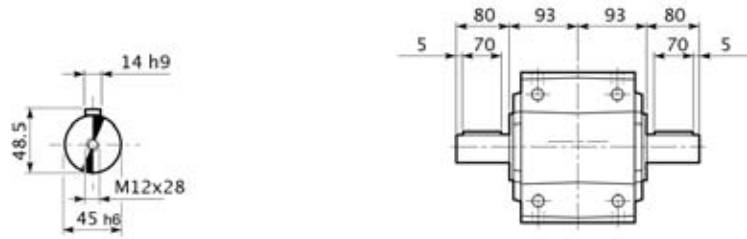


2.12.15 A 41

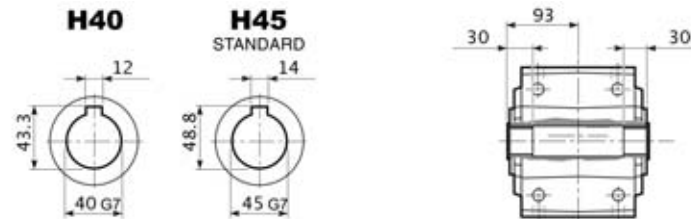
A 41...UR



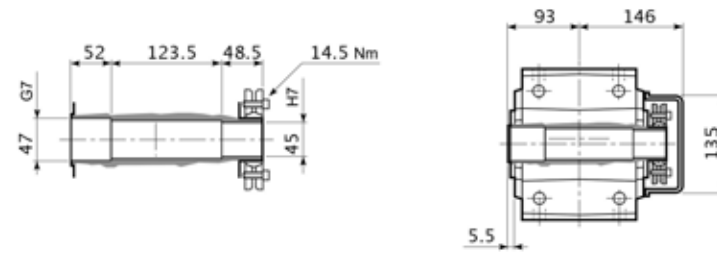
A 41...UD



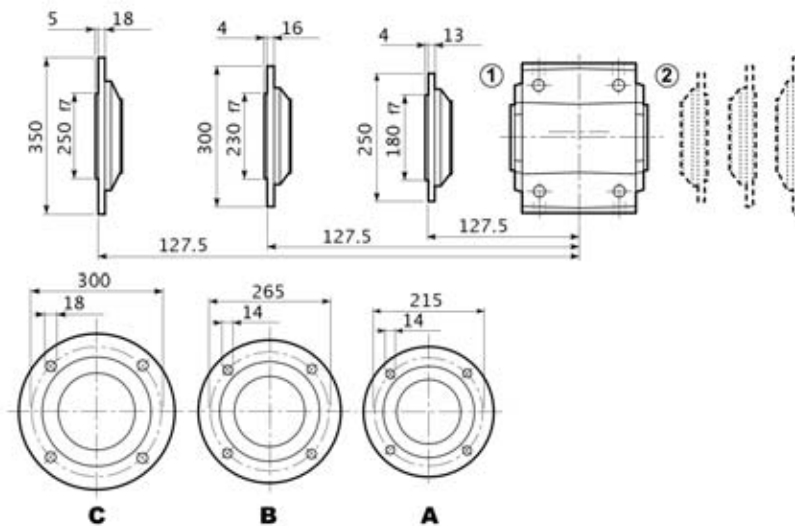
A 41...UH



A 41...US

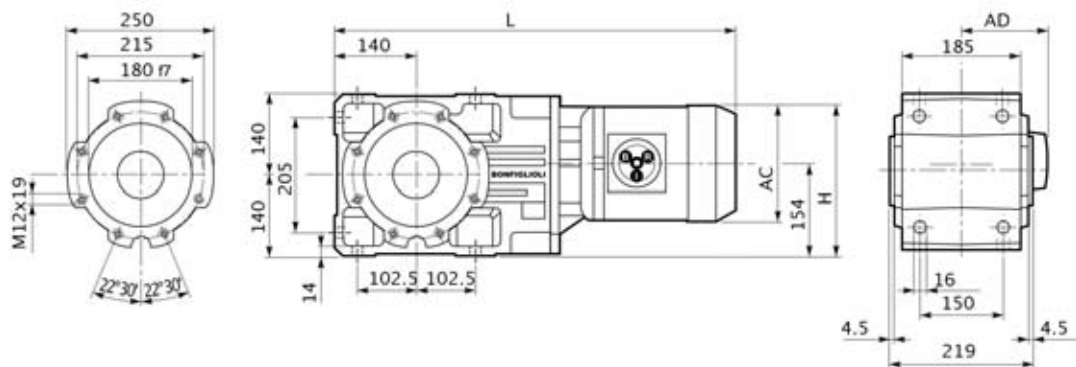






A 41...F...

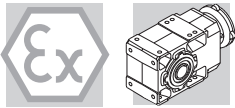




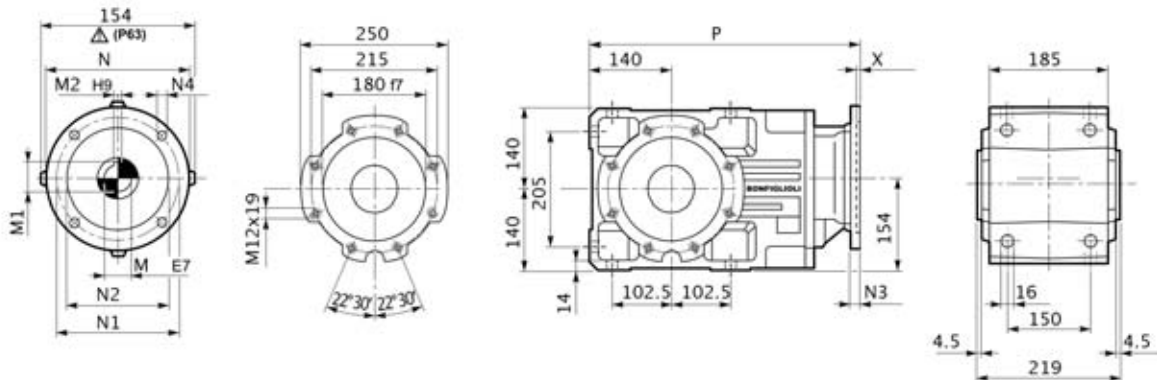
## 2.12.16 A 50\_M



A 50							
			AC	H	L	AD	
A 50 2/3	S1	M1S	138	223	585.5	108	65
A 50 2/3	S1	M1L	138	223	609.5	108	66
A 50 2/3	S2	M2S	156	232	638.5	119	68
A 50 2/3	S3	M3S	195	251.5	681.5	142	73
A 50 2/3	S3	M3L	195	251.5	713.5	142	81
A 50 4	S1	M1S	138	223	657	108	66
A 50 4	S1	M1L	138	223	681	108	67
A 50 4	S2	M2S	156	232	710	119	71
A 50 4	S3	M3S	195	251.5	753	142	76
A 50 4	S3	M3L	195	251.5	785	142	83

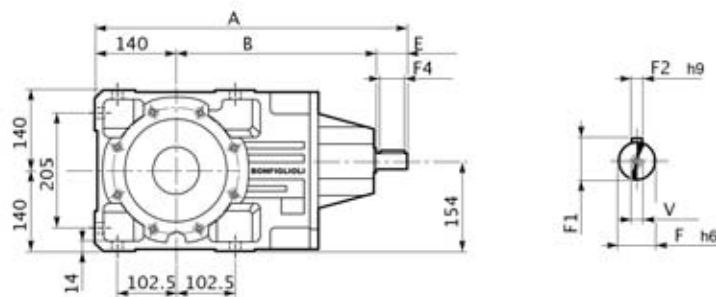


### 2.12.17 A 50\_P(IEC)



A 50												
		M	M1	M2	N	N1	N2	N3	N4	X	P	
A 50 2/3	P63	11	12.8	4	140	115	95	—	M8x19	4	454.5	60
A 50 2/3	P71	14	16.3	5	160	130	110	—	M8x16	4.5	454.5	60
A 50 2/3	P80	19	21.8	6	200	165	130	—	M10x12	4	474	61
A 50 2/3	P90	24	27.3	8	200	165	130	—	M10x12	4	474	61
A 50 2/3	P100	28	31.3	8	250	215	180	—	M12x16	4.5	484	65
A 50 2/3	P112	28	31.3	8	250	215	180	—	M12x16	4.5	484	65
A 50 2/3	P132	38	41.3	10	300	265	230	16	14	5	520.5	68
A 50 4	P63	11	12.8	4	140	115	95	—	M8x19	4	526	62
A 50 4	P71	14	16.3	5	160	130	110	—	M8x16	4.5	526	62
A 50 4	P80	19	21.8	6	200	165	130	—	M10x12	4	545.5	63

### 2.12.18 A 50\_HS



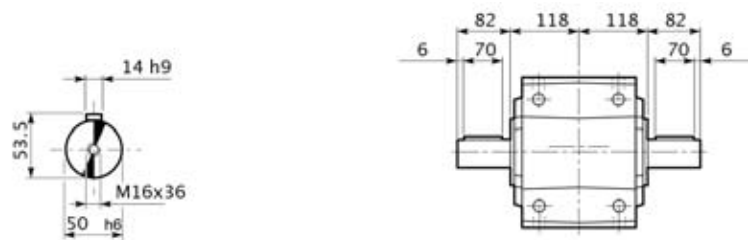
A 50										
		A	B	E	F	F1	F2	F4	V	
A 50 2	HS	543.5	353.5	50	24	27	8	45	M8x19	72
A 50 3	HS	543.5	353.5	50	24	27	8	45	M8x19	76
A 50 4	HS	576	396	40	19	21.5	6	35	M6x16	77

2.12.19 A 50

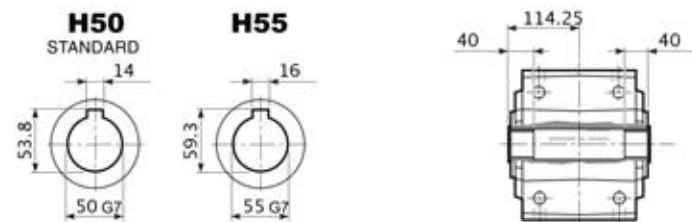
A 50...UR



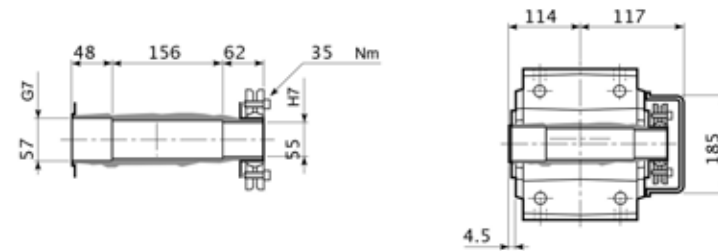
A 50...UD



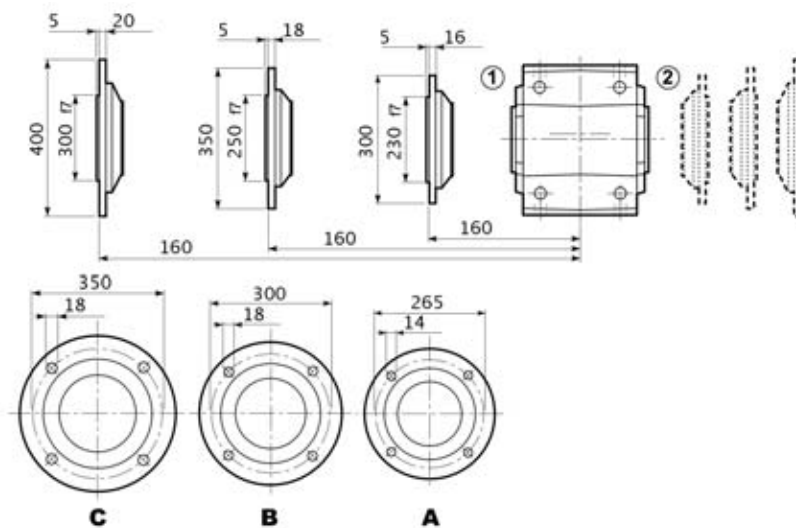
A 50...UH

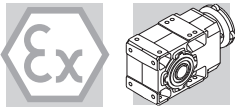


A 50...US

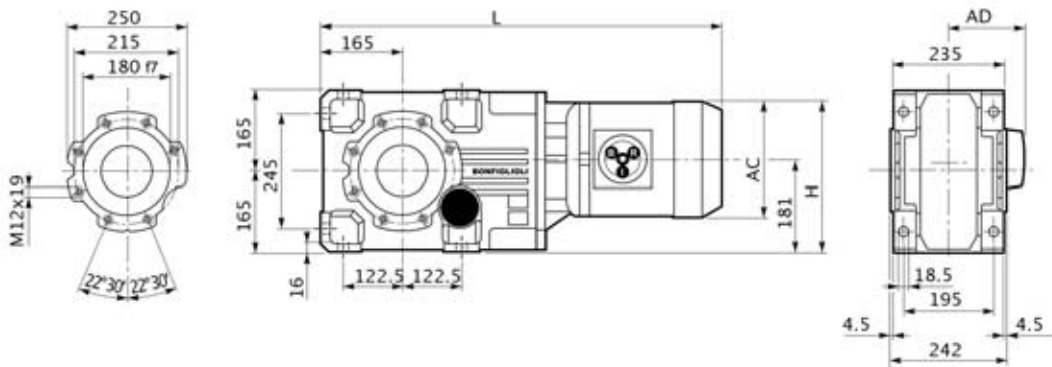






A 50...F...



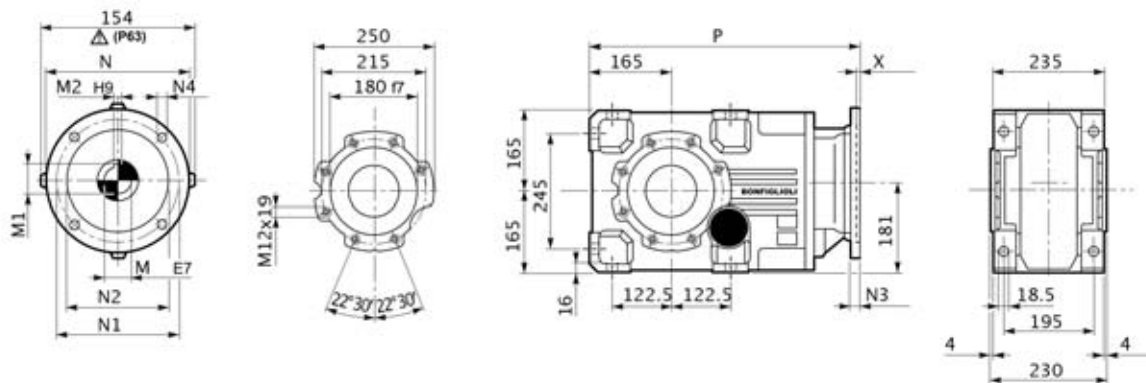





## 2.12.20 A 60\_M



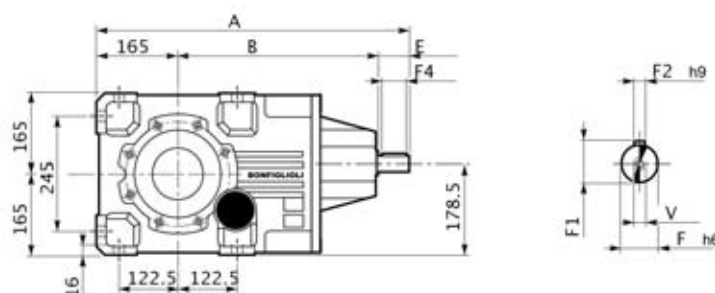
A 50							
			AC	H	L	AD	
A 60 2/3	S2	M2S	156	256.5	700.5	119	91
A 60 2/3	S3	M3S	195	276	743.5	142	92
A 60 2/3	S3	M3L	195	276	775.5	142	100
A 60 4	S1	M1S	138	247.5	718	108	91
A 60 4	S1	M1L	138	247.5	742	108	93
A 60 4	S2	M2S	156	256.5	771	119	96
A 60 4	S3	M3S	195	276	814	142	101
A 60 4	S3	M3L	195	276	846	142	109




## 2.12.21 A 60\_P(IEC)

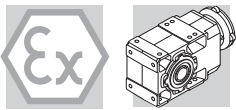


A 50												
		M	M1	M2	N	N1	N2	N3	N4	X	P	
A 60 2/3	P80	19	21.8	6	200	165	130	—	M10x12	4	536	84
A 60 2/3	P90	24	27.3	8	200	165	130	—	M10x12	4	536	84
A 60 2/3	P100	28	31.3	8	250	215	180	—	M12x16	4.5	546	88
A 60 2/3	P112	28	31.3	8	250	215	180	—	M12x16	4.5	546	88
A 60 2/3	P132	38	41.3	10	300	265	230	16	14	5	581.5	91
A 60 2/3	P160	42	45.3	12	350	300	250	23	18	5.5	633	96
A 60 2	P180	48	51.8	14	350	300	250	23	18	5.5	633	96
A 60 4	P63	11	12.8	4	140	115	95	—	M8x19	4	587	88
A 60 4	P71	14	16.3	5	160	130	110	—	M8x16	4.5	587	88
A 60 4	P80	19	21.8	6	200	165	130	—	M10x12	4	606.5	90
A 60 4	P90	24	27.3	8	200	165	130	—	M10x12	4	606.5	90

## 2.12.22 A 60\_HS

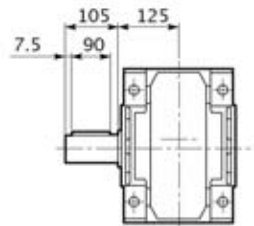
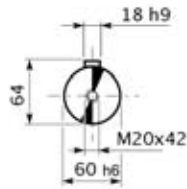


A 60										
		A	B	E	F	F1	F2	F4	V	
A 60 2	HS	633	408	60	28	31	8	50	M10x22	97
A 60 3	HS	633	408	60	28	31	8	50	M10x22	119
A 60 4	HS	676	396	50	24	27	8	45	M8x19	105

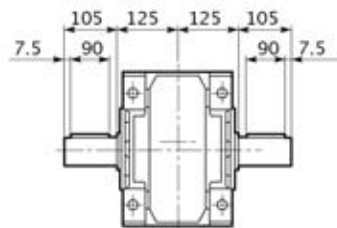
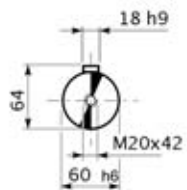


2.12.23 A 60

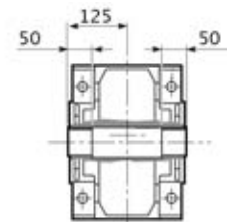
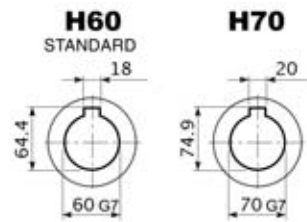
A 60...UR



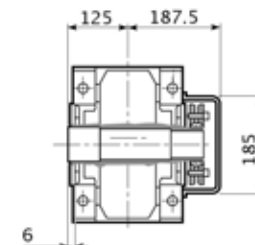
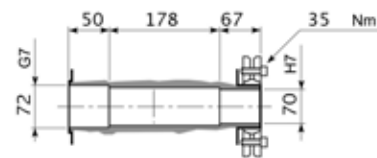
A 60...UD



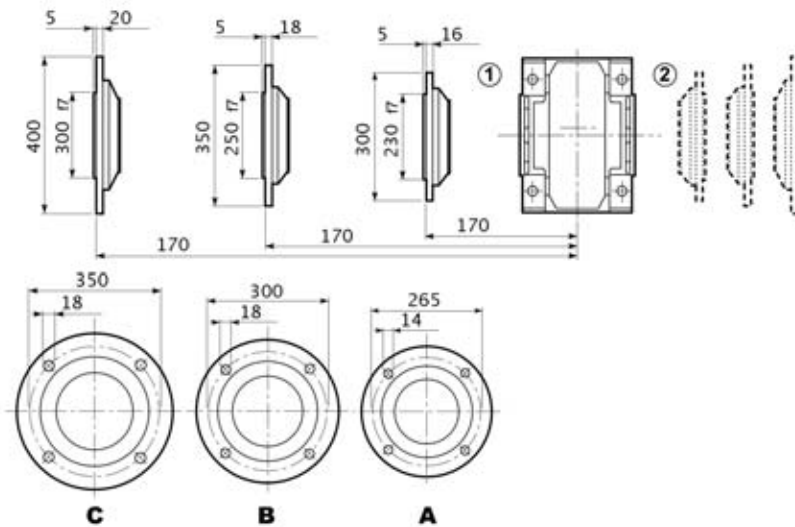
A 60...UH

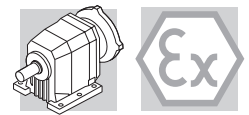


A 60...US



A 60...F...





## 2.13 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

 **BONFIGLIOLI**

### **CERTIFICATE OF COMPLIANCE (according to EC Directive 94/9/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**

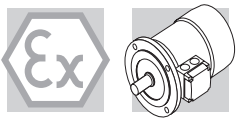
**BONFIGLIOLI RIDUTTORI** filed the documents according to 94/9/IEC Annex VIII, with the following notified body:

TÜV PRODUCT SERVICE GmbH- Identification number 0123

Lippo di Calderara di Reno, 27/11/2003

Place and date

Ing. Enzo Cognigni  
R&D Manager

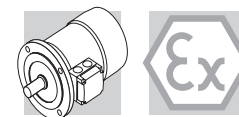


### 3 ATEX MOTORS

#### 3.1 SYMBOLS AND UNITS OF MEASUREMENT

<b>cos<math>\phi</math></b>	-	Power factor
<b><math>\eta</math></b>	-	Efficiency
<b><math>I_N</math></b>	[A]	Rated current
<b><math>I_S</math></b>	[A]	Locked rotor current
<b><math>J_M</math></b>	[Kgm <sup>2</sup> ]	Moment of inertia
<b><math>M_A</math></b>	[Nm]	Mean breakaway torque
<b><math>M_N</math></b>	[Nm]	Rated torque
<b><math>M_S</math></b>	[Nm]	Starting torque
<b><math>n</math></b>	[min <sup>-1</sup> ]	Rated speed
<b><math>P_n</math></b>	[kW]	Motor rated power
<b><math>T_a</math></b>	[°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 and are 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 harmonized Norms EN 50014 and EN 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 ≤ 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.

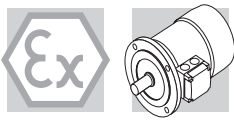
Motors also meet the requirements of standard CEI EN 60204-1 "Electrical equipment of machines".

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.



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)

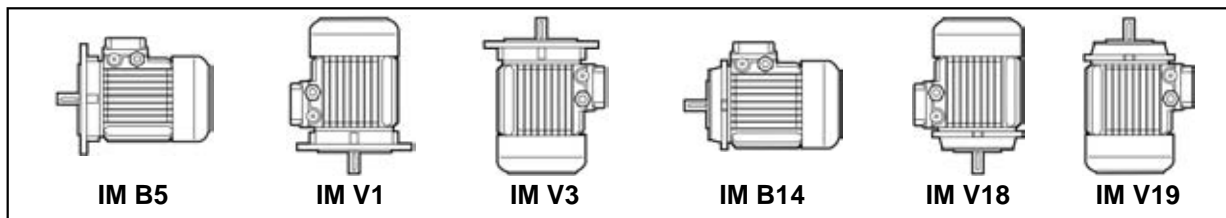
IM V1, IM V3 (derived)

**IM B14** (basic)

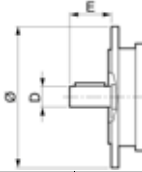
IM V18, IMV19 (derived)

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			
<b>B5R</b> (1)	11 x 23 - Ø 140	14 x 30 - Ø 160	19 x 40 - Ø 200	24 x 50 - Ø 200
<b>B14R</b> (2)	11 x 23 - Ø 90	14 x 30 - Ø 105	19 x 40 - Ø 120	24 x 50 - Ø 140

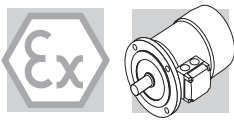
(1) flange con through holes

(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
<b>BN - Ex II 2D 125°C</b>	<b>M - Ex II 2D 125°C</b>	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 R). Table below shows the value for the vibration velocity for standard (N) and improved (R) balancing.

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

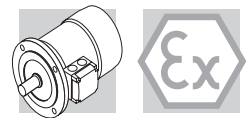
Values refer to measures with freely suspended motor in unloaded conditions.

### 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  $\geq 4 \text{ mm}^2$ ). 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 [ $\text{mm}^2$ ]
<b>BN 63...BN 71</b>	<b>M05, M1</b>	6	M4	2.5
<b>BN 80, BN 90</b>	<b>M2</b>	6	M4	2.5
<b>BN 100</b>	<b>M3</b>	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
<b>BN 63</b>	<b>M05</b>	2 x M20 x 1.5
<b>BN 71</b>	<b>M1</b>	2 x M25 x 1.5
<b>BN 80, BN 90</b>	<b>M2</b>	2 x M25 x 1.5
<b>BN 100</b>	<b>M3</b>	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
<b>M05</b>	6004 2Z C3	6201 2RS C3	<b>BN 63</b>	6201 2RZ C3	6201 2RS C3
<b>M1</b>	6004 2Z C3	6202 2RS C3	<b>BN 71</b>	6202 2RZ C3	6202 2RS C3
<b>M2</b>	6007 2Z C3	6204 2RS C3	<b>BN 80</b>	6204 2RZ C3	6204 2RS C3
<b>M3</b>	6207 2Z C3	6206 2RS C3	<b>BN 90</b>	6205 2RZ C3	6205 2RS C3
			<b>BN 100</b>	6206 2RZ C3	6206 2RS C3

## 3.4 ELECTRICAL CHARACTERISTICS

### 3.4.1 VOLTAGE / FREQUENCY

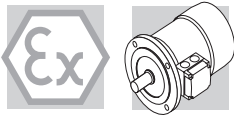
Motors are designed for direct mains supply and, in their standard execution, to be connected 230V Δ / 400V Y, 50Hz with a ± 10% tolerance applying to voltage. In addition to nominal voltage-frequency values the name plate also shows voltage ranges the motor can operate under:

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)	
		$63 < H \leq 132$	$132 < H \leq 200$
<b>N</b>	$600 < n < 3600$	1.8	2.8
<b>R</b>	$600 < n < 1800$	0.71	1.12
	$1800 < n < 3600$	1.12	1.8



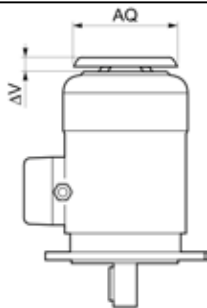
Values are obtained from measurements on freely suspended motor during no-load operation; tolerance  $\pm 10\%$ .

### 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.

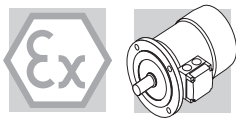
		AQ	$\Delta V$	
BN 63	M05	118	24	
BN 71	M1	134	27	
BN 80	M2	134	25	
BN 90	-	168	30	
BN 100	M3	168	28	

### 3.5.3 SECOND SHAFT EXTENSION

#### PS

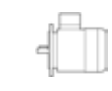

Motors carrying this modification cannot be fitted with the drip cover (option RC).

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<sup>-1</sup>)

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

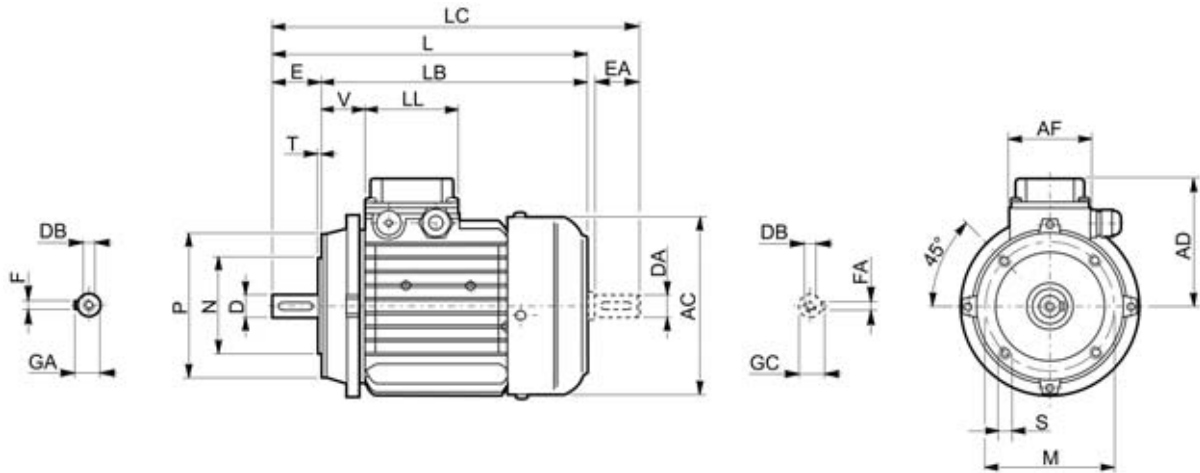
#### 3.6.2 M - Ex II 2D 125°C (1500 min<sup>-1</sup>)

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



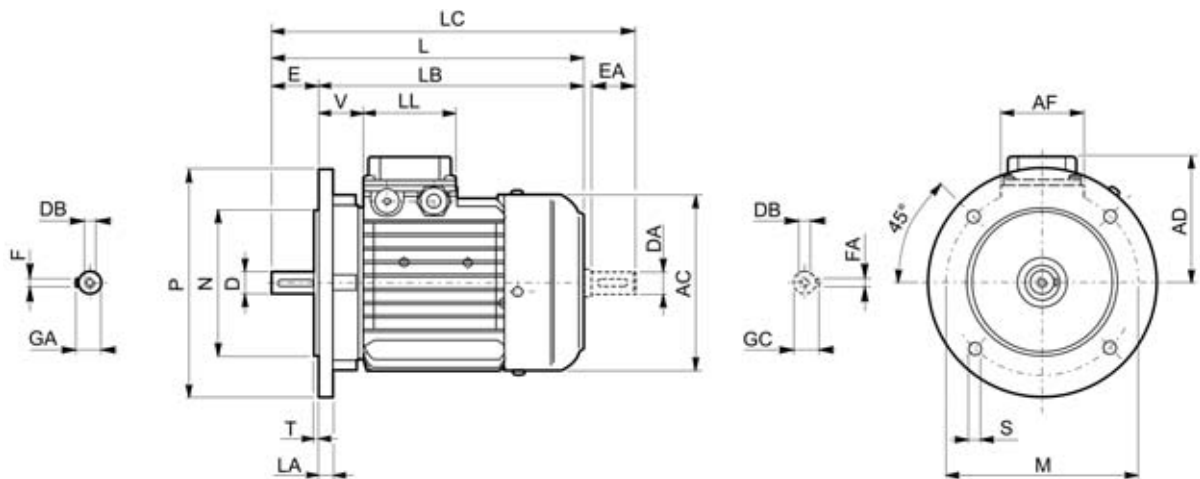
### 3.7 MOTORS DIMENSIONS

#### 3.7.1 BN - IMB14

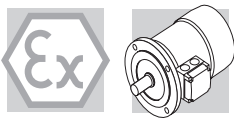


	Shaft					Flange					Motor							
	D DA	E EA	DB	GA GC	F FA	M	N	P	S	T	AC	L	LB	LC	AD	AF	LL	V
<b>BN63_2D</b>	11	23	M4	12.5	4	75	60	90	M5	2.5	121	215	192	240	95	74	80	26
<b>BN71_2D</b>	14	30	M5	16	5	85	70	105	M6	2.5	138	254	224	286	108	74	80	37
<b>BN80_2D</b>	19	40	M6	21.5	6	100	80	120	M6	3	156	276	236	318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

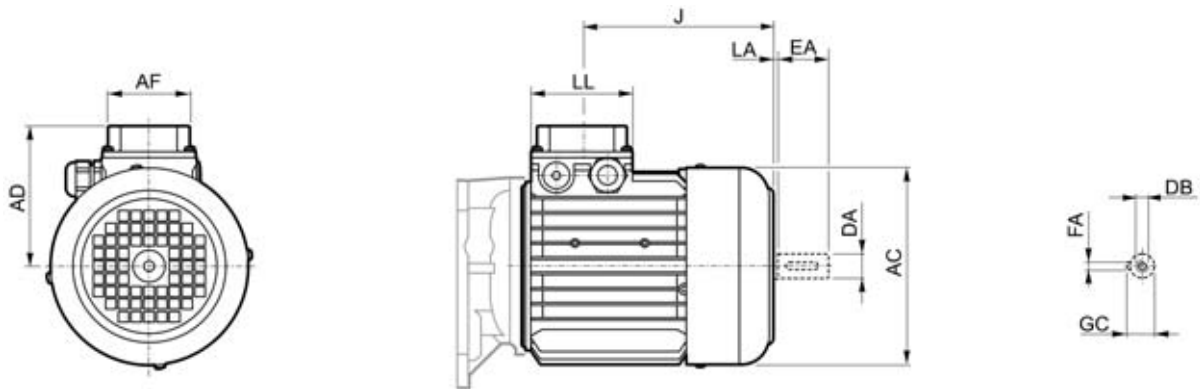
#### 3.7.2 BN - IMB5



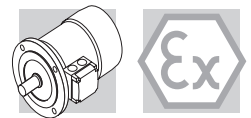
	Shaft					Flange						Motor							
	D DA	E EA	DB	GA GC	F FA	M	N	P	S	T	LA	AC	L	LB	LC	AD	AF	LL	V
<b>BN63_2D</b>	11	23	M4	12.5	4	115	95	140	9.5	3	10	121	207	184	240	95	74	80	26
<b>BN71_2D</b>	14	30	M5	16	5	130	110	160	9.5	3	10	138	249	219	286	108	74	80	37
<b>BN80_2D</b>	19	40	M6	21.5	6	165	130	200	11.5	3.5	11.5	156	274	234	318	119	74	80	38
<b>BN90_2D</b>	24	50	M8	27	8	165	130	200	11.5	3.5	11.5	176	326	276	378	133	98	98	44
<b>BN100_2D</b>	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
<b>M05_2D</b>	121	95	74	80	117	11	23	3	M4	12.5	4
<b>M1S_2D</b>	138	108	74	80	118	14	30	2	M5	16	5
<b>M1L_2D</b>	138	108	74	80	142	14	30	2	M5	16	5
<b>M2S_2D</b>	156	119	74	80	152	19	40	3	M6	21.5	6
<b>M3S_2D</b>	195	142	98	98	176.5	28	60	3	M10	31	8
<b>M3L_2D</b>	195	142	98	98	208.5	28	60	3	M10	31	8



### 3.8 DECLARATION OF CONFORMITY

**BONFIGLIOLI RIDUTTORI S.p.A.**

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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 94/9/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**

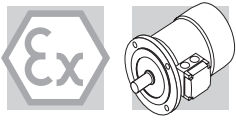
Conformity with the provisions of this Directive is proven by complete compliance to the following Standards:

**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)	R1
Description	
<ul style="list-style-type: none"><li>- Added gearmotor rating charts</li><li>- Added gearmotor dimensions</li><li>- Added electric motors section</li></ul>	

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