

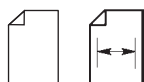


GENERAL INFORMATION

1 SYMBOLS AND UNITS OF MEASURE

Symbols	Units of Measure	Description	Symbols	Units of Measure	Description
$A_{N 1,2}$	[N]	Permissible axial force	$P_{1,2}$	[kW]	Power
f_s	–	Service factor	$P_{N 1,2}$	[kW]	Rated power
f_T	–	Thermal factor	$P_{R 1,2}$	[kW]	Power demand
f_{TP}	–	Temperature factor	$R_{C 1,2}$	[N]	Calculated radial force
i	–	Gear ratio	$R_{N 1,2}$	[N]	Permissible overhung load
l	–	Cyclic duration factor	S	–	Safety factor
J_C	[Kgm ²]	Mass moment of inertia to be driven	t_a	[°C]	Ambient temperature
J_M	[Kgm ²]	Motor mass moment of inertia	t_s	[°C]	Surface temperature
J_R	[Kgm ²]	Mass moment of inertia for the gear unit	t_o	[°C]	Oil temperature
K	–	Mass acceleration factor	t_f	[min]	Work time under constant load
K_r	–	Transmission element factor	t_r	[min]	Rest time
$M_{1,2}$	[Nm]	Torque	η_d	–	Dynamic efficiency
$M_{C 1,2}$	[Nm]	Calculated torque	η_s	–	Static efficiency
$M_{n 1,2}$	[Nm]	Rated torque	φ	[']	Output shaft angular backlash (with locked input shaft)
$M_{r 1,2}$	[Nm]	Torque demand			
$n_{1,2}$	[min ⁻¹]	Speed			

$_1$ value applies to input shaft
 $_2$ value applies to output shaft



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



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



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



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



IMPORTANT
This symbol indicates important technical information.



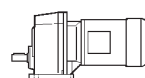
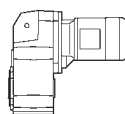
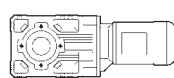
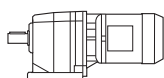
Apply to equipment complying with "ATEX" Directive.

Series C

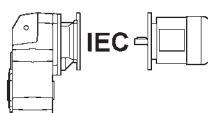
Series A

Series F

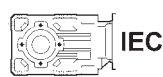
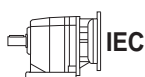
Series S



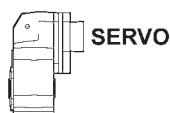
Gearmotor with compact motor.



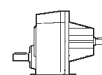
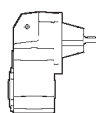
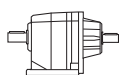
Gearmotor with IEC motor.



Gear unit with IEC motor interface.



Gear unit with servomotor input adapter.




Speed reducer with solid input shaft.




2 ALLOWED TEMPERATURE LIMITS

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

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

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

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



3 TORQUE

3.1 Rated torque M_{n2} [Nm]

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

Rating is speed sensitive.

3.2 Required torque M_{r2} [Nm]

The torque demand based on application requirement.

It must always be equal to or less than torque M_{n2} the gearbox under study is rated for.

3.3 Calculated torque M_{c2} [Nm]

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

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

4 POWER

4.1 Rated power P_{n1} [kW]

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

5 THERMAL CAPACITY P_t [kW]

P_t is the power that can be transmitted through the gear unit, under a continuous duty and an ambient temperature of 20 °C, without resulting into damage of the inner parts or degradation of the lubricant properties. Refer to chart (A1) for specific kW ratings.


In case of intermittent duty, or an operating ambient temperature other than the rated 20°C, the P_t value should be adjusted through the factor f_t , obtained from chart (A2), as per the following equation:


$$P_t' = P_t \times f_t$$





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

(A 1)

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

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

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

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



(A 2)

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

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

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

The condition to be verified is:

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





6 EFFICIENCY





6.1 Dynamic efficiency η_d





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



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

(A 3)

	2 x 	3 x 	4 x 
η_d	95%	93%	90%

	2 x 	3 x 	4 x 
η_d	94%	91%	89%

	2 x 	3 x 	4 x 
η_d	95%	93%	90%

	1 x 		
η_d	98%		



7 GEAR RATIO i

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

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

The gear ratio is usually a decimal number which in this catalogue is truncated at one digit after the comma (no decimals for $i > 1000$).

If interested in knowing the exact value see also chapters "EXACT RATIOS".

8 ANGULAR VELOCITY

8.1 Input speed n_1 [min⁻¹]

The speed is related to the prime mover selected. Catalogue values refer to speed of either single or double speed motors that are common in the industry.

If the gearbox is driven by an external transmission it is recommended to operate it with a speed of 1400 min⁻¹, or lower, in order to optimise operating conditions and lifetime.

Higher input speeds are permitted, however in this case consider that torque rating M_{n2} is affected adversely.

Please consult a Bonfiglioli representative.

8.2 Output speed n_2 [min⁻¹]

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

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

9 MOMENT OF INERTIA J_r [Kgm²]

Moments of inertia specified in the catalogue refer to the gear unit input axis.

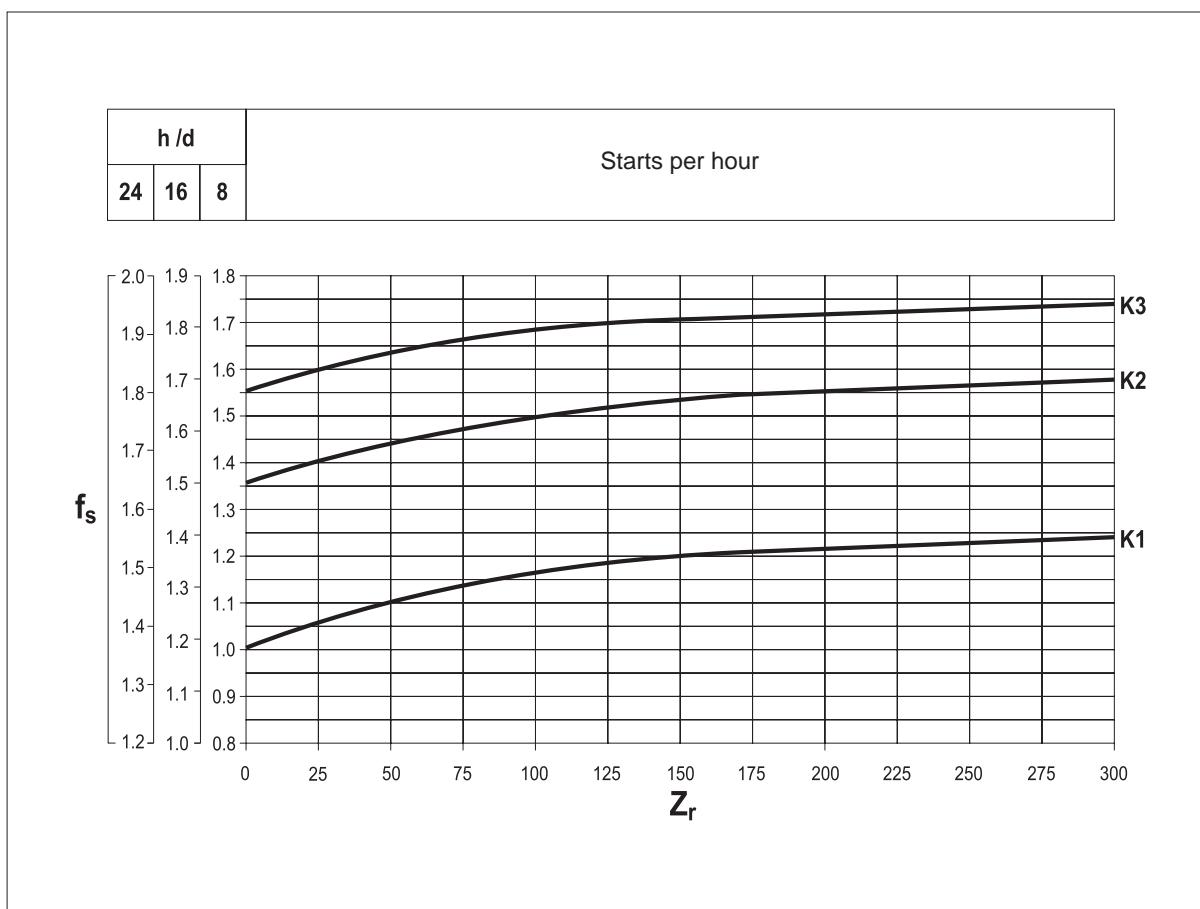
They are therefore related to motor speed, in the case of direct motor mounting.



10 SERVICE FACTOR f_s

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

(A 4)



10.1 Acceleration factor of masses K

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

(A 5)

$K = \frac{J_c}{J_m}$	→	$J_c =$ Moment of inertia of driven masses referred to motor drive shaft	$K \leq 0,25$	→	K1 Uniform load
	→	$J_m =$ Motor moment of inertia	$0,25 < K \leq 3$	→	K2 Moderate shock load
			$3 < K \leq 10$	→	K3 Heavy shock load
			$K > 10$	→	Please consult Bonfiglioli Technical Service



11 LUBRICATION

Life lubricated gearboxes do not require any periodical oil changes.

Refer to the User's Manual available at www.bonfiglioli.com for indications about checking the oil level and its replacement for other types of gearboxes.

Do not mix mineral oils with synthetic oils and/or different brands.

However, oil level should be checked at regular intervals and topped up as required.

Check monthly if unit operates under intermittent duty, more frequently if duty is continuous.

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

(A 6)

		Operating ambient temperature [C°]																			
		-40	-35	-30	-25	-20	-15	-10	-5	0	+5	+10	+15	+20	+25	+30	+35	+40	+45	+50	
		suitability seals check				standard seals provided in the catalog															
Splash lubrication	Mineral oil	150 VG							*												
		220 VG	⊘						*											☎	
		320 VG								*											
		460 VG									*										
	Synthetic oil (PAG)	150 VG								*											☎
		220 VG	⊘							*											
		320 VG								*											
	Synthetic oil (PAO)	150 VG								*											☎
		220 VG	⊘							*											
		320 VG								*											

Recommended operating limits

Allowed operating limits. ☎

Forbidden operating limits.

* = It is recommended to ramp-up and to provide for greater absorption of the motor.

If needed and in the event of impulse loads, contact Bonfiglioli Technical Service. ☎



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

The inner parts of Bonfiglioli gear units are oil-bath and splash lubricated.

Frame sizes C 05...C 41, A 05...A 41, F 10...F 41, S 10...S 40 are supplied by the factory, or by the authorized dealers, already filled with oil.

Unless otherwise specified, units size C 51, A 50, F 51, S 50 and larger are usually supplied unlubricated at it will be the customer care to fill them with oil prior to putting them into operation. In both cases, depending on the version, prior to putting the gear unit into operation may need to replace the closed plug used for transportation purposes with breather plug supplied with.

For the reference charts of oil plugs placement and quantity of lubricant, refer to the Installation, Operation and Maintenance Manual (available on www.bonfiglioli.com).

The “long life” polyglycol-based lubricant supplied by the factory, in the absence of contamination, does not require periodical oil changes throughout the lifetime of the gear unit.

11.3 Lubrication for A-EX (Atex) gearboxes

The inner parts of Bonfiglioli gear units are oil-bath and splash lubricated.

The ATEX version gear unit (with some exceptions see Table below) are factory-charged with “long-life” lubricant SHELL OMALA S4 WE 320 in the quantity suitable for the mounting position specified in the order.

(A 7)

A 05	A 10	A 20	A 30	A 35	A 41	A 50	A 55 ¹⁾	A 60 2 ²⁾	A 60 3 ¹⁾	A 60 4 ¹⁾	A 70 ¹⁾	A 80 ¹⁾	A 90 ¹⁾
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 Gearbox pre-filled with a synthetic “for life” lubricant

 Gearbox pre-filled with a synthetic lubricant

¹⁾ Without lubricant for mounting positions B6 and B7

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

Gearboxes are fitted with sealed filler plugs for transport purposes. Depending on version, they may be supplied with a vented plug which the user must fit before putting the gearbox into service.

Refer to the installation, operation and maintenance manual to replace the filler plug correctly. (These manuals are available in a number of languages and can be downloaded in pdf format from the website www.bonfiglioli.com.)

When a gearbox is supplied with no lubricant, it is recommended to fill it with a lubricant of a similar type, selected from those listed in its installation, operation and maintenance manual.





12 SELECTION

Some fundamental data are necessary to assist the correct selection of a gearbox or gearmotor. The table below (A7) briefly sums up this information.

To simplify selection, fill in the table and send a copy to our Technical Service which will select the most suitable drive unit for your application.

(A 8)

Type of application	A_{c1} Thrust load on input shaft (+/-)(***)	N
P_{r2} Output power at n_2 max	J_c Moment of inertia of the load	Kgm ²
P_{r2'} Output power at n_2 min	t_a Ambient temperature	C°
M_{r2} Output torque at n_2 max	Altitude above sea level	m
n₂ Max.output speed	Duty type to IEC norms S...../.....%	
n_{2'} Min.output speed	Z Starting frequency	1/h
n₁ Max.input speed	Motor voltage	V
n_{1'} Min.input speed	Brake voltage	V
R_{c2} Radial load on output shaft	Frequency	Hz
x₂ Load application distance (*)	M_b Brake torque	Nm
Load orientation at output 	Motor protection degree IP.....	
Output shaft rotation direction (CW-CCW) (**)	Insulation class	
R_{c1} Radial load on input shaft		
x₁ Load application distance (*)		
Load orientation at input 		
Input shaft rotation direction (CW-CCW) (**)		
A_{c2} Thrust load on output shaft (+/-)(***)		N

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

(**) CW = clockwise;
CCW = counterclockwise

(***) + = push
- = pull



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

12.1 Selection of a gearmotor

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

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

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

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

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

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

Unless otherwise specified, power P_n of motors indicated in the catalogue refers to continuous duty S1. For motors used in conditions other than S1, the type of duty required by reference to CEI 2-3/IEC 34-1 Standards must be mentioned.

For duties from S2 to S8 in particular and for motor frame 132 or smaller, extra power output can be obtained with respect to continuous duty.

Accordingly the following condition must be satisfied:

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

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

12.2 Intermittence ratio

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

t_f = work time at constant load

t_r = rest time



(A 9)

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

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

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

The safety factor is so defined:

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

As standard, gear and motor combinations are implemented with 2, 4 and 6 pole motors, 50 Hz supplied.

Should the drive speed be different from 2800, 1400 or 900 min⁻¹, base the selection on the gear unit nominal rating.

12.3 Selection of speed reducer and gearbox with IEC motor adapter

a) Determine service factor f_s .

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

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

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

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



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

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

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

13 VERIFICATION

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

a) Thermal capacity

Make sure that the thermal capacity of the gearbox is equal to or greater than the power required by the application according to equation (3) on page 7.

If this condition is not verified, select a larger gearbox or apply a forced cooling system.

b) Maximum torque

The maximum torque (intended as instantaneous peak load) applicable to the gearbox must not, in general, exceed 200% of rated torque M_{n2} . Therefore, check that this limit is not exceeded, using suitable torque limiting devices, if necessary.

For three-phase double speed motors, it is important to pay attention to the switching torque which is generated when switching from high to low speed, because it could be significantly higher than maximum torque.

A simple, economical way to minimize overloading is to power only two phases of the motor during switch-over (power-up time on two phases can be controlled with a time-relay):

$$M_{g2} = 0.5 \cdot M_{g3}$$

M_{g2} = Switching torque with two-phase power-up

M_{g3} = Switching torque with three-phase power-up

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

c) Radial loads

Make sure that radial forces applying on input and/or output shaft are within permitted catalogue values.

If they were higher consider designing a different bearing arrangement before switching to a larger gear unit.

Catalogue values for rated overhung loads refer to mid-point of shaft under study.

Should application point of the overhung load be localised further out the revised loading capability must be adjusted as per instructions given in this manual.

Please refer to the paragraphs relating to radial loads.



d) Thrust loads

Actual thrust load must be found within 20% of the equivalent overhung load capacity.

Should an extremely high, or a combination of radial and axial load apply, consult Bonfiglioli Technical Service.

e) Starts per hour

For duties featuring a high number of switches the actual starting capability in loaded condition [Z] must be calculated.

Actual number of starts per hour must be lower than value so calculated.

14 INSTALLATION

The following installation instructions must be observed:

a) Make sure that the gearbox is correctly secured to avoid vibrations.

If shocks or overloads are expected, install hydraulic couplings, clutches, torque limiters, etc.

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

c) Parts fitted on the gearbox output shaft must be machined to ISO H7 tolerance to prevent interference fits that could damage the gearbox itself.

Further, to mount or remove such parts, use suitable pullers or extraction devices using the tapped hole located at the top of the shaft extension.

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

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

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

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



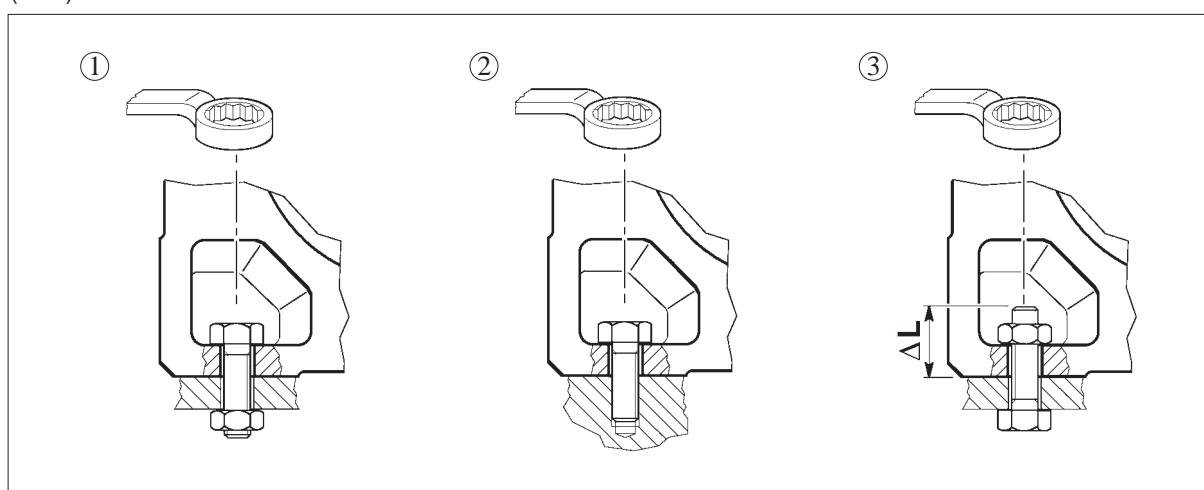
14.1 Fitting servomotors to gear heads featuring a clamping device (adapter type SC)

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

15 INSTALLATION INSTRUCTIONS

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

(A 10)



(A 11)

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

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



16 STORAGE

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

- a) Do not store outdoors, in areas exposed to weather or with excessive humidity.
- b) Always place boards, wood or other material between the products and the floor. The gearboxes should not have direct contact with the floor.
- c) In case of long-term storage all machined surfaces such as flanges, shafts and couplings must be coated with a suitable rust inhibiting product (Mobilarma 248 or equivalent).

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

17 CONDITIONS OF SUPPLY

Gear units are supplied as follows:

- a) configured for installation in the mounting position specified when ordering;
- b) tested to manufacturer specifications;
- c) mating machined surfaces come unpainted;
- d) nuts and bolts for mounting motors are provided;
- e) shafts are protected during transportation by plastic caps;
- f) supplied with lifting lug (where applicable).

18 PAINT SPECIFICATIONS

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