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Revisions

Refer to page 150 for the catalogue revision index.

Visit www.bonfiglioli.com to search for catalogues with latest revision index.

1.0 GENERAL INFORMATION

1.1 SYMBOLS AND UNITS

Symb.	U.m.	Description	Symb.	U.m.	Description
A_c	[lbs]	Calculated thrust load	P_t	[hp]	Thermal capacity
A_n	[lbs]	Rated thrust load	P_r	[hp]	Power required
f_m	–	Adjusting duty factor	R_c	[lbs]	Calculated radial load
f_t	–	Thermal correction factor	R_n	[lbs]	Rated OHL
i	–	Gear ratio	R_x	[lbs]	Radial OHL for load shifted from shaft midpoint
I	–	Intermittence	S	–	Safety factor
J_c	[lb·ft ²]	Load moment of inertia	S.F.	–	Service factor
J_m	[lb·ft ²]	Mass moment of inertia for motor	t_a	[°C/ °F]	Ambient temperature
J_r	[lb·ft ²]	Mass moment of inertia for gearbox	t_f	[min]	Operating time under constant load
K	–	Acceleration factor of masses	t_r	[min]	Rest time
K_r	–	Transmission element factor	W	[ft·lb]	Brake dissipated energy between two successive air-gap adjustments
T_b	[lb·in]	Brake torque	W_{max}	[ft·lb]	Maximum energy for each braking operation
T	[lb·in]	Torque	x	[in]	Load application distance from shaft shoulder
T_c	[lb·in]	Calculated torque	Z	[1/h]	Number of permitted starts in loaded conditions
T_n	[lb·in]	Speed reducer rated torque	Z_r	[1/h]	Number of starts
T_r	[lb·in]	Torque required	η_d		Dynamic efficiency
n	[rpm]	Speed			
P	[hp]	Power			
P_c	[hp]	Calculated power			
P_n	[hp]	Motor rated power			
P_n	[hp]	Rated horsepower			

Footnotes:

□₁ *Applies to input shaft*

□₂ *Applies to output shaft*

NOMENCLATURE

1.2 TORQUE

Nominal output torque T_{n2}

Torque transmitted at output shaft under uniform load, referred to input speed n_1 and corresponding output speed n_2 .

It is calculated according to service factor S.F. = 1.

Application torque T_{r2}

This is torque corresponding to application requirements. It must be equal to or less than rated output torque T_{n2} for the gearmotor selected.

Calculated torque T_{c2}

Torque value to be used for selecting the gearbox, considering required torque T_{r2} and service factor S.F., and is obtained by:

$$T_{c2} = T_{r2} \times S.F. \leq T_{n2}$$

1.3 POWER

Rated input horsepower P_{n1}

In the speed reducer selection charts, this is power applicable at input shaft referred to speed n_1 and considering a service factor S.F. = 1.

Output horsepower P_{n2}

Value represents rated HP as referred to speed reducer output shaft.

$$P_{n2} = P_{n1} \times \eta_d$$

$$P_{n2} = \frac{T_{n2} \times n_2}{63025} \quad P_{n2} \text{ in [hp]}; M_{n2} \text{ in [lb}\cdot\text{in]}$$

1.4 THERMAL CAPACITY

 P_t

The value indicates the speed reducer thermal limit and corresponds to the power transmission capacity under continuous duty at an ambient temperature of 20°C [70°F] without using a supplementary cooling system.

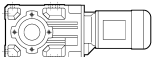
For short operating periods with sufficiently long pauses to allow the unit to cool, thermal power is not a factor important and it does not need to be taken into consideration.

For ambient temperature different from 20°C [70°F] and intermittent duty, P_t value can be adjusted according to thermal factor f_t listed in table (A1), provided the following condition is satisfied.

$$P_{r1} \leq P_t \times f_t$$

Gear units A 10 through A 30 are not thermally limited and the thermal verification does not apply.

(A0)

	P_t [hp] [20 °C / 70 °F]	
	$n_1 = 1750$ rpm	$n_1 = 3500$ rpm
A 10 2	6.4	5.4
A 20 2	8.0	7.2
A 30 2	10.7	8.9
A 41 2	13.4	11.7
A 50 2	27	24.1
A 60 2	36	31
A 70 3	42	35
A 80 3	59	52
A 90 3	86	76

(A1)

		f_t			
ta max. °C [°F]	Continuous duty	Intermittent duty			
		Intermittence % (I)			
		80	60	40	20
40 [105]	0.8	1.1	1.3	1.5	1.6
30 [85]	0.85	1.3	1.5	1.6	1.8
20 [70]	1.0	1.5	1.6	1.8	2.0
50 [10]	1.15	1.6	1.8	2.0	2.3

Intermittence (I)% is obtained dividing operating time under load [t_f] by total time, expressed as a percentage:

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

1.5 EFFICIENCY η

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

$$\eta = \frac{P_2}{P_1}$$

Torque value M_{n2} specified in this catalogue takes the dynamic efficiency η_d into account.

1.6 MASS MOMENT OF INERTIA J_r

Values for the moment of inertia specified in the catalogue refer to gear unit input shaft. They are therefore related to motor speed, in the case of direct motor mounting.

1.7 SERVICE FACTOR **S.F.**

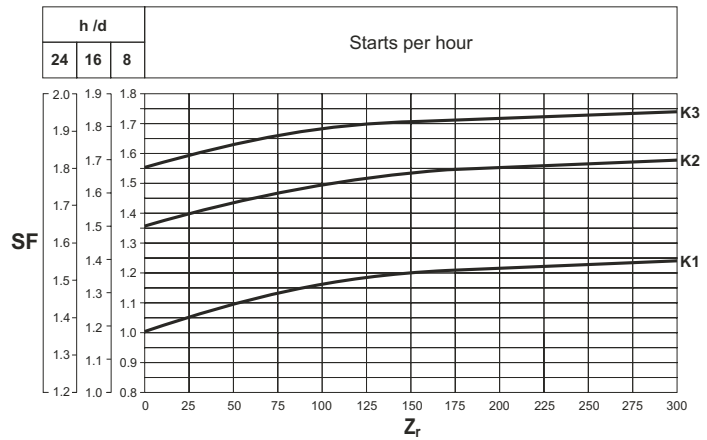
The service factor is the numerical parameter that describes the severity of the application. Its value results from the combination of the actual duty the gearbox is operated at, the number of starts per hour and the daily operating hours.

The graph (A2) here after comes handy when calculating the actual value for the service factor:

1. Enter the chart with the starts per hour [Z_r]
2. Intersect the $K_$ curve that applies for the application
3. Read the service factor **S.F.** from the column marked with the applicable hours per day [h/d]

Intermediate values can be obtained by interpolation.

(A2)



Acceleration factor of masses **K**

Used for establishing the service factor and obtained from the following equation:

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

Where:

J_c [lb·ft²]

moment of inertia of the driven masses in proportion to the speed of the applied motor

J_m [lb·ft²]

motor moment of inertia

K1 uniform load

$$K \leq 0.25$$

K2 moderate shock load

$$K \leq 3$$

K3 heavy shock load

$$K \leq 10$$

For values of $K > 10$, please contact our Technical Service.

1.8 SELECTION

AGMA Service Factor charting 24hr service (continuous duty)

(A3)

Application	S.F.
AGITATORS	
Pure Liquids	1.25
Liquids & Solids	1.50
Liquids - variable density	1.50
BLOWERS	
Centrifugal	1.25
Lobe	1.50
Vane	1.50
BREWING AND DISTILLING	
Bottling Machinery	1.25
Brew Kettles - Continuous Duty	1.25
Cookers - Continuous Duty	1.25
Mash Tubs - Continuous Duty	1.25
Scale Hopper - Frequent Starts	1.50
CAN FILLING MACHINES	
	1.25
CAR DUMPERS	
	2.00
CAR PULLERS	
	1.50
CLARIFIERS	
	1.25
CLASSIFIERS	
	1.50
CLAY WORKING MACHINERY	
Brick Press	2.00
Briquette Machine	2.00
Pug Mill	1.50
COMPACTORS	
	2.00
COMPRESSORS	
Centrifugal	1.25
Lobe	1.50
Reciprocating, Multi-Cylinder	1.75
Reciprocating, Single-Cylinder	2.00
CONVEYORS - GENERAL PURPOSE	
<i>includes Apron, Assembly, Belt, Bucket, Chain, Flight, Oven and Screw</i>	
Uniformly Loaded or Fed	1.25
Heavy Duty - Not Uniformly Fed	1.50
Severe Duty - Reciprocating or Shaker	2.00
CRANES	
Dry Dock	
Main Hoist	2.50
Auxiliary Hoist	3.00
Boom Hoist	3.00
Slewing Hoist	3.00
Traction Drive	3.00

Application	S.F.
Container	
Main Hoist	3.00
Boom Hoist	2.00
Trolley Drive	
Gantry Drive	3.00
Traction Drive	2.00
Mill Duty	
Main Hoist	3.50
Auxiliary	3.50
Bridge Travel	3.00
Trolley Travel	3.00
Industrial Duty	
Main	3.00
Auxiliary	3.00
Bridge Travel	3.00
Trolley Travel	3.00
CRUSHERS	
Stone or Ore	2.00
DREDGES	
Cable Reels	1.50
Conveyors	1.50
Cutter Head Drives	2.00
Pumps	2.00
Screen Drives	2.00
Stackers	1.50
Winches	1.50
ELEVATORS	
Bucket	1.50
Centrifugal Discharge	1.25
Escalators	1.25
Freight	1.50
Gravity Discharge	1.25
EXTRUDERS	
General	1.50
Plastics	
Variable Speed Drive	1.50
Fixed Speed Drive	1.75
Rubber	
Continuous Screw Operation	1.75
Intermittent Screw Operation	1.75
FANS	
Centrifugal	1.25
Cooling Towers	2.00
Forced Draft	1.25
Induced Draft	1.50
Industrial & Mine	1.50
FEEDERS	
Apron	1.50
Belt	1.50
Disc	1.25
Reciprocating	2.00
Screw	1.50

Application	S.F.
FOOD INDUSTRY	
Cereal Cooker	1.25
Dough Mixer	1.50
Meat Grinder	1.50
Slicers	1.50
GENERATORS AND EXITORS	1.25
HAMMER MILLS	2.00
HOISTS	
Heavy Duty	2.00
Medium Duty	1.50
Skip Hoist	1.50
LUMBER INDUSTRY	
Barkers	
Spindle Feed	1.50
Main Drive	1.75
Conveyors	
Burner	1.50
Main or Heavy Duty	1.50
Main Log	2.00
Re-saw, Merry-Go-Round	1.50
Slab	2.00
Transfer	1.50
Chains	
Floor	1.50
Green	1.75
Cut-Off Saws	
Chain	1.75
Drag	1.75
Debarking Drums	2.00
Feeds	
Edger	1.50
Gang	1.75
Trimmer	1.50
Log Deck	1.75
Log Hauls - Incline - Well Type	1.75
Log Turning Devices	1.75
Planer Feed	1.50
Planer Tilting Hoists	1.50
Rolls - Live-off brg. - Roll Cases	1.75
Sorting Table	1.50
Tipple Hoist	1.50
Transfer	
Chain	1.75
Craneway	1.75
Tray Drives	1.50
Veneer Lathe Drives	1.50
METAL MILLS	
Draw Bench Carriage and Main Drive	1.50
Runout Table	
Non-reversing	1.50
Group Drives	1.50
Individual Drives	2.00

Application	S.F.
Reversing	2.00
Slab Pushers	1.50
Shears	2.00
Wire Drawing	1.50
Wire Winding Machine	1.50
METAL STRIP PROCESSING MACHINERY	
Bridles	1.50
Coilers & Uncoilers	1.25
Edge Trimmers	1.50
Flatteners	1.50
Loopers (Accumulators)	1.25
Pinch Rolls	1.50
Scrap Choppers	1.50
Shears	2.00
Slitters	1.50
MILLS, ROTARY TYPE	
Ball & Rod	
Spur Ring Gear	2.00
Helical Ring Gear	1.50
Direct Connected	2.00
Cement Kilns	1.50
Dryers & Coolers	1.50
MIXERS, CEMENT	1.50
PAPER MILLS	
Agitator (Mixer)	1.50
Agitator for Pure Liquors	1.25
Barking Drums	2.00
Barkers - Mechanical	2.00
Beater	1.50
Breaker Stack	1.25
Calendar	1.25
Chipper	2.00
Chip Feeder	1.50
Coating Rolls	1.25
Conveyors	
Chip, Bark, Chemical	1.25
Log (including Slab)	2.00
Couch Rolls	1.25
Cutter	2.00
Cylinder Molds	1.25
Dryers	
Paper Machine	1.25
Conveyor Type	1.25
Embosser	1.25
Extruder	1.50
Fourdrinier Rolls	1.25
(includes Lump breaker, dandy roll, wire turning, and return rolls)	
Jordan	1.50
Kiln Drive	1.50
Mt. Hope Roll	1.25
Paper Rolls	1.25
Platter	1.50

Application	S.F.
Presses - Felt & Suction	1.25
Pulper	2.00
Pumps - Vacuum	1.50
Reel (Surface Type)	1.25
Screens	
Chip	1.50
Rotary	1.50
Vibrating	2.00
Size Press	1.25
Super Calender	1.25
Thickener (AC Motor)	1.50
Thickener (DC Motor)	1.25
Washer (AC Motor)	1.50
Washer (DC Motor)	1.25
Wind and Unwind Stand	1.25
Winders (Surface Type)	1.25
Yankee Dryers	1.25
PLASTICS INDUSTRY - PRIMARY PROCESSING	
Intensive Internal Mixers	
Batch Mixers	1.75
Continuous Mixers	1.50
Batch Drop Mill - 2 smooth rolls	1.25
Continuous Feed, Holding & Blend Mill	1.25
Calender	1.50
PLASTICS INDUSTRY - SECONDARY PROCESSING	
Blow Molder	1.50
Coating	1.25
Film	1.25
Pipe	1.25
Pre-Plasticizer	1.50
Rods	1.25
Sheet	1.25
Tubing	1.50
PULLER - BARGE HAUL	1.50
PUMPS	
Centrifugal	1.25
Proportioning	1.50
Reciprocating	
Single Acting, 3 or more cylinders	1.50
Double Acting, 2 or more cylinders	1.50
Rotary	
Gear Type	1.25
Lobe	1.25
Vane	1.25
RUBBER INDUSTRY	
Intensive Internal Mixers	
Batch Mixers	1.75
Continuous Mixers	1.50
Mixing Mill	
2 smooth rolls	1.50
1 or 2 corrugated rolls	
Batch Drop Mill - 2 smooth rolls	1.50

Application	S.F.
Cracker - 2 corrugated rolls	2.00
Holding, Feed & Blend Mill - 2 rolls	1.25
Refiner - 2 rolls	1.50
Calender	1.50
SAND MULLER SEWAGE DISPOSAL EQUIPMENT	1.50
Bar Screens	1.25
Chemical Feeders	1.25
Dewatering Screens	1.50
Scum Breakers	1.50
Slow or Rapid Mixers	1.50
Sludge Collectors	1.25
Thickener	1.50
Vacuum Filters	1.50
SCREENS	
Air Washing	1.25
Rotary - Stone or Gravel	1.50
Traveling Water Intake	1.25
SUGAR INDUSTRY	
Beet Slicer	2.00
Cane Knives	1.50
Crushers	1.50
Mills (low speed end)	1.75
TEXTILE INDUSTRY	
Batchers,	1.50
Calenders	1.50
Cards	1.50
Dry Cans	1.50
Dyeing Machinery	1.50
Looms	1.50
Mangles	1.50
Nappers	1.50
Pads	1.50
Slashers	1.50
Soapers	1.50
Spinners	1.50
Tenter Frames	1.50
Washers	1.50
Winders	1.50

Recommended procedure for correct selection of drive unit:

Selecting a gearmotor

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

B) Once torque T_{r2} , speed n_2 and dynamic efficiency η_d are known, input power can be calculated as follows:

$$P_{r1}(\text{hp}) = \frac{T_{r2}(\text{lb} \cdot \text{in}) \times n_2(\text{rpm})}{63,025 \times \eta_d}$$

Values for η_d for the different sizes of speed reducer are indicated in table (A4) below:

(A4)

	Reductions		
	2	3	4
η_d	0.95	0.93	0.91

C) Consult the gearmotor selection charts and locate the table corresponding to power

$$P_n \geq P_{r1}$$

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 60034-1 Standards must be mentioned.

For duties from S2 to S8 in particular, and for IEC motor frame 132 or smaller, extra power can be obtained with respect to continuous duty, consequently the following condition must be satisfied:

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

The adjusting duty factor f_m can be obtained from chart (A5).

(A5)

	Duty						Please consult factory	
	S2			S3*				S4 - S8
	Cycle duration [min]			Intermittence (I)				
	10	30	60	25%	40%	60%		
fm	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 Department.

Intermittence:

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

t_f = operating time at constant load
 t_r = rest time

Next, according to output speed n_2 , select a gearmotor featuring a safety factor S greater than or equal to service factor S.F.

$$S \geq \text{S.F.}$$

The gearmotor selection charts features combination with 2, 4 and 6 pole motors.

If motors with different speed shall be used, refer to the selection procedure for speed reducers and choose the most suitable gear unit.

For applications such as hoisting and travelling, contact our Technical Service Department.

Selecting a speed reducer with a motor adapter

A) Determine service factor S.F. based on application. See pages 5 - 7.

B) Assuming the required output torque for the application T_{r2} is known, the calculated torque can be defined as:

$$T_{c2} = T_{r2} \times \text{S.F.}$$

C) The gear ratio is calculated according to requested output speed n_2 and the drive input speed n_1

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

Once the torque T_{c2} and gear ratio [i] are calculated consult the speed reducer rating chart for the actual drive speed n_1 and select the unit that features a torque rating T_{n2} that equals or exceeds the computational torque T_{c2} :

$$T_{n2} \geq T_{c2}$$

If an electric motor, with either a NEMA or a IEC flange, is going to be fitted onto the captioned gear unit, check that matching is feasible at chapter "Motor availability".

1.9 VERIFICATIONS

After the selection of the speed reducer, or gearmotor, is complete:

A) Thermal capacity

Make sure that the thermal capacity of the speed reducer is equal to or higher than power required by the application. If this condition is not verified, select a larger speed reducer or apply a supplementary cooling system.

B) Maximum torque

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

For three-phase two speed motors, it is important to pay attention to switching torque generated (from high to low speed), because it could be significantly higher than maximum torque.

C) Radial loads

Check that forces applying on input and/or output shafts are within permitted catalogue values. If they are higher, select a larger speed reducer or change bearing arrangement.

Remember that all values listed in the catalogue refer to loads acting at mid-point of the shaft. The permissible radial load value should be adjusted if the radial load is not acting at mid point of shaft.

See para 2.8.

D) Thrust loads

Thrust loads, if applicable, must also be compared to the permitted values indicated in the catalogue. In the event of extremely high thrust loads, or a combination of thrust and radial loads, contact our Technical Service for advise.

E) Electric motors

For duties with considerable number of starts per hour, factor Z must be considered (it can be sorted from the motor rating chart). Factor Z defines the maximum number of starts for the application under consideration.

1.10 INSTALLATION

The following installation instructions must be followed:

A) Make sure that the speed reducer is adequately secured to avoid vibrations. If shocks, prolonged overloading, or the possibility of locking are expected, install hydraulic couplings, clutches, torque limiters, etc.).

B) Prior to painting the gear unit,, the outer face of the oil seals must be protected to prevent the solvent drying out the rubber, thus jeopardizing the sealing function.

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

D) Before starting up the machine, make sure that oil level is correct for the actual mounting position, and that viscosity is suitable for the specific duty. See table (B1).

1.11 STORAGE

Observe the following instructions to ensure correct storage of 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 gearbox should not have direct contact with the floor.
- C) For long term storage (over 60 days), all machined surfaces such as flanges, shafts and couplings must be protected with a suitable rust inhibiting product (Mobilarma 248 or equivalent).
- D) The following measures must be taken when products are stored for a period exceeding 6 months:
 - For life lubricated products, the machined areas must be greased to prevent oxidation.
 - In addition to above, products originally supplied w/o oil must be positioned with the breather plug at the highest point, and filled with oil.
Before operating the speed reducer, restore the correct quantity of oil.

1.12 MAINTENANCE

Speed reducers A 10 through A 30 are lubricated and do not require periodical oil change.
For larger speed reducers, the first oil change must take place after about 300 hours of operation, flushing the interior of the unit using suitable detergents.
Do not mix mineral oils with synthetic oils.
Check oil periodically and restore the level, if necessary.

2.0 BEVEL-HELICAL GEARMOTORS



A SERIES

2.1 ORDERING NUMBERS

Speed reducer designation

A 30 2 NUH F1A 76.5 S1 B3

OPTIONS

MOUNTING POSITION

B3 (default), B6, B7, B8, VA, VB

INPUT OPTIONS

NHS for speed reducer with solid input shaft (inch dims.)

HS for speed reducer with solid input shaft (metric dims.)

P + IEC frame size for gear head with IEC motor adapter

S + motor size for integral gearmotor

Specify for NEMA inputs:

	56C	56C
	140TC	143TC and 145TC
	180TC	182TC and 184TC
N +	210TC	for motors: 213TC and 215TC
	250TC	254TC and 256TC
	280TC	284TC and 286TC
	320TC	324TC and 326TC

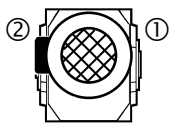
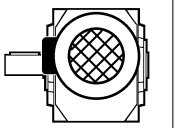
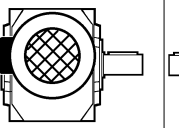
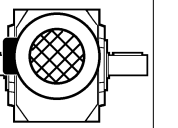
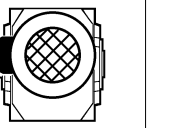
GEAR RATIO

F = flange

1 = R.H. mount; **2** = L.H. mount

A, B, C = size of flange

VERSION

					shaft dims.
NUH : hollow shaft (A 10...A 60)	NUL (A 10...A 60)	NUR (A 10...A 60)	NUD (A 10...A 60)	—	inch
UH_ : hollow shaft (A 70...A 90)	—	UR (A 70...A 90)	UD (A 70...A 90)	US : shrink disc (A 10...A 90)	metric

REDUCTIONS

2, 3, 4

FRAME SIZE

10, 20, 30, 41, 50, 60, 70, 80, 90

SERIES

A = bevel-helical

Bonfiglioli motor

MOTOR

BRAKE

M 1LA 4 230/460-60 IP54 CLF W FD 15 R SB 220 SA

OPTIONS

BRAKE SUPPLY

AC/DC RECTIFIER
NB, NBR, SB, SBR

BRAKE HAND RELEASE (optional)
R, RM

BRAKE TORQUE [specify Nm!]

[1 ft · lb = 1.356 Nm]

BRAKE TYPE
FD (DC brake)
FA (AC brake)

TERMINAL BOX
W (default), N, S, E

MOUNTING
blank for compact motor
B5 for IEC motor

INSULATION CLASS
CL F default

PROTECTION CLASS
IP 55 standard (**IP 54** standard for brake motors)

VOLTAGE - FREQUENCY

NUMBER OF POLES

MOTOR FRAME SIZE
05A...5LA - integral motor
63A...225S4 - IEC style motor

TYPE OF MOTOR

M = AC, 3-ph, integral style

BN = AC, 3-ph, IEC face motor

NEMA motors to be specified thru their ordering numbers

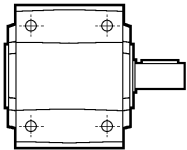
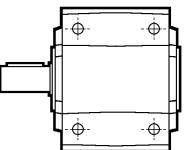
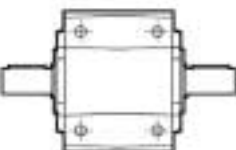
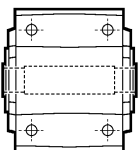
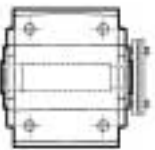
2.2 DESIGN ADVANTAGES

The main design characteristics are:

- modularity
- compact design
- universal mounting
- high efficiency
- low noise
- gears in hardened and case-hardened steel
- aluminium housing for sizes 10, 20, 30, unpainted, high strength painted cast-iron housings for larger sizes.
- input and output shafts in high grade steel

2.3 VERSIONS

Available version for A series gearbox and gearmotors are illustrated below.

	NUL (inch series)
	UR (metric series) NUR (inch series)
	UD (metric series) NUD (inch series)
	UH (metric series) NUH (inch series)
	US (metric series)

2.4 SPEED REDUCER OPTIONS

AL, AR

Anti-run back device.

The gear units the device can be specified for and the direction of free rotation are described at chapter 2.11

SO

Gearboxes A 10, A 20, A 30, are supplied without oil.

LO

Gearboxes A 41, A 50, A 60, A 70, A 80, A 90, usually supplied without oil, to be factory filled with synthetic oil currently used by BONFIGLIOLI RIDUTTORI according to the mounting position specified.

DV

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

VV

Viton® oil seal on input shaft.

PV

All oil seals in Viton® material.

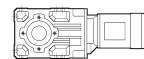
Terminal box location

Location of motor terminal box can be specified by viewing the motor from the fan side; default position is highlighted in bold (**W**).

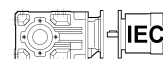
Angular position of the brake release lever

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

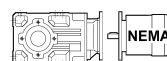
2.5 SYMBOLS



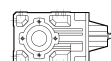
Gearmotor with compact motor.



Gearmotor with motor adapter.



Gearbox with NEMA input.



Gearbox with solid input shaft.



2 Reduction



3 Reduction



4 Reduction



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

2.6 LUBRICATION

Speed reducer size A 10...A 30 are supplied with life lubrication and do not have oil filling, level, and drain plugs.

These long-life lubricated units are capable of operating at an ambient temperature range of 0 °C to +50 °C [32 to 122 °F]. For temperatures below 0 °C [32 °F], contact our Technical Service.

Speed reducers for which the SO options is specified come without oil and must be filled by the user prior to be put into operation.

In this case refer to charts (B1) and (B2) for the most appropriate type of oil and relevant change interval.

Customers must always advise mounting position to ensure the correct arrangement of the filling, level and drain plugs.

Periodical oil changes are not required for sizes A 10...A 30 as they are lubricated for life with synthetic oil.


(B1)

Duty	Ambient temp. 0 - 20 °C [32 - 70 °F]		Ambient temp. 20 - 40 °C [70 - 104 °F]	
	Mineral oil ISO VG	Synthetic oil ISO VG	Mineral oil ISO VG	Synthetic oil ISO VG
Light duty	150	150	220	220
Medium duty	150	150	320	220
Heavy duty	220	220	460	320

(B2)

Oil temperature °C [°F]	Oil change interval [hours]	
	Mineral oil	Synthetic oil
< 65 [< 150 °F]	8000	25000
65 - 80 [150 °F - 175 °F]	4000	15000
80 - 95 [175 °F - 200 °F]	2000	12500




(B3)

Oil quantity						
	Mounting positions					
	B3	B6	B7	B8	VA	VB
A 10 2	0.37	0.37	0.37	0.37	0.37	0.37
	1.4	1.4	1.4	1.4	1.4	1.4
A 20 2	0.61	0.61	0.61	0.61	0.61	0.61
	2.3	2.3	2.3	2.3	2.3	2.3
A 20 3	0.69	0.69	0.69	0.69	0.69	0.69
	2.6	2.6	2.6	2.6	2.6	2.6
A 30 2	0.84	0.84	0.84	0.84	0.84	0.84
	3.2	3.2	3.2	3.2	3.2	3.2
A 30 3	0.95	0.95	0.95	0.95	0.95	0.95
	3.6	3.6	3.6	3.6	3.6	3.6
A 41 2	1.06	1.08	1.08	1.24	1.37	1.16
	4.0	4.1	4.1	4.7	5.2	4.4
A 41 3	1.06	1.06	1.06	1.24	1.61	1.03
	4.0	4.0	4.0	4.7	6.1	3.9
A 50 2	1.29	2.14	1.24	2.22	2.90	2.43
	4.9	8.1	4.7	8.4	11	9.2
A 50 3	1.35	2.14	1.24	2.22	2.90	2.43
	5.1	8.1	4.7	8.4	11	9.2
A 50 4	1.66	2.16	1.40	2.19	3.43	2.40
	6.3	8.2	5.3	8.3	13	9.1
A 60 2	1.80	2.14	3.17	3.96	4.75	3.96
	6.8	8.1	12	15	18	15
A 60 3	1.80	2.14	3.17	3.96	4.75	3.96
	6.8	8.1	12	15	18	15
A 60 4	1.90	2.90	1.95	4.22	5.02	3.70
	7.2	11	7.4	16	19	14
A 70 3	2.64	3.70	2.64	3.96	5.28	3.70
	10	14	10	15	20	14
A 70 4	3.43	3.70	2.64	3.96	6.07	3.70
	13	14	10	15	23	14
A 80 3	3.96	5.81	3.96	6.86	9.24	5.81
	15	22	15	26	35	22
A 80 4	5.28	5.81	3.96	6.86	10.30	5.81
	20	22	15	26	39	22
A 90 3	8.18	9.24	9.77	11.62	17.42	10.30
	31	35	37	44	66	39
A 90 4	10.82	9.24	9.77	11.62	19.27	10.30
	41	35	37	44	73	39

 Life lubricated

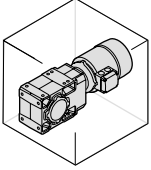
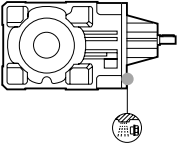
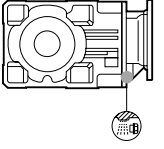
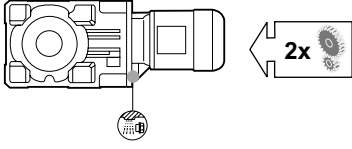
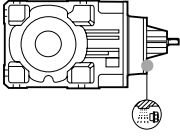
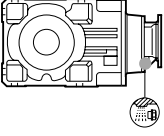
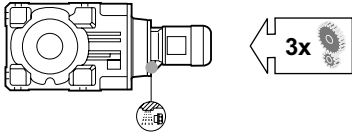
Quantities are $\frac{\text{gallons}}{\text{litres}}$

2.7 MOUNTING POSITION AND TERMINAL BOX SPECIFICATION

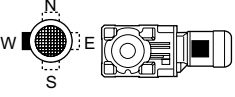
 Fill / breather plug	 Level plug	 Drain plug
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Input:	HS	P (IEC) N (NEMA)	S
---------------	-----------	-----------------------------	----------

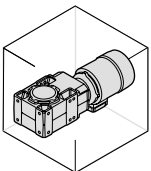
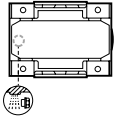
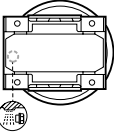
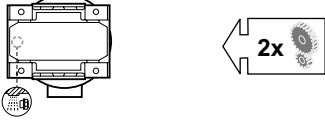
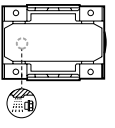
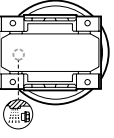
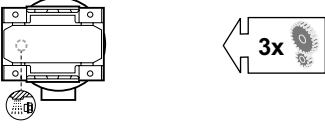
B3

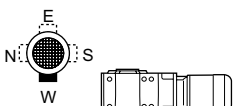
W = Default



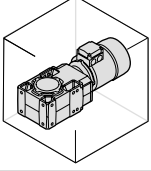
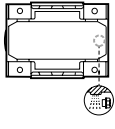
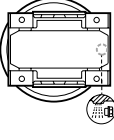
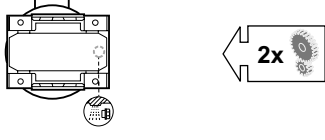
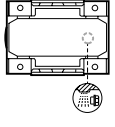
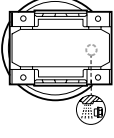
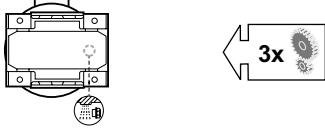
B6

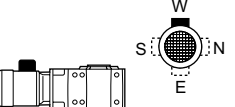
W = Default



B7

W = Default



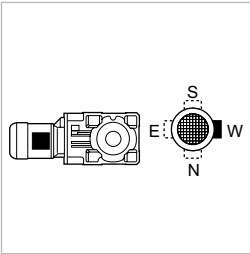
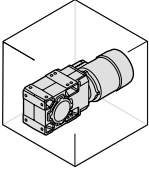
Input:

HS

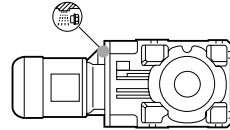
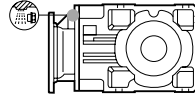
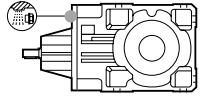
P (IEC)
N (NEMA)

S

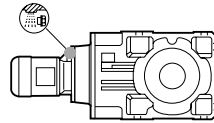
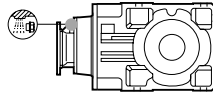
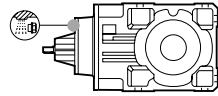
B8



W = Default

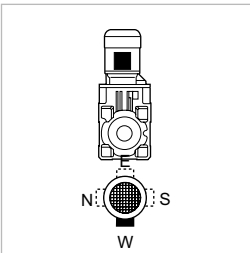
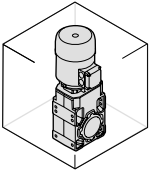


← 2x

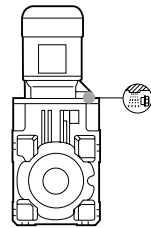
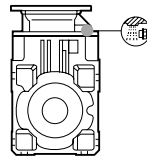
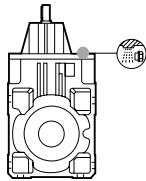


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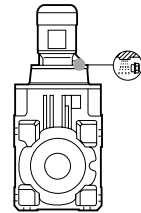
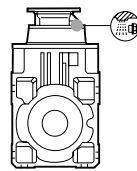
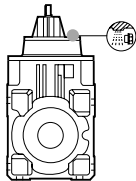
VA



W = Default

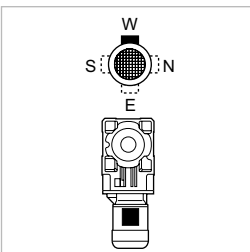
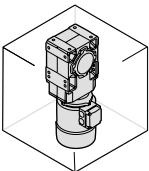


← 2x

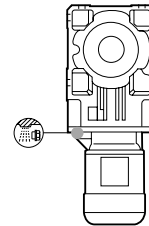
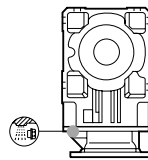
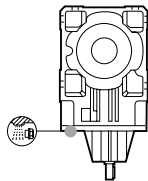


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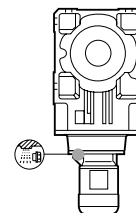
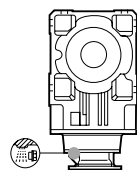
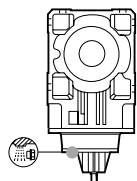
VB



W = Default



← 2x



← 3x

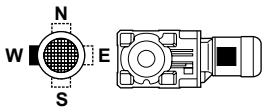
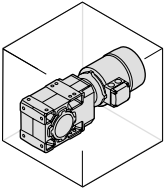
Input:

HS

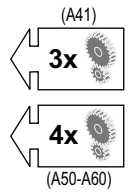
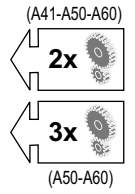
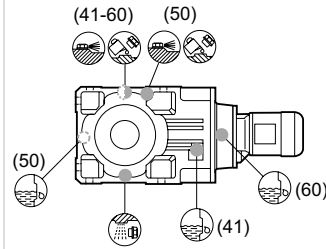
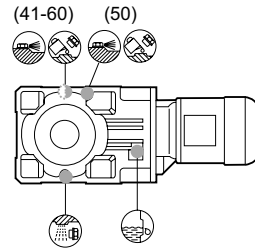
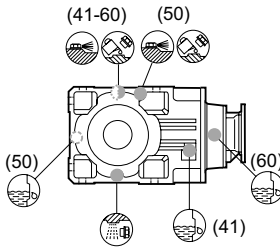
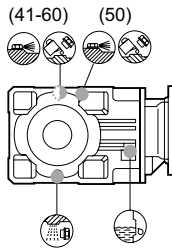
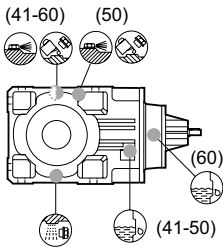
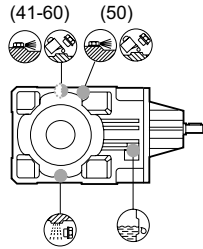
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N (NEMA)**

S

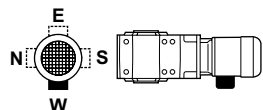
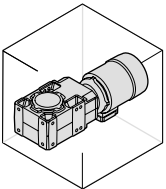
B3



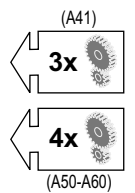
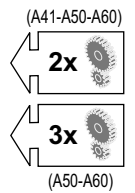
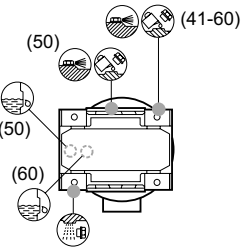
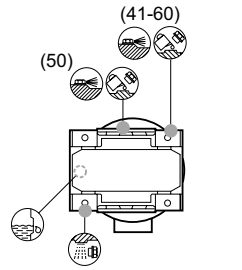
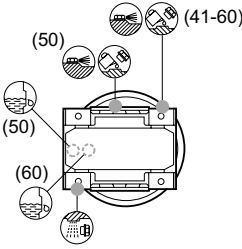
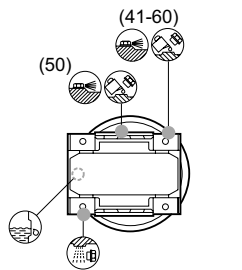
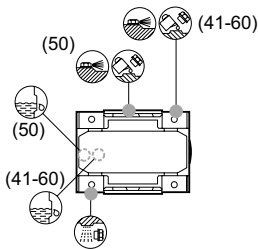
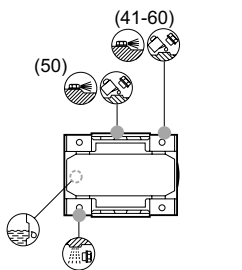
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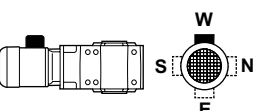
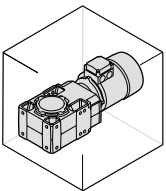
B6



W = Default



B7



W = Default

