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Revisions

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1.0 GENERAL INFORMATION

1.1 SYMBOLS AND UNITS

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

Footnotes:

$\square_1$ *Applies to input shaft*

$\square_2$ *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.

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

$$P_{n2} = \frac{T_{n2} \times n_2}{63025}$$

P_{n2} in [hp]; M_{n2} in [ib·in]

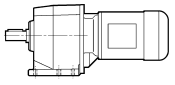
1.4 THERMAL CAPACITY P_t

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 C 05 through C 31 are not thermally limited and the thermal verification does not apply.

(A0)

	**Pt** [hp] [20 °C / 70 °F]	
	n_1 = 1750 rpm	n_1 = 3500 rpm
C 05 2	—	—
C 11 2	—	—
C 21 2	—	—
C 31 2	—	6.0
C 35 2	8.7	6.7
C 41 2	10.7	8.0
C 51 2	14.7	10.5
C 61 2	18.8	13.4
C 70 2	28	21
C 80 2	43	32
C 90 2	58	43
C 100 2	79	56

(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.

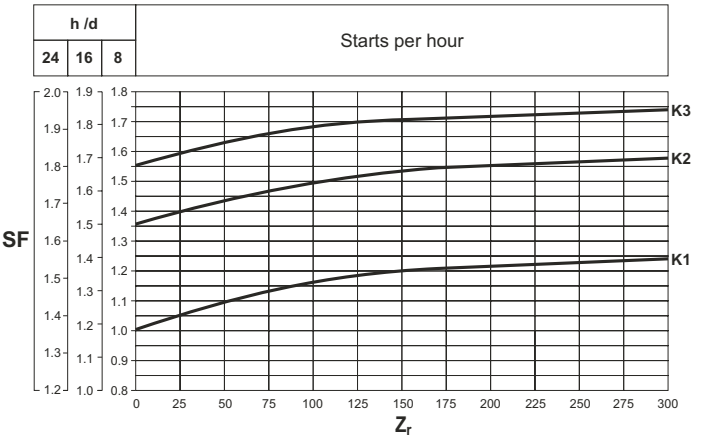
1.7 SERVICE FACTOR S.F.

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:

Jc [lb·ft^2]
moment of inertia of the driven masses in proportion to the speed of the applied motor

Jm [lb·ft^2]
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	
includes Apron, Assembly, Belt, Bucket, Chain, Flight, Oven and Screw	
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
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
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 Tr_2, speed n_2 and dynamic efficiency η_d are known, input power can be calculated as follows:

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

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 Pn 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						
	S2			**S3***			**S4 - S8**
	Cycle duration [min]			Intermittence (I)			Please consult factory
	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:

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

tf = operating time at constant load
tr = 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.

$S \geq S.F.$

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 Tr_2 is known, the calculated torque can be defined as:

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

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

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

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

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

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:

For gear units type C 11 2, C 21 2 and C 31 2, with ratio i > 40:1, operated with Z > 30 switches per hour, adjust the service factor calculated through diagram (A2) and multiply the value by 1.2

Then check that for the revised service factor the condition S ≥ S.F. still applies.

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 outer face of the oil seals must be protected to prevent the solvent drying out the rubber, thus jeopardizing the oil-seal function.

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

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

E) Coupling to the speed reducer output hollow shaft (tolerance G7) is usually effected with shafts machined to h6 tolerance. If the type of application requires it, coupling with a slight interference (G7-j6) is possible.

F) 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).

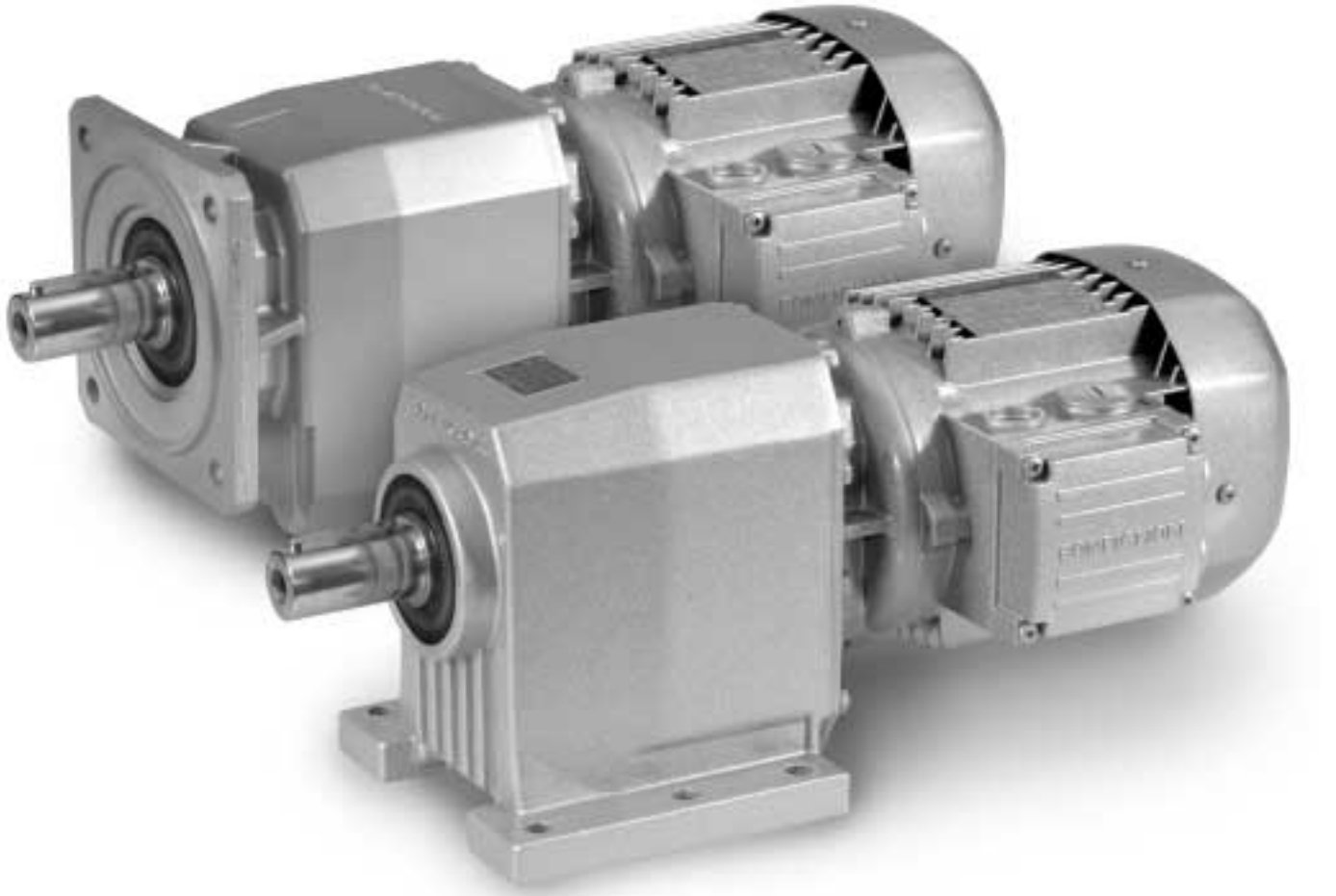
D) The following measures must be taken when products are stored for a period exceeding 6 months:

- 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

Life lubricated speed reducers 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 HELICAL IN-LINE GEARMOTORS



C SERIES

2.1 ORDERING NUMBERS

Gearbox

C 21 2 NP 24.3 S2 B3 .....

OPTIONS

MOUNTING POSITION

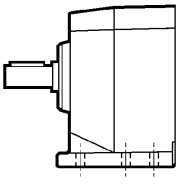
B3 (default), B6, B7, B8, V5, V6
B5 (default), B51, B53, B52, V1, V3

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

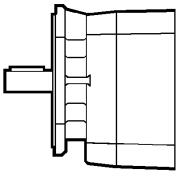
Specify for NEMA inputs:			
	56C		56C
	140TC		143TC and 145TC
	180TC		182TC and 184TC
N +	210TC	for motors:	213TC and 215TC
	250TC		254TC and 256TC
	280TC		284TC and 286TC
	320TC		324TC and 326TC

GEAR RATIO

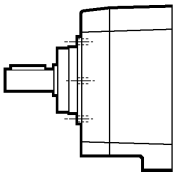
VERSION



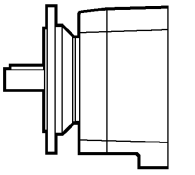
NP: foot mounted inch shaft (C 05...C 61)
P: foot mounted metric shaft (C 70...C 100)



NF: flange mounted inch shaft (C 05...C 31)
F: flange mounted metric shaft (C 70...C 100)



NU: universal housing inch shaft (C 11...C 61)



NUF_: bolt-on output flange (**A, B, C**) inch shaft (C 11...C 61)

REDUCTIONS

2, **3**, **4**

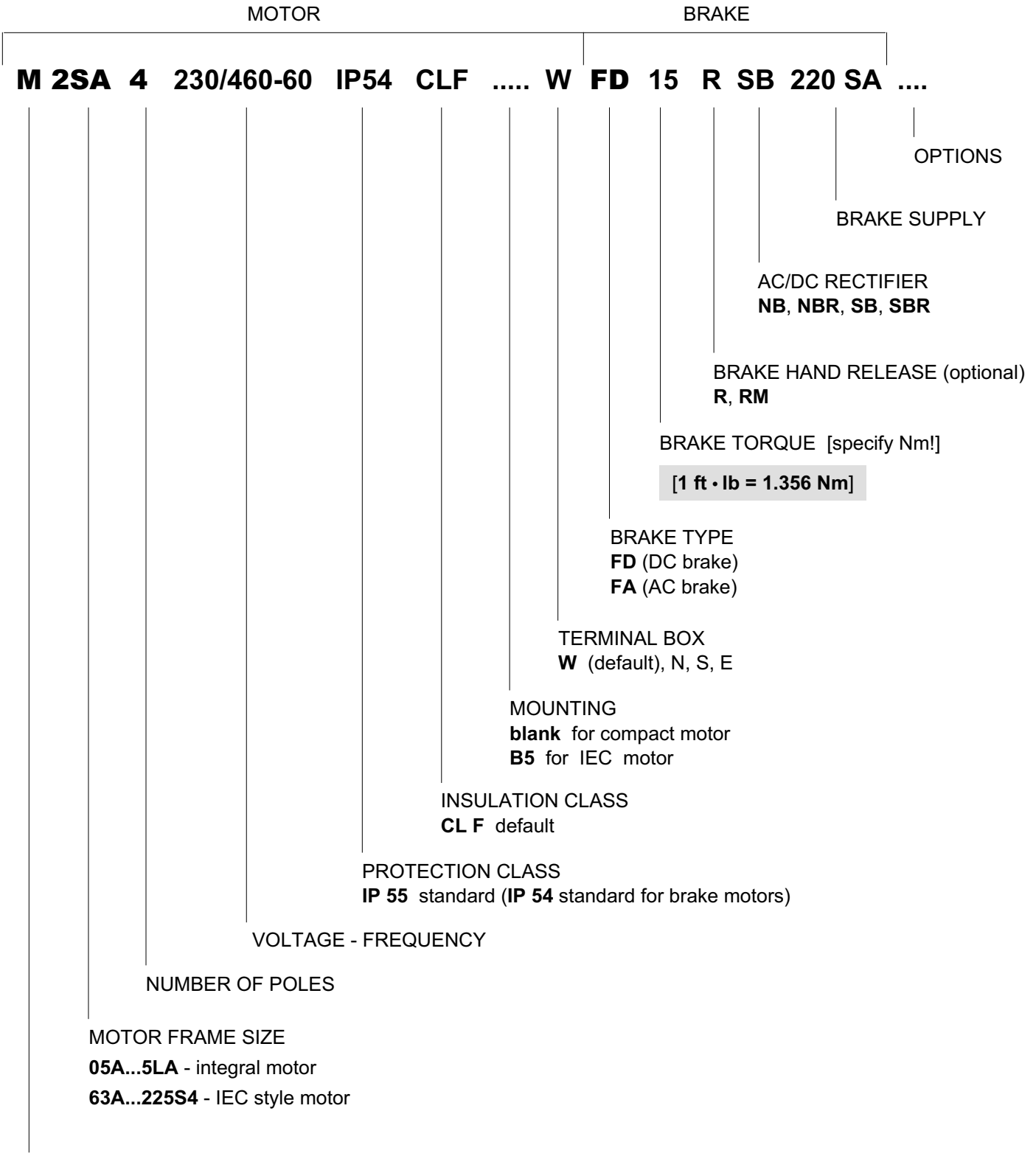
FRAME SIZE

05, **11**, **21**, **31, 35, 41 ,51 ,61, 70, 80, 90, 100**

SERIES

C = helical in-line

Bonfiglioli motor



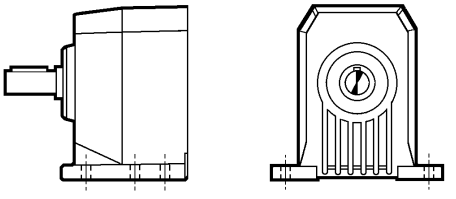
2.2 DESIGN ADVANTAGES

Main product features are:

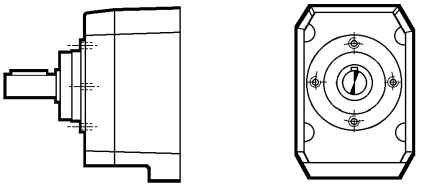
- compact design
- universal mounting
- high efficiency
- low noise
- gears from hardened and case-hardened steel
- bare aluminium housing
- input and output shafts from high grade steel

2.3 VERSIONS

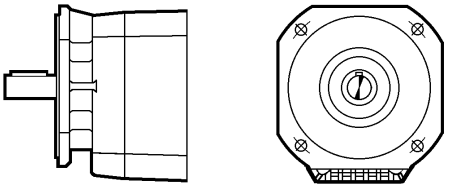
Versions available for C series speed reducer and gearmotors are shown below.



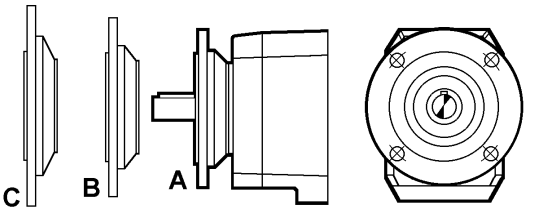
NP: foot mounted
inch shaft (C 05...C 61)
P: foot mounted
metric shaft (C 70...C 100)



NU: universal housing
inch shaft (C 11...C 61)



NF: flange mounted
inch shaft (C 05...C 31)
F: flange mounted
metric shaft (C 70...C 100)



NUF_: bolt-on output flange (**A, B, C**)
inch shaft (C 11...C 61)

2.4 SPEED REDUCER OPTIONS

SO

Speed reducers C 05, C 11, C 21, C 31, C 35 and C 41 to be supplied unlubricated.

LO

Gearboxes C 51, C 61, C 70, C 80, C 90, C 100 usually supplied without oil, to be factory filled with synthetic oil currently used by BONFIGLIOLI RIDUTTORI and according to the mounting position specified.

DL

Two oil seals on output shaft.

DV

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

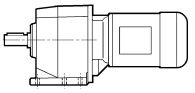
VV

Viton® oil seal on input shaft.

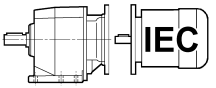
PV

All oil seals in Viton®.

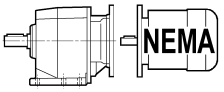
2.5 SYMBOLS



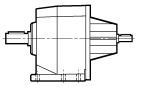
Gearmotor with compact motor.



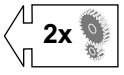
Speed reducer with IEC motor adapter.



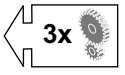
Speed reducer with NEMA input flange.



Speed reducer 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 C 05...C 41 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.

(B1)

Duty	**t_a 0 - 20 °C [32 - 70 °F]**		**t_a 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

Periodical oil changes are not required for sizes C 05...C 41 as they are lubricated for life with synthetic oil.

Terminal box location

Location of motor terminal boxes can be specified by viewing the motor from the fan side; standard 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.

Oil quantity

(B3)

	SHELL Tivela Oil S 320 (for life)																	
	P - NP						F - NF						NU - NUF					
	B3	B6	B7	B8	V5	V6	B5	B51	B53	B52	V1	V3	B5	B51	B53	B52	V1	V3
C 05 2	0.09 *0.35*	0.09 *0.35*	0.09 *0.35*	0.09 *0.35*	0.09 *0.35*	0.09 *0.35*	0.09 *0.35*	0.09 *0.35*	0.09 *0.35*	0.09 *0.35*	0.09 *0.35*	0.09 *0.35*	-	-	-	-	-	-
C 11 2	0.12 *0.45*	0.12 *0.45*	0.12 *0.45*	0.12 *0.45*	0.13 *0.50*	0.16 *0.60*	0.10 *0.40*	0.10 *0.40*	0.13 *0.50*	0.13 *0.50*	0.13 *0.50*	0.16 *0.60*	0.10 *0.40*	0.10 *0.40*	0.13 *0.50*	0.13 *0.50*	0.13 *0.50*	0.16 *0.60*
C 21 2	0.21 *0.80*	0.21 *0.80*	0.21 *0.80*	0.21 *0.80*	0.22 *0.85*	0.27 *1.05*	0.20 *0.75*	0.20 *0.75*	0.20 *0.75*	0.20 *0.75*	0.21 *0.80*	0.26 *1.00*	0.20 *0.75*	0.20 *0.75*	0.20 *0.75*	0.20 *0.75*	0.21 *0.80*	0.26 *1.0*
C 21 3	0.32 *1.2*	0.32 *1.2*	0.32 *1.2*	0.32 *1.2*	0.34 *1.3*	0.37 *1.4*	0.31 *1.2*	0.31 *1.2*	0.31 *1.2*	0.31 *1.2*	0.33 *1.3*	0.35 *1.4*	0.31 *1.2*	0.31 *1.2*	0.31 *1.2*	0.31 *1.2*	0.33 *1.3*	0.35 *1.4*
C 31 2	0.36 *1.4*	0.36 *1.4*	0.36 *1.4*	0.36 *1.4*	0.39 *1.5*	0.39 *1.5*	0.35 *1.3*	0.35 *1.3*	0.35 *1.3*	0.35 *1.3*	0.38 *1.5*	0.38 *1.5*	0.35 *1.3*	0.35 *1.3*	0.35 *1.3*	0.35 *1.3*	0.38 *1.5*	0.38 *1.5*
C 31 3	0.42 *1.6*	0.42 *1.6*	0.42 *1.6*	0.42 *1.6*	0.47 *1.8*	0.47 *1.8*	0.42 *1.6*	0.42 *1.6*	0.42 *1.6*	0.42 *1.6*	0.46 *1.8*	0.46 *1.8*	0.42 *1.6*	0.42 *1.6*	0.42 *1.6*	0.42 *1.6*	0.46 *1.8*	0.46 *1.8*
C 35 2	0.41 *1.6*	0.39 *1.5*	0.40 *1.5*	0.34 *1.3*	0.54 *2.1*	0.62 *2.4*	-	-	-	-	-	-	0.41 *1.6*	0.39 *1.5*	0.40 *1.5*	0.34 *1.3*	0.54 *2.1*	0.62 *2.4*
C 35 3	0.40 *1.5*	0.36 *1.4*	0.40 *1.5*	0.34 *1.3*	0.53 *2.0*	0.60 *2.3*	-	-	-	-	-	-	0.40 *1.5*	0.36 *1.4*	0.40 *1.5*	0.34 *1.3*	0.53 *2.0*	0.60 *2.3*
C 35 4	0.59 *2.3*	0.55 *2.1*	0.59 *2.3*	0.55 *2.1*	0.70 *2.7*	0.79 *3.1*	-	-	-	-	-	-	0.59 *2.3*	0.55 *2.1*	0.59 *2.3*	0.55 *2.1*	0.70 *2.7*	0.79 *3.1*
C 41 2	0.56 *2.2*	0.52 *2.0*	0.54 *2.1*	0.50 *1.9*	0.70 *2.7*	0.87 *3.4*	-	-	-	-	-	-	0.56 *2.2*	0.52 *2.0*	0.54 *2.1*	0.50 *1.9*	0.70 *2.7*	0.87 *3.4*
C 41 3	0.53 *2.1*	0.50 *1.9*	0.54 *2.1*	0.50 *1.9*	0.68 *2.6*	0.82 *3.2*	-	-	-	-	-	-	0.53 *2.1*	0.50 *1.9*	0.54 *2.1*	0.50 *1.9*	0.68 *2.6*	0.82 *3.2*
C 41 4	0.72 *2.8*	0.69 *2.6*	0.72 *2.8*	0.69 *2.6*	0.90 *3.5*	1.0 *3.9*	-	-	-	-	-	-	0.72 *2.8*	0.69 *2.6*	0.72 *2.8*	0.69 *2.6*	0.90 *3.5*	1.0 *3.9*
C 51 2	0.82 *3.1*	0.77 *3.0*	0.80 *3.1*	0.79 *3.0*	1.1 *4.3*	1.3 *5.0*	-	-	-	-	-	-	0.82 *3.1*	0.77 *3.0*	0.80 *3.1*	0.79 *3.0*	1.1 *4.3*	1.3 *5.0*
C 51 3	0.78 *3.0*	0.74 *2.8*	0.80 *3.1*	0.78 *3.0*	1.07 *4.1*	1.27 *4.9*	-	-	-	-	-	-	0.78 *3.0*	0.74 *2.8*	0.80 *3.1*	0.78 *3.0*	1.1 *4.1*	1.3 *4.9*
C 51 4	1.1 *4.3*	1.1 *4.1*	1.1 *4.4*	1.1 *4.2*	1.4 *5.4*	1.6 *6.1*	-	-	-	-	-	-	1.1 *4.3*	1.1 *4.1*	1.1 *4.4*	1.1 *4.2*	1.4 *5.4*	1.6 *6.1*

Life lubricated

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

Oil quantity

(B3)

	SHELL Tivela Oil S 320 (for life)																	
	P - NP						**F - NF**						**NU - NUF**					
	B3	**B6**	**B7**	**B8**	**V5**	**V6**	**B5**	**B51**	**B53**	**B52**	**V1**	**V3**	**B5**	**B51**	**B53**	**B52**	**V1**	**V3**
C 61 2	1.1 *4.2*	1.0 *4.0*	1.1 *4.2*	1.1 *4.1*	1.6 *6.0*	1.7 *6.7*	-	-	-	-	-	-	1.1 *4.2*	1.0 *4.0*	1.1 *4.2*	1.1 *4.1*	1.6 *6.0*	1.7 *6.7*
C 61 3	1.1 *4.2*	1.0 *4.0*	1.1 *4.2*	1.1 *4.1*	1.6 *6.0*	1.7 *6.7*	-	-	-	-	-	-	1.1 *4.2*	1.0 *4.0*	1.1 *4.2*	1.1 *4.1*	1.6 *6.0*	1.7 *6.7*
C 61 4	1.6 *6.1*	1.5 *5.9*	1.6 *6.1*	1.6 *6.0*	2.0 *7.9*	2.2 *8.6*	-	-	-	-	-	-	1.6 *6.1*	1.5 *5.9*	1.6 *6.1*	1.6 *6.0*	2.0 *7.9*	2.2 *8.6*
C 70 2	1.7 *6.5*	2.2 *8.5*	2.2 *8.5*	2.0 *7.5*	2.7 *11*	2.0 *7.5*	1.7 *6.5*	2.2 *8.5*	2.2 *8.5*	2.0 *7.5*	2.7 *11*	2.0 *7.5*	-	-	-	-	-	-
C 70 3	1.7 *6.5*	2.2 *8.5*	2.2 *8.5*	2.0 *7.5*	2.7 *11*	2.0 *7.5*	1.7 *6.5*	2.2 *8.5*	2.2 *8.5*	2.0 *7.5*	2.7 *11*	2.0 *7.5*	-	-	-	-	-	-
C 70 4	1.7 *6.5*	2.2 *8.5*	2.2 *8.5*	2.0 *7.5*	2.7 *11*	2.0 *7.5*	1.7 *6.5*	2.2 *8.5*	2.2 *8.5*	2.0 *7.5*	2.7 *11*	2.0 *7.5*	-	-	-	-	-	-
C 80 2	2.9 *11*	3.6 *14*	3.6 *14*	3.4 *13*	4.7 *18*	3.4 *13*	2.9 *11*	3.6 *14*	3.6 *14*	3.4 *13*	4.7 *18*	3.4 *13*	-	-	-	-	-	-
C 80 3	2.9 *11*	3.6 *14*	3.6 *14*	3.4 *13*	4.7 *18*	3.4 *13*	2.9 *11*	3.6 *14*	3.6 *14*	3.4 *13*	4.7 *18*	3.4 *13*	-	-	-	-	-	-
C 80 4	2.9 *11*	3.6 *14*	3.6 *14*	3.4 *13*	4.7 *18*	3.4 *13*	2.9 *11*	3.6 *14*	3.6 *14*	3.4 *13*	4.7 *18*	3.4 *13*	-	-	-	-	-	-
C 90 2	4.9 *19*	6.5 *25*	6.5 *25*	5.7 *22*	8.1 *31*	5.7 *22*	4.9 *19*	6.5 *25*	6.5 *25*	5.7 *22*	8.1 *31*	5.7 *22*	-	-	-	-	-	-
C 90 3	4.9 *19*	6.5 *25*	6.5 *25*	5.7 *22*	8.1 *31*	5.7 *22*	4.9 *19*	6.5 *25*	6.5 *25*	5.7 *22*	8.1 *31*	5.7 *22*	-	-	-	-	-	-
C 90 4	4.9 *19*	6.5 *25*	6.5 *25*	5.7 *22*	8.1 *31*	5.7 *22*	4.9 *19*	6.5 *25*	6.5 *25*	5.7 *22*	8.1 *31*	5.7 *22*	-	-	-	-	-	-
C 100 2	7.0 *27*	9.6 *37*	9.6 *37*	8.6 *33*	11.7 *45*	8.6 *33*	7.0 *27*	9.6 *37*	9.6 *37*	8.6 *33*	11.7 *45*	8.6 *33*	-	-	-	-	-	-
C 100 3	7.0 *27*	9.6 *37*	9.6 *37*	8.6 *33*	11.7 *45*	8.6 *33*	7.0 *27*	9.6 *37*	9.6 *37*	8.6 *33*	11.7 *45*	8.6 *33*	-	-	-	-	-	-
C 100 4	7.0 *27*	9.6 *37*	9.6 *37*	8.6 *33*	11.7 *45*	8.6 *33*	7.0 *27*	9.6 *37*	9.6 *37*	8.6 *33*	11.7 *45*	8.6 *33*	-	-	-	-	-	-

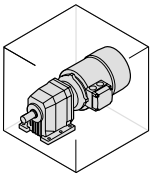
Quantities are $\frac{\text{gallons}}{\textit{litres}}$

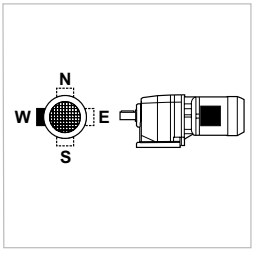
2.7 MOUNTING POSITION AND TERMINAL BOX SPECIFICATION

Fill / breather plug	Level plug	Drain plug

Input:	HS	P (IEC) N (NEMA)	S

B3





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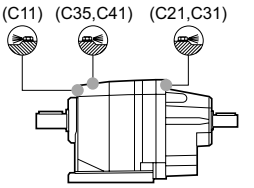
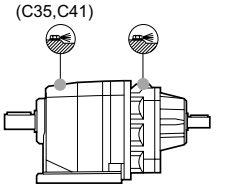
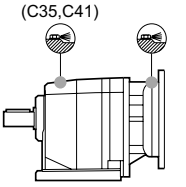
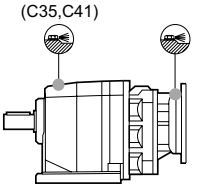
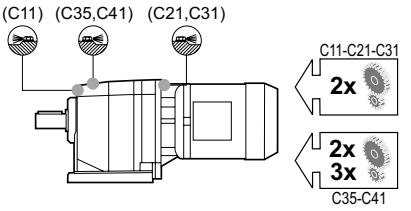
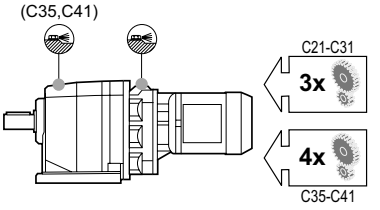




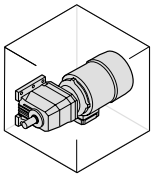


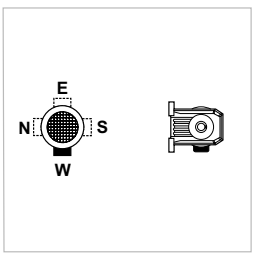






B6





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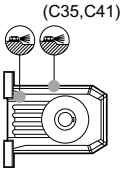
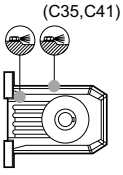
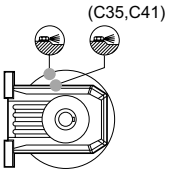
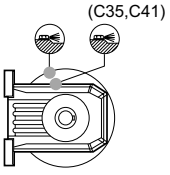
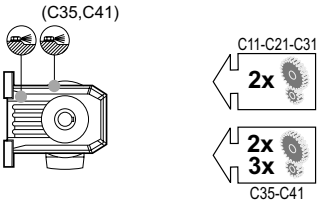
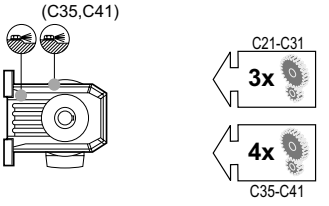




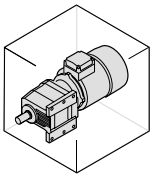


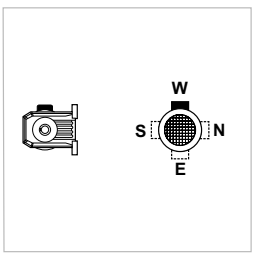




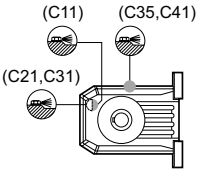


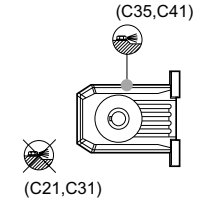
B7

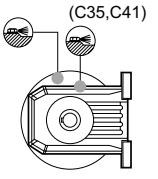


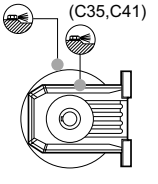


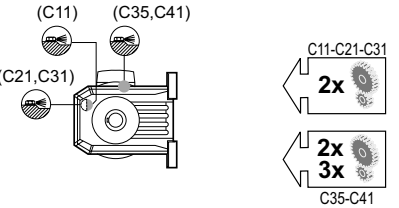
W = Default

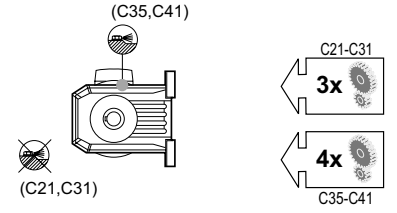






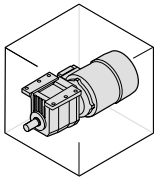


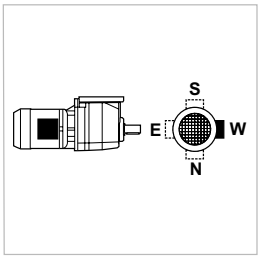




Input:	HS	P (IEC) N (NEMA)	S

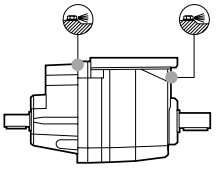
B8

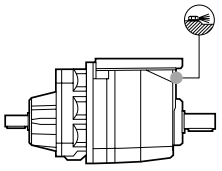




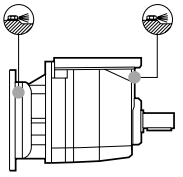
W = Default

(C21,C31) (C11,C35,C41)

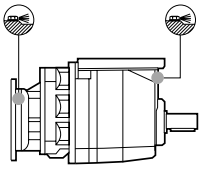


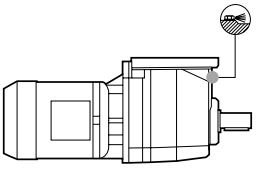


(C35,C41)

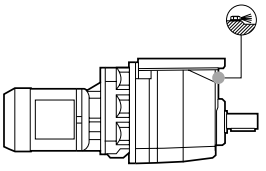


(C35,C41)



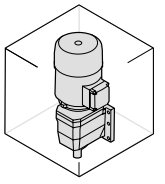


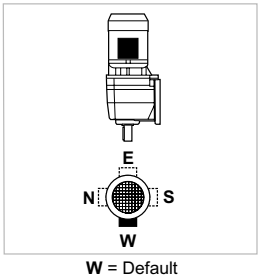
C11-C21-C31
2x
2x
3x
C35-C41



C21-C31
3x
4x
C35-C41

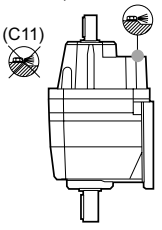
V5

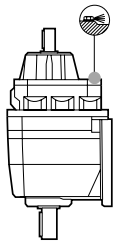




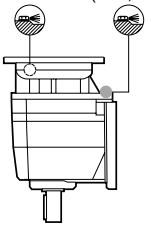
W = Default

(C21, C31,C35,C41)
(C11)

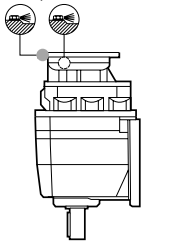




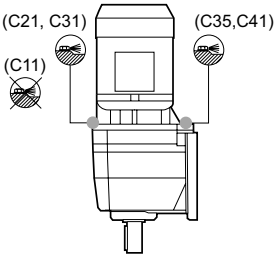
(C35,C41)

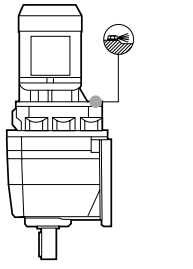


(C35,C41)



(C21, C31)
(C11)
(C35,C41)

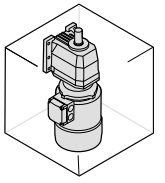


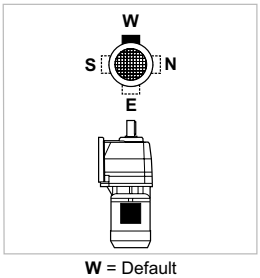


C11-C21-C31
2x
2x
3x
C35-C41

C21-C31
3x
4x
C35-C41

V6





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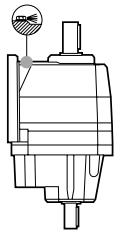

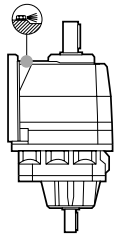

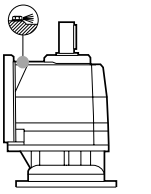

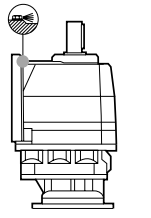

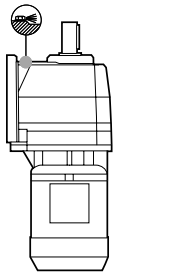

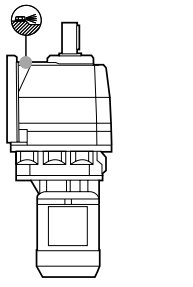

C11-C21-C31
2x
2x
3x
C35-C41

C21-C31
3x
4x
C35-C41