Intelligent Drivesystems

92 SERIES BEVEL GEARMOTORS & SPEED REDUCERS

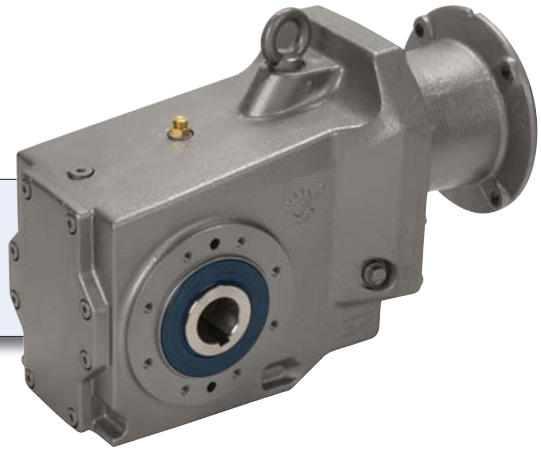
Durable & Premium Efficient Gear Units

G1142

NORD DRIVESYSTEMS

92 Series Bevel
Innovative Design

FOOT-MOUNT
GEARMOTOR



FOOT-MOUNT REDUCER
NEMA C-FACE INPUT

FLANGE-MOUNT REDUCER
GEARMOTOR &
SOLID OUTPUT SHAFT

FOOT-MOUNT
SOLID INPUT SHAFT &
DOUBLE OUTPUT SHAFT

DRIVESYSTEMS

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NORD DRIVESYSTEMS

www.nord.com

NORD Gear

Company Overview

Since 1965, NORD Gear has grown to global proportions on the strength of product performance, superior customer service, and intelligent solutions to a never ending variety of industrial challenges.

All mechanical and electrical components of a drive are available from NORD Gear. Our products cover the full range of drive equipment: helical in-line, Clincher™ shaft-mount, helical-bevel, and helical-worm gearboxes, motors and AC drives from 1/6 hp to 250 hp, with torques from 90 lb-in to 900,000 lb-in.

But NORD Gear does far more than manufacture the world's finest drive components. We provide our customers with optimum drive configurations for their specific purposes. NORD provides each and every one of them with truly complete and efficient systems at a price/quality ratio unmatched in today's fast-changing markets.

NORD Gear makes its wide range of products easily available through a global network that provides all customers with prompt delivery and expert support services to consistently exceed customer expectations. We are firmly committed to being totally responsive to the ideas and specifications of every customer, anywhere in the world.

High-Performance Motors & Brakemotors

NORD motors are designed to run cool for longer service life. Low rotor inertia and high starting torque allow peak performance in the most difficult applications for inverter and vector duty per NEMA MG 1-2006 Section 31.4.4.2 voltage spikes. Our motors are internationally accepted, conforming to North American NEMA MG 1 and international IEC electrical specifications. High performance options include brakes, encoders, and forced cooling fans.

Short, On-Time Delivery

As a NORD customer, you can rest assured that your order will be delivered on time. Because NORD has both decentralized assembly and manufacturing operations paired with a globally linked network, we have the ability to offer our customers:

- Fast, reliable responses
- Greater product versatility
- Shorter lead times
- Timely shipping
- Rapid delivery

Quality

Quality is assured at NORD's assembly and manufacturing facilities, based on ISO 9000 standards — from careful inspection of incoming materials to closely monitored machining operations, including gear cutting, turning, hardening & grinding as well as finishing & assembly.

NORD 911

Trouble? Just call 715-NORD-911 (in Canada, 905-796-3606). Emergency service is available 24 hours a day, 7 days a week. We'll answer your call, ship the parts, or build a unit and have it shipped directly to you to provide what you need, when you need it.

Manufacturing

NORD continually invests in research, manufacturing and automation technology. This is to ensure the highest possible quality at affordable prices. NORD invests heavily in our North American facilities as well as our factories around the world. Recent examples include expanding our Waunakee factory and adding numerous new large gear unit assembly cells. In our Glinde, Germany gear factory we added a state-of-the-art multi-chamber vacuum carburization system.

Global Availability

From Shanghai to Charlotte, and all points in-between, NORD reaches customers around the world. Deliveries, service, and product support are close at hand, regardless of your location.

Worldwide Standards

NORD products are designed and manufactured based on the latest North American and global standards.

Increased North American Presence

NORD covers North America with over 30 district offices and over 500 distributor branches. NORD operates a manufacturing and assembly facility in Waunakee, WI, Charlotte, NC, Corona, CA, Brampton, ON, and Monterrey, Mexico, resulting in an ever-increasing capacity in North America and giving our customers the shortest lead times in the industry.

Energy Efficiency

Lowering your operating costs is one of our greatest goals! NORD research and development focuses on energy efficiency, with gearboxes, motors, and frequency inverters designed for lower energy consumption. Our fully diverse line of in-line or right-angle units and motors has been developed to suit your needs.

Modular Design

NORD's modular design philosophy provides you with a competitive edge by allowing you to configure drive systems to exactly fit your applications.

More than 20,000,000 combinations of totally unique gearmotors and speed reducers are possible – assembled in-line or right-angle, mounted by foot or flange, featuring solid or hollow shafts with either metric or inch shaft extensions – to give you complete freedom to specify a drive solution that's perfect for you.

Benefits

- More output speeds
- More mounting arrangements/Greater flexibility
- Fewer gear stages/Lower cost
- Metric and inch products

NORD engineers stand ready to assist you with your custom applications. Most standard drives can be modified to your purposes, and custom designs can be developed for special applications.

Key Features

Helical-bevel 92-Series Overview

NORD has developed a unique class of high performance right-angle speed reducers. The 92-series helical-bevel drives are available as gearmotors and speed reducers with many mounting options. The 92-series bevel units provide high performance right-angle helical-bevel gear units at the cost effectiveness of a single worm system.

92 Series Bevel Units

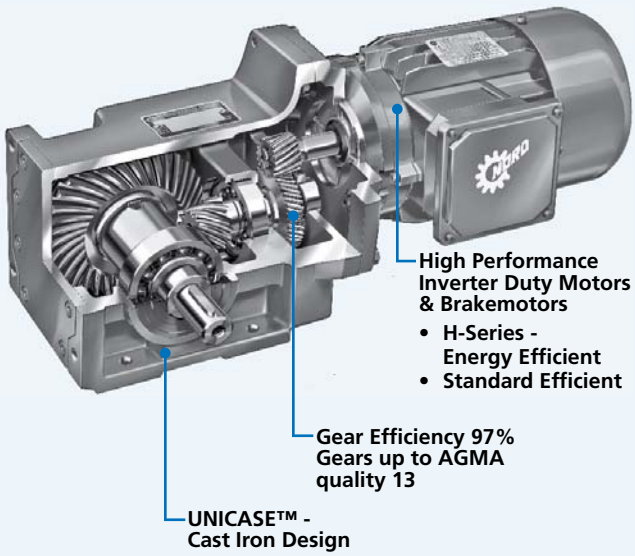
SK 92072
SK 92172
SK 92372
SK 92672
SK 92772

UNICASE™ Design

NORD heavy-duty, one-piece housings are precisely machined to meticulous standards. Internal reinforcements further increase strength and rigidity. All bearings and seal seats are contained within the casting, eliminating splits or bolt-on carriers that can weaken the housing and allow oil leakage. Bores and mounting faces are machined in one step, producing extrememly precise tolerances – thus ensuring accurate positioning of gear teeth, bearings and seals, and longer life for all components.

92 Helical-Bevel

- Premium efficiency
- Wear-free Gears
- Leak-free Design
- Quiet Operation



92-Bevel Advantages Compared to Single Worm Units

- ***Premium efficiency*** – 97% gear efficiency compared to 40-90% of worm units (depending on the ratio)
- ***Long gear life*** – 92-Series gears are wear-free for infinite life – worms are designed to need replacement.
- ***Many more ratios*** – over 21 ratios per case size vs. worm's 9 ratios up to 60:1. May reduce the need for additional components – belts, chains, guards...
- ***UNICASE™ quiet leak-free design*** – The UNICASE™ system eliminates splits or bolt-ons that may weaken housings and aid oil leakage.
- ***Runs cooler due to the high efficiency*** – worm gear units tend to generate more heat and we believe to have found a solution to that trend with our high efficiency ratings.
- ***NORD motor advantages*** - inverter/vector duty, many options: brakes, encoders, forced vent fans....

92-Bevel Advantages Compared To Competitor Helical-Bevel Designs

- The cost is up to 40% lower than traditional helical-bevel designs
- There are Lower gear ratios available that produce higher output speeds

Concepts that Helped Acheive this Innovative Product

Optimal computerized design – NORD has invested in the latest design and manufacturing tools to ensure maximum performance and price.

Reduced parts counts – most helical-bevel reducers are 3-stage: input helical, middle bevel stage, final stage helical. NORD has developed a two-stage helical-bevel reducer: first stage helical and output stage bevel. This reduces the number of parts required to build a gear unit - 2 fewer gears, 2 fewer bearings, 1 less shaft, and fewer spacers and shims. This allows NORD to achieve significant cost reduction while maintaining the ultra high quality of a helical-bevel design.

Key Features

Standard NORD features

Modular Design

All NORD products including the 92 Series bevel units are modular in design and provide extraordinary flexibility. The 92 Series bevel units provide great mounting versatility including:

- Foot mount
- Flange mount B5
- Face flange mount B14

The 92 Series bevel unit may also be provided with a number of different input components including:

- Integral motor (Gearmotor)
- NEMA C-face motor adapter
- IEC B5 motor adapter
- Solid input shaft
- Custom motor adapter
  (servo, hydraulic motors, and more)

Large Ratio Per Gear Stage

NORD gear cutting technology allows for the production of gear sets with a higher maximum ratio per stage than many other speed reducer manufacturers. NORD commonly produces gear sets with a maximum ratio of between 9:1 and 10:1 per stage. This allows for double reduction gear units with a maximum ratio between 72:1 and 100:1. Most speed reducer manufacturer's can only produce single-stage reduction of between 5:1 and 6:1. This means a two-stage reducer with a maximum reduction of about 25:1 to 35:1. NORD can often provide a two-stage reducer when most companies must provide three-stage units. The same situation applies to three, four and higher gear stages. This allows NORD to provide superior value and performance in many conditions.

Benefits

- Better value
- Higher efficiency
- Quieter operation
- Lower weight
- Longer life

AUTOVENT™

The AUTOVENT™ prevents bearing damage by blocking entry of foreign material (water, dust, corrosives, etc.) through the breather. A ball and spring check valve opens at approximately 2 psi during operation and closes tightly when the gearbox cools, producing a slightly negative pressure that ensures the valve seals tight. This keeps contaminants out of the oil to maintain proper oil cleanliness reducing contamination, foaming and oxidation. The AUTOVENT™ is perfect for humid conditions, washdown applications, and dusty environments.

Benefits

- Cleaner gearbox oil
- Extended lubrication life
- Longer-lasting seals, gears, and bearings

High-Quality Gearing (Infinite Life Design)

NORD continually invests in state-of-the-art gear production equipment and in gear research. This allows us to produce exceptionally high quality gears.

Benefits

- Designed and manufactured up to AGMA CLASS 13
- Infinite design life
- Case-hardened steel
- Exceptional hardness: 58 Rc minimum
- High-speed gears are ground;
  low speed gears are skive hobbed
- 275% momentary overload capacity
- Low noise
- Low maintenance

Factory Oil Filled

All 92 Series Bevel units are filled at the factory with the proper quantity and type of lubrication. Oil fill before shipping prevents damage from dry start-ups.

Benefits

- No need for filling on-site
- Ensures proper oil grade and fill level

NORD High-Performance Motors & Options

NORD motors are designed to run cool for producing longer service life. Low rotor inertia and high starting torque allow peak performance in the most difficult applications for inverter and vector duty per NEMA MG 1-2006 Section 31.4.4.2 voltage spikes. Our motors are internationally accepted, conforming to North American NEMA MG 1 and international IEC electrical specifications. High performance options include brakes, encoders, and forced cooling fans.

Premium Efficiency

Premium Efficiency

NORD's research and development is focused on energy efficiency. The design of our gearboxes, motors & AC vector drives will dramatically reduce energy consumption. The 92-series helical-bevel gear unit was developed with a gear efficiency of 97%. Typical right angle worm reducers range in efficiency from 40% to 90%, depending on size, ratio and output speed. NORD offers motors of either standard efficiency or of the energy efficient design to suit your needs. Lowering our customers' operating expenses is one of our primary goals.

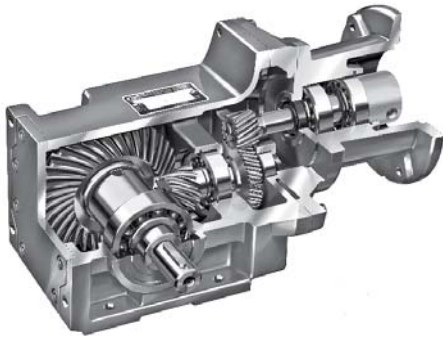
Benefits:

- Reduced energy consumption
- Lower operating costs

Comparison

Following is an example of the cost savings that might be expected by selecting a NORD 92-series helical-bevel gearmotor instead of a worm only design.

	Competitor Worm Gear	NORD Gearmotor	
	Energy Efficient	Energy Efficient	Standard Efficient
Model	5.16 inch CD worm	SK92772-90LH/4	SK92772-90L/4
Motor power (hp)	3	2	2
Gear ratio	50	52.48	52.48
Output speed (rpm)	35	33	33
Output torque (lb-in)	3780	3823	3823
Gear efficiency	70%	97%	97%
Motor efficiency	87.5%	84.0%	75.0%
Operating hours per year	4000	4000	4000
Price of electricity (¢/kWh)	5	5	5
Energy cost per year	$511.54	$355.24	$397.87
Savings per year	N/A	$156.30	$113.68
Percent energy savings	N/A	31%	22%
Price of electricity (¢/kWh)	10	10	10
Energy cost per year	$1,023.09	$710.48	$795.73
Savings per year	N/A	$312.61	$227.35
Percent energy savings	N/A	31%	22%
Price of electricity (¢/kWh)	15	15	15
Energy cost per year	$1,534.63	$1,065.71	$1,193.60
Savings per year	N/A	$468.91	$341.03
Percent energy savings	N/A	31%	22%



Results

The NORD gearmotor can do the same job at 2 hp as the competitors worm reducer does with 3 hp. Both produce approximately the same amount of output torque. This is due to the higher NORD gear efficiency. The NORD Energy Efficient gearmotor also produces a 31% reduction in consumed electricity. This produces an annual cost savings of $312.61 per year at 10 cents per kilowatt-hour energy cost. The savings are even greater at higher energy costs.

92 Series Bevel Ordering Guide

	Gear Unit	Shaft/Mounting	Reducer Options		Motor/Input	Motor Options
SK	❶	❷	❸	-	❹	
					see page 23	see page 126

❶ **Gear Unit**

92072
92172
92372
92672
92772

❷ **Shaft/Mounting**

- Solid Shaft/Foot Mount	**AX** - Hollow Shaft/Foot Mount
VF - Solid Shaft/B5 Flange	**AF** - Hollow Shaft/B5 Flange
VZ - Solid Shaft/B14 Flange	**AZ** - Hollow Shaft/B14 Flange
VFL - Double Solid Shaft /B5 Flange	**AFSH** - Hollow Shaft/B5 Flange/Shrink Disc
LX - Double Solid Shaft/Foot	**AZSH** - Hollow Shaft/B14 Flange/Shrink Disc
LXZ - Double Solid Shaft/Foot/ B14 Flange	

❸ **Reducer Options**

❒ **B** - Fixing Element Kit 19	❒ **PR** - Flange Pilot Removal 17	❒ **VI** - Flouro-rubber Seals 20
❒ **H** - Hollow Shaft Cover 18	❒ **SM5** - Stainless Steel Shaft 19	❒ **OSG** - Oil Sight Glass 20
❒ **D** - Torque Arm 19	❒ **SWA**-SpecialHollow Shaft 19	❒ **MDP** - Magnetic Drain Plug 21
❒ **LL** - Long Term Storage 21	❒ **SS** - Special Shrink Disc 19	❒ **ADP** - Additional Drain Plug 21

❹

Input Shaft	NEMA Adapter	IEC Adapter	Integral Motors	Integral Energy Efficent Motors
W	**N56C**	**IEC 63**	**63S/4** - 0.16hp	**80LH/4** - 1hp
	N140TC	**IEC 71**	**63L/4** - 0.25hp	**90SH/4** - 1.5hp
	N180TC	**IEC 80**	**71S/4** - 0.33hp	**90LH/4** - 2hp
	N210TC	**IEC 90**	**71L/4** - 0.50hp	**100LH/4** - 3hp
	N250TC	**IEC 100**	**80S/4** - 0.75hp	**112MH/4** - 5hp
		IEC 112	**80L/4** - 1hp	**132SH/4** - 7.5hp
		IEC 132	**90S/4** - 1.5hp	**132MH/4** - 10hp
		IEC160	**90L/4** - 2hp	
			100L/4 - 3hp	
			100LA/4 - 5hp	
			112M/4 - 5.4hp	
			132S/4 - 7.5hp	
			132M/4 - 10hp	
			Other Speeds Available	Other Speeds Available

Product Specifications

Ratio

_____ :1

see pages 58 - 71

— OR —

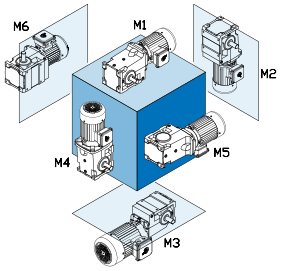
Output Speed

_____ rpm

see pages 58 - 71

Mounting Position

- ❍ M1
- ❍ M2
- ❍ M3
- ❍ M4
- ❍ M5
- ❍ M6
- ❍ Special _____



Paint

- ❍ Standard Stainless Steel Paint
- ❍ NSD+ (gray)
- ❍ NSD+W (white)
- ❍ NSD-X3 (gray)
- ❍ NSD-X3W (white)
- ❍ Casting Primed
- ❍ Special _____

Lubricant

- ❍ Standard
- ❍ Synthetic
- ❍ Food Grade
- ❍ Other _____

Solid Shaft Side (if required)

- ❍ Shaft Side A
- ❍ Shaft Side B
- ❍ Shaft Side A&B

see page 15

Hollow Shaft Diameter (if required)

_____

see pages 113 - 114

B5 Flange Side (if required)

- ❍ Flange Side A
- ❍ Flange Side B
- ❍ Flange Side A&B

see page 15

B5 Flange Diameter (if required)

_____

Torque Arm Side & Location (if required)

- ❍ Side A
- ❍ Side B

_____ Location

see page 15

Shrink Disc Side (if required)

- ❍ Side A
- ❍ Side B

see page 15

H66 Side (if required)

- ❍ H66 Side A
- ❍ H66 Side B

see page 15

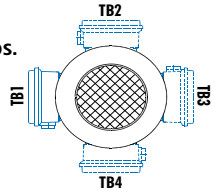
Gearmotor Only Details

Voltage & Frequency

- ❍ 230/460V-60Hz (460V only ≥ 40 hp)
- ❍ 575V-60Hz
- ❍ 208V-60Hz
- ❍ 400V-50Hz
- ❍ 115/230V-60Hz, 1 ph.
- ❍ Other _____

Terminal Box Pos.

- ❍ TB1
- ❍ TB2
- ❍ TB3
- ❍ TB4



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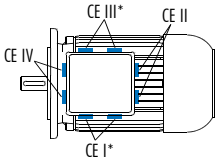
Conduit Entry Loc.

- ❍ CE I *
- ❍ CE II
- ❍ CE III *
- ❍ CE IV

* Brakemotor



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Motor Order Form

	Frame	Size	Poles	Motor Options	Brake Size	Brake Options
SK						

Frame	Size	Poles
63	**S**	**4**
71	**SH**	**2**
80	**M**	**6**
90	**MH**	**4-2**
100	**MX**	**8-2**
112	**L**	**8-4**
132	**LA**	**12-2**
	LH	**Other**
	LX	

Paint

- ❍ Unpainted Aluminum Alloy
- ❍ Stainless Steel Paint
- ❍ NSD+ (gray)
- ❍ NSD+W (white)
- ❍ NSD-X3 (gray)
- ❍ NSD-X3W (white)
- ❍ Special _____

Electrical Motor Options

- ❒ **H** - Energy Efficient Motor
- ❒ **TW** - Thermostat
- ❒ **TF** - Thermistor
- ❒ **SH** - Space Heater (select voltage)
  - ❍ 110 Volt ❍ 230 Volt ❍ 460 Volt
- ❒ **ISO** H - Class H insulation
- ❒ **WU** - High Resistance Rotor
- ❒ **4-2** - 2-Speed, 4/2 Pole, 1800/3600rpm
- ❒ **8-2** - 2-Speed, 8/2 Pole, 900/3600rpm
- ❒ **ECR** - Single Phase Motor

Environmental Options

- ❒ **NSD+** - Nord Severe Duty Paint
- ❒ **NSDx3** - Nord Extreme Duty Paint
- ❒ **RD** - Canopy Drip Cover
- ❒ **RDD** - Double Fan Cover
- ❒ **KB** - Condensation Drain Holes (plugged)
- ❒ **KBO** - Condensation Drain Holes (open)
- ❒ **IP66** - IP66 Enclosure Protection
- ❒ **KKV** - Terminal Box Sealed with Resin
- ❒ **AICM** - Additional Insulation
- ❒ **EP** - Epoxy Dipped Windings

Frequency Inverter Related Options

- ❒ **F** - Blower Fan (200-575V 1 & 3 Phase)
- ❒ **FC** - Blower Cooling Fan (115V, 1 Phase)
- ❒ **IG__** - Incremental Encoder
- ❒ **IG__P** - Incremental Encoder with Plug
- ❒ **AG** - Absolute Encoder

Additional Motor Options

- ❒ **OL** - Totally Enclosed Non-Ventilated (TENV)
- ❒ **OL/H** - (TENV) Without Fan Cover
- ❒ **WE** - Second Shaft Extension (Fan Side)
- ❒ **HR** - Hand Wheel
- ❒ **Z** - High Inertia Cast Iron Fan
- ❒ **RLS** - Motor Backstop (rotation viewing fan)
  - ❍ Clockwise ❍ Counter-Clockwise
- ❒ **EKK** - Small Terminal Box (not UL approved)
- ❒ **MS** - Quick Power Plug Connector

Brake Size
BRE 5
BRE 10
BRE 20
BRE 40
BRE 60
BRE 100
BRE 150

- ❒ **HL** - Hand Release Lever
- ❒ **FHL** - Locking Hand Release Lever
- ❒ **HLH** - Hand Release Lever with Hole
- ❒ **RG** - Corrosion Protected Brake
- ❒ **SR** - Dust and Corrosion Protected Brake
- ❒ **ADJ_____Nm** - Adjust Brake Torque
- ❒ **BIP66** - IP66 Brake Enclosure
- ❒ **MIK** - Micro-switch
- ❒ **BSH** - Brake Heating/Bifilar Coil
- ❒ **NRB1** - Quiet Brake Release
- ❒ **NRB2** - Quiet Brake Motor Operation
- ❒ **FBR** - Brass Foil
- ❒ **DBR** - Double Brake
- ❒ **G...P** - High Performance Rectifier
- ❒ **G...V** - Sealed Rectifier
- ❒ **IR** - Current Sensing Relay

Rectifier Selection

Rectifier Wiring

- ❍ Across the line (from motor terminal box)
- ❍ Separate power source (frequency inverter, soft starter)

Brake Supply Voltage

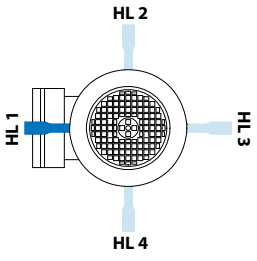
- ❍ 24 VDC
- ❍ 115 VAC
- ❍ 200 VAC
- ❍ 230 VAC
- ❍ 400 VAC
- ❍ 460 VAC
- ❍ 500 VAC
- ❍ 575 VAC
- ❍ Other _____

Braking Method

- ❍ Method 10
- ❍ Method 15
- ❍ Method 20
- ❍ Method 25
- ❍ Method 30
- ❍ Method 35
- ❍ Method 40
- ❍ Method 45
- ❍ Method 50
- ❍ Method 55

Hand Release Position

- ❍ HL1
- ❍ HL2
- ❍ HL3
- ❍ HL4



Mounting

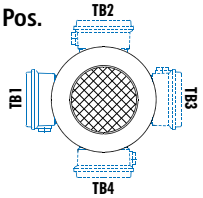
- ❍ Integral to gearbox
- ❍ NEMA C-Face
- ❍ IEC B5 Mount

Voltage & Frequency

- ❍ 230/460V-60Hz
- ❍ 575V-60Hz
- ❍ 208V-60Hz
- ❍ 400V-50Hz
- ❍ 115/230V, 60Hz-1-ph.
- ❍ Other

Terminal Box Pos.

- ❍ TB1
- ❍ TB2
- ❍ TB3
- ❍ TB4

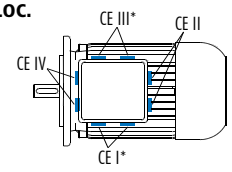


Mtg. Pos. M1 Shown

Conduit Entry Loc.

- ❍ CE I *
- ❍ CE II
- ❍ CE III *
- ❍ CE IV

* Brakemotor



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Gearbox Selection

A number of factors are considered when selecting a gear unit, including gearbox rating, service factor, speed and speed variation, horsepower, thermal capacity, ratio, physical size, ambient conditions and cost. Below are some guideline steps to help aid in the gear unit selection.

1. Determine the speed and/or gear ratio
2. Determine the required power or torque
3. Determine Service Factor
4. Select the basic gearbox type and input
5. Determine the required mounting position
6. Select options
7. Checks – overhung load, thrust load, NEMA motor weight, thermal considerations, and other application considerations

1. Speed and Gear Ratio

The first step in selecting a gear unit is determining the final output speed or speeds you need. This speed is normally described in revolutions per minute (rpm). This output speed or speeds is determined by the input speed to the gear unit divided by its gear ratio. Their relationship is described by the following formulas.

$$\text{i (gear ratio)} = \frac{\text{Input speed [rpm]}}{\text{Output speed [rpm]}}$$

$$\text{Output speed [rpm]} = \frac{\text{Input speed [rpm]}}{\text{i (gear ratio)}}$$

To specify a gear unit, you can identify either gear ratio needed or the output speed (rpm) if the input speed is known.

2. Power and Torque

The second step for selecting a gear unit is the required power or torque needed to power the load. Torque in this catalog is normally expressed in pound-inches [lb-in].

$$\text{Power [hp]} = \frac{\text{Torque [lb-in] x speed [rpm]}}{63025}$$

$$\text{Torque [lb-in]} = \frac{\text{Power [hp] x 63025}}{\text{speed [rpm]}}$$

For a proper selection you must ensure that the motor or other prime mover can produce enough torque or power and that the gear unit has adequate torque or power capacity.

To specify a gear unit you can identify either torque or power.

3. Service Factor or Service Class

In addition to power or torque, service factor must also be considered. A service factor is essentially the ratio of extra capacity in a gear unit compared to the power or torque that is needed to run that application. The goal of selecting a gear unit with extra capacity (service factor) is to provide adequate service life in operation.

One reason to apply a larger service factor is if a unit operates more hours per day. If a unit runs 24 hours per day it should normally have a higher service factor than a unit that runs 8 hours per day if you expect the same calendar life.

A second reason for applying a larger service factor is to cope with a more difficult application. Even if it takes the same power and speed to operate a rock crusher as a fan, the rock crusher needs a stronger gearbox (higher service factor) to give the same calendar operating life as the gear unit powering the fan.

The real question is how to determine the proper service factor for a gear unit in an application. Following are four possible methods.

Customer or User Specification

Many customers will have their own service factor guidelines or specifications.

AGMA Service Factoring

American Gear Manufacturers Association (AGMA) publishes lists of recommended service factors for different applications. These service factor recommendations have been determined form the experience of many gear manufactures and are in AGMA standard 6010. See page 44 for additional detail.

AGMA Service Classes

American Gear Manufactures Association (AGMA) has another method for selecting gear units service factors. AGMA standard 6009 lists many applications by a service class (I, II, III) with class I being the simplest applications and class III being the hardest. These application service classes are associated with a range of service factors by the following table.

AGMA Service Class	Service Factor
I	1.00 to 1.39
II	1.40 to 1.99
III	2.00 and above

In the gearmotors selection table each unit is also classified by an AGMA service class. See page 44 for additional detail.

Selection Information

NORD Mass Acceleration Service Factoring

NORD often uses a calculation based system to properly assign a service factor. This system considers hours of operation per day, the severity of the application and the number of times the equipment is cycled. See page 44 for additional detail.

4. Gearbox Type & Input

92 Bevel gear drives are available in the following mechanical configurations including:

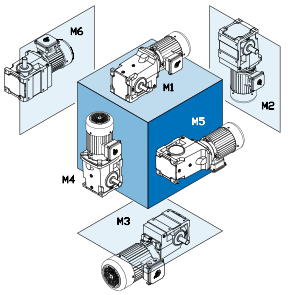
- Foot mount
- Flange mount
- Foot mount with flange

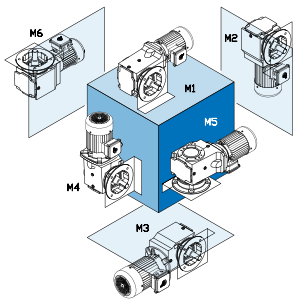
NORD's modular design allows for a number of different inputs to be added to NORD reducers including:

- Integral motor
- NEMA-C and IEC motor adapter
- Solid input shaft

5. Mounting Position

The gearbox mounting position is an important and often overlooked specification. The mounting position determines how much oil the gear reducer requires, in addition to determining the position of the oil drain, oil fill and vent on the gear drive. NORD offers six basic mounting positions. If your application requires a variation from the six basic mounting positions, please contact NORD.



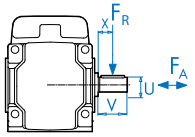


6. Options

NORD offers a number of mechanical, protective, paint and lubrication options for gear reducers and motors. Please see page 16 for gear unit options and refer to the motor section for motor options.

7. Checks

Overhung Load



An overhung or radial load exists when a force is applied at right-angles to a shaft beyond the shaft's outermost bearing. Pulleys, sheaves and sprockets will cause an overhung load when used as a power take-off. The amount of overhung load will vary, depending on the type of power take-off used and where it is located on the shaft.

Overhung load [F_R] can be found in the gearmotor rating tables and input shaft overhung load ratings [F_{R1}] can be found on pages 35 - 41. Overhung load capacities should not exceed the values in the table to ensure long bearing life.

To calculate overhung load see page 35.

Thrust Loads (Axial)

Loads that are directed towards or away from the gearbox along the axis of the shaft are called thrust or axial loads. Output shaft thrust capacity [F_A] can be found in the gearmotor rating tables. Input shaft capacity [F_{A1}] can be found on pages 41. Thrust load capacities should not exceed the values listed in the tables to ensure long bearing life. Contact NORD for combination loads or a more exact examination of the application.

NEMA C-face Motor Weight Limits

When mounting a motor to a NORD NEMA C-face motor adapter it is important to consider the motor's weight. Following is a table that includes the maximum motor weight the NEMA adapter can support. If the motor exceeds the listed weight it must be externally supported. When a C-face mounted motor is externally supported care must be taken to ensure that the support system does not impose additional pre-loads on the NEMA motor adapter.

NEMA Weights

Motor FRAME	56C	143TC	145TC	182TC
Max Weight [lb]	66	88	110	130
Motor FRAME	**184TC**	**210TC**		
Max Weight [lb]	175	220		

General Warnings & Cautions

⚠ GENERAL WARNINGS & CAUTIONS ⚠

Applications with risk of personal injury should be reviewed together with NORD. Examples of these are hoist, lifts or other applications where people may be at risk.

NEMA and IEC Adapters

NEMA/IEC adapter have additional shaft coupling and additional bearing seats compared to integral motors so there are higher no-load losses with NEMA or IEC adapters. We recommend mounting the motor directly, since it offers both technical and cost advantages.

NEMA and IEC adapters used in hoist, lifts and other applications with danger of personal injury should be reviewed together with NORD.

NEMA C-Face Adapter Capacity

The NEMA adapters are designed to handle the torques produced by the standard NEMA power assignment at 4-pole (1800 rpm) motor speeds. If a larger motor power is used than the power below, NORD should be consulted. Also if a NEMA adapter is being used for other than an AC induction motor NORD should be consulted.

Adapter	Max Power [hp]
56C	1
140TC	2
180TC	5
210TC	10

External Installation, Tropical Use

Gearboxes installed outside, in damp rooms, or used in the tropics may require special seals and anti-corrosion options. Please contact NORD for application assistance.

Special conditions

If special environmental or other conditions exist in transit, storage or operation these need to be considered in the unit selection. Special conditions may include (but are not limited to):

- Exposure to aggressive corrosive materials (contaminated air, gasses, acids, bases, salts, etc.)
- Very high relative humidity
- Direct contact between the motor and liquid
- Material build-up on the gear unit or motor (dirt, dust, sand, etc.)
- High atmospheric pressure
- Radiation
- Extreme temperatures, high, low or large temperature changes
- High vibration, acceleration, shocks or impacts
- Other abnormal conditions

Gear Reducer Ratings

The permissible continuous power limit of gear reducers is limited by both the mechanical rating and the thermal rating. The mechanical rating depends upon the material strength of the gear reducer's gears, bearings, housing, shafts, etc. The mechanical input power limit to the reducer is also a function of the mechanical power rating divided by the relevant reducer service factor.

The thermal rating or thermal limit depends upon the amount heat generated within the reducer and is influenced by a variety of factors including:

- Churning or splashing losses in the lubricant which depend upon reducer type, ratio, input style, mounting position or oil fill-level, and the circumferential travel velocities of the gear wheels.
- The actual speed and load conditions. These factors determine load-depedent losses in the gear areas and frictional losses in the gear, bearing & seal areas.
- Ambient Conditions:
  - Ambient Temperature.
  - Amount of free air circulation around the drive.
  - Possible near-by heat sources.
  - Heat dissipation or the ability of the reducer to transfer heat through the housing, shafts, and the mating sub-structure or mounting surface.

Storage Before Installation

The gear units and motors should be stored in a dry area before they are to be installed. Special measures are required for longer storage. Please request long term storage instructions from NORD Gear or see page 21.

Thermal Considerations

Observing the Reducer's Thermal Limit

When to Contact NORD

Through computer program analysis NORD can evaluate application conditions and the impact they have on a reducer's thermal capacity.

When applying 92 series bevel gear units of case size SK 92672 & larger, consult NORD if any two or more of the following conditions apply:

- Gear ratio, $i_{total} \leq 48:1$
- Input speed, $n_1 > 1800$
- Vertical positioning (mounting position M2 or M4)
- Input configuration: NEMA C-face, IEC, servo adapter or solid-shaft input (Type-W)
- An elevated ambient temperature ≥ 86° F (30 °C)

Dangers of Reducer Overheating

The following problems may result when the reducer's thermal capacity or maximum oil sump temperatures are exceeded:

- Lubrication oxidation, breakdown & deterioration.
- A decrease in lubrication viscosity & film thickness.
- Loss of critical bearing and gear clearances required for proper lubrication.
- Increased contact pressures and increased operating temperatures in the critical load zones of the gearing and bearings.
- An increased possibility for metal-to-metal contact and premature component wear.
- A significant reduction in the lubricant's ability to prevent scuffing, pitting, and in extreme cases galling or welding.

Maximum Oil Sump Temperature Limit

To prevent reducer overheating, the reducer's maximum oil sump temperature limit must not be exceeded for prolonged periods of operation (up to 3 hours continuous operation, depending upon reducer size).

Oil Type	Maximum Oil Temperature Limit	
	NORD	AGMA 9005-D94
Mineral	80-85 °C (176-185 °F)	95 °C (203 °F)
Synthetic	105 °C (220 ° F)	107 ° C (225 ° F)

IMPORTANT NOTE

Use caution when specifying gear reducers for high temperature service. If there is concern about exceeding the allowable safe operating temperatures, please consult NORD to discuss alternatives.

Measures to Expand the Application Range

There are a variety of measures that may be taken in order to protect against thermal overload and expand the application range of the gear reducer. Common examples include the following:

- Recommending a change in lubrication viscosity and/or a specific synthetic lubricant type.
- Applying high-temperature seals.
- Increasing air flow around the gear unit.
- Shielding or protecting the reducer from high heat sources.
- Considering an integral motor instead of the bolt-on input assembly covers. In many cases the motor fan will substantially increase air-flow around the gear unit.

Selection Inquiry

Contact: _____ **Company:** _____

Telephone: _____ **Email:** _____

Fax: _____ **Date:** _____

Project Name: _____ **Application:** _____

Qty: _____ **Type: SK** _____

Gearbox Parameters

Unit

❍ Gearmotor ❍ Gearbox with Motor Adapter
❍ Gearbox with Solid Input Shaft

Mounting Position

❍ M1 ❍ M4
❍ M2 ❍ M5
❍ M3 ❍ M6
❍ Special _____

Lubricant

❍ Standard
❍ Synthetic
❍ Food Grade
❍ Other _____

Flange

❍ None
❍ B14 (Z)
❍ B5 (F) Outside Diameter _____ [mm]

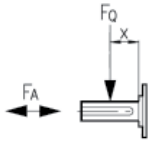
Ratio _____ : 1 or Output Speed _____ [rpm]

Output Torque _____ [lb-in] or Power _____ [hp]

Minimum Service Factor [f_b] _____ [lb]

Radial Load at Output Shaft [F_Q] _____ [lb]

Axial Load at Output Shaft [F_A] _____ [lb]



Distance from Shaft Shoulder [x] _____ [in]

Minimum Required Bearing Lifetime [Lh10] _____ [hours]

Bearing Type

❍ Standard
❍ VL - Heavy Duty
❍ AL - Axial/Thrust

Environmental Parameters

Ambient Temperature Range _____ °F to _____ °F

Location of Unit

❍ Indoor
❍ Outdoor
❍ Severe Environment

Paint

❍ No Paint
❍ Stainless Steel Paint
❍ NSD+ (gray)
❍ NSD+W (white)
❍ NSD-X3 (gray)
❍ NSD-X3W (white)
❍ Casting Primed
❍ Special _____

Motor Parameters

Power _____ [hp]

Voltage & Frequency

❍ 230/460V-60Hz
❍ 575V-60Hz
❍ 208V-60Hz
❍ 400V-50Hz
❍ 115/230V-60Hz, 1 ph.
❍ Other _____

Enclosure

❍ IP55 (Standard)
❍ IP66

Insulation Class

❍ F (Standard)
❍ H

Duty

❍ S-1 Continuous Operation
❍ Periodic/Short Time Operation

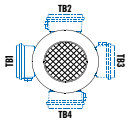
Thermal Protection

❍ None
❍ Thermostat
❍ Thermistor

Cycles Per Hour _____ cycles/hour

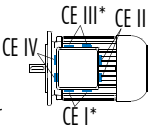
Terminal Box Position

❍ TB1
❍ TB2
❍ TB3
❍ TB4



Conduit Entry Location

❍ CE I *
❍ CE II
❍ CE III *
❍ CE IV
* Brakemotor



Brake Parameters

Brake

❍ No Brake (cont. to next section)
❍ Holding Brake/Emergency Brake
❍ Working Brake

Brake Supply

❍ Power from motor term. block
❍ Separate Power Source

Brake AC Supply _____ [Volts]

Brake Torque _____ [Nm]

Brake Release

❍ Standard
❍ Fast

Brake Stopping

❍ Standard
❍ Fast
❍ Very Fast

Frequency Inverter Parameters

Frequency Inverter

❍ No Frequency Inverter
❍ Customer Supplied Inverter
❍ NORD Panel Mounted Frequency Inverter
❍ NORD Motor Mounted Frequency Inverter

Line Voltage: _____ [Volts] Frequency _____ [Hz]

Operating Frequency Range: _____ [Hz] to _____ [Hz]

How is the Inverter Controlled?

❍ PC
❍ Operator Control
❍ Other

Bus System?

❍ None ❍ InterBus
❍ Profibus ❍ CANopen
❍ CANBus ❍ RS232
❍ AS Interface

Are You Using an Encoder?

❍ No
❍ Yes → ❍ Position Feedback
❍ Speed Control

Mounting Positions

Mounting Positions

The reducer mounting position determines the approximate oil fill level and the appropriate vent location. In some cases the mounting position may dictate possible variation in final reducer assembly. If considering any mounting positions that are not shown as catalog-standard options, it is critical that the customer consult with NORD prior to ordering.

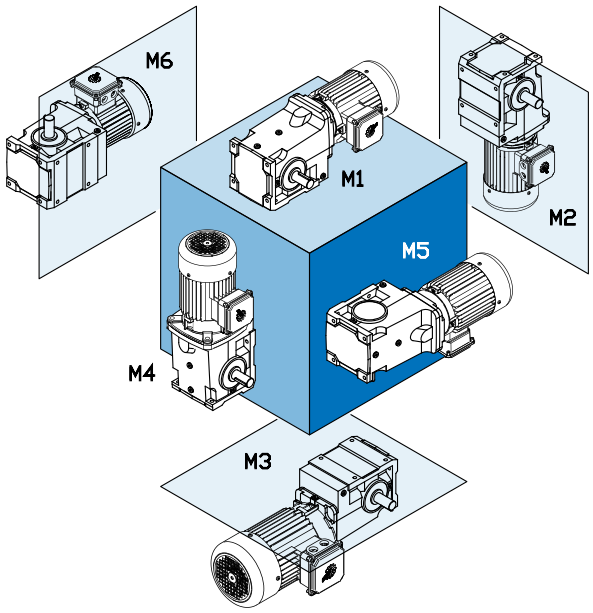
New Mounting Position System

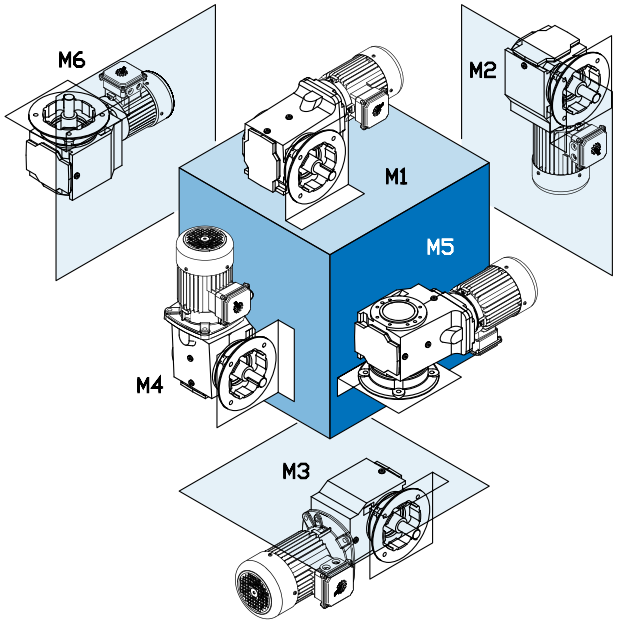
NORD is in the processes of incorporating a new mounting position systems. Historically the NORD mounting position system was based on international motor standards. NORD is changing in an effort to simplify the system. The new system is based on the six sides of a cube. Below is a cross reference between the old and new mounting position codes.

Mounting Position Cross Reference Table

New	M1	M2	M3	M4	M5	M6
Old	B3, B5	V3, V6	B8, B5I	V1, V5	B5II, B6	B7, B5III

92 Series Bevel





Mounting Positions

Mounting Configuration

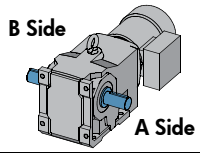
NORD provides gearmotors, speed reducers and motors that can be configured very differently to suit customer needs. It is beneficial while ordering that the drive be specified exactly the way you want it delivered.

Mounting Positions

Basic mounting

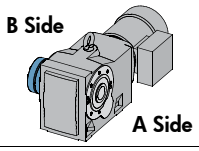
❍ M1 ❍ M2 ❍ M3 ❍ M4 ❍ M5 ❍ M6

Right-angle with solid shaft



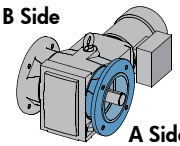
❍ Shaft Side A
❍ Shaft Side B
❍ Shaft Side A+B

Right-angle with shrink disc



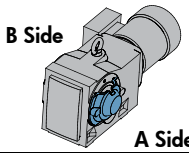
❍ Shrink Disc Side A
❍ Shrink Disc Side B

Right-angle flange mount units



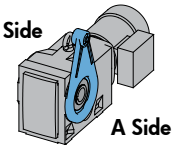
❍ Flange Side A
❍ Flange Side B
❍ Flange Side A+B

Right-angle with hollow shaft cover



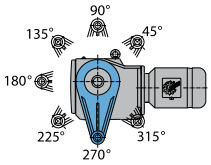
❍ Hollow Shaft Cover Side A
❍ Hollow Shaft Cover Side B

Right-angle with torque arm



❍ Torque Arm Side A
❍ Torque Arm Side B

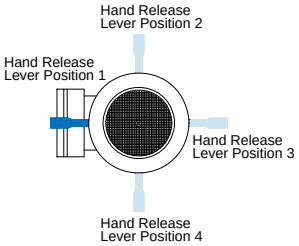
Shaft mount torque arm orientation



Orientation _____

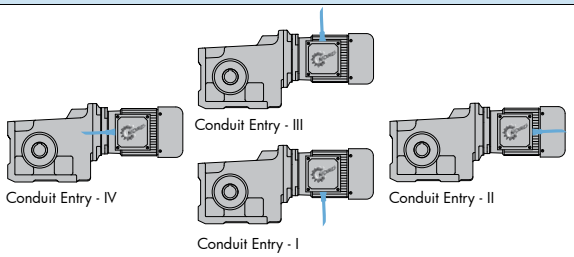
92 - Bevel	90° - 315°, Every 45°
90 - Bevel	45° - 270°, Every 45°
Helical-worm	45° - 270°, Every 45°
Helical-worm 02040	90°, 180°, 270°, Every 90°

Brake motor with hand release lever



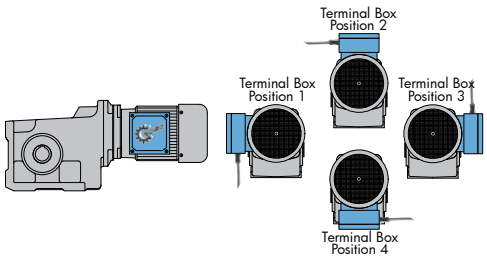
❍ Hand Release Lever Pos. 1
❍ Hand Release Lever Pos. 2
❍ Hand Release Lever Pos. 3
❍ Hand Release Lever Pos. 4

Conduit entry location



❍ Conduit Entry Location I*
❍ Conduit Entry Location II
❍ Conduit Entry Location III*
❍ Conduit Entry Location IV
* Denotes Brakemotor

Terminal box location



❍ Terminal Box Position 1
❍ Terminal Box Position 2
❍ Terminal Box Position 3
❍ Terminal Box Position 4

Gear Unit Options

92 Series Bevel Gearbox Options

Abbreviation	Description	Page
Blank or X	Foot mount	17
A	Keyed Hollow Shaft	18
ADP	Additional drain plug	21
AF	Keyed Hollow Shaft with B5 Flange	18 (A) & 17 (F)
AZ	Keyed Hollow Shaft with B14 Flange	18 (A) & 17 (Z)
B	Fixing Element Kit	19
D	Torque Arm	19
DR	Autovent	20
F	B5 flange	17
FV	Filtered Vent	20
H	Hollow Shaft Cover	18
LL	Long term storage	21
LX	Foot Mount with Double Solid Shaft	18
MDP	Magnetic drain plug	21
OSG	Oil sight glass	20
OV	Open vent	20
PR	B5 flange pilot removal	17
SH	Shrink Disc and Cover	18
SM5	Stainless steel output shaft	19
SS	Special Shrink Disc	19
SWV	Special Solid Shaft	19
SWA	Special Hollow Shaft	19
Blank or V	Solid Shaft	18
VI	(FKM) Fluoro-rubber seals	20
VF	Shaft Mount with B5 Flange	18 (V) & 17 (F)
VZ	Shaft Mount with B14 Flange	18 (V) & 17 (Z)
X	Foot Mount	17
Z	B14 flange	17
none	Special Drain Plugs	21
none	Paint coatings	22

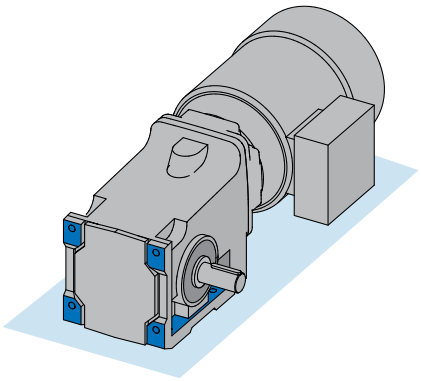
Mounting

NORD offers a number of different mounting arrangements including:

- Foot (X)
- B5 flange (F)
- B14 flange (Z)

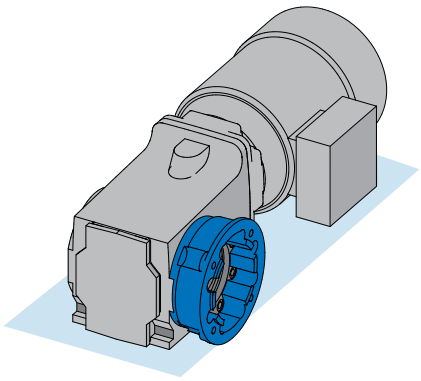
Foot Mounted (Blank or X)

Foot or base mounting is the most common method of reducer mounting. The speed reducer is secured in place with bolts or studs to a mounting base.



B5 Flange (F)

A B5 flange provides a simple, large diameter mounting flange with clearance holes and a centering pilot to firmly secure the speed reducer to the application. The B5 flange utilizes standard metric dimensions and is available for all NORD reducers. 92 Series bevel reducers offer a number of B5 flange diameters.



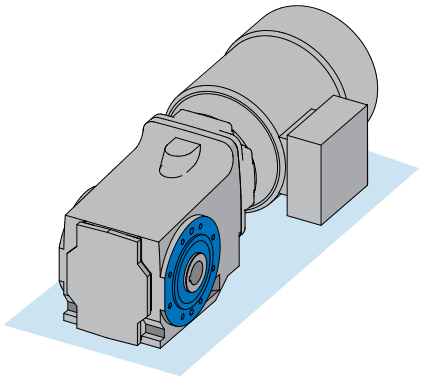
B5 Flange Pilot Removal (PR)

B5 flanges have a centering pilot machined onto the flange. In cases where there is not a matching counter bore or when the flange must sit flush to the mounting surface then the centering pilot must be removed. This pilotless flange is used to firmly secure the speed reducer to the application.

In some cases the matching surface already has a centering pilot and the use of a female pilot (counter bored flange surface) is recommended. Counter rotating drives are an example of where a female pilot is frequently used.

B14 Flange (Z)

The B14 flange consists of threaded holes and a centering pilot machined into the reducer housing. It is commonly used to secure the reducer to the application, machine base or to mount one of many bolt on components such as a B5 flange, or shaft cover. The B14 flange uses standard metric dimensions and allows a compact method of securing the reducer.

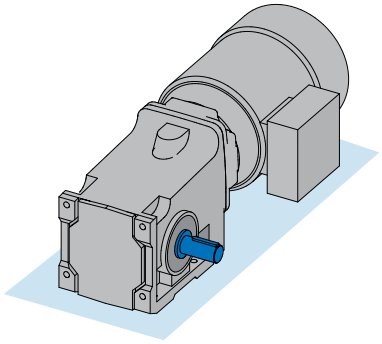


Gear Unit Options

Shaft Options

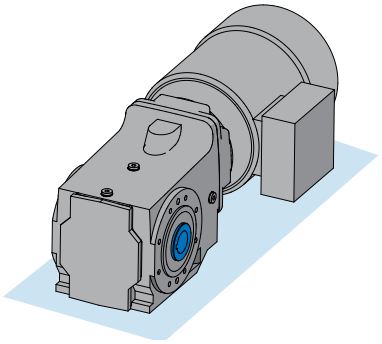
Solid Shaft (Blank or V)

NORD's standard keyed solid shafts include a centered threaded hole. Shafts are available in inch or metric versions. The standard shaft materials are AISI1045 high carbon steel, AISI 4140 or an equivalent.



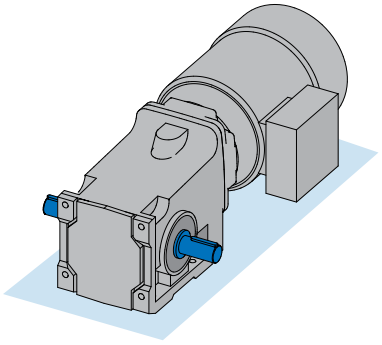
Keyed Hollow Shaft (A)

NORD's standard keyed hollow shafts are made from AISI 1045 high carbon steel. They feature standard keyway dimensions and are available both inch and metric designs. Many NORD reducers offer a variety of hollow shaft diameters.



Double Solid Shaft (L)

The standard solid shaft end is projected out both sides of the speed reducer. This option is commonly used to transfer torque out of both sides of the reducer or to mount a speed-monitoring device such as an encoder on one of the shaft ends.



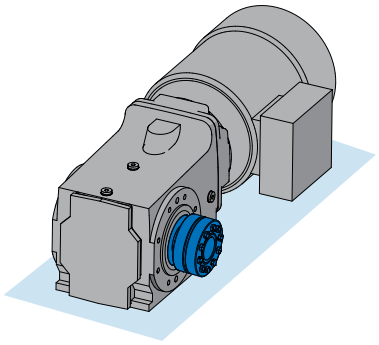
Shrink Disc & Cover (SH)

The shrink disc relies on the proven wedge principle to create a keyless, mechanical interference fit by converting locking screw tension into radial contact pressure on shaft and hub in effect "shrinking" it on to the customer shaft. Shrink discs result in a zero backlash mechanical interference fit that can accommodate high torque unlike other mounting technologies and will never wear or pound out, even for high cycle fluctuating and reversing loads.

The shrink disc cover is required with all shrink disc units and provides protection from the rotating shrink disc.

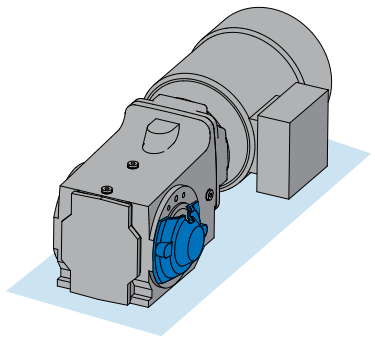
Other shrink disc advantages include:

- Elimination of fretting corrosion associated with key connections.
- Generous clearance for easy mounting & dismounting.
- Allow for larger bores sizes compared to keyed hollow shafts.



Hollow Shaft Cover (H)

An optional cover can be used to guard from rotating hollow output shafts. It also protects the output shaft seals against dust and dirt particles and in some cases can be sealed against moisture and dust.



Special Shafts & Shaft Materials

Stainless Steel Output Shaft (SM5)

Output shafts made from stainless steel are available and are frequently used in food, pharmaceutical, and washdown applications. In some cases stainless steel solid input shafts may also be provided.

Special Solid Shaft (SWV)

Special solid shaft diameters and lengths may be provided for a nominal price adder. Special features are also available including keyless shafts, cross drilled shafts or special threaded taps. Different shaft materials are also available. NORD has in-house drafting, design and machining departments so we may provide special requirements in short lead times. Specify your shaft requirements and NORD will verify the design's feasibility.

Special Hollow Shaft (SWA)

Special hollow bore shafts may also be provided. Special hollow bore shafts can be provided with special diameters, multiple keyways, and even special extended hollow shafts that are frequently used with counter rotating drives. Different shaft materials are also available. Specify your shaft requirements and NORD will verify the design's feasibility.

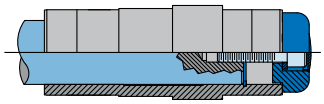
Special Shrink Disc (SS)

Special shrink discs shafts may be provided with your-specified diameters based on the table found on page 115. Special shrink discs can be provided with special diameters and even special extended hollow shafts that are frequently used with counter rotating drives. Different shaft materials are also available. Specify your shaft requirements and NORD will verify the design's feasibility.

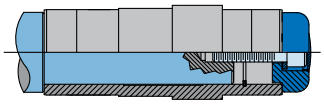
Fixing Element Kit (B) (shaft shoulder fixed and snap ring fixed)

Due to the slight oscillations inherent in any rotating shaft, NORD offers an optional "fixing element kit". This is a method to prevent the reducer from "walking out" of position. The kit includes all necessary parts to secure the shaft in the axial direction by using a tapped hole in the end of the mating male shaft.

There are two methods for securing the fixing element kit. The first involves pulling the customer supplied male shaft to the snap ring (type 1) and the second method the customer supplied shaft is shouldered (type 2) and pulled against the hollow shaft and not the snap ring.



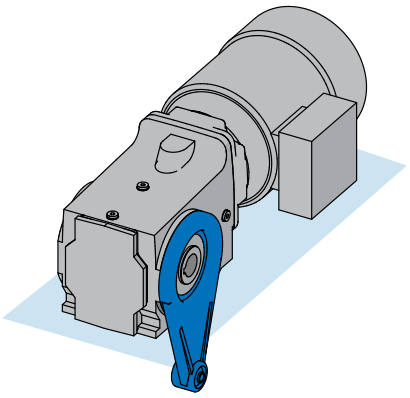
Snap Ring Fixed (Type 1)



Shaft Shoulder Fixed (Type 2)

Torque Arm (D)

A torque arm is a compact, simple way to secure a shaft mounted reducer. It is bolted onto the reducers B14 flange. The tear drop shaped torque arm has a rubber bushing located at the fastening hole-end to act as a shock absorber to dampen out peak shock loads.



Specify the torque arm location and orientation when ordering

Torque arm location _____
Torque arm orientation _____
See Page 15 for details

Gear Unit Options

Other Options

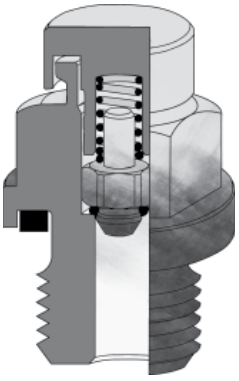
(FKM) Fluoro-rubber Seals (VI)

The NORD standard oil seals are made of Nitrile or rubber and are rated for temperatures up to 125°C or 250°F. If ambient or oil temperatures rise above this level NORD recommends using flouro-rubber (also called FKM) oil seals. FKM seals are rated from -30°F to 400°F (-35°C to 200°C).

Oil Sight Glass (OSG)

The oil sight glass provides a visible oil level indication on the reducer. The sight glass replaces the standard steel fill plug and consists of a sealed clear porthole centered in the middle of a brass plug. The sight glass allows for quick oil level and color inspection.

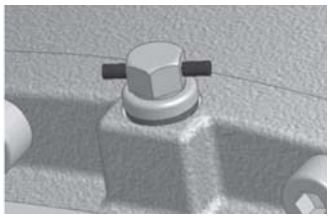
Autovent™ (DR)



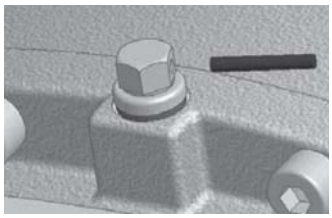
The Autovent™ prevents entry of foreign material, such as water, dust, corrosives, etc… and is perfect for washdown and dusty environments. The Autovent™ is a ball and spring check valve that opens at 2 psi during operation and closes tightly when the gearbox cools. The Autovent™ is standard on all vented NORD reducers some of the benefits are cleaner gearbox oil, extended lubrication life and longer lasting seals, gears, and bearings.

Open Vent (OV)

An open vent may be optionally supplied on NORD reducers. The open vent allows for air pressure differences between the inner space of the reducer and the atmosphere. This open vent will be closed upon delivery to prevent oil leakage. Before the reducer is put in service the open vent should be activated by removing the sealing plug.



Sealed vent



Activated vent

Filtered Vent (FV)

NORD offers a filtered vent, which allows gases to permeate, but does not allow dust and debris to pass through the vent.

Magnetic Drain Plug (MDP)

Magnetic drain plugs attract and hold ferrous metal particles that may circulate inside the reducer's oil sump. These potentially abrasive particles may cause excessive wear in the reducer if they remain circulating. An increase of material collected by the magnetic plug may be a warning sign of future problems. The magnetic plug is available for units SK 92672 and larger.

Special Drain Plugs

NORD oil drain valves are offered to make draining the oil from the gearbox clean and easy. The drain hose needs to be supplied by the customer. The hose fittings are offered in either 90° or straight to accommodate the user.

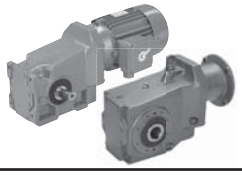
A brass drain valve is threaded into the existing oil drain port of the gearbox. The spring valve is closed using a rubber o-ring. When the hose fitting is threaded into the drain valve, the spring valve is pushed open and allows oil to drain. When the hose fitting is removed, the drain valve closes. A brass, threaded cap is supplied to cover the drain valve when not in use.

Additional Drain Plug Hole (ADP)

NORD can add an additional drain hole to the reducer housing for a small surcharge if required for special oil plumbing needs.

Long Term Storage (LL)

Speed reducers are frequently put in storage prior to installation for long periods of time & in some cases exposed to the elements. NORD's long term storage option protects the unit from moisture or corrosion by coating all unpainted surfaces with a dry, transparent, durable waxy film. Once installation is necessary this waxy film can be easily removed with a commercial de-greaser or petroleum solvent. If possible the store room should be vented and dry, with room temps. between 32°F and 104 °F (0 °C and 40 °C).



Paint Coatings

NORD's standard paint coating is a two component, aliphatic polyurethane finish contaning 316 stainless steel material. This gray stainless steel paint has excellent appearance and outstanding physical properties. It is suitable for both indoor and outdoor applications.

Advantages of NORD's stainless steel two component polyurethane:

- Excellent adhesion to cast iron, aluminum, steel, and plastics
- Excellent corrosion resistance
- Excellent chemical resistance
- Excellent gloss and color retention
- Suitable for indoor and outdoor exposure
- Nonporous and excellent abrasion resistance
- USDA compliant

NORD also offers a variety of severe duty paint coatings that provide a high level of protection against water and severe environments both indoors and outdoors. NSD+ (NORD Severe Duty) consists of a primer undercoat and a stainless steel polyurethane topcoat. For the most demanding environments, NORD offers NSD-X3 (NORD Severe Duty triple coated) which consists of a primer undercoat, stainless steel polyurethane coating, and a clear topcoat. Paint coatings are also available in alternate colors as seen in the table below.

Finish	Color	Coating	Use
Standard (stainless steel paint)	Stainless steel silver (Gray)	1 x Stainless steel (316) top coat (polyurethane)	Indoor or outdoor moderate environment
Alternate color	Black, Blue, Red, Orange	1 x Color top coat (polyurethane)	Indoor or outdoor protected
NSD+			
NORD Severe Duty + NSD+	Stainless steel silver (Gray)	1 x Primer high solid alkyd system 1 x Stainless steel (316) top coat (polyurethane)	Indoor or outdoor moderate environment
NORD Severe Duty +W NSD+W	White	1 x Primer high solid alkyd system 1 x White top coat (polyurethane)	Indoor or outdoor moderate environment
Alternate color NSD+	Black, Blue, Red, Orange	1 x Primer high solid alkyd system 1 x Color top coat (polyurethane)	Indoor or outdoor moderate environment
NSD X3			
NORD Severe Duty Extreme NSD-X3	Stainless steel silver (Gray)	1 x Primer high solid alkyd system 1 x Stainless steel (316) (polyurethane) 1 x Clear top coat (polyurethane)	Indoor or outdoor more severe environment
NORD Severe Duty Extreme NSD-X3W	White	1 x Primer high solid alkyd system 1 x White (polyurethane) 1 x Clear top coat (polyurethane)	Indoor or outdoor more severe environment
Alternate color NSD-X3	Black, Blue, Red, Orange	1 x Primer high solid alkyd system 1 x Color (polyurethane) 1 x Clear top coat (polyurethane)	Indoor or outdoor more severe environment

Special colors and paints possible please contact NORD with your specific requirements.

Input

NORD's modular design allows for many different types of inputs to be added to gear reducers. All inputs are bolt on and include machined pilots to ensure simple and accurate assembly. NORD offers the following different input types:

- Integral motor
- Solid input shaft
- NEMA C-face motor adapter
- IEC B5 motor adapter
- Custom mounting interface

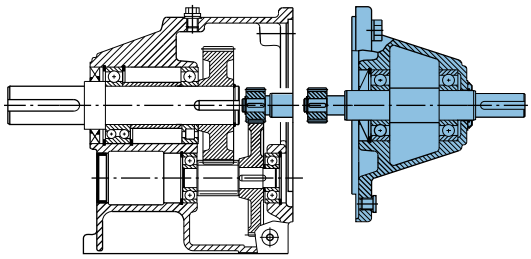
Integral Motors

NORD provides integral motors that mount directly to the gearbox. Integral motor mounting eliminates the need for costly v-belts or sheaves and directly couples the motor to the reducer. This also results in a dimensionally compact one-piece package.

NORD high performance integral motors are available in many operational voltages, are inverter duty rated, and offer many valuable options including energy efficient motors and power off brakes. For more information on integral motors, see the catalogs motor section found on page 117.

Solid Input Shaft

Designed to mount couplings, sheaves or sprockets, which transfer torque from the prime mover. The input shaft is made from ANSI 1045 or stronger material dimensioned with long keys according to ANSI B17 standards. Bearings are sized to handle overhung loads resulting from belt or sprocket inputs. See page 41 for more information on the capacity of each input housing assembly. The maximum gearbox input power rating is indicated in the speed reducer performance tables.



NEMA C-Face Motor Adapter

NEMA C-face motor adapters allow for easy installation and removal of industry standard C-face motors. NEMA C-face motor adapters consist of a coupling and an adapter housing that connects the motor to the gear reducer. Gear units with NEMA C-face adapters are commonly used where applications require specialized motors or the user wants to easily find a replacement motor if failure occurs. NORD also offers high performance NEMA C-facemotors and brakemotors, that can be factory installed to the motor adapter.

NORD motor adapters deliver nearly 100% of the torque generated by the motor and can be used from -13°F (-25°C) to 212°F (100°C). Most motor adapters have specially sealed bearings that are lubricated for life.

The maximum input power of a gear unit with a NEMA C-face adapter is generally limited by the power rating of the standard NEMA C-face motor size. The power limit is indicated in the ratings table for a standard 4-pole 1750 rpm motor. In some cases the gearbox limit ($T2_{max}$) will be the limiting capacity. Both the NEMA adapter limit and the gearbox torque limit must be considered. If the speeds required exceed those included in the performance and speed reduction tables please contact NORD.

IEC Motor Adapter

IEC motor adapters allow for easy installation and removal of industry standard IEC motors according to DIN 42677. The IEC adapter is very similar to the NEMA C-face adapter in construction. The maximum input power is generally limited by the IEC motor size. For ratings and dimensions, please consult NORDS metric catalogs that may be found online at www.nord.com under the document section.

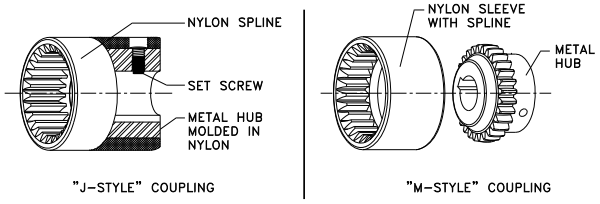
Vertical Motor Adapter Applications

Gear units with motors frame sizes 250TC (IEC160) and larger, in a vertical up motor mounting position, NORD recommends using an integral gearmotor instead of a NEMA or IEC input adapter. If your application requires this mounting position and a NEMA or IEC input, please consult NORD. In vertical down motor mounted applications it is recommended to shorten the maintenance interval.

Key Features

Couplings

Couplings are made with tough abrasion resistant materials, which resist most chemicals and petroleum products. They are electrically isolated (prevent metal to metal contact) and require no lubrication or maintenance.



Gear Couplings

Gear couplings are used with 56C to 250TC adapters and provide a compact space saving design. C-face adapter input shafts have a machined male spline that meshes with a molded nylon spline on the coupling. This specially designed molded nylon sleeve that exhibits high torsional stiffness, resulting in minimum fit-up backlash and reduced internal frictional losses. Gear couplings lightweight design yields low inertia and use blind assembly and slip together components to make inspection easy without disassembly.

NORD incorporates two styles of gear couplings, the "J" and "M" styles. The "J" style is a one-piece coupling consisting of a nylon sleeve and metal hub that is fused together. The "M" style is a two-piece coupling consisting of a separate nylon sleeve and metal hub.

NEMA Motor Adapter Details

NEMA C-face Motor Frame Size	NEMA Adapter Nomenclature	4 pole Motor HP	Max Motor Weight [lb]	Coupling Description	Coupling Bore (inches)	Maximum Coupling Torque Capacity (in-lb)	Safety Factor
56 C	- 56C	≤ 1.0	66	J14	0.625	177	3.3 min
56 C	- 56C	≤ 1.5	66	J24	0.875	354	6.6 min
143 TC	- 140TC	≤ 1.5	88				6.6 min
145 TC	- 140TC	≤ 2	110				4.9 min
145 TC	- 140TC	3	110				3.3 min
182 TC	- 180TC	3	130	J28	1.125	797	7.4 min
184 TC	- 180TC	5	175				4.4 min
182 TC	- 180TC	3	130	M38	1.125	1416	13.1 min
184 TC	- 180TC	5	175				7.9 min
213 TC	- 210TC	7.5	220		1.375		5.2 min
215 TC	- 210TC	10	220				4.0 min
254 TC	- 250TC	15	450	M42	1.625	1770	3.3 min
256 TC	- 250TC	20	450				2.5 min

IEC Motor Adapter Details

IEC Motor B5 4 pole	IEC Adapter Nomenclature	HP / kW	Max Weight Limit [lb]	Coupling Description	Coupling Bore (mm)	Maximum Coupling Torque Capacity (Nm)	Safety Factor
63 S/4	- IEC 63	0.16 / 0.12	56	J14	11	20	23.2 min
63 L/4	- IEC 63	0.25 / 0.18	56				15.8 min
71 S/4	- IEC 71	0.33 / 0.25	67		14		11.5 min
71 L/4	- IEC 71	0.50 / 0.37	67				7.8 min
80 S/4	- IEC 80	0.75 / 0.55	89	J24	19	40	10.4 min
80 L/4	- IEC 80	1.00 / 0.75	89				7.6 min
90 S/4	- IEC 90	1.5 / 1.1	111		24		5.3 min
90 L/4	- IEC 90	2.0 / 1.5	111				3.8 min
100 L/4	- IEC 100	3.0 / 2.2	133	J28	28	90	6.1 min
100 L/40	- IEC 100	5.0 / 3.7	133				4.4 min
112 M/4	- IEC 112	5.3 / 4.0	177				3.4 min
132 S/4	- IEC 132	7.5 / 5.5	221	M38	38	160	4.3 min
132 M/4	- IEC 132	10 / 7.5	221				3.2 min
160 M/4	- IEC 160	15 / 11	441	M42	42	200	2.2 min
160 L/4	- IEC 160	20 / 15	441				1.6 min

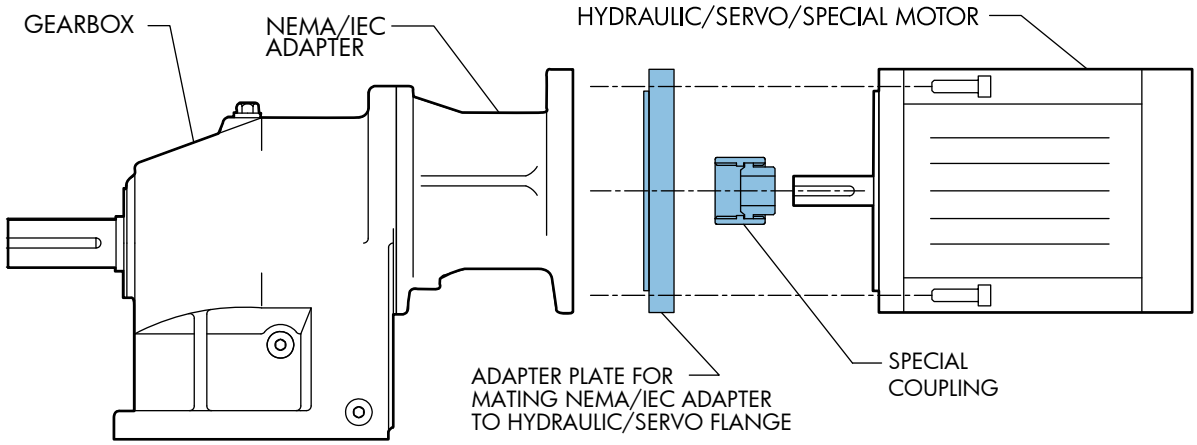
Custom Mounting Interface

NORD can provide custom input adapters typically consisting of a special adapter plate and special coupling to mount non-standard dimensioned motors or other devices.

When a custom input adapter is required, special attention needs to be given for each application to be sure the customer receives the performance that is necessary. The following information is required:

- Motor Dimensional Drawing
- Motor Weight
- Motor performance specifications, including torque, horsepower and operating speed ranges.

NORD engineers will review the performance requirements and make a unit selection based on given parameters.



Lubrication

The Importance of Proper Lubrication

Proper gearbox lubrication is essential in order to reduce friction and component wear, and protect against corrosion and rust. Gear lubricants reduce heat and wear by inserting a load-sharing "protective fluid film" between mating parts and preventing direct metal to metal contact. Properly selected lubricants will operate under various film conditions, improve heat transfer, optimize reducer efficiency, absorb shock loads, reduce noise, inhibit foaming, and separate water readily.

Design Considerations

Along with many other factors, the gear designer must consider the gear load and speed conditions, and the expected operating oil temperatures. These factors help determine a generally suitable oil category, a desired additive package, preferred base-oil type, and oil viscosity.

It is important that the consumer be aware of these many design factors before making any changes in the critical areas (oil category, base-oil type, viscosity, etc.) One should consult their preferred lubrication supplier or NORD Gear when questions arise.

Gear Oil Types, Categorized by Base Oil

Mineral Oil with an EP Additive (DIN 51517, Type CLP)

High performance mineral gear oils are carefully engineered and manufactured to improve aging characteristics, minimize friction, offer good wear protection, provide corrosion and oxidation resistance, minimize foam, and separate water. Mineral gear oils are classified as API Group I or II oils, depending upon viscosity.

The standard NORD mineral gear oil has an extreme pressure (EP) additive ISO Viscosity Grade EP220 (AGMA 5 EP) and is generally acceptable for helical gear units. Good quality mineral oil should have the ability to operate at moderate sump temperatures (up to 80-85 °C) without losing viscosity or thickness. A minimum viscosity index (VI) of 93 or higher is suggested. The oil must also have good film strength to handle shock loads, high torque, and start-up conditions. A minimum FZG Scuffing Load Stage 12 is desirable.

Advantages:

- Most economical of all the gear oil types.
- Generally offers good compatibility with shaft seals, gaskets, paint finishes, etc.
- Offers good corrosion and oxidation protection.
- Effectively reduces internal friction and wear.

When Synthetic Oils Are Used

Synthetic gear oils are suggested when mineral gear oils have reached their performance limit or when they no longer meet certain application requirements. NORD may recommend synthetic oil for any one of the following conditions:

- Severe duty applications or when gears are exposed to frequent starts and stops, high-load or shock.
- For applications in low or high temperature service.
- To extend oil service interval requirements.
- To eliminate the necessity for seasonal oil changes.
- To extend service life of factory-sealed or maintenance-free gear units.
- To take advantage of performance benefits: shear resistance, low traction coefficient, reduced internal friction, improved lubricity, reduced operating temperatures, improved gear efficiency, etc.

Performance Advantages of Synthetic Oil

Compared to mineral oils, synthetic oils provide a number of performance advantages including:

- Ability to operate at higher temperatures without losing viscosity or thickness, due to a much improved viscosity index.
- Improved low-temperature stability due to a lower pour point
- Increased oil change intervals due to superior oxidative & wear resistance
- Lower tendency to form residues and increased resistance to foaming.
- Other benefits may include: very good shear resistance, low traction coefficient, reduced internal friction, improved lubricity, reduced operating temperatures, improved gear efficiency, extended component life and wear protection.

When application conditions warrant the use of synthetic oil, NORD may suggest a particular type of synthetic oil, depending upon the gear unit type and the application.

Synthetic Hydrocarbon/Polyalphaolefin (SHC/PAO) Oil (DIN 51517, Type CLP-HC)

Synthetic Hydrocarbons (SHC) or Polyalphaolefin (PAO) synthetic base oils offer good miscibility with mineral base oils and are very readily available. SHC/PAO oils are classified as API Group IV oils. The can be formulated with or without anti-wear (AW) or extreme pressure (EP) additives. They can also be formulated for acceptance in food-grade applications.

Advantages:

- Higher viscosity index and therefore greater high-temperature stability than mineral oil.
- Better low-temperature stability and lower pour point than mineral type gear oils
- High surface tension and lower tendency to foam compared to mineral oil, and water-soluble polyglycol gear oils.
- Compatible (miscible) with mineral oil.
- Better water seperability (demulsibility) than PG oils.

Polyalkylene Glycol or Polyglycol Synthetic Oil (DIN 51517, Type CLP-PG)

Polyalkylene glycol or polyglycol (PAG or PG) synthetic gear oils are made readily available through many lubrication suppliers. PG oils are classified as API Group V gear oils. They can also be formulated for acceptance in food-grade applications.

PG gear oils possess extremely low traction coefficients and a viscosity index higher than any of the other synthetics (often greater than 220 VI), resulting in excellent heat resistant, shear stability, and natural anti-wear properties.

Typical PG gear oils are formulated with a 1:1 or higher ratio of ethylene oxide to propylene oxide (50:50 or 60:40 is common); this makes PG gear oils water soluble, providing them with very good corrosion resistance even when water is present in concentrations that are higher then what is normally allowed.

Advantages:

- PG oils offer the highest viscosity index of any other synthetic resulting in excellent heat resistant, shear stability, and superior natural anti-wear properties without requiring EP-additives.
- PG gear oils minimize internal friction and often result in improved gear efficiency.
- PG oils have significantly higher film strength than mineral and SHC/PAO oils and out perform these oils at higher operating oil temperatures (approaching 80°C or higher).

IMPORTANT NOTE

Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral oil, hydrosynthesized synthetic or PAO synthetic oils.

Lubrication

Food-Grade Lubricants

Food-grade lubricants should be manufactured in compliance with FDA 212 CFR 178.3570 and should either satisfy the former 1998 USDA Guidelines as an H1 lubricant or currently qualify as a NSF-H1 lubricant. Please consult with lubrication manufacturers for more information or visit www.nsf.org

H1 food grade oil can only contain additives which appear on the FDA "approved list" for food safe compounds. H1 oils are generally absent of common zinc-based AW additives, and sulfur-phosphorus based, EP chemistries, commonly found in many industrial gear oils.

Food manufacturers control risk and liability by following detailed guidelines outlined by the HACCP (Hazard Analysis and Critical Control Point) program, which includes food-grade H1 lubricants.

Food grade H1 lubricants may be formulated as highly refined mineral oils (white oils), SHC/PAO synthetic oils or PG synthetic oils.

The highly refined nature of good-quality food-grade white-oils provides good long-term oxidative stability and in most cases adequate lubrication under high-load (boundary) conditions. So long as food-grade white oils meet the minimum anti-wear requirements of the normally specified non-food grade oil, they are often acceptable.

Both food-grade white oils and PAO's have an inherent "purity" and absence of polar compounds, making them better than the average mineral oil or even PG oil in terms of demulsibility (water seperability).

Compared to food-grade white-oils, food-grade synthetic PAO or PG oils typically provide:

- Better wear and oxidation resistance.
- Improved high-temperature characteristics.
- Better cold-temperature behavior.

The Importance of Oil Viscosity

Viscosity or the oil's resistance to shear under load, is often considered the single most important property of any gear oil.

NORD Gear Designers have selected the most appropriate ISO viscosity grade of oil, for each type or class of gear reducer. Gear oil viscosity is selected by assuming typical ambient conditions, at rated speed and load conditions.

Important Considerations:

- The correct viscosity selection helps provide proper lubrication and assures that a minimum film thickness is maintained between interacting surfaces.
- The degree to which viscosity changes with temperature or the viscosity index, varies from oil to oil, and depends upon the type of lubricant & additive agents used.
- Selecting too low of a viscosity can result in mixed boundary (partial metal-to metal contact) or boundary lubrication (full metal-to-metal contact) conditions, increasing internal friction heat build-up and wear.
- Selecting too high of a viscosity results in increased churning and squeezing losses in the load zone and excessive heat (especially when peripheral gear speeds are high); Ultimately, this causes the oil temperature to rise and the viscosity to go down, decreasing the effectiveness of the lubricant.

Considering an Oil Viscosity Change

There are three primary reasons to consider a lubrication viscosity change as follows:

1. Low temperature gear oils should be selected so that the pour point is at least 9°F (5°C) lower than the expected minimum ambient temperature. In extreme cases, consider a lower ISO Viscosity rating and test the critical performance of the gear box under cold start-up.

2. High temperature applications may require an increase in the lubricants viscosity to assure proper lubrication conditions in the critical load zones of the gear unit. NORD also recommends switching to synthetic oil if oil sump temperatures exceed 176-185 °F (80-85 °C).

3. In cases of extreme load conditions, gear pairs and antifriction bearings may be more susceptible to scuffing wear. In these operating conditions, it may be beneficial to consider an increased lubrication viscosity and/or lubrication with improved antiwear additive packages.

IMPORTANT NOTE

NORD recommends that the user consult with their primary lubrication supplier when considering changes in oil viscosity.

Maximum Oil Sump Temperature Limit

To prevent reducer overheating, the reducer's maximum oil sump temperature limit must not be exceeded for prolonged periods of operation (up to 3 hours continuous operation, depending upon reducer size).

Oil Type	Maximum Oil Temperature Limit	
	NORD	AGMA 9005-D94
Mineral	80-85 °C (176-185 °F)	95 °C (203 °F)
Synthetic	105 °C (220 ° F)	107 ° C (225 ° F)

IMPORTANT NOTE

Use caution when specifying gear reducers for high temperature service. If there is concern about exceeding the allowable safe operating temperatures, please consult NORD to discuss alternatives.

Lubrication

Ventilation

Most gear reducers are equipped with a vent which helps compensate for air pressure differences between the inner space of the gear unit and the atmosphere.

The spring-pressure vent (Autovent™) is commonly supplied and factory-installed. Normally open vents may also be supplied as an option; normally-open vents are closed upon delivery in order to prevent oil leakage during transport. When normally open vents are supplied, the sealing plugs must be removed prior to commissioning the reducer.

Prior to reducer start-up, it is important to check the maintenance manual to verify that the vent is properly located with respect to mounting position.

Mounting Position

The reducer mounting position determines the approximate oil fill-level and the appropriate vent location. In some cases mounting position may dictate possible variation in final reducer assembly.

If considering any mounting positions that are not shown as catalog-standard options, it is critical that the customer consult with NORD prior to ordering.

Oil Fill Quantities

Oil fill quantities shown in the catalog or maintenance instructions are approximate amounts. The actual oil volume varies depending upon the gear ratio. Prior to commissioning the reducer, the oil-fill level should be checked using the reducer's oil-level plug. It may be necessary to drain excess oil or add additional oil.

Unless otherwise specified, NORD supplies most all gear units factory-filled with the standard lubrication type per the specified mounting position.

Lubrication Replacement

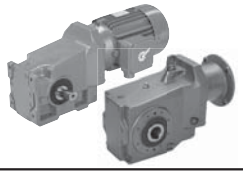
If the gear unit is filled with mineral oil, the lubricant should be replaced at least after every 10,000 operating hours or after every two years. If the gear unit is filled with synthetic oil, the lubricant should be replaced at least after every 20,000 operating hours or after every four years. Often gear reducers are exposed to extreme ambient conditions, hostile environments, wet conditions, or dirty and dusty operating areas. Especially in these situations, it is important to establish a condition-based oil service interval.

The Importance of Routine Oil Analysis

Routine oil analysis, sound lubrication practices, and good tracking of oil performance trends will help establish proper lubrication maintenance and change-out intervals. To maximize equipment reliability, NORD Gear generally recommends a condition-based lubrication maintenance program. One may take exceptions to this general recommendation on sealed-for-life or maintenance-free gear units or smaller and less costly gear units. In these instances, the replacement cost of the gear unit is often small compared to the costs associated with this type of oil analysis program.

NORD suggests replacing the gear oil if oil analysis indicates any of the following:

- Viscosity has changed by approximately 10% or more.
- Debris particles (silicon, dust, dirt or sand) exceed 25 ppm.
- Iron content exceeds 150-200 ppm.
- Water content is greater than 0.05% (500 ppm).
- The total acid number (TAN) tests indicate a significant level of oxidative break-down of the oil, and a critical reduction in performance; If the TAN number measured changes by more than 5% over the new oil, then an oil change would be recommended.



Lubrication Types

Proper gearbox lubrication is essential in order to reduce friction, heat, and component wear. Lubricants reduce heat and wear by inserting a protective "fluid boundary" between mating parts and preventing direct metal to metal contact. Lubricants also help prevent corrosion and oxidation, minimize foam, improve heat transfer, optimize reducer efficiency, absorb shock loads and reduce noise.

Mounting position not only determines the proper fill-level but may also have some effect on final reducer assembly. If considering any mounting positions that are not shown as catalog-standard options, it is critical that the customer consult with NORD prior to ordering. Unless otherwise specified, NORD supplies all 92 Bevel gear units factory-filled with the standard mineral lubrication type and the appropriate quantity.

Standard Oil Lubricants

Gear Unit Type	ISO Viscosity	Oil Type	Ambient Temperature Range	Manufacturer Brand/Type	Notes
92 Bevel	VG220	MIN-EP	0 to 40°C (32 to 104°)	Mobilgear 600XP220	♦❶
	VG220	PAO	-35 to 60°C (-31 to 140°F)	Mobil SHC630	♦
	VG220	FG	-5 to 40°C (23 to 104°F)	Fuchs FM220	♦

Optional Oil Lubricants

Gear Unit Type	ISO Viscosity	Oil Type	Ambient Temperature Range	Manufacturer Brand/Type	Notes
92 Bevel	VG460	PAO	-35 to 80°C (-31 to 176°F)	Mobil SHC 634	-
	VG460	FG-PAO	-35 to 80°C (-31 to 176°F)	Mobil/Cibus SHC460	-
	VG220	FG-PAO	-35 to 60°C (-31 to 140°F)	Mobil/Cibus SHC220	-
	VG150	PAO	-35 to 25°C (-31 to 77°F)	Mobil SHC629	-

Standard Bearing Grease Lubricants

Grease Type/Thickener	NLGI Grade	Ambient Temperature Range	Manufacturer Brand/Type	Notes
Standard (Li-Complex)	NLGI 2	-30 to 60°C (-22 to 140°F)	Mobil Grease XHP222	♦❶
High Temp (Polyurea)	NLGI 2	-25 to 80°C (-13 to 176°F)	Mobil Polyrex EP 2	♦
Food-Grade (AL-Complex)	NLGI 2	-25 to 40°C (-13 to 104°F)	Mobil Grease FM222	♦

♦ Stocked Lubricants

❶ Standard Oil Fill

IMPORTANT NOTES

- Food grade lubricants must be in compliance with FDA 212 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacturer for more information.
- When making a lubrication change, check with the lubrication supplier to assure compatibility and to obtain recommended cleaning or flushing procedures.
- Do not to mix different oils with different additive packages or different base oil formulation types. Polyglycol(PG) oils are not miscible with other oil types and should never be mixed with mineral oil.
- Consult NORD if considering oils of ISO Viscosity VG100 or lower.

Oil Formulation Codes

MIN-EP	Mineral Oil with EP Additive
PAO	Synthetic Polyalphaolefin Oil
FG	Food-Grade Oil
FG-PAO	Food-Grade, Synthetic Polyalphaolefin Oil

92 Series Bevel Foot Mount Positions & Oil Fill Quantities

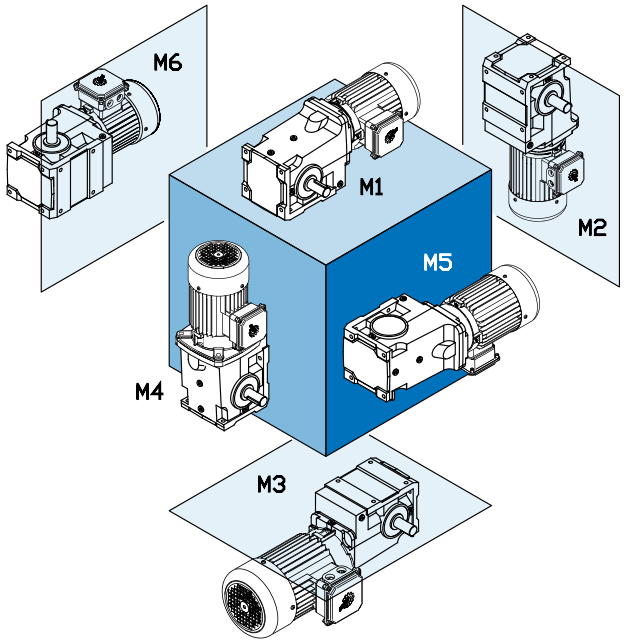
92 Helical-bevel foot mount lubrication

All NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.

STOP *HARMFUL SITUATION* **STOP**

Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add addition oil as needed.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.



Type	M1		M2		M3		M4		M5		M6	
	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters
SK 92072	0.420	0.400	0.630	0.600	0.530	0.500	0.530	0.500	0.420	0.400	0.420	0.400
SK 92172	0.580	0.550	0.950	0.900	1.000	0.950	1.16	1.10	0.790	0.750	0.660	0.620
SK 92372	0.950	0.900	1.37	1.30	1.53	1.45	1.69	1.60	1.27	1.20	1.27	1.20
SK 92672	1.90	1.80	3.70	3.50	3.38	3.20	3.59	3.40	2.75	2.60	2.75	2.60
SK 92772	2.43	2.30	4.76	4.50	4.86	4.60	5.60	5.30	4.33	4.10	4.33	4.10

Oil Levels shown apply to base models and gear units ending in LX, AX, & VX.

92 Series Bevel Flange Mount Positions & Oil Fill Quantities

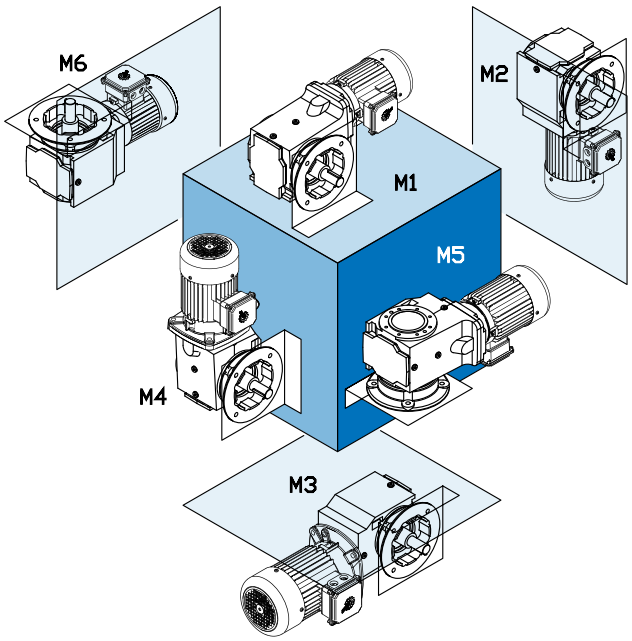
92 Helical-bevel flange/shaft mount lubrication

All NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.

STOP *HARMFUL SITUATION* **STOP**

Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add addition oil as needed.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.



Type	M1		M2		M3		M4		M5		M6	
	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters
SK 92072	0.420	0.400	0.630	0.600	0.530	0.500	0.530	0.500	0.420	0.400	0.420	0.400
SK 92172	0.530	0.500	0.970	0.920	0.920	0.870	1.11	1.05	0.790	0.750	0.690	0.650
SK 92372	1.22	1.15	1.59	1.50	1.27	1.20	1.80	1.70	1.22	1.15	1.22	1.15
SK 92672	1.64	1.55	2.96	2.80	2.64	2.50	3.49	3.30	2.54	2.40	2.54	2.40
SK 92772	2.91	2.75	4.65	4.40	4.76	4.50	5.81	5.50	3.70	3.50	3.70	3.50

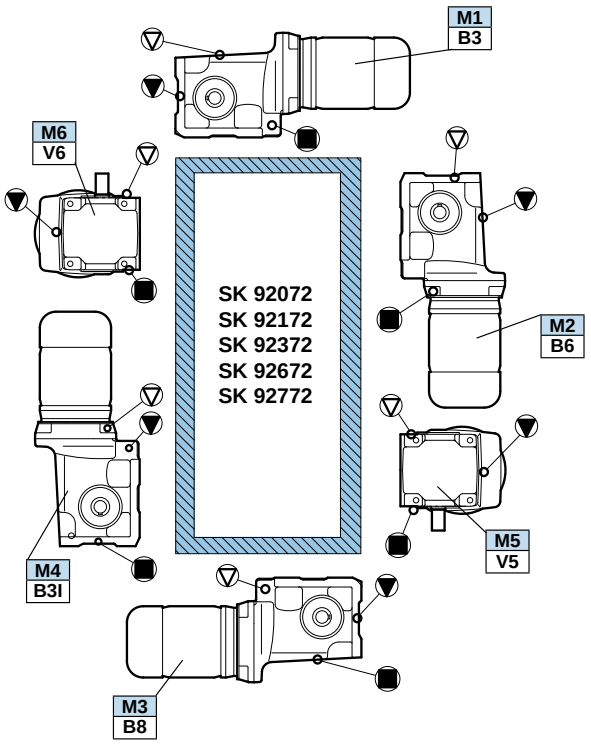
Oil Levels shown apply to gear units ending in AZ, AF, VZ, & VF.

92 Series Bevel
Oil Plug & Vent Locations

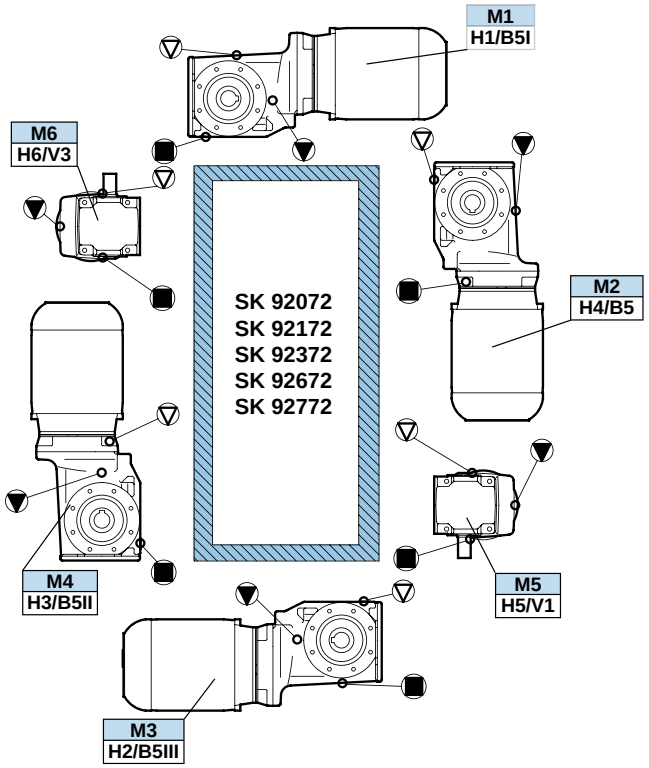
Oil plug locations

Prior to commissioning the reducer, check the oil-fill level using the reducer's oil-level plug and drain or add additional oil as needed. ***For mounting orientations other than shown please consult NORD Gear. New plug locations may be required.***

Foot Mount



Shaft/Flange Mount



▽ = Vent ▼ = Oil Level ■ = Oil Drain

Radial Overhung Load (OHL)

Any radial force or side force applied to the reducer shaft is a source of OHL and should be examined during the reducer selection process. An overhung load is radial a force that pulls (or pushes) against the reducer's output (or input) shaft.

OHL is produced by one or more of the following conditions:

- Transferring power at a right angle to the reducer's shaft, through an externally mounted power transmission device, such as a belt pulley, chain sprocket, or gear.
- By tensioning of the external belt or chain, which is required to keep belts from slipping, or to assure proper chain wrap around sprockets.
- The hanging weight of a pulley, sprocket or gear, mounted on the reducer shaft.

F_{OHL} = Applied overhung load condition at output shaft [lb]

F_{OHL1} = Applied overhung load condition at input shaft [lb]

OHL Rating – General Conditions

The catalog OHL ratings are based upon the following:

- The applied OHL is at the midpoint of the shaft.
- The worst-case direction of shaft rotation.
- There are no axial or thrust load conditions applied to the reducer shaft.

The above conditions apply whether or not one is evaluating the output shaft or input shaft OHL conditions.

Output Shaft OHL Rating

The maximum permissible output shaft OHL rating is found in the gearmotor selection tables. Output shaft OHL ratings apply to integral gearmotors, C-face reducers, and reducers with solid input shaft.

This is done by identify the power of the gear unit's driving motor or prime mover, and then using the selection tables to match the output shaft OHL rating with the selected gear unit type, power, ratio and output speed condition.

F_R = Output shaft OHL rating, at shaft center [lb]

Input Shaft OHL Rating

Input shaft (Type W) OHL ratings are given on page 37 and are represented by unit type and input power.

F_{R1} = Input shaft OHL rating, at shaft center

Axial Load or Thrust Load

Loads that are directed towards or away from the gearbox, along the axis of the shaft, are considered to be axial loads and are more commonly called thrust loads. Thrust loads can result from the following conditions:

- There is a hanging weight connected to the reducer shaft. This is common in mixer applications.
- While operating the equipment, a net axial force is directed towards or away from the reducer, along the shaft axis. This is common in many screw conveyor or mixer applications.

F_{THRUST} = Applied axial thrust load condition at output [lb]

$F_{THRUST1}$ = Applied axial thrust load condition at input [lb]

Thrust Rating – General Conditions

The published thrust ratings are based upon the following:

- The thrust capacity shown represents the worst case, and is independent of direction.
- Application loads can not exceed the values shown in the tables.
- There is no applied overhung load on the shaft.

Output Shaft and Input Shaft Thrust Rating

The output shaft thrust capacity can be found in the gearmotor selection tables, adjacent to the OHL ratings.

F_A = Output shaft thrust rating [lb]

The input shaft thrust capacity is given on page 40.

F_{A1} = Input shaft thrust rating [lb]

IMPORTANT NOTE

To validate the gear unit selection, assuming negligible OHL, the applied thrust condition must be less than the shaft thrust rating.

Combined OHL and Thrust Load Conditions

Published values for both overhung load and thrust capacity are based upon the presence of a single condition and assume the other condition is absent from the application. In many applications, it is feasible to have both overhung load and thrust at the same time.

Please contact NORD for more exact examination of the application, when both OHL and thrust conditions exist at the same time.

Engineering
OHL & Thrust

1. Calculate the applied OHL at the designated shaft

The most common radial OHL forces are created by transferring power at a right angle to the reducer's shaft, through an externally mounted power transmission device, such as a belt pulley, chain sprocket, or spur gear.

Included in the overhung load formula is an additional factor that is called the power transmission component factor (f_z). The (f_z) factor accounts for the extra radial force caused by proper tensioning of belts or chains or the additional forces created by the action of meshing gears.

The following equations are used to calculate the OHL forces generated by a belt pulley, chain sprocket, or spur gear and they also account for the extra radial force caused by proper tensioning of the transmission component. These equations treat the hanging weight of the transmission component as being negligible.

Variable definitions

F_{OHL}	=	Calculated shaft overhung load at output
F_{OHL1}	=	Calculated shaft overhung load at input
T_2 or T_1	=	Load Torque [lb-in]
n_2 or n_1	=	Shaft speed [rpm]
P_1	=	Load power at input
η	=	Gear reducer efficiency [%] ❶
d_{OHL}	=	Pitch diameter of power transmission component [in]
f_z	=	Power transmission component factor

❶ Gear reducer efficiency can generally be ignored unless considering compounded gear units, helical worm gear units or worm gear units.

Output shaft equations

$$F_{OHL} = \frac{2 \times T_2}{d_{OHL}} \times f_z \text{ (common equation)}$$

$$F_{OHL} = \frac{2 \times P_1 \times 63025 \times \eta}{n_2 \times d_{OHL} \times 100} \times f_z \text{ (alternate equation)}$$

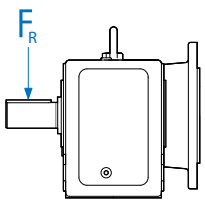
Input shaft equations

$$F_{OHL1} = \frac{2 \times P_1 \times 63025}{n_1 \times d_{OHL}} \times f_z \text{ (common equation)}$$

$$F_{OHL1} = \frac{2 \times T_1}{d_{OHL}} \times f_z \text{ (alternate equation)}$$

f_z factor table

Transmission Component	Factor f_z	Notes
Gear	1.00	17 teeth or less
Gear	1.15	18 teeth or more
Chain Sprocket	1.40	13 teeth or less
Chain Sprocket	1.20	13 to 20 teeth
Chain Sprocket	1.00	20 teeth or more
Timing Belt Pulley	1.50	-
V-Belt Pulley	1.70	-
Flat Belt Pulley	2.50	-



HARMFUL SITUATION

When gear units are flange mounted opposite shaft, their OHL capacity is greatly reduced compared to the standard catalog ratings. Please consult NORD for details on OHL ratings.

2. Determine the permissible shaft OHL rating

Output shaft OHL rating

Whether considering an integral gearmotor, C-face reducer, or reducer with solid input shaft, the maximum permissible output shaft OHL rating is found in the gearmotor selection tables. Establish the output shaft OHL rating as follows:

- ❶ First, identify the power of the gear unit's driving motor or prime mover.
- ❷ Then, use the gearmotor selection tables to identify the output shaft OHL rating, by selecting the appropriate gear unit type, power, ratio and output speed condition.
- ❸ Next, identify the output shaft OHL rating.

F_R = Output shaft OHL rating, at shaft center [lb]

Input shaft OHL rating

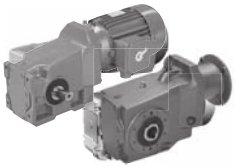
Input shaft (Type W) OHL ratings are given below and are represented by unit type and input power.

F_{R1} = Input shaft OHL rating at shaft center [lb]

Permissable Overhung Loads (F_{R1}) at Input Shaft [Lbs]

Gearbox Type	Input Power - P_1 [HP]											
	0.16	0.25	0.33	0.50	0.75	1.0	1.5	2.0	3.0	5.0	7.5	10
SK 92072	124	122	119	113	106	98	83	68	–	–	–	–
SK 92172	124	122	119	113	106	98	83	68	–	–	–	–
SK 92372	191	185	176	169	162	158	136	97	95	52	–	–
SK 92672	479	743	466	461	448	434	407	414	389	362	230	225
SK 92772	518	495	473	466	495	450	439	428	410	394	338	293

At midpoint of input shaft with no axial load

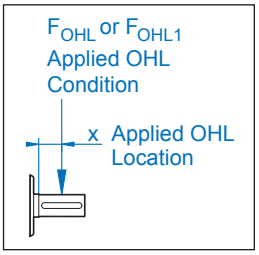


3. OHL rating correction – applied load is not at the shaft center or midpoint.

If the OHL force is not applied at the midpoint of the shaft, an overhung load rating correction must be applied to the catalog listed OHL rating. This OHL load correction is evaluated in two steps.

I. Verify the bearing OHL capacity (Formula I).

II. Verify the shaft OHL capacity (Formula II).



Overhung Load Variables

F_R	=	Output shaft OHL Rating, at shaft center [lb]
F_{R1}	=	Input shaft OHL Rating, at shaft center [lb]
F_{RX}	=	Standard Bearing Capacity Rating, with OHL applied at output shaft location "x" [lb]
F_{RX1}	=	Input Shaft Bearing Capacity, with OHL applied at Input shaft location "x" [lb]
F_{RXW}	=	Output shaft OHL Rating, at applied load location "x" with standard bearings [lb]
F_{RXW1}	=	Input shaft OHL Rating, applied at shaft location "x" [lb]
x	=	applied OHL location with respect to shaft shoulder [in]

Refer to Calculation Table Below

z	=	Factor from table [lb-in]
y	=	Internal Geometry Factor from table [in]
f	=	Internal Geometry Factor from table [in]
c	=	Internal Geometry Factor from table [lb-in]

Make certain to apply the proper table values for the shaft (output or input) that is being evaluated.

Formula I – Verifying Bearing Capacity

Output shaft (Standard bearings) $F_{RX} = \frac{z}{y+x} \times F_R$

Input shaft $F_{RX1} = \frac{z}{y+x} \times F_{R1}$

Formula II – Calculating the shaft OHL capacity

Output shaft (Standard bearings) $F_{RXW} = \frac{c}{f+x}$

Input shaft $F_{RXW1} = \frac{c}{f+x}$

Output Shaft OHL Rating Correction Factors (for applied loads not at shaft center)

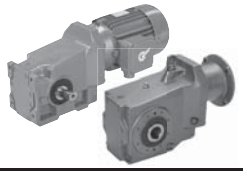
Gearbox Type	y [in]	z [in]	c [lb-in]	f [in]	U [in]	V [in]	T_{2max} [lb-in]
SK 92072	3.74	4.53	531	0.0	0.750	1.50	797
SK 92172	4.37	5.16	443	0.0	0.750	1.50	1,062
SK 92372	5.04	6.02	708	0.0	1.000	2.13	2,036
SK 92672	5.35	6.54	1,062	0.0	1.000	2.75	3,363
SK 92772	6.02	7.32	1,416	0.0	1.375	3.00	5,841

Input Shaft OHL Rating Correction Factors (for applied loads not at shaft center)

Gearbox Type	y [in]	z [in]	c [lb-in]	f [in]	d [in]	l [in]
SK 92072 - W	2.30	3.09	239	0.0	0.500	1.50
SK 92172 - W	2.30	3.09	239	0.0	0.500	1.50
SK 92372 - W	2.30	3.09	239	0.0	0.625	1.50
SK 92672 - W	2.34	3.13	283	0.0	0.750	1.50
SK 92772 - W	2.72	3.70	965	0.0	0.875	2.00

IMPORTANT NOTE

Calculations should always be made in accordance with Formula I (bearing capacity) and Formula II (shaft capacity). The corrected OHL rating (for loads not at the shaft midpoint) will always be the lower of the two limiting values based upon direct application of Formula I or Formula II.



4. Compare the applied OHL to the OHL rating

To validate the unit selection (assuming negligible thrust loading), the applied OHL condition must be less than the rated OHL capacity as shown below.

Output Shaft

$F_{OHL} < F_R$ (applied load at shaft center)
$F_{OHL} < F_{RX}$ (applied load not at shaft center)

Input Shaft

$F_{OHL1} < F_{R1}$ (applied load at shaft center)
$F_{OHL1} < F_{RX1}$ (applied load not at shaft center)

Variable definitions

F_{OHL}	=	Calculated shaft overhung load at output
F_{OHL1}	=	Calculated shaft overhung load at input
T_2 or T_1	=	Load Torque [lb-in]
n_2 or n_1	=	Shaft speed [rpm]
P_1	=	Load power at input
η	=	Gear reducer efficiency [%] ❶
d_{OHL}	=	Pitch diameter of power transmission component [in]
f_Z	=	Power transmission component factor

❶ Gear reducer efficiency can generally be ignored unless considering compounded gear units, helical worm gear units or worm gear units.

Output Shaft Comparisons

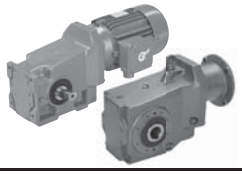
$$\frac{}{F_{OHL}} < \frac{}{F_R} \quad \text{or} \quad \frac{}{F_{OHL}} < \frac{}{F_{RX}\ \text{(Step 3)}}$$

Input Shaft Comparisons

$$\frac{}{F_{OHL1}} < \frac{}{F_{R1}} \quad \text{or} \quad \frac{}{F_{OHL1}} < \frac{}{F_{RX1}\ \text{(Step 3)}}$$

IMPORTANT NOTE

Please contact NORD for more exact examination of the application when both OHL and thrust conditions exist at the same time.



5. Evaluating Thrust Capacity

To validate the unit selection (assuming negligible thrust loading), the applied thrust condition must be less than the rated thrust capacity as shown below.

Output Shaft

$F_{THRUST} < F_A$

Input Shaft

$F_{THRUST1} < F_{A1}$

The output shaft thrust capacity (F_A) can be found in the gearmotor selection tables, adjacent to the OHL ratings. The input shaft thrust capacity (F_{A1}) can be found in the table below.

Permissable Axial (Thrust) Loads (F_{A1}) at Input Shaft [Lbs]

Gearbox Type	0.16	0.25	0.33	0.50	0.75	1.0	1.5	2.0	3.0	5.0	7.5	10
SK 92072	277	252	224	200	173	131	79	65	–	–	–	–
SK 92172	277	252	224	200	173	131	79	65	–	–	–	–
SK 92372	277	252	224	200	173	131	79	65	45	34	–	–
SK 92672	659	646	626	587	558	525	467	441	392	329	146	101
SK 92772	833	788	720	698	675	630	585	540	495	450	405	338

With no overhung load

Output Shaft Comparisons

$$\frac{F_{THRUST}\ \text{(Supplied By Customer)}}{} < \frac{F_A\ \text{(Gearmotor Selection)}}{}$$

Input Shaft Comparisons

$$\frac{F_{THRUST1}\ \text{(Supplied By Customer)}}{} < \frac{F_{A1}\ \text{(Found in Table)}}{}$$

IMPORTANT NOTE

Please contact NORD for more exact examination of the application when both OHL and thrust conditions exist at the same time.

Computer Program Analysis Capabilities

Upon request, NORD can calculate the bearing service life and check the shaft durability for a specific gear unit type and ratio, if provided with the following:

Type	=	Complete gearmotor or reducer model or type
i	=	Gear ratio
P_1	=	Load power at input [Hp]
n_2	=	Operating reducer output speed [rpm]
F_{OHL}	=	Applied shaft overhung load [lb]
F_{THRUST}	=	Applied thrust load condition [lb]
DIR	=	Applied thrust direction (towards or away) from gear unit.
x	=	applied OHL location with respect to the shaft shoulder [in]
L10h	=	Desired bearing service life L10h [hours]

When provided the proper information NORD Engineering can provide detailed analysis using a proprietary calculation program.

Reducer Tolerances

Solid Shaft Diameter Tolerance		[in]
> 0.375	≤ 1.750	+0.0000 / -0.0005

All Keys and Keyways: Inch - ANSI B17

Solid Shaft Diameter Tolerance		[mm]
> 10	≤ 18	+0.012 / +0.001
> 18	≤ 30	+0.015 / +0.002
> 30	≤ 50	+0.018 / +0.002

All Keys and Keyways: Metric - DIN 6885, class m6

Solid Shaft Drill & Tap Shaft End - Threaded Holes		[in]
> ø 0.500	≤ ø 0.875	1/4-20 x 0.59
> ø 0.875	≤ ø 0.938	5/16-18 x 0.71
> ø 0.938	≤ ø 1.100	3/8-16 x 0.87
> ø 1.100	≤ ø 1.300	1/2-13 x 1.10
> ø 1.300	≤ ø 1.875	5/8-11 x 1.42

Solid Shaft Drill & Tap Shaft End - Threaded Holes		[mm]
> ø 16	≤ ø 21	M6 x 16
> ø 21	≤ ø 24	M8 x 19
> ø 24	≤ ø 30	M10 x 22
> ø 30	≤ ø 38	M12 x 28

Keyed Hollow Bore Tolerances		[in]
> ø 0.4375	≤ ø 1.6250	+0.0010 / -0.0000

Keyed Hollow Bore Tolerances		[mm]
> ø 18	≤ ø 30	+0.021 / -0.000
> ø 30	≤ ø 50	+0.025 / -0.000

Metric hollow bore tolerances per ISO286-2, Class H7

Suggested Solid Shaft Tolerances for Keyed Hollow Bore		[in]	
		Uniform Load	Shock Load
> ø 0.4375	≤ ø 0.8750	+0.0000 / -0.0005	+0.0000 / -0.0005
> ø 0.8750	≤ ø 4.5000	+0.0000 / -0.0010	+0.0000 / -0.0010

Suggested Solid Shaft Tolerances for Keyed Hollow Bore		[mm]	
		Uniform Load ❶	Shock Load ❷
> ø 18	≤ ø 30	+0.000 / -0.013	+0.015 / +0.002
> ø 30	≤ ø 50	+0.000 / -0.016	+0.018 / +0.002

❶ **Uniform load: Mating shaft diameter tolerance per ISO286-2, class h6**
❷ **Shock load: Mating shaft diameter tolerance per ISO286-2, class k6**

Customer Shaft Diameter Tolerance w/ Shrink Disk		[in]	
Shaft Diameter		Shaft Tolerance ❶	Bore Tolerance ❷
≥ ø 0.4375	≤ ø 0.6875	+0.0000 / -0.0004	+0.0007 / -0.0000
≥ ø 0.7500	≤ ø 1.1250	+0.0000 / -0.0005	+0.0008 / -0.0000
≥ ø 1.1250	≤ ø 1.9375	+0.0000 / -0.0006	+0.0009 / -0.0000

❶ **Inch Shaft Tolerances per ISO286-2, Class h6**
❷ **Inch hollow bore tolerances per ISO286-2, Class H7**
• **Solid Shaft finish to be 125 micro inches (3.2mm) or smoother**

Customer Shaft Diameter Tolerance w/ Shrink Disk		[mm]	
Shaft Diameter		Shaft Tolerance ❶	Bore Tolerance ❷
> ø 18	≤ ø 30	+0.000 / -0.013	+0.021 / -0.000
> ø 30	≤ ø 50	+0.000 / -0.016	+0.025 / -0.000

❶ **Metric Shaft Tolerances per ISO286-2, Class h6**
❷ **Metric hollow bore tolerances per ISO286-2, Class H7**
• **Solid Shaft finish to be 125 micro inches (3.2mm) or smoother**

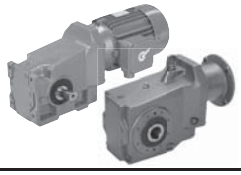
Flange Pilot (AK or AK1) Tolerance		[in]	
Flange Pilot Diameter		Pilot Tolerance	Fit Class ❶
> ø 1.969	≤ ø 3.150	+0.0005 / -0.0003	j6
> ø 3.150	≤ ø 4.724	+0.0005 / -0.0004	j6
> ø 4.724	≤ ø 7.087	+0.0006 / -0.0004	j6
> ø 7.087	≤ ø 9.055	+0.0000 / -0.0005	h6

❶ **Inch Pilot Tolerances per ISO286-2**

Flange Pilot (AK or AK1) Tolerance		[mm]	
Flange Pilot Diameter		Pilot Tolerance	Fit Class ❶
> ø 80	≤ ø 120	+0.013 / -0.009	j6
> ø 120	≤ ø 180	+0.014 / -0.011	j6
> ø 180	≤ ø 230	+0.000 / -0.013	h6

❶ **Metric Pilot Tolerances per ISO286-2**

Casting Surfaces may differ slightly (approximately 0.125 inches or 3.2mm) from the specified nominal dimensions as a result of the manufacturing process



Engineering Conversions & Formulas

Metric ⇒ Inch

Multiply	By	To Obtain
Gram [g]	x 0.0353	= oz
Kilogram [kg]	x 2.205	= lb
Newton [N]	x 0.2248	= lb
Newton meter [Nm]	x 8.851	= lb-in
Newton meter [Nm]	x 0.7375	= lb-ft
Inertia [kgm^2]	x 23.75	= lb-ft^2
Kilowatt [kW]	x 1.341	= hp
Meter [m]	x 39.4	= in
Meter [m]	x 3.281	= ft
Meter [m]	x 1.094	= yd
Millimeter [mm]	x 0.0391	= in
Centimeter [cm]	x 0.394	= in
Cubic Centimeter [cm^3]	x 0.061	= in^3
Liter [l]	x 61.023	= in^3
Liter [l]	x 1.057	= qt
Liter [l]	x 0.2642	= gal

Inch ⇒ Metric

Multiply	By	To Obtain
Ounce [oz]	x 28.35	= g
Pound [lb]	x 0.454	= kg
Ounce [oz]	x 0.028	= kg
Pound [lb]	x 4.448	= N
Pound-Inch [lb-in]	x 0.113	= Nm
Pound Feet [lb-ft]	x 1.3558	= Nm
Pound Feet Squared [lb-ft^2]	x 0.0421	= kgm^2
Horsepower [hp]	x 0.746	= kW
Feet [ft]	x 0.3048	= kW
Yard [yd]	x 0.9144	= m
Inch [in]	x 25.4	= mm
Inch [in]	x 2.54	= cm
Inch [in]	x 0.0254	= m
Cubic Inch [in^3]	x 16.39	= cm^3
Cubic Inch [in^3]	x 0.016	= liters
Gallon [gal]	x 3.785	= liters

Temperature

°F = 1.8 °C + 32

°C = 0.5555 x (°F - 32)

°C = °K - 273.16

Linear Velocity

Miles per Hour [mph]	x 88	= ft/min [fpm]
Miles per Hour [mph]	x 1.4677	= ft/sec [fps]
Feet per Minute [fpm]	x 0.3048	= m/min
Feet per Minute [fpm]	x 0.00508	= m/sec
Meter per Minute [m/min]	x 3.2808	= ft/min [fpm]
Meter per Second [m/sec]	x 196.85	= ft/min [fpm]

Power

$$hp = \frac{\text{Torque (lb-in) x rpm}}{63025}$$

$$hp = \frac{\text{Torque (lb-ft) x rpm}}{5252}$$

$$hp_{(Lift)} = \frac{\text{Wgt (lb) x fpm}}{\text{33000 x Efficiency}}$$

$$hp_{(Slide)} = \frac{\text{Wgt (lb) x } \mu \text{ x fpm}}{\text{33000 x Efficiency}}$$

Torque

$$T_{(lb\text{-}in)} = \frac{\text{hp x 63025}}{\text{rpm}}$$

$$T_{(lb\text{-}ft)} = \frac{\text{hp x 5252}}{\text{rpm}}$$

Linear & Rotational Speed

$$fpm = 0.2618 \times Dia_{(in)} \times rpm$$

$$rpm = \frac{\text{fpm x 3.820}}{Dia_{(in)}}$$

Electric Motor 3-phase

$$hp_{(3ph\text{-}motor)} = \frac{\text{1.732 x V x I x PF x Efficiency}}{746}$$

Metric M Threads

For metric "M" threads, it is customary to omit the thread pitch for course threads. For example, if a thread is called out as an M8 with no pitch shown, it is automatically a course pitch thread.

Course threads and pitch
M6 x 1
M8 x 1.25
M10 x 1.5
M12 x 1.75
M16 x 2
M20 x 2.5
M24 x 3

Engineering NORD Service Factor

Mass Acceleration Service Factor

The mass acceleration factor (m_{af}) uses a ratio of the load inertia to motor inertia. This method of service factor calculation can be used for both gearmotors and speed reducers and is valid for helical gear units.

Short-term and infrequent torque impulses significantly influence the load and selection of a gear unit. The gear unit service factor, f_B, takes this and other affects on the gear unit into account.

The mass acceleration factor (m_{af}) represents the relationship between external low-speed output side and high-speed input side masses. The mass acceleration factor significantly influences the level of torque impulses in the gear unit upon start-up and braking procedures, and upon vibration. The external mass moments of inertia also include the load, such as the material transported on conveyor belts. We ask you to consult with NORD if the $m_{af} > 10$, if there is a large play in transfer elements, vibration in the system, uncertainty regarding the load classification, or you are in doubt.

For applications with relatively high external mass moments of inertia, $m_{af} > 2$ (i.e. travel drives, slewing gears, rotary tables, gear drives, agitators, and surface aerators), we recommend breaking torque that does not exceed 1.2 times the rated motor torque. If a higher breaking torque is to be used, this must be considered when selecting the gear unit.

1. Calculate mass acceleration factor:

$$m_{af} = \frac{J_{load}}{J_{motor}} \times \left(\frac{1}{\text{reducer ratio}} \right)^2$$

J_{load} = External load inertia including all components of the system outside of the reducer
J_{motor} = Motor inertia.

For NORD motors see pages 140 - 146

If $m_{af} \leq 0.25$ use curve A (uniform operation)

Light conveyor screws, fans, assembly lines, light conveyor belts, small agitators, elevators, cleaning machines, filling machines, inspection machines, belt conveyors.

If ≤ 0.25 $m_{af} \leq 3.00$ use curve B (moderate shocks)

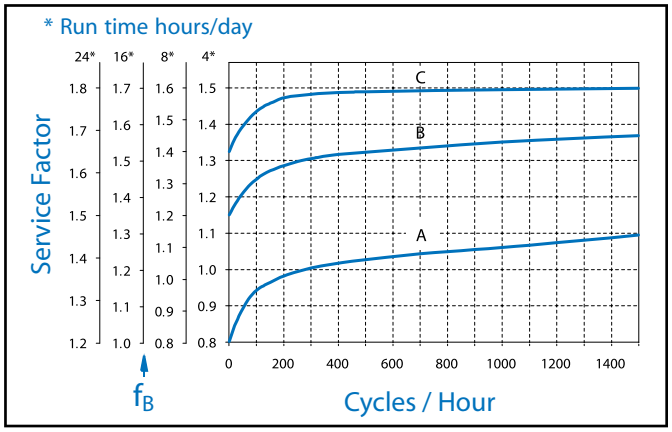
Coilers, feed-mechanism drivers for woodworking machines, dumbwaiters, balancing machines, thread cutting machines, medium-sized agitators and mixers, heavy conveyor belts, winches, sliding doors, manure scrapers, packing machines, concrete mixers, overhead crane traveling mechanisms, mills, bending machines, gear pumps.

If $3.01 \leq m_{af}$ 10.00 use curve C (heavy shocks)
Heavy mixers, shears, presses, centrifuges, rolling stands, heavy winches and lifts, grinding mills, stone crushers, bucket elevators, punching machines, hammer mills, eccentric presses, folding machines, roller tables, tumbling barrels, vibrators, shredders.

2. Determine the cycles/hour. A cycle is a start or hard stop, where a hard stop decelerates the motion of the system when a mechanical brake is activated.

3. Determine the run time in hours/day.

4. Using the chart; locate the cycles/hour on the horizontal axis and move vertically up to intersect curve A, B, or C based on the m_{af}. From the intersection point, move horizontally left to the service factor f_B, which is based on the run time in hours/day.



EXAMPLE for gearmotor:

A smooth running conveyor operates 24 hours/day with 500 cycles/hour. The calculated $m_{af} = 0.16$, therefore use curve A for this type of application.

From the chart, find 500 cycles/hour and follow the axis vertically up until you intersect curve A. From the intersection point, move horizontally left to find the service factor $f_B = 1.4$ based on 24 hours/day operation. Consult the selection pages of the catalog to find a gearmotor with a service factor $f_B = 1.4$ or greater.

AGMA Selection Method

Gearmotors

Before a gearmotor is selected, an application class number must be determined. Since application classification represents the normal relationship between gear design power rating and the maximum potential transmitted power, it is suggested that the application class number be applied to the nameplate rating of the electric motor. The application class numbers are I, II, and III.

Their relationship to service factor is:

Class Numbers	f_B
I	1.0 - 1.39
II	1.4 - 1.99
III	≥ 2.0

Application class numbers may be selected from the table. Some operational characteristics that affect an application's classification are:

- **Starting conditions:** Starting conditions where peak loads exceed 200 percent of rated load, applications with frequent starts and stops and reversing applications require special analysis. Rated load is defined as the unit rating with an application class number of I (1.0 - 1.39 service factor).
- **Overloads:** Loads in excess of the rated load are considered overloads. Overload can be of momentary duration, periodic, quasi-steady state, or vibratory in nature. The magnitude and the number of stress cycles require special analysis to prevent low cycle fatigue or yield stress failure. Applications with high torque motors, motors for intermitent operation and applications where extreme repetitive shock occurs or where high-energy loads must be absorbed as when stalling require special consideration.
- **Brake equipped applications:** When a gear drive is equipped with a brake that is used to decelerate the motion of the system, select the drive based on the brake rating or the equivalent power, which ever is greater. If the brake is located on the output shaft of the gear drive, special analysis is required.
- **Reliability and life requirement:** Applications requiring a high degree of reliability or unusually long life should be given careful consideration by the user and NORD GEAR before assigning an application class number. High reliability and life should be addressed by using an increased safety factor agreed to between NORD and the purchaser.

Synchronous motors, certain types of high torque induction motors and generator drives require special analysis.

- Synchronous motors have high transient torque during starting and restarting after they trip out momentarily.
- Induction motors of special high slip design can produce extremely high starting torque. High torque loads are produced when the motor trips out for a very short time and then the trip re-closes.
- Generators have extremely high loads when they are out of phase with the main system and when there are across the line short circuits.

Adjustments to the gear drive selection may be necessary when one or more of the following exist:

- Extremes of temperature and environment.
- Lubrication. Any lubricant not in accordance with NORD's recommendations.
- Misalignment and distortions due to inadequate foundations.
- Reversing applications.
- High-risk applications involving human safety.

The purpose of this table is to provide a guide in the selection and application of gear drives designed and rated in accordance with AGMA Standard 6009.

The service factor table has been developed from the experience of manufacturers and users of gear drives for use in common applications and has been found to be generally satisfactory for the listed industries when gears are applied using AGMA standards. It is recommended that the user and NORD Gear agree upon class numbers for special applications when variations of the table may be required.

Engineering
AGMA Service Classes

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
AGITATORS (mixers)			
Pure Liquids	I	I	II
Liquids and Solids	I	II	II
Liquids – Variable Density	I	II	II
BLOWERS			
Centrifugal	I	I	II
Lobe	I	II	II
Vane	I	II	II
BREWING AND DISTILLING			
Bottling Machinery	I	I	II
Brew Kettles – Continuous Duty	II	II	II
Cookers – Continuous Duty	II	II	II
Mash Tubs – Continuous Duty	II	II	II
Scale Hopper – Frequent Starts	II	II	II
CAN FILLING MACHINES	I	I	II
CAR DUMPERS	II	III	III
CAR PULLERS	I	II	II
CLARIFIERS	I	I	II
CLASSIFIERS	I	II	II
CLAY WORKING MACHINERY			
Brick Press	II	III	III
Briquette Machine	II	III	III
Pug Mill	I	II	II
COMPACTORS	III	III	III
COMPRESSORS			
Centrifugal	I	I	II
Lobe	I	II	II
Reciprocating, Multi-Cylinder	II	II	III
Reciprocating, Single-Cylinder	III	III	III
CONVEYORS – GENERAL PURPOSE			
Includes Apron, Assemble, Belt, Bucket, Chain, Flight, Oven & Screw Uniformly loaded or Fed	I	I	II
Heavy Duty – Not Uniformly Fed	I	II	II
Severe Duty – Reciprocating or Shaker	II	III	III
CRANES			
Main Hoist			
Medium Duty	II	II	II
Heavy Duty	III	III	III
Reversing	II	II	II
Skip Hoist	II	II	II
Trolley Drive	II	II	II
Bridge Drive	II	II	II
CRUSHER			
Stone or Ore	III	III	III
DREDGES			
Cable Reels	II	II	II
Conveyors	II	II	II
Cutter Head Dives	III	III	III
Pumps	III	III	III
Screen Drives	III	III	III
Stackers	II	II	II
Winches	II	II	II

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
ELEVATORS			
Bucket	I	II	II
Centrifugal Discharge	I	I	II
Escalators	I	I	II
Freight	I	II	II
Gravity Discharge	I	I	II
EXTRUDERS			
General	II	II	II
Plastics			
Variable Speed Drive	III	III	III
Fixed Speed Drive	III	III	III
Rubber			
Continuous Screw Operation	III	III	III
Intermittent Screw Operation	III	III	III
FANS			
Centrifugal	I	I	II
Cooling Towers	III	III	III
Forced Draft	II	II	II
Induced Draft	II	II	II
Industrial & Mine	II	II	II
FEEDERS			
Apron	I	II	II
Belt	I	II	II
Disc	I	I	II
Reciprocating	II	III	III
Screw	I	II	II
FOOD INDUSTRY			
Cereal Cooker	I	I	II
Dough Mixer	II	II	II
Meat Grinders	II	II	II
Slicers	I	II	II
GENERATORS AND EXCITERS	II	II	II
HAMMER MILLS	III	III	III
HOISTS			
Heavy Duty	III	III	III
Medium Duty	II	II	II
Skip Hoist	II	II	II
LAUNDRY TUMBLERS	II	II	II
LAUNDRY WASHERS	II	II	III

Engineering
AGMA Service Classes

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
LUMBER INDUSTRY			
Barkers			
Spindle Feed	II	II	II
Main Drive	III	III	III
Conveyors			
Burner	II	II	II
Main or Heavy Duty	II	II	II
Main log	III	III	III
Re-saw, Merry-Go-Round	II	II	II
Slab	III	III	III
Transfer	II	II	II
Chains			
Floor	II	II	II
Green	II	II	III
Cut-Off Saws			
Chain	II	II	III
Drag	II	II	III
Debarking Drums	III	III	III
Feeds			
Edger	II	II	II
Gang	II	III	III
Trimmer	II	II	II
Long Deck	III	III	III
Log Hauls – Incline – Well Type	III	III	III
Log Turning Devices	III	III	III
Planer Feed	II	II	II
Planer Tilting Hoists	II	II	II
Rolls – live-off brg. – Roll Cases	III	III	III
Sorting Table	II	II	II
Tipple Hoist	II	II	II
Transfers			
Chain	II	II	III
Craneway	II	II	III
Tray Drives	II	II	II
Veneer Lathe Drives	II	II	II
METAL MILLS			
Draw Bench Carriage & Main Drive	II	II	II
Runout Table			
Non-reversing Group Drives	II	II	II
Individual Drives	III	III	III
Reversing	III	III	III
Slab Pushers	II	II	II
Shears	III	III	III
Wire drawing	II	II	II
Wire Winding Machine	II	II	II
METAL STRIP PROCESSING MACHINERY			
Bridles	II	II	II
Coilers & Uncoilers	I	I	II
Edge Trimmers	I	II	II
Flatteners	II	II	II
Loopers (Accumulators)	I	I	I
Pinch Rolls	II	II	I
Scrap Choppers	II	II	II
Shears	III	III	III
Slitters	I	II	II

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
MILLS, ROTARY TYPE			
Ball & Rod			
Spur Ring Gear	III	III	III
Helical Ring Gear	II	II	II
Direct Connected	III	III	III
Cement Kilns	II	II	II
Dryers & Coolers	II	II	II
PAPER MILLS[1]			
Agitator (Mixer)	II	II	II
Agitator for Pure liquors	II	II	II
Barking Drums	III	III	III
Barkers – Mechanical	III	III	III
Beater	II	II	II
Breaker Stack	II	II	II
Calender[2]	II	II	II
Chipper	III	III	III
Chip Feeder	II	II	II
Coating Rolls	II	II	II
Conveyors			
Chip, Bark, Chemical	II	II	II
log (including Slab)	III	III	III
Couch Rolls	II	II	II
Cutter	III	III	III
Cylinder Molds	II	II	II
Dryers[2]			
Paper Machine	II	II	II
Conveyor Type	II	II	II
Embosser	II	II	II
Extruder	II	II	II
Fourdrinier Rolls (Includes lump Breaker, Dandy Roll, Wire Turning, and Return Rolls)	II	II	II
Jordan	II	II	II
Kiln Drive	II	II	II
Mt. Hope Roll	II	II	II
Paper Rolls	II	II	II
Platter	II	II	II
Presses – Felt & Suction	II	II	II
Pulper	III	III	III
Pumps – Vacuum	II	II	II
Reel (Surface Type)	II	II	II
Screens			
Chip	II	II	II
Rotary	II	II	II
Vibrating	III	III	III
Size Press	II	II	II
Supercalendar[3]	II	II	II
Thickener (AC Motor)	II	II	II
Thickener (DC Motor)	II	II	II
Washer (AC Motor)	II	II	II
Washer (DC Motor)	II	II	II
Wind and Unwind Stand	I	I	I
Winders (Surface Type)	II	II	II
Yankee Dryers[2]	II	II	II

Engineering
AGMA Service Classes

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
PLASTICS INDUSTRY – PRIMARY PROCESSING			
Intensive Internal Mixers			
Batch Mixers	III	III	III
Continuous Mixers	II	II	II
Batch Drop Mill – 2 smooth rolls	II	II	II
Continuous Feed, Holding &	II	II	II
Biend Mill Calendars	II	II	II
PLASTICS INDUSTRY – SECONDARY PROCESSING			
Blow Molders	II	II	II
Coating	II	II	II
Film	II	II	II
Pipe	II	II	II
Pre-Plasticizers	II	II	II
Rods	II	II	II
Sheet	II	II	II
Tubing	II	II	II
PULLERS – BARGE HAUL	II	II	II
PUMPS			
Centrifugal	I	I	II
Proportioning	II	II	II
Reciprocating			
Single Acting, 3 or more cylinders	II	II	II
Double Acting, 2 or more cylinders	II	II	II
Rotary			
Gear Type	I	I	II
Lobe	I	I	II
Vane	I	I	II
RUBBER INDUSTRY			
Intensive Internal Mixers			
Batch Mixers	III	III	III
Continuous Mixers	II	II	II
Mixing Mill			
2 smooth rolls	II	II	II
1 or 2 corrugated rolls	III	III	III
Batch Drop Mill – 2 smooth rolls	II	II	II
Cracker Warmer – 2 roll, 1 corrugated roll	III	III	III
Cracker – 2 corrugated rolls	III	III	III
Holding, Feed & Blend Mill – 2 rolls	II	II	II
Refiner – 2 rolls	II	II	II
Calendars	II	II	II
SAND MULLER	II	II	II
SEWAGE DISPOSAI EQUIPMENT			
Bar Screens	II	II	II
Chemical Feeders	II	II	II
Dewatering Screens	II	II	II
Scum Breakers	II	II	II
Slow or Rapid Mixers	II	II	II
Sludge Collectors	II	II	II
Thickener	II	II	II
Vacuum Filters	II	II	II

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
SCREENS			
Air Washing	I	I	II
Rotary – Stone or Gravel	II	II	II
Traveling Water Intake I	I	I	I
SCREW CONVEYORS			
Uniformly loaded or Fed	I	I	II
Heavy Duty	I	II	II
SUGAR INDUSTRY			
Beet Slicer	III	III	III
Cane Knives	II	II	II
Crushers	II	II	II
Mills (low speed end)	III	III	III
TEXTILE INDUSTRY			
Batchers	II	II	II
Calendars	II	II	II
Cards	II	II	II
Dry Cans	II	II	II
Dyeing Machinery	II	II	II
Looms	II	II	II
Mangles	II	II	II
Nappers	II	II	II
Pads	II	II	II
Siashers	II	II	II
Soapers	II	II	II
Spinners	II	II	II
Tenter Frames	II	II	II
Washers	II	II	II
Winders	II	II	II

Notes to GEARMOTOR SERVICE FACTOR table:

1) The class numbers listed for paper mill applications are consistent with those shown in TAPPI (Technical Association of Pulp and Paper Industry) Technical Information Sheet 0406-18 1967, Service Factors for Gears on major Equipment in the Paper and Pulp Industry.

2) Anti-friction bearings only.

3) A Class Number of I may be applied at base speed of a super-calendar operating over a speed range of part-range constant horsepower and part-range constant torque where the constant horsepower speed range is greater than 1.5 to 1. A Class Number of II is applicable to supercalendars operating over the entire speed range at constant torque or where the constant horsepower speed range is less than 1.5 to1.

Engineering
AGMA Service Factors

Speed Reducers

Before an enclosed speed reducer or increaser can be selected for any application, an equivalent unit power rating (service factor = 1.0) must be determined. This is done by multiplying the specified power by the service factor. Since the service factor represents the normal relationship between the gear unit rating and the required application power, it is suggested that the service factor be applied to the nameplate rating of the prime mover or driven machine rating, as applicable.

NORD GEAR and the user must agree upon which power, prime mover rating or driven machine requirements, should dictate the selection of the gear drive. It is necessary that the gear drive selected have a rated unit capacity equal to or in excess of this "equivalent unit power rating".

All service factors listed are 1.0 or greater. Service factors less than 1.0 can be used in some applications when specified by the user and agreed to by NORD GEAR.

The REDUCER SERVICE FACTOR table should be used with caution, since much higher values have occurred in some applications. Values as high as ten have been used. On some applications up to six times nominal torque can occur, such as: Turbine/Generator drives, Heavy Plate and Billet rolling mills.

It has been developed from the experience of manufacturers and users of gear drives for use in common applications. It is suggested that service factors for special applications be agreed upon by the user and NORD GEAR when variations of the values in the table may be required.

Service factors shown are for reducers driven by motors (electric or hydraulic) and turbines (steam or gas) according to AGMA 6010. When the driver is a single cylinder or multi-cylinder engine, the service factors from the table must be modified for the appropriate type of prime mover.

As an example, if the application is a centrifugal blower, the service factor from the REDUCER SERVICE FACTOR table is 1.25 for a motor or turbine. The CONVERSION TABLE changes this value to 1.75 for a single cylinder engine and 1.50 for a multi-cylinder engine.

CAUTION: Any user of enclosed gear drives should make sure that the latest available information affecting the selection of a gear drive is used. When better load intensity data is available on the driving or driven equipment, this should be considered when a service factor is selected.

Conversion Table

Electric Motor, Steam & Gas Turbines, Hydraulics	Single-Cylinder Engines	Multi-Cylinder Engines
1.00	1.50	1.25
1.25	1.75	1.50
1.50	2.0	1.75
1.75	2.25	2.00
2.00	2.50	2.25
2.25	2.75	2.50
2.50	3.00	2.75
2.75	3.25	3.00
3.00	3.50	3.25

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
AGITATORS (mixers)			
Pure Liquids	1.00	1.00	1.25
Liquids and Solids	1.00	1.25	1.50
Liquids – Variable Density	1.00	1.25	1.50
BLOWERS			
Centrifugal	1.00	1.25	1.50
Lobe	1.00	1.25	1.50
Vane	1.00	1.00	1.25
BREWING AND DISTILLING			
Bottling Machinery	1.00	1.00	1.25
Brew Kettles – Continuous Duty	1.00	1.00	1.25
Cookers – Continuous Duty	1.00	1.00	1.25
Mash Tubs – Continuous Duty	1.00	1.00	1.25
Scale Hopper – Frequent Starts	1.00	1.25	1.50
CAN FILLING MACHINES	1.00	1.00	1.25
CAR DUMPERS	1.25	1.50	1.75
CAR PULLERS	1.00	1.25	1.50
CLARIFIERS	1.00	1.00	1.25
CLASSIFIERS	1.00	1.25	1.50
CLAY WORKING MACHINERY			
Brick Press	1.25	1.50	1.75
Briquette Machine	1.25	1.50	1.75
Pug Mill	1.00	1.25	1.50
COMPACTORS	1.50	1.75	2.00
COMPRESSORS			
Centrifugal	1.00	1.00	1.25
Lobe	1.00	1.25	1.50
Reciprocating, Multi-Cylinder	1.00	1.25	1.50
Reciprocating, Single-Cylinder	1.25	1.50	1.75
CONVEYORS – GENERAL PURPOSE			
Uniformly loaded or fed	1.00	1.00	1.25
Not uniformly fed	1.00	1.25	1.50
Reciprocating or shaker	1.25	1.50	1.75
CRANES			
Dry dock			
Main hoist	1.25	1.50	1.75
Auxilliary hoist	1.25	1.50	1.75
Boom hoist	1.25	1.50	1.75
Slewing drive	1.25	1.50	1.75
Traction drive	1.50	1.50	1.50
Industrial Duty			
Main hoist	1.00	1.25	1.50
CRUSHER			
Stone or ore	1.50	1.75	2.00

Engineering
AGMA Service Factors

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
DREDGES			
Cable reels	1.00	1.25	1.50
Conveyors	1.00	1.25	1.50
Cutter Head Dives	1.25	1.50	1.75
Pumps	1.00	1.25	1.50
Screen Drives	1.25	1.50	1.75
Stackers	1.00	1.25	1.50
Winches	1.00	1.25	1.50
ELEVATORS			
Bucket	1.00	1.25	1.50
Centrifugal Discharge	1.00	1.00	1.25
Gravity Discharge	1.00	1.00	1.25
EXTRUDERS			
General	1.25	1.25	1.25
Plastics			
Variable Speed Drive	1.50	1.50	1.50
Fixed Speed Drive	1.75	1.75	1.75
Rubber			
Continuous Screw Operation	1.50	1.50	1.50
Intermittent Screw Operation	1.75	1.75	1.75
FANS			
Centrifugal	1.00	1.00	1.25
Forced Draft	1.25	1.25	1.25
Induced Draft	1.00	1.25	1.50
Industrial & Mine	1.00	1.25	1.50
FEEDERS			
Apron	1.00	1.25	1.50
Belt	1.00	1.25	1.50
Disc	1.00	1.00	1.25
Reciprocating	1.25	1.50	1.75
Screw	1.00	1.25	1.50
FOOD INDUSTRY			
Cereal Cooker	1.00	1.00	1.25
Dough Mixer	1.00	1.25	1.50
Meat Grinders	1.00	1.25	1.50
Slicers	1.00	1.25	1.50
GENERATORS AND EXCITERS	1.00	1.00	1.25
HAMMER MILLS	1.50	1.50	1.75
HOISTS			
Heavy Duty	1.25	1.50	1.75
Medium Duty	1.00	1.25	1.50
Skip Hoist	1.00	1.25	1.50
LAUNDRY TUMBLERS	1.00	1.25	1.50
LAUNDRY WASHERS	1.25	1.25	1.50

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
LUMBER INDUSTRY			
Barkers	1.25	1.25	1.50
Spindle Feed	1.50	1.50	1.50
Main Drive	1.25	1.25	1.50
Conveyors			
Burner	1.25	1.25	1.50
Main or Heavy Duty	1.50	1.50	1.50
Main log	1.50	1.50	1.75
Re-saw, Merry-Go-Round	1.25	1.25	1.50
Slab	1.50	1.50	1.75
Transfer	1.25	1.25	1.50
Chains			
Floor	1.50	1.50	1.50
Green	1.50	1.50	1.50
Cut-Off Saws			
Chain	1.50	1.50	1.50
Drag	1.50	1.50	1.50
Debarking Drums	1.50	1.50	1.75
Feeds			
Edger	1.25	1.25	1.50
Gang	1.50	1.50	1.50
Trimmer	1.25	1.25	1.50
Long Deck	1.50	1.50	1.50
Log Hauls – Incline – Well Type	1.50	1.50	1.50
Log Turning Devices	1.50	1.50	1.50
Planer Feed	1.25	1.25	1.50
Planer Tilting Hoists	1.50	1.50	1.50
Rolls – live-off brg. – Roll Cases	1.50	1.50	1.50
Sorting Table	1.25	1.50	1.50
Tipple Hoist	1.25	1.25	1.50
Transfers			
Chain	1.50	1.50	1.50
Causeway	1.50	1.50	1.50
Tray Drives	1.25	1.25	1.50
METAL MILLS			
Draw Bench Carriage & Main Drive	1.00	1.25	1.50
Runout Table			
Non-reversing			
Group Drives	1.00	1.25	1.50
Individual Drives	1.50	1.50	1.75
Reversing	1.50	1.50	1.75
Slab Pushers	1.25	1.25	1.50
Shears	1.50	1.50	1.75
Wire drawing	1.00	1.25	1.50
Wire Winding Machine	1.00	1.25	1.50

Engineering
AGMA Service Factors

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
METAL STRIP PROCESSING MACHINERY			
Bridles	1.25	1.25	1.50
Coilers and uncoilers	1.00	1.00	1.25
Edge Trimmers	1.00	1.25	1.50
Flatteners	1.00	1.25	1.50
Loopers (accumulators)	1.00	1.00	1.00
Pinch rolls	1.00	1.25	1.50
Scrap choppers	1.00	1.25	1.50
Shears	1.50	1.50	1.75
Slitters	1.00	1.25	1.50
MILLS, ROTARY TYPE			
Ball & Rod			
Spur Ring Gear	1.50	1.50	1.75
Helical Ring Gear	1.50	1.50	1.50
Direct Connected	1.50	1.50	1.75
Cement Kilns	1.50	1.50	1.50
Dryers & Coolers	1.50	1.50	1.50
MIXERS CONCRETE	1.00	1.25	1.50
PAPER MILLS[1]			
Agitator (Mixer)	1.50	1.50	1.50
Agitator for Pure liquors	1.25	1.25	1.25
Barking Drums	1.75	1.75	1.75
Barkers – Mechanical	1.75	1.75	1.75
Beater	1.50	1.50	1.50
Breaker Stack	1.25	1.25	1.25
Calender[2]	1.25	1.25	1.25
Chipper	1.75	1.75	1.75
Chip Feeder	1.50	1.50	1.50
Coating Rolls	1.25	1.25	1.25
Conveyors			
Chip, Bark, Chemical	1.25	1.25	1.25
log (including Slab)	1.75	1.75	1.75
Couch Rolls	1.25	1.25	1.25
Cutter	1.75	1.75	1.75
Cylinder Molds	1.25	1.25	125
Dryers[2]			
Paper Machine	1.25	1.25	1.25
Conveyor Type	1.25	1.25	1.25
Embosser	1.25	1.25	1.25
Extruder	1.50	1.50	1.50
Fourdrinier Rolls (Includes lump Breaker, Dandy Roll, Wire Turning, and Return Rolls)	1.25	1.25	1.25
Jordan	1.25	1.25	1.25
Kiln Drive	1.50	1.50	1.50
Mt. Hope Roll	1.25	1.25	1.25
Paper Rolls	1.25	1.25	1.25

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
PAPER MILLS (cont)			
Presses – Felt & Suction	1.25	1.25	1.25
Pulper	1.50	1.50	1.75
Pumps – Vacuum	1.50	1.50	1.50
Reel (Surface Type)	1.25	1.25	1.50
Screens			
Chip	1.50	1.50	1.50
Rotary	1.50	1.50	1.50
Vibrating	1.75	1.75	1.75
Size Press	1.25	1.25	1.25
Supercalendar[3]	1.25	1.25	1.25
Thickener (AC Motor)	1.50	1.50	1.50
Thickener (DC Motor)	1.25	1.25	1.25
Washer (AC Motor)	1.50	1.50	1.50
Washer (DC Motor)	1.25	1.25	1.25
Wind and Unwind Stand	1.00	1.00	1.00
Winders (Surface Type)	1.25	1.25	1.25
Yankee Dryers[2]	1.25	1.25	1.25
PLASTICS INDUSTRY –			
PRIMARY PROCESSING			
Intensive Internal Mixers			
Batch Mixers	1.75	1.75	1.75
Continuous Mixers	1.50	1.50	1.50
Batch Drop Mill – 2 smooth rolls			
Cont. Feed, Holding & Biend Mill	1.25	1.25	1.25
Calendars	1.50	1.50	1.50
PLASTICS INDUSTRY –			
SECONDARY PROCESSING			
Blow Molders	1.50	1.50	1.50
Coating	1.25	1.25	1.25
Film	1.25	1.25	1.25
Pipe	1.25	1.25	1.25
Pre-Plasticizers	1.50	1.50	1.50
Rods	1.25	1.25	1.25
Sheet	1.25	1.25	1.25
Tubing	1.25	1.25	1.50
PULLERS – BARGE HAUL	1.00	1.50	1.75
PUMPS			
Centrifugal	1.00	1.00	1.25
Proportioning	1.00	1.25	1.50
Reciprocating			
Single Acting, 3 or more cylinders	1.00	1.25	1.50
Double Acting, 2 or more cylinders	1.00	1.25	1.50
Rotary			
Gear Type	1.00	1.00	1.50
Lobe	1.00	1.00	1.25
Vane	1.00	1.00	1.25

Engineering
AGMA Service Factors

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
RUBBER INDUSTRY			
Intensive Internal Mixers			
Batch Mixers	1.50	1.75	1.75
Continuous Mixers	1.25	1.50	1.50
Mixing Mill			
2 smooth rolls	1.50	1.50	1.50
1 or 2 corrugated rolls	1.75	1.75	1.75
Batch Drop Mill – 2 smooth rolls	1.50	1.50	1.50
Cracker Warmer – 2 roll, 1 corrugated roll	1.75	1.75	1.75
Cracker – 2 corrugated rolls	1.75	1.75	1.75
Holding, Feed & Blend Mill – 2 rolls	1.25	1.25	1.25
Refiner – 2 rolls	1.50	1.50	1.50
Calendars	1.50	1.50	1.50
SAND MILLER	1.00	1.25	1.50
SEWAGE DISPOSAI EQUIPMENT			
Bar Screens	1.00	1.00	1.25
Chemical Feeders		1.00	1.25
Dewatering Screens	1.00	1.25	1.50
Scum Breakers	1.00	1.25	1.50
Slow or Rapid Mixers	1.00	1.25	1.50
Sludge Collectors	1.00	1.00	1.25
Thickener	1.00	1.25	1.50
Vacuum Filters	1.00	1.25	1.50
SCREENS			
Air Washing	1.00	1.00	1.25
Rotary – Stone or Gravel	1.00	1.25	1.50
Traveling Water Intake I	1.00	1.00	1.25
SCREW CONVEYORS			
Uniformly loaded or Fed			
Heavy Duty			
SUGAR INDUSTRY			
Beet Slicer	1.50	1.50	1.75
Cane Knives	1.50	1.50	1.50
Crushers	1.50	1.50	1.50
Mills (low speed end)	1.50	1.50	1.50

Application	Load Duration		
	Up to 3 hrs per day	3-10 hrs per day	Over 10 hrs per day
TEXTILE INDUSTRY			
Batchers	1.00	1.25	1.50
Calendars	1.00	1.25	1.50
Cards	1.00	1.25	1.50
Dry Cans	1.00	1.25	1.50
Dyeing Machinery	1.00	1.25	1.50
Looms	1.00	1.25	1.50
Mangles	1.00	1.25	1.50
Nappers	1.00	1.25	1.50
Pads	1.00	1.25	1.50
Siashers	1.00	1.25	1.50
Soapers	1.00	1.25	1.50
Spinners	1.00	1.25	1.50
Tenter Frames	1.00	1.25	1.50
Washers	1.00	1.25	1.50
Winders	1.00	1.25	1.50

Notes to REDUCER SERVICE FACTOR table:

1) Service factors for paper mill applications are applied to the nameplate rating of the electric motor at the motor rated based speed.

2) Anti-friction bearings only. Use 1.5 for sleeve bearings.

3) A service factor of 1.0 may be applied at base speed of a super calender operating over-speed range of part range constant horsepower, part range constant torque where the constant horsepower speed range is greater that 1.5 to 1. A service factor of 1.25 is applicable to super calenders operating over the entire speed range at constant torque or where the constant horsepower speed range is less than 1.5 to 1. Explanatory notes.

92 Series Bevel Weights

Approximate Gearmotor Weights [lb]

Type	63S	63L	71S	71L	80S	80L	90S	90L	100L	100LA	132S
SK 92072	19	20	23	25	29	31	37	42	–	–	–
SK 92172	30	31	34	36	40	42	49	53	–	–	–
SK 92372	43	45	47	49	53	55	62	66	75	82	–
SK 92672	–	81	84	86	89	92	98	103	111	118	169
SK 92772	–	–	–	–	105	107	114	118	127	134	184

Above weights are approximate. Depending upon ratio, oil quantity and optional equipment, reducer weights may be different than shown. Exact weights can be obtained after the unit is fully assembled.

Approximate Reducer Weights [lb]

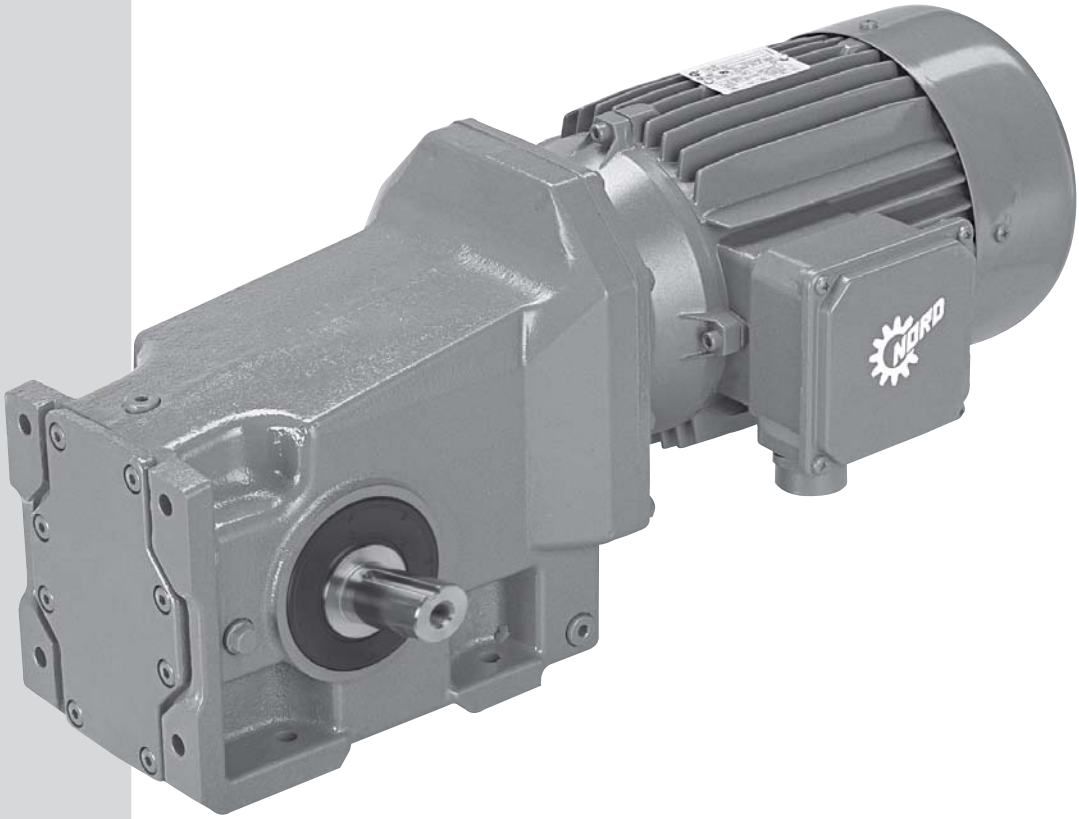
Type	W	56C	140TC	180TC	210TC	250TC
SK 92072	15	24	24	–	–	–
SK 92172	26	35	35	–	–	–
SK 92372	40	49	49	60	–	–
SK 92672	79	86	86	97	112	–
SK 92772	99	101	101	112	128	128

Above weights are approximate. Depending upon ratio, oil quantity and optional equipment, reducer weights may be different than shown. Exact weights can be obtained after the unit is fully assembled.

Notes

Gearmotor Selection

- 0.16 hp
- 0.25 hp
- 0.33 hp
- 0.5 hp
- 0.75 hp
- 1 hp
- 1.5 hp
- 2 hp
- 3 hp
- 5 hp
- 7.5 hp



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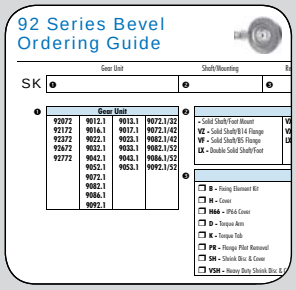

92 Series Bevel Ordering Guide

Gear Unit | Shaft/Mounting

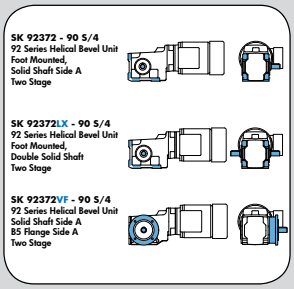
SK ❶ | ❷ | ❸

❶ Gear Unit

92072	9012.1	9013.1	9072.1/32
92172	9016.1	9017.1	9072.1/42
92372	9022.1	9023.1	9082.1/42
92672	9032.1	9033.1	9082.1/52
92772	9042.1	9043.1	9086.1/52
	9052.1	9053.1	9092.1/52
	9072.1		
	9082.1		
	9086.1		
	9092.1		

❷
- Solid Shaft/Foot Mount
- VZ - Solid Shaft/B14 Flange
- VF - Solid Shaft/B5 Flange
- LX - Double Solid Shaft/Foot

❸
- B - Fixing Element Kit
- H - Cover
- H66 - IP66 Cover
- D - Torque Arm
- K - Torque Tab
- FR - Flange Pilot Removal
- SH - Shrink Disc & Cover
- VSH - Heavy Duty Shrink Disc &


SK 92372 - 90 S/4
92 Series Helical Bevel Unit
Foot Mounted,
Solid Shaft Side A
Two Stage

SK 92372LX - 90 S/4
92 Series Helical Bevel Unit
Foot Mounted,
Double Solid Shaft
Two Stage

SK 92372VF - 90 S/4
92 Series Helical Bevel Unit
Solid Shaft Side A
B5 Flange Side A
Two Stage

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}
15	65	14614	2.8	III	27.35
	57	16714	2.5	III	31.28
	49	19348	2.2	III	36.21
	45	21223	2	III	39.72
	39	24023	1.8	II	44.96
	32	29153	1.5	II	54.56
	28	33352	1.3	I	62.42
	25	38599	1.1	I	72.24
	20	47111	0.9	*	88.17
	50	18803	3.3	III	35.19
	43	21966	3.1	III	41.11
	35	26903	2.7	III	50.35

92 Series Bevel Ordering Guide

	Gear Unit	Shaft/Mounting	Reducer Options		Motor/Input	Motor Options
SK	❶	❷	❸	-	❹	
					see page 23	see page 126

❶

Gear Unit
92072
92172
92372
92672
92772

❷

Shaft/Mounting	
- Solid Shaft/Foot Mount	**AX** - Hollow Shaft/Foot Mount
VF - Solid Shaft/B5 Flange	**AF** - Hollow Shaft/B5 Flange
VZ - Solid Shaft/B14 Flange	**AZ** - Hollow Shaft/B14 Flange
VFL - Double Solid Shaft /B5 Flange	**AFSH** - Hollow Shaft/B5 Flange/Shrink Disc
LX - Double Solid Shaft/Foot	**AZSH** - Hollow Shaft/B14 Flange/Shrink Disc
LXZ - Double Solid Shaft/Foot/ B14 Flange	

❸

Reducer Options		
❒ **B** - Fixing Element Kit 19	❒ **PR** - Flange Pilot Removal 17	❒ **VI** - Flouro-rubber Seals 20
❒ **H** - Hollow Shaft Cover 18	❒ **SM5** - Stainless Steel Shaft 19	❒ **OSG** - Oil Sight Glass 20
❒ **D** - Torque Arm 19	❒ **SWA**-SpecialHollow Shaft 19	❒ **MDP** - Magnetic Drain Plug 21
❒ **LL** - Long Term Storage 21	❒ **SS** - Special Shrink Disc 19	❒ **ADP** - Additional Drain Plug 21

❹

Input Shaft	NEMA Adapter	IEC Adapter	Integral Motors	Integral Energy Efficent Motors
W	**N56C**	**IEC 63**	**63S/4** - 0.16hp	**80LH/4** - 1hp
	N140TC	**IEC 71**	**63L/4** - 0.25hp	**90SH/4** - 1.5hp
	N180TC	**IEC 80**	**71S/4** - 0.33hp	**90LH/4** - 2hp
	N210TC	**IEC 90**	**71L/4** - 0.50hp	**100LH/4** - 3hp
	N250TC	**IEC 100**	**80S/4** - 0.75hp	**112MH/4** - 5hp
		IEC 112	**80L/4** - 1hp	**132SH/4** - 7.5hp
		IEC 132	**90S/4** - 1.5hp	**132MH/4** - 10hp
		IEC160	**90L/4** - 2hp	
			100L/4 - 3hp	
			100LA/4 - 5hp	
			112M/4 - 5.4hp	
			132S/4 - 7.5hp	
			132M/4 - 10hp	
			Other Speeds Available	Other Speeds Available

Product Specifications

Ratio

_____ :1

see pages 58 - 71

— OR —

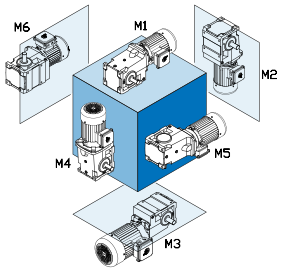
Output Speed

_____ rpm

see pages 58 - 71

Mounting Position

- ❍ M1
- ❍ M2
- ❍ M3
- ❍ M4
- ❍ M5
- ❍ M6
- ❍ Special _____



Paint

- ❍ Standard Stainless Steel Paint
- ❍ NSD+ (gray)
- ❍ NSD+W (white)
- ❍ NSD-X3 (gray)
- ❍ NSD-X3W (white)
- ❍ Casting Primed
- ❍ Special _____

Lubricant

- ❍ Standard
- ❍ Synthetic
- ❍ Food Grade
- ❍ Other _____

Solid Shaft Side (if required)

- ❍ Shaft Side A
- ❍ Shaft Side B
- ❍ Shaft Side A&B

see page 15

Hollow Shaft Diameter (if required)

see pages 113 - 114

B5 Flange Side (if required)

- ❍ Flange Side A
- ❍ Flange Side B
- ❍ Flange Side A&B

see page 15

B5 Flange Diameter (if required)

Torque Arm Side & Location (if required)

- ❍ Side A
- ❍ Side B

Location

see page 15

Shrink Disc Side (if required)

- ❍ Side A
- ❍ Side B

see page 15

H66 Side (if required)

- ❍ H66 Side A
- ❍ H66 Side B

see page 15

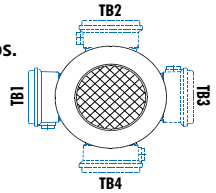
Gearmotor Only Details

Voltage & Frequency

- ❍ 230/460V-60Hz (460V only ≥ 40 hp)
- ❍ 575V-60Hz
- ❍ 208V-60Hz
- ❍ 400V-50Hz
- ❍ 115/230V-60Hz, 1 ph.
- ❍ Other _____

Terminal Box Pos.

- ❍ TB1
- ❍ TB2
- ❍ TB3
- ❍ TB4

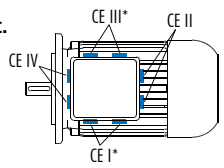


Mtg. Pos. M1 Shown

Conduit Entry Loc.

- ❍ CE I *
- ❍ CE II
- ❍ CE III *
- ❍ CE IV

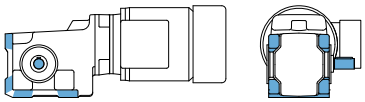
* Brakemotor



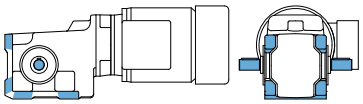
Mtg. Pos. M1 Shown

Examples of Available Helical-bevel Units with Solid Shaft Design

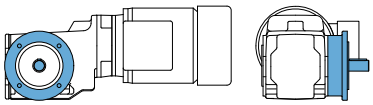
SK 92372 - 90 S/4
92 Series Helical Bevel Unit
Foot Mounted,
Solid Shaft Side A
Two Stage



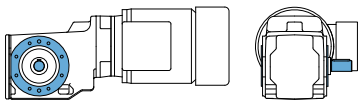
SK 92372LX - 90 S/4
92 Series Helical Bevel Unit
Foot Mounted,
Double Solid Shaft
Two Stage



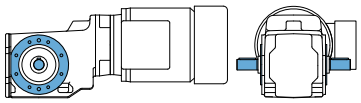
SK 92372VF - 90 S/4
92 Series Helical Bevel Unit
Solid Shaft Side A
B5 Flange Side A
Two Stage



SK 92372VZ - 90 S/4
92 Series Helical Bevel Unit
Solid Shaft Side A
B14 Flange Side A & B
Two Stage

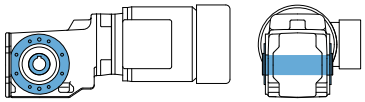


SK 92372VZL - 90 S/4
92 Series Helical Bevel Unit
Double Solid Shaft
B14 Flange Side A & B
Two Stage

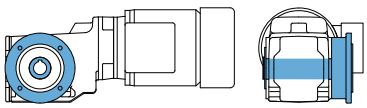


Examples of Available Helical-bevel Units with Hollow Shaft Design

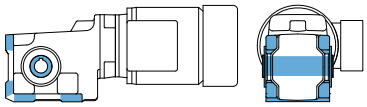
SK 92372AZ - 90 S/4
92 Series Helical Bevel Unit
Hollow Shaft,
B14 Flange Side A & B
Two Stage



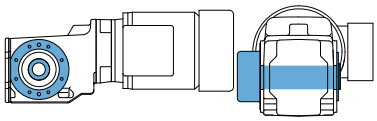
SK 92372AF - 90 S/4
92 Series Helical Bevel Unit
Hollow Shaft,
B5 Flange Side A
Two Stage



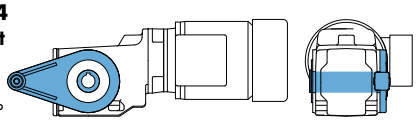
SK 92372AX - 90 S/4
92 Series Helical Bevel Unit
Hollow Shaft,
Foot Mounted
Two Stage



SK 92372AZSH - 90 S/4
92 Series Helical Bevel Unit
Hollow Shaft,
B14 Flange Side A & B,
Shrink Disc & Cover Side B
Two Stage



SK 92372AZD - 90 S/4
92 Series Helical Bevel Unit
Hollow Shaft,
B14 Flange Side A & B
Torque Arm Side A at 180°
Two Stage



0.16 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
0.16	442	23	18.9	III	3.85	610	864	SK 92072 - 63S/4	19	78
	324	31	16.8	III	5.24	673	979			
	294	35	18.8	III	5.79	695	1024			
	264	38	15.4	III	6.44	718	1069			
	216	47	16.8	III	7.87	738	1148			
	189	54	14.9	III	8.99	738	1148			
	176	58	13.8	III	9.68	738	1148			
	154	66	12.1	III	11.06	738	1148			
	125	81	8.2	III	13.55	738	1148			
	97	105	5.1	III	17.56	736	1148			
	83	122	6.6	III	20.37	736	1148			
	73	139	5.7	III	23.28	736	1148			
	64	157	5.1	III	26.39	734	1148			
	56	180	3.4	III	30.15	734	1148			
	49	207	3.2	III	34.73	731	1148			
	43	237	3.0	III	39.67	729	1148			
	36	285	1.4	II	47.83	725	1148			
	31	326	1.4	II	54.65	722	1148			
	415	24	21.3	III	4.10	729	1008	SK 92172 - 63S/4	30	84
	356	28	20.2	III	4.77	767	1071			
	319	32	19.7	III	5.33	767	1121			
	281	36	18.8	III	6.04	767	1184			
	241	42	20.0	III	7.04	767	1260			
	212	48	18.5	III	8.01	765	1260			
	187	54	17.2	III	9.07	765	1260			
	164	62	15.7	III	10.37	765	1260			
	144	70	14.4	III	11.81	765	1260			
	126	80	13.2	III	13.49	765	1260			
	109	93	11.4	III	15.61	765	1260			
	90	112	6.7	III	18.79	765	1260			
	60	168	6.3	III	28.24	763	1260			
	53	193	5.5	III	32.27	761	1260			
	47	215	4.1	III	36.11	758	1260			
	41	246	4.1	III	41.26	758	1260			
	36	280	2.4	III	46.90	754	1260			
	32	320	2.5	III	53.59	752	1260			
	27	378	1.2	I	63.29	745	1260			
	24	431	1.1	I	72.31	738	1260			
	262	39	22.0	III	6.49	1067	1811	SK 92372 - 63S/4	43	90
	232	44	22.0	III	7.32	1067	1908			
	205	49	22.4	III	8.29	1067	2012			
	180	56	22.4	III	9.47	1067	2025			
	157	65	21.5	III	10.84	1067	2025			
	149	68	20.0	III	11.39	1067	2025			
	131	78	20.0	III	13.01	1067	2025			
	116	87	19.1	III	14.65	1067	2025			
	50	202	8.1	III	33.80	1064	2025			
	44	230	7.3	III	38.62	1062	2025			
	39	260	5.1	III	43.52	1062	2025			
	34	297	5.1	III	49.73	1060	2025			
	31	328	3.0	III	55.00	1060	2025			
	27	375	3.0	III	62.85	1058	2025			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = $f_B \geq 2.0$ * = $f_B < 1.0$)

0.16, 0.25 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
0.16	134	75	24.7	III	12.64	1395	2700	**SK 92672 - 63S/4**	80	96
	121	84	24.2	III	14.08	1395	2700			
	106	96	24.2	III	16.08	1395	2700			
	33	309	9.9	III	51.86	1391	2700			
	29	353	9.4	III	59.25	1391	2700			
	109	93	24.2	III	15.60	1863	2700	**SK 92772 - 63S/4**	95	102
	95	106	24.2	III	17.83	1863	2700			
	30	334	10.6	III	56.02	1861	2700			
	27	382	10.7	III	64.01	1861	2700			
0.25	436	36	12.0	III	3.85	608	855	**SK 92072 - 63L/4**	20	78
	321	50	10.5	III	5.24	668	968			
	290	55	11.8	III	5.79	691	1015			
	261	62	9.6	III	6.44	716	1053			
	213	75	10.5	III	7.87	738	1148			
	187	86	9.3	III	8.99	738	1148			
	174	93	8.6	III	9.68	738	1148			
	152	106	7.5	III	11.06	736	1148			
	124	130	5.1	III	13.55	736	1148			
	96	168	3.2	III	17.56	734	1148			
	82	195	4.1	III	20.37	734	1148			
	72	223	3.6	III	23.28	731	1148			
	64	252	3.2	III	26.39	729	1148			
	56	288	2.1	III	30.15	725	1148			
	48	332	2.0	III	34.73	720	1148			
	42	379	1.9	II	39.67	716	1148			
	410	39	13.3	III	4.10	729	1001	**SK 92172 - 63L/4**	31	84
	352	46	12.6	III	4.77	763	1064			
	315	51	12.3	III	5.33	765	1116			
	278	58	11.8	III	6.04	765	1175			
	239	67	12.5	III	7.04	765	1253			
	210	77	11.6	III	8.01	765	1260			
	185	87	10.7	III	9.07	765	1260			
	162	99	9.8	III	10.37	765	1260			
	142	113	9.0	III	11.81	765	1260			
	125	129	8.2	III	13.49	765	1260			
	108	149	7.1	III	15.61	763	1260			
	89	180	4.2	III	18.79	761	1260			
	59	270	3.9	III	28.24	756	1260			
	52	308	3.4	III	32.27	752	1260			
	47	345	2.6	III	36.11	747	1260			
	41	394	2.6	III	41.26	743	1260			
	36	448	1.5	II	46.90	736	1260			
	31	512	1.6	II	53.59	725	1260			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0)

0.25, 0.33 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
0.25	259	62	13.7	III	6.49	1067	1811	**SK 92372 - 63L/4**	45	90
	230	70	13.7	III	7.32	1067	1904			
	203	79	14.0	III	8.29	1067	2005			
	177	91	14.0	III	9.47	1067	2025			
	155	104	13.4	III	10.84	1067	2025			
	147	109	12.5	III	11.39	1067	2025			
	129	124	12.5	III	13.01	1067	2025			
	115	140	11.9	III	14.65	1064	2025			
	50	323	5.1	III	33.80	1060	2025			
	44	369	4.6	III	38.62	1058	2025			
	39	416	3.2	III	43.52	1055	2025			
	34	475	3.2	III	49.73	1051	2025			
	31	526	1.9	II	55.00	1049	2025			
	27	601	1.8	II	62.85	1042	2025			
	133	121	15.4	III	12.64	1395	2700	**SK 92672 - 63L/4**	81	96
	119	135	15.1	III	14.08	1393	2700			
	104	154	15.1	III	16.08	1393	2700			
	32	496	6.2	III	51.86	1386	2700			
	28	566	5.9	III	59.25	1384	2700			
	108	149	15.1	III	15.60	1863	2700	**SK 92772 - 63L/4**	97	102
	94	170	15.1	III	17.83	1863	2700			
	30	535	6.6	III	56.02	1856	2700			
	26	612	6.7	III	64.01	1856	2700			
0.33	444	47	9.2	III	3.85	601	839	**SK 92072 - 71S/4**	23	78
	326	65	8.1	III	5.24	662	950			
	295	72	9.1	III	5.79	682	990			
	266	80	7.4	III	6.44	707	1031			
	217	97	8.1	III	7.87	738	1118			
	190	111	7.2	III	8.99	736	1148			
	177	120	6.7	III	9.68	736	1148			
	155	137	5.8	III	11.06	736	1148			
	126	167	4.0	III	13.55	734	1148			
	97	217	2.4	III	17.56	731	1148			
	84	252	3.2	III	20.37	729	1148			
	73	288	2.8	III	23.28	725	1148			
	65	326	2.4	III	26.39	722	1148			
	57	373	1.7	II	30.15	716	1148			
	49	429	1.5	II	34.73	709	1148			
	43	490	1.4	II	39.67	700	1148			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0)

0.33 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
0.33	417	51	10.3	III	4.10	720	986	**SK 92172 - 71S/4**	34	84
	358	59	9.7	III	4.77	756	1049			
	321	66	9.5	III	5.33	765	1098			
	283	75	9.1	III	6.04	765	1157			
	243	87	9.7	III	7.04	765	1235			
	213	99	8.9	III	8.01	765	1260			
	189	112	8.3	III	9.07	765	1260			
	165	128	7.6	III	10.37	765	1260			
	145	146	7.0	III	11.81	763	1260			
	127	167	6.4	III	13.49	763	1260			
	110	193	5.5	III	15.61	761	1260			
	91	232	3.2	III	18.79	758	1260			
	61	349	3.0	III	28.24	747	1260			
	53	399	2.7	III	32.27	743	1260			
	47	446	2.0	III	36.11	736	1260			
	41	510	2.0	III	41.26	727	1260			
	36	580	1.1	I	46.90	713	1260			
	32	662	1.2	I	53.59	695	1260			
	263	80	10.6	III	6.49	1067	1782	**SK 92372 - 71S/4**	47	90
	234	90	10.6	III	7.32	1067	1877			
	206	102	10.8	III	8.29	1067	1976			
	181	117	10.8	III	9.47	1067	2025			
	158	134	10.4	III	10.84	1064	2025			
	150	141	9.7	III	11.39	1064	2025			
	131	161	9.7	III	13.01	1064	2025			
	117	181	9.2	III	14.65	1064	2025			
	51	418	3.9	III	33.80	1055	2025			
	44	477	3.5	III	38.62	1051	2025			
	39	538	2.5	III	43.52	1046	2025			
	34	614	2.4	III	49.73	1042	2025			
	31	680	1.4	II	55.00	1035	2025			
	27	777	1.4	II	62.85	1026	2025			
	135	156	11.9	III	12.64	1393	2700	**SK 92672 - 71S/4**	84	96
	121	174	11.7	III	14.08	1393	2700			
	106	199	11.7	III	16.08	1393	2700			
	33	641	4.8	III	51.86	1379	2700			
	29	732	4.5	III	59.25	1375	2700			
	110	193	11.7	III	15.60	1861	2700	**SK 92772 - 71S/4**	99	102
	96	220	11.7	III	17.83	1861	2700			
	31	692	5.1	III	56.02	1854	2700			
	27	791	5.1	III	64.01	1852	2700			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0)

0.5 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
0.5	447	71	6.1	III	3.85	592	819	**SK 92072 - 71L/4**	25	78
	328	95	5.5	III	5.24	653	920			
	297	105	6.2	III	5.79	673	961			
	267	117	5.0	III	6.44	693	995			
	219	143	5.5	III	7.87	736	1078			
	191	163	4.9	III	8.99	734	1136			
	178	176	4.5	III	9.68	734	1148			
	156	201	4.0	III	11.06	731	1148			
	127	246	2.7	III	13.55	729	1148			
	98	319	1.7	II	17.56	722	1148			
	84	370	2.2	III	20.37	716	1148			
	74	423	1.9	II	23.28	709	1148			
	65	480	1.7	II	26.39	702	1148			
	57	548	1.1	I	30.15	689	1148			
	50	631	1.1	I	34.73	673	1148			
	43	721	1.0	I	39.67	650	1148			
	420	75	7.0	III	4.10	713	970	**SK 92172 - 71L/4**	36	84
	361	87	6.6	III	4.77	752	1031			
	323	97	6.5	III	5.33	765	1076			
	285	110	6.2	III	6.04	765	1132			
	244	128	6.6	III	7.04	765	1202			
	215	146	6.1	III	8.01	763	1260			
	190	165	5.6	III	9.07	763	1260			
	166	189	5.2	III	10.37	761	1260			
	146	215	4.7	III	11.81	761	1260			
	128	245	4.3	III	13.49	758	1260			
	110	284	3.7	III	15.61	754	1260			
	92	342	2.2	III	18.79	749	1260			
	61	513	2.1	III	28.24	725	1260			
	53	587	1.8	II	32.27	711	1260			
	48	657	1.3	I	36.11	698	1260			
	42	750	1.4	II	41.26	675	1260			
	37	853	0.8	*	46.90	646	1260			
	32	974	0.8	*	53.59	605	1260			
	265	118	7.2	III	6.49	1067	1760	**SK 92372 - 71L/4**	49	90
	235	133	7.2	III	7.32	1064	1850			
	207	151	7.4	III	8.29	1064	1949			
	182	172	7.4	III	9.47	1064	2025			
	159	197	7.1	III	10.84	1064	2025			
	151	207	6.6	III	11.39	1064	2025			
	132	237	6.6	III	13.01	1062	2025			
	117	266	6.3	III	14.65	1062	2025			
	51	615	2.7	III	33.80	1042	2025			
	45	702	2.4	III	38.62	1033	2025			
	40	791	1.7	II	43.52	1024	2025			
	35	904	1.7	II	49.73	1010	2025			
	31	1000	1.0	I	55.00	997	2025			
	27	1143	1.0	I	62.85	974	2025			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0)

0.5, 0.75 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
0.5	136	230	8.1	III	12.64	1393	2700	SK 92672 - 71L/4	86	96
	122	256	7.9	III	14.08	1393	2700			
	107	292	7.9	III	16.08	1391	2700			
	33	943	3.2	III	51.86	1364	2700			
	29	1077	3.1	III	59.25	1352	2700			
	110	284	7.9	III	15.60	1861	2700	SK 92772 - 71L/4	101	102
	96	324	7.9	III	17.83	1861	2700			
	31	1019	3.5	III	56.02	1843	2700			
	27	1164	3.5	III	64.01	1836	2700			
0.75	444	106	4.1	III	3.85	583	790	SK 92072 - 80S/4	29	78
	326	145	3.6	III	5.24	639	882			
	295	160	4.1	III	5.79	659	918			
	266	178	3.3	III	6.44	680	945			
	217	218	3.6	III	7.87	718	1019			
	190	249	3.2	III	8.99	729	1069			
	177	268	3.0	III	9.68	727	1091			
	155	306	2.6	III	11.06	725	1139			
	126	375	1.8	II	13.55	716	1148			
	97	486	1.1	I	17.56	700	1148			
	84	564	1.4	II	20.37	686	1148			
	73	644	1.2	I	23.28	668	1148			
	65	730	1.1	I	26.39	648	1148			
	417	113	4.6	III	4.10	707	947	SK 92172 - 80S/4	40	84
	358	132	4.3	III	4.77	740	1008			
	321	148	4.3	III	5.33	763	1049			
	283	167	4.1	III	6.04	763	1105			
	243	195	4.3	III	7.04	761	1166			
	213	222	4.0	III	8.01	758	1222			
	189	251	3.7	III	9.07	756	1260			
	165	287	3.4	III	10.37	754	1260			
	145	327	3.1	III	11.81	749	1260			
	127	373	2.8	III	13.49	745	1260			
	110	432	2.5	III	15.61	738	1260			
	91	520	1.4	II	18.79	725	1260			
	75	631	1.7	II	22.78	702	1260			
	66	720	1.5	II	26.03	682	1260			
	61	782	1.4	II	28.24	666	1260			
	53	893	1.2	I	32.27	632	1260			
	47	999	0.9	*	36.11	594	1260			
	41	1142	0.9	*	41.26	531	1260			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0)

0.75, 1.0 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
0.75	263	180	4.7	III	6.49	1064	1733	**SK 92372 - 80S/4**	53	90
	234	203	4.7	III	7.32	1064	1818			
	206	229	4.8	III	8.29	1062	1910			
	181	262	4.8	III	9.47	1062	2014			
	158	300	4.6	III	10.84	1060	2025			
	150	315	4.3	III	11.39	1060	2025			
	131	360	4.3	III	13.01	1058	2025			
	117	405	4.1	III	14.65	1055	2025			
	70	673	2.8	III	24.33	1035	2025			
	62	759	2.7	III	27.41	1026	2025			
	55	867	1.9	II	31.32	1015	2025			
	51	936	1.8	II	33.80	1006	2025			
	44	1069	1.6	II	38.62	988	2025			
	39	1205	1.1	I	43.52	963	2025			
	34	1376	1.1	I	49.73	932	2025			
	135	350	5.3	III	12.64	1391	2700	**SK 92672 - 80S/4**	89	96
	121	390	5.2	III	14.08	1388	2700			
	106	445	5.2	III	16.08	1388	2700			
	46	1033	2.8	III	37.32	1357	2700			
	41	1164	2.6	III	42.04	1346	2700			
	36	1329	2.5	III	48.03	1330	2700			
	33	1435	2.1	III	51.86	1319	2700			
	29	1640	2.0	III	59.25	1296	2700			
	110	432	5.2	III	15.60	1859	2700	**SK 92772 - 80S/4**	105	102
	96	494	5.2	III	17.83	1859	2700			
	42	1128	3.5	III	40.77	1838	2700			
	37	1271	3.5	III	45.93	1832	2700			
	33	1453	3.5	III	52.48	1823	2700			
	31	1551	2.3	III	56.02	1816	2700			
	27	1772	2.3	III	64.01	1802	2700			
1.0	429	147	2.9	III	3.85	581	772	**SK 92072 - 80L/4**	31	78
	315	201	2.6	III	5.24	632	851	SK 92072 - 80LH/4		
	285	222	2.9	III	5.79	648	884			
	256	247	2.4	III	6.44	668	909			
	210	302	2.6	III	7.87	704	968			
	184	345	2.3	III	8.99	720	1015			
	170	372	2.1	III	9.68	716	1026			
	149	425	1.9	II	11.06	709	1069			
	122	521	1.3	I	13.55	693	1091			
	81	783	1.0	I	20.37	635	1148			
	71	894	0.9	*	23.28	599	1148			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0) (Model Type in blue is an Energy Efficient motor)

1.0 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
1.0	402	158	3.3	III	4.10	704	938	**SK 92172 - 80L/4**	42	84
	346	183	3.1	III	4.77	738	990	**SK 92172 - 80LH/4**		
	310	205	3.1	III	5.33	761	1033			
	273	232	2.9	III	6.04	758	1080			
	234	270	3.1	III	7.04	756	1139			
	206	308	2.9	III	8.01	752	1188			
	182	348	2.7	III	9.07	747	1240			
	159	398	2.4	III	10.37	743	1260			
	140	454	2.2	III	11.81	734	1260			
	122	518	2.0	III	13.49	725	1260			
	106	600	1.8	II	15.61	709	1260			
	88	722	1.0	I	18.79	682	1260			
	72	875	1.2	I	22.78	639	1260			
	63	1000	1.1	I	26.03	594	1260			
	58	1085	1.0	I	28.24	558	1260			
	51	1240	0.9	*	32.27	477	1260			
	254	249	3.4	III	6.49	1062	1721	**SK 92372 - 80L/4**	55	90
	225	281	3.4	III	7.32	1062	1811	**SK 92372 - 80LH/4**		
	199	318	3.5	III	8.29	1060	1895			
	174	364	3.5	III	9.47	1058	1996			
	152	416	3.3	III	10.84	1055	2025			
	145	438	3.1	III	11.39	1053	2025			
	127	500	3.1	III	13.01	1049	2025			
	113	563	3.0	III	14.65	1044	2025			
	68	935	2.0	III	24.33	1006	2025			
	60	1053	1.9	II	27.41	990	2025			
	53	1203	1.4	II	31.32	965	2025			
	49	1298	1.3	I	33.80	947	2025			
	43	1484	1.1	I	38.62	907	2025			
	131	486	3.8	III	12.64	1386	2700	**SK 92672 - 80L/4**	92	96
	117	541	3.8	III	14.08	1384	2700	**SK 92672 - 80LH/4**		
	103	618	3.8	III	16.08	1382	2700			
	44	1434	2.0	III	37.32	1319	2700			
	39	1615	1.9	II	42.04	1298	2700			
	34	1845	1.8	II	48.03	1267	2700			
	32	1992	1.5	II	51.86	1244	2700			
	28	2276	1.5	II	59.25	1195	2700			
	106	599	3.8	III	15.60	1856	2700	**SK 92772 - 80L/4**	107	102
	93	685	3.8	III	17.83	1854	2700	**SK 92772 - 80LH/4**		
	40	1566	2.5	III	40.77	1816	2700			
	36	1764	2.5	III	45.93	1802	2700			
	31	2016	2.5	III	52.48	1784	2700			
	29	2152	1.6	II	56.02	1773	2700			
	26	2459	1.7	II	64.01	1746	2700			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0) (Model Type in blue is an Energy Efficient motor)

1.5 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
1.5	431	219	2.8	III	3.85	558	707	**SK 92072 - 90S/4**	37	78
	287	330	2.1	III	5.79	617	797	SK 92072 - 90SH/4		
	405	234	2.8	III	4.10	686	891	**SK 92172 - 90S/4**	49	84
	348	272	2.6	III	4.77	716	934	SK 92172 - 90SH/4		
	311	304	2.5	III	5.33	738	968			
	275	344	2.3	III	6.04	747	1008			
	236	401	2.1	III	7.04	743	1055			
	207	457	1.9	II	8.01	734	1094			
	183	517	1.8	II	9.07	725	1130			
	160	591	1.6	II	10.37	711	1172			
	313	302	3.7	III	5.30	1028	1539	**SK 92372 - 90S/4**	62	90
	278	340	3.7	III	5.97	1060	1609	SK 92372 - 90SH/4		
	256	370	3.5	III	6.49	1058	1654			
	227	417	3.5	III	7.32	1055	1737			
	200	473	3.3	III	8.29	1051	1811			
	175	540	2.9	III	9.47	1046	1904			
	153	618	2.6	III	10.84	1040	1989			
	146	650	2.7	III	11.39	1037	2025			
	128	742	2.3	III	13.01	1028	2025			
	113	835	2.0	III	14.65	1019	2025			
	97	973	2.1	III	17.06	1001	2025			
	86	1095	1.9	II	19.21	983	2025			
	76	1252	1.4	II	21.95	956	2025			
	68	1387	1.3	I	24.33	929	2025			
	61	1563	1.3	I	27.41	887	2025			
	53	1786	0.9	*	31.32	826	2025			
	342	277	4.5	III	4.85	1310	1892	**SK 92672 - 90S/4**	98	96
	304	311	4.5	III	5.46	1357	1989	SK 92672 - 90SH/4		
	191	497	4.0	III	8.71	1386	2374			
	170	558	3.9	III	9.78	1384	2480			
	151	628	3.9	III	11.02	1379	2597			
	131	721	3.7	III	12.64	1375	2700			
	118	803	3.6	III	14.08	1370	2700			
	103	917	3.6	III	16.08	1364	2700			
	63	1514	1.9	II	26.55	1310	2700			
	55	1706	1.8	II	29.91	1287	2700			
	49	1949	1.7	II	34.17	1251	2700			
	44	2128	1.4	II	37.32	1222	2700			
	39	2397	1.3	I	42.04	1172	2700			
	35	2739	1.2	I	48.03	1094	2700			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0) (Model Type in blue is an Energy Efficient motor)

1.5, 2.0 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
1.5	306	310	4.5	III	5.43	1346	2012	**SK 92772 - 90S/4**	114	102
	272	348	4.5	III	6.11	1395	2115	SK 92772 - 90SH/4		
	153	620	4.0	III	10.88	1665	2648			
	134	709	4.0	III	12.43	1733	2700			
	119	793	3.9	III	13.91	1796	2700			
	106	890	3.6	III	15.60	1847	2700			
	93	1017	3.6	III	17.83	1843	2700			
	58	1622	3.3	III	28.44	1814	2700			
	52	1827	3.1	III	32.04	1798	2700			
	45	2088	2.8	III	36.61	1780	2700			
	41	2325	1.7	II	40.77	1757	2700			
	36	2619	1.7	II	45.93	1730	2700			
	32	2993	1.7	II	52.48	1688	2700			
2.0	431	292	2.1	III	3.85	538	650	**SK 92072 - 90L/4**	42	78
	287	439	1.6	II	5.79	585	711	SK 92072 - 90LH/4		
	405	311	2.1	III	4.10	668	842	**SK 92172 - 90L/4**	53	84
	348	362	2.0	III	4.77	695	882	SK 92172 - 90LH/4		
	311	404	1.9	II	5.33	713	911			
	275	458	1.7	II	6.04	734	938			
	236	534	1.6	II	7.04	722	977			
	207	608	1.5	II	8.01	709	1001			
	183	688	1.4	II	9.07	691	1028			
	160	787	1.2	I	10.37	666	1051			
	313	402	2.7	III	5.30	1010	1483	**SK 92372 - 90L/4**	66	90
	278	453	2.7	III	5.97	1046	1555	SK 92372 - 90LH/4		
	256	492	2.6	III	6.49	1051	1589			
	227	555	2.6	III	7.32	1046	1661			
	200	629	2.5	III	8.29	1040	1730			
	175	718	2.2	III	9.47	1031	1811			
	153	822	1.9	II	10.84	1019	1886			
	146	864	2.0	III	11.39	1015	1904			
	128	987	1.7	II	13.01	999	1985			
	113	1111	1.5	II	14.65	981	2025			
	97	1294	1.6	II	17.06	947	2025			
	86	1457	1.4	II	19.21	914	2025			
	76	1665	1.0	I	21.95	860	2025			
	68	1846	1.0	I	24.33	806	2025			
	61	2079	1.0	I	27.41	720	2025			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0) (Model Type in blue is an Energy Efficient motor)

2.0, 3.0 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
2.0	342	368	3.4	III	4.85	1296	1854	**SK 92672 - 90L/4**	103	96
	304	414	3.4	III	5.46	1343	1953	SK 92672 - 90LH/4		
	191	661	3.0	III	8.71	1379	2300			
	170	742	2.9	III	9.78	1375	2394			
	151	836	2.9	III	11.02	1370	2516			
	131	959	2.8	III	12.64	1361	2626			
	118	1068	2.7	III	14.08	1352	2700			
	103	1220	2.7	III	16.08	1341	2700			
	63	2014	1.4	II	26.55	1242	2700			
	55	2269	1.3	I	29.91	1197	2700			
	49	2592	1.3	I	34.17	1130	2700			
	44	2831	1.0	I	37.32	1071	2700			
	39	3189	0.9	*	42.04	965	2700			
	35	3644	0.9	*	48.03	790	2700			
	306	412	3.4	III	5.43	1332	1973	**SK 92772 - 90L/4**	118	102
	272	464	3.4	III	6.11	1379	2075	SK 92772 - 90LH/4		
	153	825	3.0	III	10.88	1638	2567			
	134	943	3.0	III	12.43	1703	2700			
	119	1055	2.9	III	13.91	1757	2700			
	106	1183	2.7	III	15.60	1814	2700			
	93	1353	2.7	III	17.83	1827	2700			
	58	2158	2.5	III	28.44	1773	2700			
	52	2431	2.3	III	32.04	1748	2700			
	45	2777	2.1	III	36.61	1712	2700			
	41	3093	1.3	I	40.77	1674	2700			
	36	3484	1.3	I	45.93	1620	2700			
	32	3981	1.3	I	52.48	1537	2700			
3.0	322	588	2.2	III	5.30	968	1366	**SK 92372 - 100L/4**	75	90
	286	663	2.1	III	5.97	997	1422	SK 92372 - 100LH/4		
	263	721	2.0	III	6.49	1017	1447			
	233	813	1.8	II	7.32	1022	1510			
	206	921	1.7	II	8.29	1008	1555			
	180	1052	1.5	II	9.47	990	1620			
	157	1204	1.3	I	10.84	965	1661			
	150	1265	1.4	II	11.39	954	1670			
	131	1445	1.2	I	13.01	916	1721			
	100	1894	1.1	I	17.06	790	1744			
	89	2133	1.0	I	19.21	698	1780			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0) (Model Type in blue is an Energy Efficient motor)

3.0, 5.0 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
3.0	352	539	2.3	III	4.85	1253	1762	**SK 92672 - 100L/4**	111	96
	312	606	2.3	III	5.46	1301	1836	SK 92672 - 100LH/4		
	288	657	3.4	III	5.92	1328	1879			
	251	753	3.2	III	6.78	1375	1971			
	221	858	3.1	III	7.73	1368	2052			
	196	967	2.9	III	8.71	1361	2129			
	174	1086	2.6	III	9.78	1352	2205			
	155	1224	2.4	III	11.02	1341	2302			
	135	1404	2.1	III	12.64	1323	2394			
	121	1563	1.9	II	14.08	1305	2464			
	106	1785	1.8	II	16.08	1276	2619			
	94	2008	1.4	II	18.08	1242	2592			
	84	2262	1.3	I	20.37	1199	2682			
	73	2585	1.3	I	23.28	1132	2700			
	64	2948	1.0	I	26.55	1040	2700			
	57	3321	0.9	*	29.91	920	2700			
	50	3794	0.9	*	34.17	716	2700			
	314	603	2.3	III	5.43	1294	1881	**SK 92772 - 100L/4**	127	102
	279	678	2.3	III	6.11	1341	1971	SK 92772 - 100LH/4		
	266	712	3.4	III	6.41	1355	1996			
	224	844	3.2	III	7.60	1424	2117			
	199	949	3.1	III	8.55	1469	2210			
	177	1069	3.1	III	9.63	1519	2302			
	157	1208	2.9	III	10.88	1571	2396			
	137	1380	2.9	III	12.43	1627	2516			
	123	1545	2.8	III	13.91	1676	2597			
	109	1732	2.4	III	15.60	1717	2678			
	96	1980	2.4	III	17.83	1775	2700			
	86	2191	2.4	III	19.73	1771	2700			
	77	2467	2.2	III	22.22	1744	2700			
	67	2819	2.0	III	25.39	1708	2700			
	60	3158	1.7	II	28.44	1665	2700			
	53	3558	1.6	II	32.04	1609	2700			
	47	4065	1.4	II	36.61	1521	2700			
5.0	325	968	1.3	I	5.30	891	1159	**SK 92372 - 100LA/4**	82	90
	289	1091	1.3	I	5.97	911	1195	SK 92372 - 112MH/4		
	266	1186	1.2	I	6.49	925	1195			
	236	1338	1.1	I	7.32	938	1231			
	208	1515	1.0	I	8.29	900	1242			
	182	1731	0.9	*	9.47	842	1258			
	159	1981	0.8	*	10.84	758	1258			
	151	2082	0.8	*	11.39	718	1231			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0) (Model Type in blue is an Energy Efficient motor)

5.0 hp
Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
5.0	356	886	1.4	II	4.85	1190	1593	**SK 92672 - 100LA/4**	118	96
	316	998	1.4	II	5.46	1229	1658	SK 92672 - 112MH/4		
	291	1082	2.1	III	5.92	1249	1679			
	254	1239	2.0	III	6.78	1289	1744			
	223	1413	1.9	II	7.73	1321	1791			
	198	1592	1.8	II	8.71	1301	1836			
	176	1787	1.6	II	9.78	1276	1872			
	157	2014	1.5	II	11.02	1242	1940			
	136	2310	1.3	I	12.64	1188	1978			
	123	2573	1.2	I	14.08	1134	1996			
	107	2939	1.1	I	16.08	1042	2140			
	95	3304	0.9	*	18.08	927	1971			
	85	3723	0.8	*	20.37	752	2012			
	74	4255	0.8	*	23.28	380	2142			
	318	992	1.4	II	5.43	1233	1733	**SK 92772 - 100LA/4**	134	102
	282	1117	1.4	II	6.11	1276	1802	SK 92772 - 112MH/4		
	269	1171	2.1	III	6.41	1289	1823			
	227	1389	2.0	III	7.60	1341	1913			
	202	1563	1.9	II	8.55	1382	1973			
	179	1760	1.9	II	9.63	1418	2052			
	159	1988	1.8	II	10.88	1456	2115			
	139	2272	1.8	II	12.43	1499	2180			
	124	2542	1.7	II	13.91	1528	2230			
	111	2851	1.5	II	15.60	1555	2259			
	97	3258	1.5	II	17.83	1589	2318			
	87	3606	1.5	II	19.73	1600	2318			
	78	4061	1.4	II	22.22	1523	2345			
	68	4640	1.2	I	25.39	1402	2390			
	61	5198	1.0	I	28.44	1258	2318			
	54	5855	1.0	I	32.04	1037	2318			
	47	6691	0.9	*	36.61	590	2300			

(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0) (Model Type in blue is an Energy Efficient motor)

7.5 hp Gearmotors

Motor Power P_n [hp]	Output Speed n_2 [rpm]	Output Torque T_a [lb-in]	Service Factor f_B	AGMA Class	Gear Ratio i_{tot}	Standard Bearings F_R OHL [lb]	Standard Bearings F_A Thrust [lb]	Model Type	Weight [lb]	Dim. Page
7.5	358	1321	1.8	II	4.85	1116	1395	**SK 92672 - 132S/4**	169	96
	318	1487	1.6	II	5.46	1143	1445	SK 92672 - 132SH/4		
	293	1612	1.5	II	5.92	1159	1440			
	256	1846	1.4	II	6.78	1184	1467			
	224	2105	1.3	I	7.73	1206	1472			
	199	2372	1.2	I	8.71	1177	1483			
	177	2663	1.1	I	9.78	1114	1469			
	157	3001	1.0	I	11.02	1024	1501			
	137	3442	0.9	*	12.64	875	1472			
	123	3834	0.8	*	14.08	695	1440			
	361	1310	2.8	III	4.81	1132	1512	**SK 92772 - 132S/4**	184	102
	320	1479	2.5	III	5.43	1166	1559	SK 92772 - 132SH/4		
	284	1664	2.2	III	6.11	1195	1607			
	271	1745	2.3	III	6.41	1202	1613			
	228	2070	2.0	III	7.60	1242	1665			
	203	2328	1.9	II	8.55	1271	1694			
	180	2622	1.7	II	9.63	1294	1733			
	159	2963	1.5	II	10.88	1314	1762			
	140	3385	1.3	I	12.43	1334	1782			
	125	3788	1.3	I	13.91	1348	1784			
	111	4248	1.0	I	15.60	1350	1762			
	97	4855	1.0	I	17.83	1350	1744			
	88	5373	1.0	I	19.73	1206	1658			
	78	6051	0.9	*	22.22	956	1627			
	68	6914	0.8	*	25.39	367	1559			

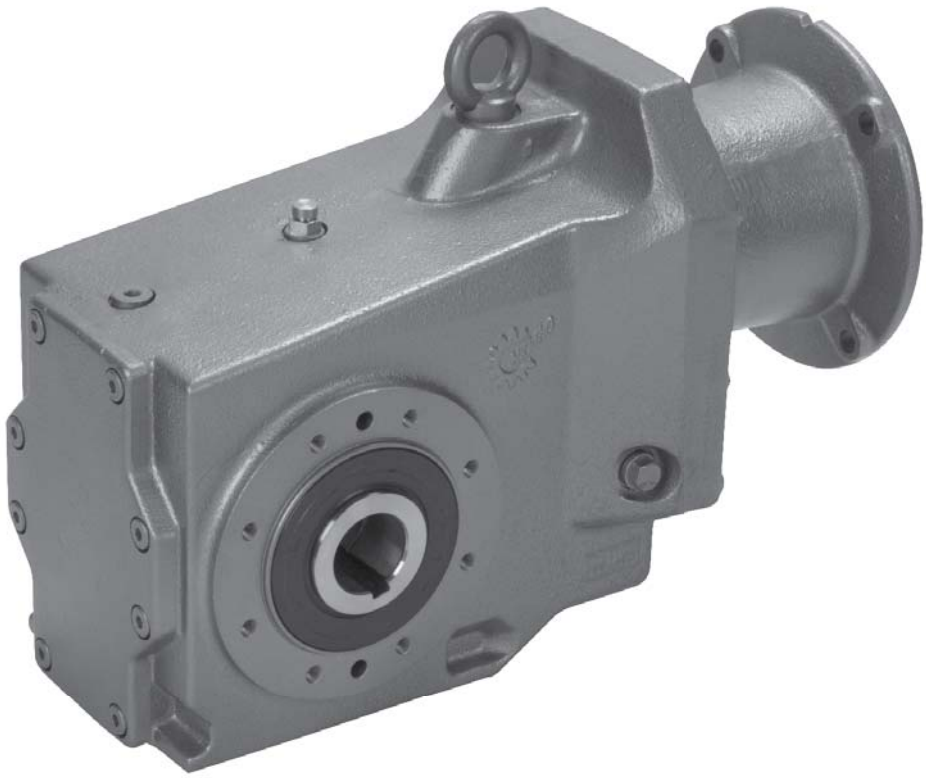
(AGMA Class I = f_B 1.0 - 1.39 II = f_B 1.4 - 1.99 III = f_B ≥ 2.0 * = f_B < 1.0) (Model Type in blue is an Energy Efficient motor)

Notes

92 Series Reducers & Combinations

Speed Reducer Selections

- SK92072
- SK92172
- SK92372
- SK92672
- SK92772



NORD DRIVESYSTEMS

www.nord.com

Type	Gear Ratio i_{tot}	Output Speed n_2 1750 rpm [rpm]	Output Torque* $T_{2\,max}$ [lb-in]
SK 92072	17.42	100	3806
	19.22	91	3806
	21.32	82	3806
	23.79	74	3806
	26.77	65	3806
	30.93	57	3894
	34.80	50	3894
	38.02	46	3983
	42.18	41	3983
	43.40	40	3983
	47.95	36	3983

SK 92072, SK 92172 NEMA-C + W Ratings & Combinations

Model Type	Gear Ratio i_{tot}	Output Speed n_2 [rpm]	Output Torque $T_{2\,max}$ [lb-in]	Maximum input power◈ [hp]	[hp]	[hp]	[hp]	Input Shaft W	NEMA C-Face* Available Combinations 56C	140TC	180TC	210TC	250TC
SK 92072	3.85	455	708	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	5.24	334	708	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	5.79	302	708	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	6.44	272	752	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	7.87	222	797	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	8.99	195	797	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	9.68	181	797	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	11.06	158	797	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	13.55	129	664	1.36	0.90	0.68	0.45	X	X	X			
	17.56	100	531	0.84	0.56	0.42	0.28	X	X	X			
	20.37	86	797	1.09	0.72	0.54	0.36	X	X	X			
	23.28	75	797	0.95	0.63	0.47	0.31	X	X	X			
	26.39	66	797	0.83	0.55	0.42	0.28	X	X	X			
	30.15	58	620	0.57	0.38	0.29	0.19	X	X	X			
	34.73	50	664	0.53	0.35	0.26	0.17	X	X				
	39.67	44	708	0.49	0.33	0.25	0.16	X	X				
	47.83	37	398	0.23	0.15	0.12	0.08	X	X				
	54.65	32	443	0.22	0.15	0.11	0.07	X	X				
SK 92172	4.10	427	664	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	4.77	367	708	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	5.33	328	752	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	6.04	290	797	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	7.04	249	841	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	8.01	218	885	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	9.07	193	929	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	10.37	169	974	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	11.81	148	1018	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	13.49	130	1062	*2.00*	*1.32*	*1.00*	*0.66*	X	X	X			
	15.61	112	1062	1.89	1.25	0.94	0.62	X	X	X			
	18.79	93	752	1.11	0.73	0.56	0.37	X	X	X			
	22.78	77	1062	1.30	0.86	0.65	0.43	X	X	X			
	26.03	67	1062	1.13	0.75	0.56	0.37	X	X	X			
	28.24	62	1062	1.04	0.69	0.52	0.34	X	X	X			
	32.27	54	1062	0.91	0.60	0.45	0.30	X	X	X			
	36.11	48	885	0.67	0.44	0.34	0.22	X	X	X			
	41.26	42	1018	0.68	0.45	0.34	0.22	X	X	X			
	46.90	37	664	0.39	0.26	0.19	0.13	X	X				
	53.59	33	797	0.42	0.28	0.21	0.14	X	X				
	63.29	28	443	0.20	0.13	0.10	0.06	X	X				
	72.31	24	487	0.19	0.12	0.09	0.06	X	X				
	Based upon 1750 rpm Input Speed			**1750 rpm**	**1150 rpm**	**875 rpm**	**580 rpm**	-	**1 hp**	**2 hp**	**5 hp**	**10 hp**	**20 hp**
				Input Speed					**C-face Adapter Maximum Input Power ***				

◈ The maximum input power limit shown is the largest motor power typically combined with the gear unit. *The Italicized power values shown are not the mechanical limit and often may be increased through discussion with our sales or engineering department.*

* The NEMA C-face power limit must also be considered when selecting a reducer. The C-face Adapter's Maximum Input Power values are displayed under the Available Combinations and based on a 1750 rpm motor.

lb	W	56C	140TC
SK 92072	15	24	24
SK 92172	26	35	35

SK 92372, SK 92672 NEMA-C + W Ratings & Combinations

Model Type	Gear Ratio i_{tot}	Output Speed n_2 [rpm]	Output Torque* $T_{2\,max}$ [lb-in]	Maximum input power◈ [hp]	[hp]	[hp]	[hp]	Input Shaft W	NEMA C-Face* Available Combinations 56C	140TC	180TC	210TC	250TC
SK 92372	5.30	330	1283	6.72	4.43	3.36	2.22	X	X	X	X		
	5.97	293	1372	6.38	4.21	3.19	2.10	X	X	X	X		
	6.49	270	1416	6.07	4.00	3.03	2.00	X	X	X	X		
	7.32	239	1460	5.54	3.65	2.77	1.83	X	X	X	X		
	8.29	211	1549	5.19	3.42	2.59	1.71	X	X	X	X		
	9.47	185	1549	4.55	3.00	2.27	1.50	X	X	X	X		
	10.84	161	1593	4.07	2.69	2.03	1.34	X	X	X	X		
	11.39	154	1726	4.22	2.78	2.11	1.39	X	X	X	X		
	13.01	135	1726	3.70	2.44	1.85	1.22	X	X	X	X		
	14.65	119	1682	3.17	2.10	1.59	1.05	X	X	X			
	17.06	103	2036	3.33	2.20	1.66	1.10	X	X	X	X		
	19.21	91	2036	2.94	1.94	1.47	0.97	X	X	X	X		
	21.95	80	1726	2.19	1.45	1.10	0.72	X	X	X	X		
	24.33	72	1859	2.12	1.40	1.06	0.70	X	X	X			
	27.41	64	2036	2.07	1.36	1.03	0.68	X	X	X			
	31.32	56	1682	1.49	0.99	0.75	0.49	X	X	X			
	33.80	52	1637	1.35	0.89	0.68	0.45	X	X	X			
	38.62	45	1682	1.20	0.79	0.60	0.40	X	X	X			
	43.52	40	1328	0.84	0.56	0.42	0.28	X	X	X			
	49.73	35	1505	0.84	0.55	0.42	0.28	X	X	X			
	55.00	32	974	0.49	0.33	0.25	0.16	X	X				
	62.85	28	1106	0.49	0.32	0.25	0.16	X	X				
SK 92672	4.85	361	2345	*7.50*	*4.95*	*3.75*	*2.48*	X	X	X	X	X	
	5.46	321	2345	*7.50*	*4.95*	*3.75*	*2.48*	X	X	X	X	X	
	5.92	296	2478	*7.50*	*4.95*	*3.75*	*2.48*	X			X	X	
	6.78	258	2611	*7.50*	*4.95*	*3.75*	*2.48*	X			X	X	
	7.73	226	2744	*7.50*	*4.95*	*3.75*	*2.48*	X			X	X	
	8.71	201	2832	*7.50*	*4.95*	*3.75*	*2.48*	X	X	X	X	X	
	9.78	179	2832	*7.50*	*4.95*	*3.75*	*2.48*	X	X	X	X	X	
	11.02	159	2965	7.48	4.94	3.74	2.47	X	X	X	X	X	
	12.64	138	3009	6.59	4.35	3.29	2.17	X	X	X	X	X	
	14.08	124	3009	5.92	3.91	2.96	1.95	X	X	X	X	X	
	16.08	109	3275	5.66	3.74	2.83	1.87	X	X	X	X	X	
	18.08	97	2832	4.36	2.88	2.18	1.44	X			X	X	
	20.37	86	3009	4.11	2.71	2.05	1.35	X			X	X	
	23.28	75	3275	3.90	2.57	1.95	1.29	X			X	X	
	26.55	66	2921	3.06	2.02	1.53	1.01	X	X	X	X		
	29.91	59	3009	2.82	1.86	1.41	0.93	X	X	X	X		
	34.17	51	3363	2.72	1.80	1.36	0.90	X	X	X	X		
	37.32	47	2921	2.18	1.44	1.09	0.72	X	X	X			
	42.04	42	3009	2.01	1.32	1.00	0.66	X	X	X			
	48.03	36	3319	1.90	1.25	0.95	0.63	X	X	X			
	51.86	34	3053	1.65	1.09	0.82	0.54	X	X	X			
	59.25	30	3319	1.58	1.04	0.79	0.52	X	X	X			
	Based upon 1750 rpm Input Speed			**1750 rpm**	**1150 rpm**	**875 rpm**	**580 rpm**	-	**1 hp**	**2 hp**	**5 hp**	**10 hp**	**20 hp**
				Input Speed					**C-face Adapter Maximum Input Power ***				

◈ The maximum input power limit shown is the largest motor power typically combined with the gear unit. *The Italicized power values shown are not the mechanical limit and often may be increased through discussion with our sales or engineering department.*

* The NEMA C-face power limit must also be considered when selecting a reducer. The C-face Adapter's Maximum Input Power values are displayed under the Available Combinations and based on a 1750 rpm motor.

lb	W	56C	140TC	180TC	210TC
SK 92372	40	49	49	60	-
SK 92672	79	86	86	97	112

SK 92772 NEMA-C + W
Ratings & Combinations

Model Type	Gear Ratio	Output Speed	Output Torque	Maximum input power◈				Input Shaft	NEMA C-Face* Available Combinations				
	i_{tot}	n_2	$T_{2\ max}$										
		[rpm]	[lb-in]	[hp]	[hp]	[hp]	[hp]	W	56C	140TC	180TC	210TC	250TC
SK 92772	4.81	364	3629	*7.50*	*4.95*	*3.75*	*2.48*	X			X	X	X
	5.43	322	3761	*7.50*	*4.95*	*3.75*	*2.48*	X			X	X	X
	6.11	286	3717	*7.50*	*4.95*	*3.75*	*2.48*	X			X	X	X
	6.41	273	3983	*7.50*	*4.95*	*3.75*	*2.48*	X			X	X	X
	7.60	230	4204	*7.50*	*4.95*	*3.75*	*2.48*	X			X	X	X
	8.55	205	4381	*7.50*	*4.95*	*3.75*	*2.48*	X			X	X	X
	9.63	182	4381	*7.50*	*4.95*	*3.75*	*2.48*	X			X	X	X
	10.88	161	4558	*7.50*	*4.95*	*3.75*	*2.48*	X	X	X	X	X	
	12.43	141	4558	*7.50*	*4.95*	*3.75*	*2.48*	X	X	X	X	X	
	13.91	126	4735	*7.50*	*4.95*	*3.75*	*2.48*	X	X	X	X	X	
	15.60	112	5177	*7.50*	*4.95*	*3.75*	*2.48*	X	X	X	X	X	
	17.83	98	5177	*7.50*	*4.95*	*3.75*	*2.48*	X	X	X	X	X	
	19.73	89	5310	*7.50*	*4.95*	*3.75*	*2.47*	X			X	X	
	22.22	79	5487	6.88	4.54	3.44	2.27	X			X	X	
	25.39	69	5753	6.30	4.16	3.15	2.08	X			X	X	
	28.44	62	5310	5.22	3.45	2.61	1.72	X	X	X	X	X	
	32.04	55	5576	4.87	3.21	2.43	1.61	X	X	X	X	X	
	36.61	48	5841	4.45	2.94	2.22	1.47	X	X	X	X	X	
	40.77	43	3983	2.72	1.79	1.36	0.90	X	X	X			
	45.93	38	4469	2.69	1.78	1.35	0.89	X	X	X			
	52.48	33	5089	2.66	1.76	1.33	0.88	X	X	X			
	56.02	31	3540	1.74	1.15	0.87	0.57	X	X	X			
	64.01	27	4071	1.74	1.15	0.87	0.58	X	X	X			
	Based upon 1750 rpm Input Speed			**1750 rpm**	**1150 rpm**	**875 rpm**	**580 rpm**	-	**1 hp**	**2 hp**	**5 hp**	**10 hp**	**20 hp**
				Input Speed					**C-face Adapter Maximum Input Power ***				

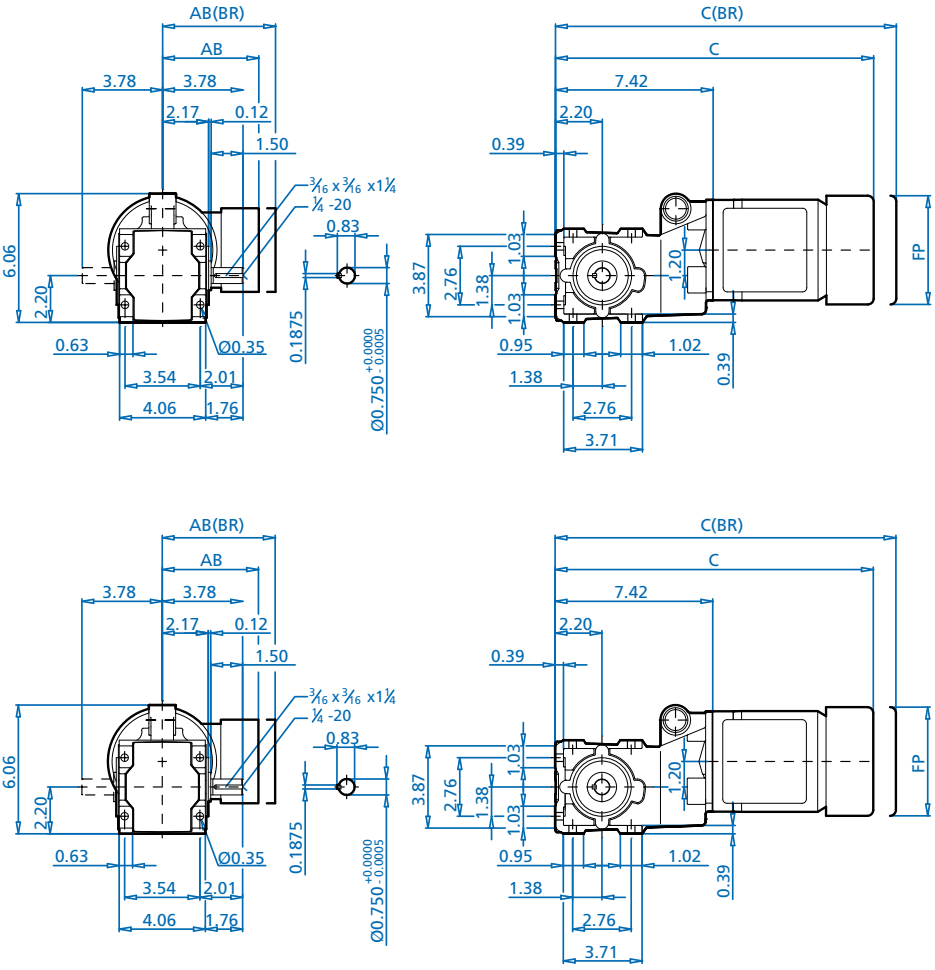
◈ The maximum input power limit shown is the largest motor power typically combined with the gear unit. *The Italicized power values shown are not the mechanical limit and often may be increased through discussion with our sales or engineering department.*

* The NEMA C-face power limit must also be considered when selecting a reducer. The C-face Adapter's Maximum Input Power values are displayed under the Available Combinations and based on a 1750 rpm motor.

lb	W	56C	140TC	180TC	210TC	250TC
SK 92772	99	101	101	112	128	128

Dimensions

- Gearmotor
- Reducers C-Face
- Options
- Shafts



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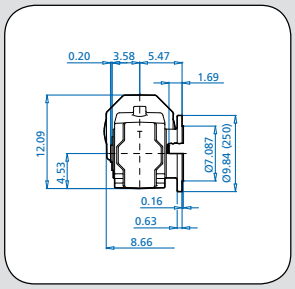
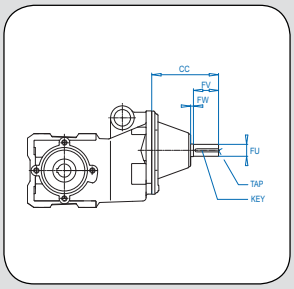
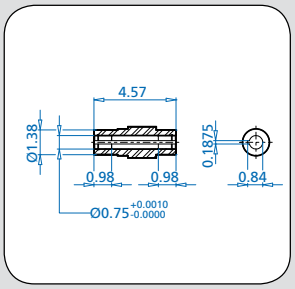
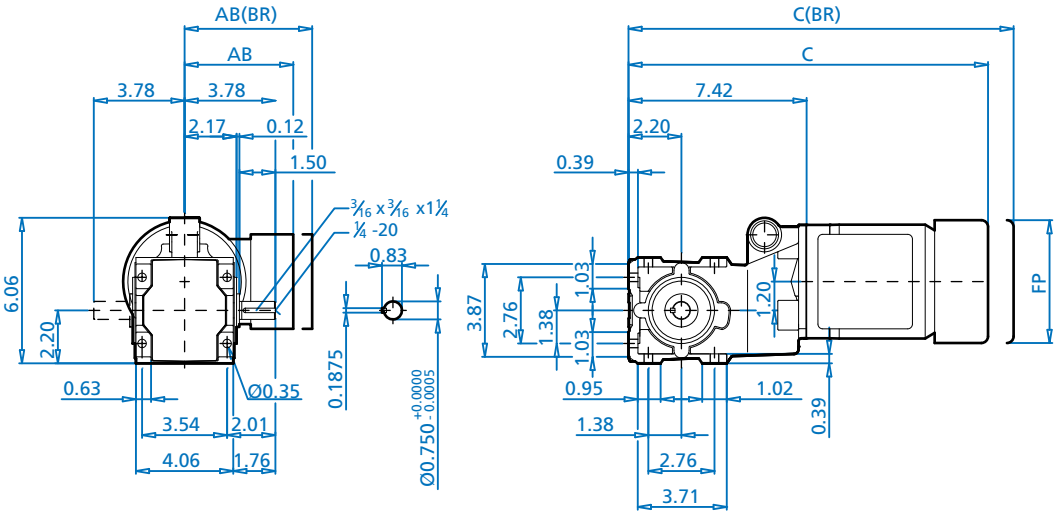






SK 92072



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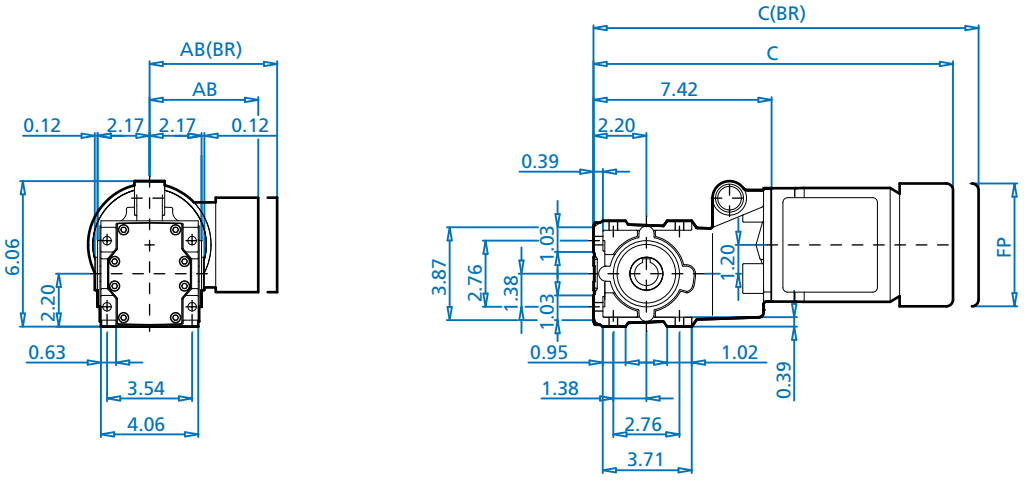

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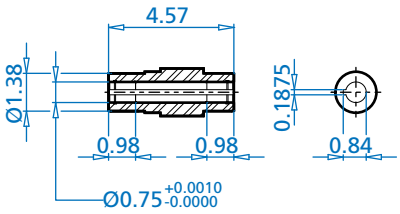
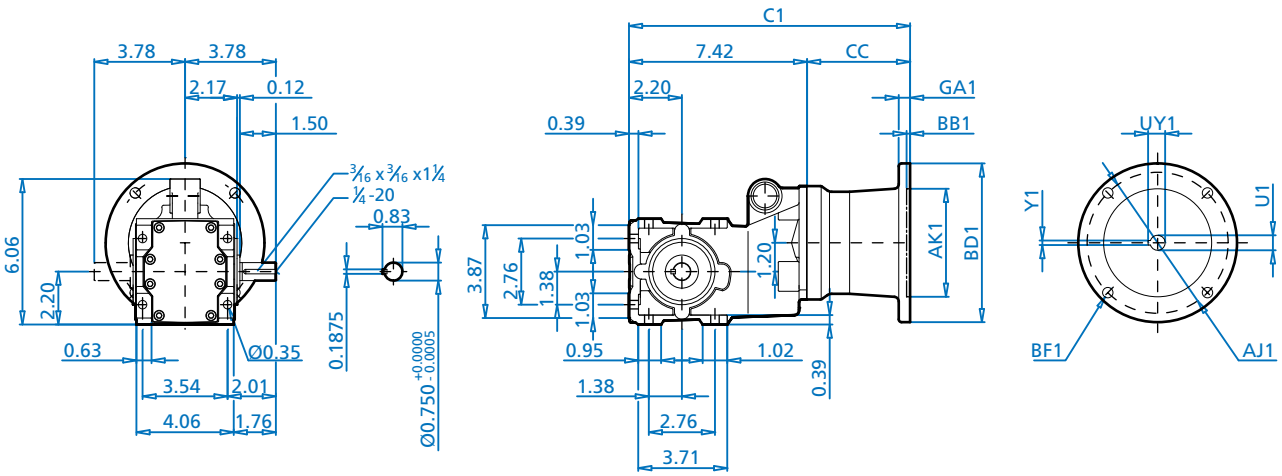


Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	
AB	4.51	4.86	5.59	5.79	
AB (BR)	4.84	5.24	5.59	5.79	
C	15.01	15.86	16.73	18.26	
C (BR)	17.21	18.15	19.25	21.22	
FP	5.09	5.72	6.43	7.19	

SK 92072



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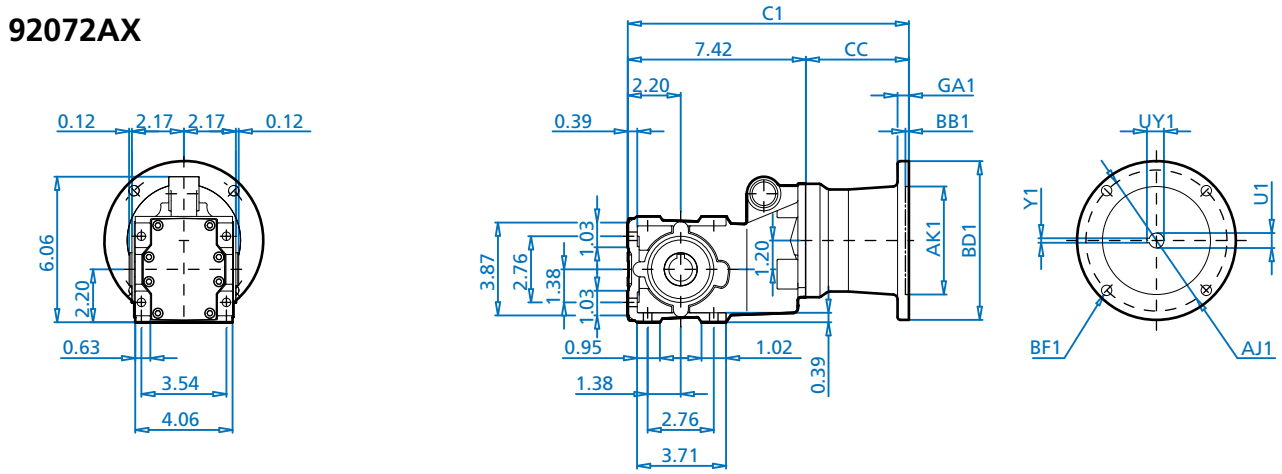

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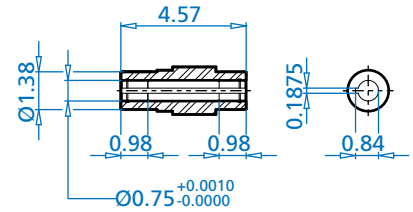
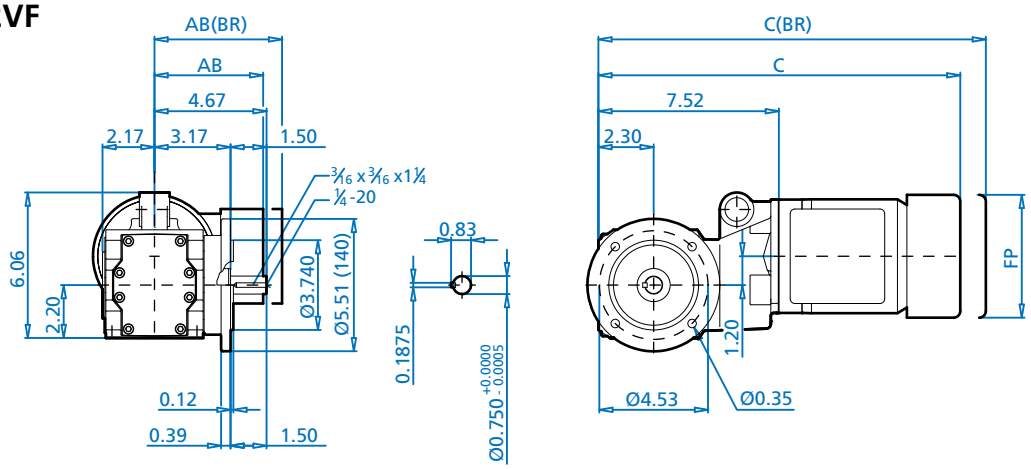


NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	11.71	4.29
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	11.71	4.29

SK 92072VF



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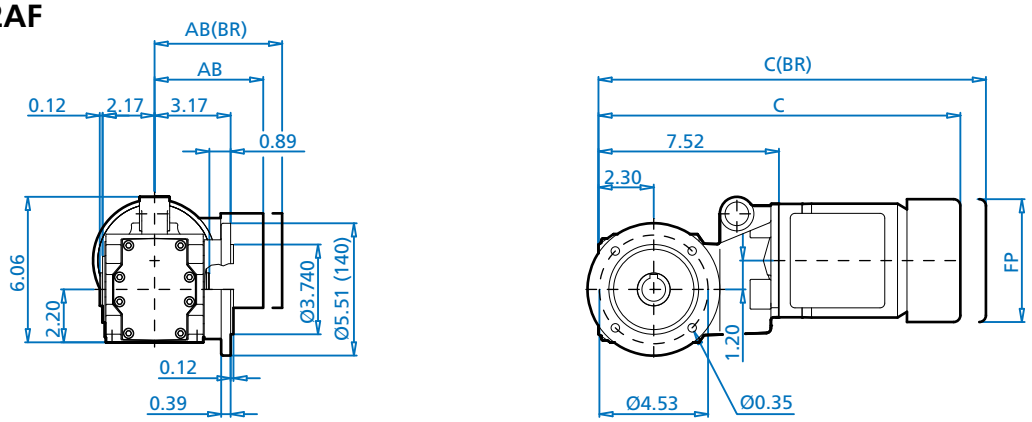

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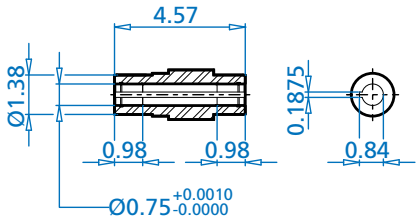

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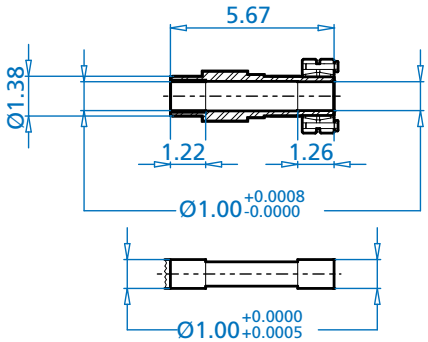
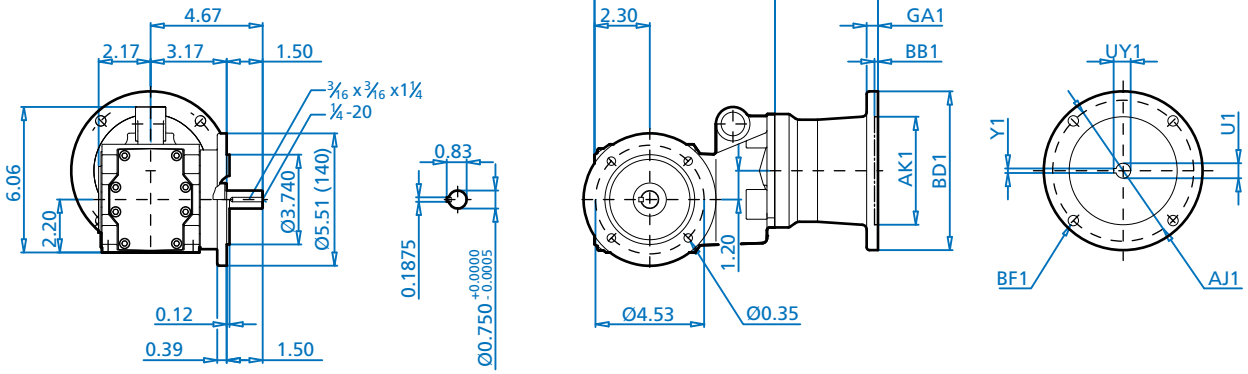


Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	
AB	4.51	4.86	5.59	5.79	
AB (BR)	4.84	5.24	5.59	5.79	
C	15.11	15.96	16.83	18.36	
C (BR)	17.31	18.24	19.35	21.31	
FP	5.09	5.72	6.43	7.19	

SK 92072VF



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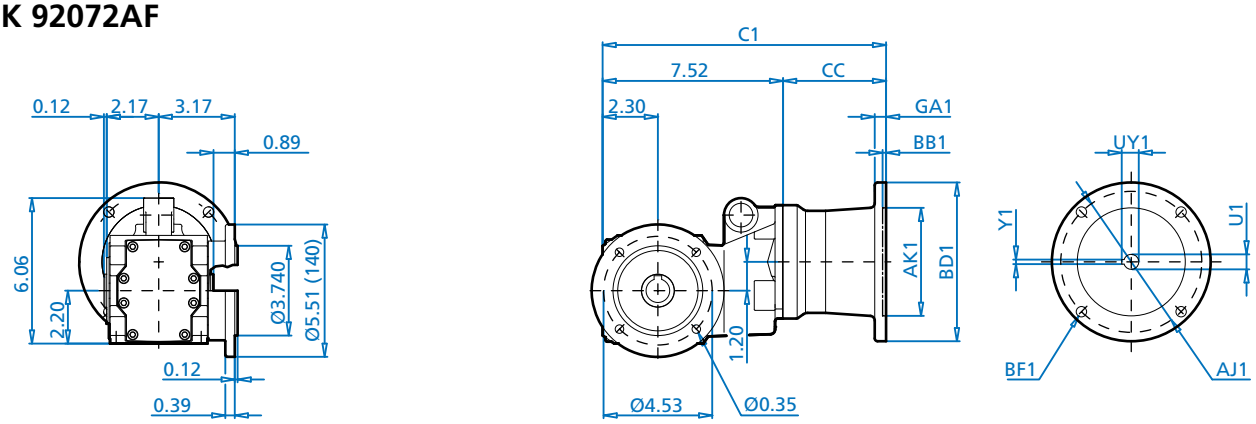

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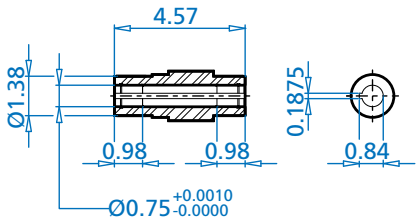

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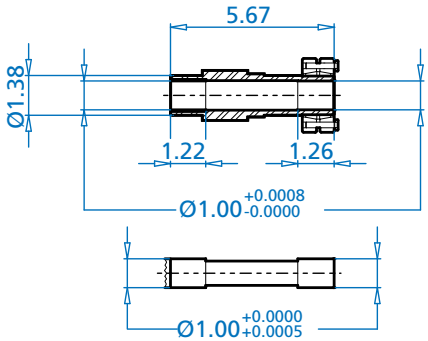
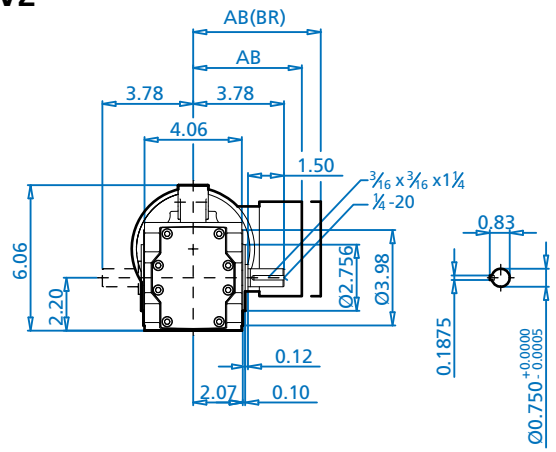
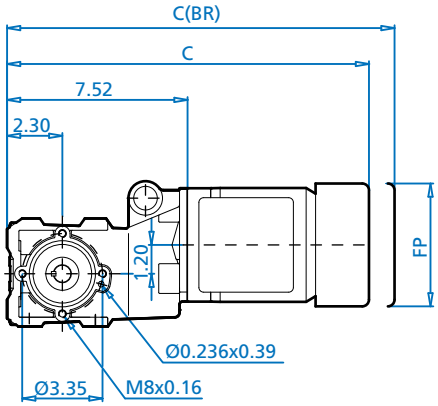


NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	11.81	4.29
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	11.81	4.29

SK 92072VZ





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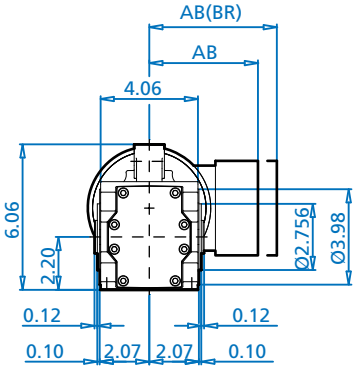

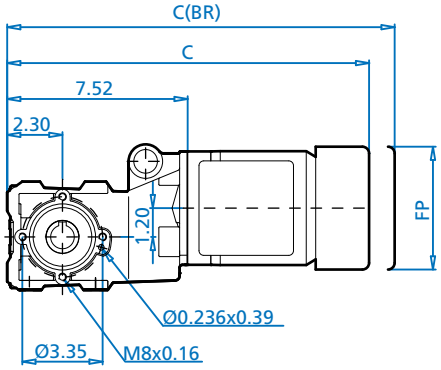

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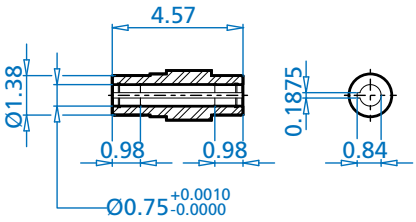

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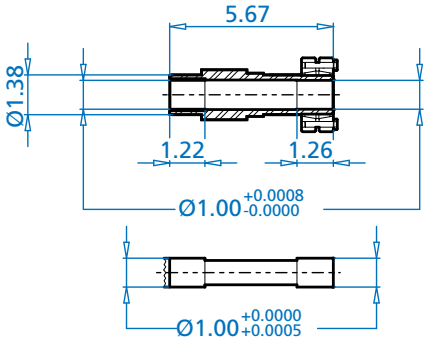
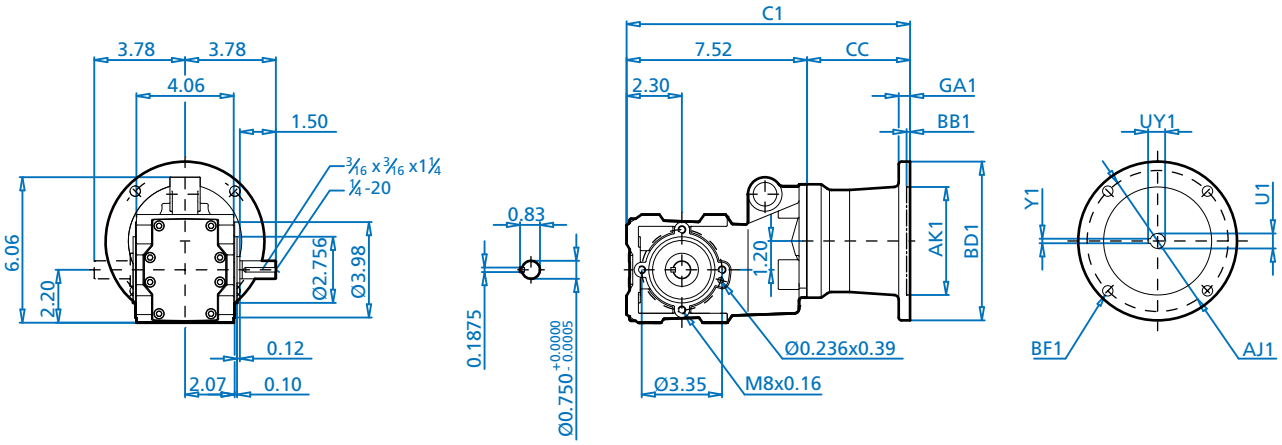


Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	For Other Connection Possibilities please see ⇨ 📖 108 & 109
Energy efficiency			80LH	90SH/LH	
AB	4.51	4.86	5.59	5.79	
AB (BR)	4.84	5.24	5.59	5.79	
C	15.11	15.96	16.83	18.36	
C (BR)	17.31	18.24	19.35	21.31	
FP	5.09	5.72	6.43	7.19	

SK 92072VZ



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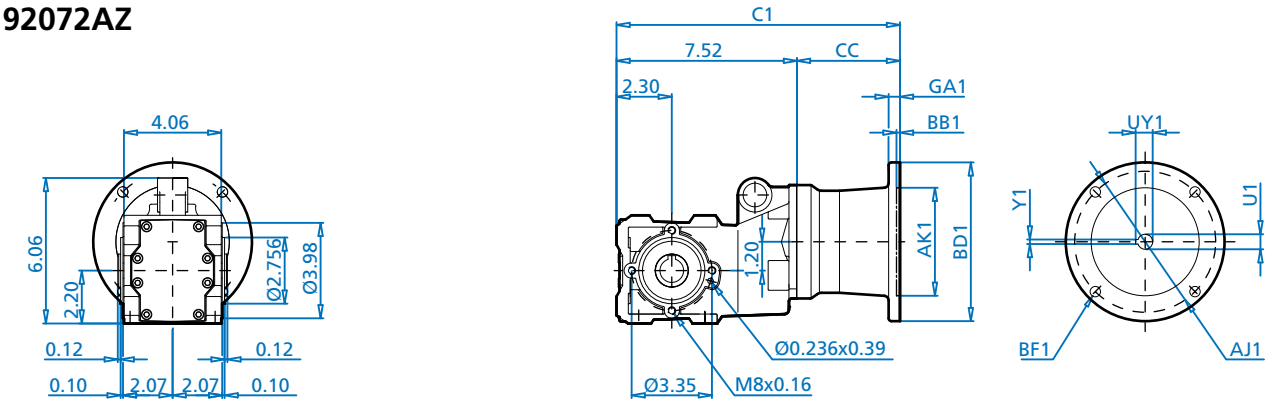

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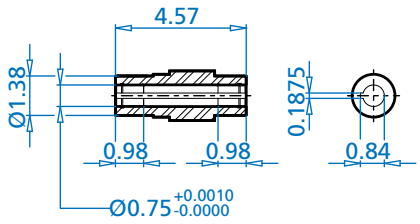

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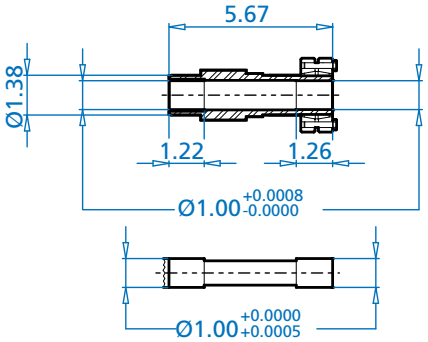
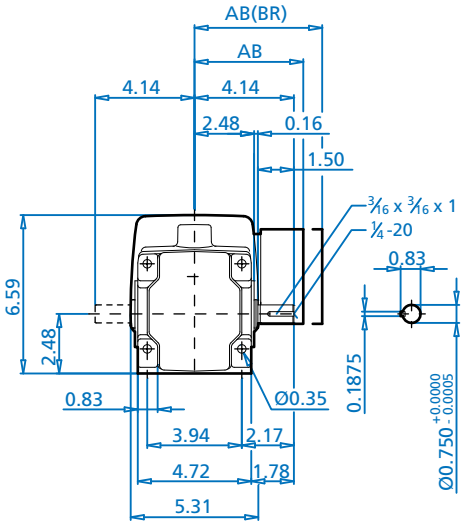
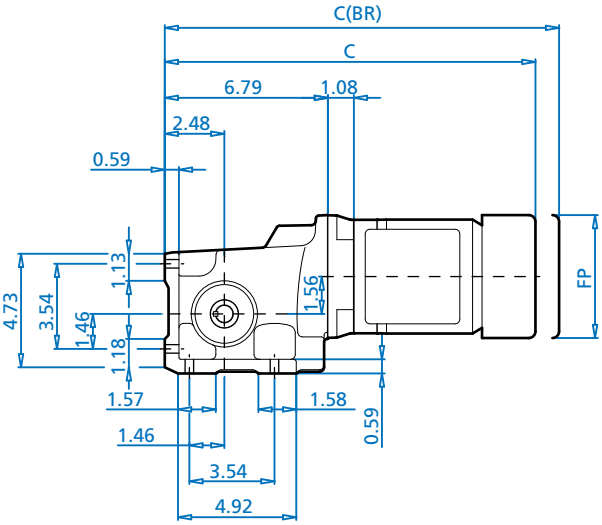


NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	11.81	4.29
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	11.81	4.29

SK 92172





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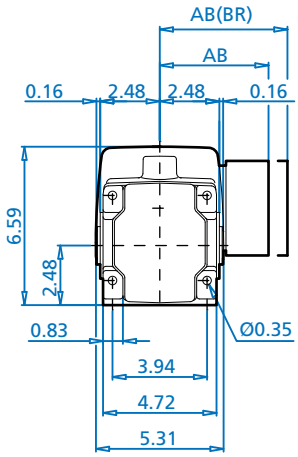

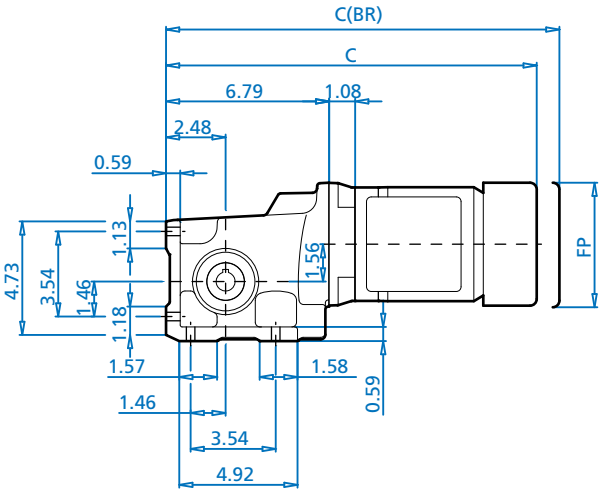

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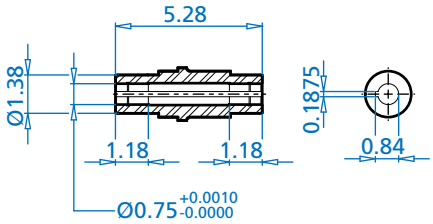
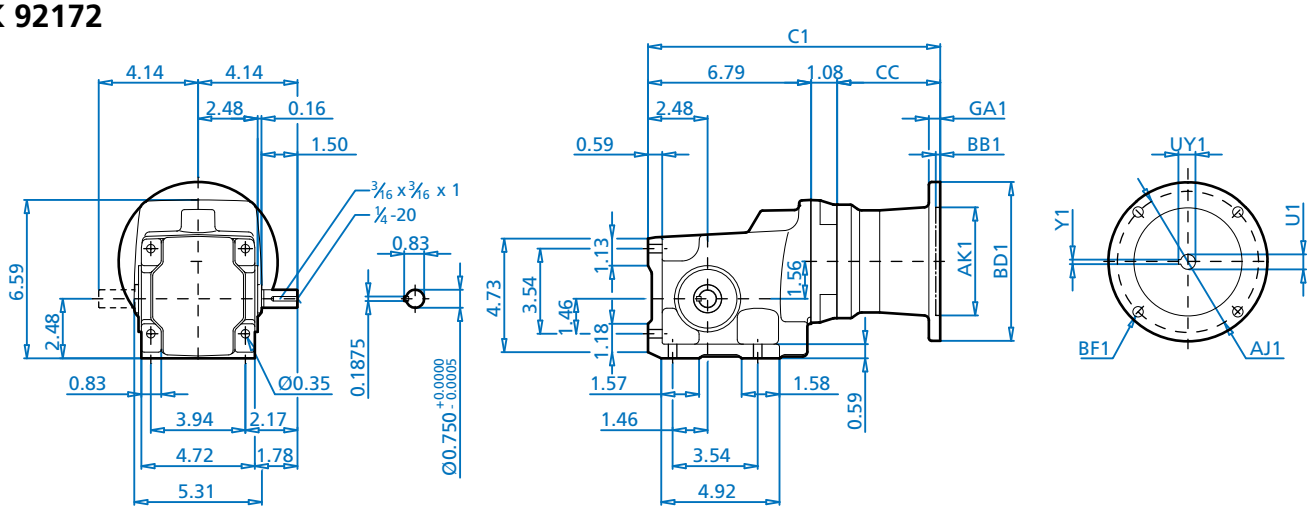


Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	
AB	4.51	4.86	5.59	5.79	
AB (BR)	4.84	5.24	5.59	5.79	
C	15.46	16.31	17.18	18.72	
C (BR)	17.67	18.60	19.70	21.67	
FP	5.09	5.72	6.43	7.19	

SK 92172



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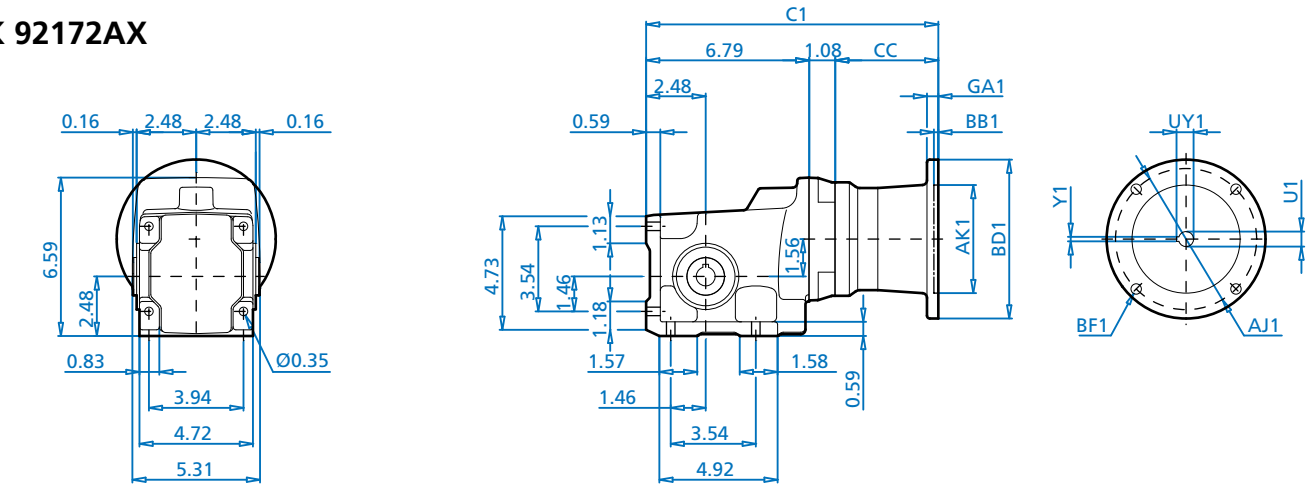

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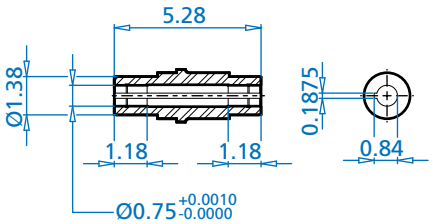
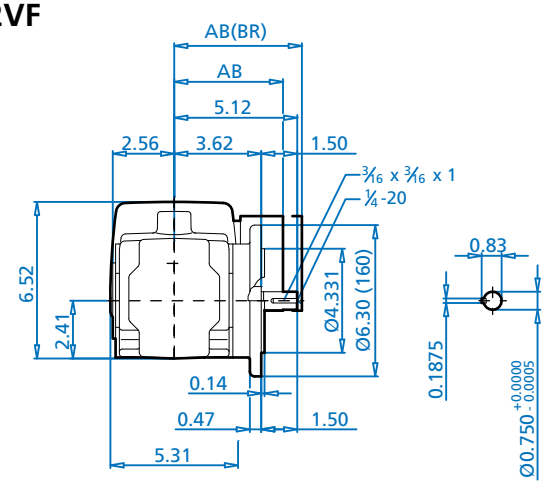
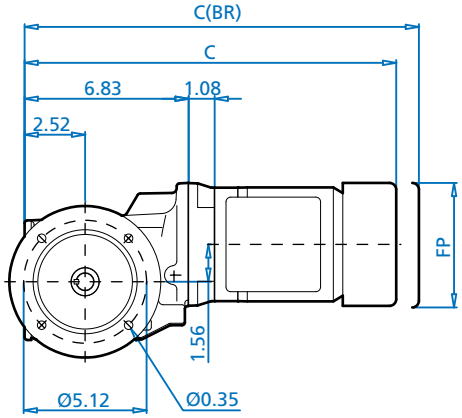


NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	12.17	4.29
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	12.17	4.29

SK 92172VF





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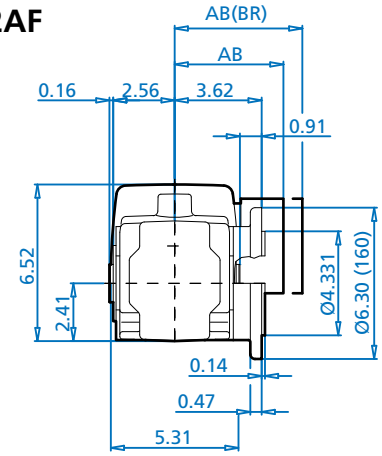

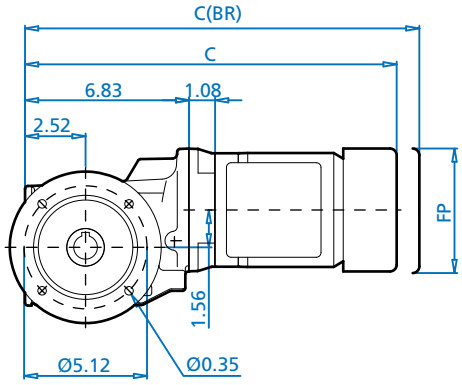

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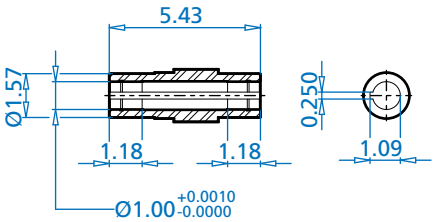
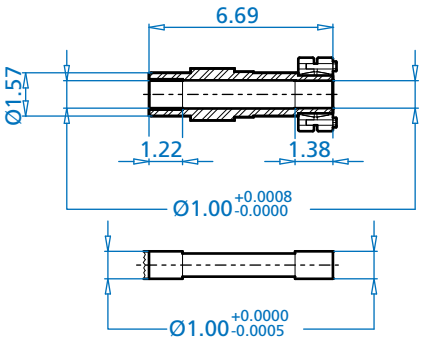


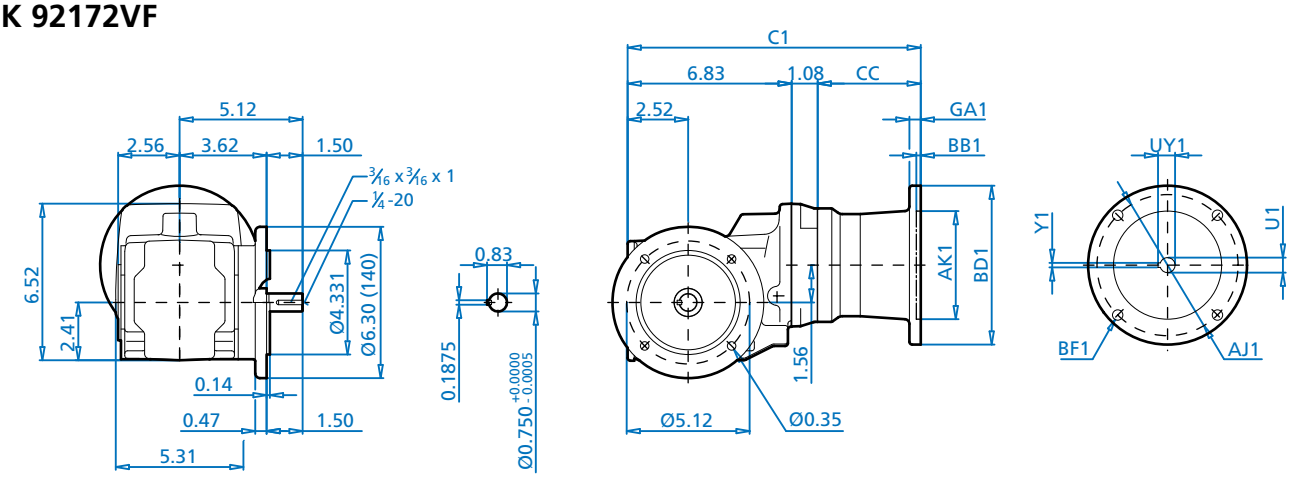
SK 92172AFS



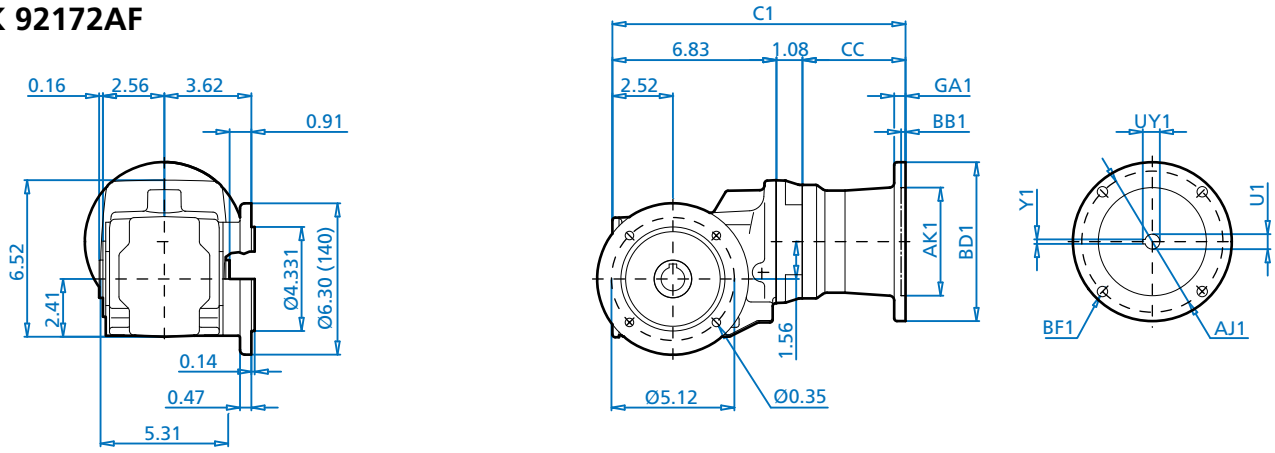
Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	
AB	4.51	4.86	5.59	5.79	
AB (BR)	4.84	5.24	5.59	5.79	
C	15.50	16.35	17.22	18.76	
C (BR)	17.70	18.64	19.74	21.71	
FP	5.09	5.72	6.43	7.19	

SK 92172VF



SK 92172AF



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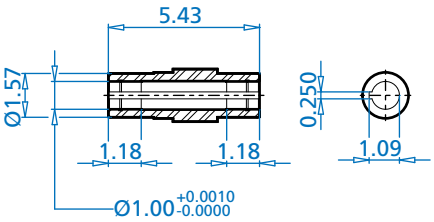

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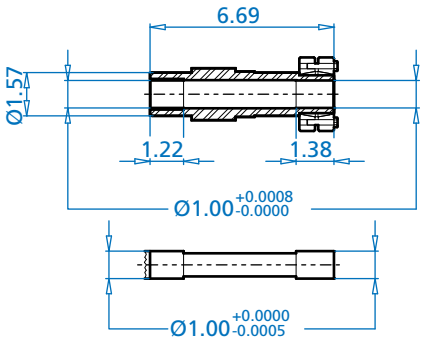
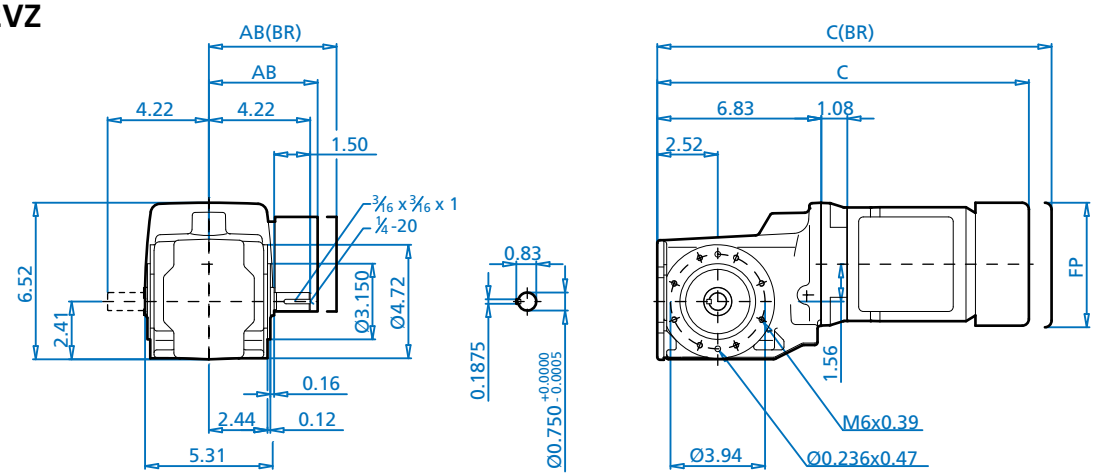


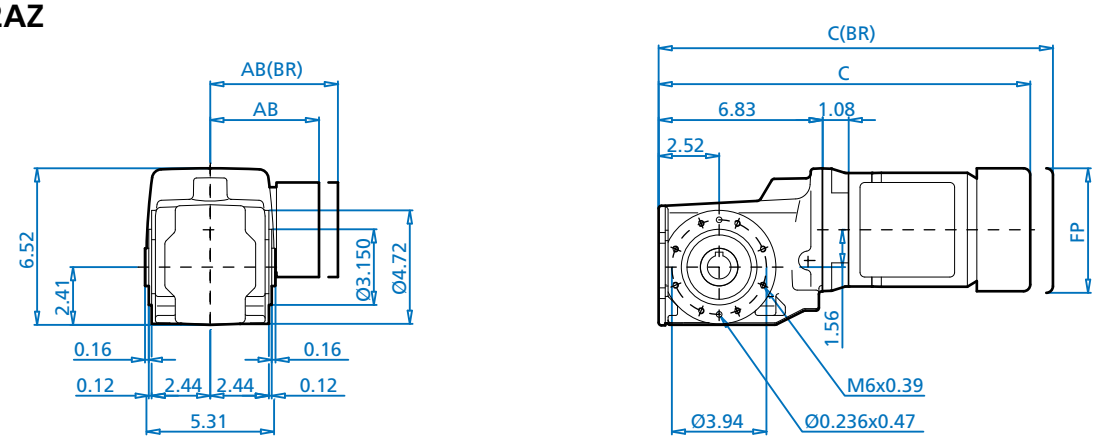
NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	12.20	4.29
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	12.20	4.29

SK 92172VZ



SK 92172AZ



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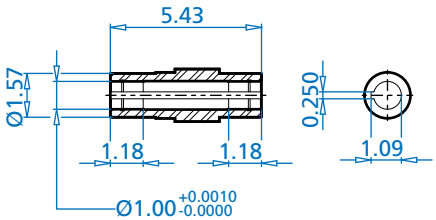

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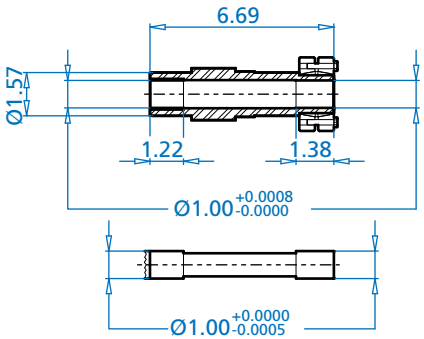
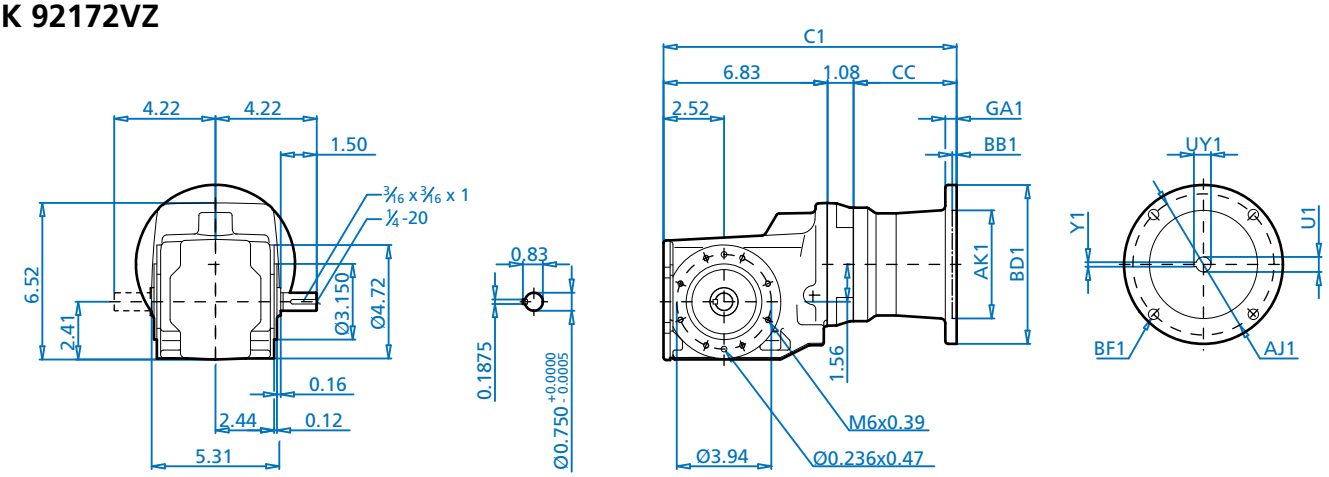


Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	
AB	4.51	4.86	5.59	5.79	
AB (BR)	4.84	5.24	5.59	5.79	
C	15.50	16.35	17.22	18.76	
C (BR)	17.70	18.64	19.74	21.71	
FP	5.09	5.72	6.43	7.19	

SK 92172VZ



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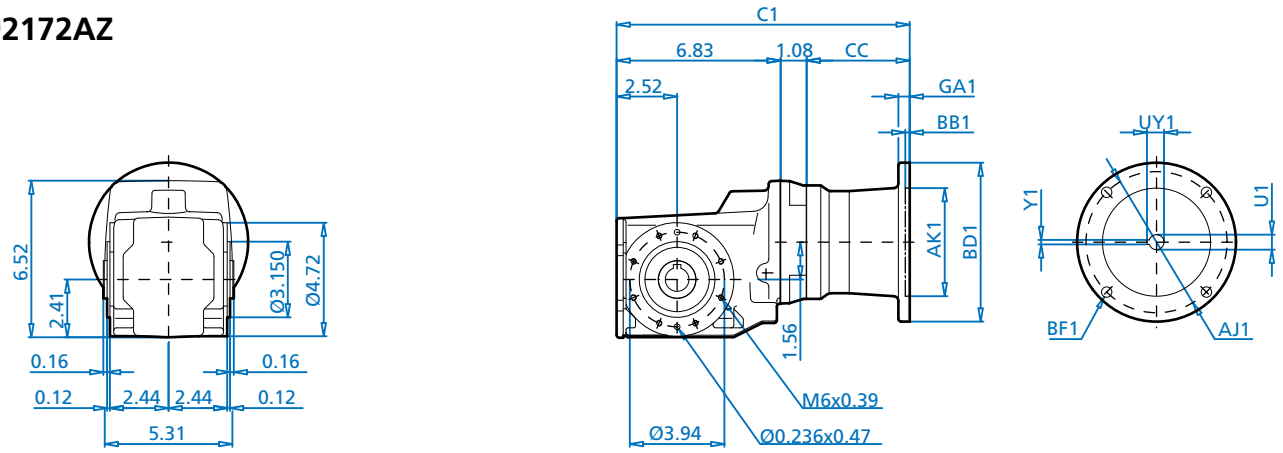

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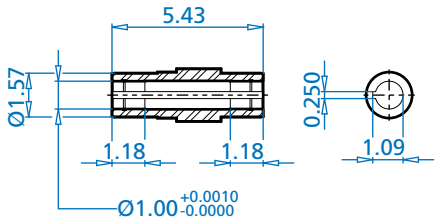

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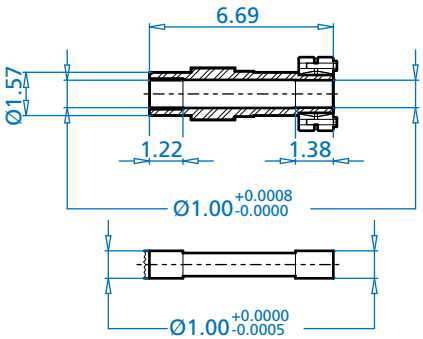
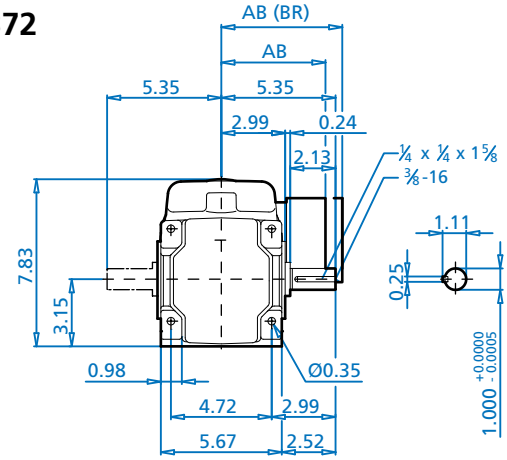


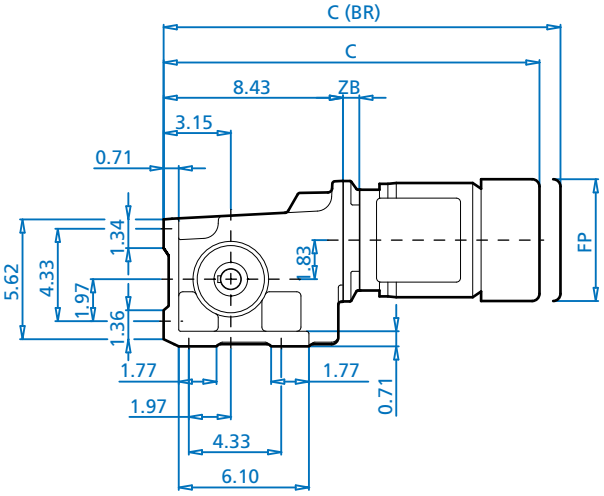
NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	12.20	4.29
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	12.20	4.29

ALTERNATE SHAFTS SEE PAGES 112 - 116

SK 92372





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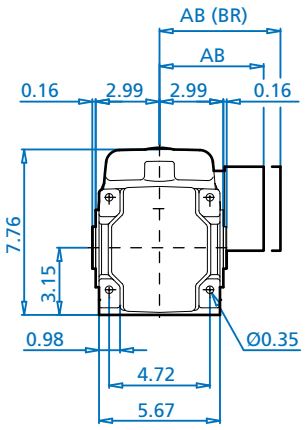

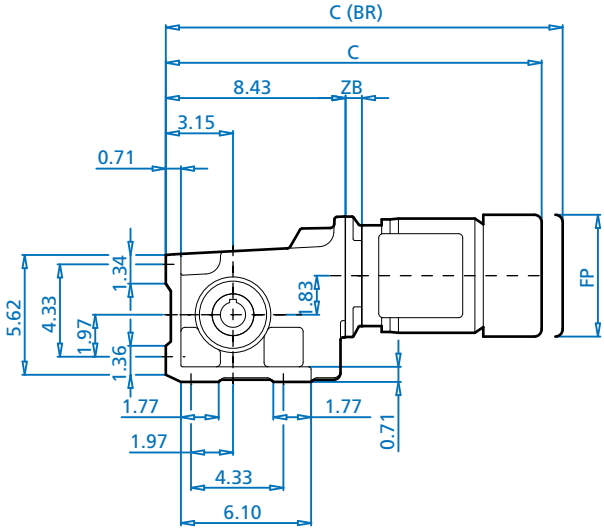

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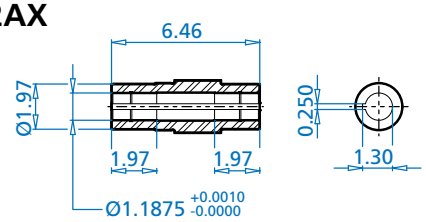
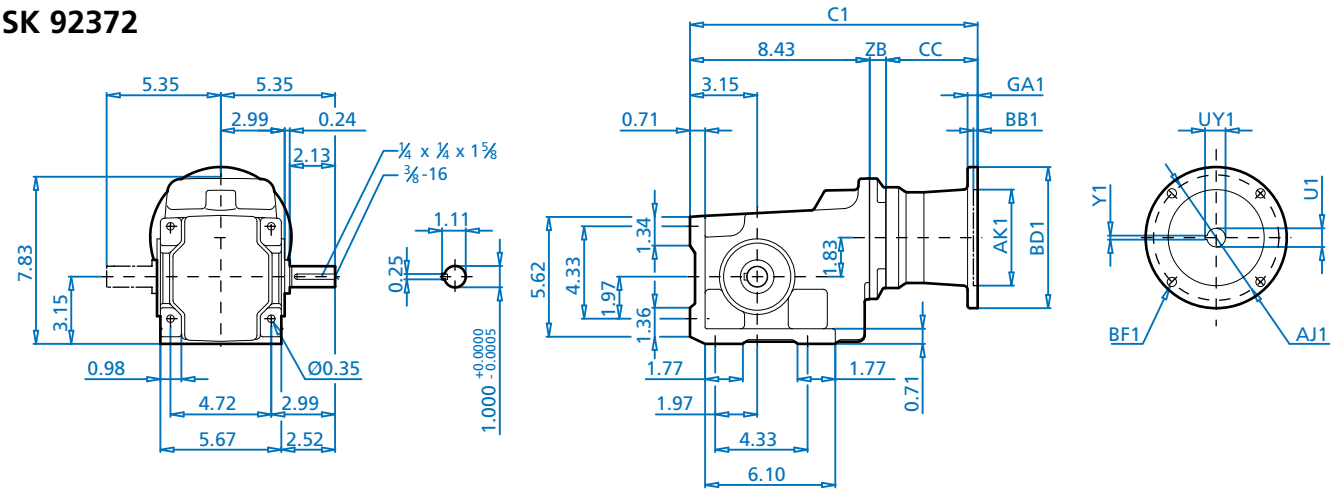


Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	100L	112M		For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	100LH		112MH	
AB	4.51	4.86	5.59	5.79	6.65	7.05	7.05	
AB (BR)	4.84	5.24	5.59	5.79	6.77	7.17	N/A	
C	16.80	17.65	18.52	20.65	21.87	22.62	23.61	
C (BR)	19.00	19.94	21.04	23.60	25.47	26.32	N/A	
FP	5.09	5.72	6.43	7.19	7.90	8.87	8.87	
ZB	0.79	0.79	0.79	1.38	1.38	1.38	1.38	

SK 92372



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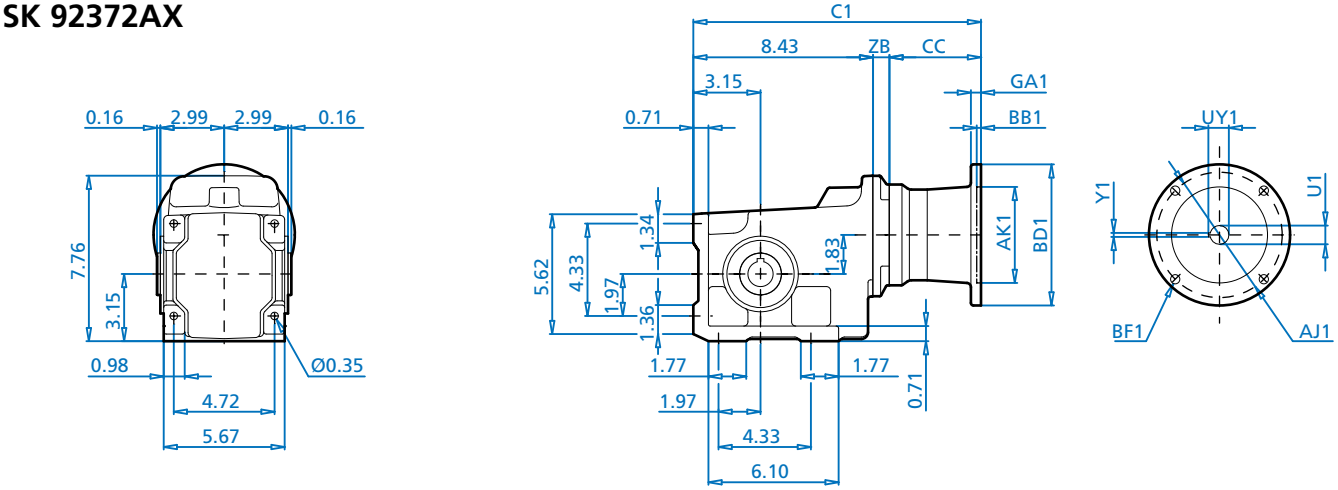

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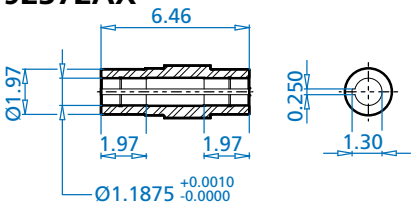
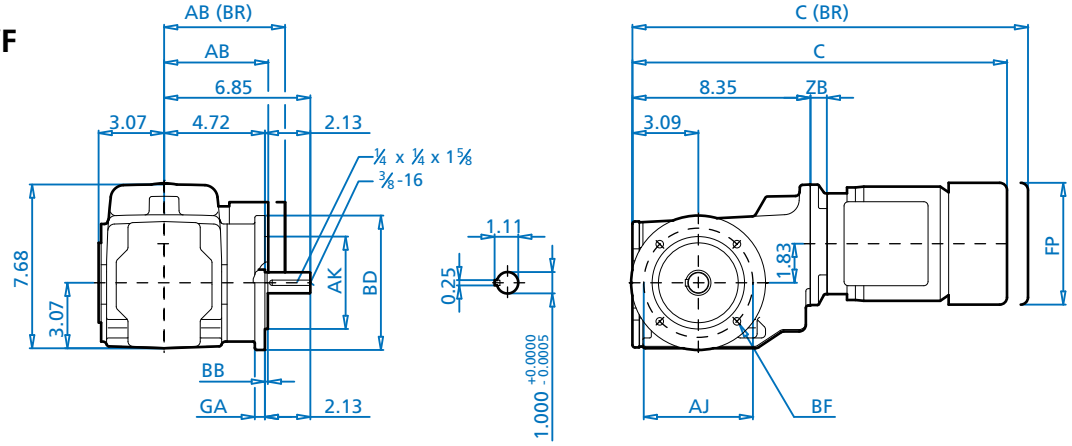


NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC	ZB
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	13.50	4.29	0.79
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	13.50	4.29	0.79
180TC	7.25	8.500	0.23	9.17	0.59	1.125	1.24	0.250	15.09	5.28	1.38

SK 92372 + Motor

SK 92372VF



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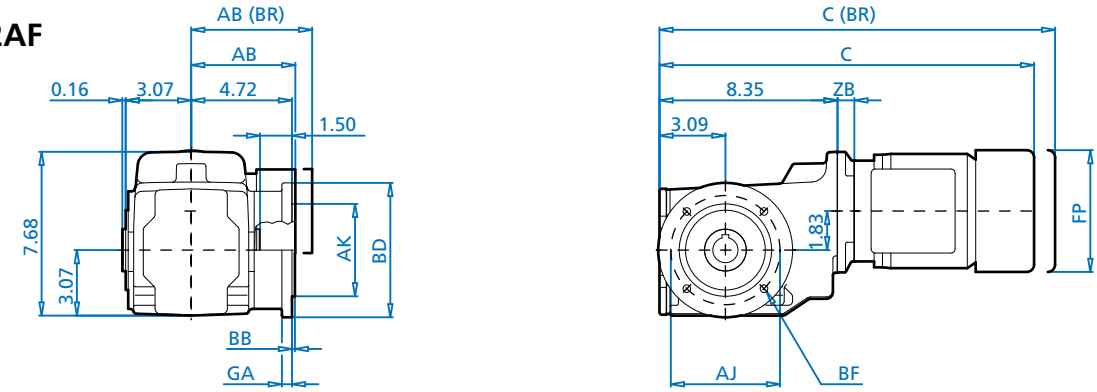

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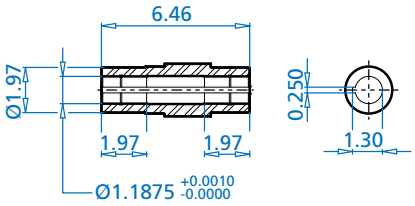

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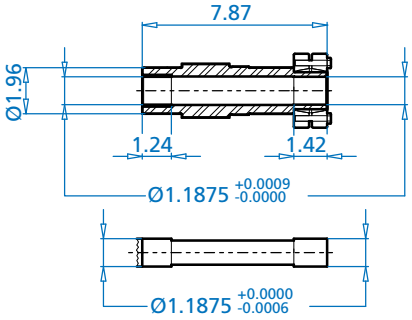
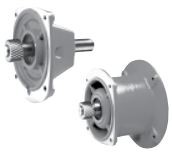


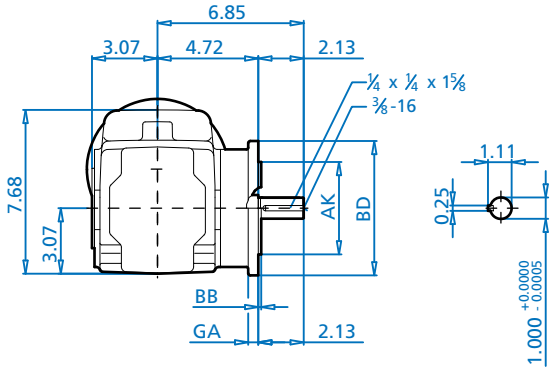
Mounting flange

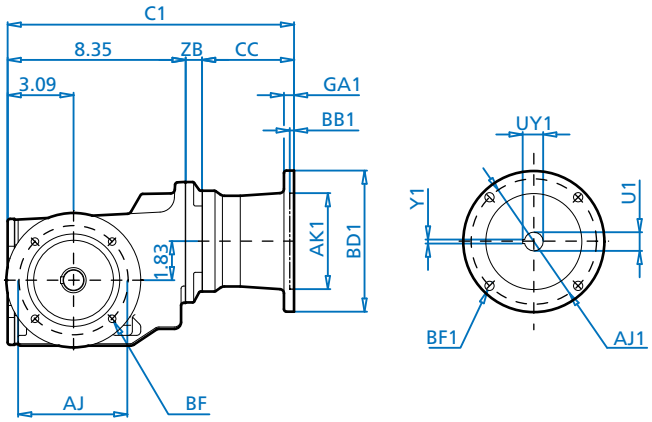
BD (mm)	AJ	AK		BB	BF	GA
6.30 (160)	5.12	4.33	+0.0005 - 0.0004	0.14	0.35	0.47
7.87 (200)	6.50	5.118	+0.0005 - 0.0004	0.14	0.43	0.47

Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	100L	112M		For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	100LH		112MH	
AB	4.51	4.86	5.59	5.79	6.65	7.05	7.05	
AB (BR)	4.84	5.24	5.59	5.79	6.77	7.17	N/A	
C	16.72	17.57	18.44	20.57	21.79	22.54	23.53	
C (BR)	18.93	19.86	20.96	23.52	25.39	26.24	N/A	
FP	5.09	5.72	6.43	7.19	7.90	8.87	8.87	
ZB	0.79	0.79	0.79	1.38	1.38	1.38	1.38	

SK 92372VF





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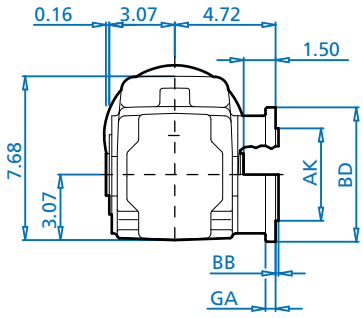

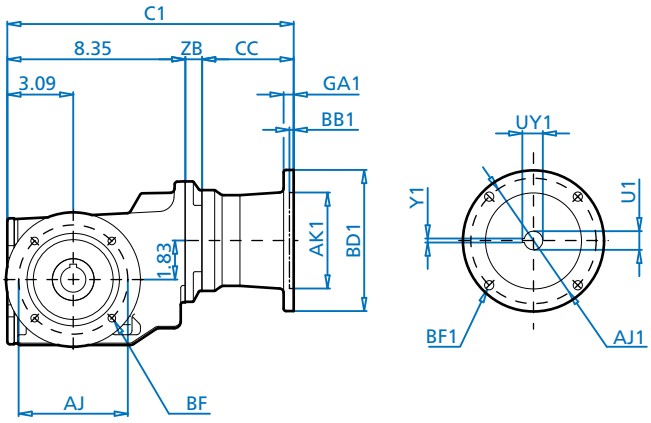

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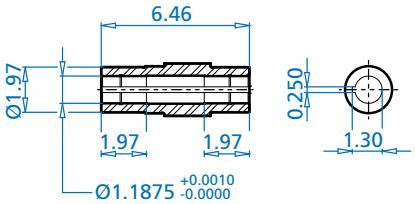

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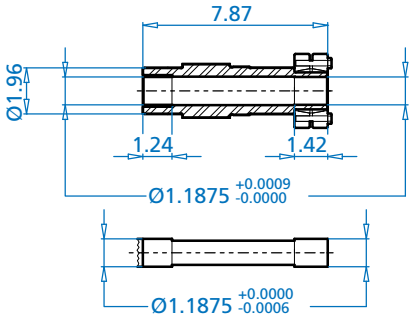


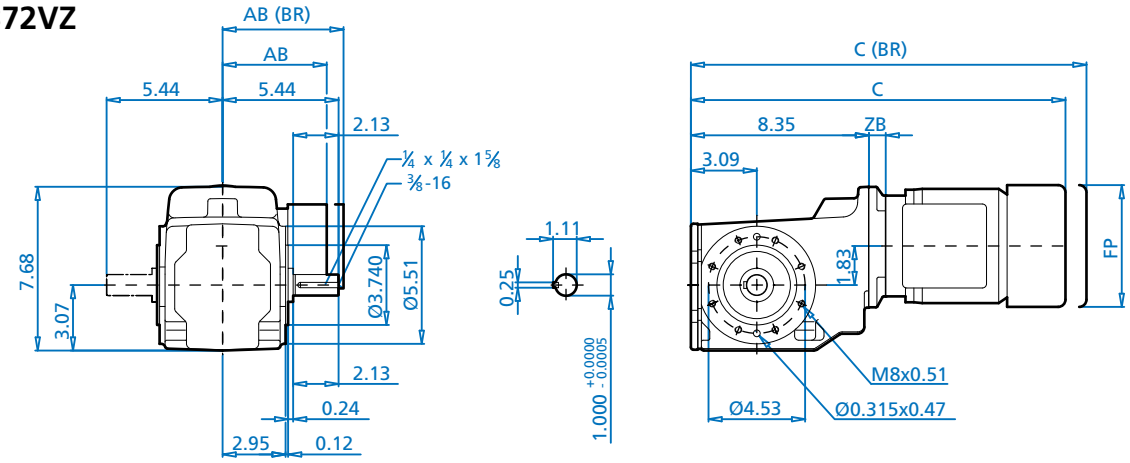
Mounting flange

BD (mm)	AJ	AK	BB	BF	GA
6.30 (160)	5.12	4.33 +0.0005 - 0.0004	0.14	0.35	0.47
7.87 (200)	6.50	5.118 +0.0005 - 0.0004	0.14	0.43	0.47

NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC	ZB
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	13.43	4.29	0.79
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	13.43	4.29	0.79
180TC	7.25	8.500	0.23	9.17	0.59	1.125	1.24	0.250	15.01	5.28	1.38

SK 92372VZ



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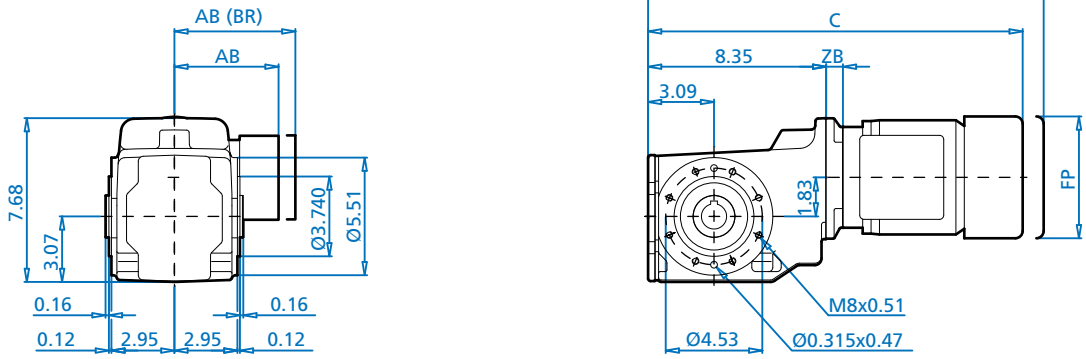

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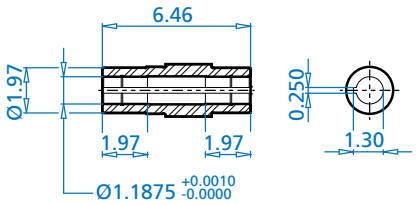

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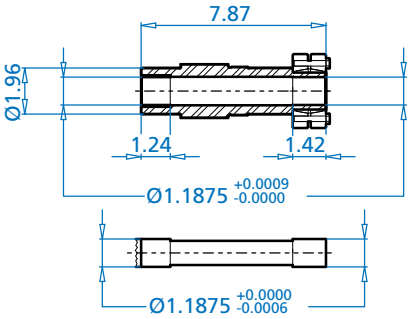
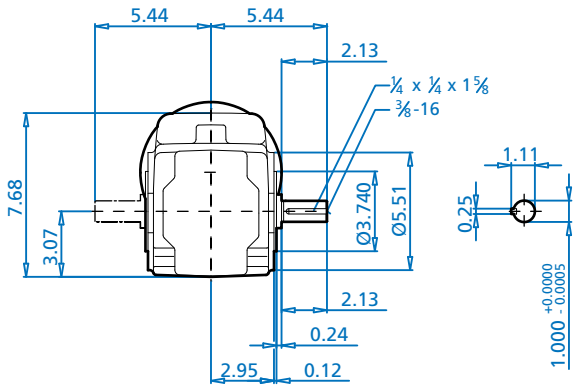
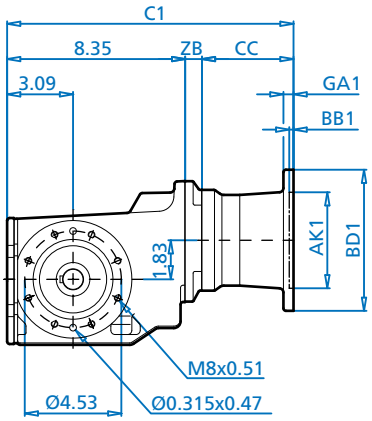


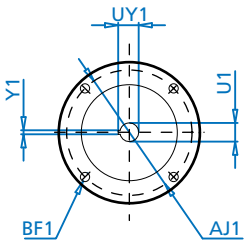
Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	100L	112M		For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	100LH		112MH	
AB	4.51	4.86	5.59	5.79	6.65	7.05	7.05	
AB (BR)	4.84	5.24	5.59	5.79	6.77	7.17	N/A	
C	16.72	17.57	18.44	20.57	21.79	22.54	23.53	
C (BR)	18.93	19.86	20.96	23.52	25.39	26.24	N/A	
FP	5.09	5.72	6.43	7.19	7.90	8.87	8.87	
ZB	0.79	0.79	0.79	1.38	1.38	1.38	1.38	

SK 92372VZ







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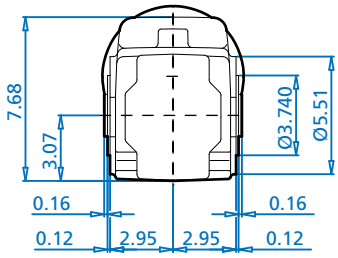

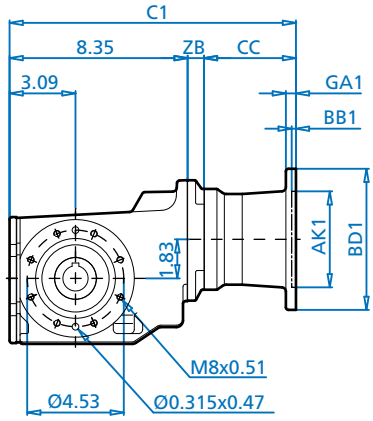

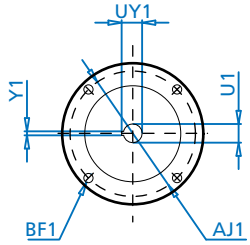

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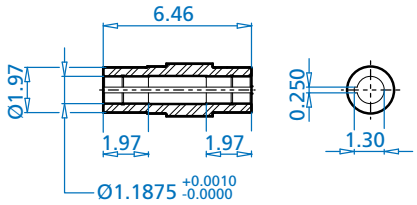

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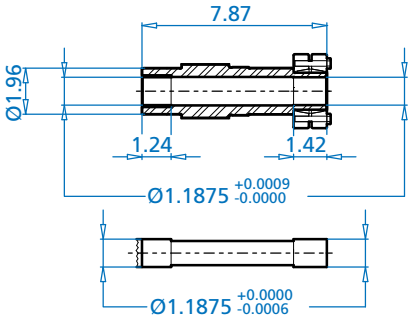
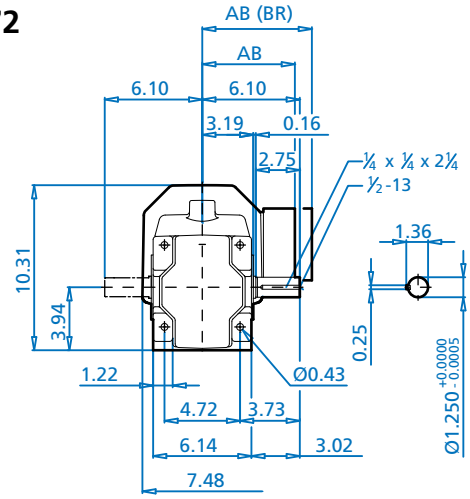
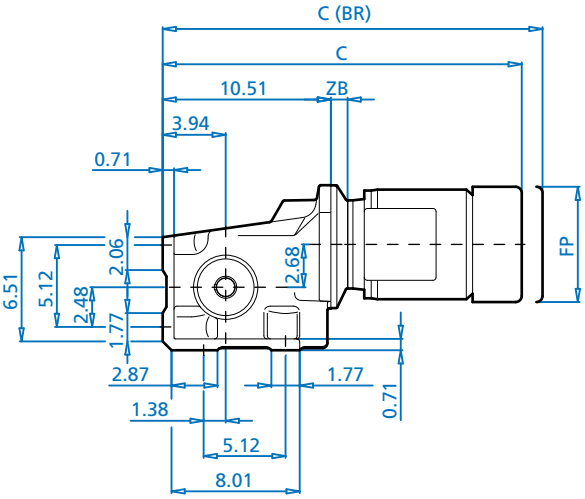


NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC	ZB
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	13.43	4.29	0.79
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	13.43	4.29	0.79
180TC	7.25	8.500	0.23	9.17	0.59	1.125	1.24	0.250	15.01	5.28	1.38

SK 92672





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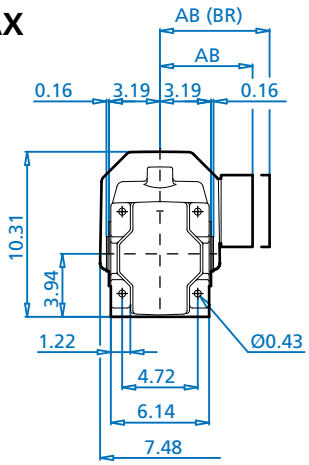

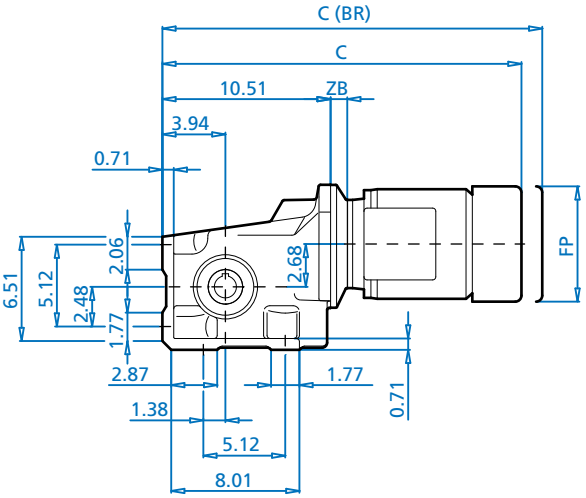

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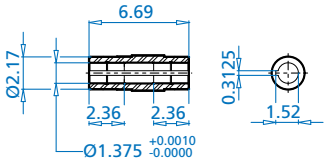
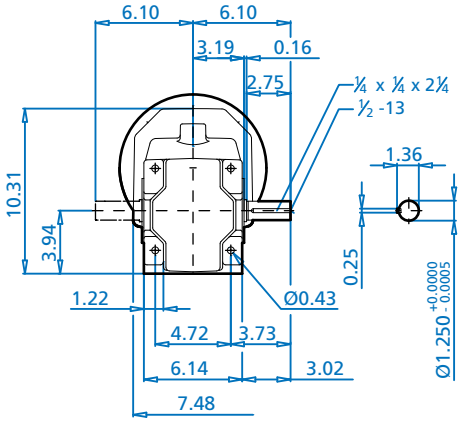
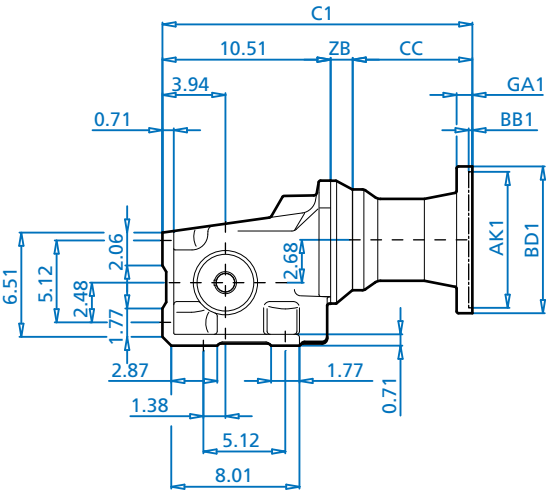


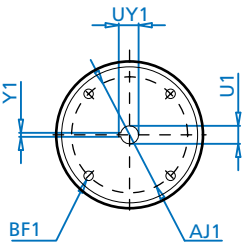
Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	100L	112M		132S	For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	100LH		112MH	132SH	
AB	4.51	4.86	5.59	5.79	6.65	7.05	7.05	8.03	
AB (BR)	4.84	5.24	5.59	5.79	6.77	7.17	N/A	7.91	
C	18.61	19.46	20.33	22.42	23.64	24.70	25.70	28.32	
C (BR)	20.81	21.75	22.85	25.37	27.24	28.41	N/A	32.54	
FP	5.09	5.72	6.43	7.19	7.90	8.87	8.87	10.45	
ZB	0.51	0.51	0.51	1.06	1.06	1.38	1.38	1.38	

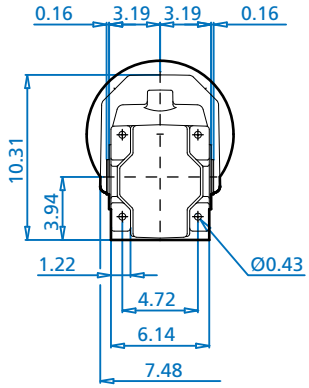
SK 92672

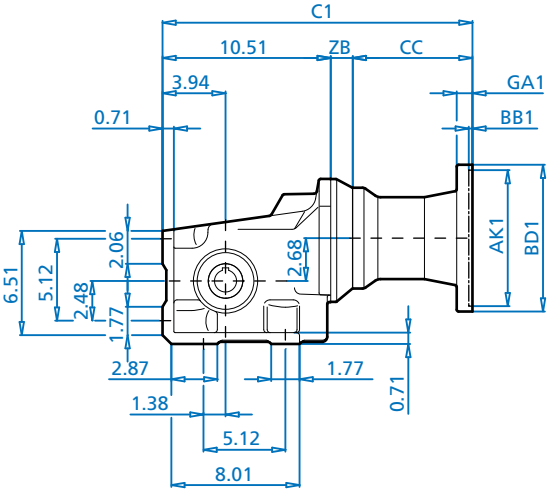


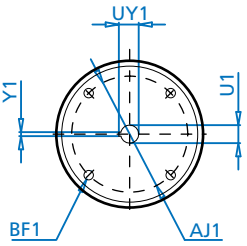




SK 92672AX







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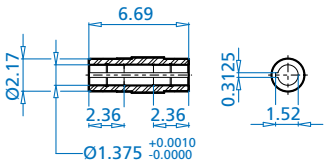
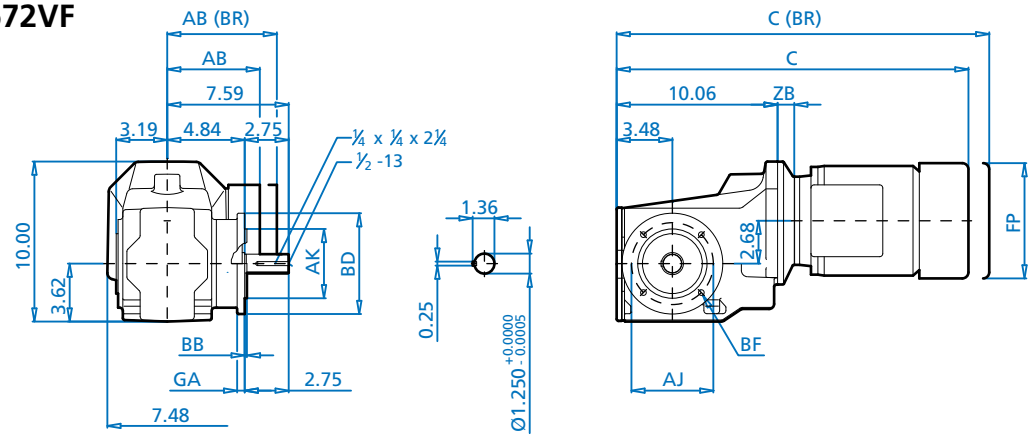


NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC	ZB
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	15.31	4.29	0.51
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	15.31	4.29	0.51
180TC	7.25	8.500	0.23	9.17	0.59	1.125	1.24	0.250	19.14	7.25	1.38
210TC	7.25	8.500	0.23	9.17	0.59	1.375	1.52	0.312	19.14	7.25	1.38

ALTERNATE SHAFTS SEE PAGES 112 - 116

SK 92672VF



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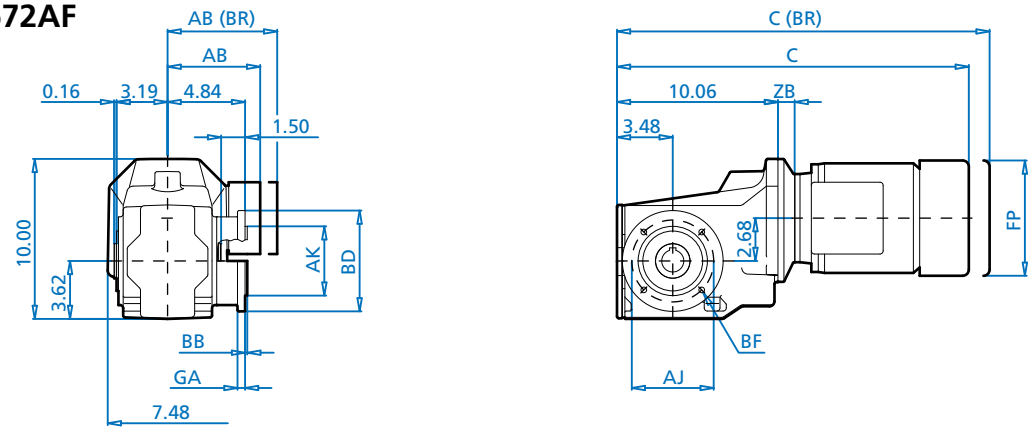

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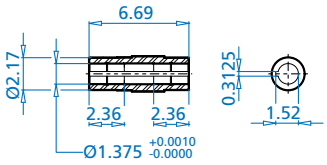

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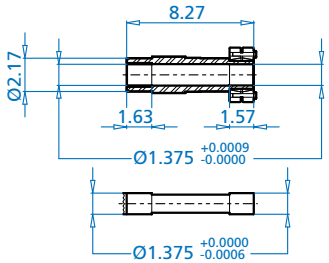


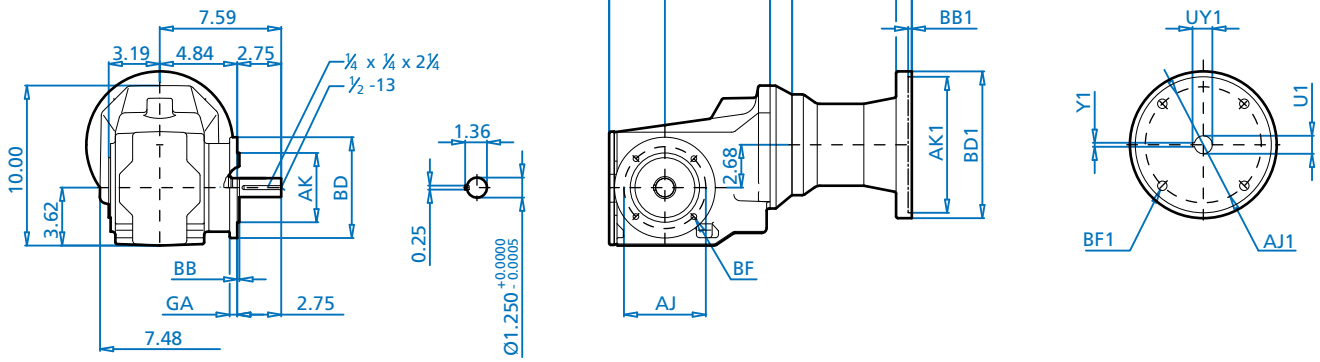
Mounting flange

BD (mm)	AJ	AK	BB	BF	GA
6.30 (160)	5.12	4.331 +0.0005 - 0.0004	0.14	0.35	0.47
7.87 (200)	6.50	5.118 +0.0005 - 0.0004	0.14	0.43	0.47

Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	100L	112M		132S	For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	100LH		112MH	132SH	
AB	4.51	4.86	5.59	5.79	6.65	7.05	7.05	8.03	
AB (BR)	4.84	5.24	5.59	5.79	6.77	7.17	N/A	7.91	
C	18.16	19.01	19.88	21.96	23.19	24.25	25.24	27.87	
C (BR)	20.36	21.30	22.40	24.92	26.79	27.95	N/A	32.08	
FP	5.09	5.72	6.43	7.19	7.90	8.87	8.87	10.45	
ZB	0.51	0.51	0.51	1.06	1.06	1.38	1.38	1.38	

SK 92672VF



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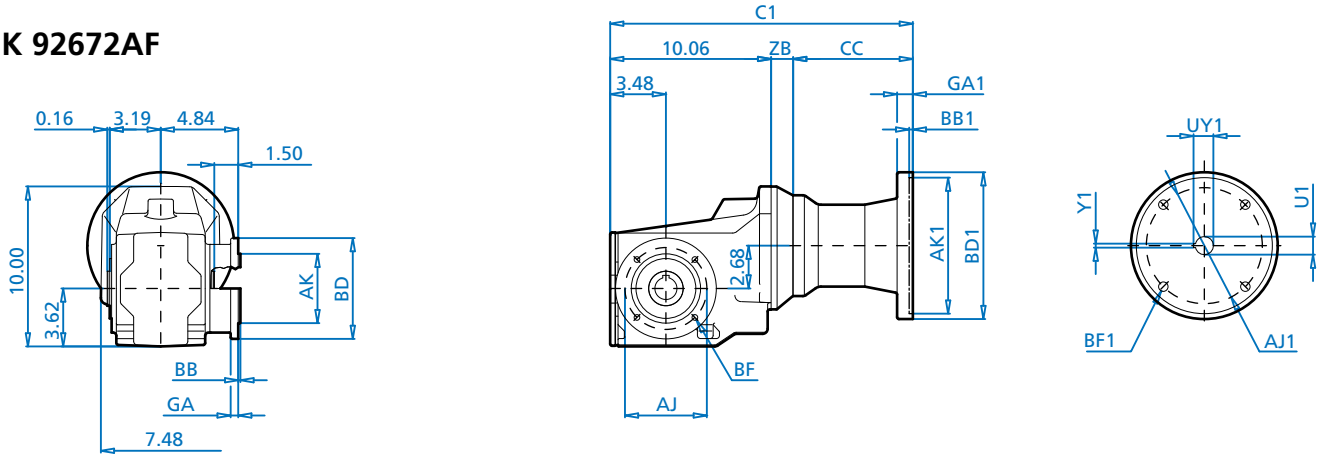

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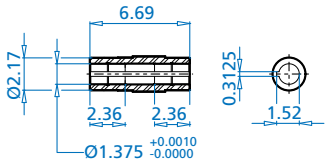

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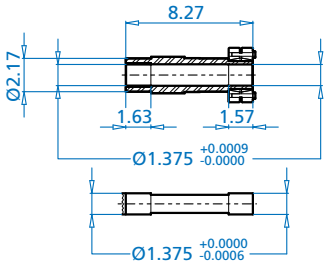


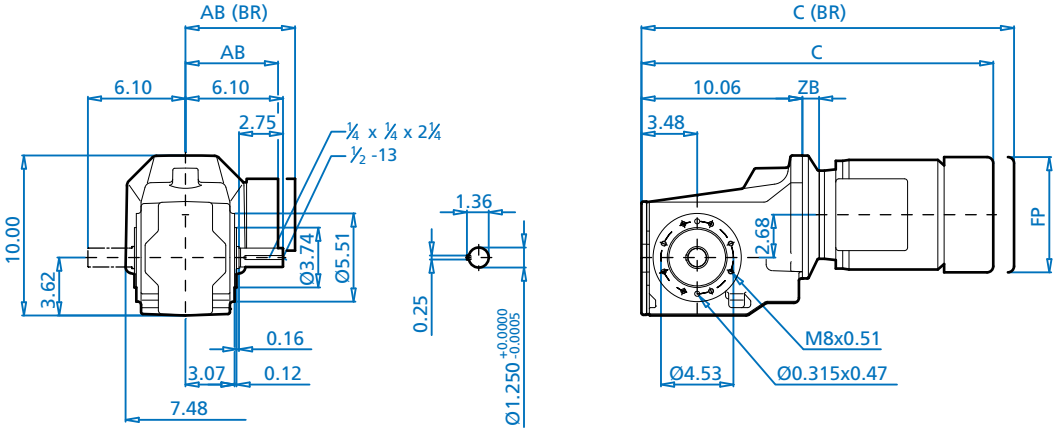
Mounting flange

BD (mm)	AJ	AK	BB	BF	GA
6.30 (160)	5.12	4.331 +0.0005 - 0.0004	0.14	0.35	0.47
7.87 (200)	6.50	5.118 +0.0005 - 0.0004	0.14	0.43	0.47

NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC	ZB
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	14.86	4.29	0.51
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	14.86	4.29	0.51
180TC	7.25	8.500	0.23	9.17	0.59	1.125	1.24	0.250	18.69	7.25	1.38
210TC	7.25	8.500	0.23	9.17	0.59	1.375	1.52	0.312	18.69	7.25	1.38

SK 92672VZ



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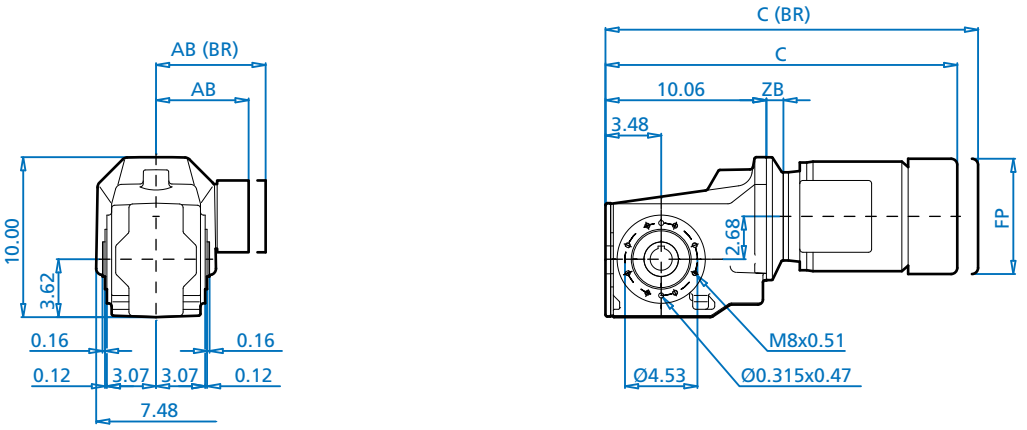

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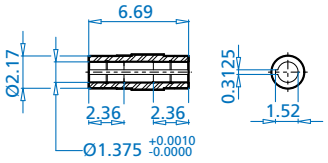

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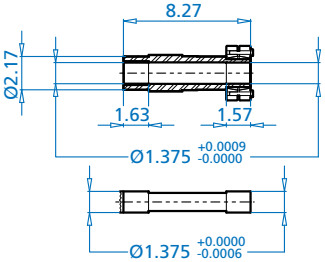
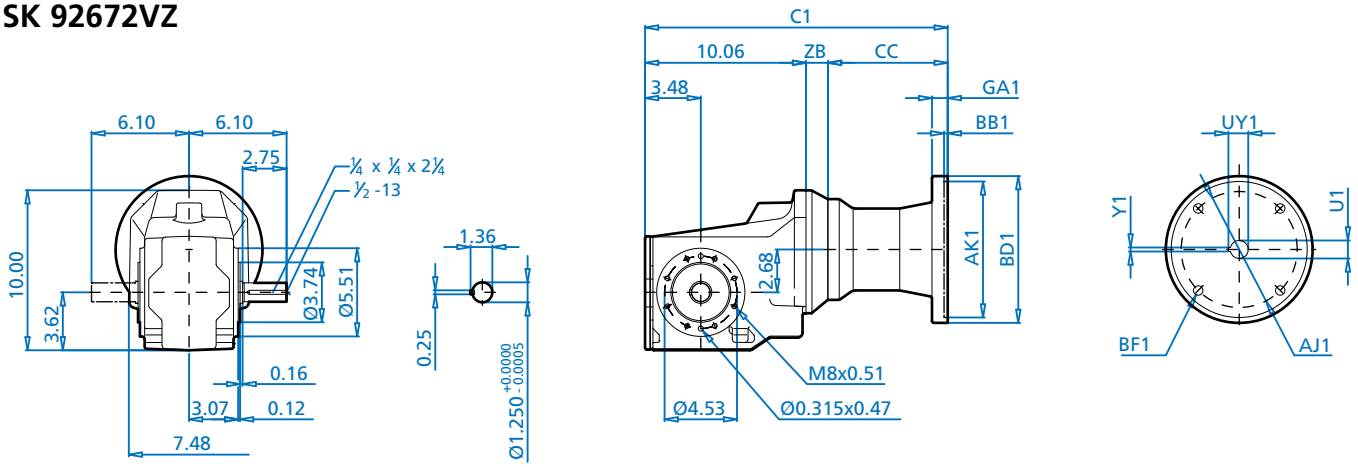


Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	100L	112M		132S	For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	100LH		112MH	132SH	
AB	4.51	4.86	5.59	5.79	6.65	7.05	7.05	8.03	
AB (BR)	4.84	5.24	5.59	5.79	6.77	7.17	N/A	7.91	
C	18.16	19.01	19.88	21.96	23.19	24.25	25.24	27.87	
C (BR)	20.36	21.30	22.40	24.92	26.79	27.95	N/A	32.08	
FP	5.09	5.72	6.43	7.19	7.90	8.87	8.87	10.45	
ZB	0.51	0.51	0.51	1.06	1.06	1.38	1.38	1.38	

SK 92672VZ



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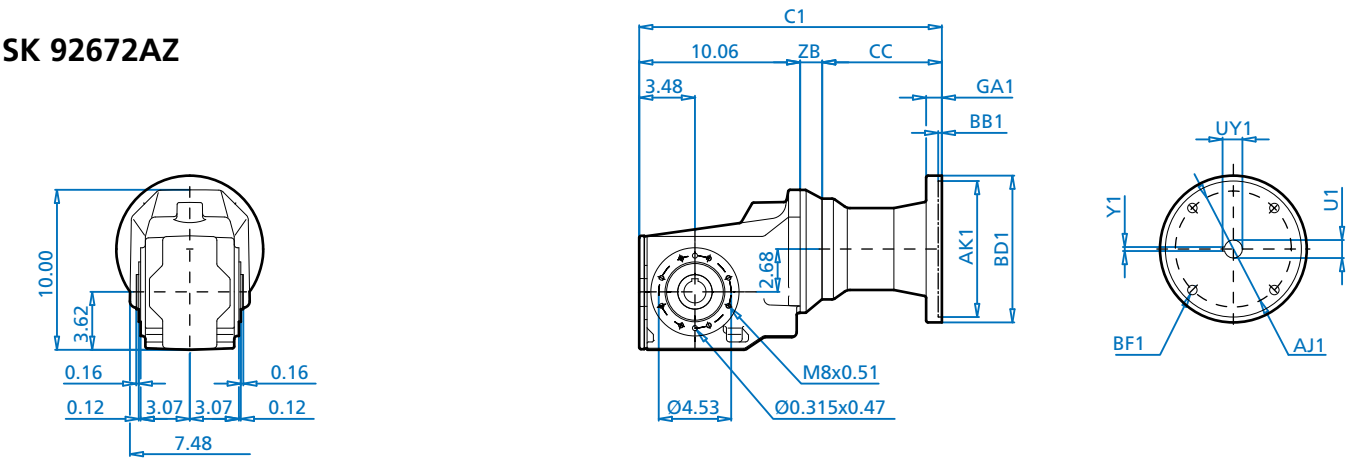

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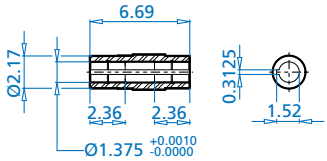

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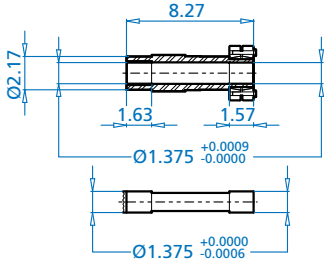
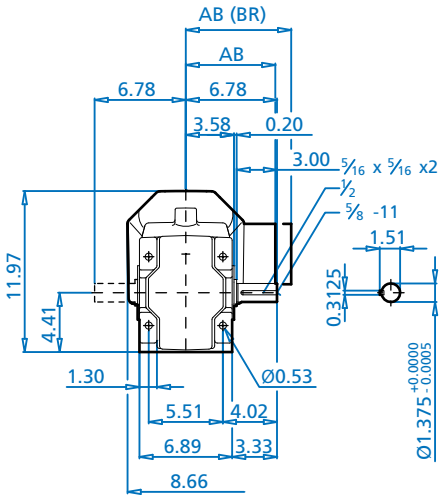


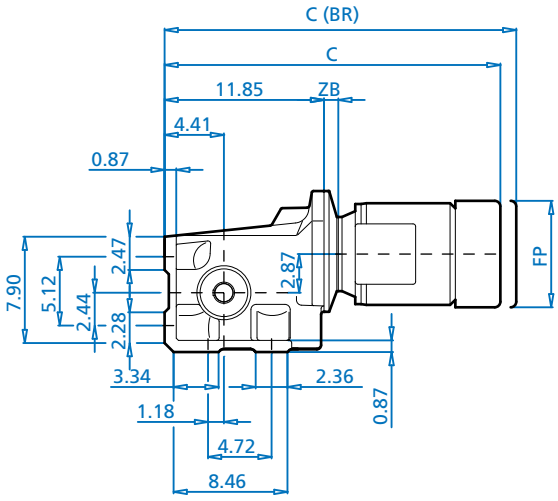
NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC	ZB
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	14.86	4.29	0.51
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	14.86	4.29	0.51
180TC	7.25	8.500	0.23	9.17	0.59	1.125	1.24	0.250	18.69	7.25	1.38
210TC	7.25	8.500	0.23	9.17	0.59	1.375	1.52	0.312	18.69	7.25	1.38

SK 92772 + Motor

SK 92772





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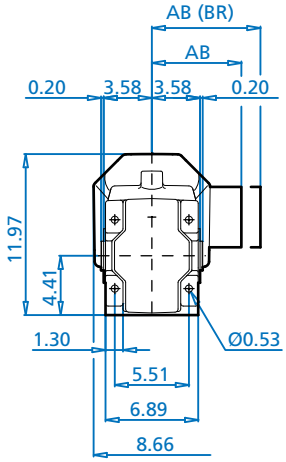

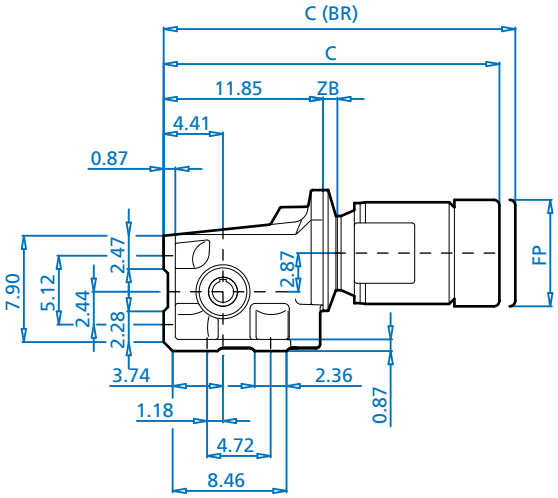

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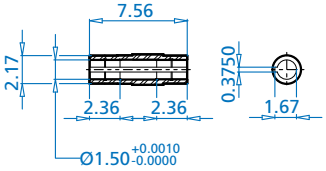
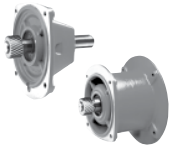
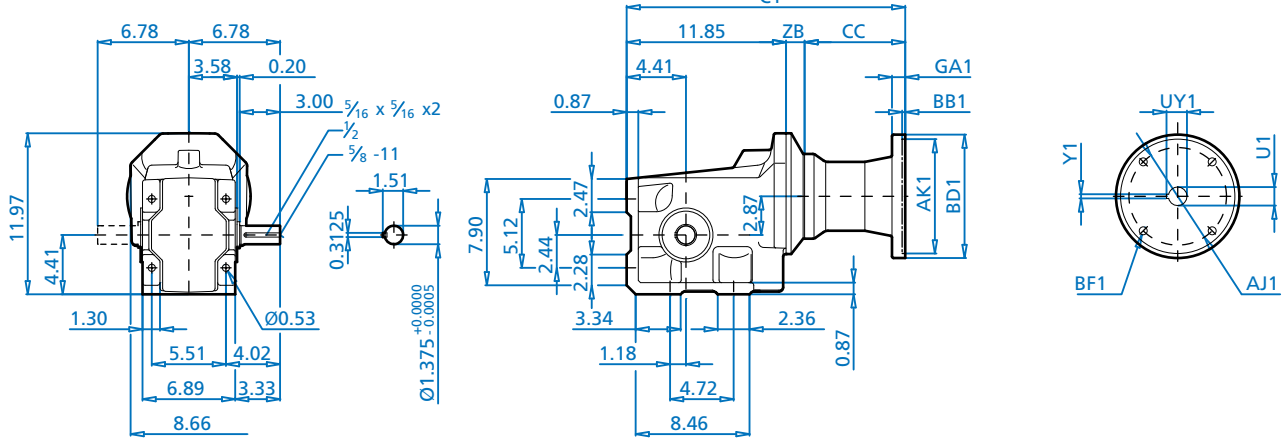


Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	100L	112M		132S	For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	100LH		112MH	132SH	
AB	4.51	4.86	5.59	5.79	6.65	7.05	7.05	8.03	
AB (BR)	4.84	5.24	5.59	5.79	6.77	7.17	N/A	7.91	
C	19.95	20.80	21.67	23.76	24.98	26.04	27.04	29.70	
C (BR)	22.15	23.09	24.19	26.71	28.58	29.74	N/A	33.91	
FP	5.09	5.72	6.43	7.19	7.90	8.87	8.87	10.45	
ZB	0.51	0.51	0.51	1.06	1.06	1.38	1.38	1.65	

SK 92772



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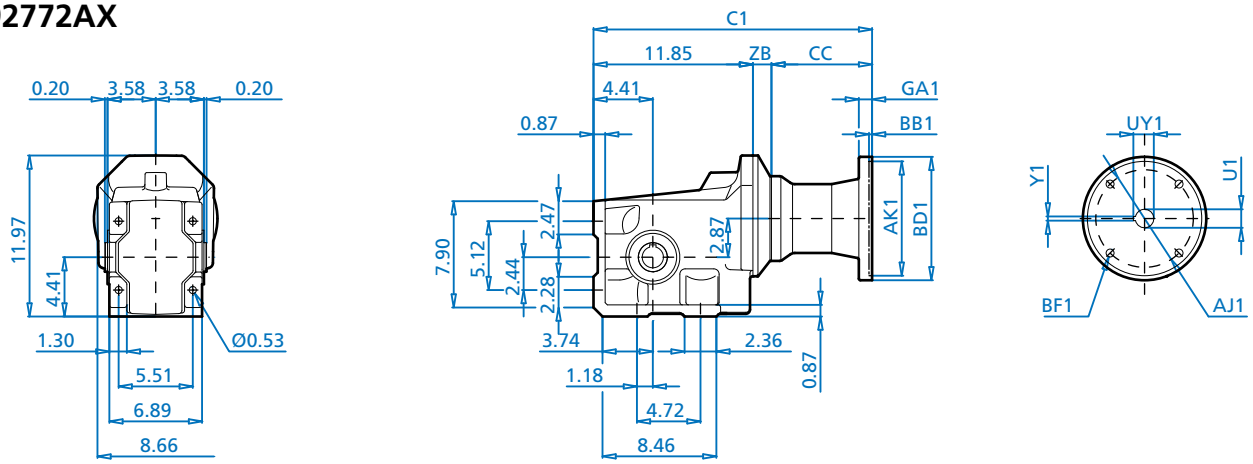

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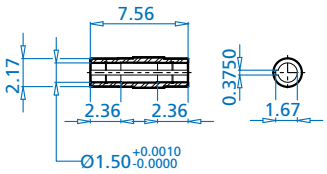
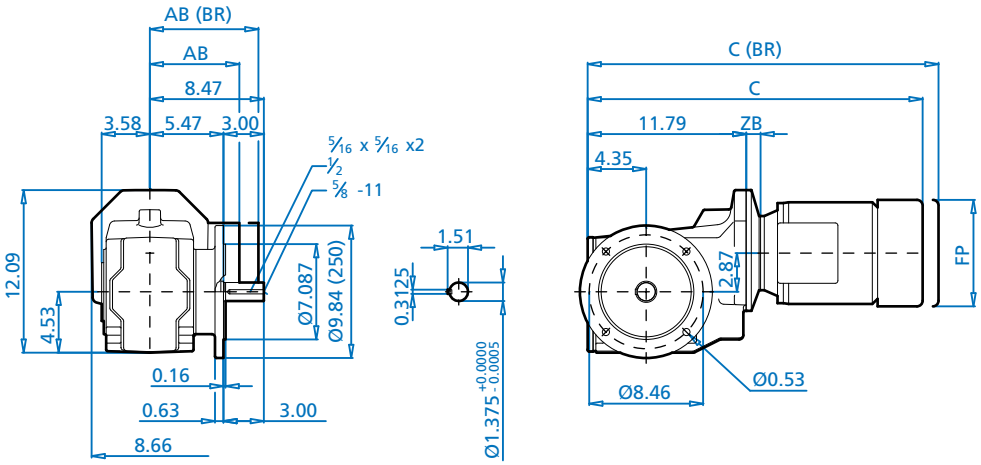


NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC	ZB
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	16.65	4.29	0.51
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	16.65	4.29	0.51
180TC	7.25	8.500	0.23	9.17	0.59	1.125	1.24	0.250	20.48	7.25	1.38
210TC	7.25	8.500	0.23	9.17	0.59	1.375	1.52	0.312	20.48	7.25	1.38
250TC	7.25	8.500	0.23	9.17	0.59	1.625	1.80	0.375	21.37	7.86	1.65

SK 92772VF



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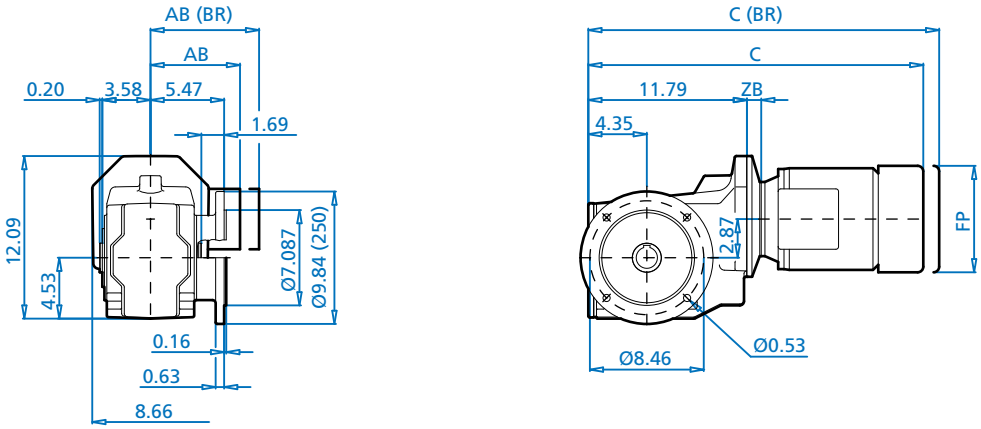

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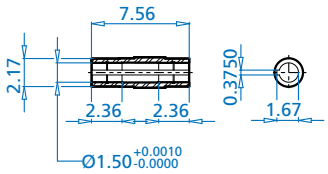

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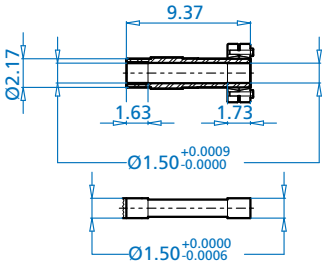
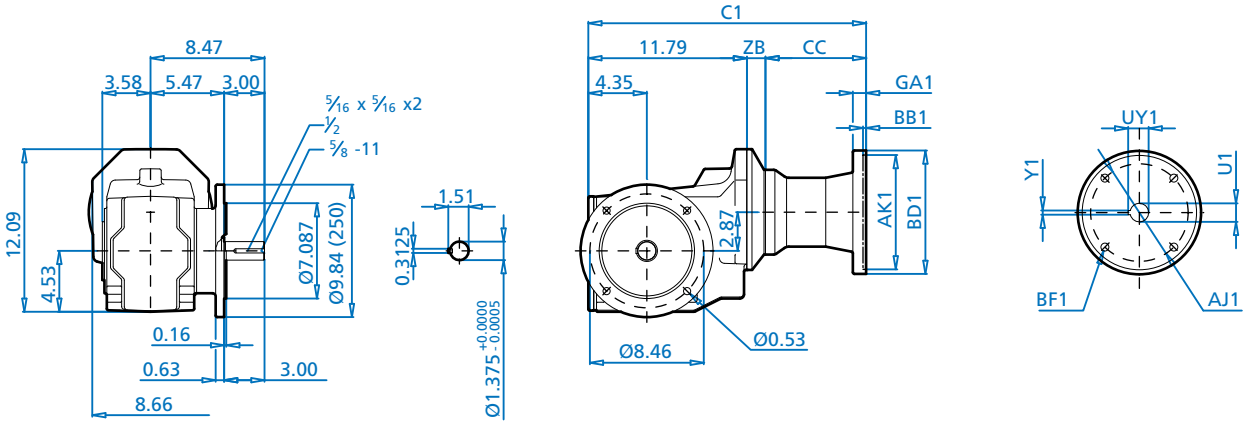


Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	100L	112M		132S	For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	100LH		112MH	132SH	
AB	4.51	4.86	5.59	5.79	6.65	7.05	7.05	8.03	
AB (BR)	4.84	5.24	5.59	5.79	6.77	7.17	N/A	7.91	
C	19.89	20.74	21.61	23.70	24.92	25.98	26.98	29.64	
C (BR)	22.09	23.03	24.13	26.65	28.52	29.69	N/A	33.85	
FP	5.09	5.72	6.43	7.19	7.90	8.87	8.87	10.45	
ZB	0.51	0.51	0.51	1.06	1.06	1.38	1.38	1.65	

SK 92772VF



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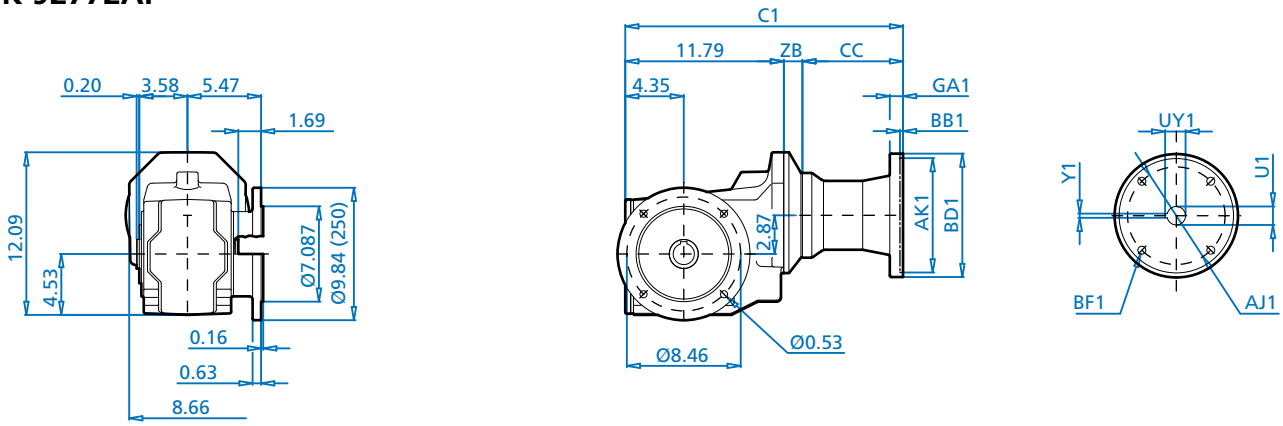

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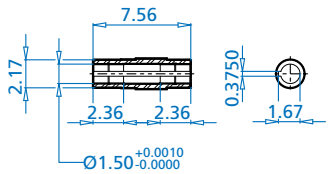

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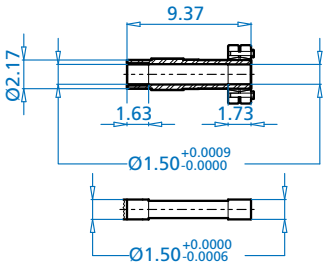
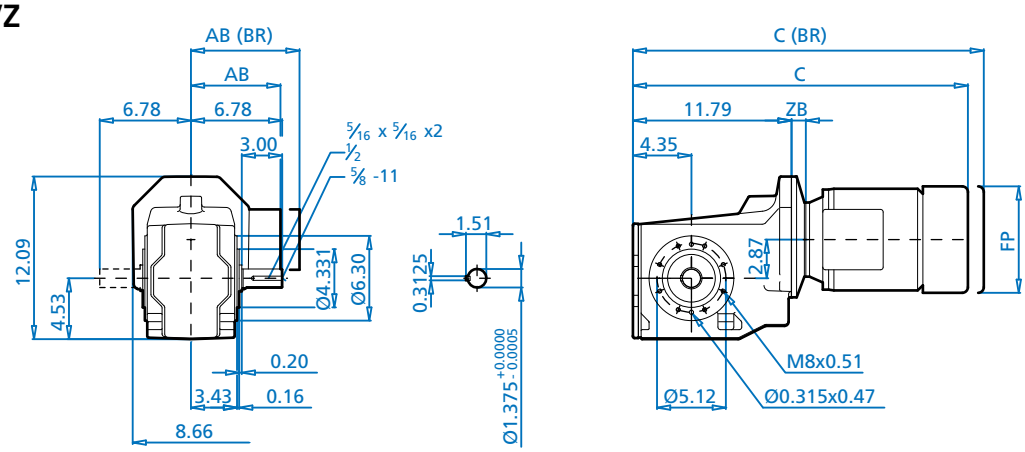


NEMA Dimensions

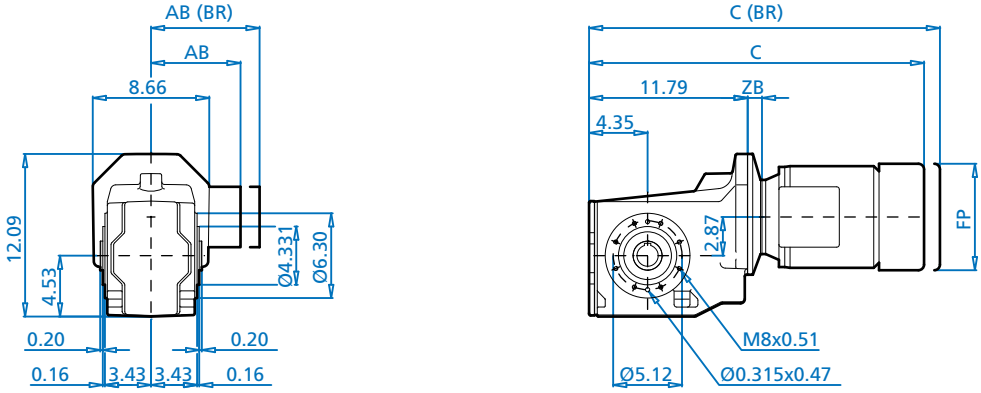
Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC	ZB
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	16.59	4.29	0.51
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	16.59	4.29	0.51
180TC	7.25	8.500	0.23	9.17	0.59	1.125	1.24	0.250	20.42	7.25	1.38
210TC	7.25	8.500	0.23	9.17	0.59	1.375	1.52	0.312	20.42	7.25	1.38
250TC	7.25	8.500	0.23	9.17	0.59	1.625	1.80	0.375	21.31	7.86	1.65

SK 92772 + Motor

SK 92772VZ



SK 92772AZ



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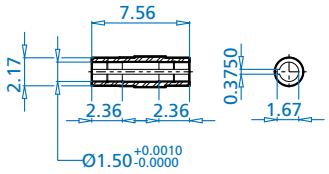

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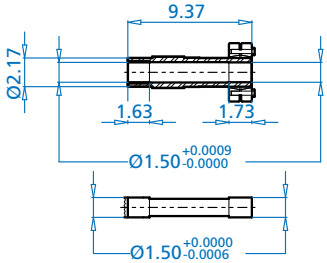
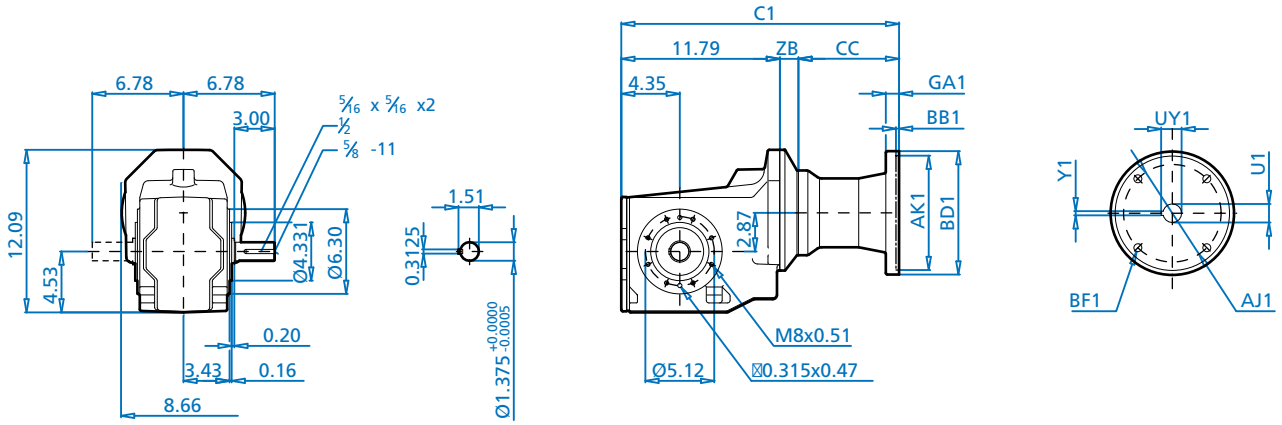


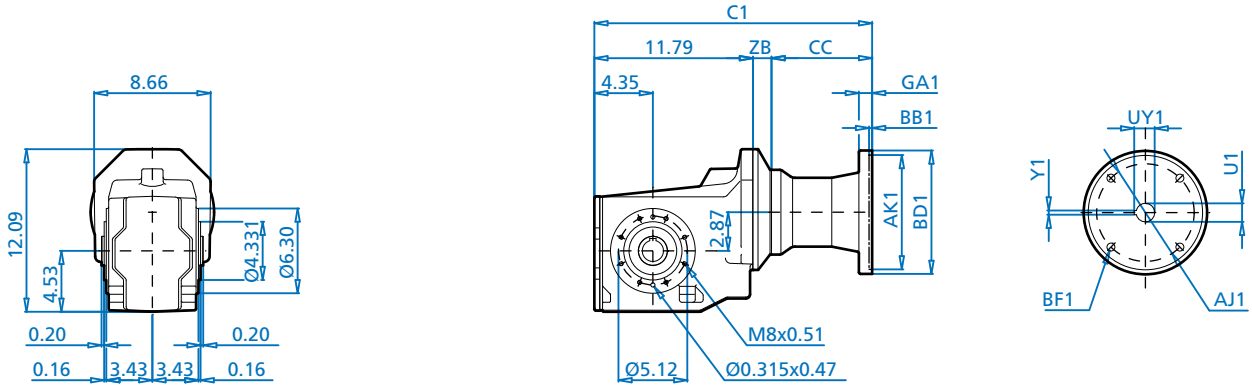
Motor Dimensions

Standard efficiency	63S/L	71S/L	80S/L	90S/L	100L	112M		132S	For Other Connection Possibilities please see ⇨ 🕮 108 & 109
Energy efficiency			80LH	90SH/LH	100LH		112MH	132SH	
AB	4.51	4.86	5.59	5.79	6.65	7.05	7.05	8.03	
AB (BR)	4.84	5.24	5.59	5.79	6.77	7.17	N/A	7.91	
C	19.89	20.74	21.61	23.70	24.92	25.98	26.98	29.64	
C (BR)	22.09	23.03	24.13	26.65	28.52	29.69	N/A	33.85	
FP	5.09	5.72	6.43	7.19	7.90	8.87	8.87	10.45	
ZB	0.51	0.51	0.51	1.06	1.06	1.38	1.38	1.65	

SK 92772VZ



SK 92772AZ



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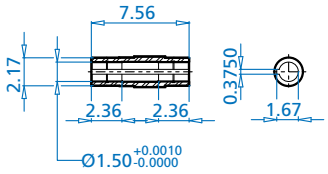
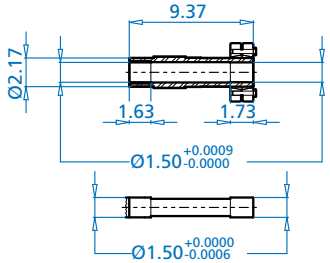


SK 92772AZS

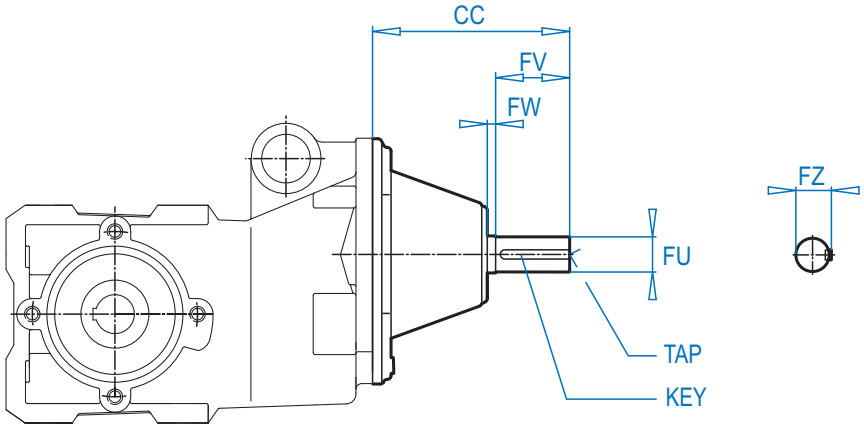


NEMA Dimensions

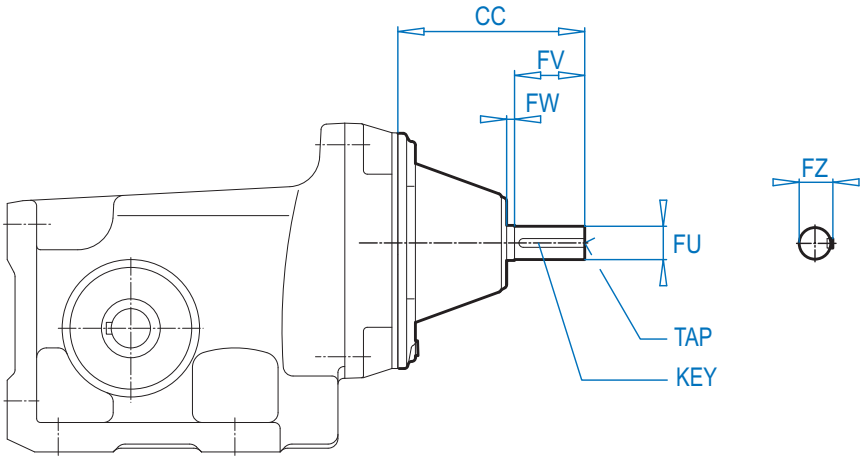
Type	AJ1	AK1	BB1	BD1	BF1	U1	UY1	Y1	C1	CC	ZB
56C	5.88	4.500	0.20	6.61	0.43	0.625	0.71	0.188	16.59	4.29	0.51
140TC	5.88	4.500	0.20	6.61	0.43	0.875	0.96	0.188	16.59	4.29	0.51
180TC	7.25	8.500	0.23	9.17	0.59	1.125	1.24	0.250	20.42	7.25	1.38
210TC	7.25	8.500	0.23	9.17	0.59	1.375	1.52	0.312	20.42	7.25	1.38
250TC	7.25	8.500	0.23	9.17	0.59	1.625	1.80	0.375	21.31	7.86	1.65

Solid Input Shaft
Type - W

SK 92072

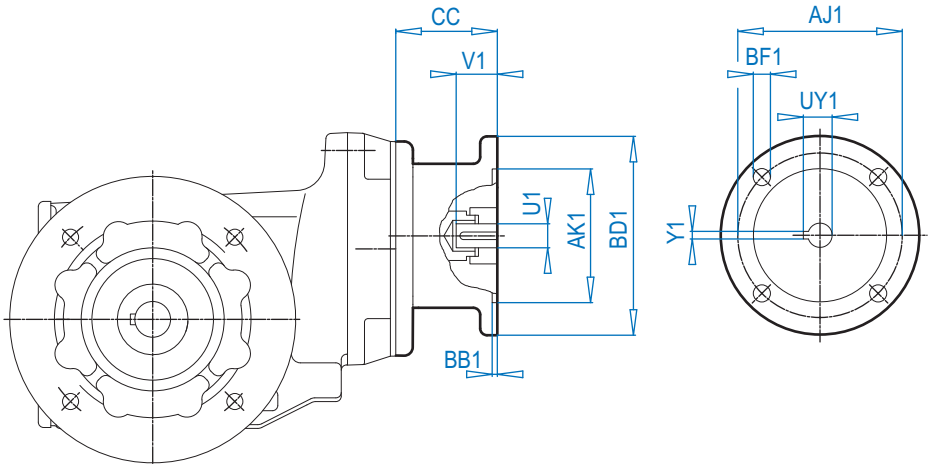


SK 92172 - SK 92772



Unit	CC	FW	FV	FU	FZ	TAP	KEY	Unit Dimensions
SK 92072	3.89	0.16	1.13	0.500 +0.0000 - 0.0005	0.56	1/4-20	$^1/_8$ x $^1/_8$ x $^7/_8$	⇨🕮 78
SK 92172	3.89	0.16	1.13	0.500 +0.0000 - 0.0005	0.56	1/4-20	$^1/_8$ x $^1/_8$ x $^7/_8$	⇨🕮 84
SK 92372	4.33	0.16	1.57	0.625 +0.0000 - 0.0005	0.70	1/4-20	$^3/_{16}$ x $^3/_{16}$ x 1 $^1/_4$	⇨🕮 90
SK 92672	4.33	0.16	1.57	0.750 +0.0000 - 0.0005	0.83	1/4-20	$^3/_{16}$ x $^3/_{16}$ x 1 $^1/_4$	⇨🕮 96
SK 92772	4.84	0.12	1.97	0.875 +0.0000 - 0.0005	0.96	1/4-20	$^3/_{16}$ x $^3/_{16}$ x 1 $^5/_8$	⇨🕮 102

SK 92072 - SK 92772



Dimensions in Inches
DIMENSIONS

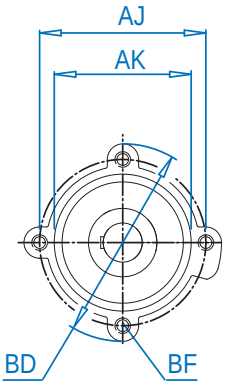
ALTERNATE SHAFTS SEE PAGES 112 - 116

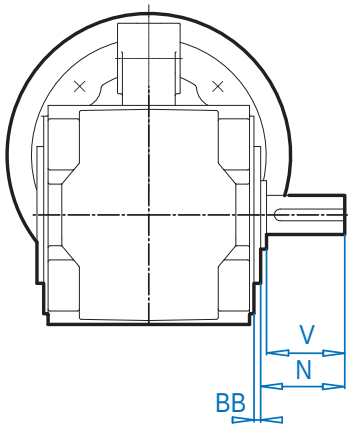
IEC Dimensions (mm)

Input	CC	AJ1	AK1	BB1	BD1	BF1	U1	V1	UY1	Y1
IEC 63	85	115	95	3.5	140	M8	11	23	12.8	4
IEC 71	85	130	110	4.0	160	M8	14	30	16.3	5
IEC 80	102.5	165	130	4.0	200	M10	19	40	21.8	6
IEC 90	102.5	165	130	4.0	200	M10	24	50	27.3	8
IEC 100	125.5	215	180	5.0	250	M12	28	60	31.3	8
IEC 112	125.5	215	180	5.0	250	M12	28	60	31.3	8
IEC 132	175	265	230	5.0	300	M12	38	80	41.3	10
IEC 160	–	300	250	6.0	350	M16	42	110	45.3	12
IEC 180	–	300	250	6.0	350	M16	48	110	51.8	14
IEC 200	–	350	300	6.0	400	M16	55	110	59.3	16

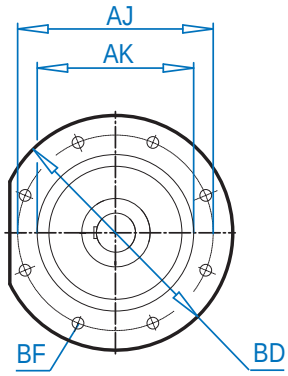
B14 Flange Design Option VZ

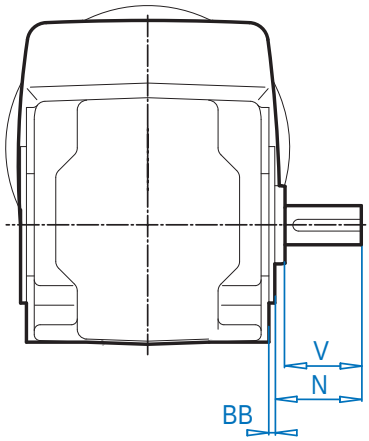
SK 92072 VZ





SK 92172 VZ - SK 92772 VZ

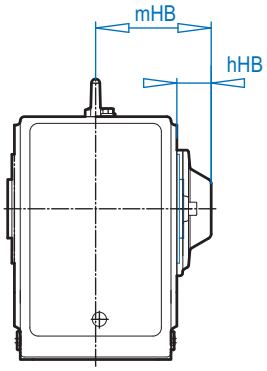


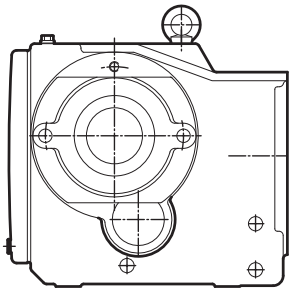


ALTERNATE SHAFTS SEE PAGES 112 - 116

Type		Mounting dimensions flange B14					Shaft dimensions	
		BD	AK	AJ	BB	BF(mm)	V	N
SK 92072	VZ	4.04	2.756	3.35	0.10	M8 x 13	1.57	1.69
SK 92172	VZ	4.72	3.150	3.94	0.12	M6 x 13	1.57	1.73
SK 92372	VZ	5.51	3.740	4.53	0.12	M8 x 13	1.97	2.20
SK 92672	VZ	5.51	3.740	4.53	0.12	M8 x 13	2.36	2.52
SK 92772	VZ	6.30	4.331	5.12	0.16	M8 x 13	2.76	2.95

SK ... AZH

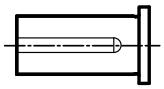




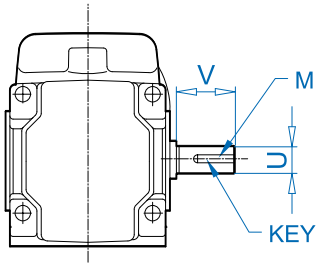
ALTERNATE SHAFTS SEE PAGES 112 - 116

Type

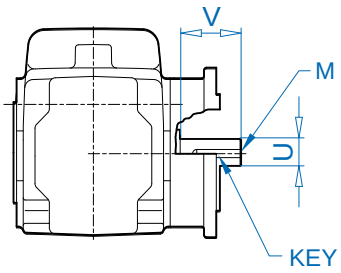
		hHB	mHB
SK 92072	AZH	1.34	3.41
SK 92172	AZH	1.46	3.90
SK 92372	AZH	1.65	4.61
SK 92672	AZH	1.65	4.72
SK 92772	AZH	1.73	5.16



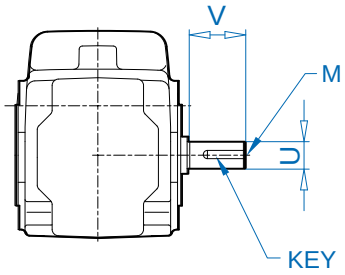
Solid Shaft Dimensions



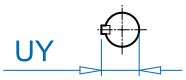
FOOTED



VF



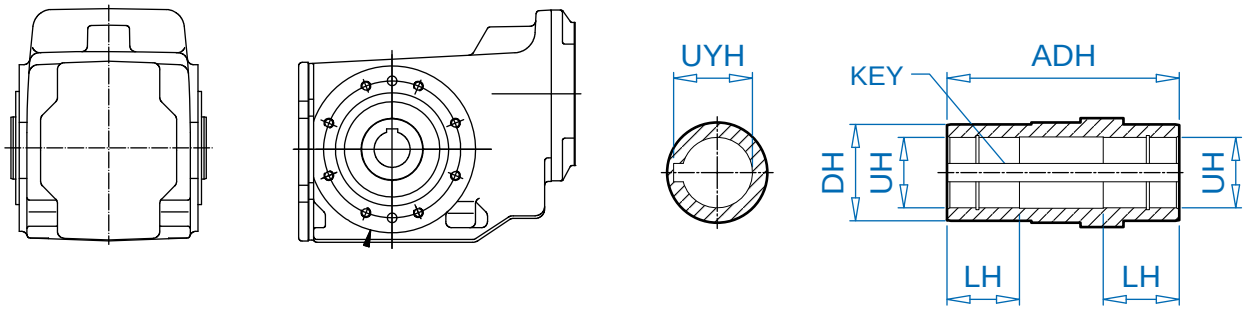
VZ



UNIT	U	Diameter Tolerance	V	UY	KEY SIZE	KEY QTY	DRILL & TAP M
SK 92072	0.750	+0.0000 / -0.0005	1.50	0.83	3/16 x 3/16 x 1-1/4	1	1/4-20
	20mm	+0.015 / +0.002mm	40mm	22.5mm	6 x 6 x 32mm	1	M6
SK 92172	0.750	+0.0000 / -0.0005	1.50	0.83	3/16 x 3/16 x 1	1	1/4-20
	20mm	+0.015 / +0.002mm	40mm	22.5mm	6 x 6 x 32mm	1	M6
SK 92372	1.000	+0.0000 / -0.0005	2.13	1.11	1/4 x 1/4 x 1-5/8	1	3/8-16
	25mm	+0.015 / +0.002mm	50mm	28.0mm	8 x 7 x 40mm	1	M10
SK 92672	1.250	+0.0000 / -0.0005	2.75	1.36	1/4 x 1/4 x 2-1/4	1	1/2-13
	30mm	+0.015 / +0.002mm	60mm	33.0mm	8 x 7 x 50mm	1	M10
SK 92772	1.375	+0.0000 / -0.0005	3.00	1.51	5/16 x 5/16 x 2-1/2	1	5/8-11
	35mm	-0.018 / +0.002mm	70mm	38.0mm	10 x 8 x 56mm	1	M12

- Dimensions are in inches unless otherwise noted.
- Metric Keys are captured in keyways.
- For shaft sizes not shown, consult NORD.

Hollow Shaft Dimensions (AZ-AF)

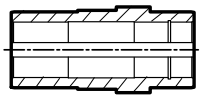


TYPE	UH	DIAMETER TOLERANCE	ADH	LH	DH	UYH	KEY SIZE w x h x l	KEY QTY
SK 92072 AZ/AF	0.750*	+0.0010 / -0.0000	4.57	0.98	1.38	0.84	3/16 x 3/16 x 2	2
	0.500	+0.0010 / -0.0000	4.57	0.98	1.38	0.56	1/8 x 1/8 x 7/8	2
	25mm	+0.021 / -0.000mm	116mm	30mm	35mm	28.3mm	8 x7 x 25mm	2
SK 92172 AZ/AF	1.000*	+0.0010 / -0.0000	5.43	1.18	1.57	1.09	1/4 x 3/16 x 2	2
	25mm	+0.021 / -0.000mm	138mm	30mm	40mm	28.3mm	8 x7 x 32mm	2
SK 92372 AZ/AF	1.1875*	+0.0010 / -0.0000	6.46	1.97	1.97	1.30	1/4 x 1/4 x 2-1/4	2
	1.250	+0.0010 / -0.0000	6.46	1.97	1.97	1.37	1/4 x 1/4 x 2-1/4	2
	1.4375	+0.0010 / -0.0000	6.46	1.97	1.97	1.61	3/8 x 3/8 x 2-1/2	2
	30mm	+0.021 / -0.000mm	164mm	50mm	50mm	33.3mm	8 x 7 x 60mm	2
SK 92672 AZ/AF	1.375*	+0.0010 / -0.0000	6.69	2.36	2.17	1.52	5/16 x 5/16 x 2-1/2	2
	1.4375	+0.0010 / -0.0000	6.69	2.36	2.17	1.61	3/8 x 3/8 x 2-1/2	2
	1.500	+0.0010 / -0.0000	6.69	2.36	2.17	1.67	3/8 x 3/8 x 2-1/2	2
	35mm	+0.025 / -0.000mm	170mm	55mm	60mm	38.3mm	10 x 8 x 60mm	2
SK 92772 AZ/AF	1.500*	+0.0010 / -0.0000	7.56	2.36	2.17	1.67	3/8 x 3/8 x 2-1/4	2
	1.4375	+0.0010 / -0.0000	7.56	2.36	2.17	1.61	3/8 x 3/8 x 2-1/4	2
	40mm	+0.025 / -0.000mm	192mm	60mm	55mm	43.3mm	12 x 8 x 60mm	2

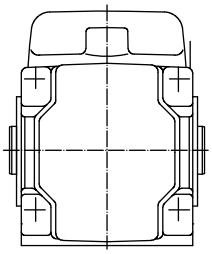
* standard size

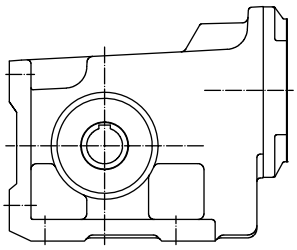
- Dimensions are in inches unless otherwise noted.
- For shaft sizes not shown, consult NORD.

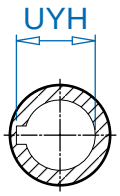
Dimensions in Inches
DIMENSIONS
ALTERNATE SHAFTS SEE PAGES 112 - 116

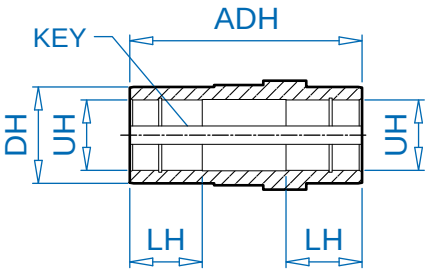


Hollow Shaft Foot Mount Dimensions (AX)







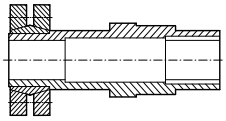


TYPE	UH	DIAMETER TOLERANCE	ADH	LH	DH	UYH	KEY SIZE w x h x l	KEY QTY
SK 92072 AX	0.750*	+0.0010 / -0.0000	4.57	0.98	1.38	0.84	3/16 x 3/16 x 2	2
	0.500	+0.0010 / -0.0000	4.57	0.98	1.38	0.56	1/8 x 1/8 x 7/8	2
	25mm	+0.021 / -0.000mm	116mm	30mm	35mm	28.3mm	8 X 7 x 25mm	2
SK 92172 AX	0.750	+0.0010 / -0.0000	5.28	1.18	1.38	0.84	3/16 x 3/16 x 2	2
	20mm	+0.021 / -0.000mm	134	40	35	22.8	6 x 6 x 50mm	2
SK 92372 AX	1.1875*	+0.0010 / -0.0000	6.46	1.97	1.97	1.30	1/4 x 1/4 x 2-1/4	2
	1.250	+0.0010 / -0.0000	6.46	1.97	1.97	1.37	1/4 x 1/4 x 2-1/4	2
	1.4375	+0.0010 / -0.0000	6.46	1.97	1.97	1.61	3/8 x 3/8 x 2-1/2	2
	30mm	+0.021 / -0.000mm	164mm	50mm	50mm	33.3mm	8 x 7 x 60mm	2
SK 92672 AX	1.375*	+0.0010 / -0.0000	6.69	2.36	2.17	1.52	5/16 x 5/16 x 2-1/2	2
	1.4375	+0.0010 / -0.0000	6.69	2.36	2.17	1.61	3/8 x 3/8 x 2-1/2	2
	1.500	+0.0010 / -0.0000	6.69	2.36	2.17	1.67	3/8 x 3/8 x 2-1/2	2
	35mm	+0.025 / -0.000mm	170mm	60mm	55mm	38.3mm	10 x 8 x 60mm	2
SK 92772 AX	1.500*	+0.0010 / -0.0000	7.56	2.36	2.17	1.67	3/8 x 3/8 x 2-1/4	2
	1.4375	+0.0010 / -0.0000	7.56	2.36	2.17	1.61	3/8 x 3/8 x 2-1/4	2
	40mm	+0.025 / -0.000mm	192mm	60mm	55mm	43.3mm	12 x 8 x 60mm	2

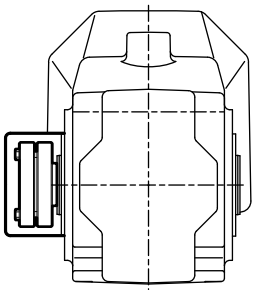
* standard size

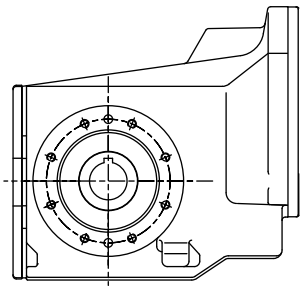
- Dimensions are in inches unless otherwise noted.
- For shaft sizes not shown, consult NORD.

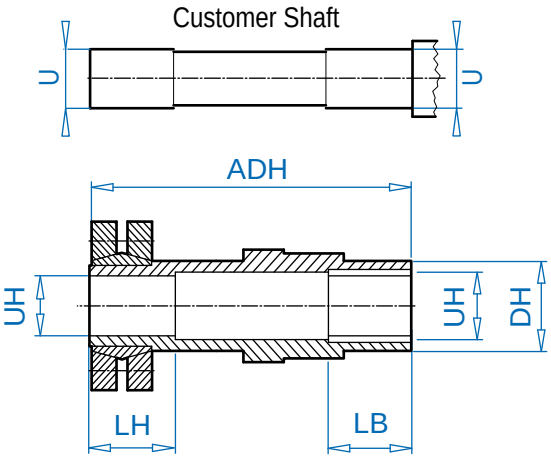
ALTERNATE SHAFTS SEE PAGES 112 - 116



Shrink Disc Shaft Dimensions (AZSH)





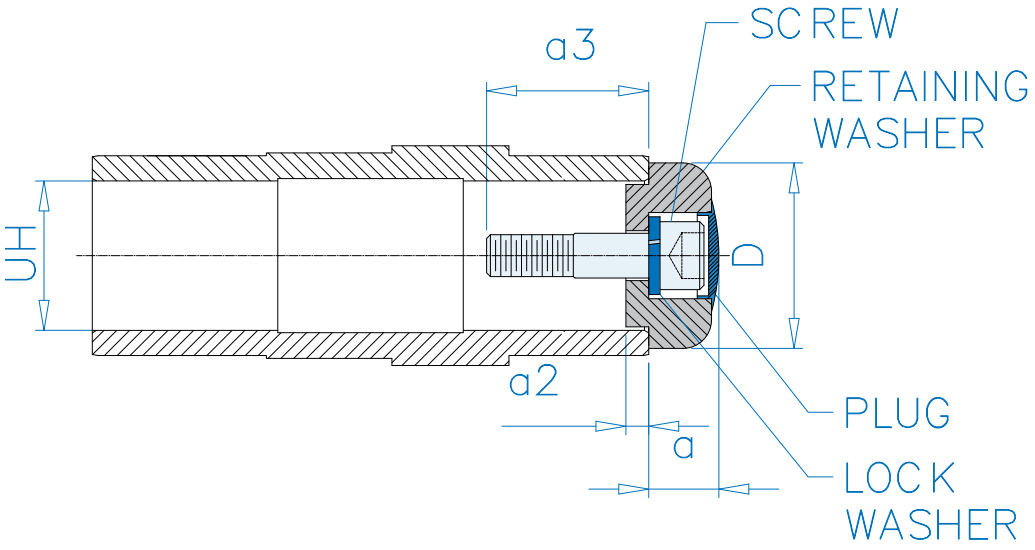


Type	HOLLOW SHAFT UH	HOLLOW SHAFT TOLERANCE	ADH	LB	LH	DH	CUSTOMER SHAFT U	CUSTOMER SHAFT TOLERANCE
SK 92072 AZSH	1.000 25mm	+0.0008 / -0.0000 +0.021 / -0.000mm	5.67 144mm	1.22 31mm	1.26 32mm	1.38 35mm	1.000 25 mm	+0.0000 / -0.0005 +0.000 / -0.013mm
SK 92172 AZSH	1.000 25mm	+0.0008 / -0.0000 +0.021 / -0.000mm	6.69 170mm	1.22 31mm	1.38 35mm	1.57 40mm	1.000 25mm	+0.0000 / -0.0005 +0.000 / -0.013mm
SK 92372 AZSH	1.1875 30mm	+0.0009 / -0.0000 +0.021 / -0.000mm	7.87 200mm	1.24 31.5mm	1.42 36mm	1.97 50mm	1.1875 30 mm	+0.0000 / -0.0006 +0.000 / -0.013mm
SK 92672 AZSH	1.375 35mm	+0.0009 / -0.0000 +0.025 / -0.000mm	8.27 210mm	1.63 41.5mm	1.57 40mm	2.17 55mm	1.375 35 mm	+0.0000 / -0.0006 +0.000 / -0.016mm
SK 92772 AZSH	1.500 40mm	+0.0009 / -0.0000 +0.025 / -0.000mm	9.37 238mm	1.63 41.5mm	1.73 44mm	2.17 55mm	1.500 40 mm	+0.0000 / -0.0006 +0.000 / -0.016mm

* Non-shrink disc side diameter larger for clearance.

Dimensions in Inches
DIMENSIONS
ALTERNATE SHAFTS SEE PAGES 112 - 116

Fixing
Element Kit



Inch Shaft Hollow Bore (in)

UH	D	a	a2	Screw ❶	a3 ❶	Screw ❷	a3 ❷	Screw ❸	a3 ❸
0.5000	0.984	0.595	0.110	10 - 32 x 5/8	0.499	-	-	-	-
0.7500	1.181	0.557	0.118	1/4 - 20 x 3/4	0.652	1/4 - 20 x 1	0.902	-	-
1.0000	1.496	0.767	0.150	3/8 - 16 x 3/4	0.624	3/8 - 16 x 1-1/4	1.124	-	-
1.1875	1.575	0.769	0.150	7-16 - 14 x 2-1/16	2.016	-	-	-	-
1.2500	1.575	0.769	0.150	7-16 - 14 x 2-1/16	2.016	-	-	-	-
1.3750	1.772	0.946	0.197	5/8 - 11 x 1-1/2	1.461	5/8 - 11 x 2-1/4	2.211	5/8 - 11 x 1	0.961
1.4375	1.772	0.946	0.197	5/8 - 11 x 1-1/2	1.461	5/8 - 11 x 2-1/4	2.211	5/8 - 11 x 1	0.961
1.5000	1.772	0.946	0.197	5/8 - 11 x 1-1/2	1.461	5/8 - 11 x 2-1/4	2.211	5/8 - 11 x 1	0.961

Metric Hollow Bore (mm)

UH	D	a	a2	Screw ❶	a3 ❶	Screw ❷	a3 ❷
25	38	19	3.8	M10 x 45	41.8	M10 x 30	26.8
30	40	19	3.8	M10 x 45	43.8	M10 x 30	28.8
35	45	23.5	3.8	M12 x 55	54	M12 x 35	34
40	55	24	8	M16 x 70	70	M16 x 45	45

❶, ❷, ❸ - Each fixing element kit may contain up to 3 different kinds of screws

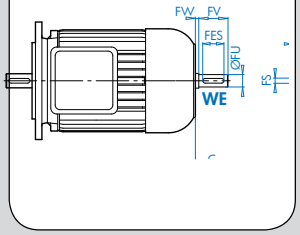
Motors

NORD DRIVESYSTEMS

www.nord.com

INVERTER DUTY MOTOR

Motor Type	Power Pn		Nn Full-load	In Full-Load Current 230V[a]	In Full-Load Current 460V[a]
	[hp]	[kW]	[rpm]	[A]	[A]
63S/4	0.16	0.12	1700	0.88	0.44
63L/4	0.25	0.18	1680	1.12	0.56
71S/4	0.33	0.25	1710	1.56	0.78
71L/4	0.5	0.37	1720	1.90	0.95
80S/4	0.75	0.55	1710	2.70	1.35
80L/4	1	0.75	1650	3.66	1.83
90S/4	1.5	1.1	1660	4.84	2.42
90L/4	2	1.5	1660	6.34	3.17
100L/4	3	2.2	1705	9.0	4.50
100LA/4	5	3.7	1725	15.2	7.62
132S/4	7.5	5.5	1735	19.8	9.9
132M/4	10	7.5	1735	25.8	12.9
160M/4	15	11	1770	38.4	19.2



Motor Order Form

	Frame	Size	Poles	Motor Options	Brake Size	Brake Options
SK						

Frame	Size	Poles
63	**S**	**4**
71	**SH**	**2**
80	**M**	**6**
90	**MH**	**4-2**
100	**MX**	**8-2**
112	**L**	**8-4**
132	**LA**	**12-2**
	LH	**Other**
	LX	

Paint

- ❍ Unpainted Aluminum Alloy
- ❍ Stainless Steel Paint
- ❍ NSD+ (gray)
- ❍ NSD+W (white)
- ❍ NSD-X3 (gray)
- ❍ NSD-X3W (white)
- ❍ Special _____

Electrical Motor Options

- ❒ **H** - Energy Efficient Motor
- ❒ **TW** - Thermostat
- ❒ **TF** - Thermistor
- ❒ **SH** - Space Heater (select voltage)
  - ❍ 110 Volt ❍ 230 Volt ❍ 460 Volt
- ❒ **ISO** H - Class H insulation
- ❒ **WU** - High Resistance Rotor
- ❒ **4-2** - 2-Speed, 4/2 Pole, 1800/3600rpm
- ❒ **8-2** - 2-Speed, 8/2 Pole, 900/3600rpm
- ❒ **ECR** - Single Phase Motor

Environmental Options

- ❒ **NSD+** - Nord Severe Duty Paint
- ❒ **NSDx3** - Nord Extreme Duty Paint
- ❒ **RD** - Canopy Drip Cover
- ❒ **RDD** - Double Fan Cover
- ❒ **KB** - Condensation Drain Holes (plugged)
- ❒ **KBO** - Condensation Drain Holes (open)
- ❒ **IP66** - IP66 Enclosure Protection
- ❒ **KKV** - Terminal Box Sealed with Resin
- ❒ **AICM** - Additional Insulation
- ❒ **EP** - Epoxy Dipped Windings

AC Vector Drive Related Options

- ❒ **F** - Blower Fan (200-575V 1 & 3 Phase)
- ❒ **FC** - Blower Cooling Fan (115V, 1 Phase)
- ❒ **IG__** - Incremental Encoder
- ❒ **IG__P** - Incremental Encoder with Plug
- ❒ **AG** - Absolute Encoder

Additional Motor Options

- ❒ **OL** - Totally Enclosed Non-Ventilated (TENV)
- ❒ **OL/H** - (TENV) Without Fan Cover
- ❒ **WE** - Second Shaft Extension (Fan Side)
- ❒ **HR** - Hand Wheel
- ❒ **Z** - High Inertia Cast Iron Fan
- ❒ **RLS** - Motor Backstop (rotation viewing fan)
  - ❍ Clockwise ❍ Counter-Clockwise
- ❒ **EKK** - Small Terminal Box (not UL approved)
- ❒ **MS** - Quick Power Plug Connector

Brake Size
BRE 5
BRE 10
BRE 20
BRE 40
BRE 60
BRE 100
BRE 150

- ❒ **HL** - Hand Release Lever
- ❒ **FHL** - Locking Hand Release Lever
- ❒ **HLH** - Hand Release Lever with Hole
- ❒ **RG** - Corrosion Protected Brake
- ❒ **SR** - Dust and Corrosion Protected Brake
- ❒ **ADJ_____Nm** - Adjust Brake Torque
- ❒ **BIP66** - IP66 Brake Enclosure
- ❒ **MIK** - Micro-switch
- ❒ **BSH** - Brake Heating/Bifilar Coil
- ❒ **NRB1** - Quiet Brake Release
- ❒ **NRB2** - Quiet Brake Motor Operation
- ❒ **FBR** - Brass Foil
- ❒ **DBR** - Double Brake
- ❒ **G...P** - High Performance Rectifier
- ❒ **G...V** - Sealed Rectifier
- ❒ **IR** - Current Sensing Relay

Rectifier Selection

Rectifier Wiring

- ❍ Across the line (from motor terminal box)
- ❍ Separate power source (frequency AC vector drive, soft starter)

Brake Supply Voltage

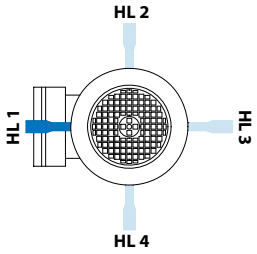
- ❍ 24 VDC
- ❍ 115 VAC
- ❍ 200 VAC
- ❍ 230 VAC
- ❍ 400 VAC
- ❍ 460 VAC
- ❍ 500 VAC
- ❍ 575 VAC
- ❍ Other _____

Braking Method

- ❍ Method 10
- ❍ Method 15
- ❍ Method 20
- ❍ Method 25
- ❍ Method 30
- ❍ Method 35
- ❍ Method 40
- ❍ Method 45
- ❍ Method 50
- ❍ Method 55

Hand Release Position

- ❍ HL1
- ❍ HL2
- ❍ HL3
- ❍ HL4



Mounting

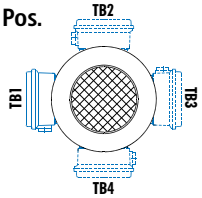
- ❍ Integral to gearbox
- ❍ NEMA C-Face
- ❍ IEC B5 Mount

Voltage & Frequency

- ❍ 230/460V-60Hz
- ❍ 575V-60Hz
- ❍ 208V-60Hz
- ❍ 400V-50Hz
- ❍ 115/230V, 60Hz-1-ph.
- ❍ Other

Terminal Box Pos.

- ❍ TB1
- ❍ TB2
- ❍ TB3
- ❍ TB4

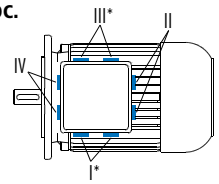


Mtg. Pos. M1 Shown

Conduit Entry Loc.

- ❍ CE I *
- ❍ CE II
- ❍ CE III *
- ❍ CE IV

*Brakemotor



Mtg. Pos. M1 Shown

MOTORS

Motor Options & Construction

NORD motors are stocked in one of two ways. The first method is to stock a complete motor that is ready to be assembled to a gear reducer or shipped as a stand alone motor. The second method, the motor is assembled from component parts. The Mod next to a motor option designates that the option can be added to a complete motor by simple modification. The Build next to a motor option indicates that the motor will need to be built from component parts in order to incorporate the motor option.

Motor Options

Abbreviation	Description	Mod	Build	Page
AG	Absolute Encoder		✓	135
AICM	Additional Insulation		✓	129
ECR	Single Phase Motors, 60Hz		✓	128
EKK	Small Terminal Box	✓		132
EP	Epoxy Dipped Windings		✓	129
F	Blower Cooling Fan	✓		133
FC	Blower Cooling Fan	✓		133
HR	Hand Wheel		✓	130
IG...P	Incremental Encoder		✓	134
ISO H	Class H Insulation		✓	128
KB	Plugged Condensation Drain Holes		✓	129
KBO	Open Condensation Drain Holes		✓	129
KKV	Terminal Box Sealed with Resin	✓		129
MS	Quick Power Plug Connector	✓		132
OL	Totally Enclosed Non-Ventilated	✓		130
OL/H	Totally Enclosed Non Ventilated without Fan Cover		✓	130
RD	Canopy Drip Cover	✓		129
RDD	Double Fan Cover	✓		129
RLS	Motor Backstop		✓	131
SH	Space Heater		✓	128
TF	Thermistor		✓	127
TW	Thermostat		✓	127
WE	2nd Shaft Extension on Fan Side		✓	130
WU	High Resistance Rotor		✓	128
Z	High Inertia Cast Iron Fan		✓	131
-	IP66 Enclosure Protection	✓		129
-	Paint Coatings	✓		22

Stocked NEMA C-Face Motors

NEMA C-Face Motors

The National Electrical Manufacturers Association (NEMA) provides standardization of electrical equipment, enabling customers to select from a range of safe, effective and compatible products. A NEMA C-face motor has a machined face with a pilot and threaded holes for direct mounting onto a NORD reducer or other industrial equipment. NORD offers NEMA C-face motors stocked as finished goods and will also assemble NEMA C-face motors to your specifications. For ratings, see page 140.

Stocked NEMA C-Face Motors

Stocked NEMA C-face motors are offered in standard efficiency, energy efficient and in a brakemotor design. They are available in 230/460V-60Hz and 575V-60Hz up to 10 hp. Part numbers for stocked NEMA C-face motors are in the table below.

Assembled per Order NEMA C-Face Motors

NORD will assemble a NEMA C-face motor to your specifications based upon the available motor options from this catalog.

Motor Type	Power	Part Number 230/460V-60Hz	Part Number 575V-60Hz	Weight [lb]
High Performance Motors				
63S/4-56C	1/6 hp	31110012	31110013	7.9
63L/4-56C	1/4 hp	31610012	31610013	9.3
71S/4-56C	1/3 hp	32110012	32110013	11.9
71L/4-56C	1/2 hp	32610012	32610013	13.9
80S/4-56C	3/4 hp	33110012	33110013	17.6
80L/4-56C	1 hp	33610022	n/a	19.8
80L/4-143TC	1 hp	33610012	n/a	19.8
90S/4-145TC	1.5 hp	34110012	n/a	26.5
90L/4-145TC	2 hp	34610012	n/a	30.9
100L/4-182TC	3 hp	35110012	n/a	39.7
100LA/4-184TC	5 hp	35610012	n/a	46.3
132S/4-213TC	7.5 hp	36410012	n/a	97.0
132M/4-215TC	10 hp	36710012	n/a	121.3
160M/4-254TC TW	15 hp	37310012	n/a	160.9
160L/4-256TC TW	20 hp	37510012	n/a	178.6
180MX/4-284TC TW	25hp	37610012	n/a	276.3
180LX/4-286TC TW	30hp	37810012	n/a	307.2
Energy Efficient Motors				
80LH/4-56C	1 hp	33610094	33610095	19.8
80LH/4-143TC	1 hp	33610092	33610093	19.8
90SH/4-145TC	1.5 hp	34110092	34110093	26.5
90LH/4-145TC	2 hp	34610092	34610093	30.9
100LH/4-182TC	3 hp	35610092	35610093	39.7
112MH/4-184TC	5 hp	36110082	36110083	83.6
132SH/4-213TC	7.5 hp	36410092	36410093	97.0
132MH/4-215TC	10 hp	36710092	36710093	121.3
160MH/4-254TC TW	15 hp	37310092	37310093	160.9
160LH/4-256TC TW	20 hp	37510092	37510093	198.4
Brakemotors				
63S/4-56C BRE5 HL	1/6 hp	31110034 ◈	31110035 ∗	12.4
63L/4-56C BRE5 HL	1/4 hp	31610034 ◈	31610035 ∗	13.7
71S/4-56C BRE5 HL	1/3 hp	32110034 ◈	32110035 ∗	16.3
71L/4-56C BRE5 HL	1/2 hp	32610034 ◈	32610035 ∗	18.3
80S/4-56C BRE10 HL	3/4 hp	33110034 ◈	33110035 ∗	24.3
80L/4-56C BRE10 HL	1 hp	33610024 ◈	33610025 ∗	26.5
80L/4-143TC BRE10 HL	1 hp	33610034 ◈	33610035 ∗	26.5
90S/4-145TC BRE20 HL	1.5 hp	34110034 ◈	34110035 ∗	36.4
90L/4-145TC BRE20 HL	2 hp	34610034 ◈	34610035 ∗	40.8
100L/4-182TC BRE40 HL	3 hp	35110034 ◈	35110035 ∗	55.1
100LA/4-184TC BRE40 HL	5 hp	35610034 ◈	35610035 ∗	61.7
132S/4-213TC BRE60 HL	7.5 hp	36410034 ◈	36410035 ∗	123.5
132M/4-215TC BRE100 HL	10 hp	36710034 ◈	36710035 ∗	156.5
160M/4-254TC BRE 150 HL TW	15 hp	37310034 ◈	37310035 ∗	220.5
160L/4-256TC BRE 250 HL TW	20 hp	37510034 ◈	37510035 ∗	242.5

◈230/460V motors have brake systems supplied with 230VAC to a GVE20L rectifier that outputs 205VDC to the brake coil

∗ 575V motors have brake systems supplied with 575VAC to a GHE50L rectifier that outputs 250VDC to the brake coil

Standards

All motors are in accordance with existing standards and regulations:

NEMA MG 1 - Motors and Generators:

- Electrical performance
- Motors for operation on variable AC vector drive

UL 1004 – Electric Motors

CSA C22.2 No. 100-04 - Motors and Generators:

Industrial Products
IEC 60034 parts 1, 5, 6, 8, 9, 11 and 14.

- Part 1 – General rules
- Part 5 – Types of enclosures
- Part 6 – Types of cooling
- Part 8 – Terminal lead designations and sense of rotation
- Part 9 – Noise limits
- Part 11 – Integrated thermal protection
- Part 14 – Mechanical vibration

IEC 60038 – Standard voltages

CE	NORD motors carry the CE mark in accordance with the Low Voltage Directive and, if installed properly, the Electromagnetic Compatibility Directive (EMC). The CE mark is required for installation in European Union (EU) states.
®	Many NORD motors from frame size 63 to 315 are an Underwriters Laboratories Recognized component per UL standard 1004. Frames 63-132 File number E191510 Frames 160+ File number E227215
c SA us	The Canadian Standards Association CUS mark indicates that CSA has tested and approved NORD motors according to both US and Canadian standards. It is equivalent to the Underwriters Laboratories RU recognition mark (UL standard 1004) and the CSA mark according to CSA Standard C22.2 No. 100-04 Frames 63-132 File number LR112560 Frame 160+ File number LR13494
ee	NORD Energy Efficient motors up to frame 160 have been evaluated by the United States Department of Energy and recieved a Certificate of Compliance to certify the efficiency ratings. The certificate of compliance is CC 092B.
CSA E	NORD energy efficient motors carry the CSA energy efficiency verification mark. This mark ensures that CSA has verified that NORD motors are designed and manufactured to meet energy efficiency requirements number EEV112560.

EPAct – US Energy Efficiency

The Energy Policy Act of 1992 (EPAct) covers efficiency levels of general purpose industrial electric motors and became effective October 24, 1997. The basic goal of the law is to promote energy conservation. This law mandated energy efficiency requirements for many devices including some types of industrial electric motors. The efficiency levels are defined in NEMA MG-1 table 12-10. The regulations to implement this law have been developed by the Department of Energy (DOE).

The law covers minimum efficiency levels for general purpose motors including:

- Single-speed, polyphase NEMA T frame (and IEC equivalents)
- 1 to 200 hp (0.75 to 150 kW)
- 1200, 1800 or 3600 rpm
- NEMA design A and B
- Continuous rated
- Foot-mounted
- 230/460V-60Hz

The law excludes the following motor types from minimum efficiency levels:

- Integral gearmotors
- Brake motors

The NORD "H" line of energy efficient motors are designed to meet the efficiency levels defined by EPAct. NORD offers these motors as an option in combination with our high efficiency gear units for superior energy savings.

Efficiency levels for enclosed 4-pole motors per EPAct and NEMA MG 1 - in percent efficiency [%]

Efficiency for EPACT & NEMA MG1 4-Pole Motors

hp	1	1.5	2	3	5	7.5	10
kW	0.75	1.1	1.5	2.2	3.7	5.5	7.5
Eff%	82.5	84.0	84.0	87.5	87.5	89.5	89.5

hp	15	20	25	30	40	50	60
kW	11	15	18.5	22	30	37	45
Eff%	91.0	91.0	92.4	92.4	93.0	93.0	93.6

hp	75	100	125	150	200
kW	55	75	90	110	150
Eff%	94.1	94.5	94.5	95.0	95.0

Canadian Energy Efficiency

The Energy Efficiency Act and the Energy Efficiency Regulations establish minimum energy performance levels for electric motors from 1 to 200 HP (0.75 to 150 kW) for sale or lease in Canada. The Energy Efficiency Regulations were developed by Natural Resources Canada (NRCan).

Certain National Electrical Manufacturers Association (NEMA) motors have been regulated since Feb. 3,1995. Effective Nov. 27, 1997, the Energy Efficiency Regulations were amended to include International Electrotechnical Commission (IEC) motors. This amendment also increased the minimum energy performance levels that motors must meet. For explosion-proof motors and motors contained within an integral gear assembly, the effective date of the Regulations is Nov. 27, 1999.

The regulations mandate that motors carry an energy efficiency verification mark that is authorized by Standards Council of Canada (SCC) accredited certification organization such as Canadian Standards Association (CSA).

CEMEP Agreement
European Efficiency Categories

CEMEP, the association of European Electric Motor Manufacturers, has reached an agreement with the European Commission's General Directorate for Energy that in the future all 2 and 4-pole low voltage motors from 1 to 100kW will be categorized on the basis of their efficiency. The classification will be displayed on the nameplate and in catalogs. The following categories will be used: EFF1, EFF2 and EFF3.

EFF 1	EFF1-indicates a high efficiency factor.
EFF 2	EFF2-inicates an improved efficiency factor.
EFF 3	Indicates a standard efficiency motors.

NORD supplies both motors of EFF1 and EFF2 categories in its 4-pole motors. The category EFF2 motors are the standard efficiency motors and the EFF1 motors are the "H" line of energy efficient motors.

In the future NORD will mark all of its 50-Hz motor with the CEMEP efficiency symbols.

kW	1.1	1.5	2.2	3	4	5.5
hp	1.5	2	3	4	5.4	7.5
EFF1 [%]	83.3	85.0	86.4	87.4	88.3	89.2
EFF2 [%]	76.2	78.5	81.0	82.6	84.2	85.7
EFF3 [%]	<76.2	<78.5	<81.0	<82.6	<84.2	<85.7

kW	7.5	11	15	18.5	22	30
hp	10	15	20	25	30	40
EFF1 [%]	90.1	91.0	91.8	92.2	92.6	93.2
EFF2 [%]	87.0	88.4	89.4	90.0	90.5	91.4
EFF3 [%]	<87.0	<88.4	<89.4	<90.0	<90.5	<91.4

kW	37	45	55	75	90
hp	50	60	75	100	120
EFF1 [%]	93.6	93.9	94.2	94.7	95.0
EFF2 [%]	92.0	92.5	93.0	93.6	93.9
EFF3 [%]	<92.0	<92.5	<93.0	<93.6	<93.9

INVERTER DUTY MOTOR

Inverter/Vector Duty

NORD single–speed motors are Inverter/Vector Duty. The construction of the NORD motors insulating system takes into account the non-sinusoidal wave forms produced by variable frequency drives. NORD uses high grade insulating components and extra first turn protection as well as double coated wire to ensure long service life when connected to AC vector drives. NORD motors can produce full torque at zero speed if properly sized, selected and controlled.

Voltage and Frequency

NORD motors are available in a wide range of voltages and frequencies for use in North America and around the world. For a more detailed list of choices see page 126.

NORD motors designed for North American voltages (208V, 230V, 460V and 575V) conform to the voltage and frequency tolerances in NEMA MG-1. The voltage tolerance is +/-10%, the frequency tolerance is +/- 5% or a combined voltage and frequency tolerance of +/-10%.

Low Inertia

The motor inertia in all NORD motors is extremely low which allows for a much more dynamic motor control capability. Low motor inertia is a significant advantage when using NORD motors with AC vector drives or vector controllers. NORD motors can cycle more frequently and require less mechanical energy to start than standard NEMA frame motors. This leaves more energy to start the load.

High Torque

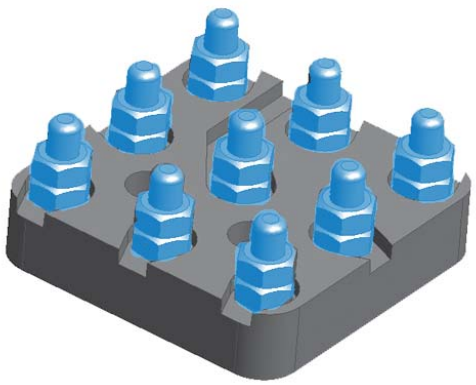
The NORD motors produce higher starting torque than required by NEMA standards. This is achieved through improved motor winding, rotor design and construction.

Non-Sparking Fan

The standard NORD motor fan is a non-sparking design. The fan will also provide proper airflow in either direction of rotation.

Terminal Block

Each NORD motor uses a terminal block, which is a superior method of wire termination when compared to pigtail leads. A terminal block ensures long-term reliability of the power connections.

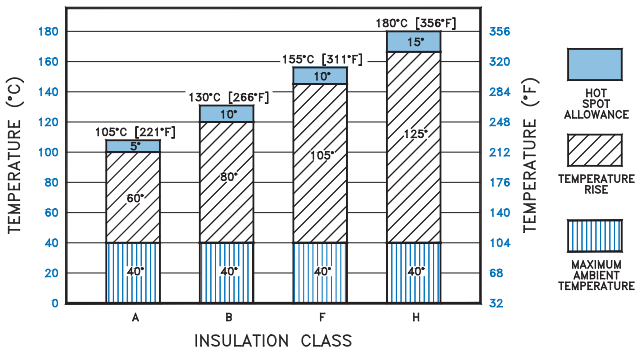


Tropical Protection (Anti-fungal)

As standard the NORD motor insulation system is tropically protected. The insulating and construction components are inorganic materials so they resist fungal growth.

Insulation Class

NORD motors are constructed with a thermal class F insulating system. The motors are also designed for a class B temperature rise (80°C). The use of class F insulation with a class B temperature rise provides increased operating life. Motors constructed with class H insulation are also available as an option.



Insulation System

NORD motor insulation system is designed to provide a superior degree of protection. NORD utilizes the following insulation components:

- Magnet wire – double coated insulation
- Varnish dip impregnation
- Slot liners
- Phase paper
- Phase separators
- Top sticks
- Connecting wire sleeves

Other motor manufacturers eliminate some of these insulating components for cost reduction.

Inverter/Vector Duty – Voltage Spikes

All NORD motors are constructed with an insulating system designed to withstand the repeated voltage spikes generated by modern AC vector drives. The insulation system withstands the ratings in conformance with NEMA MG 1-2006 Section 31.4.4.2 Voltage Spikes.

$V_{peak} = 3.1 \times V_{rated}$ with a Rise time ≤ 0.1µs.

Ambient Temperature

NORD motors are designed to operate with a maximum ambient temperature of 40°C (104°F). If the motor's operating environment exceeds 40°C, the motor's nominal power P_n either needs to be de-rated (see table below) or use upgraded insulation.

Ambient temp [°F]	113	122	131	140
Ambient temp [°C]	45	50	55	60
De-rate factor	0.96	0.92	0.87	0.82

Motor Rated Power = [P_n x De-rate factor]

Elevation

NORD motors are designed to operate at an elevation of up to 3300 ft (1000 m) above sea level. At higher elevations the air is thinner resulting in less cooling capacity. If the motor's nominal power P_n installation elevation exceeds 3300 ft (1000 m), the motor either needs to be de-rated (see table below) or requires upgraded insulation.

Altitude [ft]	5000	6500	8200	10000	11500	13000
Altitude [m]	1500	2000	2500	3000	3500	4000
De-rate Factor	0.97	0.94	0.90	0.86	0.83	0.80

Motor Rated Power = [P_n x De-rate factor]

Service Factor

Motors rated 230/460V-60Hz and 332/575V-60Hz have a service factor of 1.15. Almost all other motors have a service factor of 1.1 or 1.0.

Duty Classes

The following duty types are defined in IEC 60034-1.

Duty Type	Explanation Excerpts
S1	Continuous operation at a constant load, the motor reaches thermal equilibrium
S2	Short-time operation at a constant load for a given time followed by a time of rest until the motor is completely cooled down to ambient temperature. Example: S2-10 minutes Recommended values for determination: 10, 30 min.
S3	Intermittent operation sequential, identical run and rest cycles with constant load. Temperature equilibrium is never reached. Starting current has little effect on temperature rise. The cyclic duration factor (cdf) indicates the portion of operation time in relation to a complete duty cycle. The typical duty cycle time is 10 minutes, unless otherwise specified. Example: S3-40% Recommended values for determination: 25, 40, 60%
S6	Continuous operation with intermittent load sequential, identical cycles of running with constant load and running with no load. No rest periods. Example: S6-40% Recommended values for determination: 25, 40, 60%

Power Increasing Factor for Short-term & Intermittent Operation

Motor ratings in this catalog are based on continuous duty operation (S1). If a motor is designed for S1 duty, but is to be operated for short-time or intermittent operation it can be subjected to higher loads. The available motor power can be raised above the motor rated power by the "increasing factor" in the table below.

Duty Type			Increasing factor
S2	Operating time	10 min	1.40
		30 min	1.15
S3	Cyclic duration factor (cdf)	25%	1.33
		40%	1.18
		60%	1.08
S6	Cyclic duration factor (cdf)	25%	1.45
		40%	1.35
		60%	1.15

Motor Rated Power = [P_n x Increasing factor]

Enclosure

The NORD standard motors are provided with Totally Enclosed Fan-Cooled (TEFC) with an IP55 enclosure rating. Other enclosures are available, including Totally Enclosed Non-Ventilated (TENV), Totally Enclosed Blower-Cooled (TEBC), and IP66.

The motor integral cooling fan provides proper air flow in either direction of rotation. The IEC cooling classification is IC 411 according to IEC 60034-6.

IP Enclosures per IEC 60034-5 - Simplified

	1st digit Foreign body protection		2nd digit Water protection
0	No protection	0	No Protection
1	Protected against solid objects 50mm (2 in) in diameter and larger	1	Protected against dripping water
2	Protected against solid objects 12 mm (1/2 in) in diameter and larger	2	Protected against dripping water up to a 15 degree angle
3	Protected against solid objects 2.5 mm (0.1 in) in diameter and larger	3	Protection against sprayed water
4	Protected against solid objects 1 mm (0.04 in) in diameter and larger	4	Protection against splashed water
5	Protected against dust	5	Protection against water jets
6	Dust tight	6	Protection against high pressure water jets
7	--	7	Protection against intermittent submersion in water
8	--	8	Protection against continuous submersion in water

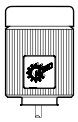
Protective Features

All NORD Motors and Speed Reducers are constructed to provide a high degree of protection against wet and severe environments. NORD Motors and Speed Reducers are extremely well sealed against moisture ingress and use corrosion and moisture resistant components. NORD has recently made many enhancements in the motor and gear units standard construction to provide improved environmental protection. Many of the standard protection features of the NORD units are only available at an additional cost from other motor and gear drive suppliers. NORD designs all gearmotors, speed reducers and motors for installation in harsh industrial, commercial and municipal installation environments.

Standard Construction

- Shaft lip seals on both ends of the motor shafts
- Stator to endbell connections sealed to exclude moisture
- Double coated magnetic wire insulation
- Inverter/vector duty insulation system conforms to NEMA MG1-1998, section 31.4.4.2 voltage spikes
- Moisture resistant varnish dipped windings improved varnish materials
- Inorganic insulating components for tropical protection
- Moisture resistant motor windings
- Conduit box sealed with gaskets
- Corrosion resistant alloy materials
- Threaded cable entry holes

Motors for Indoor Operation - Option Codes

	Dry Conditions	Wet or Humid Conditions
Ambient Temperature Fluctuation	–	KB, SH
Paint	–	NSD+
Vertical Motor Mount 	RD	RDD
Brakemotor	–	RG

Motors for Outdoor Operation - Option Codes

	Sheltered from the Elements	Exposed to the Elements
Ambient Temperature Fluctuation	KB, SH	KB, SH, KKV
Paint	NSD+	NSDx3
Vertical Motor Mount 	RD	RDD
Brakemotor	RG	RG

Option Code Key

KB	Condensation Drain Holes - Plugged	Page 129
SH	Space Heater	Page 128
KKV	Terminal Box Sealed with Resin	Page 129
NSD+	Nord Severe Duty Paint	Page 22
NSDx3	Nord Severe Extreme Duty X3 Paint	Page 22
RD	Canopy Drip Cover	Page 129
RDD	Double Fan Cover	Page 129
RG	Corrosion Protected Brake	Page 163

General Options

Voltage and Frequency

NORD motors are available in a number of voltages and frequencies. The standard voltages are commonly available. Optional voltages can be provided, but may include an increase in price and additional lead time. It also may be possible to provide motors with special voltages and frequency operation points.

Standard Voltages

Single speed motors	Two speed motors
230/460V-60Hz (up to 30 hp)	460V-60Hz
460V-60Hz (40 hp and larger)	230V-60Hz
575V-60Hz	575V-60Hz
400V-50Hz	400V-50Hz

Optional Voltages

Single speed motors	Two speed motors
208V-60Hz (up to 10 hp, not available in energy efficient design)	Other voltages & frequencies available upon request
380V-50Hz	
415V-50Hz	
380V-60Hz	
Other voltages & frequencies available upon request	

Poles / speeds

NORD offers a variety of single speed and two speed motors in addition to the standard 4 pole motor. NORD single speed motors are inverter/vector duty rated, however, it is not recommended to run a NORD two speed motor with an AC vector drive.

Number of Poles	Synchronous Speed at 60Hz	Synchronous Speed at 50Hz	Notes:
Single Speed Motors			
4	1800 rpm	1500 rpm	–
2	3600 rpm	3000 rpm	–
6	1200 rpm	1000 rpm	–
Two Speed Motors			
4-2	1800/3600 rpm	1500/3000 rpm	Single winding
8-2	900/3600 rpm	750/3000 rpm	Two winding
8-4	900/1800 rpm	750/1500 rpm	Single winding

Other speeds available upon request.

US Canadian Standard (CUS)

CUS motor construction defines that NORD motors are constructed in accordance to UL 1004 (electric motors) and CSA C22.2 No. 100-04 (motors and generators) guidelines. This option is standard for 208, 230, 460, and 575 Volt operation at 60 Hz.

Motors nameplated with the CUS option will be marked and indicating that the Underwriters Laboratories and CSA have tested and approved NORD motors according to both US and Canadian standards.

Motor Protection

Selecting the appropriate motor protective system is a key factor in reliable motor operation. There are two common classes of motor protection; current based and motor temperature based. Electrical installation codes require at least two types of protection in the motors circuit, both of which are normally current based. First is short-circuit protection normally accomplished by fuses or circuit breakers. Second is "motor overload protection" this is normally a device called a "motor overload" or a "heater." Current based protection is effective in some conditions. NORD can provide two different types of motor temperature based protection, a PTC thermistor (TF) or a bi-metallic thermostat (TW). Temperature based protection is more effective motor protection in many situations, see the table below.

⬆ = Good protection ⬌= Limited protection ⬇ = No protection	Fuses	Motor Overloads	PTC Thermistor (TF)	Bi-metallic Switch (TW)
Over current up to 200%	⬇	⬆	⬆	⬆
High inertia starting	⬇	⬌	⬆	⬌
Frequent motor starts	⬇	⬌	⬆	⬆
Stalling	⬌	⬌	⬌	⬌
Single phasing	⬇	⬌	⬆	⬆
Supply voltage deviations	⬇	⬆	⬆	⬆
Supply frequency deviations	⬇	⬆	⬆	⬆
Inadequate motor cooling	⬇	⬇	⬆	⬆
Bearing Damage	⬇	⬇	⬆	⬆

Thermostat (TW)

Build

Three bimetallic switches are connected in series in the motor windings, one per motor phase. Upon reaching the limit temperature, this device automatically opens circuits. The installer is responsible to wire the thermostat into the motor control circuit. After the temperature has fallen below the trip limit, the thermostat switch re-sets automatically. The auto resetting property must be considered when designing the safety aspects of the control scheme.

TW Ratings	
NC (Normally Closed)	auto resetting
Voltage	6 to 500VAC
Current	1.6 A
Resistance	less than 50 mΩ

Thermistor (TF)

Build

Three positive temperature coefficient (PTC) thermistors are connected in series in the motor windings, one per motor phase. Thermistors require an external tripping device. Upon reaching the limit temperature, the thermistors change their resistance suddenly. In connection with a tripping device, this property is employed to monitor the motor temperature. The relay built into the tripping device has a make-and-break-contact, which is used in the control wiring. NORD does not provide the external tripping device with the TF thermistor option. You must request a thermistor tripping device separately. Many AC vecotor drives and PLCs include a built in PTC thermistor evaluation input.

TF Ratings	
Transition Temperature	150 °C +/- 5°C
Resistance < Transition	20 ... 500 . Ω
Resistance > Transition	> 4k Ω.
Reed Voltage	< 7,5 V
Rated Current	< 1 mA
Motor Ambient Temp.	40°C

Space Heater (SH)

Build

Motors subjected to extreme temperature fluctuations or severe climatic conditions can be damaged by the formation of condensation. NORD can provide motor anti-condensation space heaters inside the motor to heat up the windings when the motor is not operating. This will prevent moisture from condensing inside the motor. The space heaters must not be switched on while the motor is running.

Space Heater Voltage Must be specified

Voltages available
❍ 115V – 50/60Hz
❍ 230V – 50/60Hz
❍ 460V – 50/60Hz
❍ other voltages available on request

Class H Insulation (ISO H)

Build

NORD motors can be manufactured with class H insulation system. Standard NORD motors include double coated magnetic wire windings. When these windings are paired with a class H insulation it provides extra temperature capacity for the motor and will lengthen the motor's life. Class H insulation rated motors are also an advantage in some severe applications:

- Increased ambient temperature installations above 40°C (104°F)
- Increased elevation installations – above 3300 ft (1000 m)
- Applications with a high number of starts per hour.
- Meets class H insulation motor specifications
- Lower operating frequency when used with AC vector drive systems
- For additional information on insulation class see page 123.

High Resistance Rotor (WU)

Build

Using Silumin rotor material, NORD offers a high resistance rotor to soften the motors operation and allow higher overload torques.

Single Phase Motors, 60Hz (ECR)

Build

The ECR series of single phase motors is intended for demanding operation at 60Hz with a supply voltage of 115V or 230V. The permissible voltage range is 115/230V +/- 10%. The ECR motors have a 1.15 service factor and are available from 0.16 - 2 hp.

Paint Coatings

Mod

NORD's standard paint coating is a two component, aliphatic polyurethane finish contaning 316 stainless steel material. This gray stainless steel paint has excellent appearance and outstanding physical properties. It is suitable for both indoor and outdoor applications. For more information and an explanation of all of our paint options please see page 22.

Condensation Drain Holes

NORD motors can be equipped with condensation drain holes. These drain holes are placed in the motor endbells at the lowest possible point. The drain holes are closed at the factory with plastic snap in plugs. They allow for condensation accumulation in the motor to drain after the closing plugs are removed.

The motor drain holes can be provided by NORD either open (KBO) or sealed with a closing plug (KB).

IMPORTANT NOTE

The motor must be installed in the mounting orientation specified on the nameplate or the drain holes will not function properly and may result with the motor filling with water.

Condensation Drain Holes, Plugged (KB)

Build

KB drain holes are plugged for shipment. In order for the holes to effectively drain moisture, the plugs must be removed before using the motor.

Condensation Drain Holes, Open (KBO)

Build

KBO drain holes are shipped open (not plugged).

IP66 Enclosure Protection

Mod

NORD motors can be provided with an IP66 enclosure protection. IP66 protection is suitable for wet, high-pressure wash down and extremely dusty environments, and includes all requirements included in IP65 enclosure protection.

IP	1st digit Foreign body protection	IP	2nd digit Water protection
6	Dust tight	6	Protection against high pressure water jets

Terminal Box Sealed with Resin (KKV)

Mod

Terminal boxes can be sealed with a flexible, electrically safe resin to ensure that contaminants, water, and moisture cannot pass through the terminal box into the stator body. This option is helpful in extremely dusty, wet and humid environments. Another environment where this option is helpful is in installations that have frequent large temperature swings where condensation may form.

Additional Insulation (AICM)

Build

NORD can provide additional insulation inside the motor to provide additional electrical protection in extremely wet or corrosive environments. An electrically safe insulating material is coated internally in the stator windings and on the rotor body

Epoxy Dipped Windings (EP)

Build

In extremely wet environments, the motor windings are dipped in epoxy for improved moisture protection. The motor can also be treated with the standard NORD Severe Duty + (NSD+) package for an even higher degree of protection.

Canopy Drip Cover (RD)

Mod

For wet or dirty installations where the fan end of the motor is mounted up, thus allowing water or debris to fall into the motor's fan guard, NORD offers a canopy drip cover to block this falling water or debris.

Double Fan Cover (RDD)

Mod

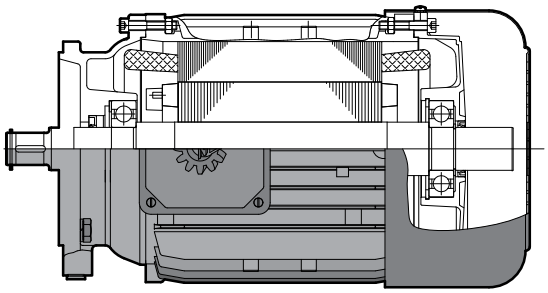
For wet or dirty installations where the fan end of the motor is mounted up, the NORD Double Fan Cover provides protection against falling or wind blown water, snow, dirt or debris from entering the back of the motor.

Additional Options

Totally Enclosed Non-Ventilated (OL) Mod

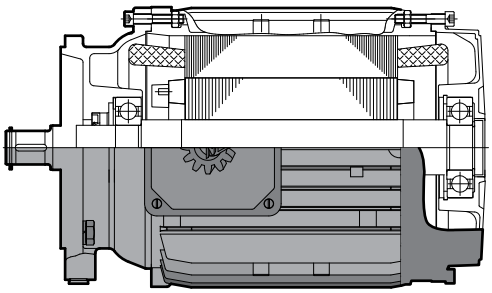
NORD can provide totally enclosed non-ventilated (TENV) motor enclosure. TENV motors provide benefits in certain operating environments; such as extremely dusty or dirty applications, where cooling fans may have material accumulation, which can be detrimental to the motor and the application. The OL series of motors are the standard fan cooled motor construction including the fan cover, but provided without the fan. TENV motors can also be used to reduce cooling fan noise on a standard motor.

A TENV motor's frame size is larger then a totally enclosed fan cooled (TEFC) motor. For intermittent operation, a TENV motor can be operated at a 50% duty cycle at full rated power.



Totally Enclosed Non-Ventilated, without Fan Cover (OL/H) Build

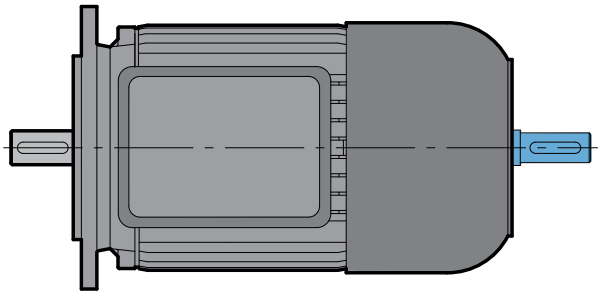
The OL/H series of TENV motors are more compact in space than the OL series. They do not include the rotor shaft extension through the back bearing end bell or the fan cover.



2nd Shaft Extension on Fan Side (WE) Build

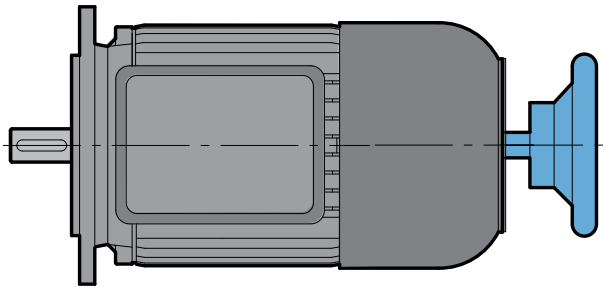
NORD can provide a second shaft extension on the fan side of the motor that protrudes through the fan cover. This extension can be used as a power take-off or to mount customer supplied devices such as encoders and tachometers.

The shaft extension can be provided on both motors with and without brakes. The shaft extension can not be used on motors with blower fans (F) or (FC). For dimensions see pages 148 - 151.



Hand Wheel (HR) Build

Motors can be supplied with a hand wheel provided on the second shaft extension. The hand wheel can be used for manual operation during power outages, or for machine positioning setup. For dimensions see pages 148 - 151.



WARNING

The customer is required to provide appropriate safety guarding of the rotating hand wheel.

High Inertia Cast Iron Fan (Z)

Build

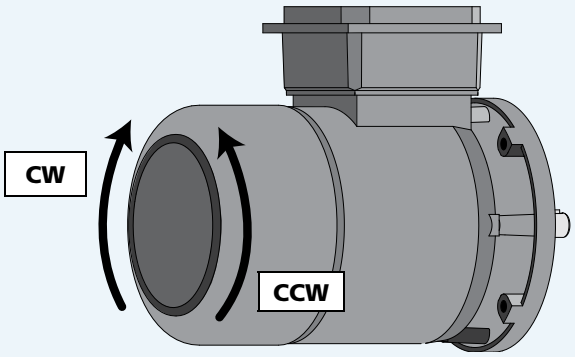
An optional cast iron motor cooling fan is available. This fan is used as a mechanical soft start and/or soft stop. This fan adds inertia to the motor. The high inertia fan can also be used for a flywheel effect to store mechanical energy. This can be helpful in smoothing rapid load changes. The cast iron fan replaces the standard plastic motor fan. The motor length is the same as a brakemotor.

Motor Frame	Fan Inertia J_z[lb-ft²]
71	0.0475
80	0.1140
90	0.2375
100	0.2684
112	0.5653
132	0.9500

Motor Backstop (RLS)

Build

NORD can provide backstops on many motor frames. A backstop will prevent the motor from rotating in one direction. A common use is to prevent a motor from allowing a load to move backwards when power is removed. A motor brake can also be used for this same purpose. A backstop adds length to the motor. For the motor length extension, see the table below.



The allowable direction of rotation must be specified in the order.

Allowable Shaft Rotation
❍ Clockwise - Back of Motor
❍ Counter Clockwise - Back of Motor

Motor Size	Backstop Torque [lb-in]	Minimum Speed [rpm]	Motor Extension [in]
80S/L	1150	860	2.52
90S/L	1150	860	2.95
100L	1150	860	3.58
112M	3270	750	3.66
132S/M	3270	750	4.21
160M/L	7880	670	6.57
180MX/LX	7880	670	6.73
200L	9120	630	6.57
225S/M	9120	630	6.57
250M	22130	400	9.84
280S/M	51330	320	11.02

Additional Options

Quick Power Plug Connector (MS)

Mod

The quick power plug connector (MS) is a simple and fast way to connect and disconnect a motor or brake motor. The MS connector is available on NORD three-phase motors from frame size 63 to 132. The motor connections are made by a modular power plug manfacturer by Harting. After the first installation, the motor can be quickly changed by simply plugging and unplugging the electrical connections. This will ensure the new motor is properly wired. This is a significant advantage to equipment builders who fabricate machinery on site and then ship to another location. The motor with the MS connector can simply be plugged in during final installation.

NORD supplies the male connector half mounted on the motor conduit box. The customer must supply the female connector half mounted on the power wiring. NORD supplies a protective plastic cover on the motor male connector half to protect from dirt and damage prior to installation.

Advantages:

- Simple motor wiring
- Accurate wiring of motor at final job site
- Fast motor replacement
- Accurate wiring of replacement motor
- Ideal for portable equipment
- Reduces the required personnel for motor replacement
- Faster motor changes reduce down time

Plug ratings:

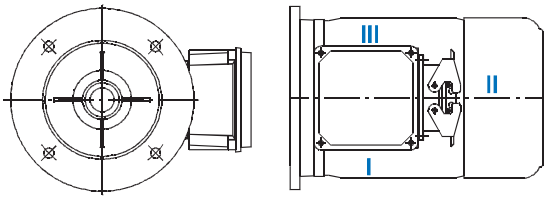
Manufacturer	Harting
Connector	HAN 10 ES/HAN 10ESS Cage Clamp Connectors
Number of Pins	10-Male
Voltage	600VAC per UL/CSA
Current	16A - Continuous

Motor Power Plug Kits:

Includes conduit box, mounting hardware & Male Harting Motor Plug

P/N	Motor size
11035350	63 + 71
13035350	80 + 90 + 100
16035350	112
16335350	132

Power Plug Positions



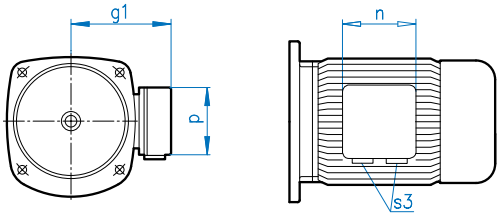
Power plug position must be specified

Power Plug Position		
❍ I	❍ II	❍ III

Small Terminal Box (EKK)

Mod

The motor terminal box can be provided as a smaller, one-piece terminal design. This option is valid for standard motors 0.16 - 10 hp and is not available for Brakemotors.

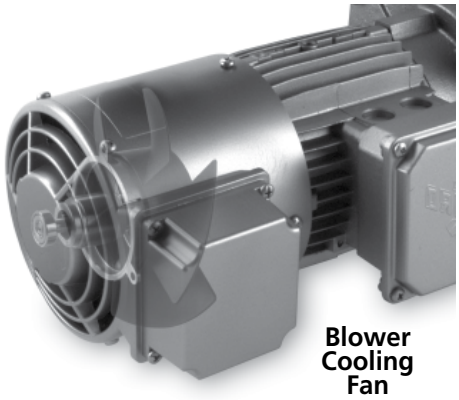


EKK Dimensions				
Motor Frame	**g1**	**n**	**p**	**S3**
63	3.94	2.95	2.95	2x M16 x 1.5
71	4.29	2.95	2.95	2x M16 x 1.5
80	4.88	3.62	3.62	2x M20 x 1.5
90	5.08	3.62	3.62	2x M20 x 1.5
100	5.51	3.62	3.62	2x M20 x 1.5
112	5.91	3.62	3.62	2x M20 x 1.5
132	6.85	4.13	4.13	2x M25 x 1.5

Blower Cooling Fan (F & FC)

Mod

NORD offers continuous running motor mounted cooling fans that provide motor cooling at low motor speeds. When a motor is operated on an AC vector drive at low frequency, standard rotor fans do not provide adequate airflow for cooling. NORD's separate powered motor cooling fans provide that necessary airflow. These separately powered fans replace the standard motor fan cover and fan.



Blower Cooling Fan

Option F – 3ph & 1ph 220-575V 50/60Hz

Motor Frame	60Hz Ratings			50Hz Ratings		
	Voltage [V]	Current [A]	Power [W]	Voltage [V]	Current [A]	Power [W]
Single phase connection - ⊥ (Delta)						
63	230 – 277	0.11	38	230 – 277	0.10	27
71	230 – 277	0.12	41	230 – 277	0.10	28
80	230 – 277	0.13	44	230 – 277	0.11	29
90	230 – 277	0.25	88	230 – 277	0.26	72
100	230 – 277	0.28	88	230 – 277	0.26	70
112	230 – 277	0.31	107	230 – 277	0.26	73
132	230 – 277	0.27	89	230 – 277	0.29	82
160 - 225	230 – 277	0.41	140	230 – 277	0.45	128
Three phase low-voltage connection - ⊥ (Delta)						
63	220 – 332	0.08	23	220 – 290	0.10	27
71	220 – 332	0.08	24	220 – 290	0.10	30
80	220 – 332	0.08	25	220 – 290	0.01	29
90	220 – 332	0.21	64	220 – 290	0.28	86
100	220 – 332	0.21	66	220 – 290	0.27	86
112	220 – 332	0.23	70	220 – 290	0.27	85
132	220 – 332	0.25	74	220 – 290	0.32	96
160 - 225	220 – 322	0.49	165	220 – 290	0.52	155
Three phase high-voltage connection - (Y)						
63	380 – 575	0.04	23	380 – 500	0.05	29
71	380 – 575	0.04	25	380 – 500	0.05	30
80	380 – 575	0.04	26	380 – 500	0.05	29
90	380 – 575	0.12	62	380 – 500	0.16	82
100	380 – 575	0.12	66	380 – 500	0.16	83
112	380 – 575	0.13	70	380 – 500	0.16	82
132	380 – 575	0.14	75	380 – 500	0.18	96
160 - 225	380 – 575	0.28	165	380 – 500	0.29	155

Option FC – 115V 50/60Hz 1ph

Motor Frame	60Hz Ratings			50Hz Ratings		
	Voltage [V]	Current [A]	Power [W]	Voltage [V]	Current [A]	Power [W]
Single Phase Connection - ⊥ (Delta)						
63	100 – 135	0.23	42	100 – 135	0.30	42
71	100 – 135	0.23	47	100 – 135	0.30	44
80	100 – 135	0.27	57	100 – 135	0.30	43
90	100 – 135	0.46	102	100 – 135	0.57	78
100	100 – 135	0.53	105	100 – 135	0.54	78
112	100 – 135	0.60	115	100 – 135	0.55	80

AC Vector Drive
Related Options

Incremental Encoder (IG..P)

Build

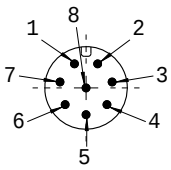
NORD can provide an incremental encoder mounted on the back of a motor or brake motor. Commonly encoders are used as speed or position feedback devices for use with AC drives, motion controllers or PLC's. Below are standard encoders; however, others can be supplied on request.

Encoder nomenclature must be specified.

Encoder nomenclature

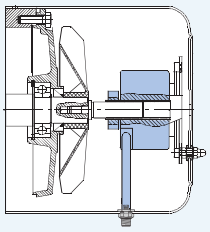
Encoder Type: Quadrature
Differential Marker pulse

M12 Connector Interface

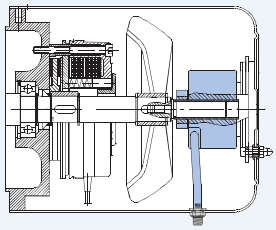


Wiring Diagram

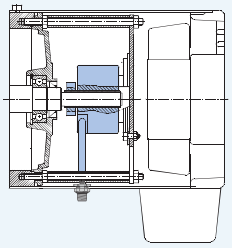
Pin	Conn	Cord
1	0V	WH
2	+V	BN
3	A	GN
4	A\	YE
5	B	GY
6	B\	PK
7	Z	BU
8	Z\	RD
Nut	Gnd	Open



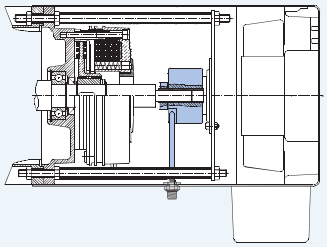
Standard Motor with Encoder



Encoder with Brake Option



Encoder with F Type Blower Fan



Brake Option, Blower Fan with Encoder

	IG1 P	IG4 P	IG11 P	IG41 P	IG12 P	IG42 P	IG13 P	IG43 P
Interface	TTL/RS422 (26C31)		TTL/RS422 (26C31)		HTL/Push-pull (IC-WE)		Line Driver (7272)	
Logic [VDC]	5		5		10-30		5-30	
Pulse Count [PPR]	1024	4096	1024	4096	1024	4096	1024	4096
Power Supply [VDC]	4-6	4-6	10-30	10-30	10-30	10-30	5-30	5-30
Part Number	19551500	19551520	19551502	19551522	19551501	19551521	19551503	19551523
Max Current Draw [mA]	100				150			
Max Frequency [kHz]	300							
Ambient Temperature [°F]	-4 to185							
Enclosure	IP66							
Cable	M12 8-pin male plug							

Pre-fabricated Encoder Cables

NORD can provide Turck pre-fabricated encoder molded cordsets (M12, 8-pin, shielded, twisted pair)

Length	In-line		Right-angle	
	NORD P/N	Turck P/N	NORD P/N	Turck P/N
2m	19551580	E-RKC 8T-264-2	19551584	E-WKC 8T-264-2
5m	19551581	E-RKC 8T-264-5	19551585	E-WKC 8T-264-5
10m	19551582	E-RKC 8T-264-10	19551586	E-WKC 8T-264-10
15m	19551583	E-RKC 8T-264-15	19551587	E-WKC 8T-264-15
Field Wireable	19551588	CMB 8181-0	-	-
Custom	order from Turck	E-RKC 8T-264	order from Turck	E-WKC 8T-264

Encoders for NORD AC Drives

NORD AC vector drives with encoder inputs are designed to use TTL/RS422 encoders. There are also advantages in using an encoder with the 10-30VDC power supply system. The NORD AC vector drives can use a wide range of pulse counts, however the 1024PPR version provides good performance with minimal interference issues. A 4096 PPR encoder can also be used and will provide increased precision in some application but has some increased concerns with noise interference.

Recommended encoder: IG11P – 1024PPR/TTL/10-30VDC
Alternate encoder: IG41P – 4096PPR/TTL/10-30VDC

Absolute Encoder (AG)

Build

Absolute encoders offer a unique value (voltage, binary count, etc.) for each mechanical position. When an absolute encoder is powered up, the position of the encoder is known. Absolute encoders are available in single or multi-turn versions. The encoder is attached under the fan cover with field bus connection outside the fan cover.

Absolute encoders can be provided to meet a variety of specifications:

- Resolution: up to 17 bits of resolution per turn (131,072 steps) with 4096 turns (12 bits of turns)
- Interfaces: Synchronous serial interface (SSI), SSI with incremental track, ProfiBus, DeviceNet, CANopen, CANlift, and other interfaces

AC Vector Drive
SK 300E Trio

NORDAC SK 300E
Motor Mounted Frequency AC Vector Drive

For select HP ratings, NORD can provide a fully programmable, high performance AC vector drive mounted on the motor. This motor mounted AC vector drives:

- Eliminates the need to separately mount & wire the AC drive
- Insures AC vector drive/motor compatibility
- Has an IP 55 washdown duty enclosure
- Provides Electronic Motor Overload protection
- Insures smooth constant torque operation down to 2 Hz (check motor thermal limitations)
- Features a unique plug-in construction where the program stays with the motor, minimizing return to service time in the event of AC vector drive replacement

SK 300E AC Vector Drive Ratings

- 200-240 VAC 3 phase 50/60 Hz input, ½ through 3 HP
- 380-480 VAC 3 phase 50/60 Hz input, 3/4 through 5 HP
- Full range of built-in pre-engineered options available
- For dimensions see page 152

Selection Steps

1) Choose the SK300E-trio AC vector drive based on motor ratings and input line voltage
2) Select the required Trio Interface (TI)
3) Select the braking resistor if required
4) Select additional customer based I/O if required (SK CU2-STD)
5) Select cover mounted technology unit if required
6) If remote wall mounting is required
7) Select any needed programming tools

Step 1: AC vector drive Selection

Basic NORD Motor Description	Power Rating HP/kW	P [in]	240 VAC Input Inverter Type SK 300E	480 VAC Input Inverter Type SK 300E
63 S/4	0.16 / 0.12	5.12	-370-323-B	-550-340-B
63 L/4	0.25 / 0.18	5.12	-370-323-B	-550-340-B
71 S/4	0.33 / 0.25	5.71	-370-323-B	-550-340-B
71/L/4	0.50 / 0.37	5.71	-370-323-B	-550-340-B
80 S/4	0.75 / 0.55	6.5	-550-323-B	-550-340-B
80 L/4	1.00/ 0.75	6.5	-750-323-B	-750-340-B
90 S/4	1.50/ 1.1	7.2	-111-323-B	-111-340-B
90 L/4	2.00/ 1.5	7.2	-151-323-B	-151-340-B
100 L/4	3.00/ 2.2	7.91	-221-323-B	-221-340-B
100 L/40	5.00/ 3.7	7.91	Not Available	-401-340-B

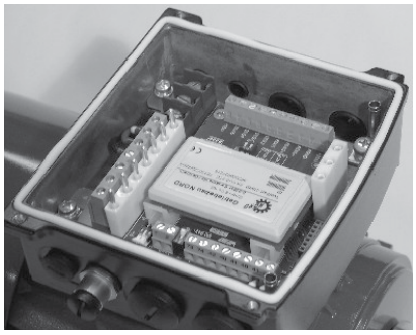
AC Vector Drive Ratings

Type designation SK 300E	-370-323-B	-550-323-B	-750-323-B	-111-323B	-151-323-B	-221-323-B	-550-340-B	-750-340-B	-111-340-B	-151-340-B	-221-340-B	-301-340-B	-401-340-B
Supply Voltage	3 Phase 200-240 VAC +/- 10%, 47-63 Hz						3 Phase 380-480 VAC, -20%/+10%, 47-63 Hz						
Motor Rating	1/2 HP	3/4	1 HP	1 1/2 HP	2 HP	3 HP	3/4 HP	1 HP	1 1/2 HP	2 HP	3 HP	4 HP	5 HP
Rated Output Current Amps [RMS]	2.2	3	4	5.5	7	9.5	1.6	2.2	3	3.7	5.5	7	9.2
Typical Output Current Amps [RMS]	3.1	4.2	5.6	7.7	9.8	13.3	2.5	3.1	4.2	5.2	7.7	9.8	12.9

Step 2: Selection of Trio Interface (TI)

Following selection of the appropriate SK 300E AC vector drive rating from the preceding chart, an appropriate Trio Interface (TI) must be specified. The Trio Interface (TI) is an adapter that replaces the motor conduit box and contains a circuit board that the SK 300E plugs into.

A typical TI is shown below



SK 300E Trio Interface (TI) Types

SK TI 0/1	For standard 380-480 VAC units
SK TI 0/1 - 230	For standard 200-240 VAC units
SK TI 0/2	For 380-480 VAC units using Harting connectors
SK TI 0/2 – 230	200-240 VAC units using Harting connectors

Harding H10E series connector options for side 1(CE1) of SK TI 0/2 (and -230) Interfaces

LE H10E	Socket for AC supply input
MA H10E	Plug for motor output

Conduit plate options for side 3(CE3) of SK TI 0/2 (and -230) Interfaces

SK DA4	Plate with 4 x M16
SK DA2	Plate with 2 x M20 and 1 x M16 (Provided as standard with SK TI 0/2)
SK DA1	Plate with 1 x M25 and 2 x M16
SK DA0	Plate with no entries

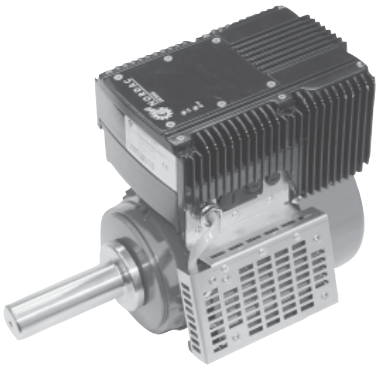
Added related components for Trio Interfaces

P/N 018524200	M20 x ½ adapter (Qty 2 provided as standard on assembled trios)
P/N 011015410	Adapter to mount Trio Interface on 63 & 71 frame motors
P/N 013097000	Gasket to mount Trio Interface on 63 & 71 frame motors

SK 300E Options & Related Information

Step 3: Braking Resistors

Braking Resistor Options for SK 300E for mounting on Trio Interface



During dynamic braking, energy is delivered from the load through the motor (acting as a generator) to the AC vector drive. The AC vector drive dissipates this energy as heat via the integral brake chopper to the optional external braking resistors.

For use with SK TI 0/1 adapters

SK BR3-120/100-TI 0/1	120 ohm/100 W for all ratings except 5 HP
SK BR3-82/200-TI 0/1	82 ohm/200 W for 5 HP only

For use with SK TI 0/2 adapters

SK BR3-120/100-TI 0/2	120 ohm/100 W for all ratings except 5 HP
SK BR3-82/200-TI 0/2	82 ohm/200 W for 5 HP only

Step 4: Customer I/O Based Control Interface Option - SK CU2-STD

The standard I/O based control available via the Trio Interface can be expanded via selection of an optional Customer Unit, **SK CU2-STD**, that plugs into the Trio Interface. Interface I/O points are listed on the following chart:

I/O on standard Trio Interface	Additional I/O on SK CU2-STD Option
1 X programmable digital input	4 X programmable digital input
5 VDC and 15 VDC power supplies	2 X single-ended analog inputs
RS 485 interface via M-12 connector and terminals	+10 VDC reference supply
1 X programmable relay output	1 X selectable/programmable analog/digital output
	PID control access

Step 5: Cover Mounted Technology Unit (TU) Options

A variety of pre-engineered plug in Technology Unit (TU) options can be ordered to replace the standard blank cover of the SK 300E AC vector drive. Only a single TU can be installed on the AC vector drive at a given time. Available units include operator and field bus interfaces:

Technology Unit (TU) Name	Description
SK TU2-POT	Analog reference potentiometer box with L/Off/R control switch
SK TU2-CTR	Digital control/programmer with 4 digit, 7 segment LED display
SK TU2-PBR	Profibus field bus interface
SK TU2-PBR-24V	Profibus field bus interface powered by customer 24 VDC supply
SK TU2-PBR-KL	Profibus field bus interface with clamp on connectors
SK TU2-AS1	AS (Actuator/Sensor) Interface
SK TU2-CAO	CANopen field bus interface
SK TU2-DEV	DeviceNet field bus interface
SK TU2-IBS	InterBus field bus interface
SK TU2-DECKEL	Original blank cover for TU slot (in case TU option is removed)

Step 6: Wall Mounting Option Kit, SK WMK-DA1

The wall mounting kit enables placing the SK 300E AC vector drive on a nearby wall or the machine instead of directly on the NORD motor or gearmotor. The Trio Interface (TI) is still required and all other options can be used.

Step 7 : Additional Tools & Related Interface Options

In addition to the cover mounted SK TU2-CTR option, there are several additional options that enable simple programming and control of the SK 300E:

Handheld Parameter Box (P-Box) with 10 foot cable, SK PAR-2H

Detachable external add-on unit that can be used to program and display parameters and control the operation of the connected SK 300E. Features multi-line plain text display selectable in six languages. Manages and stores up to five unique AC vector drive programs. Cable plugs into M-12 connector in side of Trio Interface.

Panel Mount Parameter Box (P-Box), SK PAR-2E

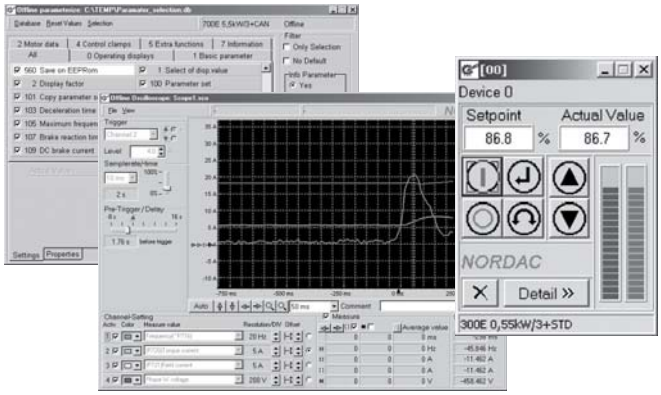
Panel Mount version of Parameter Box with same functionality as SK PAR-2H. Installs in cut-out in front of customer supplied operator panel. Interface connection is performed by customer with their shielded cable via terminals on SK PAR-2E and SK 300E.

NORD CON Software – Available free at NORD Website

NORD CON Software is a Windows-based PC program that enables the control and programming of NORDAC AC vector drives. It provides for accessing up to 31 AC vector drives simultaneously via the RS485 interface. It features both off-line and on-line programming and data management modes.

NORD CON allows user to:

- Program AC vector drives and upload/download parameter files
- Control connected AC vector drives for test/troubleshooting
- Monitor connected AC vector drives and examine up to four variables versus time with built-in oscilloscope feature
- Display parameter information in six languages



Optional accessories required to interface user PC to SK 300E via NORD CON are:

SK IC1 – RS 485 to RS 232 interface converter
Enables communication between RS 232 port on computer and RS 485 port on SK 300E

Cable SK 300E –
10 foot cable that connects between the 9-Pin D shell connector on the SK IC1 and the M-12 connector on the side of the SK 300E Trio Interface.

Electromechanical Brake Interface & Coil Voltage Selection

As standard, the SK 300E provides a dedicated high voltage DC power supply and coordination software to directly control an Electromechanical Brake. This is equivalent to using a half wave rectifier, so the brake coil voltage must be specified per the following chart:

Nominal Inverter AC Input Voltage	Brake Coil Voltage
440 – 480 VAC	205 VDC
200 – 240 VAC	105 VDC
380 – 415 VAC	180 VDC

The brake gets connected to terminals +Br and –Br on the Trio Interface

Motor overload protection

Electronic motor overload protection is provided as standard on the SK 300E AC vector drive. If required, more precise protection can be achieved via the use of motor thermostats (TW) or thermistor sensors (TF). These devices can be interfaced to the SK 300E via the programmable digital input to indicate a motor over temperature error.

Performance Data

Standard Efficiency

230/460V – 60Hz

Inverter duty • TEFC
Synchronous speed 1800rpm @ 60Hz • 4-pole • Three-phase
Voltages: 230/460V – 60Hz • 1.15 Service Factor
Continuous Duty • 40°C Ambient • up to 3300ft Elevation
Class B temperature rise • Class F insulation

Motor Type	Power Pn		Nn Full-load	In Full-Load Current 230V	In Full-Load Current 460V	Ia/In	Code Letter	Torque Tn	Ta/Tn	Tk/Tn	pf	Eff.	Jm Inertia
	[hp]	[kW]	[rpm]	[A]	[A]	[%]		[lb-in]				[%]	[lb-ft²]
63S/4	0.16	0.12	1700	0.88	0.44	245	F	5.92	2.1	2.2	0.66	52	0.005
63L/4	0.25	0.18	1680	1.12	0.56	275	E	8.99	2.1	2.2	0.71	57	0.0067
71S/4	0.33	0.25	1710	1.56	0.78	310	G	12.3	2.5	2.4	0.64	63	0.017
71L/4	0.5	0.37	1720	1.90	0.95	355	F	18.0	2.45	2.6	0.69	71	0.0204
80S/4	0.75	0.55	1710	2.70	1.35	355	F	27.0	2.2	2.2	0.71	72	0.0259
80L/4	1	0.75	1650	3.66	1.83	390	G	38.1	2.2	2.3	0.74	70	0.0345
90S/4	1.5	1.1	1660	4.84	2.42	445	G	55.6	2.7	2.6	0.78	73	0.055
90L/4	2	1.5	1660	6.34	3.17	465	G	75.8	2.55	2.5	0.80	74	0.074
100L/4	3	2.2	1705	9.0	4.50	490	G	108	2.3	2.6	0.81	82	0.107
100LA/4	5	3.7	1725	15.2	7.62	510	G	180	2.7	3.1	0.75	81	0.141
132S/4	7.5	5.5	1735	19.8	9.9	545	G	267	2.45	2.75	0.82	86	0.55
132M/4	10	7.5	1735	25.8	12.9	645	H	363	2.9	3.2	0.84	87	0.752

Pn - **Full load power**
Nn - **Full load speed**
In - **Full load current**
Ia - **Locked-rotor current**
Ia/In - **Locked-rotor current ratio (%)**
Tn - **Full-load torque**
Ta - **Locked-rotor torque**
Ta/Tn - **Locked-rotor torque ratio**
Tk - **Break-down torque**
Tk/Tn - **Break-down torque ratio**
pf - **Power factor**
Eff - **Normal efficiency**
Jm - **Motor inertia**

Energy Efficient (EPAct)

230/460V – 60Hz / EE

Inverter duty • TEFC
Synchronous speed 1800rpm @ 60Hz • 4-pole • Three-phase
Voltages: 230/460V – 60Hz • 1.15 Service Factor
Continuous Duty • 40°C Ambient • up to 3300ft Elevation
Class B temperature rise • Class F insulation

Motor Type	Power Pn		Nn Full-load	In Full-Load Current		Ia/In	Code Letter	Torque Tn	Ta/Tn	Tk/Tn	pf	Eff.	Jm Inertia
				230V	460V								
	[hp]	[kW]	[rpm]	[A]	[A]	[%]		[lb-in]				[%]	[lb-ft²]
80LH/4	1	0.75	1750	3.88	1.94	600	L	36.0	4.6	4.3	0.59	82.5	0.051
90SH/4	1.5	1.1	1740	4.3	2.15	630	J	53.1	3.5	3.8	0.76	84.0	0.085
90LH/4	2	1.5	1745	6.3	3.15	670	K	72.1	4.3	4.5	0.71	84.0	0.092
100LH/4	3	2.2	1765	8.6	4.3	790	L	105	3.6	4.7	0.73	87.5	0.178
112MH/4	5	3.7	1770	14.4	7.2	810	L	176	4.0	4.8	0.76	87.5	0.304
132SH/4	7.5	5.5	1780	20.9	10.5	820	L	259	4.3	4.6	0.74	89.5	0.75
132MH/4	10	7.5	1770	27.0	13.5	735	J	356	3.2	4.0	0.78	89.5	0.84

Pn - **Full load power**
Nn - **Full load speed**
In - **Full load current**
Ia - **Locked-rotor current**
Ia/In - **Locked-rotor current ratio (%)**
Tn - **Full-load torque**
Ta - **Locked-rotor torque**
Ta/Tn - **Locked-rotor torque ratio**
Tk - **Break-down torque**
Tk/Tn - **Break-down torque ratio**
pf - **Power factor**
Eff - **Normal efficiency**
Jm - **Motor inertia**

Performance Data

Standard Efficiency

575V – 60Hz

Inverter duty • TEFC
Synchronous speed 1800rpm @ 60Hz • 4-pole • Three-phase
Voltages: 332/575V – 60Hz • 1.15 Service Factor
Continuous Duty • 40°C Ambient • up to 3300ft Elevation
Class B temperature rise • Class F insulation

Motor Type	Power Pn		Nn Full-load	In Full-Load Current 575V	Ia/In	Code Letter	Torque Tn	Ta/Tn	Tk/Tn	pf	Eff.	Jm Inertia
	[hp]	[kW]	[rpm]	[A]	[%]		[lb-in]				[%]	[lb-ft²]
63S/4	0.16	0.12	1700	0.37	245	F	5.92	2.1	2.2	0.66	52	0.005
63L/4	0.25	0.18	1680	0.46	275	E	8.99	2.1	2.2	0.71	57	0.0067
71S/4	0.33	0.25	1710	0.66	310	G	12.3	2.5	2.4	0.64	63	0.017
71L/4	0.5	0.37	1720	0.8	355	F	18.0	2.45	2.6	0.69	71	0.0204
80S/4	0.75	0.55	1710	1.12	355	F	27.0	2.2	2.2	0.71	72	0.0259
80L/4	1	0.75	1650	1.46	390	G	38.1	2.2	2.3	0.74	70	0.0345
90S/4	1.5	1.1	1660	1.94	445	G	55.6	2.7	2.6	0.78	73	0.055
90L/4	2	1.5	1660	2.54	465	G	75.8	2.55	2.5	0.80	74	0.074
100L/4	3	2.2	1705	3.6	490	G	108	2.3	2.6	0.81	82	0.107
100LA/4	5	3.7	1725	6.1	510	G	180	2.7	3.1	0.75	81	0.141
132S/4	7.5	5.5	1735	7.92	545	G	267	2.45	2.75	0.82	86	0.55
132M/4	10	7.5	1735	10.3	645	H	363	2.9	3.2	0.84	87	0.752

Pn - **Full load power**
Nn - **Full load speed**
In - **Full load current**
Ia - **Locked-rotor current**
Ia/In - **Locked-rotor current ratio (%)**
Tn - **Full-load torque**
Ta - **Locked-rotor torque**

Ta/Tn - **Locked-rotor torque ratio**
Tk - **Break-down torque**
Tk/Tn - **Break-down torque ratio**
pf - **Power factor**
Eff - **Normal efficiency**
Jm - **Motor inertia**

Energy Efficient (EPAct)

575V – 60Hz / EE

Inverter duty • TEFC
Synchronous speed 1800rpm @ 60Hz • 4-pole • Three-phase
Voltages: 332/575V – 60Hz • 1.15 Service Factor
Continuous Duty • 40°C Ambient • up to 3300ft Elevation
Class B temperature rise • Class F insulation

Motor Type	Power Pn		Nn Full-load	In Full-Load Current 575V	Ia/In	Code Letter	Torque Tn	Ta/Tn	Tk/Tn	pf	Eff.	Jm Inertia
	[hp]	[kW]	[rpm]	[A]	[%]		[lb-in]				[%]	[lb-ft²]
80LH/4	1	0.75	1750	1.5	600	L	36.0	4.6	4.3	0.59	82.5	0.051
90SH/4	1.5	1.1	1740	1.75	630	J	53.1	3.5	3.8	0.76	84.0	0.085
90LH/4	2	1.5	1745	2.45	670	K	72.1	4.3	4.5	0.71	84.0	0.092
100LH/4	3	2.2	1765	3.4	790	L	105	3.6	4.7	0.73	87.5	0.178
112MH/4	5	3.7	1770	5.6	810	L	176	4.0	4.8	0.76	87.5	0.304
132SH/4	7.5	5.5	1780	8.3	820	L	259	4.3	4.6	0.74	89.5	0.75
132MH/4	10	7.5	1770	10.8	735	J	356	3.2	4.0	0.78	89.5	0.84

Pn - **Full load power**
Nn - **Full load speed**
In - **Full load current**
Ia - **Locked-rotor current**
Ia/In - **Locked-rotor current ratio (%)**
Tn - **Full-load torque**
Ta - **Locked-rotor torque**
Ta/Tn - **Locked-rotor torque ratio**
Tk - **Break-down torque**
Tk/Tn - **Break-down torque ratio**
pf - **Power factor**
Eff - **Normal efficiency**
Jm - **Motor inertia**

Performance Data

Standard Efficiency

200-208V – 60Hz

Inverter duty • Induction motor • TEFC
Synchronous speed 1800rpm @ 60Hz • 4-pole • Three-phase
Voltages: 208V – 60Hz • 1.15 Service Factor
Continuous Duty • 40°C Ambient • up to 3300ft Elevation
Class B temperature rise • Class F insulation

Motor Type	Power Pn		Nn Full-load	In 208V	Ia/In	Code Letter	Torque Tn	Ta/Tn	Tk/Tn	pf	Eff.	Jm Inertia
	[hp]	[kW]	[rpm]	[A]	[%]		[lb-in]				[%]	[lb-ft²]
63S/4	0.16	0.12	1700	0.97	245	F	5.93	2.1	2.2	0.66	52	0.005
63L/4	0.25	0.18	1680	1.24	275	E	9.38	2.1	2.2	0.71	57	0.0067
71S/4	0.33	0.25	1710	1.73	310	G	12.2	2.5	2.4	0.64	63	0.015
71L/4	0.5	0.37	1720	2.10	355	F	18.3	2.45	2.6	0.69	71	0.0181
80S/4	0.75	0.55	1710	2.99	355	F	27.6	2.2	2.2	0.71	72	0.0304
80L/4	1	0.75	1650	4.05	390	G	38.2	2.2	2.3	0.74	70	0.0392
90S/4	1.5	1.1	1660	5.35	445	G	57.0	2.7	2.6	0.78	73	0.0670
90L/4	2	1.5	1660	7.01	465	G	75.9	2.55	2.5	0.80	74	0.0855
100L/4	3	2.2	1705	9.95	490	G	111	2.3	2.6	0.81	82	0.107
100LA/4	5	3.7	1725	16.8	510	G	183	2.7	3.1	0.75	81	0.162
132S/4	7.5	5.5	1735	21.9	545	G	272	2.45	2.75	0.82	86	0.553
132M/4	10	7.5	1735	28.5	645	H	363	2.9	3.2	0.84	87	0.753

Pn - **Full load power**
Nn - **Full load speed**
In - **Full load current**
Ia - **Locked-rotor current**
Ia/In - **Locked-rotor current ratio (%)**
Tn - **Full-load torque**
Ta - **Locked-rotor torque**
Ta/Tn - **Locked-rotor torque ratio**
Tk - **Break-down torque**
Tk/Tn - **Break-down torque ratio**
pf - **Power factor**
Eff - **Normal efficiency**
Jm - **Motor inertia**

Standard Efficiency (EFF2)

400V – 50Hz

Inverter duty • TEFC
Synchronous speed 1500rpm @ 50Hz • 4-pole • Three-phase
Voltages: 400V (380-420) – 50Hz • 1.0 Service Factor
Continuous Duty • 40°C Ambient • up to 3300ft Elevation
Class B temperature rise • Class F insulation

Motor Type	Power Pn		Nn Full-load	In Full-Load Current 380-420V[a)]	Ia/In	Code Letter	Torque Tn	Ta/Tn	Tk/Tn	pf	Eff Full load	Eff 75% load	Eff Class	Jm Inertia
	[hp]	[kW]	[rpm]	[A]	[%]		[lb-in]				[%]	[%]		[lb-ft2]
63S/4	0.16	0.12	1335	0.46	245	E	7.55	1.8	1.9	0.76	50.0	b)	b)	0.005
63L/4	0.25	0.18	1325	0.62	260	D	11.4	1.8	1.9	0.80	56.5	b)	b)	0.0066
71S/4	0.33	0.25	1380	0.76	330	F	15.2	2.2	2.1	0.77	61.3	b)	b)	0.015
71L/4	0.5	0.37	1360	1.1	320	E	22.8	2.1	2.3	0.75	62.7	b)	b)	0.018
80S/4	0.75	0.55	1375	1.52	330	E	33.6	1.9	2.0	0.73	71.5	b)	b)	0.03
80L/4	1	0.75	1375	2.1	350	F	45.8	2.0	2.1	0.74	69.7	b)	b)	0.039
90S/4	1.5	1.1	1445	2.98	500	H	63.9	3.2	3.4	0.69	77.4	79.0	EFF2	0.067
90L/4	2	1.5	1440	3.73	540	H	87.5	3.1	3.6	0.73	79.3	80.0	EFF2	0.085
100L/4	3	2.2	1440	5.22	510	G	128	2.3	3.0	0.74	81.1	81.1	EFF2	0.107
100LA/4	4	3	1460	7.2	540	H	172	2.7	3.3	0.73	82.7	83.4	EFF2	0.16
112M/4	5.4	4	1445	8.3	530	G	232	2.3	2.8	0.80	86.0	84.0	EFF2	0.28
132S/4	7.5	5.5	1445	11.4	540	G	319	2.1	2.7	0.81	85.8	89.0	EFF2	0.55
132M/4	10	7.5	1445	14.8	550	G	436	2.5	2.8	0.84	87.0	86.0	EFF2	0.75

a) Motors 3 hp(2.2 kW) and below are rated 230 /400Y – volts, motors above 3 hp (2.2 kW) are rated 400 /690Y-volts
b) EFF classes levels not applicable – motor outside the power range covered by the aggreement

Pn - **Full load power**
Nn - **Full load speed**
In - **Full load current**
Ia - **Locked-rotor current**
Ia/In - **Locked-rotor current ratio (%)**
Tn - **Full-load torque**
Ta - **Locked-rotor torque**
Ta/Tn - **Locked-rotor torque ratio**
Tk - **Break-down torque**
Tk/Tn - **Break-down torque ratio**
pf - **Power factor**
Eff - **Normal efficiency**
Jm - **Motor inertia**

Performance Data

Energy Efficient (EFF1)

400V – 50Hz / EE

Inverter duty • TEFC
Synchronous speed 1500rpm @ 50Hz • 4-pole • Three-phase
Voltages: 400V (380-420) – 50Hz • 1.0 Service Factor
Continuous Duty • 40°C Ambient • up to 3300ft Elevation
Class B temperature rise • Class F insulation

Motor Type	Power Pn		Nn Full-load	In Full-Load Current 400V * a) (380-420V)	Ia/In	Code Letter	Torque Tn	Ta/Tn	Tk/Tn	pf	Eff Full load	Eff 75% load	Eff Class	Jm Inertia
	[hp]	[kW]	[rpm]	[A]	[%]		[lb-in]				[%]	[%]		[lb-ft2]
90SH/4	1.5	1.1	1430	2.51	520	G	64.6	2.8	3.1	0.75	84.0	85.1	EFF1	0.082
90LH/4	2	1.5	1435	3.59	560	H	87.7	3.6	3.7	0.71	85.0	85.3	EFF1	0.093
100LH/4	3	2.2	1465	4.88	685	J	126	3.3	4.0	0.74	87.5	87.9	EFF1	0.17
112SH/4	4	3	1460	6.7	715	K	172	3.25	4.2	0.72	87.4	90.0	EFF1	0.28
112MH/4	5.4	4	1455	8.9	685	J	224	3.4	4.1	0.74	88.3	90.2	EFF1	0.30
132SH/4	7.5	5.5	1470	12	750	K	314	3.8	4.15	0.73	90.1	90.5	EFF1	0.75
132MH/4	10	7.5	1470	15.5	665	J	428	2.9	3.5	0.77	90.8	91.0	EFF1	0.84

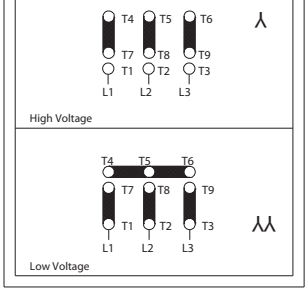
a) Motors 3 hp(2.2 kW) and below are rated 230 /400Y – volts, motors above 3 hp (2.2 kW) are rated 400 /690Y-volts

Pn - **Full load power**
Nn - **Full load speed**
In - **Full load current**
Ia - **Locked-rotor current**
Ia/In - **Locked-rotor current ratio (%)**
Tn - **Full-load torque**
Ta - **Locked-rotor torque**
Ta/Tn - **Locked-rotor torque ratio**
Tk - **Break-down torque**
Tk/Tn - **Break-down torque ratio**
pf - **Power factor**
Eff - **Normal efficiency**
Jm - **Motor inertia**

Frames 63-132
230 / 460V, 60Hz, 3Ø 200 / 400V, 50Hz, 3Ø
190 / 380V, 60Hz, 3Ø

120094410

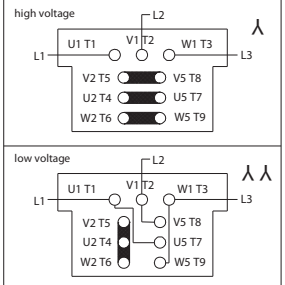
WIRING DIAGRAM
3 PHASE MOTOR



Frames 160 +
230 / 460V, 60Hz, 3Ø 200 / 400V, 50Hz, 3Ø
190 / 380V, 60Hz, 3Ø

120095260

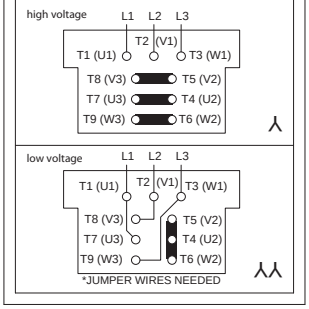
WIRING DIAGRAM
3 PHASE MOTOR



Frames 160 +
230 / 460V, 60Hz, 3Ø 200 / 400V, 50Hz, 3Ø
190 / 380V, 60Hz, 3Ø

120095500 REV 1

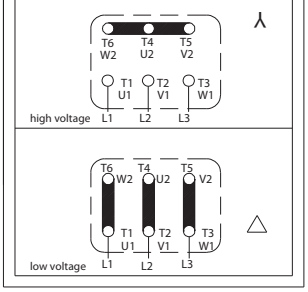
WIRING DIAGRAM
3 PHASE MOTOR



460 / 800V, 60Hz, 3Ø 230 / 400V, 50Hz, 3Ø
208 / 360V, 60Hz, 3Ø 400 / 690V, 50Hz, 3Ø
332 / 575V, 60Hz, 3Ø

120095270

WIRING DIAGRAM
3 PHASE MOTOR



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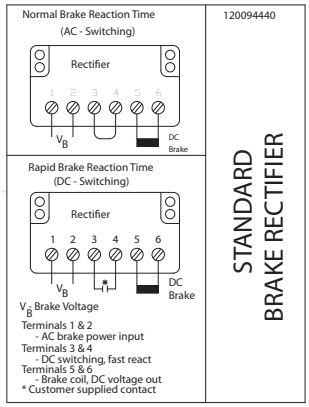
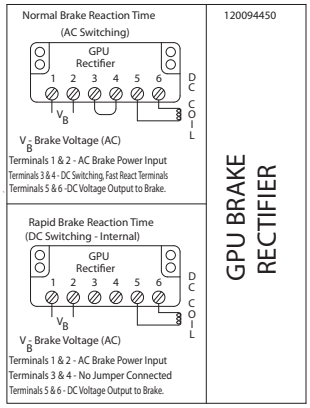


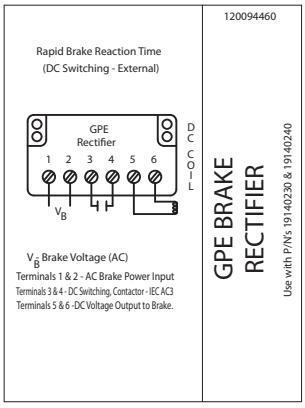
STANDARD
BRAKE RECTIFIER

120094450



GPU BRAKE
RECTIFIER

120094460

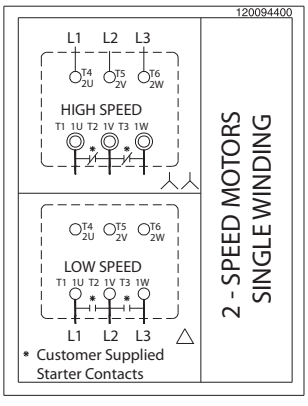


GPE BRAKE
RECTIFIER

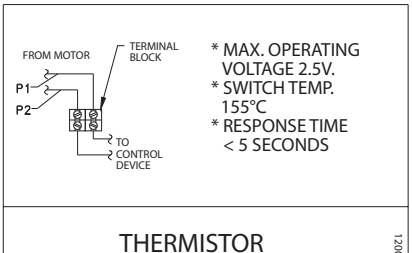
Use with P/N's 19140230 & 19140240

2 - SPEED MOTORS
SINGLE WINDING (4-2 & 8-4 POLE)

120094400

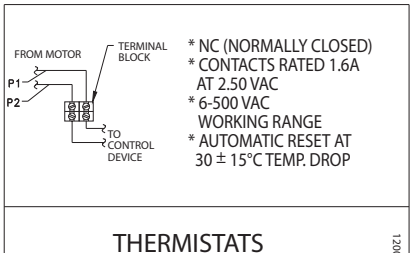


2 - SPEED MOTORS
SINGLE WINDING



THERMISTOR
"TF" OPTION

120095240

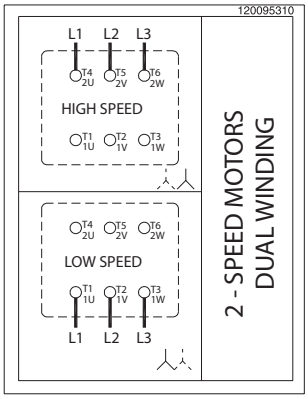


THERMISTATS
"TW" OPTION

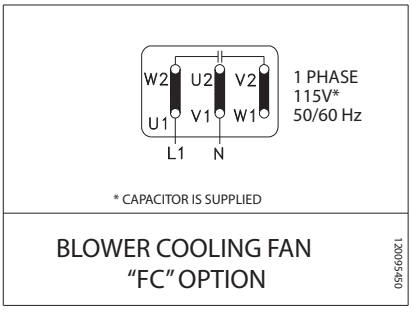
120095230

2 - SPEED MOTORS
DUAL WINDING (8-2 POLE)

120095310

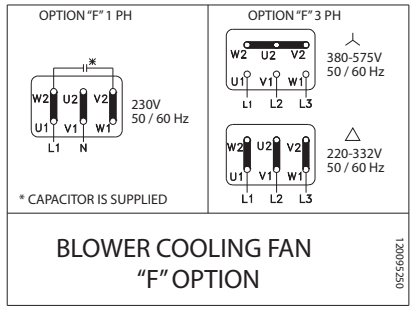


2 - SPEED MOTORS
DUAL WINDING



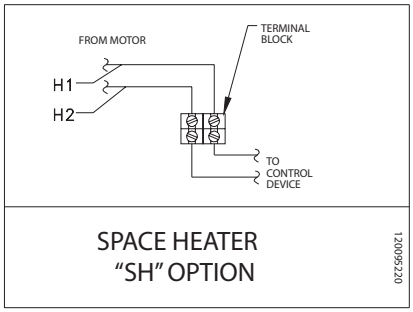
BLOWER COOLING FAN
"FC" OPTION

120095450



BLOWER COOLING FAN
"F" OPTION

120095250



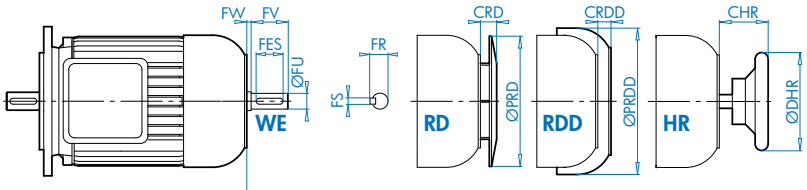
SPACE HEATER
"SH" OPTION

120095220

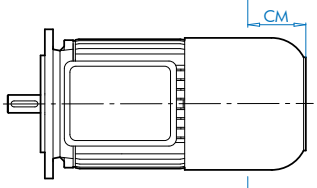
MOTORS

Dimensions
Motor Options

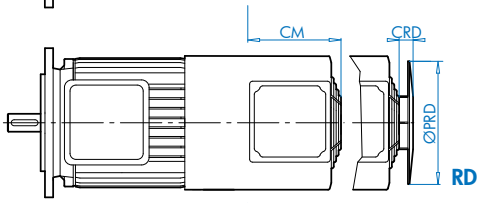
Standard Motor



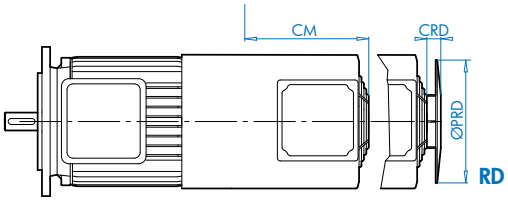
Option IG



Option F

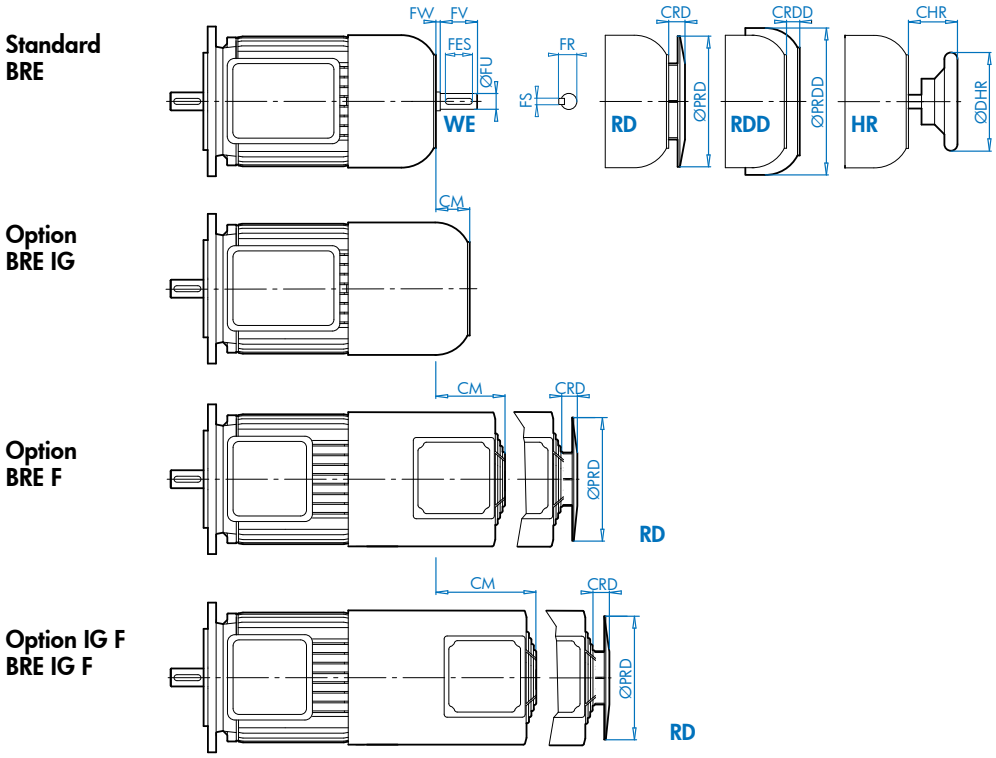


Option IG F



Motor Type	WE						RD		RDD		HR		IG	F	IG F	RD/IG/IGF	
	FU	FR	FV	FW	FES	FS	PRD	CRD	PRDD	CRDD	DHR	CHR	CM	CM	CM	PRD	CRD
	[mm]						[in]										
63S/L	11	12.5	23	0	16	4	4.84	0.47	6.02	1.06	3.94	1.54	2.20	3.46	6.22	5.24	1.46
71S/L	11	16.0	23	1	16	4	5.43	0.47	6.65	0.94	3.94	1.57	2.20	3.50	5.67	5.91	1.46
80S/L	14	21.5	30	3	20	5	6.14	0.63	7.20	1.22	3.94	1.93	2.40	3.54	5.51	6.69	1.57
90S/L	19	27.0	40	7	32	6	6.93	0.63	7.91	1.22	6.30	2.64	2.83	4.09	5.87	7.40	1.18
100L	24	31.0	50	6	40	8	7.64	0.63	8.86	1.10	6.30	2.95	2.71	3.74	6.10	8.27	1.10
112M	24	31.0	50	4	40	8	8.58	0.63	10.43	1.50	6.30	2.91	2.67	3.90	5.87	9.80	1.30
132S/M	32	41.0	80	18	70	10	10.12	0.71	12.51	1.61	7.87	4.57	2.48	4.53	6.10	11.81	0.98

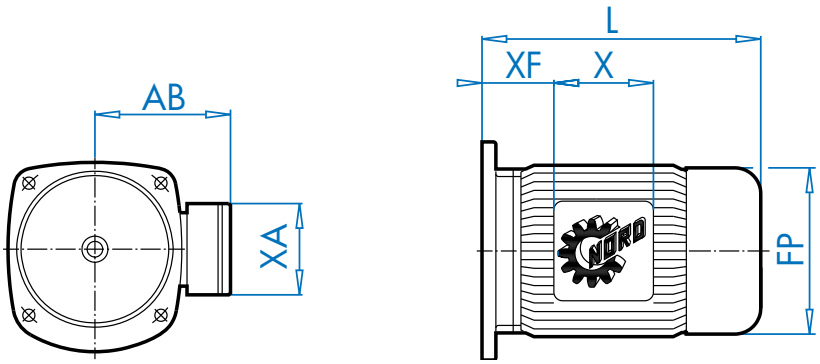
*** Consult Factory**



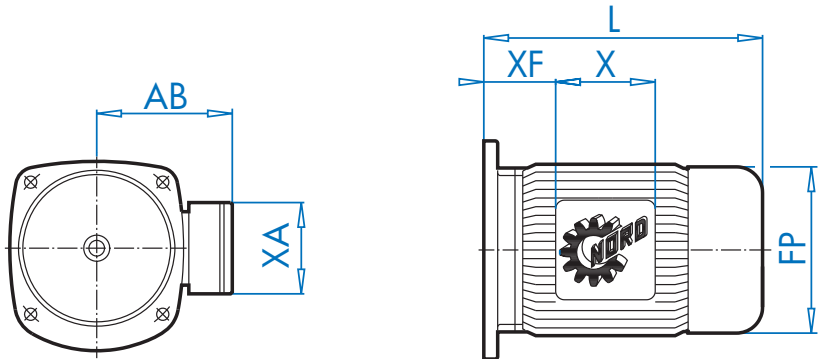
Motor Type	WE						RD		RDD		HR		IG	F	IG F	RD/IG/IGF	
	FU	FR	FV	FW	FES	FS	PRD	CRD	PRDD	CRDD	DHR	CHR	CM	CM	CM	PRD	CRD
	[mm]						[in]										
63S/L	11	12.5	23	3.5	16	4	4.84	0.47	6.02	1.02	0.39	1.69	2.44	3.54	4.92	5.24	1.46
71S/L	11	16.0	23	3.5	16	4	5.43	0.47	6.65	0.94	3.94	1.69	2.91	3.70	5.47	5.91	1.46
80S/L	14	21.5	30	4	20	5	6.14	0.63	7.20	1.22	3.94	1.97	2.20	3.50	5.47	6.69	1.57
90S/L	14	27.0	30	8	32	6	6.93	0.63	7.91	1.22	6.30	2.68	2.76	3.94	5.71	7.40	1.18
100L	24	31.0	50	10	40	8	7.64	0.63	8.86	0.87	6.30	3.07	2.80	4.13	5.52	8.27	1.10
112M	24	31.0	50	7	40	8	8.58	0.63	10.43	1.50	6.30	3.03	2.52	4.13	5.52	9.80	1.30
132S/M	32	41.0	80	10	70	10	10.12	0.71	12.60	1.61	7.87	4.25	2.56	4.92	6.10	11.81	0.98

*** Consult Factory**

Dimensions
Conduit Box & Cable Entry



Type / Flange	Options	Outline dimensions						Cable entry	
63S/L		FP	AB	XF	X	L	XA	ce	ce-adapter
B14		5.12	4.53	0.47	3.94	7.56	3.94	2 × M20×1.5	1/2" NPT
160S		5.12	4.53	0.63	3.94	7.72	3.94	2 × M20×1.5	1/2" NPT
B14	BRE	5.12	4.84	0.71	5.28	9.76	3.50	2 × M20×1.5	1/2" NPT
160S	BRE	5.12	4.84	0.87	5.28	9.92	3.50	2 × M20×1.5	1/2" NPT
71S/L		**FP**	**AB**	**XF**	**X**	**L**	**XA**	**ce**	**ce-adapter**
B14		5.71	4.88	0.79	3.94	8.43	3.94	2 × M20×1.5	1/2" NPT
160S		5.71	4.88	1.65	3.94	9.29	3.94	2 × M20×1.5	1/2" NPT
250S		5.71	4.88	1.42	3.94	9.06	3.94	2 × M20×1.5	1/2" NPT
B14	BRE	5.75	5.24	1.02	5.28	10.71	3.50	2 × M20×1.5	1/2" NPT
160S	BRE	5.75	5.24	1.89	5.28	11.57	3.50	2 × M20×1.5	1/2" NPT
250S	BRE	5.75	5.24	1.65	5.28	11.34	3.50	2 × M20×1.5	1/2" NPT
80S/L/LH		**FP**	**AB**	**XF**	**X**	**L**	**XA**	**ce**	**ce-adapter**
B14		6.50	5.59	0.87	4.49	9.29	4.49	2 × M25×1.5	3/4" NPT
160S		6.50	5.59	1.85	4.49	10.28	4.49	2 × M25×1.5	3/4" NPT
250S		6.50	5.59	1.61	4.49	10.04	4.49	2 × M25×1.5	3/4" NPT
B14	BRE	6.50	5.59	1.02	6.02	11.81	4.25	2 × M25×1.5	3/4" NPT
160S	BRE	6.50	5.59	2.01	6.02	12.80	4.25	2 × M25×1.5	3/4" NPT
250S	BRE	6.50	5.59	1.77	6.02	12.56	4.25	2 × M25×1.5	3/4" NPT
90S/L/SH/LH		**FP**	**AB**	**XF**	**X**	**L**	**XA**	**ce**	**ce-adapter**
B14		7.20	5.79	1.02	4.49	10.87	4.49	2 × M25×1.5	3/4" NPT
160S		7.20	5.79	2.05	4.49	11.89	4.49	2 × M25×1.5	3/4" NPT
250S		7.20	5.79	1.81	4.49	11.65	4.49	2 × M25×1.5	3/4" NPT
300S		7.20	5.79	1.02	4.49	10.87	4.49	2 × M25×1.5	3/4" NPT
B14	BRE	7.20	5.79	1.18	6.02	13.82	4.25	2 × M25×1.5	3/4" NPT
160S	BRE	7.20	5.79	2.20	6.02	14.84	4.25	2 × M25×1.5	3/4" NPT
250S	BRE	7.20	5.79	1.97	6.02	14.61	4.25	2 × M25×1.5	3/4" NPT
300S	BRE	7.20	5.79	1.18	6.02	13.82	4.25	2 × M25×1.5	3/4" NPT



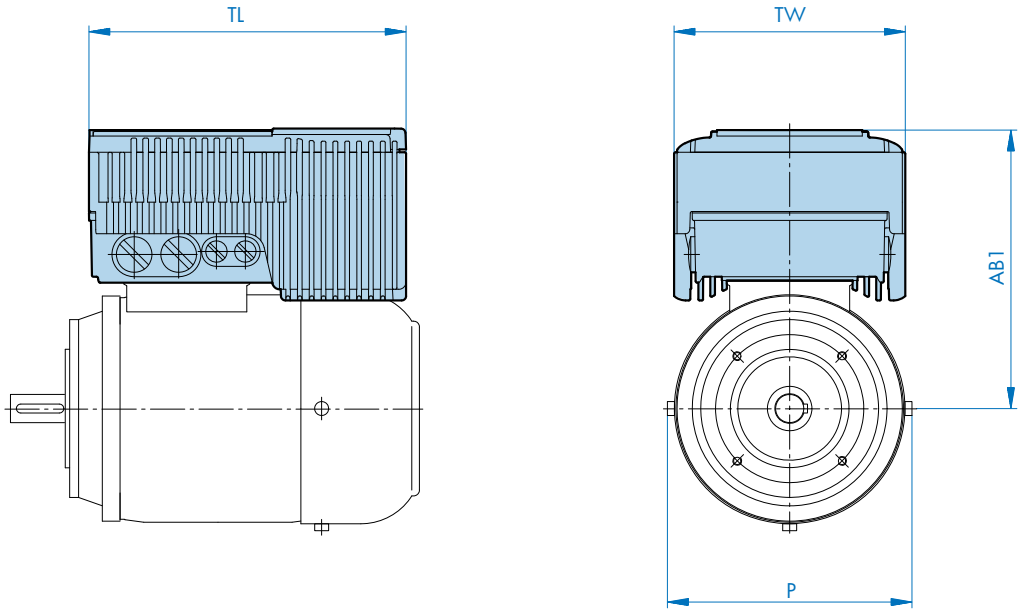
Type / Flange	Options	Outline dimensions						Cable entry	
100L/L/LA/LH		FP	AB	XF	X	L	XA	ce	ce-adapter
B14		7.91	6.65	1.26	4.49	12.05	4.49	2 × M32×1.5	1" NPT
160S		7.91	6.65	2.28	4.49	13.07	4.49	2 × M32×1.5	1" NPT
250S		7.91	6.65	2.05	4.49	12.83	4.49	2 × M32×1.5	1" NPT
300S		7.91	6.65	1.26	4.49	12.05	4.49	2 × M32×1.5	1" NPT
Ø 250		7.91	6.65	1.26	4.49	12.05	4.49	2 × M32×1.5	1" NPT
B14	BRE	7.91	6.77	1.42	6.02	15.63	4.25	2 × M32×1.5	1" NPT
160S	BRE	7.91	6.77	2.44	6.02	16.65	4.25	2 × M32×1.5	1" NPT
250S	BRE	7.91	6.77	2.20	6.02	16.42	4.25	2 × M32×1.5	1" NPT
300S	BRE	7.91	6.77	1.42	6.02	15.63	4.25	2 × M32×1.5	1" NPT
Ø 250	BRE	7.91	6.77	1.42	6.02	15.63	4.25	2 × M32×1.5	1" NPT

112M/SH/MH		FP	AB	XF	X	L	XA	ce	ce-adapter
B14		8.98	7.05	1.77	4.49	12.83	4.49	2 × M32×1.5	1" NPT
160S		8.98	7.05	2.91	4.49	13.98	4.49	2 × M32×1.5	1" NPT
250S		8.98	7.05	2.68	4.49	13.74	4.49	2 × M32×1.5	1" NPT
300S		8.98	7.05	1.89	4.49	12.95	4.49	2 × M32×1.5	1" NPT
Ø 250		8.98	7.05	1.77	4.49	12.83	4.49	2 × M32×1.5	1" NPT
B14	BRE	8.98	7.17	1.93	6.02	16.50	4.25	2 × M32×1.5	1" NPT
160S	BRE	8.98	7.17	3.07	6.02	17.64	4.25	2 × M32×1.5	1" NPT
250S	BRE	8.98	7.17	2.83	6.02	17.40	4.25	2 × M32×1.5	1" NPT
300S	BRE	8.98	7.17	2.05	6.02	16.61	4.25	2 × M32×1.5	1" NPT
Ø 250	BRE	8.98	7.17	1.93	6.02	16.50	4.25	2 × M32×1.5	1" NPT

132S/M/SH/MH		FP	AB	XF	X	L	XA	ce	ce-adapter
B14		10.47	8.03	2.09	4.80	16.42	4.80	2 × M32×1.5	1" NPT
250S		10.47	8.03	2.80	4.80	17.13	4.80	2 × M32×1.5	1" NPT
300S		10.47	8.03	2.01	4.80	16.34	4.80	2 × M32×1.5	1" NPT
Ø 250		10.47	8.03	2.80	4.80	17.13	4.80	2 × M32×1.5	1" NPT
B14	BRE	10.47	7.91	1.77	7.28	20.59	5.47	2 × M32×1.5	1" NPT
250S	BRE	10.47	7.91	7.28	7.28	21.34	5.47	2 × M32×1.5	1" NPT
300S	BRE	10.47	7.91	1.73	7.28	20.55	5.47	2 × M32×1.5	1" NPT
Ø 250	BRE	10.47	7.91	2.52	7.28	21.34	5.47	2 × M32×1.5	1" NPT

Dimensions
SK 300E Trio AC Vector Drive

Motor Dimensions with SK 300E Motor Mounted AC Vector Drive

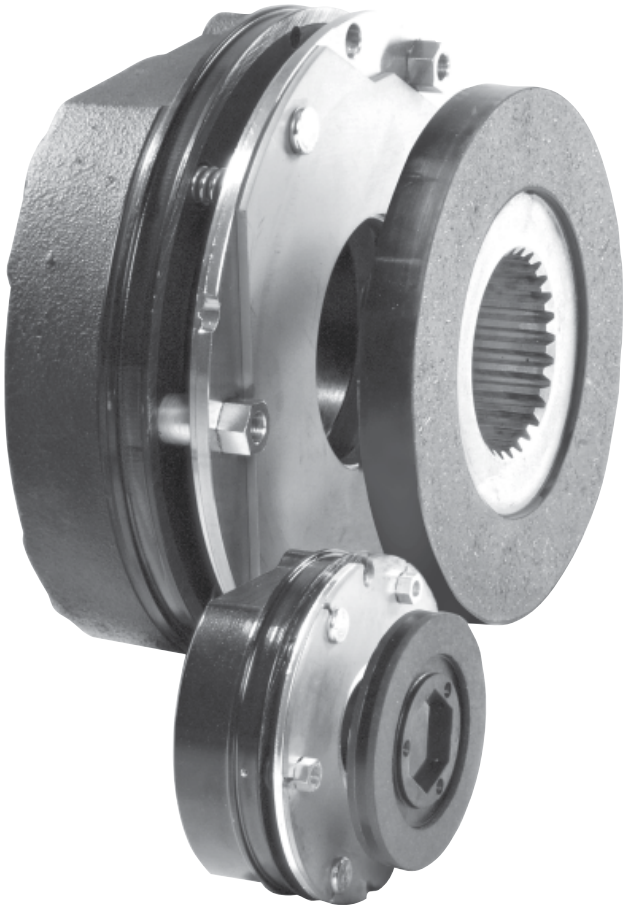


Basic NORD Motor Description	Power Rating HP/kW	240 VAC Input AC Vector Drive			480 VAC Input AC Vector Drive		
		Type SK 300E	AC Vector Drive Size	AB1 [in]	Type SK 300E	AC Vector Drive Size	AB1 [in]
63S/4	0.16 / 0.12	**-370-323-B**	Size 1	7.48	**-550-340-B**	Size 1	7.48
63L/4	0.25 / 0.18	**-370-323-B**	Size 1	7.48	**-550-340-B**	Size 1	7.48
71S/4	0.33 / 0.25	**-370-323-B**	Size 1	7.78	**-550-340-B**	Size 1	7.78
71L/4	0.50 / 0.37	**-370-323-B**	Size 1	7.78	**-550-340-B**	Size 1	7.78
80S/4	0.75 / 0.55	**-550-323-B**	Size 1	7.42	**-550-340-B**	Size 1	7.42
80L/4	1.00/ 0.75	**-750-323-B**	Size 1	7.42	**-750-340-B**	Size 1	7.42
90S/4	1.50/ 1.1	**-111-323-B**	Size 2	8.69	**-111-340-B**	Size 1	7.62
90L/4	2.00/ 1.5	**-151-323-B**	Size 2	8.69	**-151-340-B**	Size 1	7.62
100L/4	3.00/ 2.2	**-221-323-B**	Size 2	9.19	**-221-340-B**	Size 2	9.19
100LA/4	5.00/ 3.7	**Not Available**	N/A	N/A	**-401-340-B**	Size 2	9.19

AC Vector Drive Size	TL [in]	TW [in]	Weight [lbs]
Size 1	8.43	6.14	8.8
Size 2	11.14	7.72	18.5

Brakes

- Operation
- Selection-Torque
- Rectifiers
- Selection-Performance
- Mechanical Options
- Connection Diagrams



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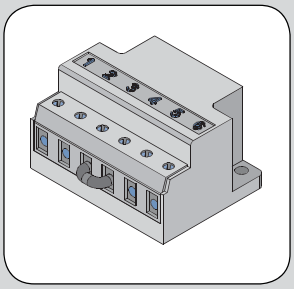
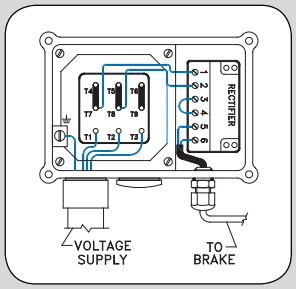


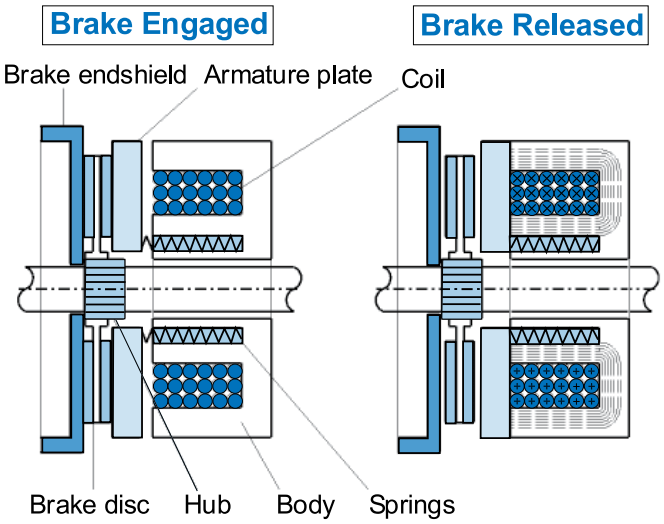


Motor-Brake Option (BRE)

The standard NORD motor brake is spring-set when power is removed from the brake circuit (power-off). The brake coil utilizes a DC voltage supplied through a rectified power source.

Advantages

- Each NORD motor frame size has a number of brake sizes available, with different torque capacities.
- Brake adjustment is possible by changing the brake spring combinations. In addition, several common brake sizes also have an additional spanner-nut adjustment available.
- Compared to the many AC brakes on the market, NORD brakes offer better wear capacity, easier field adjustability, greater reliability, and lower end-cost to the consumer.
- NORD motor-brakes operate with a high degree of safety, because the brake is actively engaged with the no brake supply voltage (power-off).
- The rotating brake disc is environmentally safe with an asbestos-free friction material bonded to each side.
- The connection between the rectifier and the brake coil is already completed at the factory.
- The brake air-gap is factory-set but can easily be adjusted in the event of wear.



Operation

The main AC supply power to the brake rectifier can be supplied from either the motor terminal board or from a separately switched power source.

- In typical direct-across-the-line motor operation, AC brake power may be supplied from the motor's terminal board.
- If the motor is a two-speed model, or if the motor is being controlled by a variable frequency drive or electrical soft-start, then the brake rectifier must be powered from a separate AC source.

When the brake is de-energized (Power off), the braking springs exert a force against the armature plate (pressure plate), preventing the brake rotor from rotating. Conversely, when the brake coil is energized (Power on), a magnetic field builds and pulls the armature plate across the air gap to the brake oil casing. This action frees the brake rotor and allows the motor shaft to rotate.

Brake Selection

The selection of a motor brake system is broken down into five phases. The selection of the braking torque, the selection of the braking times (release times and setting times), the selection of the electrical supply and connection, the selection of brake options, and the final phase is the verification of the permissible brake work.

Selection steps

1) Brake torque (page 156)
2) Brake times (page 160)
3) Electrical supply and connection (page 161)
4) Brake options (page 163)
5) Brake work verification (page 168)

Brake Options

Abbreviation	Description	Page
ADJ	**Torque Adjustment** - Brake torque may be adjusted at the factory	157
BIP66	**IP66 Brake Enclosure** - Brake with IP66 enclosure	163
BSH	**Brake Heating/Bifilar Coil** - Provides a seperate coil for heating to avoid condensation	163
DBR	**Double Brake (2xBRE)** - Double brakes are used for redundancy and additional safety	166
FBR	**Brass Foil** - Provides a brass foil in the brake air-gap to provide faster braking times	164
FHL	**Locking Hand Release Lever** - Lockable manual hand release lever	163
HL	**Hand Release Lever** - Manual hand release lever	163
HLH	**Hand Release Lever with Hole** - Hand lever with 5.5mm hole	163
IR	**Current Sensing Relay** - Fast brake engagement (stopping) without external control equipment	165
MIK	**Micro-Switch** - Brake fitted with a micro-switch for sensing the brake state (released or engaged)	164
NRB1	**Quiet Brake Release** - An o-ring is placed between the coil body and the armature plate for noise reduction	164
NRB2	**Quiet Brake Motor Operation** - An o-ring is placed between the carrier hub & the armature plate to prevent clattering.	164
RG	**Corrosion Protected Brake** - Corrosion protected brake	163
SR	**Dust & Corrosion Protected Brake** - Dust & corrosion protected brake	163

Rectifier Options

Abbreviation	Description	Page
Rectifiers	Most NORD brakes are provided with a rectifier that converts AC voltage to DC voltage. Rectifiers are used because most motors are AC powered, but brakes require DC power.	158
G...V	**Sealed Rectifier** - Rectifiers sealed with an electrically safe resin	158
GP...	**High Performance Rectifier** - Improves brake release and stopping times	159

Brake Nomenclature

BRE – –

- **Additional Brake Options**
- **Brake Size/Torque Rating**
- **Brake**

Ordering Examples

BRE 100 HL RG IR

- **Current Sensing Relay**
- **Corrosion Protected Brake**
- **Hand Release Lever**
- **100 Nm Brake Torque**
- **Brake**

Brake, 100 Nm with a hand release lever, corrosion protected brake, and a current sensing relay.

BRE 40 FHL SR

- **Dust & Corrosion Prot. Brake**
- **Locking Hand Release Lever**
- **40 Nm Brake Torque**
- **Brake**

Brake, 40 Nm with a locking hand release lever and dust & corrosion protected brake.

Brake Torque Selection

Each NORD motor size has a number of brake torque sizes available. The bold value in the table below is the standard brake torque size for each motor.

Example for ordering: SK 32 - 80S/4 **BRE 10**

(**BRE 10** indicates the unit has a brake torque size of 10 Nm)

General Selection Considerations

NORD relies on the equipment builder to specify appropriate brake sizing for their application, while giving consideration to the following:

- For most applications, we advise sizing the brake to 1.5 - 2 times the motor rated torque.
- For vertical applications, it may be advisable to size the brake size up to 3 times the motor rated torque.
- For some applications, it may be necessary to specify a reduced brake torque setting to prevent, excessive peak load conditions developed at the reducer output.
- On travel drive applications, excessive brake torque may lead to wheel skid, and excess hoist-cable swing.

Motor Frame	Units	Brake Size						
		BRE5	BRE10	BRE20	BRE40	BRE60	BRE100	BRE150
63S/L	Nm	**5**	10 * [1]					
	lb-ft	**3.7**	7.4 * [1]					
71S/L	Nm	**5**	10 *					
	lb-ft	**3.7**	7.4					
80S	Nm	**5**	10	20 *				
	lb-ft	**3.7**	7.4	15 *				
80L	Nm	5	**10**	20 *				
	lb-ft	3.7	**7.4**	15 *				
90S	Nm		10	**20**	40 *			
	lb-ft		7.4	**15**	30 *			
90L	Nm		10	**20**	40 *			
	lb-ft		7.4	**15**	30			
100L	Nm			**20**	40	60 * [1]		
	lb-ft			**15**	30	44		
100LA/4	Nm			20	**40**	60 * [1]		
	lb-ft			15	**30**	44 * [1]		
112M	Nm			20	40	**60**		
	lb-ft			15	30	**44**		
132S	Nm					**60**	100	150 * [1]
	lb-ft					**44**	74	110 * [1]
132M	Nm					60	**100**	150 * [1]
	lb-ft					44	**74**	110 * [1]
+ weight	kg	2	3	5.5	7	10	16	22
	lb	4.4	6.6	12.1	15.4	22	35	49
+ inertia	$kgm^2 \times 10^{-3}$	0.15	0.45	0.153	0.45	0.86	1.22	2.85
	$lb\text{-}ft^2 \times 10^{-3}$	0.356	1.07	3.63	10.7	20.4	29.0	67.7

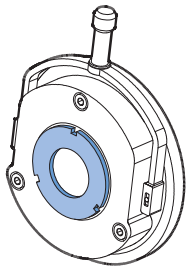
* BIP66 – IP66 brake not possible.
1) Brake release lever "HL" and "FHL" not possible.
2) When used as a stopping brake, evaluation of brake work is essential.
3) Designed as holding brake or emergency stop brake only.

1 Nm = 0.738 lb-ft
1 lb-ft = 1.36 Nm

Torque Adjustment (ADJ)

Mod

The brake torque can be adjusted by changing the brake spring combinations. Additionally, on brakes up to size BRE40, the user can can make fine torque adjustments by turning the spanner nut. From the factory, the spanner nut will be tight against the brake casing. The braking torque is adjusted by unscrewing the spanner nut a number of clicks with a spanner wrench.



When Ordering the Torque Adjustment option specify ADJ _____ Nm

Torque Spring Adjustments								
# Springs	Unit	BRE5	BRE10	BRE20	BRE40	BRE60	BRE100	BRE150
8	[Nm]							
	[lb-ft]							
7	[Nm]	5	10	20	40	60	100	150
	[lb-ft]	3.7	7.4	14.8	29.5	44.3	74	111
6	[Nm]							
	[lb-ft]							
5	[Nm]	3.5	7	14	28	43	70	107
	[lb-ft]	2.6	5.2	10.3	20.7	31.7	51.6	79.0
4	[Nm]	3	6	12	23	34	57	85
	[lb-ft]	2.2	4.4	8.9	17.0	25.1	42.0	62.7
3	[Nm]	2	4	8	17	26	42	65
	[lb-ft]	1.5	3.0	5.9	12.5	19.2	31.0	47.9

Reduction of Brake Torque with Spanner Nut					
	Unit	BRE5	BRE10	BRE20	BRE40
Torque Reduction per Spanner Nut Click (Adjustment Step)	[Nm]	0.2	0.2	0.3	1.0
	[lb-ft]	0.15	0.15	0.22	0.74
Lowest Torque Setting	[Nm]	0.8	1.6	4.4	5.0
	[lb-ft]	0.59	1.18	3.25	3.69

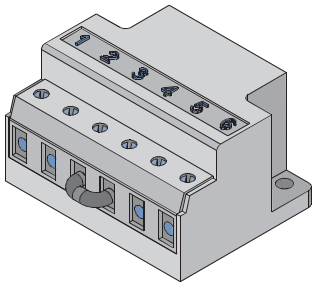
WARNING

- **Brake torque** - The brake torque is measured with a mean friction radius of the brake pad surface with a circumferential speed of 1m/sec (197 fpm).
- **Brake torque tolerance** - For different applications and operating conditions, brake torque can vary from +40/-20% compared to the rated brake torque.
- **Initial operation & wear in period** - In new condition, the brake will have a reduced torque of up to 30%. In order to achieve full rated brake torque, a short break in period is required. The break in time will vary depending on system loads.
- **Setting times** - The lower the brake torque, the longer the brake setting times.
- **Release times** - The lower the brake torque, the faster the brake release times.

Brake Control Rectifiers

NORD brake control rectifiers convert AC voltage to DC voltage. Rectifiers are used because most applications require AC voltage to power the motor, but DC power is required to power the brake and DC power is not typically available.

NORD brakemotors include the rectifier located inside the terminal box. NORD rectifiers have six terminals and can be powered by the motor terminal block, or by a separate power source.



Rectifier Terminals	Description
1 & 2	Brake Supply AC Voltage
3 & 4	DC-Switching Contact or Jumper
5 & 6	Connection to Brake Coil

Rectifier Advantages:

- Individual power source for each brake
- Compact size, mounted inside the terminal box
- Multiple voltage options, types, and release/engagement modes available
- Mountable in remote control cabinet
- Integral protection against voltage spikes

Rectifier Types:

- **Full-wave rectifier:** The DC output voltage is 90% of the applied input AC voltage – types "GV…"
- **Half-wave rectifier:** The DC output voltage is 45% of the applied input AC voltage – types "GH…"
- **Push-hybrid rectifier (full-wave and half-wave):** The rectifier is designed to switch from an initial full-wave mode to a final half-wave mode in approximately 250 ms – types "GP…"

Rectifier Nomenclature

G H E 4 0 L

- **L** — **Electronic Protection**
  - L = Varnish coated
  - V = Encapsulated
- **0** — **Components Current Rating**
  - 0 = 0.5A (75°C)
  - 1 = 1.5A (75°C)
- **4** — **Voltage Range**
  - 2 = up to 275VAC input
  - 4 = up to 480VAC input
  - 5 = up to 575VAC input
- **E** — **Type of DC Switching**
  - E = External DC-switching (contact)
  - U = Internal DC-switching (voltage)
- **H** — **Type of Rectifier**
  - H = Half-wave
  - V = Full-wave (bridge)
  - P = Push-Hybrid (full & half-wave)
- **G** — **Rectifier**

Standard Rectifier

NORD standard rectifiers are provided with each brake motor (except 24V DC brakes) unless a sealed or high performance rectifier is specified.

Standard Rectifier			
Nomenclature	**Part #**	**Type**	**Color**
GVE20L	19141000	Full-wave	Black
GHE40L	19141010	Half-wave	Yellow
GHE50L	19141020	Half-wave	Gray

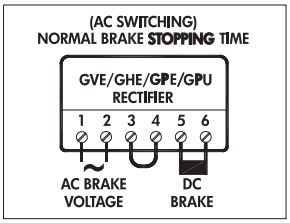
Sealed Rectifiers G…V

NORD offers rectifiers that are sealed with an electrically safe resin to ensure that water and moisture will not pass into the rectifier. Sealed rectifiers have the same brake performance ratings as the standard rectifier and can be beneficial if water is present in the motor's terminal box.

Sealed Rectifier			
Nomenclature	**Part #**	**Type**	**Color**
GVE20V	19141030	Full-wave	Black
GHE40V	19141040	Half-wave	Yellow
GHE50V	19141050	Half-wave	Gray

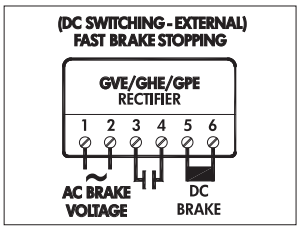
AC Switching (Standard Stopping)

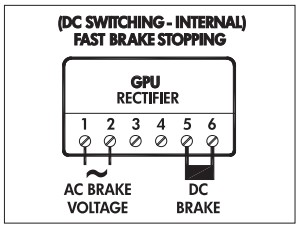
The rectifier can be wired to operate by supplying and removing AC power, commonly called AC switching. The advantage to using AC switching is that the rectifier can be powered directly from the motor's terminal block and no additional wiring is required. However, tapping into the motor's terminal block gives the slower stopping time due to the de-energizing time of the motor's magnetic field. The stopping time can be improved by wiring the rectifier from an external power supply.



DC switching (Fast Stopping)

DC switching directly interrupts the current flow in the DC circuit of the rectifier. This provides much faster stopping, because you do not need to wait for the motor's magnetic field to de-energize. To implement DC switching, a normally open relay must be installed between terminals 3 and 4 on the rectifier for rectifier types GVE, GHE, and GPE. For GPU type rectifiers simply remove the jumper between terminals 3 & 4 to activate DC switching.





GP.. High Performance Rectifiers

The "GP…" high performance rectifiers improve brake release time & stopping time. The "GP…." rectifier is a push-hybrid rectifier; meaning that it initially acts as a full-wave rectifier for approximately 250 ms, after which it operates as a half-wave rectifier.

There are two types of "GP…" rectifiers. The first type utilizes External DC Switching "GPE...", this is primarily used in across-the-line applications, where the brake power is supplied from the motor terminal block. The second type utilizes Integrated DC Switching "GPU...". The built-in DC switching of the "GPU" rectifiers is supply voltage triggered. The "GPU" rectifiers can only be used when the brake is powered separately from the motor. Examples include using an AC vector drive, two-speed motor or soft-starter. The "GPU" rectifiers are not suitable for use when the brake power is taken form the motor supply power (motor terminal block).

There are two ways to apply "GP…" rectifiers. The first is called, "overexcitation (fast brake release)" and the second is called, "reduced power holding (very fast stopping)"

GPE - High Performance Rectifier with External DC switching			
Nomenclature	**Part #**	**Type**	**Color**
GPE20L	19140230	Push-hybrid	Black
GPE40L	19140240	Push-hybrid	Black

GPU - High Performance Rectifier with Integrated DC switching			
Nomenclature	**Part #**	**Type**	**Color**
GPU20L	19140090	Push-hybrid	Black
GPU40L	19140170	Push-hybrid	Black

Overexcitation (fast brake release)

In overexcitation, the rectifier initially over-voltages (overexcites) the brake coil, causing a stronger than normal magnetic field which releases the brake quicker than normal. The rectifier then is switched to a lower holding voltage so it does not thermally overload the brake coil. In this method, the brake coil is selected as if the brake system is powered by a half-wave rectifier. In other words, the DC brake voltage should be 45% of the applied AC rectifier input voltage. This brake control is also sometimes referred to as "Voltage Forcing" or "Supercharging".

Overexcitation is commonly used in very high cycling brakemotor applications to reduce motor heating during the motor start and brake release.

Reduced Power Holding (very fast stopping)

In reduced power holding, the rectifier initially supplies the rated DC voltage to the brake coil. When voltage is first applied, the rectifier operates as a full-wave rectifier (90% of the applied AC voltage), releasing the brake in the standard time. After the brake is released, the rectifier switches to half-wave mode (45% of the applied DC voltage), weakening the brake's magnetic field. The weaker field will allow the brake to stop more quickly when power is removed. In this method the brake coil is selected as if the brake system is powered by a full-wave rectifier. Therefore, the brake coil's DC voltage rating should be 90% of the AC voltage applied to the rectifier.

Brake Times & Electrical Selection

Brake timing performance is critical in selecting the optimal brake system. NORD brakes can provide exceptional performance in terms of the release (start) times and engagement (stop) times. Use the following guidelines in order to select the correct brake control components and connections.

1) Determine if the brake needs to be wired directly from the motor terminal block or powered by a separate source.

- If you are using an AC vector drive, soft-start or a two speed motor you will need to supply the rectifier from a separate power source.

- If the motor is powered direct across-the-line the rectifier power can be supplied from the motor's terminal block.

2) What type of performance do I need?

- Is the standard brake performance OK?

- Is a higher performance required for fast brake release or very fast brake stopping?

Selection Suggestions

When Fast or Very Fast Stopping is Recommended

Any applications that require quick stops and positive action at stand-still

- conveyors and inclined conveyors
- hoists and lifts
- bulk material handling equipment (bucket elevators, idler conveyor's).

WARNING

- **Hoisting (lifting/lowering) applications** - must have the brake wired for fast response.

When Fast-Release is Recommended (Overexcitation)

Any application that is very high-cycling with frequent starts and stops. These applications require the brake to release very-quickly in order to avoid excessive heat build-up in the AC motor and brake coil.

- Index conveyors
- Diverters
- Storage and retrieval crane systems

Power Source	Brake Release (start)	Brake engagement (stop)	Braking Method	Rectifier
Motor Terminal Block	Standard	Standard (AC switching)	10*	GV/GH
	Standard	Fast (DC switching)	15*	GV/GH
	Standard	Very Fast (Reduced power holding)	40*	GPE
	Fast (Overexcitation)	Standard (AC switching)	30*	GPE
	Fast (Overexcitation)	Fast (DC switching)	35*	GPE
Separate Power Source	Standard	Standard (AC switching)	20*	GV/GH
	Standard	Fast (DC switching)	25*	GV/GH
	Standard	Very Fast (Reduced power holding)	55*	GPU
	Fast (Overexcitation)	Standard (AC switching)	45*	GPU
	Fast (Overexcitation)	Fast (DC switching)	50*	GPU

*** Braking methods referenced in connection diagrams on pages 169 - 174**

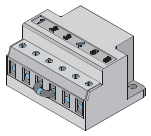
3) What is the AC brake supply voltage?

The table below determines the rectifier and DC brake voltage required, based on the AC supply voltage & braking method.

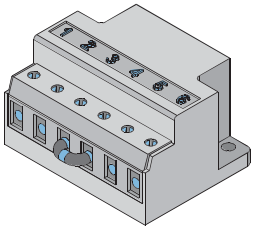
AC Brake Supply Voltage (VAC)	Braking Method	Rectifier Model Type	DC Brake Voltage (VDC)	Rectifier Part Number
115 (105-120)	20	GVE20L	105	19141000
	25	GVE20L	105	19141000
208 (200-208)	10	GVE20L	180	19141000
	15	GVE20L	180	19141000
	20	GVE20L	180	19141000
	25	GVE20L	180	19141000
	40	GPE20L	180	19140230
	55	GPU20L	180	19140090
230 (220-240)	10	GVE20L	205	19141000
	10	GHE40L	105	19141010
	15	GVE20L	205	19141000
	15	GHE40L	105	19141010
	20	GVE20L	205	19141000
	20	GHE40L	105	19141010
	25	GVE20L	205	19141000
	25	GHE40L	105	19141010
	30	GPE20L	105	19140230
	35	GPE20L	105	19140230
	40	GPE20L	205	19140230
	45	GPU20L	105	19140090
	50	GPU20L	105	19140090
	55	GPU20L	205	19140090
400 (380-415)	10	GHE40L	180	19141010
	15	GHE40L	180	19141010
	20	GHE40L	180	19141010
	25	GHE40L	180	19141010
460 (440-480)	10	GHE40L	205	19141010
	15	GHE40L	205	19141010
	20	GHE40L	205	19141010
	25	GHE40L	205	19141010
	30	GPE40L	205	19140240
	35	GPE40L	205	19140240
	45	GPU40L	205	19140170
	50	GPU40L	205	19140170
500	10	GHE50L	225	19141020
	15	GHE50L	225	19141020
	20	GHE50L	225	19141020
	25	GHE50L	225	19141020
575 (550-600)	10	GHE50L	250	19141020
	15	GHE50L	250	19141020
	20	GHE50L	250	19141020
	25	GHE50L	250	19141020

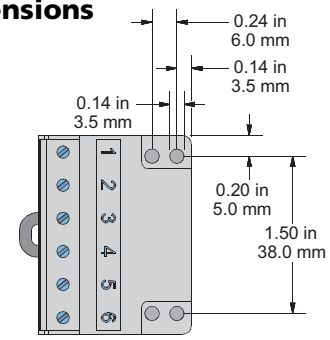
Specify Rectifier Model Type _____ **And DC Brake Voltage** _____

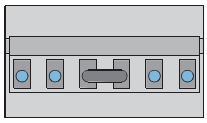
Rectifier Ratings & Dimensions

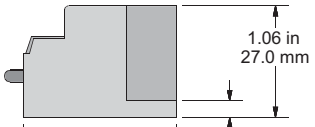


Standard Rectifier Dimensions







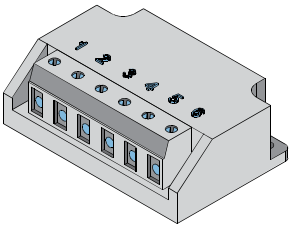


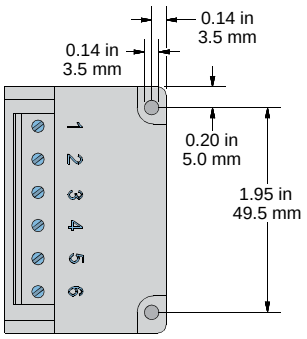
1.89 in
48.0 mm

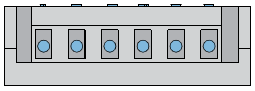
1.46 in
37.0 mm

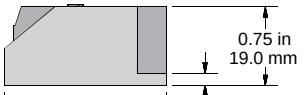
0.16 in
4.0 mm

GP Rectifier Dimensions









2.34 in
59.5 mm

1.54 in
39.0 mm

0.12 in
3.0 mm

Rectifier Overview

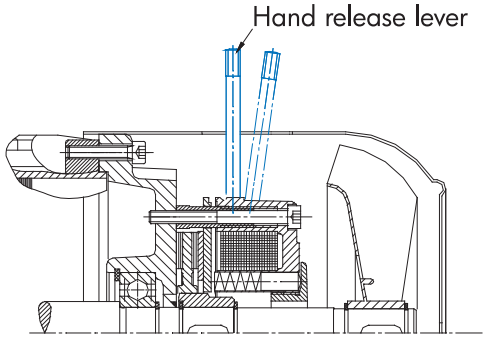
Rectifier Model Type	Part Number	Part Color	Type 1 input Voltage	Input Voltage Range	Output Voltage	Rated Output Current		DC switching Mode
Standard Protected Electronics "L"						(40°C)	(75°C)	
GVE20L Full-Wave	19141000	Black	230VAC	110-275VAC +/- 10%	205VDC (VDC = VAC x 0.9)	1.5ADC	1.0ADC	External Contact
GHE40L Half-Wave	19141010	Yellow	480VAC	230-480VAC +/- 10%	216VDC (VDC = VAC x 0.45)	1.0ADC	0.5ADC	External Contact
GHE50L Half-Wave	19141020	Grey	575VAC	500-575VAC +/- 10%	259VDC (VDC = VAC x 0.45)	1.0ADC	0.5ADC	External Contact
GPE20L Push-Hybrid	19140230	Black	230VAC	200-275VAC +/- 10%	205VDC / 105VDC (VDC = VAC x 0.9) / (VDC = VAC x 0.45)	0.7ADC	0.5ADC	External Contact
GPE40L Push-Hybrid	19140240	Black	480VAC	380-480VAC +/-10%	432VDC / 216VDC (VDC = VAC x 0.9) / (VDC = VAC x 0.45)	1.0ADC	0.5ADC	External Contact
GPU20L Push-Hybrid	19140090	Black	230VAC	200-275VAC +/- 10%	205VDC / 105VDC (VDC = VAC x 0.9) / (VDC = VAC x 0.45)	0.7ADC	0.5ADC	Internal Activation*
GPU40L Hybrid	19140170	Black	480VAC	380-480VAC +/-10%	432VDC / 216VDC (VDC = VAC x 0.9) / (VDC = VAC x 0.45)	1.0ADC	0.5ADC	Internal Activation*
Rectifier Electronics Protected with Potting Option "V"								
GVE20V Full-Wave	19141030	Black	230VAC	110-275VAC +/- 10%	205VDC (VDC = VAC x 0.9)	1.5ADC	1.0ADC	External Contact
GHE40V Half-Wave	19141040	Yellow	480VAC	230-480VAC +/- 10%	216VDC (VDC = VAC x 0.45)	1.0ADC	0.5ADC	External Contact
GHE50V Half-Wave	19141050	Grey	575VAC	500-575VAC +/- 10%	259VDC (VDC = VAC x 0.45)	1.0ADC	0.5ADC	External Contact

* Voltage based - deactivated with a jumper between terminals 3 & 4

Hand Release Lever (HL)

Mod

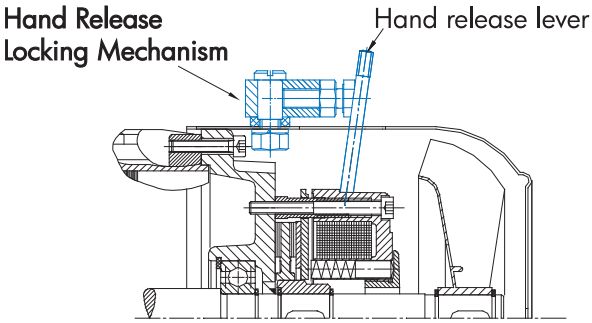
The hand release option allows the brake to be manually released without requiring that the brake be energized with voltage. The lever has a spring return that allows the brake to be hand released and returned automatically to its set position. The hand release lever can be unscrewed for easy removal.



Locking Hand Release Lever (FHL)

Mod

This option allows the brake to be manually released and locked off without requiring voltage to the brake. The lock mechanism prevents the spring from returning the brake to a closed state without manual action by the user. The hand release lever can be unscrewed for easy removal.



Hand Release Lever With Hole (HLH)

Build

The hand release levers can be provided with a 5.5mm through hole. The hole can be used for attaching external pulling devices such as a cord to release the brake at a distance. This option is available for brake sizes BRE5 to BRE60.

Corrosion Protected Brake (RG)

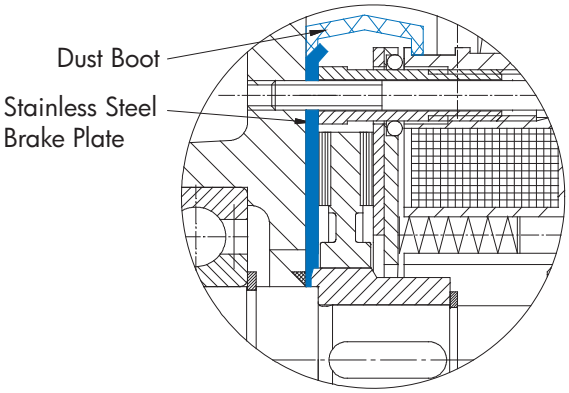
Build

The brake is fitted with a stainless steel brake plate to provide additional corrosion protection in severe and wet environments.

Dust & Corrosion Protected Brake (SR)

Build

A rubber-sealing boot is installed on the brake to provide additional protection in dusty environments. This feature includes the stainless steel brake plate (RG).



IP66 Brake Enclosure (BIP66)

Build

A sealed brake with IP66 enclosure protection can also be provided. This brake has a different mechanical housing that provides a higher degree of protection against severe environments.

Brake Heating / Bifilar Coil (BSH)

Build

Brakes can be provided with a circuit to heat the brake while the motor and brake are inactive (at rest). This is accomplished via a second coil in winding in the brake. This coil is opposite in polarity (bifilar) as the main brake coil so when current passes through both coils, no net magnetic field is created – only heat.

Warning – Heating the brake with full operation voltage is only possible at temperatures below freezing (32°F / 0°C). If heating is also required above freezing then reduced operating voltage is required.

Quiet Brake Release (NRB1)

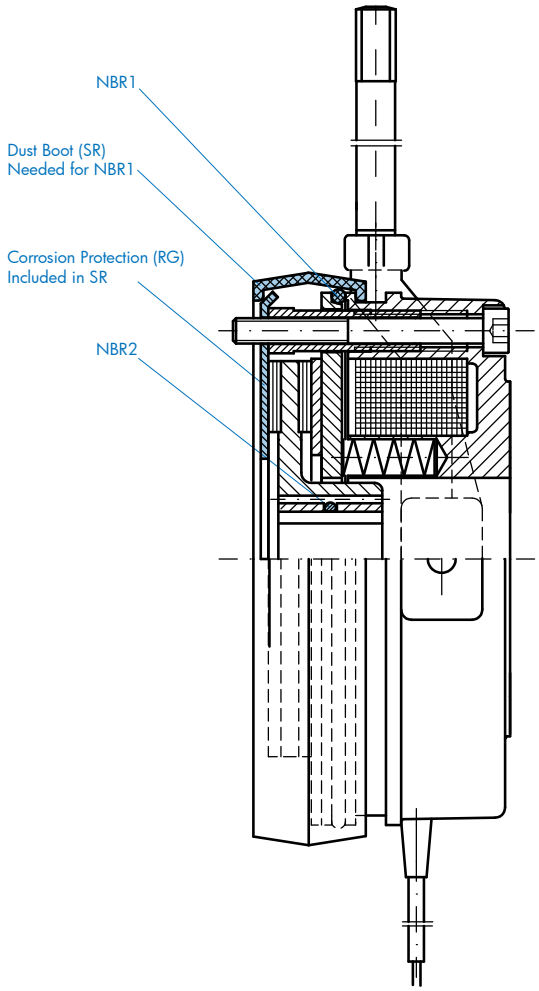
Build

To reduce the noise of the brake release, an o-ring can be placed between the brake coil body and the armature plate (stationary disc). The o-ring dampens the impact caused by the armature plate hitting the brake coil body during the release process. When ordering NRB1, the SR (Dust Boot) option is required. The SR option also includes the RG stainless steel corrosion plate.

Quiet Brake Motor Operation (NRB2)

Build

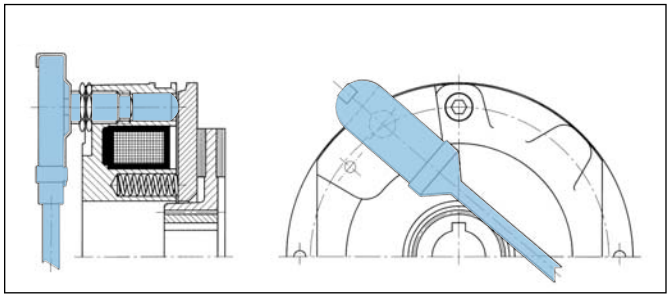
Noise due to vibration in the brake components is possible during motor operation particularly with variable frequency drive or single phase motor operation. To reduce this vibration the brake can be constructed with an o-ring between the brake carrier hub and the armature plate. This o-ring will prevent the clattering caused by the rapid micro speed changes in the motor caused by or single phase operation.



Micro Switch (MIK)

Build

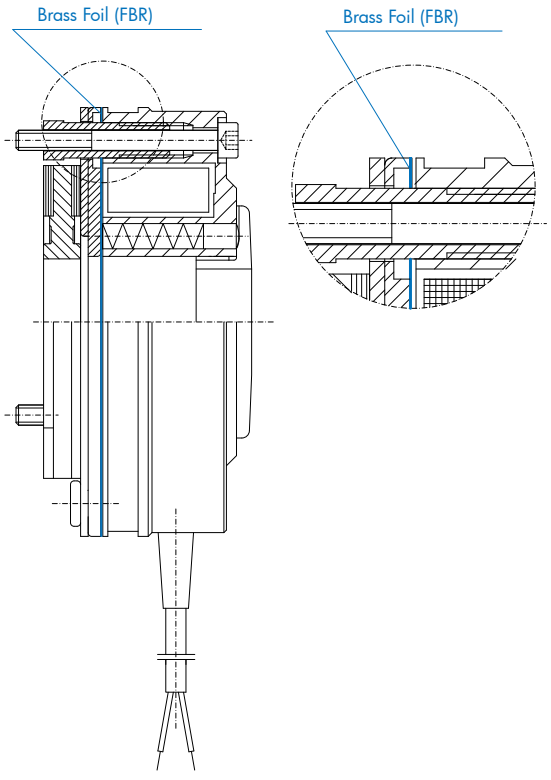
The micro switch monitors the release state of the brake and can be wired into external control circuitry to provide additional safety. The switch can also be used to detect certain brake service problems including excessive brake wear.



Brass Foil (FBR)

Build

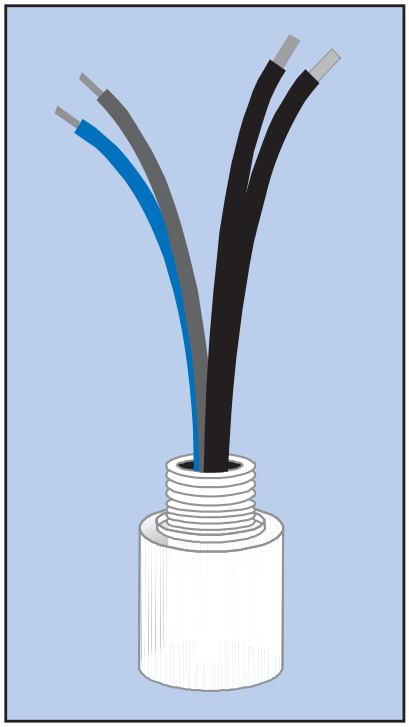
NORD brakes can be fitted with a brass foil in between the armature plate and the brake coil body. The foil acts as a magnetic resistance to weaken the brake coil's magnetic attraction to the armature plate. The weaker magnetic attraction between the armature plate and the brake coil will provide faster brake reaction (stopping) times. The brake release (start) times will be increased. The brass foil is normally used in combination with the fast GP rectifiers in over excitation mode.



Current Sensing Relay (IR)

Mod

The current sensing relay, normally called the IR option, is used to achieve improved brake engagement or stopping time without the use of external control equipment or additional wiring. The relay is mounted directly onto the motor terminal box. The relay switch leads are connected to terminals 3 and 4 of the rectifier. When the power to the motor is shut off, the IR relay opens the brake circuit on the DC side; this allows the brake to demagnetize quickly.



WARNING

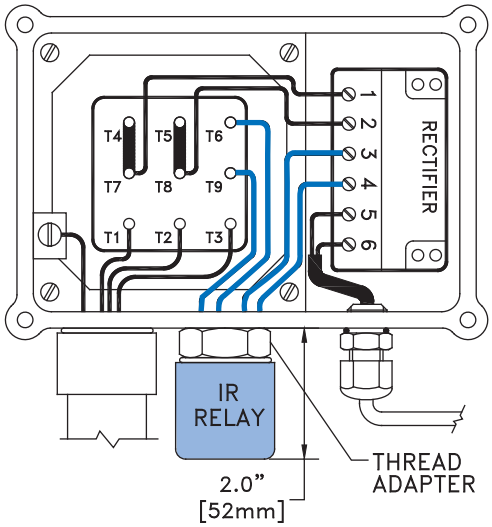
Requirements

- Motor must be powered across-the-line (not inverter powered or controlled with a soft-start)
- The brake power must be provided from the motor's terminal block (not separately powered)
- Motor must be a single-speed (not possible with two-speed motors)

Ratings

Part number	18556010	18556020
Motor Frame Sizes	63S - 180M*	180L - 225M
AC Input Current - black/white wires	25AAC 75AAC - 0.2 s	50 AAC 75 AAC - 0.2 s
DC Brake Current - red/blue wires	2.0 ADC	2.0 ADC
Additional Brake Setting Delay	18 ms	18 ms
Ambient Temperature	- 40 to 75 °C - 40 to 167 °F	- 40 to 75 °C - 40 to 167 °F
Enclosure Rating	IP65	IP65

* For 180MX motor frame at 230/460V use part number 18556020



Connection Notes

Rectifier			IR-Relay Wires to Rectifier	
Model Type	Part Number	Design	Red	Blue
GVE20L	1914000	Full-wave	3	4
GHE40L	19141010	Half-wave	4	3
GHE50L	19141020	Half-wave	4	3
GPE20L	19140230	Push-hybrid	4	3
GPE40L	19140240	Push-hybrid	4	3

Conduit Box Thread Adapter

Thread	Motor Frame	Part Number
M20	63-71	18542006*
M25	80-90	18522253
M32	100-132	18522320
M40	160-180	18522400 + 18522253

* Spacer

Double Brakes (DBR)

Build

Some applications require two independent brakes to meet industry safety guidelines.

Double Brakes for Theatrical Applications

Many international standards for braking systems used on theatre hoists mandate the use of brakes that automatically set when power is removed. Redundancy is also required with the system brakes. If one brake fails, the other brake can still operate the system by running independently and parallel to each other. NORD DBR (2xBRE) brake systems are designed to meet these requirements. The NORD double brakes are also designed for quiet operation < 50dB(A).

Some safety standards require that the load brake hold 1.25 times the rated load at test. We recommend selecting the brake for approximately 1.6 to a maximum of 2.0 times the required operating torque for each brake.

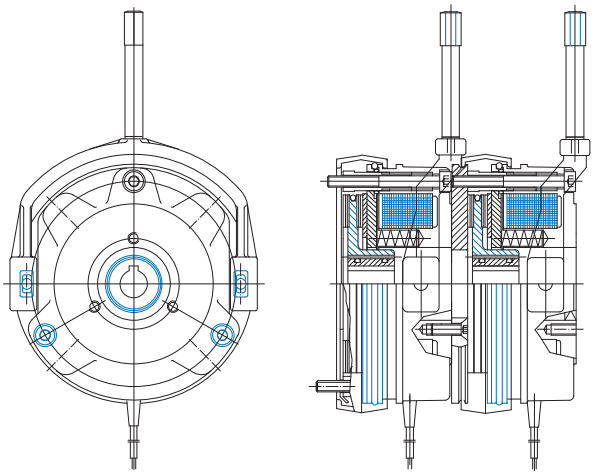
The NORD double theatre brakes do not need to be worn-in and will achieve their full braking torque initially.

Two brake rectifiers are required for operating a double brake system. These will be provided as loose parts and are normally mounted in the customers control panel.

The double brake option will add motor length compared to the single brake.

WARNING

- NORD recommends delayed operation of one of the brakes. If the brakes are operated simultaneously, the combined torques may result in excessive torque for the gear unit or other mechanical system elements. If the brakes are set at the same time even in an E-stop condition, the gear units must be sized to handle this increased torque.



Motor	Brake	7 Springs		5 Springs		4 Springs	
		[Nm]	[lb-ft]	[Nm]	[lb-ft]	[Nm]	[lb-ft]
63S/L	DBR6	2 x 6	2 x 4.4	2 x 4	2 x 3	2 x 3.5	2 x 2.6
71S/L	DBR6	2 x 6	2 x 4.4	2 x 4	2 x 3	2 x 3.5	2 x 2.6
80S	DBR6	2 x 6	2 x 4.4	2 x 4	2 x 3	2 x 3.5	2 x 2.6
80L	DBR12	2 x 12.5	2 x 9.2	2 x 8.5	2 x 6.3	2 x 7	2 x 5.2
90S	DBR12	2 x 12.5	2 x 9.2	2 x 8.5	2 x 6.3	2 x 7	2 x 5.2
90L	DBR25	2 x 25	2 x 18.4	2 x 17.5	2 x 12.9	2 x 14	2 x 10.3
100L	DBR25	2 x 25	2 x 18.4	2 x 17.5	2 x 12.9	2 x 14	2 x 10.3
110L/40	DBR50	2 x 50	2 x 37	2 x 35	2 x 26	2 x 28	2 x 20.7
112M	DBR50	2 x 50	2 x 37	2 x 35	2 x 26	2 x 28	2 x 20.7
132S	DBR75	2 x 75	2 x 55	2 x 52	2 x 38	2 x 42	2 x 31
132M	DBR125	2 x 125	2 x 92	2 x 89	2 x 66	2 x 70	2 x 52

Detailed Brake Performance Data

Brake Size		BRE5	BRE10	BRE20	BRE40	BRE60	BRE100	BRE150
Brake torque $_{-max}$	[lb-ft]	3.7	7.4	15	30	44	74	110
	[lb-in]	44	89	177	354	531	885	1330
	[Nm]	5	10	20	40	60	100	150
Power coil P_{20}	[W]	22	28	39	42	50	75	76
Nominal air gap	[in]	0.008	0.008	0.008	0.012	0.012	0.016	0.020
	[mm]	0.2	0.2	0.2	0.3	0.3	0.4	0.5
Maximum air gap (re-adjust) a_{max}	[in]	0.024	0.013	n/a *	0.035	0.039	0.043	0.043
	[mm]	0.6	0.8	n/a *	0.9	1.0	1.1	1.1
Max brake pad wear - must be replaced	[in]	0.118	0.118	0.039	0.118	0.138	0.138	0.138
	[mm]	3	3	1	3	3.5	3.5	3.5
Minimum brake pad thickness	[in]	0.177	0.217	0.295	0.374	0.453	0.492	0.571
	[mm]	4.5	5.5	7.5	9.5	11.5	12.5	14.5
Max work per cycle W_{rmax}	[Jx103]	3	6	12	25	35	50	75
Work until re-adjust W_{rn}	[Jx107]	5	12	20	35	60	125	200
Heat load per cycle	[J/s]	80	100	130	160	200	250	300
Release time (start) t_1	[ms]	35	45	70	80	120	160	200
Release time (start) $t_{1\text{-}OE}$	[ms]	15	15	28	28	75	110	110
Setting time (stop) $t_{2\text{-}AC}$	[ms]	70	95	140	175	210	280	350
Setting time (stop) $t_{2\text{-}DC}$	[ms]	30	45	30	75	90	120	150
Setting time (stop) $t_{2\text{-}DCRP}$	[ms]	5	6	11	12	12	13	17
IR relay delay (stop) $t_{2\text{-}IR}$	[ms]	18	18	18	18	18	18	18
Current – 250VDC coil	[A]	0.09	0.11	0.16	0.18	0.19	0.31	0.31
Current – 225VDC coil	[A]	0.09	0.13	0.18	0.20	0.22	0.35	0.36
Current – 205VDC coil	[A]	0.11	0.13	0.22	0.24	0.28	0.44	0.45
Current – 180VDC coil	[A]	0.12	0.16	0.21	0.25	0.30	0.46	0.47
Current – 105VDC coil	[A]	0.21	0.32	0.36	0.46	0.60	0.88	0.89
Current – 24VDC coil	[A]	0.92	1.17	1.63	1.75	2.08	3.10	3.20

Release times

t_1 – Brake release time - Standard
$t_{1\text{-}OE}$ – Brake release time – Overexcitation (GP)

Set (stop) times

$t_{2\text{-}AC}$ – Brake set time – AC switching
$t_{2\text{-}DC}$ – Brake set time – DC switching
$t_{2\text{-}DCRP}$ – Brake set time – DC switching reduced power
$t_{2\text{-}IR}$ – Additional brake stopping of the IR relay

An increased air gap will alter the braking times.

Brake Calculations

Brake Size Calculation

Torque and inertias below are based on the motor speed. Load side torques must always be divided by the gear reduction ratio. Inertias must be divided by the *square* of the gear ratio. You must also consider any external reduction ratio outside the gearbox.

Selection for holding loads (static)

$$T_{req} = T_{stat} = T_{load} \times K$$

Selection for stopping loads (static + dynamic)

$$\sum J = J_{motor} + \frac{J_{load}}{i^2}$$

Typically other inertias, like the gearbox, can be ignored.

$$T_{dyn} = \frac{\sum J \times n}{25.7 \times t_r}$$

$$T_{req} = (T_{dyn} \pm T_{load}) \times K$$

For driving loads use: $-T_{load}$
For overhauling loads use: $+T_{load}$

Brake Work Verification

$$W = \frac{\sum J \times n^2}{5880} \times \frac{T_B}{T_B \pm T_{load}} \Longrightarrow W \leq W_{max}$$

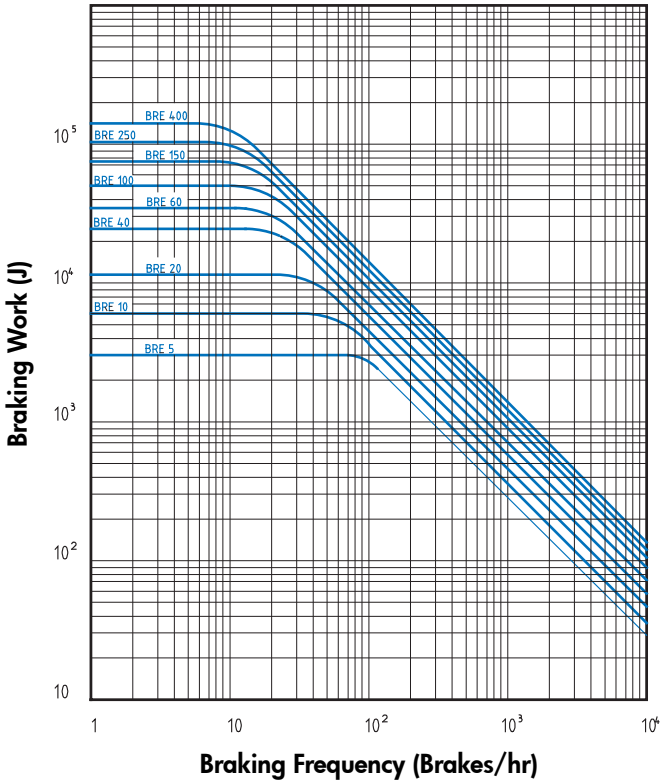
For driving loads use: $+T_{load}$
For overhauling loads use: $-T_{load}$

The permissible values for W_{max} (Friction work) depend on the stopping frequency. See diagram at right.

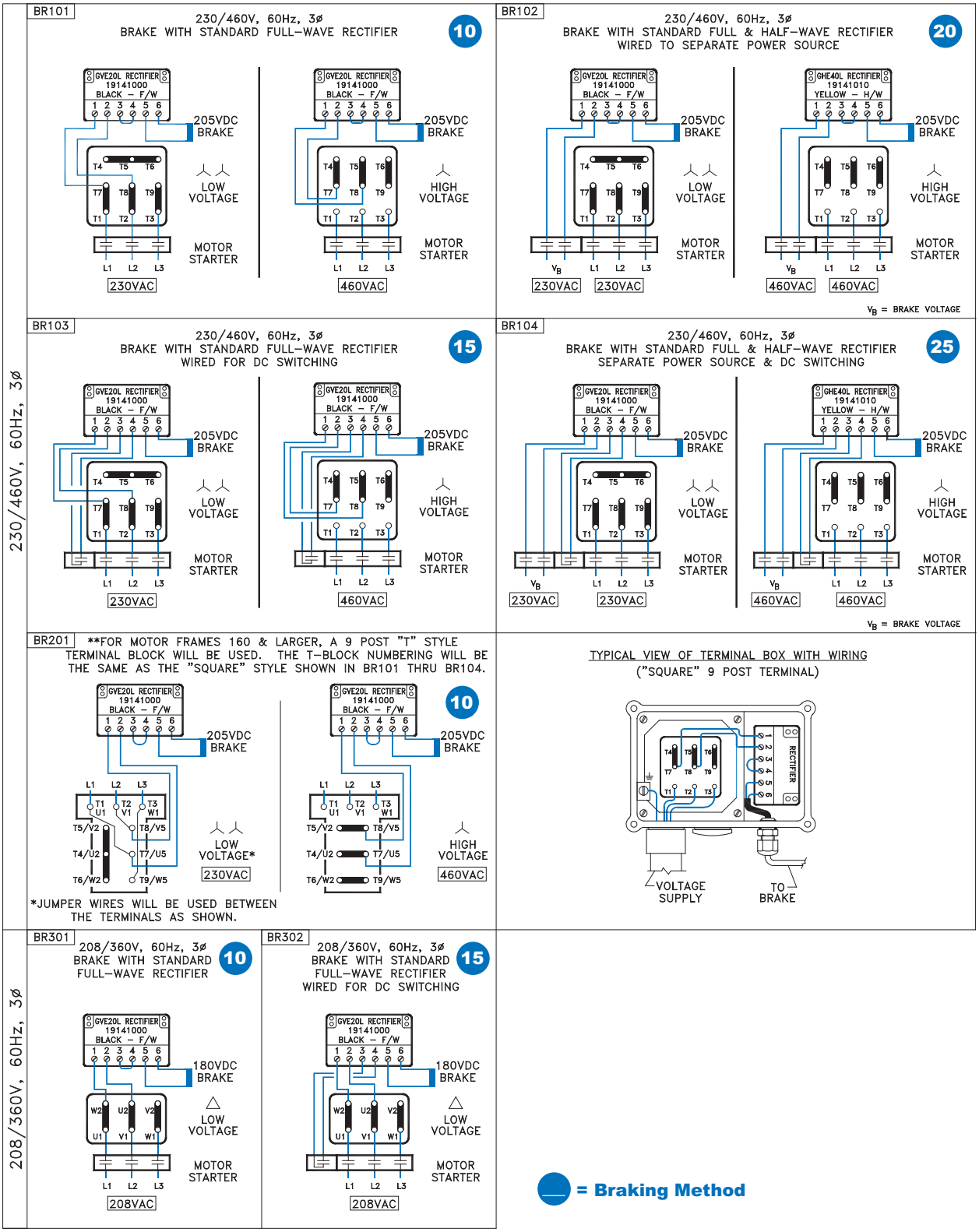
In applications where the brake is operated frequently, two brake work values should be evaluated to ensure adequate brake life: the braking work compared to the braking frequency and the maximum work limit for a single operation, such as an E-stop. Reviewing these two values will help determine the optimal solution and ensure long brake life.

Abbreviation Key

c/h	=	Number of brakes per hour
J [lb-ft²]	=	Inertia
J_{motor} [lb-ft²]	=	Motor inertia
i	=	System reduction ratio
K	=	Safety factors. Based on application and according to industry rules and practices Hoisting >2 Hoisting with people >2..3 Travel drives 0.5 to 1.5
T_B [lb-in]	=	Brake torque
T_{dyn} [lb-in]	=	Dynamic torque
T_{req} [lb-in]	=	Required brake torque
T_{load} [lb-in]	=	Load torque
T_{stat} [lb-in]	=	Static torque
n [rpm]	=	Motor speed
t_r [sec]	=	Stopping time
W [J]	=	Brake work
W_{max} [J]	=	Maximum brake work for one brake operations



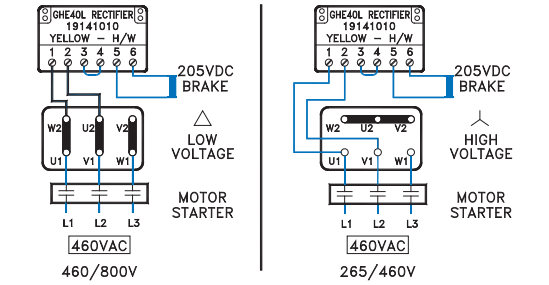
Typical Connection Diagrams



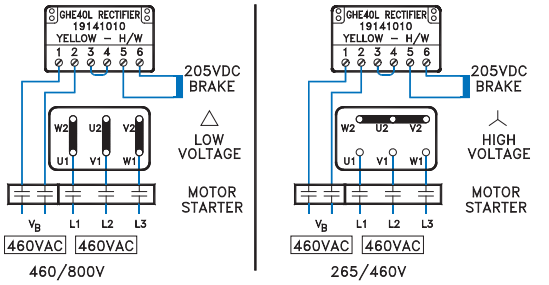
Typical Connection Diagrams

265/460V & 460/800V, 60Hz, 3ø

BR401 — 265/460V & 460/800V, 60Hz, 3ø — BRAKE WITH STANDARD HALF-WAVE RECTIFIER — 10



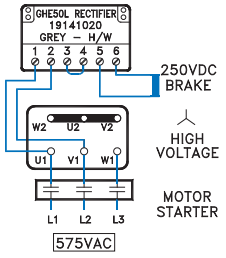
BR402 — 265/460V & 460/800V, 60Hz, 3ø — BRAKE WITH STANDARD HALF-WAVE RECTIFIER WIRED TO SEPARATE POWER SOURCE — 20



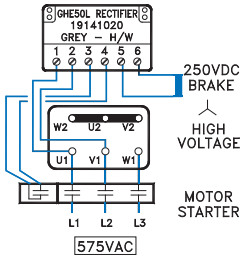
V_B = BRAKE VOLTAGE

332/575VAC, 60Hz

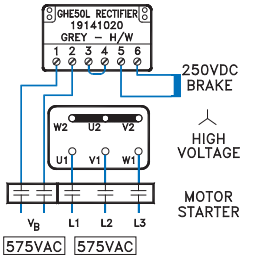
BR501 — 332/575V 60Hz 3ø — BRAKE WITH STANDARD HALF-WAVE RECTIFIER — 10



BR502 — 332/575V 60Hz 3ø — BRAKE WITH STANDARD HALF-WAVE RECTIFIER WIRED FOR DC SWITCHING — 15

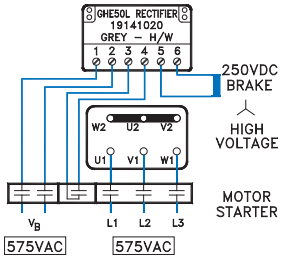


BR503 — 332/575V 60Hz 3ø — BRAKE WITH STANDARD HALF-WAVE RECTIFIER WIRED TO SEPARATE POWER SOURCE — 20



V_B = BRAKE VOLTAGE

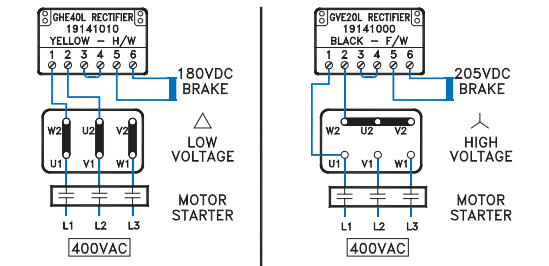
BR504 — 332/575V 60Hz 3ø — BRAKE WITH STANDARD HALF-WAVE RECTIFIER WIRED TO SEPARATE POWER SOURCE & DC SWITCHING — 25



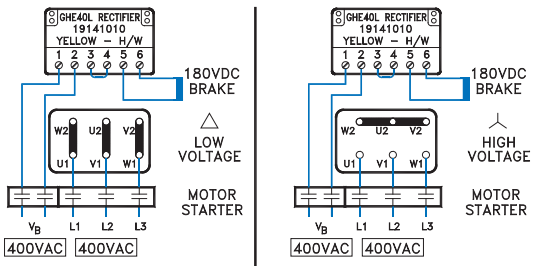
V_B = BRAKE VOLTAGE

230/400V & 400/690V, 50Hz, 3ø

BR601 — 230/400V & 400/690V 50Hz 3ø — BRAKE WITH STANDARD FULL & HALF-WAVE RECTIFIER — 10

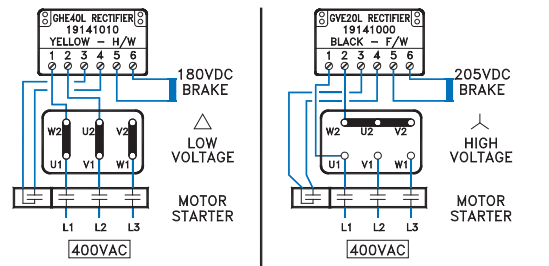


BR602 — 230/400V & 400/690V 50Hz 3ø — BRAKE WITH STANDARD HALF-WAVE RECTIFIER WIRED TO SEPARATE POWER SOURCE — 20

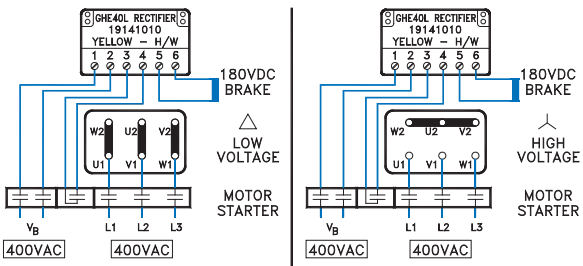


V_B = BRAKE VOLTAGE

BR603 — 230/400V & 400/690V 50Hz 3ø — BRAKE WITH STANDARD FULL & HALF-WAVE RECTIFIER WIRED FOR DC SWITCHING — 15



BR604 — 230/400V & 400/690V 50Hz 3ø — BRAKE WITH STANDARD HALF-WAVE RECTIFIER WIRED TO SEPARATE POWER SOURCE & DC SWITCHING — 25

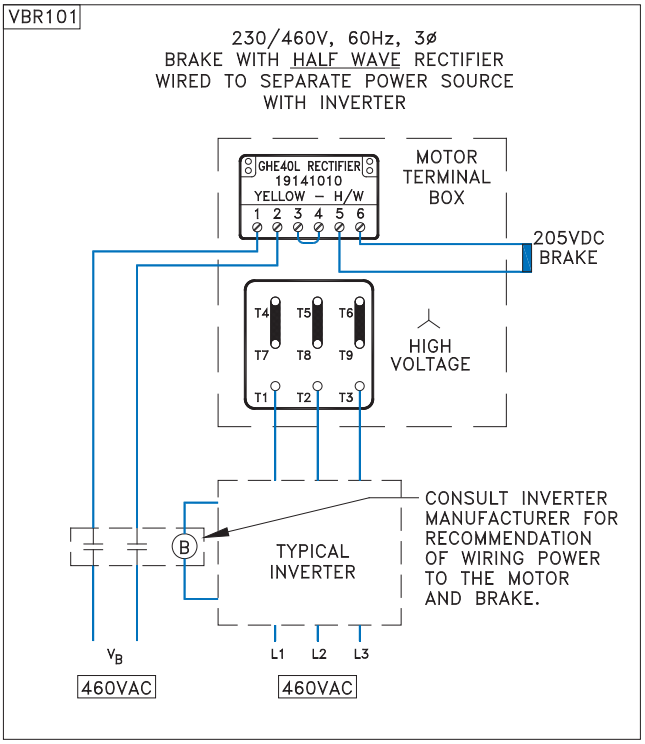


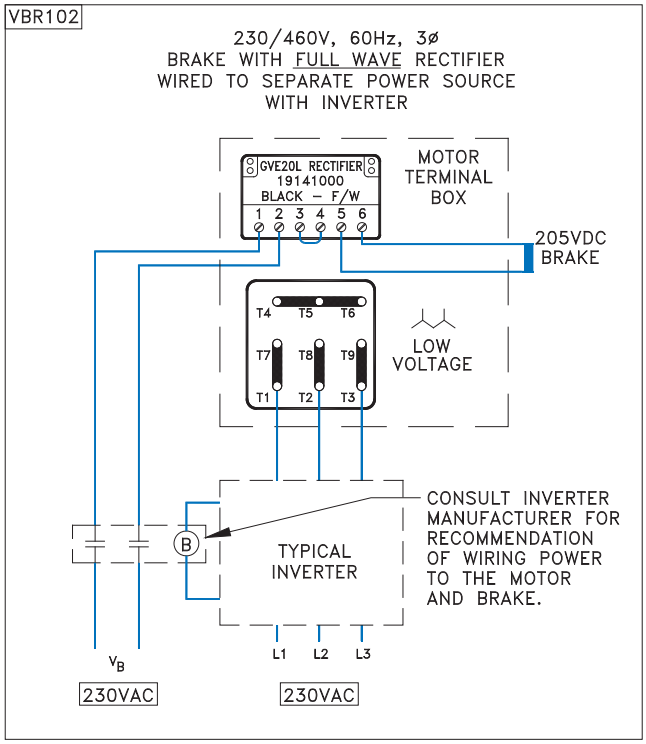
V_B = BRAKE VOLTAGE

= Braking Method

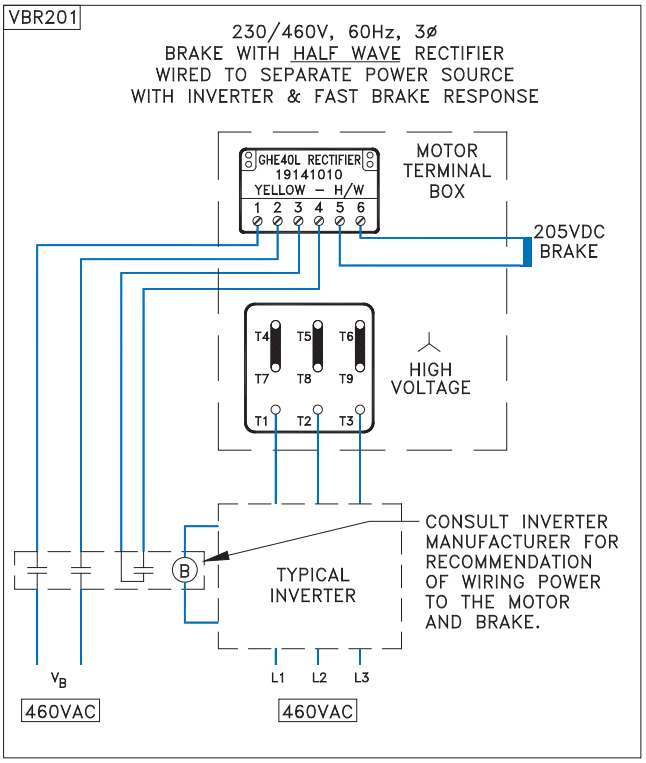
AC Vector Drive Driven Brakemotors

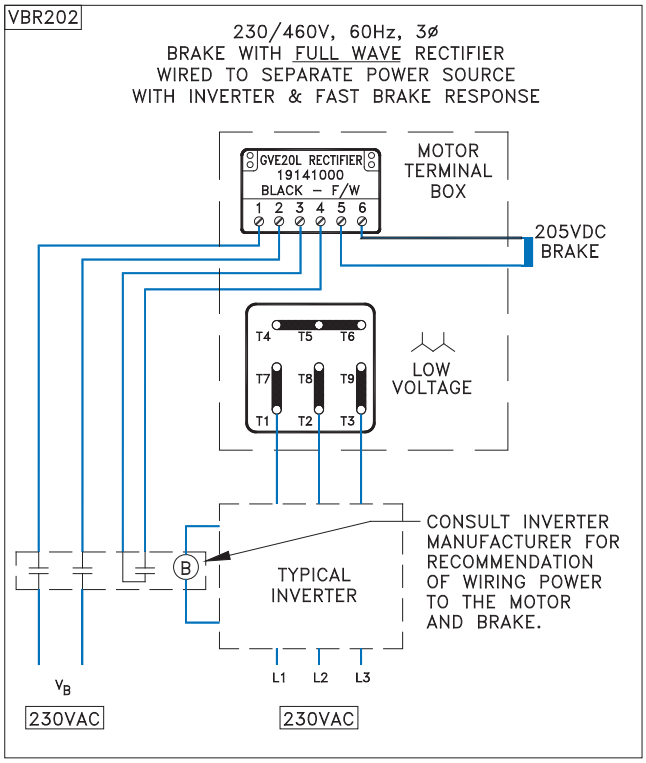
Connection Guide for Brakes with AC-Switching





Connection Guide for Brakes with DC-Switching



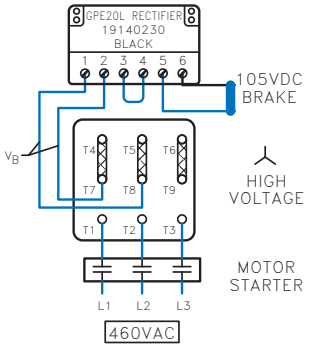


GPE & GPU Rectifier - Connection Diagrams

Motor Across the-Line Operation
Brake Powered from the motor terminal block

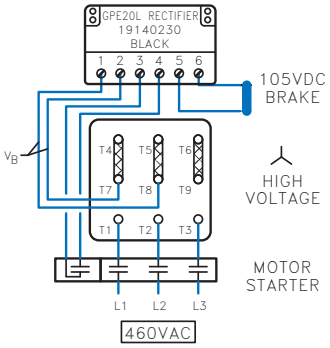
GP101 — 30

START – FAST RELEASE (OVEREXCITATION)
STOP – NORMAL STOP (AC–SWITCHING)
BSG TYPE – EXTERNAL DC–SWITCHING
TERMINAL 3 & 4 – JUMPERED
V_B = BRAKE VOLTAGE = 230V



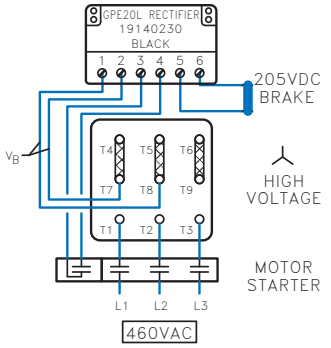
GP102 — 35

START – FAST RELEASE (OVEREXCITATION)
STOP – FAST STOP (DC–SWITCHING)
BSG TYPE – EXTERNAL DC–SWITCHING
TERMINAL 3 & 4 – CONTACT OR IR RELAY
V_B = BRAKE VOLTAGE = 230V



GP103 — 40

START – STANDARD RELEASE
STOP – VERY FAST STOP
(REDUCED POWER HOLD DC–SWITCHING)
BSG TYPE – EXTERNAL DC–SWITCHING
TERMINAL 3 & 4 – CONTACT OR IR RELAY
V_B = BRAKE VOLTAGE = 230V

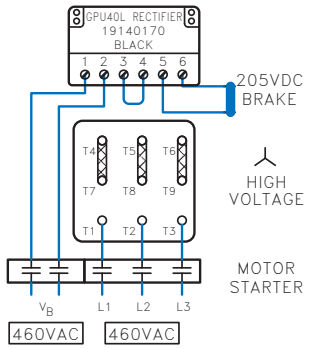


= Braking Method

Power supplied from a seperate power source.
Use with AC vector drives, soft starters, and multi-speed motors

GP104 — 45

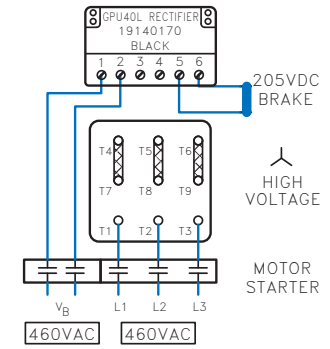
START – FAST RELEASE (OVEREXCITATION)
STOP – NORMAL STOP (AC–SWITCHING)
BSG TYPE – INTEGRATED DC–SWITCHING
TERMINAL 3 & 4 – JUMPERED



V_B = BRAKE VOLTAGE

GP105 — 50

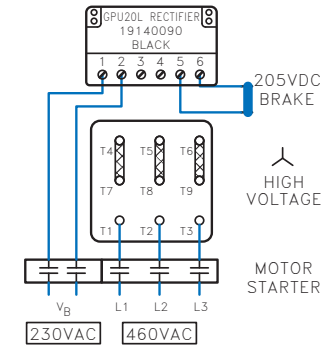
START – FAST RELEASE (OVEREXCITATION)
STOP – FAST STOP (DC–SWITCHING)
BSG TYPE – INTEGRATED DC–SWITCHING
TERMINAL 3 & 4 – NOT JUMPERED (OPEN)



V_B = BRAKE VOLTAGE

GP106 — 55

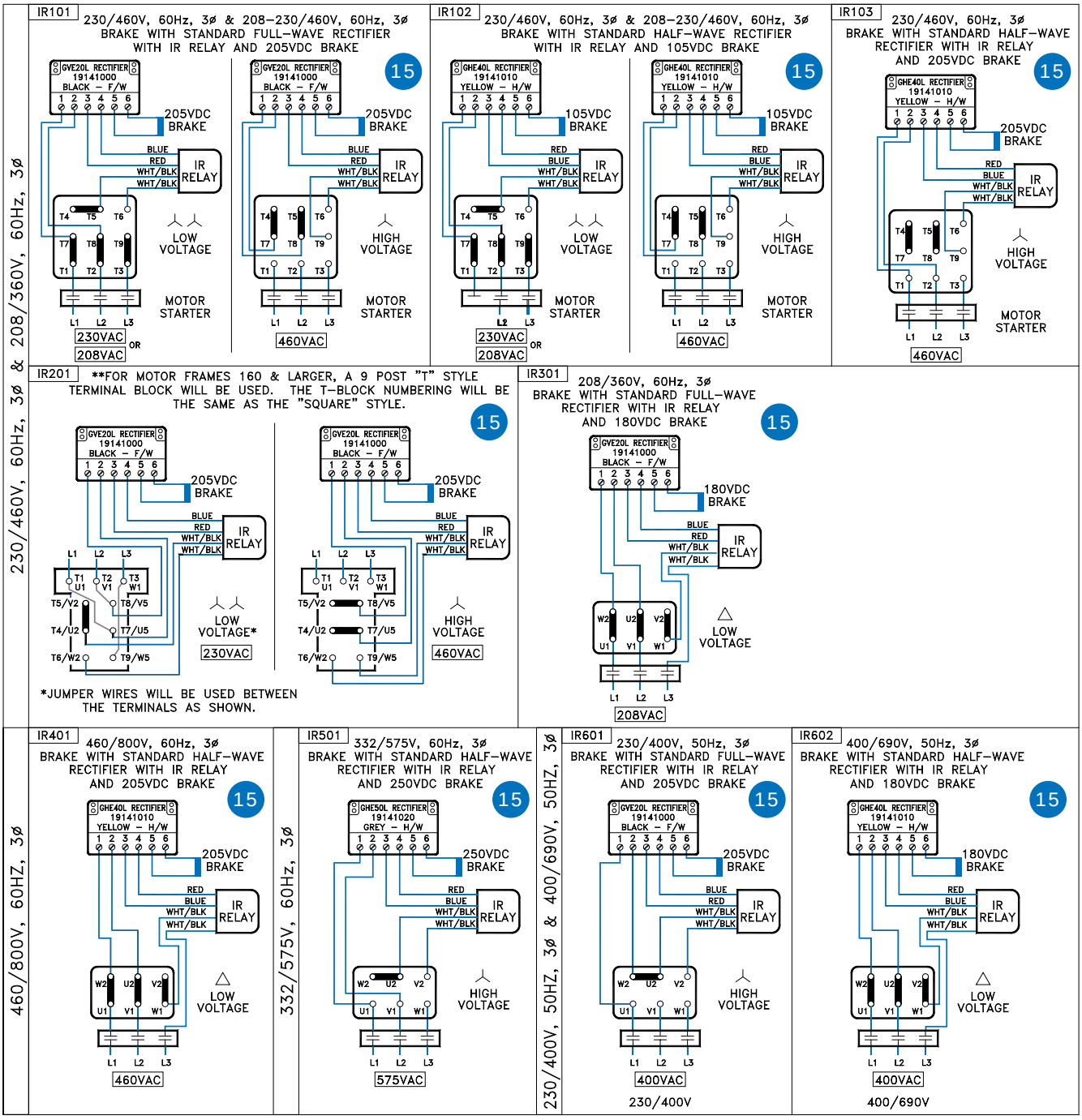
START – STANDARD RELEASE
STOP – VERY FAST STOP
(REDUCED POWER HOLD DC–SWITCHING)
BSG TYPE – INTEGRATED DC–SWITCHING
TERMINAL 3 & 4 – NOT JUMPERED (OPEN)



V_B = BRAKE VOLTAGE

= Braking Method

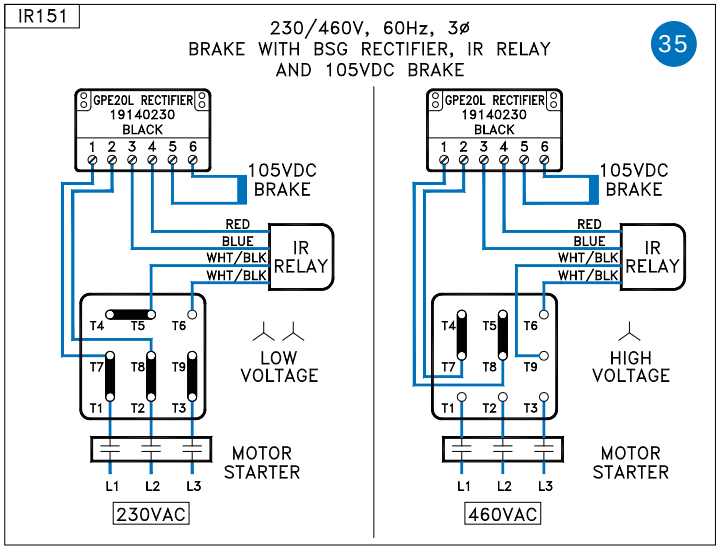
IR Relay Typical Connection Diagrams



GPE Rectifier for External DC-Switching with IR Relay

Method Operation

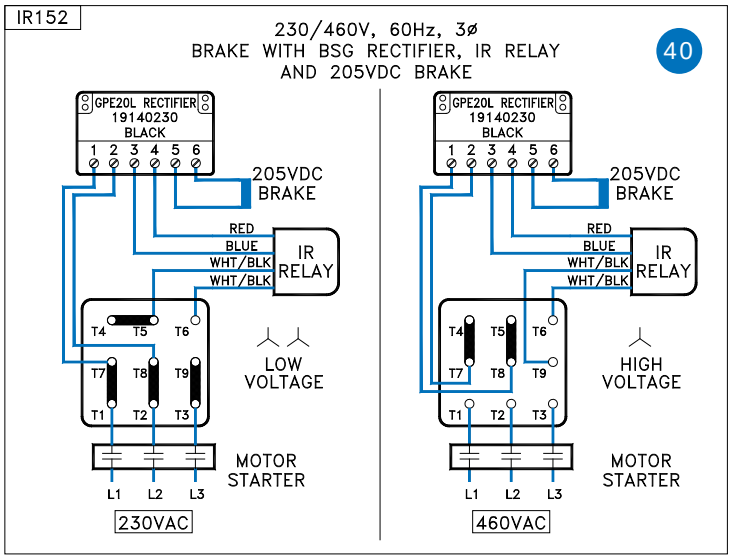
Start - Fast release (Overexcitation)
Stop - Fast stop (DC-Switching)
GPE type - External DC-Switching
Terminal 3 & 4 - Contact or IR-relay



= Braking Method

Method Operation

Start - Standard Release
Stop - Very Fast stop (Reduced power Hold)
GPE type - External DC-Switching
Terminal 3 & 4 - Contact or IR-relay



= Braking Method

Contact Information:

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- Global

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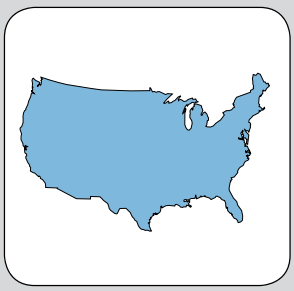

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92 Series Bevel Ordering Guide

	Gear Unit	Shaft/Mounting	Reducer Options		Motor/Input	Motor Options
SK	❶	❷	❸	-	❹	
					see page 23	see page 126

❶

Gear Unit
92072
92172
92372
92672
92772

❷

Shaft/Mounting	
- Solid Shaft/Foot Mount	**AX** - Hollow Shaft/Foot Mount
VF - Solid Shaft/B5 Flange	**AF** - Hollow Shaft/B5 Flange
VZ - Solid Shaft/B14 Flange	**AZ** - Hollow Shaft/B14 Flange
VFL - Double Solid Shaft /B5 Flange	**AFSH** - Hollow Shaft/B5 Flange/Shrink Disc
LX - Double Solid Shaft/Foot	**AZSH** - Hollow Shaft/B14 Flange/Shrink Disc
LXZ - Double Solid Shaft/Foot/ B14 Flange	

❸

Reducer Options		
❒ **B** - Fixing Element Kit 19	❒ **PR** - Flange Pilot Removal 17	❒ **VI** - Flouro-rubber Seals 20
❒ **H** - Hollow Shaft Cover 18	❒ **SM5** - Stainless Steel Shaft 19	❒ **OSG** - Oil Sight Glass 20
❒ **D** - Torque Arm 19	❒ **SWA**-SpecialHollow Shaft 19	❒ **MDP** - Magnetic Drain Plug 21
❒ **LL** - Long Term Storage 21	❒ **SS** - Special Shrink Disc 19	❒ **ADP** - Additional Drain Plug 21

❹

Input Shaft	NEMA Adapter	IEC Adapter	Integral Motors	Integral Energy Efficent Motors
W	**N56C**	**IEC 63**	**63S/4** - 0.16hp	**80LH/4** - 1hp
	N140TC	**IEC 71**	**63L/4** - 0.25hp	**90SH/4** - 1.5hp
	N180TC	**IEC 80**	**71S/4** - 0.33hp	**90LH/4** - 2hp
	N210TC	**IEC 90**	**71L/4** - 0.50hp	**100LH/4** - 3hp
	N250TC	**IEC 100**	**80S/4** - 0.75hp	**112MH/4** - 5hp
		IEC 112	**80L/4** - 1hp	**132SH/4** - 7.5hp
		IEC 132	**90S/4** - 1.5hp	**132MH/4** - 10hp
		IEC160	**90L/4** - 2hp	
			100L/4 - 3hp	
			100LA/4 - 5hp	
			112M/4 - 5.4hp	
			132S/4 - 7.5hp	
			132M/4 - 10hp	
			Other Speeds Available	Other Speeds Available

Product Specifications

Ratio

_____ :1

see pages 58 - 71

— OR —

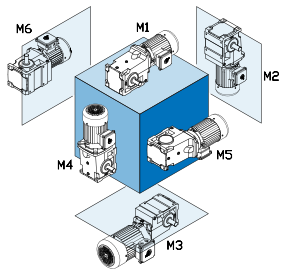
Output Speed

_____ rpm

see pages 58 - 71

Mounting Position

- ❍ M1
- ❍ M2
- ❍ M3
- ❍ M4
- ❍ M5
- ❍ M6
- ❍ Special _____



Paint

- ❍ Standard Stainless Steel Paint
- ❍ NSD+ (gray)
- ❍ NSD+W (white)
- ❍ NSD-X3 (gray)
- ❍ NSD-X3W (white)
- ❍ Casting Primed
- ❍ Special _____

Lubricant

- ❍ Standard
- ❍ Synthetic
- ❍ Food Grade
- ❍ Other _____

Solid Shaft Side (if required)

- ❍ Shaft Side A
- ❍ Shaft Side B
- ❍ Shaft Side A&B

see page 15

Hollow Shaft Diameter (if required)

see pages 113 - 114

B5 Flange Side (if required)

- ❍ Flange Side A
- ❍ Flange Side B
- ❍ Flange Side A&B

see page 15

B5 Flange Diameter (if required)

Torque Arm Side & Location (if required)

- ❍ Side A
- ❍ Side B

Location

see page 15

Shrink Disc Side (if required)

- ❍ Side A
- ❍ Side B

see page 15

H66 Side (if required)

- ❍ H66 Side A
- ❍ H66 Side B

see page 15

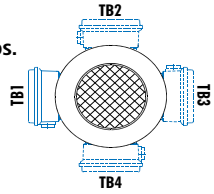
Gearmotor Only Details

Voltage & Frequency

- ❍ 230/460V-60Hz (460V only ≥ 40 hp)
- ❍ 575V-60Hz
- ❍ 208V-60Hz
- ❍ 400V-50Hz
- ❍ 115/230V-60Hz, 1 ph.
- ❍ Other _____

Terminal Box Pos.

- ❍ TB1
- ❍ TB2
- ❍ TB3
- ❍ TB4

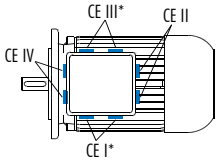


Mtg. Pos. M1 Shown

Conduit Entry Loc.

- ❍ CE I *
- ❍ CE II
- ❍ CE III *
- ❍ CE IV

* Brakemotor



Mtg. Pos. M1 Shown

CONTACTS

Motor Order Form

	Frame	Size	Poles	Motor Options	Brake Size	Brake Options
SK						

Frame	Size	Poles
63	S	4
71	SH	2
80	M	6
90	MH	4-2
100	MX	8-2
112	L	8-4
132	LA	12-2
	LH	Other
	LX	

Paint

- ❍ Unpainted Aluminum Alloy
- ❍ Stainless Steel Paint
- ❍ NSD+ (gray)
- ❍ NSD+W (white)
- ❍ NSD-X3 (gray)
- ❍ NSD-X3W (white)
- ❍ Special _____

Electrical Motor Options

- ❒ **H** - Energy Efficient Motor
- ❒ **TW** - Thermostat
- ❒ **TF** - Thermistor
- ❒ **SH** - Space Heater (select voltage)
  - ❍ 110 Volt ❍ 230 Volt ❍ 460 Volt
- ❒ **ISO** H - Class H insulation
- ❒ **WU** - High Resistance Rotor
- ❒ **4-2** - 2-Speed, 4/2 Pole, 1800/3600rpm
- ❒ **8-2** - 2-Speed, 8/2 Pole, 900/3600rpm
- ❒ **ECR** - Single Phase Motor

Environmental Options

- ❒ **NSD+** - Nord Severe Duty Paint
- ❒ **NSDx3** - Nord Extreme Duty Paint
- ❒ **RD** - Canopy Drip Cover
- ❒ **RDD** - Double Fan Cover
- ❒ **KB** - Condensation Drain Holes (plugged)
- ❒ **KBO** - Condensation Drain Holes (open)
- ❒ **IP66** - IP66 Enclosure Protection
- ❒ **KKV** - Terminal Box Sealed with Resin
- ❒ **AICM** - Additional Insulation
- ❒ **EP** - Epoxy Dipped Windings

Frequency Inverter Related Options

- ❒ **F** - Blower Fan (200-575V 1 & 3 Phase)
- ❒ **FC** - Blower Cooling Fan (115V, 1 Phase)
- ❒ **IG__** - Incremental Encoder
- ❒ **IG__P** - Incremental Encoder with Plug
- ❒ **AG** - Absolute Encoder

Additional Motor Options

- ❒ **OL** - Totally Enclosed Non-Ventilated (TENV)
- ❒ **OL/H** - (TENV) Without Fan Cover
- ❒ **WE** - Second Shaft Extension (Fan Side)
- ❒ **HR** - Hand Wheel
- ❒ **Z** - High Inertia Cast Iron Fan
- ❒ **RLS** - Motor Backstop (rotation viewing fan)
  - ❍ Clockwise ❍ Counter-Clockwise
- ❒ **EKK** - Small Terminal Box (not UL approved)
- ❒ **MS** - Quick Power Plug Connector

Brake Size
BRE 5
BRE 10
BRE 20
BRE 40
BRE 60
BRE 100
BRE 150

- ❒ **HL** - Hand Release Lever
- ❒ **FHL** - Locking Hand Release Lever
- ❒ **HLH** - Hand Release Lever with Hole
- ❒ **RG** - Corrosion Protected Brake
- ❒ **SR** - Dust and Corrosion Protected Brake
- ❒ **ADJ_____Nm** - Adjust Brake Torque
- ❒ **BIP66** - IP66 Brake Enclosure
- ❒ **MIK** - Micro-switch
- ❒ **BSH** - Brake Heating/Bifilar Coil
- ❒ **NRB1** - Quiet Brake Release
- ❒ **NRB2** - Quiet Brake Motor Operation
- ❒ **FBR** - Brass Foil
- ❒ **DBR** - Double Brake
- ❒ **G...P** - High Performance Rectifier
- ❒ **G...V** - Sealed Rectifier
- ❒ **IR** - Current Sensing Relay

Rectifier Selection

Rectifier Wiring

- ❍ Across the line (from motor terminal box)
- ❍ Separate power source (frequency inverter, soft starter)

Brake Supply Voltage

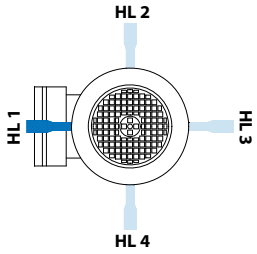
- ❍ 24 VDC
- ❍ 115 VAC
- ❍ 200 VAC
- ❍ 230 VAC
- ❍ 400 VAC
- ❍ 460 VAC
- ❍ 500 VAC
- ❍ 575 VAC
- ❍ Other _____

Braking Method

- ❍ Method 10
- ❍ Method 15
- ❍ Method 20
- ❍ Method 25
- ❍ Method 30
- ❍ Method 35
- ❍ Method 40
- ❍ Method 45
- ❍ Method 50
- ❍ Method 55

Hand Release Position

- ❍ HL1
- ❍ HL2
- ❍ HL3
- ❍ HL4



Mounting

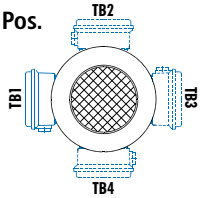
- ❍ Integral to gearbox
- ❍ NEMA C-Face
- ❍ IEC B5 Mount

Voltage & Frequency

- ❍ 230/460V-60Hz
- ❍ 575V-60Hz
- ❍ 208V-60Hz
- ❍ 400V-50Hz
- ❍ 115/230V, 60Hz-1-ph.
- ❍ Other

Terminal Box Pos.

- ❍ TB1
- ❍ TB2
- ❍ TB3
- ❍ TB4

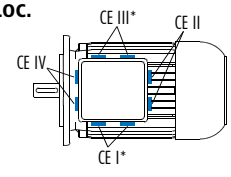


Mtg. Pos. M1 Shown

Conduit Entry Loc.

- ❍ CE I *
- ❍ CE II
- ❍ CE III *
- ❍ CE IV

* Brakemotor



Mtg. Pos. M1 Shown

CONTACTS

NORD GEAR CORPORATION

Conditions of Sale

1. CONTRACT

Any contract between Nord Gear Corporation, hereinafter designated as Seller, and the Buyer is subject to the terms and conditions of sale hereinafter set forth. Any deviation from such terms and conditions must be specifically set forth in writing and consented to by Seller. Accordingly, the Buyer and Seller acknowledge and agree that the terms and conditions set forth below and on the face hereof shall govern Buyer's purchase of the goods described on the face hereof and shall take precedence over and represents the final agreement between Buyer and Seller, notwithstanding any inconsistent, contradictory or other prior or further conditions contained in any oral or written request or purchase order issued by Buyer or any other document furnished by Buyer in connection with its purchase of the Goods, regardless of whether such document or documents are exchanged simultaneously with this Invoice or prior or subsequent thereto. Any additional or different terms or conditions which may appear in any communicaiton, oral or written, from Seller, its officers, employees, agents or representatives, are hereby expressly rejected and shall not be effective or binding upon the Seller, unless specifically hereafter agreed to in writing by Seller and no such additional or different terms or conditions in any document submitted to Seller by Buyer shall become part of the contract between Buyer and Seller, unless such written acceptance by Seller specifically recognizes and assents to their inclusion. Any objection by Buyer to the terms and conditions hereof shall be ineffective unless Seller is advised in writing thereof within two (2) days of the date of this Invoice.

2. CONFIRMATION

An order shall be deemed accepted only when duly confirmed by Seller, at Nord Gear Corporation's home office in Waunakee, Wisconsin, and upon such confirmation the order shall become a contract binding upon the parties hereto, their successors and assigns.

3. PRICES

Prices shown are list prices and may be subject to applicable discounts. Unless otherwise agreed upon in writing, prices are FOB factory Waunakee, Wisconsin. Prices and discounts are subject to change without notice until order is accepted. Seller's prices do not include cost of any inspection permits required.

4. LIMITED WARRANTY

Seller warrants the goods sold hereunder to be free from defects in material and workmanship under normal use and service not arising from misuse, negligence, or accident, including but not limited to the use, installation, and transportation of the goods by the Buyer, its agents, servants, employees, or by carriers. Such obligations under this warranty are limited to remedying any deficiencies in the goods at Waunakee, Wisconsin, or at such place or places in the United States of America as may be designated by Seller. THIS WARRANTY SHALL PERTAIN TO ANY PART OR PARTS OF ANY GOODS TO WHICH BUYER OR ITS ASSIGNS HAS GIVEN WRITTEN NOTICE OF CLAIMED DEFECTS TO SELLER. NORD GEAR CORP. WARRANTS ITS PRODUCTS AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF 12 MONTHS FROM DATE OF INSTALLATION OR 18 MONTHS FROM DATE OF SHIPMENT WHICHEVER COMES FIRST ON ALL COMPONENTS. 36 MONTHS FROM DATE OF INVOICE OR 24 MONTHS FROM DATE OF INSTALLATION WHICHEVER COMES FIRST ON GEARS AND HOUSINGS ONLY. PARTS WHICH ARE SUBJECT TO OPERATIONAL WEAR AND TEAR, SUCH AS BELTS & TRACTION DISCS, ARE NOT COVERED BY THE LIMITED WARRANTY. Buyer shall be required to furnish Seller with details of such defects and this warranty shall be effective as to such goods which Seller's examination shall disclose to its satisfaction to have been defective and which at Seller's option shall promptly thereafter be returned to Seller or its nominees. THE LIMITED WARRANTY SET FORTH HEREIN IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. EXCEPT FOR THE EXPRESS WARRANTIES SET FORTH HEREIN, SELLER HAS MADE AND MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, AS TO THE GOODS SOLD HEREUNDER, INCLUDING, BUT NOT LIMITED TO, THEIR MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. ANY DESCRIPTION OR MODEL OF THE GOODS IS FOR IDENTIFICATION OR ILLUSTRATIVE PURPOSES ONLY AND SHALL NOT BE DEEMED TO CREATE ANY WARRANTY, EXPRESS OR IMPLIED. SELLER MAKES NO REPRESENTATIONS AS TO THE CAPACITY OR PERFORMANCE OF THE GOODS SOLD HEREUNDER, EXCEPT AS SET FORTH IN THE INVOICE'S SPECIFICATIONS OR OTHER VALID AGREEMENT OR CONDITION AGREED TO BETWEEN THE PARTIES, AND ANY SUCH REPRESENTATIONS ARE EXPRESSLY CONDITIONED UPON THE CORRECTNESS OF THE DATA AND INFORMATION FURNISHED BY THE BUYER AND UPON THE GOODS BEING PROPERLY INSTALLED AND MAINTAINED. THE REMEDIES OF THE BUYER PROVIDED HEREUNDER ARE EXCLUSIVE. In no event shall the Seller be liable to the Buyer or to any other person for any loss or damage, direct or indirect, arising out of or caused by the use or operation of the goods, or for the loss of profits, business, or good will, or for any incidental, special or consequential damages. Seller shall in no event be liable to any person or firm (including any assignee or Buyer) except Buyer and its successors. Unless specifically authorized by Seller in writing, Seller shall not become responsible for any repair work done by Buyer or any other party on any goods sold. Any and all costs of the return to the Seller of such goods and all related costs to remove and re-install such goods, shall be borne by Buyer. Goods sold but not manufactured by the Seller are being warranted as to defects in material and workmanship consistent with the limited warranty policy of the original manufacturer of the goods and if there is not such a limited warranty policy, the warranty shall be limited to the provision of the preceding paragraph of Article 4 herein. Standards for the operating characteristics of the gearboxes and the gearmotors are in conformity with Seller's tests.

5. SHORTAGE AND NONCONFORMITY

Any claim of shortage or that the goods do not conform with the specifications of the order or model must be made in writing within ten (10) days after delivery of the goods (as to which such claim is made) to Buyer or its nominees, but in no event shall the claim be later than within the time limit provided by the carrier or insurance company, otherwise such claim shall be deemed waived. Buyer may not return any goods claimed to be in non-conformity without Seller's prior written authorization. Goods returned without permission will not be accepted, including for credit, and will be returned to Buyer, F.O.B. Sellter's plant. Any claim based on the receipt of damaged Goods must be filed with the carrier which delivered the goods. The samples, measurements, dimensions and weights contained in the Seller's catalogs, sales manuals, photographs and drawings constitute only an approximate guide. The Seller reserves the right to make any change which the Seller, in its absolute discretion, considers necessary. While the goods will be delivered principally according to specifications or standards or quantities agreed upon, insignificant deviations or insignificant changes in construction are permissible. The same applies to partial deliveries, In the event that Buyer has a verified claim of shortage or nonconformity of the goods to the specifications of the order or the model, and if such claim has been submitted within the required time limit as set forth above, the Seller shall, at its own expense, make up for the shortage of the goods, or replace or repair the goods, as the case may be, but in no event shall Seller be or become liable to Buyer or to any other person or persons for any loss in damage, direct or indirect, arising out of or caused by such incidents or for the loss of profits, business or good will. The liability of the Seller to Buyer, if any hereunder, for breach of warranty, contract, negligence or otherwise, shall in no event exceed the amount of the purchase price of the goods sold with respect to which any damages are claimed. Shipping dates are estimates unless parties expressly agree on time of the essence.

6. FORCE MAJEURE

The obligation of the Seller shall be modified or excused, as the case may be, for reasons of Acts of God, war, governmental law regulations, strikes or lock-outs, fire, breakdown of machinery, whether in its own business enterprise, or if for any other cause beyond Seller's control, the goods cannot be delivered or their delivery becomes delayed in whole or in part. In the above instances time for delivery shall be extended for the period of the delay caused, with the proviso, however, that either party may cancel in writing the undelivered portion of the order or contract if the delay exceeds six (6) months from the delivery date originally confirmed by Seller. In no event shall Seller become liable in the aforesaid instances to Buyer or any third party for consequential damages or business loss.

7. SHIPMENT AS UNIT

Each shipment by Seller shall be treated as a separate and distinct unit with respect, but only with respect to forwarding, terms of payment, and the making of claims by the Buyer: provided, however, that if the Buyer defaults in the payment of any obligation to Seller or any installments thereof, under any agreement between Buyer and Seller, or if Buyer refuses to accept any goods when tendered for delivery, the Seller may, on fifteen (15) days written notice to the Buyer, without prejudice to Seller's other lawful remedies, either defer further performance until the defaulted payments are made in full, or make future deliveries for cash in advance only, or treat the entire contract or contracts with Buyer as breached by the Buyer and pursue its remedies for breach.

8. BUYER'S REFUSAL OF DELIVERY

If Buyer refuses to accept delivery of any goods tendered for delivery, then Seller, without prejudice to Seller's other lawful remedies, may either store or cause such goods to be stored in a warehouse, for buyer's account and at Buyer's cost, risk and expense, or sell such goods (without notice) to any purchases at public or private sale, and hold the Buyer liable for any difference between (a) the contract price of the goods, and (b) the price at which goods are resold less the costs and expense of such resale including brokerage commissions, or restocking charges.

9. GOODS IN TRANSIT

If prior to delivery or while the goods are in transit, Buyer or Seller becomes bankrupt or insolvent, or any petition in bankruptcy or for the reorganization or for a state court receivership is filed against Buyer or Seller, as the case may be, then the other party hereto may forthwith terminate this contract by giving written notice of such termination. Such termination shall not affect any claim for damages available to the Buyer, provided that if Buyer is then indebted to Seller, the amount of any such damage claim shall be abated to the extent that the indebtedness of Buyer to Seller, as actually paid in money, is abated by any order of judgement entered or any plan adopted in any bankruptcy, reorganization, receivership, or similar proceeding. Such termination shall not prejudice the Seller's rights to any amounts then due under the contract. If Buyer becomes bankrupt or insolvent or any petition in bankruptcy or for reorganizing or if a state court receivership is filed against Buyer, then, at its option Seller may take possession of any goods theretofore sold to Buyer, in connection with which the full purchase price has not been paid, analogous to the terms and provisions set forth in Paragraphs 11 and 12 hereinafter.

10. DELIVERY

(a) Any indicated dates of delivery are approximate only, but NORD Gear will attempt to meet them whenever possible. (b) NORD Gear will not be liable for any penalty clausess contained in any specifications or order submitted unless agreed to in writing by an authorized officer of NORD Gear Corporation. (c) Unless otherwise agreed, delivery of the goods to any carrier shall constitute delivery to the Buyer, and thereafter the risk of loss or damage to the goods shall be upon the Buyer. (d) If the Buyer does not give delivery instructions to the Seller at least (10) days prior to the delivery date ex factory confirmed by the Seller, the Seller may deliver the goods to a carrier of its own choosing, at Buyer's cost and risk, or, at Seller's option, may store the goods on the pier or any warehouse, at Buyer's cost and risk. Any purchase price in such event becomes due and payable within ten (10) days of such storage.

11. PAYMENT OF PURCHASE PRICE

Time of payment is of the essence under the contract. Unless otherwise provided, terms of payment are 30 days net from the date of invoice with a 1% discount if paid within 10 days of date of invoice. Upon default in any of the terms of the contract, or failure to comply with any of the conditions thereof, or upon seizure of the property under execution or other legal process, or if the Buyer becomes bankrupt or insolvent, or any petition for reorganization or for a state court receivership is filed against Buyer, or if the Buyer makes any assignment for the benefit of it's creditors or otherwise sells, encumbers or disposes of the goods, or if for any other reason the Seller should deem itself insecure, the full amount of the purchase price then remaining unpaid shall at once become due and payable at the option of the Seller.

12. BUYER'S DEFAULT

Upon the Buyer's default, the Seller may dispose of the merchandise in any manner that it deems fit and, if it desires to resell same, may do so at private or public sale, with or without notice, and with or without the property being at the place of sale, subject, however, to applicable laws. The Seller or its assigns shall have the right to bid at such sale and may become the purchaser of the property. The proceeds of the sale shall first be applied to the expenses incurred in retaking, repairing, storing and selling the goods, reasonable attorney's fees included, and then shall be applied to the payment of the balance due under the contract. Any surplus amount shall be paid to the Buyer. If a deficiency results after the resale, the Buyer agrees to pay such forthwith, together with reasonable attorney's fees, for the recovery of the goods incurred by the Seller. If upon the Buyer's default, the Seller elects not to resell any goods which it may repossess, then the cost of repossession, including reasonable attorney's fees, shall forthwith be due and payable from Buyer to Seller. Buyer agrees to pay all reasonable costs and reasonable attorneys' fees incurred by Seller in enforcing Seller's rights against Buyer, including Seller's right to payment of the purchase price of the goods and Buyer's payment of all other amounts owing to Seller required under this Invoice and Conditions of Sale.

13. SECURITY INTEREST AND TITLE

In states and localities which are governed by the Uniform Commercial Code, this contract shall serve as security agreement, reserving in Seller a security interest until full payment of purchase price. The provisions of the Uniform Commercial Code regarding security interest shall have preference and apply if inconsistent with other terms of the conditions of sale. In states and localities where the Uniform Commercial Code does not apply, title to the goods shall remain in the Seller or its assigns until full payment of the purchase price. Buyer agrees to execute forthwith any and all documents in such a way and form as Seller may need for filing or recording the security interest under the Uniform Commercial Code with the proper registers or offices, or for filing or recording the conditional sales contract.

14. SALES AND USE TAX

Buyer agrees to bear and pay any sales or use tax in connection with the purchase herein, and to hold the Seller harmless from payment. At the option the Seller, Buyer shall give evidence of payment or of exemption certificate.

15. INSURANCE

The Buyer shall keep the goods insured against damage by fire, water or other casualty as required by Seller, with a company acceptable to Seller, with loss payable to Seller for the total purchase price until the Seller is fully paid. Seller, if it so elects, may place said insurance at Buyer's expense; Seller may cancel such insurance at any time and without notice and may receive the return premium, if any.

16. MODIFICATION BY SELLER

Any contract may be assigned or transferred by the Seller, or the time for the making of any payment due by Buyer may be extended by Seller without derogation of any of the rights of the Seller or its assigns. Waiver by any party of any default shall not be deemed a waiver of any subsequent default.

17. RETURNED GOODS

No goods will be accepted for return unless authorized in writing by Seller. In all cases, transportation and restocking charges will be borne by Buyer.

18. PACKING

The Buyer will be charged for export packaging or other special packing desired. Cost for cartage to ship or transfer express will be added to the invoice. No credit will be allowed if no packing is required.

19. CHANGES/CANCELLATION

NORD Gear will not accept changes in specifications to a confirmed order unless such changes are requested in writing and confirmed back in writing. In addition, the purchaser must to agree to any additional charges that may arise from the change. Placing orders on hold or cancellation of orders require Seller's written approval, and are subject to cancellation and/or restocking charges.

20. BUYER'S RESPONSIBILITY AS TO MAINTENANCE

Buyer shall use and shall require its employees and agents to use all safety devices and guards and shall maintain the same in proper working order. Buyer shall use and require its employees and agents to use safe operation procedures in operating the equipment and shall further obey and have its employees and agents obey safety instructions given by Seller. If Buyer fails to meet the obligations herein, Buyer agrees to defend, indemnify and save Seller harmless from any liability or obligation with regard to any personal injuries or property damages directly or indirectly connected with the operation of the equipment. Buyer further agrees to notify Seller promptly and in any event not later than ten (10) days after notice or knowledge of any accident or malfunction involving Seller's equipment which has caused personal injury or property damages and to cooperate fully with Seller in investigating and determining the causes of such accident and malfunction. In the event that Buyer fails to give such notice to Seller or to cooperate with Seller, Buyer shall be obligated to defend, indemnify and save Seller harmless from any such claims arising from such accident.

21. MISCELLANEOUS PROVISIONS

(a) If for any reason a provision of a contract is legally invalid, then in such event the rest of the contract shall remain in full force and affect, except that the parties shall try to replace such invalid provision closest to their original mutual intentions. (b) This Invoice and these Conditions of Sale constitute the entire agreement between the parties regarding the subject matter hereof and supercedes all prior agreements, understandings and statements, whether oral or written, regarding such subject matter. No modification to, change in or departure from, the provisions of this Invoice and Conditions of Sale shall be valid or binding on Seller, unless approved in writing by Seller. No course of dealing or usage of trade shall be applicable unless expressly incorporated into this Invoice and Conditions of Sale. Any amendments to any contract or contracts between the parties shall be valid only upon the written consent of both parties.

22. NON ASSIGNMENT BY BUYER

Contract or contracts may not be assigned by the Buyer without prior written consent of the Seller.

23. APPLICABLE LAW AND VENUE

All contracts and their interpretation are governed by the applicable, substantive laws of the State of Wisconsin. Any litigation brought by the Buyer regarding this Invoice or goods purchased hereunder may only be brought in the Circuit Court for Dane County, Wisconsin.

NORD GEAR LIMITED

Terms and Conditions of Sale

1. CONTRACT

Any contract between Nord Gear Limited, hereinafter designated as Seller, and the Buyer is subject to the terms and conditions of sale hereinafter set forth. Any deviation from such terms and conditions must be specifically set forth in writing and consented to by Seller.

2. CONFIRMATION

An order shall be deemed accepted only when duly confirmed by Seller, at Nord Gear Limited's home office in Brampton, Ontario, and upon such confirmation the order shall become a contract binding upon the parties hereto, their successors and assigns.

3. PRICES

Prices shown are list prices and may be subject to applicable discounts. Unless otherwise agreed upon in writing, prices are FOB factory Bramton, Ontario. Prices and discounts are subject to change without notice until order is accepted. Seller's prices do not include cost of any inspection permits required.

4. LIMITED WARRANTY

Seller warrants the goods sold hereunder to be free from defects in material and workmanship under normal use and service not arising from misuse, negligence, or accident, including but not limited to the use, installation, and transportation of the goods by the Buyer, its agents, servants, employees, or by carriers. Such obligations under this warranty are limited to remedying any deficiencies in the goods at Brampton, Ontario, or at such place or places in Canada as may be designated by Seller. This warranty shall pertain to any part or parts of any goods to which Buyer or its assigns has, within one year from date of original factory invoice, given written notice of claimed defects to Seller. Buyer shall be required to furnish Seller with details of such defects and this warranty shall be effective as to such goods which Seller's examination shall disclose to its satisfaction to have been defective and which at Seller's option shall promptly thereafter be returned to Seller or its nominees. EXCEPT FOR THE EXPRESS WARRANTIES SET FORTH ABOVE, SELLER HAS MADE NO WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, AS TO THE GOODS SOLD HEREUNDER, INCLUDING, BUT NOT LIMITED TO THEIR MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. ANY DESCRIPTION OR MODEL OF THE GOODS IS FOR IDENTIFICATION OR ILLUSTRATIVE PURPOSES ONLY AND SHALL NOT BE DEEMED TO CREATE AN EXPRESS WARRANTY. THE REMEDIES OF THE BUYER SET FORTH IN THIS SECTION ARE EXCLUSIVE. In no event shall the Seller be liable to the Buyer or to any other person for any loss or damage, direct or indirect, arising out of or caused by the use or operation of the goods, or for the loss of profits, business, or good will, or for any incidental, special or consequential damages. Seller shall in no event be liable to any person or firm (including any assignee or Buyer) except Buyer and its successors. Unless specifically authorized by Seller in writing, Seller shall not become responsible for any repair work done by Buyer or any other party on any goods sold. Any costs of the return of such goods to Seller shall be borne by Buyer. Goods sold but not manufactured by the Seller are being warranted as to defects in material and workmanship consistent with the limited warranty policy of the original manufacturer of the goods and if there is not such a limited warranty policy, the warranty shall be limited to the provisions of the preceding paragraph of Article 4 herein. Standards for the operating characteristics of the gearboxes and the gearmotors are in conformity with Seller's test. THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE THE SELLER DOES NOT ASSUME, NOR DOES IT AUTHORIZE ANY PERSON TO ASSUME, ON ITS BEHALF, ANY OTHER OBLIGATION OR LIABILITY.

5. SHORTAGE AND NONCONFORMITY

Any claim of shortage or that the goods do not conform with the specifications of the order or model must be made in writing within ten (10) days after delivery of the goods (as to which such claim is made) to Buyer or its nominees, but in no event shall the claim be later than within the time limit provided by the carrier or insurance company, otherwise such claim shall be deemed waived. The samples, measurements, dimensions and weights contained in the Seller's catalogs, sales manuals, photographs and drawings constitute only an approximate guide. The Seller reserves the right to make any changes which the Seller, in its absolute discretion, considers necessary. While the goods will be delivered principally according to specifications or standards or quantities agreed upon, insignificant deviations or insignificant changes in construction are permissible. The same applies to partial deliveries. In the event that Buyer has a verified claim of shortage or noncomformity of the goods to the specifications of the order or the model, and if such claim has been submitted within the required time limit as set forth above, the Seller shall, at its own expense, make up for the shortage of the goods, or replace or repair the goods, as the case may be, but in no event shall Seller be or become liable to Buyer or to any other person or persons for any loss in damage, direct or indirect, arising out of or caused by such incidents or for the loss of profits, business or good will. Shipping dates are estimates unless parties expressly agree on time of the essence.

6. FORCE MAJEURE

The obligation of the Seller shall be modified or excused, as the case may be, for reasons of Acts of God, war, governmental law regulations, strikes or lock-outs, fire, breakdown of machinery, whether in its own business enterprise, or if for any other cause beyond Seller's control, the goods cannot be delivered or their delivery becomes delayed in whole or in part. In the above instances time for delivery shall be extended for the period of the delay caused, with the proviso, however, that either party may cancel in writing the undelivered portion of the order or contract if the delay exceeds six (6) months from the delivery date originally confirmed by Seller. In no event shall Seller become liable in the aforesaid instances to Buyer or any third party for consequential damages or business loss.

7. SHIPMENT AS UNIT

Each shipment by Seller shall be treated as a separate and distinct unit with respect, but only with respect to forwarding, terms of payment, and the making of claims by the Buyer; provided, however, that if the Buyer defaults in the payment of any obligation to Seller or any installments thereof, under any agreement between Buyer and Seller, or if Buyer refuses to accept any goods when tendered for delivery, the Seller may, on fifteen (15) days' written notice to the Buyer, without prejudice to Seller's other lawful remedies, either defer further performance until the defaulted payments are made in full, or make future deliveries for cash in advance only, or treat the entire contract or contracts with Buyer as breached by the Buyer and pursue its remedies for breach.

8. BUYER'S REFUSAL OF DELIVERY

If Buyer refuses to accept delivery of any goods tendered for delivery, then Seller, without prejudice to Seller's other lawful remedies, may either store or cause such goods to be stored in a warehouse, for Buyer's account and at Buyer's cost, risk and expense, or sell such goods (without notice) to any purchaser at public or private sale, and hold Buyer liable for any difference between (a) the contract price of the goods, and (b) the price at which goods are resold less the costs and expense of such resale including brokerage commissions, or restocking charges.

9. GOODS IN TRANSIT

If prior to delivery or while the goods are in transit, Buyer or Seller becomes bankrupt or insolvent, or any petition in bankruptcy or for the reorganization or for appointment of a receiver is filed against Buyer or Seller, as the case may be, then the other party hereto may forthwith terminate this contract by giving written notice of such termination. Such termination shall not affect any claim for damages available to the Buyer, provided that if Buyer is then indebted to Seller, the amount of any such damage claim shall be abated to the extent that the indebtedness of Buyer to Seller, as actually paid in money, is abated by any order or judgment entered or any plan adopted in any bankruptcy, reorganization, receivership, or similar proceeding. Such termination shall not prejudice the Seller's rights to any amounts then due under the contract. If Buyer becomes bankrupt or insolvent or any petition in bankruptcy or for reorganization or if a state court receivership is filed against Buyer, then, at its option, Seller may take possession of any goods theretofore sold to Buyer, in connection with which the full purchase price has not been paid, analogous to the terms and provisions set forth in Paragraphs 11 and 12 hereinafter.

10. DELIVERY

(a) Unless otherwise agreed, delivery of the goods to any carrier shall constitute delivery to the Buyer, and thereafter the risk of loss or damage to the goods shall be upon the Buyer. (b) If the Buyer does not give delivery instructions to the Seller at least (10) days prior to the delivery date *ex factory* confirmed by the Seller, the Seller may deliver the goods to a carrier of its own choosing, at Buyer's cost and risk, or, at Seller's option, may store the goods on the pier or on any warehouse, at Buyer's cost and risk. Any purchase price in such event becomes due and payable within ten (10) days of such storage.

11. PAYMENT OF PURCHASE PRICE

Time of payment is of the essence under the contract. Upon default in any of the terms of the contract, or failure to comply with any of the conditions thereof, or upon seizure of the property under execution or other legal process, or if the Buyer becomes bankrupt or insolvent, or any petition for reorganization or for appointment of a receiver is filed against Buyer, or if the Buyer makes any assignment for the benefit of its creditors or otherwise sells, encumbers or disposes of the goods, or if for any other reason the Seller should deem itself insecure, the full amount of the purchase price then remaining unpaid shall at once become due and payable at the option of the Seller.

12. BUYER'S DEFAULT

Upon the Buyer's default, the Seller may dispose of the merchandise in any manner that it deems fit and, if it desires to resell same, may do so at private or public sale, with or without notice, and with or without the property being at the place of sale, subject, however, to applicable laws. The Seller or its assigns shall have the right to bid at such sale and may become the purchaser of the property. The proceeds of the sale shall first be applied to the expenses incurred in retaking, repairing, storing and selling the goods, reasonable solicitor's fees included, and then shall be applied to the payment of the balance due under the contract. Any surplus amount shall be paid to the Buyer. If a deficiency results after the resale, the Buyer agrees to pay such forthwith, together with reasonable solicitor's fees, for the recovery of the goods incurred by the Seller. If upon the Buyer's default, the Seller elects not to resell any goods which it may repossess, then the cost of repossession, including reasonable solicitor's fees, shall forthwith be due and payable from Buyer to Seller.

13. SECURITY INTEREST AND TITLE

In provinces which are governed by a Personal Property Security Act, this contract shall serve as Security Agreement, reserving in Seller a security interest until full payment of purchase price. The provisions of the Personal Property Security Act regarding security interest shall have preference and apply if inconsistent with other terms of the conditions of sale herein. In provinces where a Personal Property Security Act does not apply, title to the goods shall remain in the Seller or its assigns until full payment of the purchase price. Buyer agrees to execute forthwith any and all documents in such a way and form as Seller may need for filing or recording the security interest under a Personal Property Security Act with the proper registers or offices, or for filing or recording the Conditional Sales Contract herein.

14. SALES AND USE TAX

The Seller's prices do not include sales, use, excise or other taxes payable to any governmental authority in respect of the sale of Seller's goods. The Buyer shall pay, in addition to the Seller's price the amount of any such taxes or shall reimburse the Seller for the amount thereof that the Seller may be required to pay. At the option of the Seller, Buyer shall give evidence of payment or of exemption certificate.

15. INSURANCE

The Buyer shall keep the goods insured against damage by fire, water or other casualty as required by Seller, with a company acceptable to Seller, with loss payable to Seller for the total purchase price until the Seller is fully paid. Seller, if it so elects, may place said insurance at Buyer's expense; Seller may cancel such insurance at any time and without notice and may receive the return premium, if any.

16. MODIFICATION BY SELLER

Any contract may be assigned or transferred by the Seller, or the time for the making of any payment due by Buyer may be extended by Seller without derogation of any of the rights of the Seller or its assigns. Waiver by any party of any default shall not be deemed a waiver of any subsequent default.

17. RETURNED GOODS

No goods will be accepted for return unless authorized in writing by Seller. In all cases, transportation and restocking charges will be borne by Buyer.

18. PACKING

The Seller does not charge for standard packaging for domestic shipment. The Buyer will be charged, however, for export packaging or other special packing desired. Cost for cartage to ship or transfer express will be added to the invoice. No credit will be allowed if no packing is required.

19. EXPORT ORDER

Export orders are to be accompanied by a confirmed irrevocable Letter of Credit in Seller's favor, in Canadian currency, with an accredited Canadian bank, subject to Seller's draft, with shipping documents attached.

20. CANCELLATION

Placing orders on hold or cancellation of orders require Seller's written approval, and are subject to cancellation and/or restocking charges.

21. BUYER'S RESPONSIBILITY AS TO MAINTENANCE

Buyer shall use and shall require its employees and agents to use all safety devices and guards and shall maintain the same in proper working order. Buyer shall use and require its employees and agents to use safe operating procedures in operating the equipment and shall further obey and have its employees and agents obey safety instructions given by Seller. If Buyer fails to meet the obligations herein, Buyer agrees to indemnify and save Seller harmless from any liability or obligation with regard to any personal injuries or property damages directly or indirectly connected with the operation of the equipment. Buyer further agrees to notify Seller promptly and in any event not later than ten (10) days after notice or knowledge of any accident or malfunction involving Seller's equipment which has caused personal injury or property damages and to cooperate fully with Seller in investigating and determining the causes of such accident and malfunction. In the event that Buyer fails to give such notice to Seller or to cooperate with Seller, Buyer shall be obligated to indemnify and save Seller harmless from any such claims arising from such accident.

22. MISCELLANEOUS PROVISIONS

(a) If for any reason a provision of a contract is legally invalid, then in such event the rest of the contract shall remain in full force and affect, except that the parties shall try to replace such invalid provision with a provision closest to their original mutual intentions. (b) Any amendments to any contract or contracts require the consent in writing by both parties.

23. NON ASSIGNMENT BY BUYER

Contract or contracts may not be assigned by the Buyer without prior written consent of the Seller.

24. APPLICABLE LAW

All contracts are governed by the applicable laws of Ontario.

25. This instrument sets forth the entire understanding and agreement of the parties hereto in respect of the subject matter hereof, and all prior undertakings between the parties hereto, together with all representations and obligations of such parties in respect of such subject matter, shall be superceded by and merged into this instrument.

26. The provisions of this agreement shall bind and enure to the benefit of the parties hereto and their respective heirs, executors, administrators, successors and (subject to any restrictions or assignment herein above set forth) assigns, as the case may be.

27. The parties acknowledge that they have requested this Contract and all notices or other documents relating thereto be drafted in the English language.

Les parties reconnaisent qu'ils ont requis que ce contrat et tous les avis ou autres documents qui s'y rapportent soient rediges en langue anglaise.

"Terms and Conditions in French available upon request."

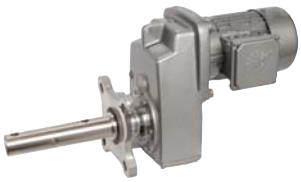
Product Overview

UNICASE™ SPEED REDUCERS

HELICAL IN-LINE
- Foot or Flange Mount
- Torque up to 205,000 lb-in
- Gear ratios – 1.82:1 to over 300,000:1

NORDBLOC®.1 HELICAL IN-LINE
- Foot or Flange Mount
- Torque up to 26,550 lb-in
- Gear ratios – 1.88:1 to over 370:1

PARALLEL HELICAL CLINCHER™
- Shaft, Flange or Foot Mount
- Torque up to 797,000 lb-in
- Gear ratios – 4.26:1 to over 300,000:1



SCP SCREW CONVEYOR PACKAGE
- Shaft, or Flange Mount
- Torque up to 53,100 lb-in
- Gear ratios – 4.32:1 to over 1500:1

RIGHT ANGLE HELICAL-BEVEL 2-STAGE
- Foot, Flange or Shaft Mount
- Torque up to 5,840 lb-in
- Gear ratios – 4.1:1 to 72:1

RIGHT ANGLE HELICAL-BEVEL
- Foot, Flange or Shaft Mount
- Torque up to 283,000 lb-in
- Gear ratios – 8.04:1 to over 300,000:1

RIGHT ANGLE HELICAL-WORM
- Foot, Flange or Shaft Mount
- Torque up to 27,585 lb-in
- Gear ratios – 4.40:1 to over 300,000:1

HIGH PERFORMANCE MOTORS & BRAKEMOTORS

INVERTER/VECTOR DUTY
- Standard or Energy Efficient
- Integral, NEMA or Metric IEC
- 1/6 to 250 hp

UNICASE™ SPEED REDUCERS

MINICASE™ RIGHT ANGLE WORM
- Foot, Flange or Shaft Mount
- Torque up to 3,540 lb-in
- Gear ratios – 5:1 to 500:1

FLEXBLOC™ WORM
- Modular bolt-on options
- Torque up to 4,683 lb-in
- Gear ratios – 5:1 to 3,000:1

MAXXDRIVE™ LARGE INDUSTRIAL GEAR UNITS PARALLEL HELICAL
- Modular bolt-on options
- Torque up to 2,027,000 lb-in
- Gear ratios – 5:1 to 1,600:1

MAXXDRIVE™ LARGE INDUSTRIAL GEAR UNITS HELICAL-BEVEL
- Modular bolt-on options
- Torque up to 2,027,000 lb-in
- Gear ratios – 5:1 to 1,600:1

NORDAC AC VECTOR DRIVES

SK200E
- Decentralized, high performance
- 380-480V, 3-phase to 10 hp
- 200-240V, 3-phase to 5 hp
- 200-240V, 1-phase to 1.5 hp
- 100-120V, 1-phase to 1 hp

SK500/520/530E
- Compact, high performance
- 380-480V, 3-phase, to 30hp
- 200-240V, 3-phase, to 15hp
- 200-240V, 1-phase, to 3hp
- 110-120V, 1-phase, to 1.5hp

SK700E
- Flexible high performance
- 380-460V, 3-phase, to 200hp

NORD DRIVESYSTEMS

DRIVESYSTEMS

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