



MINICASE® (SM SERIES) WORM GEAR OIL FILL QUANTITIES - FLANGE HOUSING



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U13200 - 1 of 1

MINICASE® (SM Series) Lubrication

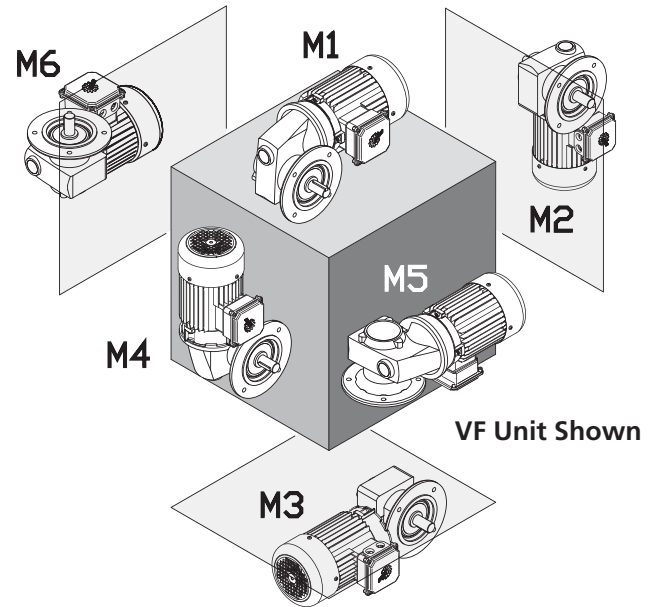
NORD MINICASE® (SM Series) worm gear reducers and worm gearmotors are inherently maintenance free, factory oil filled, and supplied with a high quality, long life synthetic gear oil intended to be suitable for the life of the product. These gear units are also supplied without oil service plugs or vents.

Related User Manuals

U10790 MINICASE® (SM Series) Worm – Lubrication Guidelines.
U11040 MINICASE® (SM Series) Worm – Lubrication Types.

STOP
HARMFUL SITUATION
STOP

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



Type	M1		M2		M3		M4		M5		M6	
	oz	ml	oz	ml	oz	ml	oz	ml	oz	ml	oz	ml
SK 1SM31	4.4	130	4.4	130	4.4	130	4.4	130	4.4	130	4.4	130
SK 1SM40	8.1	240	8.1	240	8.1	240	8.1	240	8.1	240	8.1	240
SK 2SM40	11.5	340	11.5	340	11.5	340	12.8	380	11.5	340	11.5	340
SK 1SM50	9.1	270	9.1	270	9.1	270	9.1	270	9.1	270	9.1	270
SK 2SM50	12.5	370	12.5	370	12.5	370	15.2	450	12.5	370	12.5	370
SK 1SM63	15.2	450	15.2	450	15.2	450	15.2	450	15.2	450	15.2	450
SK 2SM63	20.3	600	20.3	600	20.3	600	24.7	730	20.3	600	20.3	600

Oil Levels shown apply to flange-mount gear housings with model type ending in AZ, AF, VZ or VF.



MINICASE® (SMI/SMID) WORM GEAR OIL FILL QUANTITIES - FLANGE HOUSING



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U13250 - 1 of 1

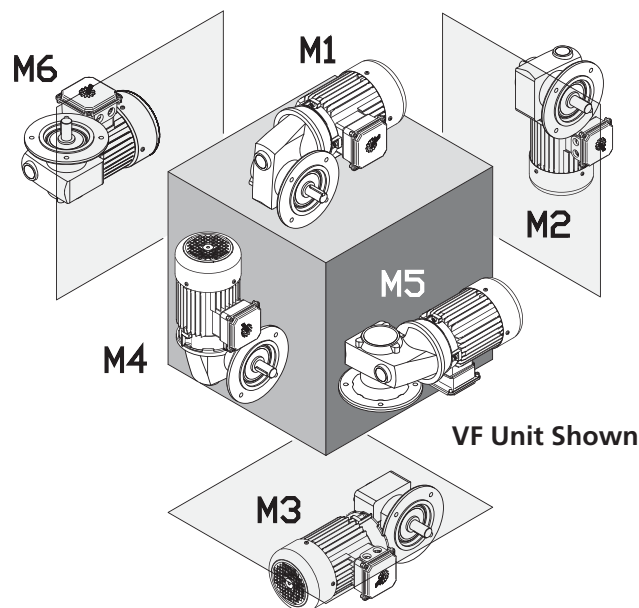
MINICASE® (SMI/SMID Series) Lubrication

NORD MINICASE® (SMI/SMID Series) worm gear reducers and worm gearmotors are inherently maintenance free, factory oil filled, and supplied with a high quality, long life synthetic gear oil intended to be suitable for the life of the product. For lubrication types see user manual U11050.

NORD MINICASE® (SMI/SMID Series) worm gear reducers and worm gearmotors are equipped with oil plugs. Venting the gear unit is optional as discussed in user manual U14750.

Related User Manuals

- U10800 - MINICASE® (SMI/SMID Series) Worm – Lubrication Guidelines.
- U11050 - MINICASE® (SMI/SMID Series) Worm – Lubrication Types
- U14750 - MINICASE® (SMI/SMID Series) Worm – Oil Plug Locations



HARMFUL SITUATION



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

MINICASE® (SMI Series) Gear Reducer Oil Fill - Flange Housing

Type	M1		M2		M3		M4		M5		M6	
	oz	ml	oz	ml	oz	ml	oz	ml	oz	ml	oz	ml
SK 1SMI31	1.5	45	1.5	45	1.5	45	1.5	45	1.5	45	1.5	45
SK 1SMI40	2.7	80	2.7	80	2.7	80	2.7	80	2.7	80	2.7	80
SK 1SMI50	4.4	130	4.4	130	4.4	130	4.4	130	4.4	130	4.4	130
SK 1SMI63	9.1	270	9.1	270	9.1	270	9.1	270	9.1	270	9.1	270
SK 1SMI75	14.2	420	14.2	420	14.2	420	14.2	420	14.2	420	14.2	420

Oil Fill is universal and independent of mounting position.

Oil Levels shown apply to flange-mount gear housings with model type ending in AZ, AF, VZ or VF.

MINICASE® (SMID Series) Integral Gearmotor Oil Fill - Flange Housing

Type	M1		M2		M3		M4		M5		M6	
	oz	ml	oz	ml	oz	ml	oz	ml	oz	ml	oz	ml
SK 1SMID31	2.0	60	3.6	105	2.4	70	1.7	50	2.4	70	2.4	70
SK 1SMID40	3.4	100	5.6	165	4.1	120	3.0	90	4.1	120	4.1	120
SK 1SMID50	5.9	175	8.8	260	6.6	195	5.4	160	6.6	195	6.6	195
SK 1SMID63	9.6	285	14.4	425	11.0	325	9.1	270	11.0	325	11.0	325

Oil Levels shown apply to flange-mount gear housings with model type ending in AZ, AF, VZ or VF.

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FLEXBLOC™ (SI/SID SERIES) WORM GEAR OIL FILL QUANTITIES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U13300 - 1 of 1

FLEXBLOC™ (SI/SID Series) Lubrication

NORD FLEXBLOC™ worm gear reducers are inherently maintenance free, factory oil filled, and supplied with a high quality, long life synthetic gear oil intended to be suitable for the life of the product. For lubrication types see User Manual U11060.

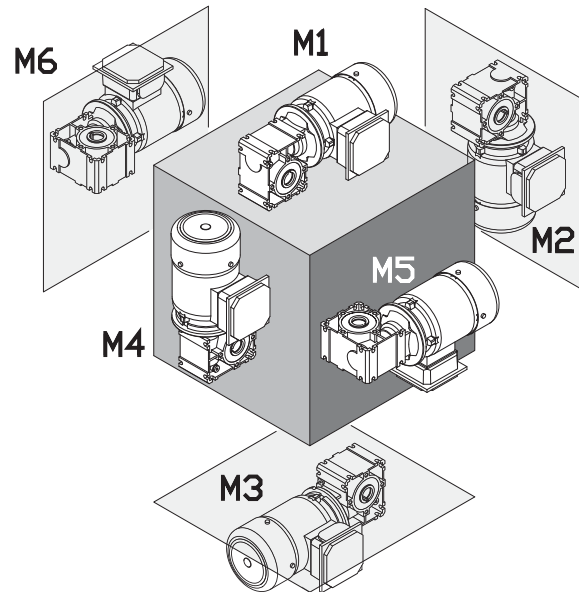
NORD FLEXBLOC™ worm gear reducers are equipped with oil plugs. Venting the gear unit is optional as discussed in User Manual U14800.

Related User Manuals

U10810 FLEXBLOC™ (SI/SID Series) Worm – Lubrication Guidelines

U11060 FLEXBLOC™ Worm (SI/SID Series) – Lubrication Types

U14800 FLEXBLOC™ Worm (SI/SID Series) – Oil Plug Locations



FLEXBLOC™ (SI Series) Gear Reducer Oil Fill

Type	M1		M2		M3		M4		M5		M6	
	oz	ml	oz	ml	oz	ml	oz	ml	oz	ml	oz	ml
SK 1SI31	1.0	30	1.0	30	1.0	30	1.0	30	1.0	30	1.0	30
SK 1SI40	1.9	55	1.9	55	1.9	55	1.9	55	1.9	55	1.9	55
SK 1SI50	3.2	95	3.2	95	3.2	95	3.2	95	3.2	95	3.2	95
SK 1SI63	6.1	180	6.1	180	6.1	180	6.1	180	6.1	180	6.1	180
SK 1SI75	12.2	360	12.2	360	12.2	360	12.2	360	12.2	360	12.2	360

Oil Fill is universal and independent of mounting position.

FLEXBLOC™ (SID Series) Gear Reducer Oil Fill

Type	M1		M2		M3		M4		M5		M6	
	oz	ml	oz	ml	oz	ml	oz	ml	oz	ml	oz	ml
SK 1SID31	1.7	50	3.0	90	2.4	70	1.7	50	2.4	70	2.4	70
SK 1SID40	3.0	90	5.1	150	3.7	110	2.7	80	4.1	120	4.1	120
SK 1SID50	5.7	170	6.8	200	5.7	170	5.1	150	6.1	180	6.1	180
SK 1SID63	9.8	280	12.2	360	9.8	290	8.1	240	10.5	310	10.5	310

Integral gear motors only available upon special request.

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DRIVESYSTEMS

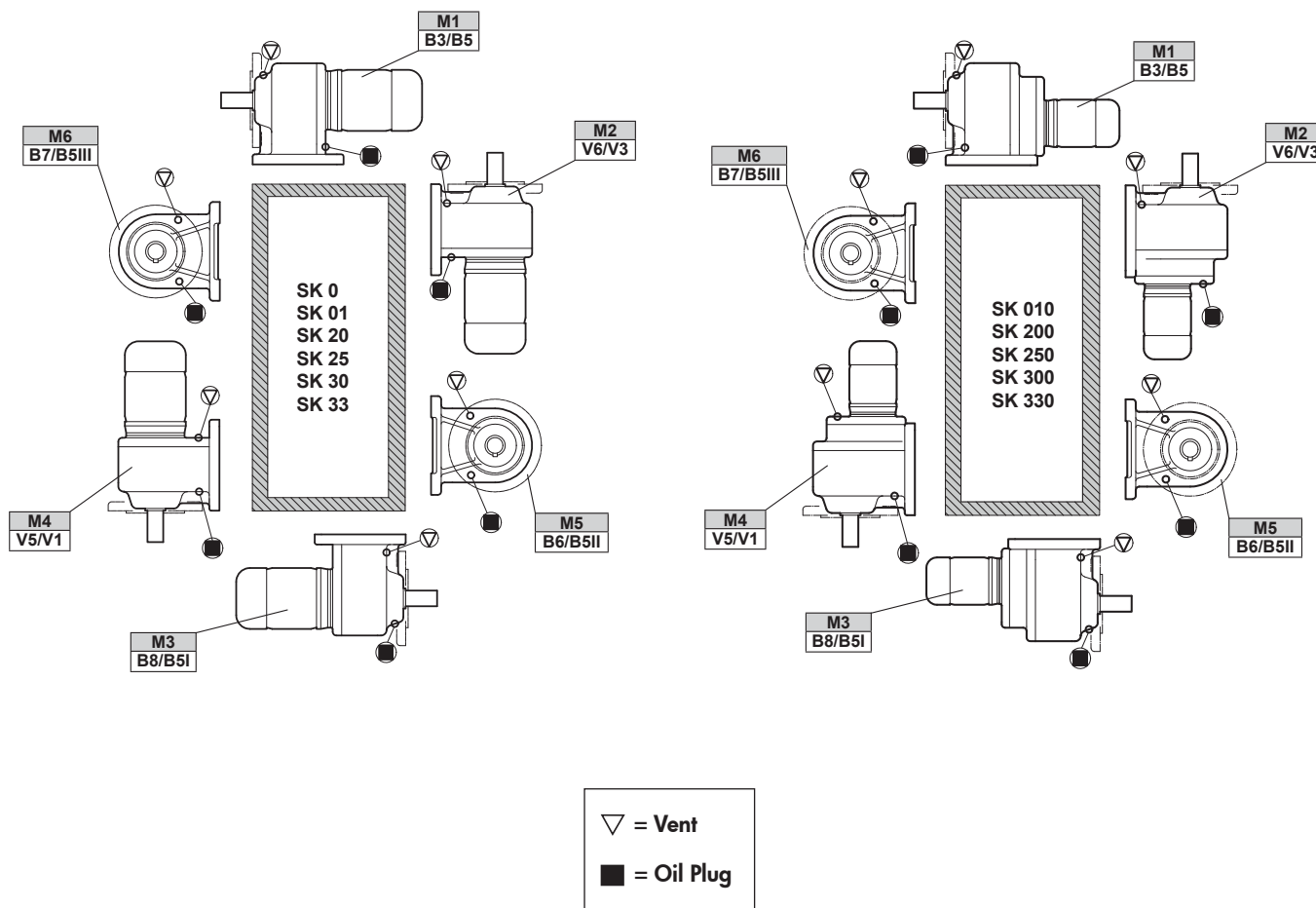
STANDARD IN-LINE OIL PLUG & VENT LOCATIONS



U14000 - 1 of 1

Oil plug connections

All reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. *For mounting orientations other than shown please consult NORD Gear. New plug locations may be required.*





DRIVESYSTEMS

HELICAL IN-LINE OIL PLUG & VENT LOCATIONS

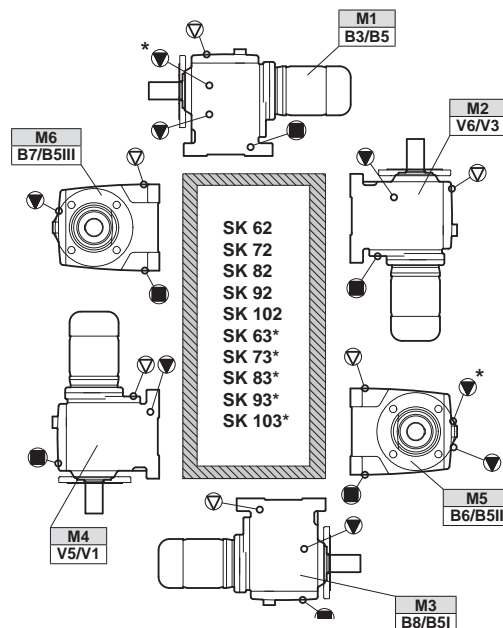
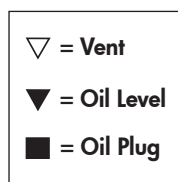
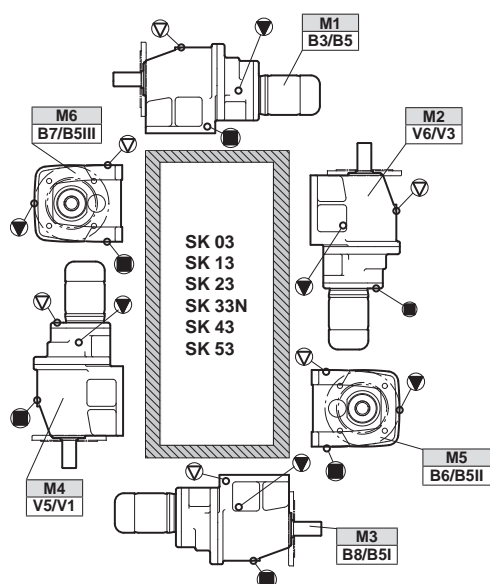
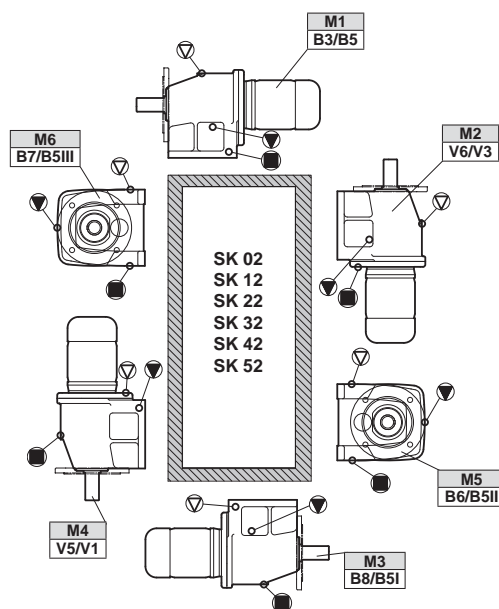
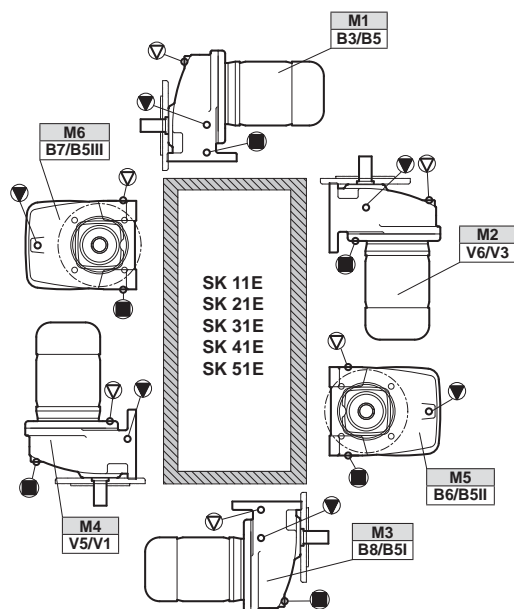


RETAIN FOR FUTURE USE

U14100 - 1 of 1

Oil plug connections

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. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole. **For mounting orientations other than shown please consult NORD Gear. New plug locations may be required.**



* Oil level for 3 stage gear units.

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DRIVESYSTEMS

CLINCHER™ OIL PLUG & VENT LOCATIONS

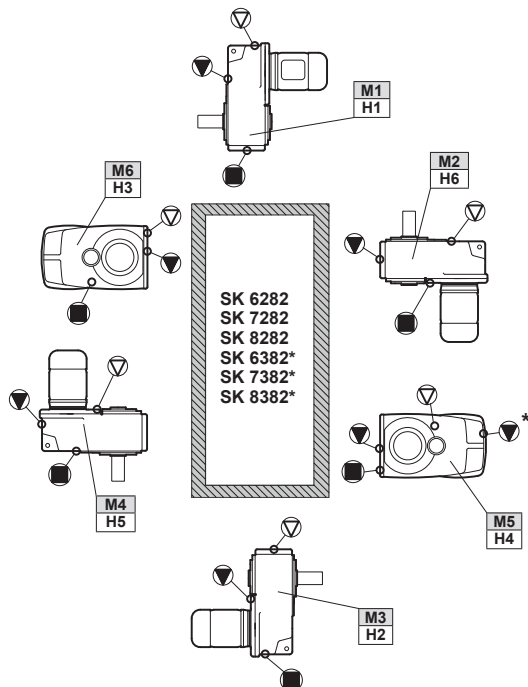
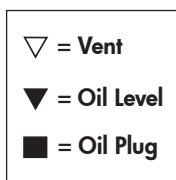
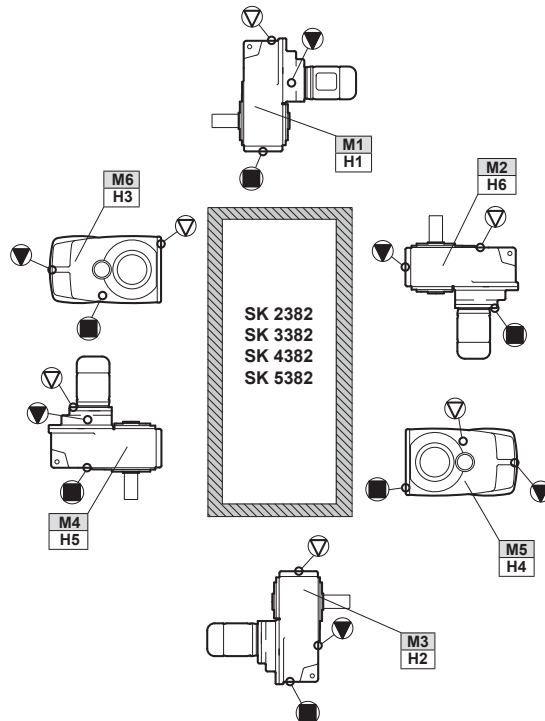
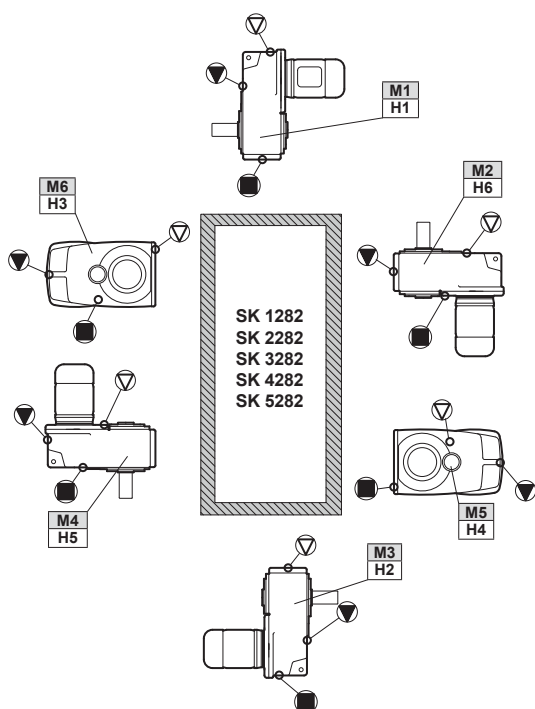


RETAIN FOR FUTURE USE

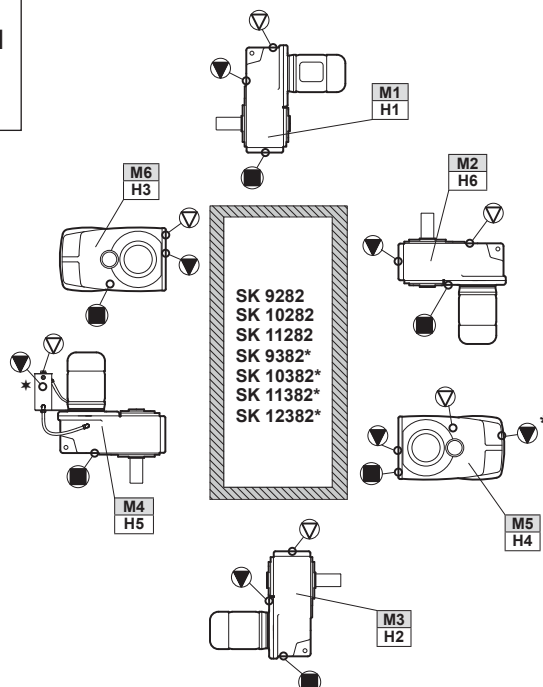
U14200 - 1 of 1

Oil plug connections

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. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole. **For mounting orientations other than shown please consult NORD Gear. New plug locations may be required.**



* Oil level for 3 stage gear units



* Oil level for 3 stage gear units

* Oil fill level should be verified using the dip stick located in the oil tank for the M4/H5 position.

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DRIVESYSTEMS

92 SERIES HELICAL-BEVEL OIL PLUG & VENT LOCATIONS



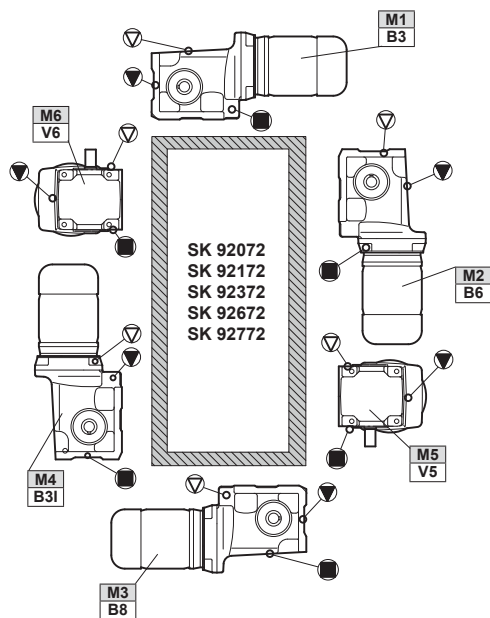
U14300 - 1 of 1

RETAIN FOR FUTURE USE

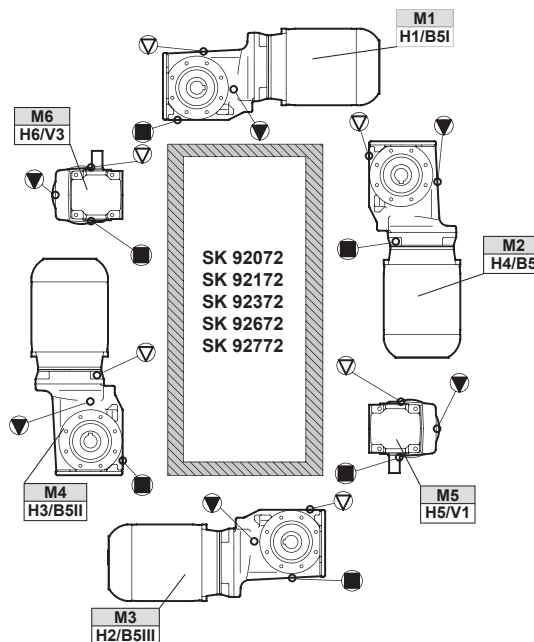
Oil plug connections

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. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole. **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 Plug



DRIVESYSTEMS

92.1/93.1 SERIES HELICAL-BEVEL OIL PLUG & VENT LOCATIONS



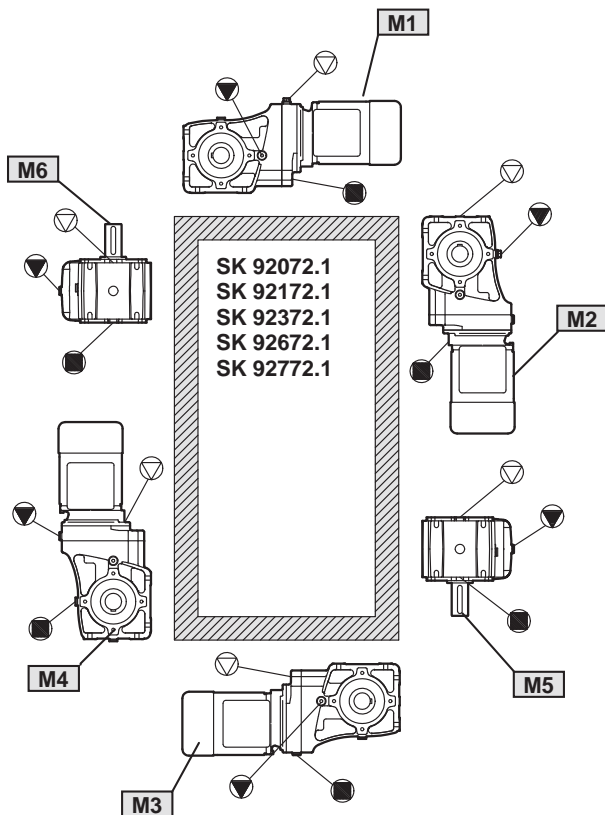
U14305 - 1 of 1

RETAIN FOR FUTURE USE

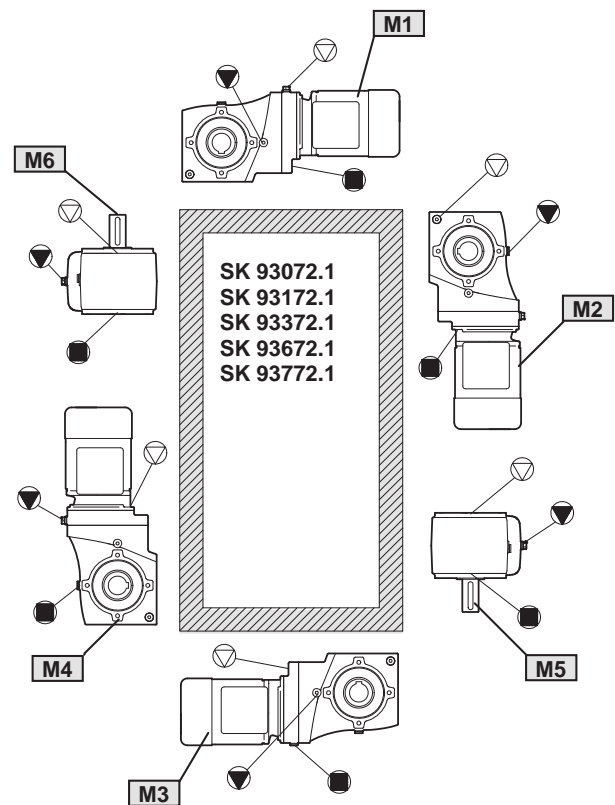
Oil plug locations

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.*

92.1 Series



93.1 Series



▽ = Vent
▼ = Oil Level
■ = Oil Plug



90.1 HELICAL-BEVEL OIL PLUG & VENT LOCATIONS



DRIVESYSTEMS

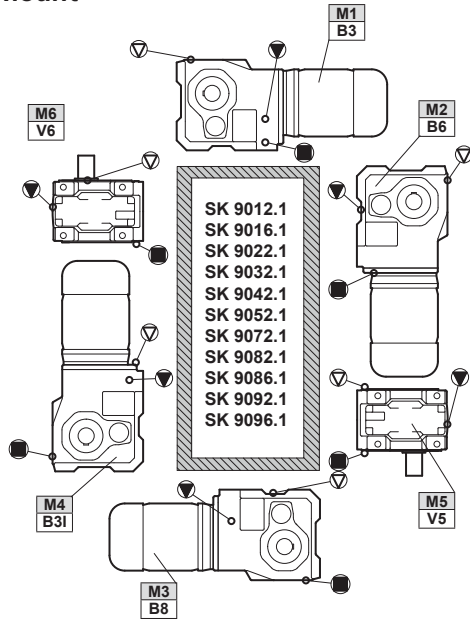
RETAIN FOR FUTURE USE

U14400 - 1 of 1

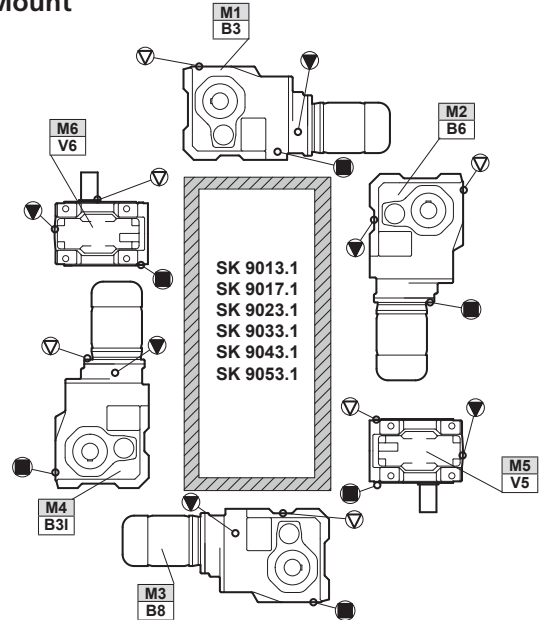
Oil plug connections

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. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole. **For mounting orientations other than shown please consult NORD Gear. New plug locations may be required.**

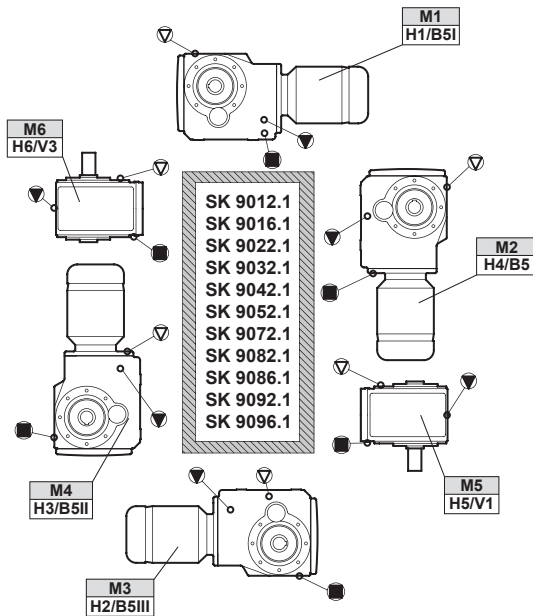
Foot Mount



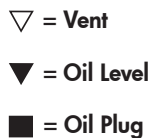
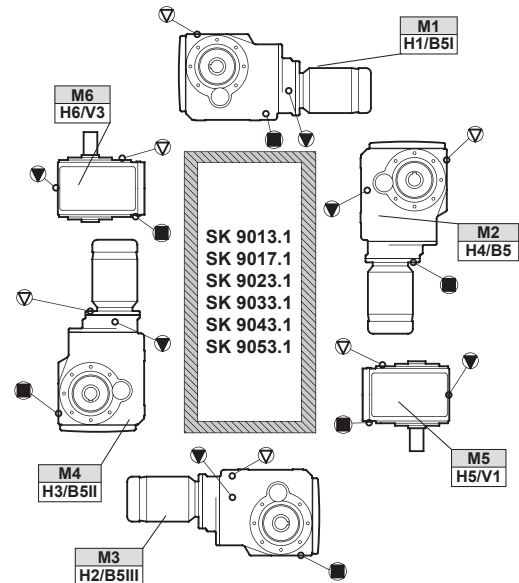
Foot Mount



Shaft/Flange Mount



Shaft/Flange Mount



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DRIVESYSTEMS

HELICAL-WORM OIL PLUG & VENT LOCATIONS

RETAIN FOR FUTURE USE

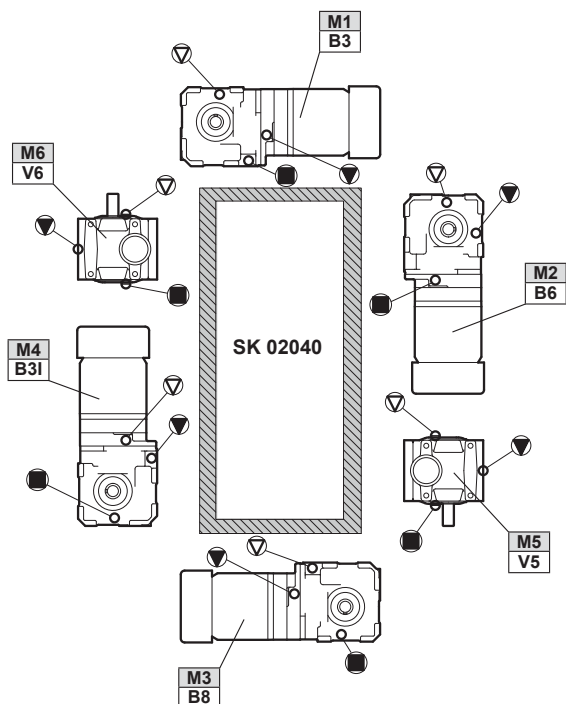


U14500 - 1 of 2

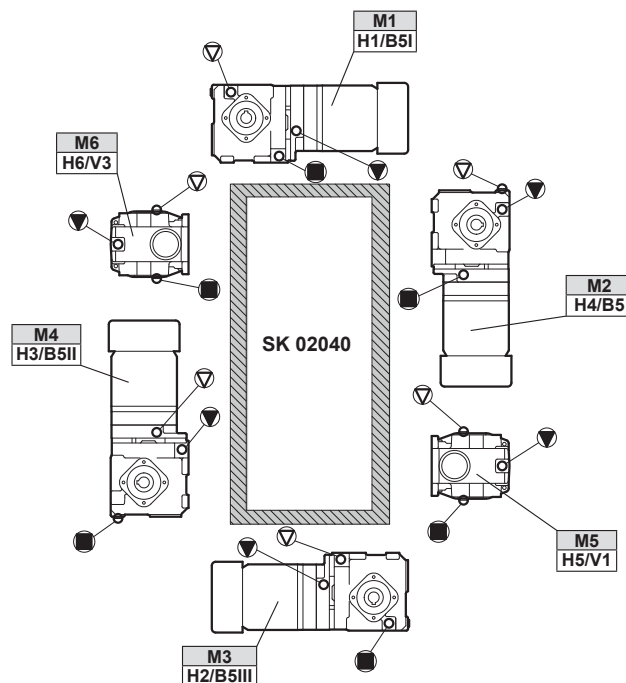
Oil plug connections

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. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole. **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 Plug



DRIVESYSTEMS

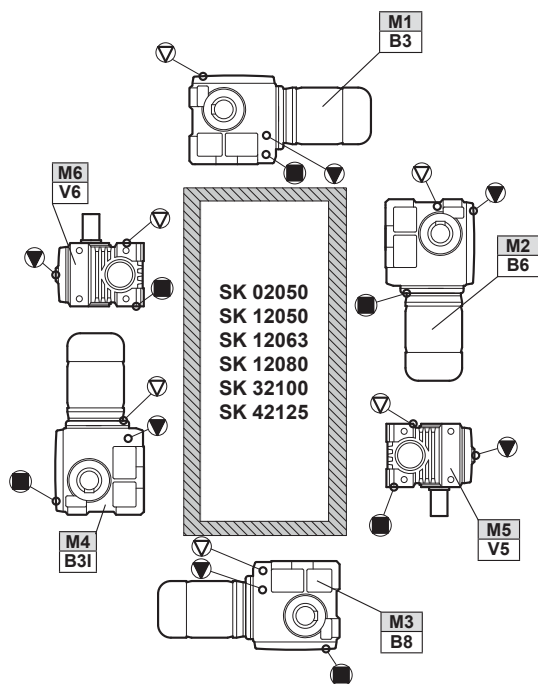
HELICAL-WORM OIL PLUG & VENT LOCATIONS

RETAIN FOR FUTURE USE

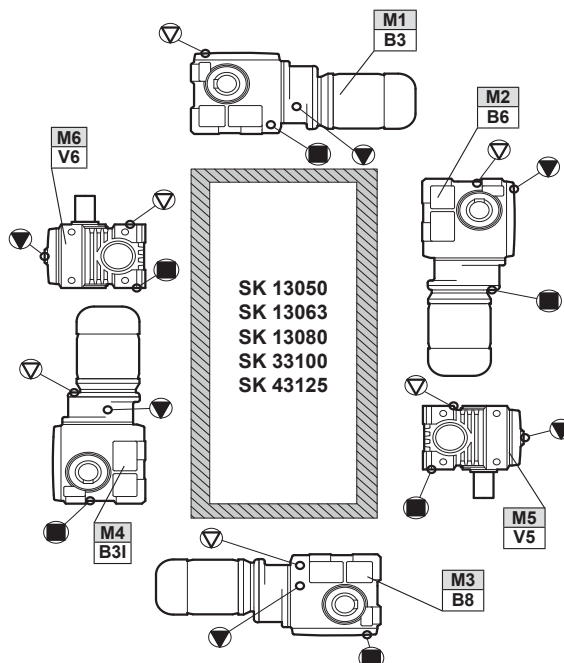


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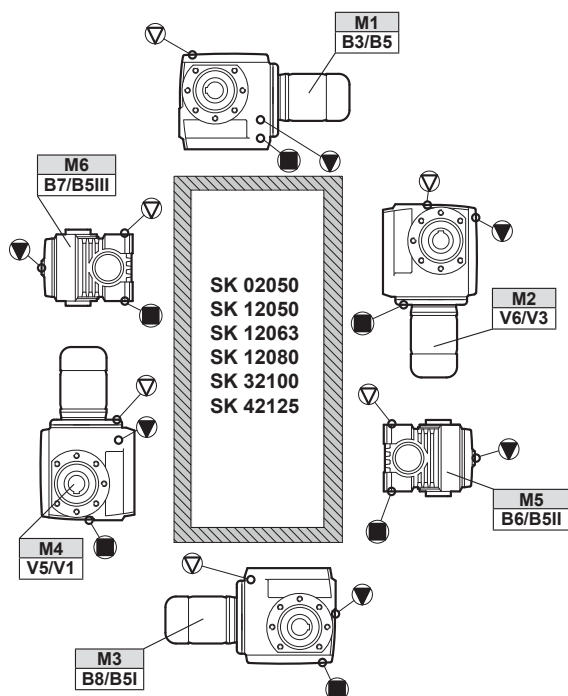
Foot Mount



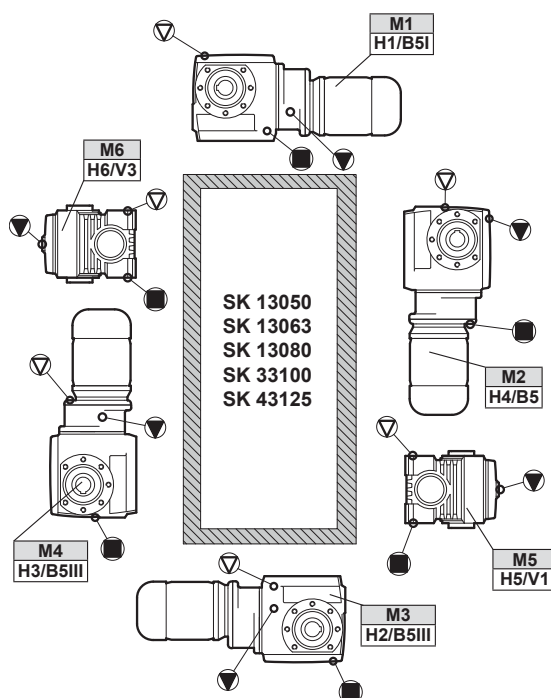
Foot Mount



Shaft/Flange Mount



Shaft/Flange Mount



- ▽ = Vent
- ▼ = Oil Level
- = Oil Drain

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DRIVESYSTEMS

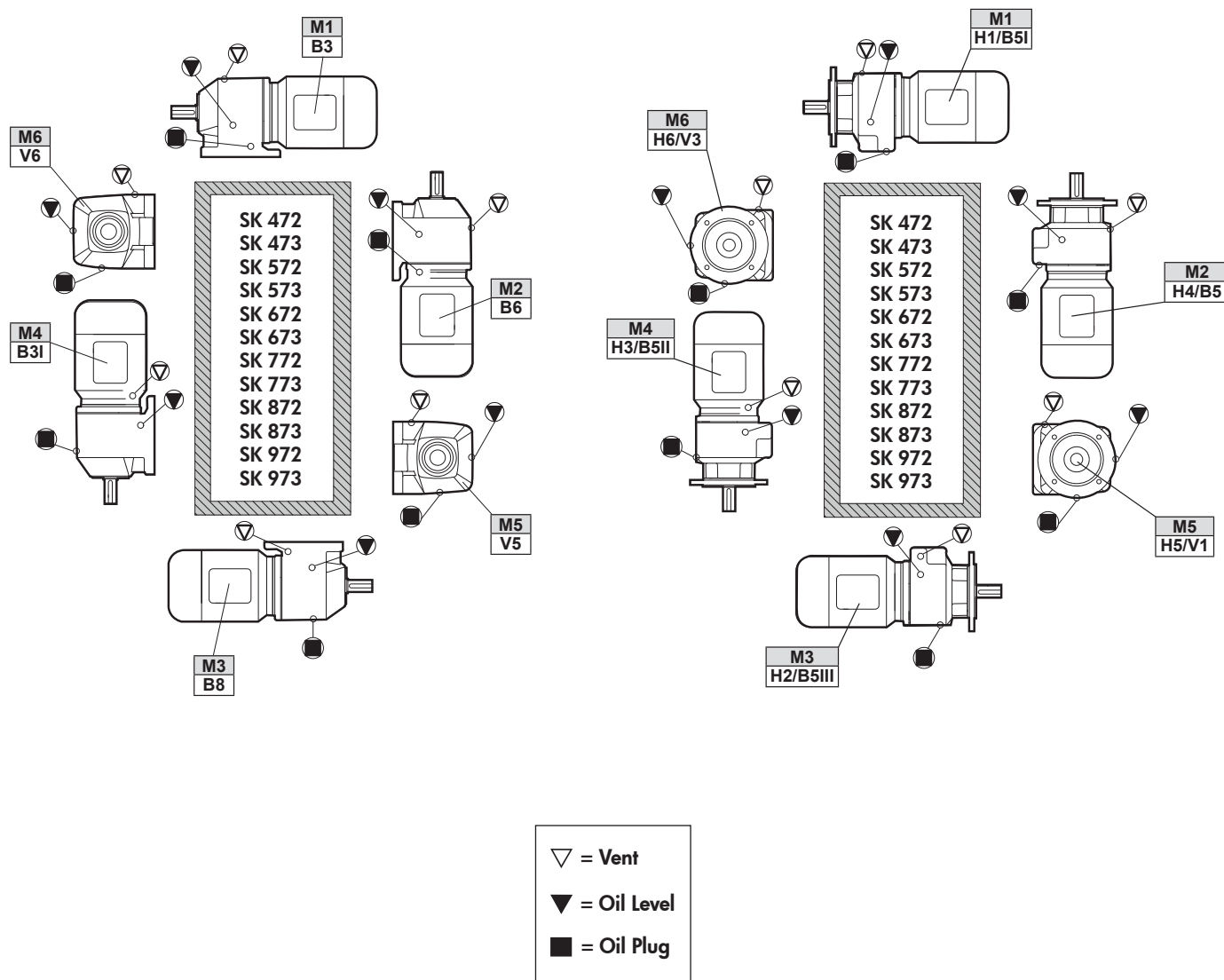
NORDBLOC® OIL PLUG & VENT LOCATIONS



U14600 - 1 of 1

Oil plug connections

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. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole. **For mounting orientations other than shown please consult NORD Gear. New plug locations may be required.**





NORDBLOC®.1 OIL PLUG & VENT LOCATIONS



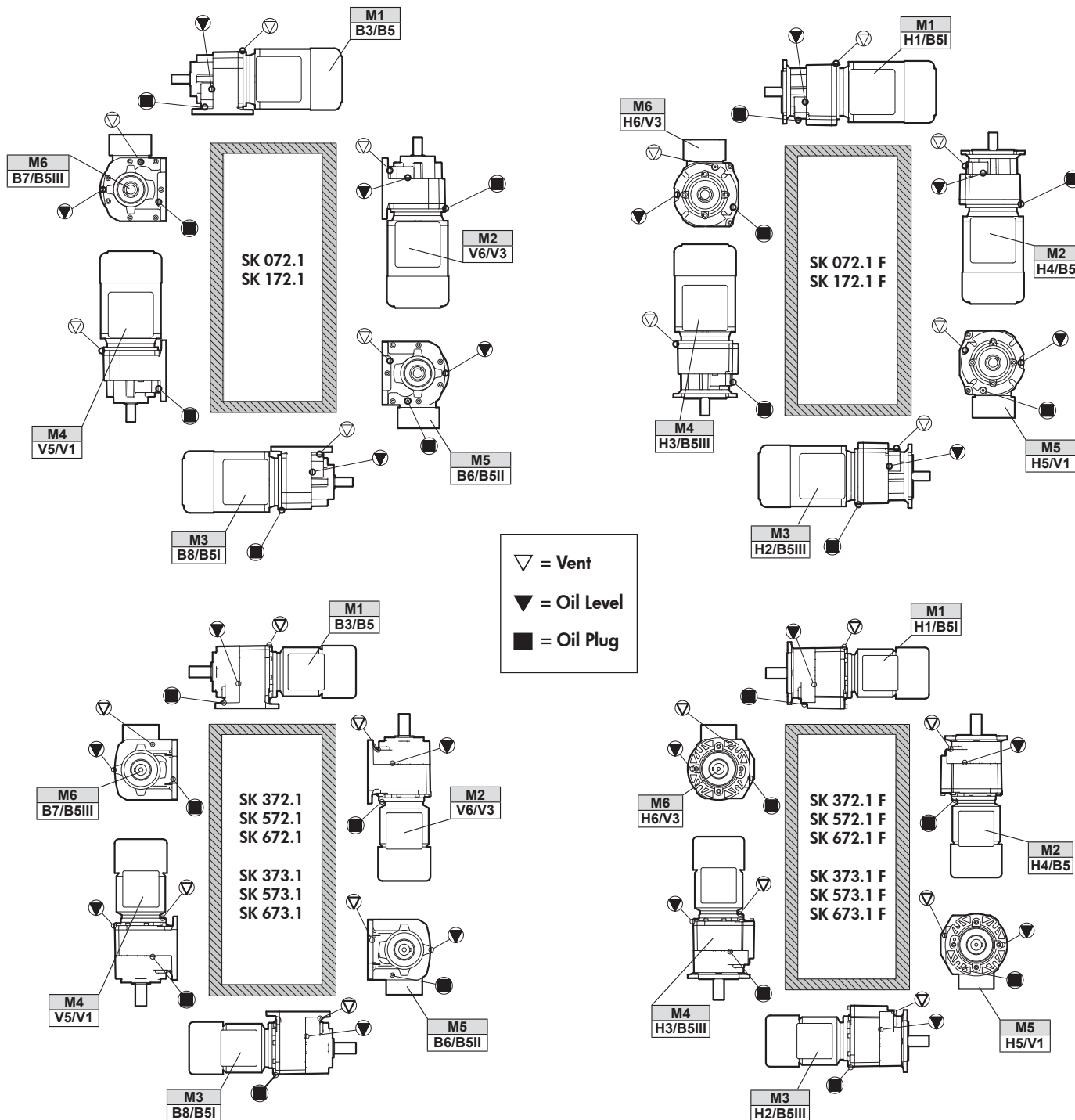
DRIVESYSTEMS

RETAIN FOR FUTURE USE

U14700 - 1 of 2

Oil plug connections

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. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole. **For mounting orientations other than shown please consult NORD Gear. New plug locations may be required.**





NORDBLOC®.1

OIL PLUG & VENT LOCATIONS



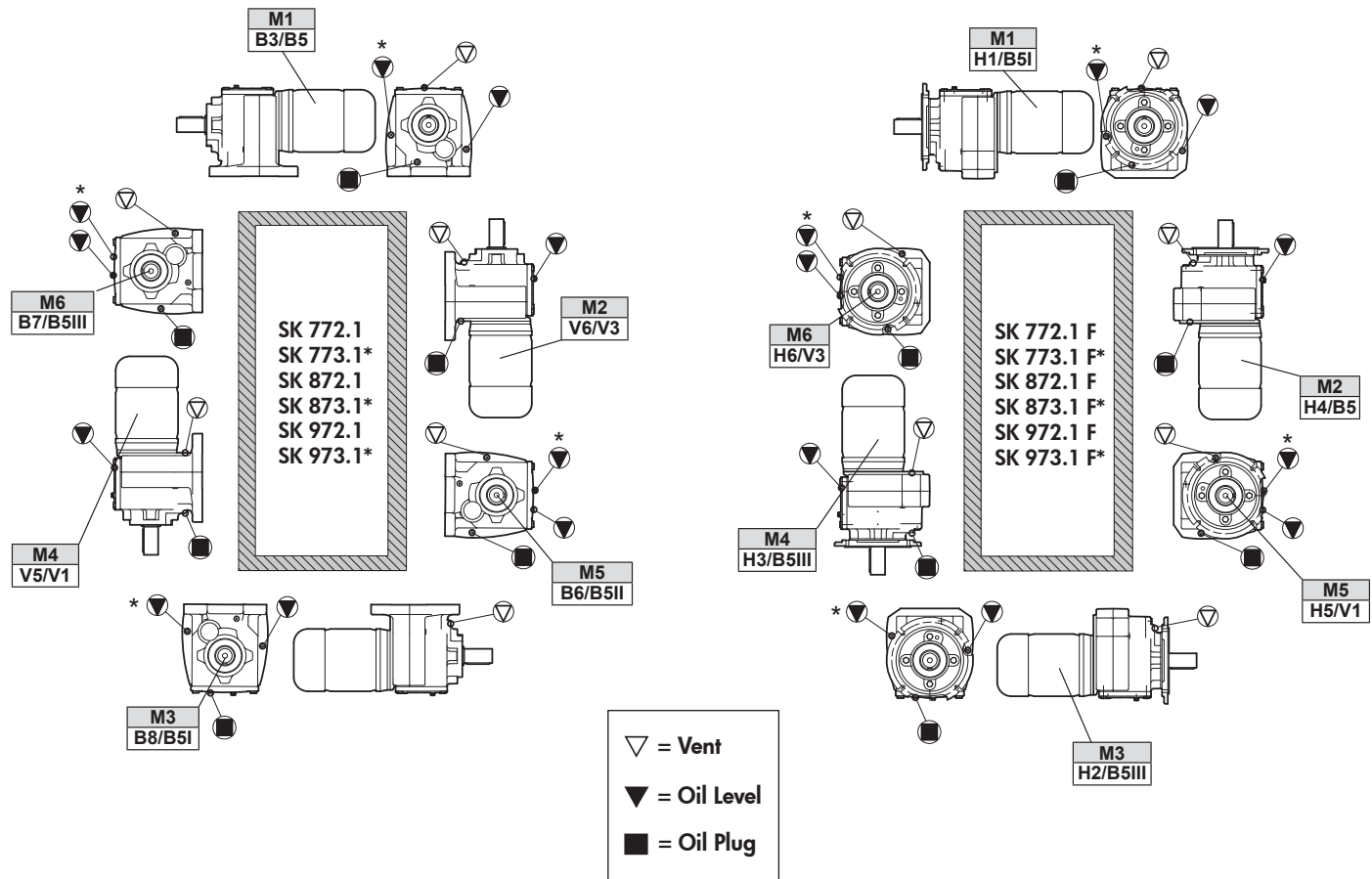
DRIVESYSTEMS

RETAIN FOR FUTURE USE

U14700 - 2 of 2

Oil plug connections

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. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole. **For mounting orientations other than shown please consult NORD Gear. New plug locations may be required.**



* Oil fill level for three stage gear units.

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MINICASE® (SMI/SMID) WORM GEAR OIL PLUG & VENT LOCATIONS



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U14750 - 1 of 1

Oil Plug and Vent Locations

MINICASE® (SMI/SMID) reducers and gear motors are fitted with oil plugs to allow for optional venting of the gear unit. NORD can supply either an AUTOVENT™ (valve-type) vent or an open vent. Vent options are available for most gear unit sizes and positions as indicated by the table below. For more complete details on vent options and when to consider reducer venting, see user manual U10800.

Vent Compatibility by Unit Size & Mounting Position

	M1	M2	M3	M4	M5	M6
SMI/SMID 31		✓	✓	✓		✓
SMI/SMID 40		✓	✓	✓		✓
SMI/SMID 50	✓	✓	✓	✓		✓
SMI/SMID 63	✓	✓	✓	✓	✓	✓
SMI/SMID 75	✓	✓	✓	✓		✓

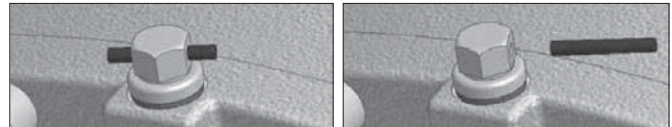
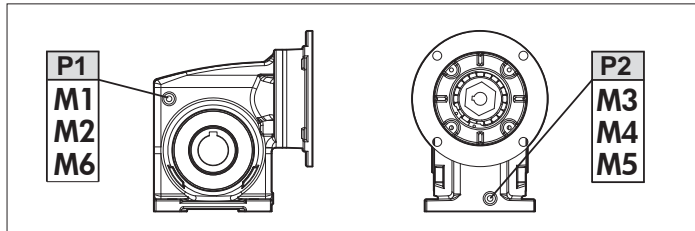
Continuous Input speed ≤ 1800 rpm

Vent Kit Part Numbers

Type	Transportation Seal	Installation	Part Number
AUTOVENT™	Included	Factory or Field site	66093510
Open Vent	None	Field Only	60693500
Open Vent	Included	Factory or Field site	22008004 (vent) 25308120 (gasket)

Unless noted by a separate part number, vent kits include the housing gasket

Optional Vent Locations

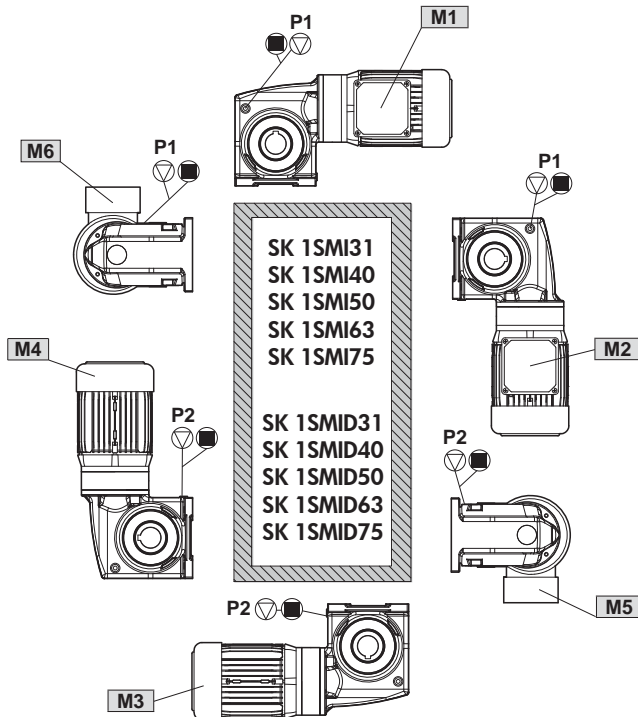


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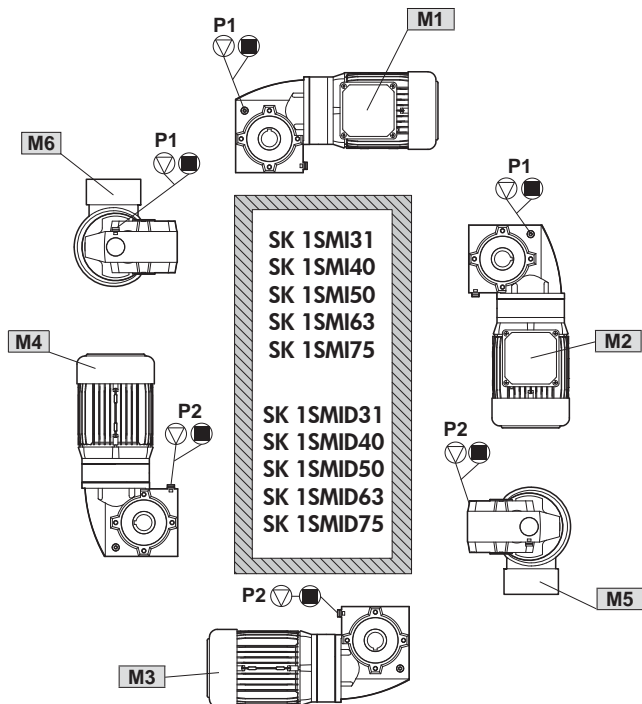


To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start-up.

MINICASE® (SMI/SMID) Foot Housing



MINICASE® (SMI/SMID) Flange Housing



▽ = Vent
■ = Oil Plug

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FLEXBLOC™ (SI/SID SERIES) WORM GEAR OIL PLUG & VENT LOCATIONS



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U14800 - 1 of 1

Vent locations

FLEXBLOC™ (SI/SID SERIES) reducers are fitted with oil plugs to allow for optional venting of the gear unit. NORD can supply either an AUTOVENT™ (valve-type) vent or an open vent. Vent options are available for most gear unit sizes and positions as indicated by the table below. For more complete details on vent options and when to consider reducer venting, see user manual U10810.

Vent Compatibility by Unit Size & Mounting Position

	M1	M2	M3	M4	M5	M6
SI/SID 31		✓	✓	✓		✓
SI/SID 40		✓	✓	✓		✓
SI/SID 50	✓	✓	✓	✓		✓
SI/SID 63	✓	✓	✓	✓	✓	✓
SI/SID 75	✓	✓	✓	✓		✓

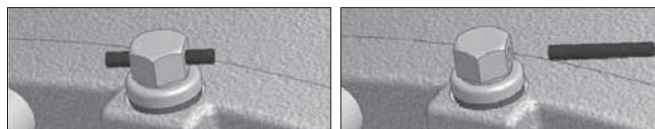
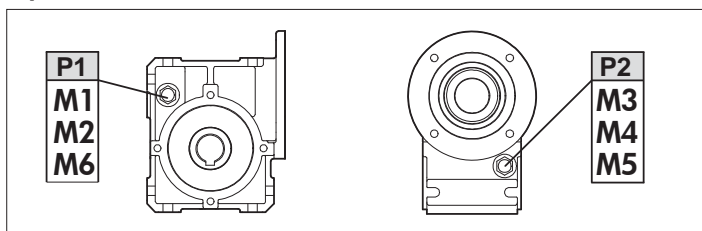
Continuous Input speed ≤ 1800 rpm

Vent Kit Part Numbers

Type	Transportation Seal	Installation	Part Number
AUTOVENT™	Included	Factory or Field site	66093510
Open Vent	None	Field Only	60693500
Open Vent	Included	Factory or Field site	22008004 (vent) 25308120 (gasket)

Unless noted by a separate part number, vent kits include the housing gasket

Optional Vent Locations

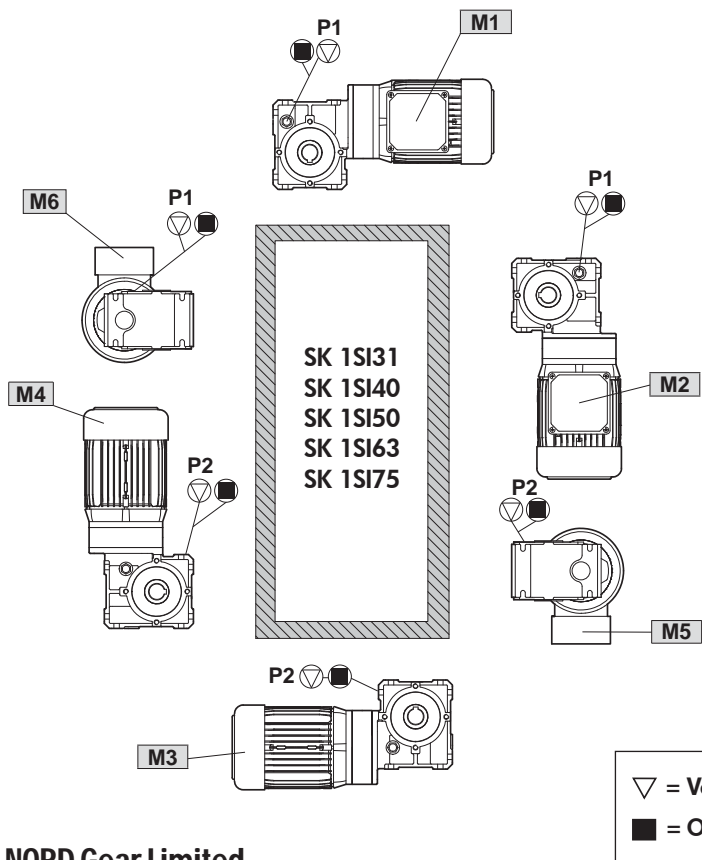


WARNING



To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start-up.

FLEXBLOC™ (SI Series) Universal Housing



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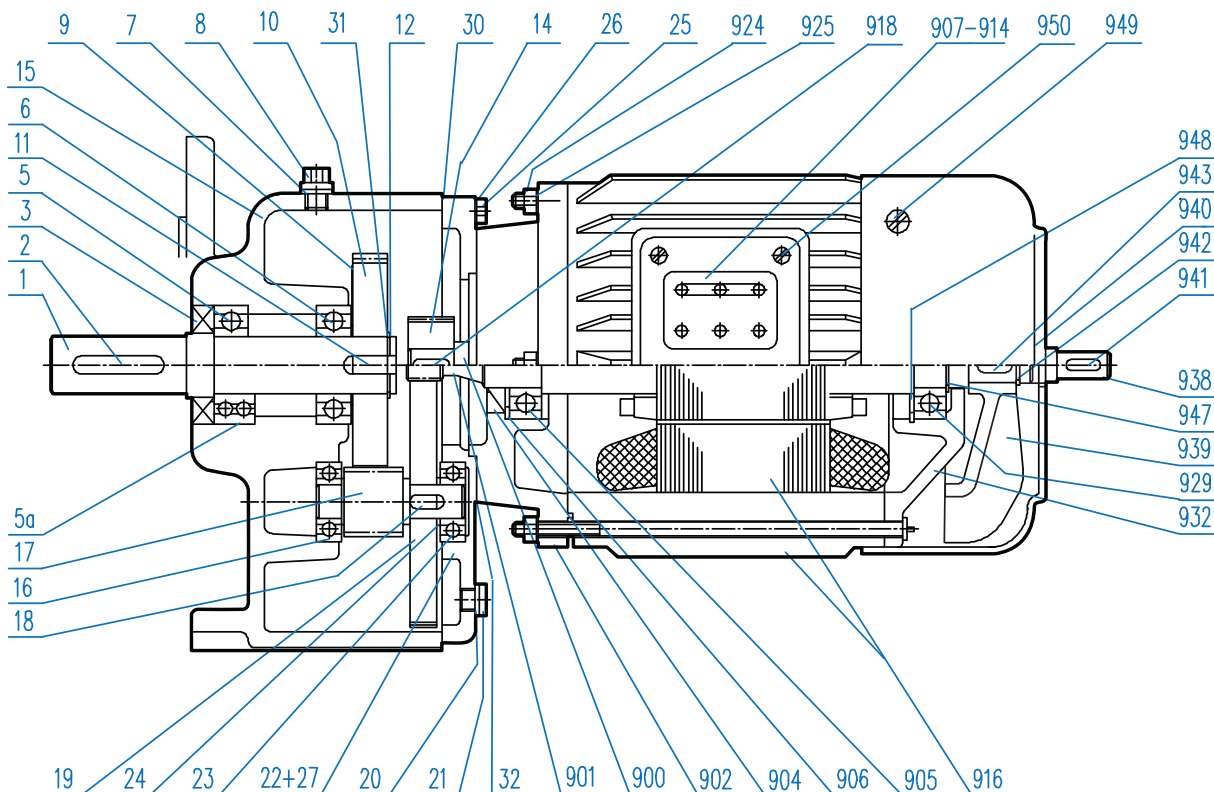
DRIVESYSTEMS

STANDARD IN-LINE PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15000 - 1 of 4



SK 0 - SK 33 Helical Gear Unit

1	Output shaft	21	Plug	910	Terminal box cover gasket
2	Key	22	Gear case cover	911	Terminal board
3	Shaft seal	23	Pinion shaft bearing	914	Cable entry gland
5	Output shaft bearing, normal	24	Shim	916	Stator case
5A	Output shaft bearing, reinforced	25	Hexagon bolt	918	Key
6	Output shaft bearing	26	Washer	924	Collar bolt
7	Seal	27	Spiral pin	925	Hexagonal nut
8	Vent screw	30	Seal	929	Bearing B
9	Shim	31	Shim	932	Endshield B
10	Driven gear	32	Seal	938	Second motor shaft end*
11	Key	900	Rotor with shaft, plain	939	Fan
12	Circlip	901	Rotor with shaft, gearcut	940	Fan cover
14	Driving pinion	902	End shield A	941	Key
15	Gear case	904	Shaft seal	942	Circlip
16	Pinion shaft, bearing	905	Bearing A	943	Key
17	Driven pinion	906	Bearing shim	947	Circlip
18	Key	907	Terminal box frame	948	Circlip
19	Driving gear	908	Terminal box cover	949	Oval flat-head bolt
20	Seal	909	Terminal box frame gasket	950	Oval flat-head bolt

* Optional Part

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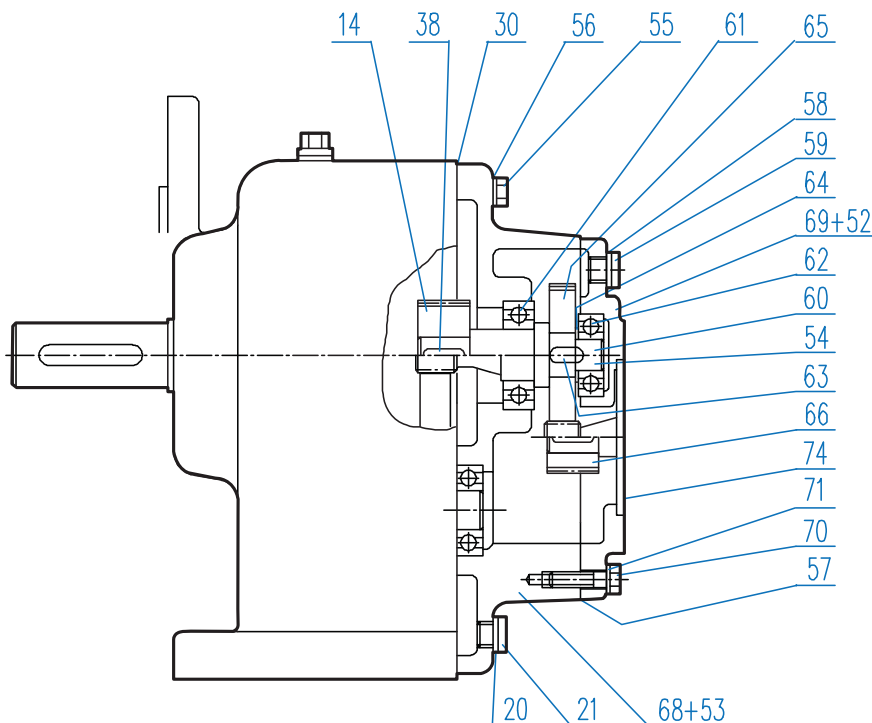
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STANDARD IN-LINE PARTS LIST DRAWINGS



SK 010 - SK 330 Third Stage Reduction Gear

14	Driving pinion	55	Hexagon bolt	64	Shim
20	Seal	56	Washer	65	Driving gear
21	Plug	57	Seal	66	Driving pinion
27	Spiral pin	58	Seal	68	Gear case 3rd.-red.
30	Seal	59	Plug	69	Gear case cover
38	Key	60	Intermediate shaft, plain	70	Hexagon bolt
52	Spiral pin	61	Grooved ball bearing	71	Washer
53	Spiral pin	62	Grooved ball bearing	74	Seal
54	Intermediate shaft, gearcut	63	Key		



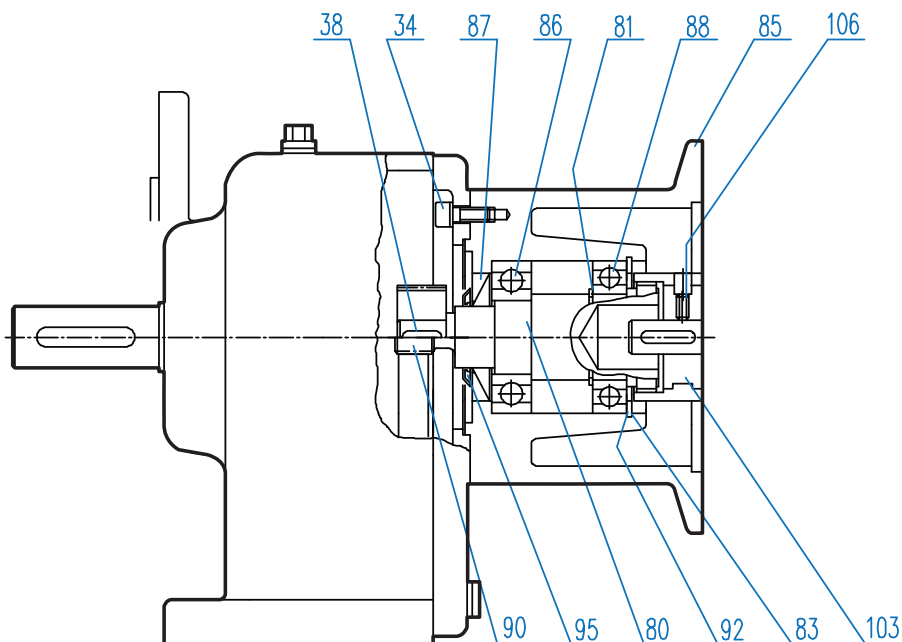
DRIVESYSTEMS

STANDARD IN-LINE PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15000 - 3 of 4



SK 0 - SK 330 IEC Input

34	Socket head bolt	85	IEC adaptor	92	Shim
38	Key	86	Input shaft bearing	103	Coupling
80	Input shaft	87	Shaft seal	106	Set screw
81	Circlip	88	Input shaft bearing		
83	Circlip	90	Pinion shaft		

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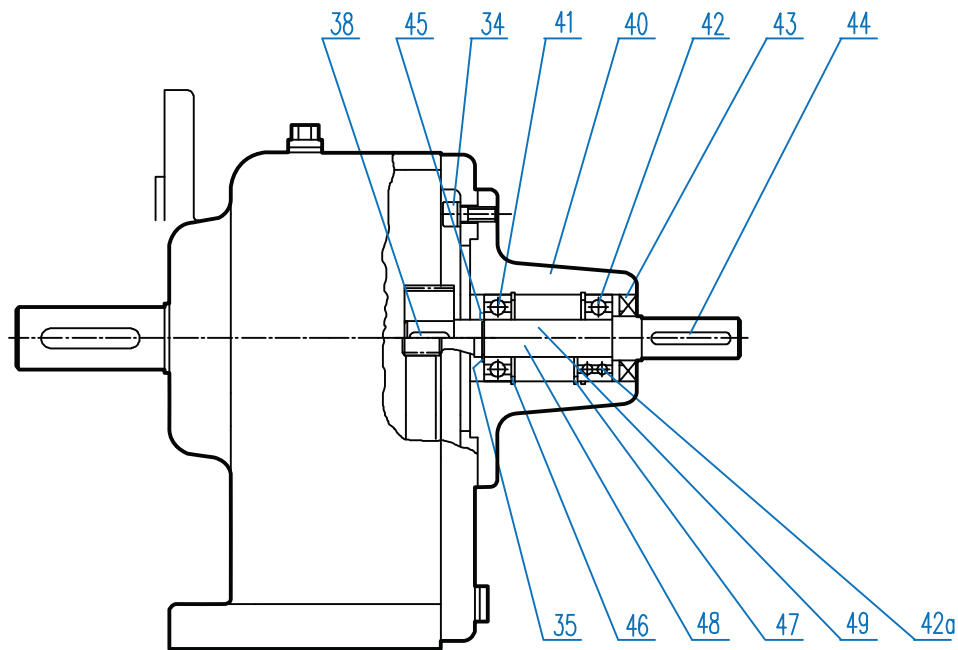
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SK 0 - SK 330 Solid Shaft Input (W)

34	Socket head bolt	42	Grooved ball bearing, normal	46	Circlip
35	Shim	42A	Grooved ball bearing, reinforced	47	Circlip
38	Key	43	Shaft seal	48	Input shaft, gearcut
40	Input bearing housing	44	Key	49	input shaft, plain
41	Grooved ball bearing	45	Circlip		



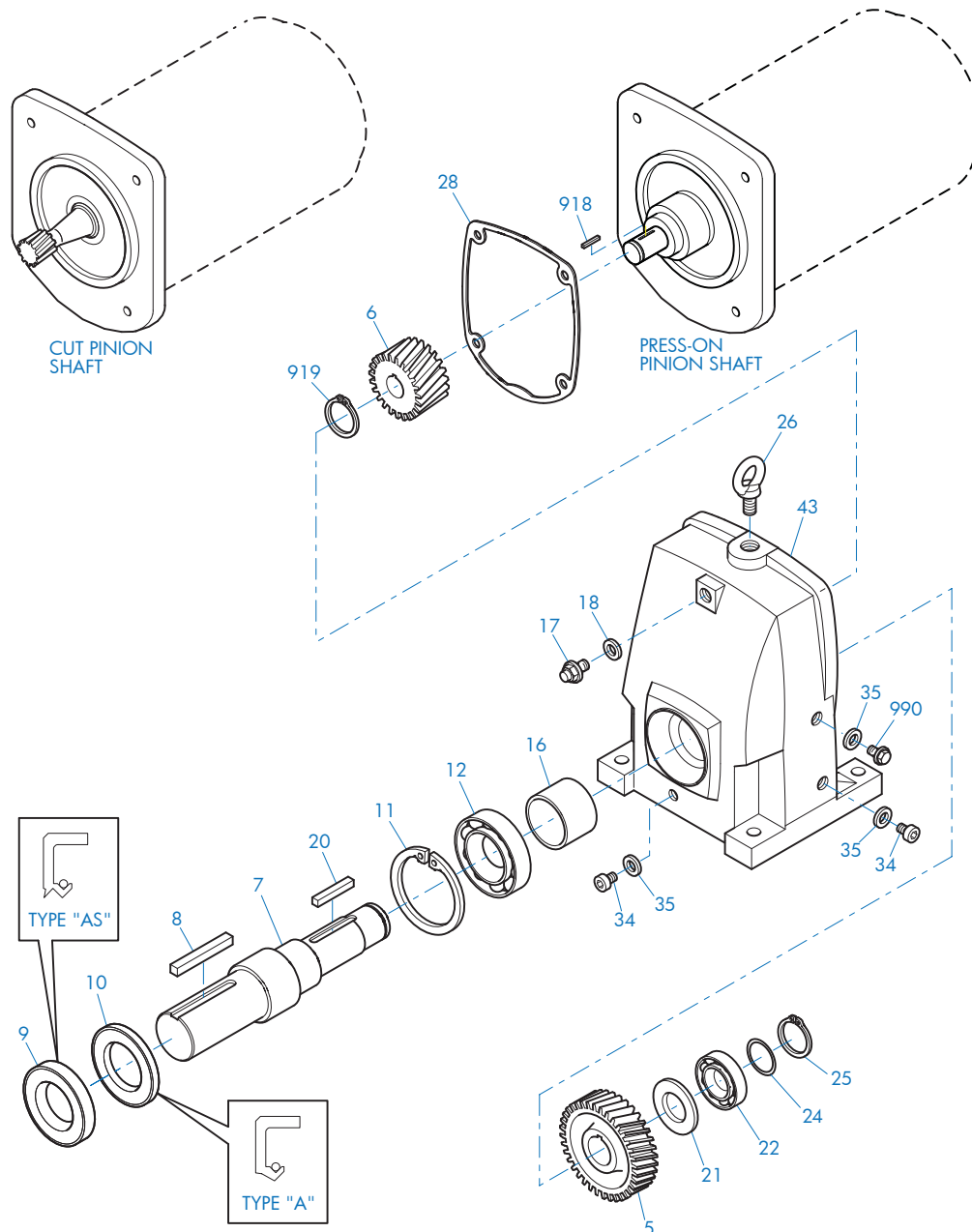
DRIVESYSTEMS

HELICAL IN-LINE PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15100 - 1 of 12



SK 11E - SK 51E Foot Mount

5	Gear	16	Spacer	26	Flanged Eye Bolt
6	Pinion	17	Vent Plug	28	Gasket
7	Output Shaft	18	Seal	34	Drain Plug
8	Key	20	Key	35	Gasket
9	Oil Seal	21	Spacer	43	Gearcase
10	Oil Seal	22	Anti-Friction Bearing	918	Key
11	Snap Ring	24	Shim	919	Snap Ring
12	Anti-Friction Bearing	25	Snap Ring	990	Oil Level Plug

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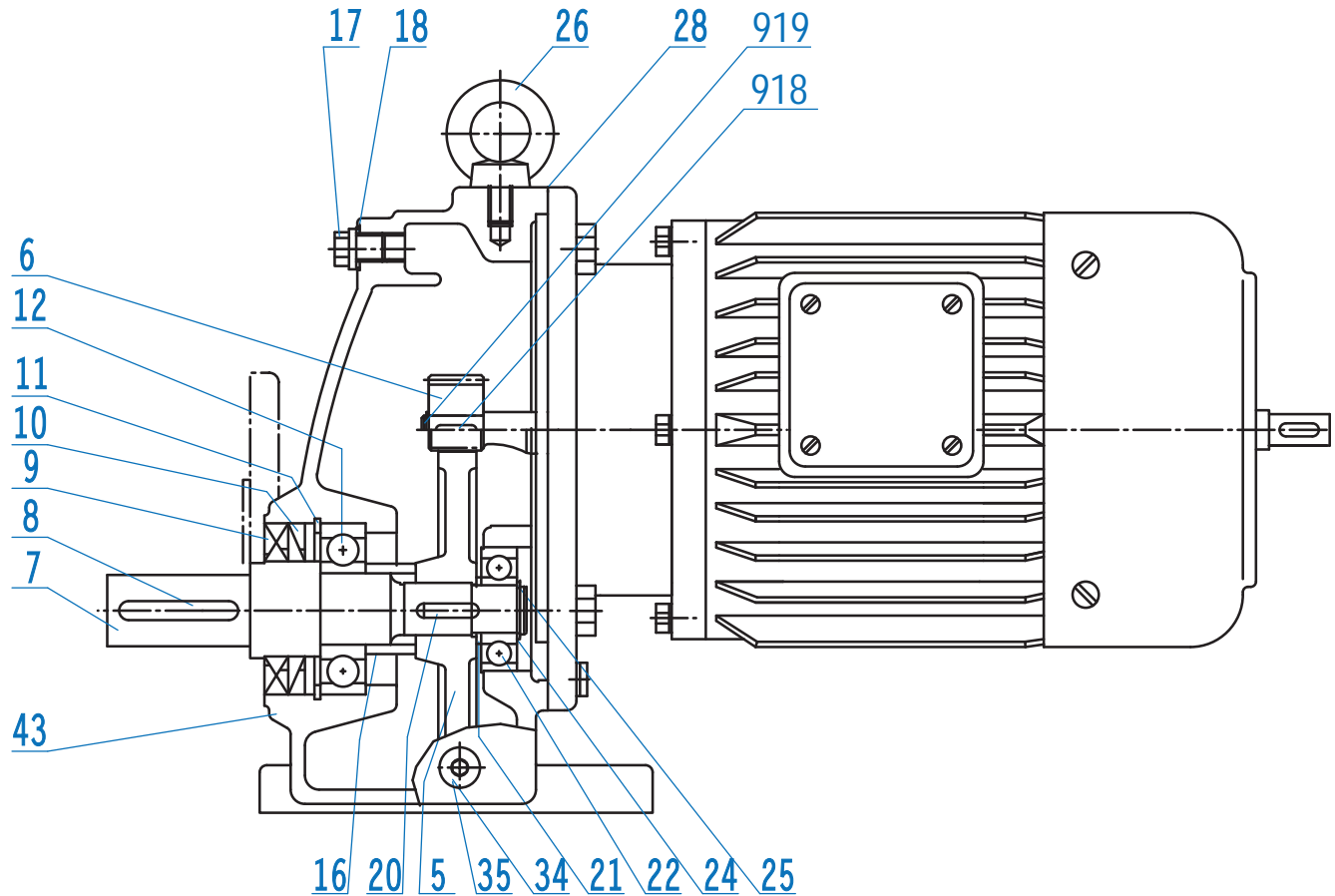
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HELICAL IN-LINE PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



SK 11E - SK 51E Foot Mount

5	Gear	16	Spacer	26	Flanged Eye Bolt
6	Pinion	17	Vent Plug	28	Gasket
7	Output Shaft	18	Seal	34	Drain Plug
8	Key	20	Key	35	Gasket
9	Oil Seal	21	Spacer	43	Gearcase
10	Oil Seal	22	Anti-Friction Bearing	918	Key
11	Snap Ring	24	Shim	919	Snap Ring
12	Anti-Friction Bearing	25	Snap Ring		



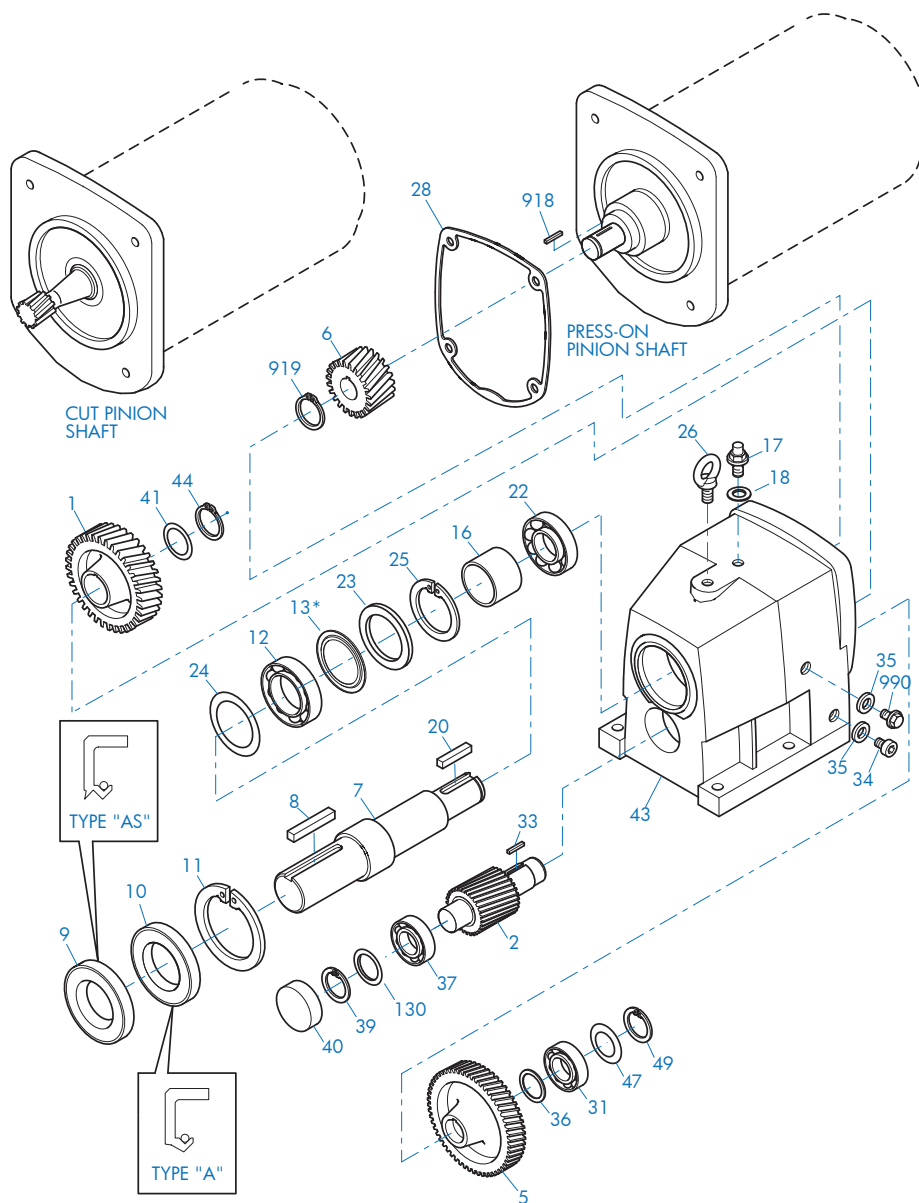
DRIVESYSTEMS

HELICAL IN-LINE PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15100 - 3 of 12



SK02 - SK52 Foot Mount

1	Gear	18	Seal	37	Anti-Friction Bearing
2	Pinion Shaft	20	Key	39	Snap Ring
5	Gear	22	Anti-Friction Bearing	40	Bore Plug
6	Pinion	23	Thrust Washer	41	Shim
7	Output Shaft	24	Shim	43	Gearcase
8	Key	25	Snap Ring	44	Snap Ring
9	Oil Seal	26	Flanged Eye Bolt	47	Shim
10	Oil Seal	28	Gasket	49	Snap Ring
11	Snap Ring	31	Anti-Friction Bearing	130	Shim
12	Anti-Friction Bearing	33	Key	918	Key
13	NILOS Ring*	34	Drain Plug	919	Snap Ring
16	Spacer	35	Gasket	990	Oil Level Plug
17	Vent Plug	36	Spacer		

* Conditionally used part

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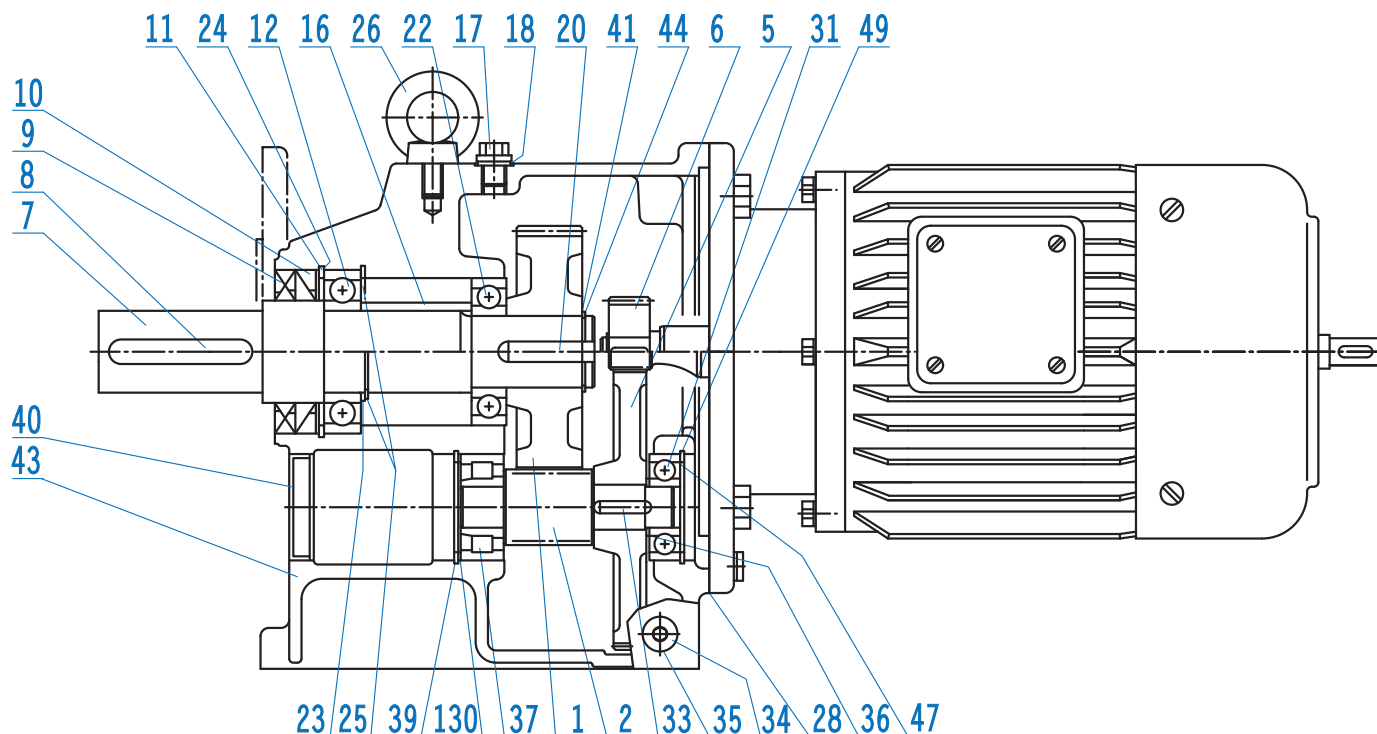
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HELICAL IN-LINE PARTS LIST DRAWINGS

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SK02 - SK52 Foot Mount

1 Gear	18 Seal	37 Anti-Friction Bearing
2 Pinion Shaft	20 Key	39 Snap Ring
5 Gear	22 Anti-Friction Bearing	40 Bore Plug
6 Pinion	23 Thrust Washer	41 Shim
7 Output Shaft	24 Shim	43 Gearcase
8 Key	25 Snap Ring	44 Snap Ring
9 Oil Seal	26 Flanged Eye Bolt	47 Shim
10 Oil Seal	28 Gasket	49 Snap Ring
11 Snap Ring	31 Anti-Friction Bearing	130 Shim
12 Anti-Friction Bearing	33 Key	918 Key
13 NILOS Ring*	34 Drain Plug	919 Snap Ring
16 Spacer	35 Gasket	
17 Vent Plug	36 Spacer	

* Conditionally used part



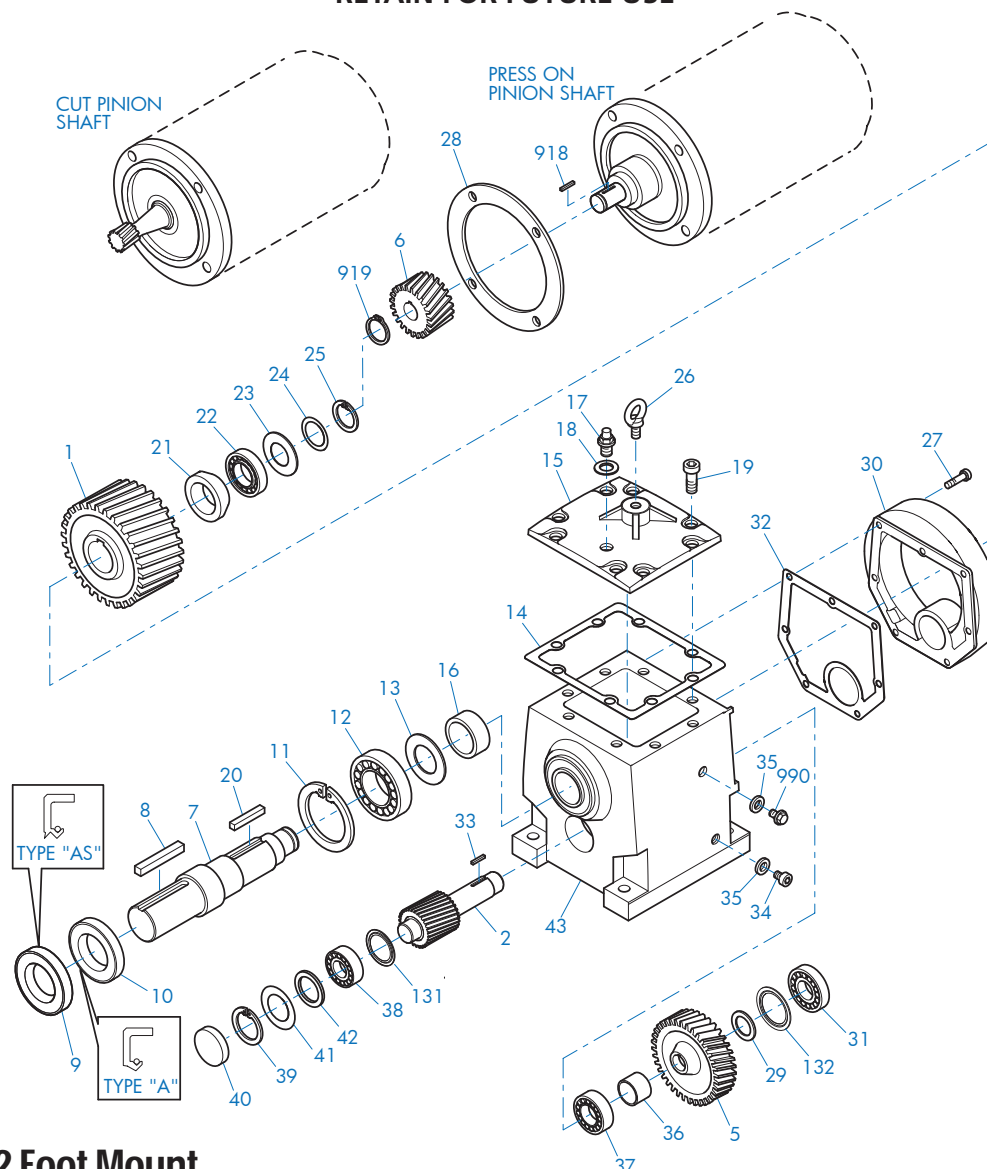
DRIVESYSTEMS

HELICAL IN-LINE PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15100 - 5 of 12



SK62 - SK102 Foot Mount

1	Gear	19	Bolt	35	Gasket
2	Pinion Shaft	20	Key	36	Spacer
5	Gear	21	Spacer	37	Anti-Friction Bearing
6	Pinion	22	Anti-Friction Bearing	38	Anti-Friction Bearing
7	Output Shaft	23	Thrust Washer	39	Snap Ring
8	Key	24	Shim	40	Bore Plug
9	Oil Seal	25	Snap Ring	41	Shim
10	Oil Seal	26	Flanged Eye Bolt	42	Thrust Washer
11	Snap Ring	27	Bolt	43	Gearcase
12	Anti-Friction Bearing	28	Gasket	131	NILOS Ring
13	NILOS ring	29	Spacer	132	NILOS Ring
14	Gasket	30	Input Cover	918	Key
15	Inspection Cover	31	Anti-Friction Bearing	919	Snap Ring
16	Spacer	32	Gasket	990	Oil Level Plug
17	Vent Plug	33	Key		
18	Seal	34	Drain Plug		

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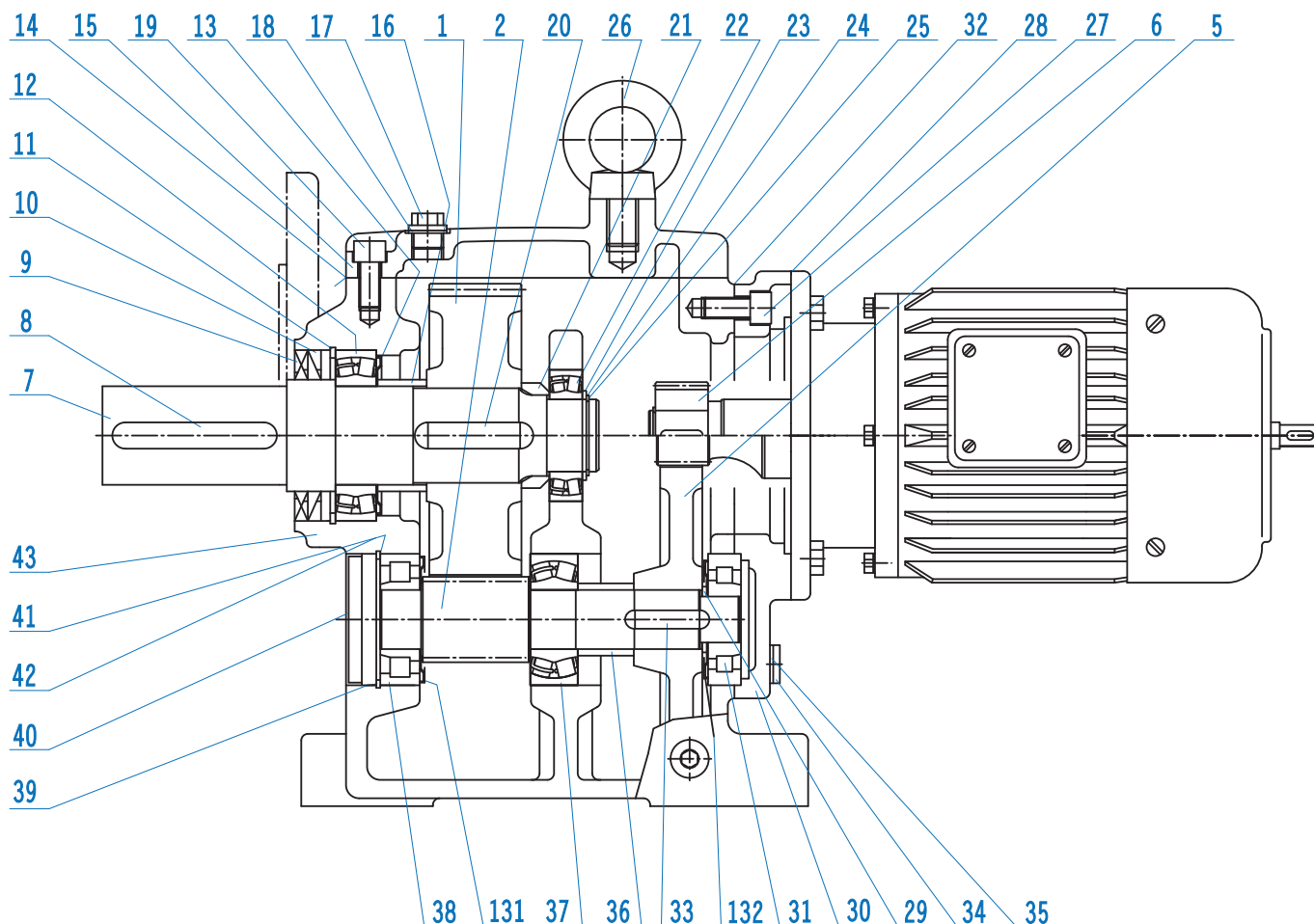
DRIVESYSTEMS

HELICAL IN-LINE PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15100 - 6 of 12



SK62 - SK102 Foot Mount

1 Gear	18 Seal	33 Key
2 Pinion Shaft	19 Bolt	34 Drain Plug
5 Gear	20 Key	35 Gasket
6 Pinion	21 Spacer	36 Spacer
7 Output Shaft	22 Anti-Friction Bearing	37 Anti-Friction Bearing
8 Key	23 Thrust Washer	38 Anti-Friction Bearing
9 Oil Seal	24 Shim	39 Snap Ring
10 Oil Seal	25 Snap Ring	40 Bore Plug
11 Snap Ring	26 Flanged Eye Bolt	41 Shim
12 Anti-Friction Bearing	27 Bolt	42 Thrust Washer
13 NILOS ring*	28 Gasket	43 Gearcase
14 Gasket	29 Spacer	131 NILOS Ring*
15 Inspection Cover	30 Input Cover	132 NILOS Ring*
16 Spacer	31 Anti-Friction Bearing	918 Key
17 Vent Plug	32 Gasket	919 Snap Ring

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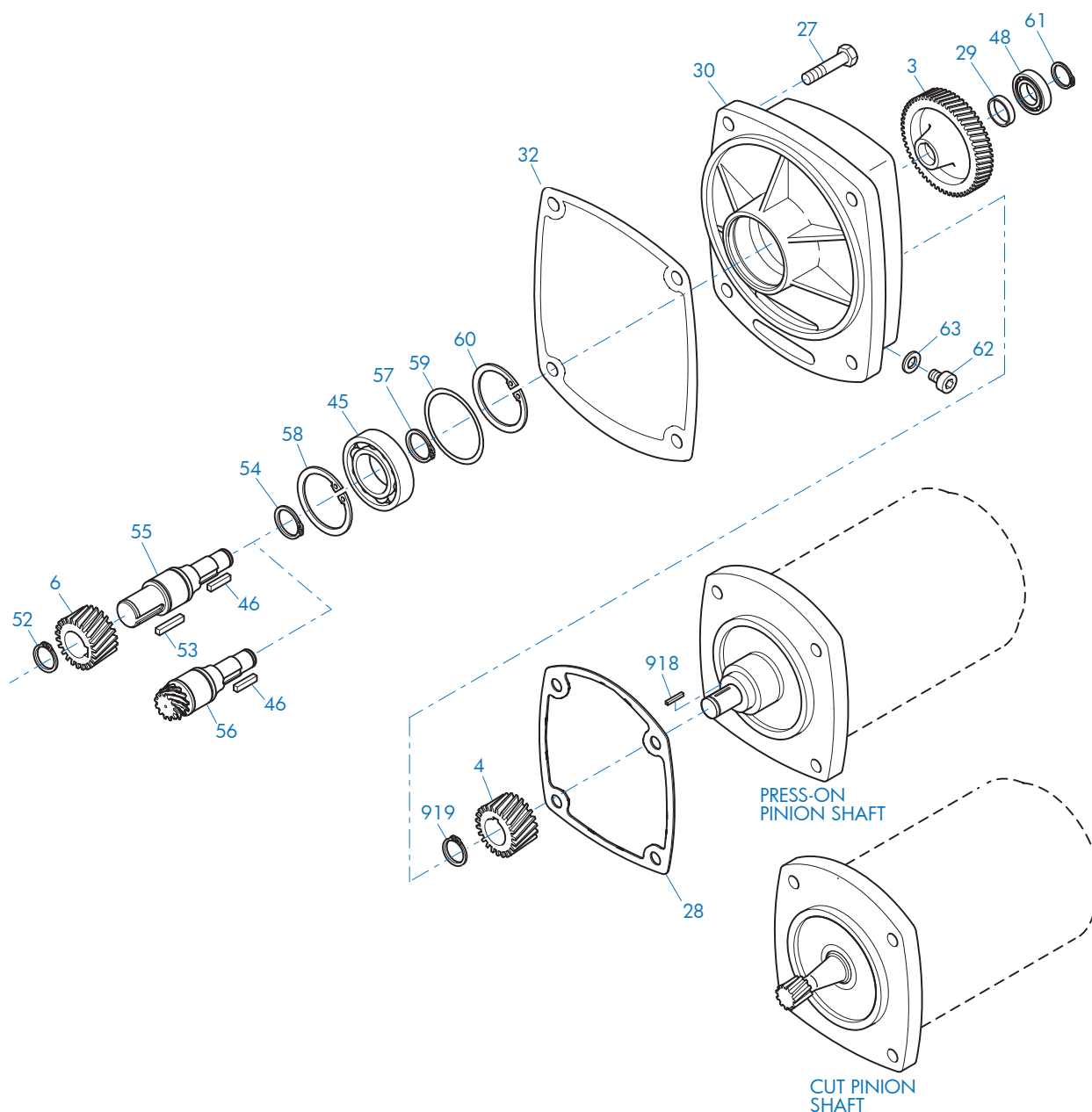
DRIVESYSTEMS

HELICAL IN-LINE PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15100 - 7 of 12



SK03 - SK53 Third Stage Reduction Gear

3	Gear	46	Key	59	Shim
4	Pinion	48	Anti-Friction Bearing	60	Snap Ring
6	Pinion	52	Snap Ring	61	Snap Ring
27	Bolt	53	Key	62	Oil Plug
28	Gasket	54	Snap Ring	63	Gasket
29	Spacer	55	Intermediate Shaft, Plain	918	Key
30	Third Reduction Gearcase	56	Intermediate Shaft, Gearcut	919	Snap Ring
32	Gasket	57	Snap Ring		
45	Anti-Friction Bearing	58	Snap Ring		

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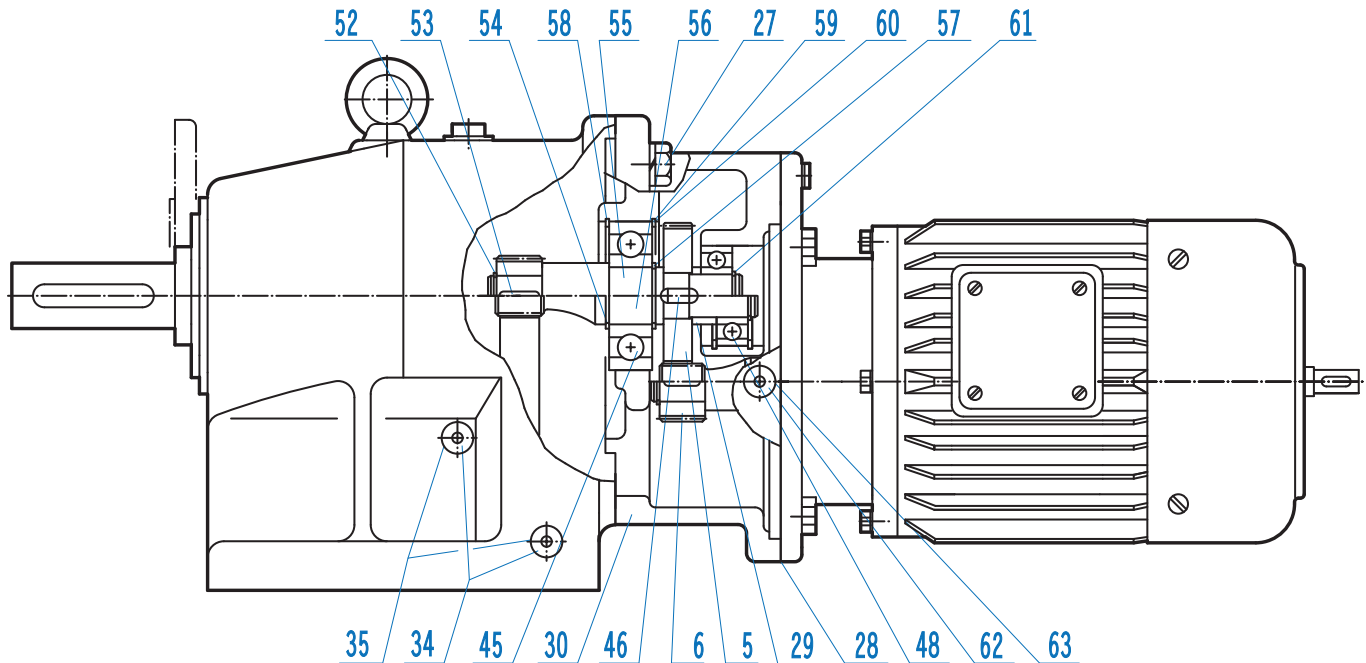
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HELICAL IN-LINE PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15100 - 8 of 12



SK03 - SK53 Using Third Stage Reduction Gear

3 Gear	46 Key	59 Shim
4 Pinion	48 Anti-Friction Bearing	60 Snap Ring
6 Pinion	52 Snap Ring	61 Snap Ring
27 Bolt	53 Key	62 Oil Plug
28 Gasket	54 Snap Ring	63 Gasket
29 Spacer	55 Intermediate Shaft, Plain	918 Key
30 Third Reduction Gearcase	56 Intermediate Shaft, Gearcut	919 Snap Ring
32 Gasket	57 Snap Ring	
45 Anti-Friction Bearing	58 Snap Ring	



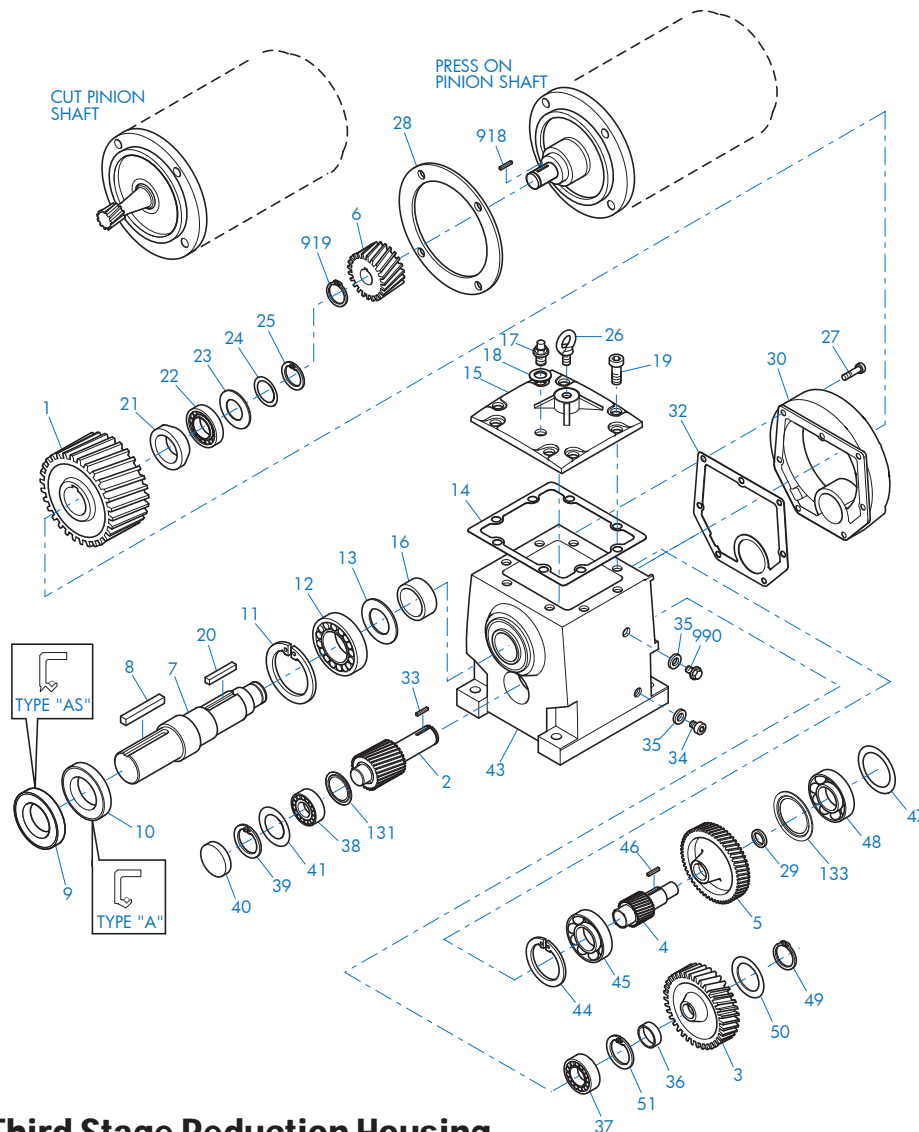
DRIVESYSTEMS

HELICAL IN-LINE PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15100 - 9 of 12



SK63 - SK103 Third Stage Reduction Housing

1 Gear	19 Bolt	38 Anti-Friction Bearing
2 Pinion Shaft	20 Key	39 Snap Ring
3 Gear	21 Spacer	40 Bore Plug
4 Pinion Shaft	22 Anti-Friction Bearing	41 Shim
5 Gear	23 Thrust Washer	43 Gearcase
6 Pinion	24 Shim	44 Snap Ring
7 Output Shaft	25 Snap Ring	45 Anti-Friction Bearing
8 Key	26 Flanged Eye Bolt	46 Key
9 Oil Seal	27 Bolt	47 Shim
10 Oil Seal	28 Gasket	48 Bearing
11 Snap Ring	29 Spacer	49 Snap Ring
12 Anti-Friction Bearing	30 Input Cover	50 Thrust Washer
13 NILOS Ring	32 Gasket	51 Snap Ring
14 Gasket	33 Key	131 NILOS Ring
15 Inspection Cover	34 Drain plug	133 NILOS Ring
16 Spacer	35 Gasket	918 Key
17 Vent Plug	36 Spacer	919 Snap Ring
18 Seal	37 Anti-Friction Bearing	990 Oil Level Plug

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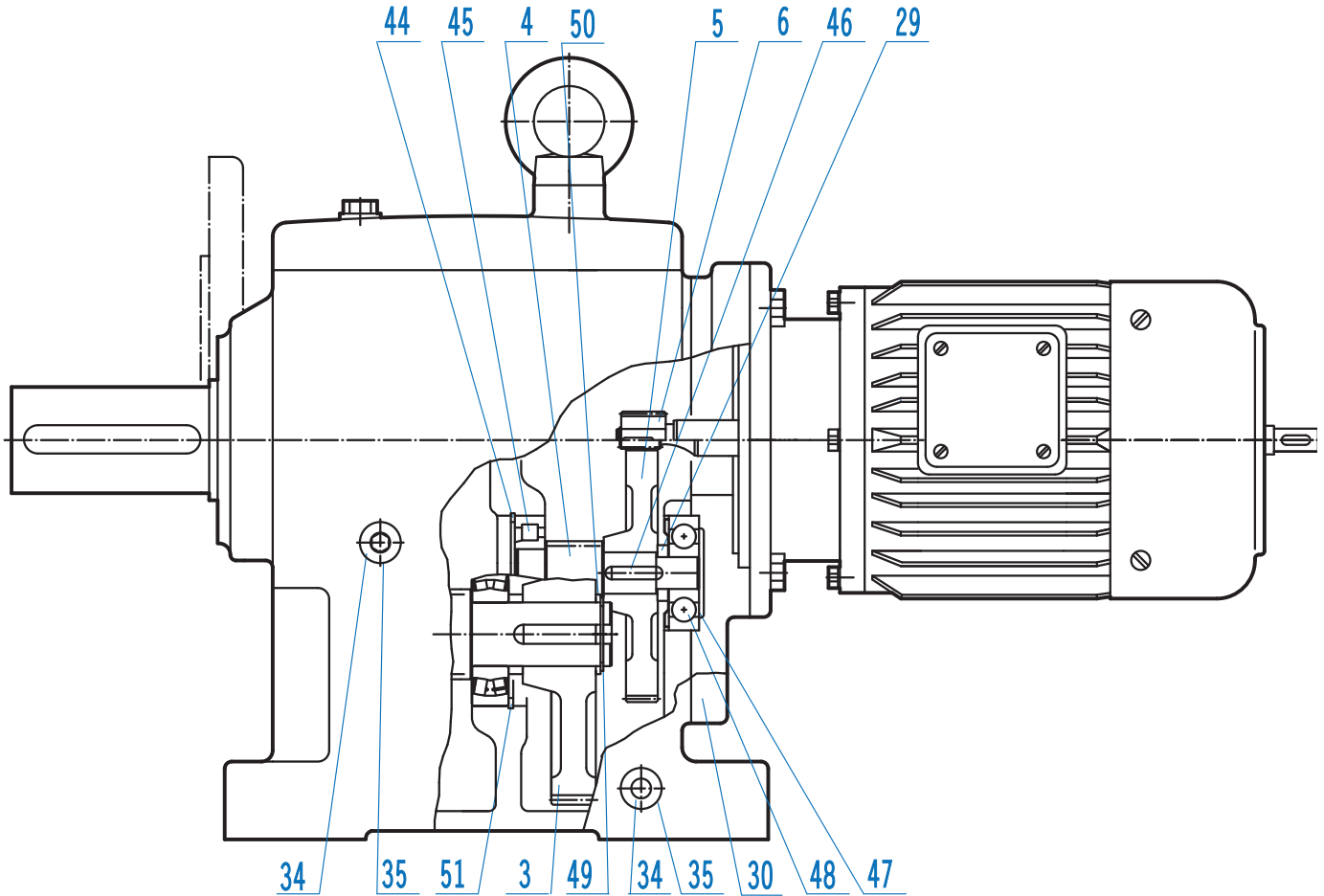
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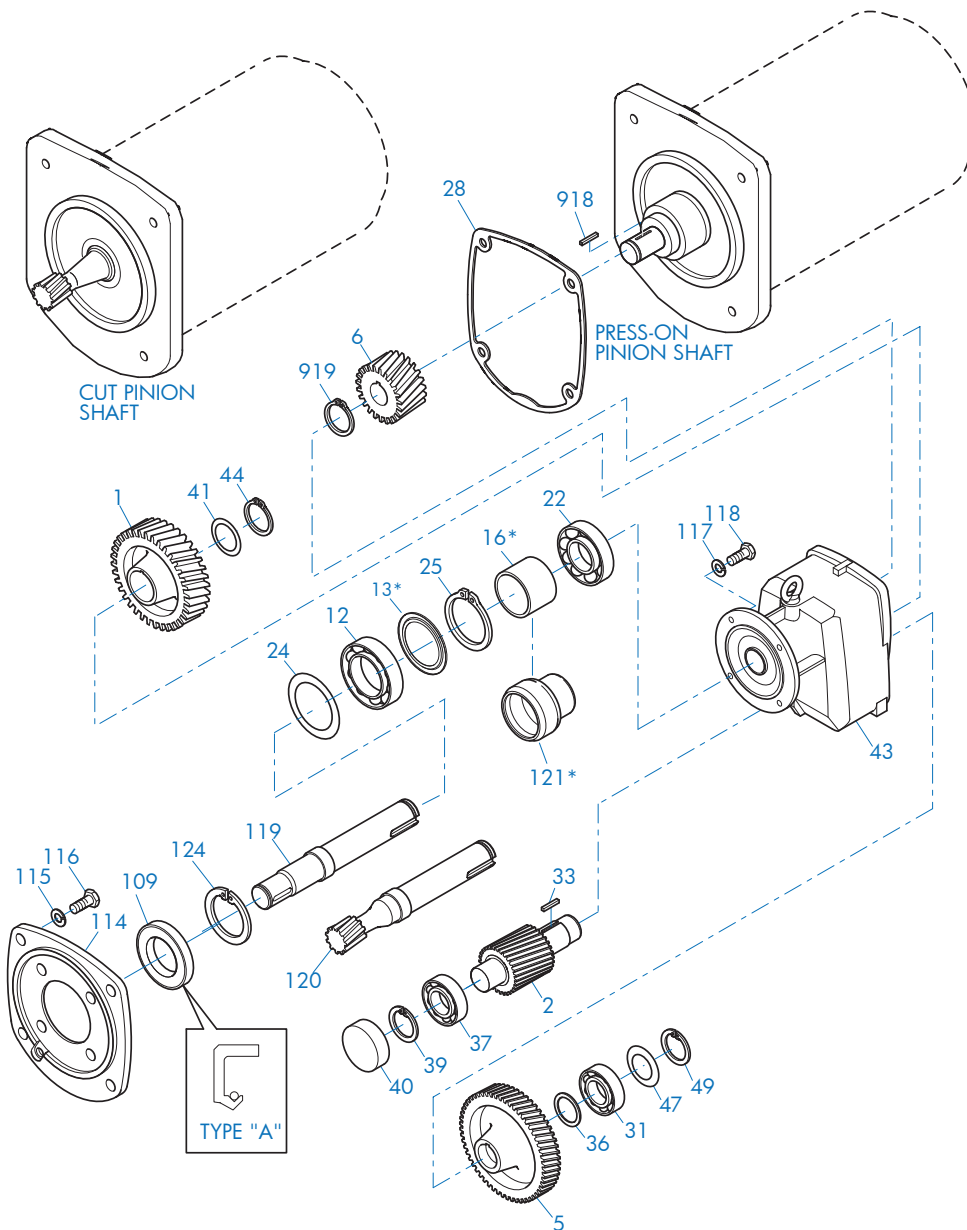


SK63 - SK103 Foot Mount

3	Gear	32	Gasket	47	Shim
4	Pinion Shaft	33	Key	48	Bearing
5	Gear	34	Drain plug	49	Snap Ring
6	Pinion	35	Gasket	50	Thrust Washer
28	Gasket	44	Snap Ring	51	Snap Ring
29	Spacer	45	Anti-Friction Bearing	133	NILOS Ring
30	Input Cover	46	Key		

HELICAL IN-LINE PARTS LIST DRAWINGS

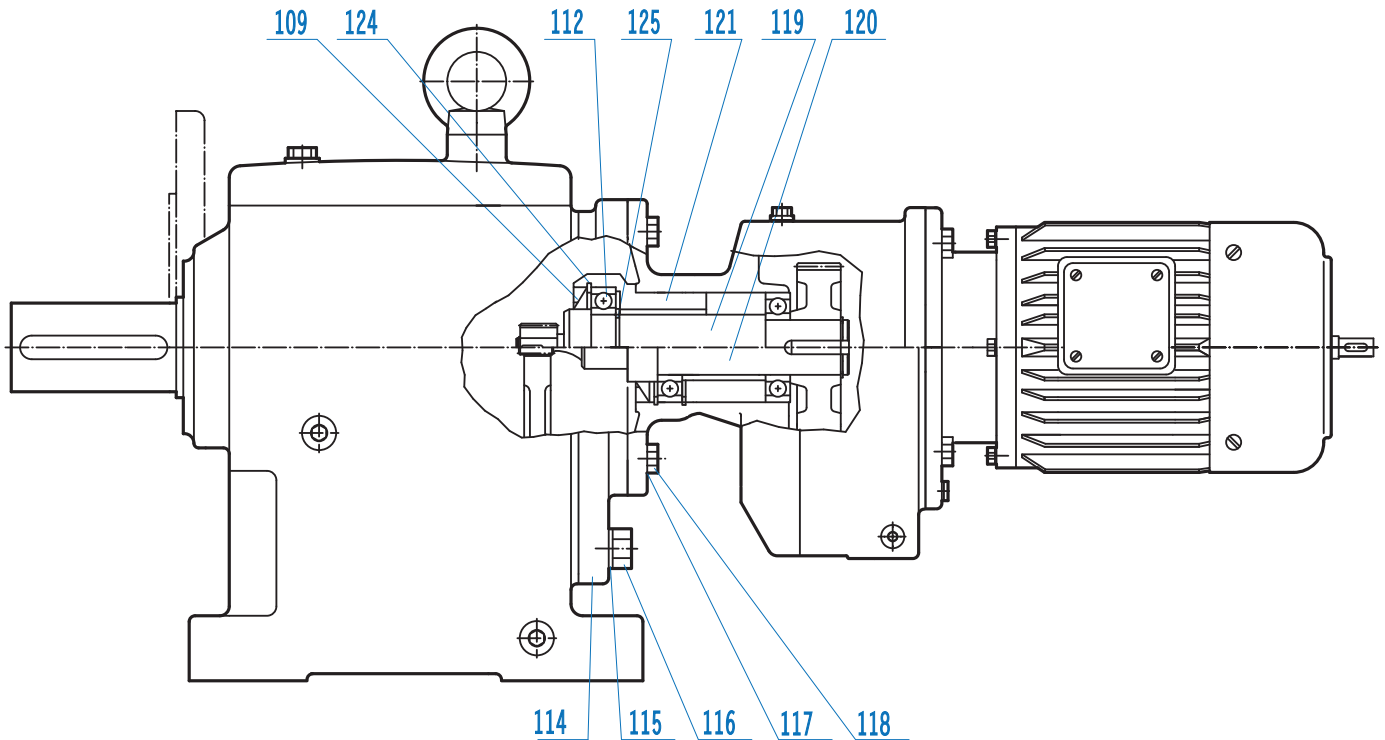
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SK12/02 - SK103/52 Input Compound Reduction

1 Gear	33 Key	115 Lock Washer
2 Pinion Shaft	36 Spacer	116 Bolt
5 Gear	37 Anti-Friction Bearing	117 Lock Washer
6 Pinion	39 Snap Ring	118 Bolt
12 Anti-Friction Bearing	40 Bore Plug	119 Intermediate Shaft, Plain
13 Nilos Ring*	41 Shim	120 Intermediate Shaft, Gearcut
16 Spacer*	43 Gearcase	121 Bearing Sleeve*
22 Anti-Friction Bearing	44 Snap Ring	124 Snap Ring
24 Shim	47 Shim	918 Key
25 Snap Ring	49 Snap Ring	919 Snap Ring
28 Gasket	109 Oil Seal	
31 Anti-Friction Bearing	114 Intermediate Flange	

* Conditionally used part



SK12/02 - SK103/52 Input Compound Reduction

12	Anti-Friction Bearing	115	Lock Washer	120	Intermediate Shaft, Gearcut
13	Nilos Ring*	116	Bolt	121	Bearing Sleeve*
16	Spacer*	117	Lock Washer	124	Snap Ring
25	Snap Ring	118	Bolt		
109	Oil Seal	119	Intermediate Shaft, Plain		
114	Intermediate Flange				

* Conditionally used part



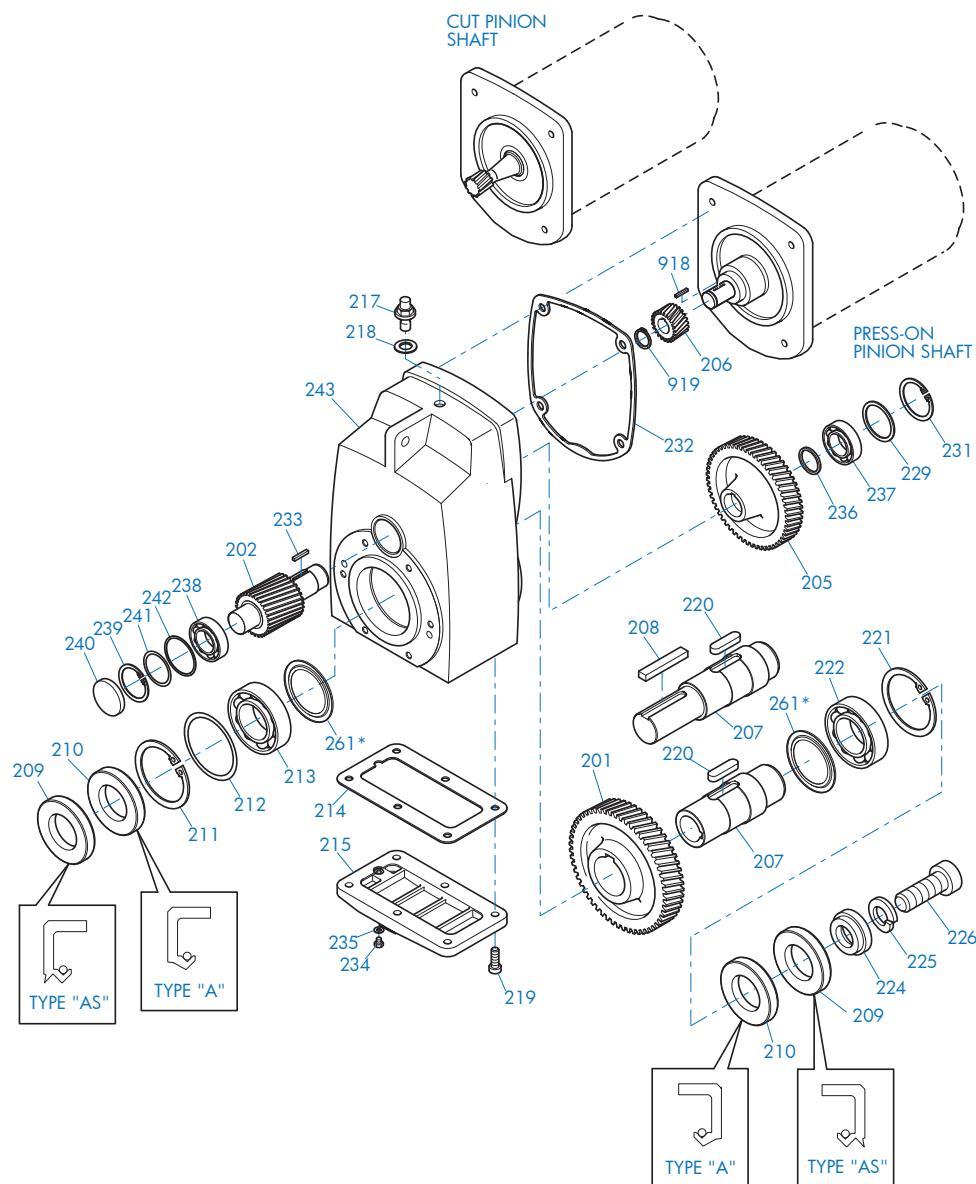
DRIVESYSTEMS

CLINCHER™ PARTS LIST DRAWINGS

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U15200 - 1 of 12



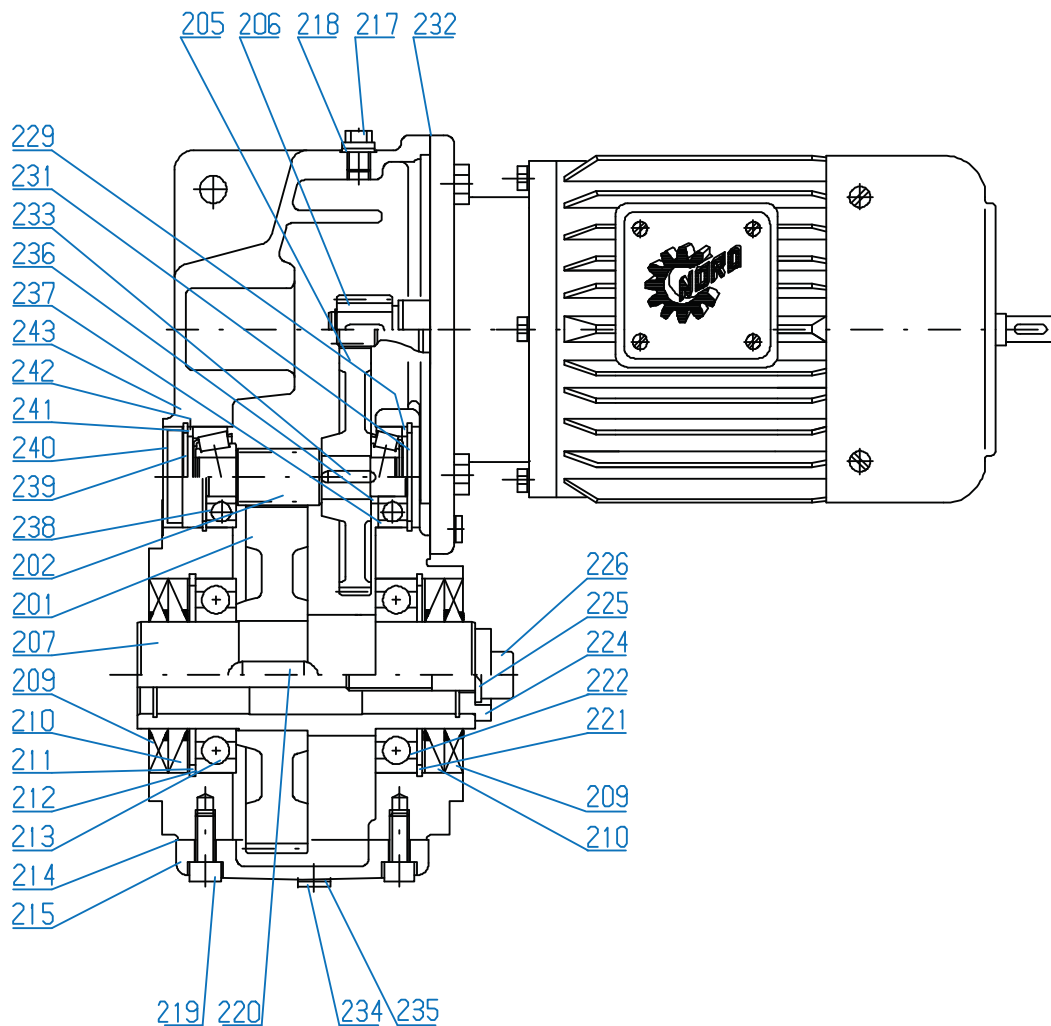
SK 0182NB - SK 5282

201 Gear	217 Vent Plug	234 Drain Plug
202 Pinion Shaft	218 Gasket	235 Gasket
205 Gear	219 Bolt	236 Thrust Washer
206 Pinion	220 Key	237 Anti-Friction Bearing
207 Output Shaft	221 Snap Ring	238 Anti-Friction Bearing
208 Key	222 Anti-Friction Bearing	239 Snap Ring
209 Oil Seal	224 Retaining Washer	240 Bore Plug
210 Oil Seal	225 Lock Washer	241 Shim
211 Snap Ring	226 Bolt	242 Thrust Washer
212 Shim	229 Thrust Washer	243 Gearcase
213 Anti-Friction Bearing	231 Snap Ring	261 Nilos Ring*
214 Gasket	232 Gasket	918 Key
215 Inspection Cover	233 Key	919 Snap Ring

* Conditionally used part

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SK 0182NB - SK 5282

201 Gear	217 Vent Plug	233 Key
202 Pinion Shaft	218 Gasket	234 Drain Plug
205 Gear	219 Bolt	235 Gasket
206 Pinion	220 Key	236 Thrust Washer
207 Output Shaft	221 Snap Ring	237 Anti-Friction Bearing
209 Oil Seal	222 Anti-Friction Bearing	238 Anti-Friction Bearing
210 Oil Seal	224 Retaining Washer	239 Snap Ring
211 Snap Ring	225 Lock Washer	240 Bore Plug
212 Shim	226 Bolt	241 Shim
213 Anti-Friction Bearing	229 Thrust Washer	242 Thrust Washer
214 Gasket	231 Snap Ring	243 Gearcase
215 Inspection Cover	232 Gasket	261 Nilos Ring*

* Conditionally used part

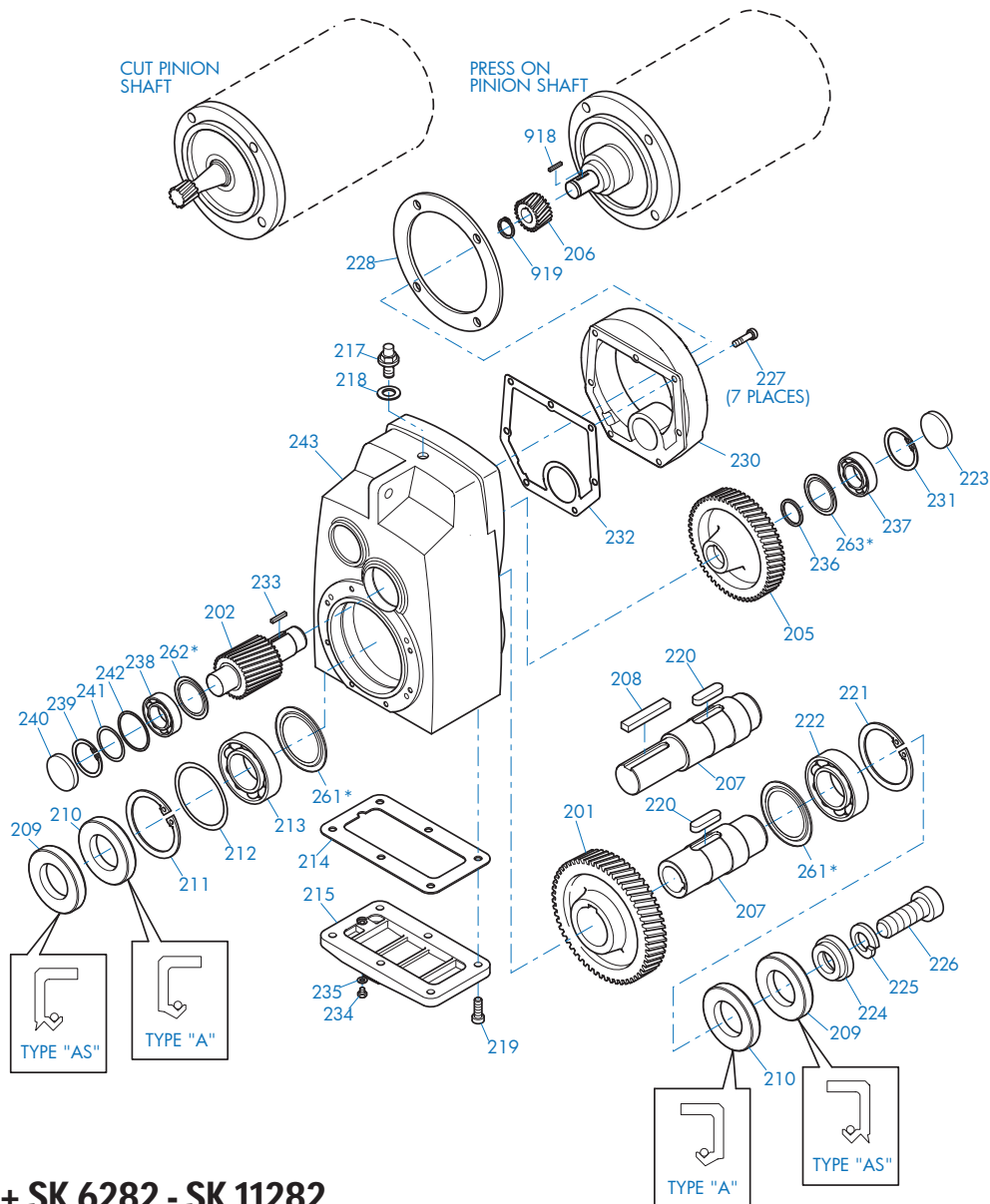


DRIVESYSTEMS

CLINCHER™ PARTS LIST DRAWINGS



U15200 - 3 of 12



SK 0282NB + SK 6282 - SK 11282

201 Gear	219 Bolt	236 Thrust Washer
202 Pinion Shaft	220 Key	237 Anti-Friction Bearing
205 Gear	221 Snap Ring	238 Anti-Friction Bearing
206 Pinion	222 Anti-Friction Bearing	239 Snap Ring
207 Output Shaft	224 Retaining Washer	240 Bore Plug
208 Key	225 Lock Washer	241 Shim
209 Oil Seal	226 Bolt	242 Thrust Washer
210 Oil Seal	227 Bolt	243 Gear case
211 Snap Ring	228 Gasket	261 Nilos Ring*
212 Shim	230 Input Cover	262 Nilos Ring*
213 Anti-Friction Bearing	231 Snap Ring	263 Nilos Ring*
214 Gasket	232 Gasket	918 Key
215 Inspection Cover	233 Key	919 Snap Ring
217 Vent Plug	234 Drain Plug	
218 Gasket	235 Gasket	

* Conditionally used part

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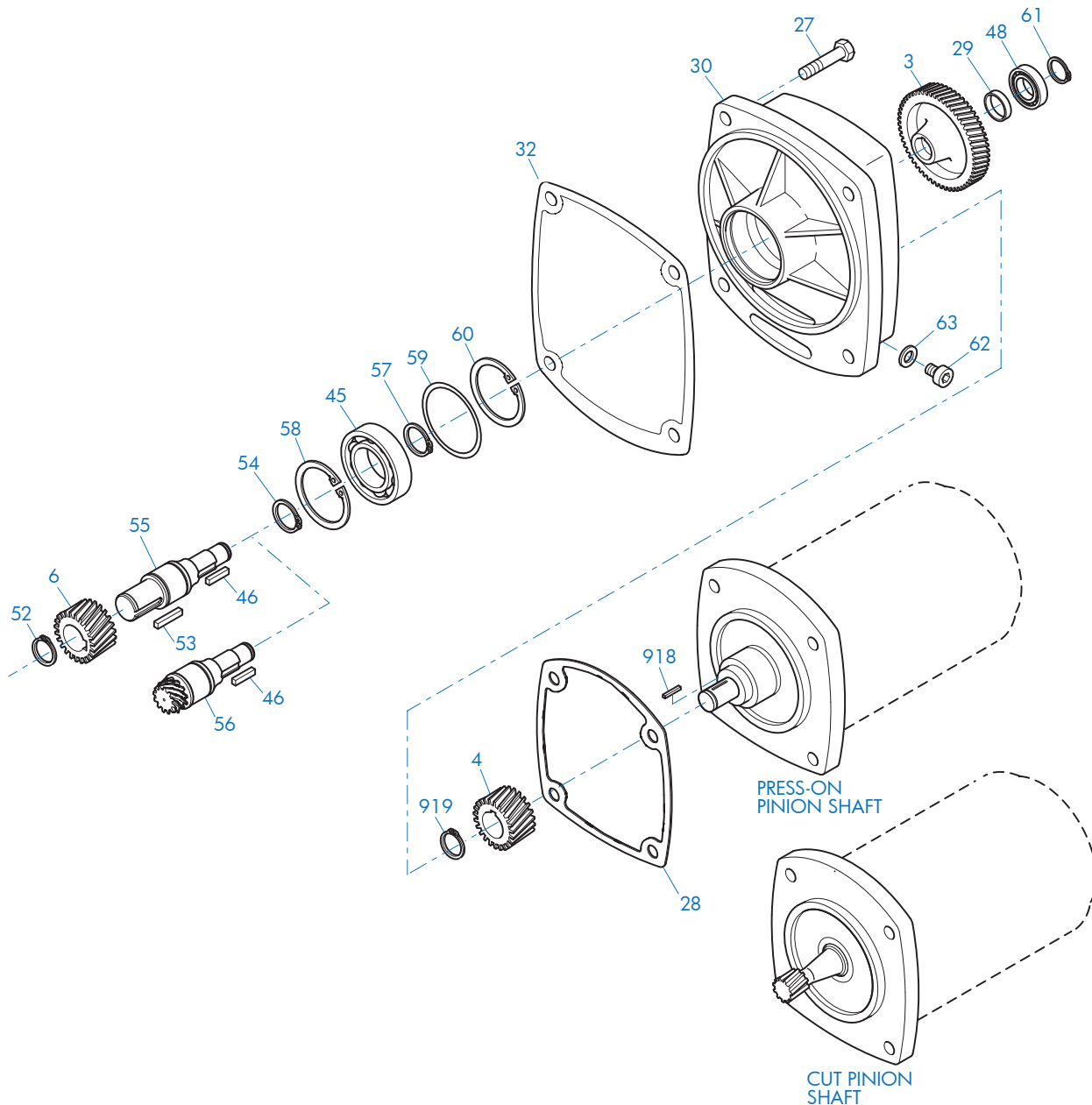
DRIVESYSTEMS

CLINCHER™ PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15200 - 5 of 12



SK 2382 - SK 5382 Third Stage Reduction Housing

3	Gear	46	Key	59	Shim
4	Pinion	48	Anti-Friction Bearing	60	Snap Ring
6	Pinion	52	Snap Ring	61	Snap Ring
27	Bolt	53	Key	62	Oil Plug
28	Gasket	54	Snap Ring	63	Gasket
29	Spacer	55	Intermediate Shaft, Plain	918	Key
30	Third Reduction Gearcase	56	Intermediate Shaft, Gearcut	919	Snap Ring
32	Gasket	57	Snap Ring		
45	Anti-Friction Bearing	58	Snap Ring		

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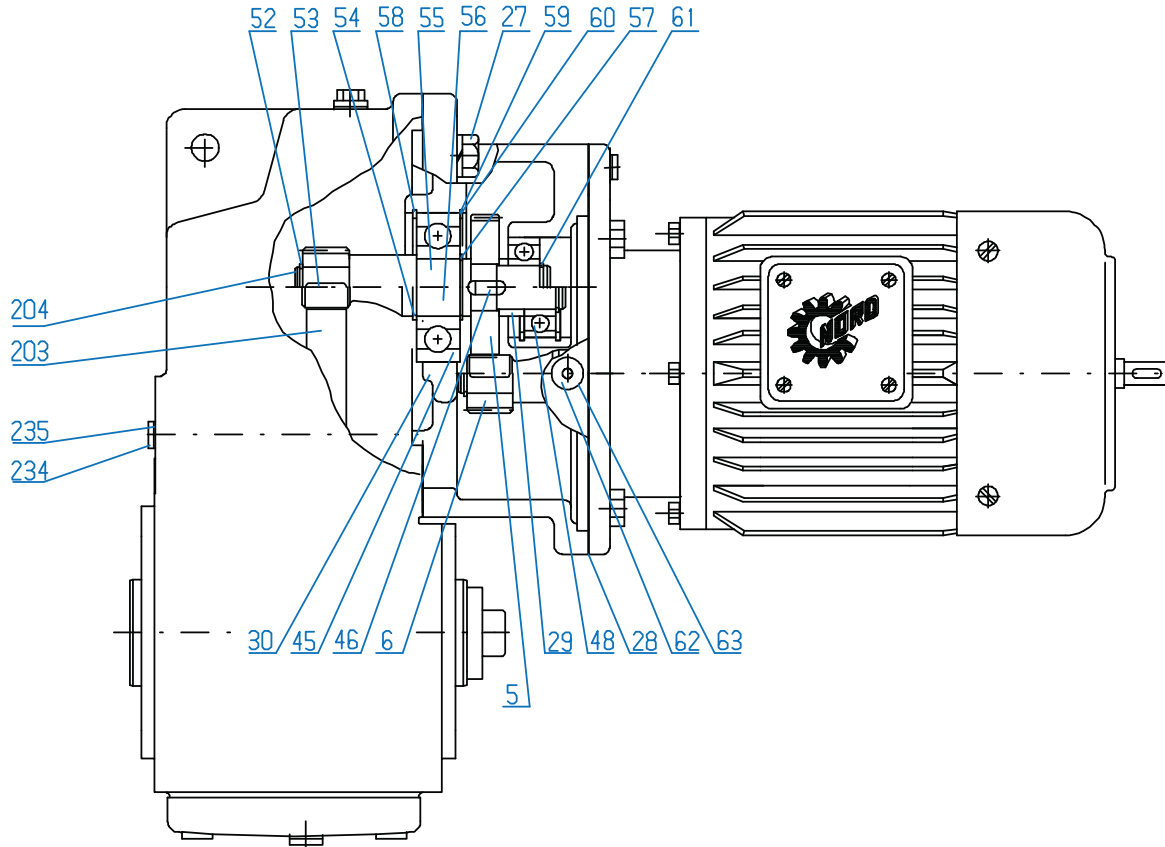
DRIVESYSTEMS

CLINCHER™ PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15200 - 6 of 12



SK 2382 - SK 5382 Third Stage Reduction Housing

3	Gear	46	Key	59	Shim
4	Pinion	48	Anti-Friction Bearing	60	Snap Ring
6	Pinion	52	Snap Ring	61	Snap Ring
27	Bolt	53	Key	62	Oil Plug
28	Gasket	54	Snap Ring	63	Gasket
29	Spacer	55	Intermediate Shaft, Plain	203	Gear
32	Gasket	56	Intermediate Shaft, Gearcut	204	Pinion Shaft
30	Third Reduction Gearcase	57	Snap Ring	234	Oil Plug
45	Anti-Friction Bearing	58	Snap Ring	235	Gasket

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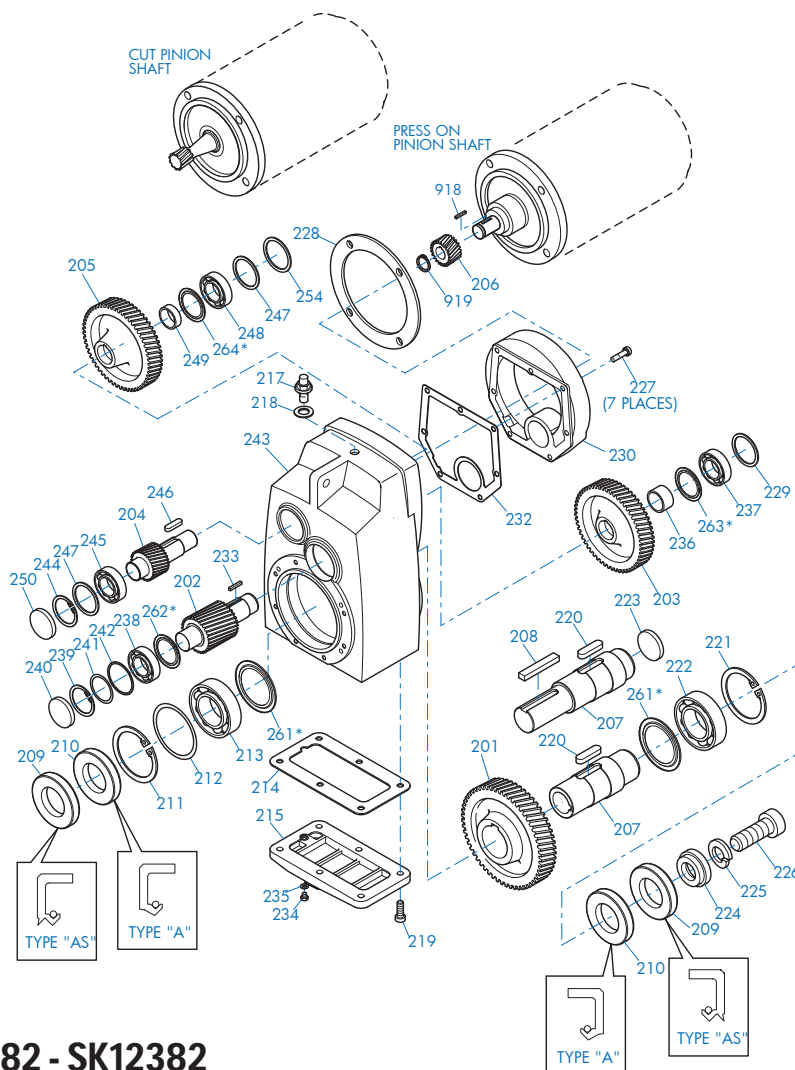
DRIVESYSTEMS

CLINCHER™ PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15200 - 7 of 12



SK 1382 NB + SK 6382 - SK12382

201 Gear	221 Snap Ring	241 Shim
202 Pinion Shaft	222 Anti-Friction Bearing	242 Thrust Washer
203 Gear	223 Bore Plug	243 Gearcase
204 Pinion Shaft	224 Retaining Washer	244 Snap Ring
205 Gear	225 Lock Washer	245 Anti-Friction Bearing
206 Pinion	226 Bolt	246 Key
207 Output Shaft	227 Bolt	247 Shim
208 Key	228 Gasket	248 Anti-Friction Bearing
209 Oil Seal	229 Thrust Washer	249 Spacer
210 Oil Seal	230 Input Cover	250 Bore Plug
211 Snap Ring	232 Gasket	254 Thrust Washer
212 Shim	233 Key	261 Nilos Ring*
213 Anti-Friction Bearing	234 Drain Plug	262 Nilos Ring*
214 Gasket	235 Gasket	263 Nilos Ring*
215 Inspection Cover	236 Thrust Washer	264 Nilos Ring*
217 Vent Plug	237 Anti-Friction Bearing	918 Key
218 Gasket	238 Anti-Friction Bearing	919 Snap Ring
219 Bolt	239 Snap Ring	
220 Key	240 Bore Plug	

* Conditionally used part

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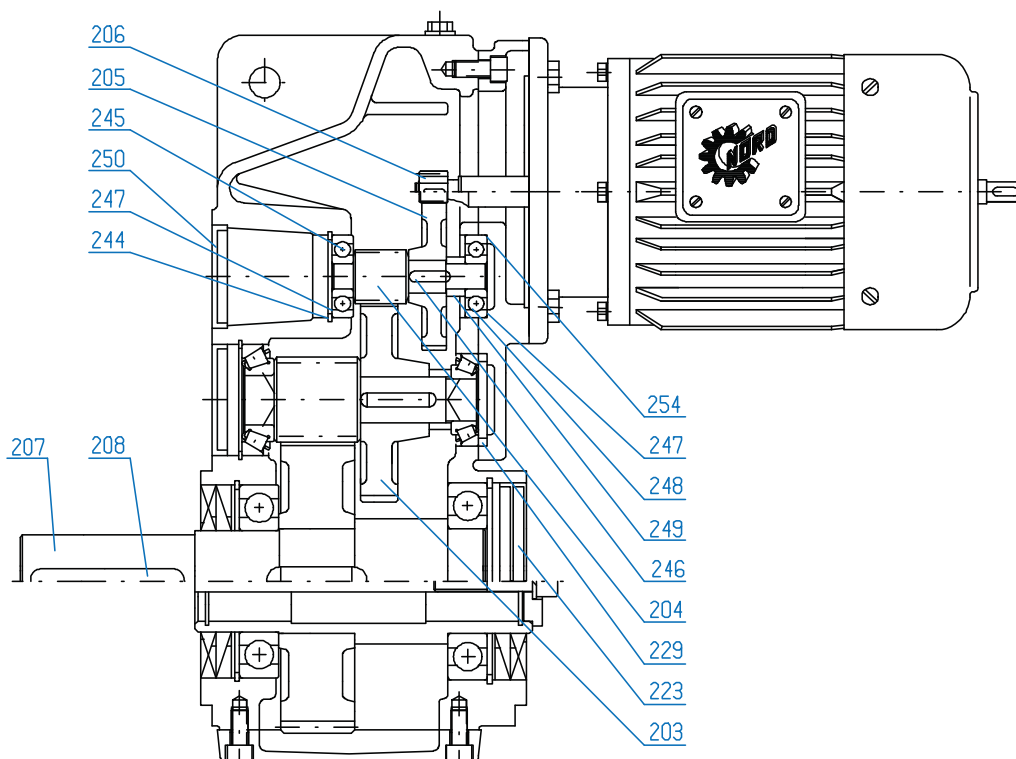
DRIVESYSTEMS

CLINCHER™ PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15200 - 8 of 12



SK 1382 NB + SK 6382 - SK12382

203 Gear	229 Thrust Washer	250 Bore Plug
204 Pinion Shaft	244 Snap Ring	254 Thrust Washer
205 Gear	245 Anti-Friction Bearing	261 Nilos Ring*
206 Pinion	246 Key	262 Nilos Ring*
207 Output Shaft	247 Shim	263 Nilos Ring*
208 Key	248 Anti-Friction Bearing	264 Nilos Ring*
223 Bore Plug	249 Spacer	

* Conditionally used part

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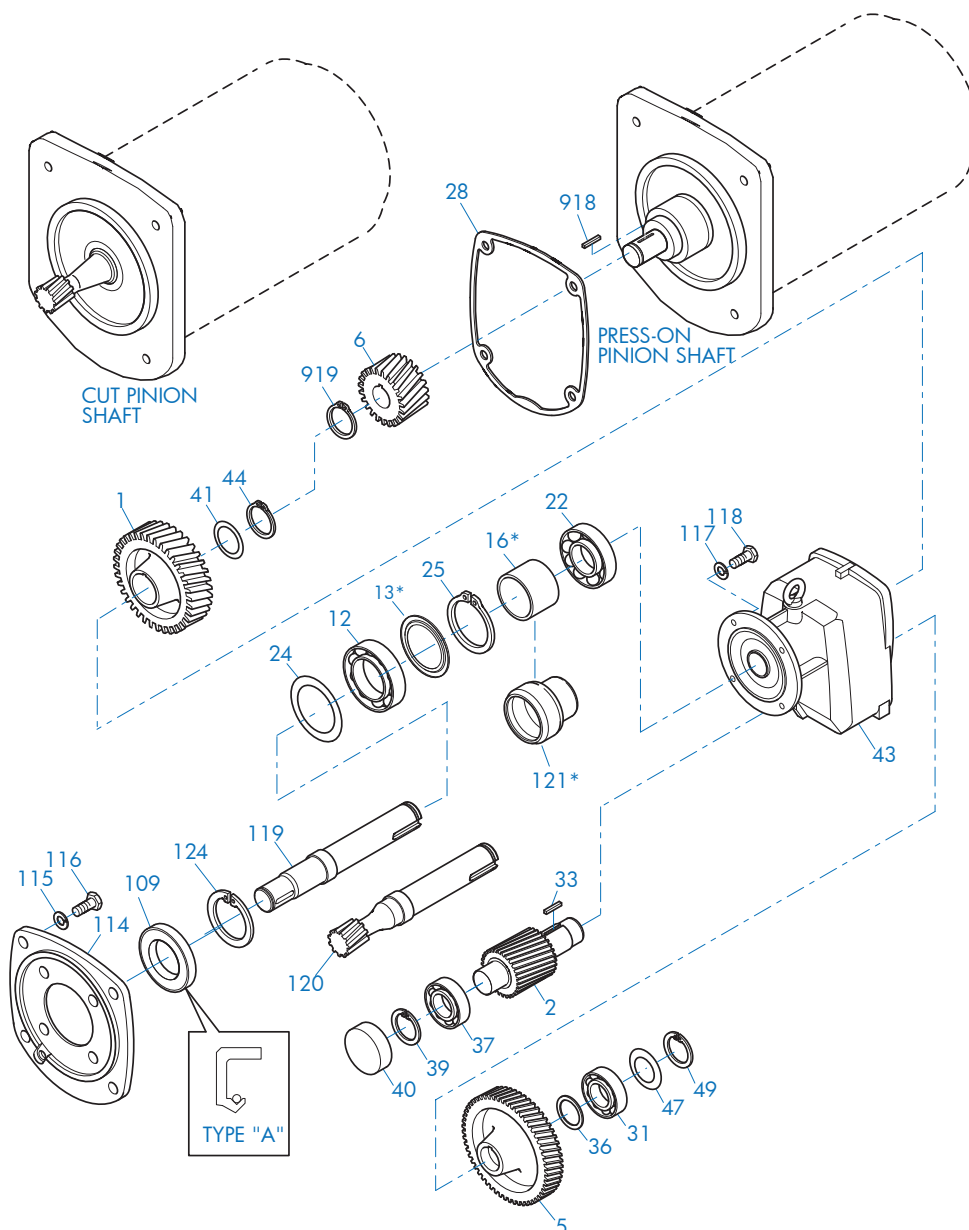
DRIVESYSTEMS

CLINCHER™ PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15200 - 9 of 12



SK1282/02 - SK11382/52 Multi-stage Reduction Unit

1 Gear	33 Key	115 Lock Washer
2 Pinion Shaft	36 Spacer	116 Bolt
5 Gear	37 Anti-Friction Bearing	117 Lock Washer
6 Pinion	39 Snap Ring	118 Bolt
12 Anti-Friction Bearing	40 Bore Plug	119 Intermediate Shaft, Plain
13 Nilos Ring*	41 Shim	120 Intermediate Shaft, Gearcut
16 Spacer*	43 Gearcase	121 Bearing Sleeve*
22 Anti-Friction Bearing	44 Snap Ring	124 Snap Ring
24 Shim	47 Shim	918 Key
25 Snap Ring	49 Snap Ring	919 Snap Ring
28 Gasket	109 Oil Seal	
31 Anti-Friction Bearing	114 Intermediate Flange	

* Conditionally used part

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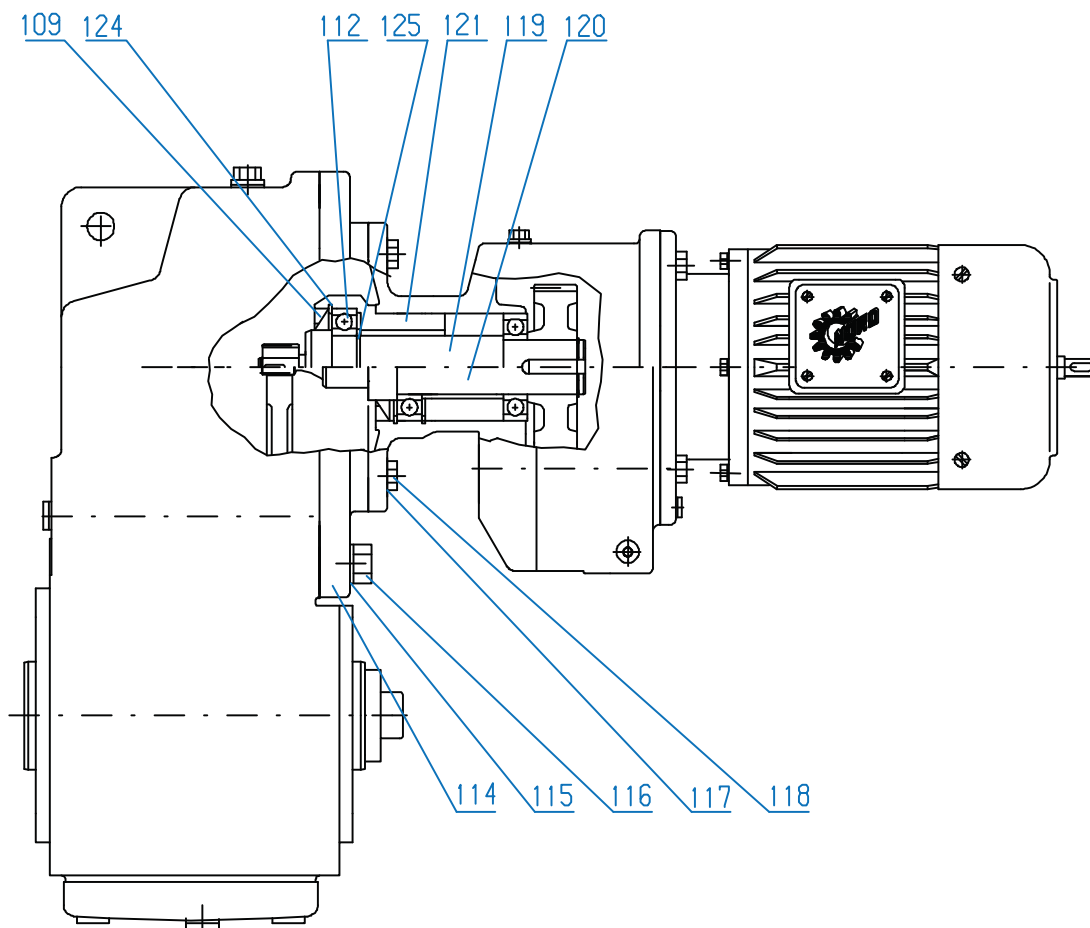
DRIVESYSTEMS

CLINCHER™ PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15200 - 10 of 12



SK 1282/02 - SK 11382/52

12 Anti-friction Bearing	114 Intermediate Flange	119 Intermediate Shaft, Plain
13 Nilos Ring*	115 Lock Washer	120 Intermediate Shaft, Gearcut
16 Spacer	116 Bolt	121 Bearing Sleeve
25 Snap Ring	117 Lock Washer	124 Snap Ring
109 Oil Seal	118 Bolt	

* Conditionally used part

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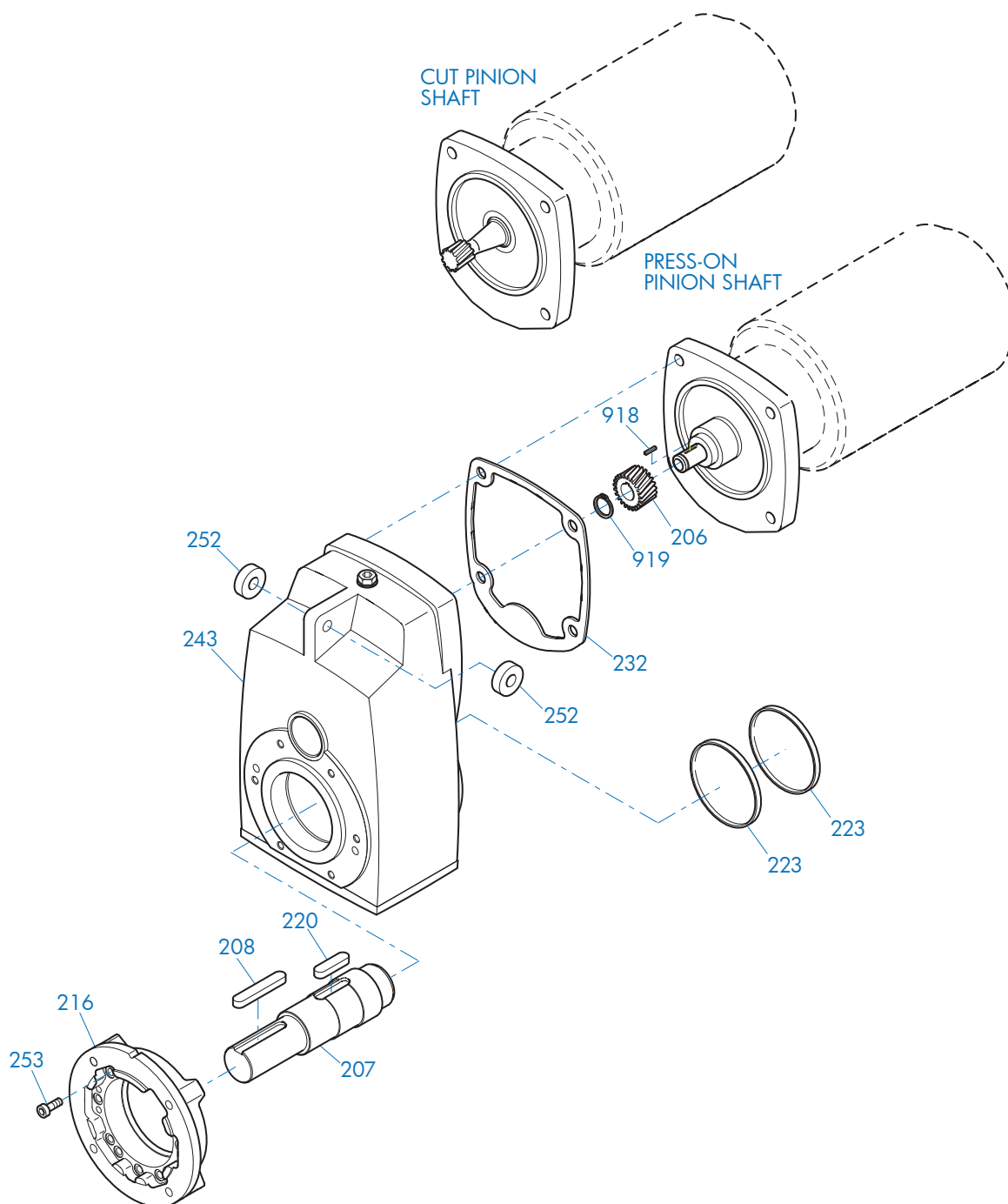
DRIVESYSTEMS

CLINCHER™ PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15200 - 11 of 12



SK 0182NB - SK 11282 & SK 1382 - SK 11382

206 Pinion
207 Output Shaft
208 Key
216 Flange

220 Key
223 Bore Plug
232 Gasket
243 Gearcase

252 Rubber Buffer
253 Bolt
918 Key
919 Snap Ring

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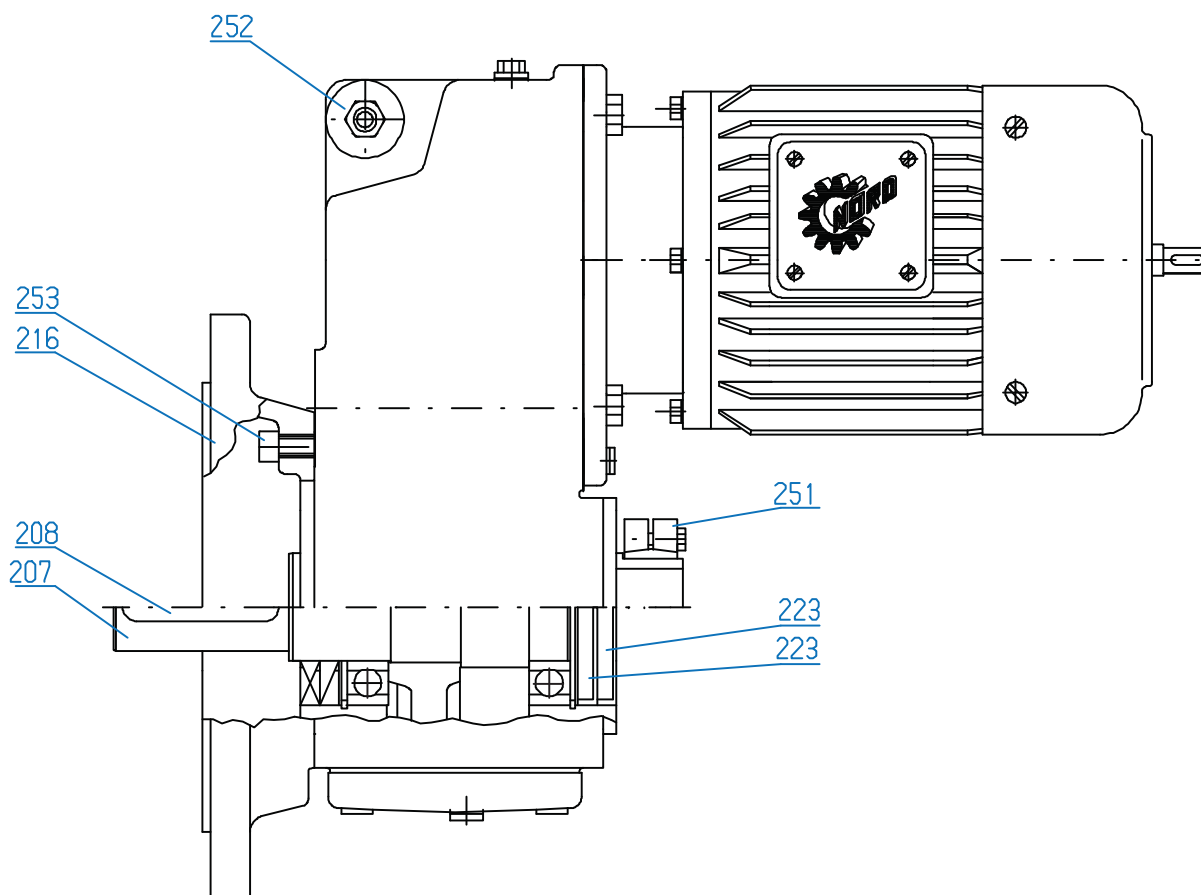
DRIVESYSTEMS

CLINCHER™ PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15200 - 12 of 12



SK 0182NB - SK 11282 & SK 1382 - SK 11382

207 Output Shaft
208 Key
216 Flange

223 Bore Plug
251 Shrink Disc
252 Rubber Buffer

253 Bolt

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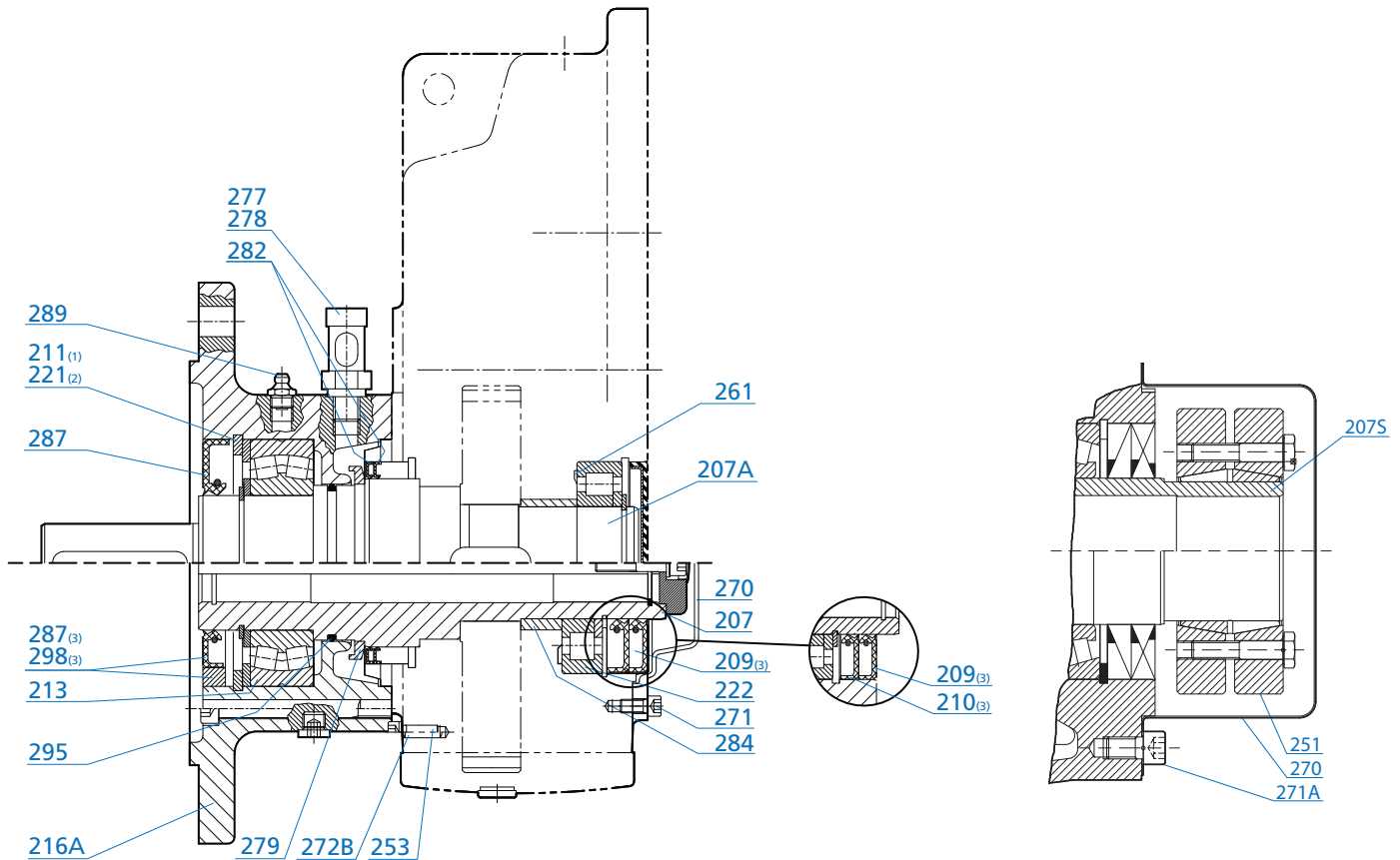
DRIVESYSTEMS

CLINCHER™ VL2 & VL3 PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15210 - 1 of 1



Parallel Helical Clincher VL2 & VL3

207A	Hollow Output Shaft	222	Bearing	278	Plug Gasket
207	Solid Output Shaft	251	Shrink Disk	279	Oil Slinger (VL3)
207S	Shrink Disk Hollow Shaft	253	Screw	282	Seal
209 (3)	Seal	261	NILOS Ring	284	Spacer
210 (3)	Seal	270	Shaft Cover	287 (3)	Seal
211 (1)	Snap Ring	271	Shaft Cover Screw	289	Grease Fitting
213	Bearing	272B	Dowel Pin	295	O-Ring
216A	Flange	277	Drain Plug (VL2)	298 (3)	Bushing
221 (3)	Snap Ring	277	Oil Level Indicator (VL3)		

(1) = Needed for 2282/3282

(3) = Varies By Unit

(2) = Needed for 3282/3382

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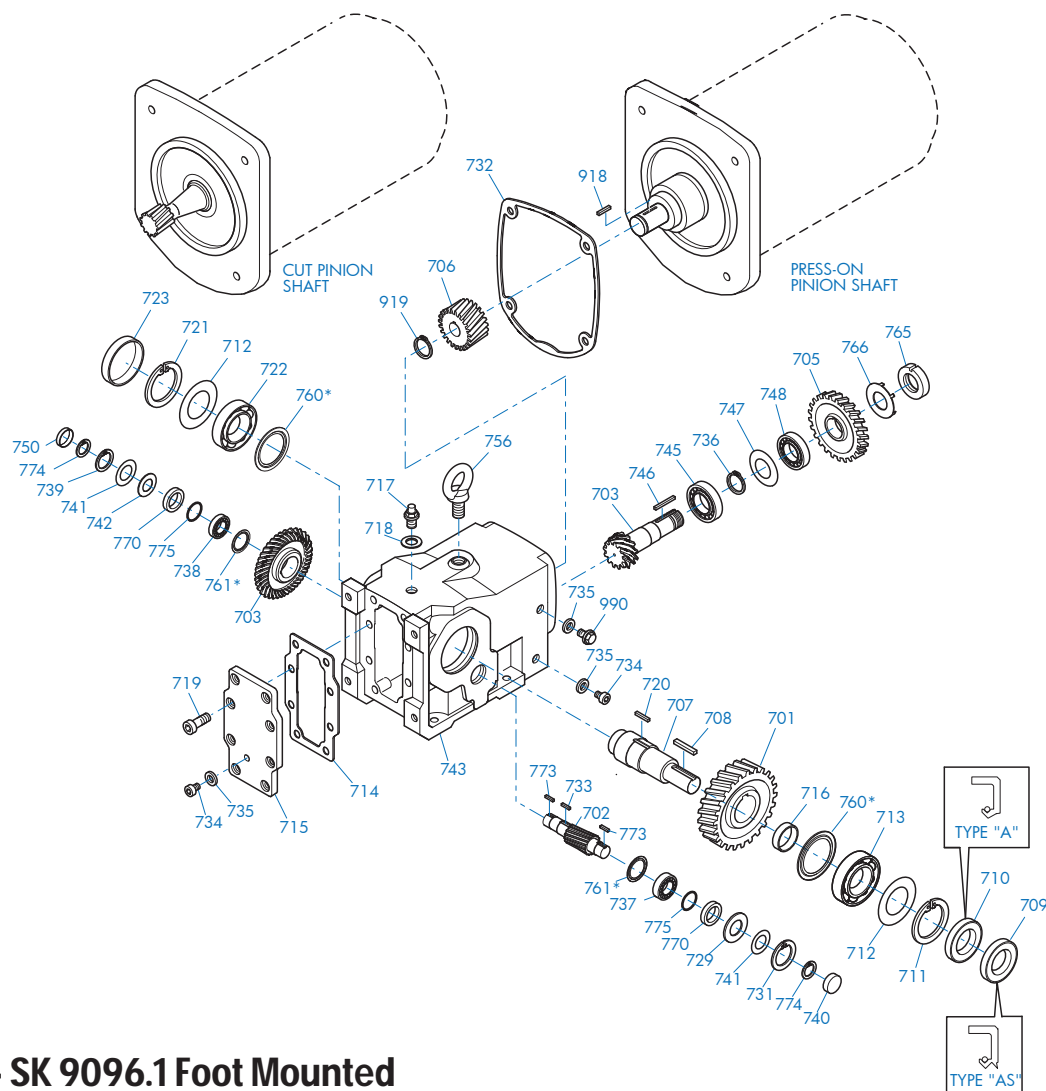
DRIVESYSTEMS

90.1 HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15300 - 1 of 10



SK 9012.1 - SK 9096.1 Foot Mounted

701 Output Gear	721 Snap Ring	747 Shim
702 Pinion Shaft	722 Anti-Friction Bearing	748 Anti-Friction Bearing
703 Bevel Gearset	723 Bore Plug	750 Bore Plug
705 Gear	729 Thrust Washer	756 Flanged Eye Bolt
706 Pinion	731 Snap Ring	760 Nilos Ring*
707 Output Shaft	732 Gasket	761 Nilos Ring*
708 Key	733 Key	765 Slotted Round Nut
709 Oil Seal	734 Oil Plug	766 Tab Lock Washer
710 Oil Seal	735 Gasket	770 Backstop (If Equipped)
711 Snap Ring	736 Snap Ring	773 Key (w/Backstop)
712 Shim	737 Anti-Friction Bearing	774 Snap Ring
713 Anti-Friction Bearing	738 Anti-Friction Bearing	(w/Backstop)
714 Gasket	739 Snap Ring	775 Thrust Washer
715 Inspection Cover	740 Bore Plug	(w/Backstop)
716 Spacer	741 Shim	918 Key
717 Vent screw	742 Thrust Washer	919 Snap Ring
718 Gasket	743 Gearcase	990 Oil Level Plug
719 Bolt	745 Anti-Friction Bearing	
720 Key	746 Key	

* Conditionally used part

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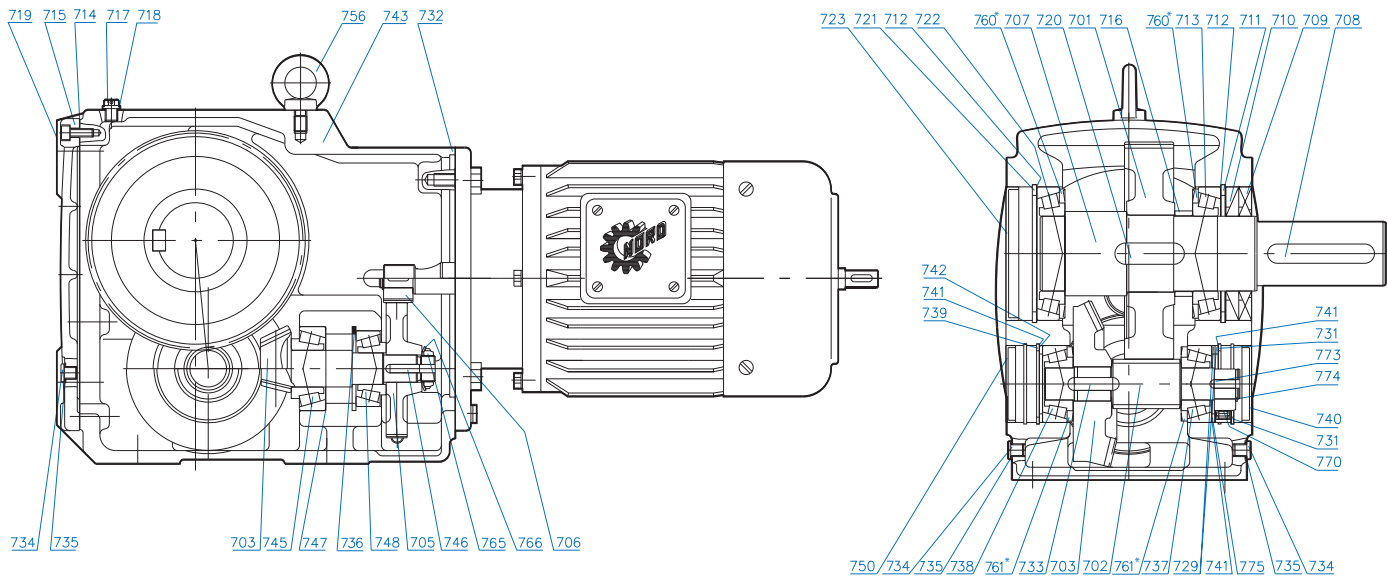
DRIVESYSTEMS

90.1 HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15300 - 2 of 10



SK 9012.1 - SK 9096.1 Foot Mounted

701 Output Gear	720 Key	745 Anti-Friction Bearing
702 Pinion Shaft	721 Snap Ring	746 Key
703 Bevel Gearset	722 Anti-Friction Bearing	747 Shim
705 Gear	723 Bore Plug	748 Anti-Friction Bearing
706 Pinion	729 Thrust Washer	750 Bore Plug
707 Output Shaft	731 Snap Ring	756 Flanged Eye Bolt
708 Key	732 Gasket	760 Nilos Ring*
709 Oil Seal	733 Key	761 Nilos Ring*
710 Oil Seal	734 Oil Plug	765 Slotted Round Nut
711 Snap Ring	735 Gasket	766 Tab Lock Washer
712 Shim	736 Snap Ring	770 Backstop (If Equipped)
713 Anti-Friction Bearing	737 Anti-Friction Bearing	773 Key (w/Backstop)
714 Gasket	738 Anti-Friction Bearing	774 Snap Ring
715 Inspection Cover	739 Snap Ring	(w/Backstop)
716 Spacer	740 Bore Plug	775 Thrust Washer
717 Vent	741 Shim	(w/Backstop)
718 Gasket	742 Thrust Washer	
719 Bolt	743 Gearcase	

* Conditionally used part

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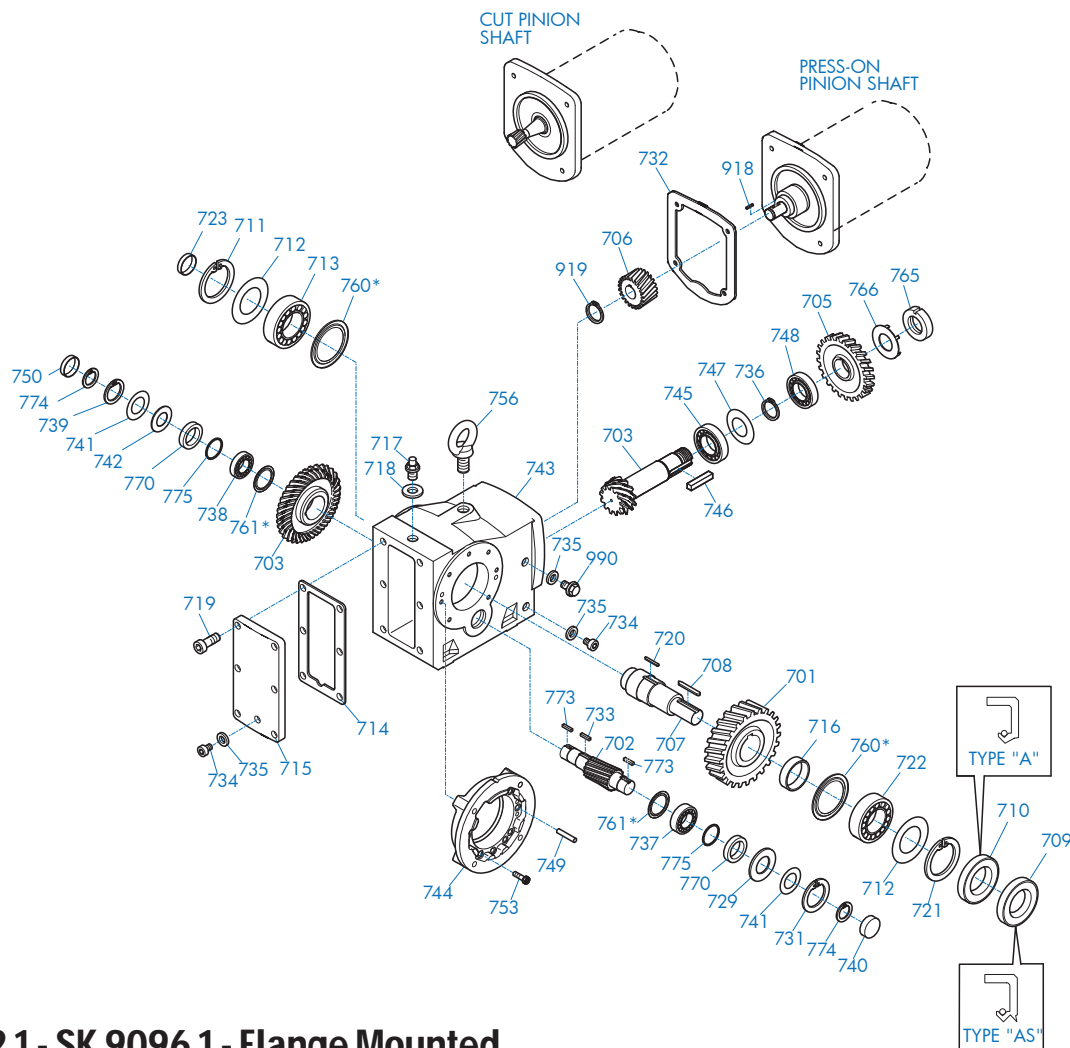
DRIVESYSTEMS

90.1 HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15300 - 3 of 10



SK 9012.1 - SK 9096.1 - Flange Mounted

701 Output Gear	722 Anti-Friction Bearing	748 Anti-Friction Bearing
702 Pinion Shaft	723 Bore Plug	749 Dowel Pin
703 Bevel Gearset	729 Thrust Washer	750 Bore Plug
705 Gear	731 Snap Ring	753 Bolt
706 Pinion	732 Gasket	756 Flanged Eye Bolt
707 Output Shaft	733 Key	760 Nilos Ring*
708 Key	734 Oil plug	761 Nilos Ring*
709 Oil Seal	735 Gasket	765 Slotted Round Nut
710 Oil Seal	736 Snap Ring	766 Tab Lock Washer
711 Snap Ring	737 Anti-Friction Bearing	770 Backstop (If Equipped)
712 Shim	738 Anti-Friction Bearing	773 Key (w/Backstop)
713 Anti-Friction Bearing	739 Snap Ring	774 Snap Ring
714 Gasket	740 Bore Plug	(w/Backstop)
715 Inspection Cover	741 Shim	775 Thrust Washer
716 Spacer	742 Thrust Washer	(w/Backstop)
717 Vent Plug	743 Gearcase	918 Key
718 Gasket	744 Flange	919 Snap Ring
719 Bolt	745 Anti-Friction Bearing	990 Oil Level Plug
720 Key	746 Key	
721 Snap Ring	747 Shim	

* Conditionally used part

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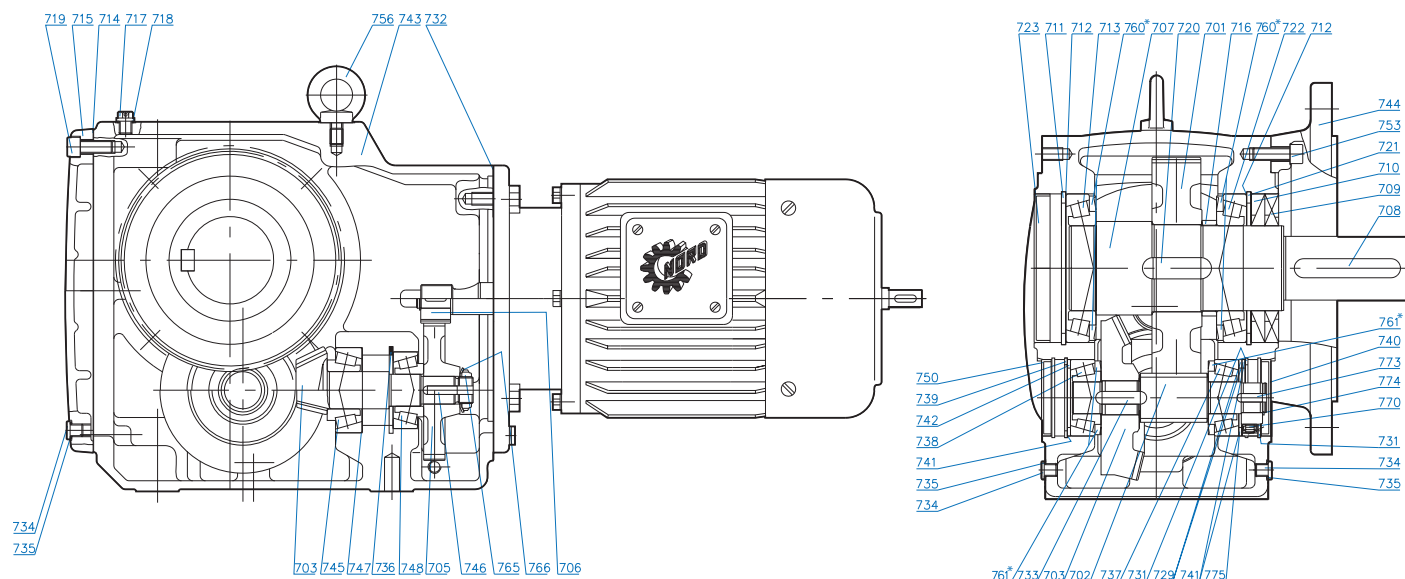
DRIVESYSTEMS

90.1 HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15300 - 4 of 10



SK 9012.1 - SK 9096.1 - Flange Mounted

701 Output Gear	720 Key	744 Flange
702 Pinion Shaft	721 Snap Ring	745 Anti-Friction Bearing
703 Bevel Gearset	722 Anti-Friction Bearing	746 Key
705 Gear	723 Bore Plug	747 Shim
706 Pinion	729 Thrust Washer	748 Anti-Friction Bearing
707 Output Shaft	731 Snap Ring	750 Bore Plug
708 Key	732 Gasket	753 Bolt
709 Oil Seal	733 Key	756 Flanged Eye Bolt
710 Oil Seal	734 Oil plug	760 Nilos Ring*
711 Snap Ring	735 Gasket	761 Nilos Ring*
712 Shim	736 Snap Ring	765 Slotted Round Nut
713 Anti-Friction Bearing	737 Anti-Friction Bearing	766 Tab Lock Washer
714 Gasket	738 Anti-Friction Bearing	770 Backstop*
715 Inspection Cover	739 Snap Ring	773 Key (w/Backstop)
716 Spacer	740 Bore Plug	774 Snap Ring
717 Vent Plug	741 Shim	(w/Backstop)
718 Gasket	742 Thrust Washer	775 Thrust Washer
719 Bolt	743 Gearcase	(w/Backstop)

* Conditionally used part

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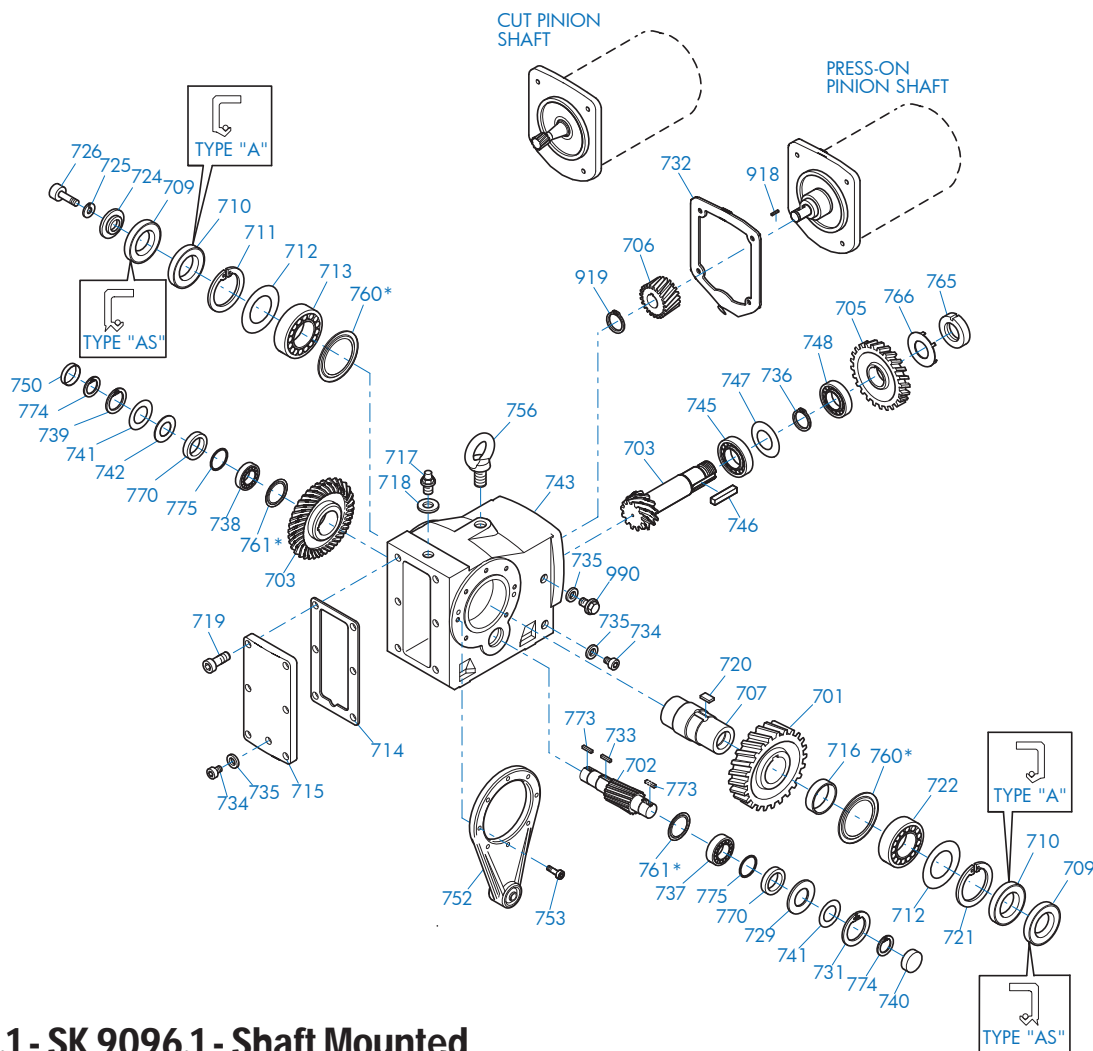
DRIVESYSTEMS

90.1 HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15300 - 5 of 10



SK 9012.1 - SK 9096.1 - Shaft Mounted

701 Gear	724 Retaining Washer	748 Anti-Friction Bearing
702 Pinion Shaft	725 Lock Washer	750 Bore Plug
703 Bevel Gearset	726 Bolt	752 Torque Arm
705 Gear	729 Thrust Washer	753 Bolt
706 Pinion	731 Snap Ring	756 Flanged Eye Bolt
707 Output Shaft	732 Gasket	760 Nilos Ring*
709 Oil Seal	733 Key	761 Nilos Ring*
710 Oil Seal	734 Oil plug	765 Slotted Round Nut
711 Snap Ring	735 Gasket	766 Tab Lock Washer
712 Shim	736 Snap Ring	770 Backstop (If Equipped)
713 Anti-Friction Bearing	737 Anti-Friction Bearing	773 Key (w/Backstop)
714 Gasket	738 Anti-Friction Bearing	774 Snap Ring
715 Inspection Cover	739 Snap Ring	(w/Backstop)
716 Spacer	740 Bore Plug	775 Thrust Washer
717 Vent Plug	741 Shim	(w/Backstop)
718 Gasket	742 Thrust Washer	918 Key
719 Bolt	743 Gearcase	919 Snap Ring
720 Key	745 Anti-Friction Bearing	990 Oil Level Plug
721 Snap Ring	746 Key	
722 Anti-Friction Bearing	747 Shim	

* Conditionally used part

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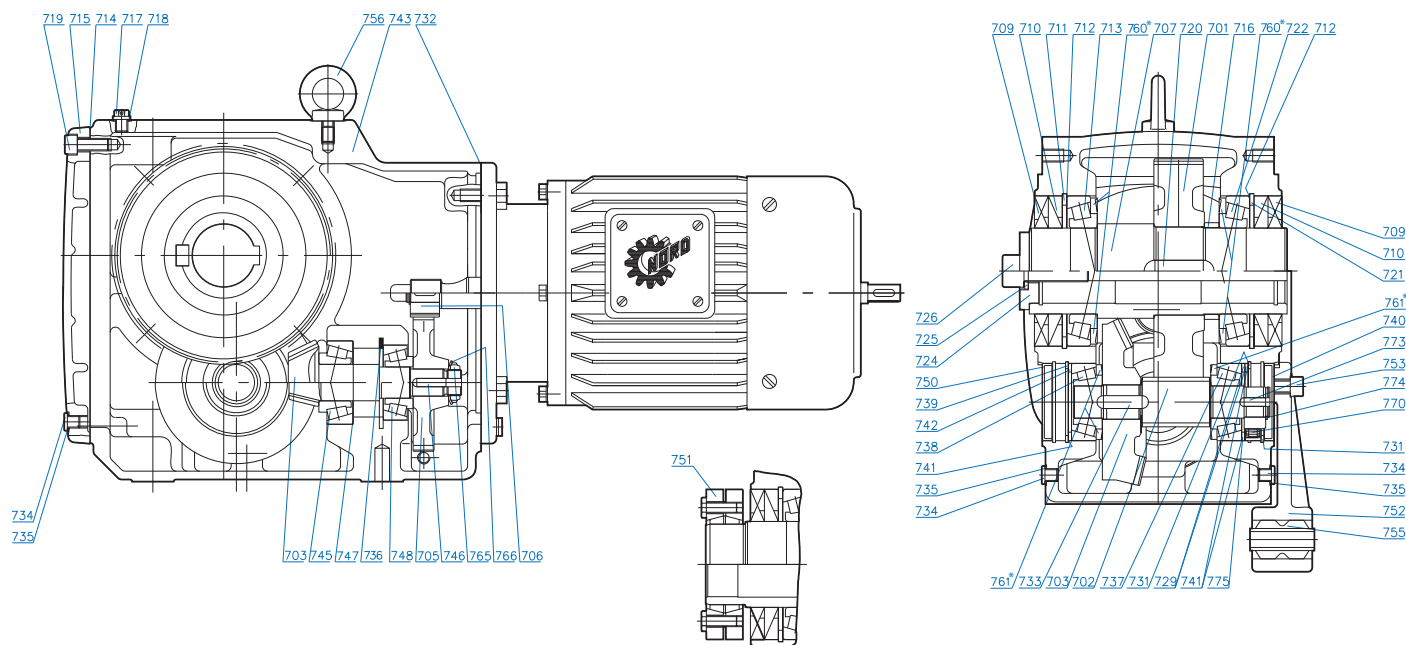
DRIVESYSTEMS

90.1 HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15300 - 6 of 10



SK 9012.1 - SK 9096.1 - Shaft Mounted

701 Gear	722 Anti-Friction Bearing	746 Key
702 Pinion Shaft	724 Washer	747 Shim
703 Bevel Gearset	725 Lock Washer	748 Anti-Friction Bearing
705 Gear	726 Bolt	750 Bore Plug
706 Pinion	729 Thrust Washer	751 Shrink Disc
707 Output Shaft	731 Snap Ring	752 Torque Arm
709 Oil Seal	732 Gasket	753 Bolt
710 Oil Seal	733 Key	755 Rubber Buffer
711 Snap Ring	734 Oil plug	756 Flanged Eye Bolt
712 Shim	735 Gasket	760 Nilos Ring*
713 Anti-Friction Bearing	736 Snap Ring	761 Nilos Ring*
714 Gasket	737 Anti-Friction Bearing	765 Slotted Round Nut
715 Inspection Cover	738 Anti-Friction Bearing	766 Tab Lock Washer
716 Spacer	739 Snap Ring	770 Backstop*
717 Vent Plug	740 Bore Plug	773 Key (w/Backstop)
718 Seal	741 Shim	774 Snap Ring
719 Bolt	742 Thrust Washer	(w/Backstop)
720 Key	743 Gearcase	775 Thrust Washer
721 Snap Ring	745 Anti-Friction Bearing	(w/Backstop)

* Conditionally used part

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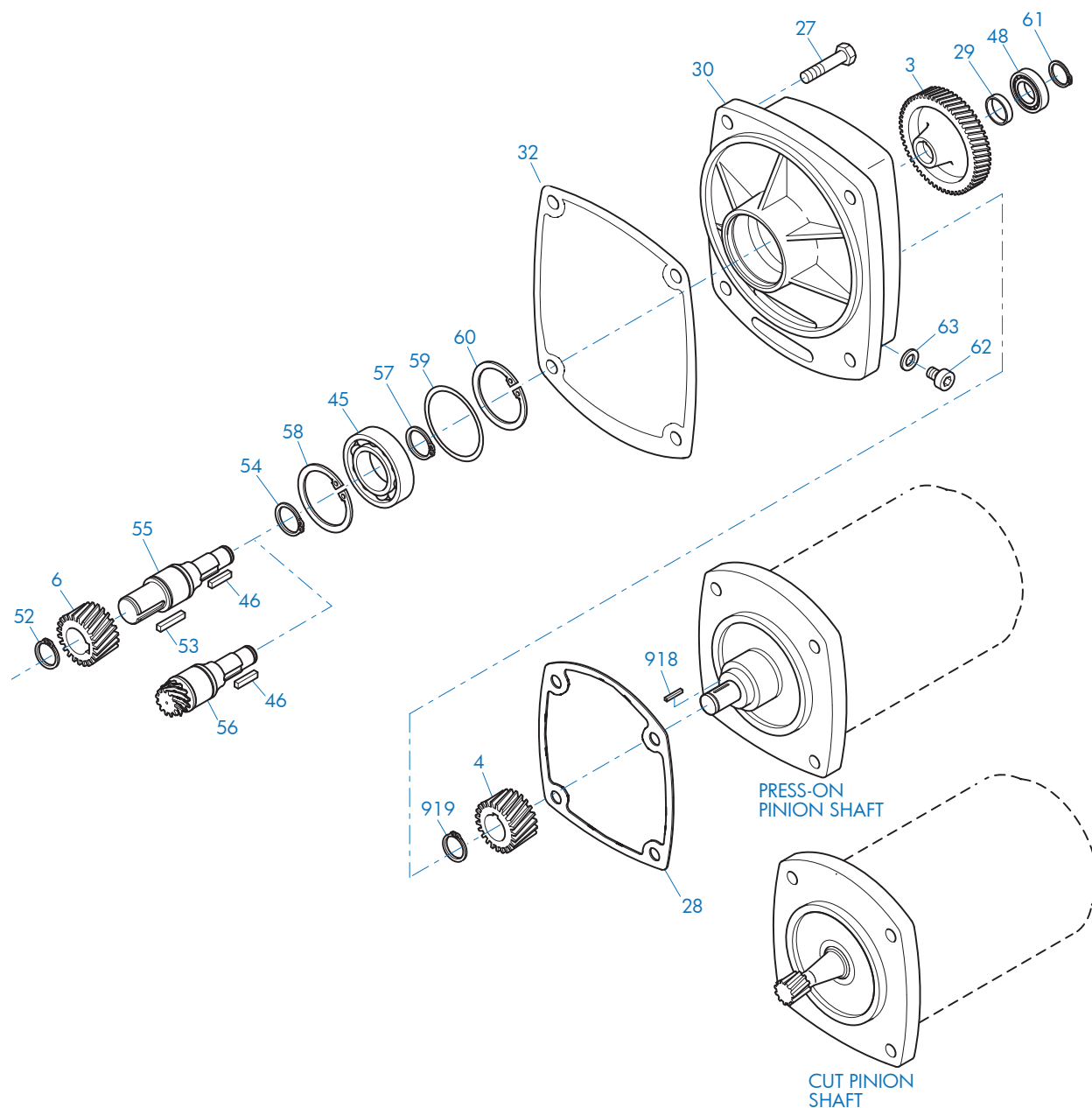
DRIVESYSTEMS

90.1 HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15300 - 7 of 10



SK9013.1 - SK9053.1 Third Stage Reduction Gear

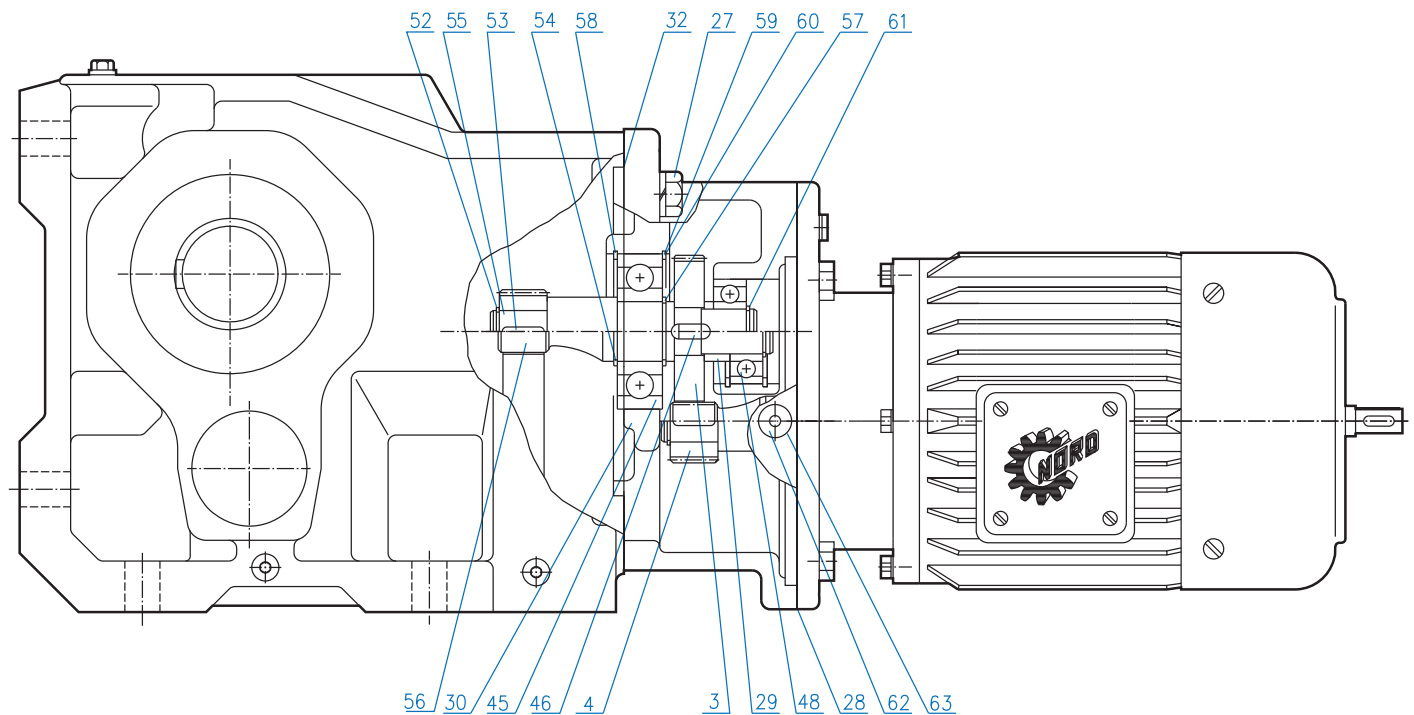
3	Gear	46	Key	59	Shim
4	Pinion	48	Anti-Friction Bearing	60	Snap Ring
6	Pinion	52	Snap Ring	61	Snap Ring
27	Bolt	53	Key	62	Oil Plug
28	Gasket	54	Snap Ring	63	Gasket
29	Spacer	55	Intermediate Shaft, Plain	918	Key
30	Third Reduction Gearcase	56	Intermediate Shaft, Gearcut	919	Snap Ring
32	Gasket	57	Snap Ring		
45	Anti-Friction Bearing	58	Snap Ring		

90.1 HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15300 - 8 of 10

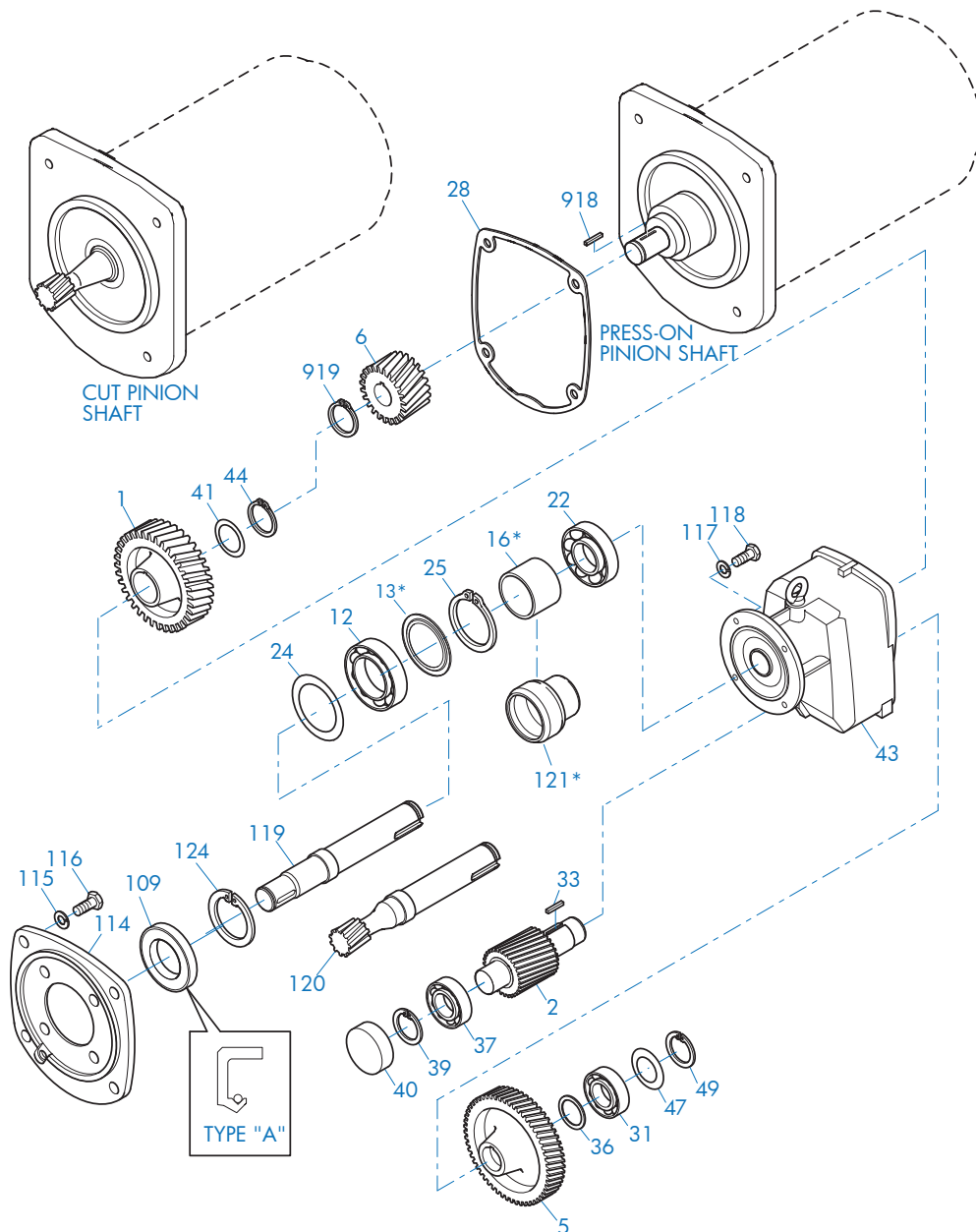


SK9013.1 - SK9053.1 Third Stage Reduction Gear

3 Gear	46 Key	58 Snap Ring
4 Pinion	48 Anti-Friction Bearing	59 Shim
27 Bolt	52 Snap Ring	60 Snap Ring
28 Gasket	53 Key	61 Snap Ring
29 Spacer	54 Snap Ring	62 Oil Plug
30 Third Reduction Gearcase	55 Intermediate Shaft, Plain	63 Gasket
32 Gasket	56 Intermediate Shaft, Gearcut	
45 Anti-Friction Bearing	57 Snap Ring	

90.1 HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



SK9062.1/32 - SK9092.1/52 Input Compound Reduction

1 Gear	33 Key	115 Lock Washer
2 Pinion Shaft	36 Spacer	116 Bolt
5 Gear	37 Anti-Friction Bearing	117 Lock Washer
6 Pinion	39 Snap Ring	118 Bolt
12 Anti-Friction Bearing	40 Bore Plug	119 Intermediate Shaft, Plain
13 Nilos Ring*	41 Shim	120 Intermediate Shaft, Gearcut
16 Spacer*	43 Gearcase	121 Bearing Sleeve*
22 Anti-Friction Bearing	44 Snap Ring	124 Snap Ring
24 Shim	47 Shim	918 Key
25 Snap Ring	49 Snap Ring	919 Snap Ring
28 Gasket	109 Oil Seal	
31 Anti-Friction Bearing	114 Intermediate Flange	

* Conditionally used part

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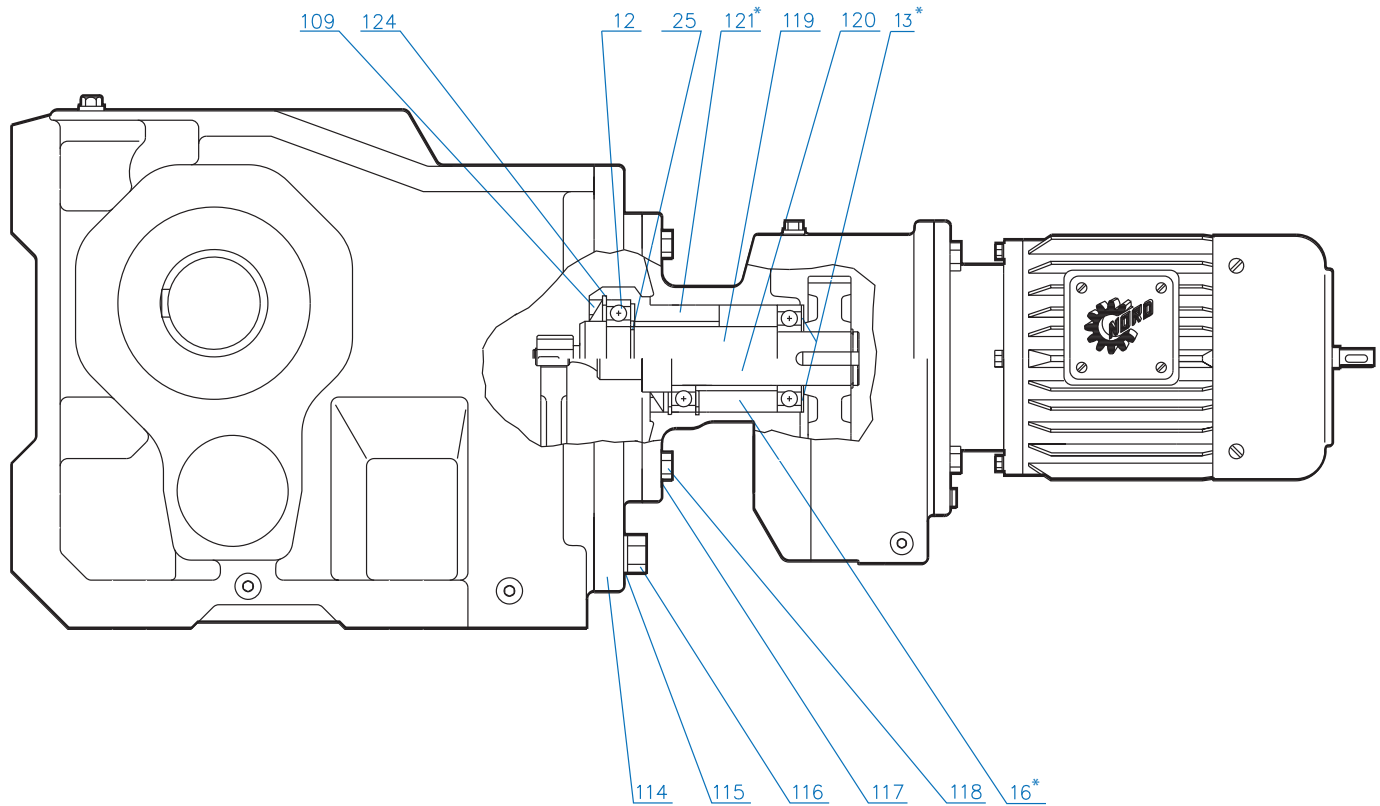
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SK9062.1/32 - SK9092.1/52 Input Compound Reduction

11 Bearing	114 Intermediate Flange	119 Intermediate Shaft, Plain
13 Nilos Ring*	115 Lock Washer	120 Intermediate Shaft, Gearcut
16 Spacer*	116 Bolt	121 Bearing Sleeve *
25 Snap Ring	117 Lock Washer	124 Snap Ring
109 Oil Seal	118 Bolt	

* Conditionally used part

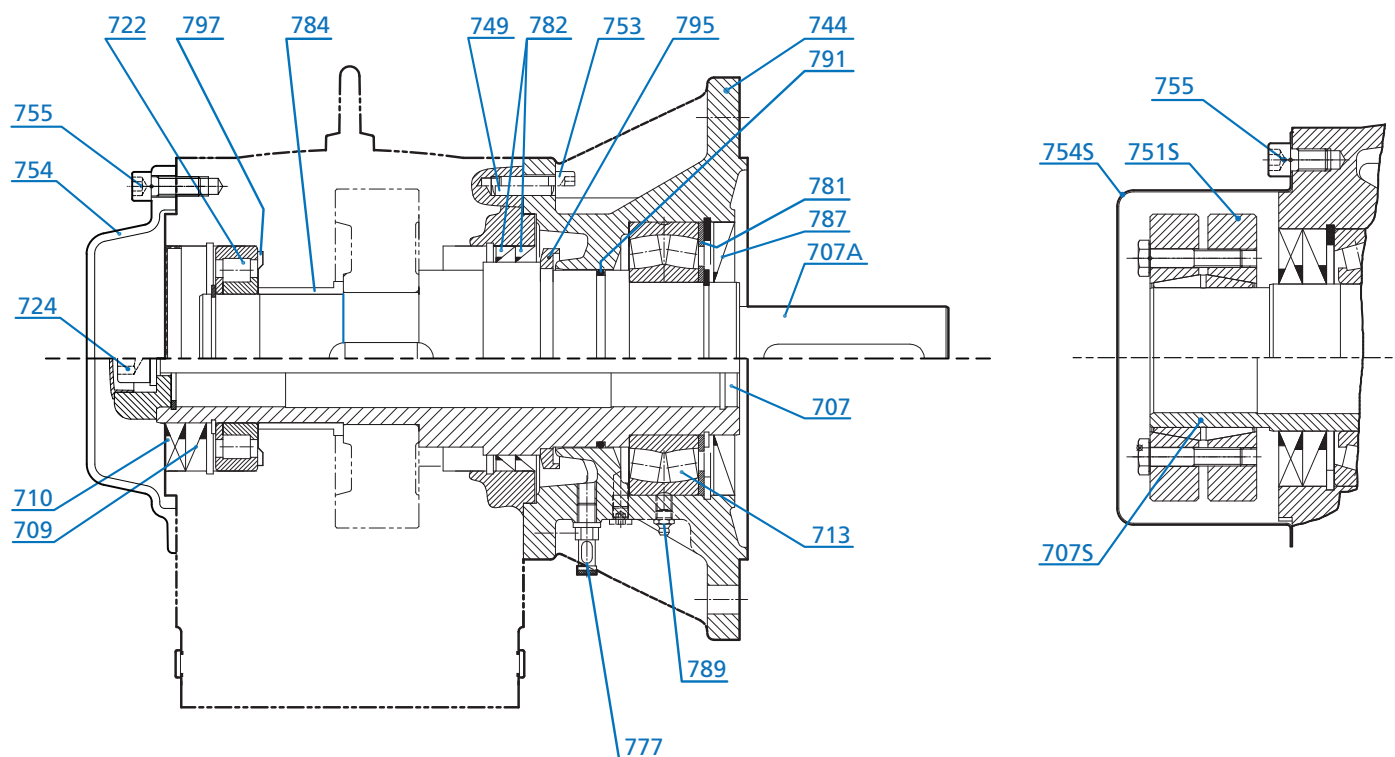


DRIVESYSTEMS

Helical Bevel VL2 & VL3 PARTS LIST DRAWINGS



U15310 - 1 of 1



Helical Bevel VL2 & VL3

707	Hollow Output Shaft	744	Flange VLII & VLIII	782	Seal
707A	Output Shaft	749	Dowel Pin	784	Spacer VLIII
707S	Shrink Disk Hollow Shaft	751S	Shrink Disk	787	Seal
709	Seal	753	Screw	789	Grease Fitting
710	Seal	754	Shaft Cover	791	O-Ring
711	Snap Ring	755	Shaft Cover Screw	795	Oil Slinger (VLIII Only)
713	Bearing	777	Drain Plug (VLII)	797	NILOS Ring
722	Bearing	777	Oil Indicator (VLIII Only)		
724	Fixing Kit	781	Axial Shim		

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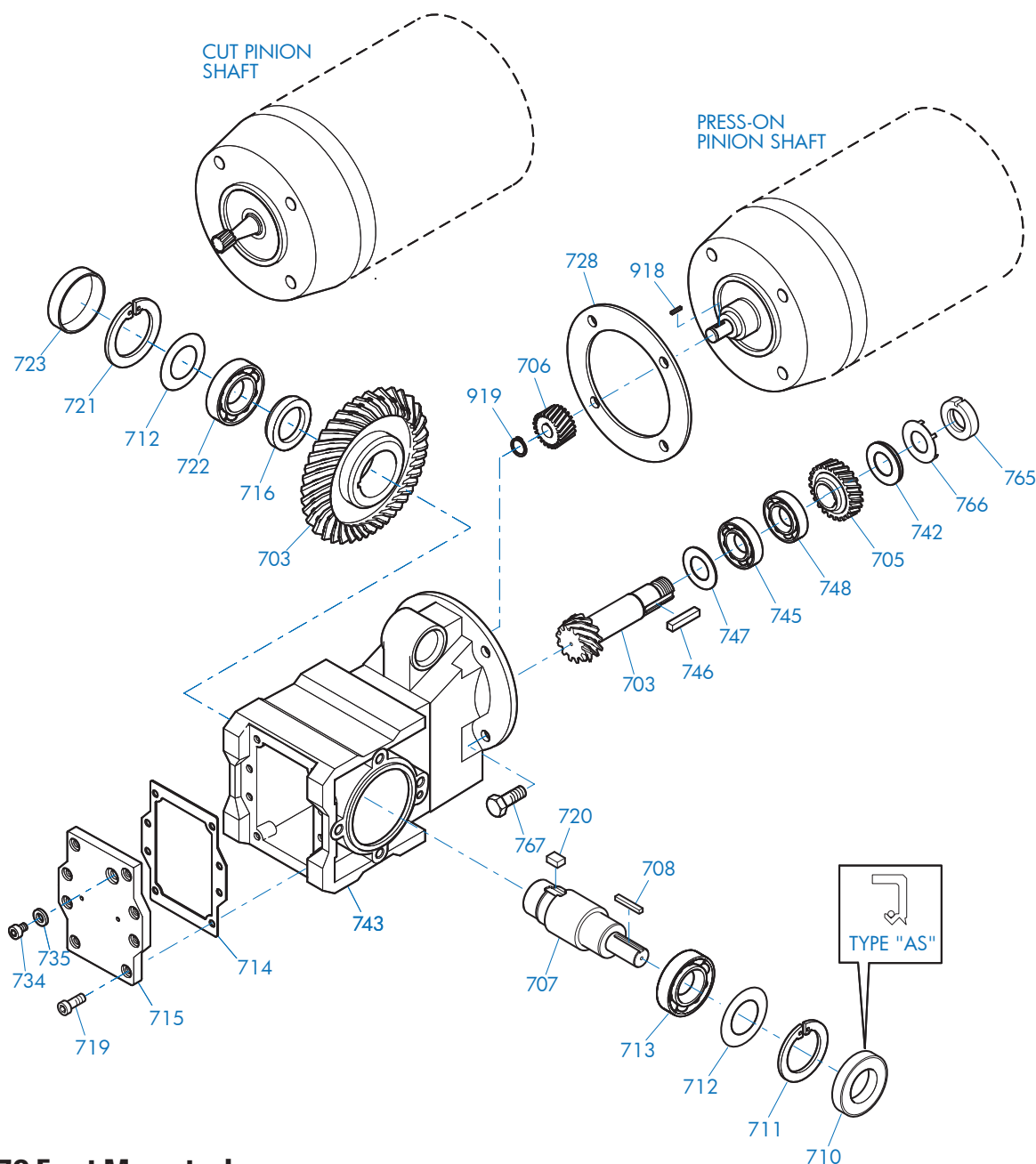
DRIVESYSTEMS

92 SERIES HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15400 - 1 of 7



SK 92072 Foot Mounted

703 Bevel Gearset	716 Spacer	745 Anti-Friction Bearing
705 Gear	719 Bolt	746 Key
706 Pinion	720 Key	747 Shim
707 Output Shaft	721 Snap Ring	748 Anti-Friction Bearing
708 Key	722 Anti-Friction Bearing	765 Slotted Nut
710 Oil Seal	723 Bore Plug	766 Tab Lock Washer
711 Snap Ring	728 Gasket	767 Bolt
712 Shim	734 Oil Plug	918 Key
713 Anti-Friction Bearing	735 Gasket	919 Snap Ring
714 Gasket	742 Thrust Washer	
715 Inspection Cover	743 Gear case	

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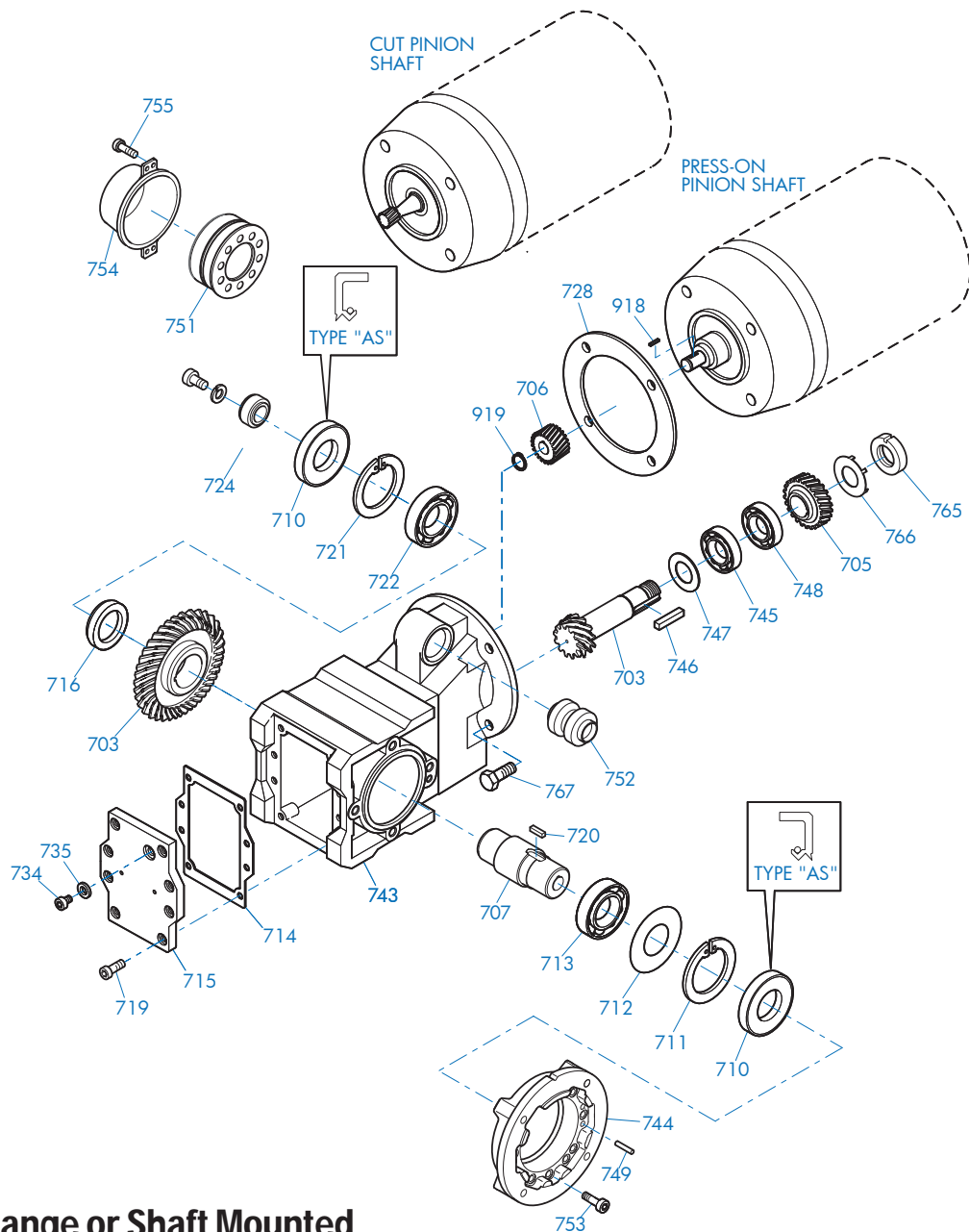
DRIVESYSTEMS

92 SERIES HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15400 - 2 of 7



SK 92072 Flange or Shaft Mounted

703 Bevel Gearset	720 Key	748 Anti-Friction Bearing
705 Gear	721 Snap Ring	749 Grooved Pin
706 Pinion	722 Anti-Friction Bearing	751 Shrink Disc
707 Output Shaft	724 Fixing Element Kit	752 Rubber Buffer
710 Oil Seal	728 Gasket	753 Bolt
711 Snap Ring	734 Oil Plug	754 Cover
712 Shim	735 Gasket	755 Bolt
713 Anti-Friction Bearing	743 Gearcase	765 Slotted Round Nut
714 Gasket	744 Flange	766 Tab Lock Washer
715 Inspection Cover	745 Anti-Friction Bearing	767 Bolt
716 Spacer	746 Key	918 Key
719 Bolt	747 Shim	919 Snap Ring

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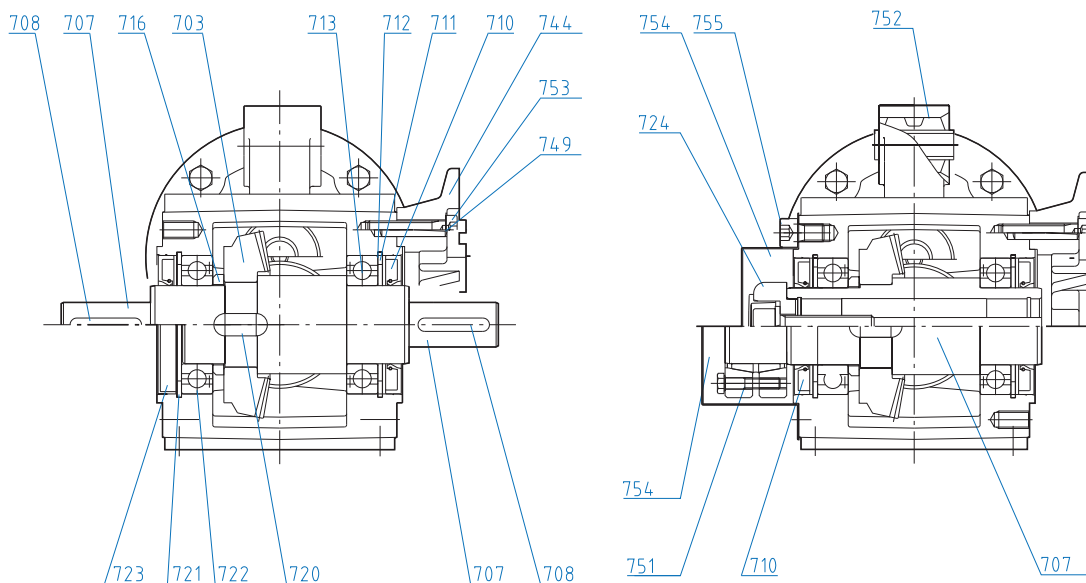
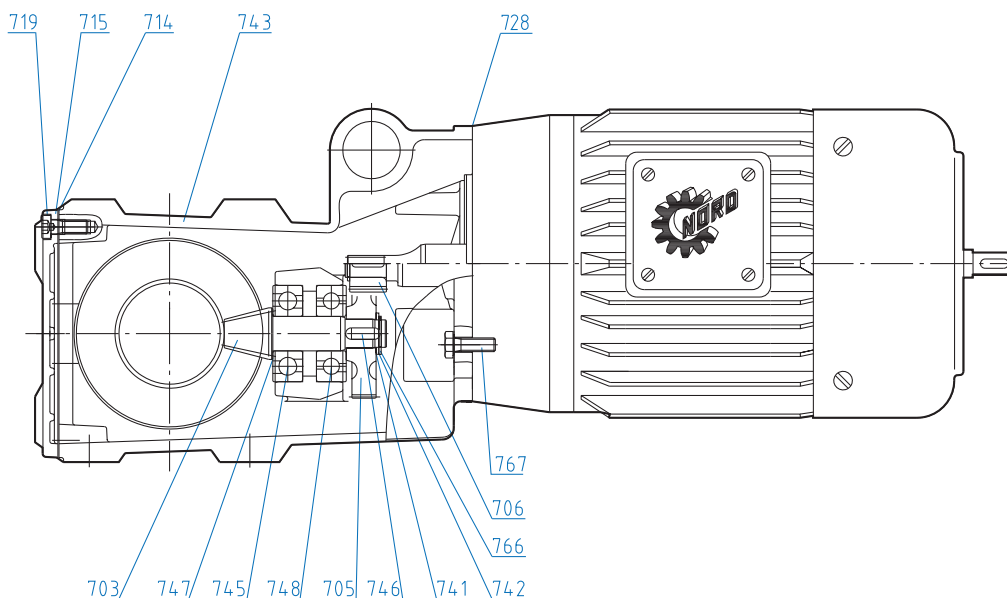


DRIVESYSTEMS

92 SERIES HELICAL-BEVEL PARTS LIST DRAWINGS



U15400 - 3 of 7



SK 92072

703 Bevel Gearset
705 Gear
706 Pinion
707 Output Shaft
708 Key
710 Oil Seal
711 Snap Ring
712 Shim
713 Anti-Friction Bearing
714 Gasket
715 Inspection Cover
716 Spacer

719 Bolt
720 Key
721 Snap Ring
722 Anti-Friction Bearing
723 Bore Plug
724 Fixing Element Kit
728 Gasket
741 Shim
742 Thrust Washer
743 Gear case
744 Flange
745 Anti-Friction Bearing

746 Key
747 Shim
748 Anti-Friction Bearing
749 Grooved Pin
751 Shrink Disc Connector
752 Rubber Buffer
753 Socket Head Screw
754 Shrink Disc Cover
755 Socket Head Screw
766 Tab Lock Washer
767 Bolt

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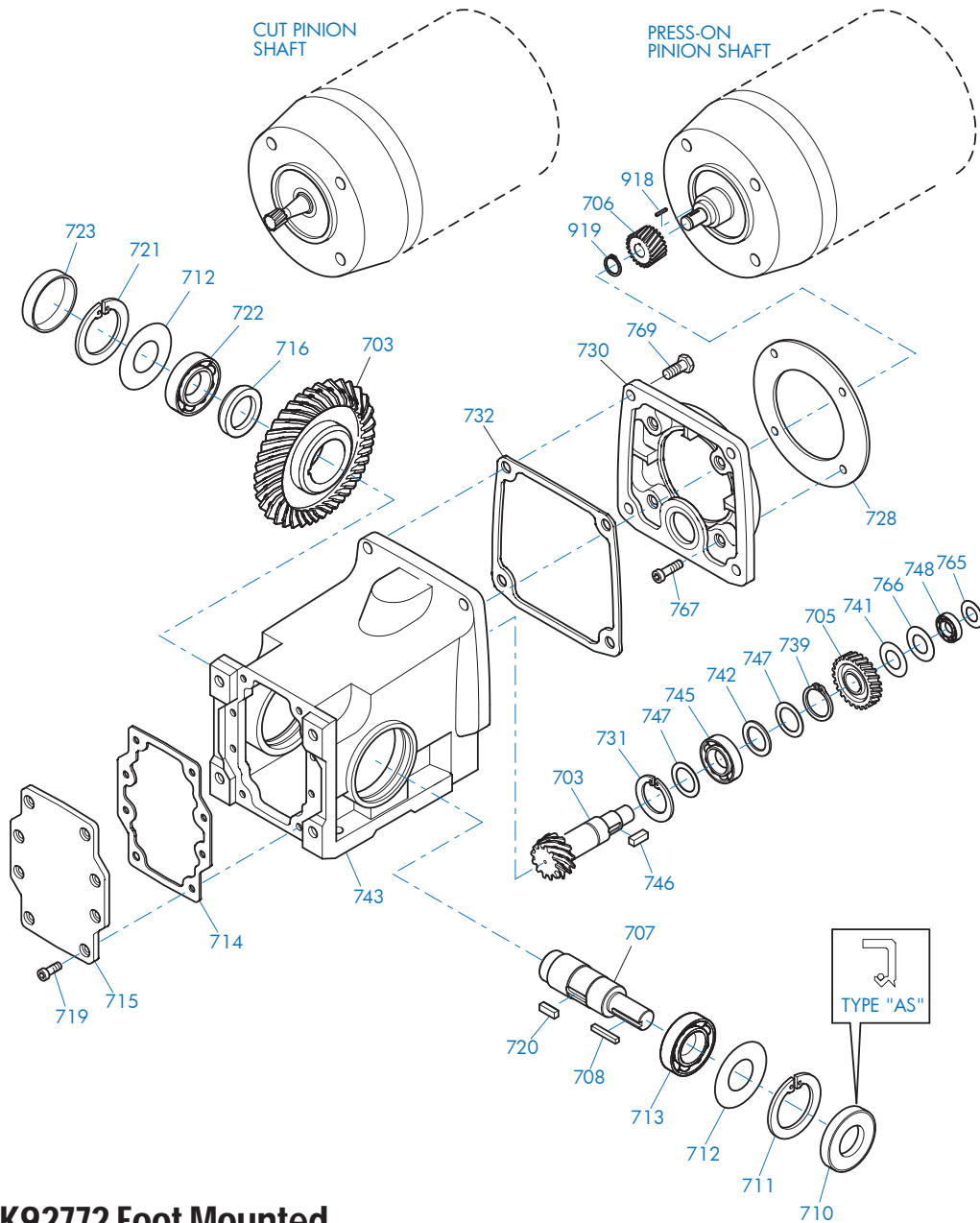
DRIVESYSTEMS

92 SERIES HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15400 - 4 of 7



SK 92172 - SK92772 Foot Mounted

703 Bevel Gearset	719 Bolt	743 Gearcase
705 Gear	720 Key	745 Anti-Friction Bearing
706 Pinion	721 Snap Ring	746 Key
707 Output Shaft	722 Anti-Friction Bearing	747 Shim
708 Key	723 Bore Plug	748 Anti-Friction Bearing
710 Oil Seal	728 Gasket	765 Shim
711 Snap Ring	730 Input Cover	766 Snap Ring
712 Shim	731 Snap Ring	767 Bolt
713 Anti-Friction Bearing	732 Gasket	769 Bolt
714 Gasket	739 Snap Ring	918 Key
715 Inspection Cover	741 Shim	919 Snap Ring
716 Spacer	742 Thrust Washer	

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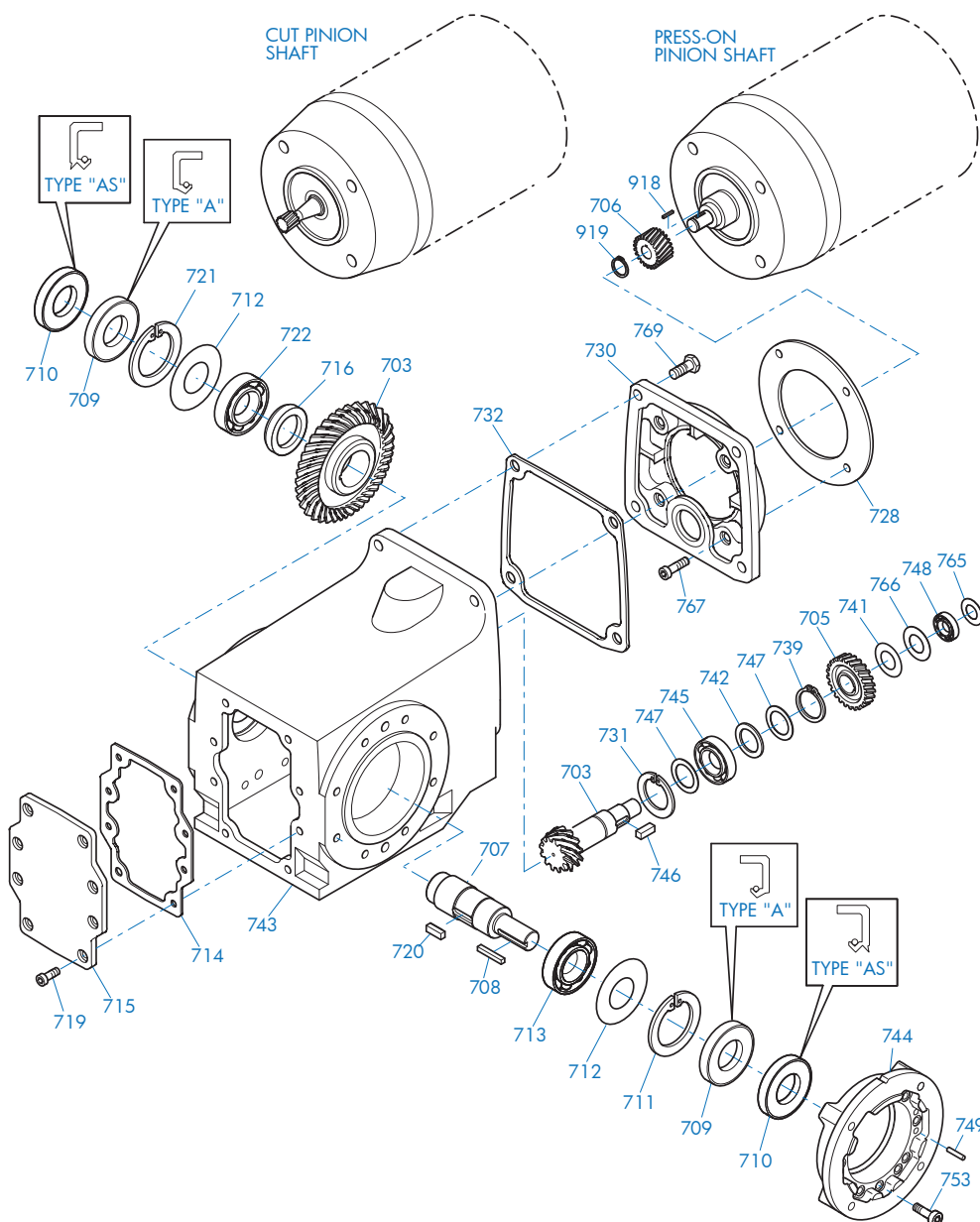
DRIVESYSTEMS

92 SERIES HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15400 - 5 of 7



SK 92172 - SK92772 Solid Shaft + Flange Mount

703 Bevel Gearset	719 Bolt	745 Anti-Friction Bearing
705 Gear	720 Key	746 Key
706 Pinion	721 Snap Ring	747 Shim
707 Output Shaft	722 Anti-Friction Bearing	748 Anti-Friction Bearing
708 Key	728 Gasket	749 Grooved Pin
709 Oil Seal	730 Input Cover	753 Bolt
710 Oil Seal	731 Snap Ring	765 Shim
711 Snap Ring	732 Gasket	766 Snap Ring
712 Shim	739 Snap Ring	767 Bolt
713 Anti-Friction Bearing	741 Shim	769 Bolt
714 Gasket	742 Thrust Washer	918 Key
715 Inspection Cover	743 Gearcase	919 Snap Ring
716 Spacer	744 Flange	

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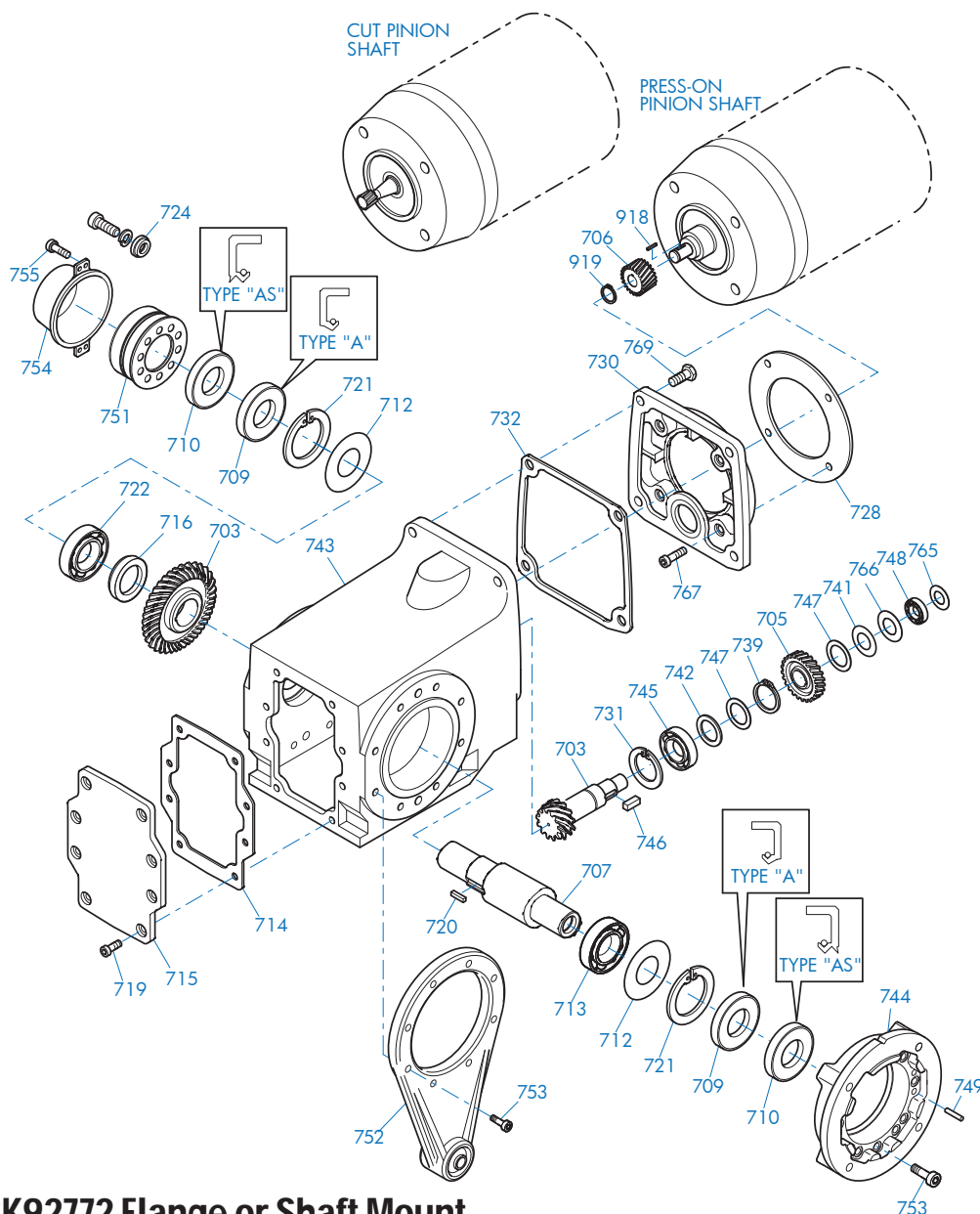
DRIVESYSTEMS

92 SERIES HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15400 - 6 of 7



SK 92172 - SK92772 Flange or Shaft Mount

703 Bevel Gearset	722 Anti-Friction Bearing	748 Anti-Friction Bearing
705 Gear	724 Fixing Element Kit	749 Grooved Pin
706 Pinion	728 Gasket	751 Shrink Disc Connector
707 Output Shaft	730 Input Cover	752 Torque Arm
709 Oil Seal	731 Snap Ring	753 Bolt
710 Oil Seal	732 Gasket	754 Cover
712 Shim	739 Snap Ring	755 Bolt
713 Anti-Friction Bearing	741 Shim	765 Shim
714 Gasket	742 Thrust Washer	766 Snap Ring
715 Inspection Cover	743 Gearcase	767 Bolt
716 Spacer	744 Flange	769 Bolt
719 Bolt	745 Anti-Friction Bearing	918 Key
720 Key	746 Key	919 Snap Ring
721 Snap Ring	747 Shim	

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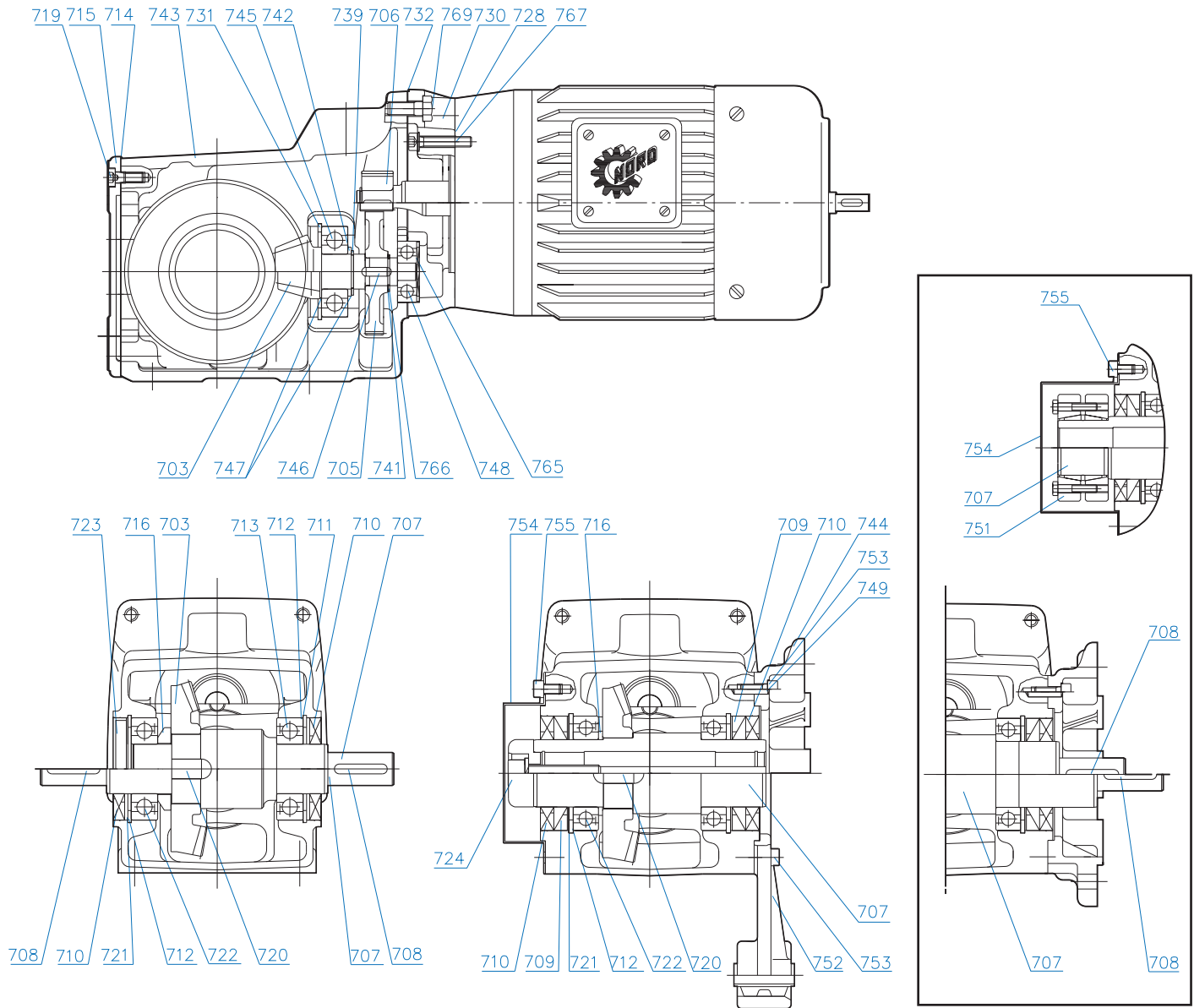
DRIVESYSTEMS

92 SERIES HELICAL-BEVEL PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15400 - 7 of 7



SK 92172 - SK 92772

703 Bevel Gearset	720 Key	745 Anti-Friction Bearing
705 Gear	721 Snap Ring	746 Key
706 Pinion	722 Anti-Friction Bearing	747 Shim
707 Output Shaft	723 Sealing Plug	748 Anti-Friction Bearing
708 Key	724 Fixing Element Kit	749 Grooved Pin
709 Oil Seal	728 Gasket	751 Shrink Disc Connector
710 Oil Seal	730 Gearbox Cover	752 Torque Arm
711 Snap Ring	731 Snap Ring	753 Bolt
712 Shim	732 Gasket	754 Cover
713 Anti-Friction Bearing	739 Snap Ring	755 Bolt
714 Gasket	741 Shim	765 Slotted Round Nut
715 Inspection Cover	742 Thrust Washer	766 Tab Lock Washer
716 Spacer	743 Gearcase	767 Bolt
719 Bolt	744 Flange	769 Hexagonal Screw

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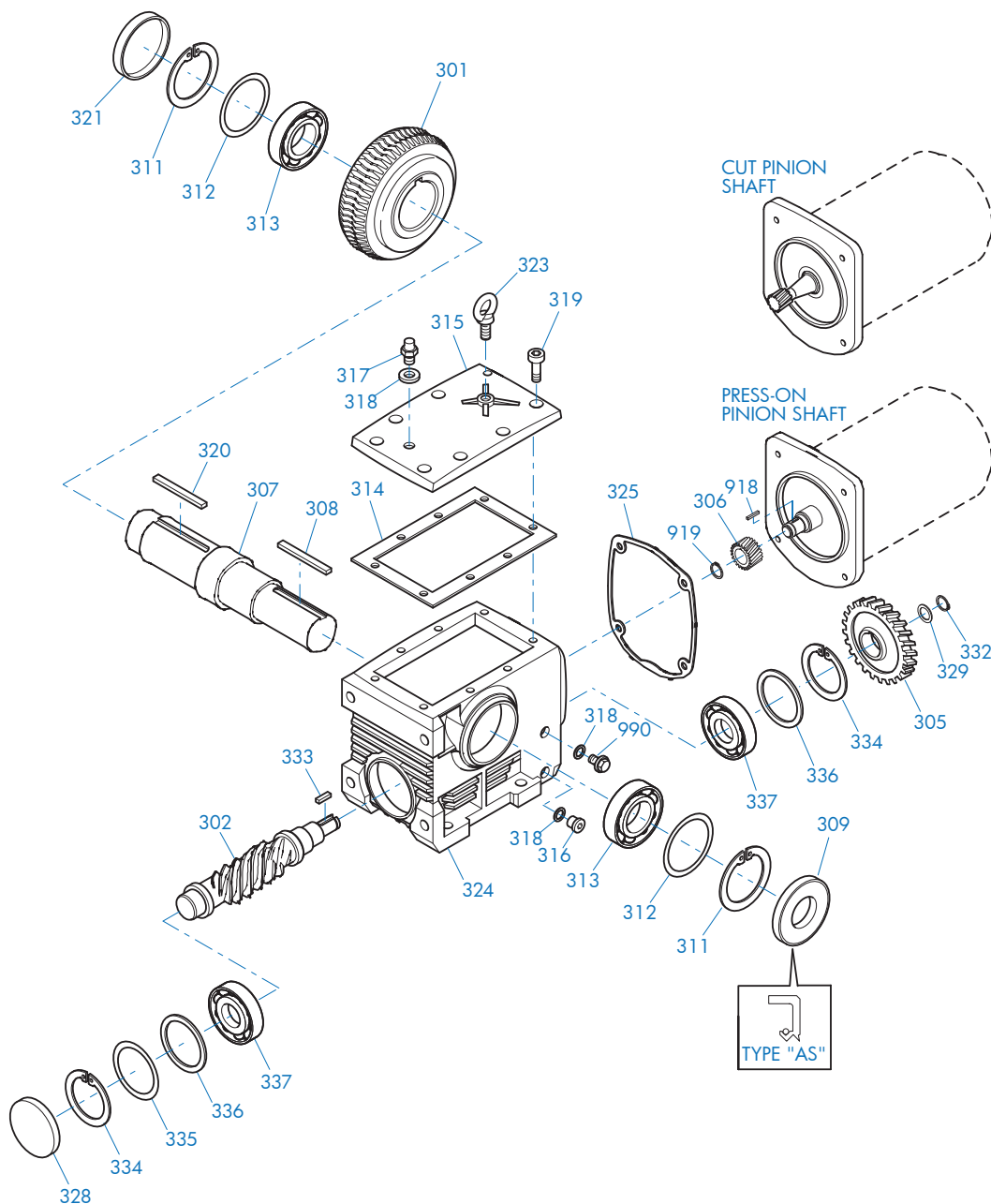
DRIVESYSTEMS

HELICAL-WORM PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15500 - 1 of 11



SK 02040 - SK 42125 Foot Mounted

301 Worm Wheel	315 Inspection Cover	329 Thrust Washer
302 Worm	316 Drain Plug	332 Snap Ring
305 Gear	317 Vent Plug	333 Key
306 Pinion	318 Gasket	334 Snap Ring
307 Output Shaft	319 Socket Head Screw	335 Shim
308 Key	320 Key	336 Thrust Washer
309 Oil Seal	321 Bore Plug	337 Anti-Friction Bearing
311 Snap Ring	323 Flanged Eye Bolt	918 Key
312 Shim	324 Gearcase	919 Snap Ring
313 Anti-Friction Bearing	325 Gasket	990 Oil Level Plug
314 Gasket	328 Bore Plug	

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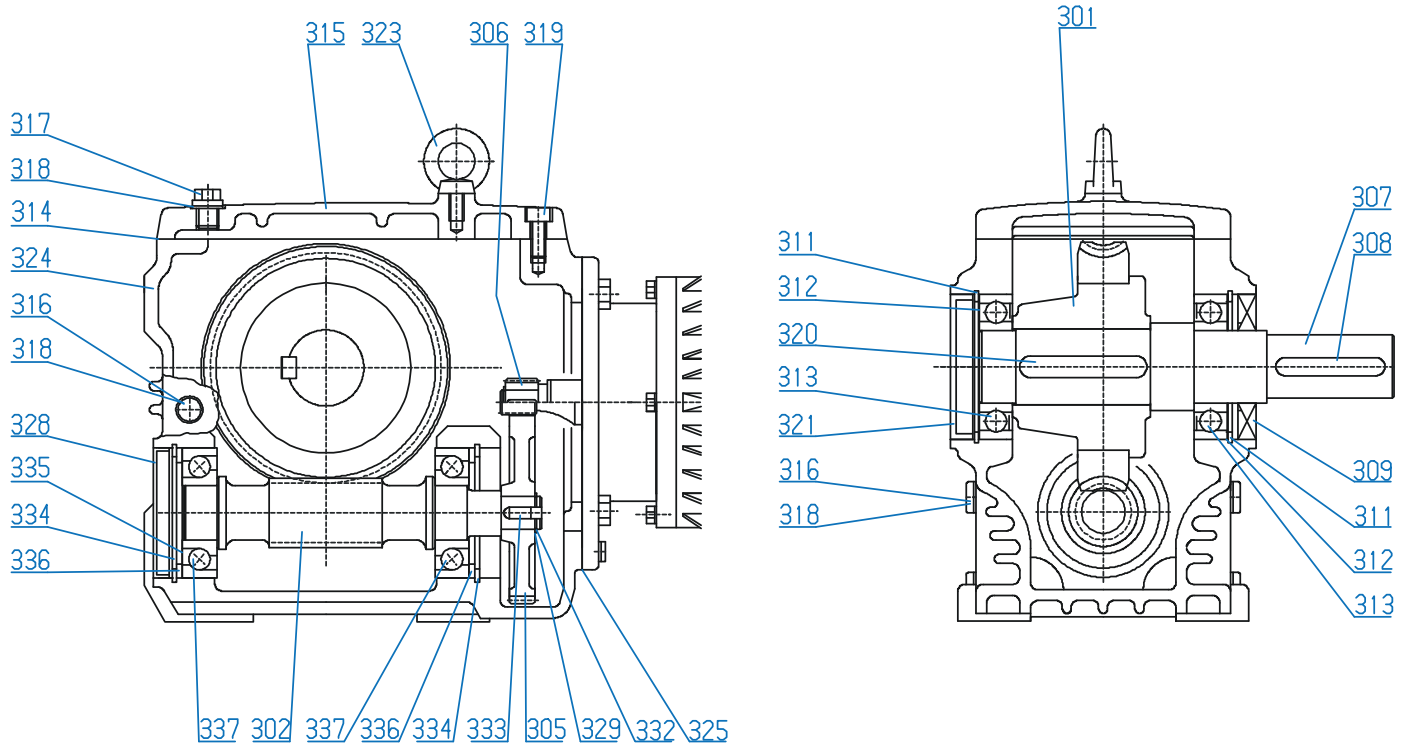
DRIVESYSTEMS

HELICAL-WORM PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15500 - 2 of 11



SK 02040 - SK 42125 Foot Mounted

301 Worm Wheel	314 Gasket	325 Gasket
302 Worm	315 Inspection Cover	328 Bore Plug
305 Gear	316 Drain Plug	329 Thrust Washer
306 Pinion	317 Vent Plug	332 Snap Ring
307 Output Shaft	318 Gasket	333 Key
308 Key	319 Socket Head Screw	334 Snap Ring
309 Oil Seal	320 Key	335 Shim
311 Snap Ring	321 Bore Plug	336 Thrust Washer
312 Shim	323 Flanged Eye Bolt	337 Anti-Friction Bearing
313 Anti-Friction Bearing	324 Gearcase	

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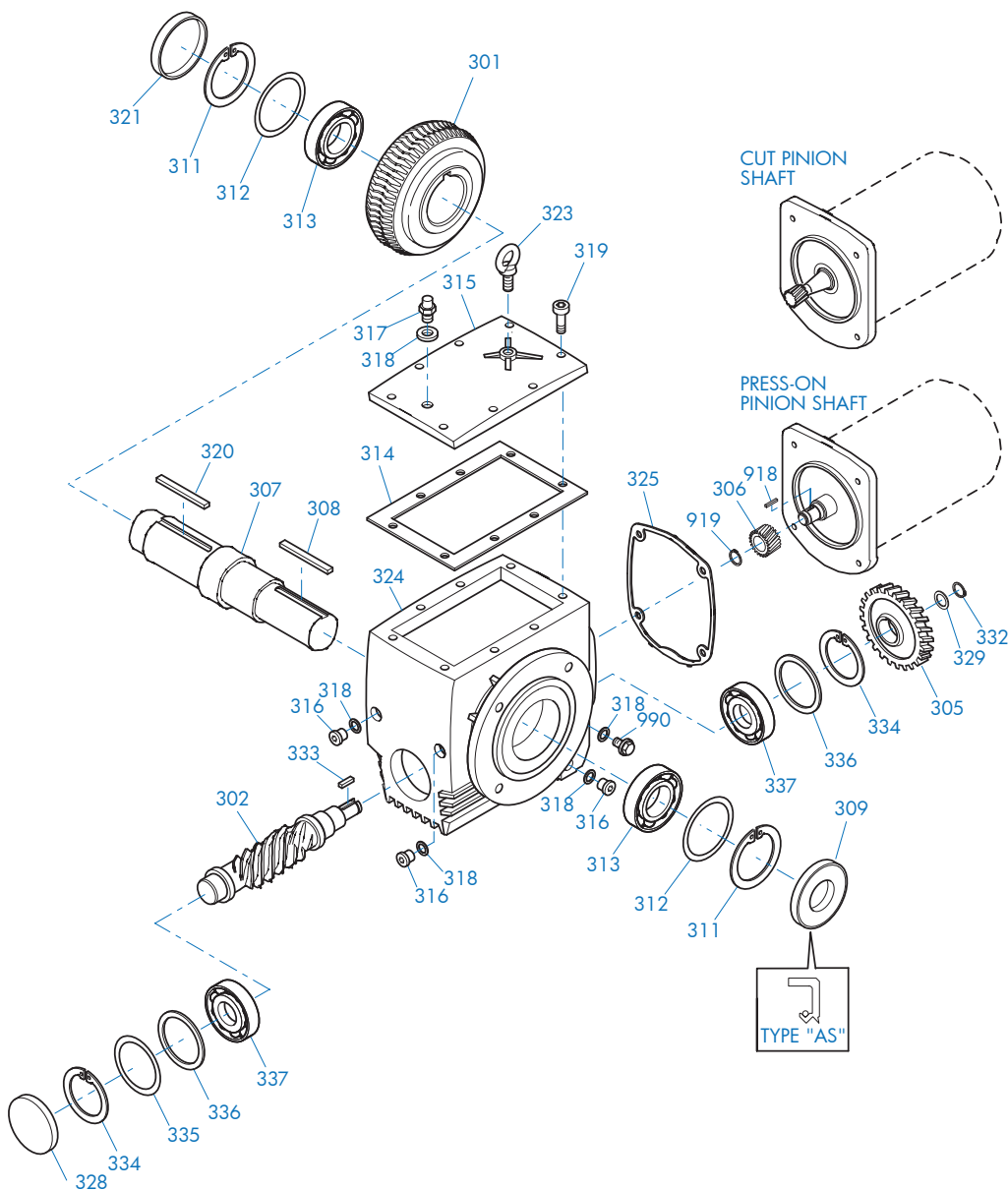
DRIVESYSTEMS

HELICAL-WORM PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15500 - 3 of 11



SK 02040 - SK 42125 Flange Mounted

301 Worm Wheel	315 Inspection Cover	329 Thrust Washer
302 Worm	316 Drain Plug	332 Snap Ring
305 Gear	317 Vent Plug	333 Key
306 Pinion	318 Gasket	334 Snap Ring
307 Output Shaft	319 Socket Head Screw	335 Shim
308 Key	320 Key	336 Thrust Washer
309 Oil Seal	321 Bore Plug	337 Anti-Friction Bearing
311 Snap Ring	323 Flanged Eye Bolt	918 Key
312 Shim	324 Gearcase	919 Snap Ring
313 Anti-Friction Bearing	325 Gasket	990 Oil Level Plug
314 Gasket	328 Bore Plug	

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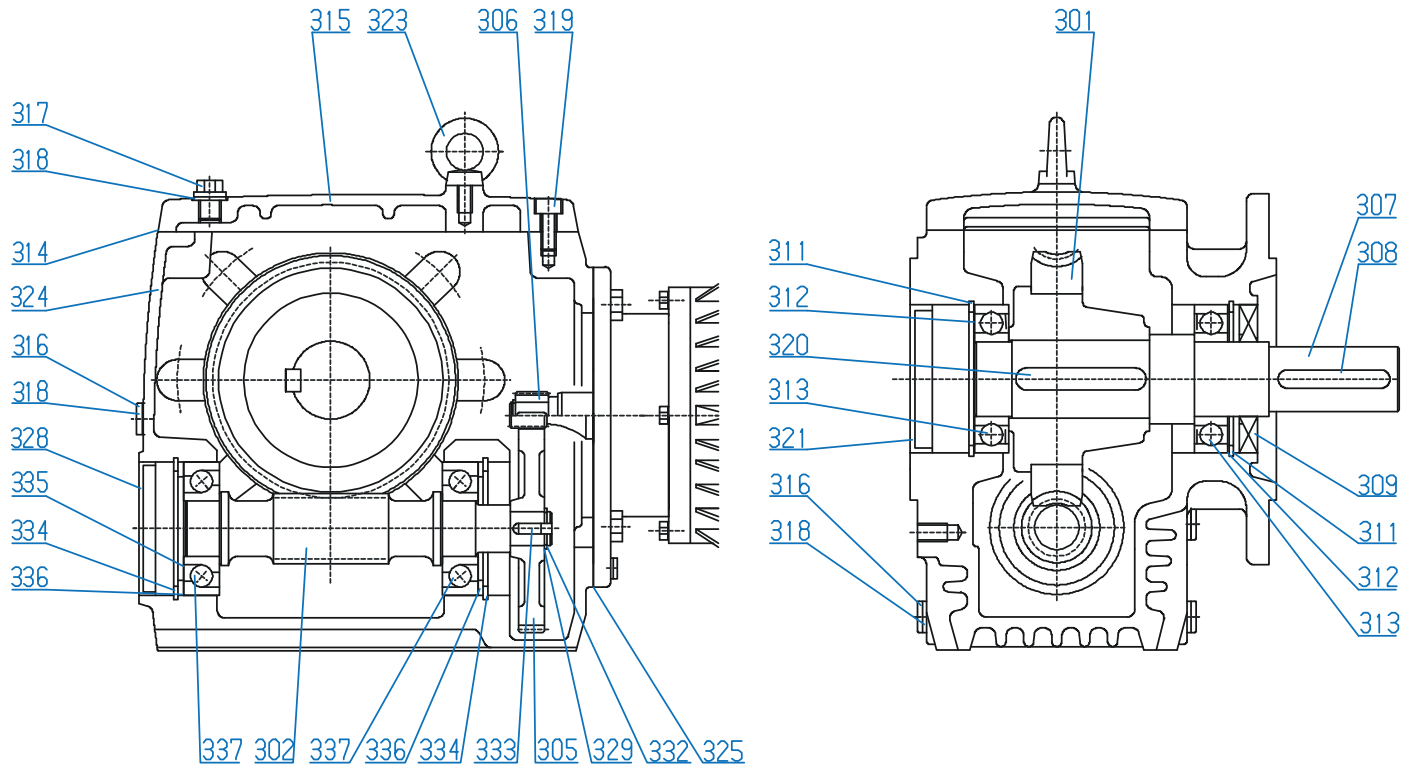
DRIVESYSTEMS

HELICAL-WORM PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15500 - 4 of 11



SK 02040 - SK 42125 Flange Mounted

301 Worm Wheel	314 Gasket	325 Gasket
302 Worm	315 Inspection Cover	328 Bore Plug
305 Gear	316 Drain Plug	329 Thrust Washer
306 Pinion	317 Vent Plug	332 Snap Ring
307 Output Shaft	318 Gasket	333 Key
308 Key	319 Socket Head Screw	334 Snap Ring
309 Oil Seal	320 Key	335 Shim
311 Snap Ring	321 Bore Plug	336 Thrust Washer
312 Shim	323 Flanged Eye Bolt	337 Anti-Friction Bearing
313 Anti-Friction Bearing	324 Gearcase	

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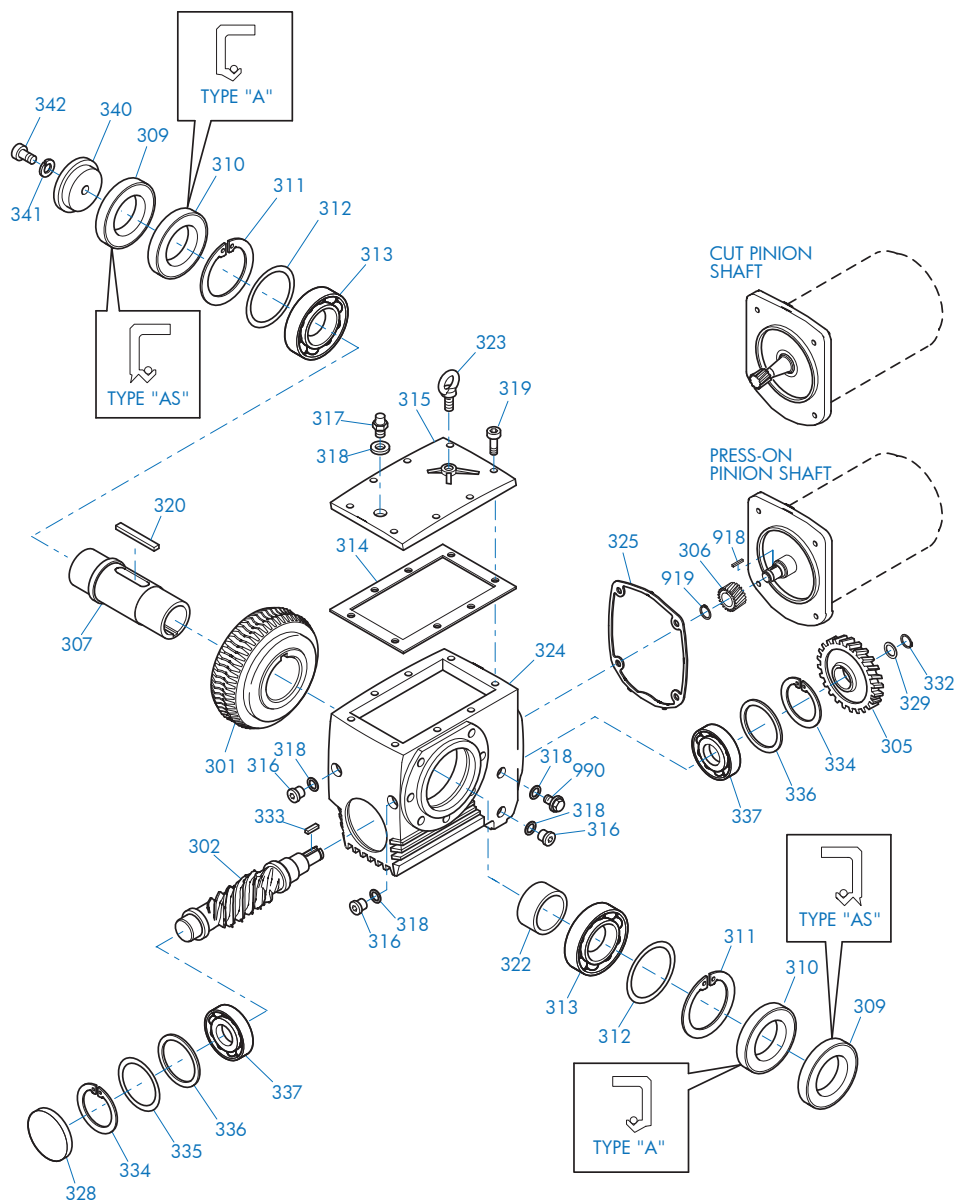
DRIVESYSTEMS

HELICAL-WORM PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15500 - 5 of 11



SK 02040 - SK 42125 Shaft Mounted

301 Worm Wheel	317 Vent Plug	335 Shim
302 Worm	318 Gasket	336 Thrust Washer
305 Gear	319 Socket Head Screw	337 Anti-Friction Bearing
306 Pinion	320 Key	340 Retaining Washer
307 Output Shaft	322 Spacer	341 Lock Washer
309 Oil Seal	323 Flanged Eye Bolt	342 Bolt
310 Oil Seal	324 Gearcase	350 Flange
311 Snap Ring	325 Gasket	351 Bolt
312 Shim	328 Bore Plug	918 Key
313 Anti-Friction Bearing	329 Thrust Washer	919 Snap Ring
314 Gasket	332 Snap Ring	990 Oil Level Plug
315 Inspection Cover	333 Key	
316 Drain Plug	334 Snap Ring	

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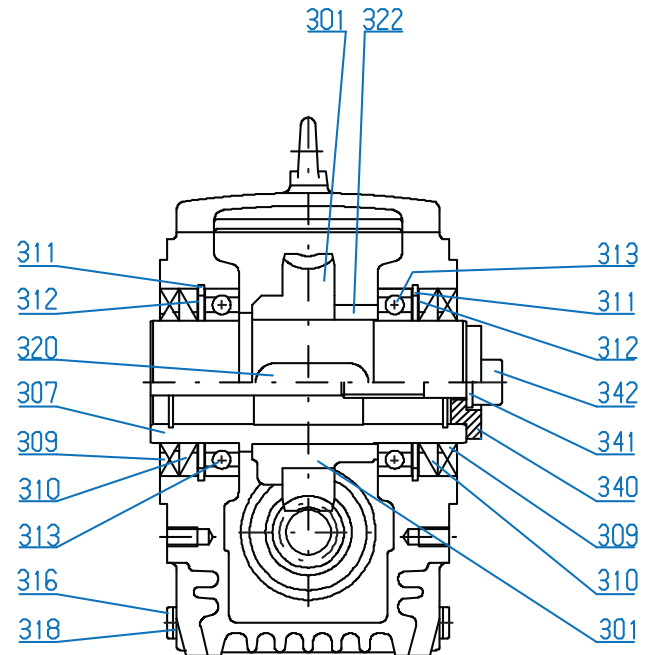
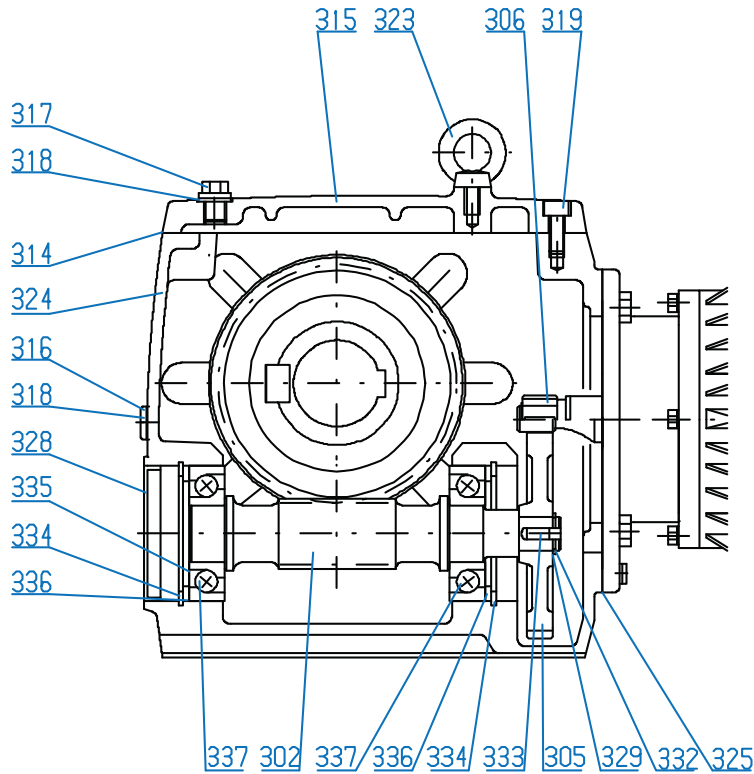
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HELICAL-WORM PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



SK 02040 - SK 42125 Shaft Mounted

301 Worm Wheel	316 Drain Plug	333 Key
302 Worm	317 Vent Plug	334 Snap Ring
305 Gear	318 Gasket	335 Shim
306 Pinion	319 Socket Head Screw	336 Thrust Washer
307 Output Shaft	320 Key	337 Anti-Friction Bearing
309 Oil Seal	322 Spacer	340 Retaining Washer
310 Oil Seal	323 Flanged Eye Bolt	341 Lock Washer
311 Snap Ring	324 Gearcase	342 Bolt
312 Shim	325 Gasket	350 Flange
313 Anti-Friction Bearing	328 Bore Plug	351 Bolt
314 Gasket	329 Thrust Washer	
315 Inspection Cover	332 Snap Ring	



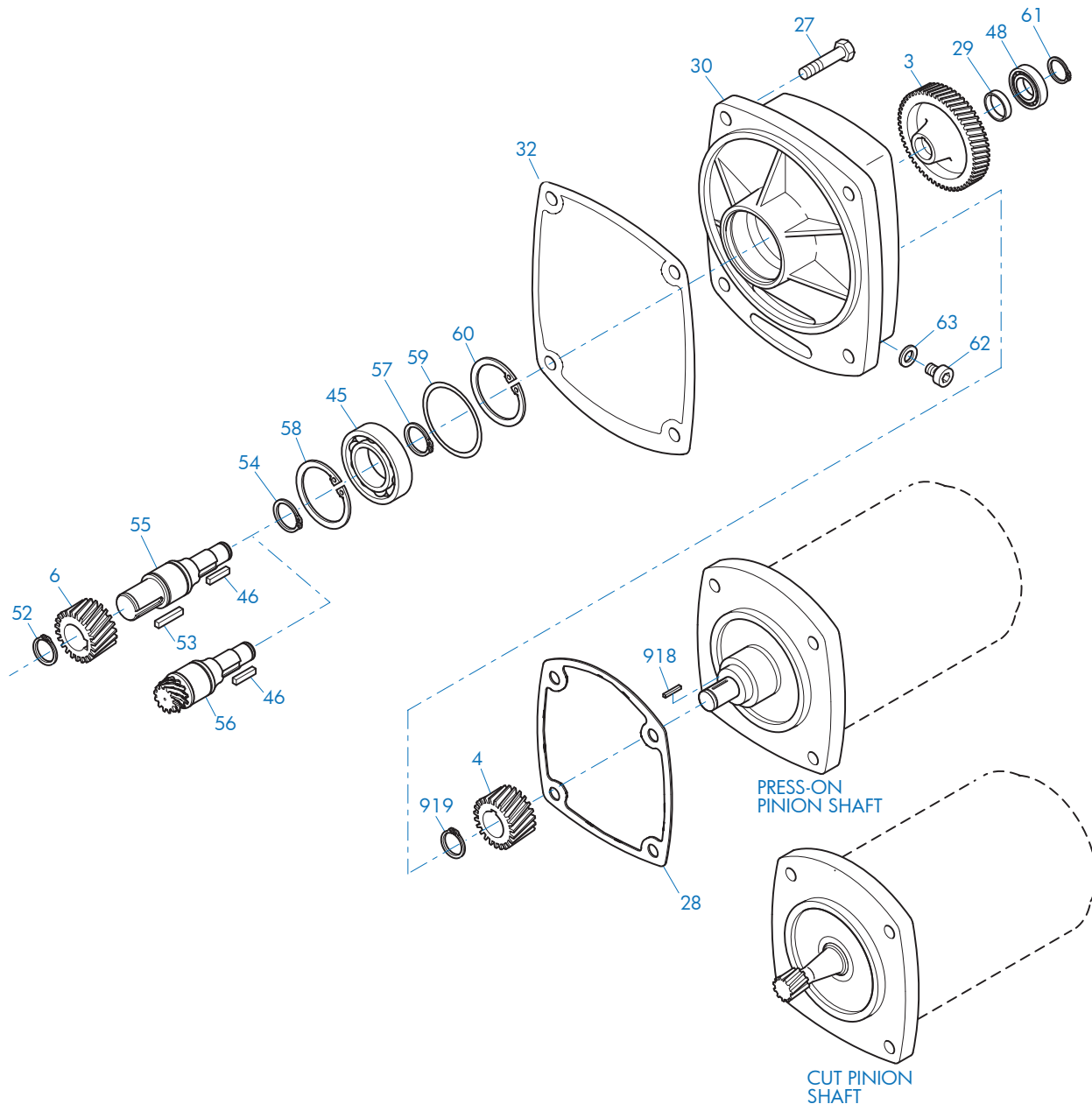
DRIVESYSTEMS

HELICAL-WORM PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15500 - 7 of 11



SK13050 - SK43125 Third Stage Reduction Gear

3	Gear	46	Key	59	Shim
4	Pinion	48	Anti-Friction Bearing	60	Snap Ring
6	Pinion	52	Snap Ring	61	Snap Ring
27	Bolt	53	Key	62	Oil Plug
28	Gasket	54	Snap Ring	63	Gasket
29	Spacer	55	Intermediate Shaft, Plain	918	Key
30	Third Reduction Gearcase	56	Intermediate Shaft, Gearcut	919	Snap Ring
32	Gasket	57	Snap Ring		
45	Anti-Friction Bearing	58	Snap Ring		

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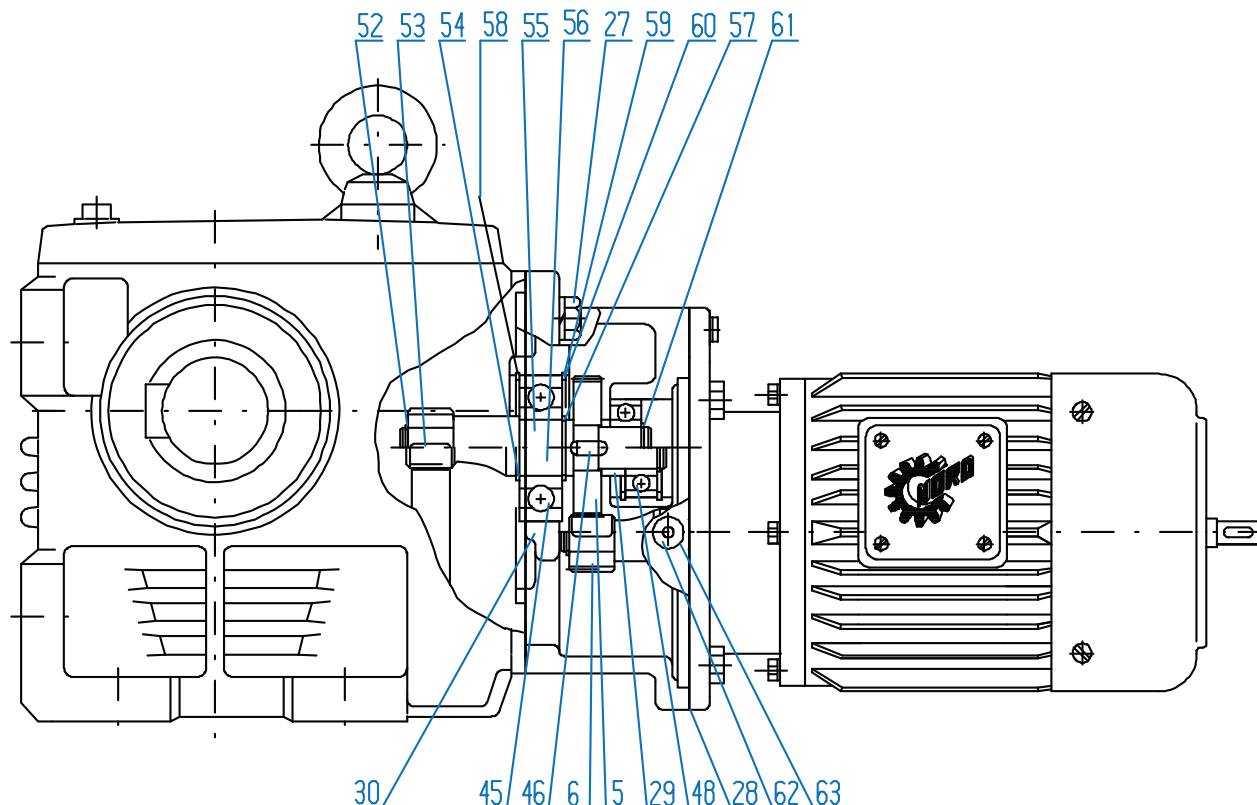
DRIVESYSTEMS

HELICAL-WORM PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15500 - 8 of 11



SK13050 - SK43125 Third Stage Reduction Gear

3	Gear	46	Key	58	Snap Ring
4	Pinion	48	Anti-Friction Bearing	59	Shim
27	Bolt	52	Snap Ring	60	Snap Ring
28	Gasket	53	Key	61	Snap Ring
29	Spacer	54	Snap Ring	62	Oil Plug
30	Third Reduction Gearcase	55	Intermediate Shaft, Plain	63	Gasket
32	Gasket	56	Intermediate Shaft, Gearcut		
45	Anti-Friction Bearing	57	Snap Ring		

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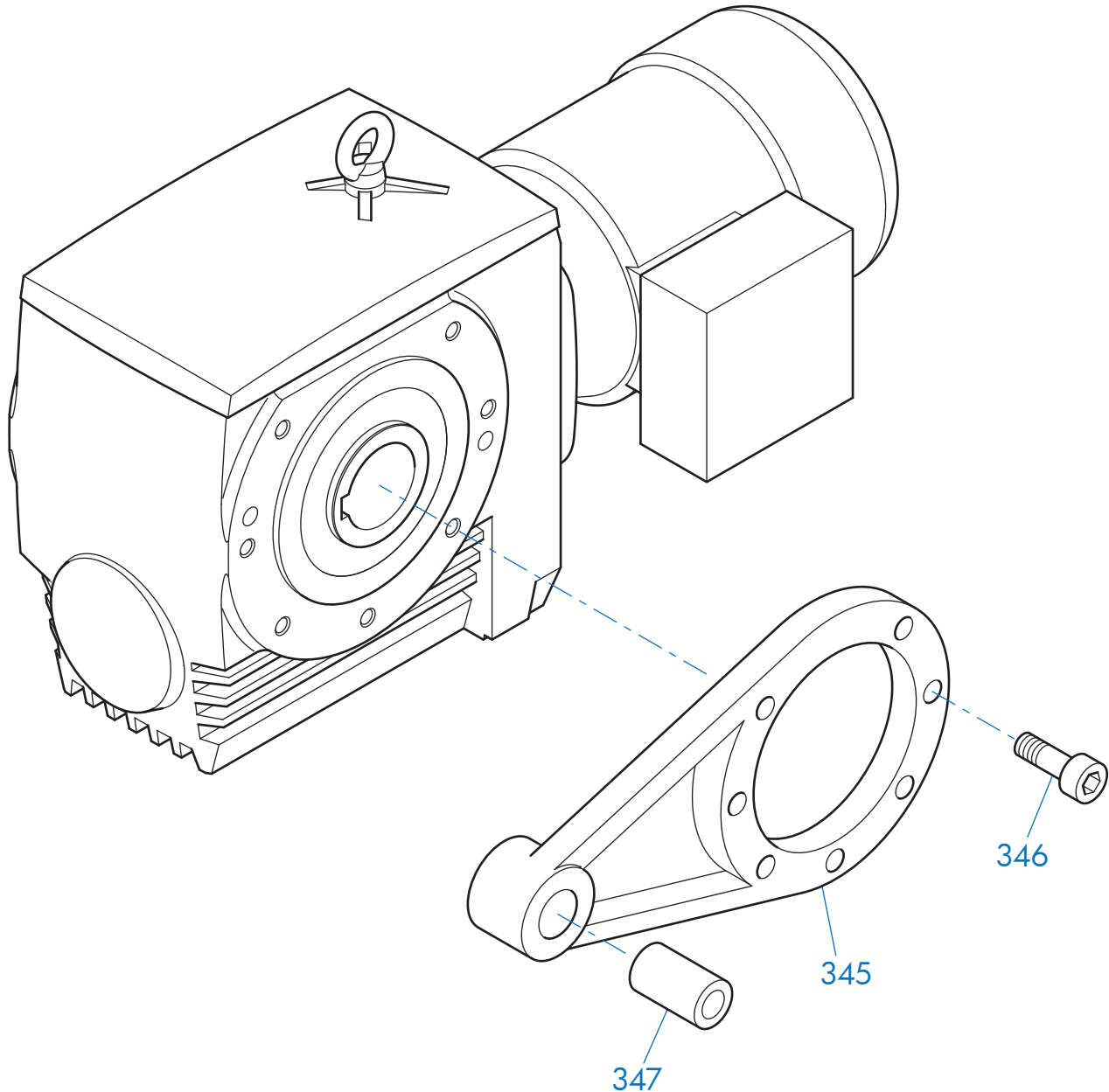
DRIVESYSTEMS

HELICAL-WORM PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15500 - 9 of 11



SK13050 - SK43125 Torque Arm

345 Torque Arm

346 Bolt

347 Bushing

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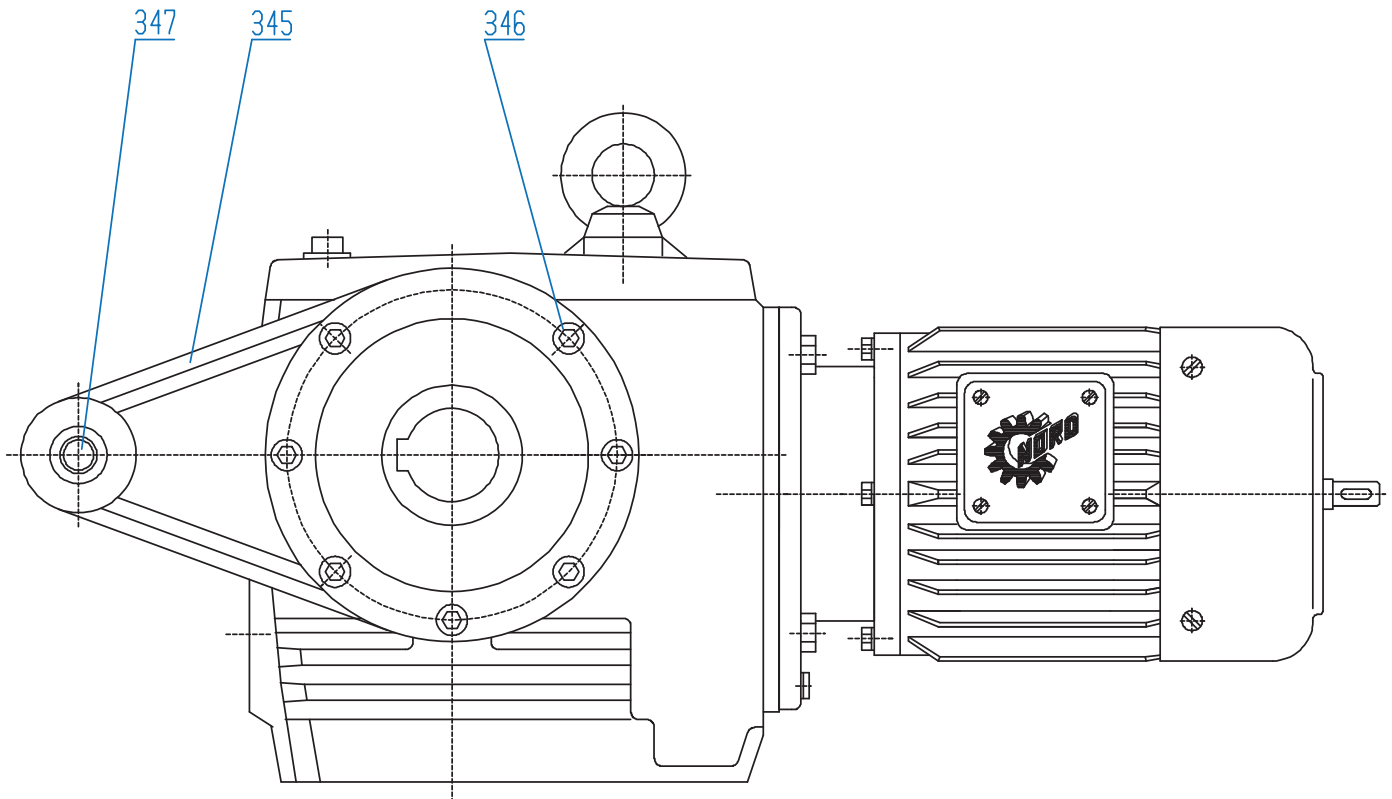
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SK13050 - SK43125 Torque Arm

345 Torque Arm

346 Bolt

347 Bushing



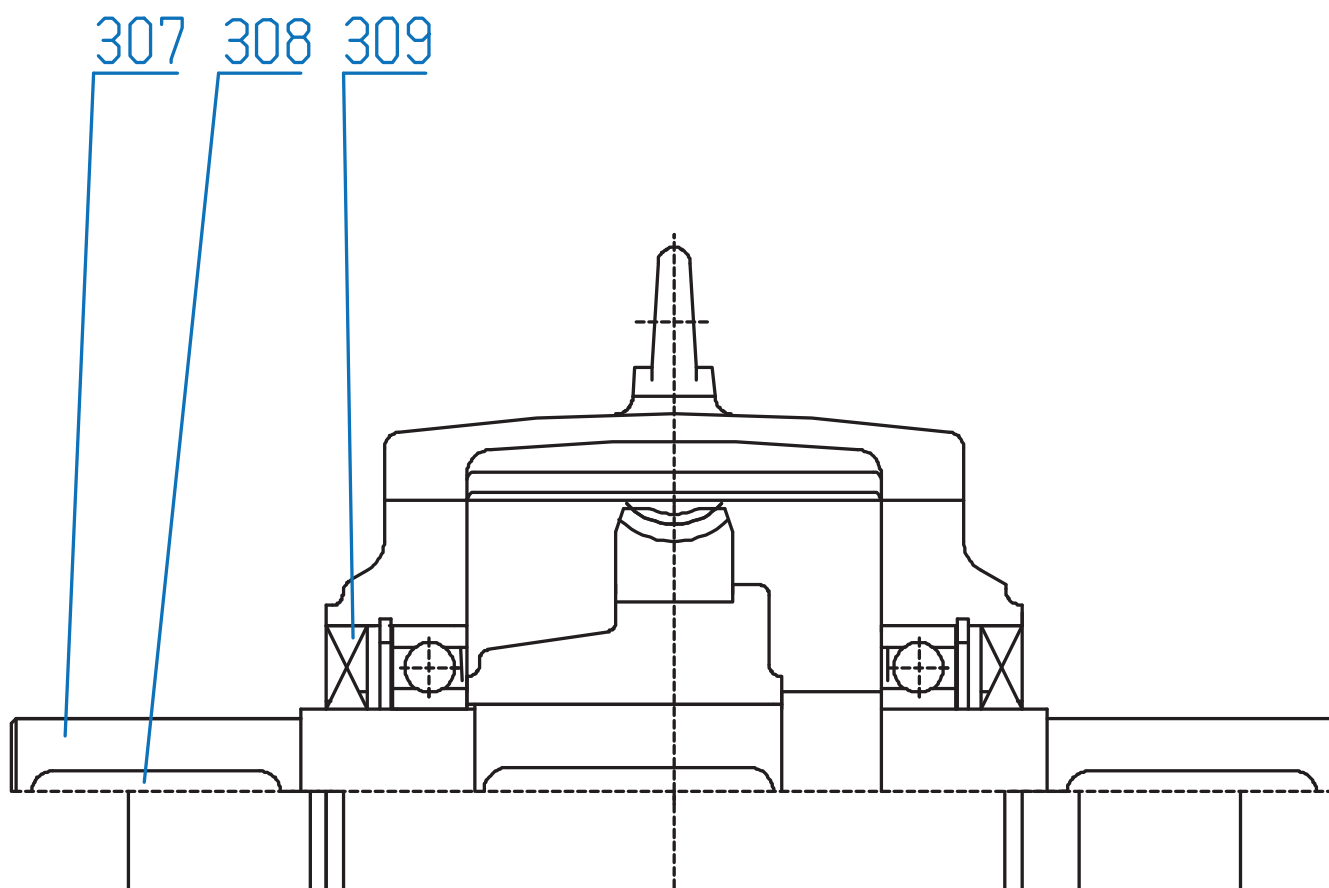
DRIVESYSTEMS

HELICAL-WORM PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15500 - 11 of 11



SK13050 - SK43125

307 Output Shaft
308 Key

309 Oil Seal
346 Screw

350 Flange
354 Shrink Disc Connector

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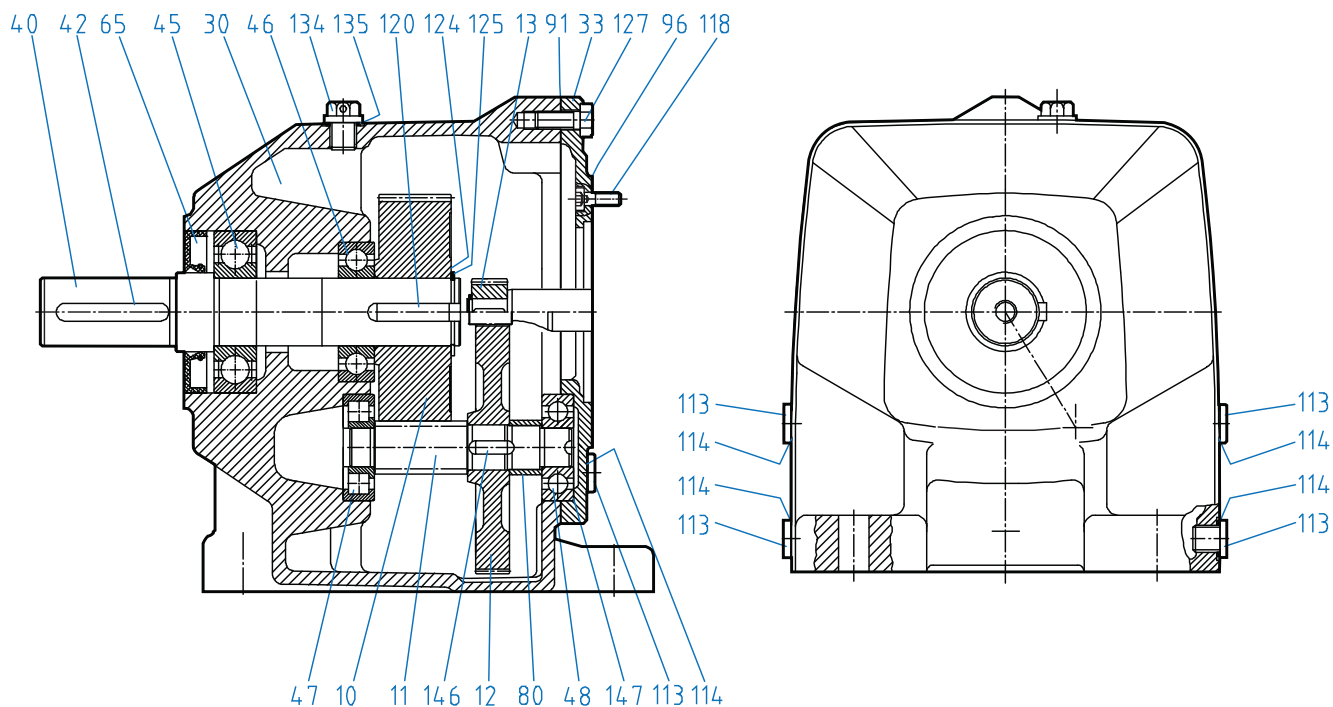
DRIVESYSTEMS

NORDBLOC® PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15600 - 1 of 4



SK 172 - SK 972 Foot Mounted

10	Driven gear	46	Output shaft bearing	118	Bolt
11	Pinion shaft	47	Pinion shaft bearing	120	Key
12	Driving gear	48	Pinion shaft bearing	124	Shim
13	Driving pinion	65	Shaft seal	125	Snap ring
30	Gearcase	80	Spacer	127	Bolt
33	Input cover	91	Gasket	134	Vent plug
40	Output shaft	96	Gasket	135	Gasket
42	Key	113	Oil plug	146	Key
45	Output shaft bearing	114	Gasket	147	Shim

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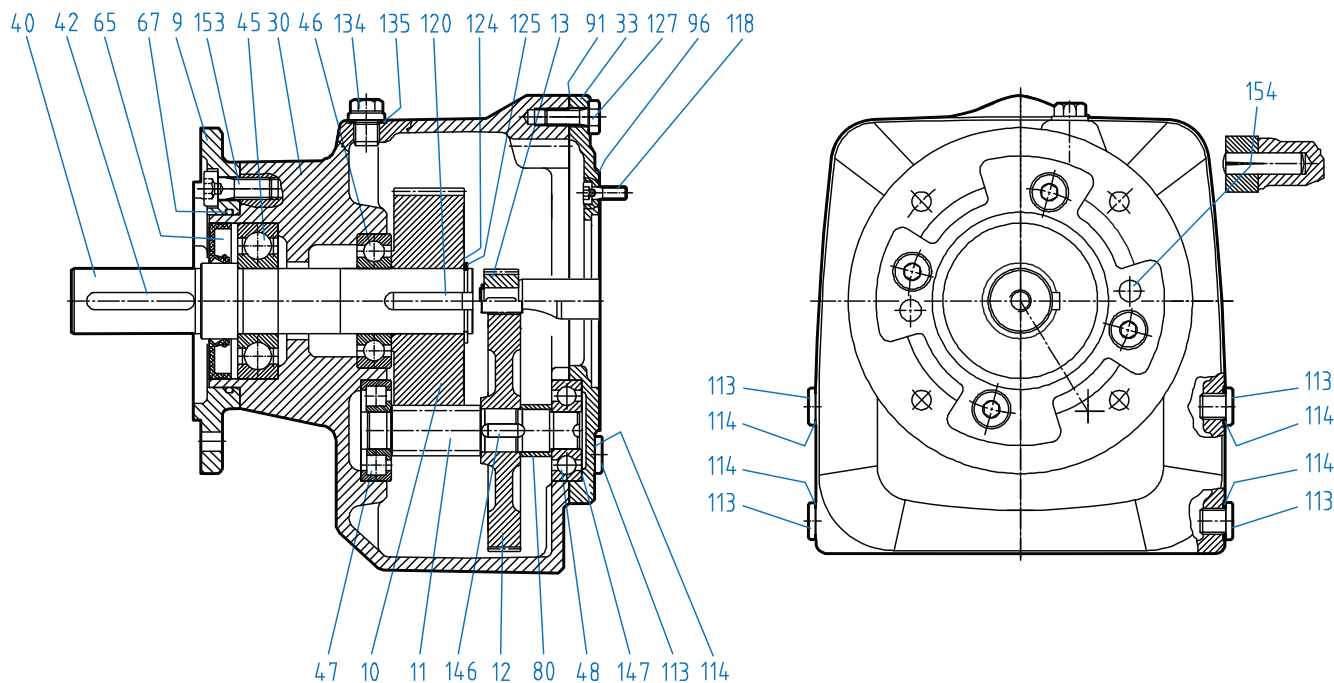
DRIVESYSTEMS

NORDBLOC® PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15600 - 2 of 4



SK 172 - SK 972 Flange Mounted

9 Flange	47 Pinion shaft bearing	124 Shim
10 Driven gear	48 Pinion shaft bearing	125 Snap ring
11 Pinion shaft	65 Shaft seal	127 Bolt
12 Driving gear	67 O-Ring	134 Vent plug
13 Driving pinion	80 Spacer	135 Gasket
30 Gearcase	91 Gasket	146 Key
33 Input cover	96 Gasket	147 Shim
40 Output shaft	113 Oil plug	153 Bolt
42 Key	114 Gasket	154 Grooved dowel pin
45 Output shaft bearing	118 Bolt	
46 Output shaft bearing	120 Key	

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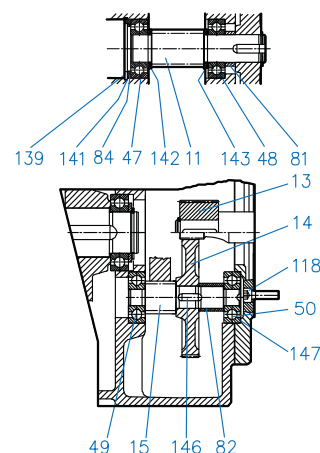
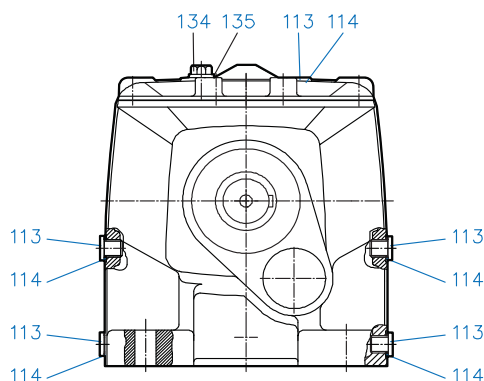
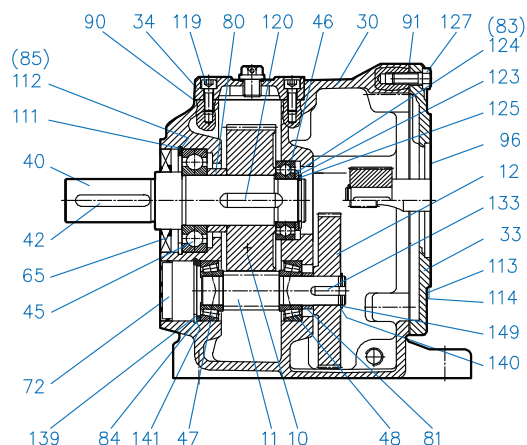
DRIVESYSTEMS

NORDBLOC® PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15600 - 3 of 4



SK 273 - SK 973 Foot Mounted

10 Driven gear	65 Shaft seal	120 Key
11 Pinion shaft	72 Bore plug	123 Thrust washer
12 Driving gear	80 Spacer	124 Shim
13 Driving pinion	81 Spacer	125 Snap ring
14 Driving gear	82 Spacer	127 Bolt
15 Pinion shaft	83 Thrust washer	133 Key
30 Gearcase	84 Thrust washer	134 Vent plug
33 Input cover	85 Thrust washer	135 Gasket
34 Gear case cover	90 Gasket	139 Snap ring
40 Output shaft	91 Gasket	140 Shim
42 Key	96 Gasket	141 Shim
45 Output shaft bearing	111 Snap ring	142 Thrust washer
46 Output shaft bearing	112 Shim	143 Thrust washer
47 Pinion shaft bearing	113 Oil plug	146 Key
48 Pinion shaft bearing	114 Gasket	147 Shim
49 Pinion shaft bearing	118 Bolt	149 Snap ring
50 Pinion shaft bearing	119 Bolt	



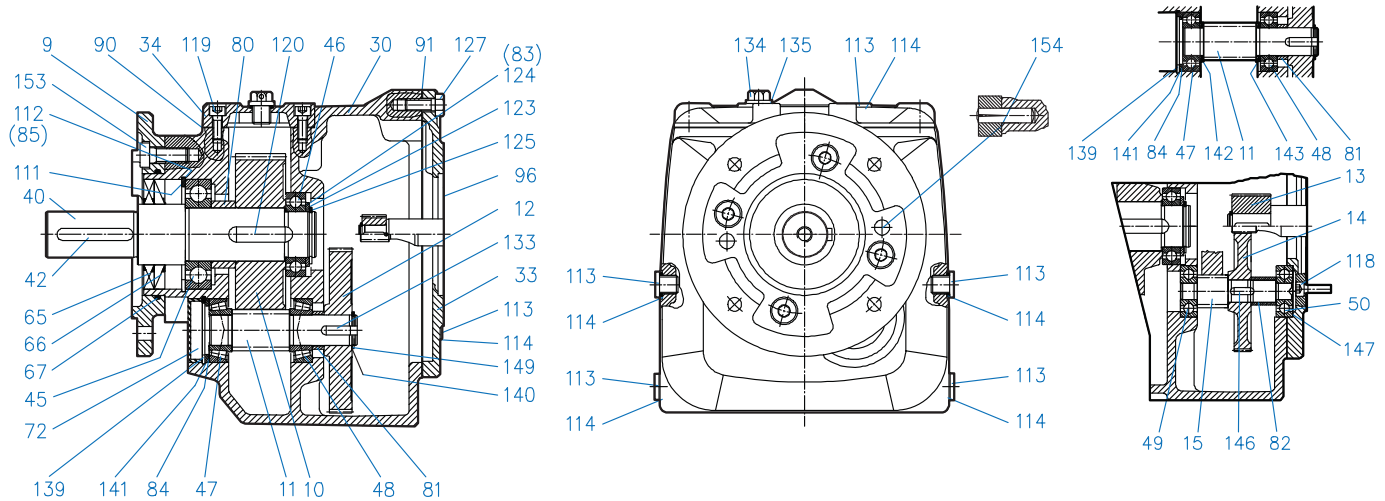
DRIVESYSTEMS

NORDBLOC® PARTS LIST DRAWINGS

RETAIN FOR FUTURE USE



U15600 - 4 of 4



SK 273 - SK 973 Flange Mounted

9 Flange	66 Shaft seal	123 Thrust washer
10 Driven gear	67 O-Ring	124 Shim
11 Pinion shaft	72 Bore plug	125 Snap ring
12 Driving gear	80 Spacer	127 Bolt
13 Driving pinion	81 Spacer	133 Key
14 Driving gear	82 Spacer	134 Vent plug
15 Pinion shaft	83 Thrust washer	135 Gasket
30 Gearcase	84 Thrust washer	139 Snap ring
33 Input cover	85 Thrust washer	140 Shim
34 Gearcase cover	90 Gasket	141 Shim
40 Output shaft	91 Gasket	142 Thrust washer
42 Key	96 Gasket	143 Thrust washer
45 Output shaft bearing	111 Snap ring	146 Key
46 Output shaft bearing	112 Shim	147 Shim
47 Pinion shaft bearing	113 Oil plug	149 Snap ring
48 Pinion shaft bearing	114 Gasket	153 Bolt
49 Pinion shaft bearing	118 Bolt	154 Grooved dowel pin
50 Pinion shaft bearing	119 Bolt	
65 Shaft seal	120 Key	

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Troubleshooting

This section identifies some of the most common issues involved with NORD Gear speed reducers , and provides recommendations to assist you in defining and answering your questions as you work with our products. You may also contact our Engineering/Application departments if your questions are not answered in the table below.

Problem With the Reducer		Possible Causes	Suggested Remedy
Runs Hot	Overloading	Load exceeds the capacity of the reducer	Check rated capacity of reducer, replace with unit of sufficient capacity or reduce the load.
	Improper lubrication	Insufficient lubrication	Check lubricant level and adjust up to recommended levels
		Excessive lubrication	Check lubricant level and adjust down to recommended levels.
		Wrong lubrication	Flush out and refill with correct lubricant as recommended
Runs Noisy	Loose foundation bolts	Weak mounting structure	Inspect mounting of reducer. Tighten loose bolts and/or reinforce mounting and structure.
		Loose hold down bolts	Tighten bolts
	Failure of bearings	May be due to lack of lubricant	Replace bearing. Clean and flush reducer and fill with recommended lubricant.
		Overload	Check rated capacity of reducer.
	Insufficient lubricant	Level of lubricant in reducer not properly maintained.	Check lubricant level and adjust to factory recommended level.
Output shaft does not turn	Internal parts are broken or missing	Overloading of reducer can cause damage	Replace broken parts. Check rated capacity of reducer.
		Key missing or sheared off on input shaft.	Replace key.
		Coupling loose or disconnected	Properly align reducer and coupling. Tighten coupling.
Oil Leakage	Worn seals	Caused by dirt or grit entering seal.	Replace seals. Autovent may be clogged. Replace or clean.
	Unit runs hot or leaks	Overfilled reducer	Check lubricant level and adjust to recommended level.
		Vent clogged.	Clean or replace, being sure to prevent any dirt from falling into the reducer.
	Incorrect fill level	Improper mounting position, such as wall or ceiling mount of horizontal reducer.	Check mounting position on the name tag & verify with mounting chart in manual.



MOTORS - AC INDUCTION, SINGLE & POLYPHASE



1. Overview

This user manual applies to NORD Motor products and it provides general information for motor operation, installation, maintenance, inspection, repair, and trouble shooting, which is relevant to most of the motor products shipped by NORD. Information and instructions provided in this manual, safety and commissioning information and all other manuals applicable to any items supplied by NORD must be observed.

This instruction manual is not intended to include comprehensive details and information related to all possible design variations or accessories options available with NORD motors. If there is any uncertainty about specific procedures, instructions or motor details, then please refer these questions to NORD for additional information or clarification.

Before installing, operating, or performing maintenance on any electrical motor become familiar with the following:

- The detailed operating instructions and wiring diagrams.
- All applicable national, local and system-specific regulations, codes and practices.
- The national / regional regulations governing safety and accident prevention.
- The proper use of any tools, transportation or hoisting equipment, and safety equipment needed to complete the installation.
- To avoid serious injury or possible damage to the equipment or machine, compliance with all safety and information notes is mandatory!

	WARNING	
<p>All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians. All applicable national, regional, and local work regulations and safety requirements must also be complied with. NORD assumes no liability for personal injury, accidental death, or equipment damage and malfunctions resulting from failure to comply with installation or operating instructions, safety notes, or any work regulations and laws!</p>		

	WARNING	
<p>To avoid electrocution, injury or death, make certain the motor is properly grounded, completely de-energized and brought to a no-voltage condition prior to working on any electrical connections.</p>		

2. Motor Types

NORD AC electric induction motors described in this manual generally include the following types:

- Single speed or two-speed design.
- Three phase alternating current or single phase design.
- Enclosure types: TEFC, TENV, and TEBC.

3. Enclosure Types

Totally enclosed fan cooled (TEFC).

TEFC motor designs rely on fan that is mounted on the motor's rotor shaft so the cooling capacity can vary based upon the motor's operating speed.

Totally enclosed, non-ventilated (TENV)

The TENV motor designs rely purely on convection cooling and they have no fan. Often TENV designs are labeled for intermittent or periodic duty or at a lower power rating than is typical for the given motor frame size.

Totally enclosed, blower cooled (TEBC)

The TEBC design uses separate blower or ventilator fan, with its own low wattage motor and a separate power supply, to provide continuous airflow and cooling. The blower can be used to extend the speed range of the motor and allow extreme slow speed operation without causing a concern for overheating. Blower data is provided in Table 6, page 11.

4. Voltage and Frequency Variation

Voltage and frequency variations are based upon the assumption that the nameplate horsepower will not be exceeded and that the motor temperature may increase. Standard allowable deviations are based upon the type of motor labeling.

NEMA and CSA Labeled Motors

Variations are based upon the nominal utilization voltage, and not the service (supply) voltage as per ANSI C84.1.

Service Voltages	Utilization Voltages
120V, 208V, 240V, 480V, 600V	115V, 200V, 230V, 460V, 575V

- Voltage variation at rated frequency = $\pm 10\%$.
- Frequency variations at rated voltage = $\pm 5\%$.
- Combined voltage/frequency variation = $\pm 5\%$.

CE Labeled Motors

Per IEC 60038, allowable service voltage variations on in the current system, compared to the previous system, are as indicated.

Previous Service Voltages	Current Service Voltages
220V, 380V, 660V	230V, 400V, 690V $+6/-10\%$
240V, 415V	230V, 400V $+10/-6\%$

- Per EN 60034-1 a $\pm 5\%$ voltage variation and a $\pm 2\%$ frequency variation can be tolerated.
- The allowed variations are based upon the voltage (or voltage range) indicated on the motor nameplate.



DRIVESYSTEMS

MOTORS - AC INDUCTION, SINGLE & POLYPHASE



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5. Motor Nameplate Information

The motor nameplate and the display of technical information may vary slightly depending upon the global standard/s that the motor conforms to and the efficiency level. Please reference the examples below.

Table 1. Nameplate Data

Field	Definition
1	Model / Type
2	Number of Phases
3	Order Number
4	Serial Number
5	Insulation Class
6	IP (Ingress Protection) Enclosure Rating
7	Duty Cycle
8	Ambient Temperature Rating (°C)
9	Enclosure Type
10	Motor Frequency (Hz)
11	Voltage Rating (V)
12	Current Rating (A)
13	Rated Power (HP or kW)

Field	Definition
14	Power Factor
15	Motor Frame Size
16	Full Load Speed (rpm or 1/min ²)
17	Efficiency
18	NEMA Code Letter
19	Service Factor
20	Current Rating (If Service Factor ≥ 1.15)
21	Operating Voltage Range (A)
22	Current Rating at Operating Voltage Range (A)
23	Service Factor at Operating Voltage Range (A)
24	Brake Rating (Nm)
25	Brake Supply Voltage (VAC)
26	Brake Coil Voltage (VDC)



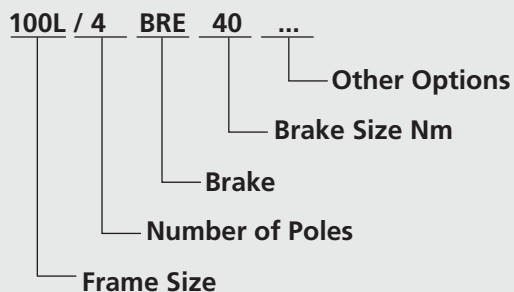
6. Motor Options And Nomenclature

NORD offers many options for its motors. The option code will be shown in the motor nomenclature. Below are commonly used options.

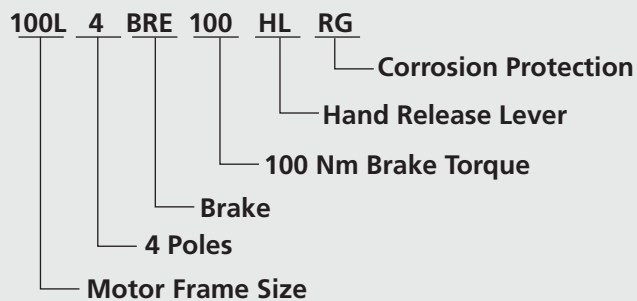
Code	Description
AICM	Additional Internal Insulation Coating Applied
BRE	With Brake
EAR	Single Phase, Start Cap/Run Cap
ECR	Single Phase, Start Cap/Run Cap Increased SF
EHB	Single Phase, Run Capacitor Only
EP	Epoxy Dipped Windings
F	Blower Cooling Fan - 3ph & 1ph
FC	Blower Cooling Fan - 1ph
FHL	Brake – Lockable Manual Release
H	Energy Efficient
HL	Brake – Manual Hand Release
IG	Incremental Encoder
IP66	IP66 Environmental Protection
IR	Brake – Current Sensing Relay
KB	Condensation Holes - Removable Plugs
KD	Condensation Holes - Open
MIK	Brake – Microswitch
MS	Power Plug Connector

Code	Description
OL	TENV Motor – Without Fan / With Cover
OL/H	TENV Motor - Without Fan & Cover
P	Premium Efficient Motors
RD	Canopy Cover
RDD	Double Canopy Cover
RG	Brake – Corrosion Protected
RLS	Backstop
SH	Motor Space Heater
SR	Brake – Dust Protected
TF	Thermistor
TW	Thermostat
VN	10:1 Constant Torque Rated Motor
VR	5:1 Constant Torque Rated Motor
VW	20:1 Constant Torque Rated Motor
VZ-F	1000+:1 Constant Torque Rated Motor
WE	2nd Motor Shaft End
WU	High Slip Rotor
Z	High Inertia Motor Fan

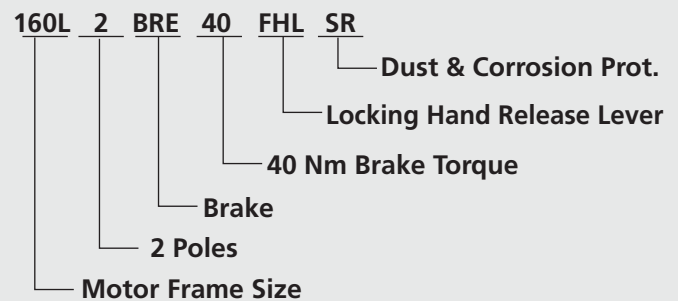
Motor Nomenclature



Ordering Examples



100 Frame Motor with 4 poles, Brake, 100 Nm with a hand release lever, corrosion protected brake, and a current sensing relay.



63 Frame Energy efficient motor with 4 poles, Brake, 40 Nm with a locking hand release lever and dust & corrosion protection.



MOTORS - AC INDUCTION, SINGLE & POLYPHASE



7. Application Conditions

Standard NORD motors are designed to operate in dusty or moist environments and have anti-fungal, thermal class F insulation.

- Enclosure Protection Rating = IP55 (minimum).
- Maximum Installation Height = 3300 ft (1000 m).
- Ambient Temperature = -4 to 104°F (-20 to 40 °C).
- Tropical-proof, Thermal Class F insulation.

The protection level and maximum ambient temperature are stated on the motor nameplate.



IMPORTANT NOTE



NORD can provide motors for an expanded range of applications and service conditions including higher protection levels, extreme ambient conditions and, higher altitudes.



WARNING



Consult NORD for recommendations if motors are operated under extreme loading conditions, exposed to high inertia loads, or need to operate under unusually high cycling conditions with high starting and stopping frequency.



WARNING



Special design and assembly considerations are needed if NORD motors are subject to any of the following conditions:

- Outdoor installation with motor in a vertical position.
- Direct contact with aggressive or corrosive materials (acids, bases, salts, certain gases, etc.).
- Exposure to extreme high or low temperatures, high relative humidity, condensation moisture or very wet environments.
- Subject to extreme material build-up on the unit (dirt, dust, sand, etc.).
- Hazardous Locations (risk of fire or explosion).

8. Transportation

During transportation observe the following:

- Make sure that all eyebolts and lifting lugs are tight and firmly against their supporting surface.
- Use all the lifting eyes that are intentionally supplied with the motor.
- Lift only at designed points.
- Protect the mounting surface from possible damage during transportation.
- Always use sufficiently rated handling equipment, lift mechanisms and lifting straps.
- With heavier objects or unbalanced loads, it may be appropriate to use more than one lifting point or an additional strap or sling to assure safe transportation of the assembly. This is especially true of assembled gearmotors and motorized reducers.
- Once the NORD motor or assembly is properly installed, remove the transportation fixtures completely or make certain they are properly re-secured and tightened.



WARNING



Transportation – Use of Lifting Devices

To avoid death, serious injury or equipment damage...

- Hoisting lugs or lifting eyes attached to the motor are designed for the weight of the motor only! Do not attach any additional loads!
- The motor must only be transported and lifted using the lifting eyes, in a position that is appropriate for its type of construction. Otherwise, it could fall over or slip in the lifting tackle.
- During suspended transport, two straps must be able to carry the entire load weight safely.
- When required use additional, suitable means of support for transportation, installation or removal.
- Always secure the support equipment to prevent it from slipping.



MOTORS - AC INDUCTION, SINGLE & POLYPHASE



9. Storage

If the motor is not in service, store it according to the following conditions:

- Store the motor in a clean, dry, dirt-free, vibration free area.
- Storage temperatures of 10°C (50°F) to 50°C (120°F) must be maintained.
- Relative humidity must not exceed 60%.
- If vibration in the area exceeds 0.002 inch (0.05 mm) at 60 hertz, then vibration isolation pads are suggested to prevent brinelling of the bearings.
- Treat the unprotected shaft end and mating flange surfaces with a corrosion inhibitor that can be cleaned off prior to commissioning.
- Before placing the motor into service, visually inspect the motor exterior for evidence of deterioration during storage. Turn the motor shaft by hand to make sure the shaft turns freely.
- Motor space heaters, when provided, are to be connected and energized whenever there is a possibility that the storage ambient conditions will reach the dew point. Space heaters are optional. Remove motor from the storage container when the heater is energized.
- If the motor needs to be stored for extended periods, or if it is stored in less than favorable conditions, it is recommend that the winding insulation resistance be checked prior to commissioning (page 7).
- Even if stored in favorable conditions, the antifriction motor bearings and motor shaft seals may need to be replaced if the storage period is more than 4 years.

10. Safety Considerations

When installing, servicing or replacing electric motors it is important to be working in a "voltage-free" state. Observe the following safety rules.

Five Safety Rules

1. Disconnect the system. Disconnect the auxiliary circuits (brakes, space heaters, etc.).
2. Prevent reconnection (follow safe lock-out/tag-out practices).
3. Make sure that the equipment is at zero voltage.
4. Make certain the equipment is properly grounded and short-circuited.
5. Cover or isolate nearby components that are still electrically live.

To energize the system, apply the measures in reverse order.

Qualified Personnel

All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians.

For the purpose of this documentation, a qualified personnel is taken to mean a person or people who fulfill the following requirements:

- Through appropriate training and experience, they are able to recognize and avoid risks and potential dangers in their particular field of activity.
- They have been instructed to carry out work on the machine by the appropriate person responsible.
- They are responsible for knowing and complying with all applicable national, regional, and local work regulations and safety requirements.



MOTORS - AC INDUCTION, SINGLE & POLYPHASE



10. Safety Considerations Ctd.

General Warnings and Cautions

⚠	WARNING	⚠
<p>To avoid electrocution, injury or death, make certain all electrical devices (motors, brakes, variable frequency drives, etc.) are properly grounded, completely de-energized, and brought to a no-voltage condition prior to working on any electrical connections. Remember that most of these devices carry potentially dangerous energy levels for a period of time after power is removed. Always follow proper lock-out/tag-out procedures.</p>		

⚠	WARNING	⚠
<p>Electrical machines contain dangerous voltage levels, electrically live parts, rotating surfaces and hot surfaces. To prevent injury, death or possible equipment damage always observe the following:</p> <ul style="list-style-type: none">• Keep all safety covers and guards in place during operation. Remove and replace covers in compliance with the applicable safety regulations.• Allow the machine to cool down before starting any work on it.• Operate the machines properly.• Perform regular maintenance on the machine.• Secure and guard free-standing shaft extensions.		

⚠	WARNING	⚠
<p>Electrically Live Parts</p> <p>Electrical machines contain electrically live parts. Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly.</p>		

⚠	WARNING	⚠
<p>Rotating Parts</p> <p>Electrical machines contain dangerous rotating parts. Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly.</p>		

⚠	WARNING	⚠
<p>Hot Surfaces</p> <p>Electrical machines have hot surfaces. Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly. Allow the machine to cool down before starting any work on it.</p>		

⚠	WARNING	⚠
<p>Maintain Proper Cooling</p> <p>Operating the motor without the intended cooling fan may cause overheating and result in very hot surfaces, personal injury and material damage. Never commission a motor intended to be fan cooled when it is missing the shaft-driven fan or external blower assembly.</p>		

⚠	WARNING	⚠
<p>Condensation Drain Holes (Optional)</p> <p>Inserting objects into the condensation drain holes can damage the winding and can result in death, serious injury and damage to property!</p> <ul style="list-style-type: none">• Before opening sealed drain holes, make sure the motor is in a no-voltage condition. Close the condensation drain holes before re-commissioning.• Exercise caution around drain holes that are intended to be left open, especially when the motor is energized.		

STOP	HARMFUL SITUATION	STOP
<p>Before start-up check the following:</p> <ul style="list-style-type: none">• All electrical connections are secure, well grounded and properly made.• The motor is rotating in the correct direction (when de-coupled from the driven load).• There are no temperature-sensitive parts (cables etc.), in contact with motor enclosure.• Condensation drain holes are always located at the lowest point of the motor.		



MOTORS - AC INDUCTION, SINGLE & POLYPHASE



11. Checking the Insulation

Before putting the motor into operation for the first time, after a lengthy period of storage or standstill (approx. 6 months), the insulation resistance of the winding should be checked.

WARNING

During and directly after measurement the motor connection terminals carry hazardous voltages.

A. Control

The insulation resistance of new, cleaned, or repaired motor windings against the grounded housing and against one another should be > 200 Mega-Ohms.

B. Measurement

Using a Mega-Ohm meter apply a DC voltage of 500 VDC to the motor winding for a period of 60 seconds and record the winding insulation resistance compared to ground.

- The 500 VDC test voltage is applicable to low voltage motors up to 1000 VAC.
- When performing this test the temperature of the windings should be $25^{\circ}\text{C} \pm 15^{\circ}\text{C}$ ($77^{\circ}\text{F} \pm 27^{\circ}\text{F}$).

C. Verification

- If the insulation resistance of the winding is less than 50 Mega-Ohms, the cause may be moisture. The windings should be dried and the test should be repeated.
- After any lengthy period of operation the insulation resistance may drop. So long as the measured value does not fall below the critical value of 50 Mega-Ohm, the motor may continue to be operated.
- If the measured value falls below the critical 50 Mega-Ohm level, the cause must be established and the windings or winding sections must be cleaned, dried, repaired, or replaced as needed.

12. Bearing Lubrication

NORD motor frame sizes 63 up to and including 225 are normally supplied with internally grease lubricated bearings and require no lubrication during normal operation.

NORD motor frame sizes 250 and larger are supplied with grease fittings for re-greasing the motor bearings.

IMPORTANT NOTE

Motors with grease fittings are normally supplied with a label indicating the grease type used, the suggested re-lubrication interval, and the amount of new grease to be applied. General bearing maintenance guidelines are listed in Table 3.

Typical motor bearing grease is an NLGI No. 2 consistency, high grade product with a polyurea base thickener, synthetic or blended mineral/synthetic oil, and stabilizing agents to protect against heat and oxidation.

Table 3 – Motor Bearing Maintenance Guidelines

Frame Size	Power	Poles	Re-greasing Interval
63-225	0.16-60 HP (0.12-45 kW)	All	Maintenance Free
250 to 280	75-125 HP (55-75 kW)	2	4000 h
		4 to 8	8000 h
315	150-250 HP (132-200 kW)	2	3000 h
		4 to 8	6000 h

HARMFUL SITUATION

When re-greasing motor bearings do not to mix different greases without verifying the compatibility with a reputable grease lubrication supplier. Mixing incompatible products can lead to bearing failure.

13. Mechanical Installation

Integral motors, NEMA C-face motors, and IEC flange mounted motors must be rigidly secured to their mating connection surface using all fastening screws tightened to the proper bolt torque. It is good practice to apply a medium strength thread-locking agent (Loctite® 242) to the mounting screws.

Foot mounted motors must be securely installed to a rigid and level foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. All mounting hole locations must be utilized. Tighten all hold down screws or bolts to the proper bolt torque.

HARMFUL SITUATION

Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Accurate alignment and proper balancing of output devices (couplings, belts, pulleys, etc.) is required to assure quite, low vibration, trouble free operation. When the motor is directly coupled to a gear drive or a driven machine make sure that the motor shaft and driven machine shaft are aligned with one another axially.

HARMFUL SITUATION

Inaccurate alignment may lead to bearing damage, excessive vibrations and shaft breakage.

IMPORTANT NOTE

For motor replacement guidelines see section 20 on page 15 and section 21 on page 16.

14. Electrical Connections

⚠
WARNING
⚠

To avoid electrocution, injury or death, make certain all electrical devices (motors, brakes, variable frequency drives, etc.) are properly grounded, completely de-energized, and brought to a no-voltage condition prior to working on any electrical connections. Remember that most of these devices potentially dangerous energy levels for a period of time after power is removed. Always follow proper lock-out/tag-out procedures.

ℹ
IMPORTANT NOTE
ℹ

External motor brakes have their own connection requirements as indicated in the appropriate brake instruction manuals.

⚠
WARNING
⚠

If the motor has an integral brake, make certain there is no load connected to the driven equipment before releasing the brake. Otherwise serious injury, death, or damage to the equipment may result.

- The supply voltage and frequency must agree with the motor nameplate data.
- Always feed the connecting leads into the terminal box using appropriate mating cable glands. The mating connection cables and cable glands should be suitable for temperatures $\geq 194^{\circ}\text{F}$ (90°C).
- Provide the ends of the connecting leads and ground lead with cable lugs or curved ring eyelets before connecting them to the terminal board.
- Make certain that the wiring connections and arrangement of the terminal board jumpers conform to the appropriate wiring diagram as provided in the motor terminal box and/or page 9 of this manual.

- Tighten the terminal board screw connections on the on the main terminal board per the table below.

**Table 4 – Tightening Torque:
Terminal Board and Grounding Screws**

Thread Size	Nut Size [mm]	Tightening Torque	
		[lb-ft]	[N-m]
M4	7	0.6-0.9	0.8-1.2
M5	8	1.3-1.8	1.8-2.5
M6	10	2.0-3.0	2.7-4
M8	13	4.0-5.9	5.5-8
M10	17	6.6-9.6	9-13
M12	19	11.8-14.8	16-20

- Upon final assembly, the terminal box cover must be sealed so that it is dust-tight and water-tight.

**Table 5 – Tightening Torque:
Terminal Box Cover Screws**

Thread Size	Tightening Torque	
	[lb-ft]	[N-m]
M4	0.6-0.9	0.8-1.2
M5	0.9-1.3	1.2-1.8
M6	1.1-1.8	1.5-2.5
M8	2.2-3.7	3.0-5.0



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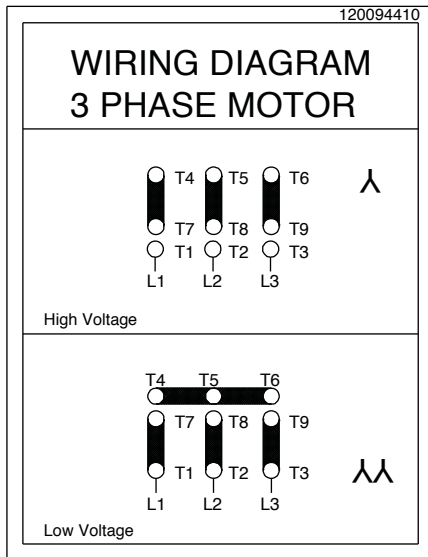


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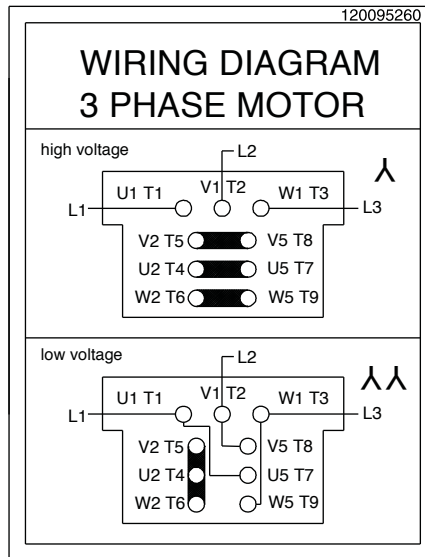
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15. Wiring Diagrams

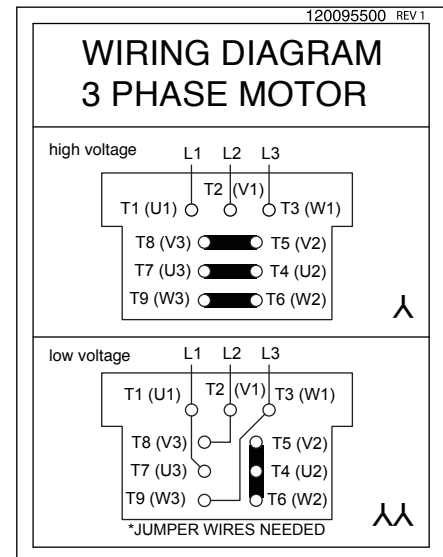
NORD Frames 63-225
230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø



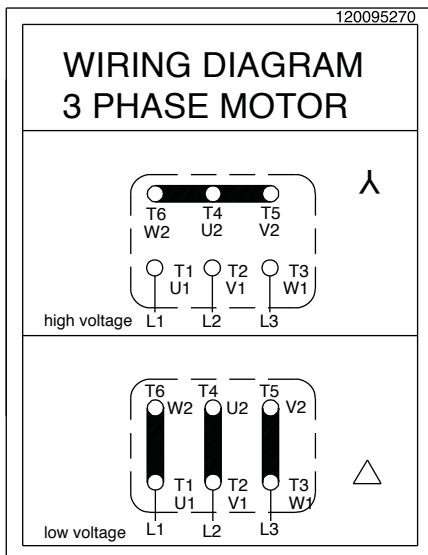
NORD mfg by Siemens - Frames 200 +
230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø
190 / 380V, 60Hz, 3Ø



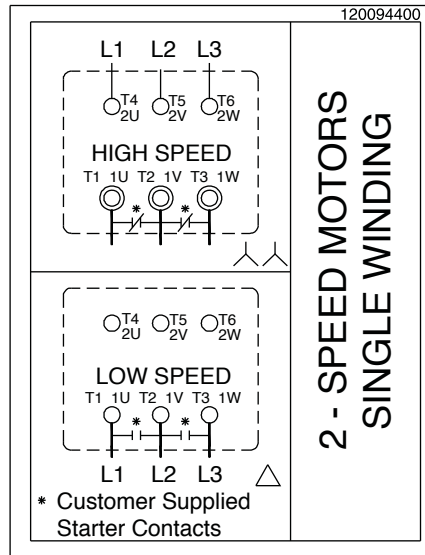
NORD mfg by Siemens - Frames 200 +
230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø
190 / 380V, 60Hz, 3Ø



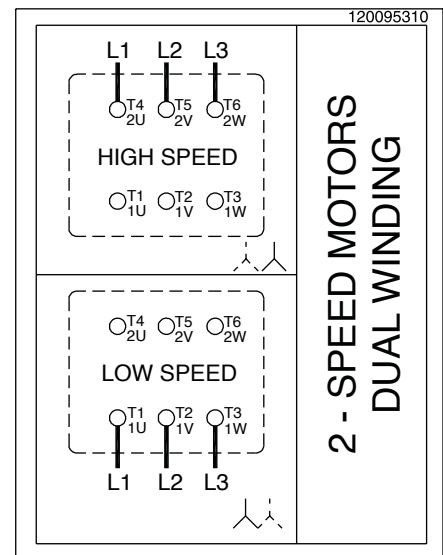
NORD Frames 63 - 225
460 / 800V, 60Hz, 3Ø | 230 / 400V, 50Hz, 3Ø
208 / 360V, 60Hz, 3Ø | 400 / 690V, 50Hz, 3Ø
332 / 575V, 60Hz, 3Ø



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



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





DRIVESYSTEMS

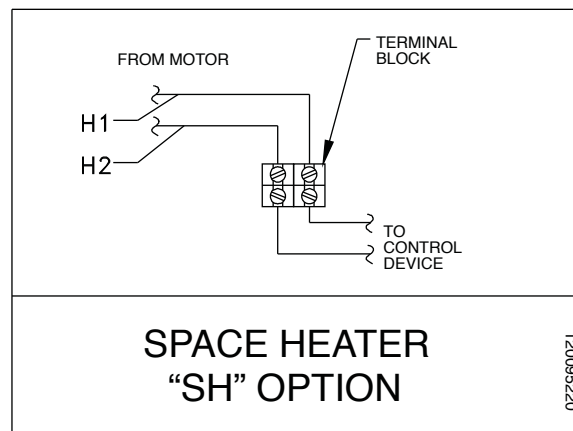
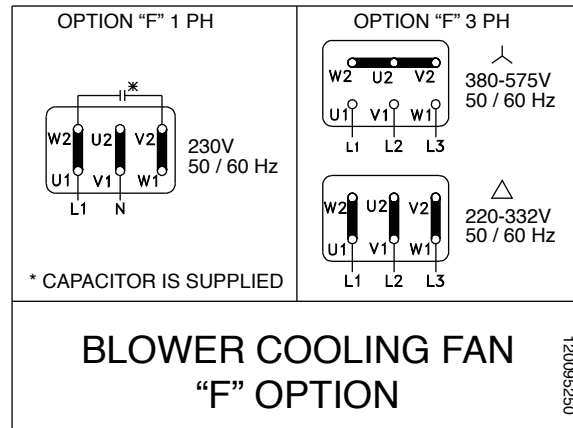
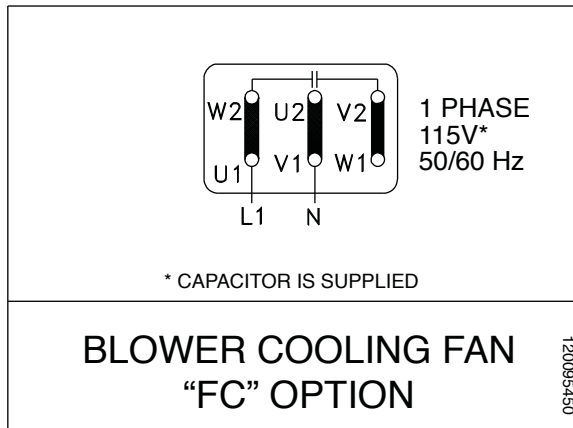
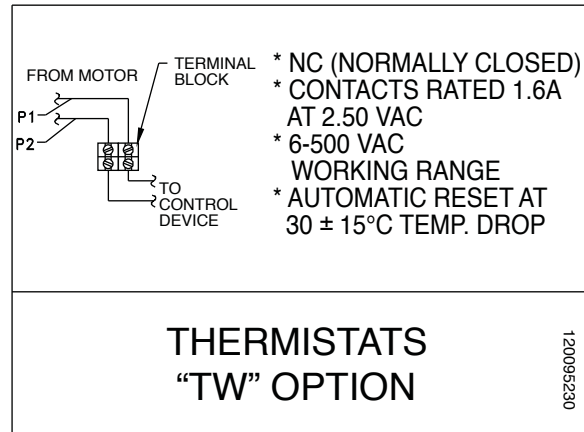
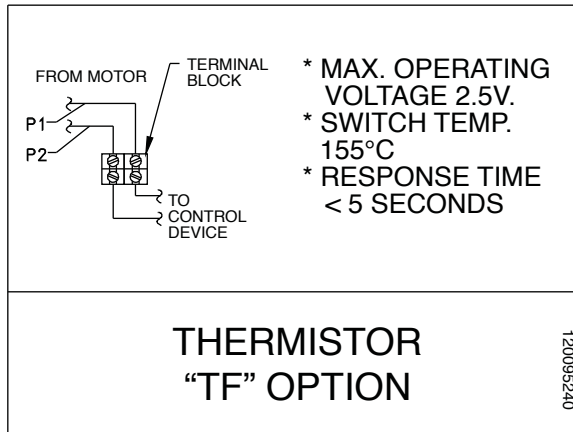
MOTORS - AC INDUCTION, SINGLE & POLYPHASE



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15. Wiring Diagrams Ctd.





MOTORS - AC INDUCTION, SINGLE & POLYPHASE



16. Motor Accessories

Blower Cooling Fan (Option F & FC)

- Connection Diagram Shown on page 10
- Option FC is 1-phase, 115V
- Option F has capability of 1 phase by connecting a supplied capacitor

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 - Δ (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 - Δ (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

Table 6 – Option F & FC



16. Motor Accessories Ctd.

Thermostats (Option TW and Option 2TW)

Standard connection	Series connected, one per phase
Contact	NC (Normally Closed)/ Auto Re-setting
Response Temperature (Option TW)	311 °F (155 °C) Shut-Off Device
Response Temperature (Option 2TW)	311 °F (155 °C) Shut-Off Device + 266°F (130 °C) Alarm Device
Nominal Current	1.6 Amp at 250 V
Resistance	< 50 mΩ
Switch Rebound	< 1ms
Insulation Rating	2000 VAC
Cycles	10,000 max
Lead Identification (inside terminal box)	P1 and P2 or TB1 and TB2 / 2TB1 and 2TB2

Motor thermostats or bi-metallic switches can be wired directly into the control circuit without a separate control module or tripping device. Thermostats operate on a relatively high control voltage so they are much less sensitive to voltage interference from the main power supply. Often one can run thermostat leads and motor power leads next to each other when using the appropriate shielded cable. The installer is responsible to wire the thermostats into the motor control circuit. The leads may be labeled in a variety of ways as indicated.

Thermistors (Option TF)

Standard Connection	Three devices, series connected, one per phase
Type	Positive temperature coefficient (PTC)
Transition Temperature	150°C±5 °C
Resistance	20... 500Ω (below transition) > 4 kΩ (above transition)
Reed Current	< 1mA
Max Voltage	30V
Lead Identification (inside terminal box)	P1 and P2 or TP1 and TP2

With a separate control module or tripping device (ex. Kirwan INT69) thermistors are used to sense motor overload/over temperature conditions by converting the critical operating temperature limit into large internal resistance change. Due to their small size, heat sink construction, and high change in resistance value, minor resistance variations caused by relatively long lead runs can be tolerated. This feature also allows for one controller to be used for several temperature sensing locations. Many variable frequency drives come with on-board thermistor inputs. NORD does not supply the thermistor control module.

	WARNING	
Thermostats and Thermistors will automatically reset.		

	WARNING	
All wiring must be completed by qualified personal and adhere to all local codes.		

Space Heaters (Option SH)

- Connection Diagram shown on Page 9
- Space Heaters are mounted directly on the motor winding
- The leads are brought into the terminal box and labeled H1 and H2
- They require a separate voltage supply and must not be energized when the motor is energized
- The heaters will keep the winding of the motor approximately 5°C above the surrounding ambient

Table 5. Space Heater Data

Frame Size	Wattage	Voltages	Heater Strips/MTR
63 & 71	18W	110V	1
		230V	
		460V	
80	25W	110V	1
		230V	
		460V	
90 – 112	50W	110V	2
		230V	
		460V	
132-180	100W	110V	2
		230V	
		460V	
200 & 225	120W	110V	2
		230V	
		460V	

Encoder (Option IG)

- Most standard encoders will be enclosed inside the fan cover
- Incremental, Quadrature, Differential, Marker Channel
- IP66 Protection
- IG1 = 1024PPR, IG2 = 2048PPR, IG4 = 4096PPR
- TTL/RS422, HTL/Push-Pull, Line Driver.
- 5V or 10-30V available.
- Absolute encoders also available.
- Separate encoder wiring instructions are provided by NORD.

17. Inspection

Inspect the motor after every 500 operating hours.



	WARNING	
If it is necessary to clean the motor exterior, do not use shop air. Shop air can force contaminants into the motor and may cause parts damage or result in blowing debris causing injury.		

Table 8 - Inspection Guidelines

Inspect	Check	Action
Motor Exterior	Check the external surfaces for contamination. Accumulation of dirt and fibrous deposits must be removed.	Clean the motor external surfaces using clean, lint-free cloths. Clean deposits from between cooling fins using a vacuum cleaner and a stiff-bristled nylon brush.
	Check the external surfaces for oil film and greasy deposits.	Clean the oil film and greasy deposits from the motor surface using clean, lint-free cloths. If necessary, moisten the cloth with an approved non-flammable, residue-free solvent. Do not pour solvent on the motor.
	Check for evidence of damage or overheating.	If the motor has physical damage, replace the motor.
Motor Mountings	Make sure the mounting hardware is secure.	If the mounting hardware is not secure, check the motor/gearbox alignment, and tighten the mounting hardware.
Motor Electrical Connections	Check that all electrical connections are secure.	If the electrical connections are not secure, tighten them.
	Check the electrical connections for evidence of arcing.	Loose electrical connections can cause arcing, which is evident by discoloration and charring. If you find evidence of arcing, replace the damaged connections.
Insulation Resistance	Using an ohmmeter, check and record the resistance of motor winding insulation.	Compare the current resistance reading to previous readings. If the resistance drops significantly, perform an internal inspection for insulation damage or deterioration.
Motor Brake	On motors that have a brake, use a feeler gauge to check the air gap in between the brake pad and the rotor according to the appropriate user manual.	If the air gap exceeds the maximum allowed for that brake configuration provided in the manual, adjust the air gap or replace the brake pad according to user manual U35000.



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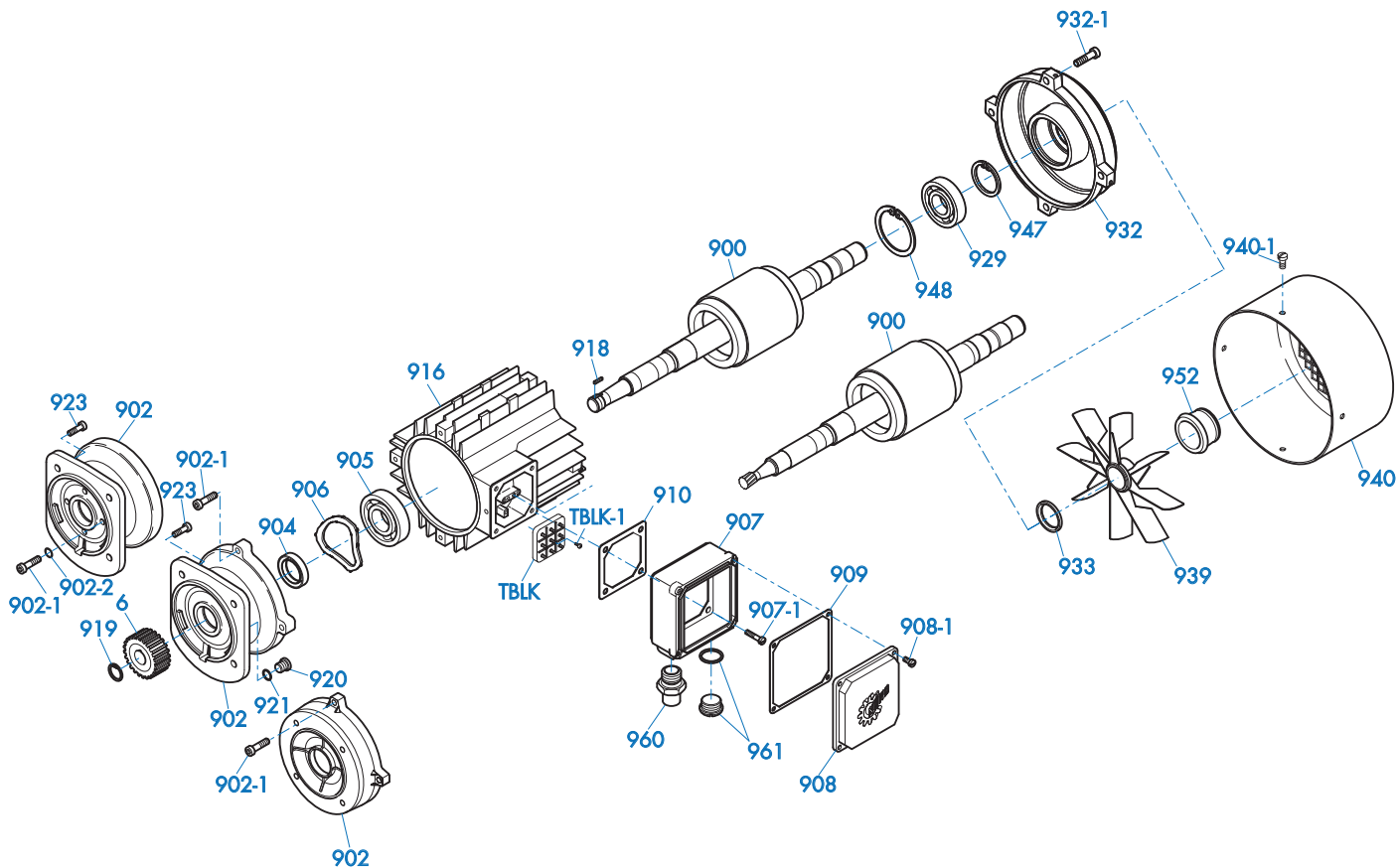


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18. Parts List

If you are ordering a part, provide the model and order number (table 1, page 2) of your motor. This will determine the specific part number you need.



Part Number	Part Description	Qty per Assembly
6	Input Pinion	1
900	Rotor Assembly	1
902	A-Endbell	1
902-1	Screw	4
902-2	Dubo Seal	4
904	Oil Seal	1
905	Bearing	1
906	Preload Spring	1
907	Terminal Box Frame	1
907-1	Screw	4
908	Terminal Box Cover	1
908-1	Screw	4
909	Gasket - Terminal Box Frame	1
910	Gasket - Terminal Box Cover	1
916	Stator	1
918	Key	1
919	Retaining Ring	1
920	Oil Plug	1

Part Number	Part Description	Qty per Assembly
921	Gasket	1
923	Screw	4
929	Bearing	1
932	B-Endbell	1
932-1	Screw	4
933	Oil Seal	1
939	Fan	1
940	Fan Cover	1
940-1	Screw	4
947	Retaining Ring	1
948	Retaining Ring	1
952	Fan Clip	1
960	NPT Thread Adapter	1
961	Plug (includes O-ring)	1
TBLK	Terminal Block	1
TBLK-1	Screw, Terminal Block Mounting	2
	Jumper Bar (not illustrated)	AR

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19. Repair

Reference the parts list drawing on page 14 for clarification.

- A. Disassemble the motor according to the general exploded view in PARTS INFORMATION. Disassemble only as far as necessary to replace the failed parts.
- B. Whenever the motor is disassembled, clean all dust and contamination from the motor interior using a vacuum cleaner and a soft-bristled nylon brush.
- C. The following parts must be replaced if they are removed:
 - Oil seal (904), Oil seal (933)
 - Gasket (909), Gasket (910), Gasket (921)
 - Gasket on plug (961)
 - Self-locking screws (907-1, 908-1, 923, 932-1, 940-1)
 - Dubo Seals (902-2)
- D. If the following parts are removed, inspect them, and replace them if they are deformed or damaged:
 - Retaining ring (919), Retaining ring (947), Retaining ring (948)
 - Fan clip (952)

20. Removing and Replacing Integral Motors

Reference the parts list on Page 14 for clarification.

- A. Disconnect the power to the electric motor. Make certain the motor is properly grounded, de-energized and secured with a lock-out/tag-out device.
- B. Drain the oil from the mating gearbox, or rotate the motor/gearbox assembly so that the motor is up, to prevent oil from spilling from the gearbox when the motor is removed.
- C. Support the motor and prepare it for removal. Steady the motor and support it. For larger motors, use of mechanical lifting or support devices to may be appropriate.
- D. Remove the fastening screws that hold the motor to the reducer input.



IMPORTANT NOTE



Most integral motor installations have mounting bolts accessible from the motor exterior. If the bolts are not clearly visible, unbolt the input flange from the gearbox. Remove the bolts securing the motor to the reducer input flange, and discard the old DUBO sealing rings that were under the screw heads.

- E. Maintain motor shaft alignment and move the motor directly away from its mounting surface until the motor shaft and mating input gear clear both the internal gear mesh and reducer input.

- F. Remove and discard the old flange gasket.
- G. Clean the gasket faces on the motor and gearbox, making sure no cleaning debris enters the gearbox.
- H. Check the replacement motor to make sure the motor flange, motor shaft, and motor pinion are identical to the motor that was removed.
- I. Place a new gasket between the gearbox and new motor.
- J. Position the motor on the gearbox, making sure the input pinion meshes with the input gear. Rotate the motor as necessary to align the bolt holes and seat the motor flange. Make sure the gasket remains properly aligned and seated.
- K. Apply a medium strength thread locking compound to the bolt threads. Install the bolts and tighten them to the appropriate torque.



IMPORTANT NOTE



If the motor/gearbox installation uses an input flange, first mount the input flange to the motor using the four mounting bolts and NEW DUBO sealing rings under the head of each fastening screw. Make sure the fastening screws are clean and apply new thread sealant if necessary.

- L. Check the gearbox oil level in accordance with the appropriate User Manual/s. If necessary fill or add oil to the gearbox.



HARMFUL SITUATION



Do not mix different types of oil!

- M. Re-establish the electrical connection to the motor.
- N. Observe the subsequent start-up closely to make certain the equipment is operating properly and there are no seal or gasket leaks.



MOTORS - AC INDUCTION, SINGLE & POLYPHASE



21. Removing and Replacing NEMA C-Face or IEC Flange-Mounted Motors

For further clarification of these instructions, reference the parts list on Page 14 of this manual.

- A. Disconnect the power to the electric motor. Make certain the motor is properly grounded, de-energized and secured with a lock-out/tag-out device.
- B. Support the motor and prepare it for removal. Steady the motor and support it. For larger motors, use of mechanical lifting or support devices to may be appropriate.
- C. Remove the fastening screws that hold the motor to the C-face or IEC mounting flange.
- D. Maintain motor shaft alignment, and move the motor directly away from its mounting surface until the motor shaft and mating coupling clear the mounting flange surface of the driven equipment.
- E. Measure and record the proper placement of the motor shaft coupling prior to removing it from the old motor.
- F. Make sure the new motor shaft, key and key slot are free of all nicks, burrs, and lubrication or grease.
- G. Install the new shaft key on the new motor. If the shaft key is not captured or if an open-ended key slot is utilized it is good practice to secure the key into the key slot with a medium strength thread locking agent or alternatively one may stake the key in place.
- H. Re-install the coupling on the new motor shaft, making sure the placement of the coupling is in the same location as it was on the old motor (See Step E).
- I. Clean all old gasket material, sealants, contamination, and corrosion from the flange surface on the driven equipment.
- J. If the motor is utilized in a wet or wash down environment apply a sealing gasket or gasket eliminating compound to the mating flange surface, as would seem most appropriate for the application.
- K. Support the new motor and mount it flush against the mating flange surface of the driven equipment.
- L. Apply a medium strength thread locking agent to the bolt threads.
- M. Install the bolts and tighten them to the appropriate torque.
- N. Re-establish the electrical connection to the motor.
- O. Observe the subsequent start-up closely to make certain the equipment is operating properly.

22. Testing



IMPORTANT NOTE



NORD electric motors do not require periodic testing. However, if a motor is removed from its installation, NORD recommends that the motor be checked according to the following static and dynamic testing procedures before it is reinstalled. Finding a condition that will require future repair before the motor is reinstalled decreases the overall maintenance time.

This section provides general test information and functional checks for the types of motors covered by this manual. Read and understand the tests and checks before performing them on your motor.

Record and date all measurements taken.

If the motor fails any of the test procedures provided below, use the troubleshooting guide to determine the motor problem.

Static Testing

- A. The motor can only be static tested if it is disconnected from the component it drives and securely mounted on a fixture or mounting plate. These tests are usually conducted when a motor has been removed for any reason other than failure
- B. Turn the motor shaft slowly by hand. Feel and listen for evidence of a failed bearing, which is indicated by a rough feel as the shaft rotates, and by noise.
- C. Check for smooth rotation, with no evidence of binding or catching. If the shaft does not rotate smoothly, or binds or catches, the bearings are worn or failing, lack lubrication, or are contaminated.
- D. Check the motor shaft for side play by applying pressure at right angles to the shaft in several places around the circumference. If the shaft moves perceptibly, the front bearing may be worn.

Dynamic Testing

- A. Find the motor voltage and rated load current values as listed on the motor nameplate.
- B. Using a volt-ohmmeter, verify that the motor power supply is in the correct range.
- C. Run the motor with no load. As the motor is operating, listen for unusual motor noise and check for excessive vibration. Vibration and motor noise are indications of bearing contamination, lack of lubrication, damage, or failure.
- D. Use an ammeter to measure the no-load current. Record the no-load current for comparison with previous readings, and for reference during future testing.
- E. If the motor passes the no-load test, operate the motor at rated load and check and record the current.
- F. Check the motor operating temperature at rated load. If the motor operates at a higher than normal temperature, the motor may be damaged, overloaded or failing.



MOTORS - AC INDUCTION, SINGLE & POLYPHASE

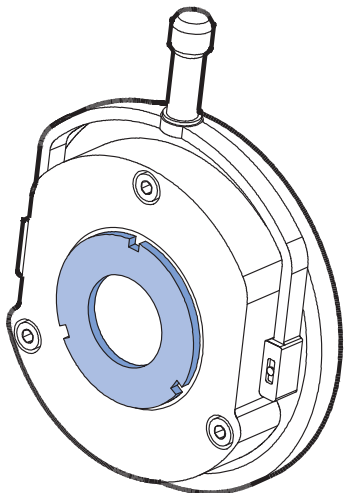


23. Troubleshooting

Fault	Likely Cause	Corrective Action
Motor fails to start.	<ul style="list-style-type: none"> Motor is mis-wired Brake is may not be releasing. Fan guard damaged and contacting fan. Motor protection device has tripped or does not switch 1-Ph Capacitor or start switch has failed. 	<ul style="list-style-type: none"> Verify and correct motor wiring. Troubleshoot brake per User Manual U35000. Replace damaged fan guard. Check motor protection device for correct setting and correct error. Discharge capacitor and use a volt-ohm meter to check the capacitor for an open circuit - replace if needed. Inspect switch and connections. Replace if contacts look burned or pitted.
Fuses blow or motor protection faults immediately.	<ul style="list-style-type: none"> Short circuit in line. Lines connected incorrectly. Fuse or circuit breaker tripped. Motor is overloaded or equipment jammed. Stator is shorted or went to ground. 	<ul style="list-style-type: none"> Rectify short circuit. Check circuit diagram and make corrections. Replace fuse or circuit breaker. Make sure load is free. Verify motor amp draw compared to nameplate rating. A damaged or blown stator will show a burn mark. Stator must be repaired or replaced.
Motor hums and has high current consumption	<ul style="list-style-type: none"> Brake may not be releasing. Rotor may be rubbing stator. Defective or incorrect stator winding. 	<ul style="list-style-type: none"> Troubleshoot brake per User Manual U35000. Send motor to a repair specialist.
Severe speed loss under load or excessive acceleration time.	<ul style="list-style-type: none"> Overload. Excessive voltage drop. Damaged or failing motor bearings. Damaged or worn gear unit. 1-Ph Capacitor or start switch has failed. 	<ul style="list-style-type: none"> Check load conditions and make certain system is unobstructed. Reduce load or consider a larger motor. Verify service voltage is within specification. Check if nearby equipment is affecting incoming power. Make sure connection harness and wiring is adequate. Replace motor bearings. Replace or repair damaged gear unit. See instructions under "Motor fails to start".
Motor runs the incorrect direction.	<ul style="list-style-type: none"> Incorrect wiring. 	<ul style="list-style-type: none"> Rewire motor according to system schematic and/or switch two incoming motor phases.
Motor heats up excessively or thermal overload protection trips	<ul style="list-style-type: none"> Overload. Ambient temperature is too high. Inadequate cooling. Operation is outside the allowed duty cycle. Motor protection device may be defective. Excessive supply voltage. System short or damaged stator. 	<ul style="list-style-type: none"> Make sure load is free. Verify motor amp draw compared to nameplate rating. Reduce load or consider a larger motor. Do not operate above the rated conditions. Correct cooling air supply. Open and clear cooling air passages. Retrofit with forced ventilator fan if needed. Adjust operating duty cycle or contact a specialist to select a suitable motor or drive. Replace motor protection device. Adapt motor supply voltage. Check for loose, cut or damaged wires. Check stator winding for defects or burn damage.
Excessive Noise or Vibration	<ul style="list-style-type: none"> Motor bearings contaminated or damaged. Excessive motor shaft end play. Misaligned or imbalanced load. 	<ul style="list-style-type: none"> Test motor by itself. If bearings are bad noise may be heard or roughness detected. Replace bearings. Add lubrication if bearings have grease fittings. Check shaft endplay with motor and system power disconnected. If shaft movement is excessive replace motor shaft bearings. Check all mating shaft connections for proper alignment and correct all imbalanced load conditions.
1 Ph Start Capacitor Failures	<ul style="list-style-type: none"> Motor is not coming up to speed quickly enough. Motor is being cycled frequently Start switch is defective or damaged. 	<ul style="list-style-type: none"> Verify motor size to load conditions. Motor should come up to speed in no more than 2-3 seconds. Verify duty cycle and consult specialist for recommendations. Replace start switch.
1 Ph Run Capacitor Failures	<ul style="list-style-type: none"> Possible power surge to motor caused by transient voltage or lightening. Excessive ambient temperature. 	<ul style="list-style-type: none"> Install proper surge protection. Verify ambient conditions do not exceed nameplate value.



MOTOR BRAKES INSTALLATION & MAINTENANCE



General Instructions

This manual describes general operating and maintenance guidelines for a majority of brake products shipped by NORD Gear. This instruction manual is not intended to include a comprehensive listing of all details or procedures required for installation, operation and maintenance.

Brakes covered in this manual are manufactured by PRECIMA. Please feel free to contact NORD with any questions about the supplied brake components.

Safety Notice

Only qualified personnel should attempt installation, operation and maintenance of NORD brakes. Read this manual in its entirety before operating, commissioning, servicing, or assembling the motor brake. If you have a question about a procedure or are uncertain about any detail, seek clarification and **DO NOT PROCEED!**



WARNING

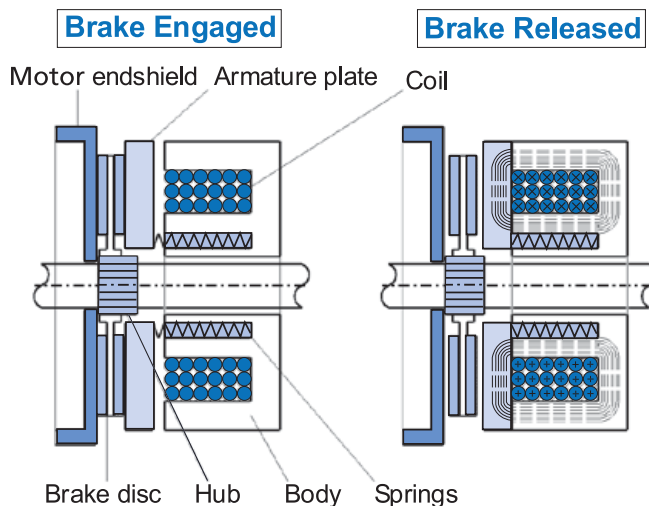


- This equipment contains high electrical voltage. Remove and lockout all power from the electric motor and brake before any work is completed on the brake.
- The user is responsible for conforming to all national and local electrical and safety codes. Wiring practices, proper grounding, disconnects, and over current protection, are of particular importance.
- Make certain the load is supported when servicing the brake. Removing power from the brake or removing the brake from the motor will release the load, which may cause severe injury or death.
- Failure to follow proper procedures and precautions may result in severe bodily injury or death.

Brake Operation

The standard NORD motor brake is "spring-set". When power is removed and the brake is de-energized (power-off), the brake springs exert a force against the armature plate in turn preventing the brake rotor (or brake disc) from rotating. When the brake coil is energized (power-on), a magnetic field builds and pulls the armature plate across the air gap to the brake casing, which releases the brake rotor and allows the motor shaft to rotate.

Figure 1: Basic Brake Operation



NORD brakes are DC voltage brakes and in most instances are supplied with a motor mounted brake rectifier for easy connections to AC power. AC power is taken directly from the power line or from the terminal block of the motor and converted to DC by the supplied rectifier.



IMPORTANT NOTE



If the motor is connected to a frequency inverter, soft start, or is a two-speed motor, the AC power must be supplied to the brake rectifier separately from the motor power.

Advantages

- Each NORD motor frame size has a number of brake sizes available, with different torque capacities.
- Brake torque adjustments are possible by changing the brake spring combinations. In addition, brake sizes from 5-40 Nm (3.7-30 lb-ft) are typically supplied with an additional spanner-nut adjustment on the back of the brake.
- NORD brakes provide a high degree of safety because when power is removed the brake will automatically set to hold the load.
- The brake rotor or brake disc is environmentally safe and asbestos-free.
- The connection between the rectifier and the brake coil is completed at the factory and the brake air-gap is factory-set but can be adjusted in the event of wear.

General Selection Considerations

As indicated in the NORD catalog, each NORD motor can be supplied with a number of brake torque sizes.

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; in addition on crane applications excess hoist-cable swing can result.



CAUTIONS



- **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.
- **Hoisting (lifting/lowering) applications** - must have the brake wired for fast response (DC-switching)
- **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 run-in period is required. The run in time will vary depending on system loads.
- **The brake rotor or brake pad** - must be protected against foreign matter, oil and grease. Contaminants of this type can greatly influence wear and reduce breaking torque.

Brake Torque Adjustment

Brake torque adjustments are possible by changing the brake spring combinations or by removing springs (Table 1).

In addition, brake sizes from 5-40 Nm (3.7-30 lb-ft) are typically supplied with a threaded adjustment nut or spanner nut to allow for additional fine torque adjustments of the brake. The braking torque can be adjusted by unscrewing the spanner nut a number of turns or "clicks" with a spanner wrench (Table 2).

Table 1a: Brake Torque Reduction - Spring Removal

"Brake Size"	7 Springs		5 Springs		3 Springs	
	[Nm]	[lb-ft]	[Nm]	[lb-ft]	[Nm]	[lb-ft]
BRE 5	5	3.7	3.5	2.6	2	1.5
BRE10	10	7.4	7	5.2	4	3.0
BRE20	20	14.8	14	10.3	8	5.9
BRE40	40	29.5	28	20.7	17	12.5
BRE60	60	44.3	43	31.7	26	19.2
BRE100	100	73.8	70	51.6	42	31.0
BRE150	150	111	107	78.9	65	47.9

On brake sizes 5-150 Nm (3.7-111 lb-ft) full brake torque is achieved with all (7) springs. The brake springs are placed in such a manner where there are (3) inner and (4) outer springs. When adjusting the brake torque, start by removing the outer springs at opposite corners to prevent uneven brake wear.

Table 1b: Brake Torque Reduction - Spring Removal

"Brake Size"	8 Springs		6 Springs		4 Springs	
	[Nm]	[lb-ft]	[Nm]	[lb-ft]	[Nm]	[lb-ft]
BRE250	250	184	187	138	125	92
BRE400	400	295	300	221	200	148
BRE800	800	590	600	443	400	295
BRE1200	1200	885	900	664	600	443

On brake sizes 250-1200 Nm (184-885 lb-ft) full brake torque is achieved with all (8) springs. The brake springs are placed in such a manner where there are (4) inner and (4) outer springs. When adjusting the brake torque, start by removing the outer springs at opposite corners to prevent uneven brake wear.

Table 2: Spanner Nut Adjustment

"Brake Size"	Torque Reduction*		Max. Turns	Minimum Torque*	
	[Nm]	[lb-ft]		[Nm]	[lb-ft]
BRE 5	0.2	0.15	6	0.8	0.59
BRE10	0.2	0.15	12	1.6	1.18
BRE20	0.3	0.22	12	4.4	3.25
BRE40	1	0.74	9	8.0	5.90

* With the minimum number of springs and maximum number of turns to the spanner nut.

* Per each turn of the spanner nut

Brake sizes from 5-40 Nm (3.7-30 lb-ft) are typically supplied with a threaded adjustment nut or spanner nut. Additional fine torque adjustment can be made by unscrewing the spanner nut a number of turns or "clicks" with a spanner wrench.

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 brake motors typically include the rectifier located inside the terminal box.

Rectifier Advantages

- Individual power source for each brake.
- Compact size, mounted inside the terminal box.
- Multiple types, voltage options and release/engagement modes available.
- Mountable in a separate control cabinet.
- Integral protection against voltage spikes.

Model	Type	Part No.	Color	Input Voltage $V_{AC} \pm 10\%$	Rated Current A_{DC}	
					(40°C)	(75°C)
GVE20L	Full-wave	19141000	Black	110-275	1.5	1.0
GVE20V	Full-wave	19141030	Black	110-275	1.5	1.0
GHE40L	Half-wave	19141010	Yellow	200-480	2.0	1.0
GHE40V	Half-wave	19141040	Yellow	200-480	2.0	1.0
GHE50L	Half-wave	19141020	Gray	200-575	2.0	1.0
GHE50V	Half-wave	19141050	Gray	200-575	2.0	1.0
GUE40V	Dual-wave	19140300	Black	230-460	0.7	0.5
PMG500	Push-Hybrid	19140200	Black	200-500	4.0	2.8

Rectifier electronics are sealed for moisture-protection; electronics on models ending with the suffix "V" are resin-encapsulated to provide added protection if water should get into the motor terminal box.

Rectifier Types

Full-wave rectifier [GVE]:

A rectifier in which both the positive and negative half-cycles of the AC input signal are rectified to produce a uni-directional DC current supply to the load or the brake. The output voltage is 90% of the input voltage ($V_{DC} = 0.90 \times V_{AC}$).

Half-wave rectifier [GHE]:

A rectifier in which only alternate half-cycles of the AC input signal are rectified to produce a uni-directional DC current supply to the load or the brake. The output voltage is 45% of the input voltage ($V_{DC} = 0.45 \times V_{AC}$).

Dual Wave Rectifier [GUE]

A rectifier that can be wired as either a full-wave rectifier or a half-wave rectifier depending upon how it is connected to the AC input signal.



IMPORTANT NOTE



If the motor is connected to a frequency inverter, soft start, or is a two-speed motor, then separate AC power must be supplied to the brake rectifier.

Rectifier Types [Ctd.]

PMG 500 Push-Hybrid rectifier [PMG]:

A fast-acting or push-hybrid brake rectifier provides an initial "push" in the form of a timed full-wave brake-release function, which is then followed by a continuous half-wave brake-holding function. There are two ways to apply these rectifiers as follows:

- "Overexcitation" of the brake coil provides faster brake release or improved cycling capacity. The DC voltage of the brake coil is determined based upon using a half-wave rectifier. The output voltage is 45% of the input voltage ($V_{DC} = 0.45 \times V_{AC}$).
- "Reducer-Power Holding" of the brake coil maintains the brake in a released state by using only 25% of the power needed for the initial brake release. This results in very fast brake stopping. The DC voltage of the brake coil is determined based upon using a full-wave rectifier. The output voltage is 90% of the input voltage. ($V_{DC} = 0.90 \times V_{AC}$).

NORD offers additional fast-acting rectifiers besides the PMG 500. For additional details please reference User Manual U35100 – Fast Acting Brake Rectifiers.



IMPORTANT NOTE



In order to prevent rapid wear, the PMG 500 rectifier is required when utilizing the larger 800 Nm (590 lb-ft) and 1200 Nm (885 lb-ft) twin-rotor brakes. The PMG 500 rectifier is wired to "overexcite" the brake during its initial release.

Brake Switching Options

The rectifiers discussed in this manual can be wired to allow brake switching at either the AC power source (input) or the DC power source (output).

- AC switching allows the brake rectifier to be powered directly from the motor's terminal block with no additional wiring. However, this provides a slower brake stopping time due to the additional time needed to de-energize or collapse the motor's magnetic field.
- DC switching directly interrupts the current flow in the DC circuit of the brake rectifier. This method of brake switching guarantees faster brake stopping or brake engagement times.



WARNING



When the moving system undergoes a change in height (such as in a lift or incline conveyor application) or if the system tends to speed up or overhaul during normal operation, then DC-switching of the brake is required in order to prevent excessive load movement, drift or falling loads during stopping.