

Installation, Maintenance and Repair Manual for DODGE CYCLONE Standard Gear Units

These instructions must be read thoroughly before installation or operation.

1. SAFETY INFORMATION

1.1 Safety notes

- The gear unit is designed and constructed in accordance with the state of the art and is reliable in the condition as shipped from our factory and installed in accordance with these instructions. Unauthorized modifications which impair reliability are NOT allowed. This also applies to removal of guards which are installed to prevent contact with rotating parts.
- The gear unit may only be used and operated within the scope of the conditions specified on the purchase order, certified dimension drawing, and nameplate.
- Do not operate the unit beyond its service rating. Failure may result in damage to property or injury to personnel.
- The system of connected rotating parts must be free from critical speeds and vibrations -regardless of how they are induced. This responsibility for this systems analysis lies with the purchaser of the gear drive.
- The user must ensure that the persons who will install, operate and maintain the drive have read and understood this manual and follow these instructions to:
 - Prevent hazard to life and limb of the user and third parties
 - Ensure the reliability of the gear drive
 - Prevent failure and environmental damage due to incorrect handling of the drive.
- The relevant regulations concerning industrial safety and pollution control should be observed during the installation, operation, and maintenance of the drive.
- The gear unit may only be operated, serviced, and repaired by authorized, trained, and properly instructed personnel.
- All work should be carried out with safety in mind.
- All work on the gear drive must be carried out when the drive is stationary. The drive unit must be secured to prevent accidental start up (for example by locking the key switch or by removing the fuses in the power supply). A notice should be displayed at the power control point that work is in progress on the gear drive.
- The drive unit should be shut off at once if changes in the gear unit are detected during operation such as abnormal increases in operating temperature or a change in gear unit noise level.
- Rotating parts, such as couplings, shafts, belt drives, and

WARNING: Because of the possible danger to persons(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed. Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance and operation procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by Baldor Electric Company nor are the responsibility of Baldor Electric Company. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and the potential hazards involved. When risk to persons or property may be involved, a holding device must be an integral part of the driven equipment beyond the speed reducer output shaft.

gears must be protected by means of suitable guards to prevent accidental contact.

- These instructions should be incorporated into any manuals the system developer provides to the end user of the drive system.
- All nameplates affixed to the gear drive must be observed and followed. The nameplates should be kept free of paint and dirt. Missing nameplates must be replaced.

2. GENERAL NOTES

These operating instructions are part of the gear unit shipment and should be kept with the gear drive at all times.

Review of these instructions will assist in trouble free installation, operation, and inspection of the gear drive.

NOTE: DODGE accepts no liability for damage or malfunction resulting from not following the instructions contained in this manual.

The gear unit is designed to be operated within the parameters specified on the nameplate of the drive as noted in Section 5.1. Operating conditions which differ from those noted on the drive requires review and approval by DODGE.

The gear drive is described in accordance with the design of the unit at the time of printing of this manual. In the interest of further development, we reserve the right to modify specific assemblies and sub-assemblies of the gear unit for particular customer requirements or to enhance the function and safety of the design.

For further information, please contact DODGE Product Support.

3. HANDLING

The gear unit is shipped assembled. Accessories (such as heat exchangers, couplings, guards) may be packaged separately.

The packaging of the gear drive may differ based on the unit size and method of shipment.

WARNING: When handling the gear unit, take care to avoid damage due to the use of force or careless loading and unloading. The gear unit may only be handled by using the lifting provisions provided on the housing. Attach slings with shackles to the lifting eyes. See Figure 1.



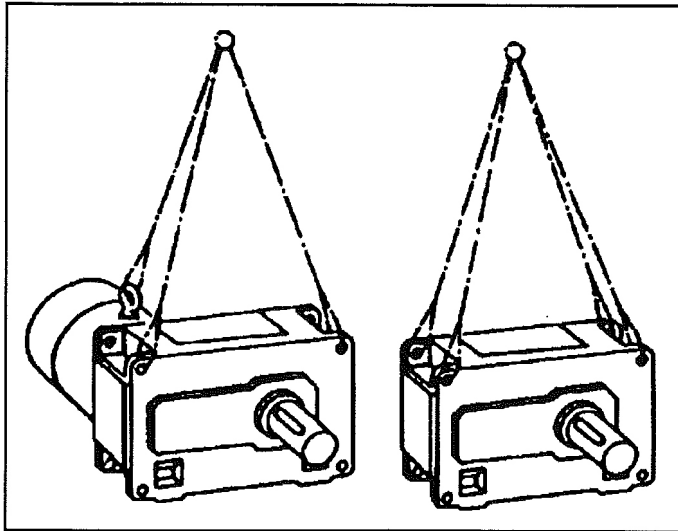


Figure 1

On gear units with lantern mounted motors, the center of gravity will shift from the gear drive. In this case, add a sling to the motor lifting bolt.

If the gear unit is mounted on a baseplate, special care is required to prevent misalignment of the components during handling.

The following symbols are used to indicate handling instructions.

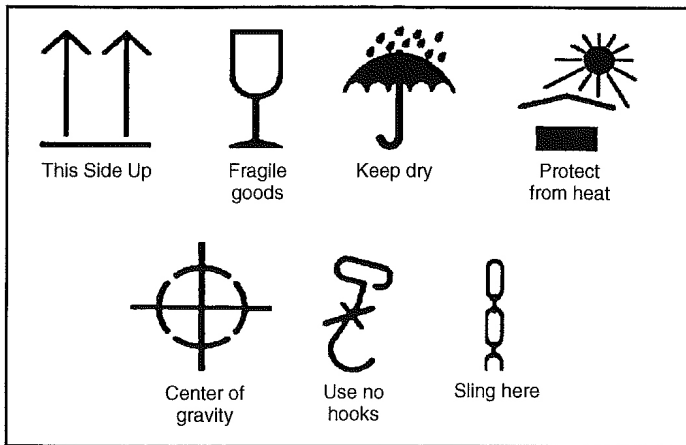


Figure 2

4. STORAGE

The gear unit should be stored in a protected location in its shipped position and covered.

CAUTION: Do not stack gear units on top of one another!

The internal parts are coated with preservative and the exposed shafts are painted with a protective coating. The external coating is resistant to weak acids, weak alkalis, oils, and solvents. It is seawater resistant, humidity resistant, and heat resistant up to 284°F (140°C).

NOTE: Unless specified, DODGE warrants the internal reservation for six months and the coating on the exposed shafts for twelve months from date of shipment. In the case of prolonged storage (greater than six months) check the internal preservative and renew it if required. See Section 7.3.1 for Long Term Storage.

CAUTION: If the unit is stored outdoors, cover the gear unit and prevent foreign matter and moisture from collecting on the gear unit.

5. TECHNICAL DESCRIPTION

5.1 General Technical Data

The gear unit is supplied as a single, double, triple, or quadruple stage helical or bevel helical gear drive. It is designed to be mounted as noted on the dimension drawing provided with the drive.

DODGE gear drives use the following product description:

H	3	S	H	11
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The first letter is the type:

- H - Helical Gear Parallel Shaft Drive
- B - Bevel Helical Right Angle Gear Drive

The second number is the number of reductions:

- 1 - Single
- 2 - Double
- 3 - Triple
- 4 - Quad

The third letter is the output shaft type:

- S - Solid shaft
- F - Flanged shaft
- H - Hollow shaft with key connection
- D - Hollow shaft with shrink disk connection

The fourth letter is the mounting method:

- H - Horizontal
- M - Horizontal without feet
- V - Vertical

The fifth number is the unit size:

1 through 26.

The nameplate contains important technical information about the drive.

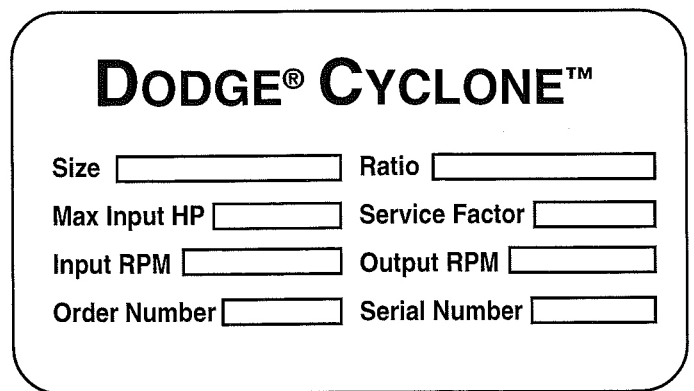


Figure 3

1. Size
2. Ratio
3. Max. Input HP
4. Service Factor
5. Input RPM
6. Output RPM
7. Order Number
8. Serial Number
9. Special Notes

Further information can be found on the dimensional drawings supplied with the unit.

5.2 Housing

The housing is made from cast iron, ductile iron, or fabricated steel plate based on the application. A dipstick for checking oil levels, oil drain plug for draining lubricant, and a vent plug for a breather are provided. See Figure 4.

5.3 Pinions and Gears

Both pinions and gears are case hardened and ground. An interference fit as well as a key are used to connect the gears to the shafting.

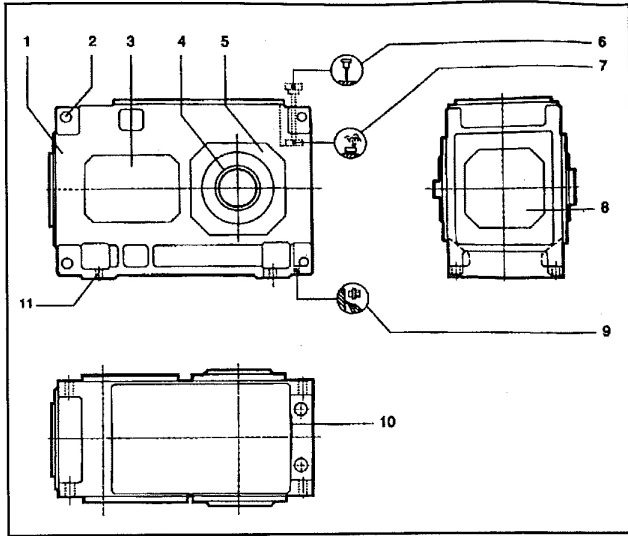


Figure 4

- | | |
|-----------------|------------------------------|
| 1. Housing | 7. Housing vent and breather |
| 2. Lifting eyes | 8. Cover |
| 3. Cover | 9. Oil drain plug |
| 4. Shaft seal | 10. Nameplate |
| 5. Cover | 11. Foundation bolt location |
| 6. Dipstick | |

5.4 Lubrication

Both gears and bearings are lubricated by splash lubrication. On some units, a reducer driven pump or motor driven pump is furnished depending on the application or customer requirement.

5.5 Bearings

All shafts are mounted on anti-friction bearings.

5.6 Shaft Seals

Labyrinth and contact type oil seals are used at shaft extensions to prevent contamination to the gear drive and oil leakage. Labyrinth seals do not contact the shaft and therefore never need to be replaced.

5.7 Cooling

In most cases, gear drives are cooled by convection. In some applications, fans, cooling coils, and heat exchangers may be used.

5.7.1 Fan

The fan is mounted on the high speed shaft of the drive. Air is drawn through the mesh grille of the fan guard and is directed around the drive to increase air flow over the gear unit.

CAUTION: Clearance is required at the fan grille to allow for sufficient air flow. Do not block the grille with couplings or guards.

Dust covering the fan and the gear unit will reduce cooling efficiency.

5.7.2 Cooling Coil

The cooling coil is located in the oil sump of the gear drive. Fresh water, sea water, or brackish water flow can be used in this coil. Water can flow through either direction inside the coil.

CAUTION: The maximum cooling water pressure must not exceed 115 psi (8 bar). In areas of frost with prolonged shutdown of the drive, the water should be drained from the coil. Water residue in the coil should be blown out with compressed air.

To prevent high water pressures, use a pressure regulator on the water inlet line.

5.7.3 Heat Exchanger

A heat exchanger is an external device used to cool the oil by water or air. Review instructions provided by the heat exchanger vendor for care and maintenance.

CAUTION: In areas of frost with prolonged shutdown of the drive, the water should be drained from the heat exchanger.

5.8 Couplings

Couplings are normally used to connect the gear drive to the driver and driven equipment.

If rigid couplings or items which induce additional radial and axial loads on the shafting (such as pulleys, sprockets, and pinions) are used, this should be reviewed by DODGE.

CAUTION: Couplings with surface speeds at maximum diameter below 4000 ft/min (20 m/s) MUST be statically balanced. Couplings above this surface speed require dynamic balancing.

Review instructions provided by the coupling vendor for care and maintenance.

5.9 Backstop

An optional feature is a mechanical backstop. During operation, the backstop permits free rotation in one direction only. This direction is marked on the gear drive input side by an arrow indicating direction of rotation. The backstop is lubricated by the gear drive. No external lubrication is required unless noted on the dimension drawing.

NOTE: The direction of rotation can be changed by reversing the cage. Contact DODGE for full instructions.

CAUTION: To prevent damage to or destruction of the backstop, do not run in the opposite direction of rotation. Proper rotation direction is marked on the gear drive input shaft side.

6. INSTALLATION

6.1 General Information

Observe all safety directions while installing the gear drive. Before installation, make sure that there is sufficient space around the drive location for installation and maintenance.

6.2 Foundation

The foundation on which the gear unit will be mounted must be flat and horizontal. No vibration can be transmitted to the gear drive from the foundation or adjacent foundations. Steel structures used for mounting must be torsionally rigid and able to carry all loads and torques imposed by the gear drive and other equipment.

NOTE: Space requirements and foundation bolt locations are found on the dimension drawing.

6.3 Installation Instructions

- Remove corrosion protection from shaft extensions with solvent.

CAUTION: Follow directions and use caution when applying solvent.

- Mount input and output shaft drive elements. When parts are shrunk onto the shaft, do not heat above 275°F (135°C). Remove flexible elements before heating.

CAUTION: Follow operating instructions when mounting couplings, sprockets and sheaves which are provided with the product. Hammering or tapping on the shaft is NOT permitted.

- Before connecting the motor, the rotating field of the 3 phase supply network should be determined with the aid of a phase rotation indicator and the motor connected according to the predetermined direction of rotation.
- Align drive elements with the gear drive. It is critical to achieve exact horizontal alignment of the unit with the prime mover and driven equipment. Precise alignment is particularly important when mounting an overhung pinion or installing an outboard bearing. Flexible couplings must always be mounted according to prescribed alignment tolerances to protect both the gear drive and the couplings. Refer to the manufacturer's recommendations. The maximum deviation may not exceed 0.008 inch over 3 15/16 inch of shaft length (0.2 mm over 100 mm).

NOTE: The service life of the shafts, bearings, and couplings are a direct function of the accuracy of the alignment process.

- Remove fan cover on H1 and H2 units to provide access to foundation bolts.
- Tighten foundation bolts.

CAUTION: The gear unit housing may not be stressed while tightening the foundation bolts.

- If there are external forces acting on the gear drive, secure the gear drive by means of dowels or stop blocks.
- Replace fan cover on H1 and H2 units after tightening foundation bolts.
- Fit safety devices on the gear unit.

6.4 Shaft Mounted Units

Shaft mounted units require a torque arm. The connection between the gear unit and the support must be flexible.

6.4.1. Shaft mounted units with key connection

- Remove corrosion protection from the inside of the hollow shaft and the shaft of the driven machine with solvent.

CAUTION: Follow directions and use caution when applying solvent.

- Check the dimensions of the bore and shaft to assure that there is not an interference fit.
- If not present, add a hole to the driven shaft for solvent access to be used during removal. See Figure 9.
- Apply a lubricant to the surfaces of the hollow shaft and machine shaft for ease of installation.
- Push the reducer onto the shaft by use of a threaded rod secured in the machine shaft. See Figure 5. A hydraulic device can also be used.

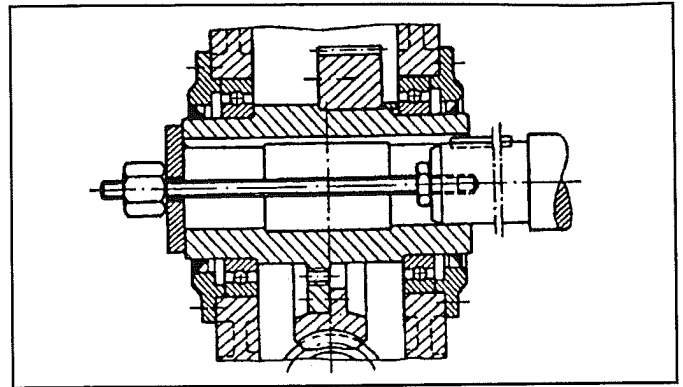


Figure 5

- Push the unit on gradually. DO NOT HAMMER.
- Secure the unit axially with an end plate.

6.4.2. Shaft mounted units with shrink disk connection

- Remove corrosion protection from the inside of the hollow shaft and the shaft of the driven machine with solvent.

CAUTION: Follow directions and use caution when applying solvent.

- Check the dimensions of the bore and shaft to assure that there is not an interference fit.
- If not present, add a hole to the driven shaft for solvent access to be used during removal. See Figure 9.
- Apply a lubricant to the surfaces of the hollow shaft and machine shaft for ease of installation. Do not apply grease to inside bore of the hollow shaft under the shrink disk. See Figure 6.

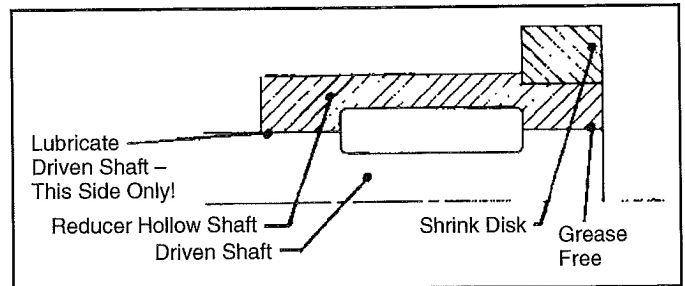


Figure 6

Push the reducer onto the shaft by use of a threaded rod secured in the machine shaft. A hydraulic device can also be used.

- Push the unit on gradually. DO NOT HAMMER.
- Take any three or four locking screws equally spaced and snug them up to establish a parallel or perpendicular position of the shrink disk collar relative to the shaft. This will properly seat the collars on the taper of the inner ring and avoid cocking of the collars.
- Using a torque wrench, tighten all locking screws gradually and all the way around in either clockwise or counterclockwise sequence (not in diametrically opposite sequence). Several passes are required until all screws are torqued to the specified tightening torque.
- Check and make sure that no screw will turn anymore by applying the specified tightening torque. Only then is the installation complete.
- Secure the unit axially with an end plate.

7. START UP

7.1 Pre-start up activities

- Verify the rating of the reducer (indicated on the nameplate and certified print) to be sure that the service rating and speed are not exceeded in actual operation.
- All exposed moving parts should be protected by guards.

7.1.1 Preservative removal

- Unscrew oil drain plug and drain off the remains of the preservative or test oil from the housing. Dispose of properly.
- Replace oil drain plug
- For units coming out of long term storage:
 - Remove inspection cover from housing.
 - Remove VPI bag from the housing.

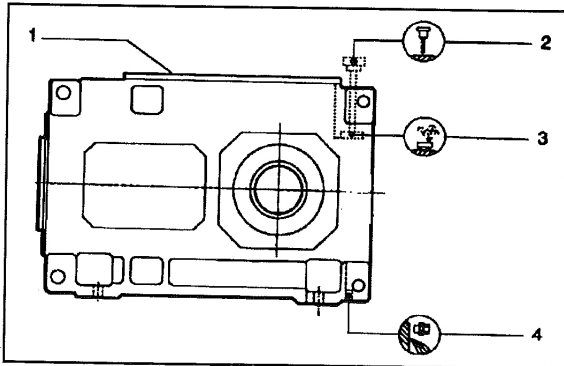


Figure 7

1. Inspection Cover 3. Vent plug/screw plug
2. Dipstick 4. Oil drain plug

7.1.2 Filling

- Remove inspection cover from housing.

CAUTION: Fill gear unit with fresh oil using a filling filter of 2.5 microns (60 µm). Add oil to all oil pockets over bearings and the input shaft bearings on type B Bevel units.

NOTE: The oil used should meet all requirements outlined in Section 10.5. Oil Viscosity and quantity required is found on the nameplate of the gear drive.

NOTE: Fill the external lubrication system if the unit is so equipped.

- Check oil level with dipstick.

NOTE: The oil level must be at the top mark on the dipstick.

- Apply Loctite 572 sealant to the sealing face of the inspection cover following Loctite instructions.
- Replace inspection cover.

7.2 Start up

- Check oil level with dipstick

NOTE: When the oil has cooled down, the oil level should be at the top mark of the dipstick. When the oil is hot, the oil level may be above the top mark on the dipstick. The oil level must never be below the lower mark on the dipstick. Add oil to bring the level above this mark before operation.

- If the unit is equipped with an oil cooling system, start water or air flow through the system.
- If the unit is equipped with a backstop:
 - Before start up, check that the shafts can be rotated in the correct direction without use of excessive force. Check to make sure that the direction of rotation

matches the arrows on the input shaft side of the drive.

CAUTION: To prevent damage to or destruction of the backstop, do not run in the opposite direction of rotation. Proper rotation direction is marked on the gear drive input shaft side.

- Before connecting the motor, the rotating field of the three phase supply network should be determined with the aid of a phase rotation indicator and the motor connected according to the predetermined direction of rotation.

7.3 Shutdown

- To shut down the gear unit, shut off the driving equipment (prime mover).

CAUTION: Secure the drive assembly to prevent accidental start up.

- Shut off auxiliary equipment such as motor driven pumps, heat exchangers, water flows.

CAUTION: In the case of water - oil coolers and cooling coils, drain the water from the system to prevent frost damage.

NOTE: If shutdown is for a long period of time, the gear drive should be run briefly at three week intervals. If shutdown is longer than six months, see Section 7.3.1.

7.3.1 Long Term Storage

Two methods are available for long term storage based on oil seal type and auxiliary equipment are available.

7.3.1.1 Storage for units with splash lubrication and contact oil seals

For units with contact type oil seals, splash lubrication, and/or without drywells, the unit can be filled to level with the vent plug with the operating oil.

7.3.1.2 Storage for units with labyrinth oil seals, oil circulating systems, or drywells

Gear drives with labyrinth oil seals, pressurized oil lubrication, or drywells should be run in no-load mode with preservative before long term storage.

Storage Time	Preservative	Special Measures
Mineral Oil		
up to 18 months	Shell Ensis Fluid SDC	none
up to 36 months	Shell Ensis Fluid SDC and Shell VPI Powder 260 ①	seal gear unit, replace and vent plug with sealing plug (change on start-up)
Synthetic Oil		
up to 18 month	Special corrosion inhibitor oil TRIBOL1390	none
up to 36 months	Special corrosion inhibitor oil TRIBOL 1390 and Shell VPI Powder 260 ①	seal gear unit, replace vent plug with sealing plug (change on start up)

CAUTION: ① Change VPI bag every two years.

- Shut off gear unit and drain oil as described in Section 10 Maintenance and Repair
- Pour in preservative in accordance with the above Table through the vent hole or through the inspection cover opening up to the top mark on the dipstick.
- Cap the vent hole or replace the inspection cover.
- Run gear unit under no-load briefly.
- Drain preservative from gear drive and dispose of properly.

CAUTION: The preservative may be hot! Wear protective clothing. Ensure proper ventilation of area.

- Replace the oil drain plug
- If storage is longer than 18 months, remove inspection cover, suspend VPI bags (one 2.7 oz bag per 18 ft³ of air) (one 25 g bag per 0.5 m³ of air) inside the gear drive, apply Loctite 572 sealant to the sealing face of the inspection cover following Loctite instructions, replace inspection cover, and replace vent plug with sealing plug.

NOTE: Before starting the gear drive, remove the VPI powder bags and replace the screw plug with the vent cap.

7.3.2 External preservative procedure

Protection Time	Preservative Name	Coating Thickness	Remarks
up to 12 months	Tectyl 846 K19	approximately 0.002 inch (50 µm)	Was based preservative seawater resistant and tropic proof

- Clean shaft surfaces.
- Coat shaft seal rings with grease for protection against the preservative.
- Apply preservative.

8. OPERATION

During operation, the gear unit should be checked for:

- Excessive operating temperature (The gear unit is designed for continuous service with a maximum oil sump temperature of 200°F (93°C) or a maximum of 100°F (55°C) rise above ambient, see Section 10 Maintenance and Repair)
- Any changes in gear unit noise level.
- Oil leakage at the housing and shaft seals.
- Correct oil level (see Section 7 Start up).

NOTE: To check the oil level, shut off the driving equipment. When the oil is hot, the oil level may be slightly above the top mark on the dipstick. Do not operate the gear drive with an oil level below the bottom mark on the dipstick. Add oil if required.

CAUTION: If irregularities are detected during operation or the pressure monitor in the oil cooling system trips an alarm (if so equipped), the drive assembly should be shut off immediately. The cause of the malfunction should be determined with the aid of the Troubleshooting Table (Section 9). This table lists possible malfunctions, their causes, and suggestions for correction. If the cause can not be determined, please contact DODGE.

9. TROUBLESHOOTING

NOTE: Malfunctions occurring during the warranty period which necessitate repair of the gear unit may only be performed by DODGE personnel. Even after the warranty period, we recommend users to consult Product Support with respect to malfunctions in which the cause can not be determined.

Malfunction	Possible Cause	Remedy
Temperature rise at bearing locations	Oil level ingear unit housing is too low.	Check oil level; add if required
	Oil is too old	Check when oil was last changed; changed oil if required; see Section 10
	Mechanical oil pump is defective	Check oil pump; replace if required
	Bearing(s) have failed	Call DODGE Product Support; check bearing(s); replace if required
Excessive operating temperature	Oil level in gear unit is too high	Check oil level; lower if required
	Oil is too old	Check when oil was last changed; change oil if required; see Section 10
	Oil is very dirty	Change oil, see Section 10
	Gear unit has oil cooling system with insufficient collant flow rate	Open valves in inlet and outlet lines; check cooling coil for free flow; check water-oil cooler for free flow; check air-oil cooler for free flow
	Coolant temperature is too high	Check temperature and correct if required
	Oil flow rate through heat exchanger is too low due to a clogged oil filter	Clean oil filter; see Section 10
	Oil flow rate through heat exchanger is toolow due to a defective oil pump	Check function of oil pump; repair or replace pump if required
	Unit is coated with dust	Clean gear unit housing
	Gear units with fan: intake opening in fan cover and/or gear unit housing is clogged	Clean fan cover and gear unit housing
Change in noise level of gear unit	Damage to gear teeth	Call DODGE; check pinions and gears; replace damaged components
	Excessive bearing play	Call DOGE; adjust bearing endplay
	Defective bearing	Call DODGE; replace defective bearing
	Defective coupling	Call coupling vendor; replace coupling
Loud noises from the gear unit mounting	Gear unit mounting has loosened	Tighten bolts/nuts to recommended tightening torque. Replace damaged bolts/nuts
Gear unit is oily	Inadequate sealing of housing cover or joints	Check seals; replace if required; seal joints
	Radial shaft seals defective	Check seals; replace if required
	Oil level in gear unit is too high	Check oil level; lower if required
	Vent is clogged	Check vent; replace if required
	Oil is leaking from drain plug	Check plug; drain unit and replace plug if required
Oil Pressure monitor trips alarm (on units so equipped)	Oil pressure less than 7 psi (0.5 bar)	Check oil level, add oil if required; check function of oil pump, repair or replace pump if required, check oil filter, clean if required, see Section 10

safety precautions.

CAUTION: The periods listed in the table below are dependent on the duty cycle of the gear drive. Recommended values are based on the following:

- 24 hour per day running time
- 100% full load
- input speed of 1800 rpm
- maximum oil temperature of 200°F (93°C)

10. MAINTENANCE AND REPAIR

10.1 General information on maintenance

NOTE: All maintenance and repair work should be carried out with due care and only by trained personnel. Observe all

Measures	Periods	Comments
Check oil temperature	daily	
Check gear unit noise level changes	daily	
Check oil level	monthly	
Check gear unit for leakage	monthly	
Check oil for water content	After approximately 400 operating hours / at least once per year	see 10.2.1
Initial oil change after start up	After approximately 400 operating hours	see 10.2.2
Subsequent oil changes	Every 18 months or 5000 operating hours	see10.2.2
Clean oil filter	Every three months	see10.2.3
Clean fan	At same time as oil change	see10.2.4
Check all mounting hardware for tightness	After first oil change, then after every other oil change	see 10.2.5
Check cooling system	At same time as oil change	see 10.2.6
Perform complete inspection of gear drive	Approximately every two years when changing oil	see 10.2.7
Grease bearings	As marked on gear drive	see 10.2.8
Grease seals	As required	see 10.2.9

NOTE: If conditions are different from above, the periods should be adjusted accordingly.

10.2 Description of maintenance and repairs

10.2.1 Examining oil for water content

Have the lubricant supplier perform an oil analysis at the time of the oil change. Consider setting up an oil sampling plan to determine the optimal time to change the lubricant based on its condition.

10.2.2 Performing oil changes

CAUTION: When changing the oil, the gear unit should always be filled with the same oil grade as previously used. Mixing oils of different grades or manufacturers are **NOT** allowed. In particular, synthetic oils may not be mixed with mineral oils or different synthetic oils. When changing over from mineral oil to synthetic oil or from synthetic oil with a particular base to synthetic oil with another base, the gear unit must be flushed thoroughly with the new oil.

When changing the oil, the housing must be cleaned thoroughly by flushing with oil to remove oil sludge, contamination, and residues of old oil. For this purpose, the same oil grade should be used as used for operation. Highly viscous oil should be warmed before use. Once all residue has been removed, add the new oil.

NOTE: The oil change must be carried out immediately after shutdown of the gear unit.

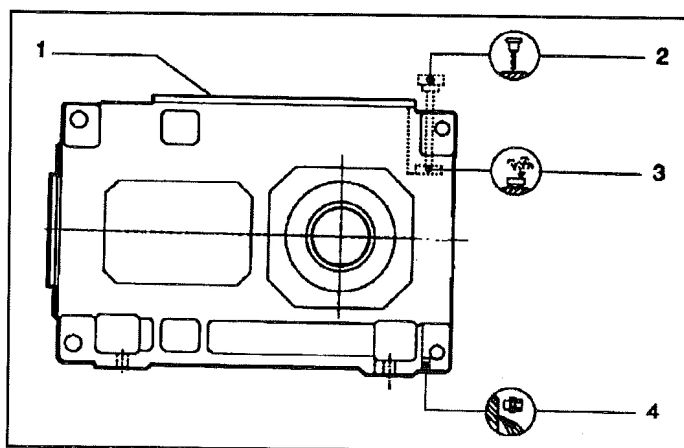


Figure 8

1. Inspection Cover
2. Dipstick
3. Vent plug/screw plug
4. Oil drain plug

- Shut down gear unity by shutting off the drive unit.

CAUTION: Secure the drive assembly to prevent accidental start up.

- Shut off valves in the coolant inlet and outlet lines (if so equipped).
- Unscrew the vent plug on the top of the housing.
- Unscrew the oil drain plug and drain oil into a suitable container.

CAUTION: Scalding risk is present from the hot oil. Wear protective clothing.

- Thoroughly clean the permanent magnet of the oil drain plug
- Replace the oil drain plug in the housing

NOTE: Check condition of the seal washer in the drain plug, use a new oil drain plug if required.

- Clean oil filter in lubrication system (if so equipped). See Section 10.2.3.
- Following filling instructions in Section 7.1.2.

10.2.3 Cleaning the oil filter

See the operating instructions supplied with the oil filter.

10.2.4 Cleaning the fan

- Shut down the gear unit by shutting off the drive unit.

CAUTION: Secure the drive assembly to prevent accidental start up.

- Remove the fan housing
- Remove dirt adhering to the fan, housing, and cover with a stiff brush.
- Remove any corrosion present.
- Replace the fan cover on the gear drive.

10.2.5 Checking fasteners

- Shut down the gear unit by shutting off the drive unit.

CAUTION: Secure the drive assembly to prevent accidental start up.

- Shut off valves in the coolant inlet and outlet lines (if so equipped).
- Check all fasteners for tightness with a torque wrench.

Thread size	Property Class	Tightening Torque	
M 10	10.9	530 lbs in	60 Nm
M 12	10.9	885 lbs in	100 Nm
M 16	10.9	2210 lbs in	250 Nm
M 20	10.9	4425 lbs in	500 Nm
M 24	10.9	7700 lbs in	870 Nm
M 30	10.9	15490 lbs in	1750 Nm
M 36	10.9	30980 lbs in	3500 Nm

NOTE: Damaged screws should be replaced by new fasteners of the same class and type.

10.2.6 Checking the heat exchanger and cooling coil

- Shut down the gear unit by shutting off the drive unit.

CAUTION: Secure the drive assembly to prevent accidental start up.

- Shut off valves in the coolant inlet and outlet lines. Shut off the motor on oil - air coolers.
- Check conditions of the heat exchanger in accordance with the Operating Instructions provided by the manufacturer.
- Check for fouling in the cooling coil. Replace if fouling is severe.

NOTE: Check fasteners for tightness; replace if required.

- Run gear unit briefly.
- Shut down gear drive and check oil level with dipstick.

NOTE: The oil level must come up to the top mark on the dipstick.

If oil is required, see Section 7.1.2 for filling instructions.

10.2.7 Gear unit inspection

The gear unit inspection can be performed by DODGE service personnel for a complete evaluation of the condition of the gear drive and required replacement parts.

10.2.8 Grease bearings

In some gear units, grease is provided for bearing lubrication. Units are greased before shipment. The intervals and the amounts required for re-greasing are shown on a label next to the grease fitting.

10.2.9 Greased shaft seals

Grease packed shaft seals must be re-greased depending on the contamination of the seal area.

10.3 Removal of shrink disk

- Shut down the gear unit by shutting off the drive unit.

CAUTION: Secure the drive assembly to prevent accidental start up.

- Loosen all tightening bolts uniformly around the bolt circle several times - a quarter turn each time. Never unscrew any of the bolts completely.
- Remove any rust in the vicinity of the shrink fit.
- Pull the shrink disk from the hub.

10.4 Removal of shaft mounted drives

- Shut down the gear unit by shutting off the drive unit.

CAUTION: Secure the drive assembly to prevent accidental start up.

- Inject a rust solvent through the solvent access in the machine shaft
- Remove the end plate
- Use a fixture as shown in Figure 9 for pulling the unit off the shaft - NEVER HAMMER. Insert the fixture bolts in the threads of either the hollow shaft, housing, or bearing cover, as required. A hydraulic device can also be used.

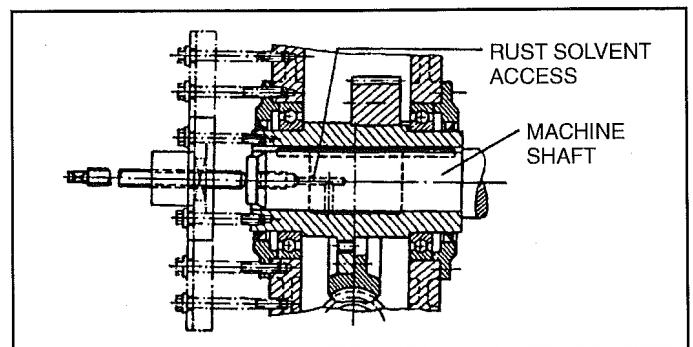


Figure 9

10.5 Lubricants

The required oil viscosity (VG Class) is specified on the nameplate of the gear drive. This viscosity is valid for normal operating conditions at an ambient temperature range of 25°F to 86°F (-4°C to 30°C) for mineral oils and -15°F to 104°F (-26°C to 40°C) for synthetic.

Viscosity Grade at 100° F			Mineral Lubricant				Synthetic Lubricant	
AGMA Grade	SSU	ISO VG Class	KLUBER	MOBIL	SHELL	TRIBOL	TRIBOL	KLUBER
8 EP	3200	VG 680	KLUBEROIL GEM 1/680	Mobilegear 636	OMALA 680	Tribol 1100/680	Tribol 800/680	SYNTHESCO D680EP
7 EP	2200	VG 460	KLUBEROIL GEM 1/460	Mobilegear 634	OMALA 460	Tribol 1100/460	Tribol 800/460	SYNTHESCO D460EP
6 EP	1500	VG 320	KLUBEROIL GEM 1/320	Mobilegear 632	OMALA 320	Tribol 1100/320	Tribol 800/320	SYNTHESCO D320EP
5 EP	1100	VG 220	KLUBEROIL GEM 1/220	Mobilegear 630	OMALA 220	Tribol 1100/220	Tribol 800/220	SYNTHESCO D220EP
4 EP	700	VG 150	KLUBEROIL GEM 1/150	Mobilegear 629	OMALA 150	Tribol 1100/150	Tribol 800/150	SYNTHESCO D150EP
3 EP	470	VG 100	KLUBEROIL GEM 1/100	Mobilegear 627	OMALA 100	Tribol 1100/100	Tribol 800/100	SYNTHESCO D100EP

Bearing Greases	EXXON	MOBIL	SHELL	TEXACO	TRIBOL
	BEACON 3	Mobilith AW 2	Alvania R2	Multifak 2	Molub-Alloy 860/220-2 Tribol 4020-220-2

If the ambient temperature is outside this range, consult DODGE for oil viscosity recommendations.

- The lubricant viscosity is shown on the nameplate of the gear drive.
- The SSU values are rounded mean values of corresponding SSU viscosity ranges.
- The permitted variation of each ISO VG class is $\pm 10\%$.
- Units with grease lubricated bearings are furnished with a lithium saponified grease. Greases with different saponification bases should not be mixed.
- All mineral based EP oils are the preferred lubricant, suitable for operating temperatures up to 195°F (90°C) as well as for low ambient temperatures down to 25°F (-4°C). For lower temperatures or critical applications, we suggest synthetic lubricants which are suitable for operating temperatures up to 212°F (100°C) as well as for low ambient temperatures down to -15°F (-26°C).

NOTE: DODGE has reviewed the above lubricants listed in this manual and they have met our criteria at time of publication of this manual. Therefore, we recommend that the end users should select a lubricant from the above table, taking into account the viscosity range stated on the nameplate.

NOTE: The above recommendation does not imply release of warranty for the quality of lubricant provided by the lubricant supplier. Each lubricant manufacturer must warrant the quality of his product themselves.

If an oil not listed in the above table is selected, DODGE will assume no responsibility for the suitability of the lubricant in our products. In order to minimize technical risk in selecting a lubricant not listed in the above table, the selected lubricant must meet the following criteria:

- All oil lubricants are extreme pressure oils (EP) and have passed 12 stages in the FZG test.
- All oil lubricants have passed 10 stages in the FVA project 54 micropitting test.
- The foam content of the oil may not exceed 10% per the DODGE FOAM TEST.

- The oil must be compatible with 72 NBR 902 and 72 FKM 585 seal ring materials.
- The oil must be compatible with DODGE standard paints and interior coatings.

11. SPARE PARTS

A stock of the most important replacement parts on site is critical for minimizing downtime and maintaining the gear drive.

Recommended spare parts are as follows:

- 1 set bearings
- 1 set contact type oil seals

For critical service, additional rotating parts may be required. We assume warranty for only original spare parts furnished by DODGE.

CAUTION: Spare parts not furnished by DODGE have not been tested for compatibility with the gear drive. Using such parts may adversely effect the performance and safety of the gear drive. No warranty or guarantee will be assumed by DODGE for damage caused by spare parts and accessories not furnished by DODGE.

When ordering spare parts, please supply the Order Number, Unit Size, Part Number, and quantity. The first two items can be found on the nameplate of the gear drive.



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MN1604 (Replaces 499334)



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