

How to Use this Manual

This manual provides detailed instructions on installation and maintenance of Falk CT-Series gear drive. Use the table of contents below to locate required information.

CAREFULLY FOLLOW THE INSTRUCTIONS IN THIS MANUAL FOR OPTIMUM PERFORMANCE AND TROUBLE-FREE SERVICE OF YOUR FALK GEAR DRIVE.

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1. INTRODUCTION

Credit for long service and dependable operation of a gear drive is often given to the engineers who designed it, the craftsmen who constructed it, or the sales engineer who recommended the type and size. Ultimate credit belongs to the mechanic on the job who worked to make the foundation rigid and level, who accurately aligned the shafts and carefully installed the accessories, and who made sure that the drive received proper lubrication. The details of this important job are the subject of this manual.

NAMEPLATE — Operate Falk gear drives only at power, speed and ratio shown on the nameplate. Before changing any one of these, submit complete nameplate data and new application conditions to Factory for correct oil level, parts, and application approval.

WARNING: Consult applicable local and national safety codes for proper guarding of rotating members. Lock out power source and remove all external loads from drive before servicing drive or accessories.

WARRANTY — Rexnord Industries, LLC (the "Company") warrants that Falk CT-Series gear drives (I) conform to Company's published specifications, and (II) are free from defects of material for two years from the date of shipment.

Company does not warrant any non-Company branded products or components (manufacturer's warranty applies) or any defects in damage to, or failure of products caused by: (I) dynamic vibrations imposed by the drive system in which such products are installed unless the nature of such vibrations has been defined and accepted in writing by Company as a condition of operation; (II) failure to provide suitable installation environment; (III) use for purposes other than those for which designed, or other abuse or misuse; (IV) unauthorized attachments, modifications or disassembly, or (V) mishandling during shipping.

2. GENERAL NOTES AND SAFETY INSTRUCTIONS

The proper operation of a gear drive not only depends on the good design, the use of good material and good workmanship but also on careful installation, proper lubrication and proper working conditions. Hence, it is of utmost importance to see that the installation of the gear drive is done according to the instructions given in this manual to ensure proper operation and long and trouble-free service.

This manual should be kept with the person in-charge who handles the installation & operation. They should thoroughly study and understand the instructions given in this manual. In the interest of future development, we reserve the right to introduce modifications to the individual subassemblies & accessories, which, while retaining the essential features, can be regarded as desirable to increase their efficiency, reliability and safety.

QUALIFIED PERSONNEL — The product or system to which these instructions relate may be handled only by persons qualified for the work and in accordance with the instructions relating to the work concerned, particularly the safety and warning notes contained in those instructions. Qualified personnel must be trained and have the experience necessary to recognize risks associated with these products or systems and to avoid possible hazards.

OBLIGATIONS OF THE USER — The operator must ensure that everyone carrying out work on the gear drive has read and understood these instructions and is adhering to them in every point in order to:

- Avoid injury or damage,
- Ensure the safety and reliability of the drive,
- Avoid disruptions and environmental damage through incorrect use

During transport, assembly, installation, dismantling, operation and maintenance of the drive, the relevant safety and environmental regulations must be complied with at all times.

The outside of the gear drive must not be cleaned with high-pressure cleaning equipment.

Electrical grounding in accordance with the applying regulations and directives must be carried out.

Removed safety equipment must be re-installed prior to operation.

Notices attached to the gear unit, e.g. nameplate, shaft rotation arrows etc., must always be observed. They must be kept free from dirt and paint at all times. Missing nameplates must be replaced.

Screws which have been damaged during assembly or disassembly work must be replaced with new ones of the same strength class and type.

ENVIRONMENTAL PROTECTION — Dispose of any packing material in accordance with regulations or separate it for recycling.

When changing oil, the used oil must be collected in suitable containers. Any pools of oil which may have collected should be removed at once with an oil-binding agent.

Preservative agents should be stored separately from used oil.

Used oil, preservative agents, oil-binding agents and oil-soaked cloths must be disposed of in accordance with environmental legislation.

Disposal of the gear drive after its useful life.

Drain all the operating oil, preservative agent and/or cooling agent from the gear drive and dispose of in accordance with regulations.

Depending on national regulations, gear-drive components and/or add-on parts may have to be disposed of or sent for recycling separately.

3. TRANSPORT AND STORAGE

The gear unit is delivered in the fully assembled condition. Additional items are delivered separately packaged, if applicable. Different forms of packaging may be used, depending on the size of the drive and method of transport.

Transport of the complete gear drive should be undertaken by using wire ropes or nylon straps of required strength.

- While lifting the complete gear drive, do not use the shaft and lugs on the casing. Instead, use the 4 eyebolts provided on top of the housing.
- If the gear drive is fitted with external lubrication piping, ensure the lifting straps are clear to avoid damage.

STORED & INACTIVE GEAR DRIVES — Each gear drive is protected with a rust preventative that will protect parts against rust for a period of 12 months in an outdoor shelter or 24 months in a dry building after shipment from the Factory.

Indoor dry storage is recommended.

CAUTION: Drives are not to be stored outdoors without shelter. Standing water on drives significantly increases risk of water ingress and rust. Installer assumes risk.

If a gear drive is to be stored or inactive after installation for 1 month to 6 months, prepare the drive for storage according to the “Customer Preparation for Storage” instructions in the “Customer Intermittent Storage” section of Manual 128-014. The gear drive should be completely sealed, and the breather replaced with a plug. Before operating, drives which have been stored or inactive must be filled to the proper level with oil meeting the specifications given in this manual. Refer to Manual 128-014 for “Start-up after Storage” instructions.

Periodically inspect stored or inactive gear drives and add rust inhibitor every six months, or more often if necessary. Rotate the shafts several times by hand periodically.

STORING THE GEAR UNIT — The gear drive must be stored in a sheltered place in the position of the original packaging, placed on a vibration-free, dry base, and covered. Do not store near vibrating machines, such as reciprocating engines, compressors, pumps or railroads in order to avoid wear of bearings by vibration.

Provisions for special environmental conditions during transport (e.g. transport by ship) and storage (climate, termites, etc.) must be contractually agreed upon.

DELIVERY CONDITIONS — All gear drives are manufactured with highest quality control while keeping the exact specifications in mind. The gears are carefully inspected at various stages and run on the test bench before shipment. After all quality control tests have been completed, the gear drives are certified for shipment.

Generally, gear drives are not supplied with oil from the factory. Oil recommendations for filling the drive when commissioning are listed in **Table 2** of this manual.

4. INSTALLATION

Installation should be performed such that the inspection cover and drain plug are readily accessible (**Figure 1**).

FOUNDATION — The foundation should be designed to minimize resonance vibrations that are transmitted from adjacent foundations. The structure on which the unit is to be mounted must be rigid and designed to accommodate the gear drive weight and reacting forces generated from torque load.

Careful alignment of the gear drive and connected equipment must be ensured. Any elastic deformation through operating forces and thermal growth must be taken into consideration. Fastening bolts or nuts must be tightened to the correct torque provided in **Table 1**. The bolts used for mounting the gear drive to the foundation or bed plate are to be 1.250"-7 UNC (not supplied).

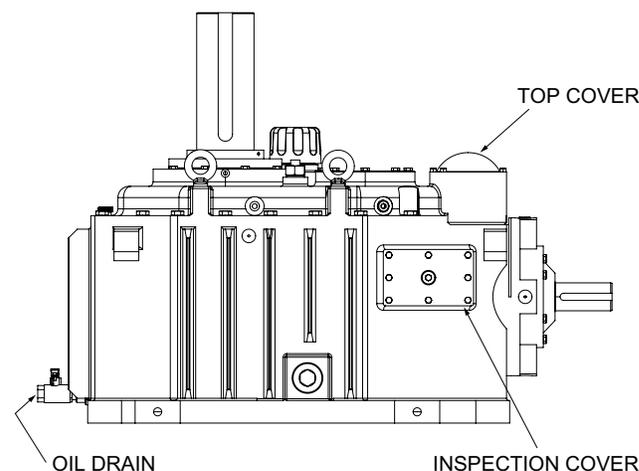


Figure 1 — Oil Drain and Cover Locations

If external forces are acting upon the gear drive, it is advisable to prevent the drive from displacement by means of lateral stops.

For dimensions, space requirement, arrangement of supply connections (e.g. with separate oil-cooling units), refer to the drawings in the supplemental documentation.

The gear drive must be mounted on level foundation using the correct size and type of foundation bolts. While aligning the gear drive with the motor and driven equipment, check the horizontal level using the machined leveling seats on the housing feet. The foundation must have sufficient load carrying capacity. A civil engineer or other structural expert should be consulted for checking suitability of foundation. Correct leveling ensures proper

lubrication of bearings. Tightening torque values for the foundation bolts can be found in **Table 1** below.

Table 1 — Tightening Torques (lb-in) $\pm 5\%$
DO NOT Lubricate Fasteners

Thread Dia – UNC	Metal to Metal	Metal to Concrete
0.250-20	90	70
0.3125-18	185	145
0.375-16	330	255
0.500-13	825	640
0.625-11	1640	1280
0.750-10	2940	2290
0.875-9	4560	3750
1.000-8	6800	5600
1.125-7	8900	7000
1.250-7	12600	10000
1.375-6	16500	13000
1.500-6	22100	17500

FOUNDATION GENERAL — The foundation frame must be horizontal and plain. The gear drive must not be excessively stressed when tensioning the fastening bolts. It is important to ensure the mounting surface of the gear drive has a flatness tolerance of less than or equal to 0.01" height per 100" length. This flatness specification ensures the contact pattern of the teeth and the load on the bearings is not compromised, and that the service life of the gear drive is fully maintained.

Clean the undersurface of the gear-drive base and the foundation frame.

Using suitable lifting equipment when lifting the gear drive on the foundation frame.

Align the gear drive in accordance with the coupling manufacturer's recommendations.

Record alignment dimensions and tighten the foundation bolts to the specified torque referenced in **Table 1**.

5. SHAFT CONNECTIONS

WARNING: Provide suitable guards in accordance with local and national standards.

COUPLING CONNECTIONS — The performance and life of any coupling depends largely upon how well the coupling is installed and serviced. Refer to the coupling manufacturer's manual for specific instructions.

ADDAX COUPLINGS — Refer to Addax installation manual 548-110 for detailed installation instructions. Addax couplings are designed to use a clearance fit between the coupling hub and the gear drive shaft, so heating of the hub is not necessary for installation.

6. LUBRICATION

Carefully follow instructions on the drive nameplate and warning tags. Lubricants listed in this manual are typical products ONLY and should not be construed as exclusive recommendations. Industrial type rust and oxidation inhibited (R & O) gear lubricants are recommended. They can be formulated using petroleum or synthetic (PAO) base stocks.

Too much oil causes heating of the gear drive and too little oil causes premature wear. The oil level must be checked from time to time and maintained strictly as per the given oil level mark on the dipstick or oil sight glass (if used). The bearings are lubricated with the oil used for gears.

The class of suggested lubricants is enclosed here within **Table 2**. The class of lubricants states which oil should be used under specific operating conditions.

When starting the gear drive below the listed ambient temperature ranges listed in **Table 2**, an oil heater is required. This can be provided as an optional accessory.

Table 2 — Lubricants Chart

	Petroleum Based R&O Inhibited Lubricants	Synthetic PAO R&O Inhibited Lubricants
Ambient Temperature Range at Drive	+50° to +125°F (+10° to +52°C)	+10° to +125°F (-12° to +52°C)
ISO Viscosity Grade	220	220
AGMA Viscosity Grade	5	5
Viscosity cSt @ 40°C	198-242	198-242
Viscosity SSU @ 100°F	918-1122	918-1122
Manufacturer	Lubricant Name	
Amoco / BP Oil Co.	American Industrial Oil 220	...
Castrol Industrial Lubricants	Hyspin AWS 220 Castrol Paradene R&O 220 Castrol Paradene AW 220	Alphasyn T 220 Castrol Isolube 220
Chevron / Texaco / Caltex	Rando HD 220 Regal Oil R&O 220	Cetus HiPerSyn Oil 220
Citgo Petroleum Corp.	Pacemaker SD 220	CITGEAR Synthetic HT 220
Exxon Mobil / Esso	DTE Oil BB Teresstic 220 Vacuoline 533	Mobil SHC 630
Kluber Lubrication	...	Klubersynth G 4 220
Petro-Canada Lubricants	TurboFlo R&O 220	Synduro SHB 220
Phillips 66 / Conoco / 76 Lubricants / Kendall	Multipurpose R&O 220 Magnus Oil 220	Syncon R&O 220
Shell Oil Co.	Morlina S2 B 220 Morlina S2 BA 220 Tellus 220	Morlina S4 B 220
Total Lubricants USA / Keystone Div. Penwalt Corp.	Cirkan ZS 220	...
Valvoline Oil Co.	Valvoline AW ISO 220	...
Whitemore Manufacturing Company	Hyperion 220	...

7. PREPARATIONS FOR OPERATION

AIR VENTS — All drives must be equipped with an air vent/breather for operation. Drives are shipped sealed, with the vent/breather port plugged. The plug must be replaced with vent/breather before operating the drive. The drive may be equipped with an optional premium desiccant vent/breather.

For “Wet Tower” applications, the vent/breather port must be piped outside of the fan stack, away from direct steam or moist air.

PRESERVATIVE AGENT — The rust preventative agent used by the factory is soluble in mineral and PAO-based synthetic oils, and does not need to be flushed from the drive prior to filling with lubricant.

FILLING WITH LUBRICANT — It is recommended to fill the gear drive before the fan hub is installed to allow for greater access to the fill port and greater clearance for removing the dipstick.

A good practice before filling the gear drive with oil is to undo and remove fastening screws on the inspection and/or assembly cover. Remove cover with seal from housing (seal will be used again). Visually check the interior parts for corrosion.

Prior to filling gear drive or after storage/inactivity of the drive for greater than 1 month, remove the top cover and prime the upper bearings by flooding the oil trough with oil volume equal to approximately 10% of the sump volume. This will provide oil to the low speed and intermediate upper bearings.

Insert a funnel into the fill port and fill the drive with oil to the level indicated on the oil dipstick or sight glass. The approximate oil capacity is given on the gear drive nameplate. Actual capacities can be more or less depending on the type of cooling, total ratio and input speed. Always fill to proper level indicated on the dipstick, and mark the corresponding level on the external oil sight glass if supplied.

DRIVES WITH OIL PUMPS — Upon request, CT-Series Gear Drives can be equipped with an oil pump for cooling of special lubrication considerations. If a drive is equipped with an oil pump, fill the drive to the level marked on the dipstick. Run the drive for several minutes to fill the system components. Verify that the pump is circulating oil properly, then recheck oil level. If necessary, add oil to compensate for such items as a filter and/or cooler if one is provided.

EXTERNAL OIL LEVEL GAUGE — An external oil level gauge can be purchased as an optional accessory. The oil level gauge must be ventilated to the atmosphere in order to function properly, and it is ideal to pipe the gauge outside of the fan stack to remove it from a high humidity environment. A vented screw cap is supplied and mounted on top of the gauge as shown in **Figure 2**. The horizontal part of the oil drain line must be level or slightly lower at the oil level gauge than at the gear drive. Refer to **Figure 3** for recommended installation.

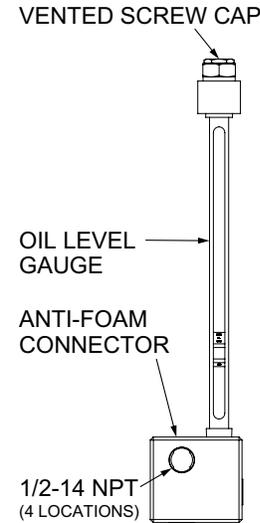


Figure 2 — Oil Level Gauge Assembly

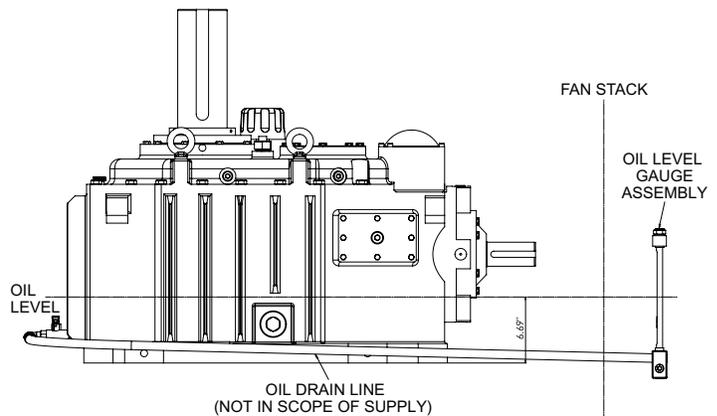


Figure 3 — Oil Level Gauge and Drain Line

8. MAINTENANCE

OIL CHANGE & OIL ANALYSIS REPORT — Checking oil condition at regular intervals is recommended. In the absence of more specific limits, the guidelines listed below may be used to indicate when to change oil:

1. Water content is greater than 0.05% (500ppm).
2. Iron content exceeds 150 ppm.
3. Silicon (dust/dirt) exceeds 25 ppm.
4. Viscosity changes more than 15%.

The first oil change should be completed after 200 working hours.

Subsequent oil changes must be made after every 1500 to 5000 operating hours, depending on working conditions. The oil change intervals should, however, not exceed 18 months.

If possible, the oil should be drained warm.

As an alternative to the oil change intervals indicated in **Table 3**, it is possible to have the oil sample tested at regular intervals by the Technical Service of the relevant oil company and to have it released for further use.

If re-usability has been confirmed, no oil change will be necessary.

Drain the oil while the gear drive is still warm, ideally right after shutting down the machinery. When changing the oil, always re-fill the gear drive with the same type of oil. Never mix different types of oil and/or oils made by different manufacturers. Polyglycol-based synthetic oils must not be mixed with PAO-based synthetic oils or mineral oils. If changing to a different grade or make of oil, the gear drive must, if necessary, be flushed out with the new oil grade. Flushing is not necessary, if the new service oil is fully compatible with the old service oil in all respects. Compatibility must be confirmed by the oil supplier. If there is a change to another oil grade or make, Rexnord recommends flushing out the gear drive with the new grade of service oil.

When changing the oil, the housing and the oil-supply system, if available, must be flushed with oil to remove sludge, metal particles and oil residue. Use the same type of oil as is used for normal operation. High-viscosity oils must be heated beforehand using suitable means. Ensure that all residues have been removed before filling with fresh oil.

For oil renewal period refer to **Table 3** based on the operating temperature.

Table 3 — Oil Renewal Period

Unit operating temperature (°F)	Renewal period
	Mineral oil ISO VG Class
Up to 170°F	4320 hours or 6 months
170°F to 185°F	3000 hours or 6 months
185°F to 200°F	2500 hours or 3 months
200°F to 220°F	2000 hours or 3 months

Oil should be drained and re-filled with fresh oil as described in section 7 of this manual.

There is a danger of scalding from the hot oil emerging from the housing. Wear safety gloves and safety glasses! Remove any oil spillage immediately with an oil-binding agent.

GENERAL NOTES ON MAINTENANCE — All maintenance and repair work must be done with care and by trained and qualified personnel only.

Lock out and secure the drive to prevent it from being started up unintentionally. Attach a warning notice to the start switch!

The periods indicated in Table 4 depend on the conditions under which the gear unit is operated.

Only average periods can therefore be stated here. These refer to:

- A daily operating time of 24 hours
- An input-drive speed of 1750 RPM
- Maximum oil temperature of 194°F (mineral oil) or 212°F (synthetic oil)

The operator must ensure that the intervals stated in **Table 4** are adhered to.

Under different operating conditions the periods indicated above must be adjusted accordingly.

Table 4 — Maintenance Intervals

Measure	Period
Check the oil temperature	Daily
Check for unusual gear-unit noise	Daily
Check the oil level	Monthly
Check the gear unit for leaks	Monthly
Test the water content of the oil	After approx. 500 operating hours, at least once per year
Perform the first oil change	Approx. 200 operating hours after start-up
Perform oil changes	After every 1500 to 5000 operating hours
Clean air filter	Every 3 months
Clean the gear unit	Depending on requirements, at least every 2 years
Check tightness of screw connections	After first oil change, then every 2 years
Inspection of the gear drive	Approx. every 2 years

GENERAL OIL-SERVICE LIVES — According to the oil manufacturers, the following are the expected periods during which the oils can be used without undergoing any significant change in quality. They are calculated based on an average oil temperature of 175°F:

- For mineral oils, biologically degradable oils and physiologically safe (synthetic esters) oils 2 years or 10,000 operating hours (does not apply to natural esters, such as rapeseed oils).
- For poly- α -olefins and polyglycols, 4 years or 20,000 operating hours.

The actual service lives may differ.

TEST WATER CONTENT OF OIL — More information about examining the oil for water content or conducting oil analyses is obtainable from your lubricant manufacturer or our customer service. For reference purposes, a fresh sample of the operating lubricating oil used must be sent with the used oil sample to the analyzing institute for analysis. The oil sample must be taken downstream of the filter of the oil-supply system while the gear unit is running. A suitable connection point is normally located upstream of the gear unit input (e.g. oil-drain cock in the pressure line). A special sample container should be filled with the specified quantity of oil. If there is no such sample container available, at least one liter of oil must be put in a clean, transport worthy, sealable vessel.

OIL SUPPLY SYSTEM — Be sure to observe the operating instructions of the oil-supply system for operation and maintenance.