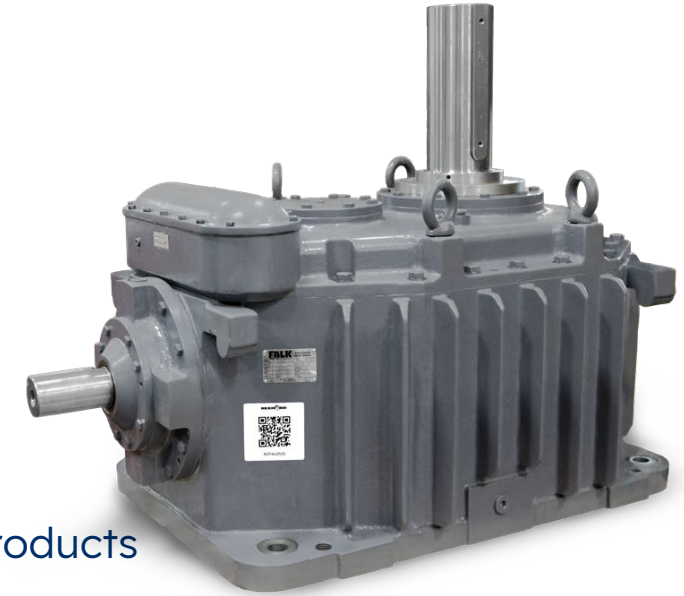
RegalRexnord

Creating a better tomorrow™...

BDI

Falk CTA Gear Drives



By RegalRexnord, the makers of Addax products

Drop-in replacements for Amarillo
double reduction models

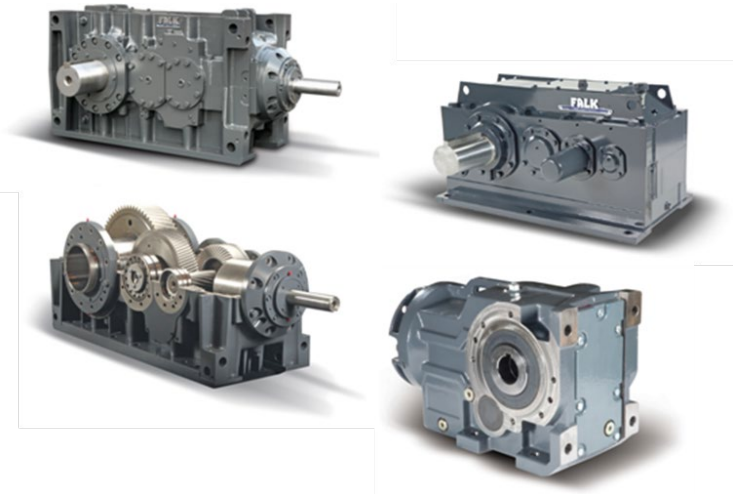
100+ YEARS OF INDUSTRIAL GEAR EXPERTISE

- **Premium-quality, reliable** and rugged gear products

- Headquarters in Milwaukee, WI
  - Manufacturing, assembly, and repair facilities in North America, Latin America, Asia, and Australia

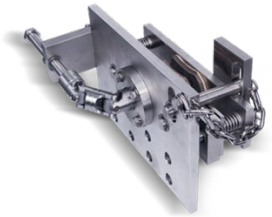
- **Hundreds of thousands of units** deployed worldwide
  - **Power generation:** FGD, conveyors, slurry pumps
  - **Oil and gas:** well pumps, filter presses, rotary kilns
  - **Refineries/petrochem plants:** crackers, mixers, refiners
  - **Paper mills:** agitators, conveyors, breakers, extruders

FALK
A GOOD NAME IN INDUSTRY®



Addax® Couplings & Drive Shafts

Addax® Cooling Tower Brakes



Cambridge Water Screen Systems

FALK® CTA Gear Drive

FALK CTA GEAR DRIVE

DOUBLE-REDUCTION, spiral bevel / helical gear drive designed specifically as drop-in replacement for Amarillo models – 1110, 1311, 1712, & 1713

Covers most popular **100…300 HP applications**

Every unit is **tested for leaks and excessive noise/vibration** prior to shipping and includes standard 2-year warranty.

Design has been validated using the rigorous Falk standards including:

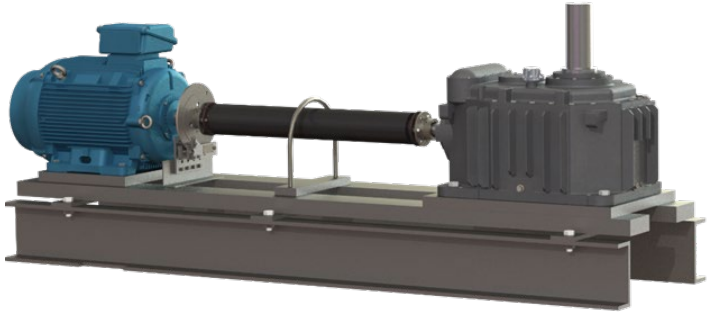
- Mechanical endurance testing
- Thermal validation testing
- Sound and vibration testing

OPTIONAL ACCESSORIES:

- **Low-level Oil Switch**
- **Temperature Sensors (RTD)**
- **Immersion Oil Heater**
- **Vibration Sensors**
- **External Backstop**

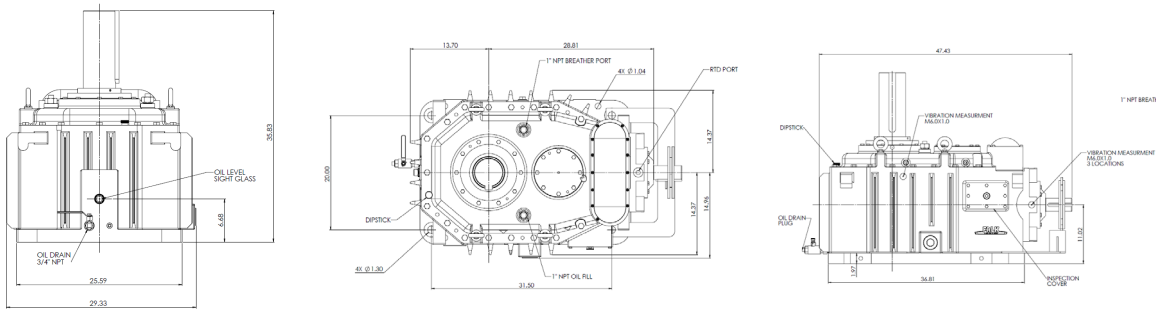
DESIGNED FOR WET COOLING TOWERS

- **Meets or exceeds requirements of CTI STD 111 and AGMA standards**
- **Service power ratings based on minimum 2.0 service factor**
- **All bearings rated 100,000-hour L10 life**
- Standard **ISO 12944-5 C5 paint system** for very high atmospheric corrosivity
- **Double radial lip seals** on LSS and HSS
- **Labyrinth ring** at output to provide extra protection against contamination
- **External housing fins** to maximize surface area and deliver cooler operation

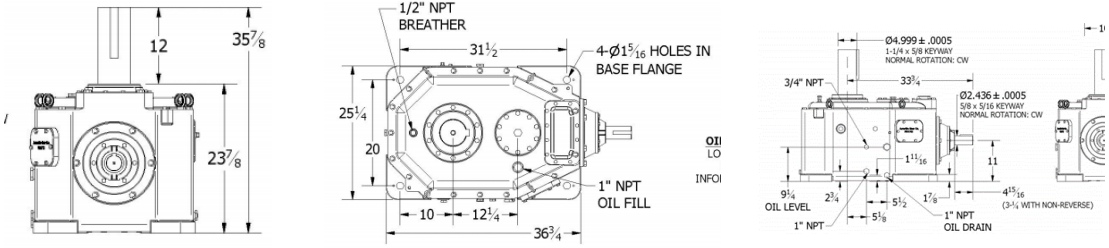


SAME FOOTPRINT, SIMPLIFIED INTERCHANGE

Falk 2310 CTA

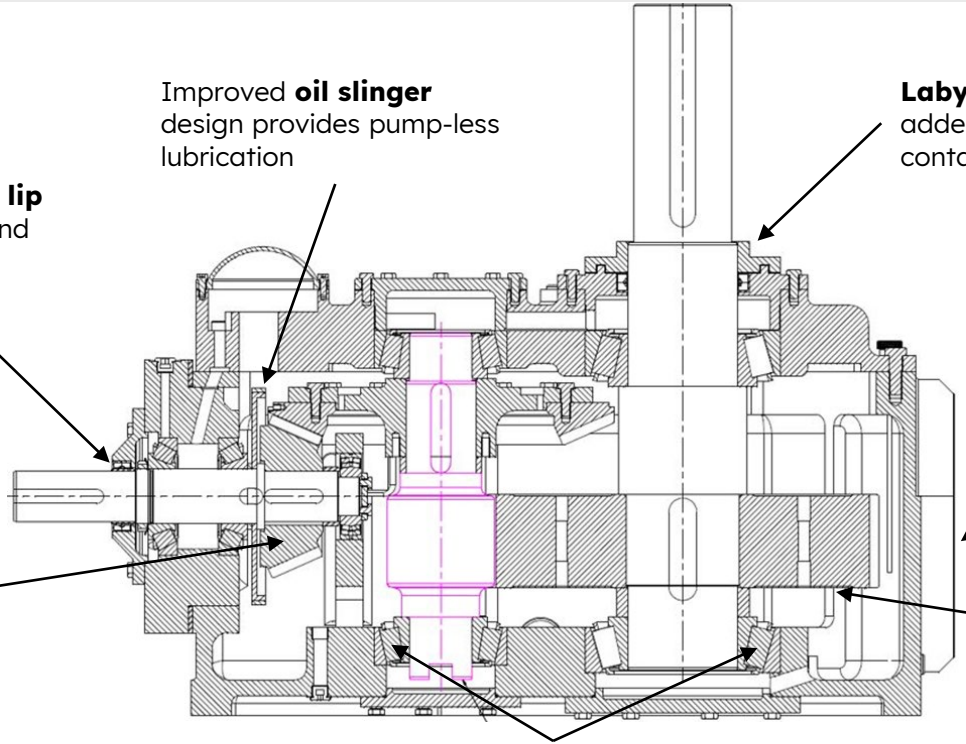


Amarillo 1712



Amarillo Model (FD)	Falk Interchange (CTA)
1110	2255
1311	2275
1712	2310
1713	2350

FALK CTA CROSS-SECTION VIEW



Improved **oil slinger** design provides pump-less lubrication

Labyrinth Ring provides added protection against contamination

Double radial lip seals on LSS and HSS

External housing fins maximize natural convection by increasing surface area

Spiral bevel gears are hard cut using state-of-the-art process

Low oil level to reduce heat generation due to churning

All **bearings** rated for **100,000-hour L_{10A} service life**

SOLVING COMMON GEARBOX PROBLEMS





Issue	CTA Solution
Oil leaking, particularly at the input shaft	CTA operates efficiently at low oil level which sits below input shaft seals, eliminating design weakness of other manufacturers.
High cost of replacement / interchange	With critical mounting dimensions that match Amarillo, troublesome gearboxes can be easily replaced without need to replace driveshafts or fan hubs.
High operating temperatures contribute to premature failure and excessive downtime	Addition of integrated cooling fins greatly increases housing surface area which improves heat dissipation, and ultimately reduces operating temperatures.
Excessive sound and vibrations levels cause noise violations and contribute to mechanical fatigue	Thicker housing castings minimize case deflections and dampen noise and vibrations. Use of premium steel shims maintain proper gear settings in harsh operating environment typical of wet cooling towers.
Costly add-on options required for cooling tower operation	Inclusion of value-added features as standard – high durability ISO 12944-5 C5 paint system, vibration monitoring ports, ball valve. Optimized oil slinger provides proper lubrication without need for pump.

CTA design addresses common gearbox issues – reducing operating costs and increasing uptime

FALK CT-SERIES COOLING TOWER GEAR DRIVE EXCEEDS EXPECTATIONS

Challenge

Old gearboxes at a chemical processing plant in Louisiana, USA were underperforming and displaying vibrational issues even with repairs and upgrades. Leaking seals resulted in frequent downtime and failure every 6-8 months. Unplanned downtime, repair, and replacements were costing the company $90,000 every time.

Solution

New Falk CTA Gear Drives saved the company over 60% per drive replacement. Thanks to improved performance and advances in engineering technology, the Falk CTA Gear Drives were also more reliable, longer lasting, and performed with lower vibration levels.

> **We installed the new Falk CT-Series Cooling Tower Gearbox, and it's exceeding our expectations in the application. We've now proceeded with standardizing to the Falk CT-Series in the plant.**

Read the full story online.

SITE SAW A CONTINUOUS UPTIME IMPROVEMENT OF 36%

Design subjected to full suite of Falk validation tests:

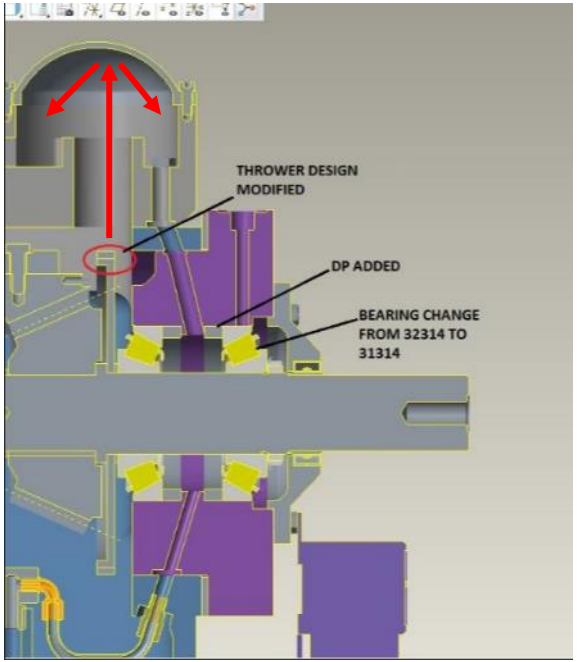
1. Mechanical endurance
   - Tested at 1.0 S.F. for 132 hours – equivalent to 15 years of continuous service at 1.25 S.F. according to AGMA calculations
   - Mechanical ratings based on 90% reliability at 100,000-hour life per AGMA 6013-A06 and CTI
2. Thermal rating validation
   - Tested at 2.0 S.F. until thermal stabilization
   - Observed maximum oil sump temperature less than CTI requirement of 200°F
3. Sound
   - Measured at distance of 1 m from each corner at mid-height and performed at 0-25-50-80-100% load
   - In accordance with Falk Technology Standard Sec. 8.0060
4. Vibration
   - Measured at high speed / intermediate / low speed shafts
   - Fully-compliant to Falk Technology Standard Sec. 8.0070

Pictured:
Falk 2310CTA under test
Rexnord Gear Product Manager
Rexnord Manager of Test Services

Validated by 3rd party – TÜV Rheinland

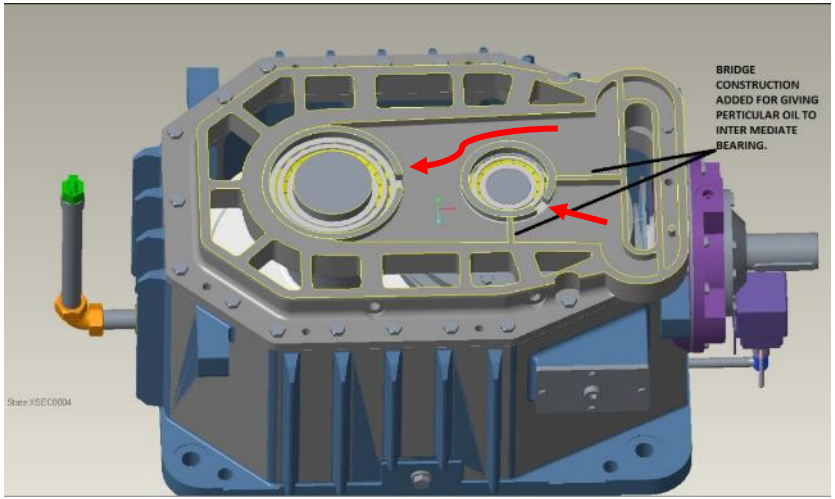
FALK CTA LUBRICATION SYSTEM

1. Oil slinger distributes oil to input bearings and trough system



Actual oil slinger/thrower

2. Oil flows through trough system to lubricate intermediate and output bearings



THERMAL COMPARISON – TEST UNITS

Amarillo Gear Drive

Model: FD1712
Nominal Ratio: 9:1
Serial Number: 335386
Service rating (@1750 RPM): 312 HP

Falk CTA Gear Drive

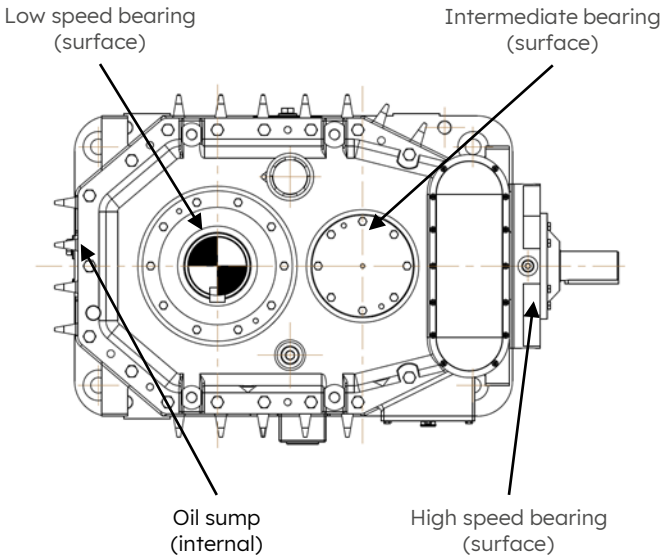
Model: 2310CTA
Nominal Ratio: 15:1
Serial Number: XCF45J2UG
Service rating (@1750 RPM): 214 HP

THERMAL COMPARISON – RESULTS

CTA Drive						
		Temperature Level-off (°F)				Ambient
Load %	Power (HP)	Oil Sump	HS Bearing	Int Bearing	LS Bearing	Temp
0%	---	149.0	146.8	138.5	135.6	73.8
65%	140.5	178.7	170.0	158.7	153.8	69.1
100%	213.3	194.2	182.0	168.1	163.9	66.6

Amarillo Drive						
		Temperature Level-off (°F)				Ambient
Load %	Power (HP)	Oil Sump	HS Bearing	Int Bearing	LS Bearing	Temp
0%	---	189.5	177.2	179.2	176.3	66.5
10%	31.2	201.5	185.2	189.0	185.5	68.2
45%	140.4	Tripped at 210.0*	194.0	199.3	196.2	70.0

Temperature Probe Locations



*Protection circuit initiated before temperature stabilization achieved

- All units spun in clockwise rotation
- Air speed up to 1.2 m/s as allowed by CTI 111
- Level-off point determined when temperature fluctuates less than 2°F per hour

Competitor unit did not achieve thermal stabilization

INSTALL BASE

APPLICATION	GEAR MODEL	NOMINAL RATIO	INSTALL YEAR	END USER	COUNTRY
WET COOLING TOWER	2310CTA	15:1	2019	BASF Corporation	USA
WET COOLING TOWER	2310CTA	13:1	2019	Westlake Chemical	USA
WET COOLING TOWER	2310CTA	15:1	2019	Koch Industries	USA
WET COOLING TOWER	2310CTA	15:1	2019	U.S. Steel	USA
WET COOLING TOWER	2310CTA	10:1	2020*	Caltex	Australia
WET COOLING TOWER	2310CTA	15.5:1	2020*	Bayport Polymers	USA
WET COOLING TOWER	2310CTA	15.5:1	2021*	Seminole Electric	USA
WET COOLING TOWER	2310CTA	14:1	2021	Dakota Gasification	USA
WET COOLING TOWER	2310CTA 2255CTA	12.5:1 9:1	2021*	Nucor Steel	USA
WET COOLING TOWER	2310CTA	15:1	2021*	NOVA Chemicals	Canada

*CTA units not yet installed. Project is scheduled for future delivery.

EPCs

- Black and Veatch
- Kiewit
- AMEC Foster Wheeler

2021 LEAD TIMES FOR NORTH AMERICAN CUSTOMERS

CTA Size	Ratios	Qty <= 4 units	Qty > 4 units
2310	All standard ratios except 15.5:1	4-6 weeks	18-20 weeks
	15.5:1	10-12 weeks	18-20 weeks
2255	All standard ratios	18-20 weeks	18-20 weeks
2275	All standard ratios	18-20 weeks	18-20 weeks
2350	All standard ratios	18-20 weeks	18-20 weeks

New capability for October 2021:
Stock + assembly at Lincoln plant

Rexnord Addax, Lincoln, Nebraska
35,000 Square Feet

Standard Accessories
Sight glass / Oil level gauge
Airmax breather

Optional Accessories	Available w/ Reduced Lead Time Program?
Low oil level switch	Yes
Accelerometer	Yes
RTD package	Yes
Immersion oil heater	Yes
External Backstop	Yes*

*Supplied separately from gear drive

LOW OIL LEVEL SWITCH

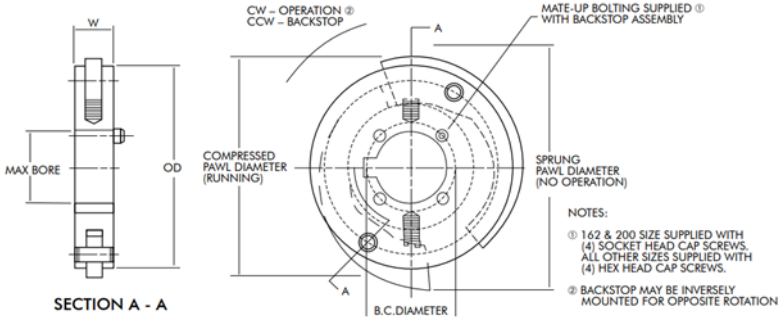
- CSA Listed for Hazardous Locations Class I, Division 1, Groups C & D
- SPDT rated 10 A @ 125 VAC, 0.5 A @ 125 VDC

Factory-mounted oil level switch

External backstop (pawl style) available as optional accessory

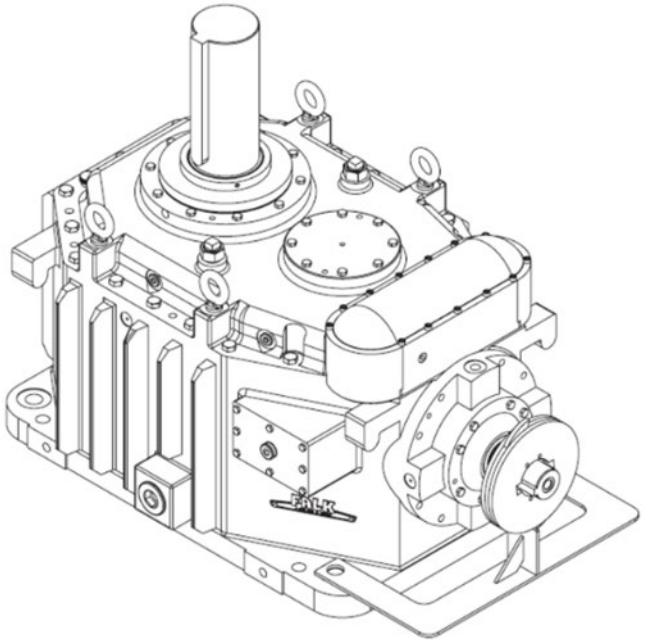
Mounts at motor or gearbox end

Rexnord Cooling Tower Backstop



Bolt-On Backstop Tabulation

Model	Mating Hub Backstop Bolting Information			OD (in / mm)	W (Ref) (in / mm)	Pawl Diameter (Ref)		Compressed Speed (RPM Ref)
	B.C. Diameter (in / mm)	Hole Diameter (in / mm)	Tightening Torque (lb-in / Nm)			Compressed (in / mm)	Sprung (in / mm)	
350/375/450	3.500 / 88.9	0.3125 / 7.938	40 / 4.5	9-1/16 / 230.2	1-1/8 / 28.6	9-3/16 / 233.4	10-9/16 / 268.3	400 RPM Ref
485	4.063 / 103.2	0.3125 / 7.938	142 / 16.0					
650	4.625 / 117.5	0.3750 / 9.525	225 / 25.4					
850	4.875 / 123.8	0.5000 / 12.700	350 / 39.5					



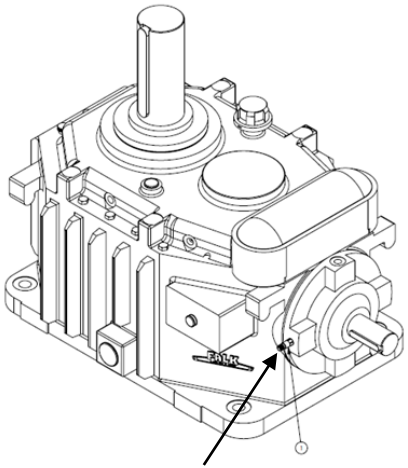
Backstop mounted at drive with bracket

Accelerometer available as optional accessory

Mounting taps included as standard:

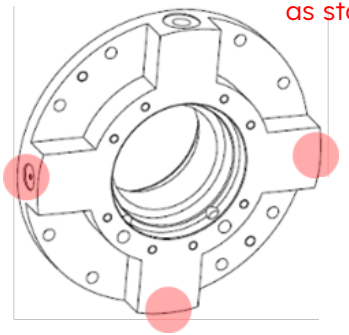
(3) At HSS, and

(1) Near LS bearing

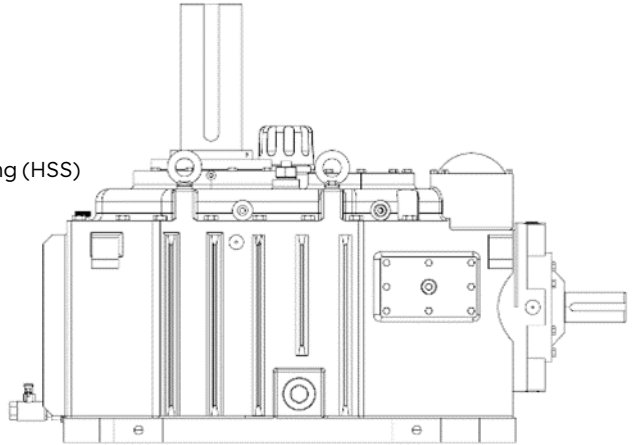


Mounted Accelerometer (HSS Position 1 of 3)

All Taps are M6.0 x 1.0 as standard



Tap Locations on Input Bearing Housing (HSS)



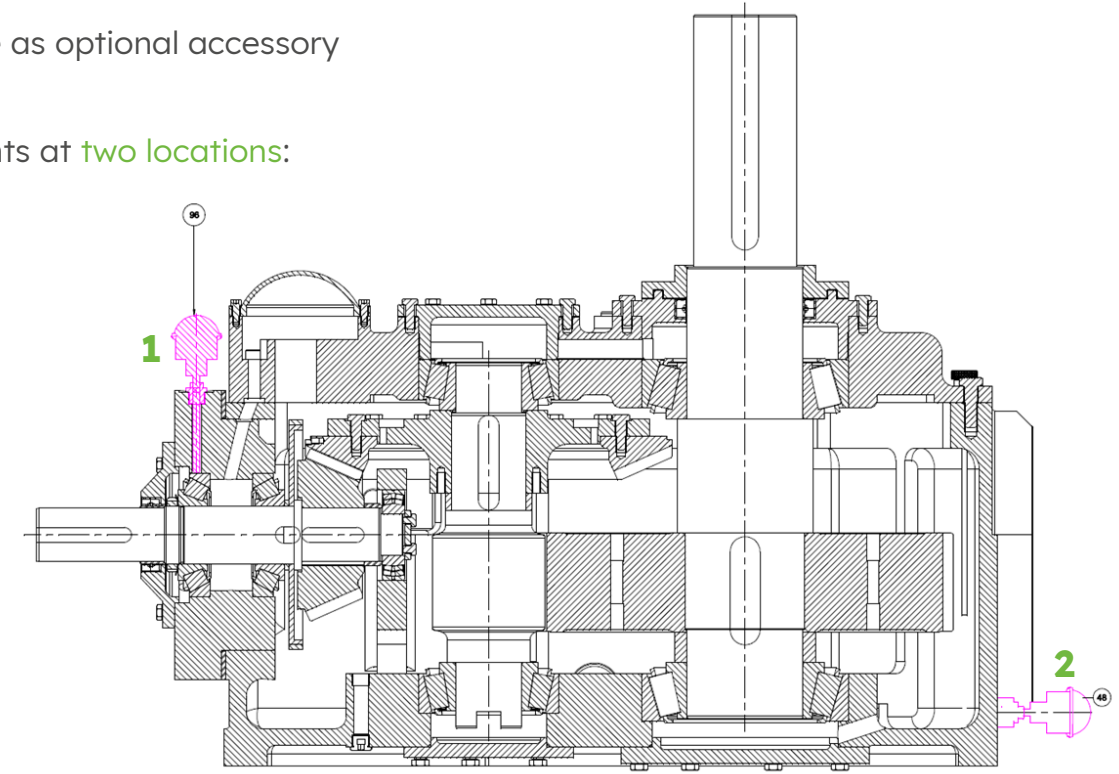
Tap Locations on Housing Near LS Bearing

TEMPERATURE MEASUREMENT

RTD temperature probes available as optional accessory

Standard ports allow measurements at two locations:

1. Input bearing
2. Oil sump (includes thermowell)



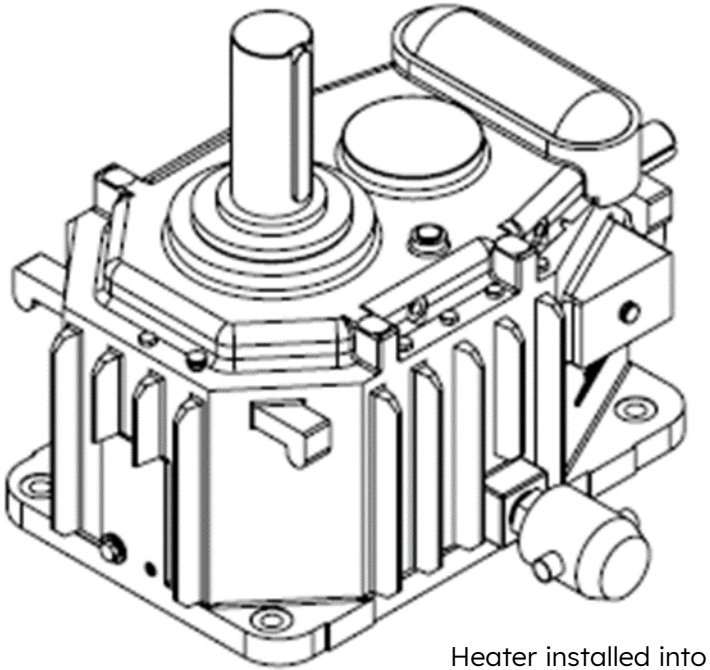
OIL HEATER + THERMOSTAT

Screw plug immersion heater with DPST thermostat

Electrical: 120V / 1PH

Required for startup in cold climates

- Mineral oil – Below 50°F
- Synthetic oil – Below 10°F



Heater installed into side port