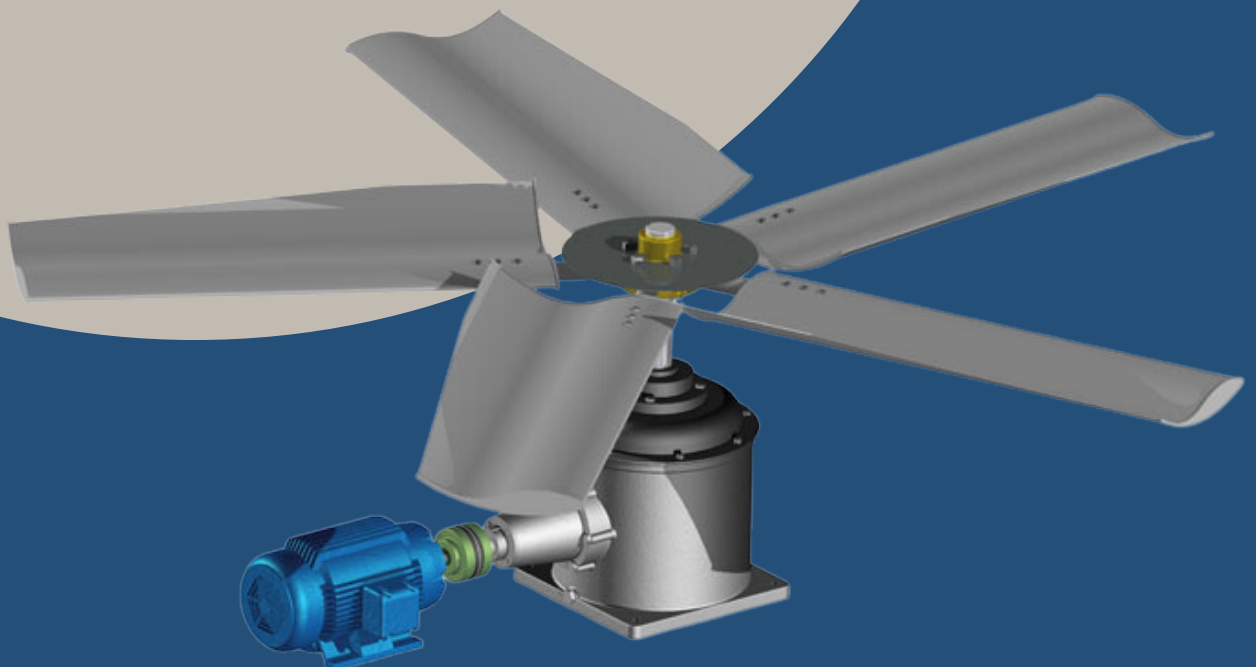




GEARGUARD

GEAR DRIVE MONITORING IN
MECHANICAL
COOLING TOWERS





THE IMPORTANCE OF GEAR DRIVE MONITORING IN COOLING TOWERS



Monitoring the gear drive in a cooling tower is paramount due to its critical role in the efficient operation and longevity of the entire cooling system. The gear drive, connected to the fan assembly, serves as the mechanical heart of the cooling tower and is responsible for driving the fans that facilitate heat exchange and the cooling process. Here's why gear drive monitoring is crucial:

Reliability and Performance

The gear drive's primary function is to ensure the fans operate at the correct speed and maintain the desired airflow through the cooling tower. Any malfunction or failure in the gear drive can disrupt this critical function, leading to reduced cooling efficiency, inadequate heat dissipation, and potentially overheating of the equipment the cooling tower serves.

Energy Efficiency

A well-maintained gear drive ensures the fans operate optimally, consuming the minimum amount of energy required to achieve the necessary cooling. Monitoring allows for early detection of issues such as

misalignment or wear in gears, which, if left unchecked, can result in energy wastage and increased operational costs.

Preventive Maintenance

Regular gear drive monitoring forms an essential part of preventive maintenance. It enables maintenance teams to identify and rectify problems before they escalate, reducing downtime, costly repairs, and the risk of catastrophic gear failures that can cause extensive system outages.

Equipment Longevity

Cooling towers are significant investments, and their reliability is essential for the longevity of the entire cooling system. By monitoring the gear drive, you can extend the life of the cooling tower and associated equipment, protecting your capital investment.



Safety

Malfunctions or failures in the gear drive can pose safety risks to personnel working in or around the cooling tower. Proper monitoring helps identify potential safety hazards and allows for timely maintenance to address them.

Environmental Impact

Cooling towers play a crucial role in heat dissipation and environmental responsibility. Inefficient cooling towers due to gear drive issues can lead to excessive water consumption and energy usage, impacting both resource conservation and greenhouse gas emissions.

In conclusion, monitoring the gear drive in a cooling tower is essential for maintaining cooling system reliability, energy efficiency, and safety. It ensures that the entire system operates at peak performance, extending equipment life, reducing operational costs, and minimizing environmental impact. Regular inspections and proactive maintenance based on monitoring data are key to reaping these benefits and ensuring the cooling tower's continuous, efficient operation.

System Description

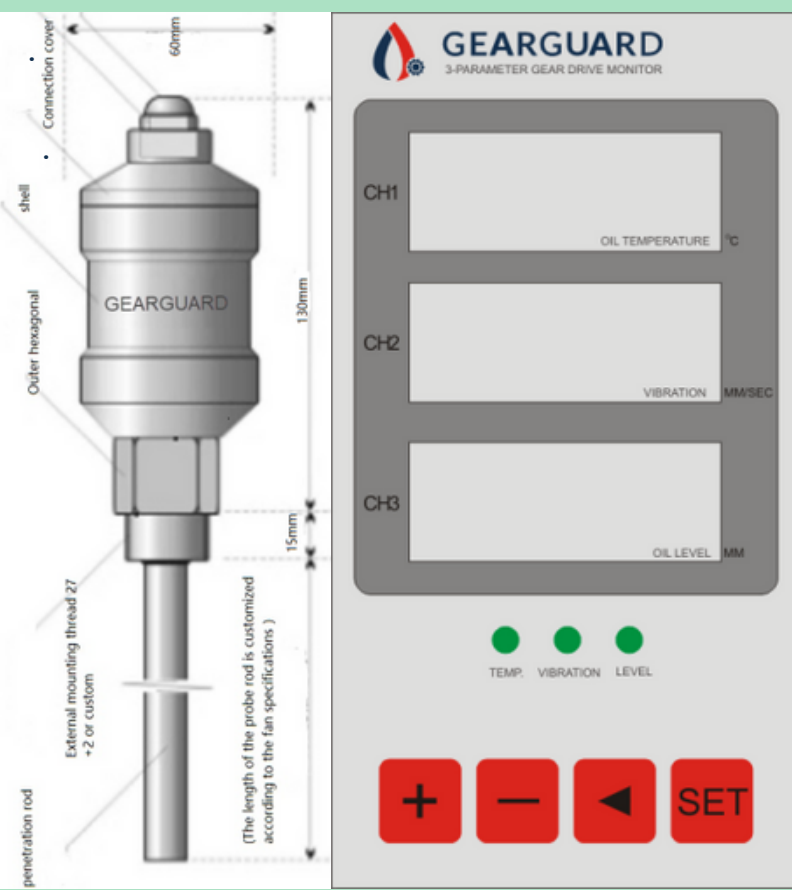
GEARGUARD is a three-parameter safety monitoring system for gear drives in cooling towers and general industrial applications. It monitors online 3 parameters:

1. Oil temperature ($^{\circ}\text{C}$)
2. vibration (mm/s)
3. oil level (% , mm)

The GEARGUARD-monitor is a set of two components:

SENSOR PROBE

CONTROL UNIT



According to the installation instructions, the sensor probe is mounted on the gear drive.

The controller is mounted in a control panel or operations control board on a visible and accessible point.

GEARGUARD directly monitors the lubricating oil temperature, lubricating oil level and fan vibration transmission to the gear drive and analyzes and displays the working condition of the gear drive. Equipped with current output, it can connect to an external process monitoring system. The device is fully digital, stable, accurate, simple in set-up and maintenance-free operation.

The monitor's controller offers versatile connectivity options. It can be linked to Building Management Systems (BMS) or Manufacturing Execution Systems (MES) for centralized monitoring and control. Alternatively, it can be directly connected to the cooling tower fan motor, allowing it to interrupt power in case of alarm threshold breaches instantly.



System Specifications

MAIN FUNCTIONS:

- Long-term online gear drive monitoring.
- Three 4-digit LED digital display:
- Each channel has an ON/OFF and 4 ~ 20mA current analogue output.

Three independent programmable alarm values, alarm mode and alarm delay.



DETAILS:

- Measurement accuracy: $\pm 0.3\%$ FS+1
- Response speed: <0.01 seconds
 - Alarm function:
- Settable Max/Min limits + Reset
- Input signal: 4-20mA (from the probe).
- Relay contact capacity: 220V 5A
 - Environment temperature: 0-50°C, RH < 85%
 - Housing enclosure IP54
- Box size: 160x80x125mm, panel opening 150x74mm
- Power supply: AC220V $\pm 10\%$ <6W

COMMUNICATION:

Communication is possible with CPU, I/O interface, EPROM, ModBus etc.

POWER		SENSOR PROBE				OUTPUT					
1	2	3	4	5	6	7	8	9	10	11	12
24V+	24V-	Temperature	Vibration	Level	24V-	+	-	+	-	+	-
						Temp. 4-20mA output		Vibration 4-20mA output		Level 4-20mA output	
			Temperature		Vibration		Level		POWER - IN		
									GND	220V -	220V +
13	14	15	16	17	18	19	20	21	22	23	24

SENSOR DETAILS:

Oil Temperature

Characteristics:

PT100 resistance sensor.
Lubricating Oil Temperature
Measurement Range: 0~100 °C.
Measurement accuracy: $\pm 3^{\circ}\text{C}$

Oil Level Measurement

Characteristics:

Capacitive Sensor.
Measurement range of lubricating
oil level: -10~40 mm,
Maximum Error of Oil Level
Measurement accuracy: $\pm 1\text{mm}$

Vibration measurement characteristics:

Piezo-electric sensor.
Vibration measurement range: 0~
20 mm/s
Effective Value of Measuring Output
and Vibration



GEARGUARD

POWERED BY WACON

Parameter Setting and Operation

PORT NR	Parameter name	Parameter description
P-00	1AL	Alarm value setting for oil temperature
P-01	1HAL	Oil temperature Alarm return value setting
P-02	1FAL	Oil temperature Alarm setting 0: No alarm 1: Upper limit alarm 2: Lower limit alarm
P-03	1dLy	Oil temperature alarm delay time, unit: sec.
P-04	2AL	Vibration alarm value setting
P-05	2HAL	Vibration alarm return value setting
P-06	2FAL	Vibration Alarm Setting 0: No alarm 1: MAX limit alarm 2: MIN limit alarm
P-07	2dLy	Vibration Alarm Delay Time in Seconds
P-08	3AL	Oil level Alarm value setting
P-09	3HAL	Oil level Alarm return value setting
P-10	3FAL	Oil level alarm mode setting 0: no alarm 1: upper limit alarm 2: lower limit alarm
P-11	3dLy	Oil level alarm delay time, unit: sec.
P-12	1n-L	Oil temperature MIN limit setting
P-13	1n-H	Oil temperature MAX limit setting
P-14	1dot	Oil temperature respond setting 0: No alarm 1: MAX alarm 2: MIN alarm
P-15	1oFF	Oil temperature measured value display offset setting
P-16	2n-L	Vibration input MIN limit setting
P-17	2n-H	Vibration input MAX limit setting
P-18	2dot	Vibration decimal point setting
P-19	2oFF	Vibration measured display value offset setting
P-20	3n-L	Oil level input range MIN setting
P-21	3n-H	Oil level input range MAX setting
P-22	3dot	Oil level decimal point setting
P-23	3oFF	Oil level measured display value off setting
P-24	1oUL	Oil temperature MIN output setting
P-25	1oUH	Oil temperature MAX output setting
P-26	2oUL	Vibration output MIN setting
P-27	2oUH	Vibration output MAX setting
P-28	3oUL	Oil level MIN output setting
P-29	3oUH	Oil level MAX output setting

INSTALLATION RECOMMENDATIONS:

The products are thoroughly tested before leaving the factory.

Before installation, the user can check the settings by simulating a level in a glass of water, the temperature in the glass of water and the vibration by holding the probe to a vibrating element, e.g., an electric drill.

Controller placement:

The controller can be placed in an indoor existing control panel or in an external cabinet, IP56, with a transparent door.

Prevent this cabinet from direct sunlight.

The cable length between the probe and controller should not exceed 100m.



Performance Monitoring for Predictive Maintenance



WARRANTY CONDITIONS

GEARGUARD Cooling Tower Gear Drive monitors are carefully engineered to your requirements and manufactured only from the best materials. Provided that the service and maintenance instructions and procedures, as laid down in the operational manuals, are followed strictly, your system can have an extended operational lifetime during which the accumulated savings will multiply the investment made.

We adhere to ORGALIME S-2022 with the following warranty conditions:

- 12 months on all components. The warranty period is counted from date of start-up or the reported Factory Acceptance Test completion date (+ 6 months); whichever comes first.
- The warranty protects against material defects or deficiencies in performance.
- Watco shall not be held responsible for any incidental damages that may arise due to the incorrect installation or malfunction of the GEARGUARD monitor unit.



WATCO CREDENTIALS

We have been active in the engineering and installation of Cooling Towers and Automatic Tube Brushing Systems since 1982.

Netherlands-owned WATCO is a Singapore-registered company with an engineering, procurement and sales basis in Guangzhou (China).

- SGBC-leader
- Member of Guangzhou Energy Saving Association
- Recognized energy saving product of Guangdong province (China)
- ISO 9001, 14001 certified
- Patented designs (Swingbox flow reversal valve)



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The consequences of sudden gear drive failure in the cooling tower of a water-cooled chiller can be severe. Firstly, it can dramatically reduce the chiller's cooling capacity, causing an immediate rise in operating temperatures. This, in turn, can result in the overheating of critical equipment components, such as compressors and condensers, potentially leading to costly damage and downtime. Moreover, increased operating temperatures can reduce the chiller's energy efficiency, raising operational costs. Additionally, if not promptly addressed, gear drive failure can disrupt the entire cooling process, impacting comfort in climate-controlled spaces and potentially causing discomfort or inconvenience to occupants. Timely maintenance and monitoring are vital to prevent such failures.

Gear drives typically demand minimal maintenance; however, neglecting essential tasks like oil checks, refills, and performance monitoring can result in sudden and expensive failures. These gear drives are located on the inaccessible upper part of cooling towers, which may lead to the omission of regular inspections for the sake of convenience. Investing in a gear drive monitor is a wise decision that can prevent costly breakdowns and ensure the continued reliability of your system.

