

Ludo-Sensor

(Sequencer Monitor System)

# Instruction Manual

- To ensure operating safety, read this manual carefully before starting work, and understand the contents thoroughly.
- Keep this manual in a designated location so that anyone can read it whenever necessary.



**Lube Corporation**

# Introduction

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## ■ Primary use of this product

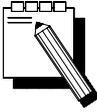
The operating conditions of a lubrication system are normally verified by detecting the overall system pressure. As the speeds and performance of equipment and machinery are continually improved, a lubrication system must meet more demanding reliability- and safety-related requirements. Using sensors and monitors, this lubrication monitor system keeps watch on individual points of lubrication to verify whether they are properly lubricated (to verify the presence or absence of oil flow).

## ■ Symbols used in this manual

In this manual, symbols are shown to draw attention to important safety-related instructions regarding the prevention of the types of accidents that may result in personal injury. Before starting work, these instructions must be read carefully and understood thoroughly.

 <b>Warning</b>	If unsafe practices are conducted in negligence of this warning, death or serious injury may result.
 <b>Caution</b>	If unsafe practices are conducted in negligence of this caution, minor or moderate injury may result.

In this manual, the following symbols are also shown to draw attention to the instructions regarding proper use of this product. These instructions must be read carefully.

	This symbol concerns an important instruction to be followed during work. If work is done in negligence of this instruction, there is the risk that this product or a piece of equipment with this product integrated may be damaged.
	This symbol concerns the information that will be useful when doing a specific type of work.
	This symbol indicates an item to be referenced.

## ■ Points of contact

If you have questions or enquiries, contact the company shown below.

### ■ Japan

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169-0051  
TEL: 03-3204-8431 FAX: 03-3204-8520  
URL: <http://www.lube.co.jp>

### ■ China

魯布潤滑機械（上海）有限公司  
上海市外高橋保稅區泰谷路 88 號 3F-C  
TEL: 021-5868-3818 FAX: 021-5868-3880

### ■ U.S.A.

LUBE USA, Inc.  
781 Congaree Road, Greenville, S.C. 29607  
TEL: 800-326-3765 FAX: 864-242-1652

## ■ Specification changes

As continual improvements are made to this product, there will be a little difference between the actual product and the descriptions or drawings given in this manual.

## ■ Reselling or lending of this product

If the user resells or lends this product, this manual and the set of documents that came with this product at delivery to the user must be handed over to the new user.

## ■ Disposal of this product

When disposing of this product, the laws and regulations provided by the national government and the municipality must be observed.

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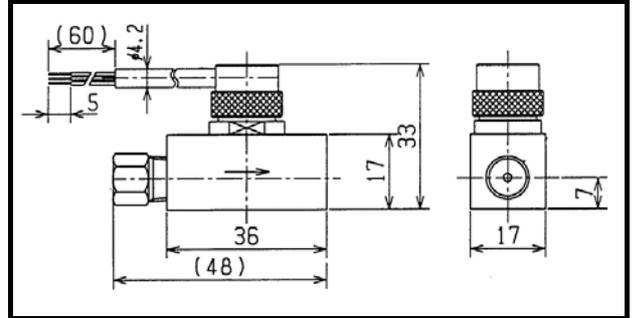
# 1. Product Specifications and Overview

## 1-1 Specifications

### 1-1-1 Ludo-sensor

#### Overview

The ludo-sensor is set on an oil feed pipe. It detects the flow of oil and outputs an oil flow detection signal via a sensor cable.



Outline drawing 1

#### Product specifications

Detection capacity	1 ml/min (working viscosity: 65 mm <sup>2</sup> /s)
Working viscosity range	65 to 1,300 (mm <sup>2</sup> /s)
Sensor cable	Red: +12 V, white: -OUT, black: -GND
Operating temperature	0 to 40°C
Source voltage	3.8 V to 24 V
Consumption current	10 mA (max.)
Output	NPN open collector (current sync)
Residual voltage	0.4 V
Switching current	20 mA
Leakage current	10 μA (max.)

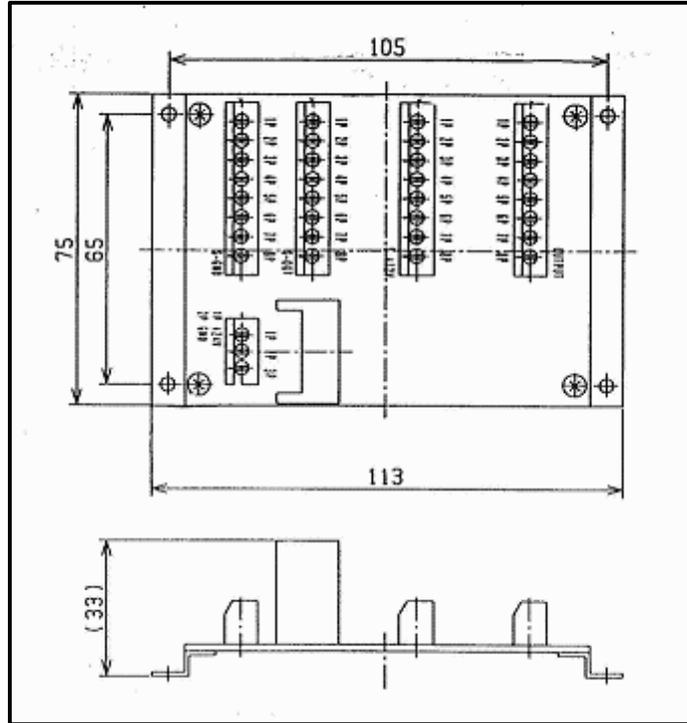


- (1) This product is for detecting the flow of oil discharged from a metering valve.
- (2) This product is for detecting the presence or absence of oil flow, not for detecting a change in the oil volume (increase or decrease in the oil volume).
- (3) After the flow of oil is detected, the time that it takes for the tripped sensor to return to the normal position and get ready for detecting the flow of oil will vary depending on the system conditions.
- (4) This product must be used in combination with either a lubrication monitor or an interface (if lubrication conditions are monitored using a sequencer without using a monitor).

## 1-1-2 Interface

### Product overview

The interface is established between the ludo-sensor and the sequencer. It sends the oil flow detection signal generated by the ludo-sensor to a piece of equipment or machinery for which the sequencer monitor system works.



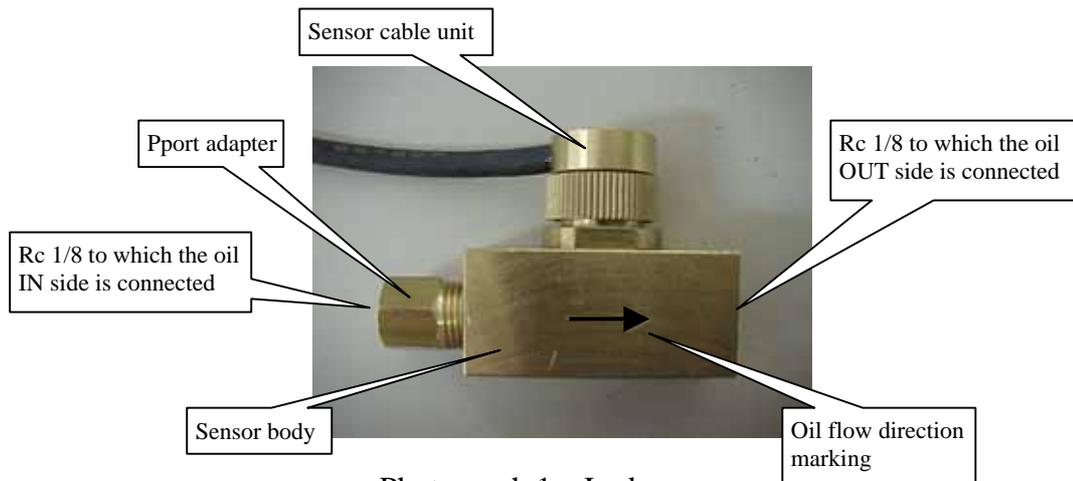
Outline drawing 2

### Product specifications

Cable connection method	Screw fastening method
Number of monitor channels	8 ch
Terminal block to which sensor cables are connected	S+12V: The red sensor cable is connected. S-OUT: The white sensor cable is connected. S-GND: The black sensor cable is connected.
Input terminal block	1P: Power (+24V) 2P: Power ground 3P: Frame ground Note: When the sensor is activated, the output transistor is turned on.
Output terminal block	Open collector Maximum voltage: 50 V Output current: 200 mA (25 mA per channel)

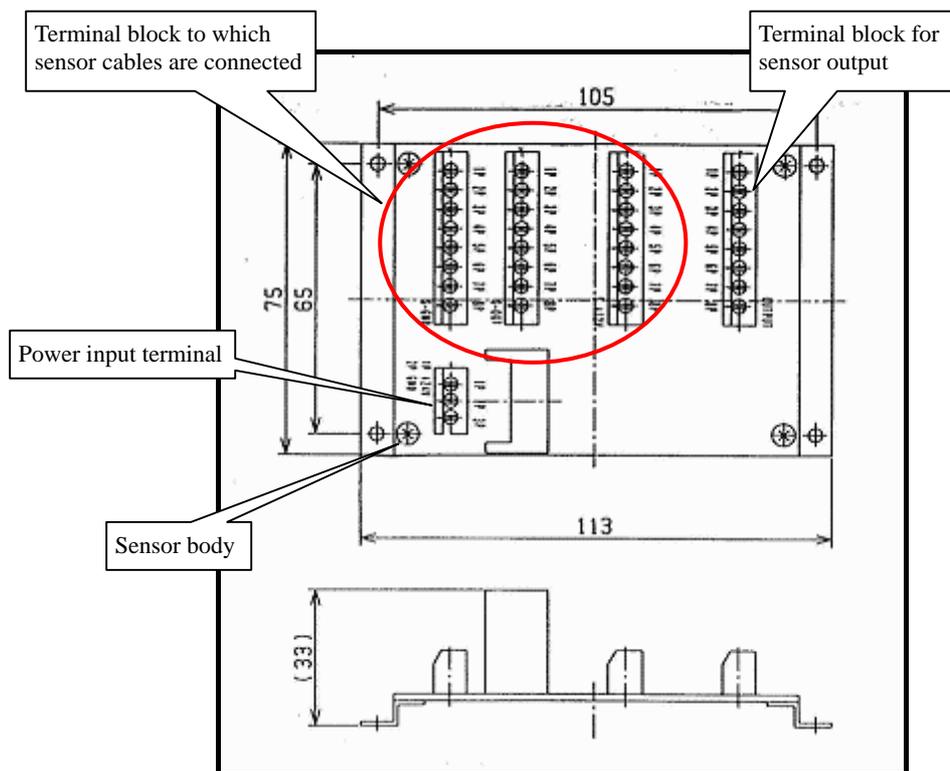
## 1-2 Description of each part

### 1-2-1 Ludo-sensor



Photograph 1 Ludo-sensor

### 1-2-2 Interface



Photograph 2 Interface

## 2. Installation

### 2-1 How to install each part

#### 2-1-1 Ludo-sensor

The ludo-sensor must be set on a pipe (outside diameter 4 mm, and inside diameter 2.5 mm to 3.0 mm) at a point less than 5 meters from the port of a metering valve. Couple steel pipes to the IN and OUT sides of this sensor, and secure them.

#### 2-1-2 Interface

The interface must be mounted using four M3 bolts on the surface of a vertical wall that is rigid enough to hold its weight.



- (1) If it is expected that vibrations may occur in a location where the interface is installed, it must be mounted by insulating it using a piece of vibration proof rubber. Otherwise, avoid installing it in a location where there are vibrations.
- (2) The interface must be mounted securely. If it is not mounted securely, it may fall and be damaged or personal injury may result.
- (3) This product is not of a waterproof construction. It must not be installed in a location where water may enter the inside.

## 3. Maintenance

### 3-1 Maintenance

A filter is built into the ludo-sensor to prevent foreign substances from causing the sensor to malfunction. Tubing parts may come off in chips in the initial period of lubrication pipe operation or foreign substances may enter oil over a long period of use. If the sensor malfunctions, the filter must be cleaned or replaced by performing the steps described below:

#### Step 1

Remove the port adapter from the sensor by turning it counterclockwise.

#### Step 2

You will find a filter that is screwed into the port adapter. Detach the filter by turning it counterclockwise. Clean it by blowing air or replace it with a new one.

#### Step 3

Screw the filter into the port adapter by manually turning it clockwise.

#### Step 4

Apply a sealing tape or sealant to the threads on the port adapter, and screw the adapter into the sensor body securely.



- (1) Take care that the sealant does not enter the inside of the sensor.
- (2) When positioning the ludo-sensor and fastening each part, note the direction of oil flow indicated by the “oil flow direction marking” on the side face of the ludo-sensor.
- (3) Use about 7 N·m of tightening torque.

### 3-2 Troubleshooting

If trouble occurs, take appropriate remedial action as instructed below.

The troubleshooting information described below assumes that the lubrication pump is functioning normally.

Phenomenon	Possible cause	Remedy
<p>The sensor lamp on the lubrication monitor is illuminated and red in color (the oil flow signal is not input from the ludo-sensor to the lubrication monitor).</p>	<p>Oil is not discharged from a metering valve or the flow rate of oil is below a detectable level (if oil flow was detected normally in the initial period of operation).</p>	<p>Replace the metering valve.</p>
	<p>Oil is leaking due to a damaged oil feed pipe and/or loosening of a point of fastening or coming off of parts from a point of fastening in a section of piping from a metering valve to the ludo-sensor.</p>	<p>Identify and solve the problems that caused the leak of the oil feed pipe.</p>
	<p>The viscosity of oil passing through the ludo-sensor is less than 65 mm<sup>2</sup>/s.</p>	<p>The viscosity of oil must be adjusted such that it is in the range of viscosity detectable by the ludo-sensor.</p>
	<p>The filter in the ludo-sensor is clogged.</p>	<p> Clean or replace the filter by referring to 3-1 Maintenance.</p>
	<p>Oil is leaking due to a damaged oil feed pipe and/or loosening of a point of fastening or coming off of parts from a point of fastening in a section of piping from a metering valve to the ludo-sensor.</p>	<p>Identify and solve the problems that caused the leak of the oil feed pipe.</p>
	<p>The sensor cable is damaged and the connector at the junction box comes off.</p>	<p>Replace the sensor cable and restore the state of connection to normal.</p>
	<p>Air is found mixed in oil in the ludo-sensor, metering valve and oil feed pipe.</p>	<p>Discharge oil from the OUT side of the ludo-sensor until no air is detected in oil.</p>
<p>The sensor lamp on the lubrication monitor is illuminated and both red and green in color. (The sensor lamp uses two color lamps: a red lamp and a green lamp. If two lamps are lit simultaneously, the color may look yellow.)</p>	<p>This happens in a situation where the presence or absence of the oil flow detection signal has been judged and the ludo-sensor has not returned to the normal position yet (not ready to perform the next detection task). (It may take a longer time than usual for the ludo-sensor to return to the normal position for reasons of its structure, although the time is also affected by operating conditions.) Possible causes are a short downtime, high viscosity of oil, etc.</p>	<p>The downtime must be established with enough margin so that the ludo-sensor can return completely to the normal position. There is a situation in which the lubrication pump is operated in a short cycle (by operating the manual buttons) to release air in the initial period of operation. If this phenomenon occurs in this situation, clear this type of trouble by pressing the reset button after air release is completed.</p>