

Date: 2017.1.16

Scanning Laser Range Finder UTM-30LX-FEW Specification

CE
RoHS

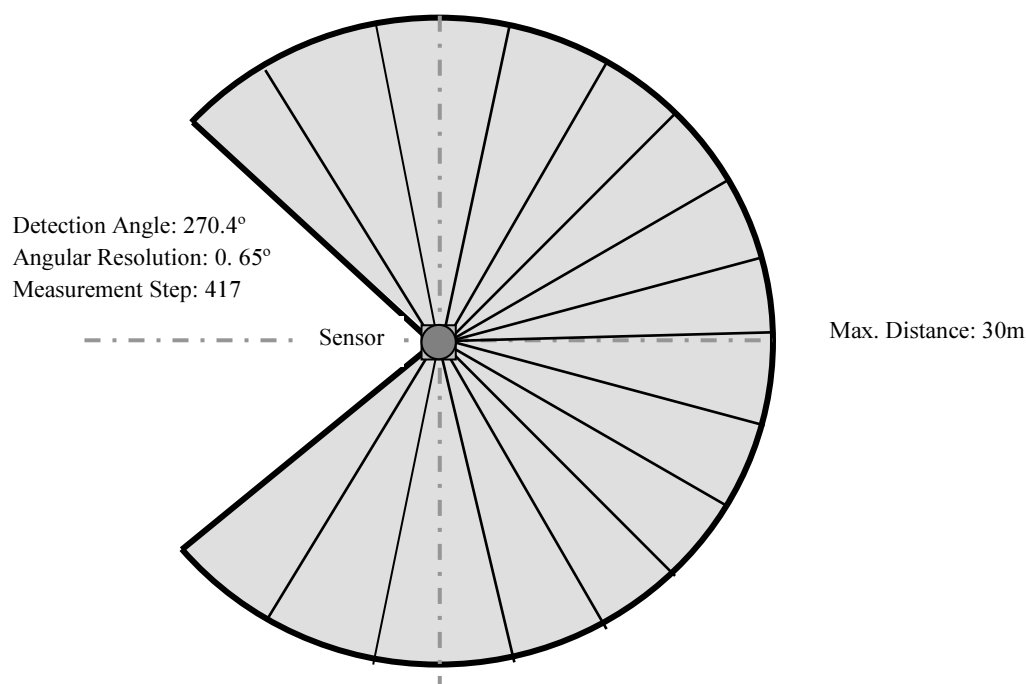
Symbol		Amendment Details		Amendment	Number
Approved by	Checked by	Drawn by	Designed by	<u>UTM-30LX-FEW</u> Specification	
		T.KAMON	T.KAMON		
				Drawing No.	1/6
				C-42-04155	

1. Introduction

Operation principles

The UTM-30LX-FEW uses a laser source ($\lambda=905\text{nm}$) to scan a 270° semicircular field. It measures the distance for each angular step to objects in its range. The measurement data along with its angular step are transmitted via a communication channel. The laser safety is class 1.

2. Structure (Scanning image of laser beam)



3. Important Notes

- This sensor is not certified for the functional safety.
- This sensor cannot be used for human body detection as per the machinery directives.
- Sensor emits laser for measurement. Sensor's operation may become unstable under the influence of strong interference light or when emitted lights are not reflected back from the object.
- Sensor's operation may become unstable due to rain, snow and fog or due to dust pollution on the optical window.
- Rules and regulations related to safety should be strictly followed when operating the sensor.
- When there is a risk that this sensor is used for mass-destruction weapons, weapons and equipment aimed at killing human beings, and relevant technologies, etc., or when its usage for those purposes has become clear, sales may be prohibited in accordance with the Foreign Exchange and Foreign Trade Act, and the Export Trade Control Order (Japanese law). Moreover, regarding export of products, the formalities according to laws/Export Trade Control Order are implemented in order to maintain international peace and safety.
- Before using the sensor, please read this specification thoroughly.

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4. Specifications

Product Name	Scanning Laser Range Finder
Model	UTM-30LX-FEW
Light Source	Laser Semiconductor $\lambda = 905\text{nm}$ Laser Class 1
Supply Voltage	DC 12V $\pm 10\%$
Supply Current	700mA or less (1.2A during start up)
Detection Range and Detection Object	Guaranteed Range : 0.1 to 30m (White Kent Sheet) * ² Maximum Range : 60m (Measurement limit) Minimum detectable width at 10m : 230mm (Vary with distance)
Accuracy	0.1 to 10m : $\pm 30\text{mm}$, 10 to 30m : $\pm 50\text{mm}$ (White Kent Sheet) * ² Under 3000lx : White Kent Sheet: $\pm 30\text{mm}^{*1}$ (0.1m to 10m) * ¹ Under 100000lx : White Kent Sheet: $\pm 50\text{mm}^{*1}$ (0.1m to 10m) * ¹
Measurement Resolution and Repeated Accuracy	1mm 0.1 to 10m : $\sigma < 10\text{mm}$, 10 to 30m : $\sigma < 30\text{mm}$ (White Kent Sheet) * ² Under 3000lx : $\sigma < 10\text{mm}^{*1}$ (White Kent Sheet up to 10m) Under 100000lx : $\sigma < 30\text{mm}^{*1}$ (White Kent Sheet up to 10m)
Scan Angle	270.4°
Angular Resolution	0.65° (270.4°/416)
Scan Speed	10ms
Interface	Ethernet 100BASE-TX(Auto-negotiation)
Output	Synchronous Output 1- Point (NPN open collector DC 30V, 30mA or less)
LED Display	Green: Power supply. Orange: Normal Operation (Continuous), Malfunction (Blink)
Ambient Condition (Temperature, Humidity)	-10°C to + 50°C Less than 85% RH (Without Dew, Frost)
Storage Temperature	-25 °C to 75°C
Environmental Effect	Measured distance will be shorter than the actual distance under the influence of rain, snow and direct sunlight* ³
Vibration Resistance	10 Hz to 55Hz Double amplitude 1.5mm in each X, Y, Z axis for 2hrs. 55 Hz to 200Hz 49m/s ² sweep of 2min in each X, Y, Z axis for 1hrs.
Impact Resistance	196m/s ² In each X, Y, Z axis 10 times.
Protective Structure	IP67 (IEC Standard) * ⁴
Insulation Resistance	10M Ω DC 500V Megger
EMC Standard	(EMI) EN61326-1:2013 EN55011:2009 + A1:2010 (EMS) EN61326-1:2013 EN61000-4-2:2009 EN61000-4-3:2006 + A1:2008 + A2:2010 EN61000-4-4:2012 EN61000-4-6:2009 EN61000-4-8:2010
Weight	300g (With cable)
Case	Polycarbonate
External Dimension (W×D×H)	62mm×62mm×87.5mm MC-40-3240

*¹ Under Standard Test Condition (Accuracy can not be guaranteed under direct sunlight.)

*² Indoor environment with less than 1000Lx.

*³ Please perform necessary tests with the actual device in the working environment.

Use data filtering techniques to reduce the effect of water droplets when detecting objects under the rain.

*⁴ The protective structure of Ethernet connector is not IP67.

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5. Quality Reference Value

Vibration resistance during operation	10 to 150Hz 19.6m/s ² Sweep of 2min in each X,Y, Z axis for 30min
Impact resistance during operation	49m/s ² X, Y, Z axis 10times
Angular Speed	2 π /s (1Hz)
Angular Acceleration	π /2rad/ s ²
Life-span	5 Years (Varies with operating conditions)
Noise Level	Less than 25dB at 300mm
Certified	FDA approved (21 CFR part 1040.10 and 1040.11)

6. Interface

6.1 Robot Cable 4 Pin (2000mm)

Color	Function
Brown	+12 V
Blue	0 V
Green	Synchronous Output

6.2 Ethernet Cable

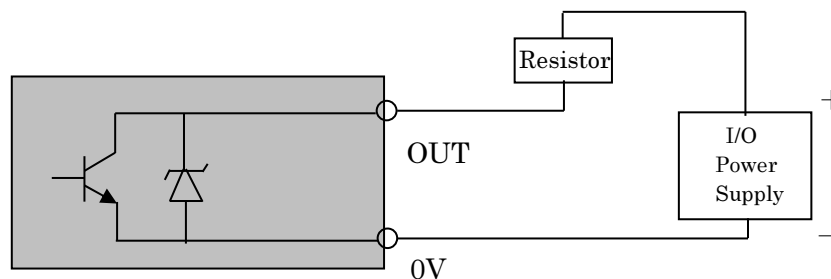
Cable length: 300mm

Supplied part RJ-45 convertible connector. (ELECOM Type: LD-RJ45JJ5Y2)

Wire color	Signal
White	TX+
Blue	TX-
Yellow	RX+
Orange	RX-

This sensor is compatible with SCIP communication protocol standard, however commands for multi-echo data are not supported by the device. Refer to Communication Protocol Specification (C-42-04230) for details.

6.3 Output Circuit



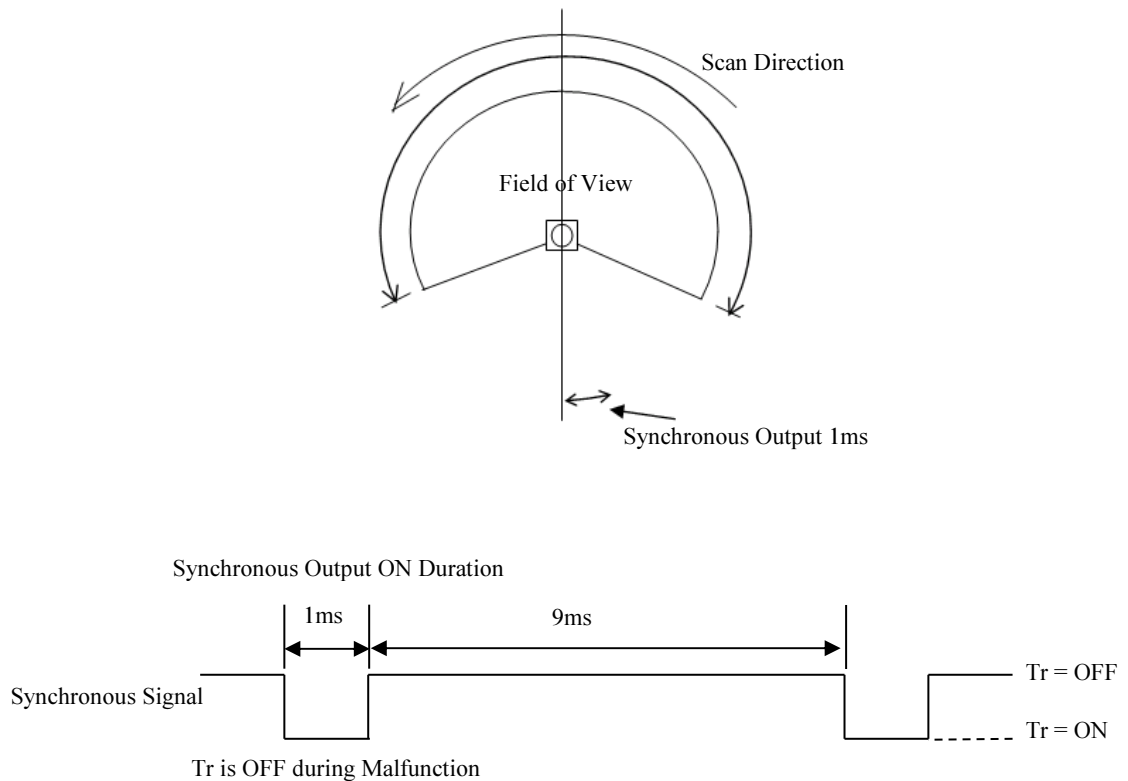
Output Rating: DC 30V, below 30mA

Note: Output connection requires limit resistor.

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7. Synchronous Output

Sensors outputs a pulsed signal with approximately 1ms width in every scan cycle. Output timing of this scan synchronized signal timing is shown below figure.



8. Malfunction Output:

1. Laser malfunction: When laser does not emit or exceeds safety class 1.
2. Motor malfunction: When motor fails to rotate at specified speed.

Sensor's outputs are switch to OFF state, laser is turned OFF and motor is stopped on malfunction detection. User sensor's communication channel for troubleshooting.

Error cause can be obtained from STAT line of the II command response of the SCIP communications protocol. Error details and troubleshooting measure and are shown in below table.

ID	Message	Details	Troubleshooting Measures
000	no error.	Normal	
050	internal chip access failed.	Processor unit fault	Sensor malfunction that needs repairing.
100	Internal chip access failed.	Processor unit fault	
150	internal chip access failed.	Processor unit fault	
151	internal chip initialize failed.	Processor unit initialization fault	
200	encoder error.	Encoder fault	
250	motor startup failed.	Motor fault	Avoid excessive vibration and/or other mechanical noise to sensor.
251	motor rotation error.	Motor rotation unstable	
300	laser too high.	Laser fault	Avoid strong interference light and /or other optical noise to sensor.
301	laser too low.	Laser fault	
302	laser no echo	Laser fault	

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Detail on measurement value

Below table shows the details of output value “x” for each measurement steps.

Range of output value	Details
$x < 23$	Measurement error. Distance could not be measured due to light interference and/or other optical/mechanical noise.
$23 \leq x < 60000$	Measured distance to object in that step.
$60000 \leq x$	Detected object has very low reflectance or object is not detected in that step.

9. Ethernet Settings

① Initial value

IP address: 192.168.0.10

Port number: 10940

② IP initialization

Remove the rubber cap located at the side of the bottom cover of the sensor. Press and hold the switch inside this hole for more than two seconds in order to start the IP initialization process. Release the switch after the LED flashes in orange color. This indicates the restart of the sensor. Finally, please insert the rubber cap to its original position.

10. Cautions

The heat is generated as the internal circuit of the sensor runs at a very high speed. The generated heat is concentrated at the bottom of the sensor. Please mount a heat sink or any appropriate component to release the heat. An aluminum plate (200mm x 200mm x 2mm) is recommended as the heat sink.

Mutual Interference could occur when two or more identical sensors are mounted at the same detection plane. This is because the sensor could not identify the origin of the received laser pulses. It causes measurement error for one or two steps. Performing data filtering could overcome this problem.

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