

Date: 2022.04.21

Scanning Laser Range Finder UTM-30LX-EW Specification

CE
RoHS

Symbol	Amendment Details	Amendment	Date	Amended by	Number
①×5	Error correction, Note added	2,3,5,6	3.11.2016	Yosimoto	RS-00696
②×2	IP initialization switch deleted, RJ45 connector deleted	4,6	4.21.2022	F.Yamamoto	RS-01819

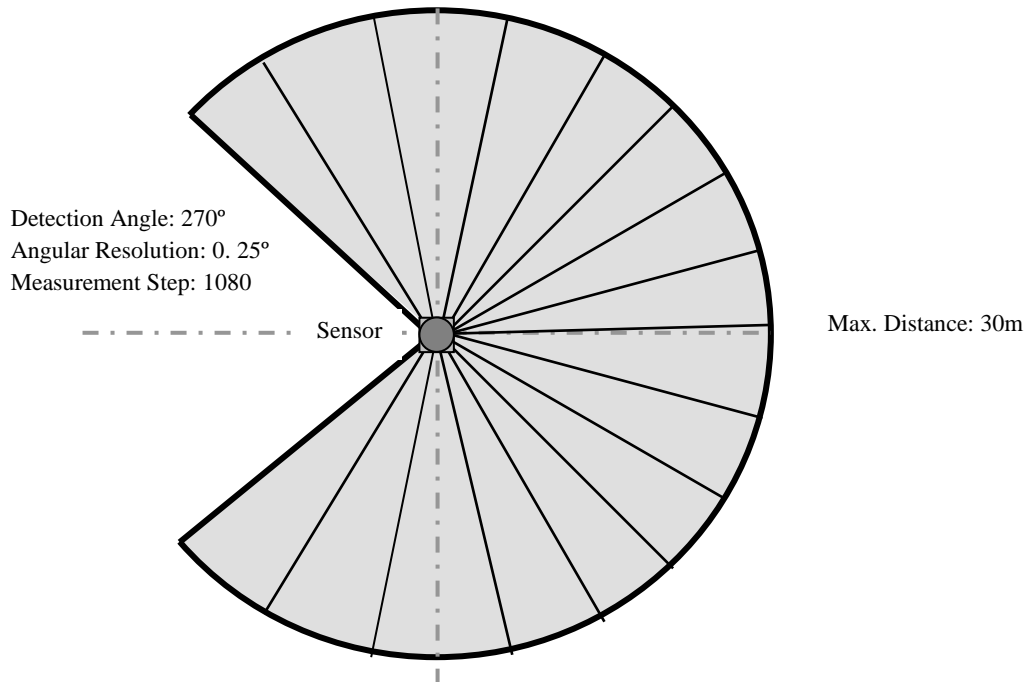
Approved by	Checked by	Drawn by	Designed by	Title	UTM-30LX-EW Specification	
Kamitani	Kamon	F.Yamamoto	Yosimoto	Drawing No.	C-42-4162	1/6

1. Introduction

Operation principles

The UTM-30LX-EW 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-EW
Light Source	Laser Semiconductor $\lambda = 905\text{nm}$ Laser Class 1
Supply Voltage	DC 12V $\pm 10\%$
Supply Current	700mA or less (1A 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 : 130mm (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) Under 10000lx : White Kent Sheet: $\pm 50\text{mm}^{*1}$ (0.1m to 10m)
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 10000lx : $\sigma < 30\text{mm}^{*1}$ (White Kent Sheet up to 10m)
Scan Angle	270°
Angular Resolution	0.25° (360°/1440)
Scan Speed	25ms *3
Interface	Ethernet 100BASE-TX(Auto-negotiation)
Output	Synchronous Output 1- Point (NPN open collector DC 30V, 30mA or less)
LED Display	Green: Power supply. Red: 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 *5
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	(EMC) 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 In the case of using other command than MD, MS and ME. There is possibility of delay in response speed, due to surrounding environment.

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

*5 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.

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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	2π/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

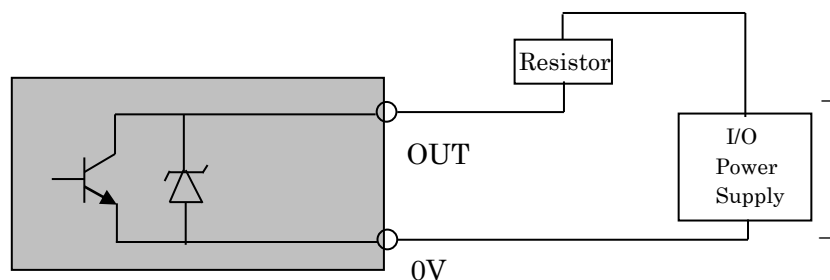
6.2 Ethernet Cable

Cable length: 300mm

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

This sensor is compatible with SCIP2.2 communication protocol standard.

6.3 Output Circuit



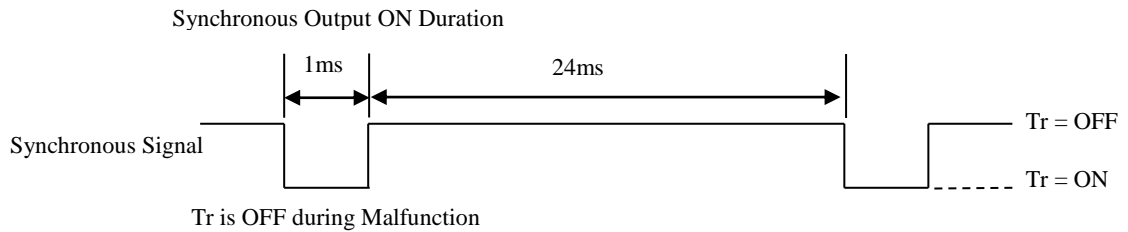
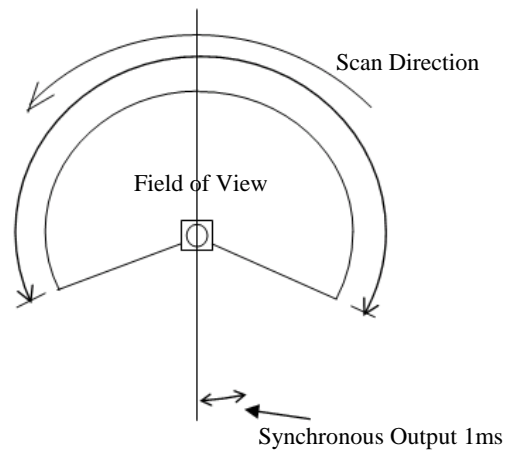
Output Rating: DC 30V, below 30mA

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	
251	motor rotation error.	Motor rotation unstable	Avoid excessive vibration and/or other mechanical noise to sensor.
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	
303	measurement error.	Measuring data processing fault	Avoid excessive vibration and/or other mechanical /optical noise to sensor



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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. Multi echo Function

The sensor measures up to three echoes of reflection for each step (direction). Distance and intensity values of every echoes are obtained

Multiple echoes are produced by reflection on surface of transparent objects, reflection on object's boundary and reflection from small particles such as rain drops, mist, dusts and fog.

This sensor feature of getting distance and intensity values of multiple reflections at the same direction is called Multi echo Function.

- ※ Two closely positioned objects or low reflectance objects may not produce multiple echoes, so that they are not detectable as separate ones.
- ※ In the case when using this function, there is possibility of delay in response speed, due to surrounding environment. ⚠

10. Ethernet Settings

① Initial value

IP address: 192.168.0.10

Port number: 10940

② IP initialization ⚠

IP can be changed and initialized with the dedicated application (IP Discovery).

Start IP Discovery from the range finder data confirmation tool (UrgBenri).

11. 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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