Laser Range Finder

UXM-30LXH-EWA
Specification

x					
x					
Symbol	Amended reason	Pages	Date	Corrector	Amended No.

Approved by	Checked by	Drawn by	Designed by	Title	UXM-30LXH-EWA Specification
				Drawing No.	C-42-03997 1/10

HOKUYO AUTOMATIC CO.,LTD

1. Outline

Operation principle

- It is a sensor which scans a semicircular field by means of a laser beam (λ= 905 nm), then calculates coordinates by measuring the distance from an object and its step angle, and detects obstacles within the setting area.
- Safety of the laser is class 1.
- By using the function of synchronizing the rotation of the motor to the reference signal from outside, influence of the interference between multiple units of this sensor is alleviated.
- By enabling the heater mounted inside the sensor with a dedicated application program, dew condensation at low temperature can be alleviated.

2. Configuration (beam scan image)

1520 steps

At 1,520 steps, the scan angle is 190°, and the step angle is 0.125°.

UXM-30LXH-EWA

30 m

760 steps

Measurement area

0 step
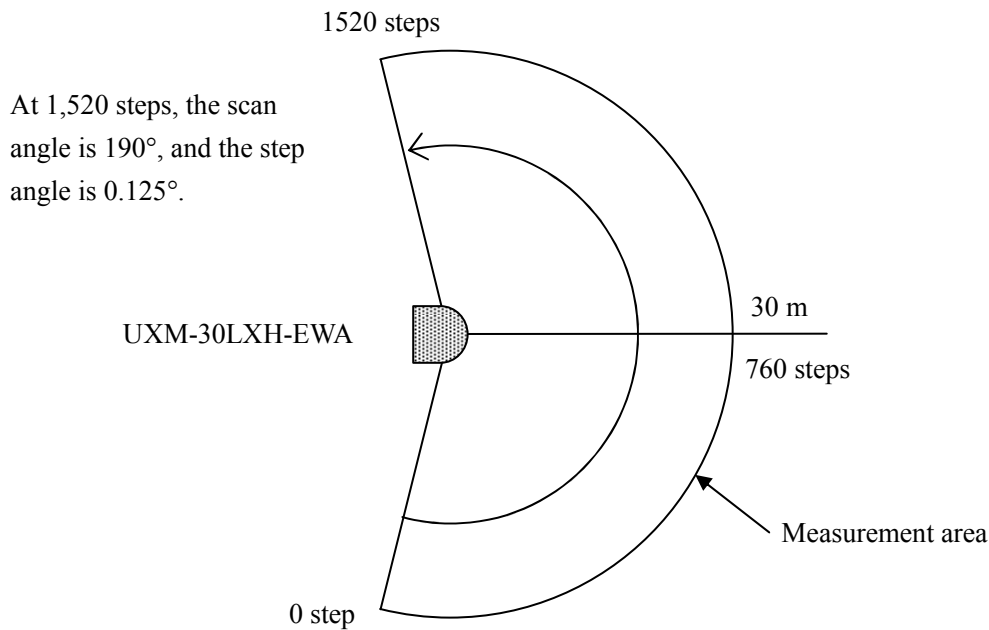
3. Disclaimer

- This sensor cannot be used as a safety device.
- This sensor cannot be used as a human body detection 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 (procedures) according to laws/Export Trade Control Order are implemented in order to maintain international peace and safety.
- Before use, please read this specification thoroughly.

Title	UXM-30LXH-EWA Specification	Drawing. No.	C-42-03997	2/10

4.Rated specification

Product name	Laser range finder
Type	UXM-30LXH-EWA
Light source	Semiconductor laser, $\lambda = 905$ nm, safety class of the laser = 1
Power supply voltage	10 to 30VDC
Power supply current	Steady-state current: 600 mA or less at 12 VDC, 300 mA or less at 24 VDC Starting current: 1.5 A or less at 12 VDC, 0.75 A or less at 24 VDC Heater in use (0°C or below): 1.25 A or less at 12 VDC, 1.25 A or less at 24 VDC
Electric power consumption	7.2 W or less (at steady-state) At usage of the heater (0°C or below): 15 W or less at 12 VDC, 30 W or less at 24 VDC
Detecting distance and object to be detected	Guaranteed value of detection: 0.1 to 30 m[1] (Reflectance of 10%, black paper, 500 mm × 500 mm) 0.1 to 80 m[1] (Reflectance of 90%, white Kent paper, 1,000 mm × 1,500 mm) Maximum detecting distance: 120 m (maximum value of area setting) Minimum object to be detected : 33 mm (5 m), 65 mm (10 m), 200 mm (30 m)
Average accuracy by distance	10% reflectance, black paper,　0.1 to 15 m: ±30 mm, 15 to 30 m: ±50 mm[1] 0.1 to 30 m: ±50 mm[2] Ambient illuminance: 3,000 lux or less 0.1 to 20 m:±50 mm[2] Ambient illuminance: 100,000 lux or less 90% reflectance, white Kent paper,　0.1 to 30 m: ±30 mm[1] 0.1 to 30 m: +50mm[2] Ambient illuminance: 3,000 lux or less 0.1 to 30 m: +50mm[2] Ambient illuminance: 100,000 lux or less
Measurement resolution and repeat accuracy	Unit of 1 mm 10% reflectance, black paper,　0.1 to 15 m: $\sigma < 10$ mm, 15 to 30 m: $\sigma < 15$ mm[1] 0.1 to 30 m: $\sigma < 20$ mm[2] Ambient illuminance: 3,000 lux or less 0.1 to 20 m: $\sigma < 30$ mm[2] Ambient illuminance: 100,000 lux or less 90% reflectance, white Kent paper,　0.1 to 30 m: $\sigma < 10$ mm[1] 0.1 to 30 m: $\sigma < 15$ mm[2] Ambient illuminance: 3,000 lux or less 0.1 to 30 m: $\sigma < 30$ mm[2] Ambient illuminance: 100,000 lux or less
Scanning angle	190°
Angular resolution	Approx. 0.125° (360°/2880 divisions)
Scanning time	50 ms (rotating speed of motor: 1200 rpm)
Interface	Ethernet 100BASE-TX (Auto-negotiation)
Output	OUTPUT　3 points: Synchronization master output, synchronization output, output of failure
Input	INPUT　1 points: Synchronization input
Output response time	100ms or less;houever,it varies depending on the setting
Starting time	Operation starts within 30 sec after turning on of power supply.
Indication lamp	Indication lamp for power supply and operation (green), indication lamp for area determination (orange) Regarding the operation of indication lamps, refer to sub-clause 7.2.
Ambient operating temperature, humidity	-10 to +50°C 85%RH (However, dew condensation and freezing shoud not exist.)
Resistance to weather	Detecting distance becomes shorter due to rain, snow, and sunlight.[3]
Vibration resistance	10 to 55 Hz, plural amplitude: 1.5 mm　in X, Y, Z directions, each 2 hours 55 to 200 Hz　19.6 m/s^2 Sweep: 2 minutes in X, Y, Z directions, each 1 hour
Resistance to shock	196 m/s^2　in X, Y, Z directions, each 10 times
Protective structure	IP67
Insulation resistance	10 MΩ
Mass	1200 g
Material	Front face of the case, optical window: Polycarbonate,　Back face of the case: Aluminum
Outside dimension (W × D × H)	124 mm × 126 mm × 150 mm (connector not included) Outline drawing No.: MC-40-3228B

Notes　　[1]Indoor environment (fluorescent lamp, 1,000 lux or less)
[2]Detection cannot be guaranteed when direct outside light enters. (Please make consideration to prevent afternoon sun, etc. from entering.)
[3]Regarding the influence of environment, please confirm with the actual equipment.

Title	UXM-30LXH-EWA　Specification	Drawing. No.	C-42-03997	3/10

5. Connection

   5.1   Specification of power cables

Power cable, 16 cores, 2 m (specification of flying reed)

Cable color	Function	Size of cable core
Brown	+V (10 to 30 V)	22
Blue	−V (0 V)	22
White/Red	Area input 1	28
White/Blue	Area input 2	28
White/Green	Area input 3	28
White/Black	Area input 4	28
White	Synchronization input	28
Orange	Output of failure	28
Pink	NC*5	28
Violet	NC*5	28
Yellow/Black	NC*5	28
Green	Synchronization output	28
Yellow	Synchronization master output	28
Red	+COM for input	28
Black	−COM for output	28
Gray	NC[*4]	28

Note [*4] There is internal connection. Do not connect because it is not used.
       [*5]It is not internally connected.

   5.2   Specification of the interface connector
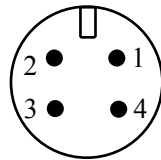
Maker: Binder
Type: 09-0431-87-04

Ethernet connecting plug

     Straight type plug (Binder, 99-0430-57-04)
        Type L plug (Binder, 99-0430-69-04)

PIN No.	Function	Wiring color (T568A)
1	TX+	White/Green
2	TX-	Green
3	RX+	White/Orange
4	RX-	Orange

RJ-45 modular wiring

PIN No.	Wiring color	
	Straight	Cross
1	White/Green	White/Orange
2	Green	Orange
3	White/Orange	White/Green
4	Blue	Blue
5	White/Blue	White/Blue
6	Orange	Green
7	White/Brown	White/Brown
8	Brown	Brown

The communication protocol is based on SCIP2.2.
As for the contents of the communication protocol, refer to the Communication specification (C-42-04041).

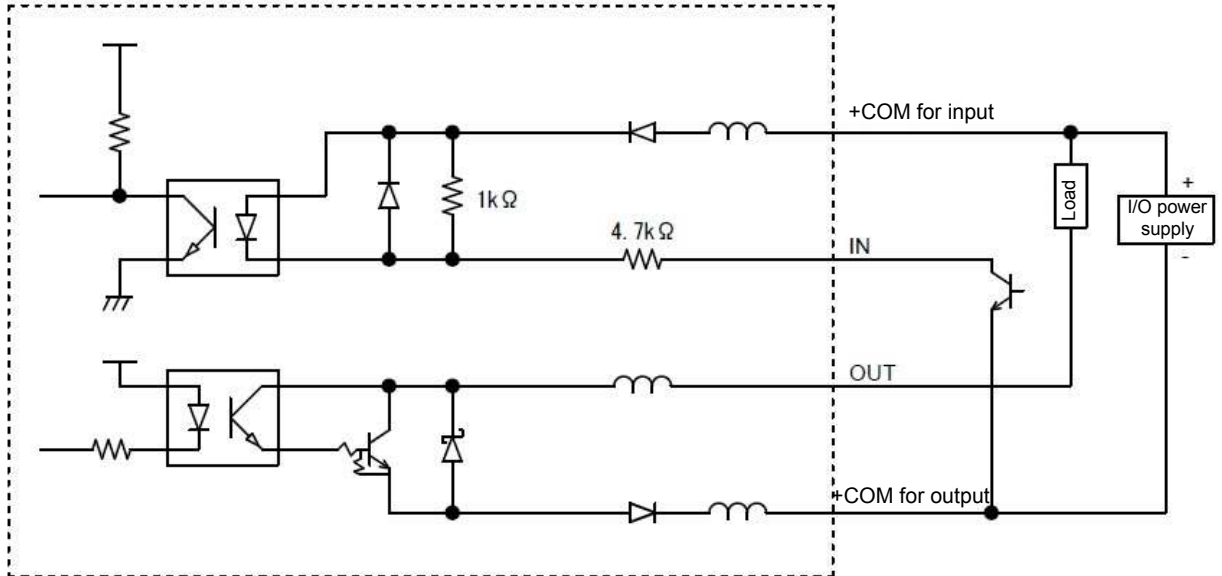| Title	UXM-30LXH-EWA Specification	Drawing. No.	C-42-03997	4/10

5.3   Input/output circuit

Input: Input by the photocoupler (common anode, current to turn on each input: 2 mA, current to turn off each input: 0.5 mA or less)

Output: Open collector output

Item	Specification
Maximum output current	50 mA
Maximum applied voltage	30 V
Output residual voltage	1 V or less
Power supply range at +COM	10 to 30 V

Example of connecting the input/output circuit

Title	UXM-30LXH-EWA Specification	Drawing. No.	C-42-03997	5/10

6. Control signal
 6.1   Failure output
         (1) Laser failure   When the laser does not emit a beam and the safety class of the laser has
                                exceeded class 1.

         (2) Motor failure   When revolution speed of the motor does not reach 1,200 rpm

         At the time of failure, turn off the output and stop laser emission as well as rotation of the motor.
         Check the error code via Ethernet. The meanings and handling methods for each error code can be
         found in Section 7.

  6.2   Synchronization output
         The output timing which is synchronized to the scanning and which outputs the signal of 1 pulse =
         about 1 ms per scan has been output at the timing as shown in the following Figure.
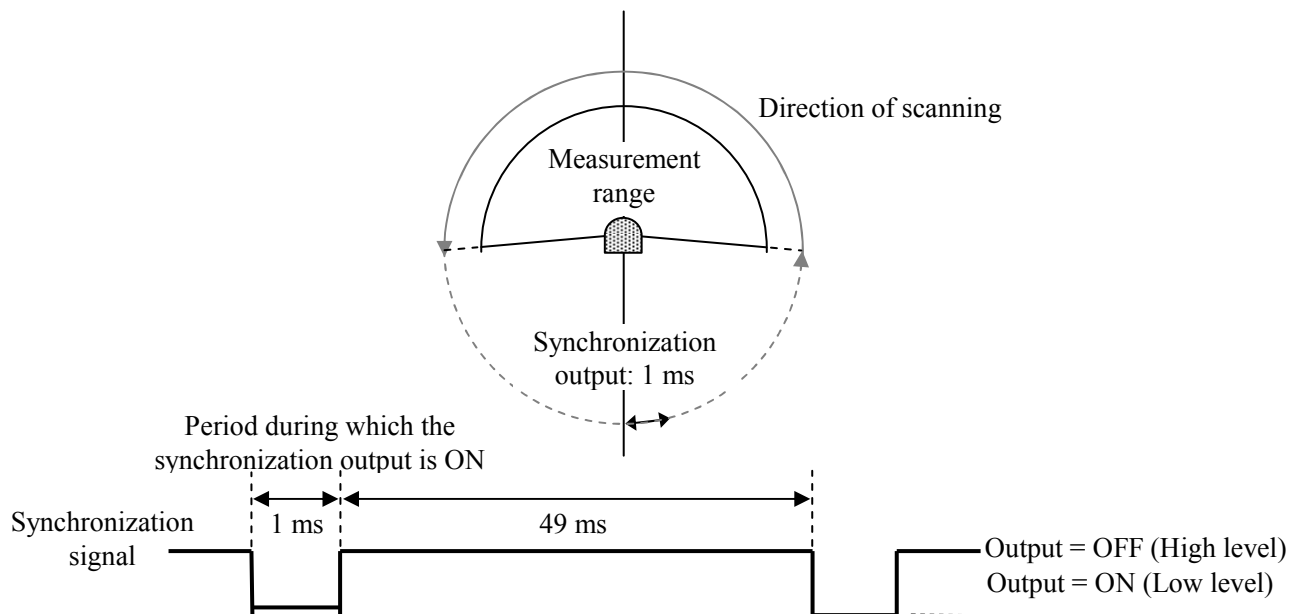
         At the time of failure, synchronization output is OFF.

  6.3   Synchronization master output
         It is the reference clock signal for synchronizing the motor revolution of each sensor.
         The clock signal is outputted where cycle is 50 ms and the period during which the output is ON (Low
         level) becomes 12.5 ms (Duty: 25%).
   Output is started just after turning on the power supply of the sensor, and output is continued even in
         the failed state.

  6.4   Synchronization input
         The signal of synchronization master output is inputted. Motor revolution is controlled so that the
         synchronization master output signal and the synchronization output signal are synchronized.
         Synchronization is performed with reference to the time of falling of the clock signal.

| Title | UXM-30LXH-EWA   Specification | Drawing. No. | C-42-03997 | 6/10 |

6.5 Example of wiring between finders (sensors)

Master		Slave
UXM-30LAH-EWA	Synchronization master output / Synchronization input / Synchronization output	UXM-30LAH-EWA
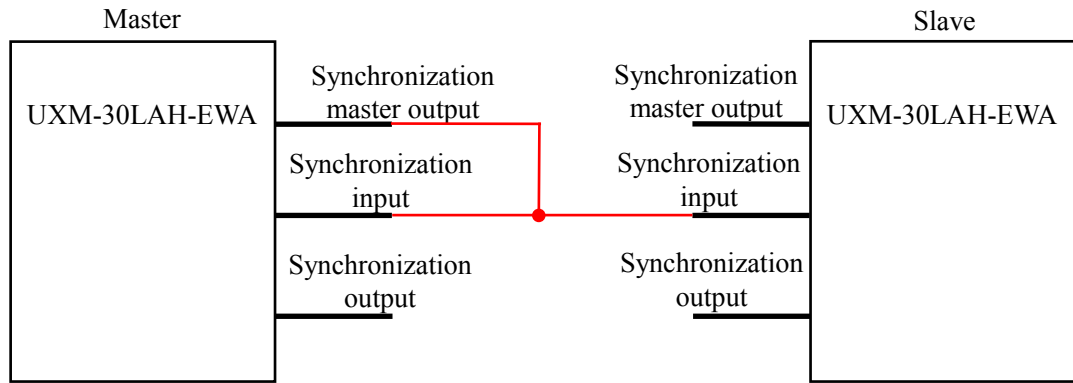
Synchronization master output of the master's sensor is connected to the synchronization input of the master itself and to the synchronization input of all slave finders (sensors). Motor revolution is synchronized at the state where timing of scanning is shifted by setting the phases of respective finders (sensors). Confirmation and change of the phase are performed by means of the dedicated application program.

Synchronization master output
Synchronization input
Synchronization output

About confirmation and change of the phase

It is to be performed by means of the application program (Phase_setter) attached to the Phase_setter.zip.
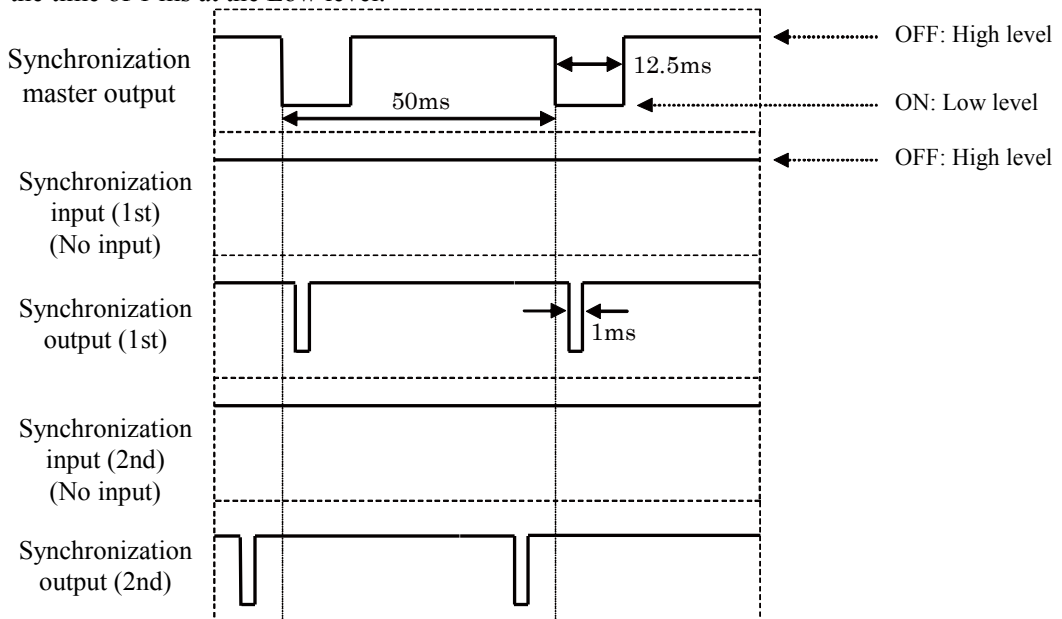
The phase can be set within the range from 0° to 359°.

For details, refer to the manual attached to the Phase_setter.zip.

6.6 Timing chart of synchronization input/output

• When the signal of synchronization master output of the master is not inputted in the synchronization input

Synchronization output of each sensor continually outputs the pulse which has a cycle of 50 ms and the time of 1 ms at the Low level.

Synchronization master output — 50ms — 12.5ms — OFF: High level / ON: Low level

Synchronization input (1st) (No input) — OFF: High level

Synchronization output (1st) — 1ms

Synchronization input (2nd) (No input)

Synchronization output (2nd)

Title	UXM-30LXH-EWA	Specification	Drawing. No.	C-42-03997	7/10

HOKUYO AUTOMATIC CO.,LTD

• When the signal of synchronization master output of the master is inputted in the synchronization input

Falling of the synchronization master output signal and falling of the synchronization output signal which are inputted in each synchronization input are synchronized.

Furthermore, when phase setting is performed by means of the application program, the synchronization output is outputted at the phase shifted by the setting amount.

Error of phase setting shall be within ± 1 ms.
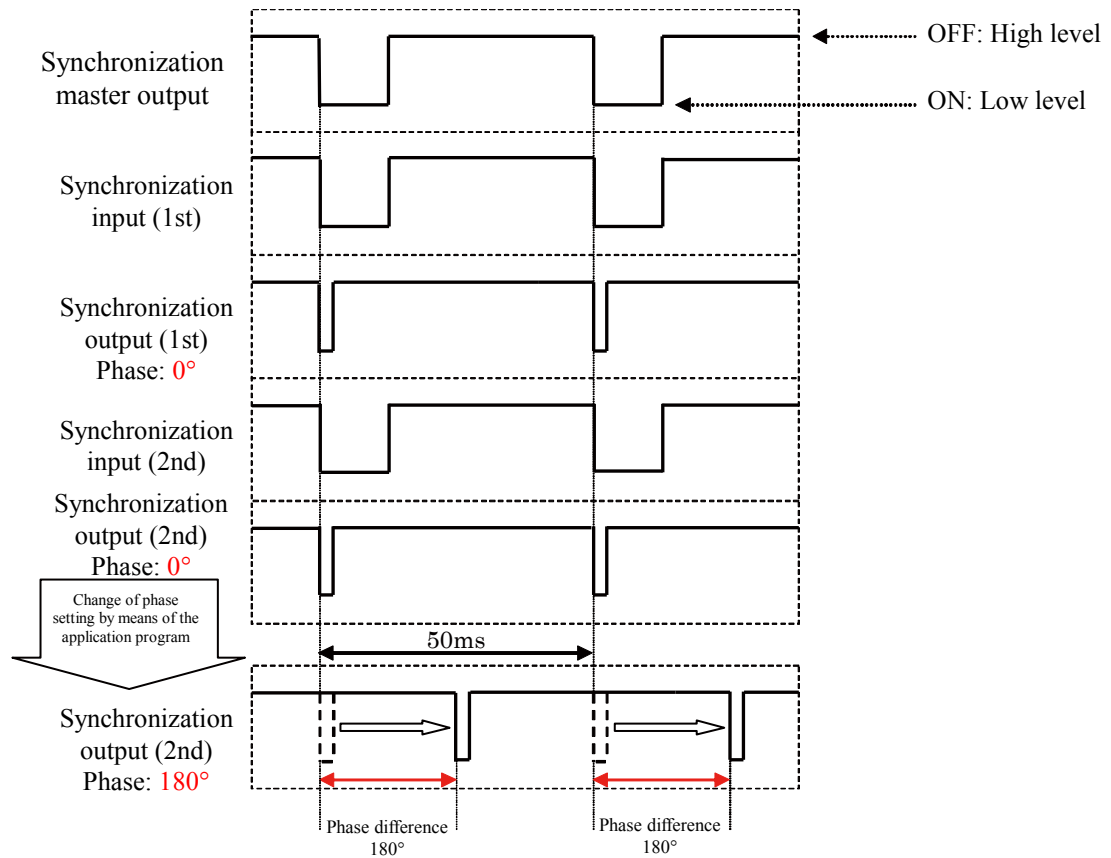
7. About failure

7.1 Error code table

The cause of an error due to failure can be obtained at the STAT row of the II Command response, in the SCIP communication protocol.

The error codes obtainable from the STAT row and the handling method are as follows.

ID	Message	Meaning	Handling method
000	no error.	Normal	Nothing
050	internal chip access failed.	Sensor error	The sensor has been failed, and repair is necessary.
100	internal chip access failed.	Same as above	
150	internal chip access failed.	Same as above	
151	internal chip initialize failed.	Sensor processing system initialization failure	
200	encoder error.	Encoder trouble	
250	motor startup failed.	Motor trouble	
251	motor rotation error.	Unstable motor rotation	Vibration and noise onto the sensor are to be reduced.
300	laser too high.	Laser beam error	Disturbance light and noise onto the sensor are to be reduced.
301	laser too low.	Same as above	
302	laser no echo.	Same as above	
303	measurement error.	Distance measurement control failure	Vibration, disturbance light, and noise onto the sensor are to be reduced.

ⒶHOKUYO AUTOMATIC CO.,LTD

About distance value

Meaning of the measured distance value x at each step are as follows.

Range of the distance value	Meaning
2x < 23	Measurement error. Distance cannot be measured due to the influence of interfering light and noise.
23 ≤ x < 120000	Measured distance value [mm]
120000 ≤ x	There is a non light-reflecting object or non-detectable object

7.2 Relation table between indication lamps and output signals

State of the sensor	Indication LED for power supply and operation (green)	Indication LED for area determination (orange)	Synchronization master output	Synchronization output	Output of failure
At start up	Blinking	Solid		Tr = OFF (Hi)[*6]	Tr = OFF (Hi)[*6]
During operation	Solid	At detection Solid At no detection Off		For 1 ms at the cycle of 50 ms Tr = ON (Low)	Tr = ON (Low)
At failure	Blinking (once/sec)			Tr = OFF (Hi)	Tr = OFF (Hi)
At stopping of motor	Blinking (once/4 sec)		Output is always continued after the power supply for the sensor has been turned on.[*6]	Tr = OFF (Hi)	Tr = ON (Low)
At initialization of IP	Blinking 2 times after pushing and holding the IP initialization switch ↓ Solid (Initialization processing of IP has been completed.) ↓ Blinking of the LED (green) 4 times, the LED (orange) is off. (Restart of the sensor begins.) ↓ Solid (Restart of the sensor has been completed.)			During initialization of IP Tr = ON (Low) During restart of the sensor Tr = OFF (Hi)[*7]	During initialization of IP Tr = ON (Low) During restart of the sensor Tr = OFF (Hi)[*7]

Note) [*6]The indefinite state continues for about 5 sec after turning on the power supply.
[*7]The indefinite state continues during the period from completion of the initialization of IP to restart of the sensor.

8. Multi-echo function

This sensor can receive four reflected waves (1st reflected wave, 2nd reflected wave, 3rd reflected wave, last reflected wave) at maximum for one step, and can obtain the distance value as well as the level value from each wave.

When a light transmitting object, rain, fog, dust, and/or a boundary of an object, etc. exist ahead of a laser beam, both the light reflected by these and the light reflected by the reflective object located behind them return to the sensor.

The capability of obtaining distance values and the level values from multiple reflected lights in the same direction such as above is called the multi-echo function.

However, if the distance between two reflective objects is too near, or the reflectance is too low, detection of the multi-echo may not be possible.

Title	UXM-30LXH-EWA Specification	Drawing. No.	C-42-03997	9/10

9. Heater function
  This sensor is provided with a heater for preventing dew condensation. It is possible to switch the state of the heater function is "on" or "off" using the dedicated application program. At the initial state, the heater function is "off."
  In the case of using the heater function, the heater operates when temperature in the sensor is 0°C or below. When temperature in the sensor has exceeded 10°C, operation of the heater is automatically stopped.

  Note) When using the heater function, it is recommendable to use the sensor at the voltage of 24 V.
       (If it is used at 12 V, the heating may not be sufficient due to lack of power to the heater.)

10. Setting of Ethernet
       10.1 About setting value
              Initialization value of IP: 192.168.0.10
              Port No.:   10940
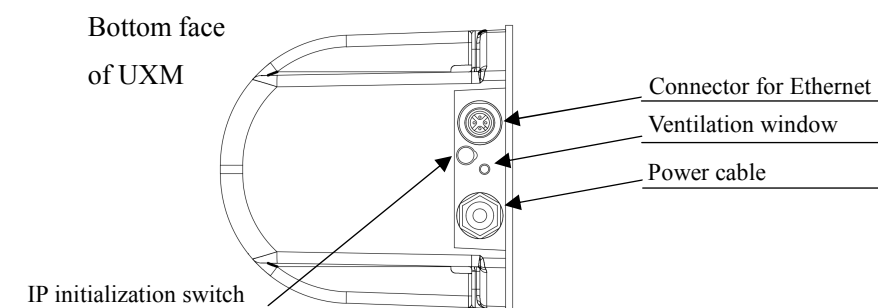
       10.2 About initialization of IP
              Detach the packing for protection at the bottom of the product, and perform long press of the IP initialization switch for 2 sec or more.
              Since the finder (sensor) restarts after blinking of the green and orange LEDs, release the switch.
              The packing for protection shall be attached after initialization without fail.
              For details, refer to the manual attached to the Urg_ip_changer_uxm_ja.zip.

Bottom face
of UXM

Connector for Ethernet
Ventilation window
Power cable

IP initialization switch

Title	UXM-30LXH-EWA Specification	Drawing. No.	C-42-03997	10/10

HOKUYO AUTOMATIC CO.,LTD