

EtherCAT TOWER LIGHT
(small size, 40 mm dia., 1 - 5 layers)

MODEL **IT40SRECT**

BEFORE USE

Thank you for choosing us. Before use, please check contents of the package you received as outlined below.

If you have any problems or questions with the product, please contact our sales office or representatives.

This equipment is for use in general industrial environments, therefore may not be suitable for applications which require higher level of safety (e.g. safety or accident prevention systems) or of reliability (e.g. vehicle control or combustion control systems). For safety, installation and maintenance of this equipment must be conducted by qualified personnel.

■ PACKAGE INCLUDES:

Tower Light(1)

■ MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

■ INSTRUCTION MANUAL

This manual describes necessary points of caution when you use this product, including installation, connection and basic maintenance procedures.

■ ESI FILE

ESI files are downloadable at our web site.

■ SYMBOLS USED ON THE PRODUCT AND IN THIS MANUAL

△ The symbol indicated on the equipment means that the user must refer to the related parts in the manual for safe operation of the equipment. It is essential to read the instructions wherever the symbol appears in the manual.

△ **WARNING:** is reserved for conditions and actions that can cause serious or fatal injury.

△ **CAUTION:** is reserved for conditions and actions that can cause injury or instrument damage.

⚠ CAUTION

■ REGARDING SAFETY

- If the equipment is used in a manner not specified by us, the protection provided by the equipment may be impaired.

■ CONFORMITY WITH EU DIRECTIVES

- This equipment is suitable for Installation Category II (transient voltage 2500V) and Pollution Degree 2. Reinforced insulation (network to power: 300V) is maintained. Prior to installation, check that the insulation class of this unit satisfies the system requirements.
- Altitude up to 2000 meters.

- The equipment must be installed such that appropriate clearance and creepage distances are maintained to conform to CE requirements. Failure to observe these requirements may invalidate the CE conformance.

- The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this unit when it is integrated in a panel system. The user may have to review the CE requirements in regard to the whole system and employ additional protective measures* to ensure the CE conformity.

* For example, installation of noise filters and clamp filters for the power source, input and output connected to the unit, etc.

- The equipment is intended to be installed in a industrial environment defined by EN 60947-5-1.

POINTS OF CAUTION

■ POWER INPUT RATING & OPERATIONAL RANGE

- Locate the power input rating marked on the product and confirm its operational range as indicated below:

100 – 240 V AC rating: 85 – 264 V, 47 – 66 Hz,
approx. 10 VA at 100 V AC
approx. 13 VA at 200 V AC
approx. 14 VA at 240 V AC

24 V DC rating: 24 V ±10 %, approx. 5.5 W

■ GENERAL PRECAUTIONS

- Before you remove the unit or mount it, turn off the power supply and input signal for safety.
- The unit must not be subjected to external force.
- Do not rub the unit with organic solvent like paint thinner.

■ ENVIRONMENT

- Indoor use.
- Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
- Environmental temperature must be within -10 to +55°C (14 to 131°F) with relative humidity within 30 to 90% RH in order to ensure adequate life span and operation.
- Mount the unit on a flat and robust plate.
- Lamps are omnidirectional.
- The buzzer sound is directional in front of the unit.
Rated voltage of buzzer: 12 V DC
(Operational voltage: 7 - 13 V DC)
Buzzer volume: approx. 71 - 78 dB
(Buzzer aperture (front) direction: 1 m, A-weighting)



EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

■ INGRESS PROTECTION (IP65)

- The IP code is conformable when the unit is mounted vertically, and the control panel cover is locked. The compartment, where connectors are located, is not protected.
- When opening the control panel cover, avoid humidity and dust penetration. Dry and clean it if condensation is formed, and close the cover locking tightly.
- In order to protect ingress of water or dust into the bottom compartment, mount the unit on the flat plane, and be sure that the gasket does not roll back or dust is not on the gasket.

■ WIRING

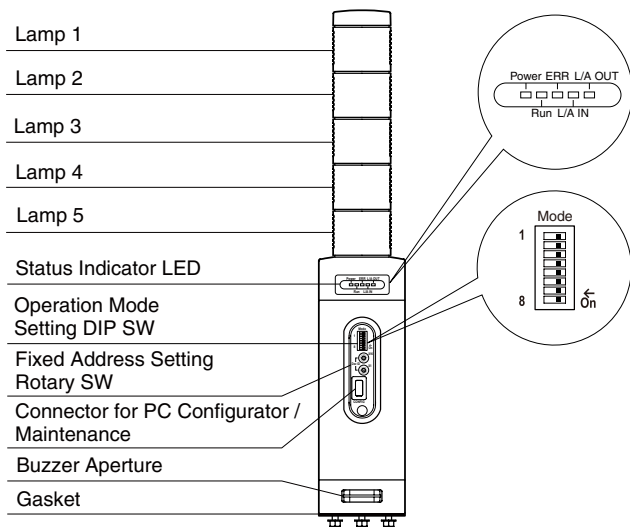
- Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind these cables together with those in which noises are present. Do not install them in the same duct.

■ AND

- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

COMPONENT IDENTIFICATION

■ FRONT VIEW (When the cover is opened)



■ STATUS INDICATOR LED

ID	FUNCTION	COLOR	STATUS	
Power	Internal power	Green	Off	Abnormal
			On	Normal
Run	Device state	Green	Off	INIT
			Blinking	PRE-OPERATIONAL
			Single Flash	SAFE-OPERATIONAL
			On	OPERATIONAL
ERR	Error	Red	Off	No error
			Blinking	Invalid Configuration
			Single Flash	Local error
			Double Flash	Process Data Watchdog Timeout/ EtherCAT Watchdog Timeout
			On	Application Controller failure
L/A IN	IN port status	Green	Off	No Link
			Flickering	Link and activity
			On	Link without activity
L/A OUT	OUT port status	Green	Off	No Link
			Flickering	Link and activity
			On	Link without activity

Blinking	200 ms-On, 200 ms-Off
Single Flash	200 ms-On, 1000 ms-Off
Double Flash	200 ms-On, 200 ms-Off, 200 ms-On, 1000 ms-Off
Flickering	50 ms-On, 50 ms-Off

■ OPERATING MODE

(*) Factory setting

• Lamp Blinking Frequency: Mode-1

SW1-1	LAMP BLINKING FREQUENCY
OFF	Approx. 2 Hz (*)
ON	Approx. 10 Hz

• Buzzer Intermittent Frequency: Mode-2

SW1-2	BUZZER INTERMITTENT FREQUENCY
OFF	Approx. 2 Hz (*)
ON	Approx. 10 Hz

• Buzzer Volume: Mode-3, Mode-4

SW1-3	SW1-4	BUZZER VOLUME
OFF	OFF	Quiet (*)
OFF	ON	Middle
ON	OFF	Loud
ON	ON	Maximum

• Output at the Loss of Communication: Mode-6

SW1-6	OUTPUT AT THE LOSS OF COMMUNICATION
OFF	Reset the output (turned off) (*)
ON	Hold the output (maintains the last data received normally)

Note: Be sure to set unused SW1-5, 7 and 8 to OFF.

■ FIXED ADDRESS

Fixed address 1 to 255 can be used by combining with two rotary switches which have address 0 to F. When fixed address is not used, set the rotary switch to 0. (Setting range: 0 to 255, factory setting: 0)



Address Setting (x16)

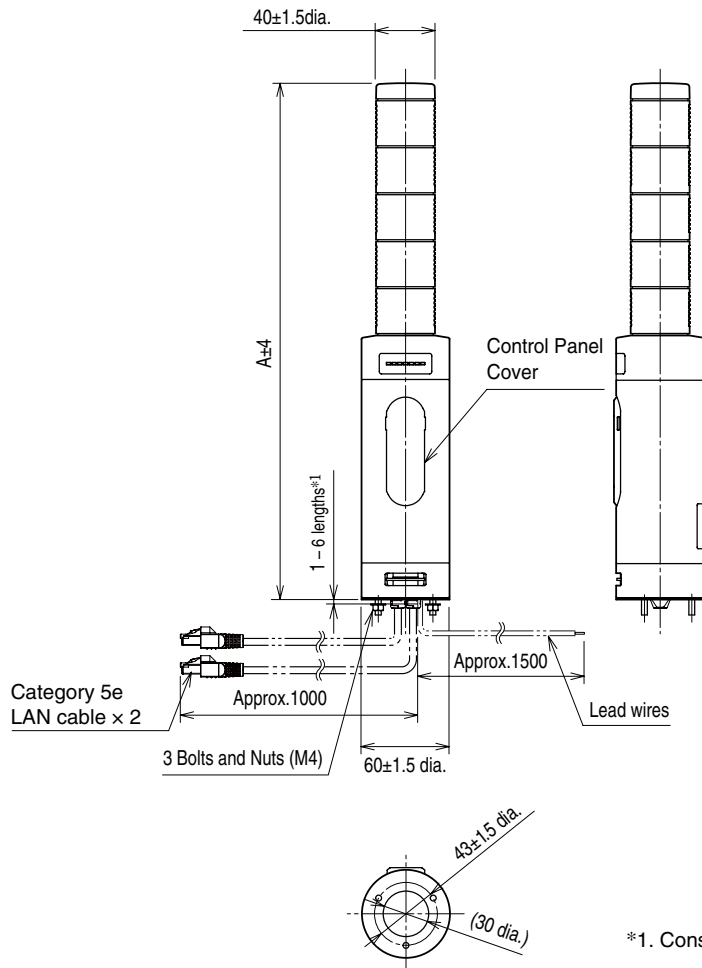


Address Setting (x1)

TERMINAL CONNECTIONS

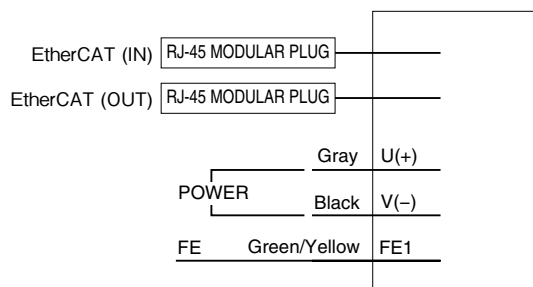
Connect the unit as in the diagram below.

EXTERNAL DIMENSIONS unit: mm

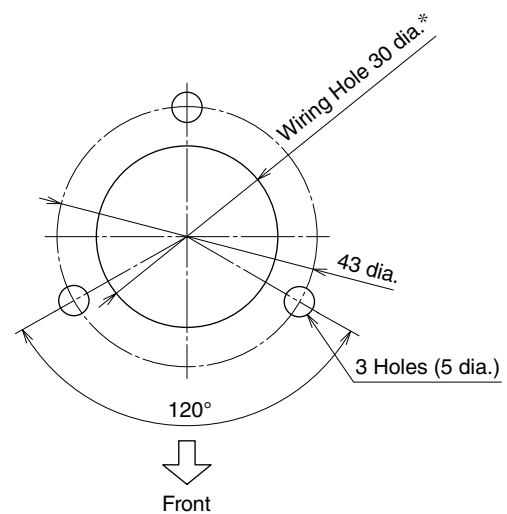


Lamp Layers	A
1	224
2	256
3	288
4	320
5	352

CONNECTION DIAGRAM



MOUNTING REQUIREMENTS unit: mm



*Protect wires to prevent scratching them at the edge of the compartment.

EtherCAT SPECIFICATIONS

■ Modular Device Profile

IT40SRECT complies with the Modular Device Profile (MDP) standard, ETG.5001.1 of the EtherCAT standard. Be sure that the master supports the MDP standard.

■ Fixed address

IT40SRECT supports Explicit Device Identification by allowing setting of fixed address using the fixed address setting rotary switches (ID selector).

The fixed address can be set to be 1 to 255.

When fixed address is not used, set the ID selector to 0.

When the power is turned on with the ID selector set to other than 0, the designated address is written in the resistor 0x0012 of ESC (EtherCAT Slave Controller) when IT40SRECT starts up.

■ Initialization

At the start up, objects of the process data mapping (RxPDO, TxPDO) corresponding to the I/O data of the device, and the other objects are created in the object dictionary.

After initialization, the master unit is available to require to the slave unit (IT40SRECT) to switch the status from INIT to PREOP.

If the initialization is not completed due to any error with the module, switching requirement is rejected with AL status code at switching from INIT to PREOP.

■ Data Configuration

Data are configured in accordance with the EtherCAT Modular Device Profile (MDP) specifications as shown below.

Table 1: Data Configuration

OBJECT	ADDRESS	CONTENT
Input Area Objects	0x6001	Input data
Output Area Objects	0x7000	Output data
PDO Mapping Objects (TxPDO)	0x1A00	Input data list
PDO Mapping Objects (RxPDO)	0x1600	Output data list
PDO Assign (IN)	0x1C13	Input data transmission order
PDO Assign (OUT)	0x1C12	Output data transmission order
Sync Manager Type	0x1C00	Sync manager type
Sync Manager Parameter Objects	0x1C32, 0x1C33	Sync mode
Device Type	0x1000	Device type
Manufacturer Device Name	0x1008	Device name
Manufacturer Hardware Version	0x1009	Hardware version
Manufacturer Software Version	0x100A	Software version
Identity Objects	0x1018	Vendor information

■ EtherCAT State

EtherCAT defines four states of slave: INIT, PREOP, SAFEOP, and OP.

TxPDO (input configuration data) is updated only in the SAFEOP or OP state, and RxPDO (output configuration data) is updated only in the OP state.

The RUN LED turns on only in the OP state and input and output data are updated, while only input data is updated in the PREOP state.

■ EtherCAT Diagnostics

• AL Status Code

When the slave (IT40SRECT) fails to receive a request from the master or when there is a problem with the slave during normal communication, an error code is set to registers 0x0134 and 0x0135 (AL Status Code) of ESC.

The error codes that IT40SRECT uses are as shown below. (See Table 2.)

Table 2: Error Codes of AL Status Code

CODE	ERROR
0x0000	No error
0x0011	Invalid requested state change
0x0012	Unknown requested state
0x0013	BOOT state not supported
0x0016	Invalid MailBox configuration (PREOP)
0x0017	Invalid SyncManager configuration
0x001B	SyncManager Watchdog Timeout
0x001D	Invalid Output Configuration
0x001E	Invalid Input Configuration
0x001F	Invalid Watchdog Configuration
0x0029	FreeRun needs 3 Buffer mode

• SDO Abort Code

When the master attempts to access the object dictionary via SDO, if the slave (IT40SRECT) fails to receive SDO messages for any reason, IT40SRECT sends an error code (SDO Abort Code) to the master and denies its access.

The following error codes are used.

Table 3: Error Codes of SDO Abort Code

CODE	ERROR
0x05030000	Toggle bit not changed
0x05040001	Client/Server command specifier not valid or unknown
0x05040005	Out of memory
0x06010000	Unsupported access to an object
0x06010002	Attempt to a read-only object
0x06020000	The object does not exist in the object directory
0x06070010	Data type does not match, length of service parameter does not match
0x06090011	Sub-index does not exist
0x08000020	Data cannot be transferred or stored to the application
0x08000022	Data cannot be transferred or stored to the application because of the present device state

OBJECT DICTIONARY (DATA DESCRIPTION)

■ Input Area Objects (Input Data Area: 0x6000)

Reserved area data is allocated to object 0x6000.

■ Output Area Objects (Output Data Area: 0x7000)

Data for operating lamp/buzzer is allocated to object 0x7000.

Table 4: Sub-Index Configuration By Module Type

MODULE TYPE	INDEX	SUB-INDEX	DATA TYPE	BIT	ACCESS	VALUE	CONTENT
Input data	0x6000	0	UINT8	8	RO	1	Number of items
		1	UINT16	16	RO	0x0000 - 0xFFFF	Reserved area (fixed at 0)
Output data	0x7000	0	UINT8	8	RO	1	Number of items
		1	UINT16	16	RO	0x0000 - 0xFFFF	Data for operating lamp/ buzzer

■ PDO Mapping Objects (Data List: 0x1600, 0x1A00)

• Objects 0x1600, 0x1A00

Output data list (RxPDO) and Input data list (TxPDO) are allocated to 0x1600 and 0x1A00, respectively.

In the data of RxPDO and TxPDO, index, sub-index, and the number of bit of each object which is referred to, are stored.

For input data, each object with the address starting with 0x6000 is referred to.

For output data, each object with the address starting with 0x7000 is referred to.

Table 5: Object Configuration For Output Data List And Input Data List

INDEX	SUB-INDEX	DATA TYPE	BIT	ACCESS	VALUE	CONTENT
0x1600 (RxPDO)	0	UINT8	8	RO	1	Number of items
	1	UINT32	32	RO	0xaaaaabbcc	aaaa: Index for referenced object bb: Sub-Index for referenced object cc: Number of bits for referenced object
0x1A00 (TxPDO)	0	UINT8	8	RO	1	Number of items
	1	UINT32	32	RO	0xaaaaabbcc	aaaa: Index for referenced object bb: Sub-Index for referenced object cc: Number of bits for referenced object

■ PDO Assign Objects (Data Transmission Order, Output: 0x1C12, Input: 0x1C13)

An allocation list for RxPDO and an allocation list for TxPDO are allocated to 0x1C12 and 0x1C13, respectively. The indexes stored in 0x1C12 and 0x1C13 are placed in the order they are actually transmitted via PDO.

Table 6: Object Configuration For PDO Allocation Lists

INDEX	SUB-INDEX	DATA TYPE	BIT	ACCESS	VALUE	CONTENT
0x1C12	0	UINT8	8	RO	1	Number of items
	1	UINT16	16	RO	0x1600	Data for operating lamp/buzzer
0x1C13	0	UINT8	8	RO	1	Number of items
	1	UINT16	16	RO	0x1A00	Reserved area data

■ Sync Manager Type (0x1C00)

Sync Manager Type is allocated to object 0x1C00 based on the EtherCAT specification.

Table 7: Object Configuration For Sync Manager Type

INDEX	SUB-INDEX	DATA TYPE	BIT	ACCESS	VALUE	CONTENT
0x1C00	0	UINT8	8	RO	4	Number of items
	1	UINT8	8	RO	1	Mailbox Write
	2	UINT8	8	RO	2	Mailbox Read
	3	UINT8	8	RO	3	Process Output Data
	4	UINT8	8	RO	4	Process Input Data

■ Sync Manager Parameter Objects (0x1C32, 0x1C33)

In IT40SRECT, objects 0x1C32 and 0x1C33 do not exist, as the value of Sync Manager Parameter is fixed.

IT40SRECT supports Free Run mode only as the Sync mode.

Note that Distributed Clock (DC) mode is not supported.

■ Device Type (0x1000)

The device type of this unit is allocated to object 0x1000. The device type is 5001.

Table 8: Object Configuration For Device Type

INDEX	DATA TYPE	BIT	ACCESS	VALUE	CONTENT
0x1000	UINT32	32	RO	5001	Device type

■ Error Register (0x1001)

IT40SRECT does not use Object 0x1001.

■ Manufacturer Device Name (0x1008)

The device name is allocated to object 0x1008 in String form.

Table 9: Object Configuration For Device Name

INDEX	DATA TYPE	BIT	ACCESS	VALUE	CONTENT
0x1008	STRING	32	RO	ITxSRECT	Model number

■ Manufacturer Hardware Version (0x1009)

The hardware device version of this unit is allocated to object 0x1009 in String form.

The format of version is “n.nn.”

Table 10: Object Configuration For Hardware Version

INDEX	DATA TYPE	BIT	ACCESS	VALUE	CONTENT
0x1009	STRING	32	RO	n.nn	Hardware version

■ Manufacturer Software Version (0x100A)

The software version of this unit is allocated to object 0x100A in String form.

The format of version is “n.nn.”

Table 11: Object Configuration For Software Version

INDEX	DATA TYPE	BIT	ACCESS	VALUE	CONTENT
0x100A	STRING	32	RO	n.nn	Software version

■ Identity Object (Vendor information: 0x1018)

Vendor information is allocated to object 0x1018.

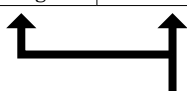
While the vendor ID and product code are fixed, the revision number is incremented by one at each major version up of the software.

A unique serial number is allocated to each product.

A serial number consists of 8 digits, starting with two alpha-numeral characters followed by six numeral characters.

The serial number is expressed as 32-bit data divided into 6-bit, 6-bit, and 20-bit groups, with the first two characters converted into 6-bit values.

6 BITS	6 BITS	20 BITS
1st digit	2nd digit	3rd to 8th digits (000000 to 999999)



CHARACTER	VALUE
0	0
1	1
:	:
9	9
A	10
B	11
:	:
Z	35

Table 12: Object Configuration For Vendor Information

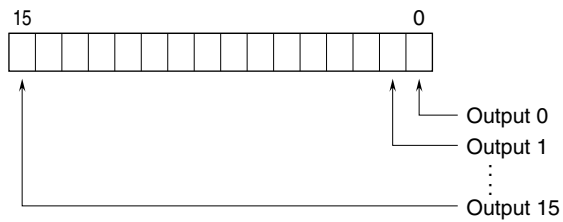
INDEX	SUB-INDEX	DATA TYPE	BIT	ACCESS	VALUE	CONTENT
0x1018	0	UINT8	8	RO	4	Number of items
	1	UINT32	32	RO	0x0000060C	Vendor ID
	2	UINT32	32	RO	0x49540001	Product code
	3	UINT32	32	RO	n	Revision number
	4	UINT32	32	RO	0 to n	Serial number

I/O DATA DESCRIPTIONS

■ INPUT DATA (RESERVED AREA DATA)

Fixed at 0.

■ OUTPUT DATA



Output 0	Lamp 1	0: Off, 1: On
Output 1	Lamp 2	0: Off, 1: On
Output 2	Lamp 3	0: Off, 1: On
Output 3	Lamp 4	0: Off, 1: On
Output 4	Lamp 5	0: Off, 1: On
Output 5	Buzzer	0: Off, 1: Continuous
Output 6		
Output 7		
Output 8	Lamp 1	0: Off, 1: Blinking
Output 9	Lamp 2	0: Off, 1: Blinking
Output 10	Lamp 3	0: Off, 1: Blinking
Output 11	Lamp 4	0: Off, 1: Blinking
Output 12	Lamp 5	0: Off, 1: Blinking
Output 13	Buzzer	0: Off, 1: Intermittent
Output 14		
Output 15		

Note: If "On" (Continuous) and "Blinking" (Intermittent) are set simultaneously for a single lamp (buzzer), "Blinking" (Intermittent) is disabled.