10 EthernNet/IP

The EtherNet/IP module maps the object temperature, internal temperature, device status and other pyrometer data to its input assembly which is then sent onto the EtherNet/IP network using CIP. In the initialization phase, the device sends configuration data which is accessible for setup via the PLC programming software controller tags. Furthermore, EtherNet/IP allows you to change a subset of sensor parameters in data exchange mode using output data. For the device diagnostics, there is a special status register containing an error code, which is sent a part of the device's input data.

Specification:

- Device class: adapter device
- Device type: 06h (photoelectric sensor)

10.1 Configuration

The easiest way to incorporate an EtherNet/IP device into a PLC programming software project is by installing the EDS file and selecting the right module type. The device's input, output and config assemblies will be configured automatically. It is also possible to add the device manually using generic Ethernet module.

To allow for an easier implementation in automation projects, the device manufacturer describes the device features in an EDS file, which is supplied to the user and can be installed into the PLC programming environment using EDS hardware installation tool.

The EtherNet/IP device EDS file is named as:

EnduranceEIP_xxxxxxxx.eds

The EtherNet/IP device configuration using the EDS file (after it has been installed) only consists of choosing the right module, naming the device and typing in its IP address.

A manual configuration of the EtherNet/IP pyrometer is based on a generic Ethernet module. In this case, the assembly instance number and size must be typed in. The device settings are:

- Data type: SINT
- Input assembly instance 101, size 23 byte
- Output assembly instance 100, size 5 byte
- Configuration assembly instance 102, size 0 (the size of the configuration assembly is 58 bytes, however, sending it empty will cause an I/O failure. Configuration assembly is available when using EDS file.)

10.2 Parameters

All settable parameters of an Endurance pyrometer are available in the Configuration Data. Changing the parameters this way can only happen upon device initialization, i.e. when downloading the program to the PLC (default values are sent if no changes have been made). Once the parameter setting has been performed, the I/O device is ready to send cyclic productive data. While certain pyrometer characteristics are parameterizable only during the configuration, others can also be set in the data exchange mode using Output Data. The tables below contain all the parametrizable characteristics and are followed by a short implementation description.

The parameters included in the configuration data are accessible through controller tags in the PLC programming environment. Changing them in the controller tags will first have effect after downloading the program to the PLC. The programming software allows however for an easy saving of these tags so that the values can always be sent as default upon initialization.

Table 10-1: Pyrometer Parameters

Starting byte	Length	Name	Data type	Data value
0	1 Byte	Temperature unit	USINT	0x43 ('C') – Celsius 0x46 ('F') – Fahrenheit
1	1 Byte	Color mode	USINT	1 – one color 2 – two color
2	4 Byte	Slope	REAL	0.85 ... 1.15
6	4 Byte	Emissivity	REAL	0.1 ... 1.1
10	4 Byte	Transmissivity	REAL	0.1 ... 1.1
14	4 Byte	Device Offset	REAL	-200 … 200
18	4 Byte	Device Gain	REAL	0.8 ... 1.2
22	4 Byte	Average Time	REAL	0.0 ... 300.0
26	4 Byte	Peak hold Time	REAL	0.0 ... 300.0
30	4 Byte	Valley hold Time	REAL	0.0 ... 300.0
34	4 Byte	Set Point	REAL	Min. … Max. Temp.
38	4 Byte	Dead Band	REAL	1.0 ... 99.0
42	4 Byte	Decay Rate	REAL	0 ... 9999
46	1 Byte	Relay control	USINT	0 - normally open 1 - normally closed 2 - permanently open 3 - permanently closed
47	1 Byte	Laser/LED control	USINT	0 - off 1 - on 2 - flashing 3 - trigger
48	1 Byte	Panel lock state	USINT	0x4C ('L') – locked 0x55 ('U') – unlocked
49	1 Byte	mA output mode	USINT	0 – 0 to 20 mA 4 – 4 to 20 mA
50	4 Byte	Analog bottom of range	REAL	Min. to max. Temp.
54	4 Byte	Analog top of range	REAL	Min. to max. Temp.

10.3 Input Data

Table 10-2: Input Data

Attribute ID	Name	Data type*	Length	Access rule
0x01	Object temperature two color	REAL	4 Byte	Read
0x02	Object temperature one color wide	REAL	4 Byte	Read
0x03	Object temperature one color narrow	REAL	4 Byte	Read
0x04	Internal temperature	REAL	4 Byte	Read
0x05	Status	DWORD	4 Byte	Read
0x06	Trigger state	USINT	1 Byte	Read
0x07	Measured attenuation	UINT	2 Byte	Read

The data must be processed (copied) into especially created tags in a correct format in accordance to column “Format”. For example, to obtain the internal temperature of the device, one should create a REAL tag and an instruction copying 4 bytes of the device’s input data into this tag, beginning with byte 12.

10.4 Output Data

Once the pyrometer has been initialized and is running in the data exchange mode, only the below listed parameters can be changed, using the device's output data.

Table 10-3: Output Data

Address without offset	Length	Format	Value
0	1 Byte	BYTE	Type of parameter
1	4 Byte	REAL / UDINT	Parameter

The <Type of parameter> gives the meaning of the following parameters with the same format as described in section 10.2 Parameters, page 71.

Table 10-4: Parameter Types

Type of parameter	Meaning	Format
0	Does not change anything	-
1	Slope	REAL
2	Emissivity	REAL
3	Transmissivity	REAL
4	Averaging time	REAL
5	Peak hold time	REAL
6	Valley hold time	REAL
7	Set point for the relay	REAL
8	Laser/LED control	UDINT

To send the parameters and their values to the device, they must be stored in the controller tags first and then copied to their destination register in the device. Please note, that most of the values of the parameters are REALs whereas the parameter for laser control uses UDINT format – at least this value must be stored in a separate tag.

10.5 Diagnostics

The EtherNet/IP device has a designated status register. The bits of this register make up for an error code, which is sent as a part of input data.

0x05	Status	DWORD	4 Byte

It can be translated using the table below.

Table 10-5: Error Codes

Bit	Description
0	Heater temperature over range
1	Heater temperature under range
2	Internal temperature over range
3	Internal temperature under range
4	Wide band detector failure
5	Narrow band detector failure
6	Energy too low
7	Attenuation for failsafe too high
8	Attenuation to activate relay too high
9	Two color temperature under range
10	Two color temperature over range
11	Wide band temperature under range
12	Wide band temperature over range
13	Narrow band temperature under range
14	Narrow band temperature over range
15	Alarm
16	Video overflow
17	EtherNet/IP not ready
18	Heater not ready