

## Endurance PN Pyrometer-System

PROFINET I/O

E1(2,3)R(M)L(H) - F1(2) - V(L,D) – 0 - 1



Technical description,  
installation and  
configuration

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## 2 Description

The Endurance PN Input/Output module maps the object temperature, internal temperature and status of pyrometer on PROFINET IO and can be used to change the initialization of the device in data exchange mode. In the initialization phase, the Endurance PN determines the physical structure of the node and creates a local process image with pyrometer.

The diagnostics concept is based on channel specific diagnostic messages that are mapped to the respective alarms. Coding is done according to IEC 61158 PROFINET IO.

The Endurance PN Input/Output module has the following features:

- Conformance class: A
- Real-Time class: 1 (RT) and the Real-Time class UDP
- Connection: 1 x M12
- Transfer speed of up to 100Mbit/s full-duplex, also with autonegotiation
- I/O update cycle time from 1 ms.
- Configurable substitute value behavior in the event of error/failure

### **3 I/O Device Configuration**

The Endurance PN takes over the task of the I/O device in PROFINET IO. Selecting the Input/Output module for the process data exchange and defining the time grid is done when configuring the I/O controller. The configuration and parameter setting of the Endurance PN is based on the device's GSD file.

#### **3.1 GSD File**

Under PROFINET IO, the features of the devices are described by the manufacturer in form of a GSD file and made available to the user. GSD file for Endurance PN device:

GSDML-V2.25-FlukeProcessInstruments-Endurance-20170413.xml

#### **3.2 Configuration**

The Endurance PN device is configured in accordance with the physical arrangement of the node (slot oriented).

Module slot 0 contains the Endurance PN in its function as station substitute. It does not deliver process data itself, but provides the parameters required to perform communication settings of the I/O device. (e.g. update cycle time)

Slot 1 (Input/Output module) reflect the physical arrangement of the pyrometer that deliver a part of the process and diagnostics data. All specific information on the relevant module is contained in the associated GSD file.

### **4 Parameter Setting**

Setting the parameters of the connected pyrometer is performed via "record data" sets. Input/Output module allow the diagnostics message to be locked or released. Once all settings have been made, the I/O device signals that it is ready to send cyclic productive data.

#### **4.1 Pyrometer parameters**

Certain characteristics of pyrometer can be parameterized during the configuration. The parameters of the pyrometer substitute are used to set the overall settings of the PROFINET IO node. Some of the settings are used in the module as default settings and can be optionally overwritten within the module configuration.

Parameter	Description	Setting
Temperature unit	Set the temperature unit	Celsius
		Fahrenheit
Color mode		1 , 2 color
Slope	* 1000 (0.9 → 900)	850 ... 1150
Emissivity	* 1000 (0.9 → 900)	100 ... 1100
Transmissivity	* 1000 (1.0 → 1000)	100 ... 1100
Sensor offset		-200 ... +200
Sensor gain		800 ... 1200
Averaging time	* 0.1s (1s → 10)	0 ...3000
Valley hold time	* 0.1s (1s → 10)	0 ...3000
Peak hold time	* 0.1s (1s → 10)	0 ...3000
Setpoint relay	in °C /°F	dev. range min.. max
Deadband		1 ...99
Decay rate		0 ...9999
Relay alarm output control		normally open, normally closed, permanently open, permanently closed.
Laser control		off / on / flashing/ trigger
Panel lock		locked / unlocked
Analog output mode	Set output mode	0 ... 20 mA / 4 ... 20 mA
Bottom temperature of output	Set bottom temperature of analog output	0...9999°C /°F
Top temperature of output	Set top temperature of analog output	0...9999°C /°F

## 4.2 Profinet alarm behavior

Parameter	Description	Setting
Message diagnostics alarm	The diagnostics information of pyrometer is not transferred to the PROFINET I/O controller	message inactive
	is transferred to the PROFINET I/O controller	message active
Message process alarm	The process alarm of pyrometer is not transferred to the PROFINET I/O controller	message inactive
	is transferred to the PROFINET I/O controller	message active
Behavior on module fault		set process data to zero, set process data to last value

## 5 Structure of the input/output data

### 5.1 Pyrometer module input data

The input data length is 23 Byte.

Address without offset	Length	Format	Value
0	4 Byte	REAL (Big Endian, Motorola)	Target Temperature 2 color
4	4 Byte	REAL (Big Endian, Motorola)	Target Temperature 1 color wide
8	4 Byte	REAL (Big Endian, Motorola)	Target Temperature 1 color narrow
12	4 Byte	REAL (Big Endian, Motorola)	Internal temperature
16	4 Byte	DWORD	Error Code
20	1 Byte	BYTE Bit0 (Bool)	Trigger state ( 0 – reset, 1 – set)
21	2 Byte	INT(Big Endian, Motorola)	Measured attenuation

### 5.2 Pyrometer module output data

The output data length of Input/Output module is 5 Byte. The output data may be used to change the initialization of the device (which was set once at start-up) when the bus is in data exchange mode.

To do so the following structure is defined:

Address without offset	Length	Format	Value
0	1 Byte	BYTE	Type of parameter
1	4 Byte	REAL/ WORD (Big Endian, Motorola)	Parameter

The <Type of parameter> gives the meaning of the following parameters (with the same format as described in section: 4.2.Parameter Setting):

Number of type	Meaning	Format
0	Do 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 control	WORD

If <Type of parameter> is set to 0 then the output data gets ignored. So it should be set to 0 as default.

## 6 Diagnostics

The diagnostics information of the fieldbus communicator can be read out acyclically using standard diagnostics data sets defined in the PROFINET IO specification.

Errors occurring when configuring and setting the parameters of the fieldbus communicator and the connected pyrometer modules as well as external errors are reported by the communicator via channel specific diagnostic.

In productive data exchange between the I/O controller and the fieldbus Endurance PN, one byte IOPS process data qualifiers are available for each module providing information of the validity of the pyrometer module data (good/ bad). In the event of an error occurs during operation, the problem-indicator in APDU-Status is set by the communicator and a diagnostic alarm is additionally transmitted.

## 6.1 The error bits of the pyrometer status register(Error code)

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	Profinet not ready
18	Heater not ready