

## 6-21 Encoder Device

**Device Type: 22 Hex**

### 6-21.1 Introduction

Encoders are used to detect positions of any kind of machines. These devices could be used for following applications: Sensing of angles, distances, tracks, velocity and motion control. This profile covers the measuring principle of absolute and incremental systems as well as the mechanical specification of rotary and linear devices.

### 6-21.2 Object Model

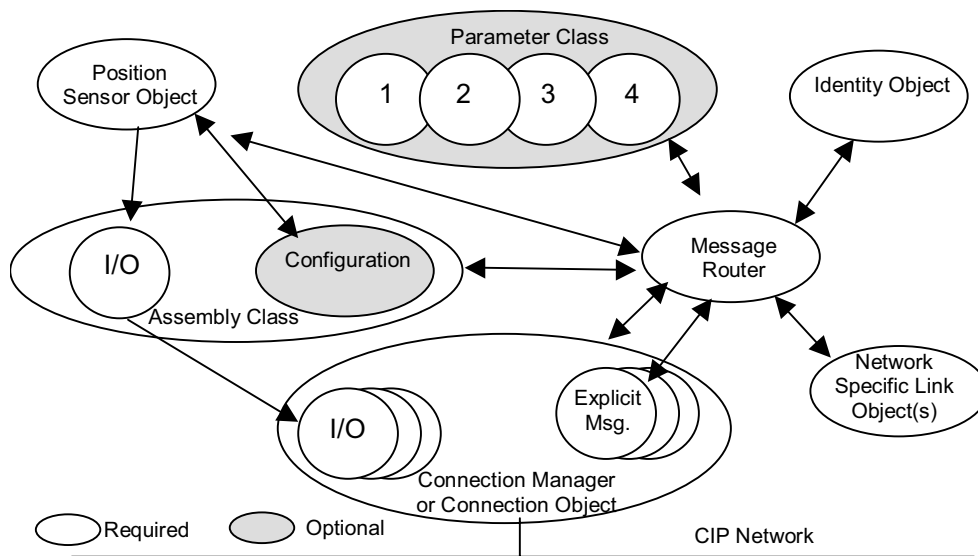
The Object Model in Figure 6-21.2 represents an encoder. The table below indicates:

- The object class
- Whether or not the class is required
- The number of instances present in each class

**Table 6-21.1 Objects Present in an Encoder Device**

Object Class	Optional / Required	# of Instances
CIP Common Required Objects	Required	See Section 6-2.1
Assembly	Required	at least 1 I/O input assembly
Parameter	Optional	-
Position Sensor	Required	1

**Figure 6-21.2 Object Model for an Encoder Device**



### 6-21.3 How Objects Affect Behavior

Objects supported for the encoder affect the device's behavior as shown in the table below.

**Table 6-21.3 Object Effect on Behavior**

Object	Effect on Behavior
CIP Common Required	See Section 6-2.2 for details.
Assembly	Defines I/O data format
Parameter	Provides a public interface to the device's configuration data
Position Sensor	Affects Value (attribute)

### 6-21.4 Defining Object Interfaces

Objects supported for the encoder have the interfaces listed in the table below.

**Table 6-21.4 Objects Interfaces**

Object	Interface
CIP Common Required	See Section 6-2.3 for details.
Assembly	I/O Connection or Message Router
Parameter	Message Router
Position Sensor	Message Router, Assembly Object or Parameter Object

### 6-21.5 I/O Assembly Instances

The following table identifies the I/O Assembly instances, which should be supported by the encoder device.

**Table 6-22.5 I/O Assembly Instances**

Number	Required/Optional	Type	Name
1	Required	Input	Position Value 1 Axis
2	Optional	Input	Position Value 1 axis & Warning Flag 1 axis & Alarm Flag 1 axis
3	Optional	Input	Position Value 1 axis & Velocity 1 axis
4	Optional	Input	Position Value 1 axis & Position Value 2 axis
5	Optional	Input	Position Value 1 axis & Velocity 1 axis & Position Value 2 axis & Velocity 2 axis

**6-21.6 I/O Assembly Data Attribute Format**

The I/O assembly data attributes have the format shown below.

**Table 6-21.6 I/O Assembly Data Attribute Format**

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	0	Position Value 1 axis (low byte)							
	1	Position Value 1 axis							
	2	Position Value 1 axis							
	3	Position Value 1 axis (high byte)							
2	0	Position Value 1 axis (low byte)							
	1	Position Value 1 axis							
	2	Position Value 1 axis							
	3	Position Value 1 axis (high byte)							
	4	Vendor Specific				Reserved by CIP			Warning Flag 1 Axis
3	0	Position Value 1 axis (low byte)							
	1	Position Value 1 axis							
	2	Position Value 1 axis							
	3	Position Value 1 axis (high byte)							
	4	Velocity 1 axis (low byte)							
	5	Velocity 1 axis							
	6	Velocity 1 axis							
	7	Velocity 1 axis (high byte)							
4	0	Position Value 1 axis (low byte)							
	1	Position Value 1 axis							
	2	Position Value 1 axis							
	3	Position Value 1 axis (high byte)							
	4	Position Value 2 axis (low byte)							
	5	Position Value 2 axis							
	6	Position Value 2 axis							
	7	Position Value 2 axis (high byte)							
5	0	Position Value 1 axis (low byte)							
	1	Position Value 1 axis							
	2	Position Value 1 axis							
	3	Position Value 1 axis (high byte)							
	4	Velocity 1 axis (low byte)							
	5	Velocity 1 axis							
	6	Velocity 1 axis							
	7	Velocity 1 axis (high byte)							
	8	Position Value 2 axis (low byte)							
	9	Position Value 2 axis							
	10	Position Value 2 axis							
	11	Position Value 2 axis (high byte)							
	12	Velocity 2 axis (low byte)							
	13	Velocity 2 axis							
	14	Velocity 2 axis							
	15	Velocity 2 axis (high byte)							

## 6-21.7 Mapping I/O Assembly Data Attribute Components

The following table indicates the I/O Assembly Data Attribute mapping for the Encoder Profile.

**Table 6-21.7 I/O Assembly Data Mapping**

Data Component Name	Class		Instance Number	Attribute	
	Name	Number		Name	Number
Position Value 1 axis	Position Sensor	23 <sub>hex</sub>	1	Position Value	10
Velocity 1 axis	Position Sensor	23 <sub>hex</sub>	1	Velocity	24
Warning Flag 1 axis	Position Sensor	23 <sub>hex</sub>	1	Warning Flag	49
Alarm Flag 1 axis	Position Sensor	23 <sub>hex</sub>	1	Alarm Flag	46
Position Value 2 axis	Position Sensor	23 <sub>hex</sub>	1	Position Flag	10
Velocity 2 axis	Position Sensor	23 <sub>hex</sub>	1	Velocity	24

## 6-21.8 Defining Device Configuration

Public access to the Position Sensor Object must be supported for configuration of an encoder device. If supported, the optional Parameter Objects may be used to access the various configuration attributes in the Position Sensor Object.

Encoder devices may contain (but are not limited to) any of the Parameter Object instances listed in the table below. Suggested parameter names are also given in the table. The set of parameters instances that are supported by a drive should be numbered sequentially with lower instance numbers assigned to parameters that appear earlier in the table. Vendor specific parameter instances should be numbered sequentially following the instances that appear in the following table.

Parameter Object instances may be implemented as EDS file definitions, parameter stubs, or full parameter objects. See Chapter 5 of the CIP Common specification for a definition of the Parameter Object and an explanation of how it is used for configuration.

## 6-21.9 Mapping Parameter Object Data

The following table indicates the Parameter Object data mapping for encoder devices.

**Table 6-21.8 Parameter Object Data Mapping**

Configuration Parameter Name	Class		Instance Number	Attribute	
	Name	Number		Name	Number
Direct Counting Toggle	Position Sensor	23 <sub>hex</sub>	1	Direction Counting Toggle	12
Commissioning Diagnostic Control	Position Sensor	23 <sub>hex</sub>	1	Commissioning Diagnostic Control	12
Scaling Function Control	Position Sensor	23 <sub>hex</sub>	1	Scaling Function Control	14
Position Format	Position Sensor	23 <sub>hex</sub>	1	Position Format	15
Measuring units per Span	Position Sensor	23 <sub>hex</sub>	1	Measuring Units	16

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Configuration Parameter Name	Class		Instance Number	Attribute	
	Name	Number		Name	Number
				per Span	
Total Measuring Range in measuring units	Position Sensor	23 <sub>hex</sub>	1	Total Measuring Range in measuring units	17
Position Measuring Increment	Position Sensor	23 <sub>hex</sub>	1	Position Measuring Increment	18
Preset Value	Position Sensor	23 <sub>hex</sub>	1	Preset Value	19
Position Value 1 axis	Position Sensor	23 <sub>hex</sub>	2	Position Value	10
Position Value 2 axis	Position Sensor	23 <sub>hex</sub>	1	Position Value	10
Operating Status	Position Sensor	23 <sub>hex</sub>	1	Operating Status	41
Physical Resolution Span	Position Sensor	23 <sub>hex</sub>	1	Physical resolution span	42
Number of Span	Position Sensor	23 <sub>hex</sub>	1	Number of Span	43
Alarm Flag 1 axis	Position Sensor	23 <sub>hex</sub>	1	Alarm Flag	46
Alarm Flag 2 axis	Position Sensor	23 <sub>hex</sub>	2	Alarm Flag	46
Alarms	Position Sensor	23 <sub>hex</sub>	1	Alarms	44
Supported Alarms	Position Sensor	23 <sub>hex</sub>	1	Supported Alarms	45
Warning Flag 1 axis	Position Sensor	23 <sub>hex</sub>	1	Warning Flag	49
Warning Flag 2 axis	Position Sensor	23 <sub>hex</sub>	2	Warning Flag	49
Warnings	Position Sensor	23 <sub>hex</sub>	1	Warnings	47
Supported Warnings	Position Sensor	23 <sub>hex</sub>	1	Supported Warnings	48