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Industrial Control Design AS



FrabaOCDIOServer V1.3

User Manual

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Contents

1. INTRODUCTION.....	3
1.1. About.....	3
2. FRABA OCD ENCODER SETUP.....	4
2.0.1. Encoder setup.....	4
3. CONFIGURATION.....	5
3.0.1. Usage.....	5
3.1. fs.....	5
3.2. IOConfig/Node.....	5
3.2.1. Description.....	5
3.2.2. Example XML.....	5
3.3. BitsPerTurn.....	6
3.3.1. Example XML.....	6
3.4. BitsTurns.....	6
3.4.1. Example XML.....	6
3.5. Counting direction.....	6
3.5.1. Example XML.....	6
3.6. CommandResponseTimeout.....	6
3.6.1. Example XML.....	6
3.7. NetworkInterface.....	6
3.7.1. Example XML.....	6
3.8. Signals.....	7
3.8.1. Description.....	7
3.9. Parameters.....	7
3.10. Messages.....	8
3.11. Alarms.....	8
4. APPENDIX.....	9
4.0.1. Example component .xml.....	9

1. Introduction

1.1. About

The FrabaOCDIOServer component provides access to the FRABA OCD Absolute Encoder. It connects to the encoder through a TCP connection to:

- Set time mode to polled
- Set counting direction
- Set output mode to Position, Velocity, Timestamp
- Set output mode to binary

The TCP connection is then closed, and a UDP connection is established with the device to send/receive data at the specified component frequency.

The following information is retrieved from the encoder:

- Position
- Speed
- Timestamp

Information abstracted from above:

- Internal fraction of turn, masked from Position
- Number of turns, masked from Position
- radians per second
- degrees per second
- speed of device
- position calculated
- position relative
- filtered speed of device
- Rotation (degrees)

2. FRABA OCD Encoder Setup

2.0.1. Encoder setup

The encoder must be set up with the correct IP address. Normally, the Fraba Encoder comes with IP address 10.10.10.10 as default. To change the encoder IP address, you can first change your own (PC) IP address to 10.10.10.x (x!=10).

- Power off the Fraba encoder, open it and set dipswitch 2 to "on". Put it back together and power it up.
- Open a web-browser (f.i. Internet Explorer) and type the address <http://10.10.10.10/>
- Click on "[Email and Network Configuration](#)".
- Wait for the Java applet to load (You must have Java installed).
- Under 'Network Configuration', change Encoder IP Address to wanted address, along with netmask and gateway.
- Change back your own IP address to what it was before.
- Power off the Fraba encoder, open it and set dipswitch 2 to "off". Put it back together.
- Power on the Fraba encoder.

It should now show its interface on the new IP Address that you set above.

3. Configuration

Configuration is done by modifying the component xml file inside the Application\Components\ folder. It should not be necessary to modify the model xml file.

3.0.1. Usage

Instantiate as subcomponent or component in Application.xml:

```
<Subcomponents>
  ..
  <Subcomponent Name="FrabaOCDIOserver" src="Components\FrabaOCDIOserver.xml"></Subcomponent>
  ..
</Subcomponents>
```

3.1. fs

The <fs> element specifies the frequency of which to run the reading and writing of the Input/Output values. <fs>100</fs> means 100 Hz, so a read and write is done every 10 milliseconds. If the runningTooFast alarm is constantly set, then you could have specified a too high fs. Typically, the maximum fs for the Wago IPC is 200 Hz.

If you want to use the '**SpeedCalculated**' signal, you must set the '**Radius**' parameter to the correct value (in meters).

If you want to use the '**PositionCalculated**' signal, you must set the '**PositionOffset**' parameter to a correct value.

In addition, the '**SignalTimeout**' parameter must be set to a non-zero value.

3.2. IOConfig/Node

3.2.1. Description

IOConfig is an XML element that wraps the configuration of the Fraba OCD Encoder.

3.2.2. Example XML

```
<IOConfig>
  <Node Name="Fraba">
    <BitsPerTurn>16</BitsPerTurn>
    <BitsTurns>14</BitsTurns>
    <CountingDir>CW</CountingDir>
    <CommandResponseTimeout>10.0</CommandResponseTimeout>
    <NetworkInterface LocalName="ETH0" RemoteIP="10.0.2.95" RemotePort="5000"></NetworkInterface>
  </Node>
</IOConfig>
```

3.3. BitsPerTurn

On the encoder casing, read the number behind Steps/Revolution. Figure out how many bits are needed to represent this number and put this number into the BitsPerTurn configuration element.

3.3.1. Example XML

```
<BitsPerTurn>16</BitsPerTurn>
```

3.4. BitsTurns

On the encoder casing, read the number behind No. of Revolutions. Figure out how many bits are needed to represent this number and put this number into the BitsTurns configuration element.

3.4.1. Example XML

```
<BitsTurns>14</BitsTurns>
```

3.5. Counting direction

The counting direction for the encoder. Can be set to either CW (ClockWise) or CCW(CounterClockWise)

3.5.1. Example XML

```
<CountingDir>CW</CountingDir>
```

3.6. CommandResponseTimeout

Timeout in seconds per command on initial setup of the unit.

3.6.1. Example XML

```
<CommandResponseTimeout>10.0</CommandResponseTimeout>
```

3.7. NetworkInterface

Set up the ip address parameters of the Encoder in this section.

3.7.1. Example XML

```
<NetworkInterface LocalName="ETH0" RemoteIP="10.0.2.95" RemotePort="5000"></NetworkInterface>
```

NetworkInterface Attribute	Description
LocalName	The name of an ethernet interface to use, as defined in Application.xml
RemoteIP	The IPAddress of the device to communicate with
RemotePort	The port of the device to communicate with.

3.8. Signals

3.8.1. Description

Several signals are available from this IOServer, see the table below.

Signal Name	Description
PositionInternal	Internal position from encoder
SpeedInternal	Internal speed from encoder
TimeInternal	Internal time from encoder
InternalTurns	Number of turns (masked from absolute position)
InternalFractionalTurn	Internal fraction of turn, masked from PositionInternal
SpeedCalculated	Calculated speed (= RadPerSec * Radius * GearRatio)
RadPerSec	Radians per second
DegPerSec	Degrees per second
PositionCalculated	Calculated/scaled position: = (PositionRelative/PositionRelativeMax) * (DevicePositionMax-DevicePositionMin)+DevicePositionMin. Can be limited by parameter LimitPositionCalculated.
AbsolutePosition	The absolute position (in turns - i.e 2.5 = 2 and a half turns)
PositionRelative	Distance from zero position, as set by message SetMaxPosition = AbsolutePosition - ABSOffset
Rotation	Rotation angle position: = (MaximumAngle-MinimumAngle)/(MaximumTurnEncoder-MinimumTurnEncoder)*(AbsolutePosition-MinimumTurnEncoder)+ MinimumAngle
SpeedFiltered	Filtered speed, as calculated by IIRFilter with SpeedFilterF3db parameter.

3.9. Parameters

The following parameters are available:

Value	Description
SignalTimeout	Specify the time in seconds to pass from sending a request until no answer is received, causing an Offline state.
ABSOffset	Absolute position offset
TurnOffset	Offset for number of turns (so number of turns can be extended to signed 32 bit).
limitRotationOneTurn	Set rotation limitation to one turn.
MinimumAngle	The minimum rotational angle
MaximumAngle	The maximum rotational angle
MinimumTurnEncoder	The minimum turn/absolute position on encoder that corresponds to the minimumAngle. Will be set by Message SetRotationMinOffset.
MaximumTurnEncoder	The maximum turn/absolute position on encoder that corresponds to the maximumAngle. Will be set by Message SetRotationMaxOffset.
DevicePositionMax	Maximum position of device connected to encoder.
DevicePositionMin	Minimum position of device connected to encoder
LimitPositionCalculated	if set to 1, limit m_positionCalculated between devicePositionMax and devicePositionMin
PositionRelativeMax	The maximum PositionRelative as set by SetMaxPosition message.
Gear ratio	Gear ratio between encoder and connected device. Value less than one when encoder rotates faster than the connected device
Radius	Radius of hub on the encoder.
SpeedFilterF3db	SpeedFilter cut-off frequency.

3.10. Messages

The Following messages are available:

Value	Description
SetABSOffset	Sets 'ABSOffset' equal to AbsolutePosition.
SetRotationMinimum	Sets 'MinimumTurnEncoder' equal to AbsolutePosition.
SetRotationMaximum	Sets 'MaximumTurnEncoder' equal to AbsolutePosition.
SetMaxPosition	Sets 'PositionRelativeMax' equal to 'PositionRelative' signal.

3.11. Alarms

The following alarm can trigger from this IOServer:

Alarm Name	Description
Transmission Error	Is set when IOServer goes Offline.

4. Appendix

4.0.1. Example component .xml

```

<?xml version="1.0" encoding="iso-8859-1"?>
<Component Name="FRABAOCDIOServer" Model="FrabaOCDIOServer">
  <Activate>5</Activate>
  <fs>100</fs>

  <Description><![CDATA[
    IOServer to communicate with Fraba OCD Encoder
  ]]></Description>
  <IOConfig>
    <Node Name="Fraba">
      <BitsPerTurn>16</BitsPerTurn>
      <BitsTurns>14</BitsTurns>
      <CountingDir>CW</CountingDir>
      <CommandResponseTimeout>10.0</CommandResponseTimeout>
      <NetworkInterface LocalName="ETH0" RemoteIP="10.0.2.38" RemotePort="5000"></NetworkInterface>
    </Node>
  </IOConfig>
  <Signals>
    <Signal Name="Send-Receive Roundtrip time" Unit="s" Type="double" Description="The time needed to perform one send and receive."></Signal>
    <Signal Name="PositionInternal" Input="1" Type="unsigned int" Unit="" Value="" Routing="No routing" Description="Internal position from encoder"></Signal>
    <Signal Name="SpeedInternal" Input="1" Type="int" Unit="" Value="" Routing="No routing" Description="Internal speed from encoder"></Signal>
    <Signal Name="TimeInternal" Input="1" Type="unsigned int" Unit="us" Value="" Routing="No routing" Description="Internal time from encoder"></Signal>
    <Signal Name="InternalTurns" Input="0" Type="int" Unit="" Description="Number of turns (masked out from absolute position)"></Signal>
    <Signal Name="InternalFractionalTurn" Input="0" Type="int" Unit="" Description="Internal fraction of turn, masked from PositionInternal"></Signal>
    <Signal Name="SpeedCalculated" Input="0" Type="double" Unit="" Description="Calculated speed (RadPerSec * Radius * GearRatio)"></Signal>
    <Signal Name="RadPerSec" Input="0" Type="double" Unit="Rad/s" Description="Radians per second"></Signal>
    <Signal Name="DegPerSec" Input="0" Type="double" Unit="Deg/s" Description="Degrees per second"></Signal>
    <Signal Name="PositionCalculated" Input="0" Type="double" Unit="Meters" Description="Calculated/scaled position: PositionCalculated = (PositionRelative/PositionRelativeMax) * (DevicePositionMax-DevicePositionMin)+DevicePositionMin. Can be limited by parameter LimitPositionCalculated." CppName="m_positionCalculated"></Signal>
    <Signal Name="AbsolutePosition" Input="0" Type="double" Unit="Turns" Description="The absolute position (in turns - i.e 2.5 = 2 and a half turns)" CppName="m_absolutePosition"></Signal>
    <Signal Name="PositionRelative" Input="0" Type="double" Unit="Turns" Description="Distance from zero position, as set by message SetMaxPosition" CppName="m_positionRelative"></Signal>
    <Signal Name="Rotation" Input="0" Type="double" Unit="Deg" Description="Rotation = (MaximumAngle-MinimumAngle)/(MaximumTurnEncoder-MinimumTurnEncoder)*(AbsolutePosition-MinimumTurnEncoder)+ MinimumAngle" CppName="m_rotation"></Signal>
    <Signal Name="SpeedFiltered" Input="0" Type="double" Unit="m/s" Description="Filtered speed" CppName="m_speedFiltered"></Signal>
  </Signals>

  <Alarms>
    <Alarm Name="Transmission Error" Level="Error" Enabled="0" Text="Network connection down for cylinder length sensor." Description="The cylinder length sensor is not responding to network requests, indicating a problem with the network cable, switch or device in question." Set="0" Unacknowledged="0"></Alarm>
  </Alarms>

  <Parameters>
    <Parma Name="SignalTimeout" Value="0.1" DefaultValue="0" PreviousValue="0.05" TimeLastChanged="Thu Mar 01 20:08:48 2007" Description="Timeout from sending packet to going to Offline." Unit=""></Parma>
    <Parma Name="ABSOffset" Unit="Turns" Value="16424.119" DefaultValue="0" PreviousValue="16405.002" TimeLastChanged="Tue Oct 07 18:10:02 2008" Description="Absolute position offset" CppName="m_aBSOffset"></Parma>
    <Parma Name="TurnOffset" Unit="N/A" Value="16384" DefaultValue="0" PreviousValue="0" TimeLastChanged="Sun Mar 04 15:07:56 2007" Description="Offset for number of turns (so number of turns can be extended to signed 32 bit)." CppName="m_radius"></Parma>

    <Parma Name="limitRotationOneTurn" Unit="0 / 1" Value="0.0" DefaultValue="0.0" PreviousValue="0.0" TimeLastChanged="" Description="Set rotation limitation to one turn." CppName="m_limitRotationOneTurn"></Parma>
    <Parma Name="MinimumAngle" Unit="Deg" Value="0.0" DefaultValue="0.0" PreviousValue="0.0" TimeLastChanged="" Description="The minimum rotational angle" CppName="minimumAngle"></Parma>
    <Parma Name="MaximumAngle" Unit="Deg" Value="360" DefaultValue="360" PreviousValue="360" TimeLastChanged="" Description="The maximum rotational angle" CppName="maximumAngle"></Parma>
    <Parma Name="MinimumTurnEncoder" Unit="Turns" Value="16429.307" DefaultValue="0" PreviousValue="16428.276" TimeLastChanged="Tue Oct 07 18:29:47 2008" Description="The minimum turn/absolute position on encoder that corresponds to the minimumAngle. Will be set by Message SetRotationMinOffset." CppName="m_minimumTurnEncoder"></Parma>
    <Parma Name="MaximumTurnEncoder" Unit="Turns" Value="16430.312" DefaultValue="0" PreviousValue="7.39328" TimeLastChanged="Tue Oct 07 18:29:57 2008" Description="The maximum turn/absolute position on encoder that corresponds to the maximumAngle. Will be set by Message SetRotationMaxOffset." CppName="m_maximumTurnEncoder"></Parma>

    <Parma Name="DevicePositionMax" Unit="m" Value="40" DefaultValue="1" PreviousValue="20" TimeLastChanged="Tue Oct 07 18:07:24 2008" Description="Maximum position of device connected to encoder."></Parma>
    <Parma Name="DevicePositionMin" Unit="m" Value="0.0" DefaultValue="0.0" PreviousValue="0.0" TimeLastChanged="" Description="Minimum position of device connected to encoder"></Parma>
    <Parma Name="LimitPositionCalculated" Unit="0/1" Value="0" DefaultValue="1" Description="if set to 1, limit m_positionCalculated between devicePositionMax and devicePositionMin" PreviousValue="1" TimeLastChanged="Tue Oct 07 18:08:21 2008"></Parma>
    <Parma Name="PositionRelativeMax" Unit="Turns" Value="19.116637" DefaultValue="7.56" PreviousValue="14.150208" TimeLastChanged="Tue Oct 07 17:59:22 2008" Description="The maximum PositionRelative as set by SetMaxPosition message."></Parma>
  </Parameters>

```

```
<Parma Name="Gear ratio"          Unit=""          Value="1"          DefaultValue="0.26" Description="Gear ratio
between encoder and winch. Value less than one when encoder rotates faster than the winch." PreviousValue="0.130508"
TimeLastChanged="Tue Feb 27 18:42:27 2007"></Parma>
<Parma Name="Radius"            Value="0.02"      DefaultValue="0"     PreviousValue="0.01" TimeLastChanged="Fri Feb
23 11:48:59 2007" Description="Radius of hub connected to encoder." Unit=""></Parma>
<Parma Name="SpeedFilterF3db"   Unit=""          Value="1"          DefaultValue="1"     Description="SpeedFilter cut-off
frequency." PreviousValue="0.1" TimeLastChanged="Tue Oct 07 17:57:50 2008"></Parma>
</Parameters>

<Subcomponents>
</Subcomponents>

<RemoteComponents>
</RemoteComponents>

</Component>
```