ROBOTICS

# Application manual

## CC-Link IE Field Basic

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# Application manual

# CC-Link IE Field Basic

RobotWare 7.15

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Original instructions.

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# Overview of this manual

## About this manual

This manual describes the following options and contains instructions on how to configure them in an OmniCore system.

- 3066-1 *CC-Link IE Field Basic Master*
- 3066-2 *CC-Link IE Field Basic Device*

> **Note**
>
> It is the responsibility of the integrator to provide safety and user guides for the robot system.

## Usage

This manual should be used during installation and configuration of the option for CC-Link IE Field Network Basic.

> **Note**
>
> Before any work on or with the robot is performed, the safety information in the product manual for the controller and manipulator must be read.

## Who should read this manual?

This manual is intended for:

- Personnel that are responsible for installations and configurations of industrial network hardware/software.
- Personnel that make the configurations of the I/O system.
- System integrators.

## Prerequisites

The reader should have the required knowledge of:

- CC-Link network
- I/O system configuration
- OmniCore controller
- RobotStudio

## References

ABB documents

| Reference | Document ID |
|---|---|
| *Application manual - I/O Engineering* | *3HAC082346-001* |
| *Technical reference manual - System parameters* | *3HAC065041-001* |
| *Product manual - OmniCore C30* | *3HAC060860-001* |
| *Product manual - OmniCore C90XT* | *3HAC073706-001* |

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| Reference | Document ID |
|---|---|
| *Product manual - OmniCore E10* | *3HAC079399-001* |
| *Product manual - OmniCore V250XT Type B* | *3HAC087112-001* |
| *Product manual - OmniCore V400XT* | *3HAC081697-001* |
| *Operating manual - OmniCore* | *3HAC065036-001* |
| *Operating manual - RobotStudio* | *3HAC032104-001* |
| *Operating manual - Integrator's guide OmniCore* | *3HAC065037-001* |

### Other references

| Reference | Description |
|---|---|
| https://www.cc-link.org/ | CC-Link Partner Association (CLPA) |

## Revisions

| Revision | Description |
|---|---|
| A | First edition. Released with RobotWare 7.6. |
| B | Released with RobotWare 7.7.<br>• Minor corrections in *CC-Link IE Field Basic for OmniCore on page 12*.<br>• Reference to AM I/O Engineering added, and section "I/O Engineering user interface" removed. |
| C | Released with RobotWare 7.10.<br>• Minor updates in *CC-Link IE Field Basic for OmniCore on page 12*. |
| D | Released with RobotWare 7.12.<br>• Option 3066-1 *CC-Link IE Field Basic Master* added. |
| E | Released with RobotWare 7.13.<br>• Minor updates in *Network connections on page 13*. |
| F | Released with RobotWare 7.15.<br>• Minor corrections. |

# Network security

## Network security

This product is designed to be connected to and to communicate information and data via a network interface. It is your sole responsibility to provide, and continuously ensure, a secure connection between the product and to your network or any other network (as the case may be).

You shall establish and maintain any appropriate measures (such as, but not limited to, the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB Ltd and its entities are not liable for damage and/or loss related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

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# 1 Introduction

## 1.1 What is CC-Link IE Field Basic

### General

CC-Link IE is a protocol for communication between a PLC (Programmable Logic Controller) and remote input/output devices. CC-Link IE is governed by the CC-Link Partner Association (CLPA).

### Standardization

CC-Link IE conforms to the following international standards:

- International Standard: ISO, ISO15745-5
- International Standard: IEC, IEC61158 and IEC61784

### Communication profiles

CC-Link IE has a modular design and different communication profiles are all combinations of modular elements from the groups transmission technology, communication protocol, and application profiles.

The communication profile used in CC-Link IE for OmniCore is CC-Link IE Field Basic. This is a Ethernet based network with the following characteristics:

- Standard Ethernet UDP/IP communication.
- Cyclic communication between master and devices.
- Devices can be assigned to groups. The master station talks to each group sequentially. Each device belongs to one group only.

### CSP+ file

CC-Link IE uses CSP+ files (.cspp) for configuration. The CSP+ (Control & Communication System Profile Plus) file is an XML-based format file that is used to describe the devices (network parameter information, memory map, etc.). The file can be imported into the engineering tool, and is used to set up the communication between the PLC/controller and the devices.

### Data

The following table specifies a number of CC-Link IE data:

| | |
|---|---|
| Network type | Ethernet based |
| Communication profile | CC-Link IE Field Basic |
| Installation | Standard Off the Shelf (COTS) Ethernet cables and connectors.<br>10/100/1000 Mbit/s TX Ethernet cable or fibre optics.<br>RJ45, M12 or fibre optic connectors. |
| Speed | 100 Mbit/s |
| Hardware requirements | No specialized hardware required. |
| Number of stations per network | 64 |

## 1.2 CC-Link IE Field Basic for OmniCore

### General

The CC-Link IE Field Basic network is running on the OmniCore main computer and does not require any additional hardware.

### Options

In order to run CC-Link IE Field Basic, the following options are required:

- 3066-1 *CC-Link IE Field Basic Master*
- 3066-2 *CC-Link IE Field Basic Device*

> **Note**
>
> In this manual, the 3066-2 *CC-Link IE Field Device* is referred to as *internal device*.

### Compatibility

CC-Link IE Field Basic has passed conformance tests to ensure compatibility according to the CC-Link IE Conformance Test Regulation from CC-Link Partner Association (CLPA).

The device is certified for the CC-Link IE Field Basic version 2.

### Specification overview, external device

| Item | Specification |
|---|---|
| CC-Link IE Field Basic version | 2 |
| Connection size | Maximum 16 devices per master. |

> **Note**
>
> No cyclic time can be set. The external devices will answer as fast they can.

### Specification overview, internal device

| Item | Specification |
|---|---|
| CC-Link IE Field Basic version | 2 |
| CSP+ version | CCLinkFamilyProfileVersion 2.2 |
| Connection size | Maximum 288 input bytes and 288 output bytes. |
| Number of stations per internal device | Maximum 4 stations. Each station holds 72 bytes. |

### Predefined internal device

When the robot system is installed with the CC-Link IE Field Network Basic option, a predefined network with the name **CC_Link_IE** and a device with the name **CC_Internal_Device** are created at system startup.

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The network and the internal device are ready to be used at once, see *Quick start instructions on page 15*.

However, if needed, the internal device can be configured using I/O Engineering in RobotStudio. For example, you can define device names, identification labels, input and output sizes and edit signals, see *Configuring the CC-Link IE Field Basic system on page 21*.

**Note**

The defined IP address controls whether **CC_Link_IE** is run on the Public Network or the I/O Network.

## Application protocols

For information about application protocols and port numbers, see section "OmniCore application protocols" in *Operating manual - Integrator's guide OmniCore*.

## Network connections

**Note**

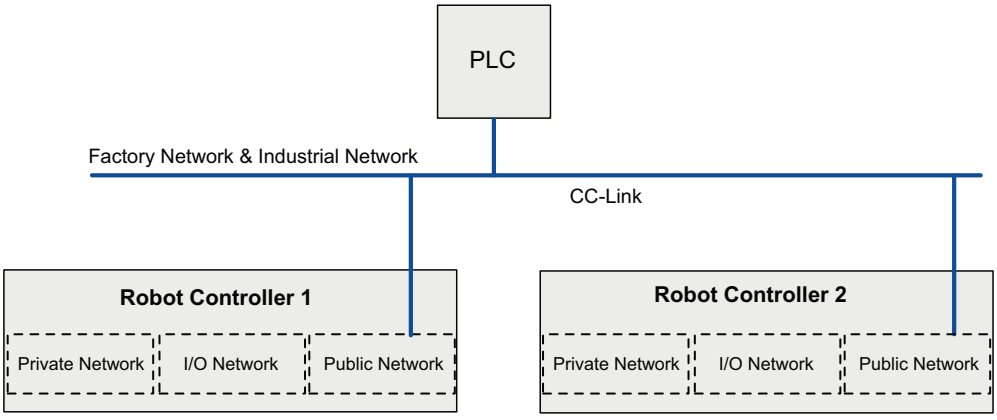
For information regarding port connectors for the network segments, see *Operating manual - Integrator's guide OmniCore* or the Product manual for the respective OmniCore controller.

**Note**

No manual port selection is needed for the device, as the internal device automatically detects to which interface the device is connected.

### CC-Link on public network

The following figure illustrates the network when connecting a PLC to the public network:

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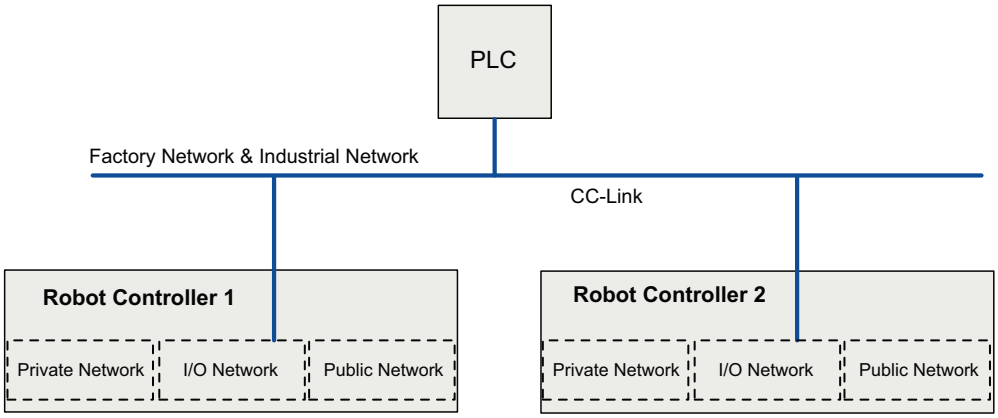
### CC-Link on I/O network

The following figure illustrates the network when connecting a PLC to the I/O network:

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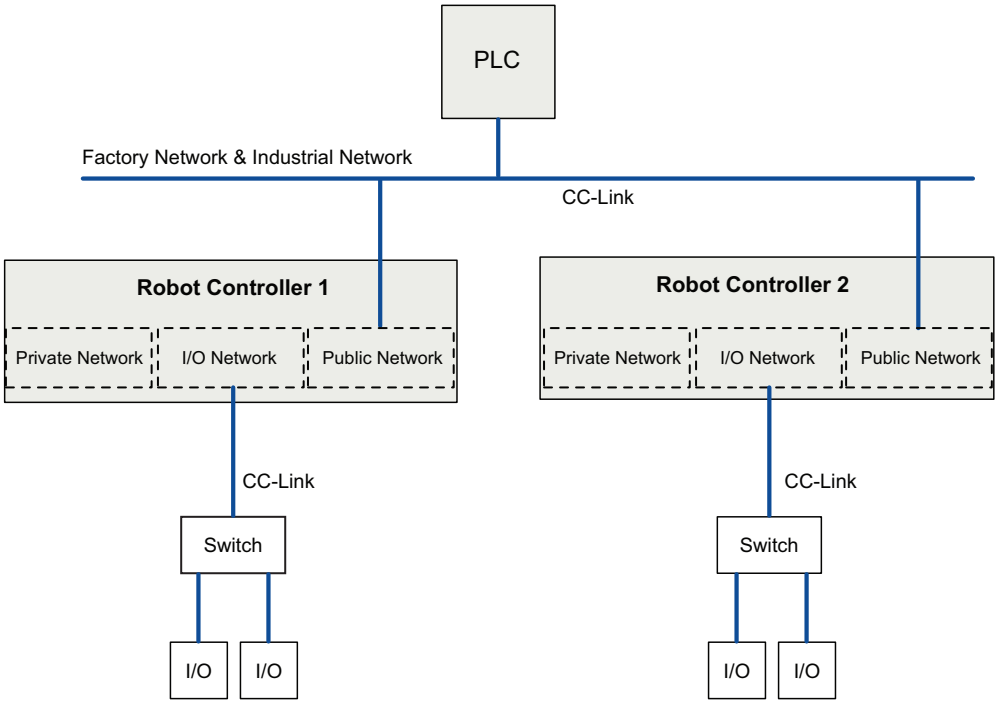
**Note**

The I/O Network is not available for OmniCore E10.

### CC-Link with internal and external devices

Internal and external devices on CC-Link cannot be used on the same network.

The following illustration shows an example of how to configure the network when using both internal and external devices:

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# 2 Quick start instructions

## Quick start

The CC-Link IE Field Basic system is predefined. Follow this procedure for a quick start of the CC-Link IE Field Basic functionality:

- Create a system with options 3066-1 *CC-Link IE Field Basic Master* and/or 3066-2 *CC-Link IE Field Basic Device*. See *Operating manual - Integrator's guide OmniCore*.
- Define the IP address on the robot controller physical port to be used. See *Operating manual - Integrator's guide OmniCore*.
- Open the firewall for the ports using the **Firewall Manager**. See *Operating manual - Integrator's guide OmniCore*.
- Connect the CC-Link IE Field Basic equipment to the physical port.
- Configure the system using I/O Engineering in RobotStudio. See *Configuring the CC-Link IE Field Basic system on page 21* and *Application manual - I/O Engineering*.

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# 3 Setting up your CC-Link IE Field Basic system

**Log in with configuration grant**

For configuration in I/O Engineering, the user grant **Modify configuration** is required. See *Operating manual - RobotStudio*, section *Managing user rights and write access on a controller*.

**Start I/O Engineering**

1. Start RobotStudio and connect to the robot system to configure.
2. In the ribbon of the **Controller** tab, select **I/O Engineering**.

   See *Application manual - I/O Engineering* for more information.

**Configure IP settings**

IP settings for the CC-Link IE Field Basic network used on the Public or I/O Network are defined in **Network Settings** in RobotStudio or on the FlexPendant. See *Operating manual - RobotStudio* and *Operating manual - Integrator's guide OmniCore*.

**Configure firewall settings**

The Firewall Management function is used to configure the network firewall on the controller. Configuration is done in RobotStudio under **Configuration\Communication\Firewall Manager** where pre-configured Network Services can be enabled or disabled. See *Operating manual - RobotStudio* and *Operating manual - Integrator's guide OmniCore*.

**Configure the network properties**

1. In the **Controller** tab in RobotStudio, select **I/O Engineering**. The **I/O Engineering** tab is displayed.
2. In the **Configuration** browser, select **CC_Link_IE** (under I/O system).

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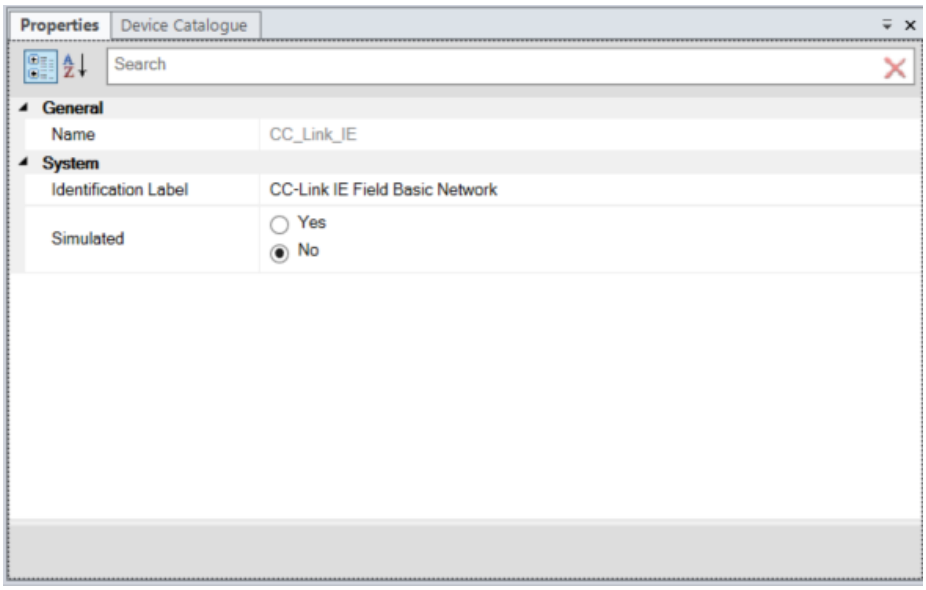
3 In the **Properties** browser, you can configure the following:

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| Parameter | Description | Allowed values |
|---|---|---|
| **Identification Label** | This parameter is an optional way to provide a label that will help the operator to identify the internal device.<br>**Note**<br>If this information is changed, it is updated both for the network and the master. | A string with maximum 80 characters. |
| **Simulated** | Select **Yes** or **No**, indicating if the industrial network and all its connected I/O devices should be treated as simulated.<br>**Note**<br>If this information is changed, it is updated for all devices connected to the network and the master. | The default value is No. |

## Import CSP+ files

A CSP+ file contains data about a device. It is necessary to add CSP+ files for all devices that should be added. It is also possible to add CSP+ files for any devices that may be added later.

1 In the **I/O Engineering** tab, select **Import files** > **CSP+ Files**, or right-click on **CC_Link_IE** (under I/O system) and select **Manage CSP+ files**.

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2 The **CSP+ Files** window is displayed. Click **Import** and browse for an CSP+ file, or **Import, Folder** to import a complete folder with CSP+ files.

**Note**

The **Used CSP+ files** window shows all CSP+ files that are used in the current I/O project.

The **Imported CSP+ files...** window shows all CSP+ files that are imported into the I/O project but are not used in the configuration.

**Note**

When a new I/O project is opened, only the used CSP+ files will be shown in the **Imported CSP+ files...** window. Click **Update** to display all previously imported, but not used, CSP+ files.

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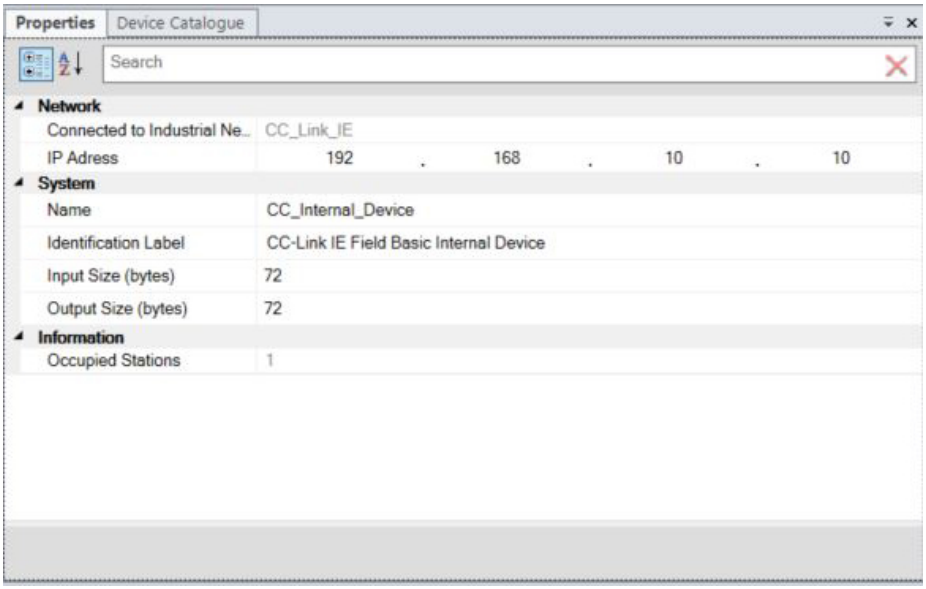
# 4 Configuring the CC-Link IE Field Basic system

## 4.1 Configuring the internal device properties

**Configure the internal device properties**

1. In the **Controller** tab in RobotStudio, select **I/O Engineering**. The **I/O Engineering** tab is displayed.
2. In the **Configuration** browser, select the internal device.
3. In the **Properties** browser, you can configure the following:

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| Parameter | Description | Allowed values |
|---|---|---|
| **IP Address** | Enter the IP address for the interface port on the controller to be used by the device.<br>For example, if the internal device should communicate on the public network, enter the IP address for that interface.<br>**Note**<br>Only displayed if option 3066-1 *CC-Link IE Field Basic Master* is used.<br>**Note**<br>The options 3066-1 *CC-Link IE Field Basic Master* and 3066-2 *CC-Link IE Field Basic Device* cannot be configured on the same interface. If only the option 3066-2 *CC-Link IE Field Basic Device* is used, the internal device will automatically detect what interface to use. | |
| **Name** | Enter the name to be used for the device. | A string with maximum 32 characters. |

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| Parameter | Description | Allowed values |
|---|---|---|
| **Identification Label** | This parameter is an optional way to provide a label that will help the operator to identify the device. | A string with maximum 80 characters. |
| **Input Size** | Enter the input size. | 0 - 288 |
| **Output Size** | Enter the output size. | 0 - 288 |

**Note**

The field **Occupied Stations** is automatically updated when the **Input Size** or **Output Size** is changed. The maximum value per station is 72. The device can have up to 4 stations.

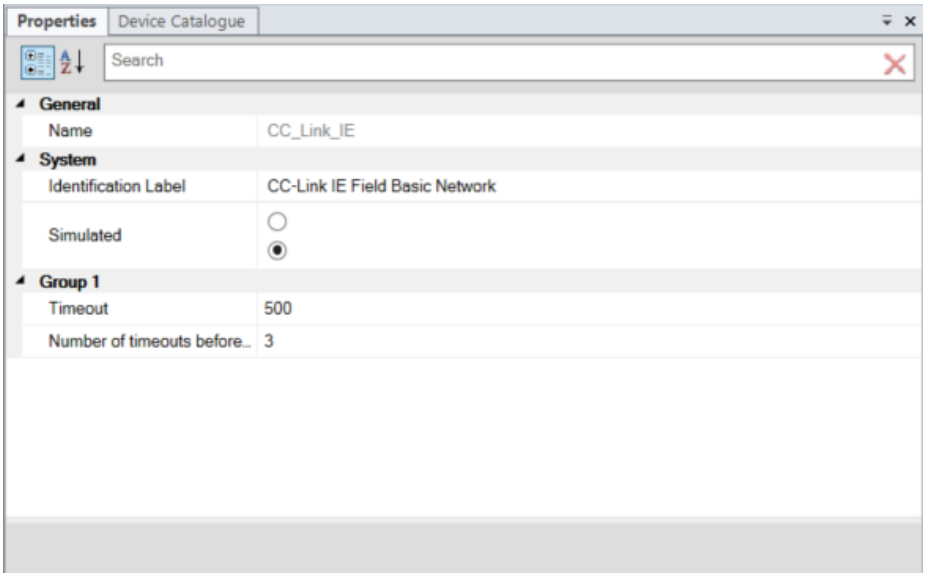
## 4.2 Configuring the master network properties

### Configure the master network properties

1 In the **Controller** tab in RobotStudio, select **I/O Engineering**. The **I/O Engineering** tab is displayed.

2 In the **Configuration** browser, select the master.

3 In the **Properties** browser, you can configure the following:

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| Parameter | Description | Allowed values |
|---|---|---|
| **Identification Label** | This parameter is an optional way to provide a label that will help the operator to identify the internal device.<br>**Note**<br>If this information is changed, it is updated both for the network and the master. | A string with maximum 80 characters. |
| **Simulated** | Select **Yes** or **No**, indicating if the industrial network and all its connected I/O devices should be treated as simulated.<br>**Note**<br>If this information is changed, it is updated both for the network and the master. | The default value is No. |
| **Timeout** | Define the timeout in milliseconds that the controller will wait for a response from a device.<br>**Note**<br>The defined value will be applied for all devices connected to this master. | 1 - 65535 |

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4.2 Configuring the master network properties
*Continued*

| Parameter | Description | Allowed values |
|---|---|---|
| **Number of timeouts before disconnect** | Define the number of timeouts before the device is disconnected.<br>  **Note**<br>The defined value will be applied for all devices connected to this master. | 1 - 65535 |

## 4.3 Adding external devices to the master

### Add external devices

1. In the **Controller** tab in RobotStudio, select **I/O Engineering**. The **I/O Engineering** tab is displayed.
2. In the **Configuration** browser, select the master.
3. Select the **Device Catalogue** tab to show a list of available devices.

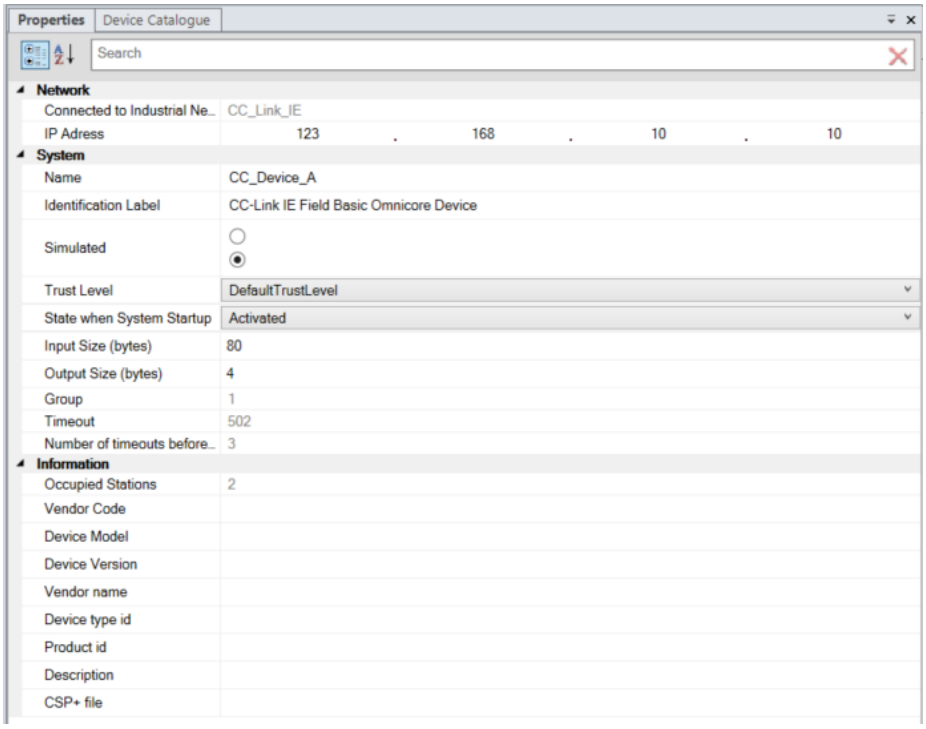
> **Note**
>
> The CSP+ files that have been imported to the project define what devices can be selected. See *Import CSP+ files on page 18*.

4. Double-click on a device in the list to add it to the master.
5. Device information is retrieved from the CSP+ file, but some parameters can be changed in the **Properties** tab if needed. See *Configuring the external device properties on page 26*.

## 4.4 Configuring the external device properties

**Configure the external device properties**

1. In the **Controller** tab in RobotStudio, select **I/O Engineering**. The **I/O Engineering** tab is displayed.
2. In the **Configuration** browser, select the external device.
3. In the **Properties** browser, you can configure the following:

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| Parameter | Description | Allowed values |
|---|---|---|
| **IP Address** | Enter the IP address for the device. | |
| **Name** | Enter the name to be used for the device. | A string with maximum 32 characters. |
| **Identification Label** | This parameter is an optional way to provide a label that will help the operator to identify the device.<br>**Note**<br>If this information is changed, it is updated both for the internal device and the external device. | A string with maximum 80 characters. |

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| Parameter | Description | Allowed values |
|---|---|---|
| **Simulated** | Select **Yes** or **No**, indicating if the industrial network and all its connected I/O devices should be treated as simulated.<br>Enter YES or NO indicating if the device is simulated on the industrial network.<br>**Note**<br>If this information is changed, it is updated both for the internal device and the external device. | The default value is No. |
| **Trust Level** | Define the trust level to be used for this device. For more information about trust levels, see *Technical reference manual - System parameters*. | |
| **State when System Startup** | Define the logical state I/O device state at system startup:<br>• **Activated**<br>Establish communication<br>• **Deactivated**<br>Do not establish communication<br>• **Last state**<br>Restore the previously stored logical state for the I/O device at system shutdown | |
| **Input Size** | Enter the input size. | 0 - 288 |
| **Output Size** | Enter the output size. | 0 - 288 |

**Note**

The field **Occupied Stations** is automatically updated when the **Input Size** or **Output Size** is changed. The maximum value per station is 72. The device can have up to 4 stations.

## 4.5 Working with signals

**Overview**

For internal devices, all signals are preloaded at installation. You can, however, edit the signals.

For external devices, no signals are preloaded, but new signals can be added.

For more information about working with signals, see *Application manual - I/O Engineering*.

## 4.6 Saving the configuration

**Save configuration**

When the configuration is finished, save the I/O project and write the configuration to the robot controller.

For more information about working with I/O projects, see *Application manual - I/O Engineering*.

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