MAQ®20

Industrial Data Acquisition and Control System

MA1060

MAQ20-951 and MAQ20-952
IPEmotion for MAQ20
Dataforth Plugin User Manual



IPEMOTION

DATAFORTH®

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IPEmotion for MAQ20 Dataforth Plugin User Manual
MA1060 Rev. B – August 2020
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Dataforth operates under an ISO9001:2015 quality management system.

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1.0 System Features

The MAQ20 Data Acquisition System encompasses more than 35 years of design excellence in the process control industry. It is a family of high performance, DIN rail mounted, programmable, multi-channel, industrially rugged signal conditioning I/O and communications modules.

Instrument Class Performance

- ±0.035% Accuracy
- Industry leading ±0.3°C CJC Accuracy over full operating temperature range
- Ultra low Zero and Span Tempco
- Over-range on one channel does not affect other channels
- 1500Vrms Channel-to-Bus Isolation
- 240Vrms Continuous Field I/O Protection
- ANSI/IEEE C37.90.1 Transient Protection
- Ventilated Communications and I/O Modules
- Industrial Operating Temperature of -40°C to +85°C
- Wide Range 7-34VDC Power
- CE Compliant, UL/CUL Listing and ATEX Compliance pending

Industry Leading Functionality

- The system is a Modbus Server and can be operated remotely with no local PC
- Up to 8GB of logged data can be transferred via FTP during real-time acquisition
- Up to 24 I/O modules, or 384 analog or 480 digital channels, per system, 19” rack width
- Per-channel configurable for range, alarms, and other functions
- Backbone mounts within DIN rail and distributes power and communications
- System firmware automatically registers the installation and removal of I/O modules
- I/O modules can be mounted remotely from the Communications Module
- Equal load sharing power supply modules allow for system expansion
- Hot Swappable I/O modules with Field-side pluggable terminal blocks on most models
- Sophisticated package enables high density mounting in 3U increments
- DIN Rail can be mounted on a continuous flat panel or plate

Distributed Processing Enables Even More Functionality

- Output modules are programmable for user-defined waveforms
- Discrete I/O modules have seven high level functions:
  - Pulse Counter
  - Frequency Counter
  - Waveform Measurement
  - Time Between Events
  - Frequency Generator
  - PWM Generator
  - One-Shot Pulse Generator

Multiple Software Options

- Intuitive Graphical Control Software
  - ReDAQ Shape Graphical HMI Design & Runtime Solution
  - IPEmotion Muli-Vendor and Multi-Language Solution
  - Programming examples and LabVIEW VIs
  - OPC Server
  - Application Program Interface (API)

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2.0 System Description and Documentation

A MAQ20 Data Acquisition System must have as a minimum a Communications Module, a Backbone, and one I/O Module. Examples include:

MAQ20-COM2, -COM4 Communications Module, Ethernet, USB & RS-232 or RS-485 Interface

MAQ20-JTC, -KTC, -TTC, -RSTC Type J, K, T, R, or S Thermocouple Input Module

MAQ20-mVDN, -VSN, -VDN Voltage Input Module

MAQ20-ISN, -IDN Process Current Input Module

MAQ20-IO, -VO Process Current Output and Process Voltage Output Module

MAQ20-BKPL4, -BKPL8, -BKPL16, -BKPL24 4, 8, 16, or 24 Channel System Backbone

Refer to Dataforth MAQ20 Industrial Data Acquistion & Control System for a complete listing of available modules and accessories.

System power is connected to the Communications Module, which in turn powers the I/O modules. For systems with power supply requirements exceeding what the Communications Module can provide, the MAQ20-PWR3 Load Share Power Supply module is used to provide additional power. When a MAQ20 I/O module is inserted into a system, module registration occurs automatically, data acquisition starts, and data is stored locally in the module. The system is based on a Modbus compatible memory map for easy access to acquired data, configuration settings, and alarm limits. Information is stored in consistent locations in module memory for ease of use and system design. MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

Input-to-Bus isolation is a robust 1500Vrms and each individual channel is protected up to 240Vrms continuous overload in the case of inadvertent wiring errors. Overloaded channels do not adversely affect other channels in the module which preserves data integrity.

MAQ20 system literature and software is available for download from the MAQ20 Software & User Manual Download Center. This includes, but is not limited to:

MA1036	MAQ20 Quick Start Guide
MA1040	MAQ20 Communications Module Hardware User Manual
MA1041	MAQ20 milliVolt, Volt and Current Input Module Hardware User Manual
MA1066	IPEmotion Software User Manual
MA1064	MAQ20 Python API User Manual
MAQ20-940/-941	ReDAQ Shape Software for MAQ20 – Developer Version/User Version
MAQ20-940/-941	ReDAQ Shape Software for MAQ20 – Developer Version/User Version
MAQ20-951/952	IPEMotion Software for MAQ20
MAQ20-960	MAQ20 Python API

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3.0 Overview

This manual describes the structure of the Dataforth Plugin for IPEmotion data acquisition and control software and how to use the features to configure and operate communications and I/O modules in the Dataforth MAQ20 data acquisition and control system.

IPEmotion for MAQ20 Dataforth Plugin

Information in this document applies to the current release of the Dataforth Plugin available on the Dataforth website.

IPEmotion

Information in this documentation applies to the current release of IPEmotion software available on the Dataforth website.

4.0 Introduction

The Dataforth Plugin offers the ability to use the Dataforth MAQ®20 modular data acquisition system in IPEmotion.

The following modules are supported:

MAQ20-COM2	Communication Module; Ethernet, USB, RS-232
MAQ20-COM4	Communication Module; Ethernet, USB, RS-485
MAQ20-MVDN	Analog Input Module; mV, Differential, 8-ch
MAQ20-VDN	Analog Input Module; V, Differential, 8-ch
MAQ20-VSN	Analog Input Module; V, Single Ended, 8-ch
MAQ20-IDN	Analog Input Module; mA, Differential, 8-ch
MAQ20-ISN	Analog Input Module; mA, Single Ended, 8-ch
MAQ20-ISOV1	Isolated Analog Voltage Input Module, +/-1V, 8-ch
MAQ20-ISOV2	Isolated Analog Voltage Input Module, +/-10V, 8-ch
MAQ20-ISOV3	Isolated Analog Voltage Input Module, +/-20V, 8-ch
MAQ20-ISOV4	Isolated Analog Voltage Input Module, +/-40V, 8-ch
MAQ20-ISOV5	Isolated Analog Voltage Input Module, +/-60V, 8-ch
MAQ20-JTC	Analog Input Module; Type J Thermocouple, 8-ch
MAQ20-KTC	Analog Input Module; Type K Thermocouple, 8-ch
MAQ20-RSTC	Analog Input Module; Type R and S Thermocouple, 8-ch
MAQ20-TTC	Analog Input Module; Type T Thermocouple, 8-ch
MAQ20-RTD31	2- or 3-Wire RTD and Potentiometer Input Module; 6-ch
MAQ20-RTD41	4-Wire RTD and Potentiometer Input Module; 5-ch
MAQ20-BRDG1	Strain Gage Input Module, 4-ch
MAQ20-FREQ	Analog Input Module; Frequency, 8-ch
MAQ20-VO	Analog Output Module; Voltage, Ch-Ch Isolated, 8-ch
MAQ20-IO	Analog Output Module; Current, Ch-Ch Isolated, 8-ch
MAQ20-DIOL	Discrete Input/Output Module, 5-ch Input, 5-ch Output
MAQ20-DIOH	Discrete Input/Output Module, High Voltage AC, 4-ch Input, 4-ch Output
MAQ20-DIV20	Discrete Input Module, 20-ch
MAQ20-DIVC20	Discrete Input Module with Compliance Voltage, 20-ch
MAQ20-DODC20SK	Discrete Output Module, 20-ch
MAQ20-DORLY20	Discrete Output Module; Isolated SPST Latching Relay Channels

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5.0 Installation, Set Up, and Removal

System Requirements

IPEmotion and the IPEmotion Dataforth Plugin can be run under the following operating systems:

- Windows 7, 32-bit or 64-bit*
- Windows 10, 32-bit or 64-bit*

* IPEmotion can run on 64-bit systems, but the 32-bit version of the IPEmotion software must be used for compatibility with the 32-bit Dataforth Plugin.

Software Installation

The following instructions guide the installation process of the Dataforth Plugin.

IPEmotion Dataforth Plugin installation requires administrator rights. To complete the installation process a minimum of limited user's or default user's rights is needed.

The installation of the IPEmotion Dataforth Plugin is based on an installation wizard that guides the setup process step by step.

To install the IPEmotion Dataforth Plugin:

1. Double-click the **IPEmotion Dataforth PlugIn Vxxx Setup.exe** to start the installation wizard.
2. **Welcome screen**: This is the first screen in the IPEmotion Dataforth Plugin installation wizard. Click **Next** to continue.
3. **Installation folder**: Accept the default installation location for IPEmotion Dataforth Plugin. To select another location click **Browse…** and select another folder.

   To get information about available disk space click **Disk Cost…**

   By default the Plugin is available for all users on the PC. To install it for only the current user, select **Just me**.

   Click **Next** to continue.
4. **Confirm installation**: This screen indicates that IPEmotion Dataforth Plugin is ready to install.

   Click **Next** to start installation.
5. **Installation**: A progress bar is shown during the installation process.
   Installation complete: This screen is shown after successful installation.
6. Click **Close** to finish installation.

Software Removal

1. Open Programs and Features by clicking the **Star**t button, **Control Panel**, **Programs** and then **Programs and Features**
2. Select the IPEmotion Dataforth Plugin, and click Uninstall.
3. Click **Yes** to confirm removal.

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6.0 Licensing

The MAQ20-951 and MAQ20-952 IPEMotion Software is used with the MAQ20 Data Acquisition System and is distributed by download only. MAQ20-951 is software which operates a system comprised of one MAQ20-COMx module and up to four MAQ20 I/O modules. The MAQ20-952 software allows the operation of up to an additional four MAQ20 I/O modules in a system. Multiple MAQ20-952 software licenses are required for systems with more than 8 MAQ20 I/O modules. A license is required for use of each MAQ20-951 and MAQ20-952.

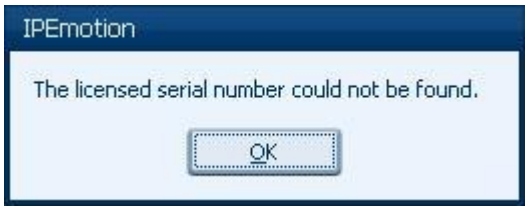
A single MAQ20-951 license will allow operation of multiple MAQ20-COM2 and MAQ20-COM4 modules. A single MAQ20-951 license enables the operation of unlimited systems on a single computer. Multiple MAQ20-952 licenses must be purchased to cover the total I/O module count for all systems connected to a single computer.

The software is accessed through the Dataforth website Software Download Center. Customers must register on the website prior to downloading.

The software is available for download at no charge but will not operate without a license. Licenses are purchased under part numbers MAQ20-951 or MAQ20-952. The license is generated from the serial number of one of the MAQ20-COM2 or MAQ20-COM4 modules connected to a computer.

The IPEmotion Dataforth Edition serial number MAQ20-COM2 (or MAQ20-COM4) module is encrypted in the IPEmotion license code. If the system is configured manually, enter the serial number of the MAQ20-COMx module in the tab **Device** of the MAQ20-COMx configuration.

If the serial number is not valid the following message will post.



7.0 Using the IPEmotion Dataforth Plugin

This section offers an overview about the usage of the Plugin to handle connected Dataforth MAQ20 systems. It shows how to configure modules and acquire data. The documentation of analyzing and managing the acquired data will not be part of this manual. For further information for these topics see MA1066 IPEmotion Software User Manual.

This documentation describes the special features and functions of the IPEmotion Dataforth Plugin. Common functionalities are not part of this documentation. For further information see MA1066 IPEmotion Software User Manual.

Adding a MAQ20 system to IPEmotion

Hardware detection

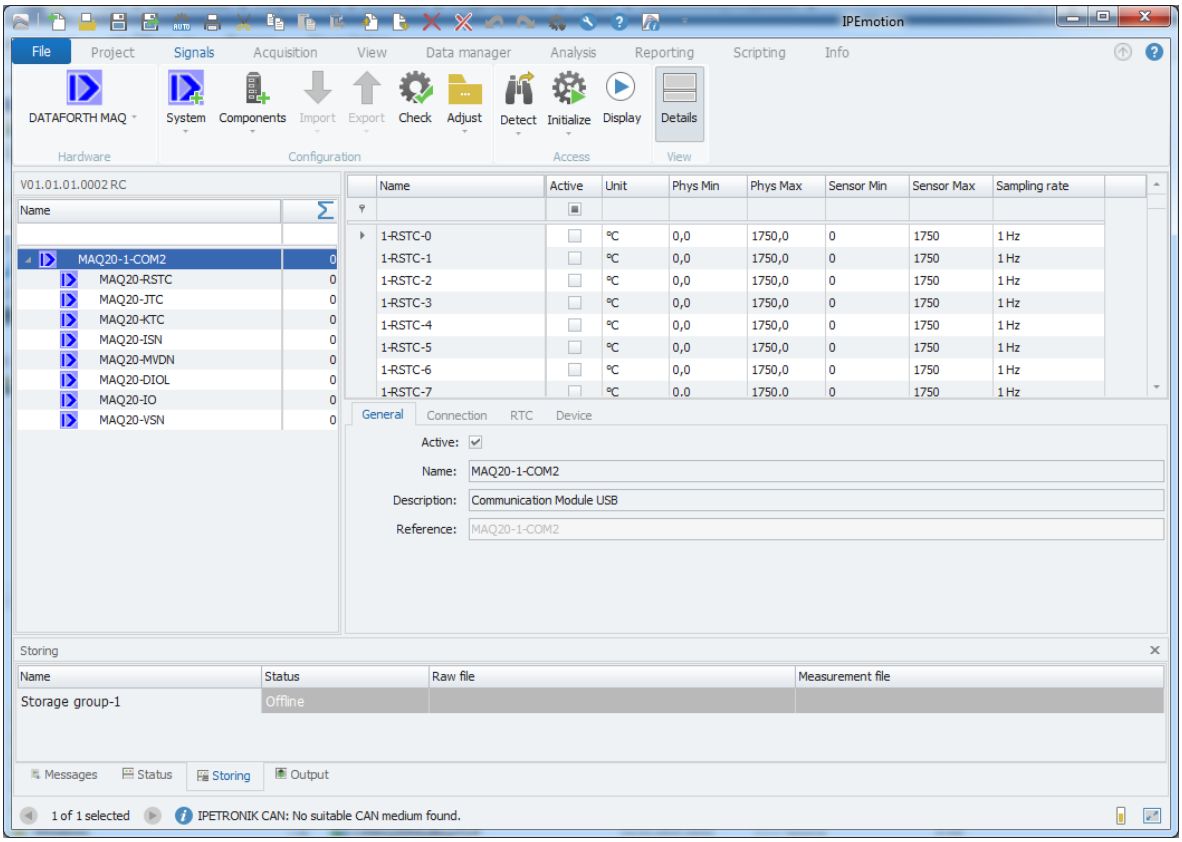
The Plugin version can detect MAQ20 systems with a MAQ20-COM2 or a MAQ20-COM4 communication module. The -COMx module must be connected via USB port to the host computer. **Systems connected via TCP/IP or RS232/RS485 will not be detected automatically!**

After starting IPEmotion, the hardware detection process will begin automatically and the Dataforth MAQ20 system with all supported modules will appear in IPEmotion as an acquisition configuration.

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If the automatic hardware detection is not configured in IPEmotion, start the detection by clicking **Detect**.

The hardware configuration screen will appear as follows:



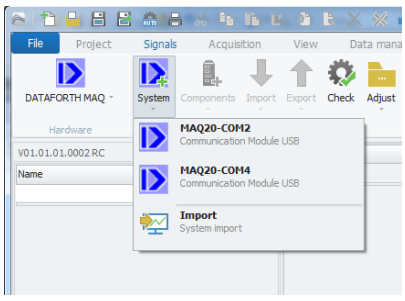
Manually Adding MAQ20 System

If Dataforth hardware is not connected via USB, manually define the hardware in IPEmotion:

1. If the Dataforth hardware is not selected, click on the icon in the hardware menu.

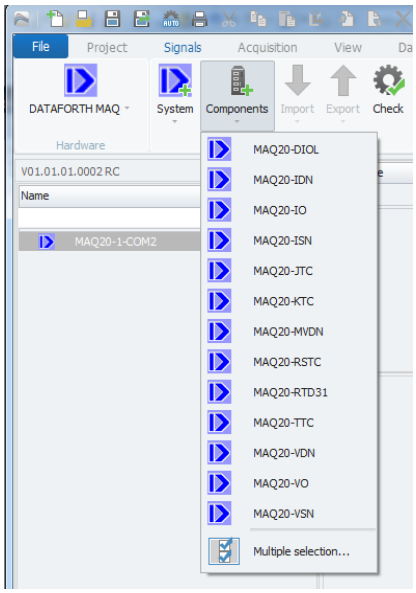


2. Press **Add system** and select the MAQ20-COMx module used in the system.



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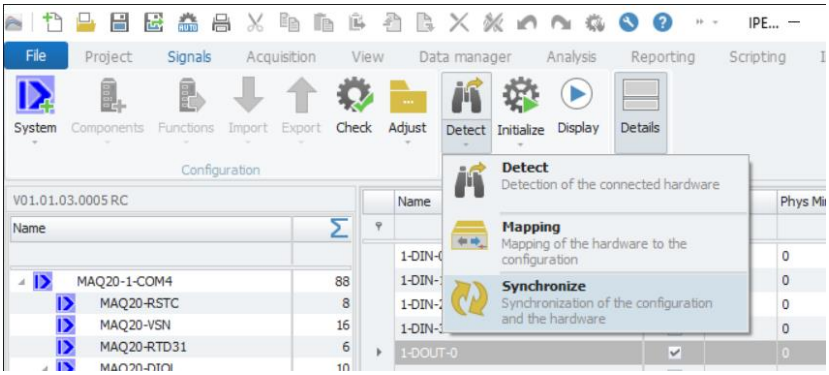
3. Press **Add component** and select the I/O modules in the system.



Configuration of individual MAQ20 I/O modules is described in the following sections.

Reassignment and Synchronization

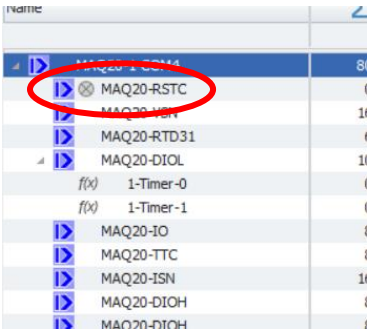
When new modules are added to a MAQ20 system or if existing MAQ20 modules are assigned to other registration slots, update the system configuration in IPEmotion by selecting **Synchronize** in the IPEmotion Signals menu.



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Synchronization triggers the following actions:

- The Plugin searches all configured modules. If they are not found, they will be deactivated



- New modules will be added to the configuration
- If existing modules are located at other slot positions the slot ID of the modules will be updated

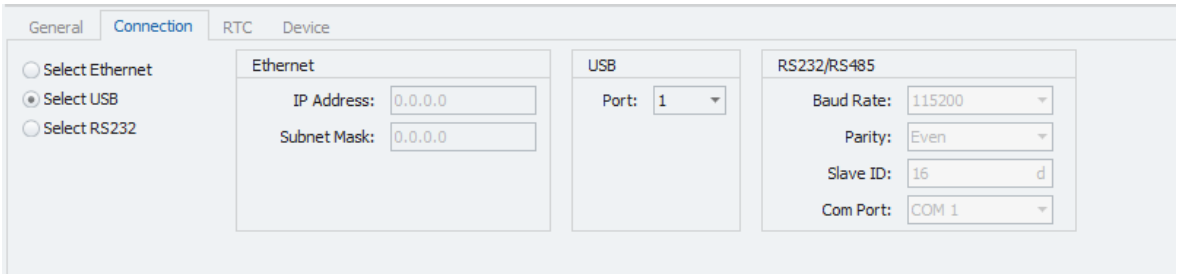
NOTE: Changes in module configurations will be active only after pressing *Initialize* in IPEmotion. With this action the data will be transferred to the module.

8.0 MAQ20-COM2

Connection

The Plugin can communicate via Ethernet, USB, or RS-232 with the Dataforth MAQ20 hardware.

The Tab Connection shows the configuration for communication.



To connect the MAQ20-COM2 via TCP/Ethernet:

1. Select **Select Ethernet** Radio Button
2. Enter **IP Address** and **Subnet Mask**

To connect the MAQ20 COM2 via USB:

1. Select **Select USB** Radio Button
2. Enter USB **Port**

To connect the MAQ20 COM2 via RS-232:

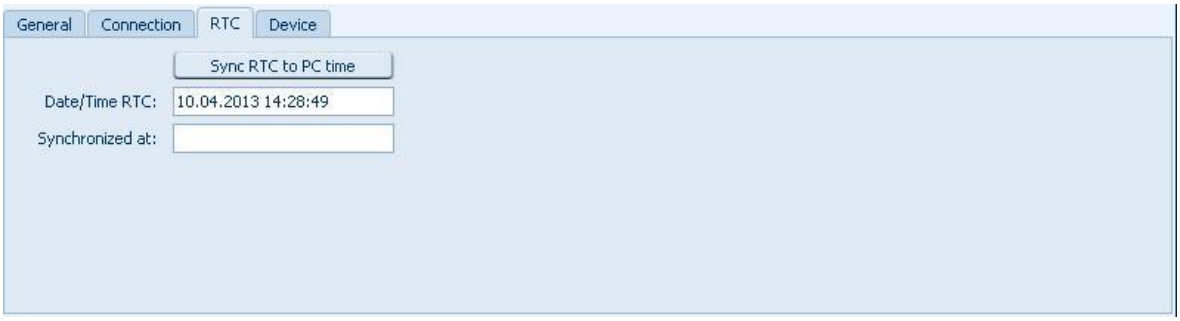
1. Select **Select RS232** Radio Button
2. Enter **Baud Rate**, **Parity**, **Slave ID** and **Com Port.**

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Real Time Clock (RTC)

The on board real time clock (RTC) on the MAQ20-COM2 can be synchronized with the PC system clock.

During hardware detection or initialization the actual date and time of the RTC will updated in the field **Date/Time RTC** in the Tab **RTC**.



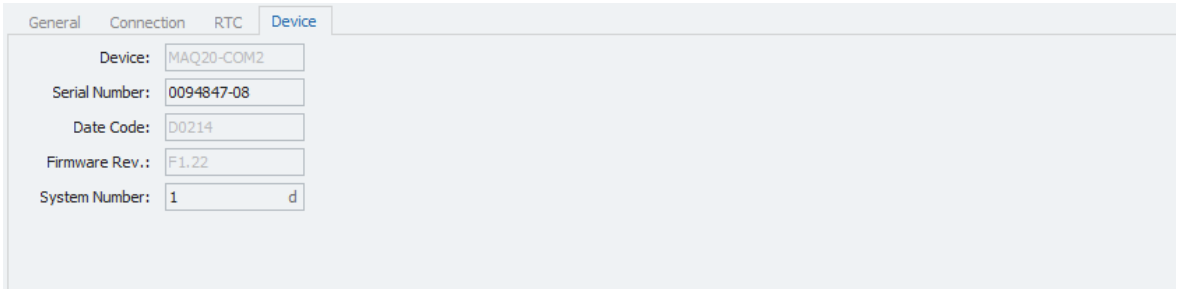
Click **Sync RTC to PC time** to synchronize the RTC. Both fields (Date/Time RTC and Synchronized at) will show the time and date stored in the RTC.

If a system is manually created, the **Sync RTC to PC time** button is disabled. Initializing the system will enable this button.

Device

After hardware detection or initialization the tab **Device** contains shows the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)



The fields for device, date code and firmware revision are read only. The field for the serial number is writable. This is used for licensing.

The edit field **System Number** can be used to define the system number of the MAQ20-COM2. This value has no relevance for system configuration but it makes it easier to allocate a module channel to a MAQ20-COM2 module. All unnamed channels of modules start with the system number of the MAQ20-COM2 in its name the modules belong to. Changing the system number will rename all unnamed channel names.

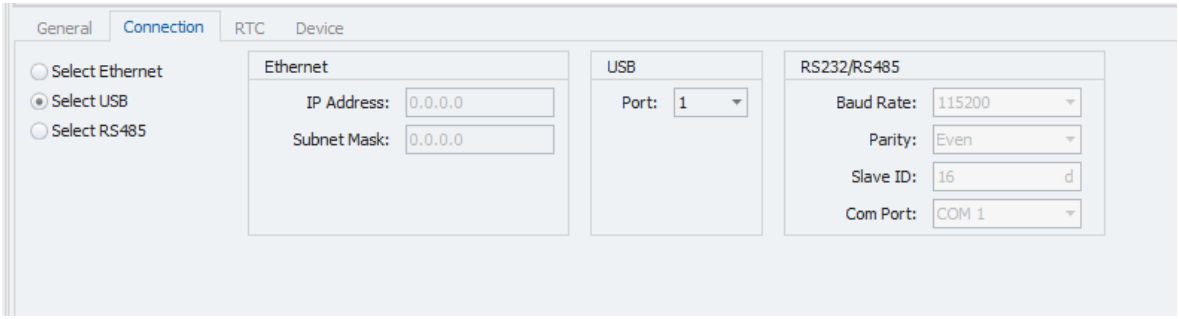
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9.0 MAQ20-COM4

Connection

The Plugin can communicate via Ethernet, USB or RS-485 with the Dataforth MAQ20 hardware.

The Tab Connection shows the configuration for communication.



To connect the MAQ20-COM4 via TCP/Ethernet:

1. Select **Select Ethernet** Radio Button
2. Enter **IP Address** and **Subnet Mask**

To connect the MAQ20-COM4 via USB:

1. Select **Select USB** Radio Button
2. Enter USB **Port**

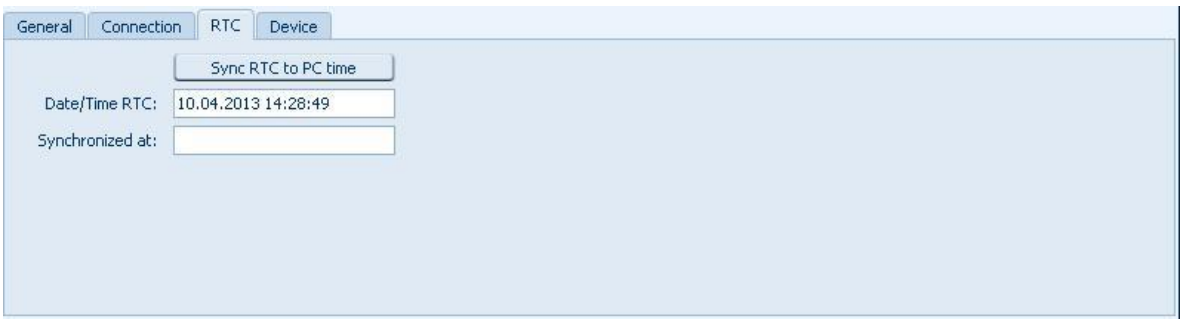
To connect the MAQ20-COM4 via RS485:

1. Select **Select RS485** Radio Button
2. Enter **Baud Rate**, **Parity**, **Slave ID** and **Com Port.**

Real Time Clock (RTC)

The on board real time clock (RTC) on the MAQ20-COM4 can be synchronized with the PC system clock.

During hardware detection or initialization the actual date and time of the RTC will updated in the field **Date/Time RTC** in the Tab **RTC**.



Click **Sync RTC to PC time** to synchronize the RTC. Both fields (Date/Time RTC and Synchronized at) will show the time and date stored in the RTC.

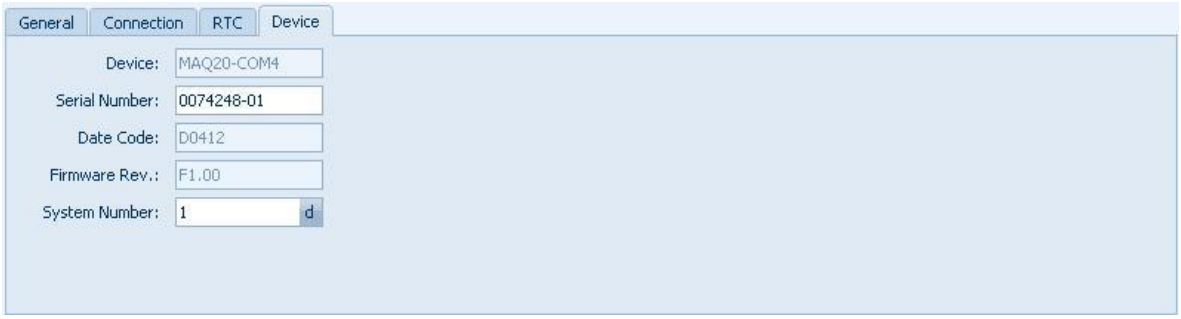
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If a system is manually created, the **Sync RTC to PC time** button will be disabled. The button will be enabled after initializing the system.

Device

After hardware detection or initialization the tab **Device** contains shows the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)



The fields for device, date code and firmware revision are read only. The field for the serial number is writable. This is used for licensing.

The edit field **System Number** can be used to define the system number of the MAQ20-COM4. This value has no relevance for system configuration but it makes it easier to allocate a module channel to a MAQ20-COM4 module. All unnamed channels of modules start with the system number of the MAQ20-COM4 in its name the modules belong to. Changing the system number will rename all unnamed channel names.

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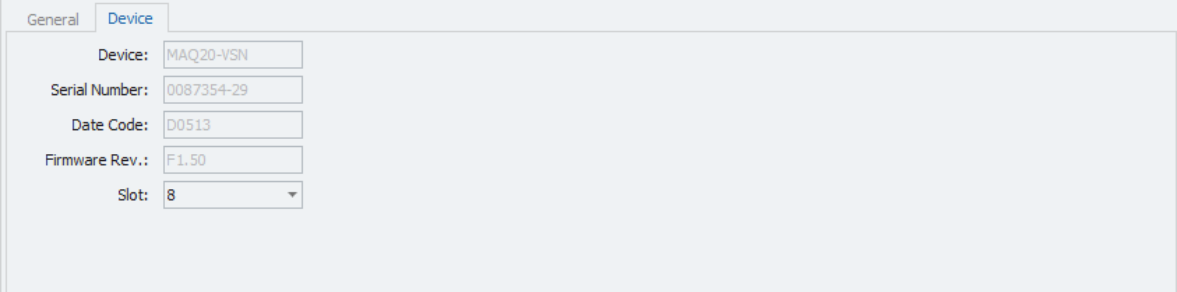
10.0 MAQ20-MVDN, MAQ20-VDN, MAQ20-VSN, MAQ20-IDN, MAQ20-ISN

This section describes the interface to the MAQ20-MVDN, MAQ20-VDN, MAQ20-VSN, MAQ20-IDN, and MAQ20-ISN voltage and current input modules**.** For a detailed description of module functions and operation, see MA1041 MAQ20-MVDN/-VDN/-VSN/-IDN/-ISN Hardware User Manual.

Device

After hardware detection or initialization the tab **Device** contains shows the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot

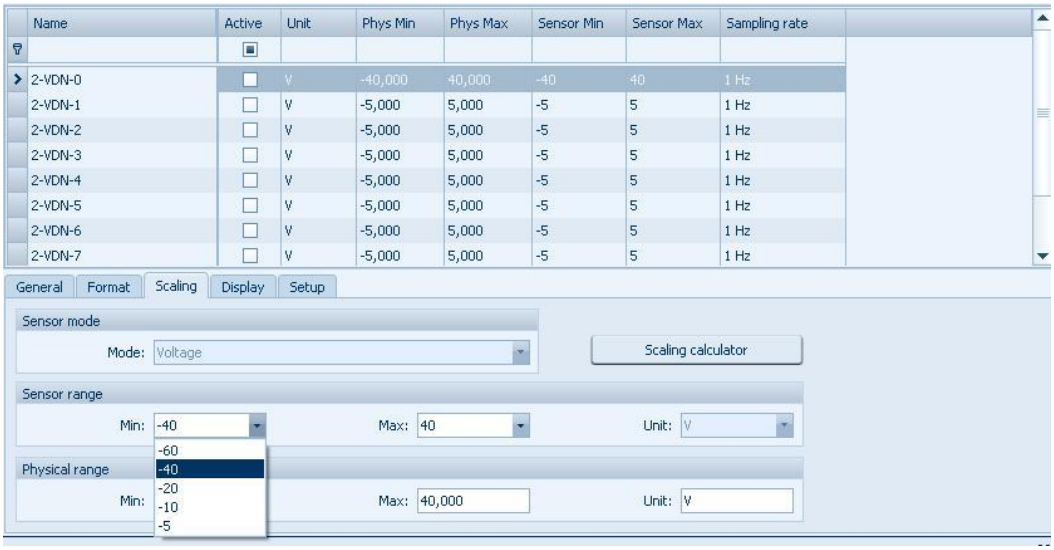


The fields for device, serial number, date code and firmware revision are read only.

The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

Channels

Input range for each channel can be defined separately. The possible ranges are defined in the sensor range of the scaling tab.



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The channels for current input or voltage input can be configured to display:

- Current channel = shows the actual voltage value
- Average channel = shows average value since acquisition start
- Minimum channel = shows minimum value since acquisition start
- Maximum channel = shows maximum value since acquisition start

These settings can be configured in the **Setup** tab for a channel



If the channel is configured to display average data the average weight can be defined in the field **Average Weight**.

If the channel is not set to display current data and has not been named by the user, the name of the channel will be added by the channel type (e. g. **2-VDN-0-Average**).

11.0 MAQ20-ISOMV1, MAQ20-ISOI1, MAQ20-ISOV1 through -ISOV5

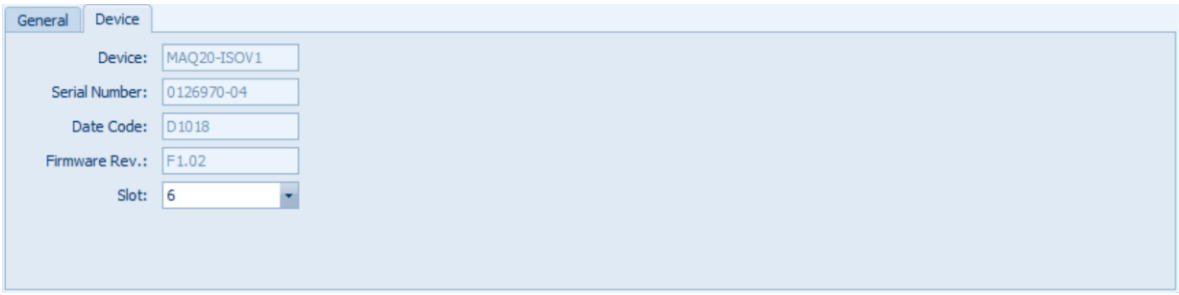
This section describes the interface to the MAQ20-ISOMV1, MAQ20-ISOI1 and MAQ20-ISOV1 through -ISOV5 isolated channel-to-channel voltage and current input modules**.** For a detailed description of module functions and operation, see MA1062 MAQ20-ISOMV/-ISOV/-ISOI Hardware User Manual.

Device

After hardware detection or initialization the tab **Device** contains shows the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot

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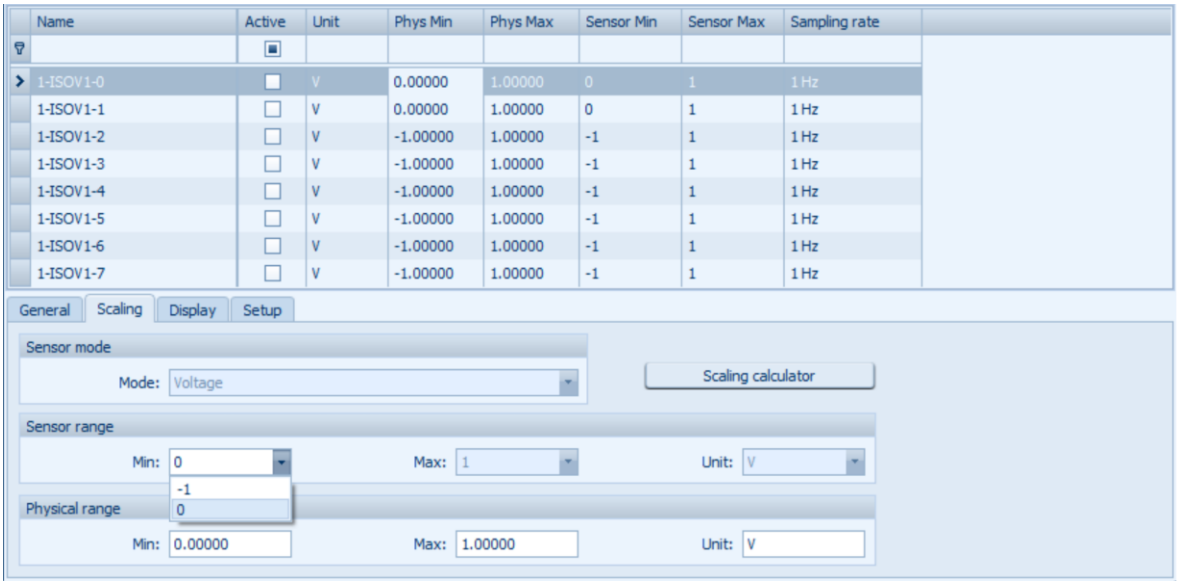


The fields for device, serial number, date code and firmware revision are read only.

The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

Channels

Input ranges for each channel can be defined separately. The possible ranges are defined in the sensor range of the scaling tab.

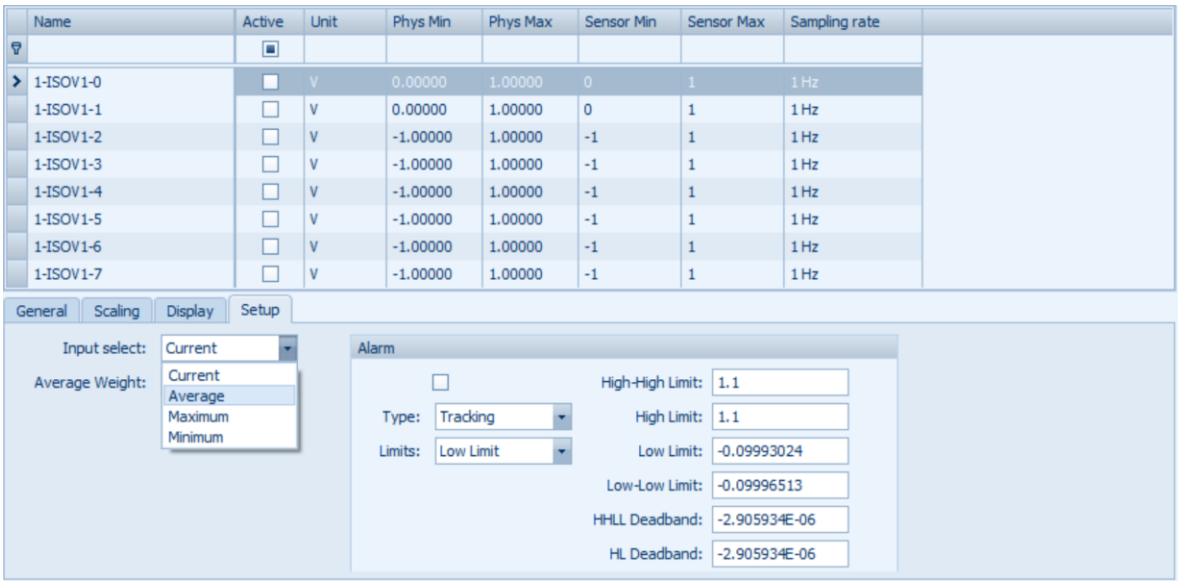


The channels for current input or voltage input can be configured to display:

- Current channel = shows the actual voltage value
- Average channel = shows average value since acquisition start
- Minimum channel = shows minimum value since acquisition start
- Maximum channel = shows maximum value since acquisition start

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These settings can be configured in the **Setup** tab for a channel



If the channel is configured to display average data the average weight can be defined in the field **Average Weight**.

If the channel is not set to display current data and has not been named by the user, the name of the channel will be added by the channel type (e. g. **2-ISOV1-0-Average**).

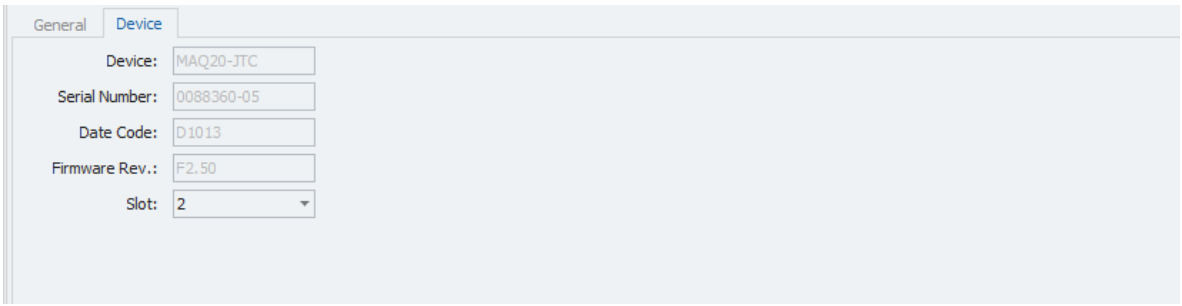
12.0 MAQ20-JTC, MAQ20-KTC, MAQ20-TTC, MAQ20-RSTC

This section describes the interface to the MAQ20-JTC, MAQ20-KTC, MAQ20-TTC and MAQ20-RSTC thermocouple input modules**.** For a detailed description of module functions and operation, see MA1047 MAQ20-JTC/-KTC/-TTC/-RSTC Hardware User Manual.

Device

After hardware detection or after initialization the tab **Device** contains shows the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot



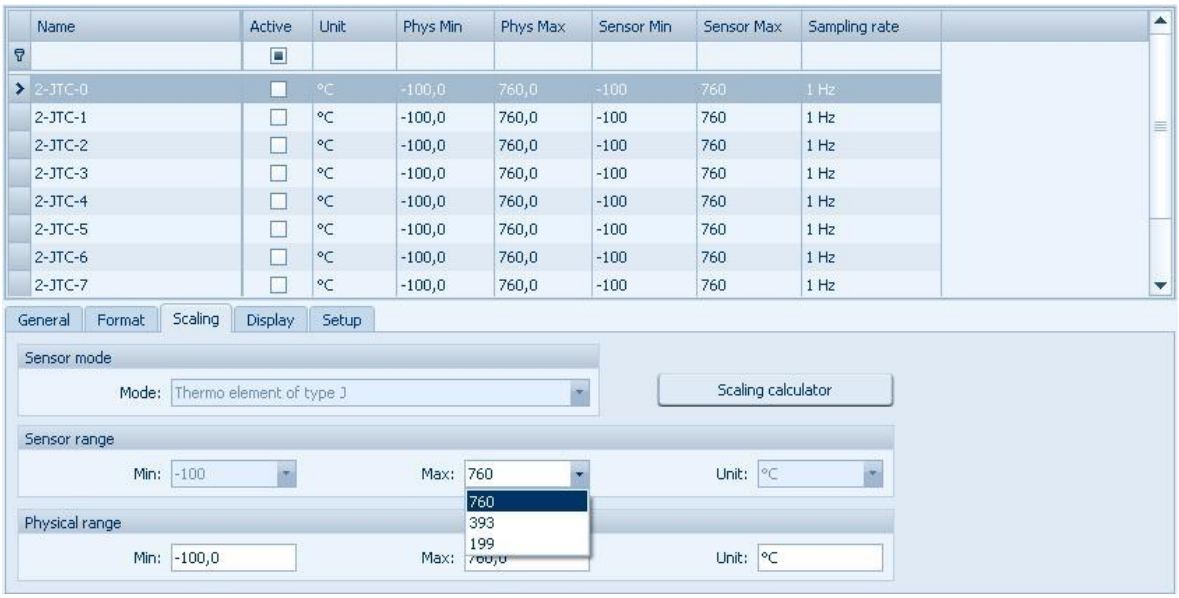
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The fields for device, serial number, date code and firmware revision are read only.

The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

Channels

The input range for each channel can be defined separately. The possible ranges are defined in the sensor range of the scaling tab.

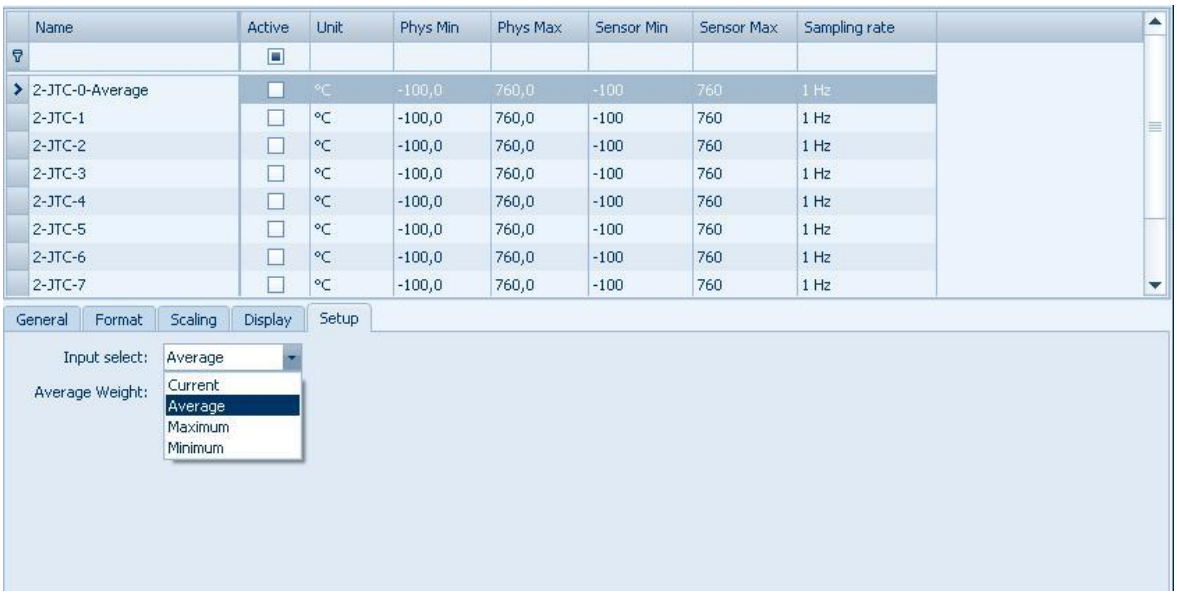


The thermocouple input modules allow channel definition as

- Current channel = shows the actual TC value
- Average channel = shows average value since acquisition start
- Minimum channel = shows minimum value since acquisition start
- Maximum channel = shows maximum value since acquisition start

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To configure the channel, select the type in the tab **Setup**



If the channel is an average channel the average weight can be defined in the field **Average Weight**.

If the channel is not a current channel and if the channel is not named by the user, the name of the channel will be added by the channel type, e. g. **2-JTC-0-Average**).

13.0 MAQ20-RTD31, MAQ30-RTD41

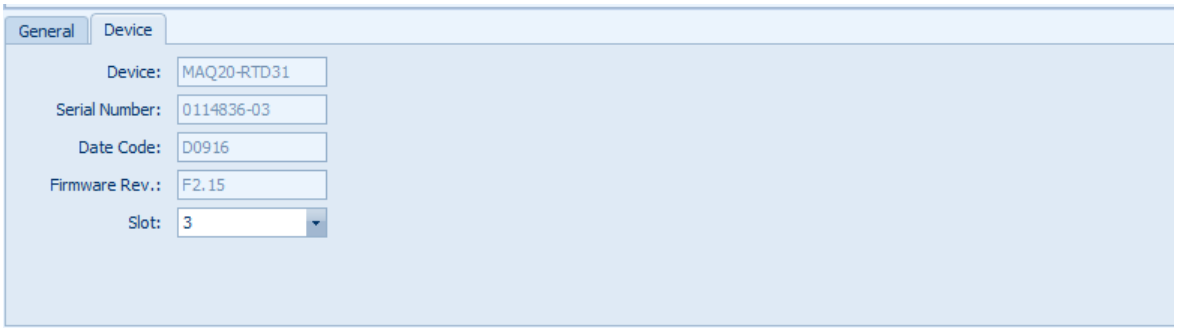
This section describes the interface to the MAQ20-RTD31 three-wire RTD and potentiometer input module and MAQ20-RTD41 four-wire RTD input module**.** For a detailed description of module functions and operation, see MA1044 MAQ20-RTD31/-RTD41 Hardware User Manual.

Device

After hardware detection or initialization the tab **Device** contains shows the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot

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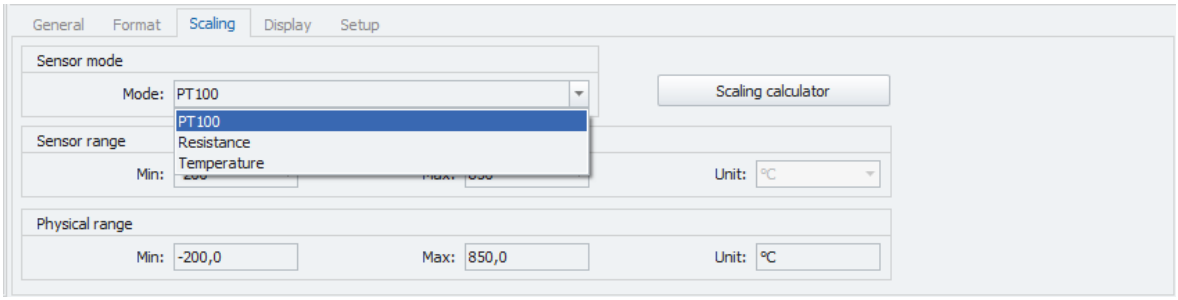
The fields for device, serial number, date code and firmware revision are read only.

The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

Channel

In the Tab **Scaling,** the following input modes can be selected:

- PT100
- Resistance
- Temperature

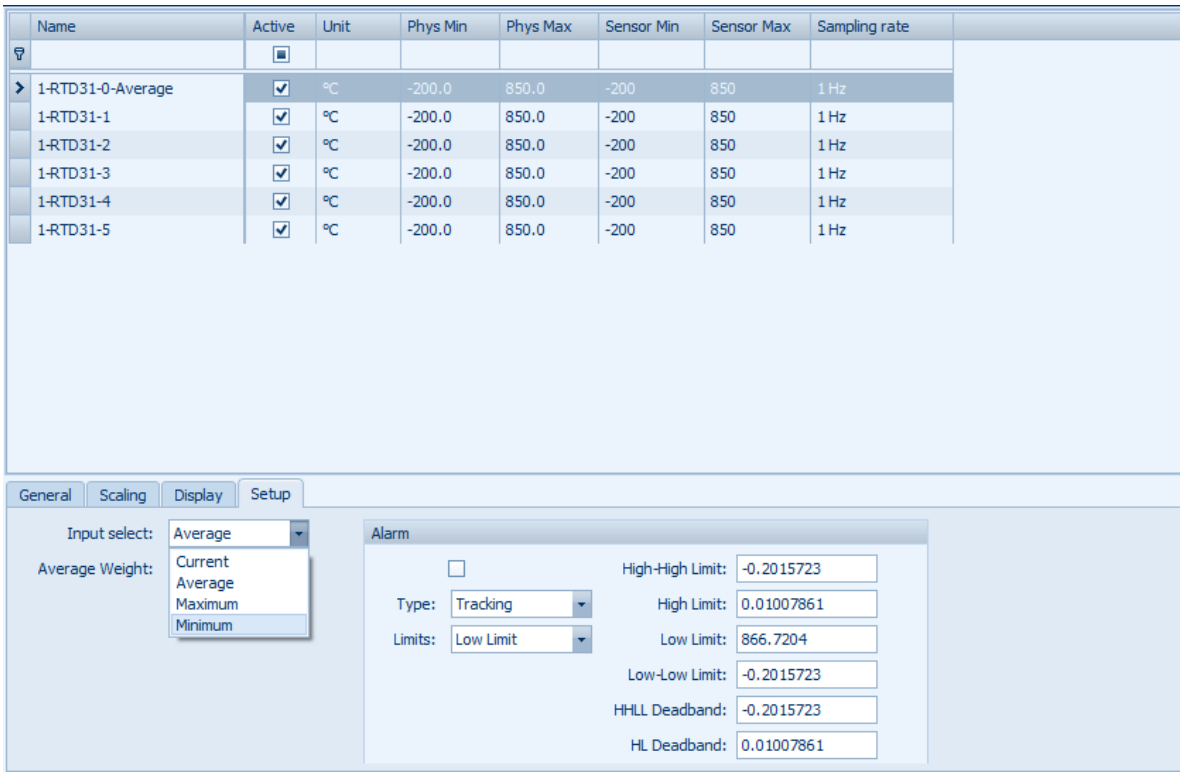


The RTD and potentiometer input modules allow channel definition as

- Current channel = shows the actual input sensor value
- Average channel = shows average value since acquisition start
- Minimum channel = shows minimum value since acquisition start
- Maximum channel = shows maximum value since acquisition start

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To configure the channel, select the type in the tab **Setup**



If the channel is an average channel the average weight can be defined in the field **Average Weight**.

If the channel is not a current channel and if the channel is not named by the user, the name of the channel will be added by the channel type, e. g. **2-RTD-0-Average**).

14.0 MAQ20-BRDG1

This section describes the interface to the MAQ20-BRDG1 strain gage module**.** For a detailed description of module functions and operation, see MA1046 MAQ20-BRDG1 Hardware User Manual.

Device

After hardware detection or initialization the tab **Device** contains the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot

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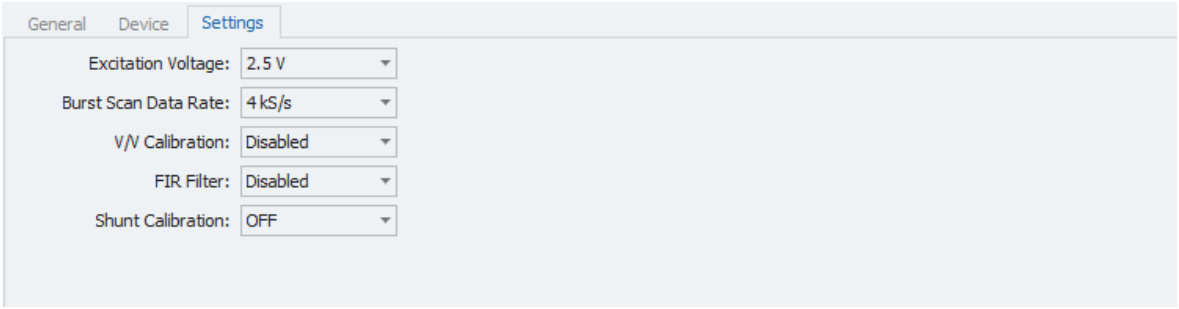
The fields for device, serial number, date code and firmware revision are read only.

The field Slot defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

Settings

The tab **Settings** contains the configuration parameters for the module. The parameters are

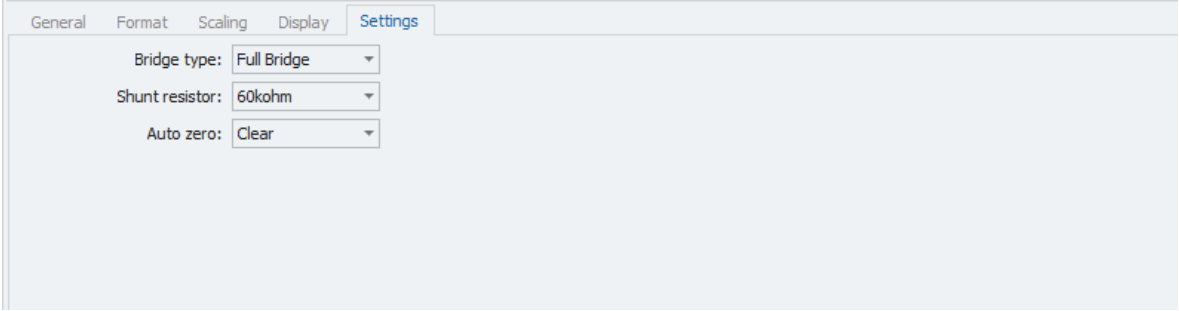
- Excitation Voltage
- Burst Scan Data Rate
- V/V Calibration
- FIR Filter
- Shunt Calibration



Strain Gage Input Channels

Strain Gage Input channels can be configured via **Settings** tab. The configuration parameters are

- Bridge type
- Shunt resistor
- Auto zero



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Excitation Channels

There is no special configuration for MAQ20-BRDG1 excitation channels. All configurations for excitation channels are typical IPEmotion functionalities. For further information see MA1066 IPEmotion Software User Manual.

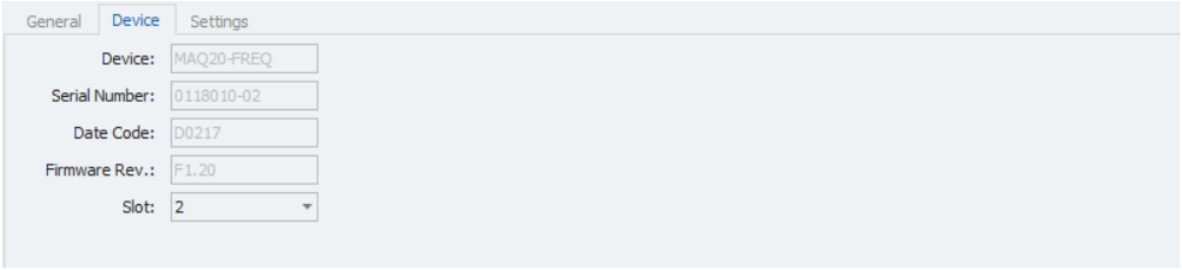
15.0 MAQ20-FREQ

This section describes the interface to the MAQ20-FREQ frequency input module**.** For a detailed description of module functions and operation, see MA1048 MAQ20-FREQ Hardware User Manual.

Device

After hardware detection or initialization the tab **Device** contains shows the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot

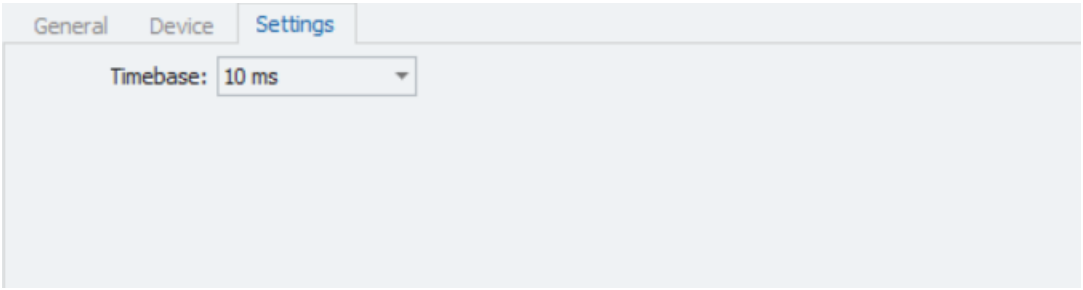


The fields for device, serial number, date code and firmware revision are read only.

The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

The tab **Settings** contains the configuration parameters for the module. Define the timebase for measurement.

- 1 s
- 100 ms
- 10 ms



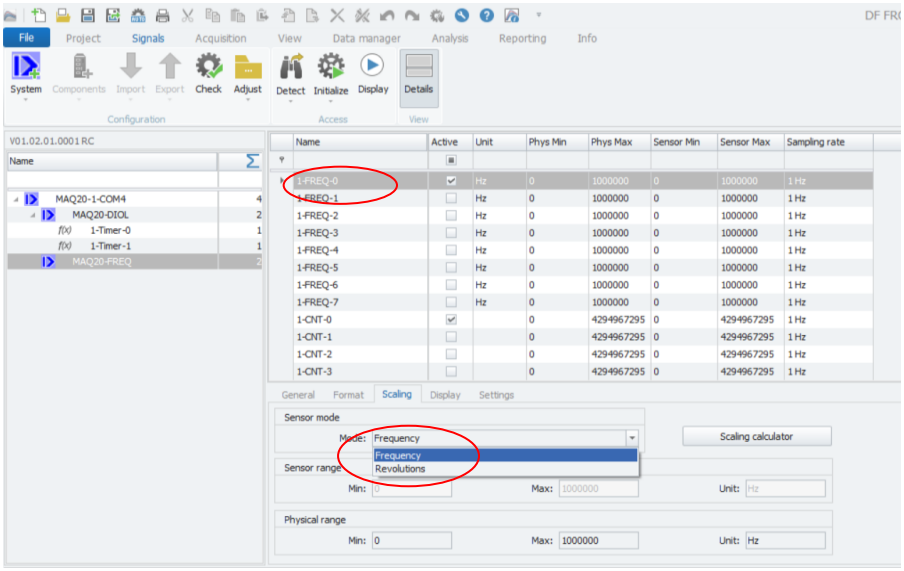
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Channels

The MAQ20-FREQ has 8 channels used as frequency counter or to measure RPM.

In IPEmotion the channel list has 8 frequency/rpm channels and 8 counter channels. The counter channels show the input signals of the frequency channels by counting the input signals.

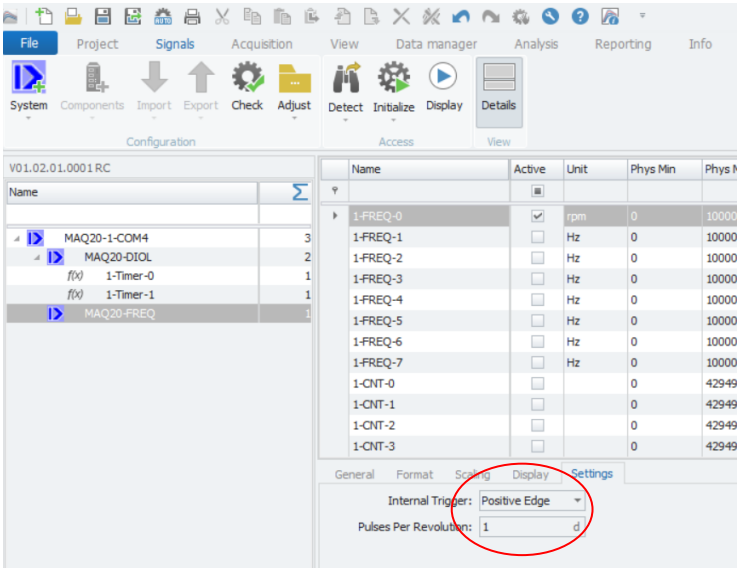
To configure a frequency channel to measure frequency select **Frequency** as sensor mode in the Scaling Tab, otherwise select **Revolutions** to report the data in revolutions.



In the RPM mode, define the pulses per revolution in tab **Settings**.

Also use tab **Settings** to define the input trigger for the counter,

- Positive edge or
- Negative edge



Hint: The counter channels will be cleared if the Initialize button in IPEmotion is pressed. If any configuration parameters are changed, IPEmotion automatically initializes the modules.

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16.0 MAQ20-VO

This section describes the interface to the MAQ20-VO voltage output module**.** For a detailed description of module functions and operation, see MA1042 MAQ20-VO/-IO Hardware User Manual.

Device

After hardware detection or initialization the tab **Device** contains shows the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot



The fields for device, serial number, date code and firmware revision are read only.

The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

The button **Standard Reset Register** resets the register contents to the last values saved by the user. The button **Reset Register to Default** resets the register to the factory default values.

The button **Save Ranges to EEPROM** saves the default output values of all module channels to the module internal EEPROM.

The button **Save Default Output to EEPROM** saves the ranges of all module channels to the module internal EEPROM.

All buttons only are enabled after hardware initialization (press **Initialize** or **Start displaying**).

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Channel

Define the default output values in the Tab **Default**.



NOTE: The Default output value will be configured in the MAQ20-VO. Before starting and after stopping an acquisition in IPEmotion the default value will be set in the module.

17.0 MAQ20-IO

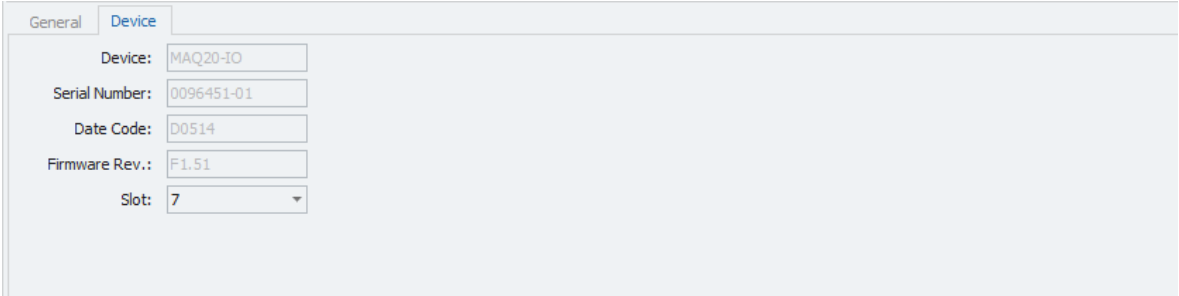
This section describes the interface to the MAQ20-IO current output module**.** For a detailed description of module functions and operation, see MA1042 MAQ20-VO/-IO Hardware User Manual.

Device

After hardware detection or initialization, the tab **Device** contains shows the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot

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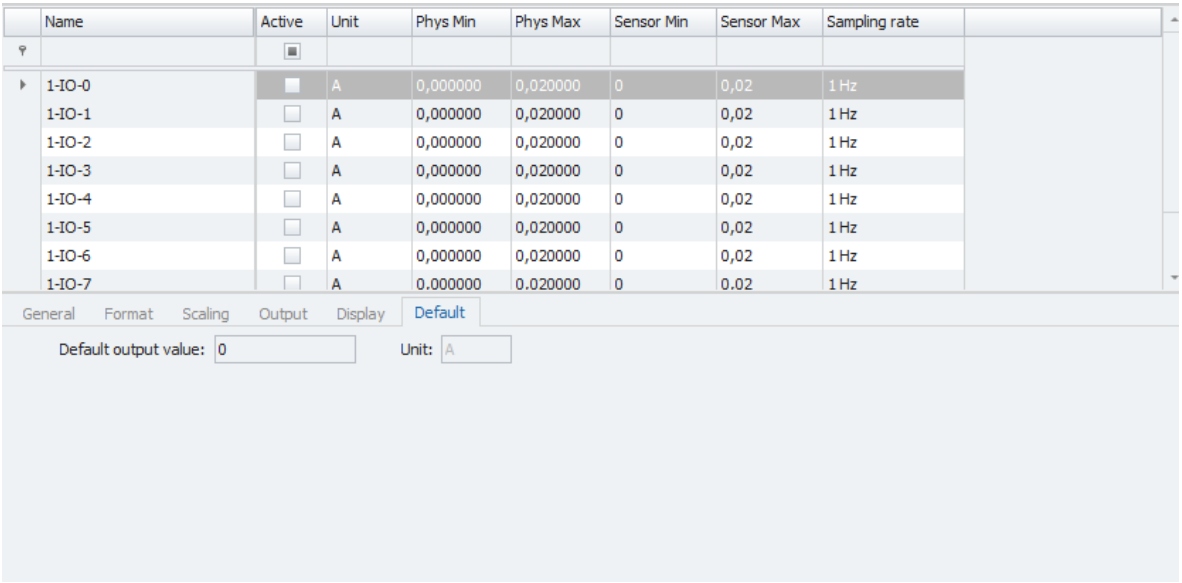


The fields for device, serial number, date code and firmware revision are read only.

The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

Channel

Define the default output values in the Tab **Default**.



NOTE: The Default output value will be configured in the MAQ20-IO. Before starting and after stopping an acquisition in IPEmotion the default value will be set in the module.

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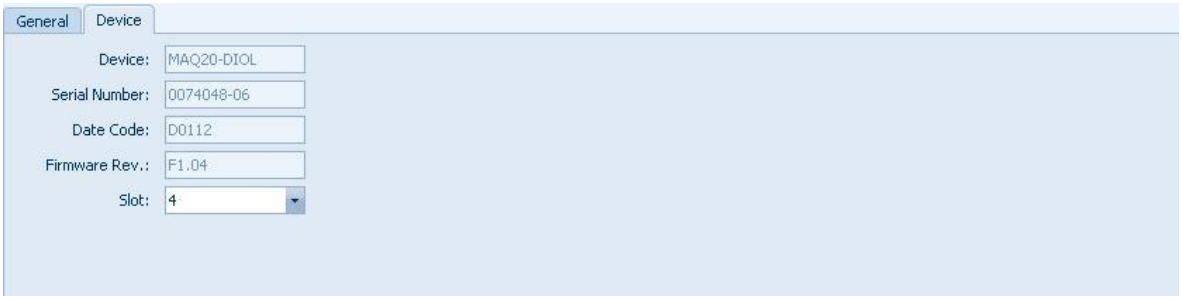
18.0 MAQ20-DIOL

This section describes the interface to the MAQ20-DIOL discrete I/O module**.** For a detailed description of module functions and operation, see MA1043 MAQ20-DIOL Hardware User Manual.

Device

After hardware detection or initialization the tab **Device** contains the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot



The fields for device, serial number, date code and firmware revision are read only.

The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

Input channel

There are no special configurations for MAQ20-DIOL input channels. All configurations for digital channels are typical IPEmotion functionalities. For further information see MA1066 IPEmotion Software User Manual.

Output channel

Among the usual configurations for digital output, default output values are defined in the Tab **Default**.

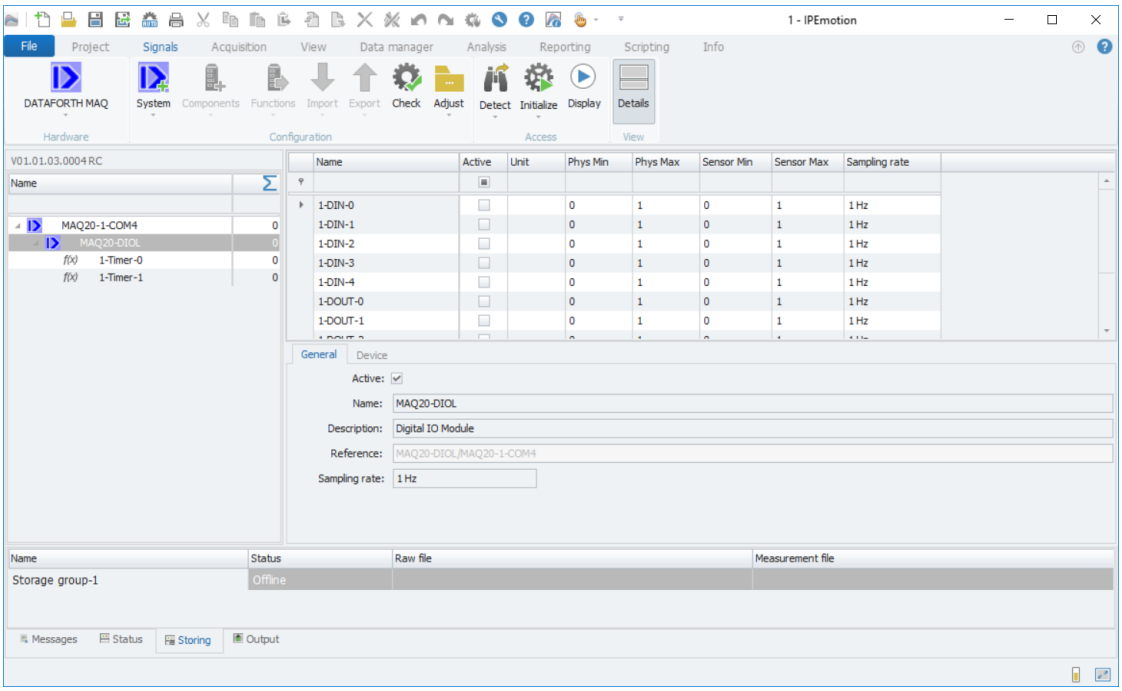
NOTE: The Default output value will be configured in the MAQ20-DIOL. Before starting and after stopping an acquisition in IPEmotion the default value will be set in the module.



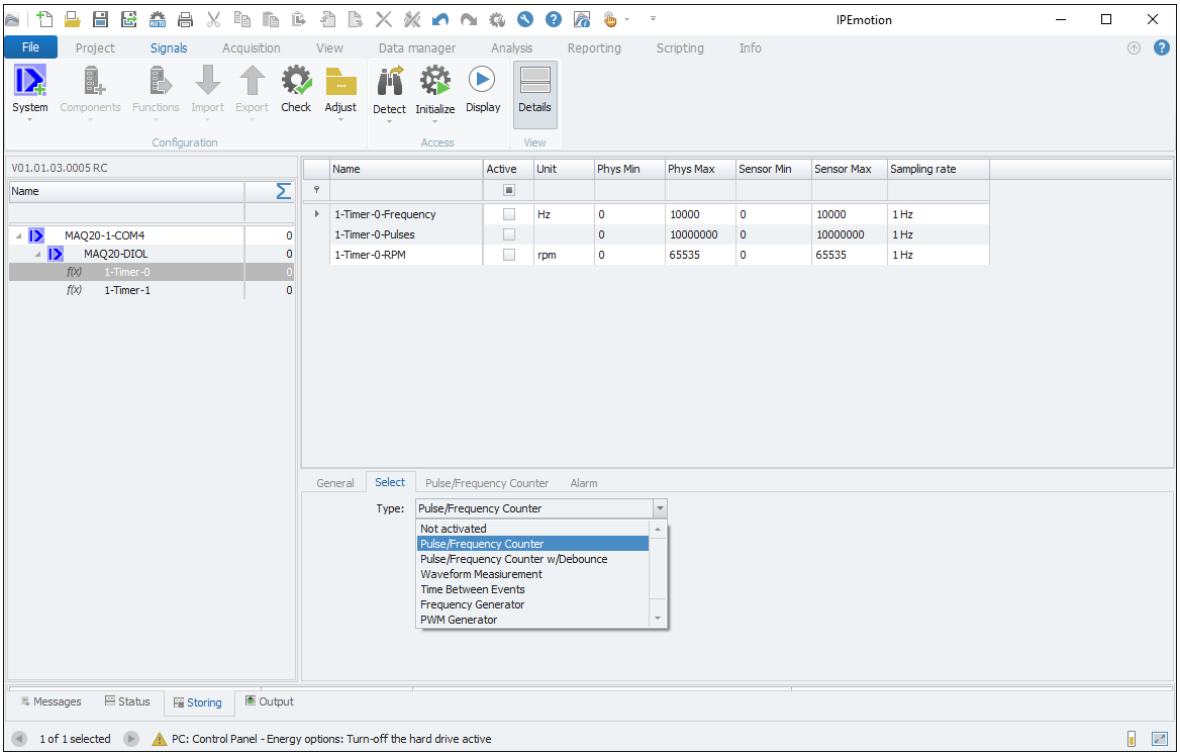
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Timer

The device tab in the IPEmotion **Signals** view shows the DIOL with two timers as sub-elements.



By default, the two timers in the DIOL are deactivated. When a timer is selected in the left component list, the tabs for the Timer configuration appear in the right panel. Expanding the **Type** box in the **Select** tab allows to select the special function needed for the timer.



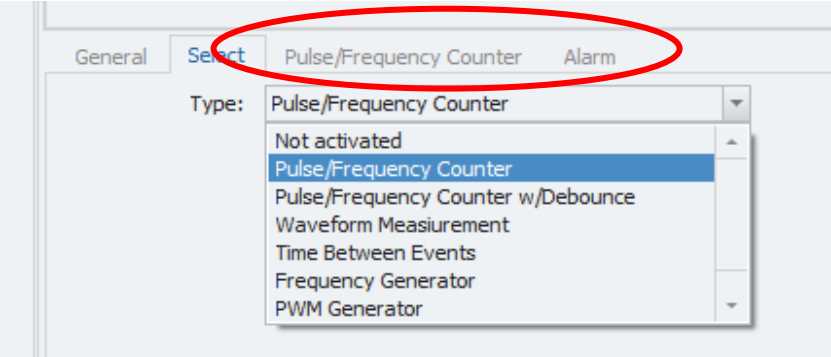
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The DIOL has the following special functions for every timer:

- Pulse/Frequency Counter
- Pulse/Frequency Counter w/Debounce
- Waveform Measurement
- Time Between Events
- Frequency Generator
- PWM Generator
- One-Shot Pulse Generator

Depending on the selected special function configuration tabs for the selected special function and timer alarms will be visible on the right side of the **Select** tab. At the same time a new set of timer channels will be shown in the right IPEmotion view. Detailed information on the special functions is presented below.

Special Function 1: Pulse / Frequency Counter

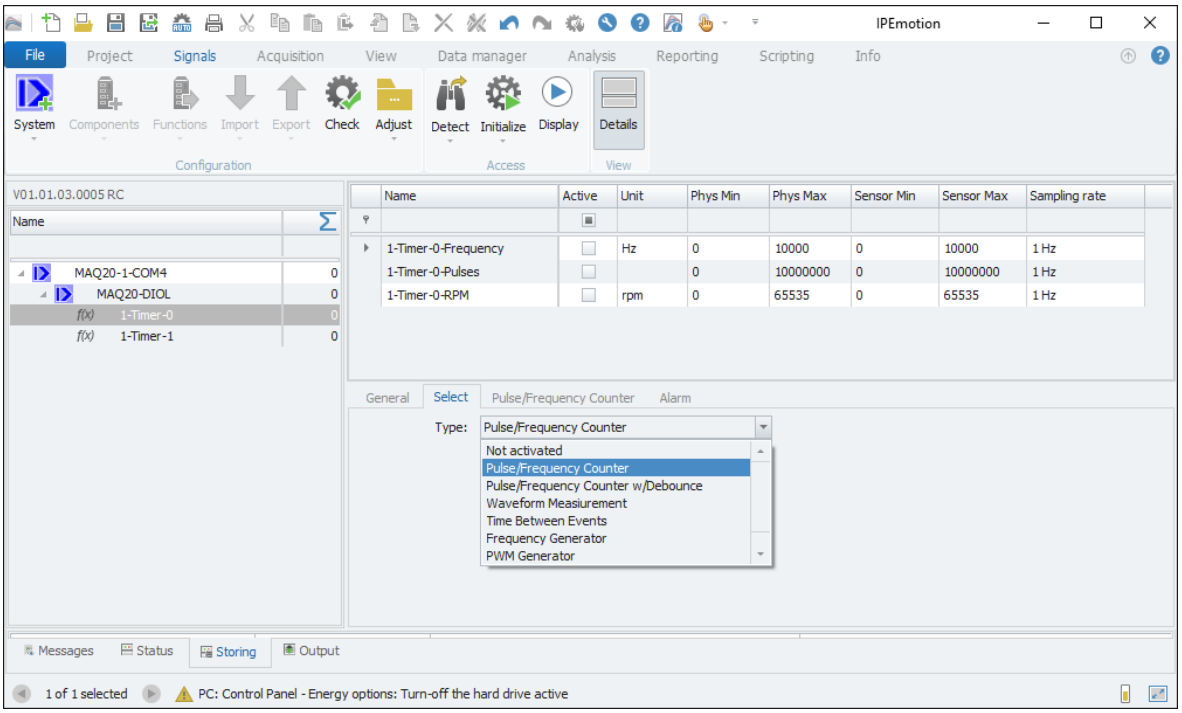


To configure a timer as a pulse/frequency counter, select the **Pulse/Frequency Counter** in the **Type** selection

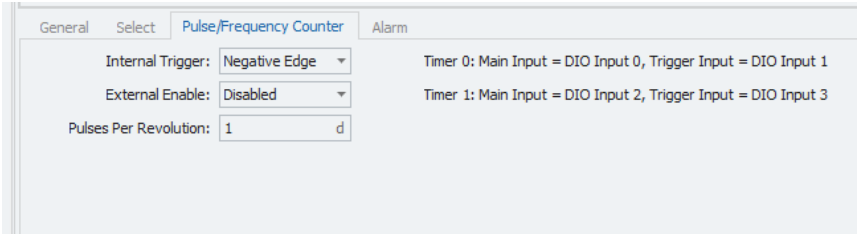
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When selected the plug-in adds the following new channels to the DIOL device

- Timer Frequency
- Timer Pulses
- Timer RPM



After selecting the special function two new tabs, **Pulse/Frequency Counter** and **Alarm**, appear.



The tab **Pulse/Frequency Counter** contains the configuration parameters for the selected timer as a pulse/frequency counter. The three parameters are

- Internal Trigger
- External Enable
- Pulses Per Revolution

For a detailed description of module functions and operation, see MA1043 MAQ20-DIOL Hardware User Manual.

In the **Alarm** tab, timer alarms can be configured. See Special Functions: Alarm configuration.

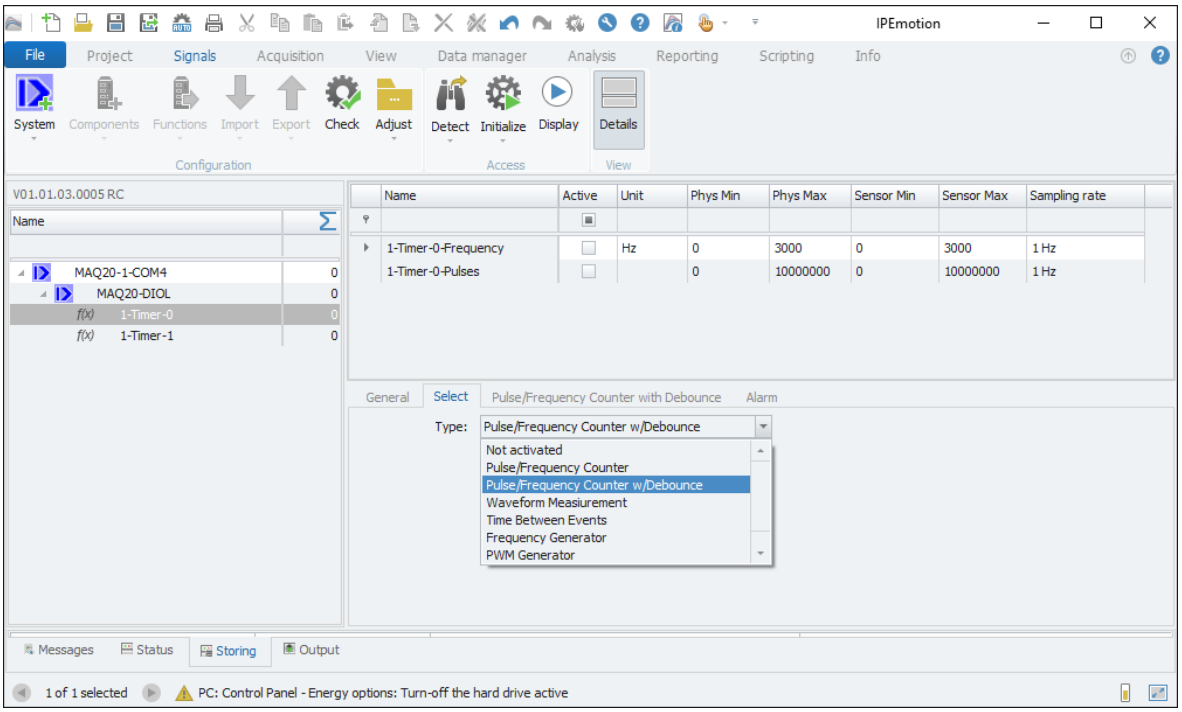
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Special Function 2: Pulse / Frequency Counter with Debounce

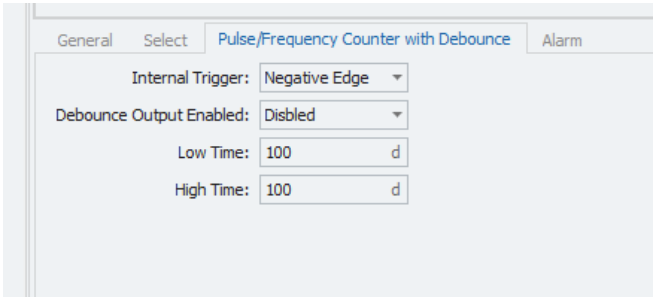
To configure a timer as a pulse/frequency counter with debounce, select the **Pulse/Frequency Counter w. Debounce** in the **Type** selection

When selected the plug-in adds the following new channels to the DIOL device

- Timer Frequency
- Timer Pulses



When selecting the special function two new tabs, **Pulse/Frequency Counter with Debounce** and **Alarm**, appear.



The tab **Pulse/Frequency Counter with Debounce** contains the configuration parameters for the selected timer as a pulse/frequency counter with debounce. The parameters are

- Internal Trigger
- Debounce Output Enabled
- Low Time
- High Time

For a detailed description of module functions and operation, see MA1043 MAQ20-DIOL Hardware User Manual.

In the **Alarm** tab, timer alarms can be configured. See Special Functions: Alarm configuration.

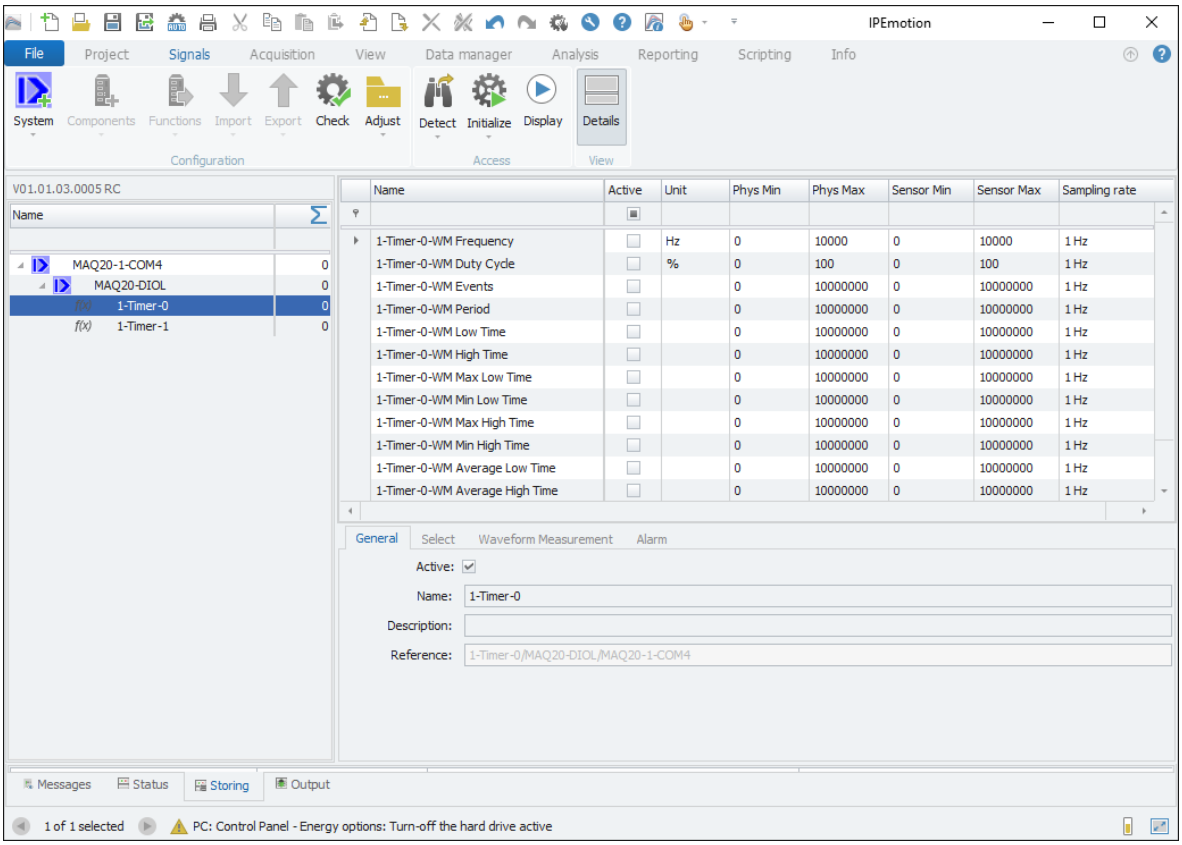
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Special Function 3: Waveform Measurement

To configure a timer for waveform measurement, select the **Waveform Measurement** in the **Type** selection

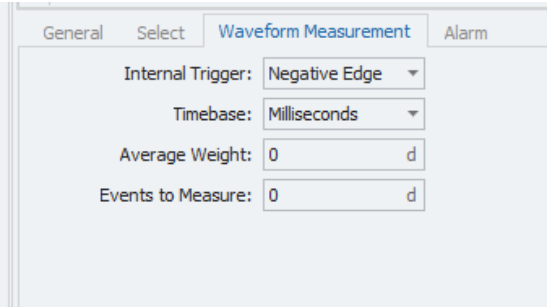
When selected the plug-in adds the following new channels to the DIOL device

- Timer Frequency
- Timer Duty Cycle
- Timer Events
- Timer Period
- Timer Low Time
- Timer High Time
- Timer Max Low Time
- Timer Min Low Time
- Timer Max High Time
- Timer Min High Time
- Timer Average Low Time
- Timer Average High Time



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When the special function is selected two new tabs, **Waveform Measurement** and **Alarm**, appear.



The tab **Waveform Measurement** contains the configuration parameters for the selected timer for waveform measurement. The parameters are

- Internal Trigger
- Timebase
- Average Weight
- Events to Measure

For a detailed description of module functions and operation, see MA1043 MAQ20-DIOL Hardware User Manual.

In the **Alarm** tab, timer alarms can be configured. See Special Functions: Alarm configuration.

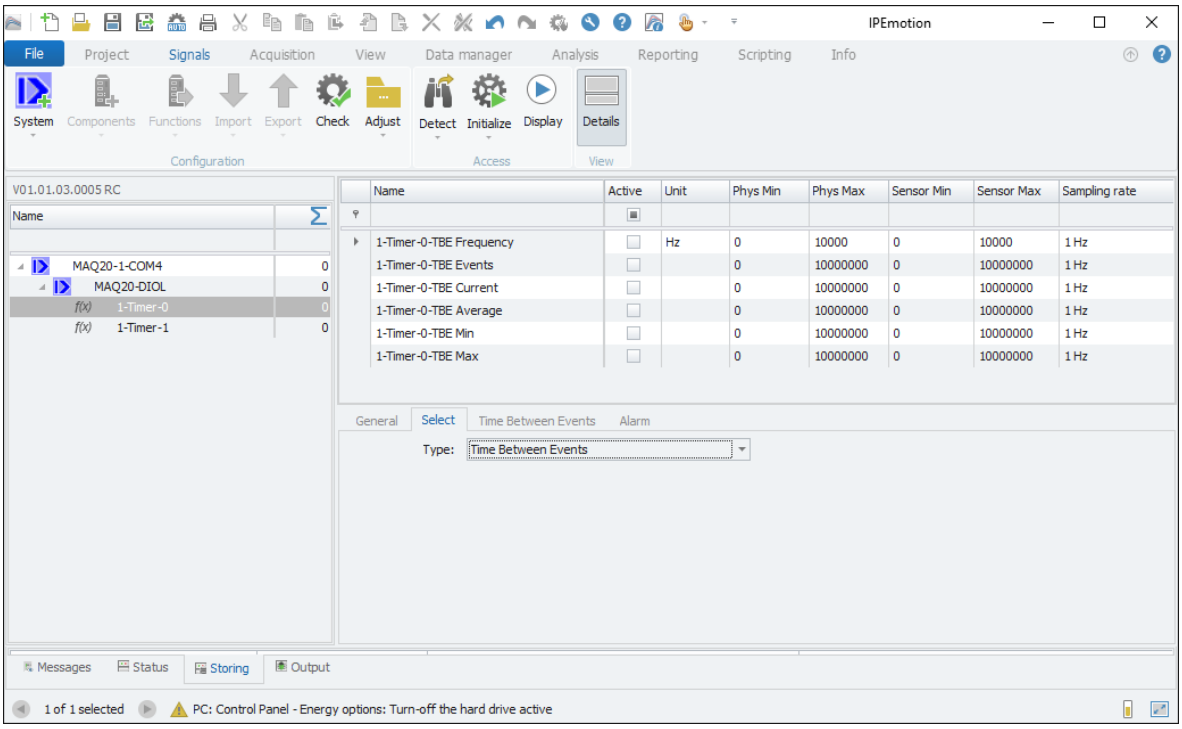
Special Function 4: Time Between Events

To configure a timer to measure time between events, select the **Time Between Events** in the **Type** selection

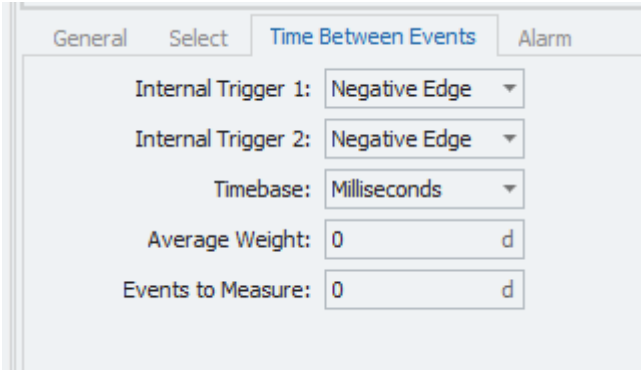
When selected the plug-in adds the following new channels to the DIOL device

- Timer Frequency
- Timer Events
- Timer Current
- Timer Average
- Timer Min
- Timer Max

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When the special function is selected two new tabs, **Time Between Events** and **Alarm**, appear.



The tab **Time Between Events** contains the configuration parameters for the selected timer to measure time between events. The parameters are

- Internal Trigger 1
- Internal Trigger 2
- Timebase
- Average Weight
- Events to Measure

For a detailed description of module functions and operation, see MA1043 MAQ20-DIOL Hardware User Manual.

In the **Alarm** tab, timer alarms can be configured. See Special Functions: Alarm configuration.

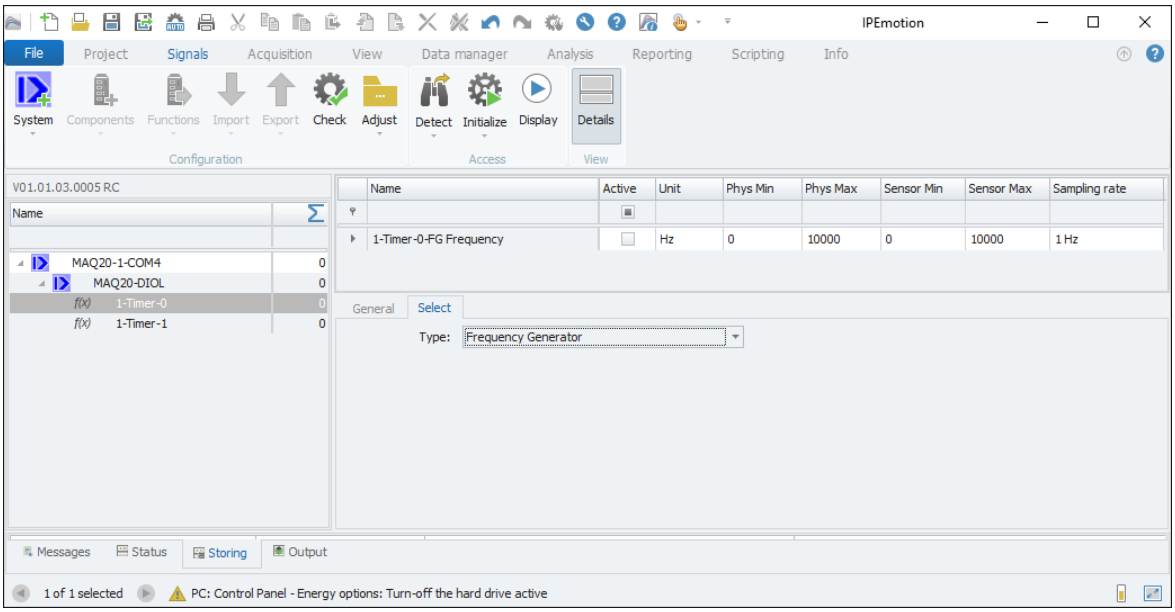
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Special Function 5: Frequency Generator

To configure a timer as a frequency generator, select the **Frequency Generator** in the **Type** selection

When selected the plug-in adds the following new channels to the DIOL device

- Timer Frequency



For a detailed description of module functions and operation, see MA1043 MAQ20-DIOL Hardware User Manual.

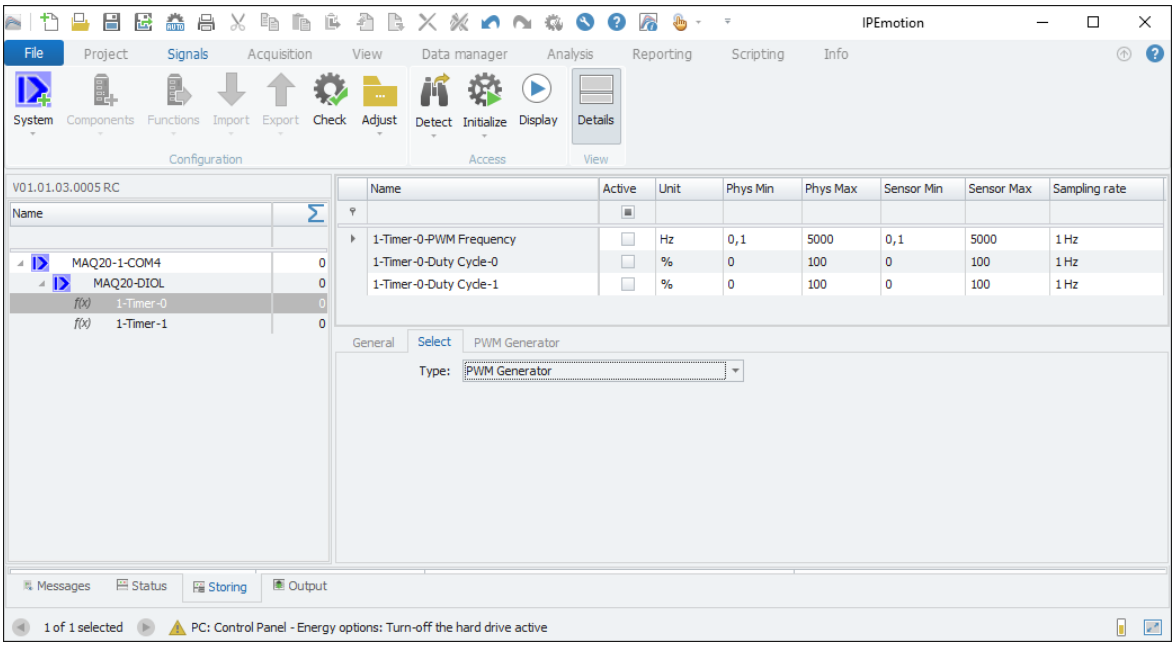
Special Function 6: PWM Generator

To configure a timer as a PWM generator, select the **PWM Generator** in the **Type** selection

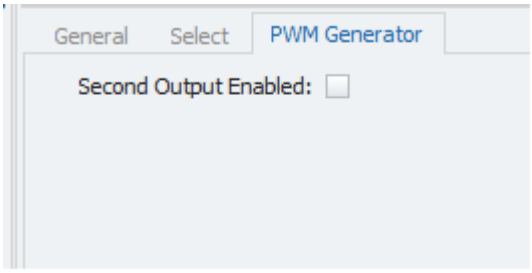
When selected the plug-in adds the following new channels to the DIOL device

- Timer Frequency
- Timer Duty Cycle 0
- Timer Duty Cycle 1

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With the special function tab is selected a new tab **PWM Generator** appears.



The tab contains the configuration parameter for the selected timer as a PWM generator. The parameter is

- Second Output Enabled

For a detailed description of module functions and operation, see MA1043 MAQ20-DIOL Hardware User Manual.

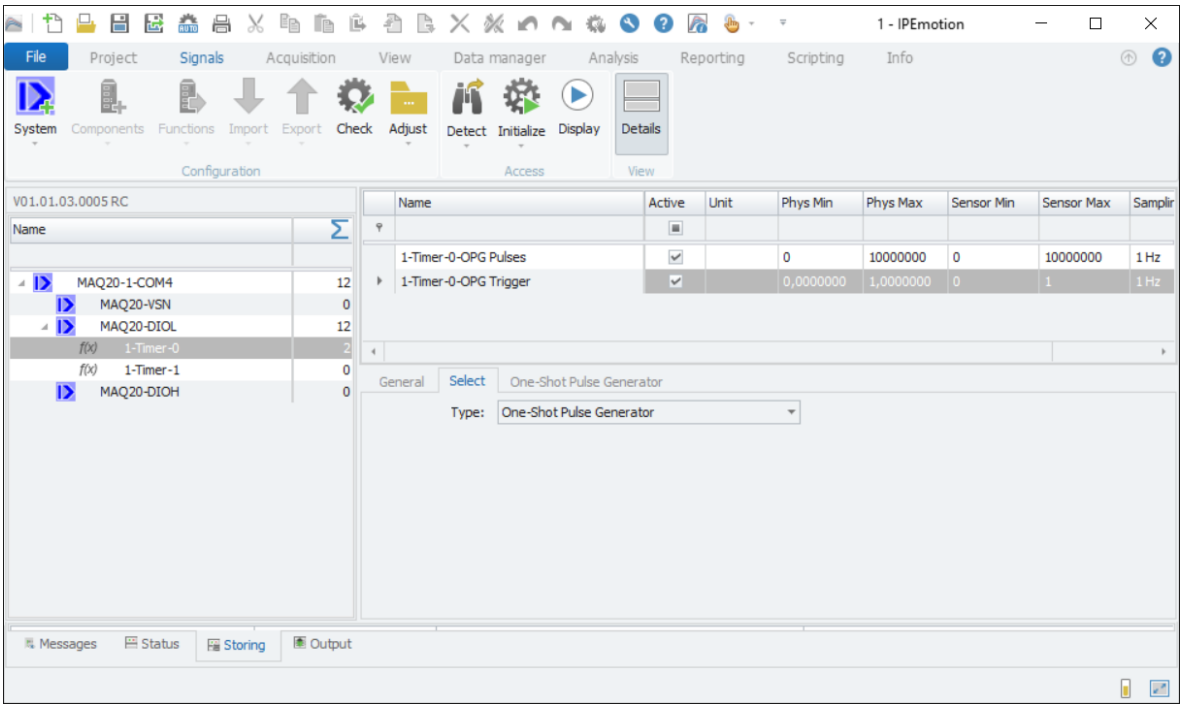
Special Function 7: One-Shot Pulse Generator

To configure a timer as a one-shot pulse generator, select the **One-Shot Pulse Generator** in the **Type** selection

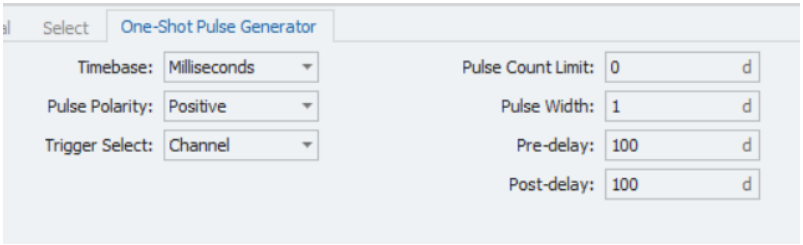
When selected the plug-in adds the following new channels to the DIOL device

- Timer Pulses
- Timer Trigger

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When the special function is selected a new tab **One-Shot Pulse Generator** appears.



The tab contains the configuration parameters for the selected timer as a one-shot pulse generator. The parameters are

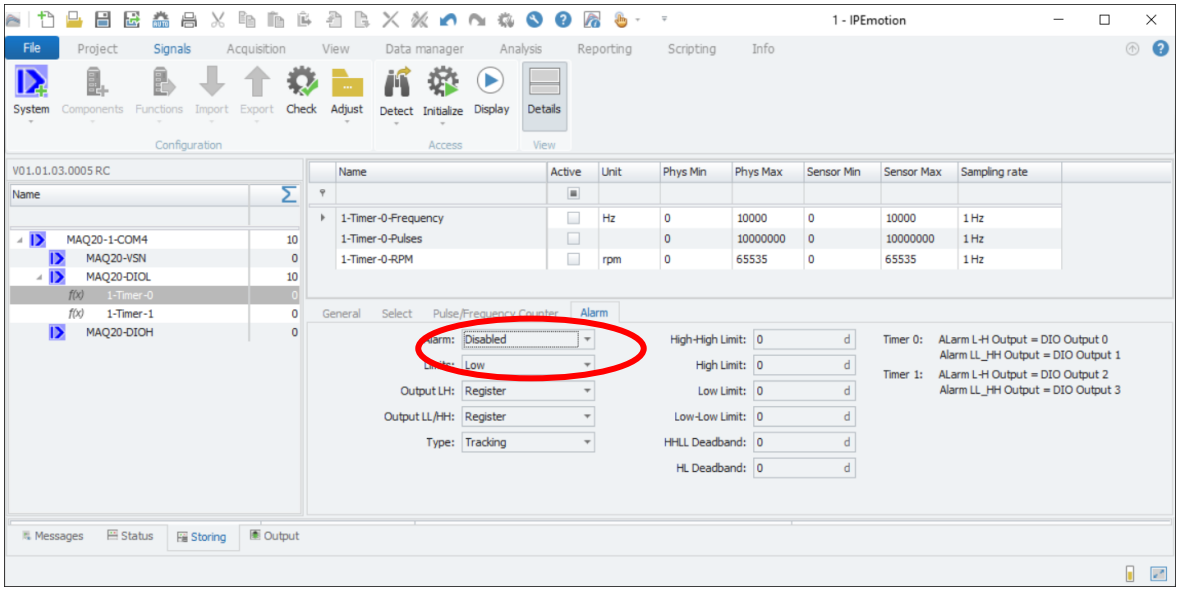
- Timebase
- Pulse Polarity
- Trigger Select
- Pulse Count Limit
- Pulse Width
- Pre-delay
- Post-delay

For a detailed description of module functions and operation, see MA1043 MAQ20-DIOL Hardware User Manual.

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Special Functions: Alarm configuration

When selecting a special function that allows an alarm, an additional tab for the alarm configuration appears. By default, the alarm is disabled.

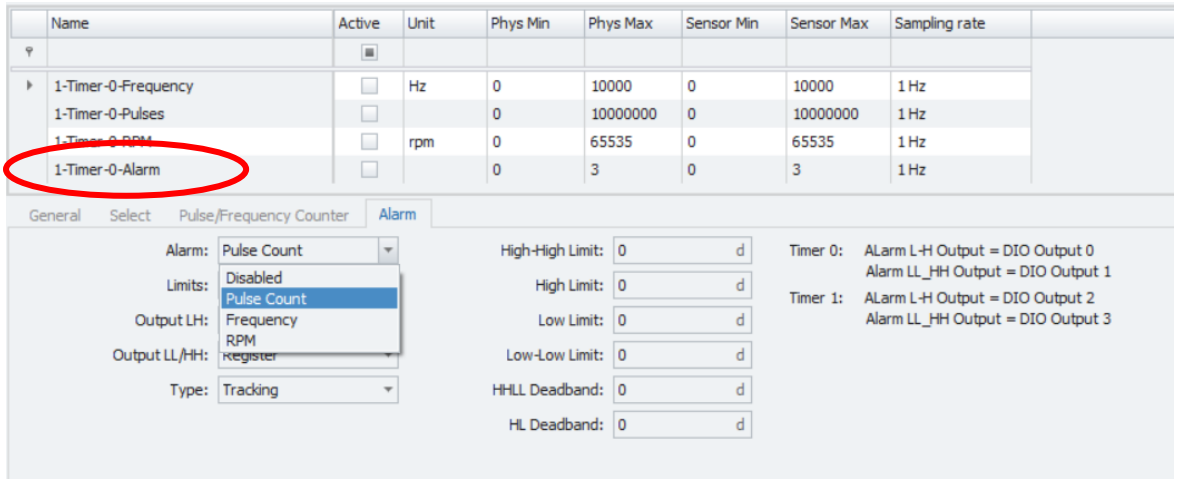


Depending on the special function there will be an individual selection of input channels an alarm can be assigned to.

For example: If the special function **Pulse/Frequency Counter** is selected**,** the alarm can be assigned to one of the following channels:

- Pulse Count
- Frequency
- RPM

When selecting one of these alarm sources a new channel **Alarm** appears.



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Depending on the alarm limits selected, the alarm channel can have four states between 0 and 3.

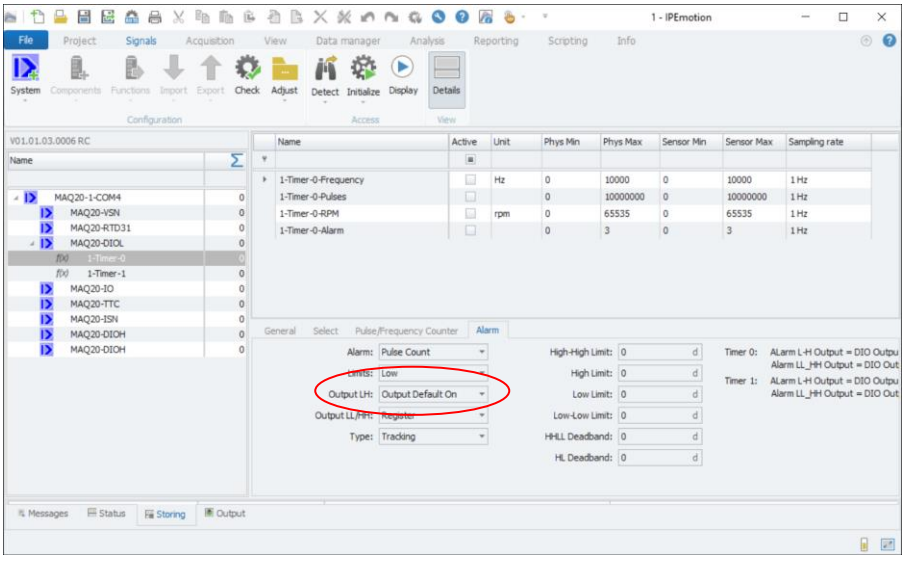
The following parameters can be set

- Alarm
- Limits
- Output LH (Target for low/high alarm)
- Output LL//HH (Target for low low/high high alarm)
- Type
- High-High Limit
- High Limit
- Low Limit
- Low-Low Limit
- HHLL Deadband
- HL Deadband

For a detailed description of module functions and operation, see MA1043 MAQ20-DIOL Hardware User Manual.

If an alarm is set and the output of the alarm is configured to a digital output, the corresponding output channel will be set as an input channel in the configuration. This is done to avoid setting the output during an acquisition by other sources.

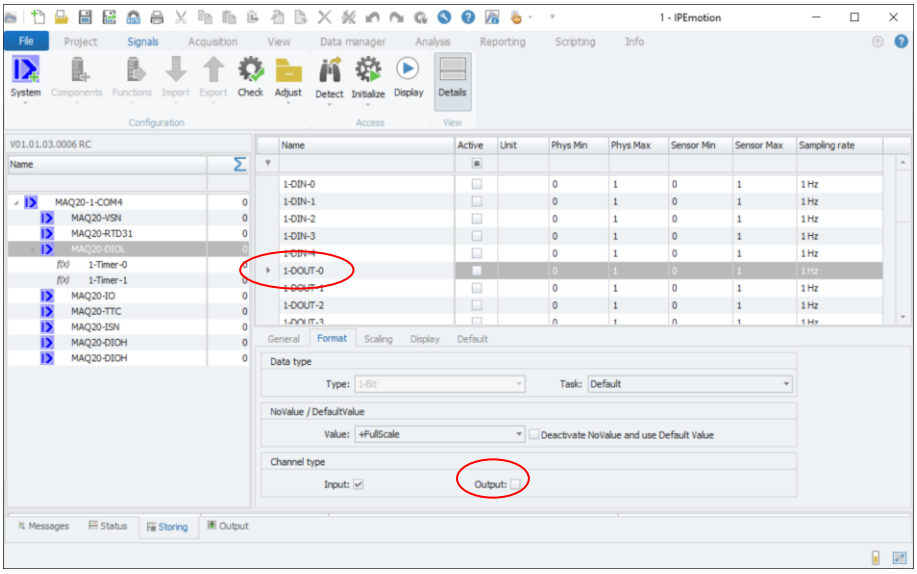
For example: Timer 0 is configured as a pulse/frequency counter. The alarm is set to pulse count and the output for LH alarm is set to 'default on'.



Automatically the digital output channel DO-0 is set to an input channel. The **Output** flag in the **Format** tab of the channel is unchecked.

For a detailed description of the usage of output channels for alarm signals, see MA1043 MAQ20-DIOL Hardware User Manual.

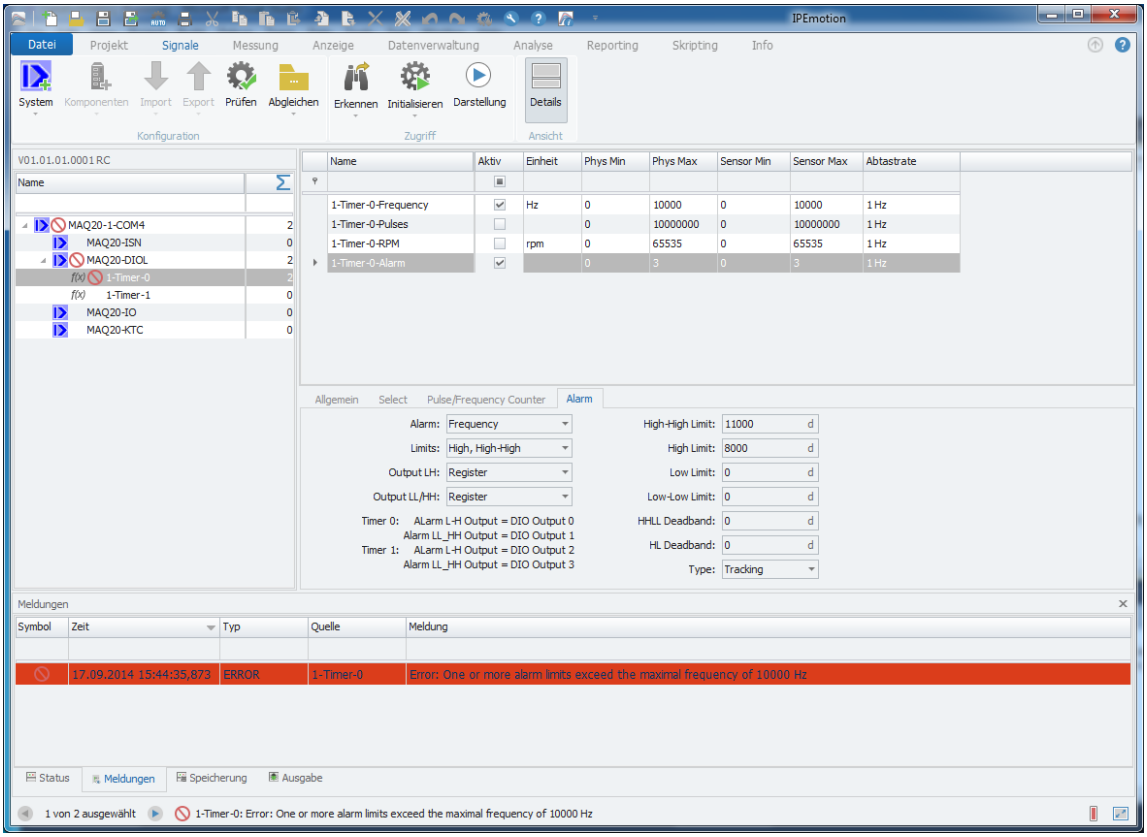
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When starting an acquisition, the plug-in checks if the limit values for an alarm are plausible. The plug-in has two rules.

Rule 1: No value greater than the maximum channel value is allowed

If an alarm limit exceeds the maximum allowed channel value, an acquisition start with the data equipment. For example: If special function 1 is selected and the alarm for frequency, no limit greater than 10000 Hz is allowed. If such a value is set and acquisition started, an error will occur with notification as shown below:



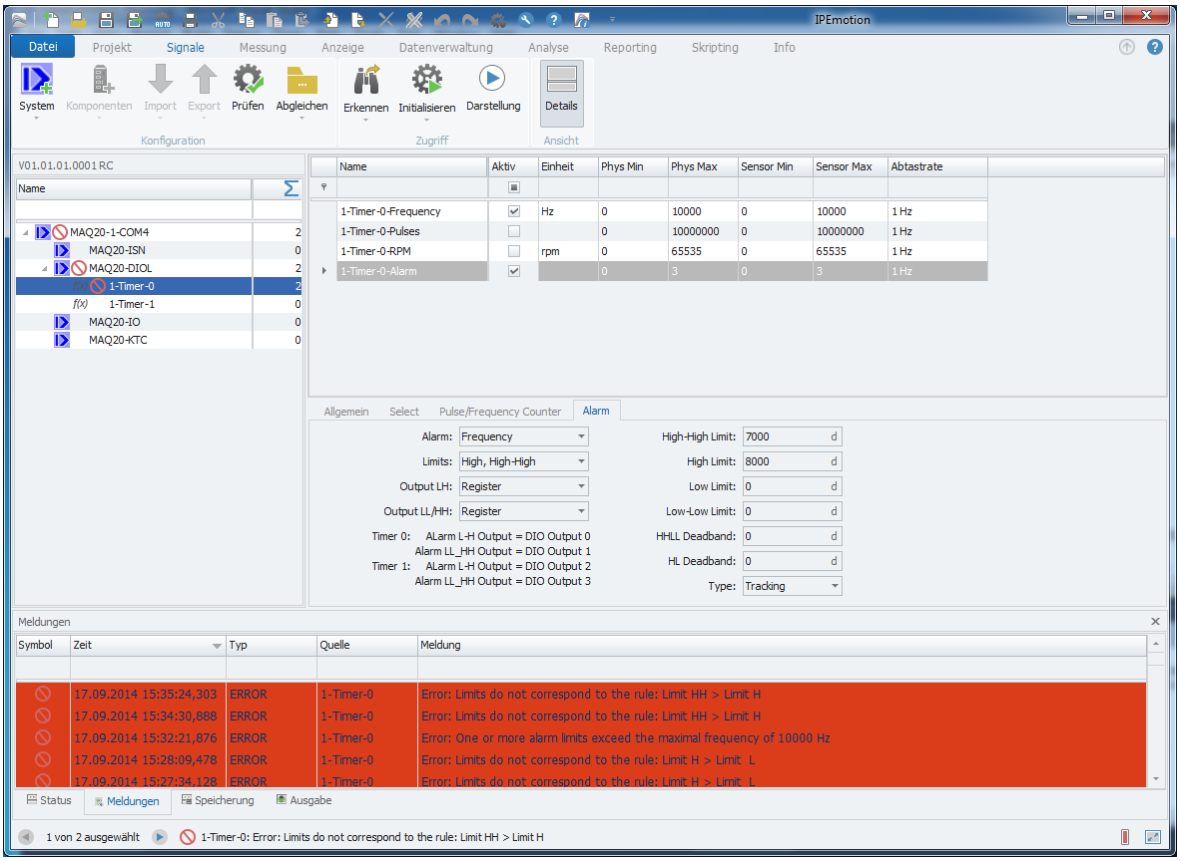
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Rule 2: High-High limit > High limit > Low limit > Low-Low limit

Depending on the limits chosen, there are up to 4 limit values to configure: High-High limit, High limit, Low limit and Low-Low limit. The ranges of the limits must be plausible. For example: a High-High limit cannot be lower than a High limit. The following table shows the rule for every limit setting

Limits	Rule
Low	Cannot exceed minimum channel value
High	Cannot exceed maximum channel value
Low/High	Low limit < high limit
Low, Low-Low	Low-Low limit < Low limit
High, High-High	High limit < High-High limit
All	Low-Low limit < Low limit < High limit < High-High limit

If the set limits break any of these rules, the acquisition fails with an error message notification as shown below:



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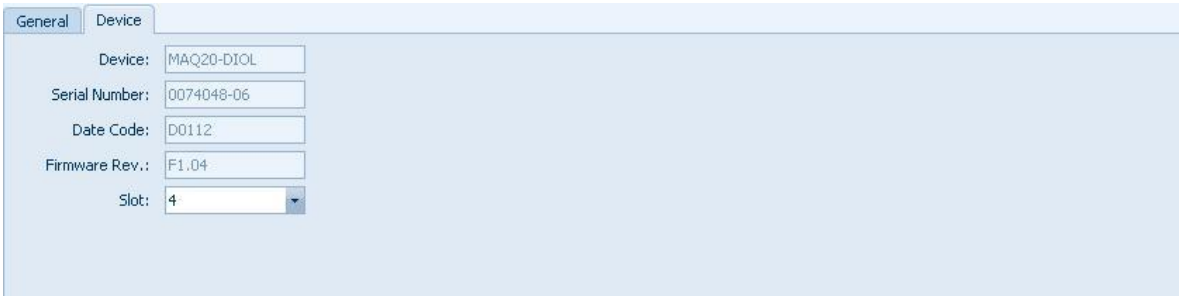
19.0 MAQ20-DIOH

This section describes the interface to the MAQ20-DIOH high voltage discrete I/O module**.** For a detailed description of module functions and operation, see MA1058 MAQ20-DIOH Hardware User Manual.

Device

After hardware detection or initialization the tab **Device** contains the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot



The fields for device, serial number, date code and firmware revision are read only.

The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

Input channel

There are no special configurations for MAQ20-DIOH input channels. All configurations for digital channels are typical IPEmotion functionalities. For further information see MA1066 IPEmotion Software User Manual.

Output channel

Among the usual configurations for digital output, default output values are defined in the Tab **Default**.

NOTE: The Default output value will be configured in the MAQ20-DIOH. Before starting and after stopping an acquisition in IPEmotion the default value will be set in the module.



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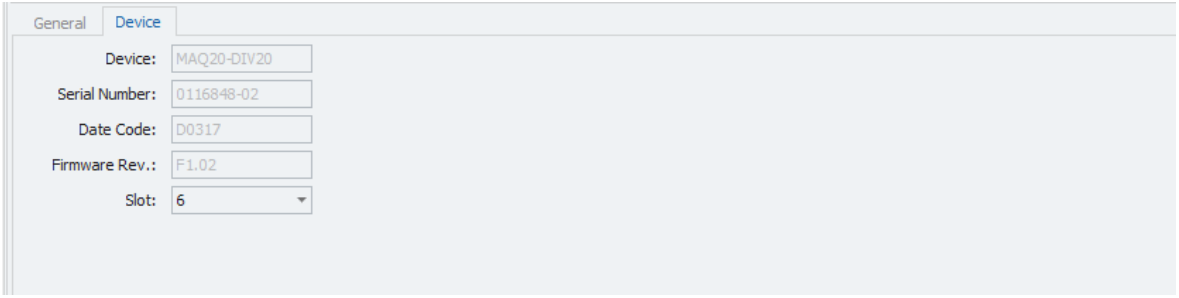
20.0 MAQ20-DIV20

This section describes the interface to the MAQ20-DIV20 discrete input module**.** For a detailed description of module functions and operation, see MA1059 MAQ20-DIV20/MAQ20-DIVC20 Hardware User Manual.

Device

After hardware detection or after initialization the tab **Device** contains the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot



The fields for device, serial number, date code and firmware revision are read only.

The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

21.0 MAQ20-DIVC20

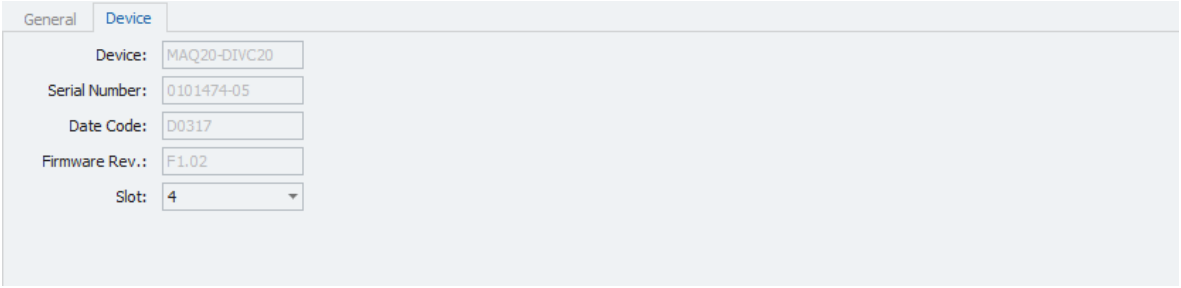
This section describes the interface to the MAQ20-DIVC20 discrete input with compliance voltage module**.** For a detailed description of module functions and operation, see MA1059 MAQ20-DIV20/MAQ20-DIVC20 Hardware User Manual.

Device

After hardware detection or initialization the tab **Device** contains the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot

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The fields for device, serial number, date code and firmware revision are read only.

The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

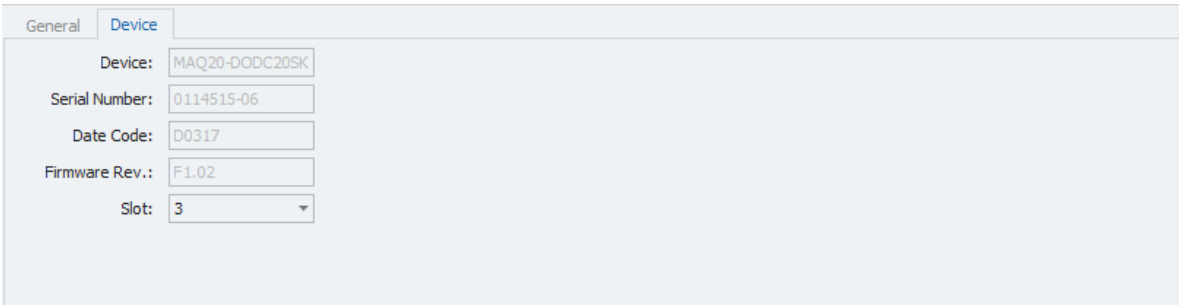
22.0 MAQ20-DODC20SK

This section describes the interface to the MAQ20-DODC20SK discrete output module**.** For a detailed description of module functions and operation, see MA1061 MAQ20-DODC20SK Hardware User Manual.

Device

After hardware detection or initialization the tab **Device** contains the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot



The fields for device, serial number, date code and firmware revision are read only.

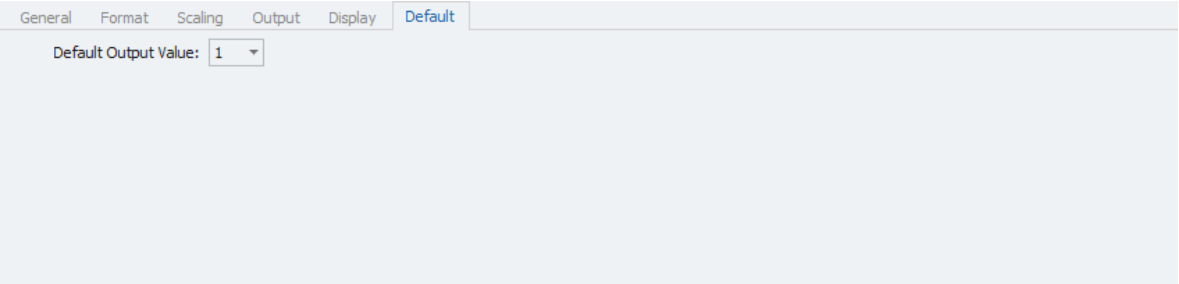
The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

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Output channel

Among the usual configurations for digital output, default output values are defined in the Tab **Default**.

NOTE: The Default output value will be configured in the MAQ20-DODC20SK. Before starting and after stopping an acquisition in IPEmotion the default value will be set in the module.



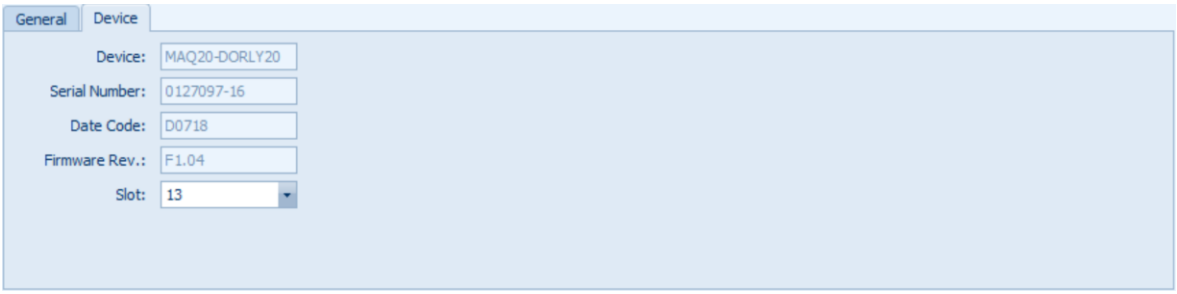
23.0 MAQ20-DORLY20

This section describes the interface to the MAQ20-DORLY20 discrete relay output module**.** For a detailed description of module functions and operation, see MA1063 MAQ20-DORLY20 Hardware User Manual.

Device

After hardware detection or initialization the tab **Device** contains shows the following module information:

- Device (name)
- Serial Number
- Date Code
- Firmware Rev. (Firmware Revision)
- Slot



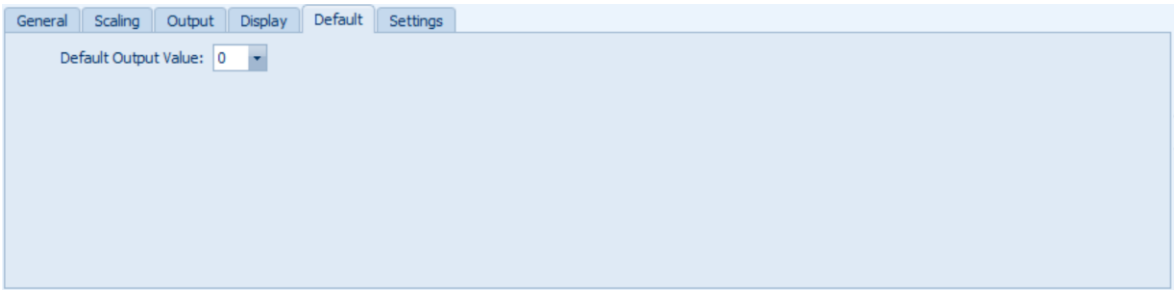
The fields for device, serial number, date code and firmware revision are read only.

The field **Slot** defines the position of the module in the MAQ20 system. The slot number corresponds to the Modbus address range of the module. When manual configuration is used, the slot number must be defined in the field **Slot**.

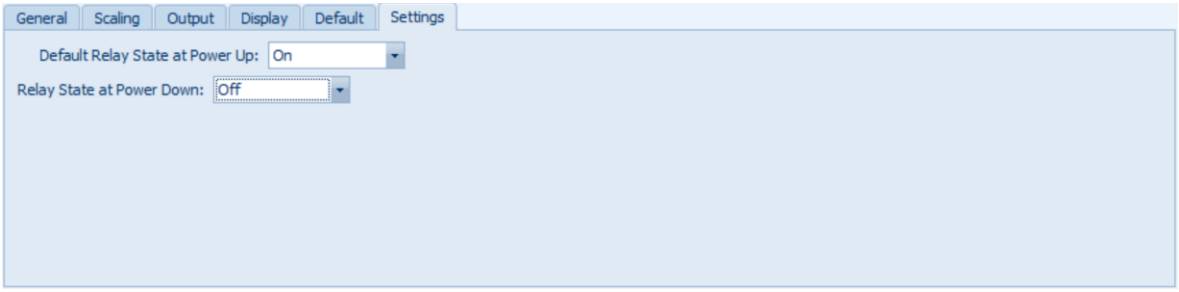
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Output channel

In the Tab **Default** default output values for a given channel can be configured. These are used to put a system or application in a known safe state at standard startup, at standard shut down, upon power loss or other non-standard operating condition, or by using the reset commands.



In the tab **Settings,** Default Relay State at Power Up and Relay State at Power Down can be turned on/off.



NOTE: The Default output value will be configured in the MAQ20-DORLY20. Before starting and after stopping an acquisition in IPEmotion the default value will be set in the module.

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