Efficient Integration
Weighing for Common PLC Systems

The present and future of network technologies in production are based on the Industrial Ethernet standard. Common solutions using this technology are PROFINET IO RT and EtherNet/IP. Sensors and actuators that comply with those standards can be easily integrated into PLC systems if vendors provide the right tools and designed installation-friendly products.

Overview

This document explains the key points for integrating a WMF high-precision weigh module into Allen-Bradly and Siemens PLC Systems. It addresses project managers, network designers and software engineers by providing a brief guideline for establishing basic connectivity to test the functionally of hardware and software.

Application

The examples in this document use the WMF high-precision weigh module. However, the content is not limited to that particular weighing device. It can be applied to many other METTLER TOLEDO products that provide PROFINET IO and EtherNet/IP connectivity.

Content

METTLER TOLEDO

1. Configuring weighing device via the web

## WMF High-Precision Weigh Module

The weigh module is tailored for the needs of machine and instrument manufacturers. It is designed for seamless integration where space is limited in applications including quality control for vial- or syringe-filling machines as well as for tablet or capsule testing.

The weigh module features fully integrated electronics, including connectivity via EtherNet/IP or PROFINET IO. Functionality testing, calibration and adjustment might be needed because the weigh module has an incorporated calibration weight.
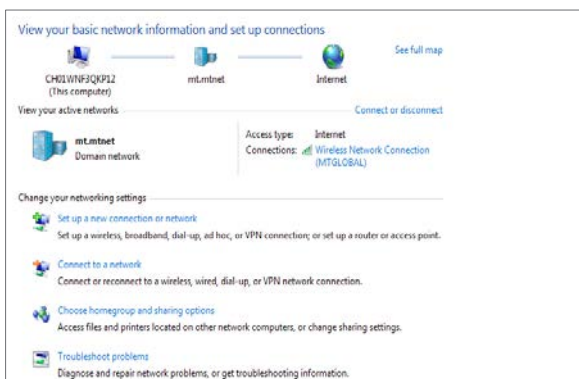
Open Network Connections by clicking the Windows 7 Start button, and then clicking Control Panel.
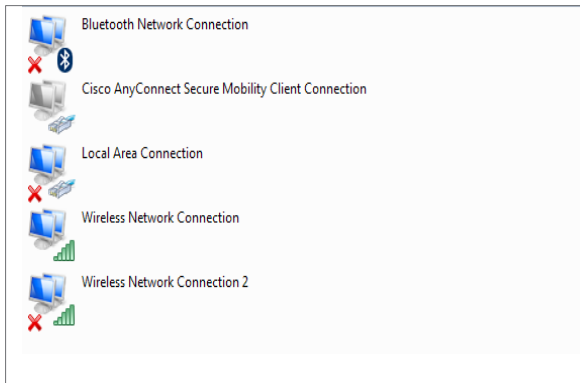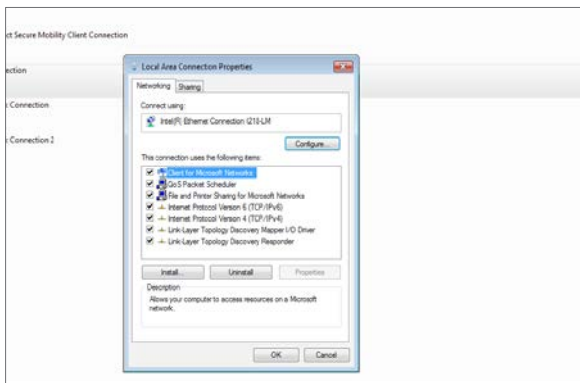
Click to Network and Internet
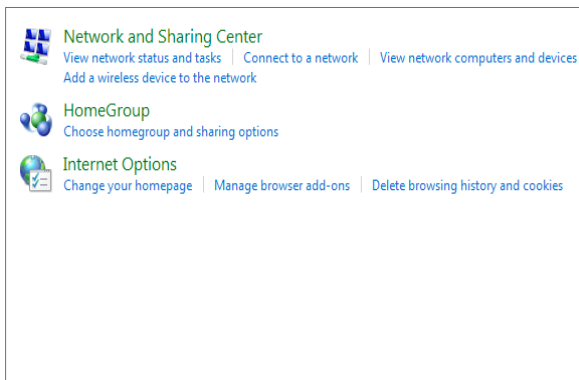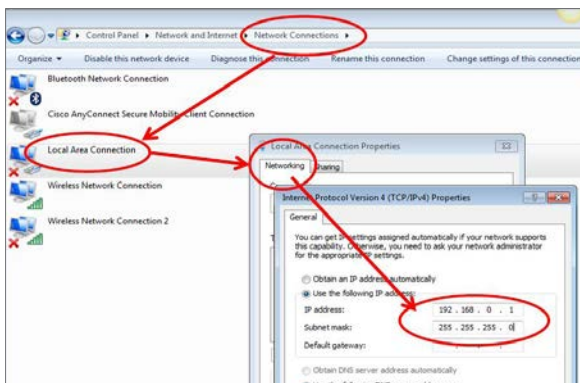
Click to Network Sharing Center

Click to Network Connections

Click to Local Area Network Connection

Set Network to Internet Protocol to Version 4 (TCP/IPv4).

The IP address for establishing connectivity with the computer can be set as shown in the following pictures. The computer and Weigh Module must be in the same IP-Address range. The default IP-Address of the Weigh Module is192.168.0.55.

The computer can be set to anything from 192.168.0.1 to 192.168.0.255. (Example: 192.168.0.50)
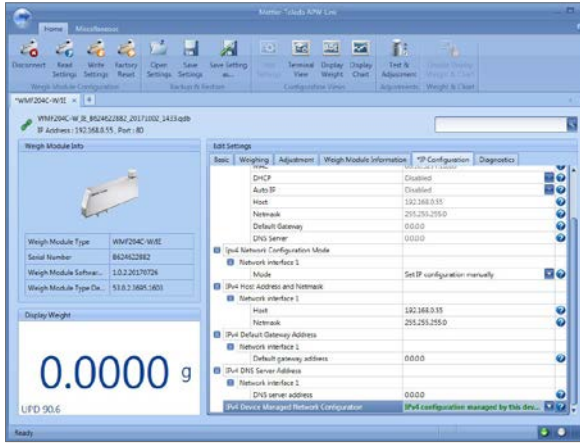

Three LEDs on the WMF weigh module indicate status of weigh module.

The first LED indicates the Module status.
• Green: normal operation
• Red, blinking: Warning
• Red, solid: Error

The 2nd and 3rd LEDs indicate Industrial Ethernet status depending on the selected type. They are not relevant at this stage of the configuration process.

You can configure the IP settings of the weigh module using APW LinkTM PC configuration software. You can download this software from www.mt.com/apw-link

Open APW-Link Software and change the setting of the parameter called "IPv4 Device Managed Configuration" to "Managed by this device" and then write the changed settings to the weigh module.

You can now assign a fixed IP address to the weigh module and this IP address will remain fixed even after a power cycle.

## 1.1. Check configuration of weighing device via the webserver (optional step)
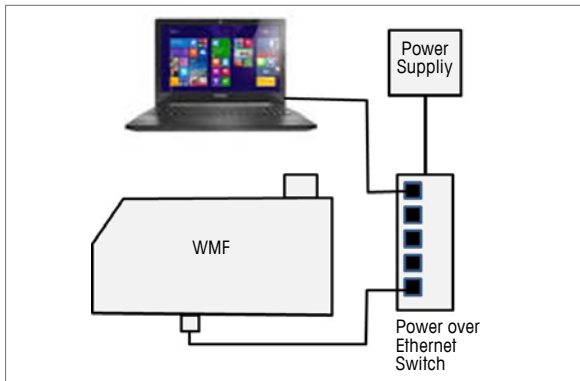
The configuration of the weigh module can be checked from the webserver. Connect the weigh module to a computer via a Power-over-Ethernet Switch using an RJ45/M12 patch cable. Enter the weigh module's IP address (default: 192.168.0.55) into the computer's browser.

Note: An IEEE 802.3af Power-over-Ethernet Switch is necessary to provide electric power to the weigh module.

Parameter settings	
Filter settings	
Weighing Mode:	Normal
Weighing Environment:	Standard
Cut Off Frequency:	0.000 Hz
Stability Criteria	
Observation Time for Weighing:	0.0 s
Tolerance for Weighing:	0.0 digit
Observation Time for Tare:	0.0 s
Tolerance for Tare:	0.0 digit
Observation Time for Zero:	0.0 s
Tolerance for Zero:	0.0 digit
Timeout	
General Timeout:	60 s
Zero Settings	
Automatic Zero Tracking:	Enabled
Zeroing at Start-Up:	Enabled
Weight Value	
Readability:	1 digit
Adjustment	
External Calibration Weight:	200.0 g
External Test Weight:	200.0 g

The webserver identifies the individual weigh module configuration including type, software version, IP-Address but also specifications and weighing parameters. It is also possible to show the weight value.

Engineering Note

2. Connecting Siemens S7 PLC via PROFINET IO
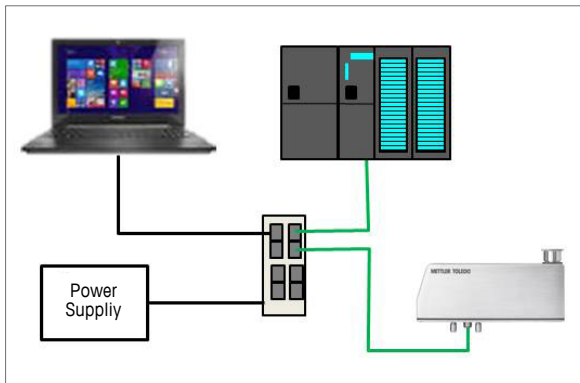
Network for connecting to a Siemens PLC over TIA Portal or Simatic Step 7 Manager via PROFINET IO requires an IEEE 802.3af Power-over-Ethernet switch to provide power to the weigh module.
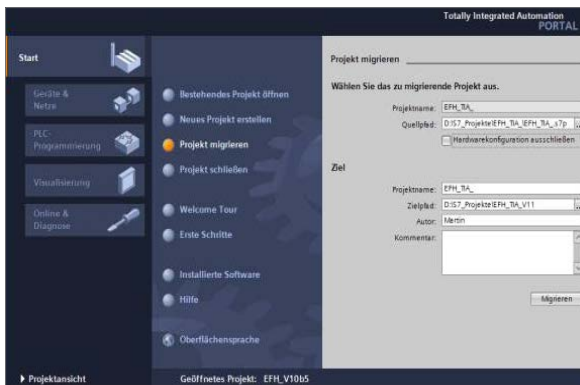
The configuration is illustrated with TIA Totally Integrated Automation. The configuration with Simatic Step 7 Manager is similar to TIA portal.
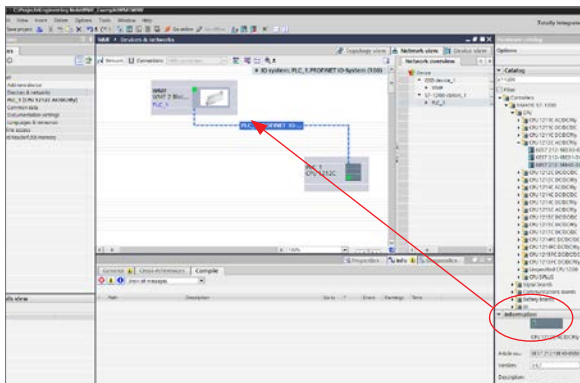
After installation of the GSDML file, the WMF weigh module is available in the hardware catalog. It can be added to the project by dragging and dropping the file.
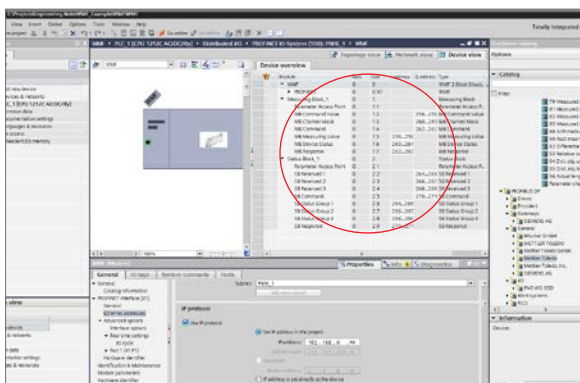
The Device Description File of the weighing device includes all the needed information. There is no additional configuration needed.

The configuration parameters for the WMF weigh module are available, as well as the Module Parameters, such as filter settings, stability criteria and adjustment configuration.
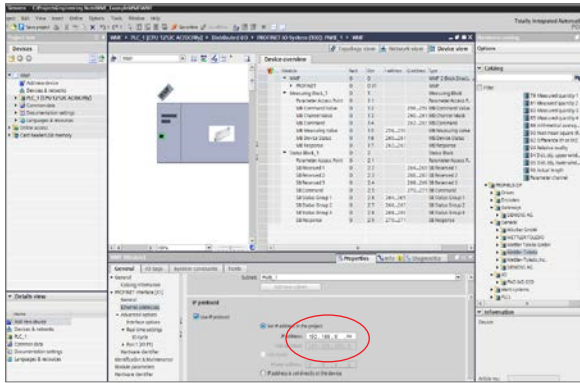
The WMF Weigh module's IP address and device name must be configured in the project and in the HW configuration tool. Default values are "WMF" and "192.168.0.55."

If more than one weigh module is connected, the addresses of the additional modules have to be changed. For example: 192.168.0.51, 192.168.0.52, etc.

The status LED on the weigh module shows installation and communication is working.

The second LED blinks in red if the module is not connected to a PROFINET network.

3. Connecting Allen-Bradley PLC via EtherNet/IP
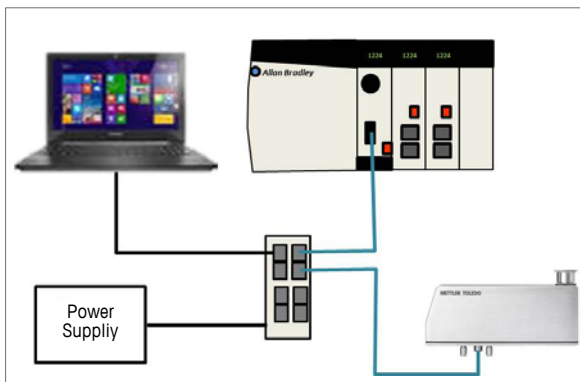
For a network connection to an Allen-Bradley PLC via EtherNet/IP network, you need an IEEE 802.3af Power-over-Ethernet switch to provide power to the weigh module.

The configuration is illustrated with Studio 5000 Environment for Allen-Bradley PLC.

Select the controller. Add an EtherNet/IP communication interface card. In the Tools drop down menu start the EDS Hardware Installation Tool. Follow the on screen prompts to complete the installation.

After installation of the Device Description Files, (eds-File) all the needed configuration and PLC-Tags are available for the WMF weigh module.

Add the WMF module to the Ethernet network by selecting it from the Mettler Toledo modules.

Use the fixed IP address which was set with APW-Link. [Note: DHCP should not be used in control networks.] The number then must be transferred manually into the weigh-module setting.

The connection type (for standard communication: I/O) must be selected and the IP-address should be configured by adding the WMF weigh module to the Ethernet/IP network.

In the Parameter Tab, the Module parameter can be easily configured directly with the PLC.

If all three LEDs are green, the module is successfully connected to the EtherNet/IP network.

4. Programming the PLC with weighing data

The Standard Automation Interface is a protocol designed to exchange data between METTLER TOLEDO devices and automation systems, such as PLC systems or industrial computers. It offers a common data layout for terminals, transmitters, platforms, weigh modules and load cells, regardless of the physical interface or automation network used.

4.1. Standard Automation Interface Format

The protocol has two primary data types: cyclic data and asynchronous data, which is also known as acyclic or explicit messaging. The Standard Automation Interface format is scalable depending on the fieldbus type and device. A standard Industrial Ethernet device with PROFINET IO RT or EtherNet/IP from METTLER TOLEDO supports the two-block format. It provides two blocks of input data and two blocks of output data with a fixed format that requires no configuration.

Measuring Data Block (Block 1)	
Word 0	Requested floating point value (32 Bit)
Word 1	
Word 2	Scale Status Group
Word 3	Response Word
Status (Block 2)	
Word 4	Status Group 1
Word 5	Status Group 2
Word 6	Status Group 3
Word 7	Response Word

Cyclic "**Read**" information in two-block format sent by weigh module.

The two-block format delivers weight values in floating point format plus status information.

Measuring Data Block (Block 1)	
Word 0	Floating point value - optionally used with command
Word 1	
Word 2	Channel Mask
Word 3	Command Word
Status (Block 2)	
Word 4	Reserved
Word 5	Reserved
Word 6	Reserved
Word 7	Command Word

Cyclic "**Write**" instructions in two-block format sent by controller to weigh module.

With the command word, the cyclic command can be changed. The default value (0=zero) provides Gross Weight Data.

Engineering Note

4.2. Status Information Provided by Standard Automation Interface

This document doesn't provide details about all status information. Below is an overview of the three most important status bits for simple PLC programs.

Heart Beat:
This bit is to confirm that the device is working normally. The heart beat bit is toggling between "1" and "0" every second.

Data Okay:
This bit is set to "1" if weighing device is working correctly. The bit is set to "0" when the device is still operational but the scale has a critical error, such as load above nominal capacity, and the value being reported cannot be guaranteed to be valid. The status block provides more detailed information about the error.

Alarm Condition:
This bit is "1" when there is an application fault, predictive diagnostics alarm or command received cannot be executed as requested. If this bit is "1," the control system can get detailed information about the nature of the failure by checking the Status Information in the 2nd Block.

5. Conclusion

METTLER TOLEDO weighing devices provide engineering solutions for easy mechanical, electrical and software integration into PLC systems and industrial computers used as controllers for automated processes. They support simple functionality checks via LED and the webserver to support step-by-step commissioning that facilitates identification of the root causes of problems.

The status information provided offers a first level with general information, but also a second level with detailed information allowing priority setting for executing different reactions tailored to individual scenarios. It is possible to distinguish between significant and insignificant errors to initiate predictive maintenance before the machine stops or damage occurs.

More Information
Links for Information about products with PROFINET IO and EtherNet/IP Connectivity:

ACT350 Weight Transmitter
▸ **www.mt.com/ACT350**
WMF weigh module with
▸ **www.mt.com/WMF**
SLP85x Load Cells
▸ **www.mt.com/SLP85x**