User's Manual

IND700

ProWorks OPC UA

METTLER TOLEDO

Contents

1 IND700 OPC UA Server

1.1. Overview

The IND700 OPC UA (Unified Architecture) server functionality provides a way for the terminal to communicate securely with other devices, industrial automation systems, and software systems using the industry standards of OPC UA. It offers several advantages to the user:

- Allows for easy integration with other systems, such as enterprise resource planning (ERP) systems. The seamless flow of data during the production process reduces the necessity for manual input, and thus minimizes the possibility of error.
- Standardizes communication and security access across different devices and systems, satisfying the needs of industries with strict regulatory requirements. Encryption and digital signatures ensures that data is transmitted securely, and that only authorized devices and users can access the terminal.
- Enables remote operation of terminal functions such as setting tare and setting zero, using OC UA methods.

1.1.1. Example Use Cases

1.1.1.1. In a Manufacturing Execution System (MES)

Scales and a terminal can be connected to the MES and used to track and coordinate the execution of tasks.

1.1.1.2. In a Pharmaceutical Application

A scale connected to a terminal can be used to perform high-precision measurements. If multiple measurements on different scales (for example, with different materials) are required, users can readily switch between scales.

1.2. Configuration

- Default values for parameters are indicated by an asterisk * and **bold text**.

When an IND700 terminal includes OPC UA functionality (i.e., a license is installed), the **Setup > Communication** menus will include an OPC UA option, with three sub-menus – **Server**, **Certificates** and **Information**.

A user with an admin-level login can

- Configure the network properties of the OPC UA server
- Configure the minimum security requirements necessary to communicate with the OPC UA server
- Restart the OPC UA server with the current settings

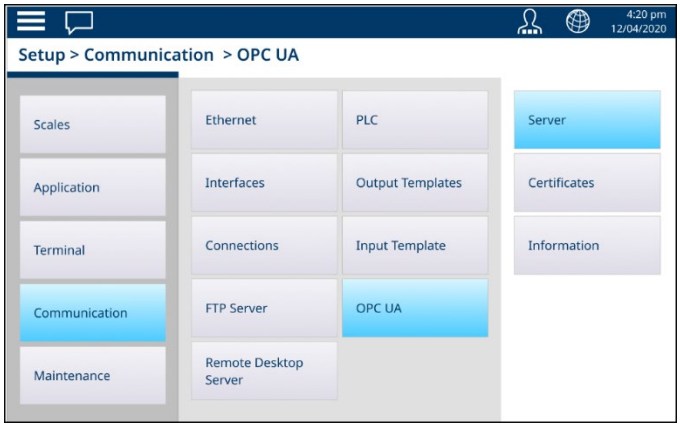

Figure 1-1: Communication Setup Menus Showing OPC UA

1.2.1. Server

The OPC UA Server screen configures the server and the security settings for each communication protocol.

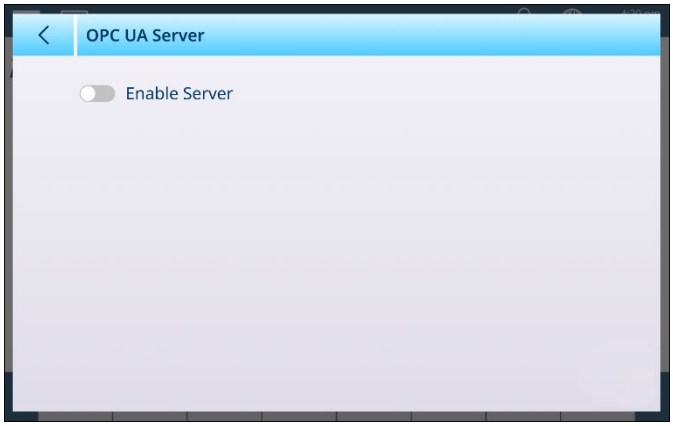

Figure 1-2: OPC UA Server Port Configuration Screen, Page 1, Server Disabled

Once the **Enable Server** toggle is set to **enabled**, the screen changes to display information about the server, as well as a set of navigation arrows at left which provide access to the security modes configured from a second page.

A **Confirm** button appears at lower right.

A **Restart Server** button appears to the left of the **Confirm** button. Refer to section 1.2.1.1, **Confirming Changes and Restarting the Server**, below.

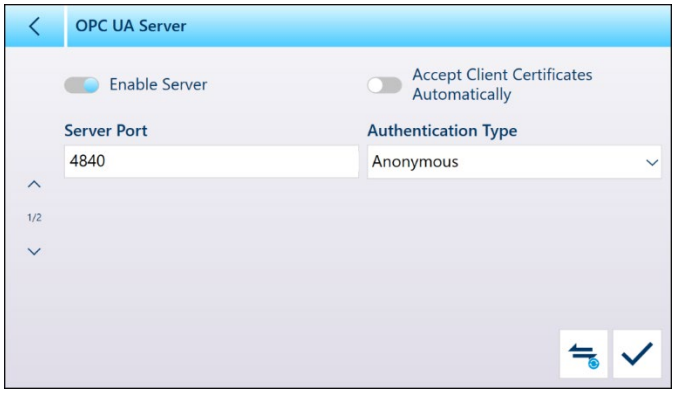

Figure 1-3: OPC UA Server Port Configuration Screen, Page 1, Server Enabled

The **Server Port** field determines which port OPC UA clients can connect to.

Accept Client Certificates Automatically is a toggle setting which determines whether any client certificate is accepted automatically. Its default value is off (disabled). This toggle should only be enabled for debugging purposes, and not in production environments.

Authentication Type determines the authentication that clients must provide to connect to the server. Options are **Anonymous** and **Username & Password**.

With **Enable Server** toggled on, use the Down navigation arrow at left to display a second page of settings.

Here, the server's security policies are configured. Note that, while it is possible to configure more than one **Security Mode**, it is only necessary to select a setting for the **Security Mode** in use.

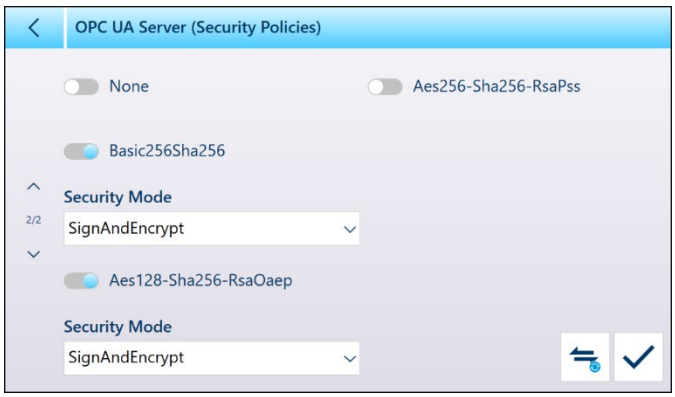

Figure 1-4: OPC UA Server Port Configuration Screen, Page 2, Basic Selected

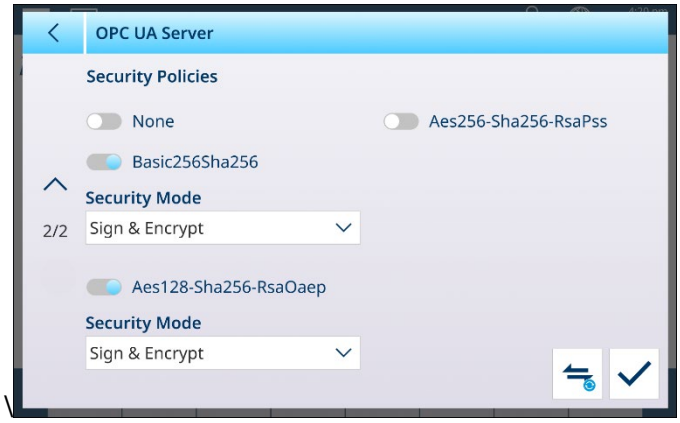

Figure 1-5: OPC UA Server Port Configuration Screen, Page 2 – Basic and Aes Selected

Each **Security Mode** can be configured from its drop down list. The default value **is Sign & Encrypt**; other options are **None** and **Sign**.

1.2.1.1. Confirming Changes and Restarting the Server

When changes are made from the **OPC UA Server** screen, two icons appear at lower right: a server restart icon , and a check mark .an OK check mark is displayed. Touch the check mark to confirm the changes, restart the server with the new settings, and return to the **Communication** menus. Touch the server restart button to restart the server – used, for example, when certificates changed.

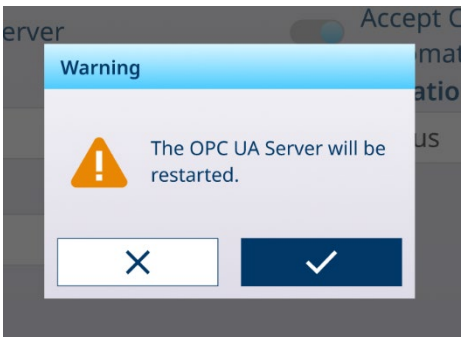

Figure 1-6: Server Restart Warning Dialog Box

A popup will indicate that the server is in the process of restarting.

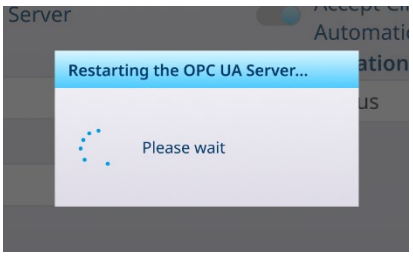

Figure 1-7: Server Restarting

If the restart was successful, an information popup will indicate this.

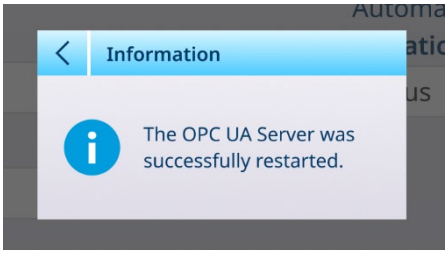

Figure 1-8: Server Restart Successful

If the restart was not successful, an Error popup will appear.

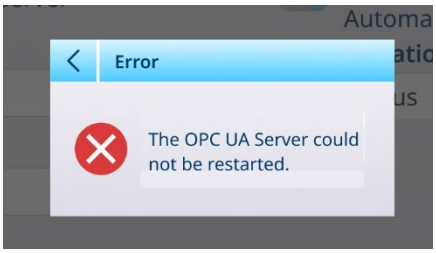

Figure 1-9: Server Restart Failed

1.2.2. Server Certificates

Certificates control the way in which the server is protected. Two types of certificates can be used – CA certificate (or any certificate not created on the terminal) and self-signed certificates generated on the terminal.

Both certificate types can be exported, and both can be imported either from an internal or an external file. Only self-signed certificates can be renewed from the terminal. Details for both types of certificate may be viewed from the terminal.

Self-signed certificates must be manually loaded into the terminal. This can be done using an ftp client or a utility such as UltraVNC Viewer. Details on file transfer to the terminal can be found in the **IND700 User's Guide**, Chapter 4 **Configuration**, at **Maintenance Setup > Software Update > Scale Interface**. Note that, for certificates, the IND700 folder structure is **C:\Import**.

The IND700 is a server, for the purposes of certificate management. To manage certificates, access the **Communication > OPC UA > Certificates** page.

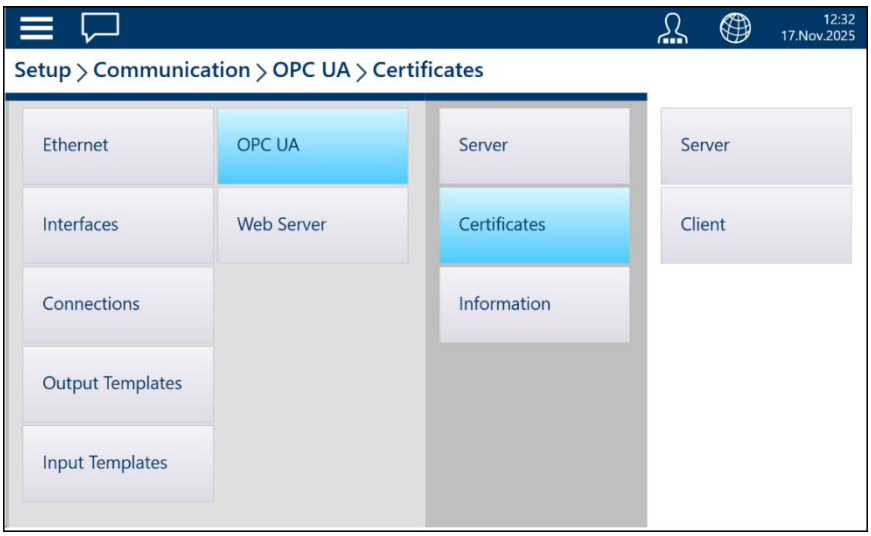

Figure 1-10: OPC UA Menus Certificates

1.2.2.1. Importing Server Certificates

The image below shows a **Server Certificates** list in which the first certificate is selected for use.

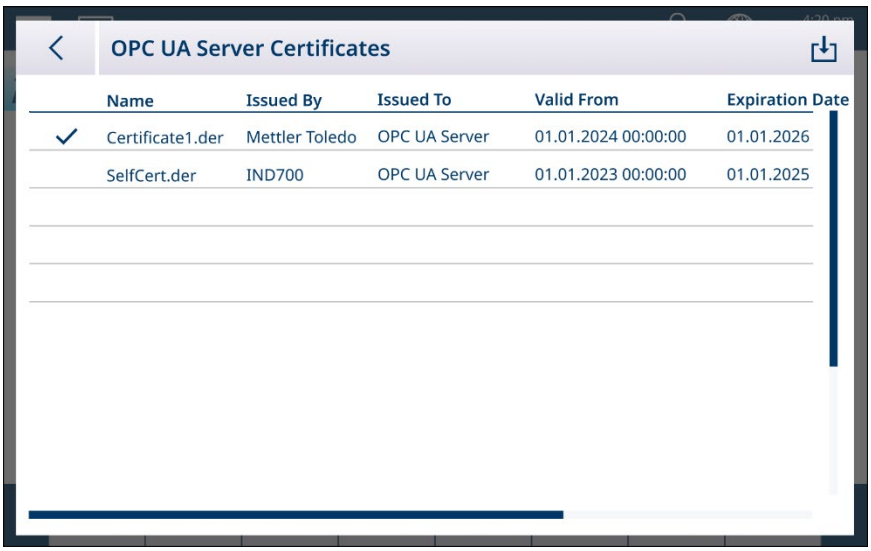

Figure 1-11: Server Certificates List

To import a server certificate, touch the Import icon at upper right in the **Server Certificates** list view. The certificate selection screen will display.

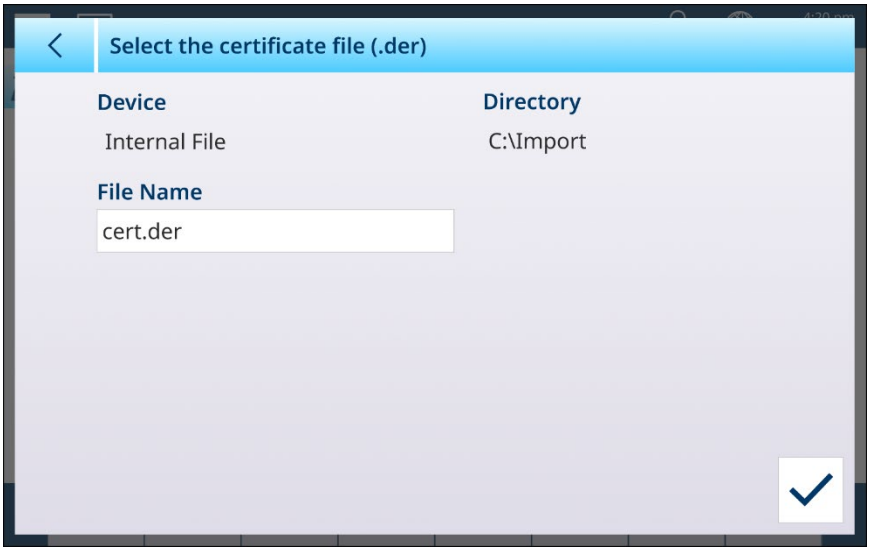

Figure 1-12: Certificate File Selection Screen

Note that the new certificate must first be copied into the terminals **C:\Import** folder. Details on file transfer to the terminal can be found in the **IND700 User's Guide**, Chapter 4 **Configuration**, at **Maintenance Setup > Software Update > Scale Interface**.

Once the file has been selected, touch the check mark to perform the import. If the import is completed successfully, the **Server Certificates** list will display, showing the newly imported certificate. The file used for the import remains in the **C:\Import** folder.

If the import fails, a message explaining the cause of the failure will display.

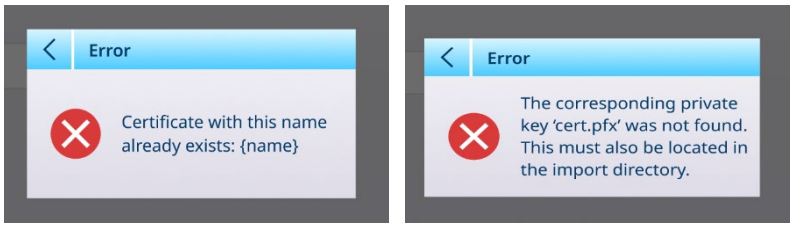

Figure 1-13: Import Errors

1.2.2.2. Renewing a Self-Signed Server Certificate

Self-signed server certificates have an expiration period of two years. To renew a self-signed server certificate, access the certificates list and touch the certificate to be renewed, then touch the renewal icon in the context menu which appears.

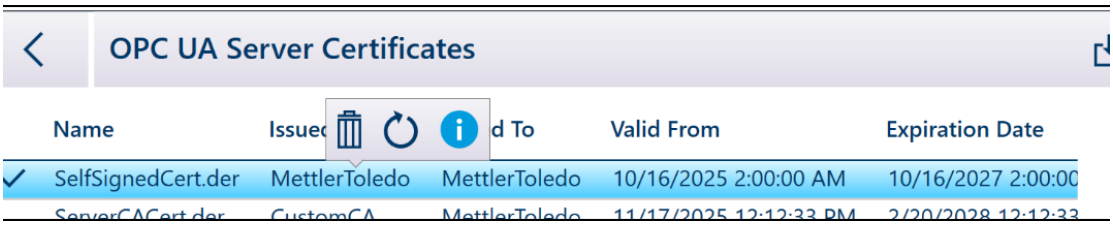

Figure 1-14: Certificate Renewal Icon Displayed in Context Menu

A message will confirm the action.

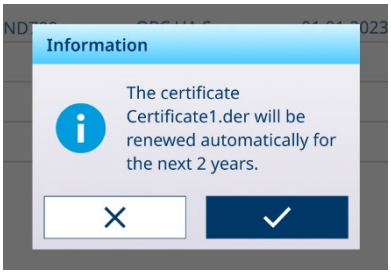

Figure 1-15: Certificate Renewal Confirmation

1.2.2.3. Deleting Server Certificates

With the certificate to delete selected, touch the Delete icon in the context menu which appears. A warning message will appear, with a **Cancel** and a **Confirm** button. Click **Cancel** to keep the certificate, or **Confirm** to delete it.

1.2.2.4. Certificate Details

The image below shows an example of the information screen that appears when a selected certificate's context menu Information icon is touched.

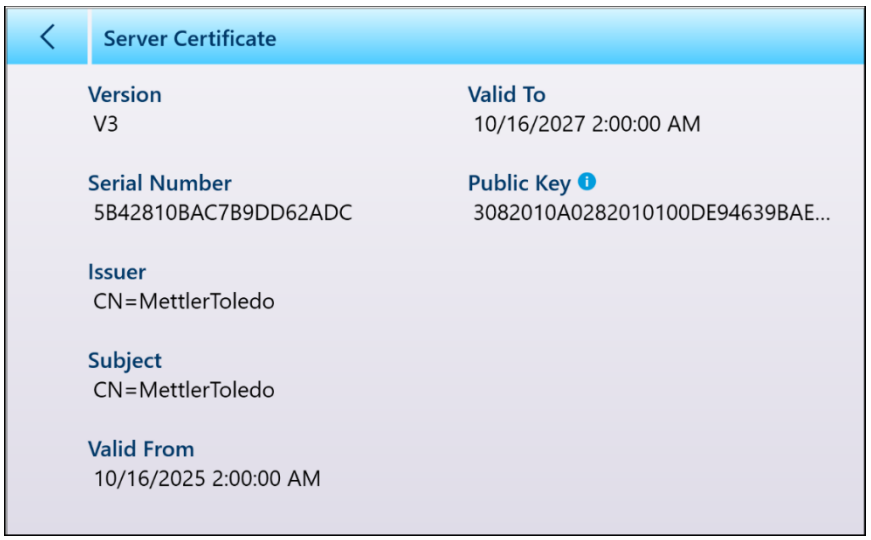

Figure 1-16: Certificate Details Screen

1.2.3. Client Certificates

To access the **Client Certificates** list, touch the **Client** item in the OPC UA menus.

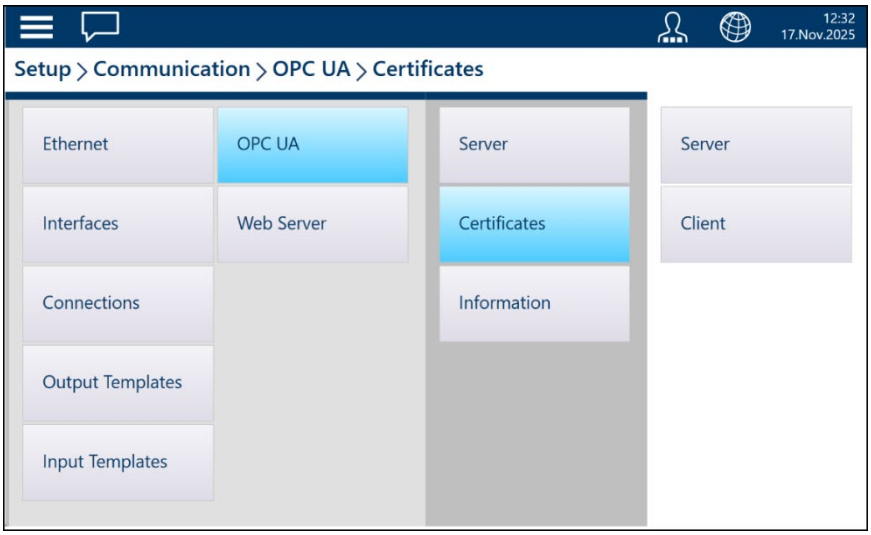

Figure 1-17: Accessing Client Certificates Item

The **OPC UA Client Certificates list** will display.

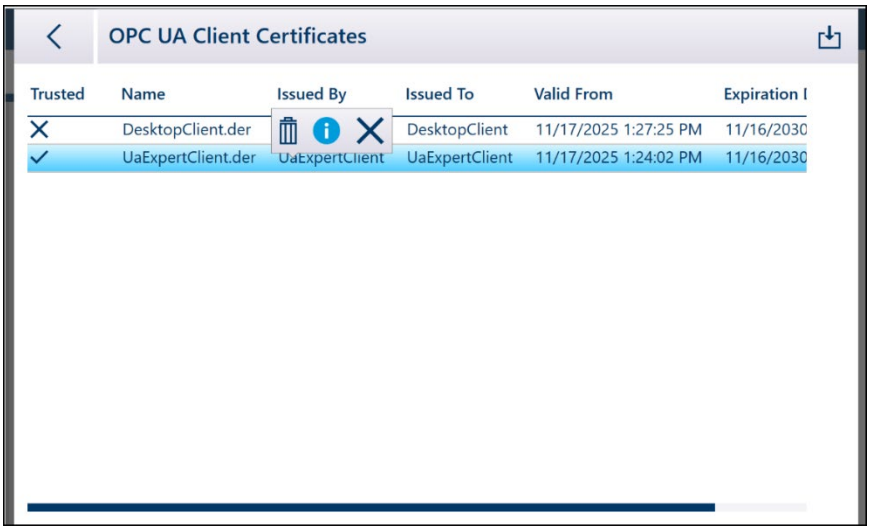

Figure 1-18: OPC UA Client Certificates List

As in the **Server Certificates** list, touch a certificate record to display a context menu. In the example shown above, the selected certificate is marked as **Trusted**, and the pop-up context menu offers options to **Delete** the certificate, **Reject** it, or display **Information** about it. In each case, a warning message will display.

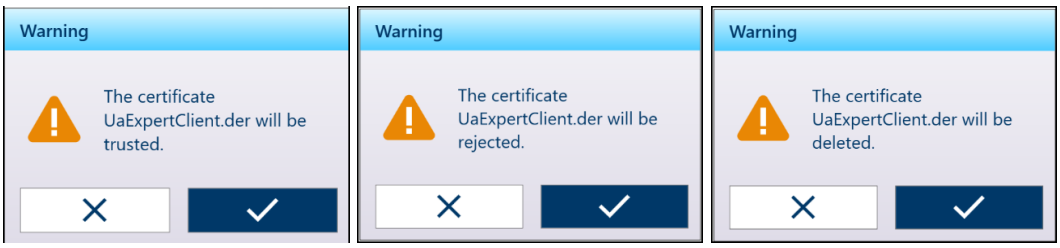

Figure 1-19: Certificate Trust, Rejection and Deletion Warning Messages

If a certificate **not** marked as is selected, the context menu appears as shown below, with options to delete or trust the certificate.

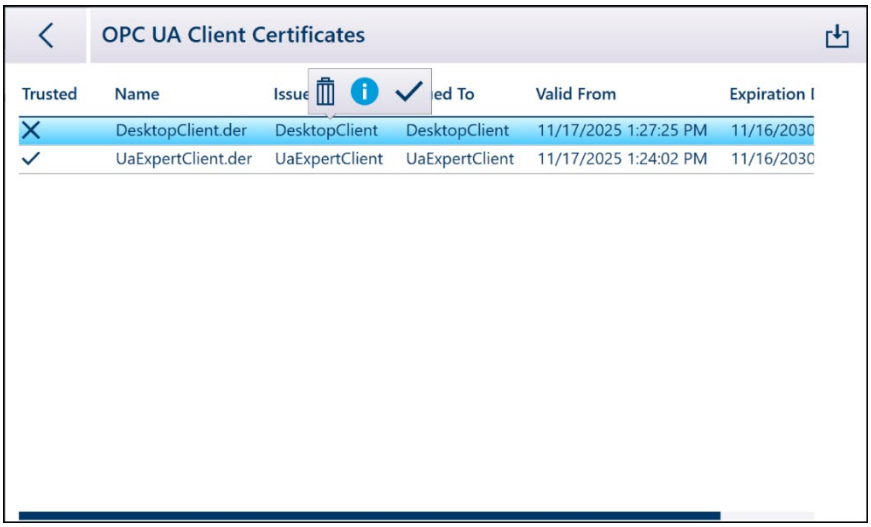

Figure 1-20: Untrusted Certificate Selected

Depending on the selection made in the context menu, one of two warnings will display:

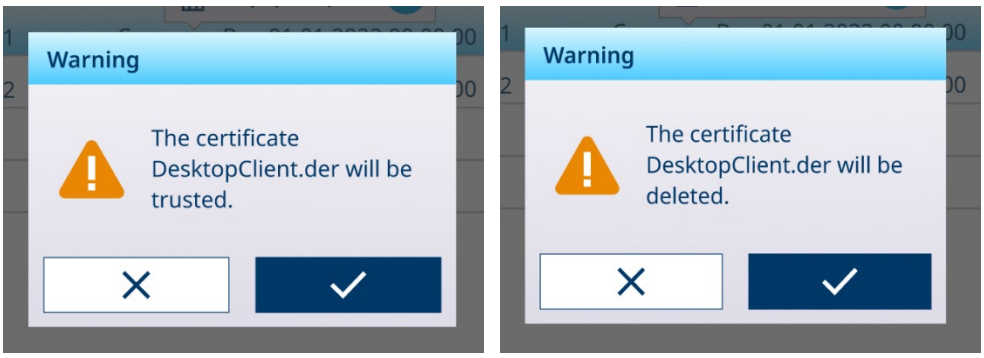

Figure 1-21: Certificate Trust and Deletion Warnings

1.2.4. Information

To access the Information page, touch the Information item in the OPC UA menus.

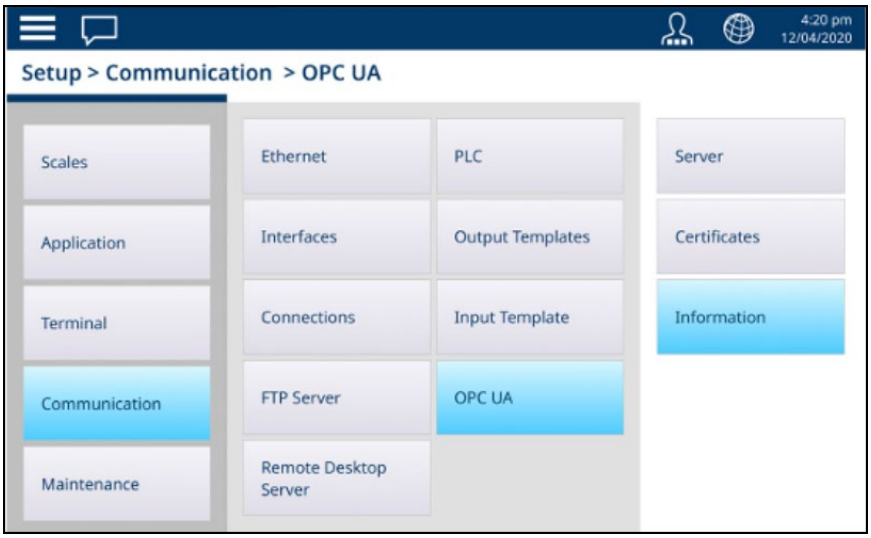

Figure 1-22: Accessing OPC UA Information Menu

The **OPC UA Server Information** screen will display.

Figure 1-23: OPC UA Server Information Screen

Touch the link icon to display the **Connected Clients** list.

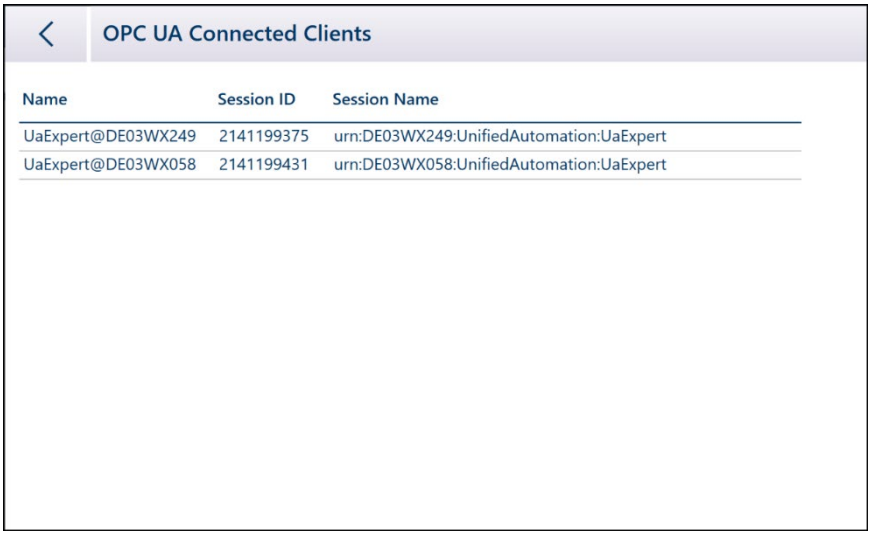

Figure 1-24: Connected Clients List

1.3. Operation

The IND700 OPC UA functionality includes the standard set of weighing nodes together with a companion set for additional weighing information.

1.3.1. Data Dictionary

The illustration below lists the nodes described in the **OPC UA Data Dictionary** table.

Figure 1-25: Standard OPC UA Data Structure Tree

Table 1-1: OPC UA Data Dictionary

Name	Type	Description	Read/Method
DeviceClass	String	Indicates for what purpose a certain Device is used.	Read
DeviceManual	String	URL address for the user manual.	Read
Manufacturer	Localized Text	Name of the company that manufactured the Device.	Read
Model	Localized Text	Provides the model name of the Device.	Read
Scale 1		A scale terminal can control more than one scale. The parameter indicates which scale the values comes from. Data from additional scales can be found in the server under "Scale 2", "Scale 3" or "Scale 4" if they are present.	
Clear Tare		The tare value is set to zero or deleted.	Method
CenterOfZero	Boolean	Indicates that the scale is in an unloaded state. The tolerance of zero is one quarter (1/4) of a measurement interval or division. For example, consider a 1000-kilogram floor scale with a measurement interval is 500 grams; the zero indication range is 0.000 +/-125g. Note that zero commands must not be used to tare the scale because in many weights-and-measures regulated applications, the zero range is limited and does not extend to the full range of the scale. Unlike tare, zero cannot be cleared; it must be reset or adjusted.	Read
Gross	Double	Gross defines the current gross value of weight as a 0:Double precision floating point number. It is the current value that is measured at the weight sensor at the current timestamp. This might be a fluctuating value.	Read
Net	Double	Net defines the net value of weight as a 0:Double precision floating point number. It is the current value that is measured at the weight sensor at the current timestamp. This might be a fluctuating value.	Read
Overload	Boolean	Indicates maximum allowed measured weight value is exceeded.	Read
Tare	Double	Tare defines the tare value of weight as a 0:Double precision floating point number. It is the current value that is measured at the weight sensor at the current timestamp. This might be a fluctuating value.	Read
TareMode	Int32	0 = No tare 1 = Tare value triggered via method call "Tare". 2 = Tare value pre-set via method call "SetPreSetTareCommand".	Read
Underload	Boolean	Indicates measured weight value is below allowed value.	Read

Name	Type	Description	Read/Method
WeightStable	Boolean	Indicates weight is stable and not in motion. The sensitivity can be adjusted in most weighing devices. It refers to gross, net and tare weight.	Read
Engineering Unit	String	The weighing unit in which the scale is set. Eg. kg, g, mg.	Read
EURange	String	Current range configuration	Read
SetPreSetTare Command	Double	The value which should be set as tare value.	Method
Tare	Boolean	Triggers the tare operation. The current weight value is used as the tare.	Method
ZeroScale	Boolean	Sets zero point. It sets the gross value of the current weight value to zero.	Method
SerialNumber	String	Unique production number of device set by the manufacturer.	Read
SoftwareRevision	String	Revision number of the software and firmware of the device.	Read

1.3.2. Tips for Dealing with Data

1.3.2.1. What is the Current Weight Node?

"Node" is the OPC UA term for a single consistent data point that may include more than one value. The Current Weight node manages three essential weight values: net, tare and gross. The gross weight is the sum of the net and the tare weights. However, the relationship between these three values bears the risk of errors resulting from time differences in the data capturing procedure in case the three values are not captured simultaneously. In other words, Current Weight provides a consistent data set.

The OPC UA Current Weight node can eliminate this potential error source by transferring all three values as one node, but the user must open the Current Weight node to transfer the correct values. However, an OPC UA Client might not support the transfer of three values in one node. Therefore, it is helpful to choose one that does. METTLER TOLEDO offers these three values as individual nodes in addition to Current Weight nodes. This built-in flexibility also respects the fact that many users do not subscribe to all three values for weight processing in their IT system.

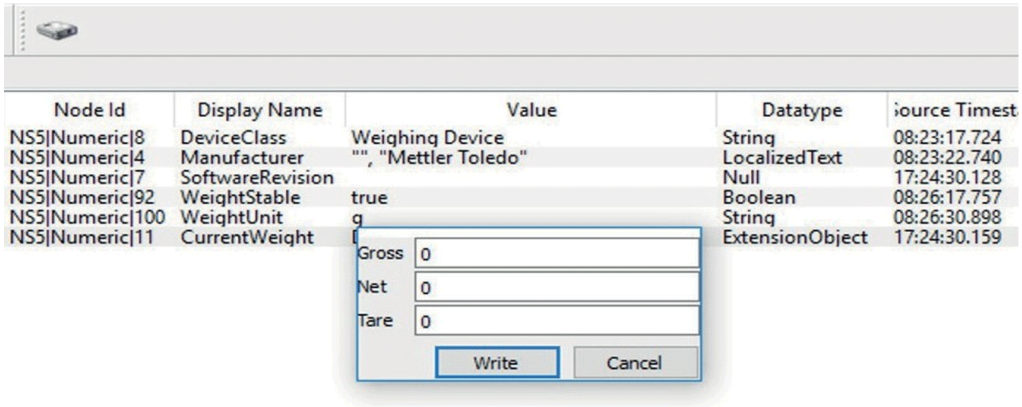

Figure 1-26: Client View Displaying Net, Tare and Gross Weight, via Current Weight

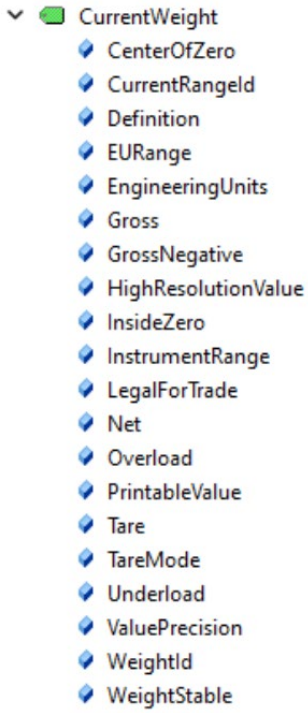

Figure 1-27: Client View with Individual Nodes for Gross, Net and Tare

1.3.2.2. What is the Registered Weight Node?

Weighing is often performed in an unstable environment with vibrations and draft. This can result in permanently fluctuating net, tare or gross values. This can pose a problem when the user wants to get the correct value for further processing in their IT system.

Fluctuating value issues can be solved by using the Registered Weight node which freezes the next stable value in the server after using a method call initiated by the client. The Registered Weight node keeps its value until the client calls the method RegisterWeight again.

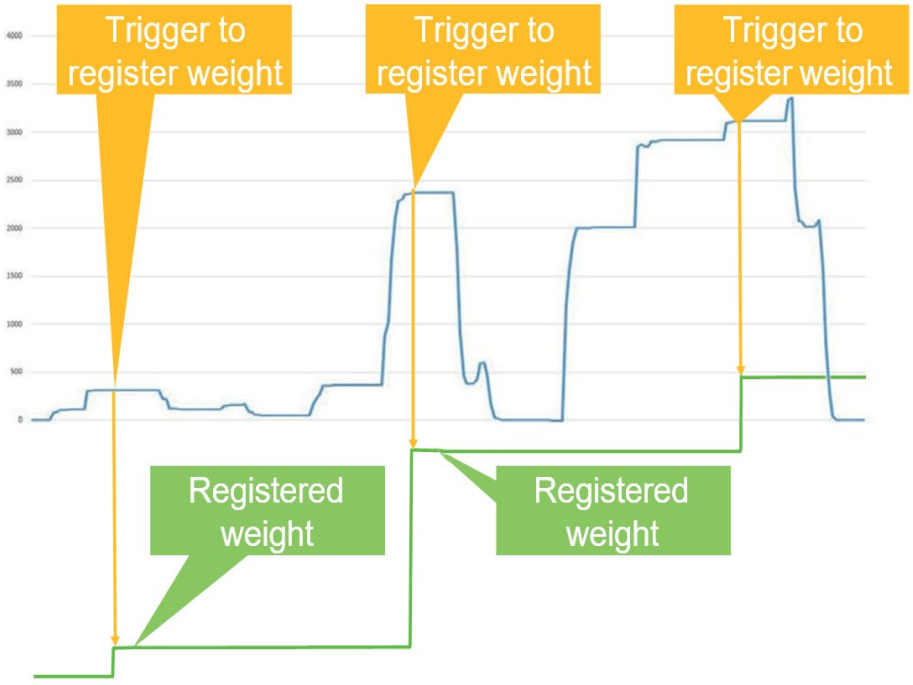

Figure 1-28: Current Weight vs. Registered Weight

1.3.2.3. Tips to Remember about Method Functionality

A method is a sub-process initiated by the client and executed by the weighing device. The use of a method relieves the software engineer from having to deal with multiple data nodes, handshakes and states to control a weighing process. The execution of a method in a Simple Weighing application can last from a fraction of a second to several minutes. However, the execution of method calls for **Tare**, **SetPresetTare** and **Zero** can last longer than expected. This can be due to an unstable environment (vibrations or draft) or the sloshing or vaporization of liquids that delays detection of the criteria for a stable weight value.

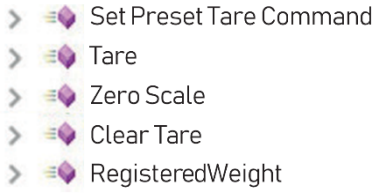

Figure 1-29: Methods for Simple Weighing

METTLER TOLEDO Service

To protect your product's future:

Congratulations on choosing the quality and precision of METTLER TOLEDO. Proper use according to these instructions and regular calibration and maintenance by our factory-trained service team ensure dependable and accurate operation, protecting your investment. Contact us about a service agreement tailored to your needs and budget.

We invite you to register your product at www.mt.com/productregistration so we can contact you about enhancements, updates and important notifications concerning your product.

www.mt.com/IND700
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