

# DNNP008

Software Add-Ons for uniVision: Yaskawa Interface Seam Tracking



## Operating Instructions

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## 1. General

The software add-on permits communication between a uniVision application DNNF012 and a robot for seam tracking applications. In this way, a 2D/3D Profile Sensor can be used with a uniVision application for seam detection and tracking in realtime with a robot.

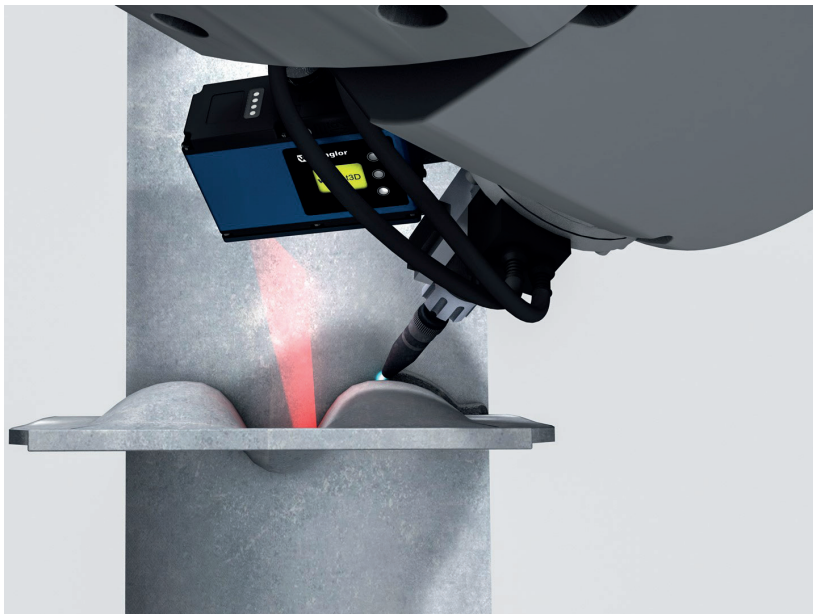


Figure 1: Seam tracking with 2D/3D Profile Sensor and robot



### NOTE!

These instructions are limited to a description of the interface between the uniVision application and the robot controller. Comprehensive information regarding uniVision parameters configuring software and the mode of operation of the 2D/3D Profile Sensors can be found in the operating instructions of the respective products. Details concerning available robot commands can be obtained from the respective robot manufacturer.

## 2. Connection Overview

Communication between the 2D/3D Profile Sensor's control unit and the robot controller takes place via a TCP/IP interface.



**NOTE!**

Bridge the network settings at the control unit of the 2D/3D Profile Sensor in order to be able to use a LAN interface for the 2D/3D profile sensor and a LAN interface for connection to the robot controller. Open the properties window for the control unit in the device list and set the "Bridge" parameter to "LAN1 and LAN2" to this end.

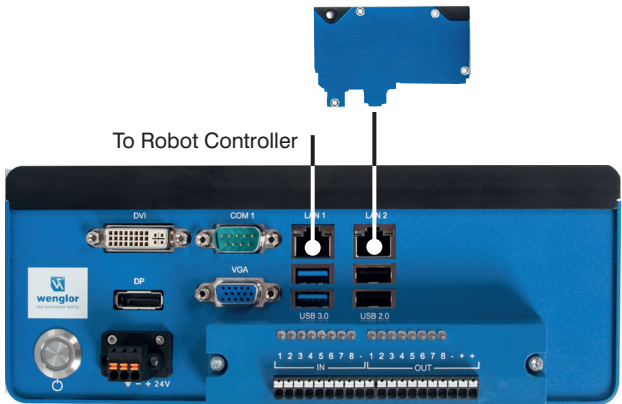


Figure 2: Connection between Control Unit and robot controller

## 3. Functions Overview

The "robot interface" software add-on is installed to the control unit of the 2D/3D profile sensor. It controls communication between the uniVision application and the robot controller.

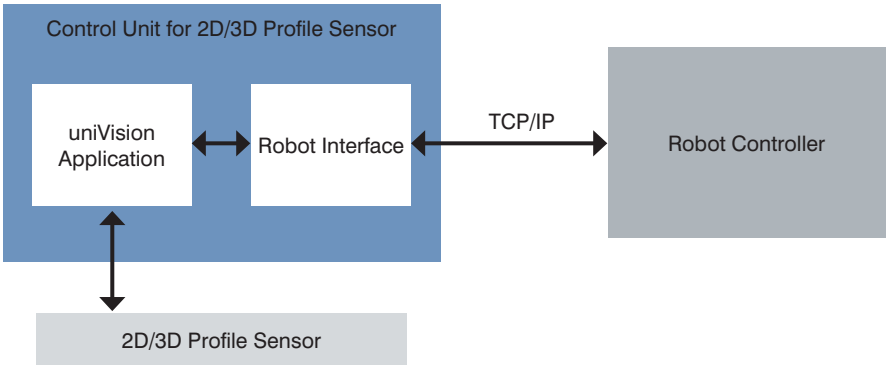


Figure 3: Function diagram

## 4. Installing the Interface

Install the software add-on to the control unit of the 2D/3D profile sensor.

1. Download the file and save it to a USB stick.
2. Connect the USB stick to one of the USB ports on the control unit.
3. Select the file and copy it to the /media/card/firmware directory.
4. Restart the control unit.
5. The software add-on is installed and started the next time the system is booted.

## 5. Universal Sensor Interface for Seam Tracking in Yaskawa

### 5.1 Setting up an uniVision Application Project

The user should create at first a uniVision project and configure it to detect the seam. Once the project is created and configured, the user should save the project using a number as project name.

Example:

- Job number on robot side: 1
- Matching name of the uniVision project: 1.u\_p

A uniVision project for robot interface should mainly consist of three basic modules:

1. Module device weCat3D
2. A module to detect the seam (e.g. module Pointcloud Measure)
3. Module Device TCP

Figure 4 shows a simple uniVision project for robot interface to find the V joint.

The user can use the point cloud measuring module together with the find line or find line segment tool, to detect the seam. The start and end points of the detected lines are determined and can be used as points for tracking.



#### **NOTE!**

uniVision 2.1.0 or higher provides ready to use templates to find different sets of simple joints. The user is free to modify a template to match his own needs.

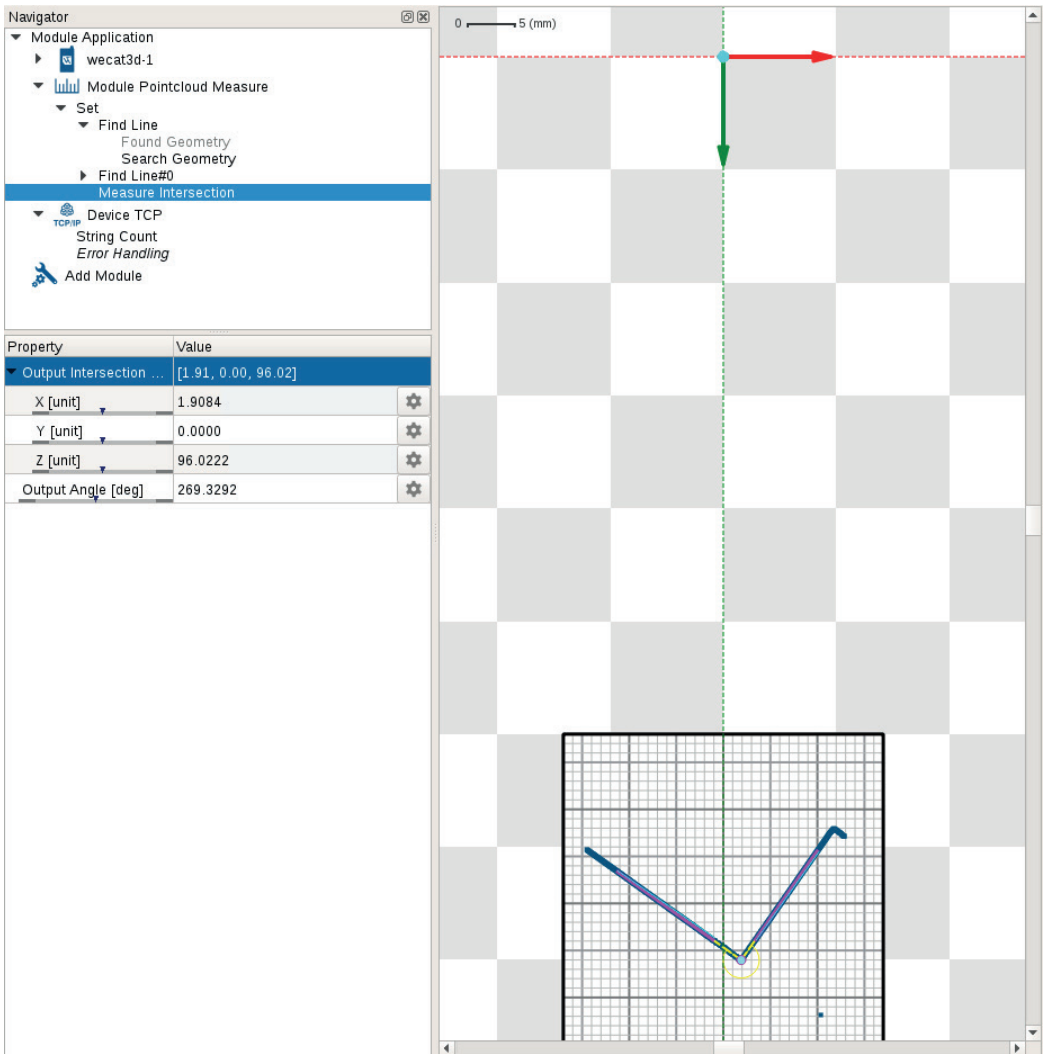


Figure 4: Basic uniVision project to detect V joint

Device TCP module should be configured as follows:

Postamble: ; (semicolon)

Delimiter: , (comma)

Number of characters: 6













Property	Value	
Process Time [us]	13	
Module State	0	
Interface Type	TCP	
Output	0,1.91785,95.9894,,;	
Preamble		
Postamble	;	
Delimiter	,	
String Count	6	
Output Mode	Unformatted	
Error Handling	Value Substitution	
Connections	1	
TCP Port	32002	
Blocking Mode	<input type="checkbox"/>	

Figure 5: Device TCP module configuration for robot interface

1. Link the values for the character strings using the “number of characters” submodule:

Character String Number	Linked Value						
Character string #1	<p>Link with a value which provides information concerning the validity of the measured value (e.g. module status of module pointcloud measure).</p> <p> <b>NOTE!</b> The linked value is interpreted as follows:</p> <table> <tr> <th>Linked Value</th><th>Meaning</th></tr> <tr> <td>0 or false</td><td>The ascertained value is valid.</td></tr> <tr> <td>Value not equal to 0 or false</td><td>The ascertained value is invalid. The robot ignores the measured value.</td></tr> </table>	Linked Value	Meaning	0 or false	The ascertained value is valid.	Value not equal to 0 or false	The ascertained value is invalid. The robot ignores the measured value.
Linked Value	Meaning						
0 or false	The ascertained value is valid.						
Value not equal to 0 or false	The ascertained value is invalid. The robot ignores the measured value.						
Character string #2	Link to the X-coordinate of the tracking point (e.g. the X-coordinate of the detected endpoint of a line).						
Character string #3	Link to the Z-coordinate of the tracking point (e.g. the Z-coordinate of the detected endpoint of a line).						
Character string #4	Link to a value which represents information concerning the width of a gap (e.g. the X-value difference at a gap).						
Character string #5	Link to a height difference (e.g. the Z-value difference at an edge).						
Character string #6	Link to a surface (e.g. a detected surface from the point cloud region module).						

**NOTE!**

Character strings 1 through 3 must be linked, but linking of character strings 4, 5 and 6 is optional.

**NOTE!**

It is fine to add more than 6 strings in the module Device TCP and link them to different values. The robot interface reads only the first 6 strings and ignores the rest.

## 5.2 Configuring the Robot Interface

The robot interface includes various setting options and results displays.

The screenshot displays the uniVision Yaskawa interface with the following sections:

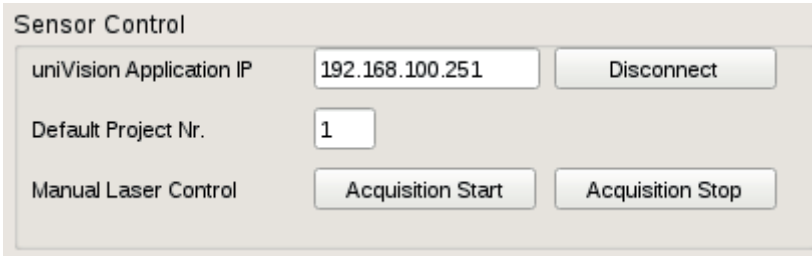
- Help**: A button at the top left.
- Sensor Control**:
  - uniVision Application IP:
  - Default Project Nr.:
  - Manual Laser Control:
- Sensor State**:
  - Connected: ☒ (green square)
  - Acquisition: ☒ (dark green square)
  - Error: ☐ (dark red square)
  - Project Nr.:
- Robot State**:
  - Listening: ☒ (dark green square)
- Sensor Data**:

Measure Error	<input type="text" value="Error"/>	GAP [mm*100]	<input type="text" value="0.00"/>
Y [mm*100]	<input type="text" value="0.00"/>	Z Diff [mm*100]	<input type="text" value="0.00"/>
Z [mm*100]	<input type="text" value="0.00"/>	Area	<input type="text" value="0.00"/>

Figure 6: uniVision Yaskawa interface



### 5.2.1 Sensor Control



The **Sensor Control** window contains the following elements:

- uniVision Application IP:** A text field displaying `192.168.100.251` and a **Disconnect** button.
- Default Project Nr.:** A text field displaying `1`.
- Manual Laser Control:** Two buttons labeled **Acquisition Start** and **Acquisition Stop**.

Figure 7: Sensor control

The robot interface automatically connects to the uniVision project through the given IP. For safety reasons the laser of the 2D/3D Profile Sensor will be automatically deactivated after establishing a connection. You can manually control the laser of the 2D/3D Profile Sensor from the robot interface through the buttons “Acquisition Start” and “Acquisition Stop”.

The robot interface communicates with the uniVision application via a TCP/IP connection.



**NOTE!**

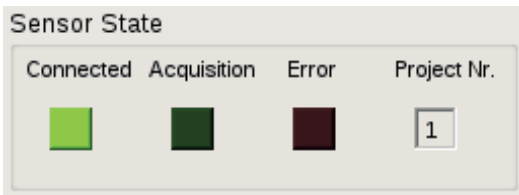
The IP address of the uniVision application is visible in the device list of the uniVision software. The default IP address is **192.168.100.251**.



**NOTE!**

In case of an open connection between the robot interface and the uniVision project, the uniVision project can be used in live mode. Changing to edit mode is only possible if the connection from the robot interface to the uniVision project is closed before.

### 5.2.2 Sensor State



The **Sensor State** window displays the current status of the sensor:

- Connected:** Represented by a green square.
- Acquisition:** Represented by a dark green square.
- Error:** Represented by a dark red square.
- Project Nr.:** A text field displaying `1`.

Figure 8: Sensor state

The table below describes the state of each LED in sensor state.

Status Value	Meaning
Connected	<p>Connection status, robot interface to uniVision project:</p> <p><b>Orange</b> Not connected</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <li>• The IP address of the uniVision application is incorrect.</li> <li>• The uniVision project is in edit mode.</li> </ul> <p>Remedy:</p> <ul style="list-style-type: none"> <li>• Enter the correct IP address.</li> <li>• Switch the uniVision project to run mode.</li> </ul>
	<p><b>Dark green</b> The connection to the uniVision application is active and the uniVision application project is being loaded.</p>
	<p><b>Bright green</b> The connection to the uniVision project is active and the 2D/3D Profile Sensor is ready.</p>
Acquisition	<p><b>Dark green</b> The 2D/3D Profile Sensor's laser is off.</p>
	<p><b>Bright green</b> The 2D/3D Profile Sensor's laser is on.</p>
Error	<p><b>Dark red</b> No errors</p>
	<p><b>Bright red</b> Problem in communication with the uniVision project</p>
Project number	Number (name) of the project which is currently loaded in the uniVision application

### 5.2.3 Robot State

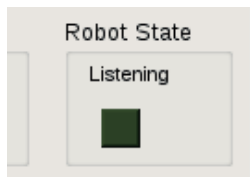


Figure 9: Robot state

The table below describes the state LED in robot state.

Status Value	Color	Status of connection between controller and robot interface
Robot status	Orange	The robot interface software is not licensed. Please refer to <a href="#">section 5.3</a> to learn more about licensing the robot interface
	Dark green	Waiting for a connection from the robot controller
	Bright green	Connected



#### NOTE!

Please refer to [section 5.4](#) to learn more about configuring the robot controller to build a connection to the robot interface.

### 5.2.4 Sensor Data

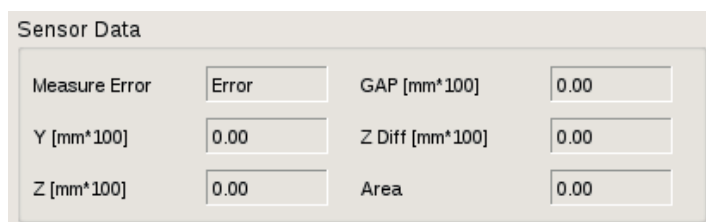


Figure 10: Sensor data

Sensor data shows the linked data in Device TCP module in the loaded uniVision project. If the laser of the 2D/3D Profile Sensor is deactivated or the uniVision project could not compute the tracking point, the measure error label will show "Error" and the data will not be updated.

### 5.3 RobotInterface Licensing

The robot interface needs to be licensed in order to accept a connection from the robot controller.

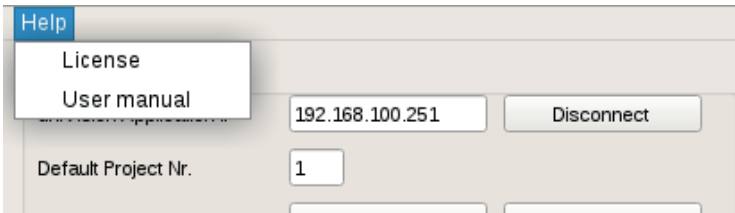


Figure 11: Robot interface licensing

In the Help menu in the menu tool click on license to open the license dialog window. In the “License Request” tab enter your data to the lines provided for this purpose and activate the checkbox next to the desired module (see Figure 12). Click “Generate request”, save the displayed license request key on the desktop and send it by e-mail to **order@wenglor.com**.

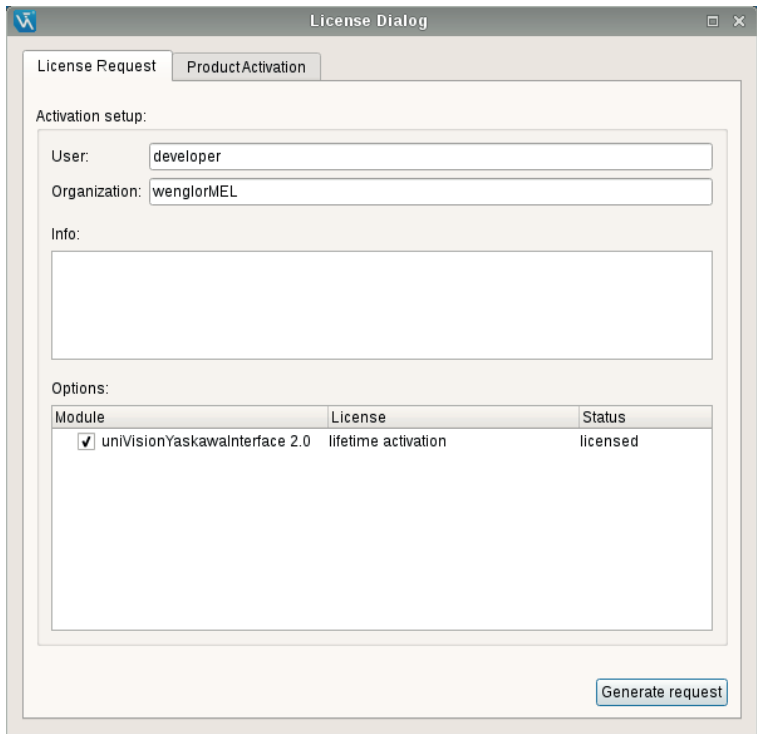


Figure 12: License window

**NOTE!**

Please make sure that the licensing process is executed on the control unit which will actually be used in the application. The license is restricted to the respective control unit.

You will receive your license activation key. Save it on your desktop. Select the “Product Activation” tab in the license dialog box and open the corresponding file. Click “Activate License” in order to enable the software.

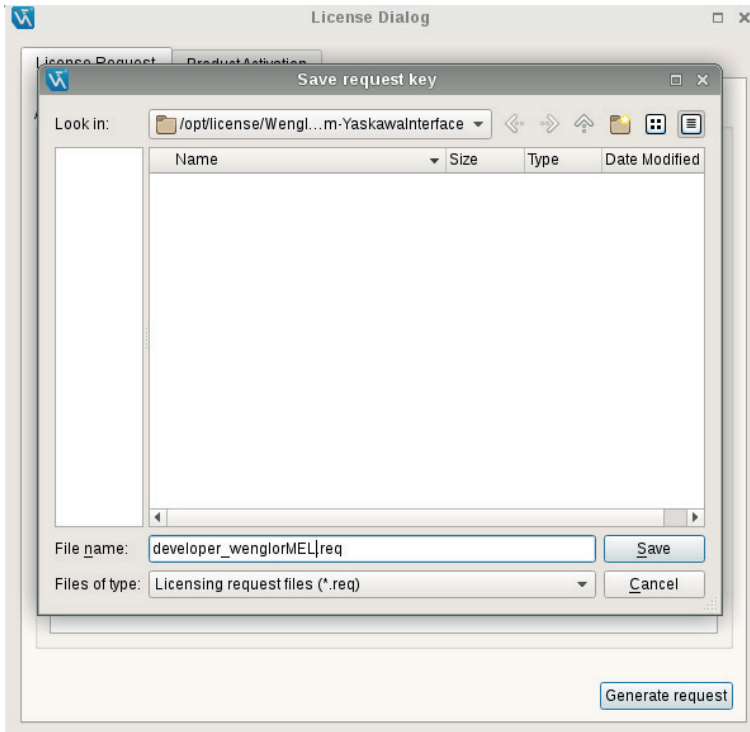


Figure 13: License activation window

## 5.4 Configuring the Universal Sensor Interface in Yaskawa Robot

The robot controller should be configured to build a connection to the robot interface. According to Yaskawa documentation, it is mandatory to have the following software requirements:

- MOTOEYE-LT
- Function specifications D2-D2013-028 (setup manual from Yaskawa)
- DX 200 Software version DN1.83.00A(--)-00
- Macro Job's and MACRO.DAT fitting to the application
- Parameter settings
- Sensor-app / motoPlus-interface LTRACK-DX200.out

In sensor parameters SXE160-163 has to be the control unit IP address (per default the control unit IP is 192.168.100.252). The sensor parameter SXE164 should have the port number (5020).

In MOTOEYELT-SETTING-JOB select the sensor model 1.



### NOTE!

Both the robot controller IP and the control unit IP should be in the same subnet (e.g. 192.198.100.xxx).



### NOTE!

To the best of our knowledge, the following robot controllers from Yaskawa support the software package MOTOEYELT: DX200 and YRC 1000.

Please refer to your robot manufacturer support for more details regarding robot controller setup.

## 5.5 2D/3D Profile Sensor Calibration for Yaskawa Robots

MOTOEYE-LT laser tracking interface provides its own calibration procedure. To carry out sensor calibration, a JOB calibration called [LT-CALIB] must be prepared. Six reference points must be taught and registered in the JOB [LT-CALIB]. Yaskawa recommends using a workpiece with a lap joint. Please refer to the MOTOEYE-LT reference documentation for more information about the calibration procedure.

## 6. Troubleshooting

### 6.1 The robot is not able to track the seam

**Possible reasons:**

- The uniVision project is not able to detect the seam.

**Solutions:**

- Make sure, that the uniVision project is able to detect correctly the seam to be tracked.

### 6.2 Activating the Debug Ouput Log

The debug output log saves the communication between the robot controller and the uniVision application. The debug output log helps the support team understanding the issue and find an appropriate solution.

To activate the debug output log go to the config.ini file located in /opt/WenglorMEL.com-YaskawaInterface/bin and change the value of the variable DebugLog to 1 (default is 0).

The robot interface will create a new file DebugLog.txt.

After doing the tests, disconnect the robot controller from the robot interface, copy the file and send it to your support team for further analysis.



**NOTE!**

Please deactivate the debug output log at the end of the test.