Smart Device Experimentation Package

SIEMENS PLC KIT LAB ACTIVITY GUIDE

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intelitek

INDUSTRY 4.0

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Intelitek software and documentation are available at http://intelitekdownloads.com.

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1. Getting Started

1.1. OVERVIEW

Thank you for purchasing the Intelitek *IO-Link Experimentation Package* for use in your classroom or laboratory. IO-Link is a communication protocol common to industrial automation systems, and the *IO-Link Experimentation Package* is meant to provide a scaled-down IO-Link system that is usable in an educational setting, while still providing users with authentic, industry-recognized hardware and software.

This guide is meant to help you get started with the laboratory curriculum and provide you with access to the various lab activities.

1.2. INTEGRATING JMTS

The lab activities in this package require access to a JobMaster Training System (JMTS) and its accompanying components.

For more information about the JMTS, its setup, and its accessory components, visit https://www.intelitekdownloads.com/Manuals/IndustrialMaint/ and download the relevant user guides.

An IO-Link master device mounted onto the JMTS

1.3. PREREQUISITES

Participants must complete the both the Proximity and Distance lab activities and Identification Kit lab activities before participating in the Siemens PLC lab activities.

It is strongly recommended that you complete Intelitek's Level 1 and Level 2 Industry 4.0 courses before performing these lab activities as well as have a basic knowledge of PLCs and how to operate the Siemens TIA Portal software. To learn more about these subjects, enroll in Intelitek's PLC Technology Training courses. You can also download the Siemens S7-1200 Getting Started Guide.

1.4. WHERE ARE THE LAB ACTIVITIES?

You can find a list of lab activities in Section 4, List of Lab Activities, on page 10. All lab activities are available on downloadable and printable PDF documents.

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2. Materials

Materials required for each lab activity are also listed at the beginning of each activity. Ensure that all materials are ready before the beginning of each lab period.

Provided Materials

Part	Part No.	Package	Req. Amt.
IO-Link Master AL1300	410495	Proximity & Distance	1
230V/24V IO-Link Power Supply	430755	Proximity & Distance	1
IO-Link Master Power Cable with Banana Connection	040513	Proximity & Distance	1
M12-RJ45 Ethernet Cable	410492	Proximity & Distance	1
IO-Link M12-M12 Connection Cable	410493	Proximity & Distance	4
Inductive Sensor	035101	Proximity & Distance	1
Ultrasonic Sensor	035102	Proximity & Distance	1
Photoelectric Sensor	035103	Proximity & Distance	1
Steel Plate	110650	Proximity & Distance	1
Brass Rod	112872	Proximity & Distance	1
Marked Aluminum Cylinder	112713	Proximity & Distance	1
Blue Block	113023	Proximity & Distance	1
Plexiglass Block	113034	Proximity & Distance	1
Magnet	410404	Proximity & Distance	1
Stack Light	035106	Identification	1
RFID Read/Write Head	035104	Identification	1
Smart RFID Tag	410489	Identification	10
JMTS Mounting Panel	00-1300-0003	JMTS/PLC	1
Power Supply Module with Power Cable	10-2550-1000	JMTS/PLC	1
Siemens PLC Module	10-2550-4000	JMTS/PLC	1
Electrical Connectors (Banana Cables)	4116XX	JMTS/PLC	2

Additional Required Materials

Part	Amount
Wrench	1
Computer	1
Ethernet Switch (Recommended)	1
Ruler	1

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Required Software

Package
LR Device
Ethernet Configuration Tool (Hilscher)
Siemens STEP 7 TIA Portal
IFM Startup Package for Profinet – Siemens S7-TIA

Intelitek software and documentation are available at http://intelitekdownloads.com.

3. Navigating the Lab Activities

3.1. OVERVIEW AND PREPARATION

3.1.1. General Preparation

Lab activities include tasks that must be performed using the IO-Link smart devices.

Participants are assigned with reading the lab activity PDFs (see Section 4, List of Lab Activities, below) and performing the tasks. Both participants and instructors are encouraged to read through the activities ahead of each lab period as preparation.

All activities require instructor verification to ensure that the work of the participants meet the requirements in the performance objectives. Performance objectives are listed at the beginning of each lab activity.

3.1.2. Preparing the TIA Portal Software

In order for Siemens TIA portal and your Siemens PLC to be able communicate with the IO-Link devices in the *Smart Sensor Module*, the relevant startup software package must be installed in TIA Portal. The installation procedure only needs to be performed once for each workstation with TIA Portal.

To perform the installation procedure:

1. Download the Siemens S7 – TIA startup package from the IO-Link Experimentation Package Resource List.
2. Unzip the downloaded package.
3. Run **Siemens TIA Portal**.
4. In the bottom-left corner (of the Portal view), click **Project view**.

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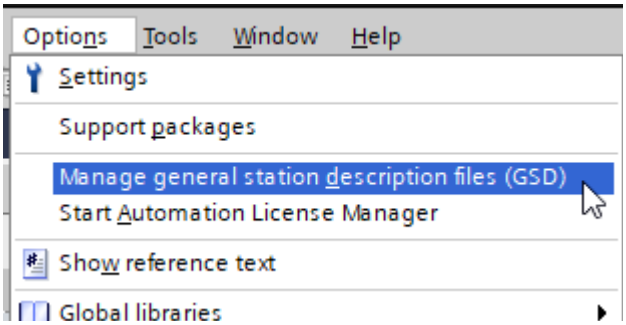
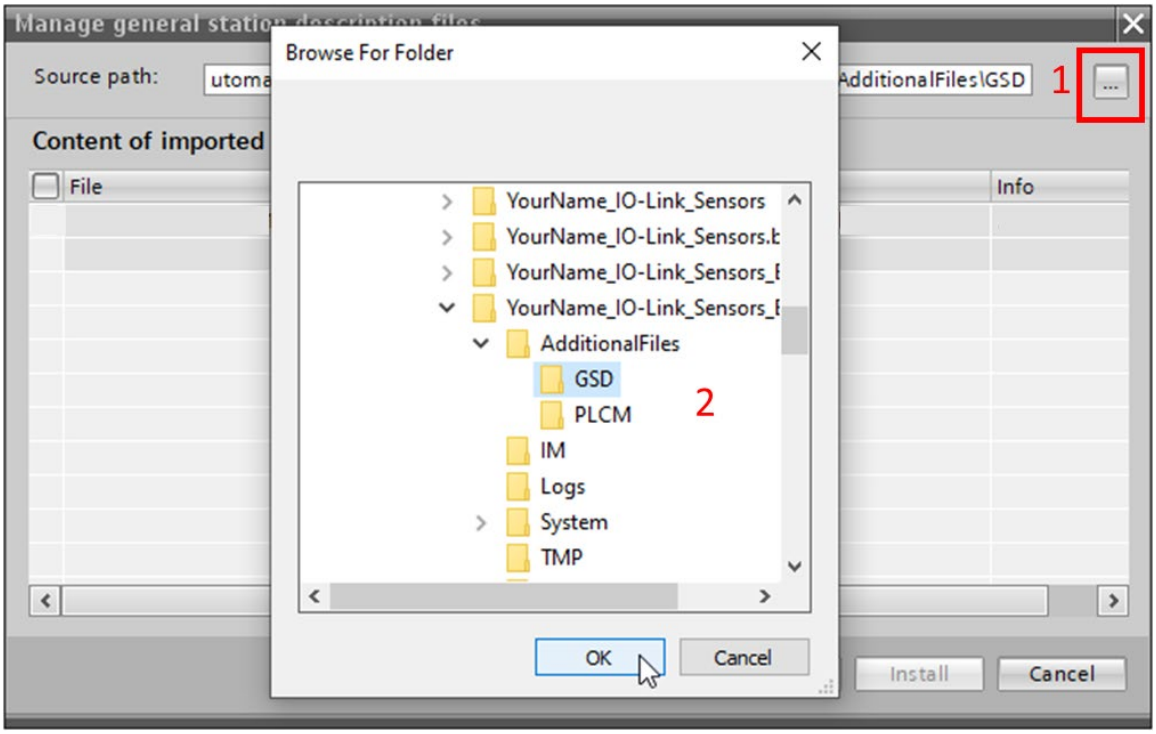
5. In Project view, in the top menu, navigate to **Options > Manage general station description files (GSD)**.



6. The Manage general station description files window opens. In the Source path area at the top, click the three-dot button and browse to where you saved the downloaded startup package. Click **OK**.



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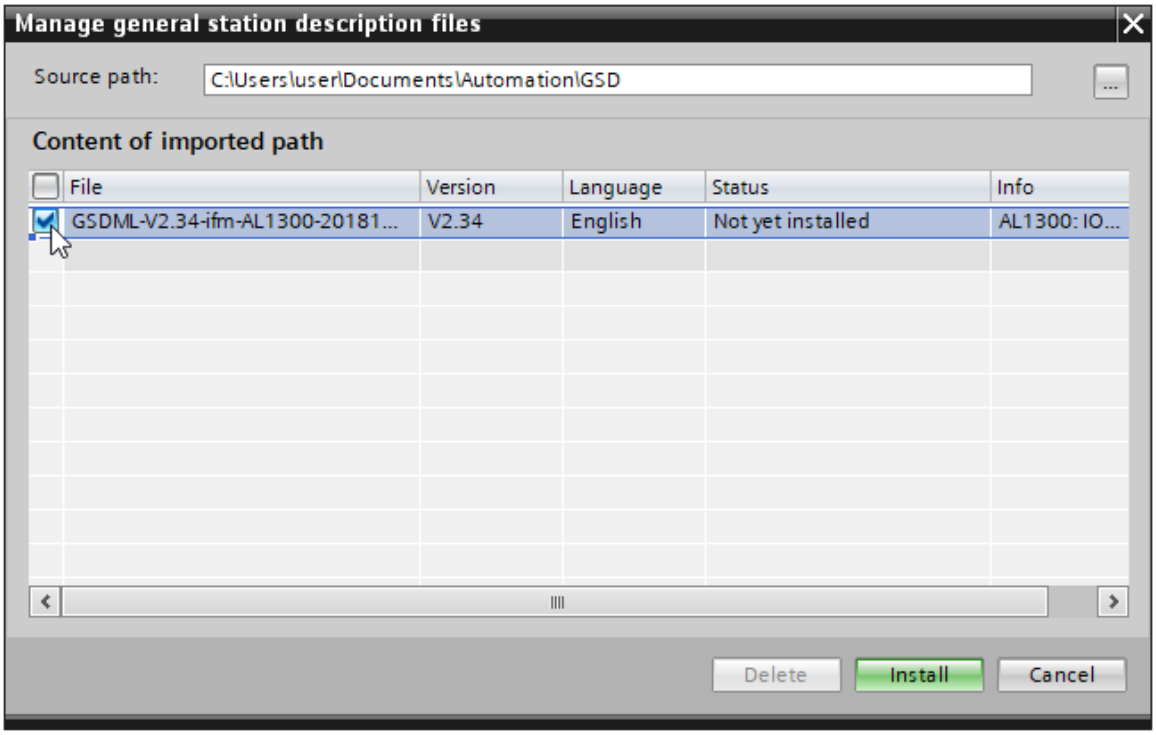
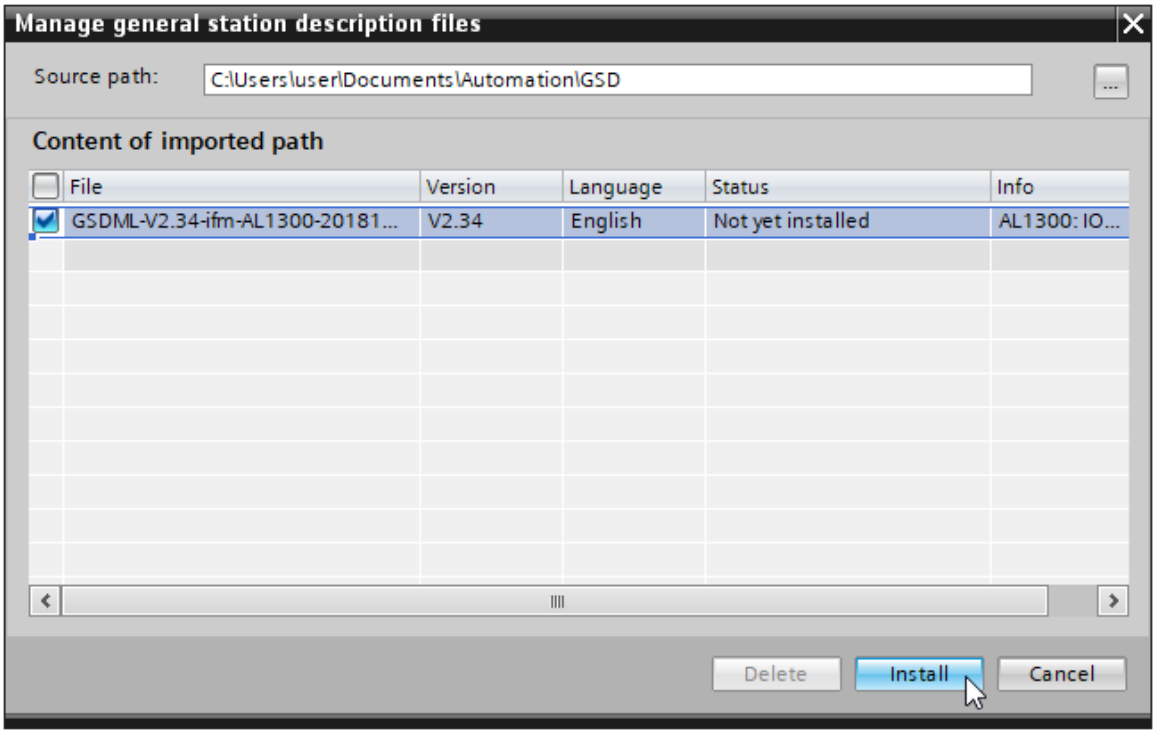
7. From the table, select your IO-Link master's GSD file.



8. Click **Install**.



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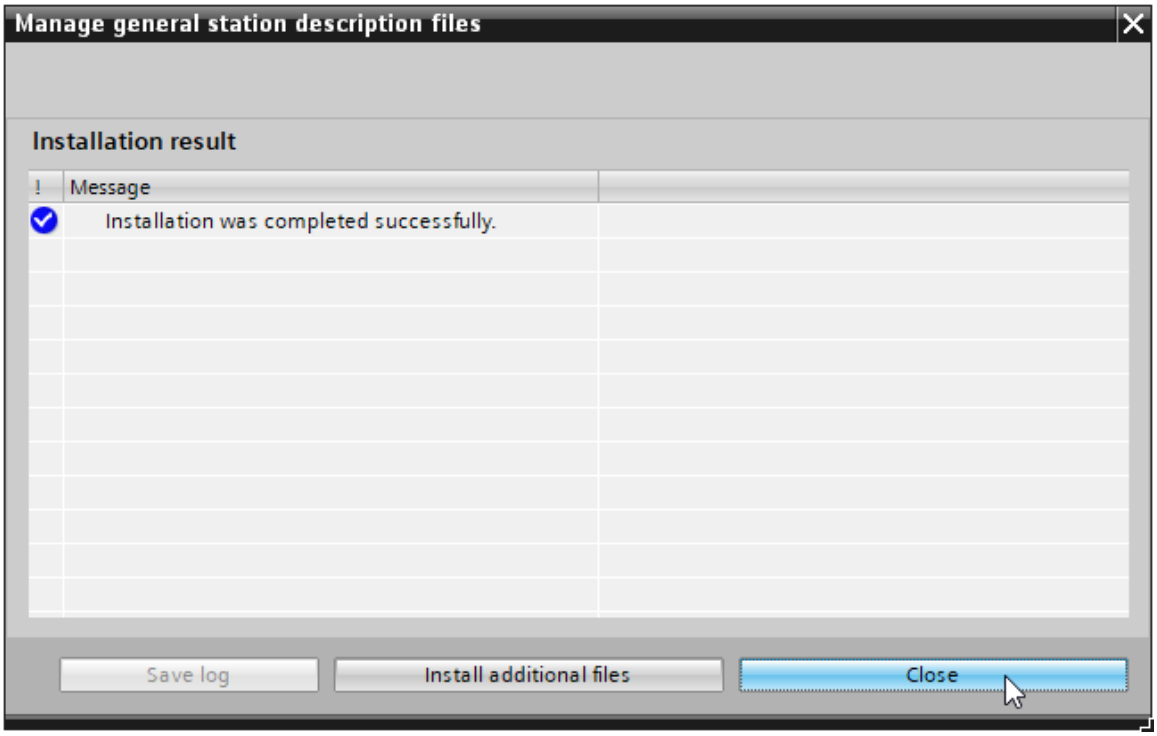
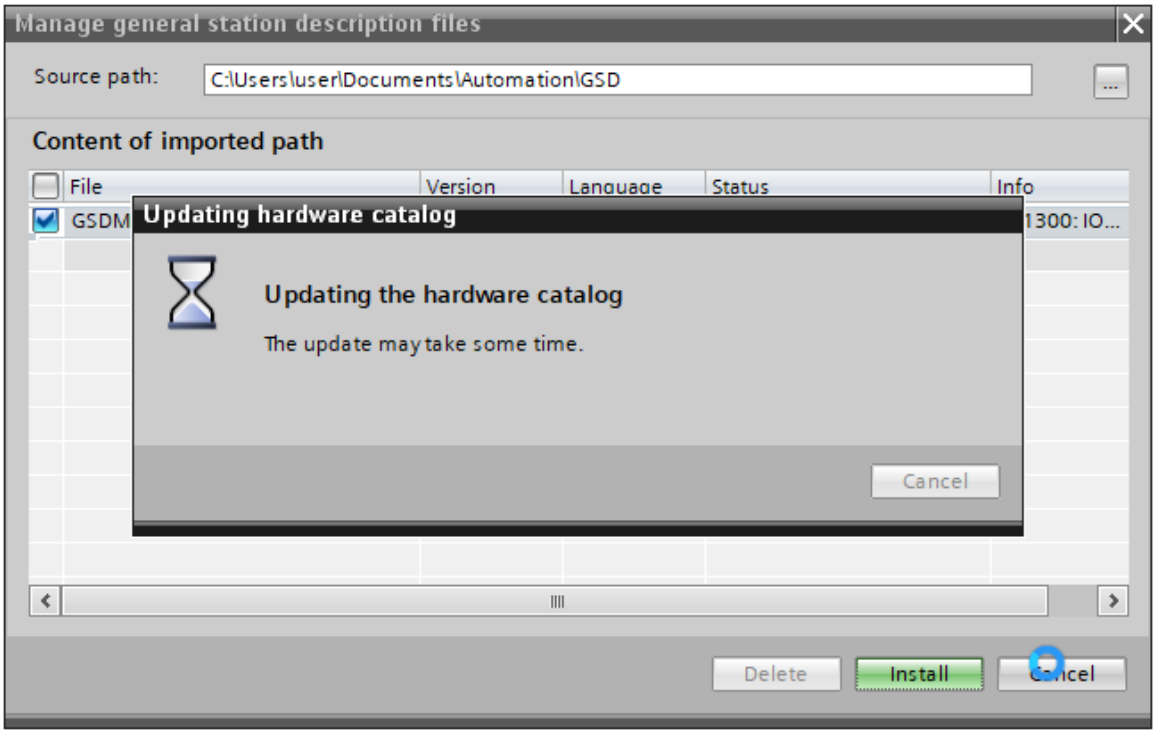
9. Once the installation is complete, click **Close**.



10. The hardware catalog is updated. The window closes automatically.



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3.2. VIDEOS AND QR CODES

Lab activities contain QR codes such as the one below. Click these codes or scan them with your smartphone to watch instructional or illustrative videos that are relevant for the specific lab activity task.

An example QR code is given here:

IO-Link Master IoT port blinking green. Click or scan the above QR code to watch the video.

4. List of Lab Activities

Below is a list of lab activities in the IO-Link Experimentation Package Siemens PLC Curriculum.

> ***Note:*** *Lab activities may be password protected. Contact support@intelitek.com if you have not received passwords for the activities.*

Lab Activity	Description
Connecting to the PLC	Create the PLC / IO-Link master network and configure communication between the devices.
Sensor to PLC Communication	Connect the photoelectric and ultrasonic smart sensors to the network. Use TIA Portal to monitor sensor readings.
PLC Communication with Slave Devices	Connect the inductive sensor and stack light to the network. Use TIA Portal to monitor sensor readings and to change stack light output.
Basic Exercises for Slave Devices	Create ladder programs in TIA Portal using sensors as input devices and the stack light as the output device.
Basic Exercises for Slave Devices: Solutions	View potential solutions for the control programs.
PLC-sensor Communication: RFID	Write data to RFID tags using a PLC watch table.
Advanced Exercises for Smart Devices	Create a TIA Portal project where the output status of the stack light is dependent on the reading of the different sensors and RFID head
Advanced Exercises for Smart Devices:	Possible solutions for the Advanced Exercises

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Solutions	
Connecting to an HMI	Connect a Siemens HMI module to your network and configure it for your PLC project. Build a basic screen to display smart sensor readings.
RFID and the HMI	Integrate an RFID head and the stack light into your HMI project. Build a user interface on the HMI that allows the user to write a color to the tag, and when the tag is read, the stack light illuminates in that color.
The Security System	Create a high security access system for employees of an industrial complex using the controller, HMI, smart sensors, and RFID tags.

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