



# Operation Manual

PRODUCT NAME

**Ethernet ITV – PROFINET™**

MODEL / Series / Product Number

**ITVXXXX-SPN-XX-DUX02357-XXXX**



## SMC Corporation

Revision History		
Revision	Description	Date
1.0	Initial release for PROFINET™ ITV.	03/31/2021
1.1	Added clarification to pressure recovery when communication is re-established and “Enable Hold” is disabled (section 15 and 20.2).	04/30/2021
1.2	Addressed incorrect bit description in Table 10 and changed data description in Tables 10 and 11 (Section 16 – Setpoint and Feedback).	09/22/2021

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## 1. Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage.

These instructions indicate the level of potential hazard with the labels of "Caution", "Warning" or "Danger". They are all important notes for safety and must be followed in addition to International standards (ISO/IEC), and other safety regulations.




ISO 4414: Pneumatic fluid power -- General rules relating to systems.

ISO 4413: Hydraulic fluid power -- General rules relating to systems.

IEC 60204-1: Safety of machinery -- Electrical equipment of machines. (Part 1: General requirements)

ISO 10218-1992: Manipulating industrial robots -- Safety.

Etc.

	<b>Caution:</b>	CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
	<b>Warning:</b>	WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	<b>Danger:</b>	DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



## **Warning**

### **1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

### **2. Only personnel with appropriate training should operate machinery and equipment.**

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

### **3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**

- The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
- When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
- Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

### **4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**

- Conditions and environments outside of the given specifications or use outdoors or in a place exposed to direct sunlight.
- Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
- An application which could have negative effects on people, property, or animals requiring special safety analysis.
- Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

## **Caution**

### **The product is provided for use in manufacturing industries.**

The product herein described is basically provided for peaceful use in manufacturing industries.

If considering using the product in other industries consult SMC beforehand and exchange specifications or a contract if necessary.

If anything is unclear, contact your nearest sales branch.

## **Limited warranty and Disclaimer/Compliance Requirements**

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".

Read and accept them before using the product.



## Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered. \*1)  
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.  
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the products.

\*1) Vacuum pads are excluded from this 1-year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.


## Compliance Requirements


When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).

## Operator

- This operation manual has been written for those who have knowledge of machinery and apparatus that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.
- Please read this operation manual carefully and understand it before assembling, operating or providing maintenance to the product.

## Precautions



 <b>Warning</b>
Do not disassemble, modify (including changing the printed circuit board) or repair. An injury or failure can result.
<b>Do not operate the product outside of the specifications.</b> <b>Do not use for flammable or harmful fluids.</b> <b>Fire, malfunction, or damage to the product can result.</b> <b>Verify the specifications before use.</b>
Do not operate in an atmosphere containing flammable or explosive gases. Fire or an explosion can result. This product is not designed to be explosion proof.
If using the product in an interlocking circuit: Provide a double interlocking system, for example a mechanical system. Check the product regularly for proper operation. Otherwise malfunction can result, causing an accident.
The following instructions must be followed during maintenance: Turn off the power supply. Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance. Otherwise an injury can result.

 <b>Caution</b>
After maintenance is complete, perform appropriate functional inspections. Stop operation if the equipment does not function properly. Safety cannot be assured in the case of unexpected malfunction.
Provide grounding to assure the safety and noise resistance of the Serial System. Individual grounding should be provided close to the product with a short cable.

## 2. Designing, selecting, and handling instructions

- Follow the instructions given below when designing, selecting and handling the product.
- The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must also be followed.

### 2.1. Product specifications

- When conformity to UL is necessary, the Ethernet ITV must be used with a UL1310 Class2 power supply.
- The unit is an  approved product only if they have a  mark on the body.
- Use the specified voltage. Otherwise failure or malfunction can result.
- Reserve a space for maintenance.
- Allow sufficient space for maintenance when designing the system.
- Do not remove any nameplates or labels.
  - This can lead to incorrect maintenance, or misreading of the operation manual, which could cause damage or malfunction to the product.
  - It may also result in non-conformity to safety standards.

### 2.2. Product handling

- **Installation**
  - Do not drop, hit or apply excessive shock to the Ethernet ITV system. Otherwise, damage to the product can result, causing malfunction.
  - Tighten to the specified tightening torque. If the tightening torque is exceeded the mounting screws may be broken.
  - IP65 protection cannot be guaranteed if the screws are not tightened to the specified torque.
  - Never mount a product in a location that will be used as a foothold.
  - The product may be damaged if excessive force is applied by stepping or climbing onto it.
- **Wiring**
  - Avoid repeatedly bending or stretching the cables or placing heavy load on them.
  - Repetitive bending stress or tensile stress can cause breakage of the cable.
  - Wire correctly.
  - Incorrect wiring can break the product.
  - Do not perform wiring while the power is on. Otherwise, damage to the fieldbus system and/or I/O device can result, causing malfunction.
  - Do not route wires and cables together with power or high voltage cables. Otherwise, the fieldbus system and/or I/O device can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line.
  - Confirm proper insulation of wiring.
  - Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied to the product, causing damage.
  - Take appropriate measures against noise, such as using a noise filter, when the fieldbus system is incorporated into equipment. Otherwise, noise can cause malfunction.

### 2.3. Environment

- Select the proper type of protection according to the operating environment.
- IP65 protection is achieved when the following conditions are met. The units are connected properly with fieldbus cables with M12 connectors and a power cable with a M12 connector. All unused connectors are closed with a properly installed seal cap.

- If using in an environment that is exposed to water splashes, please take measures such as using a cover.
- Do not use in a place where the product could be splashed by oil or chemicals.
- If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction etc.).
- Do not use the product in an environment where corrosive gases or fluids could be splashed. Otherwise, damage to the product and malfunction can result.
- Do not use in an area where surges are generated.
- If there is equipment which generates a large amount of surge (solenoid type lifter, high frequency induction furnace, motor, etc.) close to the fieldbus system, this may cause deterioration or breakage of the internal circuit of the fieldbus system. Avoid sources of surge generation and crossed lines.
- When a surge-generating load such as a relay or solenoid is driven directly, use a fieldbus system with a built-in surge absorbing element.
- Direct drive of a load generating surge voltage can damage the fieldbus system.
- The product is **NOT** immune to lightning strikes. Take measures against lightning strikes in the system.
- Prevent foreign matter such as remnant of wires from entering the fieldbus system to avoid failure and malfunction.
- Mount the product in a place that is not exposed to vibration or impact.
  - Failure or malfunction can result.
- Do not expose the product to direct sunlight.
- If using in a location directly exposed to sunlight, shade the product from the sunlight.
  - Failure or malfunction can result.
- Keep within the specified operating temperature range.
  - Malfunction can result.
- Do not operate close to a heat source, or in a location exposed to radiant heat.
  - Malfunction can result.

## 2.4. Adjustment and Operation

- Perform settings suitable for the operating conditions.
  - Incorrect setting can cause operation failure.
- Please refer to the PLC manufacturer's manual etc. for details of programming and addresses.
  - For the PLC protocol and programming refer to the relevant manufacturer's documentation.

## 2.5. Maintenance

- Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.
  - There is a risk of unexpected malfunction.
- Perform regular maintenance and inspections.
  - There is a risk of unexpected malfunction.
- After maintenance is complete, perform appropriate functional inspections.
  - Stop operation if the equipment does not function properly.
  - Otherwise, safety is not assured due to an unexpected malfunction or incorrect operation.
- Do not use solvents such as benzene, thinner etc. to clean the unit.
  - They could damage the surface of the body and erase the markings on the body. Use a soft cloth to remove stains. For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

### 3. About this Manual

The purpose of this manual is to provide the user with necessary information to install, configure, and use the ITV####-SPN-##-DUX02357-#### also known as the PROFINET ITV.

The ITV is typically operated under the control of a master device (usually a PLC). The ITV may also be operated under the control of acyclic messaging program Ex: LabVIEW™ software. Finally, the ITV may be operated using the built-in ITV web interface. Examples for each of these conditions are documented in this manual.

This manual provides information for ITV setup and configuration, examples of the web interface and a brief overview of the Siemens TIA-Portal® software. Please see the manufacturer's documentation for detailed instructions on the setup and use of your Siemens or other PLCs.

### 4. Terminology

	Terms	Meaning
A	A/D	Analog to Digital
	AR	Application Relationship – a relationship between an IO-Controller and an IO-Device.
	Auto negotiation	The function that automatically optimizes the common communication parameters such as speed, duplex mode, and flow control between Ethernet devices.
B	BF	Bus Fault
	Bus In / Bus Out	M12 Ethernet communication connectors located on top of the ITV.
C	Counts	The ITV controls and reports pressure or vacuum internally in <b>Counts</b> . The counts are used by hardware devices to control and measure the pressure or vacuum regulated by the ITV.
	CR	Communication Relation – communication channel between two nodes that are operated with a specific protocol.
	Current consumption	The current necessary to operate each unit or device using a 24 VDC.
D	DAP	Device Access Point - represents the fieldbus interface and determines the properties of the IO device.
	DCP	Discovery and Configuration Protocol - a link layer-based protocol to configure device names / IP addresses, flash LEDs, reset the device to factory settings, etc..
	Device Name	The Device Name (or Station Name) - used for unique identification of the device in the network.
	DHCP	DHCP (Dynamic Host Configuration Protocol) allows the ITV IP address to be set using an external DHCP server. DHCP may be used if desired but is not required.
	DIP	Dual in Line Package – used to describe a series of eight individual switches for configuring the device.
	DNS	Domain Name System - a naming system for resources connected to the Internet or a private network.
	Downstream	Relative to your ITV, a downstream device receives power and/or communication signals which originate <i>from</i> or are <i>passed through</i> your ITV. This also refers to pneumatic devices controlled by the ITV.
F	Fieldbus	The protocol that uses digital communication to exchange signals between field equipment (instruments and actuators).
	FSU	Fast Startup – feature which allows an IO device to go immediately from power up to cyclic data exchange with an IO controller.
	Full duplex	Communication system that can send and receive data at the same time bi-directionally (similar to standard telephone).
G	GSD	General Station Description - Device description for configuring IO devices within the engineering system.
	GSDML	General Station Description Markup Language - An XML-based language, the GSDML file is used as the language for a device description file. The file contains settable attribute information for a device (each parameter's object size, etc.). It is used by Siemens PLC TIA Portal™ software to permit faster, more consistent PLC setup.
H	Half duplex	Communication system that sends and receives data in one direction at a time (similar to a two-way radio).
	Host Address	The final (4 <sup>th</sup> ) octet of an IP Address.

	HTTP	Hyper Text Transmission Protocol - Data exchange protocol used for transmission of internet data. Web browsers communicate to web servers via this protocol.
I	I&M	Identification and Maintenance - general information functions about devices (for example manufacturer, version, ordering data, etc.)
	IO	Input/Output
	IOC	Input/Output Controller - Master in the PROFINET IO network.
	IOCR	Input/Output Communication Relation - Describes the connection for the PROFINET IO real-time channel in the input and output direction.
	IOD	Input/Output Device - Slave in the PROFINET IO network.
	IP address	A 32-bit digit sequence which is assigned to identify devices which are connected to the network. This address must be unique for each device to ensure proper operation of the network.
	IPxy	International Ingress Protection standard. xy indicates the level of protection from external objects (hands, steel balls, steel wire, dust, water, etc.) applied to the product.
	IRT	Isochronous Real-time
L	LED	Light Emitting Diode - Indicator for signaling device states.
	LLDP	Link Layer Discovery Protocol - link layer protocol used to determine a device identity and capabilities based on IEEE 802 technology.
M	MAC	Media Access Control
	MAC address	A unique number inherent to all devices which are connected to Ethernet.
	Master	The master is the device which controls the ITV. Typically, a master is a PLC. It may also be a PC (using the ITV web pages or a LabVIEW™ software program) or it may be another device capable of controlling the ITV.
	MRP	Media Redundancy Protocol - ring topology that implements recovery mechanism in milliseconds if transmission link is interrupted.
P	PC	Personal Computer.
	PI	PROFINET International – PROFINET governing body.
	PLC	Programmable Logic Controller - a digital computer/controller used for automation of electromechanical processes.
	PNIO	PROFINET Input/Output
	Power Cycle	A Power Cycle involves briefly removing power from the ITV and then restoring power.
	PROFINET™	The specific Fieldbus (network) communication protocol used by the ITV to communicate with the PLC, and any other connected devices. PROFINET is a well-documented, standard communications protocol.
	PWR	Power
Q	QoS	Quality of Service
R	RTC	Real-Time Class
S	Setpoint	The specified pressure or vacuum value which the ITV has been directed to maintain.
	Serial Interface (SI)	A communication interface between two digital systems that transmits data as a series of voltage pulses down a wire. Each pulse represents a single bit of data.
	SF	System Fault
	SI unit	Abbreviation for Serial Interface unit. A unit connected to a device to communicate input and output data. The ITV connection to another device is a Serial Interface Unit (SI Unit).
	SNMP	Simple Network Management Protocol - protocol for gathering information about devices on IP networks and used to changing device operations.
	Station Name	The Station Name (or Device Name) - used for unique identification of the device in the network.
	Subnet Address	The 3 <sup>rd</sup> octet of an IP Address. Also called Subnet.
T	Topology	Connection configuration of the network.
U	Upstream	Relative to your ITV, an upstream device provides power and/or communication signals <i>to</i> your ITV.
	UUID	Universally Unique Identifier

Table 1 – Definitions and Terminology

## 5. Product Summary

The Ethernet ITV is a pressure/vacuum regulator which is controlled over a standard ethernet interface. Pressure ITVs (ITVX010, ITVX030, and ITVX050) and Vacuum ITVs (ITV2090) regulate supplied air pressure or vacuum to an output pressure or vacuum specified by the user. The user can set the ITV pressure or vacuum and monitor the ITV operating status using the built-in webserver, PLC, or acyclic messaging.

## 6. How to Order

### 6.1. Single ITV Options

ITV ## - # ## - # # - DUX02357 - ####													
BODY SIZE		PRESSURE RANGE		INTERFACE		FIELDBUS		THREAD TYPE		PORT SIZE		MADE TO ORDER	
10	200 L/min	10	0.1 MPa	S	SERIAL	PN	PROFINET	NIL	Rc	1	1/8" (1000)	NIL	STANDARD MOUNTING
20	1500 L/min	30	0.5 MPa					N	NPT	2	1/4" (1000, 2000)	*2 X26	MANIFOLD MOUNTING
30	4000 L/min	50	0.9 MPa							3	3/8" (2000, 3000)	*3 X400	GAUGE PORT
		*1 90	-80 kPa (Vacuum)							4	1/2" (3000)		

#### HOW TO ORDER EXCEPTIONS:

1. AVAILABLE ONLY IN BODY SIZE 20 AND WITH 1/4" Rc AND NPT PORTS.
2. X26 OPTION AVAILABLE in 1010, 2030 AND 2050 WITH 1/4" Rc PORTS ONLY. ORDER MATING MANIFOLD WITH DESIRED PORT TYPE.
3. X400 AVAILABLE IN 2030 AND 2050 ONLY WITH 3/8" Rc PORTS.

\*ALSO SEE INDIVIDUAL SERIES VIEWS ON SUBSEQUENT PAGES FOR ADDITIONAL HOW TO ORDER RESTRICTIONS.

Figure 1 – ITV Options

### 6.2. Assembled Manifold Mounted Options

IITV20 - # # - # - 20#0 - ### - DUX02357									
THREAD TYPE		PORT SIZE		NUMBER OF STATIONS		PRESSURE RANGE		FIELDBUS	
NIL	Rc (PT)	2	1/4 INCH	2	2 STATIONS	2010	0.1 Mpa	SPN	PROFINET
N	NPT	3	3/8 INCH	3	3 STATIONS	2030	0.5 Mpa		
F	NPTF			4	4 STATIONS	2050	0.9 Mpa		
				5	5 STATIONS				
				6	6 STATIONS				
				7	7 STATIONS				
				8	8 STATIONS				

Figure 2 – Manifold Options



## 7. Accessories

**Connector cables** (recommended – not included with ITV)

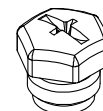
ITV unit connection	Description	Compatible cable		
		Part number	Length	Specifications
Fieldbus interface	Cables	EX9-AC010EN-PSRJ	1m	One end: molded M12 straight connector. Other end: RJ45 connector (Ethernet).
		EX9-AC020EN-PSRJ	2m	
		EX9-AC030EN-PSRJ	3m	
		EX9-AC050EN-PSRJ	5m	
		EX9-AC100EN-PSRJ	10m	
	Field wire-able Connector	PCA-1446566	5m	One end: molded M12 right angle connector. Other end: flying leads.
		EX9-AC005EN-M12M12	0.5m	Both ends: molded M12 straight connectors.
		EX9-AC050EN-M12M12	5m	
Power supply	4 Pin Cables	P398020-500-3	3m	Straight 4 Wire M12 Connector
		P398020-501-3	3m	Right Angle 4 Wire M12 Connector
		P398020-501-5	5m	Right Angle 4 Wire M12 Connector
		P398020-501-10	10m	Right Angle 4 Wire M12 Connector
	5 Pin Cables	EX500-AP010-S	1m	One end: molded M12 straight connector. Other end: flying leads.
		EX500-AP050-S	5m	
		EX500-AP010-A	1m	One end: molded M12 right angle connector. Other end: flying leads.
		EX500-AP050-A	5m	
	Cable with Speedcon connector	PCA-1401804	1.5m	One end: molded M12 straight connector. Other end: flying leads.
		PCA-1401805	3m	
		PCA-1401806	5m	

**Table 2 – Recommended Cables**

**Note:** More options are available. Contact SMC for information on these options.

### Seal cap

Seal caps are used to protect the M12 size connector openings. It is recommended that seal caps be used on all unused M12 connector openings. Use of seal caps is required for all unused connections for IP65 rating.



(One Ethernet and one Power seal cap are attached to the ITV when shipped from factory.)

Description	Part No.	Specification	Quantity	Port
Seal cap	EX9-AWTS	For M12 connector socket	10	Bus
Seal cap	P5033-88	For M12 connector socket	1	Bus
Seal cap	UIUSP-A05-DUQ00833	Cap and Gasket for M12 Female Connector	1	Power

**Table 3 – Recommended Caps**

## 8. Summary of Product Elements

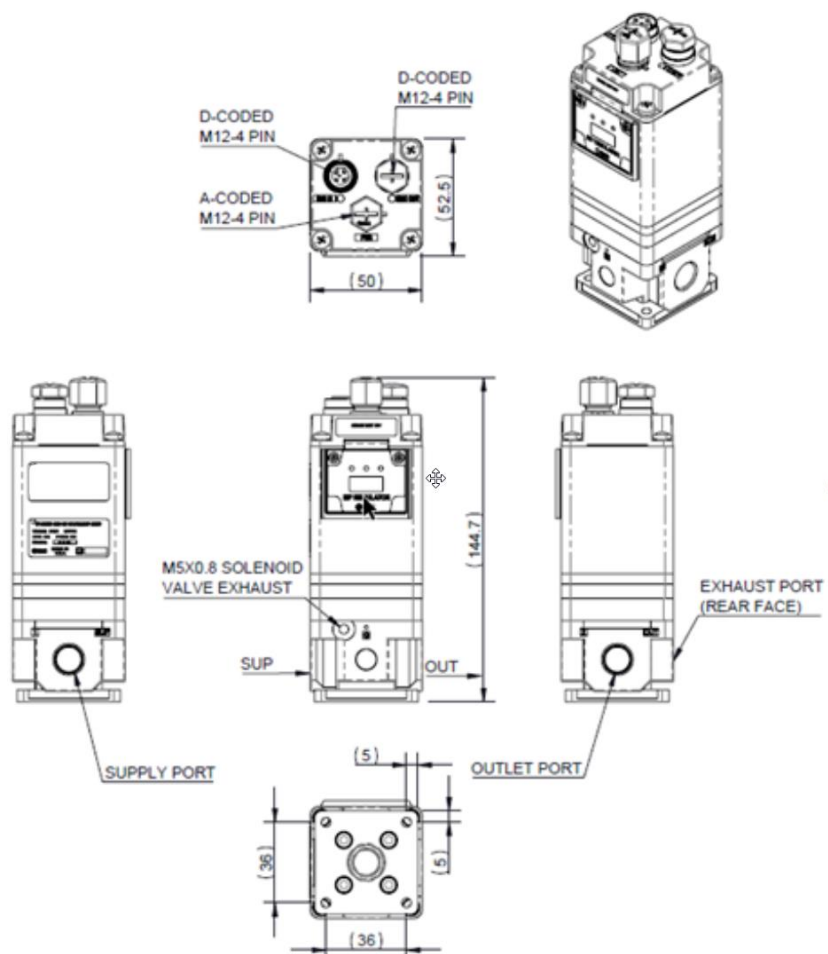


Figure 3 - ITV20XX Drawing

Element	Description
Supply Port Connection	Input Pressure Line Connection (X010, X030, X050) / Atmosphere Pressure (2090) *1
Outlet Port Connection	Output Pressure Line Connection (X010, X030, X050) / Application Vacuum Line Connection (2090) *1
Exhaust / Vacuum Port	Exhaust Port (X010, X030, X050) / Vacuum Line Connection (2090) *1
LED Display window	Network and operating status LEDs *2
Fieldbus interface connector (Bus In)	Ethernet connection (M12, 4-pin socket, D-coded) *3
Fieldbus interface connector (Bus Out)	Ethernet connection (M12, 4-pin socket, D-coded) *3
Power supply connector	24 Volt DC input power supply *3
Seal Cap (Accessory)	Seal cap for unused Fieldbus interface connector (Bus Out); Seal cap for unused power supply connector *3

Table 4 - Element Description

\*1: X is 1, 2, or 3 and designates the body type for the ITV. (See “How to Order” for more information)

\*2: See “LED Indicators” for the LED indication.

\*3: See “Accessories” for connecting cables and seal caps part numbers.

## 9. Quick Start

### 9.1. Network

1. Using the suggested M12 D-coded cable, connect the “BUS IN” network port to the network.

### 9.2. Power Connection

1. Connect common to pin 3 the blue wire typically of the M12 Cable.
2. Connect 24 VDC to pin one the brown wire typically of the M12 Cable.
3. Pins to 2 and 4 of the M12 cable are “no connect” - black and white wires typically.
4. Connect the cable to the power connector of the ITV.
5. Turn on the power if the device is not powered.

### 9.3. Device Startup

1. Initially, the PWR LED should cycle between red and green but eventually stop with the green LED on. Also, the BF LED should initially be solid red but eventually should continuously cycle on and off. The BF LED will continue to cycle until the device is properly configured for the network.
2. On top of the unit, if an active network cable is connected to the BUS IN port then the BUS IN should have the green LED on and the yellow LED possibly flashing if there is network traffic.
3. If there is no cable connected to the BUS OUT connector then the BUS OUT LEDs will be off.
4. If the device LEDs behave differently please refer to the “**LED Indicators**” and “**Troubleshooting**” sections for help.

### 9.4. Setting Device Name

1. The device comes configured to provide a default Device Name of “DUX02357-SPN”. This matches the default in the GSD file.
2. Refer to section “**Device Name**” for changing of the Device Name.
3. The default IP is blank. Please note that for PROFINET devices the IP address will be set by the controller (for example – the PLC).

### 9.5. PLC setup

1. Install GSD file per PLC software instructions.
2. Add device to your PLC network per PLC software instructions.
3. Change Device Name and IP address as needed.
4. Refer to section **Basic PLC Configuration** for more details.

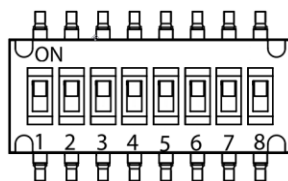
### 9.6. Setpoint and Feedback Information

1. The setpoint and feedback are scaled across 12 bits full scale.
2. Refer to the **Setpoint and Feedback** section for more information.

### 9.7. Plumbing and mounting

1. Plumb supply pressure as appropriate.
2. Plumb Outlet to device to be controlled.
3. Turn on the supply pressure and check for leak.

## 10. DIP Switches



**Figure 4 – DIP Switches**

The PROFINET ITV contains an 8 circuit DIP switch to configure the ITV. Typically, the DIP switches do not need to be changed from their factory setting, but the following describes their features. One feature that the user can use the DIP switches for is to assign the default Device Name.

### 10.1. Device Name

When power is first applied to PROFINET devices with factory settings, the Device Name is “DUX02357-SPN” and the IP address is set to 0.0.0.0. The DIP switch can be used to change the Device Name of the ITV. The user can choose an empty default Device Name, a default name of “DUX02357-SPN”, or a default name of with a unique identifier (for example “DUX02357-SPN-15”). The unit is shipped with all switches in the “ON” state which will provide a default Device Name of “DUX02357-SPN”. DIP switches are only read at power up. If a change to the DIP switches is required then power down the unit, make the change to the DIP switches, and reapply power. Also, any persisted Device Name stored in memory will take precedence over the DIP switches. If the user wishes to use the DIP switch settings and a persisted Device Name is already stored, then a factory reset to clear the name will need to be performed in order to erase the stored name.

DIP Switch	Title	Description
1	Default Device Name	The position of switch 1 determines whether to use a default Device Name in the event there is no name stored in persisted memory. In the default ON position, the device uses the default string of “DUX02357-SPN” for the name if there is no Device Name stored in persisted memory. In order to use this position, the persisted Device Name must be cleared. The “DCP Set/Reset” service can be used to perform a factory reset to clear the name from memory. In the OFF position, the device will only use the name saved in persistent memory. If no name is currently stored, then an empty character string (“”) will be used as the default setting. The “DCP Set” service can be used to set the name of the device in the persisted memory.
2	Append Suffix	The position of switch 2 can be used in conjunction with switch 1. If switch 1 is in the ON position, then switch 2 can be used to append a suffix number on the default “DUX02357-SPN” Device Name to uniquely identify the device. In the ON position, the device will only use the default Device Name described for switch 1 (“DUX02357-SPN”). In the OFF position, the device will append a hyphen and a numeric suffix to the default name (“DUX02357-SPN-XXX”). The numeric suffix is described for switches 3 through 6 (see below).
3 – 6	Suffix Number	Switches 3 through 6 uniquely identifies the device when the default Device Name is used. If all switches are in the OFF position, then a zero (0) is appended after the hyphen. If all switches are in the ON position, then a fifteen (15) is appended after the hyphen. The numeric suffix can be calculated with the following equation where n is the switch number:

		$\sum_{n=3}^6 (\text{Switch Position for } n) * 2^{(n-3)}$ <p>In the ON position, the Switch Position is a “1” and in the OFF position, the value is “0”.</p>
7 - 8	Not Used	

**Table 5 – DIP Switch Description****Example:**

The following example of a DIP switch setting illustrates an example when DIP switch 1, 3, 4, and 5 are in the ON position and DIP switches 2 and 6 are in the OFF position.

The device name “DUX02357-SPN-7” results from the example DIP switch setting.

DIP Switch (n)	State	Description
1	ON	Use the default Device Name of “DUX02357-SPN”.
2	OFF	Append a numeric suffix to the default Device Name.
3	ON	Numeric Suffix = $1 * 2^{(3-3)} + 1 * 2^{(4-3)} + 1 * 2^{(5-3)} + 0 * 2^{(6-3)}$ = $1 * 1 + 1 * 2 + 1 * 4 + 0 * 8$ = 7
4	ON	
5	ON	
6	OFF	
7 - 8	Not Used	The DIP switch settings would assign “DUX02357-SPN-7” to the Device Name.

**Table 6 – DIP Switch Example**

## 11. GSDML File

The GSDML file is an XML based device description file and provides information about the ITV I/O modules. This information is used for understanding the configuration and parameter data which includes data length, data description, alarms information, etc. The file can be read into IO controllers and tools to assist in data exchange with the device. The ITV GSDML file follows the naming convention of “GSDML-VX.XX-SMC-DUX02357-YYYYMMDD.xml” with “X.XX” being the version of the GSDML Specification the file is based on and “YYYYMMDD” is the date of the release. The latest release can be downloaded from [www.smcusa.com](http://www.smcusa.com).

## 12. Mounting and Plumbing

For standard mounting, properly install pneumatic fittings in the threaded ports of the ITV base. For additional details see [Electroinc Pressure Regulators](#). For information about SMC fittings see [Fittings - One Touch](#). See **Figure 3 – ITV20XX Drawing** for the description of fitting options. Torque the fittings as indicated:

Connection thread	1/8	1/4	3/8	1/2
Torque (N•m)	7 to 9	12 to 14	22 to 24	28 to 30

**Table 7 – Recommended proper connection torque: N•m**

### 12.1. Install pneumatic tubing

When installing this tubing, be sure that the air pressure or vacuum source is **LOCKED OFF** at the closest shutoff valve before the ITV. There must be **NO AIR PRESSURE OR VACUUM** in the pneumatic line until all connections are complete.

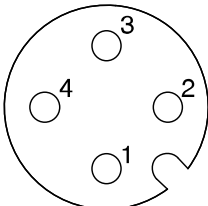
## ⚠ Caution

**DO NOT** enable air pressure or vacuum until **ALL** pneumatic lines in the circuit have been properly connected and the connections have been verified to be correct. Failure to follow this requirement can result in injury or equipment damage.

Be **SURE** to understand the location and function of the ports **BEFORE** connecting the ITV to an air or vacuum line. **VERIFY** that these lines are properly connected **BEFORE** enabling pneumatic pressure or vacuum and **BEFORE** powering the ITV.

## 13. Power Connection

Power supply connector layout - PWR: M12 4-pin Plug A-coded connector

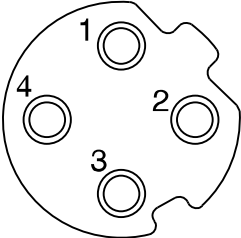
	No.	Designation	Description
	1	24 VDC	Power (Brown Wire or +24 VDC or "+" terminal)
	2	-	Do Not Connect
	3	0 VDC	Common (Blue Wire or Common or "-" terminal)
	4	-	Do Not Connect

**Table 8 – ITV Power Cable Pin Connections**

(Note: The wire colors above are for a standard SMC power cable. Power cables from other sources may use different colors.) For Power Cable selection, see **Accessories**.

## 14. Networking

Network Bus In and Bus Out: M12 4-pin socket D-coded connectors

	No.	Designation	Description
	1	TD+	Transmit Data +
	2	RD+	Receive Data +
	3	TD-	Transmit Data -
	4	RD-	Receive Data -

**Table 9 – ITV Ethernet Cable Pin Signals**

Use a standard industrial Ethernet cable. For cable selection see **Accessories**.

Connect one connector ("Bus In" or "Bus Out") to the upstream device and connect the other connector ("Bus Out" or "Bus In") to the downstream device. For cable selection see **Accessories**.

If Power Over Ethernet (POE) is **NOT** in use, either communications port can be used for input or output. It is recommended that "Bus In" be used for the input (upstream) connection to the ITV and "Bus Out" be used for the output (downstream) connection from the ITV. It is also recommended that unused connectors be capped with a seal cap to meet IP65 environmental rating. For more information see **Accessories**.

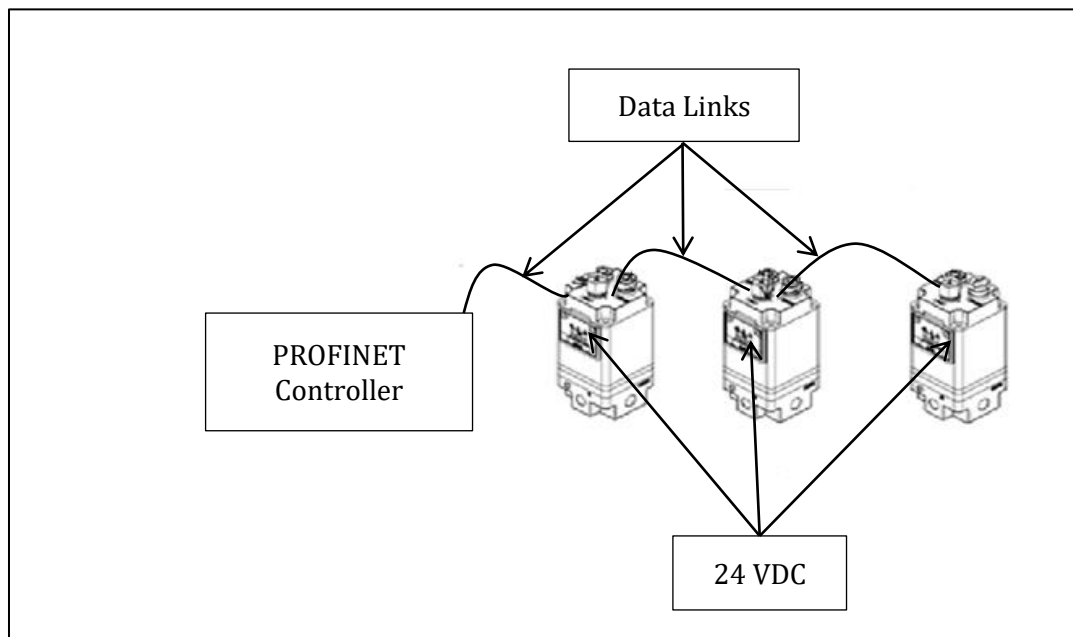


Figure 5 - Example (non-POE) ITV Data and Power Connections

### 14.1. SMC ITV POE Summary


The Power Over Ethernet (POE) feature is an *optional* way to power ITV units eliminating the need to run a power cable to all ITVs. When POE is enabled, power is provided to the ITV by the “Bus In” cable. The ITV factory **default** condition is **POE disabled**.

#### Caution


The POE on the ITV does not use the PoE 802.3 standard and therefore is not compatible with these devices. The ITV Power Over Ethernet (POE) implementation is unique to the SMC ITV. Do **NOT** operate other devices using the ITV POE. Do **NOT** use POE from other devices to operate the ITV. By default, POE is **DISABLED**. Be sure to **FULLY** understand this section **BEFORE** enabling POE on your ITV network.

### 14.2. Configuring POE

POE is enabled or disabled using the “Enable POE” checkbox on the Network tab of the Web Server. Log into the internal web server. Refer to section **Web Server** on how to log into the web server. After logging into the web server, press the “Network” menu item. The “Enable POE” check box is highlighted in the example below.



Automation • Controls • Process



User LOGOUT

System Information **Network** Device Control & Status Login Management

### SMC Electro-Pneumatic Ethernet Regulator

*Network Status and Configuration*

---

**Network Communication Status**

Active Protocol: *PROFINET*  
Communication Status: *Online*

**Ethernet Port 1**

Active  
100 Mbps  
Full Duplex  
Successfully negotiated speed and duplex

**Ethernet Port 2**

Inactive  
Unknown Mbps  
Unknown Duplex  
Autonegotiation in progress

---

**Network Configuration**

**Network Settings**

Device Name: dux02357-spn  
IP Address: 192.168.1.1  
Net Mask: 255.255.255.0  
Gateway Address: 192.168.1.1  
DNS Server: 0.0.0.0  
MAC Address: 00:23:c6:08:00:01

**Application Settings**

Enable POE: ☐  
Enable Hold: ☐

Check to enable POE.  
Clear to disable POE.  
This indicates POE is disabled.

**submit**

When a change is made, press the "submit" button.

Please submit the changes.

[Back to top](#)

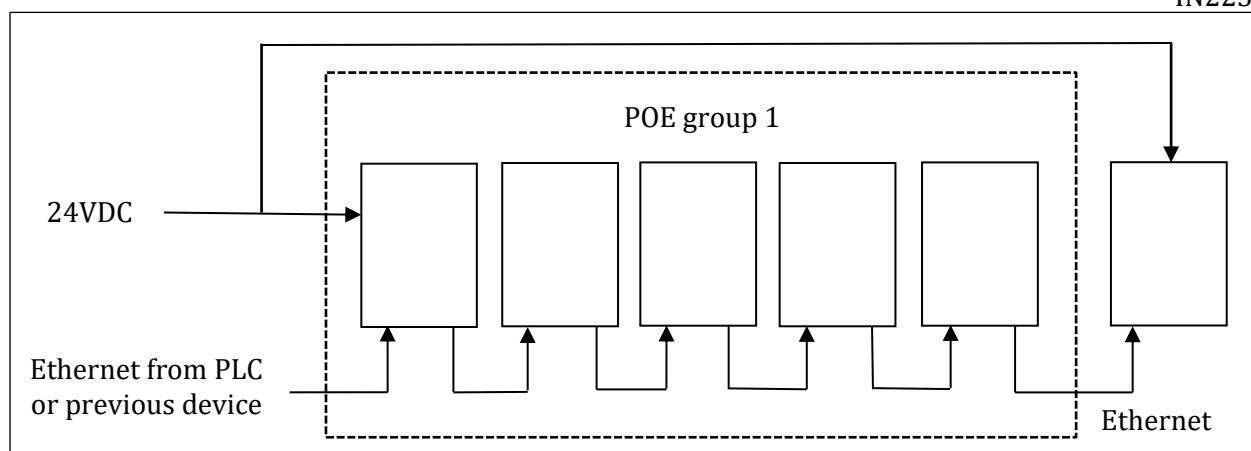
**Figure 6 – ITV in POE Mode**

Click on the checkbox to enable or disable the POE state then press “**submit**” or the keyboard **Enter** key. The ITV will update and store the new POE state. The ITV now has the “**Bus Out**” connection changed to the POE state indicated by the “Enable POE” checkbox (**enabled** – 24 VDC **on** (checked) or **disabled** – 24 VDC **off** (unchecked)).

### 14.3. Connecting ITVs for a POE Group

The cable connections are critical for proper operation of POE. The following is an example of proper POE cable connections.





**Figure 7 – ITV POE Group Ethernet Connections**

The diagram illustrates the Ethernet communication and 24 VDC power cable connections required to support 6 ITVs when Power Over Ethernet (POE) is in use. The ITVs in the dashed box form a single POE group. Note that POE supports a **maximum** of five (5) ITVs in one POE group.

The following rules **MUST** be followed for proper operation of POE:

- 1) Ethernet cable from the PLC or other device (source) must be connected to the “**Bus In**” on the first ITV in a POE group.
- 2) Ethernet cable between the ITV’s within the POE group must be connected between the “**Bus Out**” port of the **upstream** ITV and the “**Bus In**” port of the **downstream** ITV for **ALL** ITVs.

### **! Caution**

**NEVER** connect “**Bus Out**” of an ITV which has POE Enabled to **ANYTHING** other than “**Bus In**” of another ITV. “**Bus Out**” of a POE Enabled ITV provides a 24 VDC power source for the next ITV. Failure to follow this precaution can result in equipment damage.

- 3) A maximum of 5 ITVs is allowed in each POE group.
- 4) The “**Bus Out**” port on the last ITV (**POE disabled**) in the group may be connected as the **communication source** to a downstream device.
- 5) The first ITV within a POE group **must** have a power connection to a 24 VDC power supply. The first ITV is the **ONLY** ITV in the group with a connection to the 24 VDC power supply.
- 6) Every ITV in the group (**EXCEPT THE FINAL ITV**) **MUST** have POE **ENABLED**. The **FINAL** ITV **MUST** have POE **DISABLED**.

### **! Caution**

POE for the FINAL ITV in an ITV POE group **must be** disabled for proper operation.

- 7) A power supply connection is **required** for the first ITV following a POE group.
- 8) Multiple POE groups can be connected, and the number of ITVs in each POE group can vary as necessary (maximum of 5 ITVs per group).

## **15. Hold on Connection Loss**

Hold on Connection Loss is enabled or disabled using the “Enable Hold” checkbox on the **Network** tab of the Web Server. This checkbox is used to control ITV behavior in the event Ethernet

communication is lost to the PLC. If Ethernet communication is lost with “Enable Hold” checked and the ITV is powered, the ITV will continue to actively regulate to the previous pressure setpoint. If Ethernet communication is lost with “Enable Hold” unchecked and the ITV is powered, the ITV will set the pressure setpoint to 0 and the output pressure will be immediately exhausted. If communication is re-established in this case, the ITV will not automatically regulate back to the previously commanded pressure setpoint. This is done to ensure there is not an undesirable inadvertent event. To return to the previous pressure setpoint, the ITV must first be commanded to a different setpoint then back to the previously commanded pressure.

**Note:** *If power is lost, the ITV will stop actively regulating to the setpoint. This does not mean the pressure will drop to zero.*

## 16. Setpoint and Feedback

Setpoint is the requested value for the ITV’s regulated pressure or vacuum output. An external master (typically a PLC) sends the setpoint value to the ITV, either in counts or engineering units. Counts is the default of the ITV. The full-scale pressure range of the ITV is scaled across 12 bits (0-4095). Example: Mid pressure for an ITV would be 2048 counts. During machine start up or troubleshooting, the ITV web page can be used to enter a setpoint values.

This version of the ITV supports not only counts but also various types of engineering units as pressure setpoint and pressure feedback values. This ITV supports Counts, kg/cm<sup>2</sup>, bar, psi, kPa and, MPa as acceptable pressure setpoint units.

### Caution

Changing unit type should be done when setpoint is zero as current setpoint will be interpreted as the new unit type. This could cause the pressure to go to max pressure.

Standard PLC Output Control Signal Formatting (Setpoint)															
INT 0															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Byte 0								Byte 1							
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
Pressure Setpoint (Byte 0 Bit 0 is the LSb)												Ext	X	X	X

**Table 10 – Standard PLC Output Control Signal Formatting (Setpoint)**

**Note:** The “Ext” bit is used for extending the pressure range above 100% full scale and “X” bits are not used.

Standard PLC Input Control Signal formatting (Feedback)																															
INT 0																INT 1															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Byte 0								Byte 1								Byte 2								Byte 3							
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
Pressure (Byte 0 Bit 0 is the LSb)												E	X	X	X	Diagnostics															

**Table 11 – Standard PLC Input Control Signal formatting (Feedback)**

## 16.1. Counts as Setpoint

Counts can be used to control the ITV pressure. The master device sends counts to the ITV for the desired pressure. The ITV will then report the current pressure feedback value to the master device in counts. The count range is 0 to 4095 (12 bits). The count range is the same for all ITVs. The maximum pressure or vacuum corresponds to 4095 counts. For example, an X010 ITV body size has a pressure range from 0 to 0.1 MPa. The maximum pressure would correspond to 4095 counts.

A 16-bit value must be sent to the ITV. The lower or least significant 12 bits represent the count value. Counts sent to the ITV for a desired pressure or vacuum output must be scaled to an integer value between 0 and 4095.

The “Maximum Pressure Scaling Formula” for converting pressure to counts is:

$$\text{Counts} = \left( \frac{\text{desired pressure}}{\text{maximum pressure}} \right) \times 4095$$

Some of the typical pressure unit types are precalculated below in the table. If another type is needed, then counts can also be determined by using the “Scale Factor Formula”:

$$\text{Counts} = \text{desired pressure} \times \text{scale factor}$$

The following table shows some precalculated scale factors for the ITV body types and pressure units.

Pressure Body Type	MPa	kg/cm <sup>2</sup>	bar	psi	kPa
<b>X010</b>	40950.0	4014.70	4095.0	282.33	40.95
<b>X030</b>	8190.0	802.94	819.0	56.46	8.19
<b>X050</b>	4550.0	446.07	455.0	31.37	4.55
<b>2090 (Vacuum)</b>	-51187.5	-4993.90	-5118.75	-352.92	-51.18

**Table 12 – ITV Scale Factors**

For example: The desired output pressure is 10 psi for an X030 ITV. From the table, the scale factor for this body type is 56.46. Use the “Scale Factor” formula to obtain the count value.

$$\text{Counts} = 10 \times 56.46 = 564.6 \cong 565 = \text{0x0235}$$

The calculated count value must be rounded if necessary and converted to hexadecimal.

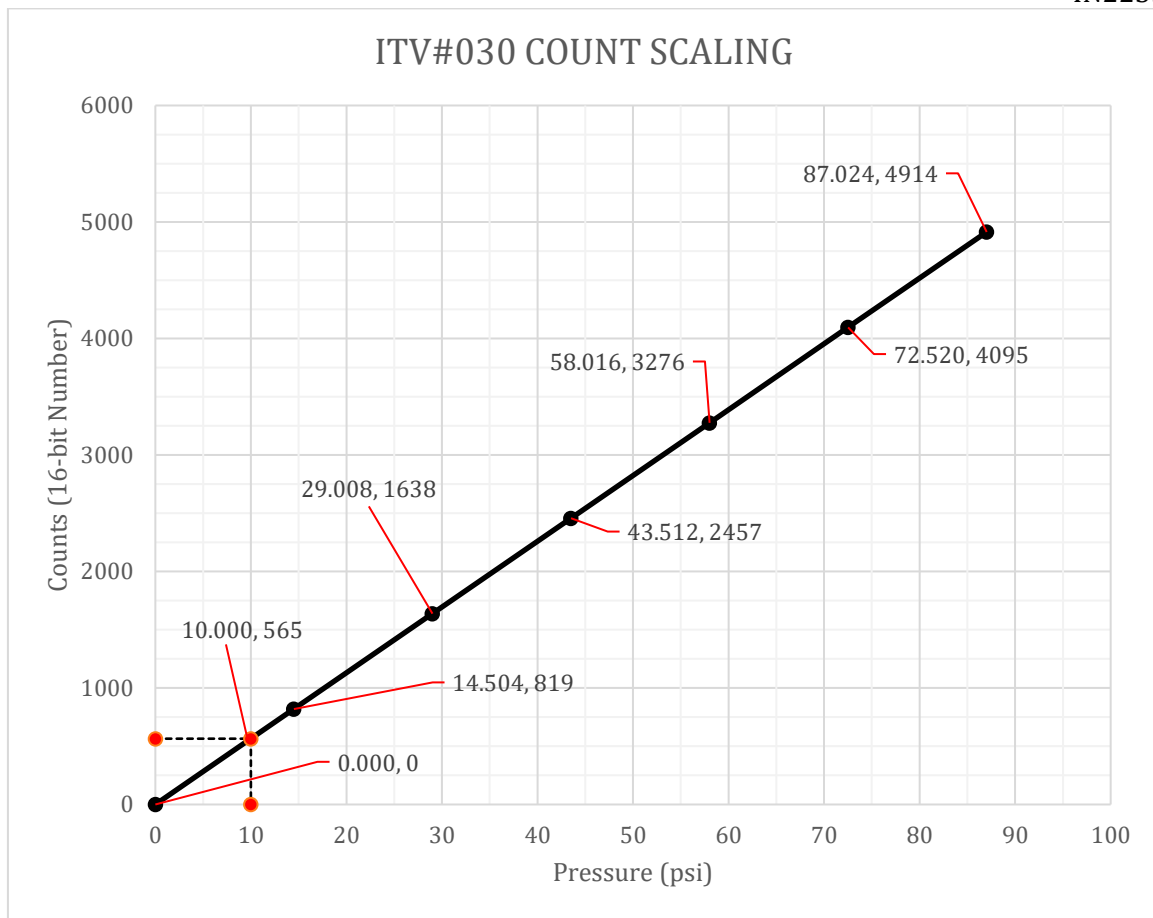


Figure 8 – Counts Example for psi Range for X030 ITV

## 16.2. Counts as Feedback

A 16-bit value is received from the ITV. The upper 4 bits are 0. The lower 12 bits represent the count value. The count value indicates the current pressure output of the ITV. The inverse of the setpoint scaling factor is used to determine the feedback in the unit type selected. The count value can be converted to pressure units using the following formulas:

“Maximum Pressure Scaling Formula” (using ITV Scale Factors):

$$\text{Feedback Pressure} = \left( \frac{\text{counts} \times \text{maximum pressure}}{4095} \right)$$

“Scale Factor Table Formula” (using ITV Scale Factors):

$$\text{Feedback Pressure} = \frac{\text{counts}}{\text{scale factor}}$$

## 16.3. Using engineering units

Engineering units can be selected from either the web page or explicit messaging. Below is how to set the ITV to engineering unit mode using the web page. Refer to Explicit Messaging to config from the PLC. Note: Changing to and from engineering mode should be done without a setpoint command.

1. Select Engineering Unit Mode from the “Device Control & Status” web page.
2. For the “Pressure Unit” in the “ITV Pressure” section, select the engineering unit desired by picking the radio button corresponding to the desired unit type.

3. Check "Engineering Unit Mode" box.
4. Click "submit" – Changes will be made immediately. The selected engineering unit will be stored in internal memory and will be retained permanently, even if power is cycled, until a different unit is selected using procedure 1-3 above.

## 16.4. Scaling the engineering units

The engineering units are scaled to use integer math and as a result require a multiplier to be used when sending the pressure setpoint of the desired engineering unit type. The multiplier used depends on what type of ITV unit is being communicated with and what type of engineering unit is selected. Please see the tables below for a full description with an example following.

ITV Unit Type – 0.1 MPa						
Engineering Units	MPa	kg/cm <sup>2</sup>	bar	psi	kPa	Counts
Multiplier	100000	10000	10000	1000	100	See Section <b>Counts as Setpoint</b>

**Table 13 – 0.1 MPa Scaling Factors**

ITV Unit Type – 0.5 MPa						
Engineering Units	MPa	kg/cm <sup>2</sup>	bar	psi	kPa	Counts
Multiplier	100000	10000	10000	100	100	See Section <b>Counts as Setpoint</b>

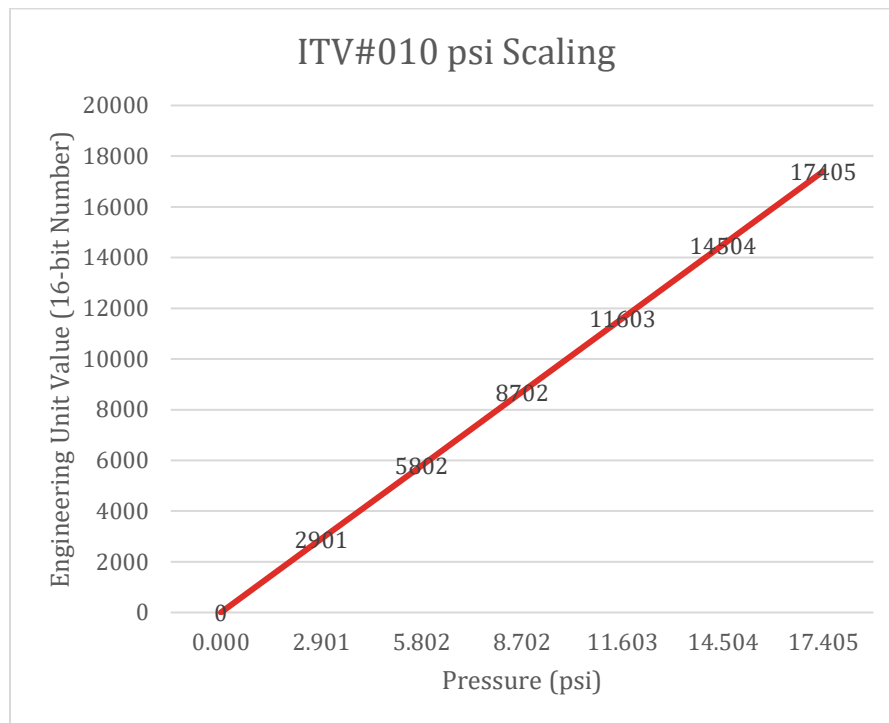
**Table 14 – 0.5 MPa Scaling Factors**

ITV Unit Type – 0.9 MPa						
Engineering Units	MPa	kg/cm <sup>2</sup>	bar	psi	kPa	Counts
Multiplier	10000	1000	1000	100	10	See Section <b>Counts as Setpoint</b>

**Table 15 – 0.9 MPa Scaling Factors**

ITV Unit Type – -80 kPa (vacuum unit)						
Engineering Units	MPa	kg/cm <sup>2</sup>	bar	psi	kPa	Counts
Multiplier	100000	10000	10000	1000	100	See Section <b>Counts as Setpoint</b>

**Table 16 – -80 kPa Scaling Factors**



**Figure 9 – psi Engineering Unit Scaling Example for 0.1MPa Range ITV**

Example: Suppose you have a 0.9 MPa ITV unit and you want to use psi engineering units. The range of the unit in psi is 0.03 psi to 130.53 psi. Making sure the engineering units are enabled with psi selected, then if you wish to send 82.4 psi refer to the table above for 0.9 MPa unit noting the multiplier for psi - as you can see, it is 100; so multiply 82.4 by 100 and you get 8240. Set the setpoint to 8240 (0x2030). Remember, you need to know what to multiply the setpoint by for engineering units and that is determined by what ITV unit type you are using and what engineering units you wish to send.

## 16.5. Engineering Units as Feedback

When an engineering unit is selected as outlined above, the unit type that was selected will be the units used for the pressure feedback. As with the pressure setpoint multiplier that was needed to be applied, the same multiplier will need to be applied on the pressure feedback. Example: if the ITV unit is a 0.5 MPa unit and the units selected is kPa, then the multiplier is 100. So, if the feedback value is 3825, then the pressure feedback is 3825/100 or 38.25 kPa.

## 16.6. 120% for Full-Scale

The calibrated range of the ITV is the full-scale value/marketed value. This ITV's range can extend beyond the 100% mark all the way to 120% of full scale. Therefore, this ITV can deliver pressures well beyond the calculated 100% of full-scale mark. Please note, the accuracy is not guaranteed beyond the full-scale value. An example of where this could be useful is a process valve rate for 15 psi. Normally a 0.5Mpa ITV would be needed to meet the 15 psi max pressure of the process valve. Now a 0.1Mpa ITV could be used gaining 5 times better precision control of the process valve. Please see table below for the overall values that can be set and measured for this ITV (all values between 100% to 120% are linear) – Note 120% of the vacuum regulator is an impossibility as there is not enough difference in the vacuum pressure for the ITV to function correctly.

ITV Unit Type - 0.1 MPa						
Engineering Units	MPa	kg/cm <sup>2</sup>	bar	psi	kPa	Counts
100%	0.1	1.0197	1	14.5038	100	4095
120%	0.12	1.2236	1.2	17.4046	120	4914

**Table 17 – 0.1 MPa 120% Conversion**

TV Unit Type - 0.5 MPa						
Engineering Units	MPa	kg/cm <sup>2</sup>	bar	psi	kPa	Counts
100%	0.5	5.0986	5	72.5189	500	4095
120%	0.6	6.1183	6	87.0227	600	4914

**Table 18 – 0.5 MPa 120% Conversion**

ITV Unit Type - 0.9 MPa						
Engineering Units	MPa	kg/cm <sup>2</sup>	bar	psi	kPa	Counts
100%	0.9	9.1775	9	130.534	900	4095
120%	1.08	11.013	10.8	156.6408	1080	4914

**Table 19 – 0.9 MPa 120% Conversion**

ITV Unit Type - -80 kPa (vacuum unit)						
Engineering Units	MPa	kg/cm <sup>2</sup>	bar	psi	kPa	Counts
100%	0.08	0.8158	0.8	11.603	80	4095
120%	0.096	0.9790	0.96	13.9236	96	4914

**Table 20 – -80 kPa 120% Conversion**

## 17. Sensitivity and Gain

These parameters can be found on the **Device Control & Status** web page. They can also be set via messaging.

### 17.1. User Sensitivity

Sensitivity is a relative measure of response to changes in a control system. In this case, it controls how sensitive the ITV will be to pressure changes. The valid range for sensitivity is 0-7, where 0 is the most sensitive and 7 is the least sensitive. The default sensitivity is 2. Changing the sensitivity will change the pressure correction operation near the set pressure point. The lower the sensitivity number, the more precise the ITV will try to maintain the setpoint. Sometimes lowering the sensitivity number too much can cause the ITV to hunt and be less precise. The larger the sensitivity number, the less likely hunting will occur, but the precision will be reduced.

### 17.2. User Gain

Gain is a measure of how quickly the unit will respond for a given change in pressure. The valid range for gain is 0-15, where 0 is no gain and 15 is the most gain possible. The default gain is 8. Increasing the gain will decrease response time but increase the possibility of overshoot to pressure changes. Excessive gain can lead to oscillating corrections in pressure, resulting in

unstable pressure control. Decreasing the gain can ensure damped response to pressure changes but increases the response time.

## 18. *Pressure In-range Window Diagnostic*

This diagnostic will monitor the pressure feedback and determine if it is outside of a window pressure range for a specified elapsed time. If it is, then an error flag is set called Pressure Window Error, else the Pressure Window Error flag is cleared as the pressure is within the in-range pressure window. This is a useful feature to test achieving or maintaining a setpoint. Refer to the **Device Control & Status** web page for the Pressure Window Error.

### 18.1. Configuring the In-range Window

In-range diagnostic is an always enabled feature. The defaults are already set at the factory and only need to be changed if a different response is desired. The in-range window is configured by adjusting the User Gain and User Sensitivity values on the **Device Control & Status** web page (also via messaging). Note: Changing the Gain and Sensitivity will also change the responsiveness of the ITV.

For User Gain: Default is 8 which is a timeout of about 5 seconds.

User Gain = 0 is a 10 second timeout.

User Gain = 15 is a 1 second timeout.

The timeout time is linear between the User Gain values of 0 to 15.

For User Sensitivity: Default is 2 which is about 2%.

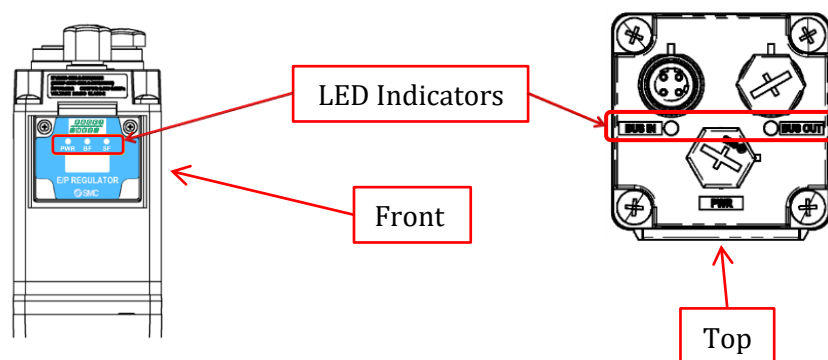
User Sensitivity = 0 is 1% of full scale.

User Sensitivity = 7 is 5% of full scale.

The percentages are linear between the User Sensitivity values of 0 to 7.

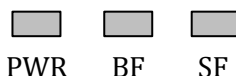
## 19. *LED Indicators*

### 19.1. Front LED Indicators



**Figure 10 – ITV LED Placement**

Front LED Indicators















LED	LED Status		Description
PWR		OFF	Load voltage for the ITV is not supplied.
		Green ON	Load voltage for the ITV is supplied and within range.
		Green/Red ON	Load voltage for the ITV is outside the tolerance range (24 VDC $\pm$ 10%) or data integrity value is corrupt.
		Red ON	Load voltage for the ITV is outside the critical range (24 VDC -15%).
BF		OFF	The ITV operating voltage is not supplied or no error.
		Red flashing	No data exchange with controller (possible device name not assigned).
		Red ON	No configuration or low speed physical link or no physical link.
SF		OFF	The ITV operating voltage is not supplied or no error.
		Red flashing	DCP Set Signal service is initiated via the bus.
		Red ON	Watchdog timeout; channel, generic or extended diagnosis present; system error.

Table 21 – ITV Front LED Indicator Status Key

## 19.2. Top LED Indicators

BUS IN    BUS OUT






LED	LED Status		Description
Bus In / Bus Out		Off	Load voltage not supplied, terminal is not connected to another operating device, or terminal failed
Bus In / Bus Out		Green ON	Terminal is connected to another operating device
Bus In / Bus Out		Yellow Flashing	Intermittently blink yellow - data transfer in progress

Table 22 – ITV Top Bus Connection LED Indicator Status Key

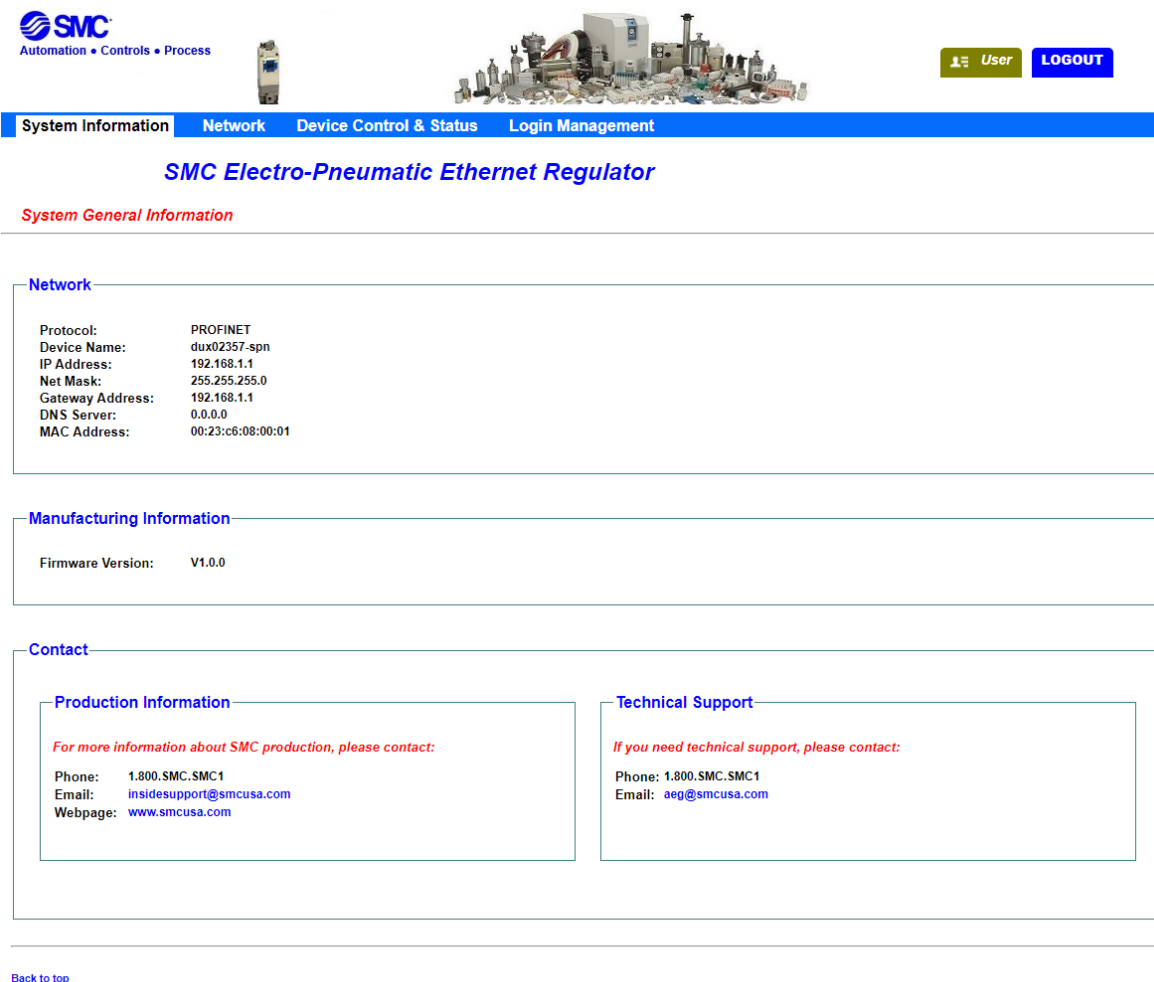
## 20. Web Server

The built-in web server can provide useful information about the ITV along with allowing for simple configuration of the ITV's features. The web page is also a great debugging tool for checking the status of the ITV along with being able to command the ITV directly. The web pages are password protected to prevent accidentally changing the settings. The default login information is username "user" and password "user". All the web pages are dynamic and update every second with the latest information. Once the ITV is assigned an IP address by the controller via the DCP Set command, the internal web browser can be viewed by typing in the assigned IP address into the browser of choice.

### 20.1. System Information

The "System Information" page will open once the web browser is started. Press the "**LOGIN**" button in the upper-right corner to open the login web page. Enter "**user**" for both the Username and the Password and then press "**submit**" button. Logging in with user privileges allows the user

to configure and control the ITV. After the user has logged in successfully, the System Information web page will be displayed, as shown below. Note that the **Login Management** web page is now accessible. The Device Status web page is changed to the **Device Control & Status** web page to allow the user to control the ITV. The **Network** web page now displays additional network information.



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System Information **Network** Device Control & Status Login Management

**SMC Electro-Pneumatic Ethernet Regulator**

*System General Information*

---

**Network**

Protocol:	PROFINET
Device Name:	dux02357-spn
IP Address:	192.168.1.1
Net Mask:	255.255.255.0
Gateway Address:	192.168.1.1
DNS Server:	0.0.0.0
MAC Address:	00:23:c6:08:00:01

**Manufacturing Information**

Firmware Version:	V1.0.0
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**Contact**

**Production Information**

*For more information about SMC production, please contact:*

Phone: 1.800.SMC.SMC1  
Email: [insidesupport@smcusa.com](mailto:insidesupport@smcusa.com)  
Webpage: [www.smcusa.com](http://www.smcusa.com)

**Technical Support**

*If you need technical support, please contact:*

Phone: 1.800.SMC.SMC1  
Email: [aeg@smcusa.com](mailto:aeg@smcusa.com)

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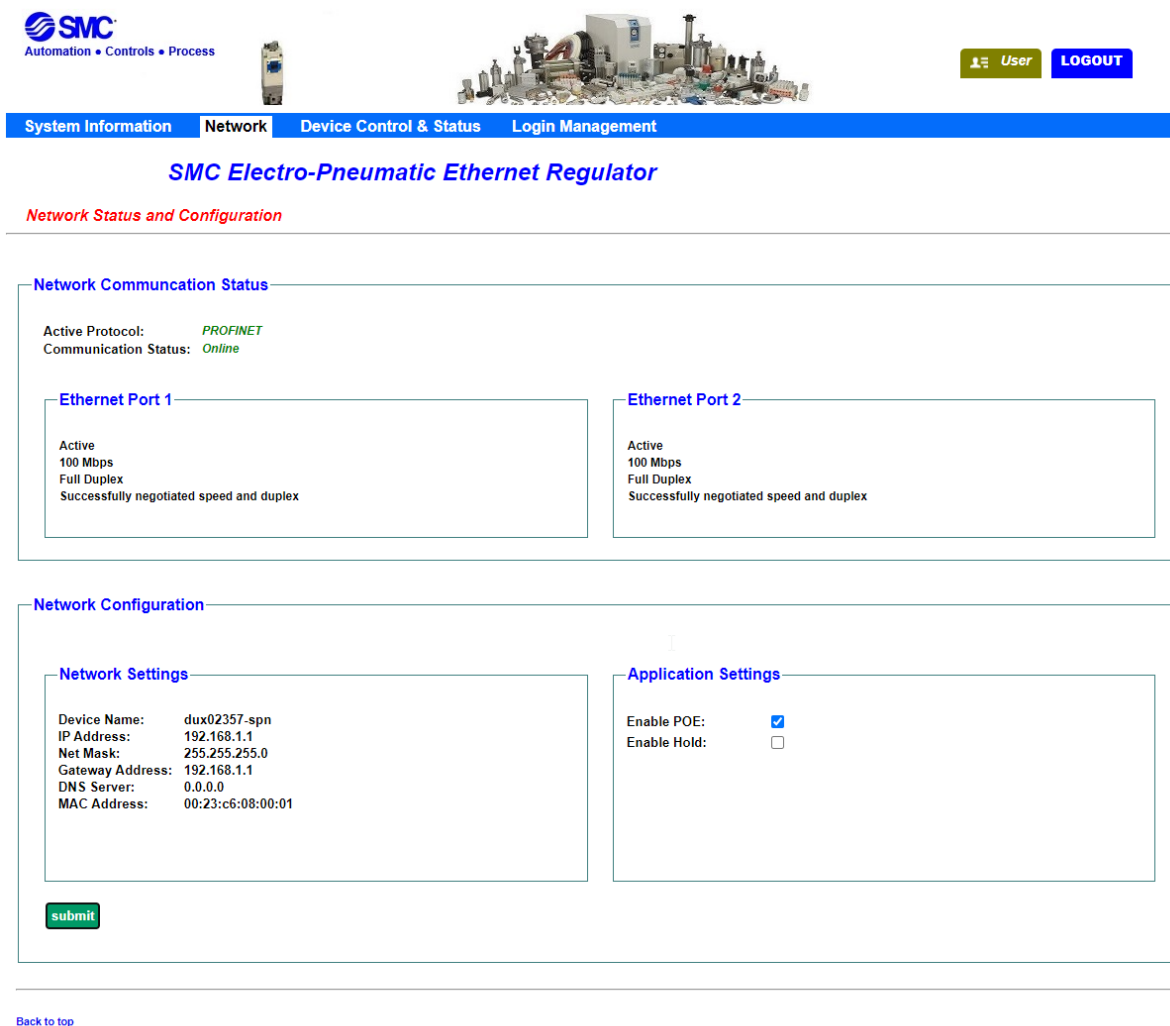
**Figure 11 – ITV System Information web page**

The “**Network**” section displays the current ITV network communication settings.

The “**Manufacturing Information**” display the version of SMC firmware. Please make note of this information if contacting SMC for technical support.

## 20.2. Network

When **Network** tab is selected, the Network page will be displayed to show the communication and connection status of the ITV. On this page, operating parameters can be changed.



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User LOGOUT

System Information **Network** Device Control & Status Login Management

**SMC Electro-Pneumatic Ethernet Regulator**

*Network Status and Configuration*

---

**Network Communication Status**

Active Protocol: **PROFINET**  
Communication Status: **Online**

**Ethernet Port 1**

Active  
100 Mbps  
Full Duplex  
Successfully negotiated speed and duplex

**Ethernet Port 2**

Active  
100 Mbps  
Full Duplex  
Successfully negotiated speed and duplex

**Network Configuration**

**Network Settings**

Device Name: dux02357-spn  
IP Address: 192.168.1.1  
Net Mask: 255.255.255.0  
Gateway Address: 192.168.1.1  
DNS Server: 0.0.0.0  
MAC Address: 00:23:c6:08:00:01

**submit**

**Application Settings**

Enable POE: ☒  
Enable Hold: ☐

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**Figure 12 – ITV Network web page**

**Network Communication Status** - Displays connection information for Ethernet Port 1 and Ethernet Port 2. From **Figure 12 – ITV Network web page**, the information displayed shows that the device is configured as a PROFINET device and is online. Also shown is that Ethernet Port 1 is active at 100Mbps.

**Network Configuration** – This area allows the user to configure the following network related items. When all items are modified, press “**submit**” or the **Enter** key for the changes to take effect. These changes will take effect immediately.

**Network Settings** – This area allows the user to monitor and set network related items.

**Device Name (Station Name)** - The ITV is assigned a Device Name by the controller via the DCP Set command. This is a way to uniquely identify the device and is required to communicate with the device.

**IP Address** – The ITV is assigned an IP address by the controller via the DCP Set command. It must be unique on a network or subnet.

**Net Mask** - The default is 255.255.255.0. The Net Mask limits the traffic the ITV must process. Good networking practices should be followed.

**Gateway Address** - The default Gateway address is 0.0.0.0. If the ITV is not connected to a Gateway Server, the Gateway Server will display 0.0.0.0.

**DNS Server** - If the ITV is not connected to a DNS (Domain Name System) Server, the DNS Server will display 0.0.0.0.

**MAC Address** - The media access control address (MAC address) is a unique identifier assigned to the device for use within the network segment.

**Application Settings** – This area allows the user to configure the following application related items.

**Enable POE** - Checkbox is used to control Power Over Ethernet feature. This feature allows a device to supply power over Ethernet to a device connected to the secondary Ethernet port. When the checkbox is checked, POE is enabled. When the checkbox is unchecked, POE is disabled. Follow the instructions in **SMC ITV POE Summary**. If the instructions are not properly followed, changing the state of POE may result in undesired performance, abnormal equipment operation, or product damage.

**Enable Hold** - Checkbox is used to control ITV behavior in the event Ethernet communication is lost to the PLC. If Ethernet communication is lost with “Enable Hold” checked and the ITV is powered, the ITV will continue to actively regulate to the previous pressure setpoint. If Ethernet communication is lost with “Enable Hold” unchecked and the ITV is powered, the ITV will set the pressure setpoint to 0 and the output pressure will be immediately exhausted. If communication is re-established in this case, the ITV will not automatically regulate back to the previously commanded pressure setpoint. This is done to ensure there is not an undesirable inadvertent event. To return to the previous pressure setpoint, the ITV must first be commanded to a different setpoint then back to the previously commanded pressure.

**Note:** *If power is lost, the ITV will stop actively regulating to the setpoint. This does not mean the pressure will drop to zero.*

## 20.3. Device Control & Status

When Device Status (without login) or Device Control & Status (with login) on the menu is selected, the Device Status or Device Control & Status web page will be displayed, respectively.



## SMC Electro-Pneumatic Ethernet Regulator

### Device Control Parameter Setup and Status

#### ITV Regulator Control Parameter Setup

	MPa	Kg/cm <sup>2</sup>	Bar	PSI	KPa	Count
Pressure Unit:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Current Pressure:	30 Counts					
Pressure Setpoint:	<input type="text" value="0"/> Counts					
Override PLC Control :	<input type="checkbox"/>					
Engineering Unit Mode :	<input type="checkbox"/>					

#### ITV System Status

System Fault:	<input checked="" type="radio"/>	Bus Input Signal Error:	<input checked="" type="radio"/>
Bus Fault:	<input checked="" type="radio"/>	Flash Configuration Data Error:	<input checked="" type="radio"/>
Voltage Out of Range:	<input checked="" type="radio"/>	Miswiring Error:	<input checked="" type="radio"/>
Pressure Error:	<input checked="" type="radio"/>	Clear Zero Error:	<input checked="" type="radio"/>
Pressure Window Error:	<input checked="" type="radio"/>	Integrity Value Error:	<input checked="" type="radio"/>

ITV Supply Voltage: 24.3

#### ITV User Configuration Settings

User Gain:	<input type="text" value="8"/>
User Sensitivity:	<input type="text" value="2"/>

#### ITV Identification and Maintenance

Device Function:	<input type="text"/>
Device Location:	<input type="text"/>
Installation Date: (YYYY-MM-DD HH:MM)	<input type="text"/>
Additional Information:	<input type="text"/>

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**Figure 13 – ITV Device Control and Status web page**

On this web page, the current ITV pressure or vacuum value will be displayed dynamically based on the pressure unit selected. The page also shows ITV system status and ITV supply voltage dynamically. This page allows the user to override PLC control, change pressure units, enable or disable the pressure engineering unit mode, change user gain and user sensitivity, and update the Identification and Maintenance information:

**ITV Regulator Control Parameter Setup** – This area allows the user to control the device.

**Pressure Unit** – Used to display the pressure in counts or the engineering unit desired. If Engineering Unit Mode is enabled, then this will also select the engineering unit type.

**Current Pressure** – This is the current feedback pressure from the ITV in the unit type selected above.

**Pressure Setpoint** – Shows the current setpoint set via the PLC unless the Override PLC Control is enabled. If the pressure setpoint value entered is legitimate, the ITV will regulate to this new pressure or vacuum. The pressure displayed on the Current Pressure box will change to the new regulated pressure value.

If the pressure setpoint value is out of range, the entered data and the title of “**Pressure Setpoint**” will be displayed in red and a note in red on the right side of the data entry will be displayed to indicate the data of the legitimate range. When the pressure setpoint value is out of range, the user cannot submit the pressure setpoint and will get an error message “*Parameter setup error. Please correct the error and submit it again*” on the web page.

**Override PLC Control** - If the checkbox is unchecked, the ITV is controlled externally (typically from a PLC). When the ITV is externally controlled, the user cannot set the ITV pressure or change the pressure units from the web page. When the Override PLC Control checkbox is changed, press “**submit**” button for the change to take effect.

Changing ITV control from the master (PLC) to the web page (checking the Override PLC Control checkbox) gives the user control of the ITV. There is no pressure change until the user enters a pressure setpoint in the Pressure Setpoint box.

Changing ITV control from the web page to the master (PLC) (clearing the Override PLC Control checkbox) gives the master device control of the ITV. There may be an immediate pressure change to the pressure setpoint sent from the master device.

**Note: Override PLC Control will be disabled when the user exits this page.**

**Engineering Unit Mode** - This is a checkbox to allow the user to change pressure engineering unit configuration of ITV from the web page. If this checkbox is checked, the user can change the engineering unit from the web page by selecting a pressure unit for the set of radio buttons of Pressure Unit. If this checkbox is unchecked, the user cannot change the engineering unit from the web page.

**ITV System Status** – This area displays dynamic information about the device that includes error conditions and supply voltage.

**Error Conditions** – This series of error indicators will change from green to red to signal an error condition with the ITV. An associated alarm will be sent to the controller as well.

**ITV Supply Voltage** – The supply voltage will be displayed in volts to the tenth of a volt.

**ITV User Configuration Settings** – This area allows the user to further control the device.

**User Gain.** This is a data entry box for entering the user gain. When the value of the user gain is changed, press “**submit**” button for the change to take effect.

If the user gain value entered is legitimate, the user gain will be submitted to the ITV for pressure or vacuum regulation.

If the user gain value is out of range, the entered data and the title of “**User Gain**” will be displayed in red and a note in red on the right side of the data entry will be displayed to indicate the data legitimate range. When the user gain value is out of range, the user cannot submit the pressure setpoint and will get an error message “*Parameter setup error. Please correct the error and submit it again*” on the web page.

**User Sensitivity.** This is a data entry box for entering the user sensitivity. When the value of the user sensitivity is changed, press “**submit**” button for the change to take effect.

If the user sensitivity value entered is legitimate, the user sensitivity will be submitted to the ITV for pressure or vacuum regulation.

If the user sensitivity value is out of range, the entered data and the title of “**User Sensitivity**” will be displayed in red and a note in red on the right side of the data entry will be displayed to indicate the data legitimate range. When the user sensitivity value is out of range, the user cannot submit the user sensitivity and will get an error message “*Parameter setup error. Please correct the error and submit it again*” on the web page.

**ITV Identification and Maintenance** – This area displays unique information about the device. The user can use this area to store information specific to this device that is important in an installation environment. The following information corresponds to I&M 1 through 3 and can be edited on the webpage as well as the controller. I&M 0 data is also supported and can be read from the controller; however, the ITV does not support I&M 4 or 5.

**Device Function** – This field is for the function or task of the device. It is part of the I&M 1 data and is 32 characters in length. Any unused characters should be set to blank (0x20).

**Device Location** – This field is for the location of the device. It is also part of the I&M 1 data and is 22 characters in length. Any unused characters should be set to blank (0x20).

**Installation Date** – This field is for the installation date of the device in the environment. It is the I&M 2 data and is 16 characters in length and follows the standard time and date format “YYYY-MM-DD HH:MM”. If the time or data fields are not used, then the characters should be set to blank (0x20).

**Additional Information** – This field allows for additional information to be stored concerning the device. For example, the next maintenance date could be stored here. It is the I&M 3 data and is 54 characters in length. Any unused characters should be set to blank (0x20).

## 20.4. Login Management

When the Login Management on the menu is selected, the Login Management web page will be displayed. With this web page, the user can change the Username and Password. Username and Password should be 1-15 alpha-numeric characters. When username or password is changed, press the “**Update**” button for the change to take effect.

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System Information Network Device Control & Status Login Management

**SMC Electro-Pneumatic Ethernet Regulator**

*Login Credential Management*

**Login Credential Update**

Username and password **MUST BE** 1-15 alpha-numeric characters. Usernames for different type of login **MUST NOT BE** the same.

Type	Username	Password
Customer	user	user

Update

**Figure 14 – ITV Login Management web page**

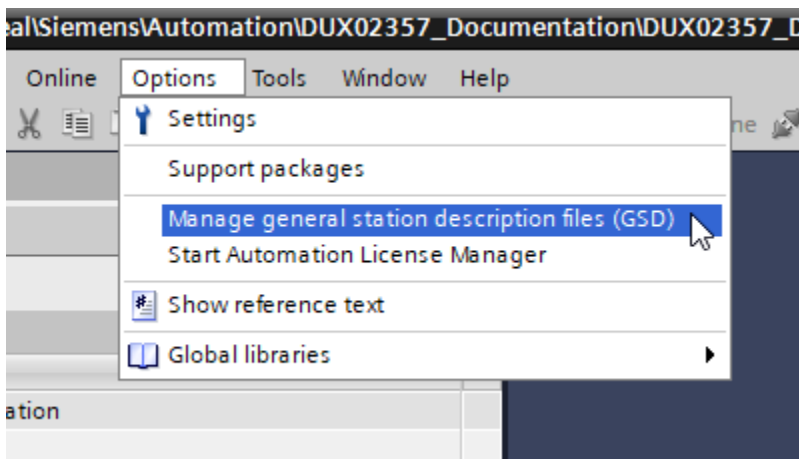
## 21. Basic PLC Configuration

Begin by configuring the PLC for use with the TIA Portal™ software. This example will use a Siemens model 1200 PLC with TIA Portal™ version 16. These instructions will vary with other configurations.

When connecting the ITV, using TIA Portal™ by Siemens, refer to TIA Portal™ manuals for detailed operation.

### 21.1. Installing the GSDML file

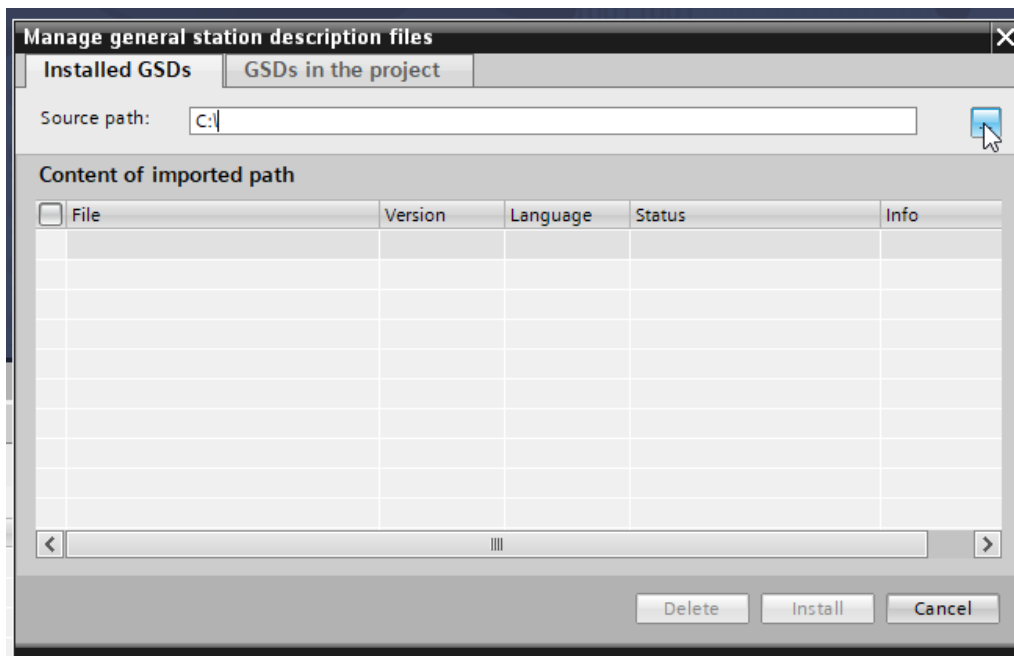
Start by powering the device and importing in the GSDML file. The GSDML file contains all properties of the device to perform. Select [Manage general station description files (GSD)] from the [Options] menu.



**Figure 15 – Manage GSDML file menu option**

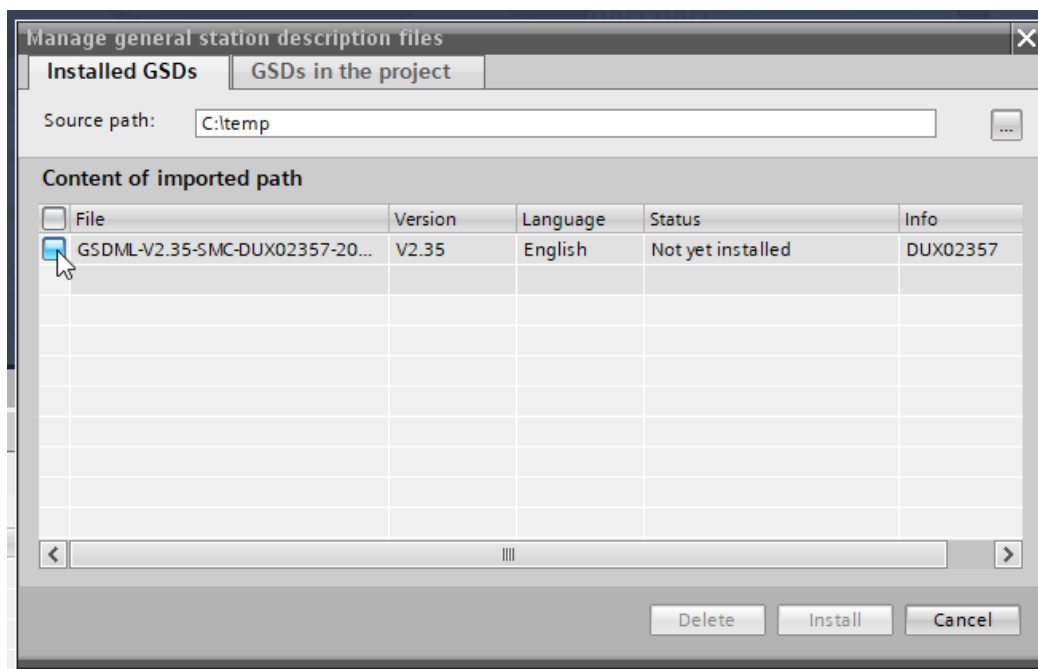
Browse to the GSDML file and bitmap file by first clicking on the [Browse] button.





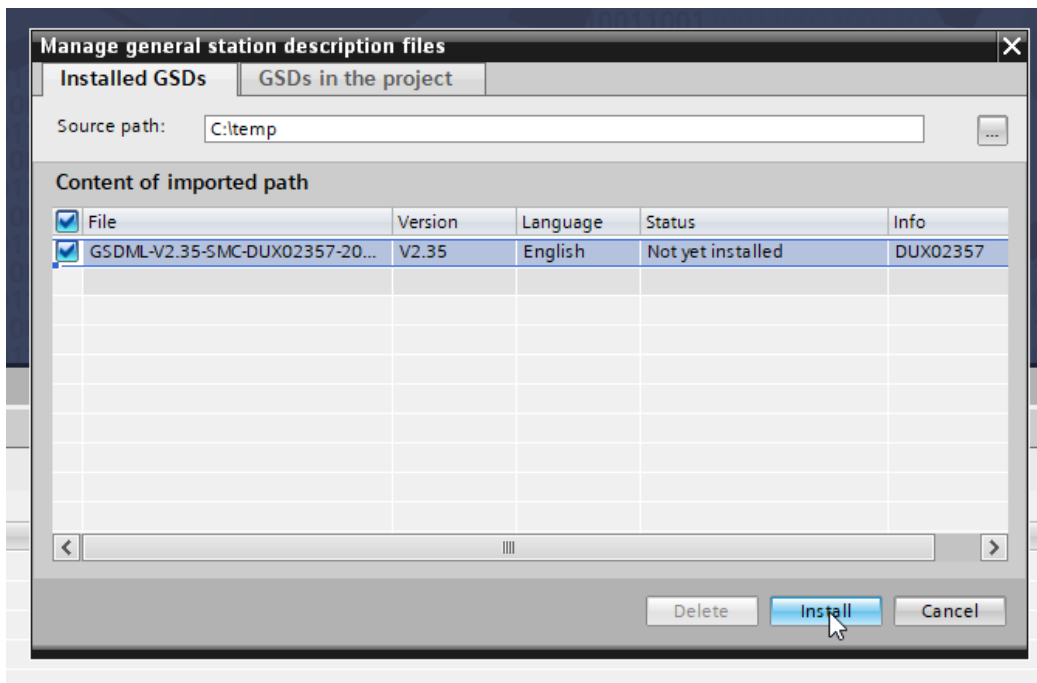
**Figure 16 – GSDML file Browse window**

Select the GSDML file by clicking on the box next to the version of the GSDML to be installed.



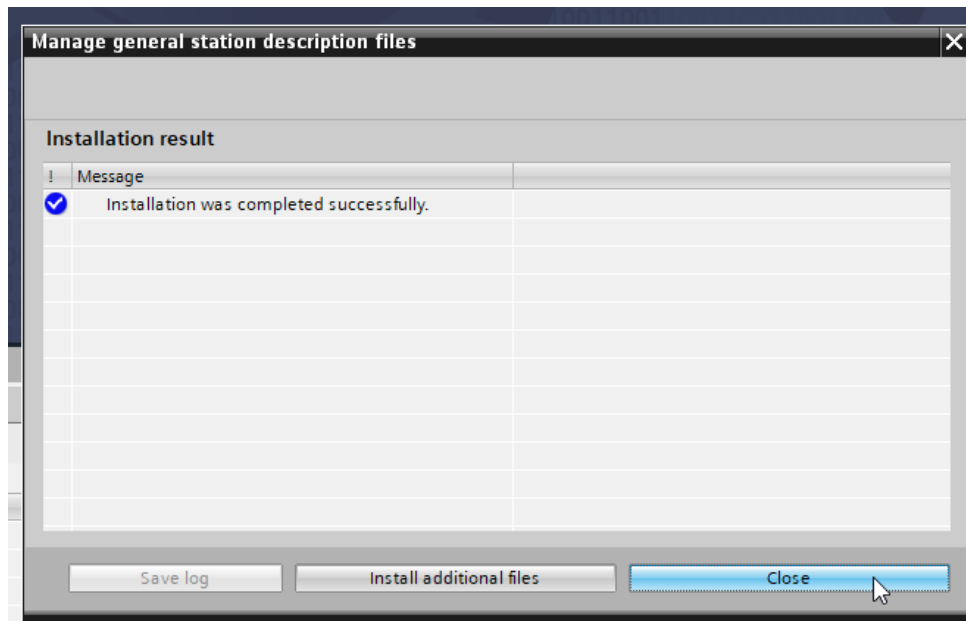
**Figure 17 – GSDML selecting window**

Install the GSDML file by clicking the [Install] button.



**Figure 18 – GSDML installing window**

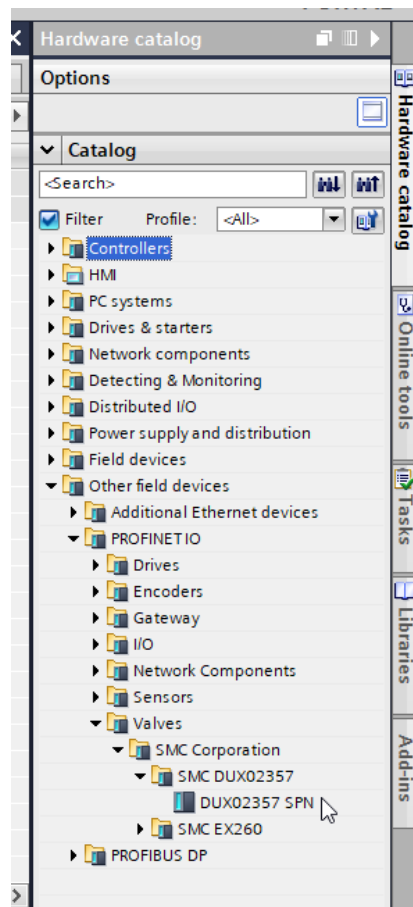
Click the [Close] button once the file has been successfully installed.



**Figure 19 – Closing GSDML installation window**

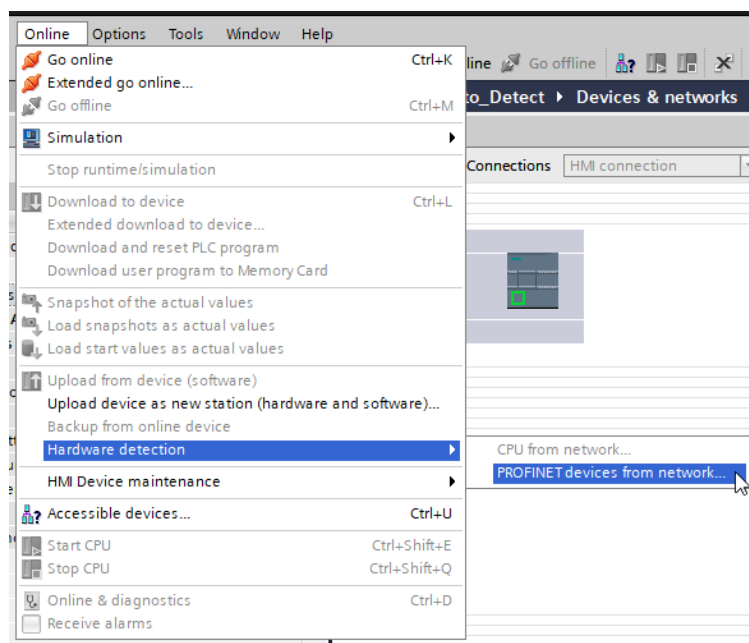
## 21.2. Adding the ITV to the Network

The device is now available in the hardware catalog of the tool. Add the ITV to the Ethernet network by first opening the [Hardware catalog] then navigate down to the [DUX02357 SPN] listed under the [Other field devices...PROFINET IO...Valves...SMC Corporation...SMC DUX02357]. Double click on the [DUX02357 SPN]. The device can also be added to the network by clicking on the device and dragging it to the [Devices & networks] screen.



**Figure 20 – Hardware Catalog window**

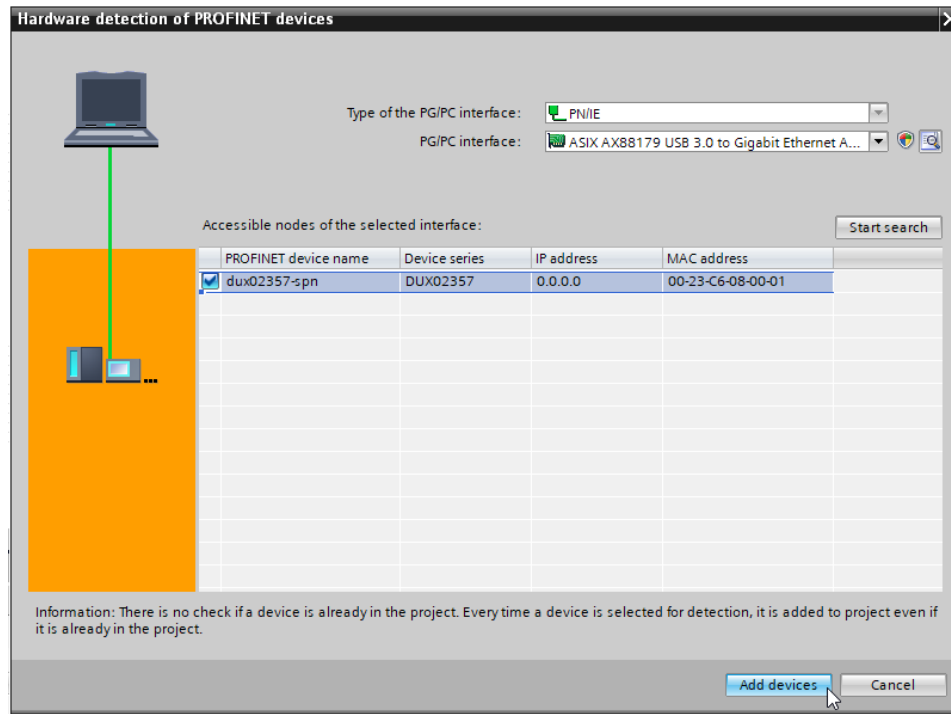
Alternately, the PROFINET ITV supports being added to the network via the automatic hardware detection feature of TIA Portal™. Ensure that the ITV is powered and is connected to the network. Begin the process by clicking on the [Online...Hardware detection...PROFINET devices from network...] menu option.



**Figure 21 – Starting Hardware Detection popup menu**

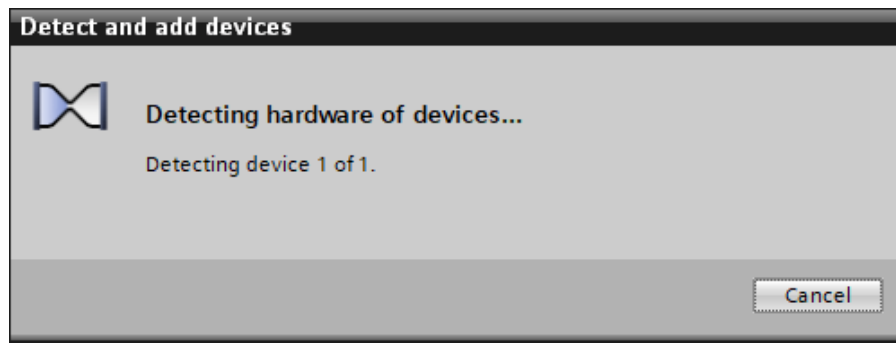


Once the device is select, click on the “Add devices” button.



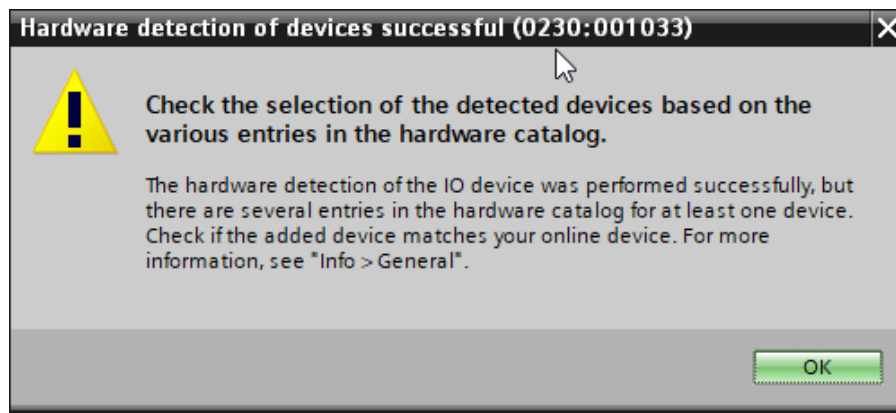
**Figure 24 – Adding device for Hardware Detection window**

TIA Portal™ will display a window as it is adding the device.



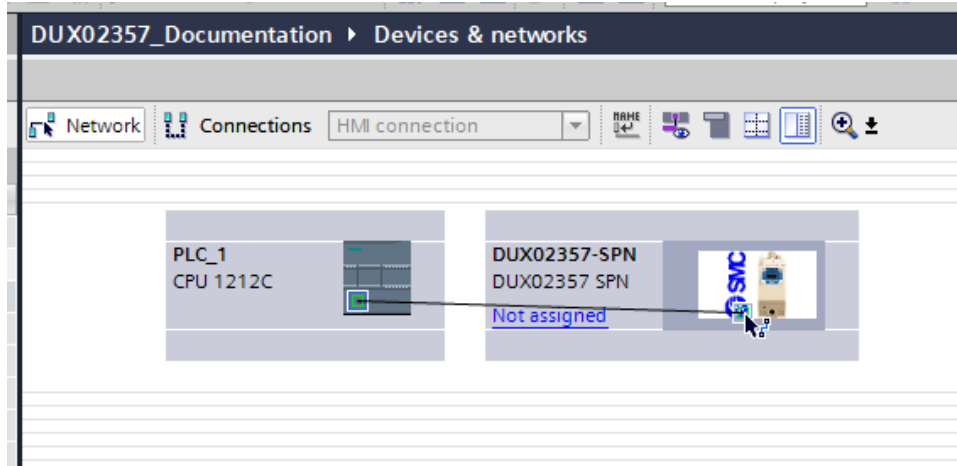
**Figure 25 – Adding device popup window**

Additional information concerning the device may be displayed.



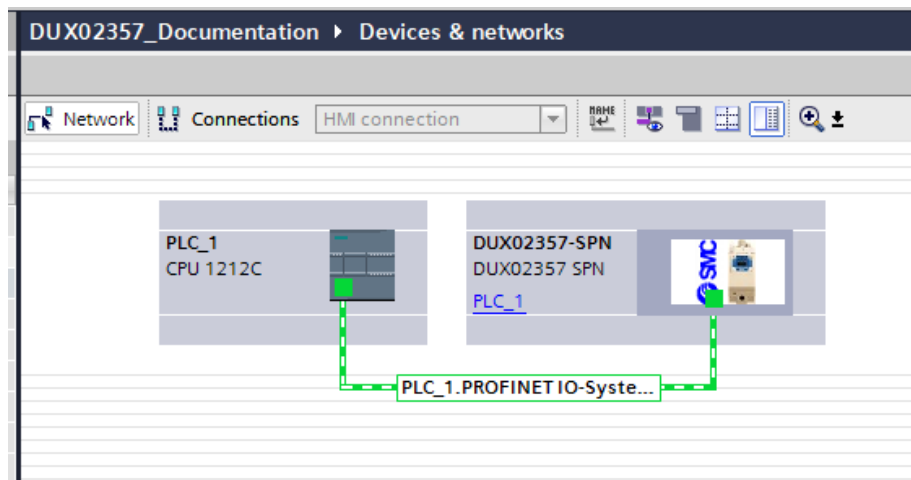
**Figure 26 – Additional device information popup window**

Next the topology needs to be built. Connect the ITV to the PLC by first clicking the green square on the PLC when while continuing to hold down the mouse button drag the cursor to the green square of the ITV. Once the cursor is on the ITV green square, release the mouse button.



**Figure 27 – Connecting devices on Devices & networks window**

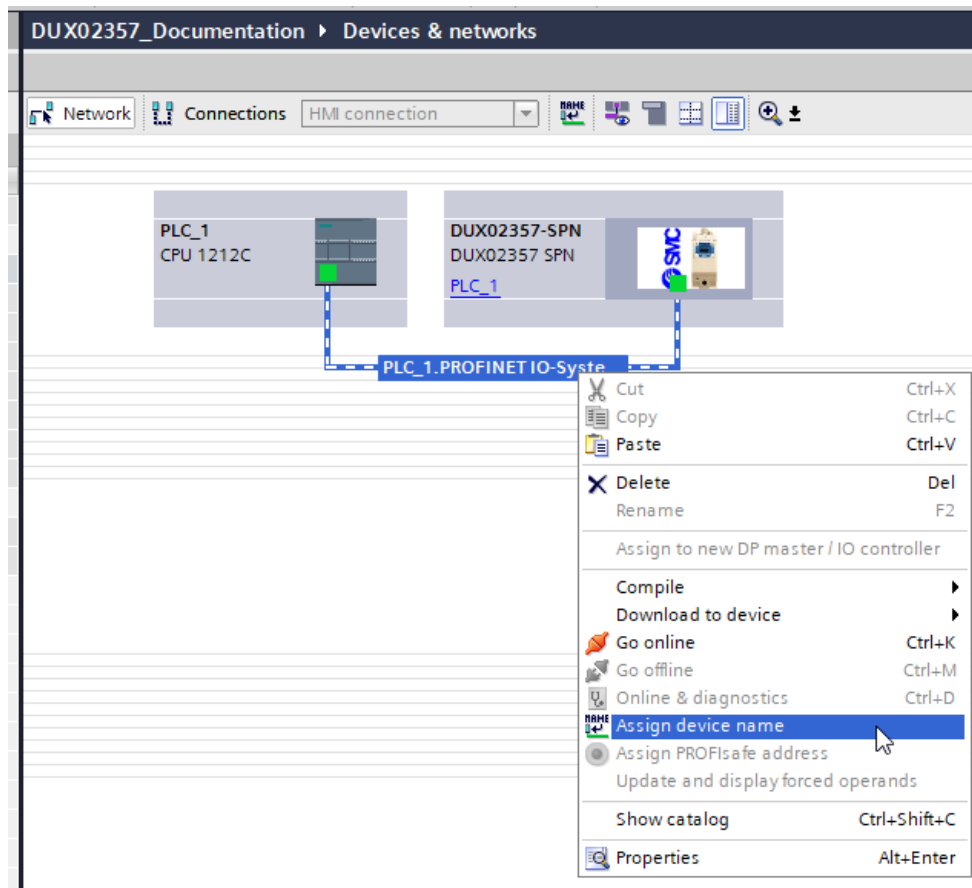
The ITV has now been added to the network.



**Figure 28 – PLC and ITV connected window**

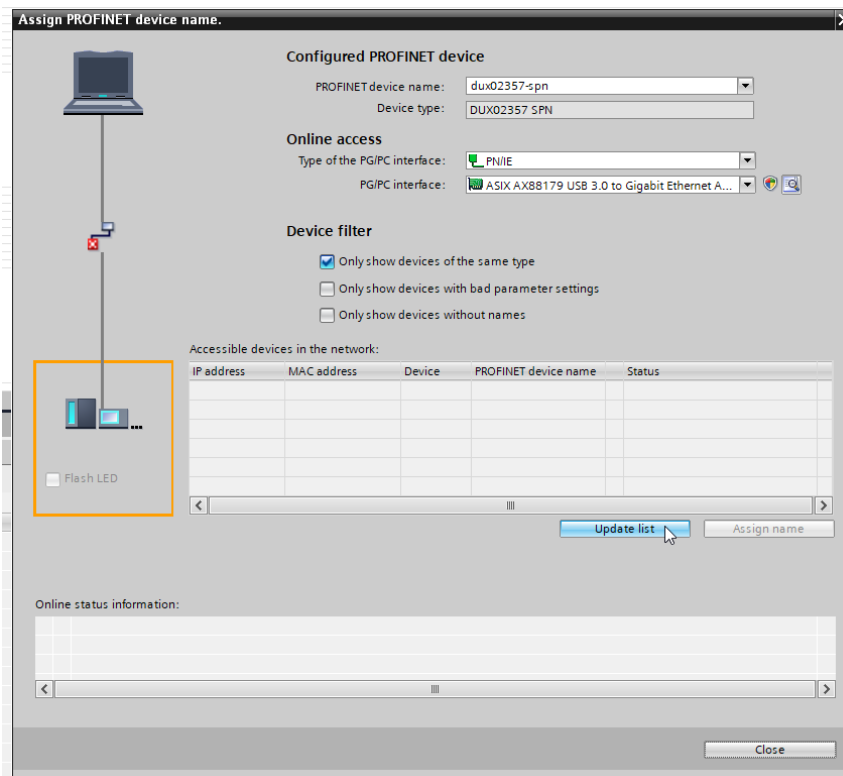
### 21.3. Assigning a Device (Station) Name to the ITV

This step applies to the case where the ITV has been configured to initially have a blank Device Name. Right click on the network and click on the [Assign device name] in the popup window.



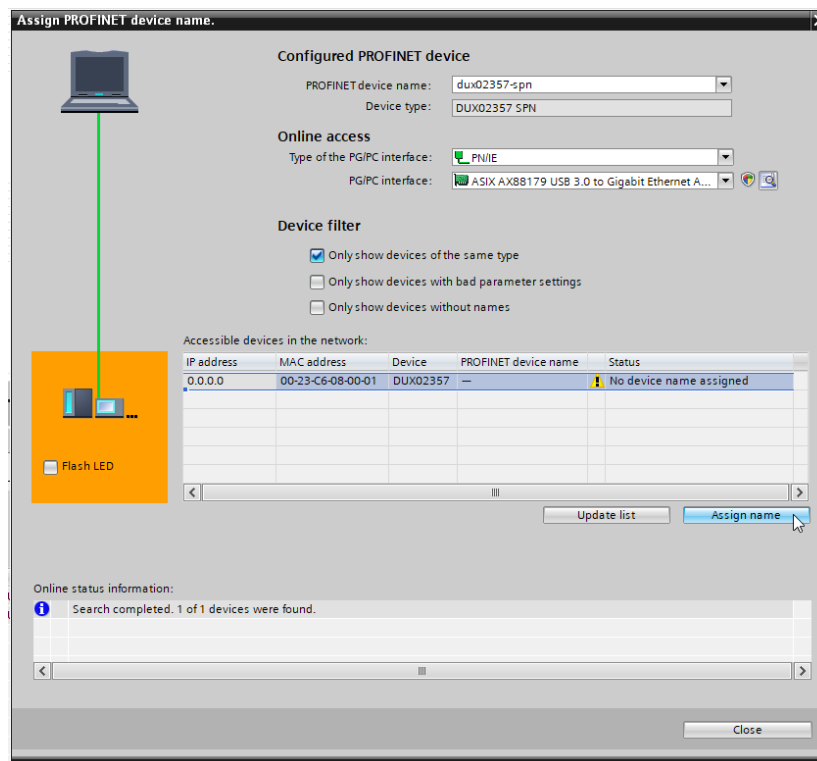
**Figure 29 – Assigning device name popup menu**

Click on the [Update list] in the popup window.



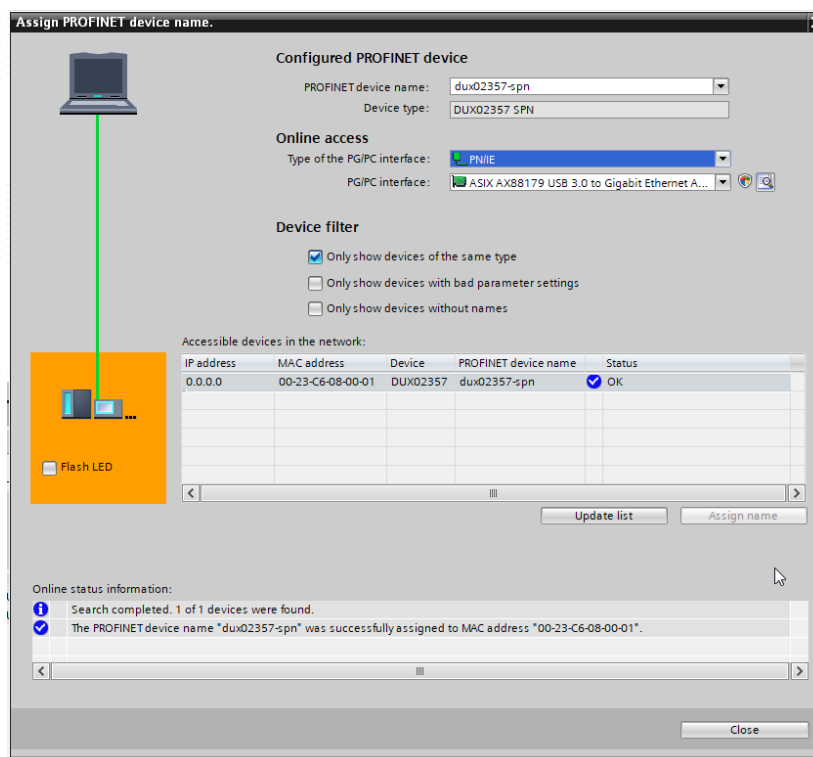
**Figure 30 – Updating list in the Assign PROFINET device name window**

The ITV should appear in the [Accessible devices in the network] window. Click on the device to highlight it and then click on the [Assign name] button.



**Figure 31 – Assigning device name in the Assign PROFINET device name window**

The Status of the ITV should now be “OK”. The window can now be closed by clicking on the [Close] button.

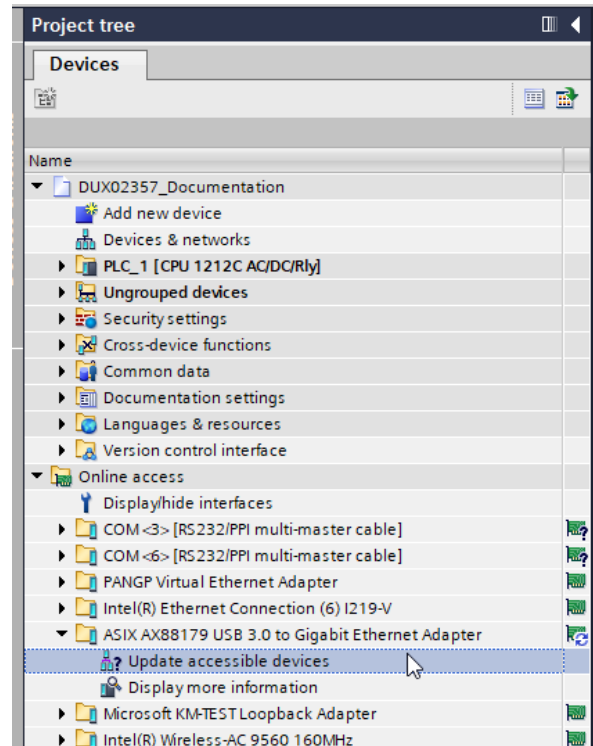


**Figure 32 – Device name assigned in the Assign PROFINET device name window**



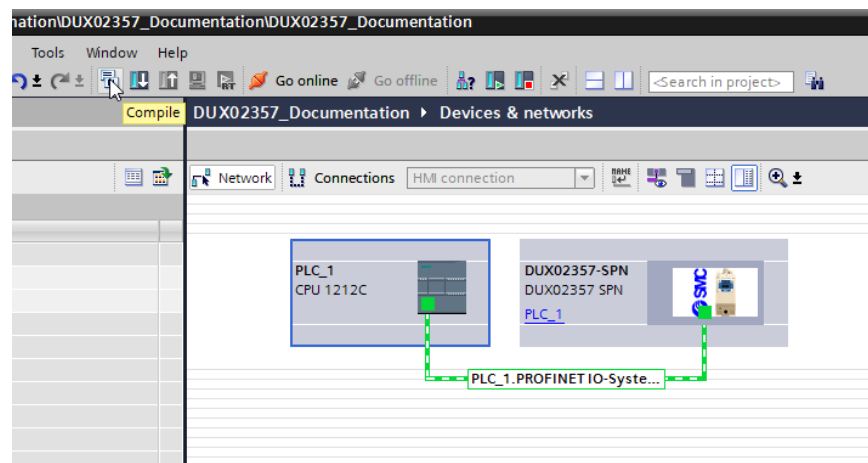
## 21.4. Going on-line with the PLC

The PLC should assign the ITV an IP address by this point. If the device is not assigned an IP address consult the TIA Portal™ manual for assigning the device an IP address under the “Functions” menu option under the “Online & diagnostics” of the ITV. There are several ways to determine this. One way is by double clicking on the [Update accessible devices] under the Ethernet adapter in the [Project tree..Devices...Online access] window.



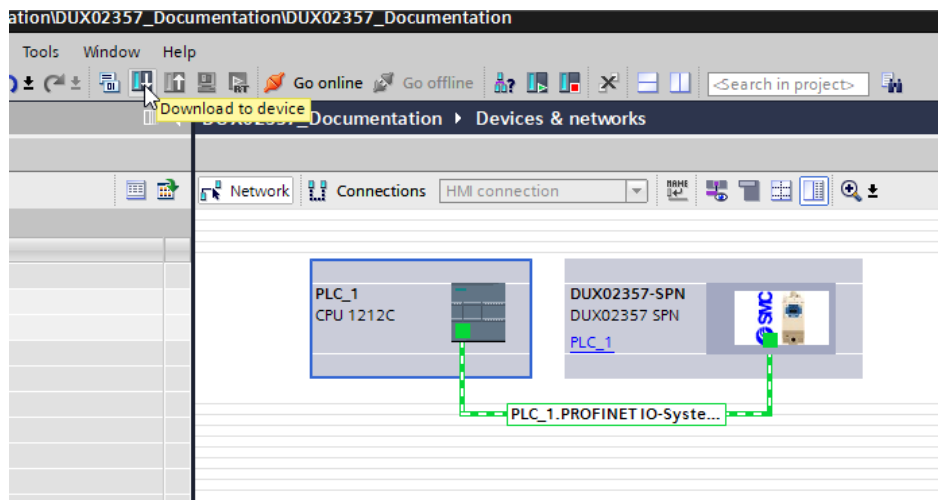
**Figure 33 – Update accessible devices window**

Now, compile the new network setup for the PLC by first clicking on the PLC in [Devices & networks] window and then click on the [Compile] menu item.



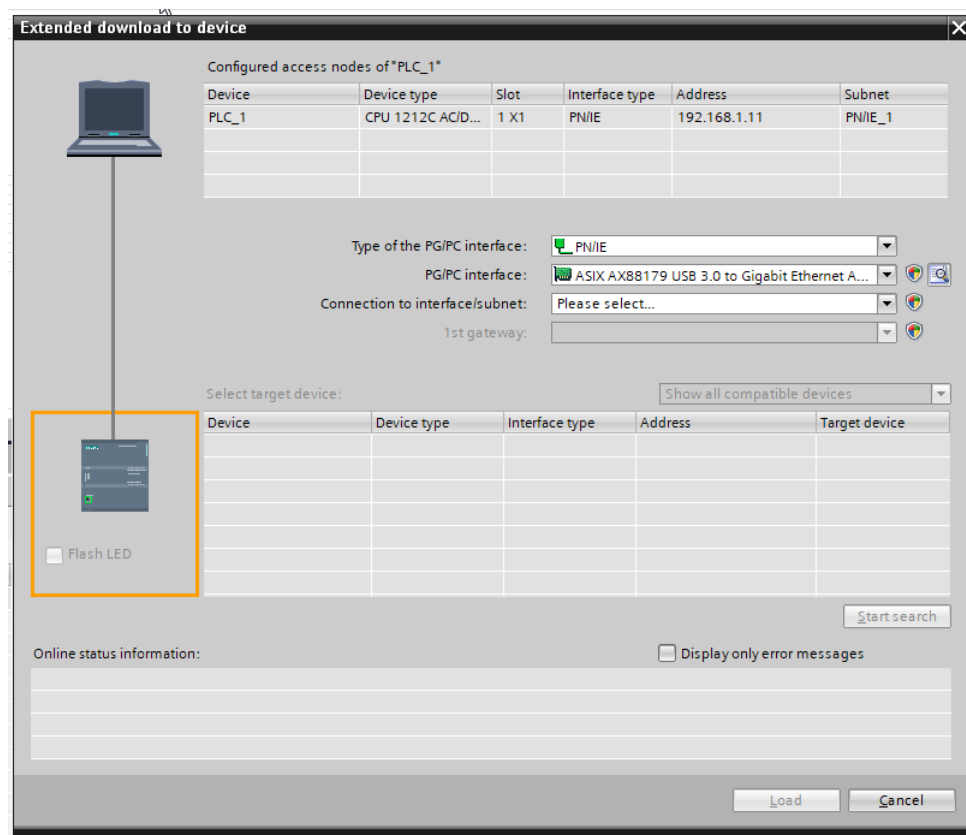
**Figure 34 – Compiling PLC code**

Now download the code to the PLC by clicking on the [Download to device] menu item.



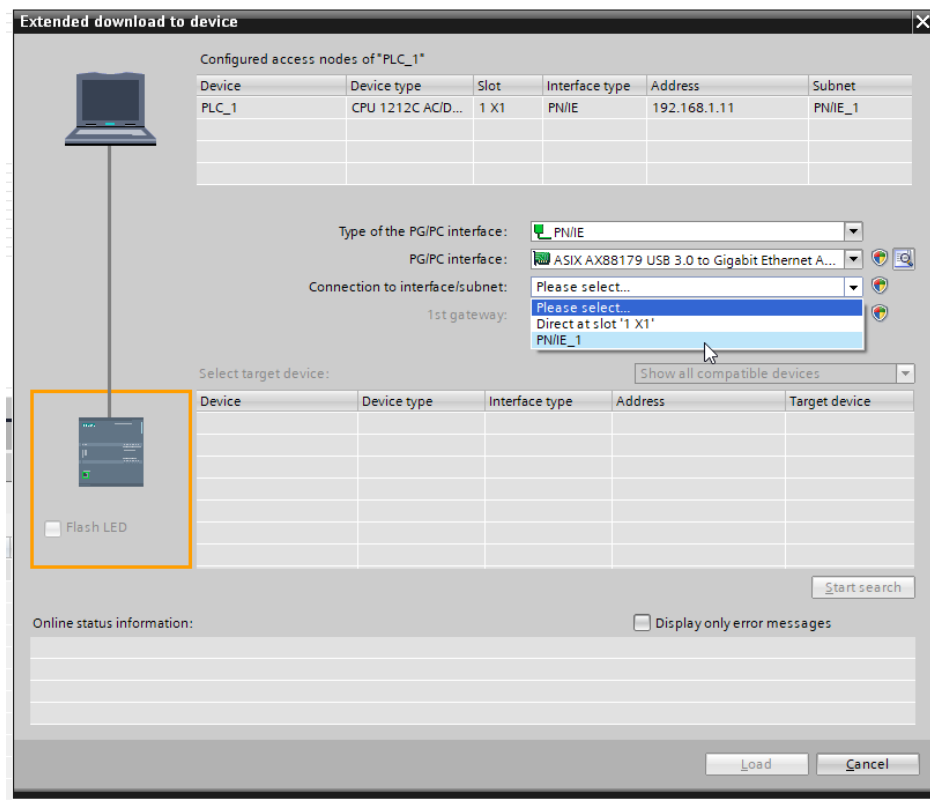
**Figure 35 – Download PLC code**

The interface may need to be configured at this point. If this is the case, the following [Extended download to device] popup window will appear.



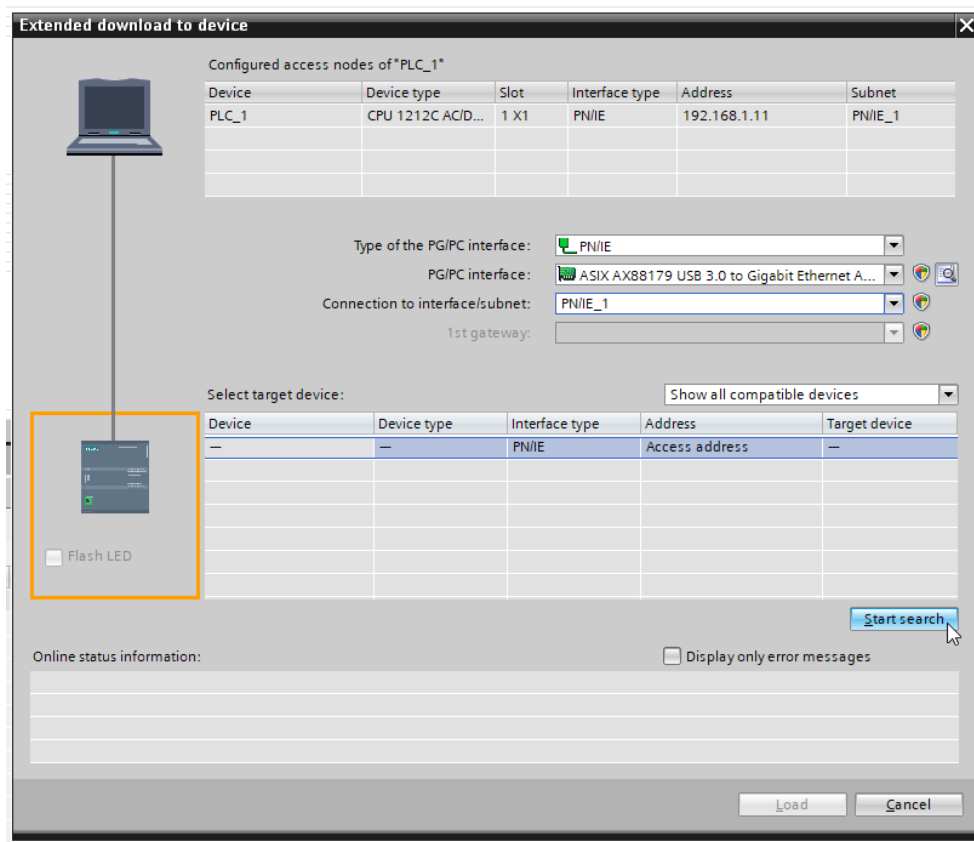
**Figure 36 – Interface setup window**

Choose an interface by selecting the [Connection to interface/subnet] pulldown menu and picking [PN/IE\_1] for this case.



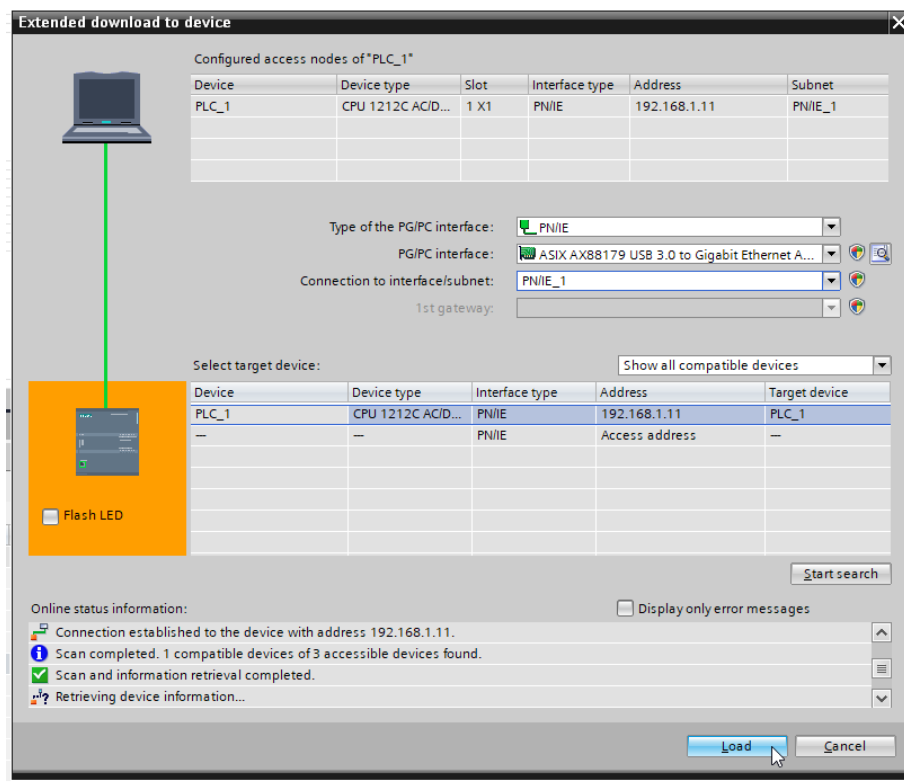
**Figure 37 – Selecting an interface window**

Begin starting for the PLC by clicking the [Start search] button.



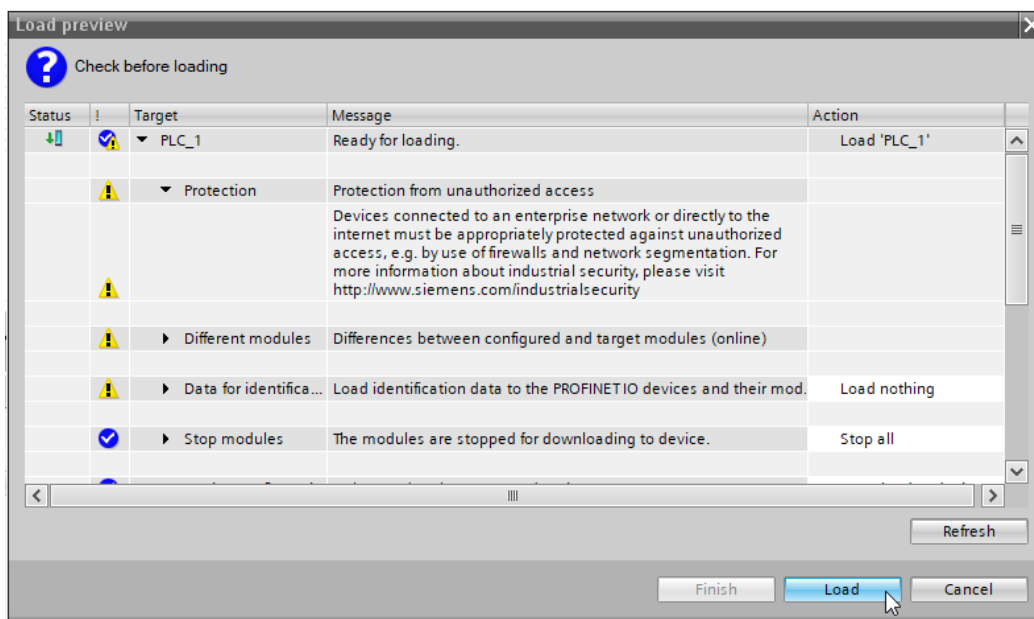
**Figure 38 – Start PLC search window**

The PLC should now appear in the list and now download the code to the PLC by clicking on the [Load] button.



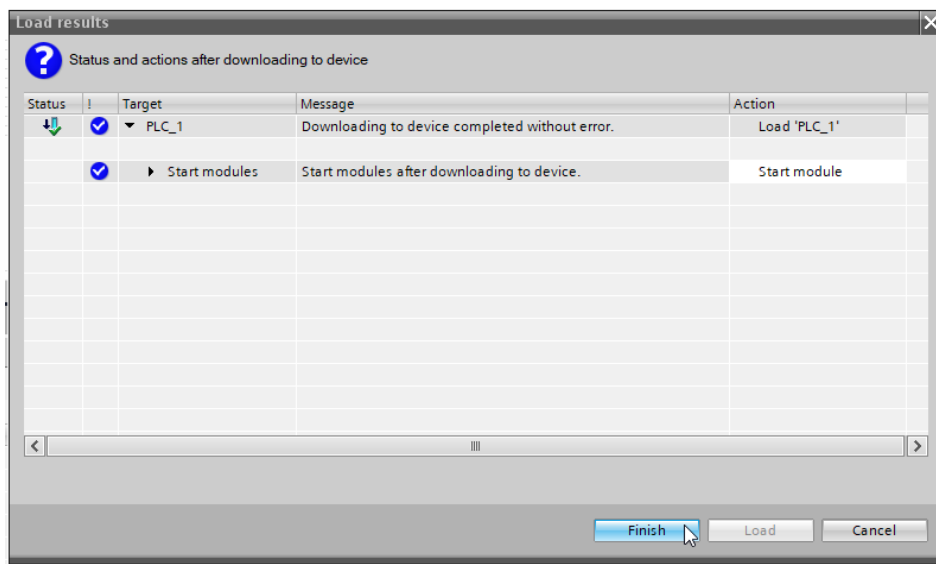
**Figure 39 – Downloading PLC code window**

A [Load preview] window will appear and then click the [Load] button.



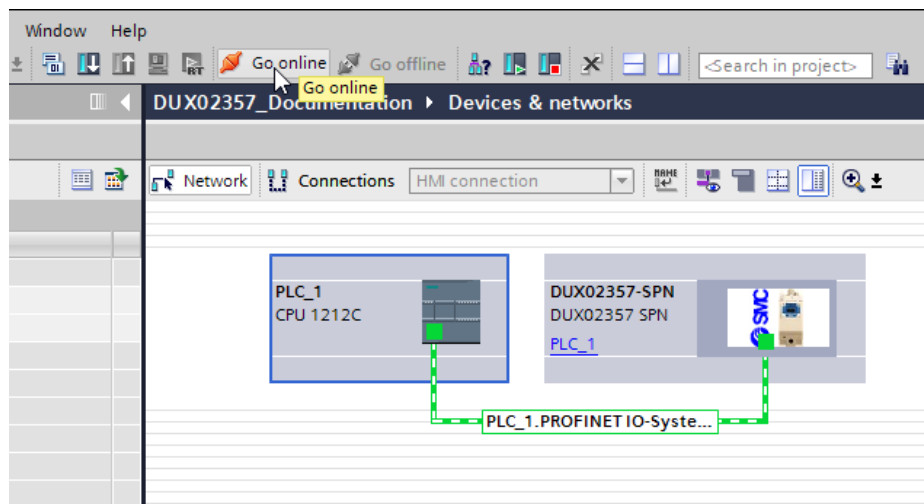
**Figure 40 – Load preview window**

A [Load results] window will appear and then click the [Finish] button.



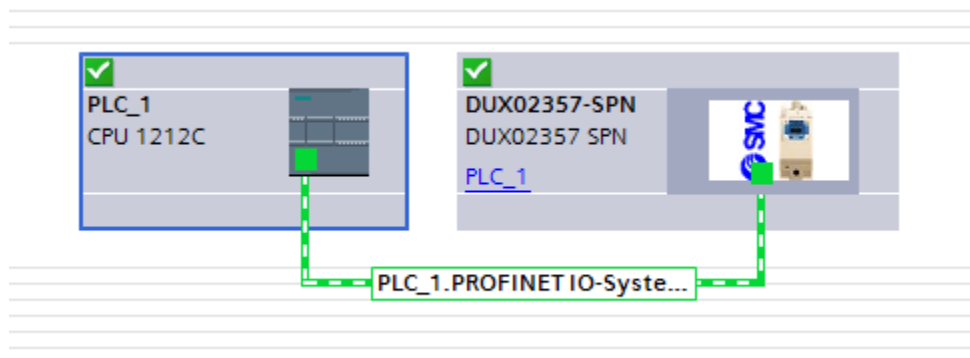
**Figure 41 – Final Load preview window**

Go online with the PLC by clicking the [Go online] menu item.



**Figure 42 – Go online with PLC**

If there are no errors, then there should be green checkmarks for each device in the [Devices & networks] window. The device parameters can be examined and modified under the Properties tab of the device once it is selected.



**Figure 43 – Devices with no errors**

## 21.5. Monitoring Data

The monitoring of the ITV cyclic data can be setup in the TIA Portal™. A Tag Table as well as a Watch Table can be developed to assign descriptive information associated with the data. Consult the TIA Portal™ documentation for developing these tables.

DUX02357\_min ▶ PLC\_1 [CPU 1212C AC/DC/Rly] ▶ PLC tags ▶ DUX02357 Tag Table [71]

**DUX02357 Tag Table**

	Name	Data type	Address	Retain	Acces...	Writa...	Visibl...	Monitor value
1	Cyclic Setpoint	Word	%QW64	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	16#0000
2	Pressure	Word	%IW68	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	16#1000
3	Setpoint Error	Bool	%I70.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
4	Clear Zero Error	Bool	%I70.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
5	Pressure Error	Bool	%I70.2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
6	Non-volatile Data Error	Bool	%I70.3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
7	Pressure Window Error	Bool	%I70.4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
8	Initializing Status	Bool	%I70.5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
9	Integrity Error	Bool	%I70.6	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
10	Not Used	Bool	%I70.7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
11	System Fault	Bool	%I71.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
12	Bus Fault	Bool	%I71.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
13	Voltage Fault	Bool	%I71.2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
14	Miswiring Fault	Bool	%I71.3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
15	Pressure (swap)	Word	%MW0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	16#0010

Figure 44 – Sample Tag Table


DUX02357\_min ▶ PLC\_1 [CPU 1212C AC/DC/Rly] ▶ Watch and force tables ▶ DUX02357 Watch Table

	i	Name	Address	Display format	Monitor value	Modify value	
1		*Pressure*	%IW68	Hex	16#1100		<input type="checkbox"/>
2		*Pressure (swap)*	%MW0	Hex	16#0011		<input type="checkbox"/>
3		*Setpoint Error*	%I70.0	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
4		*Clear Zero Error*	%I70.1	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
5		*Pressure Error*	%I70.2	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
6		*Non-volatile Data Error*	%I70.3	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
7		*Pressure Window Error*	%I70.4	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
8		*Initializing Status*	%I70.5	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
9		*Integrity Error*	%I70.6	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
10		*Not Used*	%I70.7	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
11		*System Fault*	%I71.0	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
12		*Bus Fault*	%I71.1	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
13		*Voltage Fault*	%I71.2	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
14		*Miswiring Fault*	%I71.3	Bool	<input type="checkbox"/> FALSE		<input type="checkbox"/>
15		*Cyclic Setpoint*	%QW64	Hex	16#0000		<input type="checkbox"/>

Figure 45 – Sample Watch Table

## 21.6. Forcing Data

The forcing (changing) of the ITV cyclic data to the device can also be setup in the TIA Portal™. A Watch Table as well as a Force Table can be developed to assign descriptive information associated with the data. To change the data to the device, enter the new value in the “Modify value” column in the Watch Table or the “Force value” column in the Force Table. Be sure to place the TIA Portal™

software in the monitor mode by clicking the “Monitor all” icon . Acyclic data can also be monitored by developing Ladder logic. Consult the TIA Portal™ documentation for developing these tables and Ladder logic.



DUX02357_min ▶ PLC_1 [CPU 1212C AC/DC/Rly] ▶ Watch and force tables ▶ Force table						
	i	Name	Address	Display format	Monitor value	Force value
1		"Cyclic Setpoint":P	%QW64:P	Hex		16#FF07 

Figure 46 – Sample Force Table

## 22. Advanced PLC Configuration

The PROFINET ITV supports additional features beyond the basic PLC operations. This section explains how to use these advanced features with a PLC.

### 22.1. Shared Device

One advanced feature that is supported is Shared Device. This feature allows multiple IO controllers to have exclusive access to the inputs or outputs of the same IO Device. To demonstrate this feature, the following TIA Portal™ project will show a Siemens model 1200 PLC and a generic PROFINET Driver having access to the ITV inputs and outputs. When the project is compiled the PROFINET Driver will generate an XML configuration file that can be loaded into PROFINET Commander™ to act as another IO controller. Please note the same ITV has been duplicated in this project. Each ITV instances is connected to a different IO controller and each subnet associated with the different controllers has a different subnet name (PN/IE\_1 and PN/IE\_2). However, each instance has the same IP Address.

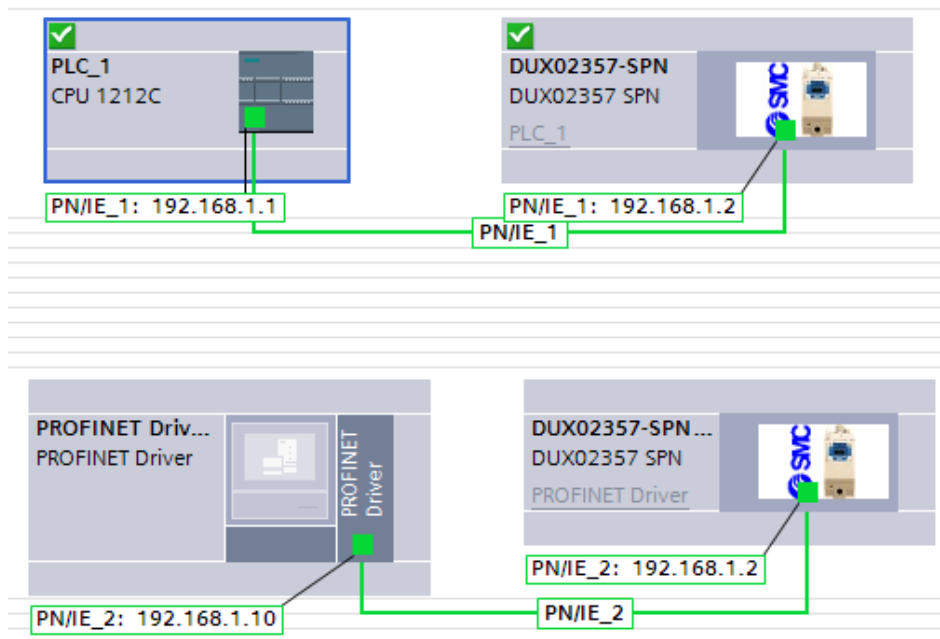
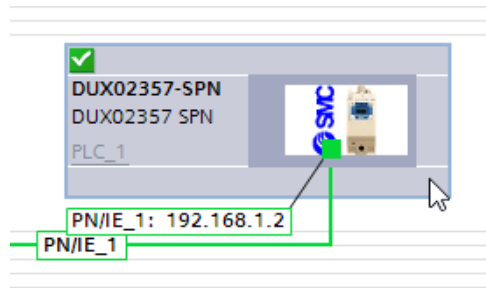


Figure 47 – Devices and Network for Shared Device example

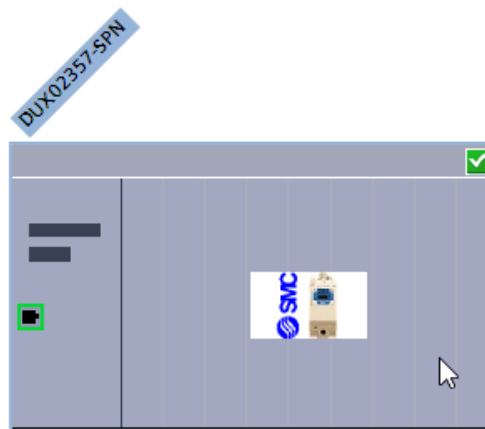
Each ITV instance needs to be uniquely identified in the project. In this case, one ITV has a Device Name of DUX02357-SPN and the other ITV is DUX02357-SPN\_1. In order to have TIA Portal™ not

assign the same Device Name to the two instances, the automatic Device Name generation needs to be disabled for both instances. This can be done by first double clicking on each ITV instance.



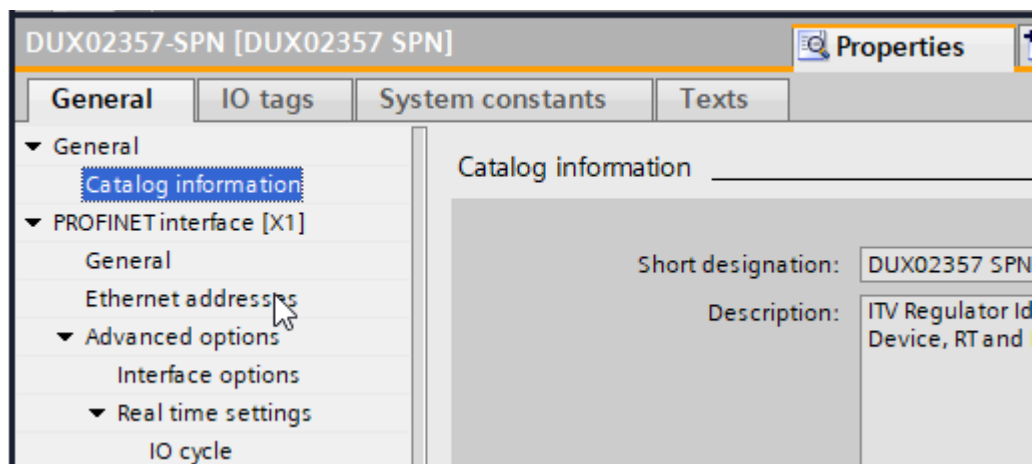
**Figure 48 – Selecting device to disable automatic Device Name generating**

Next, bring up the properties of the device by clicking on the device.



**Figure 49 – Selecting device to display properties**

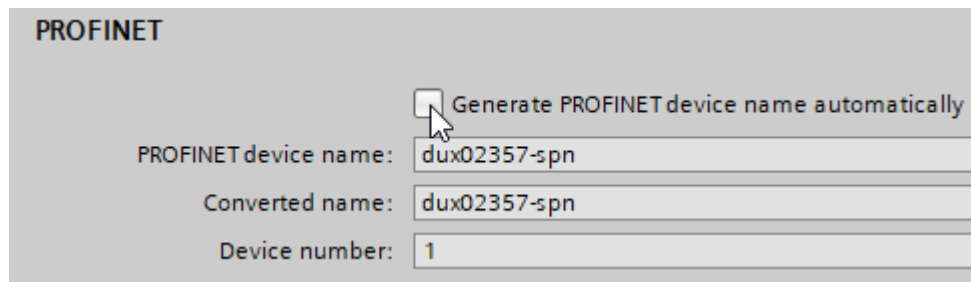
Now, click on the [Ethernet addresses] in the [Properties..General] window.



**Figure 50 – Displaying the Ethernet addresses properties of the ITV**

Ensure that the [Generate PROFINET device name automatically] feature is unchecked (disabled).

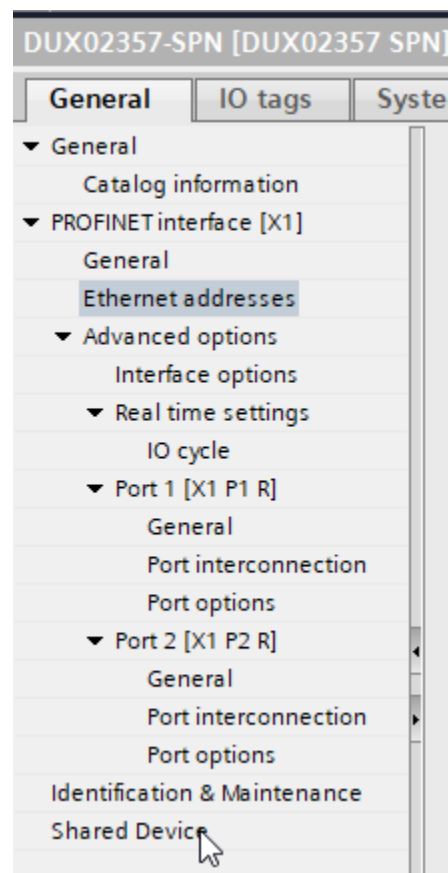




**Figure 51 – Disabling the automatic device name feature**

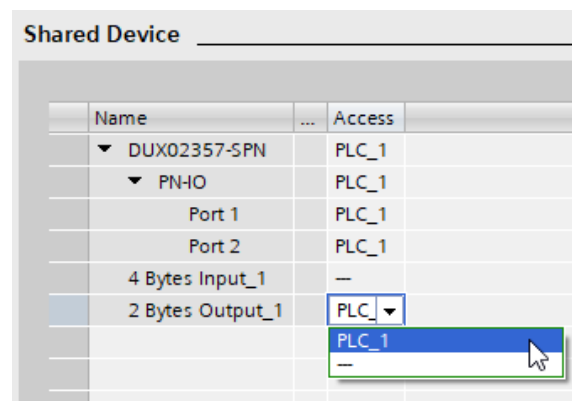
Do this for the other instance as well.

Next, the exclusive access needs to be set. In this case, the Siemens 1200 will have exclusive access to the data being written to the ITV and the PROFINET Driver will have exclusive access to the data coming from the ITV. Follow the same steps that was present above but instead of selecting the [Ethernet addresses] in the [Properties..General] window, select the [Shared Device].



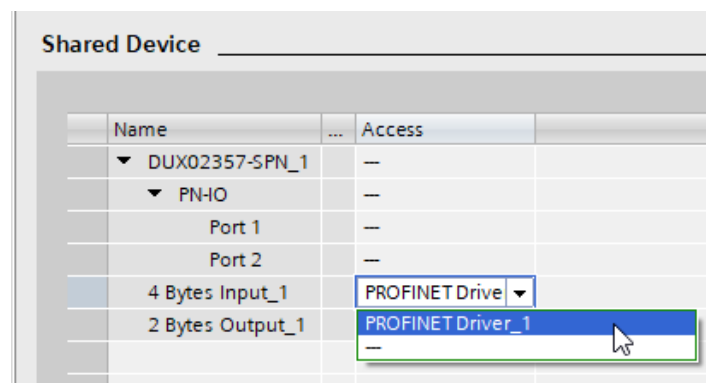
**Figure 52 – Displaying the Shared Device properties of the ITV**

Using the pulldown menu, disable the ITV Input for the PLC and enable the output.



**Figure 53 – Enabling the ITV Shared Device properties for the PLC**

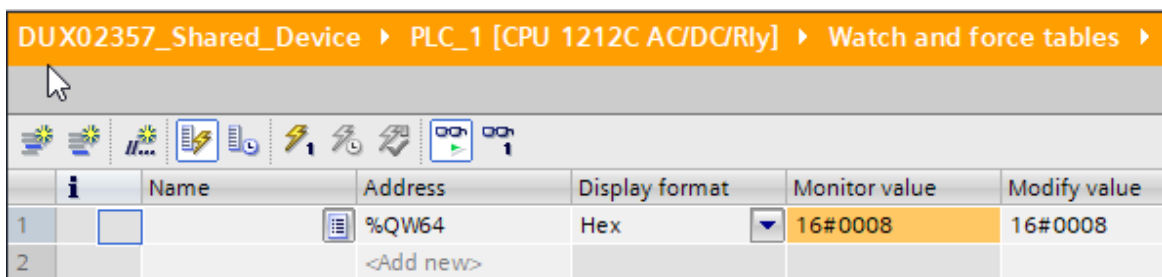
Do the same for the other ITV instance but enable the ITV Input for PROFINET Commander™ and disable the output.



**Figure 54 – Enabling the ITV Shared Device properties for PROFINET Commander™**

Next, compile and download the project to the PLC. Also select and compile the PROFINET Driver device to generate the XML configuration file for PROFINET Commander™.

In this case the ITV will be set to 50 kPa (0x8000) via the PLC and PROFINET Commander™ will read the actual pressure. From the previous section, the Monitor Table is used to set the pressure. Ensure that the PLC is in the RUN mode.



**Figure 55 – Setting the Shared Device pressure**

Load the generated XML configuration file into PROFINET Commander™. Please refer to documentation for TIA Portal™ and PROFINET Commander™ for additional information. Only the input data is displayed and the actual pressure is shown.

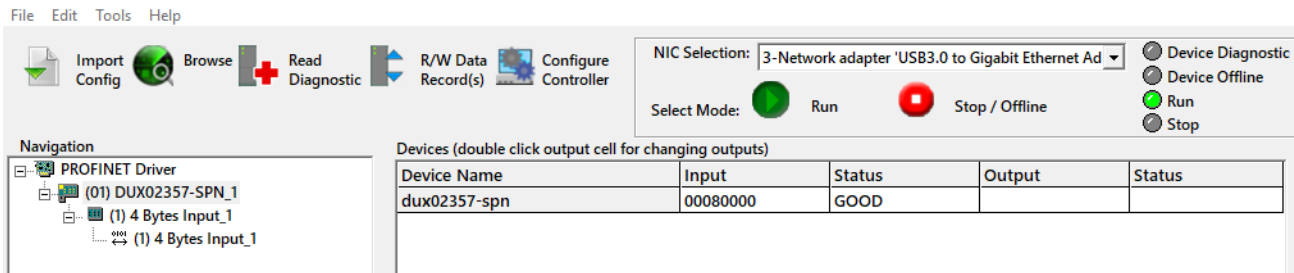


Figure 56 – Reading the Shared Device pressure

## 23. Cyclic Messages

Cyclic messages are periodically exchanged between the device and the controller. Specific information concerning the cyclic data can be found in the GSDML file.

### 23.1. Output to ITV

Data	Description	Length	Units
Pressure Setpoint	Pressure to supply	2 bytes	Counts

Table 23 – Cyclic Output Data

### 23.2. Input from ITV

Data	Description	Length	Units
Pressure	Actual device pressure (scaled) (bytes 0-1)	2 bytes	Counts
Diagnostic Flags	(bytes 2-3)	2 bytes (byte.bit)	
	Setpoint Error Setpoint Values out of range - If Setpoint greater than 120% full scale	1 bit (0.0)	N/A
	Clear Zero Error Not going zero within a timely manner	1 bit (0.1)	N/A
	Pressure Error Output Pressure Greater the 120% full scale	1 bit (0.2)	N/A
	Non-volatile Data Error Configuration data was corrupt and needed to restore defaults	1 bit (0.3)	N/A
	Pressure Window Error Not within setpoint and sensitivity in timely manner	1 bit (0.4)	N/A
	Not Used	1 bit (0.5)	N/A
	Integrity Error Memory Corruption Check	1 bit (0.6)	N/A
	Not Used	1 bit (0.7)	N/A
	System Fault	1 bit (1.0)	N/A
	Bus Fault	1 bit (1.1)	N/A
	Voltage Fault Voltage out of range (Nominal is 24 VDC $\pm 10\%$ )	1 bit (1.2)	N/A
	Miswiring Fault	1 bit (1.3)	N/A
	Not Used	4 bits (1.4 thorough 7)	N/A

Table 24 – Cyclic Input Data

## 24. Acyclic Messaging

Acyclic messages are useful for programmatically configuring the ITV settings. These options are also useful if using LabVIEW™ software or another programming language that may not have real time implicit libraries readily available.

### 24.1. Output to ITV

Index	Data	Description	Length	Units
1	Pressure Setpoint	Pressure to set ITV to	2 bytes	Counts
2	Application Configuration	Used for configuring the device	2 bytes	Refer to <b>Application Configuration</b> section
3	User Gain	Refer to <b>User Gain</b> section	2 bytes	Refer to <b>Configuring the In-range Window</b> section
4	User Sensitivity	Refer to <b>User Sensitivity</b> section	2 bytes	Refer to <b>Configuring the In-range Window</b> section

**Table 25 – Acyclic Output Data**

### 24.2. Input from ITV

Index	Returned Data	Description	Length	Units
1	Scaled Pressure	Scaled pressure	2 bytes	Counts
2	Unscaled Pressure	Unscaled A/D pressure	2 bytes	Counts
3	Diagnostic Flags		2 bytes (byte.bit)	N/A
	Setpoint Error	Setpoint Values out of range - If Setpoint greater than 120% full scale	1 bit (0.0)	N/A
	Clear Zero Error	Not going zero within a timely manner	1 bit (0.1)	N/A
	Pressure Error	Output Pressure Greater than 120% full scale	1 bit (0.2)	N/A
	Non-volatile Data Error	Configuration data was corrupt and needed to restore defaults	1 bit (0.3)	N/A
	Pressure Window Error	Not within setpoint and sensitivity in timely manner	1 bit (0.4)	N/A
	Integrity Error	Memory Corruption Check	1 bit (0.6)	N/A
	System Fault	Catastrophic system issue	1 bit (1.0)	N/A
	Bus Fault	Catastrophic communication issue	1 bit (1.1)	N/A
	Voltage Fault	Voltage out of range (Nominal is 24 VDC $\pm$ 10%)	1 bit (1.2)	N/A
	Miswiring Fault	Indication of external sensor miswiring	1 bit (1.3)	N/A
4	Supply Voltage	Power supplied to the device	2 bytes	Engineering units 10x volts (xx.x) (Example 24.2v equal 242)

**Table 26 – Acyclic Input Data**

## 24.3. Application Configuration

Bit	Description
bit 0	Hold on connection loss
bit 1	POE Enable
bit 2	Enable Engineering units
bit 3	Not Used
bits 7-4	Engineering Unit Type Refer to <b>Engineering Unit Types</b> section

**Table 27 – Application Configuration**

## 24.4. Engineering Unit Types

Type	Hex	Bits 7 - 4
MPa	0x0	0000
kg/cm <sup>2</sup>	0x1	0001
bar	0x2	0010
psi	0x3	0011
kPa	0x4	0100
Counts	0x5	0101

**Table 28 – Engineering Unit Types**

# 25. Diagnostics

## 25.1. Alarms



The ITV contains alarms for an indication of a problem. This data is sent to the PLC as alarms as well as part of the cyclic data.



Index	Title	Description	Extended Channel Diagnosis (Units)
256	Setpoint Error (Input Signal Error)	Setpoint Values out of range - If Setpoint greater than 4095 counts	N/A
257	Clear Zero Error	Not going zero within a timely manner.	N/A
258	Pressure Error	Over or under maximum and minimum pressure.	N/A
259	Non-volatile Data Error (Flash Configuration Data Error)	Configuration data was corrupt and needed to restore defaults.	N/A
260	Pressure Window Error	Not within setpoint and sensitivity in timely manner.	N/A
261	Not Used		
262	Integrity Error	Memory Corruption Check	N/A
263	Not Used		
264	System Fault	Catastrophic system issue	N/A
265	Bus Fault	Catastrophic communication issue	N/A
266	Voltage Fault	Voltage out of range (Nominal is 24.0 VDC $\pm$ 10%)	Volts (decimal)
267	Miswiring Fault	Indication of external sensor miswiring	N/A

**Table 29 – Alarms**

## 25.2. Web pages

The error conditions can also be monitored on the device web page.

 User
  LOGOUT

[System Information](#)
[Network](#)
[Device Control & Status](#)
[Login Management](#)


### SMC Electro-Pneumatic Ethernet Regulator

Device Control Parameter Setup and Status

---

#### ITV Regulator Control Parameter Setup

	MPa	Kg/cm <sup>2</sup>	Bar	PSI	KPa	Count
Pressure Unit:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Current Pressure:	30 Counts					
Pressure Setpoint:	<input type="text" value="0"/> Counts					
Override PLC Control :	<input type="checkbox"/>					
Engineering Unit Mode :	<input type="checkbox"/>					




#### ITV System Status

System Fault: <span style="color: green;">●</span>	Bus Input Signal Error: <span style="color: green;">●</span>
Bus Fault: <span style="color: green;">●</span>	Flash Configuration Data Error: <span style="color: green;">●</span>
Voltage Out of Range: <span style="color: green;">●</span>	Miswiring Error: <span style="color: green;">●</span>
Pressure Error: <span style="color: green;">●</span>	Clear Zero Error: <span style="color: green;">●</span>
Pressure Window Error: <span style="color: green;">●</span>	Integrity Value Error: <span style="color: green;">●</span>

ITV Supply Voltage: 24.3


#### ITV User Configuration Settings

User Gain:   
 User Sensitivity:



#### ITV Identification and Maintenance

Device Function:   
 Device Location:   
 Installation Date:   
 (YYYY-MM-DD HH:MM)  
 Additional Information:



[Back to top](#)

Figure 57 – Diagnostic Web Page

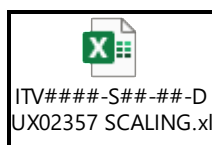
## 25.3. Initial Configuration Parameters

Item	Value
Device Name	dux02357-spn
IP address	0.0.0.0
Subnet	255:255:255:0
Enable POE	Off
Enable Hold	Off
Pressure Unit	Counts
Engineering Unit	Counts
User Gain	8
User Sensitivity	2
Webpage ID	user
Webpage Password	user

**Table 30 – ITV Initial Configuration**

## 26. *Scaling*

Here are some example graphs to help with understanding how to scale the input and output to and from the PLC.



## 27. *Troubleshooting*

This is a brief set of troubleshooting tools for the SMC PROFINET ITV. The intent of this section is to provide steps that a user can follow to diagnose and correct common issues. This set is by no means exhaustive.

### 27.1. ITV Does Not Power Up

1. Check power supply. Be sure it is providing 24 VDC  $\pm$  10%. Check the output voltage provided by the power supply using a calibrated voltage meter.
2. Check the power cable. Be sure 24 VDC is available at the ITV connector on the cable pins indicated in the power cable pin-out. Ensure the power cable is securely connected to the ITV. Be sure there are no breaks or cuts in the power cable.
3. If the ITV is being powered using POE, be sure that the requirements of POE are met. In particular, ensure that the upstream ITV has POE enabled and that the Ethernet cable is properly connected to the upstream ITV "Bus Out" connector and the "Bus In" connector of the ITV that does not power up.
4. If POE is being used to power the ITV that is not powering up, connect a 24 VDC power supply with a properly configured power cable to the power connector of the ITV. If the ITV powers up, verify POE setting and communication cable from the upstream ITV.
5. If the problem persists, contact SMC Technical Support.

### 27.2. One LED is Red

1. Solid Red **BF LED** indicates a loss of communication to the device. Verify the communication cable is properly connected between the other device and the ITV. Also, verify the other device is operational.

2. Solid Red **SF LED** indicates an **unrecoverable error**. Power cycle the ITV.
3. If the problem persists, contact SMC Technical Support.

### 27.3. Power LED is Green and BF and/or SF LEDs are flashing Red

1. Flashing Red **BF LED** indicates loss of communication with the master device. Check the BUS IN LED on top of the ITV (Bus Connector LED). The LED should be GREEN and flashing YELLOW if there is data being transferred.
  - 1.1. If the **Bus Connector LED is OFF**, the physical connection with the master device has been lost. Verify the communication cable connections. Verify that the master device is operating.
  - 1.2. If the **Bus Connector LED is GREEN**, the physical connection is operational. The master device has stopped responding to the ITV. Verify the state of the master device.
2. Flashing Red **SF LED** indicates a DCP signal service is initiated via the bus.
3. If the problem persists, contact SMC Technical Support.

### 27.4. Power LED is Red

1. A solid Red **MS LED** indicates a low voltage condition. The voltage is high enough for the ITV to power up but may not be high enough for the ITV to operate properly. Verify the ITV power is within specification.

### 27.5. Unable to Communicate with ITV

Symptom: Power and BUS IN LEDs are Green.

ITV does not respond to commands. Power LED is green, **BF** is flashing Red, and the LED on top of the ITV for the incoming signal is Green.

#### Possible Cause: Incorrect Device Name

1. Verify that the ITV has been configured with the proper Device Name.
2. If the ITV Device Name is unknown, use either TIA Portal™ or PROFINET Commander™ to attempt to determine and set the Device Name of the ITV.
3. If the problem persists, contact SMC Technical Support for assistance

Symptom: Power is green; LED on top of the ITV for the incoming signal is off.

Note: It is **normal** for a connector LED to be **OFF** if there is no physical connection to another device.

#### Possible Cause: Connector Not Connected or Not Powered

1. If a communication cable is not connected to the connector associated with the LED, the LED will be off. If this connection is not required, putting a seal cap on the connector is recommended.
2. The cable is not connected to another operating device. Verify the communication cable is properly connected between the other device and the ITV. Also, verify the other device is operational.
3. If the problem persists, contact SMC Technical Support for assistance

### 27.6. ITV Web Page Pressure Value Differs from Master Calculated Value

Note: The master device reported pressure is calculated from the pressure count value received by the master from the ITV.

#### Possible Cause: ITV and Master Pressure Units Differ



The selected pressure unit displayed on the ITV web page is different from the pressure unit used to calculate the pressure value from the counts sent to the master device.

1. Confirm the pressure unit displayed on the ITV web page matches the pressure unit used to calculate the pressure value from the counts sent to the master. Also refer to the conversions in the **Setpoint and Feedback** section.

**Possible Cause: Incorrect Count Calculation**

1. Verify the correct formula for calculating pressure is used for determining pressure value. See the conversions in the **Setpoint and Feedback** section.

**Possible Cause: Pressure Change in Progress**

1. If the master requested a pressure value change and the ITV has not settled to the new pressure value, the web page may display a different pressure value than the calculated value. Check the pressure value once the ITV has settled to the new pressure value.

## 27.7. ITV Does Not Reach Set Pressure

Symptom: ITV “Buzzes” when Directed to Set a Pressure

**Possible Cause: In Inadequate Supply Pressure**

1. Verify that supply pressure is at least set at Minimum Pressure (**Set pressure + 0.1 MPa - or Set Pressure – 13.3 kPa** for **ITV2090** Vacuum ITVs).
2. If the problem persists, contact SMC Technical Support for assistance.

Symptom: ITV Makes “Hissing” Sound when Operated at Pressure

**Possible Cause: Air or Vacuum Leak**

1. Verify that fittings are properly installed in the correct ports.
2. Verify that air lines are properly installed.
3. Verify that air lines are not cut or punctured.
4. Verify that air is not being unexpectedly exhausted from the ITV exhaust port.
5. If the problem persists, contact SMC Technical Support for assistance.

This is not an exhaustive troubleshooting guide. SMC Technical Support may request that the user to check additional things, depending on the problem experienced.

## 27.8. Setting the Device Name to a default value

The ITV has an option to use a default Device Name. Use this procedure when a default Device Name is needed when setting up a device. Refer to section **DIP Switches** for additional information.

## 27.9. Initial Power-up

The ITV web page is the mechanism used to configure an ITV and prepare it for installation. The ITV web page may also be used to operate and control the ITV.

New ITVs come from the factory preconfigured with a unique MAC address which matches the MAC address printed on the label of the ITV. New ITVs have their DIP Switches set for providing a default Device Name of “DUX02357-SPN” with no suffix. Use this Device Name to initially communicate with the device to save time. A Device Name can also be assigned to the device which can be stored in persisted memory and the DIP switches will then be ignored. Once the controller has assigned the device an IP address then the user can access the ITV web page.

The MAC address, Device Name, and IP address must be unique on a network. The default DIP switches position will set the same Device Name for *all* ITVs; therefore, the Device Name *may need to be changed* as part of the setup process. The Device Name change procedure is discussed in section **DIP Switches**.

## 27.10. Configuring the PC to use ITV Web Page

In order to initially access the ITV web page, you will need the following items:

1. One (1) power cable (with a 5-pin female M12 A-Coded connector).
2. One (1) Ethernet cable (with a 4-pin male M12 D-Coded connector on one end and a standard LAN Ethernet cable plugin connector (RJ45) on the other end).
3. A PC with a LAN port. The PC is either directly connected to the ITV using the Ethernet cable in item 2, or it may be connected to the ITV via a separate cable and switch.
4. Web browser installed on the PC. Internet Explorer (IE 9 or later), Chrome, or Firefox are supported.

Connect the Ethernet cable to the “Bus In” port of the ITV. Connect the LAN connector to your PC LAN port or switch.

Turn on the PC (and switch, if used).

Connect the power cable to a 24 VDC power supply and to the ITV

Turn on the 24 VDC power supply.

The ITV should power up, the Power LED should be solid green, and eventually the BF LED should be flashing red. If this does not occur, turn off the 24 VDC power supply or disconnect the ITV power cable. Verify all connections.

As noted, the Device Name is initially set to “DUX02357-SPN” from the default DIP switch positions. This Device Name can be used with a Controller (PLC) to set the device IP address. Refer to section **Basic PLC Configuration** for setting the Device Name and IP address of the device. The IP address is on subnet 1.

In order to access the ITV web page, the PC must also be configured to use subnet 1. The following steps (using Windows 7 – other versions of Windows may differ) describe how to set the PC to subnet 1. Note: If the PC is already configured to use subnet 1, you may skip this section.

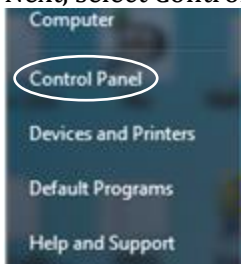
This procedure assumes that you have appropriate access privileges on your PC and you are using Windows 10. If not, please consult your PC Administrator.

Bring up the Network and Sharing Center using the Control Panel from the Start menu:

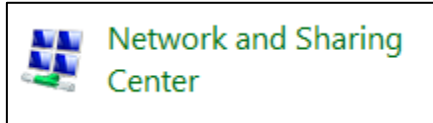
First, select the **Start** button on your PC toolbar



Next, select Control Panel on the Start Menu

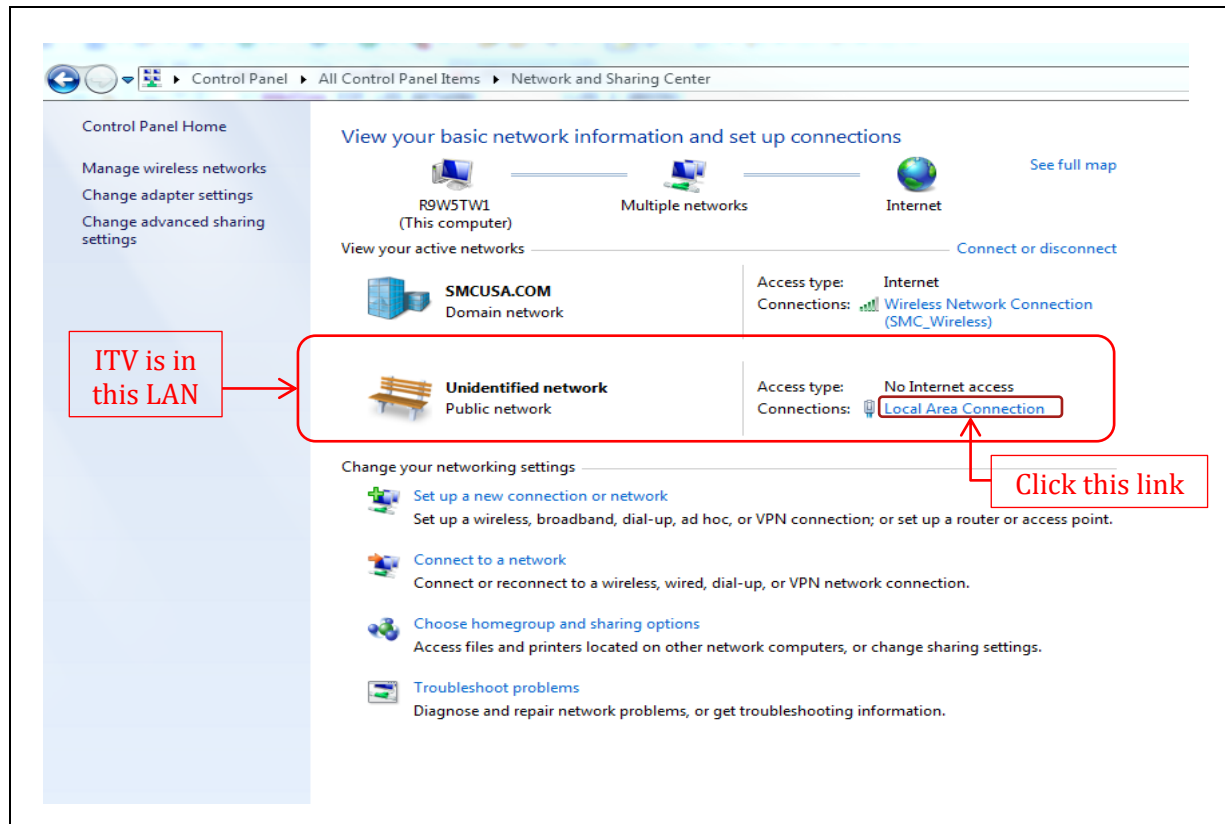


Finally select Network and Sharing Center on the Control Panel menu.



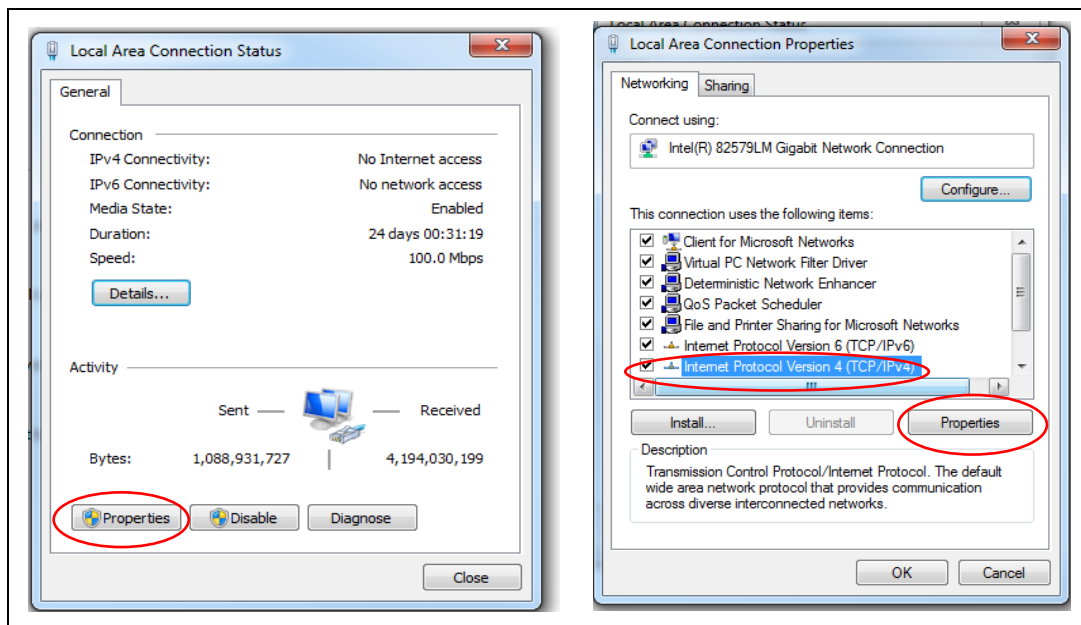
The **Network and Sharing Center** will depict the specific network configuration for your PC and its network(s). As a result, your view may be somewhat different from the following window. If you have questions, please review the documentation for your PC. If you have additional questions, please consult your PC or Network Administrator for information and assistance.

Press the “**Local Area Connection**” link (in “**Figure 58 – Windows Network and Sharing Center**”) and the **Local Area Connection Status** window will appear.

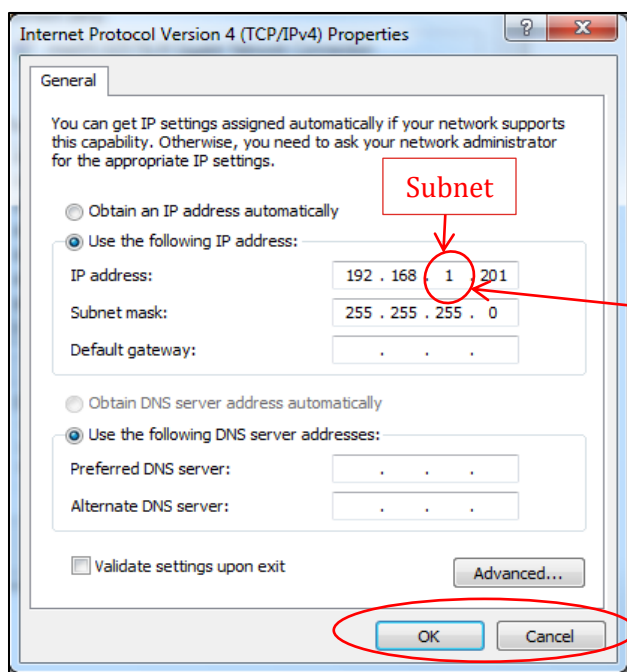


**Figure 58 – Windows Network and Sharing Center**

Then press the “**Properties**” button and the **Local Area Connection Properties** window will appear. Next select **Internet Protocol Version 4 (TCP/IPv4)** and press the **Properties** button. The **Internet Protocol Version 4 (TCP/IPv4) Properties** window will appear.



**Figure 59 – Windows Local Area Connection and Local Area Connection Properties**



Change the PC subnet value if needed to match the ITV subnet

**Figure 60 – Windows Internet Protocol - IPv4 – Properties**

The **Subnet** field is circled (in “**Figure 60 – Windows Internet Protocol - IPv4 – Properties**”). Verify that the PC Subnet value matches the Subnet in use on your ITV. Note: The PC and ITV **must** have different IP addresses.

DO NOT MODIFY ANY OTHER FIELD IN THE IPv4 PROPERTIES WINDOW.

If the Subnet field must be changed, **double click** the Subnet field entry (circled in “**Figure 60 – Windows Internet Protocol - IPv4 – Properties**”) and type the new value. Do **NOT** hit the keyboard “Enter” key. That has the effect of pressing the OK button but does not give you the opportunity to review your Subnet change to ensure it is correct before you accept it.

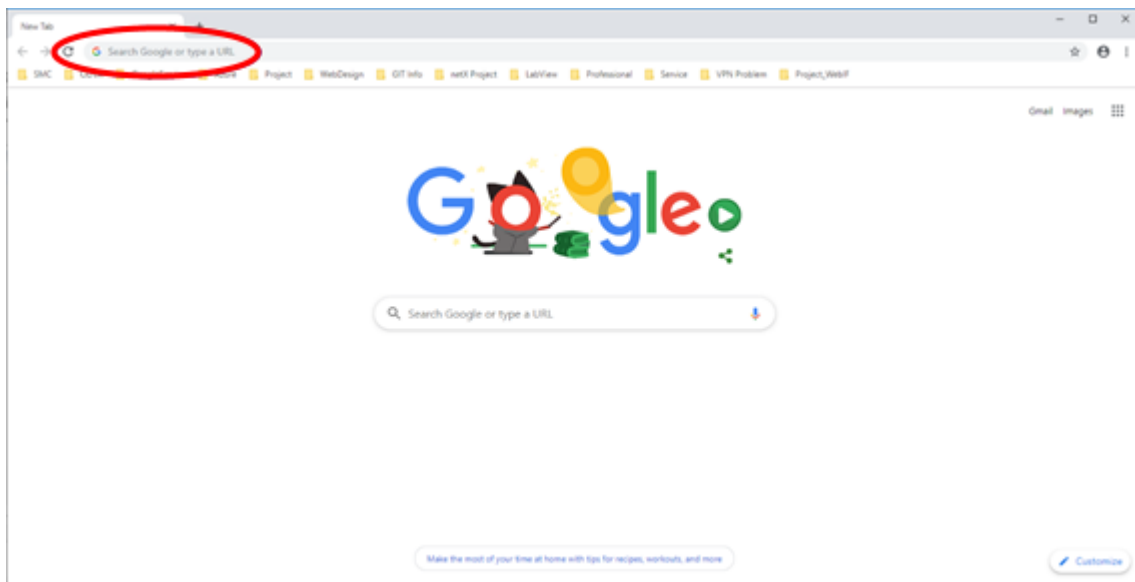
Verify that the **ONLY** change is the Subnet field. If **ANYTHING**, other than the Subnet field has changed, restore the initial value **BEFORE** you press OK.

Once you have verified the values in the **Internet Protocol Version 4 (TCP/IPv4) Properties** window, press the OK button to complete the PC subnet change. This will close the IPv4 Properties window.

Next, continue to **Connecting to the ITV Web Page**.

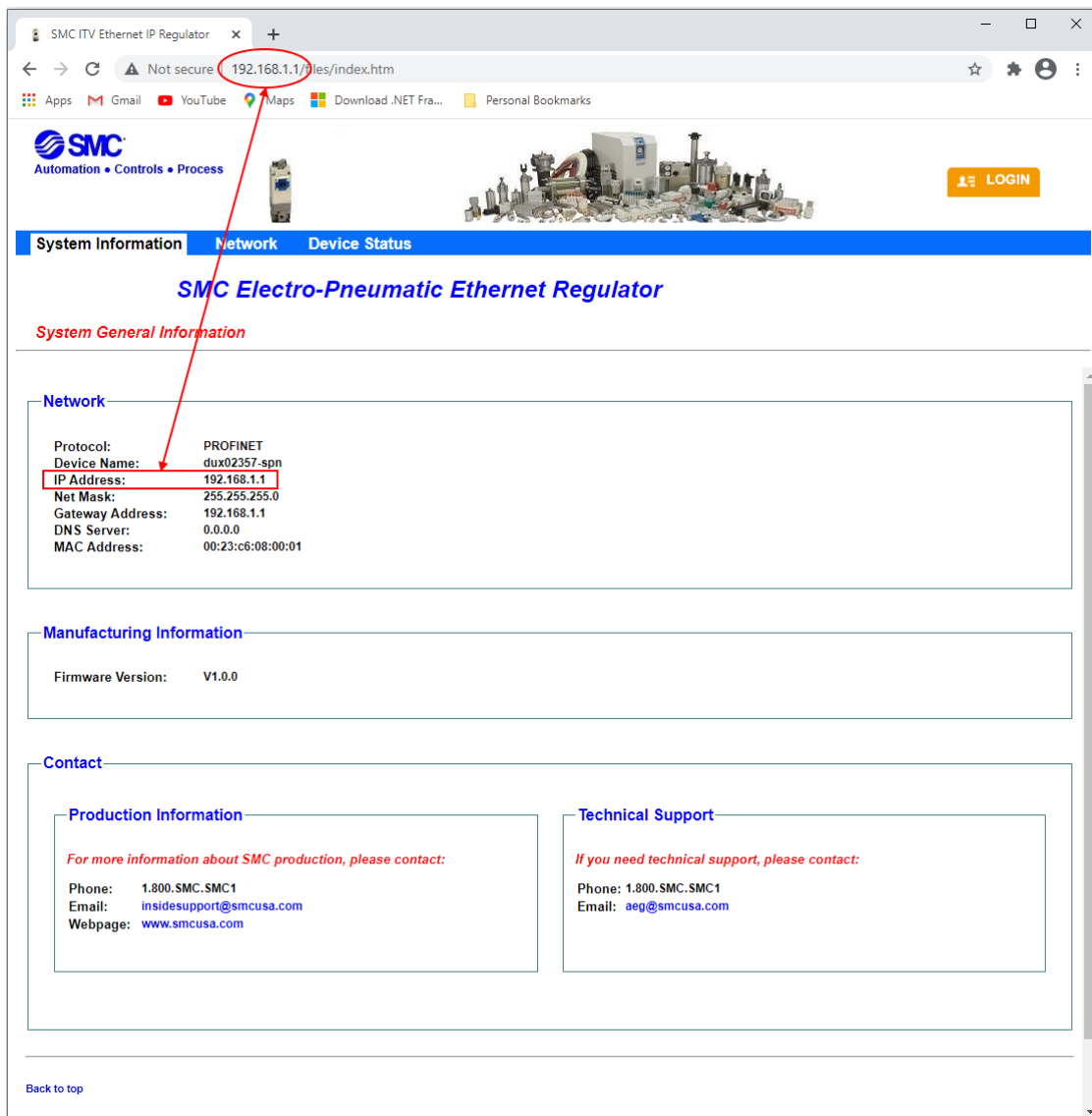
## 27.11. Connecting to the ITV Web Page

After you have confirmed that the PC and ITV are on the same Subnet, launch your preferred browser. The following examples use Google Chrome. Firefox and IE are similar.



**Figure 61 – Chrome Browser Homepage**

In order to bring up the ITV web page, type the ITV IP address on the browser URL line. The “System Information” page should appear.



**Figure 62 – ITV "System Information" Page with Controller Assigned IP Address**

If the System Information page does **NOT** appear please see the following subsections

- **ITV Does Not Power Up**
- **One LED is Red**

If necessary, contact SMC Technical Support for assistance.

Note: To change the ITV IP address, follow the instructions in section **"Basic PLC Configuration"**.

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