SmartStruxure Lite Solution

Smart Controllers (SEC-TE, SED-0)

Installation Instructions

Get Control. Get Efficient. Get Value

Schneider Electric

SmartStruxure Building Peripherals User Guide

About this User Guide

This document contains the user guide for the SmartStruxure™ Lite Wireless Smart building peripherals.

NOTE: The content of this document is applicable to the features of SmartStruxure Lite Building Peripherals firmware **version 14** and subsequent.

Who Should Read this Guide

This guide is for building automation professionals including engineers, contractors, and electricians.

SmartStruxure Lite Wireless Smart building peripherals are programmable wireless devices for the building automation industry. This document helps you understand, install, operate, and maintain your SmartStruxure Lite peripherals.

Related Topics

To appreciate the full functionality of SmartStruxure Lite Wireless Building Peripherals, a prior knowledge of the following topics and products is required:

- SmartStruxure Lite solution Multi-purpose Management Devices (MPM)
- ZigBee
- Lua script

Safety

Installation, operation, and maintenance of SmartStruxure Lite's Wireless Building Peripherals may require working with live electrical components. Only qualified licensed electricians or other individuals who have been properly trained in handling live electrical components should perform these operations.

Failure to follow electrical safety precautions when exposed to live electrical components could result in death or serious injury. Always respect local codes and regulations when installing SmartStruxure Lite products.

For more information and documentation visit our website at:

documentation.smartstruxurelite.com

Overview

SmartStruxure Lite's building peripherals are smart wireless devices that address specific building applications with the added value of wireless communication, along with local and distributed intelligence.

This document presents the following two SmartStruxure Lite Wireless Building Peripherals:

- SED-0
- SEC-TE

IMPORTANT NOTE: SmartStruxure Lite Wireless Building Peripherals are **NOT** stand-alone solutions. The SED-0 and SEC-TE require a section Manager, such as a MPM-UN, to function correctly.

SED-0 Smart Wireless Actuator

The SED-0 is a locally programmable valve/damper actuator that communicates wirelessly with SmartStruxure Lite Managers and gateways.

The SED-0 has an internal ZigBee transceiver and antenna, enabling it to communicate with SmartStruxure Lite controllers and gateways.

The SED-0 internal memory contains a control engine that supports local scripting programmability, enabling simple stand-alone control and/or a fail-safe mechanism.

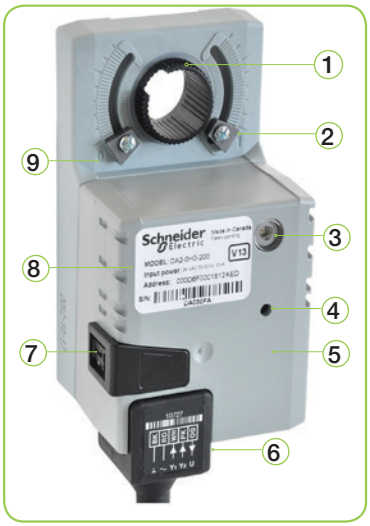
The device has the following object properties:

- Damper setpoint
- Damper position
- 2 universal Inputs
- 1 feedback output signal
- 2 analog value objects
- 1 Lua script

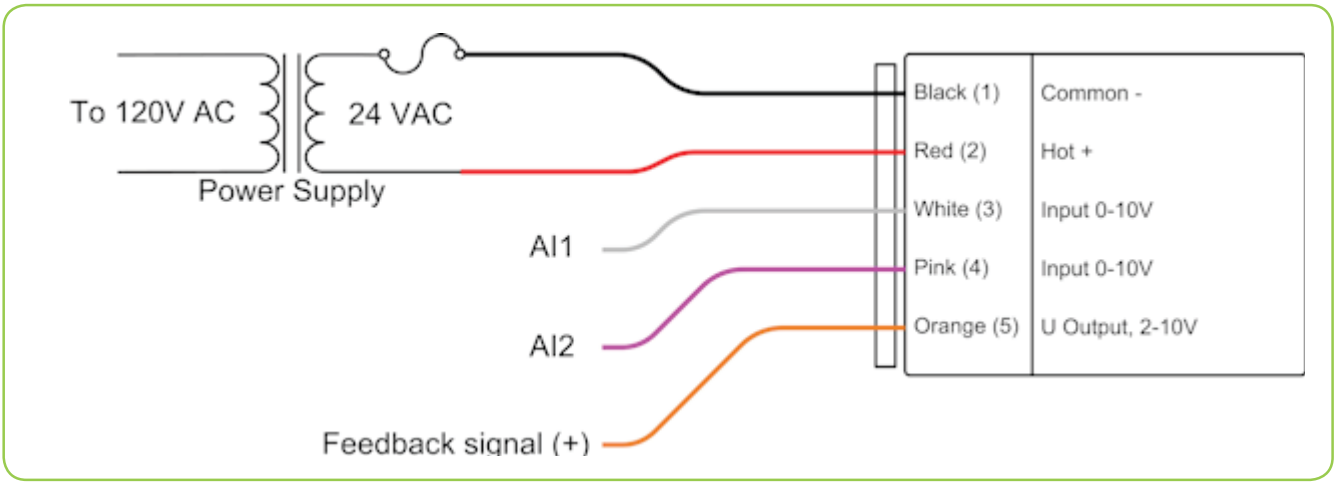
Physical Characteristics and Interactions

The figure shows the physical characteristics of the SED-0.

1. Actuator
2. 100% position of SED-0
3. LED
4. Network scan button
5. SED-0 body
6. Power supply and I/O connector
7. Manual override button
8. Label
9. 0% position of SED-0



The below figure shows the wiring diagram for the SED-0.



SEC-TE Terminal Equipment Controller

The SEC-TE is a programmable controller for terminal equipment applications such as fan coil units. The SEC-TE has an internal ZigBee transceiver and antenna, enabling it to communicate with SmartStruxure Lite controllers and gateways and other compliant devices.

The SEC-TE internal memory contains a control engine that supports local scripting/programmability, which creates a simple stand-alone control and/or fail-safe mechanism.

The device has the following object properties:

- 4 universal inputs
- 4 analog outputs
- 5 binary outputs (dry contacts)
- 2 analog value objects
- 1 Lua script

The SEC-TE can also be used as a pulse counter with one analog input configurable for this function.

Overview

Network Scan Button Detail (all models)

The network scan button is recessed. Operation of the button requires the use of a small, narrow tool such as an Allen key.

Network Scan Button Action

Table 1 below shows the effects when pressing and holding the network scan button on your Building Peripheral.

Table 1

Actions applied to button by user	Actions performed on release of button	Corresponding Blue LED behavior
Hold down between 1s and 5s	Device tries to connect to the next network on its list	LED flashes slowly (400ms)
Hold down between 6s and 30s	Device scans for joinable networks (with user defined extended pan id if applicable) and compiles a list of networks it finds, up to a maximum of 5 networks	LED flashes rapidly (200ms)
Hold down more than 30s	Device clears all analog outputs, binary outputs, analog values, and Lua script. It also causes the device to reboot	LED turns OFF
Hold down less than 1s	No action performed	LED not affected

LED Behavior

Each Building Peripheral has a blue LED and a green LED. During operation of the devices, the green LED remains illuminated solid.

The blue LED behavior characteristics are shown in Table 2 below.

Table 2

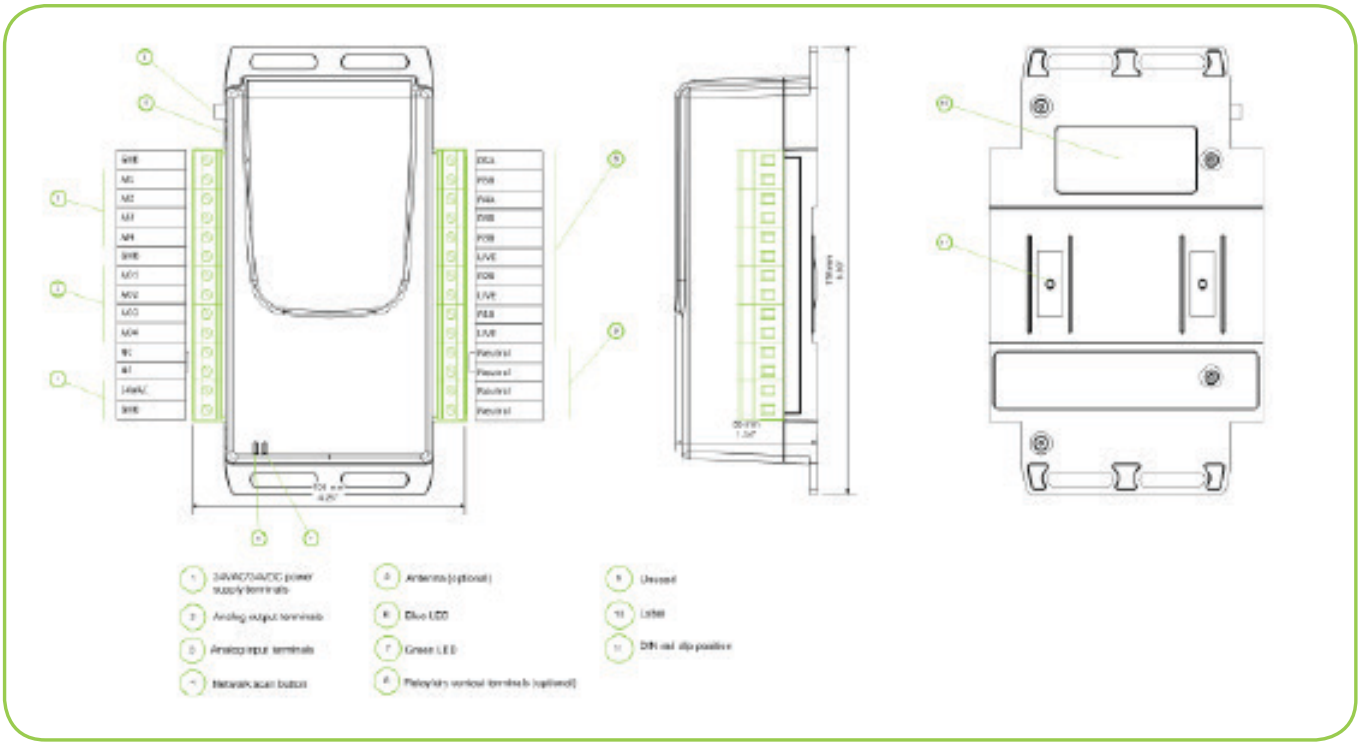
Blue LED Behavior	Corresponding device behavior
LED ON 200ms every second	Device is scanning for joinable Zigbee networks
LED ON 500ms every second	Device is trying to join one of the networks it has found during the scan
LED ON 800ms every second	Device is trying to rejoin the network it was connected to after a loss of connection or a reboot
LED ON	Device is connected to a network
LED flashes (400ms)	Button is being held down between 1s and 5s
LED flashes (200ms)	Button is being held down between 6s and 30s
LED OFF for 1s (pause)	This pause in the LED pattern indicates the device could not connect to a network. The device tries to connect to the next network on its list.
LED OFF	Button is being held for down more than 31s

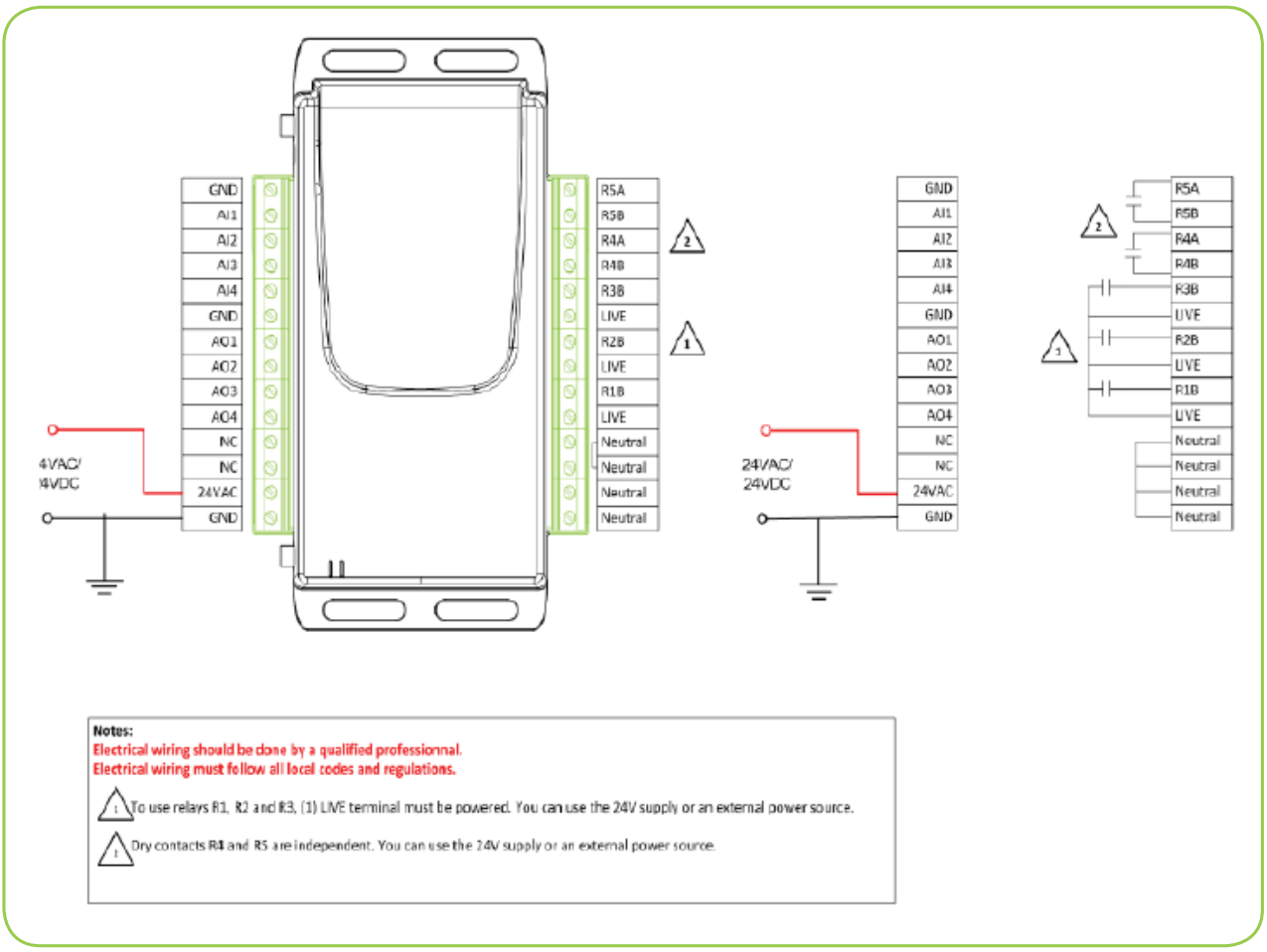
NOTE: On the SED-0, both LEDs are viewed through the same circular glass. The dominant color of the LED indicator is blue. You should not see a green LED indicator.

Wiring Diagram

The wiring diagrams for the 24VAC/24VDC SEC-TE smart wireless managers are shown below.

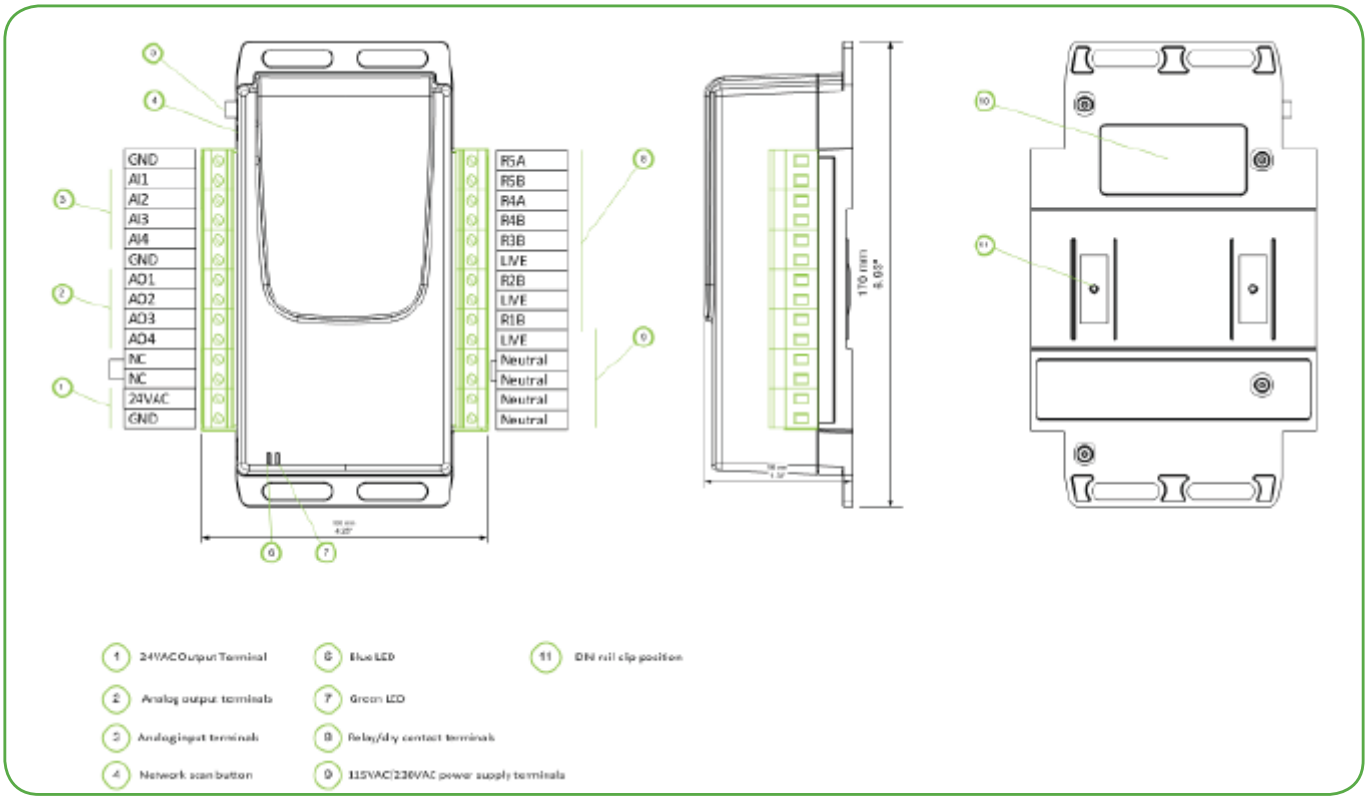
24VAC/24VDC

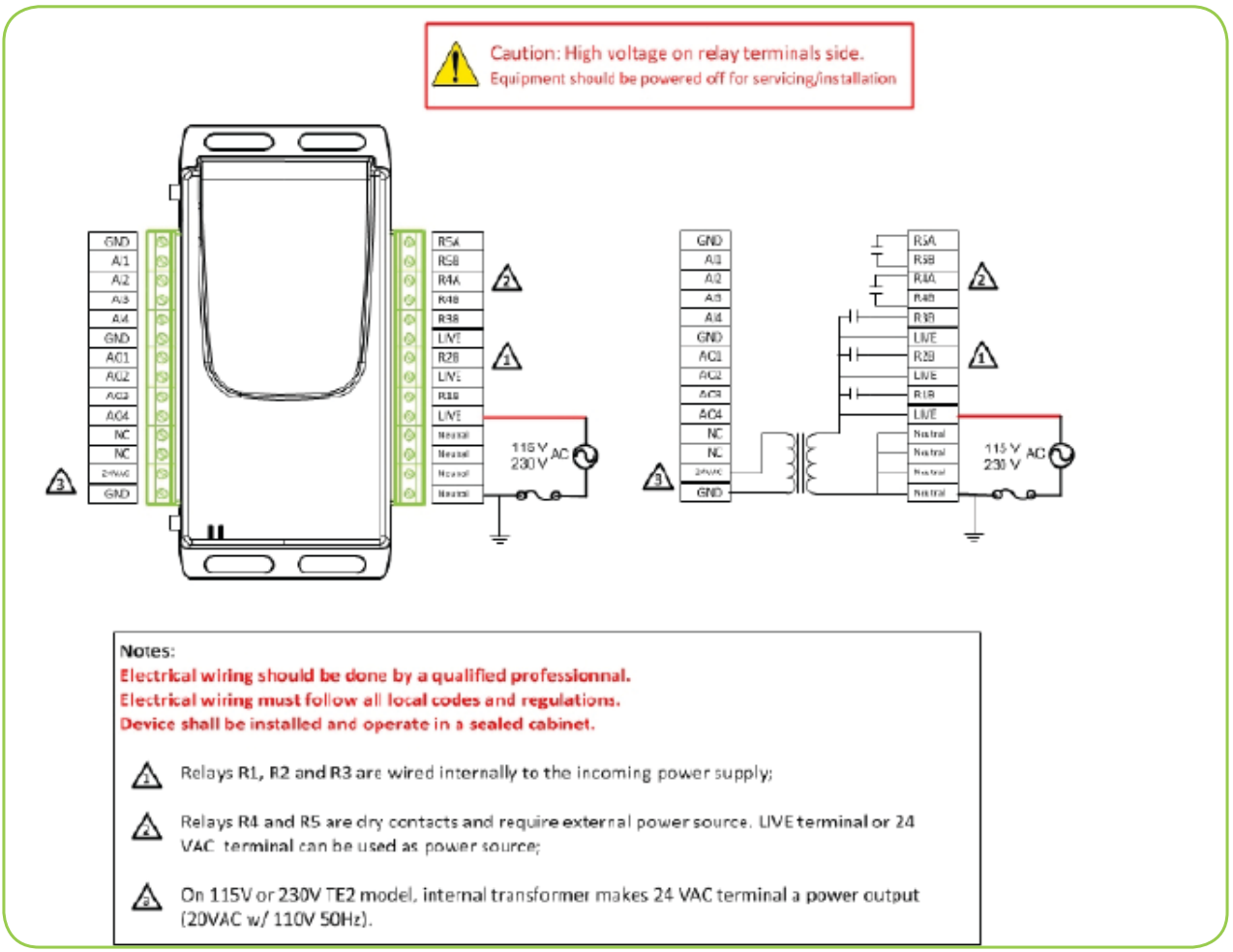




115VAC/230VDC

The wiring diagrams for the 115VAC/230VAC SEC-TE smart wireless managers are shown below.





Software Interaction

This section presents general operation of SmartStruxure Lite Building Peripherals, as well as an overview of the different states of a Building Peripheral. This information should be read in conjunction with the Device Behavior section to gain a full understanding of the behavior of your Building Peripheral in different stages of operation.

Scanning for Zigbee Networks

Wireless communication with your Building Peripheral requires the device join a ZigBee network previously formed by one or more SmartStruxure Lite Managers.

A SmartStruxure Lite Building Peripheral can store in its memory the information to connect to five different Zigbee networks. Your device discovers the available networks in its communication range by doing a network scan.

The network scan occurs under one of the following two conditions:

- **Automatic scan:** when a SmartStruxure Lite Building Peripheral is powered up and its internal memory contains no network information such as a new Building Peripheral or device that was never connected to a Zigbee network.
- **Manual scan:** when the Building Peripheral network scan button is pressed for more than five seconds and less than 30 seconds to initiate the scan.

If the network scan is unsuccessful and the device cannot find an available Zigbee network, the device remains disconnected and stays in that state until a manual network is initiated and a joinable network is found.

Joining a Zigbee network

After a successful scan, the Building Peripheral automatically joins the first Zigbee network stored on its list. When the blue LED on the Building Peripheral stops flashing, the Building Peripheral has joined a network.

If for some reason it cannot join the first network on the list before reaching a programmed timeout, the device automatically tries to join the next network. The device repeats this sequence until it joins a network on its list, or a manual network scan is initiated to refresh its network list.

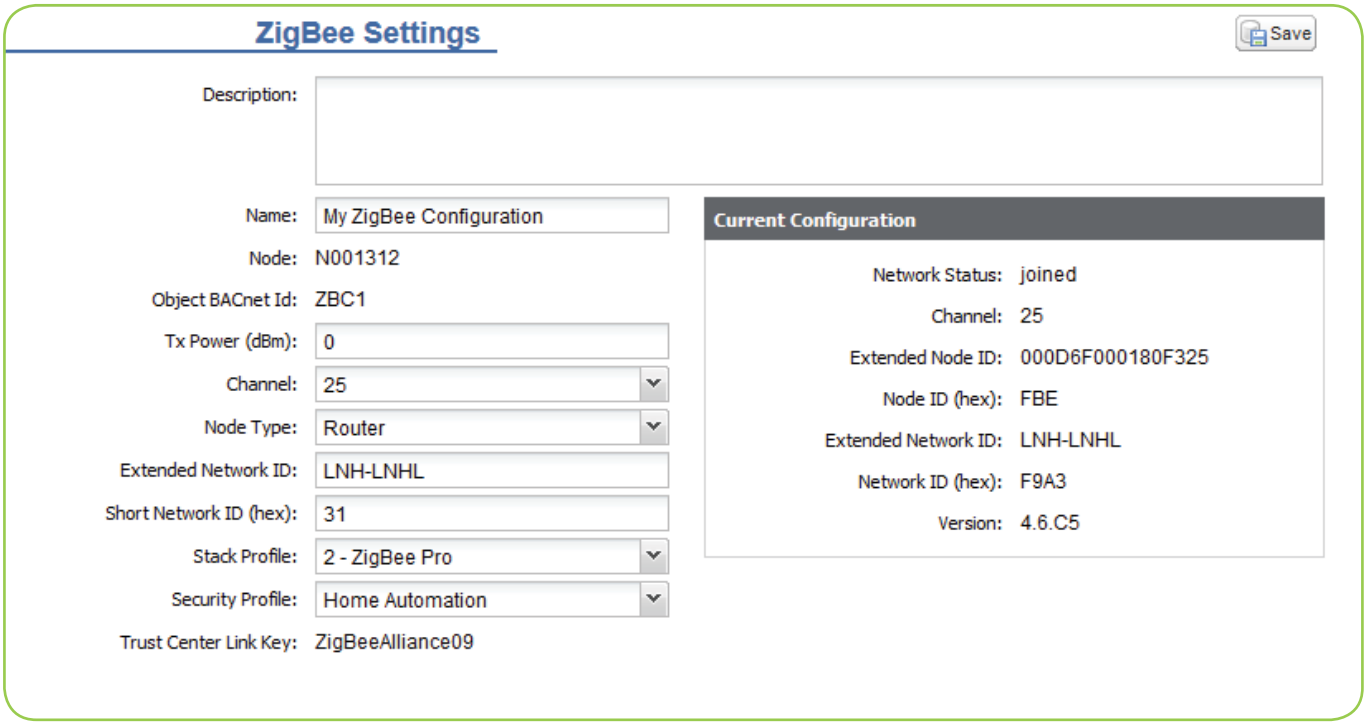
Refer to the following two sections for more details:

- “Procedure - Configure Zigbee” on page 10
- “Using Com Log” on page 14

Procedure - Configure Zigbee

NOTE: This procedure assumes you have already wired electrical power to your device as per the wiring diagrams. For the purpose of this procedure, a SED-0 Building Peripheral is used. The procedure is identical for the SEC-TE except where otherwise indicated. Also, ensure Devices tab on left side of Building Expert is expanded before you start the procedure.

Configure ZigBee



1. In **Devices** tab, select your Multi-purpose Manager.
2. In **Object** tab, select **ZigBee Configuration (ZBC1)** object.
3. Set following parameters accordingly:

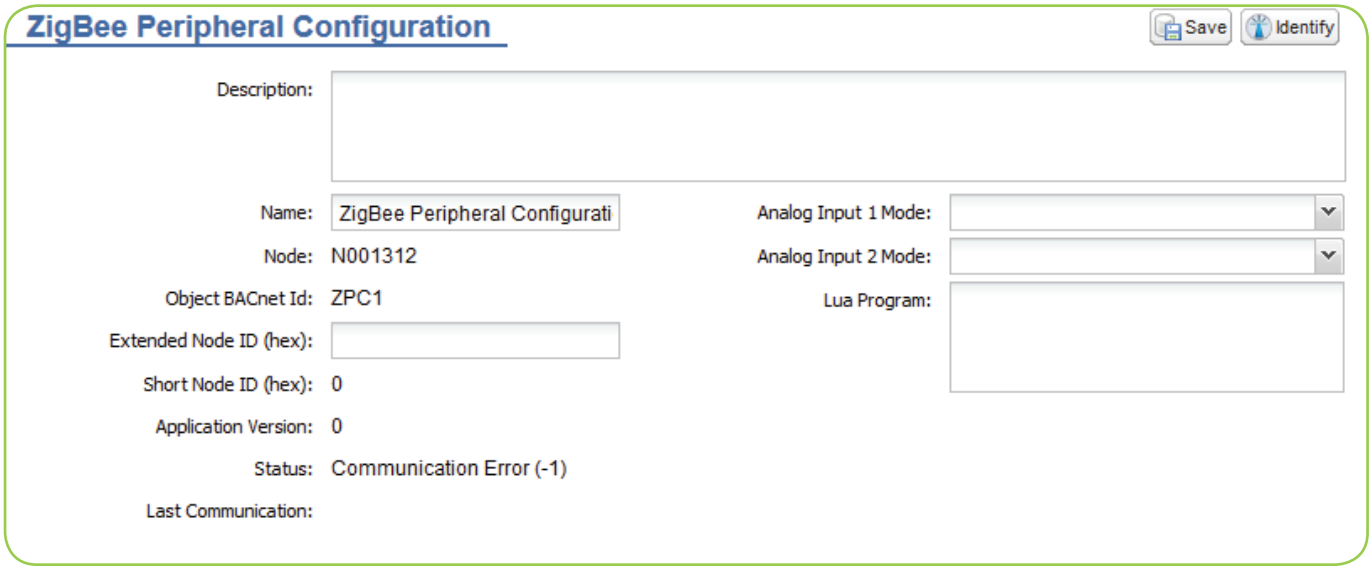
- In **Stack Profile**, select **2-ZigBee Pro**.
- In **Security Profile**, select **Home Automation**.

4. Click **Save** button.
5. In **Devices** tab, select your Multi-purpose Manager again.
6. In Explorer tab, click **Add Devices** button. 
   A new window opens.

Add Device

1. In **Add Devices** tab, select **DA2.**
2. Click **Add Devices** button.
3. In **Devices** tab, select your newly added device.
4. In **Explorer** tab, select **ZigBee Peripheral Configuration**.

Configure Device



1. In **Extended Node ID (hex)** text field, enter your Building Peripheral`s 16-digit MAC address specified on device`s label.

NOTE: For SED-0, the label is affixed to top of device. For SEC-TE, the label may be affixed to rear panel. The value must be a non-zero hexadecimal with a maximum of 16 characters.

2. Click **Save** button.
3. Using a narrow tool such as an Allen key, press **Network Scan** button on Building Peripheral for 6 to 30 seconds until LED begins flashing rapidly, Then release **Network Scan** button.
   The device begins scanning for all Zigbee networks within range and the LED flashes slowly. When the LED stops blinking and illuminates solid, the Building Peripheral has joined a network

Verify Configuration

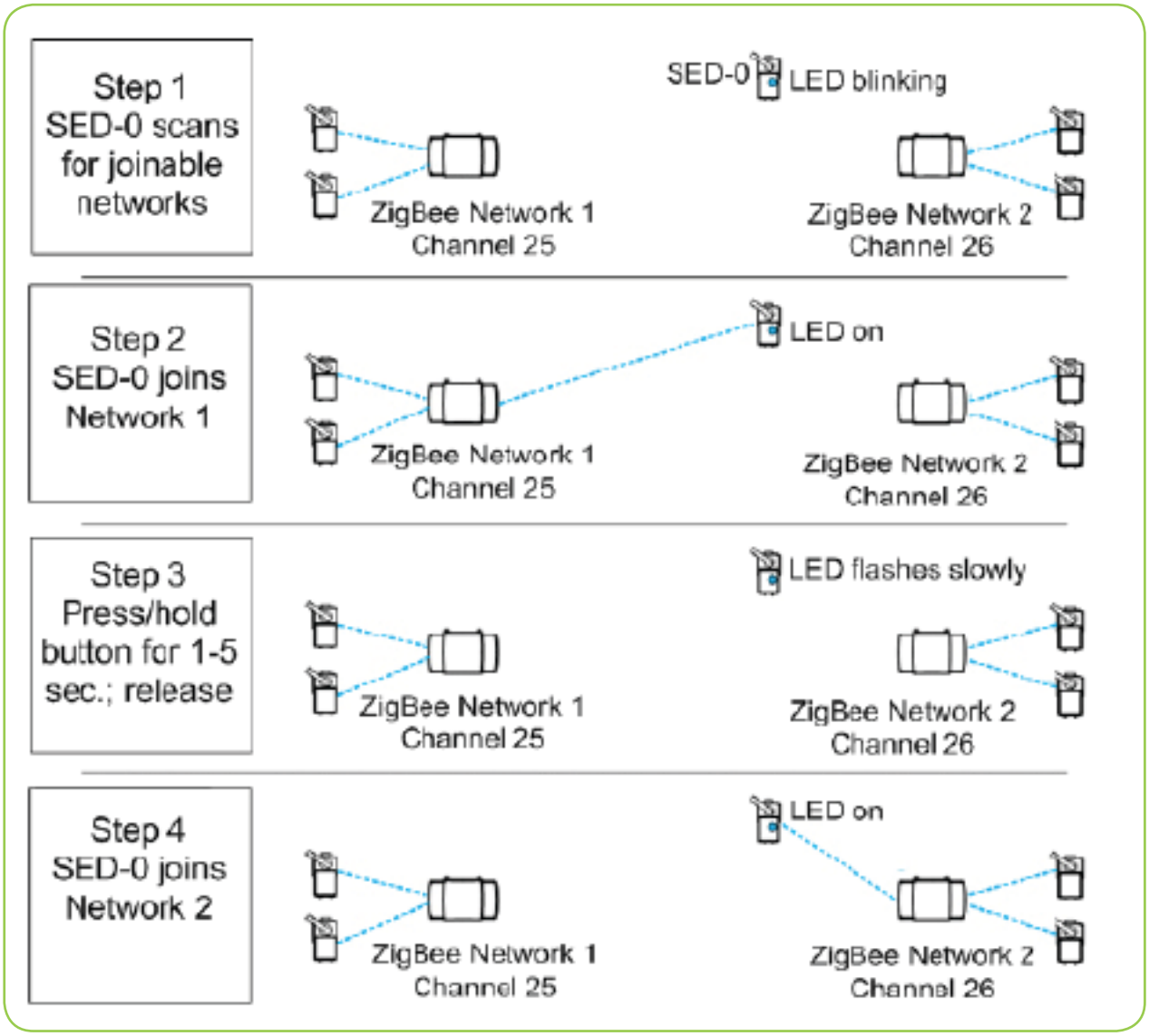
1. Allow up to 30 seconds to pass, and verify device has joined correct network:

- Case 1: If device has joined correct network, **Status** field shows **Online**. Click **Save** button.
- Case 2: If device has not joined correct network where more than one ZigBee network is present, **Status** field shows **Communication Error** followed by numeric error code.

NOTE: In Case 2, you must press network scan button again for approximately 2 seconds to skip to next network in list of stored networks. For each attempt, allow up to 30 seconds for ZPC object's status field to update. Once the device is online, click **Save** button.

Block Diagram

The block diagram below shows a graphical representation of how a SmartStruxure Lite Building Peripheral joins a ZigBee network.



Using Com Log

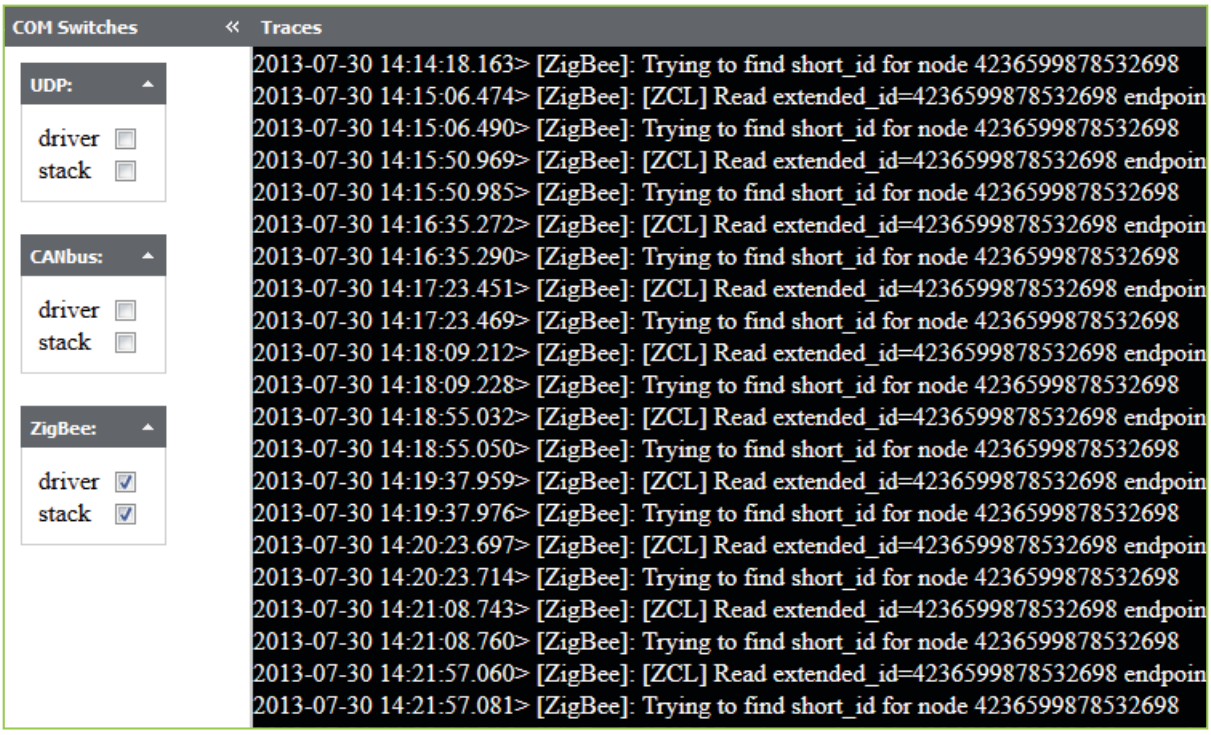
In large installations where multiple ZigBee networks may be present, the Building Expert's Com Log is a useful, time-saving tool for determining whether your Building Peripheral has joined the correct network.

To verify whether the Building Peripheral has joined the desired Zigbee network, you must monitor the Zigbee activity on the Com Log window of the section Manager where the Building Peripheral should be joining.

The Com Log should be accessed before starting the joining process to ensure you see the Com Log entry of the device joining the network.

Access Com Log

1. In **Devices** tab, right-click on your section Manager.
2. Select **Show Com Log**.
   The Com Log shows in a separate window, and the figure below shows a typical message appearing on Com Log when a Building Peripheral joins the network.



The device is identified on the Com Log with an extended_id corresponding to its MAC address. This address is unique and permanent for each device.

Note: When the device joins the network, the Device Announce message shows on the Com Log several seconds before its status field on the ZPC object updates. Allow the status field sufficient time to update to "Online" before clicking the ZPC object's **Save** button.

Joining Other Networks on the List

If the device joins a network (LED is ON) but does not appear on the Com Log, this means the device joined a network from a list not detected on the desired network. The list can contain up to 5 Zigbee networks.

To change the network, press the button on the device and hold it between 1 and 5 seconds. The blue LED flashes until the device joins the next network, and then remains solid.

Each time you press the button, the device joins the next network on its list and cycles continuously. If there is only one network available, it constantly attempts to rejoin the same network.

Other Operation Scenarios

1. **SmartStruxure Lite Building Peripheral loses power:**
   If a Building Peripheral joins a network at least once, it tries to reconnect to the same network it was last connected to if it loses power and is powered back on. If you want the device to join another network, you must do a new manual network scan, since stored networks get deleted on power loss, with the exception of the last joined network.
2. **ZigBee Network goes down:**
   If the network to which a device is connected is temporarily unavailable, the device tries to rejoin this network indefinitely. Once the network is back up, the device rejoins it.

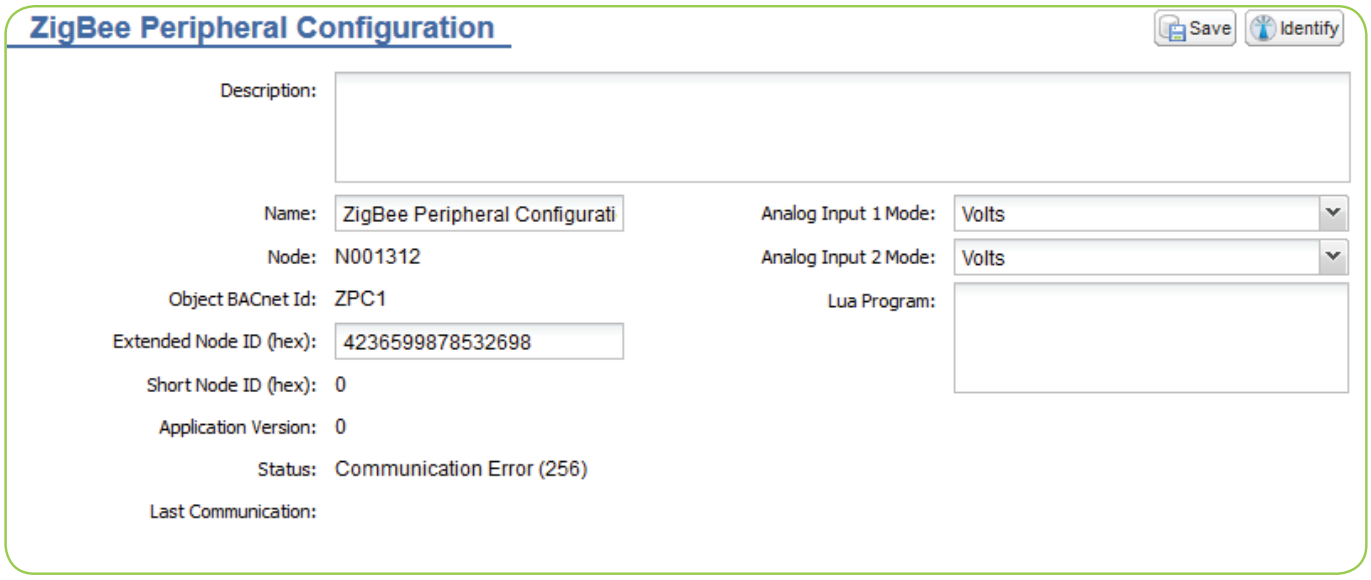
Perform one of the following if you want the device to connect to another network:

- Press the button on the device and hold it between 1 and 5 seconds to search for another network on the list of discovered networks.
- Initiate a network discovery to find available networks.

Endpoint Descriptions

Analog Inputs (AI)

Each analog input is configurable via the ZPC1 object used with devices supplying a signal in Ohms (thermistor, potentiometer, dry contact) or in Volts (analog temperature or humidity sensors). By default, all analog inputs are set to Volts.



Analog Outputs (AO) – SEC-TE Only

- SEC-TE offers 4 analog outputs.
- Value assigned to the output can be between 0V and 12V. The output value has a resolution of 12 bits.

Binary Outputs (BO) – SEC-TE Only

- SEC-TE offers (as an option) 5 relays/binary outputs.
- Each relay is rated for 5A at 24VAC.

Valve Digital Position (AI5) – SED-0 Only

- Current position of the SED-0 valve actuator is stored in AI5.
- Position is stored as a percentage, where 0% represents the valve physically in position 0, and 100% represents the valve physically in position 1.

You cannot physically reverse polarity of the SED-0 actuator. If required, reversing the polarity must be done inside your control script.

Valve Set Position (AO1) – SED-0 Only

- Desired valve actuator position is stored and can be edited in object AO1.
- Position must be defined in percentage, where 0% represents the valve physically in position 0, and 100% represents the valve physically in position 1.
- You cannot physically reverse polarity of the SED-0 actuator. If required, reversing the polarity must be done inside your control script, AV1 and AV2.
- Objects AV1 and AV2 allow you to store analog values in the SED-0 actuator memory. These objects are used mainly in the Lua script embedded in the SED-0 valve actuator.

Lua Script

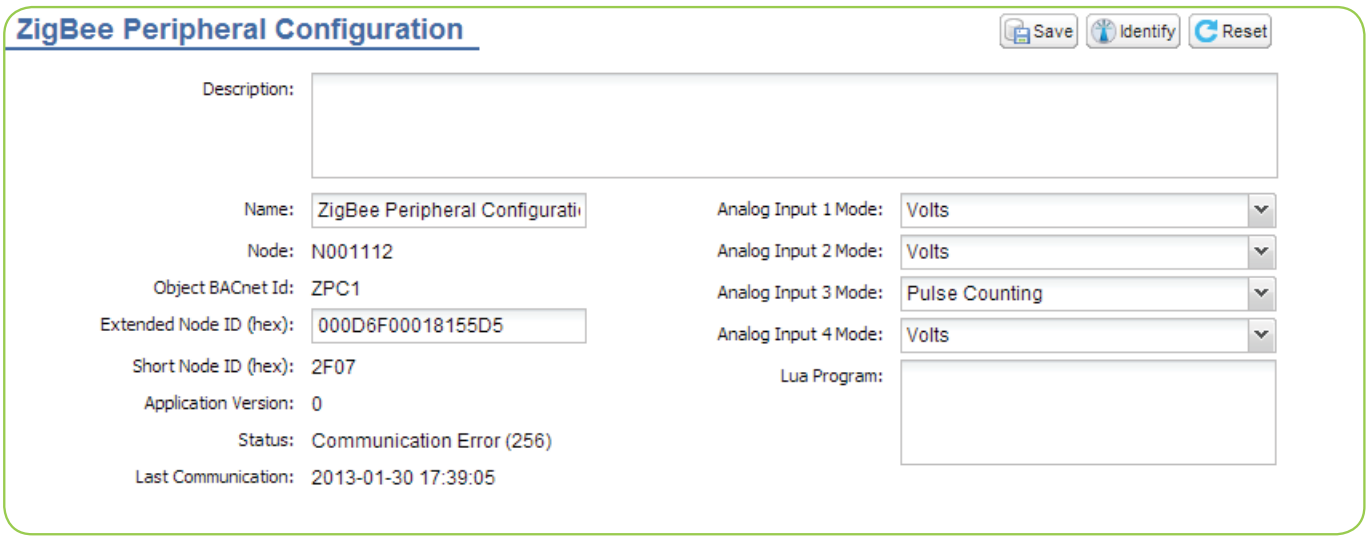
The SED-0 and SEC-TE can run a simple Lua script. This script can have a maximum of 225 characters (including spaces) and is used mostly to create a fail-safe control sequence when the ZigBee communication with the network is lost, or, to execute simple control tasks.

Tip: Optimization is the key! Do not hesitate to contact our Support Team to assist you in the development of an embedded script.

Pulse Counting– SEC-TE Only

Universal input AI3 of a SEC-TE can be configured as a pulse counter. In this configuration, pulses from a dry contact pulse source are counted, and the total gets stored in endpoint AI3 of the device firmware.

To activate particle counting, access the SEC-TE's **ZigBee Peripheral Configuration (ZPC1)** object in Building Expert and select **Pulse Counting** from **Analog Input Mode 3**.



Technical Specifications

SED-0

Power	
Voltage	24 VAC; +/-15%; 50/60Hz; Class 2
Typical Consumption	5 VA
Enclosure	
Material	Rigid ABS
Dimensions	130mm (5.12in) X 73mm (2.87in)
Rating	UL94-5VA
Environmental	
Operating Temperature	0 °C (32 °F) to 60 °C (140 °F)
Storage Temperature	-20 °C (-4 °F) to 60 °C (140 °F)
Relative Humidity	0 to 90% non-condensing
Agency Approvals	UL 61010-1 (2007/12/17, 4th edition), CSA C22.2 # 61010-1 (1983/06/01, R2009), IEC 61010-1 (2001/02/01 Corrigendum#2 2003/04), CENELEC EN 61326-1 (2006/05/01), FCC 47CFR 15B cIB (2011/04/21), ICES-003 Issue 4 (2004), CE, RoHS
Inputs	
Quantity	2
Voltage	0-10 Volts
Current	4-20 mA with 249 Ohms external resistor
Resistance	1 kOhms to 100 kOhms
Resolution	14- bit
ZigBee Transceiver	
Communication	Zigbee Pro
Frequency	2400 – 2483.5 MHz, 16 RF channels
Data rate / Mod. type	250 kbps
Receiver Sensitivity	-101dBm / -105dBm (amplified)
Nominal Output Power	8dBm / 18dBm (amplified)
Range	Up to 300m open air , Up to 100m in building
Antenna	Internal
Actuator Technical Data	
Communication	Zigbee Pro
Frequency	2400 – 2483.5 MHz, 16 RF channels
Data rate / Mod. type	250 kbps
Receiver Sensitivity	-101dBm / -105dBm (amplified)
Nominal Output Power	8dBm / 18dBm (amplified)
Range	Up to 300m open air , Up to 100m in building
Antenna	Internal

SEC-TE

Power	
Voltage	24 VAC; +/-15%; 50/60Hz; Class 2 / 24 VDC +/-10% 115 VAC; 230 VAC;
Typical Consumption	10 VA (Unloaded)
Enclosure	
Material	Rigid ABS
Dimensions	176mm (6.93in) X 108mm (4.25in)
Rating	UL94-5VA
Mounting	Din-rail, wall or ceiling mount
Environmental	
Operating Temperature	0 °C (32 °F) to 60 °C (140 °F)
Storage Temperature	-20 °C (-4 °F) to 60 °C (140 °F)
Relative Humidity	0 to 90% non-condensing
Agency Approvals	UL 61010-1 (2007/12/17, rev 2010/06/04), CSA C22.2 # 205 (1983/06/01, R2009), IEC 61010-1 (2001/02/01 Corrigendum#2 2003/04), CENELEC EN 61326-1 (2006/05/01), FCC 47CFR 15B cIB (2011/04/21), ICES-003 Issue 4 (2004), CE, RoHS
Inputs	
Quantity	4
Voltage	0-10 Volts
Current	4-20 mA with 249 Ohms external resistor
Resistance	1 kOhms to 100 kOhms
Resolution	14 bits
Outputs	
Analog (x4)	0-12V nominal 50 mA max each 12 bit resolution
Relay (x5)	24VAC, 5A per relay
Pulse Counting	
Inputs	1 (AI3)
Pulse source	Dry Contact
Period minimum	5 ms (200 Hz)
Duty Cycle	10%-50%
Count resolution	1 pulse
Accuracy	99.9% @ 200 Hz
ZigBee Transceiver	
Communication	Zigbee Pro
Frequency	2400 – 2483.5 MHz, 16 RF channels
Data rate / Mod. Type	250 kbps
Receiver Sensitivity	-101dBm / -105dBm (amplified)
Nominal Output Power	8dBm / 18dBm (amplified)
Range	Up to 300m open air ; Up to 100m in building
Antenna	Internal or (Optimal) External Whip, RP SMA 2.5 dBi

Compliance

ZigBee radio module: ETRX357 / ETRX357HR

- Contain FCC ID:S4GEM35XA
- Contain IC ID: 8735A-EM35XA

ZigBee long range radio module: ETRX357LRS / ETRX357HRLRS

- Contain FCC ID: S4GEM35X2

These enclosed devices comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- Device may not cause harmful interference.
- Device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by Schneider Electric could void the user's authority to operate the equipment.

RoHS & WEEE

The European Union has issued directives on the Restriction of Hazardous Substances (RoHS), Directive 2002/95/EC and Waste Electrical, and Electronic Equipment (WEEE), Directive 2002/96EC.

Schneider Electric is committed to comply with applicable requirements stated in the RoHS Directive which presently restricts the use of lead, mercury, cadmium, hexavalent chromium and two bromine-containing flame retardants, PBB (polybrominated biphenyls) and PBDE (polybrominated diphenyl ethers), in certain electrical and electronic products.

Additionally, Schneider Electric is dedicated to minimizing the impact our products have on the environment. The WEEE Directive aims to reduce waste arising from electrical and electronic equipment, and to improve the environmental performance of all those involved in the life cycle of these products.

Waste Electrical and Electronic Equipment (WEEE) Returns

In the European Union (EU) the processing of waste electrical and electronic equipment (WEEE) is now subject to legislation to encourage treatment and recycling measures to minimise the amount of such waste ultimately disposed to landfills. The objective of the EU WEEE Directive is to protect and improve the quality of the environment. In particular, the EU WEEE Directive 2002/96/EC (the WEEE Directive) requires the Producer or Importer of electronic equipment be held responsible for the collection, recycling and treatment of WEEE which the Producer has placed on the EU market effective 13 August, 2005.

For more information and documentation visit our website at:

documentation.smartstruxurelite.com