SmartPlug Manual

Version	Written By	Date	Change List
1.0	Yongqi	20170704	Initial
1.1	Yongqi	20170713	Add Meter Enable Configuration
1.2	Yongqi	20170826	Add "Product Test Mode" Operation
1.3	Yongqi	20170901	Modify Some Command Classes Version Number
1.4	YOngqi	20180309	Add Descriptions for SmartStart

SmartPlug is a universal, Z-Wave™ Plus compatible and relay switch in the form of a socket adapter. The device may be used to operate any device up to 3000w power output. The device features voltage, current, active power and power consumption measuring.

This product can be included and operated in any Z-Wave™ network with other Z-Wave™ certified devices from other manufacturers and/or other applications. All non-battery operated nodes within the network will act as repeaters regardless of vendor to increase reliability of the network.

Z-Wave™ Network Inclusion/Exclusion/Reset

There is one button on the top side of the device, it can be executed inclusion, exclusion and reset from Z-Wave™ network.

Add[1]	1、 Power up the device. 2、 Set Z-Wave™ Controller into inclusion mode 3、 Press the button 3 times within 1.5s to enter inclusion mode. 4、 The device will be recognized and automatically included into Z-Wave™ Network.	Led will blink with 1s interval until inclusion successful.
Remove	1、 Power up the device. 2、 Set Z-Wave™ Controller into exclusion mode 3、 Press the button 3 times within 1.5s to enter exclusion mode	Led will blink 3 times with 0.5s interval.
Factory Reset[2]	1、 Power up the device. 2、 Press and hold the button for 10s until led lights is on, then release the button.	Reset successfully, led will blink 5 times.
Product Test Mode	1、 Press and hold the button. 2、 Power on the device, device will enter factory product test mode	Led will blink with 100ms interval.
Send NIF[3]	Press the button 3 times within 1.5s	Led will blink 3 times

Notice 1: When device enters into inclusion mode, the device all functionality will be useless. The inclusion mode will be timeout after 30s, user can press the button 3 times within 1.5s to terminate inclusion mode.

Notice 2: Factory Reset will clear the device all Z-Wave™ Network data (include home id, node id, etc…) saved in memory, and restore all configuration parameters to factory default. Please use this procedure only when the network primary controller is missing or otherwise inoperable.

Notice 3: NIF – Node Infomation

Association

The device supports 2 association groups, and each group supports max 5 associated nodes.

Group 1, Lifeline – All nodes which associated in group 1(lifeline group) will receive the messages that send by device through lifeline.

Group 2, all nodes which associated in group 2 will be controlled by device through BASIC_SET command. When device detect a over-current event, the device will trigger a OCP Alarm and send a notification report to controller, the meantime device also send a BASIC_SET = 0xFF to the nodes that associated in group 2.

The Command Class supported by each association group is shown in the table below:

Group	Command Class	Command
1 (Lifeline)	COMMAND_CLASS _SWITCH_BINARY COMMAND_CLASS_METER COMMAND_CLASS_NOTIFICATION COMMAND_CLASS_DEVICE_RESET_LOCALLY	SWITCH_BINARY_REPORT METER_REPORT NOTIFICATION_REPORT DEVICE_RESET_LOCALLY_NOTIFICATION
2 (Control)	COMMAND_CLASS_BASIC	BASIC_SET

Device Functionality and Z-Wave™ Message Report

The SmartPlug has four main functions: Switch On/Off, electrical parameters measurement over-current protection, and timing.

Switch On/Off

There are three ways of controlling the outlet switch:
1) Press the button shortly
2) Operated the device Via Z-Wave™ Controller or Others Devices that associated it by Command Class list as below table.

Wall Plug State	Command Class	Command	Value
ON	COMMAND_CLASS_SWITCH_BINARY	SWITCH_BINARY_SET	0xFF
	COMMAND_CLASS_BASIC	BASIC_SET	0xFF
OFF	COMMAND_CLASS_SWITCH_BINARY	SWITCH_BINARY_SET	0x00
	COMMAND_CLASS_BASIC	BASIC_SET	0x00

Electrical Parameters Measuring

The device provides line voltage (V), loaded current (A), active power (W), and accumulated energy consumed (kWh) measurement; the significant digits of the measured result should be two digits after the decimal point;

These electrical parameters result will be reported to the Z-Wave™ controller regularly through the Meter Report of Meter Command Class, the interval of which can be configured by the user by means shown in "**Configuration: No.7**"

The device also provides the function of reporting the measurement results to the Z-Wave™ controller when the load current changes and the user can set the changed quantity of the load current freely by means shown in "Configuration**: No.9**"

The electric quantity detection result is reported to Command Class

Command Class	Command	Scale	Precision
COMMAND_CLASS_METER	METER_REPORT	kWh	0.01kWh
		Watt	0.01W
		Volt	0.01V
		Ampere	0.01A

The max accumulate energy is **21474836.47**kWh, if it is over this value, it will be back to 0kWh automatically.

Over-current Protection

The outlet can provide a maximum load current of 16A, and when the load current exceeds 16A, the load power supply will be automatically cut off. And it will inform the host of the overload of the outlet through NOTIFICATION_REPORT of the Notification Command Class, and meanwhile, the LED light of the outlet will flash with an interval of one second; Users can remove the overload alarm by pressing the button or sending SWITCH_BINARY_SET=0xFF, and for safety's sake, before that, users should remove the load from the outlet first.

Users can control the maximum output current of the outlet by setting the maximum output current, the setting method of which is shown in "**Configuration: No. 8**".

Overload protection communication Command Class

Command Class	COMMAND_CLASS_NOTIFICATION
Command	NOTIFICATION_REPORT
Type	NOTIFICATION_TYPE_POWER_MANAGEMENT (0x08)
Event	NOTIFICATION_EVENT_POWER_MANAGEMENT_OVERLOAD_DETECTED (0x08)

Timer

The device also provides the function of timing, and users can turn off the outlet by opening this function and setting the time cycle, the setting method of which is shown in "**Configuration: No.4 - 5**".

Command Class Configuration

The device supports the controller to configure parameters of the device through Configuration Command Class, and the device has 9 parameters available for users to set according to their different needs:

1) Relay On/Off state Saved Disable

   Sets this configuration to '1', the device will save the current relay state, and after the device is powered down and restarted, it will automatically recover to the relay state before power-down.

Parameter Number	Size (Byte)	Available Settings	Default value
1	1	0, 1	1

2) Button Switch Function Disable

   Setting this configuration as '0' will be disabling to turn on and off the relay by pressed button.

Parameter Number	Size (Byte)	Available Settings	Default value
2	1	0, 1	1

3) LED indication Disable

   Setting this configuration as '0' will disable led light on when turn on the device. This setting is invalid during device power-up.

Parameter Number	Size (Byte)	Available Settings	Default value
3	1	0, 1	1

4) Timer Enable

   Setting this configuration as '1' will start the timing function of the plug, and the length of time is determined by the setting of "**Configuration: No.5**".
   This function can only provide the time to turn off device function when the device is open.

Parameter Number	Size (Byte)	Available Settings	Default value
4	1	0, 1	0

5) Timing Length Setting

   This configuration sets the time length for turning off the device. This configuration is only valid when "**Configuration No.4**" is set to '1'. Unit: minute.

Parameter Number	Size (Byte)	Available Settings	Default value (min)
5	2	0 ~ 32767	120

6) Meter reporting function Disable

   This configuration sets the meter report function enabled or disabled.
   '0' – Disable meter measuring and reporting functions whatever others configurations
   '1' – Enable meter measuring and reporting function.
   When device is detected an OCP event or the relay turned on or turned off, device still will

report all meter values once if this configuration sets to '0'.

Parameter Number	Size (Byte)	Available Settings	Default value
6	1	0, 1	1

7) Interval of meter reporting setting

This configuration sets the interval of reporting electric quantity detection result. This parameter is only valid when Parameter 6 is set as '1'. Unit: Second.

Parameter Number	Size (Byte)	Available Settings	Default value
7	2	30 ~ 32767	300

8) Maximum output current setting

This configuration sets the maximum output current that the device can provide. When the current consumed by the load is greater than the setting value, the device will automatically cut off the power of the load and send out alarm information. Unit: A (Ampere).
This value must be great than the alarm value defined in **Parameter 10**.

Parameter Number	Size (Byte)	Available Settings	Default value (A)
8	1	1 ~ 16	16

9) Current Differential Setting

This configuration sets the changed value of the load current (volatility). When the differential between two measurements of current consumed by the load exceeds the value set by this configuration, the device will report the last measured results automatically to the controller.
The changed value = [Value] $\times$ 0.01A.

Parameter Number	Size (Byte)	Available Settings	Default value
9	2	1 ~ 1600	50

10) Current Alarm Value

This configuration sets the alarm value of the load current (volatility). When the load current is large than this value, the led will be indicated with yellow. Unit: A (Ampere).
This value must be less than the max. output value defined in **Parameter 8**.

Parameter Number	Size (Byte)	Available Settings	Default value
10	1	1 ~ 15	13

SmartStart

This device supports SmartStart function. QR code printed by laser can be found on surface of product and the outside of packing box. And the full DSK code is printed can be found on the packing box.
The device will enter SmartStart if the device is not included in network after power up. And then
2nd SmartStart time delay approximately 16s
3rd SmartStart time delay approximately 32s

4th SmartStart time delay approximately 64s
5th SmartStart time delay approximately 128s
6th SmartStart time delay approximately 256s
7th SmartStart time delay approximately 512s

Afterwards, the Smartstart mode will be auto running with 512 second interval until device is included successfully.

Security Network

The device supports the security function with and S2 + SmartStart encrypted communication. The device will auto switch to the security mode when the device included with a security controller. In the security mode, the follow commands must use security or security_2 command class wrapped to communicate, otherwise the device will not response any commands.

Security Keys

This device supports security levels are listed in below table:

Security Levels	Support (Yes/No)
SECURITY_KEY_S0	Yes
SECURITY_KEY_S2_UNAUTHENTICATED	Yes
SECURITY_KEY_S2_AUTHENTICATED	Yes
SECURITY_KEY_S2_ACCESS	No

All Supports Command Class

This device supports Z-Wave Command Class as follows:

* COMMAND_CLASS_ZWAVEPLUS_INFO (V2)
* COMMAND_CLASS_SECURITY (V1)
* COMMAND_CLASS_SECURITY_2 (V1)
* COMMAND_CLASS_TRANSPORT_SERVICE (V2)
* COMMAND_CLASS_VERSION (V3)
* COMMAND_CLASS_POWERLEVEL (V1)
* COMMAND_CLASS_ASSOCIATION (V2)
* COMMAND_CLASS_MULTI_CHANNEL (V4)
* COMMAND_CLASS_MULTI_CHANNEL_ASSOCIATION (V3)
* COMMAND_CLASS_ASSOCIATION_GRP_INFO (V1)
* COMMAND_CLASS_MANUFACTURER_SPECIFIC (V2)
* COMMAND_CLASS_DEVICE_RESET_LOCALLY (V1)
* COMMAND_CLASS_SWITCH_BINARY (V2)
* COMMAND_CLASS_METER (V4)

* COMMAND_CLASS_NOTIFICATION (V8)
* COMMAND_CLASS_CONFIGURATION (V1)
* COMMAND_CLASS_SUPERVISION (V1)

All Security Command Class in Security Network

The Z-Wave Command Classes are secured in security network as follows:

* COMMAND_CLASS_VERSION (V2)
* COMMAND_CLASS_POWERLEVEL (V1)
* COMMAND_CLASS_ASSOCIATION (V2)
* COMMAND_CLASS_MULTI_CHANNEL (V4)
* COMMAND_CLASS_MULTI_CHANNEL_ASSOCIATION (V3)
* COMMAND_CLASS_ASSOCIATION_GRP_INFO (V1)
* COMMAND_CLASS_MANUFACTURER_SPECIFIC (V2)
* COMMAND_CLASS_DEVICE_RESET_LOCALLY (V1)
* COMMAND_CLASS_SWITCH_BINARY (V2)
* COMMAND_CLASS_METER (V4)
* COMMAND_CLASS_NOTIFICATION (V8)
* COMMAND_CLASS_CONFIGURATION (V1)

Non-Secure Command Class in Secure Network

Unsecure Command Class which included in a secure Z-Wave Network is listed in unsecure node information.

* COMMAND_CLASS_ZWAVEPLUS_INFO (V2)
* COMMAND_CLASS_SECURITY (V1)
* COMMAND_CLASS_SECURITY_2 (V1)
* COMMAND_CLASS_TRANSPORT_SERVICE (V2)
* COMMAND_CLASS_SUPERVISION (V1)

Led Action Indicator

LED Color	Led Display Status	Description
Pink	Blink 5 Times (1s Interval)	Power on and Not Add in Z-Wave Network
	Blink 3 Times (500ms Interval)	Device has Added in a Z-Wave network: 1, Send a Node Information. 2, Enter Exclusion Mode.
Blue	Blink 5 Times (300ms Interval)	Power on and Already Add in a Z-Wave Network

Yellow	Blink 15[1] Times (1s Interval)	Device has not Added in any Z-Wave network: 1, Send a Node Information 2, Enter Inclusion Mode
	Blink 15 Times (2s Interval)	Device Is Being in Inclusion Mode and Wait for Configuration Finished.
	Light On Always	The Output Current Is Large than the Value that Defined by Configuration No. 4
Red	Blink 3 Times (300ms Interval)	Terminate the Inclusion Mode
	Blink with 2s interval always	OCP Occurred.
Green	Light On Always	Relay Is Turned On.

Notice 1: If controller is entering inclusion mode also, the times for led blinking are uncertain with different Z-Wave controller. It will blink with 2s interval after controller allocates a node id to device.

Specifications

Power Supply	110 – 230V AC, ±10%, 50/60Hz
Rated Load Current	10A, 110 – 230V, 50/60Hz, Continuous Load
Power Consumption	Up to 0.8W
Power Output:	Max 3000W for Continuous Load Max. 4000W for Momentary Load (For Resistive Load)
Operational Temperature	0 - 70℃
Communication frequency	868.40MHz, 869.85MHz (EU) 908.40MHz, 916.00MHz(US)
Range	Up to 45m indoors (depending on the building structure), and 80m for outdoor open fields. Up to 60m outdoors.